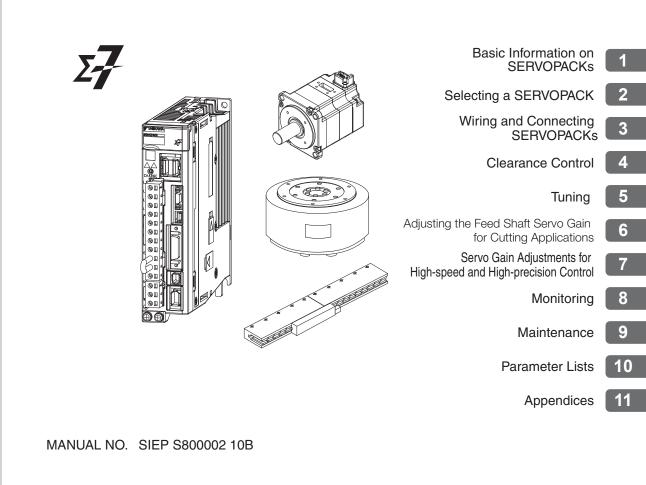
YASKAWA

$\label{eq:served} \begin{array}{l} \Sigma \mbox{-7-Series AC Serve Drive} \\ \Sigma \mbox{-7S SERVOPACK with} \\ \mbox{FT/EX Specification} \\ \mbox{for Cutting Application} \\ \mbox{for Cutting Application} \\ \mbox{Feed Shaft Motor} \\ \mbox{Product Manual} \end{array}$

Model: SGD7S-DDDA20ADDF21D



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About this Manual

This manual describes the feed shaft motor drive of the Σ -7-Series AC Servo Drive Σ -7S SERVO-PACKs for cutting applications.

Read and understand this manual to ensure correct usage of the $\Sigma\text{-}7\text{-}Series$ AC Servo Drives.

Keep this manual in a safe place so that it can be referred to whenever necessary.

Outline of Manual

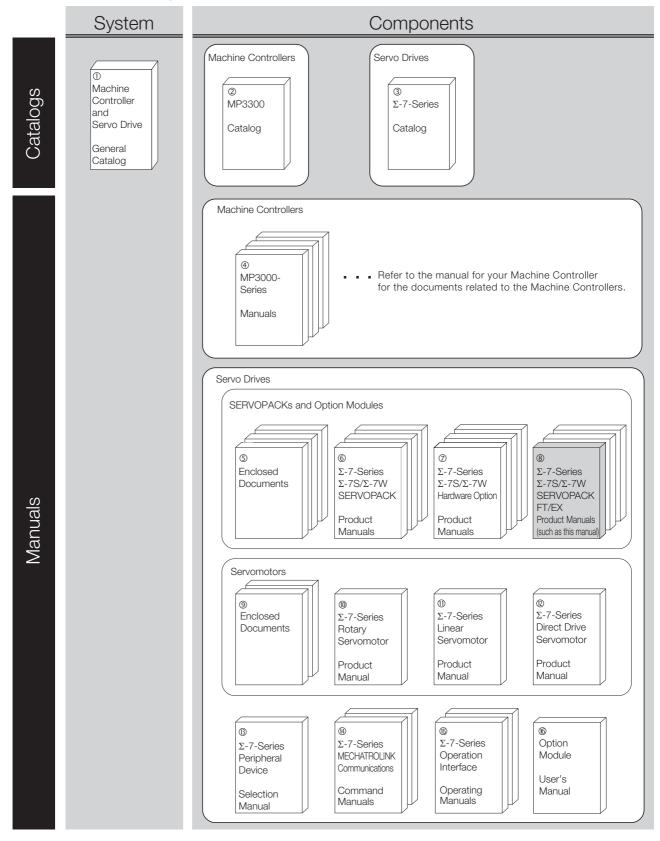
The contents of the chapters of this manual are described in the following table. When you use the SERVOPACK, read this manual and the product manual given in the following table.

	ltem	This Manual	Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)
	The Σ -7 Series	Ι	1.1
	Product Introduction	1.1	-
	Interpreting the Nameplates	_	1.2
	Part Names	-	1.3
Basic Informa-	Model Designations	1.2	-
tion on	Combinations of SERVOPACKs and Servomotors	1.3	_
SERVOPACKs	Functions	1.4	_
	Restrictions	1.5	-
	SigmaWin+	1.6	-
	Combining the SERVOPACKs with MP-Series Machine Controllers and the MPE720 Engineering Tool	1.7	-
	Ratings	2.1	_
	Overload Protection Characteristics	2.2	_
	Specifications	2.3	_
Selecting a SERVOPACK	Block Diagrams	-	2.2
	External Dimensions	-	2.3
	Examples of Standard Connections between SERVO- PACKs and Peripheral Devices	_	2.4
SERVOPACK In	stallation	-	Chapter 3
	Wiring Precautions	-	4.1
	Basic Wiring Diagrams	3.1	_
	Wiring the Power Supply to the SERVOPACK	-	4.3
Wiring and	Wiring Servomotors	-	4.4
Connecting	I/O Signal Connections	3.2	_
SERVOPAČKs	Connecting the Gap Sensor	3.3	_
	Connecting Safety Function Signals	_	4.6
	Connecting MECHATROLINK Communications Cables	_	4.7
	Connecting the Other Connectors	_	4.8
Basic Functions	That Require Setting before Operation	-	Chapter 5
Clearance Cont	rol	Chapter 4	_

			Continued from previous page.
	Item	This Manual	Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)
Application Fur	nctions	_	Chapter 6
Trial Operation	and Actual Operation	_	Chapter 7
Tuning		Chapter 5	-
Adjusting the F	eed Shaft Servo Gain for Cutting Applications	Chapter 6	_
Servo Gain Adj	ustment for High-speed and High-precision Control	Chapter 7	_
Monitoring		Chapter 8	-
Fully-Closed Lo	oop Control	-	Chapter 10
Safety Function	IS	-	Chapter 11
	Inspections and Part Replacement	-	12.1
	Alarm Displays	9.1	_
	List of Alarms	9.1.1	-
	Troubleshooting Alarms	9.1.2	_
	Resetting Alarms	-	12.2.3
	Displaying Alarm History	-	12.2.4
Maintenance	Clearing the Alarm History	-	12.2.5
	Resetting Alarms Detected in Option Modules	-	12.2.6
	Resetting Motor Type Alarms	-	12.2.7
	Warning Displays	9.2	_
	Monitoring Communications Data during Alarms or Warnings	-	12.4
	Troubleshooting Based on the Operation and Condi- tions of the Actuator		-
Parameter Lists	3	Chapter 10	-
	Interpreting Panel Displays	-	14.1
Appendices			-

Related Documents

The relationships between the documents that are related to the Servo Drives are shown in the following figure. The numbers in the figure correspond to the numbers in the table on the following pages. Refer to these documents as required.



Classification	Document Name	Document No.	Description
① Machine Controller and Servo Drive General Catalog	Machine Controller and AC Servo Drive Solutions Catalog	KAEP S800001 22	Describes the features and application examples for combinations of MP3000-Series Machine Controllers and Σ -7-Series AC Servo Drives.
② MP3300 Catalog	Machine Controller MP3300	KAEP C880725 03	Provides detailed information on MP3300 Machine Controllers, including features and specifica- tions.
③ Σ-7-Series Catalog	AC Servo Drives Σ -7 Series	KAEP S800001 23	Provides detailed information on Σ - 7-Series AC Servo Drives, including features and specifications.
④ MP3000-Series Manuals	Machine Controller MP3000 Series MP3300 Product Manual	SIEP C880725 21	Describes the functions, specifica- tions, operating methods, mainte- nance, inspections, and troubleshooting of the MP3000- series MP3300 Machine Control- lers.
	Σ -7-Series AC Servo Drive Σ -7S and Σ -7W SERVOPACK Safety Precautions	TOMP C710828 00	Provides detailed information for the safe usage of Σ -7-Series SERVOPACKs.
	Σ-V-Series/Σ-V-Series for Large-Capacity Models/ Σ-7-Series Safety Precautions Option Module	TOBP C720829 00	Provides detailed information for the safe usage of Option Modules.
	Σ -V-Series/ Σ -V-Series for Large-Capacity Models/ Σ -7-Series Installation Guide Command Option Module	TOBP C720829 01	Provides detailed procedures for installing a Command Option Mod- ule in a SERVOPACK.
్త Enclosed Documents	Σ -V-Series/ Σ -V-Series for Large-Capacity Models/ Σ -7-Series Installation Guide Fully-closed Module	TOBP C720829 03	Provides detailed procedures for installing the Fully-closed Module in a SERVOPACK.
	Σ-V-Series/Σ-V-Series for Large-Capacity Models/ Σ-7-Series Installation Guide Safety Module	TOBP C720829 06	Provides detailed procedures for installing the Safety Module in a SERVOPACK.
	Σ -V-Series/ Σ -V-Series for Large-Capacity Models/ Σ -7-Series Installation Guide Indexer Module	TOBP C720829 02	Provides detailed procedures for installing the Indexer Module in a SERVOPACK.
	Σ-V-Series/Σ-V-Series for Large-Capacity Models/ Σ-7-Series Installation Guide DeviceNet Module	TOBP C720829 07	Provides detailed procedures for installing the DeviceNet Module in a SERVOPACK.

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Classification	Document Name	Document No.	Description	
	Σ -7-Series AC Servo Drive Σ -7S SERVOPACK with MECHATROLINK-III Communications References Product Manual	SIEP S800001 28		
	Σ -7-Series AC Servo Drive Σ -7S SERVOPACK with MECHATROLINK-II Communications References Product Manual	SIEP S800001 27		
⑥ Σ-7-Series Σ-7S/Σ-7W	Σ -7-Series AC Servo Drive Σ -7S SERVOPACK with Analog Voltage/Pulse Train References Product Manual	SIEP S800001 26	Provide detailed information on selecting Σ -7-Series SERVO-PACKs and information on install-	
SERVOPACK Product Manuals	Σ -7-Series AC Servo Drive Σ -7S SERVOPACK Command Option Attachable Type with INDEXER Module Product Manual	SIEP S800001 64	ing, connecting, setting, performing trial operation for, tuning, and mon- itoring the Servo Drives.	
	Σ -7-Series AC Servo Drive Σ -7S SERVOPACK Command Option Attachable Type with DeviceNet Module Product Manual	SIEP S800001 70		
	Σ -7-Series AC Servo Drive Σ -7W SERVOPACK with MECHATROLINK-III Communications References Product Manual	SIEP S800001 29		
 Ø Σ-7-Series Σ-7S/Σ-7W SERVOPACK with 	Σ -7-Series AC Servo Drive Σ -7S/ Σ -7W SERVOPACK with Hardware Option Specifications Dynamic Brake Product Manual	SIEP S800001 73	Provides detailed information on Hardware Options for Σ -7-Series	
Specifications Product Manuals	$\begin{array}{l} \Sigma\text{-}7\text{-}Series \mbox{ AC Servo Drive}\\ \Sigma\text{-}7W \mbox{ SERVOPACK with}\\ \mbox{ Hardware Option Specifications}\\ \mbox{ HWBB Function}\\ \mbox{ Product Manual} \end{array}$	SIEP S800001 72	SERVOPACKs.	

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Classification	Document Name	Document No.	Description	
	Σ -7-Series AC Servo Drive Σ -7S SERVOPACK with FT/EX Specification for Indexing Application Product Manual	SIEP S800001 84		
	Σ -7-Series AC Servo Drive Σ -7S SERVOPACK with FT/EX Specification for Tracking Application Product Manual	SIEP S800001 89		
® Σ-7-Series Σ-7S/Σ-7W SERVOPACK with FT/EX	Σ -7-Series AC Servo Drive Σ -7S SERVOPACK with FT/EX Specification for SGM7D Motor Product Manual	SIEP S800001 91	Provides detailed information on the FT/EX Option for Σ-7-Series SERVOPACKs.	
Specification Product Manuals	Σ -7-Series AC Servo Drive Σ -7S SERVOPACK with FT/EX Specification for Press and Injection Molding Application Product Manual	SIEP S800001 94		
	Σ -7-Series AC Servo Drive Σ -7S SERVOPACK with FT/EX Specification for Cutting Application Feed Shaft Motor Product Manual	This manual (SIEP S800002 10)		
9	AC Servo Drive Rotary Servomotor Safety Precautions	TOBP C230260 00	Provides detailed information for the safe usage of Rotary Servomo- tors and Direct Drive Servomotors.	
Enclosed Documents	AC Servomotor Linear Σ Series Safety Precautions	TOBP C230800 00	Provides detailed information for the safe usage of Linear Servomo- tors.	
[®] Σ-7-Series Rotary Servomotor Product Manual	Σ-7-Series AC Servo Drive Rotary Servomotor Product Manual	SIEP S800001 36		
^{1)]} Σ-7-Series Linear Servomotor Product Manual	Σ-7-Series AC Servo Drive Linear Servomotor Product Manual	SIEP S800001 37	Provide detailed information on selecting, installing, and connecting the Σ -7-Series Servomotors.	
© Σ-7-Series Direct Drive Servomotor Product Manual	Σ-7-Series AC Servo Drive Direct Drive Servomotor Product Manual	SIEP S800001 38		
^{1)]} Σ-7-Series Peripheral Device Selection Manual	Σ-7-Series AC Servo Drive Peripheral Device Selection Manual	SIEP S800001 32	Describes the peripheral devices for a Σ -7-Series Servo System.	

Classification	Document Name	Document No.	Continued from previous page. Description
Classification	Document Name	Document No.	Description
[@] Σ-7-Series	Σ-7-Series AC Servo Drive MECHATROLINK-II Communications Command Manual	SIEP S800001 30	Provides detailed information on the MECHATROLINK-II communications commands that are used for a Σ -7-Series Servo System.
MECHATROLINK Communications Command Manuals	Σ-7-Series AC Servo Drive MECHATROLINK-III Communications Standard Servo Profile Command Manual	SIEP S800001 31	Provides detailed information on the MECHATROLINK-III communi- cations standard servo profile com- mands that are used for a Σ-7- Series Servo System.
[®] Σ-7-Series Operation Interface Operating Manuals	Σ-7-Series AC Servo Drive Digital Operator Operating Manual	SIEP S800001 33	Describes the operating proce- dures for a Digital Operator for a Σ -7-Series Servo System.
	AC Servo Drive Engineering Tool SigmaWin+ Operation Manual	SIET S800001 34	Provides detailed operating proce- dures for the SigmaWin+ Engineer- ing Tool for a Σ -7-Series Servo System.
® Option Module User's Manual	Σ-V-Series/Σ-V-Series for Large-Capacity Models/ Σ-7-Series User's Manual Safety Module	SIEP C720829 06	Provides details information required for the design and mainte- nance of a Safety Module.

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Using This Manual

◆ Technical Terms Used in This Manual

The following terms are used in this manual.

Term	Meaning	
Servomotor	A Σ-7-Series Rotary Servomotor, Direct Drive Servomotor, or Linear Servomotor.	
Rotary Servomotor	A generic term used for a Σ -7-Series Rotary Servomotor (SGM7J, SGM7A, SGM7P, or SGM7G) or a Direct Drive Servomotor (SGMCS or SGMCV). The descriptions will specify when Direct Drive Servomotors are excluded.	
Linear Servomotor	A Σ-7-Series Linear Servomotor (SGLG, SGLF, SGLT, or SGLC).	
SERVOPACK	A Σ -7-Series Σ -7S Servo Amplifier with MECHATROLINK-III Communications References.	
Servo Drive	The combination of a Servomotor and SERVOPACK.	
Servo System	A servo control system that includes the combination of a Servo Drive with a host controller and peripheral devices.	
servo ON	Supplying power to the motor.	
servo OFF	Not supplying power to the motor.	
base block (BB)	Shutting OFF the power supply to the motor by shutting OFF the base current to the power transistor in the SERVOPACK.	
servo lock	A state in which the motor is stopped and is in a position loop with a position reference of 0.	
Main Circuit Cable	One of the cables that connect to the main circuit terminals, including the Main Circuit Power Supply Cable, Control Power Supply Cable, and Servomotor Main Circuit Cable.	
SigmaWin+	The Engineering Tool for setting up and tuning Servo Drives or a computer in which the Engineering Tool is installed.	

Differences in Terms for Rotary Servomotors and Linear Servomotors

There are differences in the terms that are used for Rotary Servomotors and Linear Servomotors. This manual primarily describes Rotary Servomotors. If you are using a Linear Servomotor, you need to interpret the terms as given in the following table.

Rotary Servomotors	Linear Servomotors
torque	force
moment of inertia	mass
rotation	movement
forward rotation and reverse rotation	forward movement and reverse movement
CW and CCW pulse trains	forward and reverse pulse trains
rotary encoder	linear encoder
absolute rotary encoder	absolute linear encoder
incremental rotary encoder	incremental linear encoder
unit: min ⁻¹	unit: mm/s
unit: N⋅m	unit: N

Notation Used in this Manual

Notation for Reverse Signals

The names of reverse signals (i.e., ones that are valid when low) are written with a forward slash (/) before the signal abbreviation.

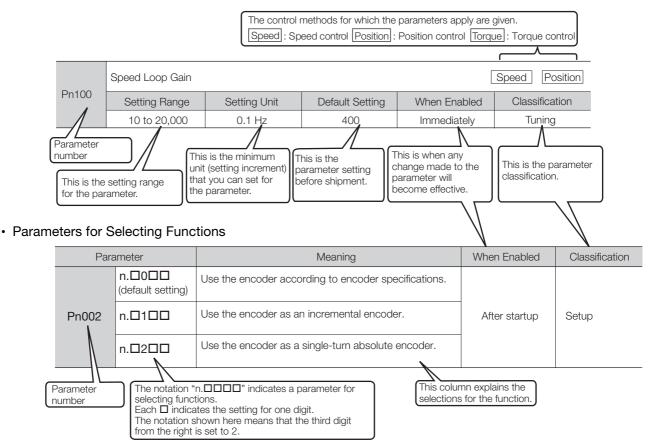
Notation Example

BK is written as /BK.

Notation for Parameters

The notation depends on whether the parameter requires a numeric setting (parameter for numeric setting) or requires the selection of a function (parameter for selecting functions).

Parameters for Numeric Settings



Notation Example

Notation Examples for Pn002

	Digit Notation		Numeric Value Notation	
n.0000 Notation Meaning		Notation	Meaning	
Pn002 = n.□□□X Pn002 = n.□□X		Indicates the first digit from the right in Pn002.	Pn002 = n.□□□1	Indicates that the first digit from the right in Pn002 is set to 1.
		Indicates the second digit from the right in Pn002.	Pn002 = n.□□1□	Indicates that the second digit from the right in Pn002 is set to 1.
	Pn002 = n.□X□□	Indicates the third digit from the right in Pn002.	Pn002 = n.⊡1⊡⊡	Indicates that the third digit from the right in Pn002 is set to 1.
	Pn002 = n.X□□□	Indicates the fourth digit from the right in Pn002.	Pn002 = n.1□□□	Indicates that the fourth digit from the right in Pn002 is set to 1.

Engineering Tools Used in This Manual

This manual uses the interfaces of the SigmaWin+ for descriptions.

♦ Trademarks

- QR code is a trademark of Denso Wave Inc.
- MECHATROLINK is a trademark of the MECHATROLINK Members Association.
- Other product names and company names are the trademarks or registered trademarks of the respective company. "TM" and the ® mark do not appear with product or company names in this manual.

Visual Aids

The following aids are used to indicate certain types of information for easier reference.

Important	Indicates precautions or restrictions that must be observed. Also indicates alarm displays and other precautions that will not result in machine damage.
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Indicates definitions of difficult terms or terms that have not been previously explained in this manual. Term

Example Indicates operating or setting examples.

Information Indicates supplemental information to deepen understanding or useful information.

Safety Precautions

Safety Information

To prevent personal injury and equipment damage in advance, the following signal words are used to indicate safety precautions in this document. The signal words are used to classify the hazards and the degree of damage or injury that may occur if a product is used incorrectly. Information marked as shown below is important for safety. Always read this information and heed the precautions that are provided.

🛕 DANGER

• Indicates precautions that, if not heeded, are likely to result in loss of life, serious injury, or fire.

• Indicates precautions that, if not heeded, could result in loss of life, serious injury, or fire.

• Indicates precautions that, if not heeded, could result in relatively serious or minor injury, or in fire.

NOTICE

• Indicates precautions that, if not heeded, could result in property damage.

Safety Precautions That Must Always Be Observed

General Precautions

- Read and understand this manual to ensure the safe usage of the product.
- Keep this manual in a safe, convenient place so that it can be referred to whenever necessary. Make sure that it is delivered to the final user of the product.
- Do not remove covers, cables, connectors, or optional devices while power is being supplied to the SERVOPACK.

There is a risk of electric shock, operational failure of the product, or burning.

- Use a power supply with specifications (number of phases, voltage, frequency, and AC/DC type) that are appropriate for the product. There is a risk of burning, electric shock, or fire.
- Connect the ground terminals on the SERVOPACK and Servomotor to ground poles according to local electrical codes (100 Ω or less for a SERVOPACK with a 100-VAC or 200-VAC power supply, and 10 Ω or less for a SERVOPACK with a 400-VAC power supply). There is a risk of electric shock or fire.
- Do not attempt to disassemble, repair, or modify the product. There is a risk of fire or failure. The warranty is void for the product if you disassemble, repair, or modify it.

- The SERVOPACK heat sinks, regenerative resistors, External Dynamic Brake Resistors, Servomotors, and other components can be very hot while power is ON or soon after the power is turned OFF. Implement safety measures, such as installing covers, so that hands and parts such as cables do not come into contact with hot components. There is a risk of burn injury.
- For a 24-VDC power supply, use a power supply device with double insulation or reinforced insulation.

There is a risk of electric shock.

- Do not damage, pull on, apply excessive force to, place heavy objects on, or pinch cables. There is a risk of failure, damage, or electric shock.
- The person who designs the system that uses the hard wire base block safety function must have a complete knowledge of the related safety standards and a complete understanding of the instructions in this document.

There is a risk of injury, product damage, or machine damage.

 Do not use the product in an environment that is subject to water, corrosive gases, or flammable gases, or near flammable materials.
 There is a risk of electric shock or fire.

- Do not attempt to use a SERVOPACK or Servomotor that is damaged or that has missing parts.
- Install external emergency stop circuits that shut OFF the power supply and stops operation immediately when an error occurs.
- In locations with poor power supply conditions, install the necessary protective devices (such as AC reactors) to ensure that the input power is supplied within the specified voltage range. There is a risk of damage to the SERVOPACK.
- Use a Noise Filter to minimize the effects of electromagnetic interference. Electronic devices used near the SERVOPACK may be affected by electromagnetic interference.
- Always use a Servomotor and SERVOPACK in one of the specified combinations.
- Do not touch a SERVOPACK or Servomotor with wet hands. There is a risk of product failure.

Storage Precautions

• Do not place an excessive load on the product during storage. (Follow all instructions on the packages.)

There is a risk of injury or damage.

NOTICE

- Do not install or store the product in any of the following locations.
 - Locations that are subject to direct sunlight
 - · Locations that are subject to ambient temperatures that exceed product specifications
 - Locations that are subject to relative humidities that exceed product specifications
 - · Locations that are subject to condensation as the result of extreme changes in temperature
 - · Locations that are subject to corrosive or flammable gases
 - · Locations that are near flammable materials
 - · Locations that are subject to dust, salts, or iron powder
 - Locations that are subject to water, oil, or chemicals
 - · Locations that are subject to vibration or shock that exceeds product specifications
 - Locations that are subject to radiation
 - If you store or install the product in any of the above locations, the product may fail or be damaged.

Transportation Precautions

- Transport the product in a way that is suitable to the mass of the product.
- Do not use the eyebolts on a SERVOPACK or Servomotor to move the machine. There is a risk of damage or injury.
- When you handle a SERVOPACK or Servomotor, be careful of sharp parts, such as the corners. There is a risk of injury.
- Do not place an excessive load on the product during transportation. (Follow all instructions on the packages.)

There is a risk of injury or damage.

- Do not hold onto the front cover or connectors when you move a SERVOPACK. There is a risk of the SERVOPACK falling.
- A SERVOPACK or Servomotor is a precision device. Do not drop it or subject it to strong shock. There is a risk of failure or damage.
- Do not subject connectors to shock. There is a risk of faulty connections or damage.
- If disinfectants or insecticides must be used to treat packing materials such as wooden frames, plywood, or pallets, the packing materials must be treated before the product is packaged, and methods other than fumigation must be used.

Example: Heat treatment, where materials are kiln-dried to a core temperature of 56°C for 30 minutes or more.

If the electronic products, which include stand-alone products and products installed in machines, are packed with fumigated wooden materials, the electrical components may be greatly damaged by the gases or fumes resulting from the fumigation process. In particular, disinfectants containing halogen, which includes chlorine, fluorine, bromine, or iodine can contribute to the erosion of the capacitors.

• Do not overtighten the eyebolts on a SERVOPACK or Servomotor. If you use a tool to overtighten the eyebolts, the tapped holes may be damaged.

Installation Precautions

- Install the Servomotor or SERVOPACK in a way that will support the mass given in technical documents.
- Install SERVOPACKs, Servomotors, regenerative resistors, and External Dynamic Brake Resistors on nonflammable materials.

Installation directly onto or near flammable materials may result in fire.

- Provide the specified clearances between the SERVOPACK and the control panel as well as with other devices.
 - There is a risk of fire or failure.
- Install the SERVOPACK in the specified orientation. There is a risk of fire or failure.
- Do not step on or place a heavy object on the product. There is a risk of failure, damage, or injury.
- Do not allow any foreign matter to enter the SERVOPACK or Servomotor. There is a risk of failure or fire.

- Do not install or store the product in any of the following locations.
 - Locations that are subject to direct sunlight
 - · Locations that are subject to ambient temperatures that exceed product specifications
 - Locations that are subject to relative humidities that exceed product specifications
 - Locations that are subject to condensation as the result of extreme changes in temperature
 - · Locations that are subject to corrosive or flammable gases
 - · Locations that are near flammable materials
 - · Locations that are subject to dust, salts, or iron powder
 - Locations that are subject to water, oil, or chemicals
 - · Locations that are subject to vibration or shock that exceeds product specifications
 - Locations that are subject to radiation
 - If you store or install the product in any of the above locations, the product may fail or be damaged.
- Use the product in an environment that is appropriate for the product specifications. If you use the product in an environment that exceeds product specifications, the product may fail or be damaged.
- A SERVOPACK or Servomotor is a precision device. Do not drop it or subject it to strong shock. There is a risk of failure or damage.
- Always install a SERVOPACK in a control panel.
- Do not allow any foreign matter to enter a SERVOPACK or a Servomotor with a Cooling Fan and do not cover the outlet from the Servomotor's cooling fan. There is a risk of failure.

Wiring Precautions

A DANGER

• Do not change any wiring while power is being supplied. There is a risk of electric shock or injury.

- Wiring and inspections must be performed only by qualified engineers. There is a risk of electric shock or product failure.
- Check all wiring and power supplies carefully. Incorrect wiring or incorrect voltage application to the output circuits may cause short-circuit failures. If a short-circuit failure occurs as a result of any of these causes, the holding brake will not work. This could damage the machine or cause an accident that may result in death or injury.
- Connect the AC and DC power supplies to the specified SERVOPACK terminals.
 - Connect an AC power supply to the L1, L2, and L3 terminals and the L1C and L2C terminals on the SERVOPACK.
 - Connect a DC power supply to the B1/ \oplus and \ominus 2 terminals and the L1C and L2C terminals on the SERVOPACK.
 - There is a risk of failure or fire.
- If you use a SERVOPACK with the Dynamic Brake Hardware Option, connect an External Dynamic Brake Resistor that is suitable for the machine and equipment specifications to the specified terminals.

There is a risk of unexpected operation, machine damage, burning, or injury when an emergency stop is performed.

Wait for at least six minutes after turning OFF the power supply (with a SERVOPACK for a 100-VAC input, wait for at least nine minutes) and then make sure that the CHARGE indicator is not lit before starting wiring or inspection work. Do not touch the power supply terminals while the CHARGE lamp is lit after turning OFF the power supply because high voltage may still remain in the SERVOPACK. There is a risk of electric shock. Observe the precautions and instructions for wiring and trial operation precisely as described in this document. Failures caused by incorrect wiring or incorrect voltage application in the brake circuit may cause the SERVOPACK to fail, damage the equipment, or cause an accident resulting in death or injury. • Check the wiring to be sure it has been performed correctly. Connectors and pin lavouts are sometimes different for different models. Always confirm the pin layouts in technical documents for your model before operation. There is a risk of failure or malfunction. Connect wires to power supply terminals and motor connection terminals securely with the specified methods and tightening torque. Insufficient tightening may cause wires and terminal blocks to generate heat due to faulty contact. possibly resulting in fire. • Use shielded twisted-pair cables or screened unshielded multi-twisted-pair cables for I/O Signal Cables and Encoder Cables. • Observe the following precautions when wiring the SERVOPACK's main circuit terminals. Turn ON the power supply to the SERVOPACK only after all wiring, including the main circuit terminals, has been completed. • If a connector is used for the main circuit terminals, remove the main circuit connector from the SER-VOPACK before you wire it. • Insert only one wire per insertion hole in the main circuit terminals. When you insert a wire, make sure that the conductor wire (e.g., whiskers) does not come into contact with adjacent wires. Install molded-case circuit breakers and other safety measures to provide protection against short circuits in external wiring.

There is a risk of fire or failure.

NOTICE

- Whenever possible, use the Cables specified by Yaskawa.
 If you use any other cables, confirm the rated current and application environment of your model and use the wiring materials specified by Yaskawa or equivalent materials.
- Securely tighten cable connector screws and lock mechanisms. Insufficient tightening may result in cable connectors falling off during operation.
- Do not bundle power lines (e.g., the Main Circuit Cable) and low-current lines (e.g., the I/O Signal Cables or Encoder Cables) together or run them through the same duct. If you do not place power lines and low-current lines in separate ducts, separate them by at least 30 cm. If the cables are too close to each other, malfunctions may occur due to noise affecting the low-current lines.
- Install a battery at either the host controller or on the Encoder Cable. If you install batteries both at the host controller and on the Encoder Cable at the same time, you will create a loop circuit between the batteries, resulting in a risk of damage or burning.
- When connecting a battery, connect the polarity correctly. There is a risk of battery rupture or encoder failure.

Operation Precautions

WARNING

• Before starting operation with a machine connected, change the settings of the switches and parameters to match the machine.

Unexpected machine operation, failure, or personal injury may occur if operation is started before appropriate settings are made.

- Do not radically change the settings of the parameters. There is a risk of unstable operation, machine damage, or injury.
- Install limit switches or stoppers at the ends of the moving parts of the machine to prevent unexpected accidents.

There is a risk of machine damage or injury.

- For trial operation, securely mount the Servomotor and disconnect it from the machine. There is a risk of injury.
- Forcing the motor to stop for overtravel is disabled when the Jog (Fn002), Origin Search (Fn003), or Easy FFT (Fn206) utility function is executed. Take necessary precautions. There is a risk of machine damage or injury.
- When an alarm occurs, the Servomotor will coast to a stop or stop with the dynamic brake according to the SERVOPACK Option and settings. The coasting distance will change with the moment of inertia of the load and the resistance of the External Dynamic Brake Resistor. Check the coasting distance during trial operation and implement suitable safety measures on the machine.
- Do not enter the machine's range of motion during operation. There is a risk of injury.
- Do not touch the moving parts of the Servomotor or machine during operation. There is a risk of injury.

- Design the system to ensure safety even when problems, such as broken signal lines, occur. For example, the P-OT and N-OT signals are set in the default settings to operate on the safe side if a signal line breaks. Do not change the polarity of this type of signal.
- When overtravel occurs, the power supply to the motor is turned OFF and the brake is released. If you use the Servomotor to drive a vertical load, set the Servomotor to enter a zero-clamped state after the Servomotor stops. Also, install safety devices (such as an external brake or counterweight) to prevent the moving parts of the machine from falling.
- Always turn OFF the servo before you turn OFF the power supply. If you turn OFF the main circuit power supply or control power supply during operation before you turn OFF the servo, the Servomotor will stop as follows:
 - If you turn OFF the main circuit power supply during operation without turning OFF the servo, the Servomotor will stop abruptly with the dynamic brake.
 - If you turn OFF the control power supply without turning OFF the servo, the stopping method that is used by the Servomotor depends on the model of the SERVOPACK. For details, refer to the manual for the SERVOPACK.
 - If you use a SERVOPACK with the Dynamic Brake Hardware Option, the Servomotor stopping methods will be different from the stopping methods used without the Option or with other Hardware Options. For details, refer to the *Σ*-7-Series AC Servo Drive *Σ*-7S/*Σ*-7W SERVOPACK with Dynamic Brake Hardware Option Specifications Product Manual.
- Do not use the dynamic brake for any application other than an emergency stop. There is a risk of failure due to rapid deterioration of elements in the SERVOPACK and the risk of unexpected operation, machine damage, burning, or injury.

- When you adjust the gain during system commissioning, use a measuring instrument to monitor the torque waveform and speed waveform and confirm that there is no vibration. If a high gain causes vibration, the Servomotor will be damaged quickly.
- Do not frequently turn the power supply ON and OFF. After you have started actual operation, allow at least one hour between turning the power supply ON and OFF (as a guideline). Do not use the product in applications that require the power supply to be turned ON and OFF frequently.
 - The elements in the SERVOPACK will deteriorate quickly.
- An alarm or warning may occur if communications are performed with the host controller while the SigmaWin+ or Digital Operator is operating.
- If an alarm or warning occurs, it may interrupt the current process and stop the system.
- After you complete trial operation of the machine and facilities, use the SigmaWin+ to back up the settings of the SERVOPACK parameters. You can use them to reset the parameters after SERVOPACK replacement.

If you do not copy backed up parameter settings, normal operation may not be possible after a faulty SERVOPACK is replaced, possibly resulting in machine or equipment damage.

Maintenance and Inspection Precautions

🛕 DANGER

• Do not change any wiring while power is being supplied. There is a risk of electric shock or injury.

• Wiring and inspections must be performed only by qualified engineers. There is a risk of electric shock or product failure.

• Wait for at least six minutes after turning OFF the power supply (with a SERVOPACK for a 100-VAC input, wait for at least nine minutes) and then make sure that the CHARGE indicator is not lit before starting wiring or inspection work. Do not touch the power supply terminals while the CHARGE lamp is lit after turning OFF the power supply because high voltage may still remain in the SERVOPACK.

There is a risk of electric shock.

• Before you replace a SERVOPACK, back up the settings of the SERVOPACK parameters. Copy the backed up parameter settings to the new SERVOPACK and confirm that they were copied correctly.

If you do not copy backed up parameter settings or if the copy operation is not completed normally, normal operation may not be possible, possibly resulting in machine or equipment damage.

NOTICE

 Discharge all static electricity from your body before you operate any of the buttons or switches inside the front cover of the SERVOPACK. There is a risk of equipment damage.

Troubleshooting Precautions

• If the safety device (molded-case circuit breaker or fuse) installed in the power supply line operates, remove the cause before you supply power to the SERVOPACK again. If necessary, repair or replace the SERVOPACK, check the wiring, and remove the factor that caused the safety device to operate.

There is a risk of fire, electric shock, or injury.

• The product may suddenly start to operate when the power supply is recovered after a momentary power interruption. Design the machine to ensure human safety when operation restarts. There is a risk of injury.

- When an alarm occurs, remove the cause of the alarm and ensure safety. Then reset the alarm or turn the power supply OFF and ON again to restart operation. There is a risk of injury or machine damage.
- If the Servo ON signal is input to the SERVOPACK and an alarm is reset, the Servomotor may suddenly restart operation. Confirm that the servo is OFF and ensure safety before you reset an alarm.
 - There is a risk of injury or machine damage.
- Always insert a magnetic contactor in the line between the main circuit power supply and the main circuit power supply terminals on the SERVOPACK so that the power supply can be shut OFF at the main circuit power supply.
 If a magnetic contactor is not connected when the SERVOPACK fails, a large current may flow, possibly resulting in fire.
- If an alarm occurs, shut OFF the main circuit power supply. There is a risk of fire due to a regenerative resistor overheating as the result of regenerative transistor failure.
- Install a ground fault detector against overloads and short-circuiting or install a molded-case circuit breaker combined with a ground fault detector. There is a risk of SERVOPACK failure or fire if a ground fault occurs.
- The holding brake on a Servomotor will not ensure safety if there is the possibility that an external force (including gravity) may move the current position and create a hazardous situation when power is interrupted or an error occurs. If an external force may cause movement, install an external braking mechanism that ensures safety.

Disposal Precautions

• When disposing of the product, treat it as ordinary industrial waste. However, local ordinances and national laws must be observed. Implement all labeling and warnings as a final product as required.

General Precautions

- Figures provided in this document are typical examples or conceptual representations. There may be differences between them and actual wiring, circuits, and products.
- The products shown in illustrations in this document are sometimes shown without covers or protective guards. Always replace all covers and protective guards before you use the product.
- If you need a new copy of this document because it has been lost or damaged, contact your nearest Yaskawa representative or one of the offices listed on the back of this document.
- This document is subject to change without notice for product improvements, specifications changes, and improvements to the manual itself.
 We will update the document number of the document and issue revisions when changes are made.
- Any and all quality guarantees provided by Yaskawa are null and void if the customer modifies the product in any way. Yaskawa disavows any responsibility for damages or losses that are caused by modified products.

Warranty

Details of Warranty

Warranty Period

The warranty period for a product that was purchased (hereinafter called the "delivered product") is one year from the time of delivery to the location specified by the customer or 18 months from the time of shipment from the Yaskawa factory, whichever is sooner.

Warranty Scope

Yaskawa shall replace or repair a defective product free of charge if a defect attributable to Yaskawa occurs during the above warranty period.

This warranty does not cover defects caused by the delivered product reaching the end of its service life and replacement of parts that require replacement or that have a limited service life.

This warranty does not cover failures that result from any of the following causes.

- Improper handling, abuse, or use in unsuitable conditions or in environments not described in product catalogs or manuals, or in any separately agreed-upon specifications
- · Causes not attributable to the delivered product itself
- Modifications or repairs not performed by Yaskawa
- Use of the delivered product in a manner in which it was not originally intended
- Causes that were not foreseeable with the scientific and technological understanding at the time
 of shipment from Yaskawa
- Events for which Yaskawa is not responsible, such as natural or human-made disasters

Limitations of Liability

- Yaskawa shall in no event be responsible for any damage or loss of opportunity to the customer that arises due to failure of the delivered product.
- Yaskawa shall not be responsible for any programs (including parameter settings) or the results of program execution of the programs provided by the user or by a third party for use with programmable Yaskawa products.
- The information described in product catalogs or manuals is provided for the purpose of the customer purchasing the appropriate product for the intended application. The use thereof does not guarantee that there are no infringements of intellectual property rights or other proprietary rights of Yaskawa or third parties, nor does it construe a license.
- Yaskawa shall not be responsible for any damage arising from infringements of intellectual property rights or other proprietary rights of third parties as a result of using the information described in catalogs or manuals.

Suitability for Use

- It is the customer's responsibility to confirm conformity with any standards, codes, or regulations that apply if the Yaskawa product is used in combination with any other products.
- The customer must confirm that the Yaskawa product is suitable for the systems, machines, and equipment used by the customer.
- Consult with Yaskawa to determine whether use in the following applications is acceptable. If use in the application is acceptable, use the product with extra allowance in ratings and specifications, and provide safety measures to minimize hazards in the event of failure.
 - Outdoor use, use involving potential chemical contamination or electrical interference, or use in conditions or environments not described in product catalogs or manuals
 - Nuclear energy control systems, combustion systems, railroad systems, aviation systems, vehicle systems, medical equipment, amusement machines, and installations subject to separate industry or government regulations
 - Systems, machines, and equipment that may present a risk to life or property
 - Systems that require a high degree of reliability, such as systems that supply gas, water, or electricity, or systems that operate continuously 24 hours a day
 - Other systems that require a similar high degree of safety
- Never use the product for an application involving serious risk to life or property without first ensuring that the system is designed to secure the required level of safety with risk warnings and redundancy, and that the Yaskawa product is properly rated and installed.
- The circuit examples and other application examples described in product catalogs and manuals are for reference. Check the functionality and safety of the actual devices and equipment to be used before using the product.
- Read and understand all use prohibitions and precautions, and operate the Yaskawa product correctly to prevent accidental harm to third parties.

Specifications Change

The names, specifications, appearance, and accessories of products in product catalogs and manuals may be changed at any time based on improvements and other reasons. The next editions of the revised catalogs or manuals will be published with updated code numbers. Consult with your Yaskawa representative to confirm the actual specifications before purchasing a product.

Compliance with UL Standards, EU Directives, and Other Safety Standards

Certification marks for the standards for which the product has been certified by certification bodies are shown on nameplate. Products that do not have the marks are not certified for the standards.

North American Safety Standards (UL)



Product	Model	North American Safety Standards (UL File No.)	
		UL 61800-5-1 (E147823) CSA C22.2 No.274	
Notary Servomotors • SGMMV • SGM7A UL 1004-1 • SGM7J UL 1004-6 • SGM7P (E165827) • SGM7G * SGM7G		UL 1004-6	
Direct Drive Servo- motors	SGM7F SGMCV SGMCS	UL 1004-1 UL 1004-6 (E165827)	
Linear Servomotors	• SGLGW • SGLFW • SGLFW2* • SGLTW	UL 1004 (E165827)	

* Certification is pending.

European Directives

CE			
Product	Model	European Directive	Harmonized Standards
		Machinery Directive 2006/42/EC	EN ISO13849-1: 2008/AC: 2009
SERVOPACKs	SGD7S	EMC Directive 2004/108/EC	EN 55011 group 1, class A EN 61000-6-2 EN 61000-6-4 EN 61800-3
		Low Voltage Directive 2006/95/EC	EN 50178 EN 61800-5-1
	SGMMV	EMC Directive 2004/104/EC	EN 55011 group 1, class A EN 61000-6-2 EN 61800-3
Potony		Low Voltage Directive 2006/95/EC	EN 60034-1 EN 60034-5
Rotary Servomotors	• SGM7J • SGM7A • SGM7P • SGM7G	EMC Directive 2004/108/EC	EN 55011 group 1, class A EN 61000-6-2 EN 61000-6-4 EN 61800-3
		Low Voltage Directive 2006/95/EC	EN 60034-1 EN 60034-5
Direct Drive Servomotors	 SGM7F^{*1} SGMCV SGMCS- DD, DDC, DD, DDE (Small-Capacity, Coreless Servomotors) 	EMC Directive 2004/108/EC	EN 55011 group 1, class A EN 61000-6-2 EN 61000-6-4 ^{*2} EN 61800-3 ^{*3}
		Low Voltage Directive 2006/95/EC	EN 60034-1 EN 60034-5
Linear Servomotors	SGLG SGLF SGLF	EMC Directive 2004/108/EC	EN 55011 group 1, class A EN 61000-6-2 EN 61000-6-4
	• SGLFW2 • SGLT	Low Voltage Directive 2006/95/EC	EN 60034-1

*1. Certification is pending.

*2. Certification for the SGMCV is pending.*3. Only the SGMCV is certified.

Note: We declared the CE Marking based on the harmonized standards in the above table.

♦ Safety Standards



Product	Model	Safety Standards	Standards
SERVOPACKs		Safety of Machinery	EN ISO13849-1: 2008/AC: 2009 IEC 60204-1
	SGD7S	Functional Safety	IEC 61508 series IEC 62061 IEC 61800-5-2
		EMC	IEC 61326-3-1

Safety Parameters

Item	Standards	Performance Level
Sofoty Integrity Lovel	IEC 61508	SIL3
Safety Integrity Level	IEC 62061	SILCL3
Probability of Dangerous Failure per Hour	IEC 61508 IEC 62061	PFH = 4.04 × 10 ⁻⁹ [1/h] (4.04% of SIL3)
Performance Level	EN ISO 13849-1	PLe (Category 3)
Mean Time to Dangerous Failure of Each Channel	EN ISO 13849-1	MTTFd: High
Average Diagnostic Coverage	EN ISO 13849-1	DCavg: Medium
Stop Category	IEC 60204-1	Stop category 0
Safety Function	IEC 61800-5-2	STO
Mission Time	IEC 61508	10 years
Hardware Fault Tolerance	IEC 61508	HFT = 1
Subsystem	IEC 61508	В

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Selecting a SERVOPACK

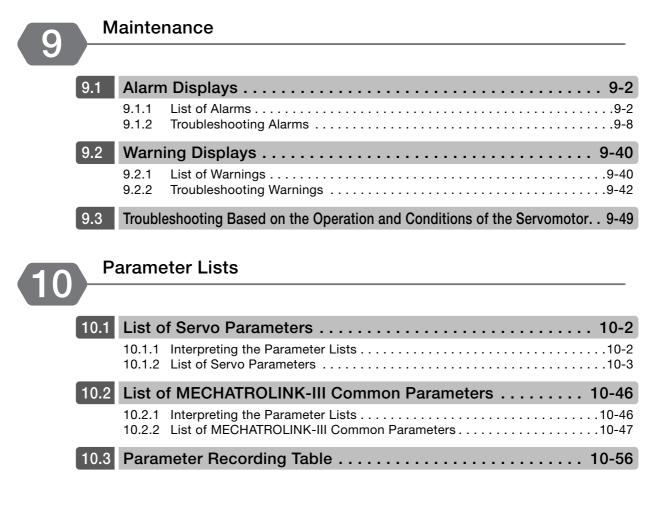
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Revision History

Basic Information on SERVOPACKs

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1.1 Product Introduction

The FT21 SERVOPACKs uses mode (gain) switching, predictive control, and quadrant projection correction to improve trajectory tracking performance. They are designed for use in contouring and other metal processing. Clearance control that uses a gap sensor has also been implemented to enable applications with laser processing machines.

This section describes the main features.

- You can use mode (gain) switching, predictive controls, and quadrant projection correction to suppress radial reduction when cutting circles and projections when switching quadrants. These enable high-speed, high-precision processing.
- You can use clearance control with a gap sensor to perform high-precision control of the gap between the workpiece and control target.

1.2.1 Interpreting SERVOPACK Model Numbers

Model Designations 1.2 1.2.1 Interpreting SERVOPACK Model Numbers SGD7S 031 F21 В А 20 Д 4th digi 3th+9th+10th st+2nd+3rd 1th+12th+13th Σ -7-Series Σ-7S SERVOPACKs Hardware Options Maximum Applicable 1st+2nd+3rd digits 8th+9th+10th digits Specification 4th digit Voltage Motor Capacity Voltage Code Specification Code Specification Code Specification R70*1 0.05 kW А 200 VAC 031 Varnished and analog sensor input R90*1 0.1 kW 100 VAC F 1R6*1 0.2 kW 1th+12th+13th digits FT/EX Specification 2R8*1 0.4 kW 5th+6th digits Interface*2 Code Specification 3R8 0.5 kW Code Specification F21 Cutting applications 5R5*1 0.75 kW MECHATROLINK-III 7R6 1.0 kW 20 Threecommunications reference 14th digit BTO Specification*3 120 1.5 kW Phase. 200 VAC Specification 180 2.0 kW Code th digit Design Revision Order 3.0 kW None None 200 А В **BTO** specification 330 5.0 kW 470 6.0 kW 7.5 kW 550 11 kW 590 780 15 kW **R70** 0.05 kW Sinale-R90 0.1 kW Phase 2R1 0.2 kW 100 VAC 2R8 0.4 kW

*1. You can use these models with either a single-phase or three-phase input.

*2. The same SERVOPACKs are used for both Rotary Servomotors and Linear Servomotors.

*3. The BTO specification indicates if the SEVOPACK is customized by using the MechatroCloud BTO service. You need a BTO number to order SERVOPACKs with customized specifications. Refer to the following catalog for details on the BTO specification.

 \square AC Servo Drives Σ -7 Series (Manual No.: KAEP S800001 23)

1.2.2 Interpreting Servomotor Model Numbers

Refer to the following manuals for information on interpreting Σ -7-Series Servomotor model numbers.

 \square Σ -7-Series Rotary Servomotor Product Manual (Manual No.: SIEP S800001 36)

- Ω Σ-7-Series Linear Servomotor Product Manual (Manual No.: SIEP S800001 37)
- \square Σ -7-Series Direct Drive Servomotor Product Manual (Manual No.: SIEP S800001 38)

1.3 Combinations of SERVOPACKs and Servomotors

Refer to the following manuals for information on combinations with Σ -7-Series Servomotors.

 $\hfill \Sigma$ -7-Series Rotary Servomotor Product Manual (Manual No.: SIEP S800001 36)

~~~  $\Sigma$  -7-Series Linear Servomotor Product Manual (Manual No.: SIEP S800001 37)

Ω Σ-7-Series Direct Drive Servomotor Product Manual (Manual No.: SIEP S800001 38)

# 1.4 Functions

This section lists the functions provided by SERVOPACKs.

Functions given inside bold lines in the functions tables are restricted for the SERVOPACKs described in this manual. Refer to the following section for details on restrictions to these functions.

1.5.1 Function Application Restrictions on page 1-8

· Functions Related to the Machine

| Function                                                            | Reference                                                                                                                    |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Power Supply Type Settings for the Main Circuit and Control Circuit |                                                                                                                              |
| Automatic Detection of Connected Motor                              |                                                                                                                              |
| Motor Direction Setting                                             |                                                                                                                              |
| Linear Encoder Pitch Setting                                        |                                                                                                                              |
| Writing Linear Servomotor Parameters                                |                                                                                                                              |
| Selecting the Phase Sequence for a Linear Servomotor                |                                                                                                                              |
| Polarity Sensor Setting                                             |                                                                                                                              |
| Polarity Detection                                                  |                                                                                                                              |
| Overtravel Function and Settings                                    |                                                                                                                              |
| Holding Brake                                                       |                                                                                                                              |
| Motor Stopping Methods for Servo OFF and Alarms                     | Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III<br>Communications References Product Manual (Manual<br>No.: SIEP S800001 28) |
| Resetting the Absolute Encoder                                      |                                                                                                                              |
| Setting the Origin of the Absolute Encoder                          |                                                                                                                              |
| Setting the Regenerative Resistor Capacity                          |                                                                                                                              |
| Operation for Momentary Power Interruptions                         |                                                                                                                              |
| SEMI F47 Function                                                   |                                                                                                                              |
| Setting the Motor Maximum Speed                                     |                                                                                                                              |
| Software Limits and Settings                                        |                                                                                                                              |
| Multiturn Limit Setting                                             |                                                                                                                              |
| Adjustment of Motor Current Detection Signal Offset                 |                                                                                                                              |
| Forcing the Motor to Stop                                           |                                                                                                                              |
| Speed Ripple Compensation                                           |                                                                                                                              |
| Current Control Mode Selection                                      | 3 1.5.1 Function Application Restrictions on page 1-8                                                                        |
| Current Gain Level Setting                                          | Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III<br>Communications References Product Manual (Manual<br>No.: SIEP S800001 28) |
| Speed Detection Method Selection                                    | 3 1.5.1 Function Application Restrictions on page 1-8                                                                        |
| Fully-Closed Loop Control                                           | $\Box$ $\Sigma$ -7-Series $\Sigma$ -7S SERVOPACK with MECHATROLINK-III                                                       |
| Safety Functions                                                    | Communications References Product Manual (Manual                                                                             |
| External Latches                                                    | No.: SIEP S800001 28)                                                                                                        |

#### • Functions Related to the Host Controller

| Function                                            | Reference                                                                                           |  |  |  |  |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------|--|--|--|--|
| Electronic Gear Settings                            |                                                                                                     |  |  |  |  |
| I/O Signal Allocations                              |                                                                                                     |  |  |  |  |
| Servo Alarm (ALM) Signal                            |                                                                                                     |  |  |  |  |
| Warning Output (/WARN) Signal                       |                                                                                                     |  |  |  |  |
| Rotation Detection (/TGON) Signal                   |                                                                                                     |  |  |  |  |
| /S-RDY (Servo Ready) Signal                         |                                                                                                     |  |  |  |  |
| Speed Coincidence Detection (/V-CMP) Signal         |                                                                                                     |  |  |  |  |
| Positioning Completion (/COIN) Signal               |                                                                                                     |  |  |  |  |
| Near (/NEAR) Signal                                 | Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III<br>Communications References Product Manual (Manual |  |  |  |  |
| Speed Limit during Torque Control                   | No.: SIEP S800001 28)                                                                               |  |  |  |  |
| Speed Limit Detection (/VLT) Signal                 |                                                                                                     |  |  |  |  |
| Encoder Divided Pulse Output                        |                                                                                                     |  |  |  |  |
| Selecting Torque Limits                             |                                                                                                     |  |  |  |  |
| Vibration Detection Level Initialization            |                                                                                                     |  |  |  |  |
| Alarm Reset                                         |                                                                                                     |  |  |  |  |
| Replacing the Battery                               |                                                                                                     |  |  |  |  |
| Setting the Position Deviation Overflow Alarm Level |                                                                                                     |  |  |  |  |

#### Functions to Achieve Optimum Motions

| Function                                      | Reference                                                                            |
|-----------------------------------------------|--------------------------------------------------------------------------------------|
| Tuning-less Function                          | 3 1.5.1 Function Application Restrictions on page 1-8                                |
| Automatic Adjustment without a Host Reference |                                                                                      |
| Automatic Adjustment with a Host Reference    | $\Box$ $\Sigma$ -7-Series $\Sigma$ -7S SERVOPACK with MECHATROLINK-III               |
| Custom Adjustment                             | Communications References Product Manual (Manual                                     |
| Anti-Resonance Control Adjustment             | No.: SIEP S800001 28)                                                                |
| Vibration Suppression                         |                                                                                      |
| Gain Selection                                | 3 1.5.1 Function Application Restrictions on page 1-8                                |
| Friction Compensation                         | $\Box$ $\Sigma$ -7-Series $\Sigma$ -7S SERVOPACK with MECHATROLINK-III               |
| Backlash Compensation                         | Communications References Product Manual (Manual                                     |
| Model Following Control                       | No.: SIEP S800001 28)                                                                |
| Compatible Adjustment Functions               | 3 1.5.1 Function Application Restrictions on page 1-8                                |
| Mechanical Analysis                           | $\square$ $\Sigma$ -7-Series $\Sigma$ -7S SERVOPACK with MECHATROLINK-III            |
| Easy FFT                                      | Communications References Product Manual (Manual No.: SIEP S800001 28)               |
| Predictive Control                            | <ul> <li>7.1 Parameter Adjustments for Predictive Control on page<br/>7-2</li> </ul> |
| Quadrant Projection Correction                | -                                                                                    |
| Mode (Gain) Switching                         | 6.4 Mode (Gain) Selection on page 6-5                                                |
| Clearance Control                             | Chapter 4 Clearance Control                                                          |

#### Functions for Trial Operation during Setup

| Function                                                 | Reference                                                                                                                     |  |  |  |  |  |  |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|
| Software Reset                                           |                                                                                                                               |  |  |  |  |  |  |
| Trial Operation of Servomotor without a Load             |                                                                                                                               |  |  |  |  |  |  |
| Program Jogging                                          | $\square$ $\Sigma$ -7-Series $\Sigma$ -7S SERVOPACK with MECHATROLINK-III<br>Communications References Product Manual (Manual |  |  |  |  |  |  |
| Origin Search                                            |                                                                                                                               |  |  |  |  |  |  |
| Test without a Motor                                     | No.: SIEP S800001 28)                                                                                                         |  |  |  |  |  |  |
| Monitoring Machine Operation Status and Signal Waveforms |                                                                                                                               |  |  |  |  |  |  |

#### • Functions for Inspection and Maintenance

| Function                                 | Reference                                                              |  |  |  |  |  |  |
|------------------------------------------|------------------------------------------------------------------------|--|--|--|--|--|--|
| Write Prohibition Setting for Parameters |                                                                        |  |  |  |  |  |  |
| Initializing Parameter Settings          |                                                                        |  |  |  |  |  |  |
| Automatic Detection of Connected Motor   | $\Box$ $\Sigma$ -7-Series $\Sigma$ -7S SERVOPACK with MECHATROLINK-III |  |  |  |  |  |  |
| Monitoring Product Information           | Communications References Product Manual (Manual                       |  |  |  |  |  |  |
| Monitoring Product Life                  | No.: SIEP S800001 28)                                                  |  |  |  |  |  |  |
| Alarm History Display                    |                                                                        |  |  |  |  |  |  |
| Alarm Tracing                            |                                                                        |  |  |  |  |  |  |

1.5.1 Function Application Restrictions

## 1.5 Restrictions

This section describes restrictions that apply when using the SERVOPACKs described in this manual.

#### 1.5.1 Function Application Restrictions

The following functional restrictions apply when the SERVOPACKs described in this manual are used.

| Function                              | Restriction                                                                                                                                                                                                                                                      |  |  |  |  |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| Current Control Mode Selection        |                                                                                                                                                                                                                                                                  |  |  |  |  |
| Speed Detection Method Selec-<br>tion | These functions cannot be used.                                                                                                                                                                                                                                  |  |  |  |  |
| Tuning-less Function                  |                                                                                                                                                                                                                                                                  |  |  |  |  |
| Gain Selection                        | This function cannot be used.<br>However, you can use similar mode (gain) switching functions that are spe-<br>cific to the SERVOPACKs described in this manual. Refer to the following<br>sections for details.<br><b>6.4 Mode (Gain) Selection on page 6-5</b> |  |  |  |  |
| Compatible Adjustment Func-<br>tions  | This function cannot be used.                                                                                                                                                                                                                                    |  |  |  |  |

#### 1.5.2 Restrictions on Specifications

The following restrictions on specifications apply when the SERVOPACKs described in this manual are used.

| Item                                                 | Restriction                   |
|------------------------------------------------------|-------------------------------|
| Linear Servomotor Overheat Protection Signal (input) | This function cannot be used. |

# 1.6 SigmaWin+

To use the SigmaWin+, a model information file for the SERVOPACK must be added to SigmaWin+ version 7.10 or higher. Contact your Yaskawa representative for the model information file.

## **1.7** Combining the SERVOPACKs with MP-Series Machine Controllers and the MPE720 Engineering Tool

If you combine the SERVOPACK with an MP-Series Machine Controller or the MPE720 Engineering Tool, it will be recognized as a SERVOPACK with standard specifications. To use the parameters that have been added or changed for the SERVOPACKs described in this manual, use the SigmaWin+.

# Selecting a SERVOPACK

This chapter provides information required to select SERVOPACKs, such as specifications, block diagrams, dimensional drawings, and connection examples.

| 2.1 | Ratings2-2                                                                                                                                                                               |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|     | 2.1.1       Three-Phase, 200 VAC       2-2         2.1.2       Single-Phase, 200 VAC       2-3         2.1.3       270 VDC       2-4         2.1.4       Single-Phase, 100 VAC       2-4 |
| 2.2 | SERVOPACK Overload Protection Characteristics 2-5                                                                                                                                        |
| 2.3 | Specifications2-6                                                                                                                                                                        |

2.1.1 Three-Phase, 200 VAC

# 2.1 Ratings

This section gives the ratings of SERVOPACKs.

## 2.1.1 Three-Phase, 200 VAC

| Model SGD7S-                              |                                                   | R70A                          | R90A | 1R6A | 2R8A   | 3R8A    | 5R5A   | 7R6A   | 120A   | 180A    | 200A    | 330A  |       |
|-------------------------------------------|---------------------------------------------------|-------------------------------|------|------|--------|---------|--------|--------|--------|---------|---------|-------|-------|
| Maximum Applicable<br>Motor Capacity [kW] |                                                   | 0.05                          | 0.1  | 0.2  | 0.4    | 0.5     | 0.75   | 1.0    | 1.5    | 2.0     | 3.0     | 5.0   |       |
| Continu<br>rent [Ar                       | uous Outp<br>ms]                                  | out Cur-                      | 0.66 | 0.91 | 1.6    | 2.8     | 3.8    | 5.5    | 7.6    | 11.6    | 18.5    | 19.6  | 32.9  |
|                                           | aneous M<br>Current [                             |                               | 2.1  | 3.2  | 5.9    | 9.3     | 11     | 16.9   | 17     | 28      | 42      | 56    | 84    |
| Main                                      | Power S                                           | Supply                        |      |      | 200 VA | C to 24 | 0 VAC, | -15% t | 0 +10% | , 50 Hz | 2/60 Hz |       |       |
| Circuit                                   | Input Cu<br>[Arms] <sup>*</sup>                   | irrent                        | 0.4  | 0.8  | 1.3    | 2.5     | 3.0    | 4.1    | 5.7    | 7.3     | 10      | 15    | 25    |
| Control                                   | l Power S                                         | upply                         |      |      | 200 VA | C to 24 | 0 VAC, | -15% t | 0 +10% | , 50 Hz | z/60 Hz |       |       |
| Power Supply Capacity [kVA]*              |                                                   | 0.2                           | 0.3  | 0.5  | 1.0    | 1.3     | 1.6    | 2.3    | 3.2    | 4.0     | 5.9     | 7.5   |       |
|                                           | Main Cir<br>Loss [W                               | Aain Circuit Power<br>oss [W] |      | 7.0  | 11.9   | 22.5    | 28.5   | 38.9   | 49.2   | 72.6    | 104.2   | 114.2 | 226.6 |
| Power                                     | Control Circuit<br>Power Loss [W]                 |                               | 12   | 12   | 12     | 12      | 14     | 14     | 14     | 15      | 16      | 16    | 19    |
| Loss*                                     | Built-in F<br>tive Resi<br>Power L                |                               | _    | _    | _      | _       | 8      | 8      | 8      | 10      | 16      | 16    | 36    |
|                                           | Total Po<br>[W]                                   | wer Loss                      | 17.0 | 19.0 | 23.9   | 34.5    | 50.5   | 60.9   | 71.2   | 97.6    | 136.2   | 146.2 | 281.6 |
| Regen                                     | Built-In Resis-<br>Regen- tance [                 |                               | _    | _    |        | -       | 40     | 40     | 40     | 20      | 12      | 12    | 8     |
| Regen<br>era-<br>tive                     | erative<br>Resis-<br>tor                          | Capacity<br>[W]               | _    | -    | -      | _       | 40     | 40     | 40     | 60      | 60      | 60    | 180   |
| Resis-<br>tor                             | Minimum Allow-<br>able External<br>Resistance [Ω] |                               | 40   | 40   | 40     | 40      | 40     | 40     | 40     | 20      | 12      | 12    | 8     |
| Overvo                                    | Itage Cate                                        | egory                         |      |      |        |         |        |        |        |         |         |       |       |

\* This is the net value at the rated load.

|                                           | Model SGD7S-                         | 470A                  | 550A               | 590A               | 780A               |                    |
|-------------------------------------------|--------------------------------------|-----------------------|--------------------|--------------------|--------------------|--------------------|
| Maximum Appli                             | cable Motor Capad                    | city [kW]             | 6.0                | 7.5                | 11                 | 15                 |
| Continuous Out                            | put Current [Arms]                   | 46.9                  | 54.7               | 58.6               | 78.0               |                    |
| Instantaneous N                           | laximum Output C                     | urrent [Arms]         | 110                | 130                | 140                | 170                |
| Main                                      | Power Supply                         |                       | 200 VAC to         | 240 VAC, -15       | % to +10%, 5       | 0 Hz/60 Hz         |
| Circuit                                   | Input Current [A                     | rms] <sup>*1</sup>    | 29                 | 37                 | 54                 | 73                 |
| Control Power S                           | Supply                               | 200 VAC to            | 240 VAC, -15       | 5% to +10%, 5      | 0 Hz/60 Hz         |                    |
| Power Supply Capacity [kVA] <sup>*1</sup> |                                      |                       | 10.7               | 14.6               | 21.7               | 29.6               |
|                                           | Main Circuit Pov                     | ver Loss [W]          | 271.7              | 326.9              | 365.3              | 501.4              |
|                                           | Control Circuit F                    | ower Loss [W]         | 21                 | 21                 | 28                 | 28                 |
| Power Loss <sup>*1</sup>                  | External Regene<br>Power Loss [W]    | rative Resistor       | 180*2              | 350 <sup>*3</sup>  | 350 <sup>*3</sup>  | 350 <sup>*3</sup>  |
|                                           | Total Power Los                      | s [W]                 | 292.7              | 347.9              | 393.3              | 529.4              |
|                                           | External                             | Resistance $[\Omega]$ | 6.25 <sup>*2</sup> | 3.13 <sup>*3</sup> | 3.13 <sup>*3</sup> | 3.13 <sup>*3</sup> |
| Regenerative                              | Regenerative<br>Resistor             | Capacity [W]          | 880 <sup>*2</sup>  | 1760 <sup>*3</sup> | 1760 <sup>*3</sup> | 1760 <sup>*3</sup> |
| Resistor                                  | Minimum Allowa Resistance $[\Omega]$ | ble External          | 5.8                | 2.9                | 2.9                | 2.9                |
| Overvoltage Cat                           | Overvoltage Category                 |                       |                    |                    | 11                 |                    |

\*1. This is the net value at the rated load.

\*2. This value is for the optional JUSP-RA04-E Regenerative Resistor Unit.

\*3. This value is for the optional JUSP-RA05-E Regenerative Resistor Unit.

## 2.1.2 Single-Phase, 200 VAC

|                              | Model SGD7S-                           |                                                  | R70A    | R90A        | 1R6A       | 2R8A       | 5R5A     |  |
|------------------------------|----------------------------------------|--------------------------------------------------|---------|-------------|------------|------------|----------|--|
| Maximum Appl                 | icable Motor Capac                     | vity [kW]                                        | 0.05    | 0.1         | 0.2        | 0.4        | 0.75     |  |
| Continuous Ou                | tput Current [Arms]                    |                                                  | 0.66    | 0.91        | 1.6        | 2.8        | 5.5      |  |
| Instantaneous I              | Maximum Output C                       | urrent [Arms]                                    | 2.1     | 3.2         | 5.9        | 9.3        | 16.9     |  |
| Main Circuit                 | Power Supply                           |                                                  | 200 VAC | C to 240 VA | C, -15% to | +10%, 50 H | lz/60 Hz |  |
| Main Circuit                 | Input Current [Ar                      | ms]*                                             | 0.8     | 1.6         | 2.4        | 5.0        | 8.7      |  |
| Control Power Supply         |                                        |                                                  | 200 VAC | C to 240 VA | C, -15% to | +10%, 50 H | lz/60 Hz |  |
| Power Supply Capacity [kVA]* |                                        |                                                  | 0.2     | 0.3         | 0.6        | 1.2        | 1.9      |  |
|                              | Main Circuit Pow                       | Main Circuit Power Loss [W]                      |         |             | 12.1       | 23.7       | 39.2     |  |
|                              | Control Circuit P                      | Control Circuit Power Loss [W]                   |         |             | 12         | 12         | 14       |  |
| Power Loss*                  | Built-in Regenera<br>Power Loss [W]    | Built-in Regenerative Resistor<br>Power Loss [W] |         |             | -          | _          | 8        |  |
|                              | Total Power Loss                       | s [W]                                            | 17.0    | 19.1        | 24.1       | 35.7       | 61.2     |  |
|                              | Built-In Regen-                        | Resistance $[\Omega]$                            | _       | _           | _          | _          | 40       |  |
| Regenerative                 | erative Resistor                       | Capacity [W]                                     | -       | _           | _          | _          | 40       |  |
| Resistor                     | Minimum Allowa Resistance [ $\Omega$ ] | ble External                                     | 40      | 40          | 40         | 40         | 40       |  |
| Overvoltage Category         |                                        |                                                  |         |             |            |            |          |  |

\* This is the net value at the rated load.

2

2-3

2.1.3 270 VDC

#### 2.1.3 270 VDC

| Model SGD7S-                                   |                                | R70A                             | R90A | 1R6A     | 2R8A     | 3R8A      | 5R5/    | A 7R6A | 120A  |  |  |
|------------------------------------------------|--------------------------------|----------------------------------|------|----------|----------|-----------|---------|--------|-------|--|--|
| Maximum Appl                                   | icable Motor Capacity [kW]     | 0.05                             | 0.1  | 0.2      | 0.4      | 0.5       | 0.75    | 5 1.0  | 1.5   |  |  |
| Continuous Output Current [Arms]               |                                | 0.66                             | 0.91 | 1.6      | 2.8      | 3.8       | 5.5     | 7.6    | 11.6  |  |  |
| Instantaneous Maximum Output Current<br>[Arms] |                                | 2.1                              | 3.2  | 5.9      | 9.3      | 11.0      | 16.9    | 17.0   | 28.0  |  |  |
| Main Circuit Power Supply                      |                                | 270 VDC to 324 VDC, -15% to +10% |      |          |          |           |         |        |       |  |  |
| Main Circuit                                   | Input Current [Arms]*          | 0.5                              | 1.0  | 1.5      | 3.0      | 3.8       | 4.9     | 6.9    | 11    |  |  |
| Control Power                                  | Supply                         |                                  | 270  | ) VDC to | o 324 V  | DC, -18   | 5% to + | -10%   |       |  |  |
| Power Supply (                                 | Capacity [kVA]*                | 0.2                              | 0.3  | 0.6      | 1        | 1.4       | 1.6     | 2.3    | 3.2   |  |  |
|                                                | Main Circuit Power Loss [W]    | 4.4                              | 5.9  | 9.8      | 17.5     | 23.0      | 30.7    | 38.7   | 55.8  |  |  |
| Power Loss*                                    | Control Circuit Power Loss [W] | 12                               | 12   | 12       | 12       | 12 14     |         | 14     | 15    |  |  |
|                                                | Total Power Loss [W]           | 16.4                             | 17.9 | 21.8     | 29.5     | 29.5 37.0 |         | 52.7   | 70.8  |  |  |
| Overvoltage Ca                                 |                                |                                  |      |          |          |           |         |        |       |  |  |
| * This is the net va                           | alue at the rated load.        |                                  |      |          |          |           |         |        |       |  |  |
|                                                | Model SGD7S-                   | 180A                             | 200A | 330      | A 47     | 70A (     | 550A    | 590A   | 780A  |  |  |
| Maximum Appl                                   | icable Motor Capacity [kW]     | 2.0                              | 3.0  | 5.0      | ) 6      | 6.0       | 7.5     | 11.0   | 15.0  |  |  |
| Continuous Ou                                  | tput Current [Arms]            | 18.5                             | 19.6 | 32.      | 9 4      | 6.9       | 54.7    | 58.6   | 78.0  |  |  |
| Instantaneous I<br>[Arms]                      | Maximum Output Current         | 42.0                             | 56.0 | 84.      | 84.0 110 |           | 130     | 140    | 170   |  |  |
| Main Circuit                                   | Power Supply                   |                                  | 270  | ) VDC to | o 324 V  | DC, -1    | 5% to + | -10%   |       |  |  |
| Main Circuit                                   | Input Current [Arms]*          | 14                               | 20   | 34       | 34 36    |           | 48      | 68     | 92    |  |  |
| Control Power Supply                           |                                |                                  | 270  | ) VDC to | o 324 V  | DC, -1    | 5% to + | -10%   |       |  |  |
| Power Supply Capacity [kVA]*                   |                                | 4.0                              | 5.9  | 7.5      | 5 1      | D.7       | 14.6    | 21.7   | 29.6  |  |  |
|                                                | Main Circuit Power Loss [W]    | 82.7                             | 83.5 | 146      | .2 21    | 1.6 2     | 255.3   | 243.6  | 343.4 |  |  |
| Power Loss*                                    | Control Circuit Power Loss [W] | 16                               | 16   | 19       |          | 21        | 21      | 28     | 28    |  |  |
|                                                | Total Dower Loop [M/]          | 00.7                             | 00 F | 105      | 0 00     |           |         | 071 0  | 071 4 |  |  |
|                                                | Total Power Loss [W]           | 98.7                             | 99.5 | 165      | .2 23    | 32.6 2    | 276.3   | 271.6  | 371.4 |  |  |

\* This is the net value at the rated load.

# 2.1.4 Single-Phase, 100 VAC

|                                                                                                                                       | Model SGD7S-                                           | R70F       | R90F         | 2R1F         | 2R8F       |  |
|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------|--------------|--------------|------------|--|
| Maximum App                                                                                                                           | licable Motor Capacity [kW]                            | 0.05       | 0.1          | 0.2          | 0.4        |  |
| Continuous O                                                                                                                          | utput Current [Arms]                                   | 0.66       | 0.91         | 2.1          | 2.8        |  |
| Instantaneous                                                                                                                         | Maximum Output Current [Arms]                          | 2.1        | 3.2          | 6.5          | 9.3        |  |
| Main Circuit                                                                                                                          | Power Supply                                           | 100 VAC to | 120 VAC, -15 | % to +10%, 5 | 0 Hz/60 Hz |  |
| Main Circuit                                                                                                                          | Input Current [Arms]*                                  | 1.5        | 2.5          | 5            | 10         |  |
| Control                                                                                                                               | Power Supply 100 VAC to 120 VAC, -15% to +10%, 50 Hz/6 |            |              |              |            |  |
| Control                                                                                                                               | Input Current [Arms]*                                  | 0.38       | 0.38         | 0.38         | 0.38       |  |
| Power Supply                                                                                                                          | Capacity [kVA]*                                        | 0.2        | 0.3          | 0.6          | 1.4        |  |
| Main Circuit Power Loss [W]                                                                                                           |                                                        | 5.3        | 7.8          | 14.2         | 26.2       |  |
| Power Loss*                                                                                                                           | Control Circuit Power Loss [W]                         | 12         | 12           | 12           | 12         |  |
|                                                                                                                                       | Total Power Loss [W]                                   | 17.3       | 19.8         | 26.2         | 38.2       |  |
| $\begin{array}{c c} \mbox{Regenera-} \\ \mbox{tive Resistor} \end{array} & \mbox{Minimum Allowable Resistance } [\Omega] \end{array}$ |                                                        | 40         | 40           | 40           | 40         |  |
| Overvoltage C                                                                                                                         | ategory                                                |            |              | I            | ·          |  |

\* This is the net value at the rated load.

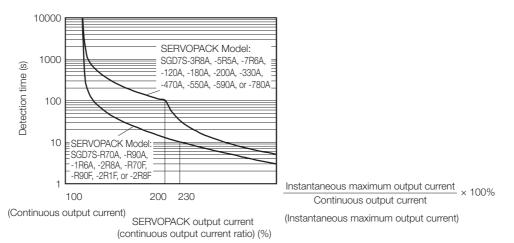
# 2.2 SERVOPACK Overload Protection Characteristics

The overload detection level is set for hot start conditions with a SERVOPACK surrounding air temperature of 55°C.

An overload alarm (A.710 or A.720) will occur if overload operation that exceeds the overload protection characteristics shown in the following diagram (i.e., operation on the right side of the applicable line) is performed.

The actual overload detection level will be the detection level of the connected SERVOPACK or Servomotor that has the lower overload protection characteristics.

In most cases, that will be the overload protection characteristics of the Servomotor.



Note: The above overload protection characteristics do not mean that you can perform continuous duty operation with an output of 100% or higher.

For a Yaskawa-specified combination of SERVOPACK and Servomotor, maintain the effective torque within the continuous duty zone of the torque-motor speed characteristic of the Servomotor.

# 2.3 Specifications

This section gives the general specifications of the SERVOPACKs.

|                    | Item                                           | Specification                                                                                                                                                                                                                                                                                               |  |  |  |  |
|--------------------|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| Drive Metho        | d                                              | IGBT-based PWM control, sine wave current drive                                                                                                                                                                                                                                                             |  |  |  |  |
| Foodbook           | With Rotary<br>Servomotor                      | Serial encoder: 17 bits (absolute encoder)<br>20 bits or 24 bits (incremental encoder/absolute<br>encoder)<br>22 bits (absolute encoder)                                                                                                                                                                    |  |  |  |  |
| Feedback           | With Linear<br>Servomotor                      | <ul> <li>Absolute linear encoder (The signal resolution depends on the absolute linear encoder.)</li> <li>Incremental linear encoder (The signal resolution depends on the incremental linear encoder or Serial Converter Unit.)</li> </ul>                                                                 |  |  |  |  |
|                    | Surrounding Air Tem-<br>perature <sup>*1</sup> | <ul> <li>-5°C to 55°C</li> <li>With derating, usage is possible between 55°C and 60°C.</li> <li>Refer to the following manual for derating specifications.</li> <li>Ω Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References<br/>Product Manual (Manual No.: SIEP S800001 28)</li> </ul> |  |  |  |  |
|                    | Storage Temperature                            | -20°C to 85°C                                                                                                                                                                                                                                                                                               |  |  |  |  |
|                    | Surrounding Air<br>Humidity                    | 95% relative humidity max. (with no freezing or condensation)                                                                                                                                                                                                                                               |  |  |  |  |
|                    | Storage Humidity                               | 95% relative humidity max. (with no freezing or condensation)                                                                                                                                                                                                                                               |  |  |  |  |
|                    | Vibration Resistance                           | 4.9 m/s <sup>2</sup>                                                                                                                                                                                                                                                                                        |  |  |  |  |
|                    | Shock Resistance                               | 19.6 m/s <sup>2</sup>                                                                                                                                                                                                                                                                                       |  |  |  |  |
|                    |                                                | Degree SERVOPACK Model: SGD7S-                                                                                                                                                                                                                                                                              |  |  |  |  |
| Environ-<br>mental | Degree of Protection                           | IP20 R70A, R90A, 1R6A, 2R8A, 3R8A, 5R5A, 7R6A, and 120A,                                                                                                                                                                                                                                                    |  |  |  |  |
| Conditions         |                                                | IP10 180A, 200A, 330A, 470A, 550A, 590A, and 780A                                                                                                                                                                                                                                                           |  |  |  |  |
|                    |                                                |                                                                                                                                                                                                                                                                                                             |  |  |  |  |
|                    | Pollution Degree                               | <ul><li>2</li><li>Must be no corrosive or flammable gases.</li><li>Must be no exposure to water, oil, or chemicals.</li><li>Must be no dust, salts, or iron dust.</li></ul>                                                                                                                                 |  |  |  |  |
|                    | Altitude <sup>*1</sup>                         | <ul> <li>1,000 m max.</li> <li>With derating, usage is possible between 1,000 m and 2,000 m.</li> <li>Refer to the following manual for derating specifications.</li> <li>Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)</li> </ul> |  |  |  |  |
|                    | Others                                         | Do not use the SERVOPACK in the following locations: Locations sub<br>ject to static electricity noise, strong electromagnetic/magnetic fields, or<br>radioactivity                                                                                                                                         |  |  |  |  |
| Ananita alala (    | No en el o undo                                | Refer to the following section for details.                                                                                                                                                                                                                                                                 |  |  |  |  |
| Applicable S       | Standards                                      | Compliance with UL Standards, EU Directives, and Other Safety Stan-<br>dards on page xxv                                                                                                                                                                                                                    |  |  |  |  |
| Mounting           | 1                                              | Base-mounted                                                                                                                                                                                                                                                                                                |  |  |  |  |
|                    | Speed Control Range                            | 1:5000 (At the rated torque, the lower limit of the speed control range must not cause the Servomotor to stop.)                                                                                                                                                                                             |  |  |  |  |
|                    |                                                | $\pm 0.01\%$ of rated speed max. (for a load fluctuation of 0% to 100%)                                                                                                                                                                                                                                     |  |  |  |  |
| Douton             | Coefficient of Speed                           | 0% of rated speed max. (for a voltage fluctuation of ±10%)                                                                                                                                                                                                                                                  |  |  |  |  |
| Perfor-<br>mance   | Fluctuation <sup>*2</sup>                      | ±0.1% of rated speed max. (for a temperature fluctuation of 25°C ±25°C)                                                                                                                                                                                                                                     |  |  |  |  |
|                    | Torque Control Precision (Repeatability)       | ±1%                                                                                                                                                                                                                                                                                                         |  |  |  |  |
|                    | Soft Start Time<br>Setting                     | 0 s to 10 s (Can be set separately for acceleration and deceleration.)                                                                                                                                                                                                                                      |  |  |  |  |
|                    |                                                | Continued on part page                                                                                                                                                                                                                                                                                      |  |  |  |  |

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|                       | Item                                                            |                                 | Specification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------|-----------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                       | Encoder Div<br>Pulse Outp                                       |                                 | Phase A, phase B, phase C: Line-driver output<br>Number of divided output pulses: Any setting is allowed.                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                       | Gap Senso<br>Input                                              | r Signal                        | Number of input points: 1<br>Input voltage range (± 12 V)                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                       |                                                                 |                                 | Allowable voltage range: 24 VDC ±20%<br>Number of input points: 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                       | Sequence<br>Input<br>Signals<br>Signals<br>Be Allo-<br>cated    |                                 | <ul> <li>Input method: Sink inputs or source inputs</li> <li>Input Signals</li> <li>/DEC (Origin Return Deceleration Switch) signal</li> <li>/EXT1 to /EXT3 (External Latch Input 1 to 3) signals</li> <li>P-OT (Forward Drive Prohibit) and N-OT (Reverse Drive Prohibit) signals</li> <li>/P-CL (Forward External Torque Limit) and /N-CL (Reverse External Torque Limit) signals</li> <li>/P-DET (Polarity Detection) signal</li> <li>A signal can be allocated and the positive and negative logic can be changed.</li> </ul> |
| I/O Signals           |                                                                 | Fixed<br>Output                 | Allowable voltage range: 5 VDC to 30 VDC<br>Number of output points: 1<br>Output signal: ALM (Servo Alarm) signal                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                       |                                                                 | itput Output                    | Allowable voltage range: 5 VDC to 30 VDC<br>Number of output points: 3<br>(A photocoupler output (isolated) is used.)                                                                                                                                                                                                                                                                                                                                                                                                             |
|                       | Sequence<br>Output<br>Signals<br>RS-422A<br>Communi-<br>cations |                                 | Output Signals<br>• /COIN (Positioning Completion) signal<br>• /V-CMP (Speed Coincidence Detection) signal<br>• /TGON (Rotation Detection) signal<br>• /S-RDY (Servo Ready) signal<br>• /CLT (Torque Limit Detection) signal<br>• /VLT (Speed Limit Detection) signal<br>• /VLT (Speed Limit Detection) signal<br>• /WARN (Warning) signal<br>• /WARN (Warning) signal<br>• /NEAR (Near) signal<br>A signal can be allocated and the positive and negative logic can be<br>changed.                                               |
|                       |                                                                 | Inter-<br>faces                 | Digital Operator (JUSP-OP05A-1-E) and personal computer (with Sig-<br>maWin+)                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                       |                                                                 | 1:N<br>Commu-<br>nications      | Up to N = 15 stations possible for RS-422A port                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Communi-<br>cations   | (CN3)                                                           | Axis<br>Address<br>Setting      | 03 to EF hex (maximum number of slaves: 62)<br>The rotary switches (S1 and S2) are used to set the station address.                                                                                                                                                                                                                                                                                                                                                                                                               |
|                       | USB                                                             | Interface                       | Personal computer (with SigmaWin+)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                       | Communi-<br>cations<br>(CN7)                                    | Commu-<br>nications<br>Standard | Conforms to USB2.0 standard (12 Mbps).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Displays/Indicators   |                                                                 |                                 | CHARGE, PWR, CN, L1, and L2 indicators, and one-digit seven-segment display                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                       | Communica<br>tocol                                              | ations Pro-                     | MECHATROLINK-III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| MECHATR               | Station Add<br>Settings                                         | lress                           | 03 to EF hex (maximum number of slaves: 62)<br>The rotary switches (S1 and S2) are used to set the station address.                                                                                                                                                                                                                                                                                                                                                                                                               |
| OLINK-III<br>Communi- | Transmissic                                                     | on Speed                        | 100 Mbps                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| cations               | Transmissic                                                     | on Cycle                        | 125 μs, 250 μs, 500 μs, 750 μs,<br>1.0 ms to 4.0 ms (multiples of 0.5 ms)                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                       | Number of sion Bytes                                            | Transmis-                       | 32 or 48 bytes/station<br>A DIP switch (S3) is used to select the number of transmission bytes.                                                                                                                                                                                                                                                                                                                                                                                                                                   |

Continued on next page.

Continued from previous page.

|                      | Item                                  | Specification                                                                                                                                                                                                  |  |  |  |
|----------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
|                      | Performance                           | Position, speed, or torque control with MECHATROLINK-III communi-<br>cations                                                                                                                                   |  |  |  |
| Reference<br>Method  | Reference Input                       | MECHATROLINK-III commands (sequence, motion, data setting, data access, monitoring, adjustment, etc.)                                                                                                          |  |  |  |
|                      | Profile                               | MECHATROLINK-III standard servo profile                                                                                                                                                                        |  |  |  |
| MECHATRC             | LINK-III Communica-                   | Rotary switch (S1 and S2) positions: 16                                                                                                                                                                        |  |  |  |
| tions Setting        | g Switches                            | Number of DIP switch (S3) pins: 4                                                                                                                                                                              |  |  |  |
| Analog Monitor (CN5) |                                       | Number of points: 2<br>Output voltage range: ±10 VDC (effective linearity range: ±8 V)<br>Resolution: 16 bits<br>Accuracy: ±20 mV (Typ)<br>Maximum output current: ±10 mA<br>Settling time (±1%): 1.2 ms (Typ) |  |  |  |
| Dynamic Bra          | ake (DB)                              | Activated when a servo alarm or overtravel (OT) occurs, or when the power supply to the main circuit or servo is OFF.                                                                                          |  |  |  |
| Regenerativ          | e Processing                          | Built-in (An external resistor must be connected to the SGD7S-470A to -780A.)<br>Refer to the following catalog for details.<br>$\square$ AC Servo Drives $\Sigma$ -7 Series (Manual No.: KAEP S800001 23)     |  |  |  |
| Overtravel (0        | OT) Prevention                        | Stopping with dynamic brake, deceleration to a stop, or coasting to a stop for the P-OT (Forward Drive Prohibit) or N-OT (Reverse Drive Prohibit) signal                                                       |  |  |  |
| Protective F         | unctions                              | Overcurrent, overvoltage, low voltage, overload, regeneration error, etc.                                                                                                                                      |  |  |  |
| Utility Funct        | ions                                  | Gain adjustment, alarm history, jogging, origin search, etc.                                                                                                                                                   |  |  |  |
|                      | Inputs                                | /HWBB1 and /HWBB2: Base block signals for Power Modules                                                                                                                                                        |  |  |  |
| Safety               | Output                                | EDM1: Monitors the status of built-in safety circuit (fixed output).                                                                                                                                           |  |  |  |
| Functions            | Applicable<br>Standards <sup>*3</sup> | ISO13849-1 PLe (Category 3), IEC61508 SIL3                                                                                                                                                                     |  |  |  |
| Applicable (         | Option Modules                        | Fully-closed Modules and Safety Modules<br>Note: You cannot use a Fully-closed Module and a Safety Module together.                                                                                            |  |  |  |

\*1. If you combine a Σ-7-Series SERVOPACK with a Σ-V-Series Option Module, the following Σ-V-Series SERVO-PACKs specifications must be used: a surrounding air temperature of 0°C to 55°C and an altitude of 1,000 m max. Also, the applicable surrounding range cannot be increased by derating.

\*2. The coefficient of speed fluctuation for load fluctuation is defined as follows:

Coefficient of speed fluctuation = <u>No-load motor speed</u> - <u>Total-load motor speed</u> × 100% Rated motor speed

\*3. Always perform risk assessment for the system and confirm that the safety requirements are met.

# Wiring and Connecting SERVOPACKs

This chapter provides information on wiring and connecting SERVOPACKs to power supplies and peripheral devices.

| 3.1 | Basic | Wiring Diagrams                                |
|-----|-------|------------------------------------------------|
| 3.2 | I/O S | ignal Connections                              |
|     | 3.2.1 | I/O Signal Connector (CN1) Names and Functions |
|     | 3.2.2 | I/O Signal Connector (CN1) Pin Arrangement 3-6 |
| 3.3 | Conn  | ecting the Gap Sensor                          |

## 3.1 Basic Wiring Diagrams

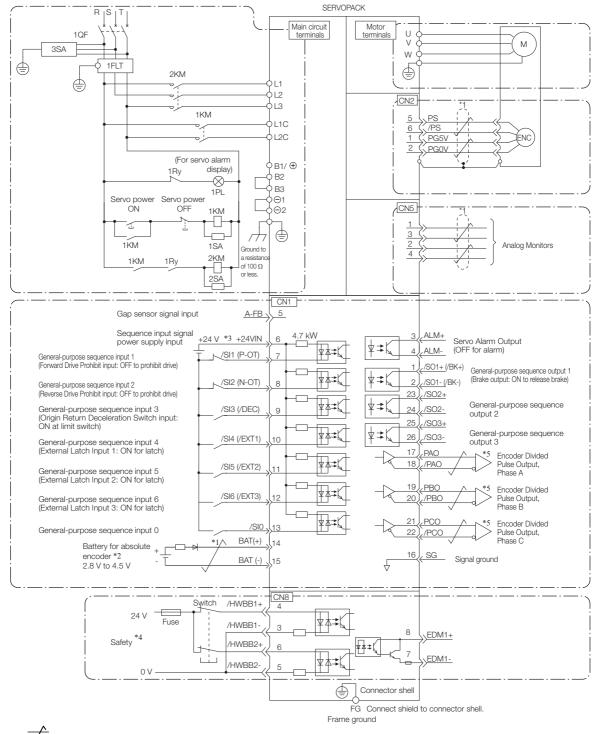
This section provides the basic wiring diagrams.

Refer to the following section for details on the I/O signal connector (CN1).

3.2 I/O Signal Connections on page 3-4

Refer to the following manual for details on terminals and connectors other than those given above.

Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)



- \*1. / represents twisted-pair wires.
- \*2. Connect these when using an absolute encoder. If the Encoder Cable with a Battery Case is connected, do not connect a backup battery.
- \*3. The 24-VDC power supply is not provided by Yaskawa. Use a 24-VDC power supply with double insulation or reinforced insulation.

- \*4. Refer to the following manual if you use a safety function device.

   Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

If you do not use the safety function, insert the Safety Jumper Connector (provided as an accessory) into CN8 when you use the SERVO-PACK.

- \*5. Always use line receivers to receive the output signals.
- Note: 1. You can use parameters to change the functions allocated to the /DEC, P-OT, N-OT, /EXT1, /EXT2, and /EXT3 input sig
  - nals and the /SO1, /SO2, and /SO3 output signals. Refer to the following manual for details. Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)
  - 2. If you use a 24-V brake, install a separate power supply for the 24-VDC power supply from other power supplies, such as the one for the I/O signals of the CN1 connector. If the power supply is shared, the I/O signals may malfunction.
  - 3. Default settings are given in parentheses.

3.2.1 I/O Signal Connector (CN1) Names and Functions

## 3.2 I/O Signal Connections

#### 3.2.1 I/O Signal Connector (CN1) Names and Functions

The following table gives the pin numbers, names, and functions the I/O signal pins for the default settings.

#### **Input Signals**

Default settings are given in parentheses.

| Signal           | Pin No. | Name                                                                               | Function                                                                                                                                                                     |  |  |
|------------------|---------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| /SI1*<br>(P-OT)  | 7       | General-purpose Sequence<br>Input 1 (Forward Drive Prohibit<br>Input)              | You can allocate the input signal to use with a parameter.<br>(Stops Servomotor drive (to prevent overtravel)                                                                |  |  |
| /SI2*<br>(N-OT)  | 8       | General-purpose Sequence<br>Input 2 (Reverse Drive Prohibit<br>Input)              | when the moving part of the machine exceeds the range of movement.)                                                                                                          |  |  |
| /SI3*<br>(/DEC)  | 9       | General-purpose Sequence<br>Input 3 (Origin Return Decel-<br>eration Switch Input) | You can allocate the input signal to use with a parameter.<br>(Connects the deceleration limit switch for origin return.)                                                    |  |  |
| /SI4*<br>(/EXT1) | 10      | General-purpose Sequence<br>Input 4 (External Latch Input<br>1)                    |                                                                                                                                                                              |  |  |
| /SI5*<br>(/EXT2) | 11      | General-purpose Sequence<br>Input 5 (External Latch Input<br>2)                    | <ul> <li>You can allocate the input signals to use with<br/>parameters.</li> <li>(Connect the external signals that latch the currer<br/>feedback pulse counter.)</li> </ul> |  |  |
| /SI6*<br>(/EXT3) | 12      | General-purpose Sequence<br>Input 6 (External Latch Input<br>3)                    |                                                                                                                                                                              |  |  |
| /SI0*            | 13      | General-purpose Sequence<br>Input 0                                                | You can allocate the input signal to use with a parameter.<br>(Used for general-purpose input. You can monitor this signal in the I/O monitor field of MECHATROLINK.)        |  |  |
| +24VIN           | 6       | Sequence Input Signal Power<br>Supply Input                                        | Inputs the sequence input signal power supply.<br>Allowable voltage range: 24 VDC ±20% The 24-<br>VDC power supply is not provided by Yaskawa.                               |  |  |
| BAT+             | 14      | Battery for Absolute Encoder (+)                                                   | These are the pins to connect the absolute encoder backup battery.                                                                                                           |  |  |
| BAT-             | 15      | Battery for Absolute Encoder<br>(-)                                                | Do not connect these pins if you use the Encoder Cable with a Battery Case.                                                                                                  |  |  |
| A-FB             | 5       | Gap Sensor Signal Input                                                            | Inputs the analog signal that is output from the gap sensor. Refer to the following section for details on the connection.                                                   |  |  |

\* You can change the allocations. Refer to the following manual for details.

Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

Note: If forward drive prohibition or reverse drive prohibition is used, the SERVOPACK is stopped by software controls. If the application does not satisfy the safety requirements, add external safety circuits as required.

#### 3.2.1 I/O Signal Connector (CN1) Names and Functions

#### **Output Signals**

Default settings are given in parentheses.

| Signal           | Pin No. | Name                                | Function                                                                                                 |  |  |  |
|------------------|---------|-------------------------------------|----------------------------------------------------------------------------------------------------------|--|--|--|
| ALM+             | 3       | Corrico Alarmo Outout               | Turne OFF (anone) when an error is detected                                                              |  |  |  |
| ALM-             | 4       | - Servo Alarm Output                | Turns OFF (opens) when an error is detected.                                                             |  |  |  |
| /SO1+*<br>(/BK+) | 1       | General-purpose                     | You can allocate the output signal to use with a parameter.                                              |  |  |  |
| /SO1-*<br>(/BK-) | 2       | Sequence Output 1 (Brake<br>Output) | (Controls the brake. The brake is released when the signal turns ON (closes).)                           |  |  |  |
| /SO2+*           | 23      | General-purpose                     |                                                                                                          |  |  |  |
| /SO2-*           | 24      | Sequence Output 2                   | Used for general-purpose outputs.                                                                        |  |  |  |
| /SO3+*           | 25      | General-purpose                     | Set the parameters to allocate functions.                                                                |  |  |  |
| /SO3-*           | 26      | Sequence Output 3                   |                                                                                                          |  |  |  |
| PAO              | 17      | Encoder Divided Pulse               |                                                                                                          |  |  |  |
| /PAO             | 18      | Output, Phase A                     | Output the encoder divided pulse output signals with a                                                   |  |  |  |
| PBO              | 19      | Encoder Divided Pulse               | 90° phase differential.                                                                                  |  |  |  |
| /PBO             | 20      | Output, Phase B                     |                                                                                                          |  |  |  |
| PCO              | 21      | Encoder Divided Pulse               | Outpute the origin signal analous supry analor ratation                                                  |  |  |  |
| /PCO             | 22      | Output, Phase C                     | Outputs the origin signal once every encoder rotation.                                                   |  |  |  |
| SG               | 16      | Signal ground                       | This is the 0-V signal for the control circuits.                                                         |  |  |  |
| FG               | Shell   | Frame ground                        | Connected to the frame ground if the shield of the I/O Signal Cable is connected to the connector shell. |  |  |  |

\* You can change the allocations. Refer to the following manual for details.  $\square \Sigma$ -7-Series  $\Sigma$ -7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

3.2.2 I/O Signal Connector (CN1) Pin Arrangement

#### 3.2.2 I/O Signal Connector (CN1) Pin Arrangement

The following figure gives the pin arrangement of the of the I/O signal connector (CN1) for the default settings.

|                                                          |    | -               |                                        |         | 100.1                                   | General-                                   |          |                        |                               |          |                      | Battery for                                 |
|----------------------------------------------------------|----|-----------------|----------------------------------------|---------|-----------------------------------------|--------------------------------------------|----------|------------------------|-------------------------------|----------|----------------------|---------------------------------------------|
|                                                          | 2  | /SO1-<br>(/BK-) | General-<br>purpose<br>Sequence        | 1       | /SO1+<br>(/BK+)                         | purpose<br>Sequence<br>Output 1            | 15       | BAT-                   | Battery for<br>Absolute       | 14       | BAT+                 | Absolute<br>Encoder (+)                     |
|                                                          |    | × /             | Output 1                               | 0       |                                         | Servo                                      |          |                        | Encoder (-)                   | 10       |                      | Signal                                      |
| Pin 1                                                    |    |                 | Servo                                  | 3       | ALM+                                    | Alarm Out-<br>put                          |          |                        | Encoder<br>Divided            | 16       | SG                   | Ground                                      |
| Pin 2 Pin 14                                             | 4  | ALM-            | Alarm<br>Output                        | 5       | A-FB                                    | Gap Sensor<br>Signal Input                 | 17       | PAO                    | Pulse Out-<br>put, Phase<br>A | 18       | /PAO                 | Encoder<br>Divided<br>Pulse Out-            |
|                                                          |    |                 | Sequence<br>Input Sig-                 |         |                                         |                                            |          |                        | Encoder<br>Divided            |          |                      | put, Phase<br>A                             |
| Pin 12<br>Pin 12<br>Pin 13<br>Pin 25                     | 6  | +24VIN          | nal Power<br>Supply<br>Input           | 7       | /SI1<br>(P-OT)                          | General-<br>purpose<br>Sequence            | 19       | PBO                    | Pulse Out-<br>put, Phase<br>B | 20       | /PBO                 | Encoder<br>Divided<br>Pulse Out-            |
| The above view is from the direction                     |    | (0)0            | General-                               |         | (1 01)                                  | Input 1                                    |          |                        | Encoder<br>Divided            |          |                      | put, Phase<br>B                             |
| of the following<br>arrow without the<br>connector shell | 8  | /SI2<br>(N-OT)  | purpose<br>Sequence<br>Input 2         | 9       | /SI3<br>(/DEC)                          | General-<br>purpose<br>Sequence            | 21       | PCO                    | Pulse Out-<br>put, Phase<br>C | 22       | /PCO                 | Encoder<br>Divided<br>Pulse Out-            |
| attached.                                                | 10 | /SI4            | /EXT1) Sequence<br>Input 4<br>General- |         | (,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | Input 3                                    |          |                        | General-<br>purpose           |          |                      | put, Phase<br>C                             |
|                                                          | 10 | (/EXT1)         |                                        | /SI5    | General-<br>purpose                     | 23 /                                       | 23 /SO2+ | + Sequence<br>Output 2 | 24                            | 24 /SO2- | General-<br>purpose  |                                             |
|                                                          | 10 | /SI6            |                                        | (/EXT2) | Sequence<br>Input 5                     |                                            | (0.0.0   | General-<br>purpose    | 24 /302-                      | /302-    | Sequence<br>Output 2 |                                             |
|                                                          | 12 | (/EXT3)         | Sequence<br>Input 6                    | 13      | /SI0                                    | General-<br>purpose<br>Sequence<br>Input 0 | 25       | /SO3+                  | Sequence<br>Output 3          | 26       | /SO3-                | General-<br>purpose<br>Sequence<br>Output 3 |

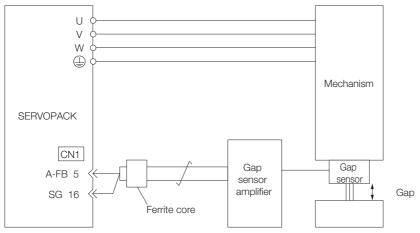
# 3.3 Connecting the Gap Sensor

The input signal from the gap sensor amplifier is connected to pins 5 (A-FB) and 16 (SG) on the CN1 connector.

| Туре   | Signal         | Pin | Name                    | Remarks                                |  |
|--------|----------------|-----|-------------------------|----------------------------------------|--|
| Inputo | A-FB           | 5   | Gap Sensor Signal Input | Connected to the gap concer emplifier  |  |
| inputs | Inputs SG 16 S |     | Signal ground           | Connected to the gap sensor amplifier. |  |

The input specifications are as follows:

- Maximum input voltage: ±12 V
- Input impedance: 30 k $\Omega$



Connect the gap sensor amplifier to the CN1 connector on the SERVOPACK.

Implement the following countermeasures against noise to prevent inductive noise.

- Use twisted-pair cables.
- Minimize the connection distance.
- Attach a ferrite core.

# **Clearance Control**

This chapter describes clearance control.

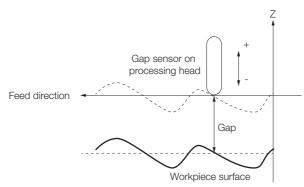
4.1 4.1.1 Recommended Gap Sensor Specifications ..... 4-2 4.1.2 4.1.3 4.2 MECHATROLINK-III Command ......4-3 4.2.1 CLC\_CTRL (Clearance Control) Command 4.3 4.3.1 Switching between Normal Control and Clearance Control ..... 4-4 4.3.2 4.3.3 DEN Signal during Clearance Control ..... 4-4 4.3.4 Overtravel during Clearance Control ..... 4-5 4.4 Parameter Setting Procedure ......4-6 4.4.1 4.4.2 Gap Sensor Application Settings ..... 4-6 4.4.3 Initial Parameter Settings ..... 4-7 4.4.4 Gap Sensor-Related Parameters ..... 4-9 4.4.5 Tuning the Servo Gains ..... 4-10 4.4.6 Analog FB Filter ..... 4-10

4.1.1 Function Overview

# 4.1 Introduction

#### 4.1.1 Function Overview

Clearance control is used to maintain a distance (gap) between a processing head and the surface of the workpiece it is processing to match the offset specified by the host controller. Input the analog signal from the gap sensor into the SERVOPACK to control the distance between the processing head and workpiece surface.



#### 4.1.2 Recommended Gap Sensor Specifications

- Output voltage: ±12 V
- Response frequency: 500 Hz min.

#### 4.1.3 Restrictions

The following functions are disabled when clearance control is executed. When clearance control is not being executed, these functions operate according to the parameter settings.

- Predictive control
- Model following control
- Backlash compensation

4.2.1 CLC\_CTRL (Clearance Control) Command (CF Hex)

# 4.2 MECHATROLINK-III Command

This section gives the command and option monitors for clearance control.

## 4.2.1 CLC\_CTRL (Clearance Control) Command (CF Hex)

|      | as in Which the Com-<br>d Can Be Executed 2 and 3 |                              | Command Clas-<br>sification                                                                                                                                                                                                                                                                                                                                                                        | Vendor-specific command                          | Asynchronous<br>command |  |  |  |
|------|---------------------------------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|-------------------------|--|--|--|
| Pr   | ocessing Time                                     | Communications cycle or less | Subcommand                                                                                                                                                                                                                                                                                                                                                                                         | Can be                                           | e used.                 |  |  |  |
| Byte | Command                                           | Response                     |                                                                                                                                                                                                                                                                                                                                                                                                    | Description                                      |                         |  |  |  |
| 0    | CLC_CTRL (CFH)                                    | CLC_CTRL (CFH)               |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                         |  |  |  |
| 1    | WDT                                               | RWDT                         |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                         |  |  |  |
| 2    |                                                   |                              | Command Overvie                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                         |  |  |  |
| 3    | CMD_CTRL                                          | CMD_STAT                     |                                                                                                                                                                                                                                                                                                                                                                                                    | learance Control) co<br>ance control. Alway      |                         |  |  |  |
| 4    |                                                   |                              | up during executio get position (TPOS                                                                                                                                                                                                                                                                                                                                                              | n. The current posit                             | ion will be the tar-    |  |  |  |
| 5    |                                                   |                              | Control is performe                                                                                                                                                                                                                                                                                                                                                                                | ed so that CLC_OFS                               |                         |  |  |  |
| 6    | SVCMD_CTRL                                        | SVCMD_STAT                   |                                                                                                                                                                                                                                                                                                                                                                                                    | C_CTRL is being ex<br>If CLC_OFS is 0, c         |                         |  |  |  |
| 7    |                                                   |                              | stops and the serve                                                                                                                                                                                                                                                                                                                                                                                | o is locked at the cu<br>DFS at any time dur     | irrent position. You    |  |  |  |
| 8    |                                                   |                              | trol.                                                                                                                                                                                                                                                                                                                                                                                              |                                                  | ing clearance con-      |  |  |  |
| 9    |                                                   |                              | Executing the Corr                                                                                                                                                                                                                                                                                                                                                                                 | imand                                            |                         |  |  |  |
| 10   | SVCMD_IO                                          | SVCMD_IO                     | <ul> <li>CLC_CTRL is executed to enable the clearance control.<br/>The positioning position will change according to the setting of CLC_OFS.</li> <li>If CLC_OFS is 0 when normal control changes to clearance control, the current position becomes the target position (TPOS) and the servo is locked.</li> <li>If CLC_OES is not 0 when normal control changes to clearance control.</li> </ul> |                                                  |                         |  |  |  |
| 11   |                                                   |                              |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                         |  |  |  |
| 12   |                                                   |                              |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                         |  |  |  |
| 13   | - CLC_OFS                                         | CPRM_SEL_MON1                |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                         |  |  |  |
| 14   |                                                   |                              |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                         |  |  |  |
| 15   |                                                   |                              |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                         |  |  |  |
| 16   |                                                   |                              | current position t<br>and the servo is l                                                                                                                                                                                                                                                                                                                                                           | becomes the target                               | position (TPOS)         |  |  |  |
| 17   |                                                   |                              | CDDM CEL MONIT and CDDM CEL MONQ in the                                                                                                                                                                                                                                                                                                                                                            |                                                  |                         |  |  |  |
| 18   | _                                                 | CPRM_SEL_MON2                |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                         |  |  |  |
| 19   |                                                   |                              |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                         |  |  |  |
| 20   |                                                   |                              | Application Precau                                                                                                                                                                                                                                                                                                                                                                                 |                                                  |                         |  |  |  |
| 21   |                                                   |                              | of the gap senso                                                                                                                                                                                                                                                                                                                                                                                   |                                                  | -                       |  |  |  |
| 22   | _                                                 | MONITOR1                     |                                                                                                                                                                                                                                                                                                                                                                                                    | rence unit] is used t<br>s unsigned 4-byte d     |                         |  |  |  |
| 23   |                                                   |                              | range is as follow                                                                                                                                                                                                                                                                                                                                                                                 | s: The setting is cla<br>n value if it is outsid | imped to the mini-      |  |  |  |
| 24   |                                                   |                              | Minimum clearan                                                                                                                                                                                                                                                                                                                                                                                    | ce offset (Pn6F4) ≤                              | CLC_OFS ≤ Maxi-         |  |  |  |
| 25   |                                                   |                              |                                                                                                                                                                                                                                                                                                                                                                                                    | offset (Pn6F2) [1 refe                           | -                       |  |  |  |
| 26   | _                                                 | MONITOR2                     | <ul> <li>In the following c<br/>mand is not exect</li> </ul>                                                                                                                                                                                                                                                                                                                                       | ase, a warning occu<br>suted.                    | urs and the com-        |  |  |  |
| 27   |                                                   |                              | When servo is Of                                                                                                                                                                                                                                                                                                                                                                                   | FF (CMD_ALM = A h<br>ase, a warning will o       |                         |  |  |  |
| 28   |                                                   |                              | torque is clampe                                                                                                                                                                                                                                                                                                                                                                                   | d at the boundary v                              | alue.                   |  |  |  |
| 29   | <b>-</b>                                          |                              | (CMD_ALM = 1 h                                                                                                                                                                                                                                                                                                                                                                                     | t) is outside the sett<br>nex or A.97B).         | ing range               |  |  |  |
| 30   | TLM                                               | MONITOR3                     |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                         |  |  |  |
| 31   |                                                   |                              |                                                                                                                                                                                                                                                                                                                                                                                                    |                                                  |                         |  |  |  |

4.3.1 Switching between Normal Control and Clearance Control

## 4.3 Precautions

#### 4.3.1 Switching between Normal Control and Clearance Control

To change to clearance control, execute the CLC\_CTRL (Clearance Control) command while clearance control is enabled (Pn6E8 =  $n.\Box\Box\Box\Box$ 1).

The positioning position will change according to the setting of CLC\_OFS (Clearance Offset Reference). Refer to the following section for details on CLC\_OFS.

3 4.2.1 CLC\_CTRL (Clearance Control) Command (CF Hex) on page 4-3

You can change CLC\_OFS at any time during clearance control. Set CLC\_OFS to 0 to stop clearance control and lock the servo with the current position as the target position (TPOS).

When you change from normal control to clearance control, do so with the motor stopped to suppress shock that can result from the change.

#### 4.3.2 Follow-up during Clearance Control

During clearance control, the SERVOPACK ignores movement references from the host controller and updates the reference position based on the motor position (follow-up).

The host controller will perform follow-up according to how much the motor position changes during clearance control. Specify the correct reference position when you change from clearance control to normal control.

#### 4.3.3 DEN Signal during Clearance Control

The status of the DEN signal during clearance control is given in the following table.

| Signal | Clearance Control Stopped<br>(CLC_OFS = 0) | Clearance Control Operation in Progress<br>(CLC_OFS ≠ 0) |
|--------|--------------------------------------------|----------------------------------------------------------|
| DEN    | 1: Distribution completed                  | 0: Distribution in progress                              |

The PSET, /COIN, and NEAR signals behave in the same ways during clearance control and normal control.

#### 4.3.4 Overtravel during Clearance Control

If the P-OT (Forward Drive Prohibit Input) signal or N-OT (Reverse Drive Prohibit Input) signal is activated while clearance control is in progress, the SERVOPACK stops the motor with the method set in Pn001 =  $n.\Box\Box X\Box$  (Overtravel Stopping Method), regardless of the movement direction.

If the drive prohibit input is activated in the opposite direction to the movement direction while clearance control is in progress, the SERVOPACK will stop the motor using the following method. If Pn001 is set to n.DD3D or n.DD4D, the setting and the actual stopping method will be different.

|           | Pn001                                                                                                             | Actual stanning method                                                                                                                                                      |  |  |  |  |
|-----------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| Setting   | Description                                                                                                       | Actual stopping method                                                                                                                                                      |  |  |  |  |
| n.□□0□    | Stop with the dynamic brake or coast to a stop. (Use the stopping method set in Pn001 = $n.\Box\Box\BoxX$ .)      |                                                                                                                                                                             |  |  |  |  |
| n.0010    | Decelerate the motor to a stop using the torque set in Pn406 as the maximum torque, and then lock the servo.      |                                                                                                                                                                             |  |  |  |  |
| n.🗆 🗆 2 🗆 | Decelerate the motor to a stop using the torque set in Pn406 as the maximum torque, and then let the motor coast. |                                                                                                                                                                             |  |  |  |  |
| n.🗆 🗆 3 🗆 | Decelerate the motor to a stop using<br>the deceleration time in Pn30A and<br>then lock the servo.                | Decelerate the motor to a stop using the torque set in Pn406 as the maximum torque, and then lock the servo. (Same stopping method as for Pn001 = $n.\Box\Box1\Box$ .)      |  |  |  |  |
| n.□□4□    | Decelerate the motor to a stop using<br>the deceleration time in Pn30A and<br>then let the motor coast.           | Decelerate the motor to a stop using the torque set in Pn406 as the maximum torque, and then let the motor coast. (Same stopping method as for Pn001 = $n.\Box\Box2\Box$ .) |  |  |  |  |

During overtravel signal input, cancel overtravel using the following sequence.

Clearance control operation will restart if you cancel overtravel with a manual pullback or other means while clearance control is stopped for overtravel.

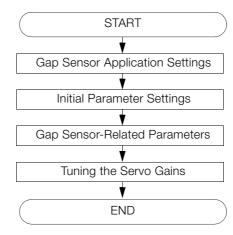
| Step | Operation                                                                                                                                                                                                                                                                                                                                   |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | After the motor is stopped for overtravel, set CLC_OFS to 0 to cancel clearance control.                                                                                                                                                                                                                                                    |
| 2    | Confirm that DEN (position reference distribution completed signal) is 1, and confirm that over-<br>travel stop processing has been completed.<br>You can accurately detect that the motor is stopped by also checking that ZSPD is 1 at this<br>time. Maintain the command as specified in step 1 until these flag conditions are met.     |
| 3    | Read the current reference position (CPOS) and reset the reference coordinate system of the controller.                                                                                                                                                                                                                                     |
| 4    | Use a movement reference command (POSING, INTERPOLATE, etc.) to perform the overtravel cancellation process (pullback). Continue the movement reference command until the pullback operation is completed.<br>If you stop the pullback operation in the middle and then restart it, continue the command from the previous target position. |

4.4.1 Flowchart

# 4.4 Parameter Setting Procedure

#### 4.4.1 Flowchart

The following flowchart gives the parameter setting procedure for clearance control.



#### 4.4.2 Gap Sensor Application Settings

Use  $Pn6E8 = n.\Box X \Box \Box$  to set the motor's CCW rotation direction as the direction in which the gap detected by the gap sensor will widen or will narrow.

Set the motor direction with  $Pn000 = n.\Box\Box\BoxX$ .

| Parameter |                             | Function                                                                              | When Enabled  | Classification |
|-----------|-----------------------------|---------------------------------------------------------------------------------------|---------------|----------------|
| Pn6E8     | n.□0□□<br>(default setting) | Use the motor's CCW rotation direction as the direction in which the gap will widen.  | After restart | Setup          |
|           | n.0100                      | Use the motor's CCW rotation direction as the direction in which the gap will narrow. | Aller lesidit |                |

|                                          | Paramete | )r                     | Pn6E8 = n.□X□□ (Gap Sensor Usage)        |                                          |                                          |                                          |
|------------------------------------------|----------|------------------------|------------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|
|                                          |          |                        | n.0000                                   |                                          | n.0100                                   |                                          |
| Pn000<br>=n.□□□X<br>(Motor<br>Direction) | n.□□□0   | Reference<br>Direction | Forward reference                        | Reverse<br>reference                     | Forward reference                        | Reverse<br>reference                     |
|                                          |          | Motor Direc-<br>tion   | CCW                                      | CW                                       | CCW                                      | CW                                       |
|                                          |          | Gap                    | Direction in<br>which the gap<br>widens  | Direction in<br>which the gap<br>narrows | Direction in<br>which the gap<br>narrows | Direction in<br>which the gap<br>widens  |
|                                          | n.0001   | Reference<br>Direction | Forward reference                        | Reverse<br>reference                     | Forward reference                        | Reverse<br>reference                     |
|                                          |          | Motor Direc-<br>tion   | CW                                       | CCW                                      | CW                                       | CCW                                      |
|                                          |          | Gap                    | Direction in<br>which the gap<br>narrows | Direction in<br>which the gap<br>widens  | Direction in<br>which the gap<br>widens  | Direction in<br>which the gap<br>narrows |

4.4.3 Initial Parameter Settings

#### 4.4.3 Initial Parameter Settings

Use the following procedure to set the parameters.

- **1.** Setting the Clearance Control Selection Switch
  - To enable clearance control, set Pn6E8 to n. DDD1 and turn the power supply OFF and ON again.



• After turning the power supply OFF and ON again, you can execute clearance control, but do not yet execute the Clearance Control command. There is a risk of collision.

| Parameter |                             | Description                | When<br>Enabled | Classification |
|-----------|-----------------------------|----------------------------|-----------------|----------------|
| Pn6E8     | n.ロロロ0<br>(default setting) | Disable clearance control. | After restart   | Setup          |
|           | n.0001                      | Enable clearance control.  |                 |                |

## 2. Setting the Clearance Control Warning Selection Switch Set this parameter to enable or disable warning detection.

| Parameter |                             | Description                                                                                | When<br>Enabled | Classification |
|-----------|-----------------------------|--------------------------------------------------------------------------------------------|-----------------|----------------|
| Pn6E8     | n.□□0□<br>(default setting) | Enable detection of gap sensor signal AD errors and clearance position deviation overflow. |                 | Setup          |
|           | n.0010                      | Disable detection of gap sensor signal AD errors.                                          | After restart   |                |
|           | n.0020                      | Disable detection of clearance position deviation overflow.                                | Alter restart   |                |
|           | n.0030                      | Disable detection of gap sensor signal AD                                                  |                 |                |

Refer to the following section for details on gap sensor AD errors and clearance position deviation overflow.

3.2.1 List of Warnings on page 9-40

#### 3. Setting the Clearance Position Deviation Overflow Level

Set the clearance position deviation overflow level.

If the difference between the clearance offset reference and the gap is Pn6F0 or greater, an A.90B warning (Clearance Position Deviation Overflow) will be output.

A warning will not be output if Pn6E8 is set to  $n.\Box\Box2\Box$  or  $n.\Box\Box3\Box$ .

|       | <b>Clearance</b> Position | Deviation Overflow | Position        |              |                     |
|-------|---------------------------|--------------------|-----------------|--------------|---------------------|
| Pn6F0 | Setting Range             | Setting Unit       | Default Setting | When Enabled | Classifica-<br>tion |
|       | 0 to 8,388,608            | 1 reference unit   | 0               | Immediately  | Setup               |

#### 4. Setting the Clearance Position Deviation Error Level

Set the clearance position deviation error level.

If the difference between the clearance offset reference and the gap is Pn6FC or greater, an A.D40 warning (Clearance Position Deviation Error) will be output.

|       | Clearance Position    | Position         |                 |              |                     |
|-------|-----------------------|------------------|-----------------|--------------|---------------------|
| Pn6FC | Setting Range         | Setting Unit     | Default Setting | When Enabled | Classifica-<br>tion |
|       | 0 to<br>1,073,741,824 | 1 reference unit | 5242880         | Immediately  | Setup               |

#### 4.4.3 Initial Parameter Settings

#### **5.** Setting the Maximum Clearance Offset

Set Pn6F2 (Maximum Clearance Offset) to the maximum value for the clearance offset reference. If the clearance offset reference is greater than the maximum clearance offset, the maximum clearance offset is used.

To set the maximum clearance offset to 1.5 mm in a machine with a 24-bit encoder and a ball screw pitch of 5 mm, calculate the maximum clearance offset in reference units as shown below. For 1 reference unit to be 1  $\mu$ m, the electronic gear ratio must be set as follows:

Electronic gear ratio =  $2^{24}/5,000 = 16,777,216/5,000$ 

Maximum clearance offset [reference units] = Number of encoder pulses [pulses/revolutions]/ball screw pitch [mm] × Maximum clearance offset [mm] × (1/electronic gear ratio) =  $2^{24}/5 \times 1.5 \times (5,000/16,777,216) = 1,500$ 

Therefore, the setting of Pn6F2 is 1,500.



• If Pn6F2 (Maximum Clearance Offset) is set to 0, clearance control is disabled. Set Pn6F2 within the measurable range (the range that maintains linearity) of the gap sensor. If the maximum clearance offset is less than the minimum clearance offset in the setting, an A.040 alarm (Parameter Setting Error) will occur.

|       | Maximum Clearanc | e Offset         | Position        |              |                     |
|-------|------------------|------------------|-----------------|--------------|---------------------|
| Pn6F2 | Setting Range    | Setting Unit     | Default Setting | When Enabled | Classifica-<br>tion |
|       | 0 to 16,777,216  | 1 reference unit | 0               | Immediately  | Setup               |

#### 6. Setting the Minimum Clearance Offset

Set Pn6F4 (Minimum Clearance Offset) to the minimum value for the clearance offset reference. If the clearance offset reference is less than the minimum clearance offset, the minimum clearance offset is used.

| CAUTION |  |
|---------|--|
|         |  |

If Pn6F4 (Minimum Clearance Offset) is set to 0, clearance control is disabled. Set Pn6F4 within the measurable range (the range that maintains linearity) of the gap sensor.
 If the maximum clearance offset is less than the minimum clearance offset in the setting, an A.040 alarm (Parameter Setting Error) will occur.

|       | Minimum Clearance | e Offset         | Position        |              |                     |
|-------|-------------------|------------------|-----------------|--------------|---------------------|
| Pn6F4 | Setting Range     | Setting Unit     | Default Setting | When Enabled | Classifica-<br>tion |
|       | 0 to 16,777,216   | 1 reference unit | 0               | Immediately  | Setup               |

#### 4.4.4 Gap Sensor-Related Parameters

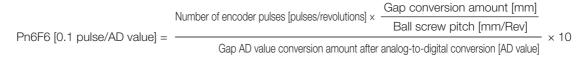
The analog voltage that is output by the gap sensor amplifier is converted to a digital signal in the SERVOPACK. The digital value that results from converting an analog signal is called the AD value. The settings of the following two parameters are used to convert the AD values to feedback pulse units.

You can use the Motion Monitor Tab Page on the SigmaWin+ or the Un116 utility function of the Digital Operator to check gap AD values.

|       | AD Input Gain      |                    | Position        |              |                     |  |
|-------|--------------------|--------------------|-----------------|--------------|---------------------|--|
| Pn6F6 | Setting Range      | Setting Unit       | Default Setting | When Enabled | Classifica-<br>tion |  |
|       | 0 to 1,073,741,824 | 0.1 pulse/AD value | 0               | Immediately  | Setup               |  |
|       | AD Zero Correction |                    |                 | Position     |                     |  |
| Pn6F8 | Setting Range      | Setting Unit       | Default Setting | When Enabled | Classifica-<br>tion |  |
|       | -4,095 to 4,095    | AD Value           | 0               | Immediately  | Setup               |  |

#### Setting the AD Input Gain

Set Pn6F6 (AD Input Gain) to the number of pulses from the motor encoder that corresponds to the AD value from the gap sensor. Use the following formula.



Example

If the AD value of the gap sensor changes from 423 to 623 after you change the gap from 1.0 mm to 1.5 mm in a machine with a 24-bit encoder and a ball screw pitch of 8 mm, use the above formula to calculate Pn6F6 as follows:

Pn6F6 [0.1 pulse/AD value] = 
$$\frac{\frac{2^{24} \times \frac{1.5 - 1.0}{8}}{623 - 423} \times 10 = 52428.8 \rightleftharpoons 52429$$

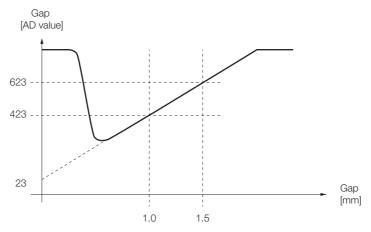
Refer to the following section for details on conversion of gap sensor AD values.

#### Setting the AD Zero Correction

Set Pn6F8 (AD Zero Correction) to the gap AD value for the gap 0 mm position.

Example

In the case shown in the following diagram, if you extrapolate the gap AD value, the AD value for gap 0 mm will be 23, so set Pn6F8 to 23.



4.4.5 Tuning the Servo Gains

#### 4.4.5 Tuning the Servo Gains

The servo gain settings during clearance control are the same as the settings during normal control. Adjust the servo gains with normal control.

Adjust the following parameters to improve response.

Clearance Position Loop Gain Switching

You can change the position loop gain between three values in response to the clearance offset reference and gap deviation.

The nth stage switching Kp ratio is the multiplier for the position loop gain. The position loop gains in the currently selected gain bank are used.

Use this function to change the speed close to the target position (i.e., the clearance offset reference) depending on the size of the deviation. If you do not need to use position loop gain switching, set Pn6E9, Pn6EC, and Pn6EF to 100.

If you increase the Kp ratios, check the balance between the position loop gain and speed loop gain. An imbalance could result in oscillation or hunting.

|       | First Stage Switchin            | ng Kp Ratio        |                 | Position     |                     |
|-------|---------------------------------|--------------------|-----------------|--------------|---------------------|
| Pn6E9 | Setting Range                   | Setting Unit       | Default Setting | When Enabled | Classifica-<br>tion |
|       | 0 to 1,000                      | 1%                 | 100             | Immediately  | Tuning              |
|       | Second Stage Swit               | ching Kp Deviation |                 | Position     |                     |
| Pn6EA | Setting Range                   | Setting Unit       | Default Setting | When Enabled | Classifica-<br>tion |
|       | 0 to 8,388,608                  | 1 reference unit   | 0               | Immediately  | Tuning              |
|       | Second Stage Switching Kp Ratio |                    |                 | Position     |                     |
| Pn6EC | Setting Range                   | Setting Unit       | Default Setting | When Enabled | Classifica-<br>tion |
|       | 0 to 1,000                      | 1%                 | 100             | Immediately  | Tuning              |
|       | Third Stage Switch              | ing Kp Deviation   |                 | Position     | •                   |
| Pn6ED | Setting Range                   | Setting Unit       | Default Setting | When Enabled | Classifica-<br>tion |
|       | 0 to 8,388,608                  | 1 reference unit   | 0               | Immediately  | Tuning              |
|       | Third Stage Switch              | ing Kp Ratio       |                 | Position     |                     |
| Pn6EF | Setting Range                   | Setting Unit       | Default Setting | When Enabled | Classifica-<br>tion |
|       | 0 to 1,000                      | 1%                 | 100             | Immediately  | Tuning              |

#### 4.4.6 Analog FB Filter

An analog FB filter smooths the analog output from the gap sensor by applying a first order lag filter. Use it to eliminate the effects of noise.

Set the analog FB filter with Pn6FA (Analog FB Filter Time Constant).

Increasing the setting too much could reduce response.

# Tuning

This chapter provides information on the flow of tuning, details on tuning functions, and related operating procedures.

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## 5.1 Overview and Flow of Tuning

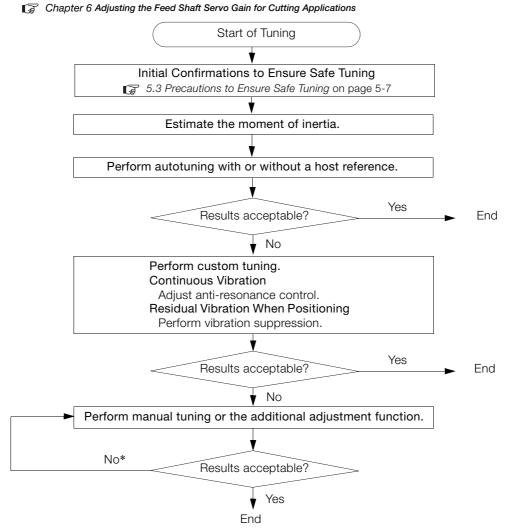
Tuning is performed to optimize response by adjusting the servo gains in the SERVOPACK.

The servo gains are set using a combination of parameters, such as parameters for the speed loop gain, position loop gain, filters, friction compensation, and moment of inertia ratio. These parameters influence each other, so you must consider the balance between them.

The servo gains are set to stable settings by default. Use the various tuning functions to increase the response even further for the conditions of your machine.

The basic tuning procedure is shown in the following flowchart. Make suitable adjustments considering the conditions and operating requirements of your machine. For cutting applications, use one of the following procedures.

- Make adjustments based the following flowchart.
- Make adjustments focused on servo gains used in cutting applications. Refer to the following sections for details.



\* For cutting applications, you can also use predictive control and friction compensation to make adjustments. Refer to the following chapter for details.

Chapter 7 Servo Gain Adjustments for High-speed and High-precision Control

5.1.1 Tuning Functions

#### **Tuning Functions** 5.1.1

The following table provides an overview of the tuning functions.

|                                      | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                          |           |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------|
| Tuning Function                      | Outline                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Applicable Con-<br>trol Methods                          | Reference |
| Moment of Inertia<br>Estimation      | The moment of inertia ratio is calculated by operat-<br>ing the Servomotor a few times.<br>The moment of inertia ratio that is calculated here<br>is used in other tuning functions.                                                                                                                                                                                                                                                                                                            | Speed control,<br>position control,<br>or torque control | page 5-11 |
| Autotuning without<br>Host Reference | <ul> <li>The following parameters are automatically<br/>adjusted in the internal references in the SERVO-<br/>PACK during automatic operation.</li> <li>Gains (e.g., position loop gain and speed loop<br/>gain)</li> <li>Filters (torque reference filter and notch filters)</li> <li>Friction compensation</li> <li>Anti-resonance control</li> <li>Vibration suppression</li> </ul>                                                                                                          | Speed control or position control                        | page 5-18 |
| Autotuning with Host<br>Reference    | <ul> <li>The following parameters are automatically adjusted with the position reference input from the host controller while the machine is in operation. You can use this function for fine-tuning after you perform autotuning without a host reference.</li> <li>Gains (e.g., position loop gain and speed loop gain)</li> <li>Filters (torque reference filter and notch filters)</li> <li>Friction compensation</li> <li>Anti-resonance control</li> <li>Vibration suppression</li> </ul> | Position control                                         | page 5-29 |
| Custom Tuning                        | <ul> <li>The following parameters are adjusted with the position reference or speed reference input from the host controller while the machine is in operation.</li> <li>Gains (e.g., position loop gain and speed loop gain)</li> <li>Filters (torque reference filter and notch filters)</li> <li>Friction compensation</li> <li>Anti-resonance control</li> </ul>                                                                                                                            | Speed control or position control                        | page 5-36 |
| Anti-resonance<br>Control Adjustment | This function effectively suppresses continuous vibration.                                                                                                                                                                                                                                                                                                                                                                                                                                      | Speed control or position control                        | page 5-45 |
| Vibration<br>Suppression             | This function effectively suppresses residual vibra-<br>tion if it occurs when positioning.                                                                                                                                                                                                                                                                                                                                                                                                     | Position control                                         | page 5-50 |
| Speed Ripple Com-<br>pensation       | This function reduces the ripple in the motor speed.                                                                                                                                                                                                                                                                                                                                                                                                                                            | Speed control,<br>position control,<br>or torque control | *         |
| Additional<br>Adjustment Function    | This function combines autotuning with custom tuning. You can use it to improve adjustment results.                                                                                                                                                                                                                                                                                                                                                                                             | Depends on the functions that you use.                   | page 5-54 |
| Manual Tuning                        | You can manually adjust the servo gains to adjust the response.                                                                                                                                                                                                                                                                                                                                                                                                                                 | Speed control,<br>position control,<br>or torque control | *         |

\* Refer to the following manual for details.

 Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

5.1.2 Diagnostic Tool

#### **Diagnostic Tool** 5.1.2

You can use the following tools to measure the frequency characteristics of the machine and set notch filters.

| Diagnostic Tool     | Outline                                                                                                                                    | Applicable<br>Control Methods                            | Reference |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------|
| Mechanical Analysis | The machine is subjected to vibration to detect resonance frequencies. The measurement results are displayed as waveforms or numeric data. | Speed control,<br>position control,<br>or torque control | *         |
| Easy FFT            | The machine is subjected to vibration to detect resonance frequencies. The measurement results are displayed only as numeric data.         | Speed control,<br>position control,<br>or torque control | *         |

\* Refer to the following manual for details.

 Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

# 5.2 Monitoring Methods

You can use the data tracing function of the SigmaWin+ or the analog monitor signals of the SERVOPACK for monitoring. If you perform custom tuning or manual tuning, always use the above functions to monitor the machine operating status and SERVOPACK signal waveform while you adjust the servo gains.

Check the adjustment results with the following response waveforms.

• Position Control

| ltem                     | Unit              |                   |  |
|--------------------------|-------------------|-------------------|--|
| nem                      | Rotary Servomotor | Linear Servomotor |  |
| Torque reference         |                   | %                 |  |
| Feedback speed           | min <sup>-1</sup> | mm/s              |  |
| Position reference speed | min <sup>-1</sup> | mm/s              |  |
| Position deviation       | Reference units   |                   |  |

### • Speed Control

| Item             | Unit              |                   |  |
|------------------|-------------------|-------------------|--|
| ILEITI           | Rotary Servomotor | Linear Servomotor |  |
| Torque reference | %                 |                   |  |
| Feedback speed   | min⁻¹             | mm/s              |  |
| Reference speed  | min <sup>-1</sup> | mm/s              |  |

### • Torque Control

| ltem             | Unit              |                   |  |
|------------------|-------------------|-------------------|--|
| item             | Rotary Servomotor | Linear Servomotor |  |
| Torque reference | %                 |                   |  |
| Feedback speed   | min⁻¹             | mm/s              |  |

5.3.1 Overtravel Settings

# **Precautions to Ensure Safe Tuning**

# CAUTION

- Observe the following precautions when you perform tuning.
  - Do not touch the rotating parts of the motor when the servo is ON.
  - · Before starting the Servomotor, make sure that an emergency stop can be performed at any time.
  - Make sure that trial operation has been successfully performed without any problems.
  - Provide an appropriate stopping device on the machine to ensure safety.

Perform the following settings in a way that is suitable for tuning.

#### 5.3.1 **Overtravel Settings**

Overtravel settings are made to force the Servomotor to stop for a signal input from a limit switch when a moving part of the machine exceeds the safe movement range.

Refer to the following manual for details on the I/O trace function.

Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

#### **Torque Limit Settings** 5.3.2

You can limit the torque that is output by the Servomotor based on calculations of the torque required for machine operation. You can use torque limits to reduce the amount of shock applied to the machine when problems occur, such as collisions or interference. If the torque limit is lower than the torgue that is required for operation, overshooting or vibration may occur.

Refer to the following manual for details.

Ω Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

#### Setting the Position Deviation Overflow Alarm Level 5.3.3

The position deviation overflow alarm is a protective function that is enabled when the SERVO-PACK is used in position control.

If the alarm level is set to a suitable value, the SERVOPACK will detect excessive position deviation and will stop the Servomotor if the Servomotor operation does not agree with the reference.

The position deviation is the difference between the position reference value and the actual position.

You can calculate the position deviation from the position loop gain (Pn102) and the motor speed with the following formula.

### Rotary Servomotors

Motor speed [min<sup>-1</sup>] Encoder resolution\*1 Pn210 Position deviation [reference units] = Pn102 [0.1/s]/10<sup>\*2, \*3</sup> Pn20E 60

### Linear Servomotors

Motor speed [mm/s] Resolution Pn210 Position deviation [reference units] =  $\overline{Pn102 [0.1/s]/10^{*2,*3}} \times \overline{Linear encoder pitch [\mum]/1,000} \times$ Pn20E

#### 5.3.3 Setting the Position Deviation Overflow Alarm Level

Position Deviation Overflow Alarm Level (Pn520) [setting unit: reference units]

#### Rotary Servomotors

 $Pn520 > \frac{Maximum motor speed [min<sup>-1</sup>]}{60} \times \frac{Encoder resolution<sup>*1</sup>}{Pn102 [0.1/s]/10^{*2, *3}} \times \frac{Pn210}{Pn20E} \times \frac{(1.2 \text{ to } 2)^{*4}}{Encoder resolution^{*1}}$ 

#### Linear Servomotors

| D- 500  | Maximum motor speed [mm/s]         | Resolution                      |   | <u>Pn210</u> × $(1.2 \text{ to } 2)^{*4}$ |
|---------|------------------------------------|---------------------------------|---|-------------------------------------------|
| Pn520 > | Pn102 [0.1/s]/10 <sup>*2, *3</sup> | Linear encoder pitch [µm]/1,000 | × | Pn20E (1.2 to 2)                          |

- \*1. Refer to the following manual for details.
- $\square$   $\Sigma$ -7-Series  $\Sigma$ -7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)
- \*2. When model following control (Pn140 = n. DDD1) is enabled, use the setting of Pn141 (Model Following Control Gain) instead of the setting of Pn102 (Position Loop Gain).
- \*3. To check the setting of Pn102 on the Digital Operator, change the parameter display setting to display all parameters (Pn00B = n.□□□1).
- \*4. The underlined coefficient "× (1.2 to 2)" adds a margin to prevent an A.d00 alarm (Position Deviation Overflow) from occurring too frequently.

If you set a value that satisfies the formula, an A.d00 alarm (Position Deviation Overflow) should not occur during normal operation.

If the Servomotor operation does not agree with the reference, position deviation will occur, an error will be detected, and the motor will stop.

The following calculation example uses a Rotary Servomotor with a maximum motor speed of

6,000 and an encoder resolution of 16,777,216 (24 bits). Pn102 is set to 400.  $\frac{Pn210}{Pn20F} = \frac{1}{16}$ 

$$Pn520 = \frac{6,000}{60} \times \frac{16,777,216}{400/10} \times \frac{1}{16} \times 2$$
$$= 2,621,440 \times 2$$

= 5,242,880 (default setting of Pn520)

If the acceleration/deceleration rate required for the position reference exceeds the tracking capacity of the Servomotor, the tracking delay will increase and the position deviation will no longer satisfy the above formulas. If this occurs, lower the acceleration/deceleration rate so that the Servomotor can follow the position reference or increase the position deviation overflow alarm level.

### **Related Parameters**

|       | Position Deviation Overflow Alarm Level            |                  |                 | Position     |                |  |
|-------|----------------------------------------------------|------------------|-----------------|--------------|----------------|--|
| Pn520 | Setting Range                                      | Setting Unit     | Default Setting | When Enabled | Classification |  |
|       | 1 to 1,073,741,823                                 | 1 reference unit | 5,242,880       | Immediately  | Setup          |  |
|       | Position Deviation Overflow Warning Level Position |                  |                 |              | ion            |  |
| Pn51E | Setting Range                                      | Setting Unit     | Default Setting | When Enabled | Classification |  |
|       | 10 to 100                                          | 1%               | 100             | Immediately  | Setup          |  |

### **Related Alarms**

| Alarm Number | Alarm Name                     | Alarm Meaning                                                                                                                    |
|--------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| A.d00        | Position Deviation<br>Overflow | This alarm is displayed when the position deviation exceeds the set-<br>ting of Pn520 (Position Deviation Overflow Alarm Level). |

5.3.4 Vibration Detection Level Setting

### **Related Warnings**

| Warning Number | Warning Name                   | Meaning                                                                                             |
|----------------|--------------------------------|-----------------------------------------------------------------------------------------------------|
| A.900          | Position Deviation<br>Overflow | This warning occurs if the position deviation exceeds the specified percentage (Pn520 × Pn51E/100). |

## 5.3.4 Vibration Detection Level Setting

You can set the vibration detection level (Pn312) to more accurately detect A.520 alarms (Vibration Alarm) and A.911 warnings (Vibration) when vibration is detected during machine operation.

Set the initial vibration detection level to an appropriate value. Refer to the following manual for details.

Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

# 5.3.5 Setting the Position Deviation Overflow Alarm Level at Servo ON

If the servo is turned ON when there is a large position deviation, the Servomotor will attempt to return to the original position to bring the position deviation to 0, which may create a hazardous situation. To prevent this, you can set a position deviation overflow alarm level at servo ON to restrict operation.

The related parameters and alarms are given in the following tables.

### **Related Parameters**

|       | Position Deviation C                                           | Overflow Alarm Level | at Servo ON     | Posit        | ion            |
|-------|----------------------------------------------------------------|----------------------|-----------------|--------------|----------------|
| Pn526 | Setting Range                                                  | Setting Unit         | Default Setting | When Enabled | Classification |
|       | 1 to 1,073,741,823                                             | 1 reference unit     | 5,242,880       | Immediately  | Setup          |
|       | Position Deviation Overflow Warning Level at Servo ON Position |                      |                 |              | ion            |
| Pn528 | Setting Range                                                  | Setting Unit         | Default Setting | When Enabled | Classification |
|       | 10 to 100                                                      | 1%                   | 100             | Immediately  | Setup          |

### Rotary Servomotors

|       | Speed Limit Level at Servo ON |                     |                 | Position     |                |  |
|-------|-------------------------------|---------------------|-----------------|--------------|----------------|--|
| Pn529 | Setting Range                 | Setting Unit        | Default Setting | When Enabled | Classification |  |
|       | 0 to 10,000                   | 1 min <sup>-1</sup> | 10,000          | Immediately  | Setup          |  |

### · Linear Servomotors

|       | Speed Limit Level at Servo ON |              |                 | Positio      | on             |
|-------|-------------------------------|--------------|-----------------|--------------|----------------|
| Pn584 | Setting Range                 | Setting Unit | Default Setting | When Enabled | Classification |
|       | 0 to 10,000                   | 1 mm/s       | 10,000          | Immediately  | Setup          |

### **Related Alarms**

| Alarm Number | Alarm Name                                                             | Alarm Meaning                                                                                                                                                                                                                                                                                              |
|--------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A.d01        | Position Deviation<br>Overflow Alarm at<br>Servo ON                    | This alarm occurs if the servo is turned ON after the position devia-<br>tion exceeded the setting of Pn526 (Position Deviation Overflow<br>Alarm Level at Servo ON) while the servo was OFF.                                                                                                              |
| A.d02        | Position Deviation<br>Overflow Alarm for<br>Speed Limit at Servo<br>ON | If position deviation remains in the deviation counter, the setting of Pn529 or Pn584 (Speed Limit Level at Servo ON) will limit the speed when the servo is turned ON. This alarm occurs if a position reference is input and the setting of Pn520 (Position Deviation Overflow Alarm Level) is exceeded. |

5.3.5 Setting the Position Deviation Overflow Alarm Level at Servo ON

Refer to the following manual for information on troubleshooting alarms.

Ω Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

### **Related Warnings**

| Warning Number | Warning Name                                          | Meaning                                                                                                                          |
|----------------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| A.901          | Position Deviation<br>Overflow Warning<br>at Servo ON | This warning occurs if the servo is turned ON while the position deviation exceeds the specified percentage (Pn526 × Pn528/100). |

5.4.1 Outline

# 5.4 Estimating the Moment of Inertia

This section describes how the moment of inertia is calculated.

The moment of inertia ratio that is calculated here is used in other tuning functions. You can also estimate the moment of inertia during autotuning without a host reference. Refer to the following section for the procedure.

5.5.4 Operating Procedure on page 5-20

## 5.4.1 Outline

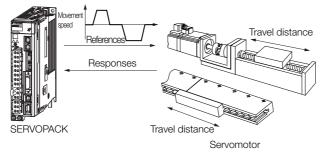
The moment of inertia during operation is automatically calculated by the SERVOPACK for round-trip (forward and reverse) operation. A reference from the host controller is not used.

The moment of inertia ratio (i.e., the ratio of the load moment of inertia to the motor moment of inertia) is a basic parameter for adjusting gains. It must be set as accurately as possible.

Although the load moment of inertia can be calculated from the weight and structure of the mechanisms, doing so is very troublesome and calculating it accurately can be very difficult with the complex mechanical structures that are used these days. With moment of inertia estimation, you can get an accurate load moment of inertia simply by operating the motor in the actual system in forward and reverse a few times.

The motor is operated with the following specifications.

- Maximum speed: ±1,000 min<sup>-1</sup> (can be changed)
- Acceleration rate: ±20,000 min<sup>-1</sup>/s (can be changed)
- Travel distance: ±2.5 rotations max. (can be changed)



Note: Execute moment of inertia estimation after jogging to a position that ensures a suitable range of motion.

## 5.4.2 Restrictions

The following restrictions apply to estimating the moment of inertia.

### Systems for which Execution Cannot Be Performed

- When the machine system can move only in one direction
- When the range of motion is 0.5 rotations or less

# Systems for Which Adjustments Cannot Be Made Accurately

- When a suitable range of motion is not possible
- When the moment of inertia changes within the set operating range
- When the machine has high dynamic friction
- When the rigidity of the machine is low and vibration occurs when positioning is performed
- When the position integration function is used

#### 5.4.3 Applicable Tools

• When proportional control is used

Note: If you specify calculating the moment of inertia, an error will occur if V\_PPI in the servo command output signals (SVCMD\_IO) changes to specify the proportional action during moment of inertia estimation.

- · When mode switching is used
  - Note: If you specify moment of inertia estimation, mode switching will be disabled and PI control will be used while the moment of inertia is being calculated. Mode switching will be enabled after moment of inertia estimation has been completed.
- · When speed feedforward or torque feedforward is input

### Preparations

Always check the following before you execute moment of inertia estimation.

- The main circuit power supply must be ON.
- There must be no overtravel.
- The servo must be OFF.
- The control method must not be set to torque control.
- The first gains must be selected.
- The test without a motor function must be disabled (Pn00C =  $n.\Box\Box\Box$ ).
- There must be no alarms or warnings.
- There must be no hard wire base block (HWBB).
- The parameters must not be write prohibited.

### 5.4.3 Applicable Tools

The following table lists the tools that you can use to estimate the moment of inertia and the applicable tool functions.

| Tool Function             |  | Operating Procedure Reference            |  |
|---------------------------|--|------------------------------------------|--|
| SigmaWin+ Tuning - Tuning |  | € 5.4.4 Operating Procedure on page 5-12 |  |

### 5.4.4 Operating Procedure

Use the following procedure to estimate the moment of inertia ratio.

## 

- Estimating the moment of inertia requires operating the motor and therefore presents hazards. Observe the following precaution.
  - Confirm safety around moving parts.

This function involves automatic operation with vibration. Make sure that you can perform an emergency stop (to turn OFF the power supply) at any time. There will be movement in both directions within the set range of movement. Check the range of movement and the directions and implement protective controls for safety, such as the overtravel functions.

# 

- Be aware of the following points if you cancel the moment of inertia estimation while the motor is operating.
  - If you cancel operation with the Servo OFF Button, the motor will stop according to setting of the Servo OFF stopping method (Pn001 = n. DDDX).
  - If you cancel operation with the **Cancel** Button, the motor will decelerate to a stop and then enter a zero-clamped state.
- 1. Click the <u>I</u> Servo Drive Button in the workspace of the Main Window of the SigmaWin+.

5.4.4 Operating Procedure

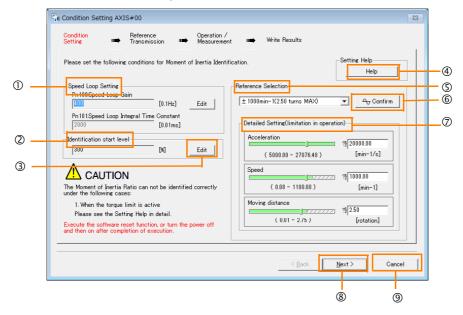
- **2.** Select Tuning in the Menu Dialog Box. The Tuning Dialog Box will be displayed. Click the **Cancel** Button to cancel tuning.
- 3. Click the Execute Button.

| Tuning                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                   |
| This function executes tuning for the Servopack. Using this function while the motor is running is dangerous. Be sure to<br>carefully read the SigmaWin+ Operation Manual before executing this function. Special care must be taken for the following.                                                                           |
| <safety precautions=""><br/>1. Before executing this function, make sure that the emergency stop (power off) can be activated when needed.<br/>The response speed may change considerably during tuning.<br/>Before executing this function, make sure that the emergency stop (power off) can be activated when needed.</safety> |
| 2. Confirm the safety of the area adjoining the drive unit.<br>Before executing this function, always confirm that the area within the motor motion range<br>and direction is clear for safe operation. Provide protective devices to ensure safety in<br>the event of overtraveling or other unexpected movement.                |
| <ol> <li>Always confirm that there is no position errors before running the motor.</li> <li>Be sure to return to the origin and reset the position prior to normal operation.</li> <li>Running the motor without resetting the origin can lead to an overrun and is extremely dangerous.</li> </ol>                               |
| 4. When the moment of inertia (mass) identification function is used for a vertical axis, check the safety of the system.<br>When the moment of inertia (mass) identification function is used for a vertical axis,<br>confirm that the axis level does not drop when the servio is turned off.                                   |
| <turing precautions=""><br/>5. Set the moment of inertia (mass) ratio first.<br/>The moment of inertia (mass) ratio must be set to achieve correct tuning.<br/>Be sure to set the ratio. The setting can be performed from the Tuning window.</turing>                                                                            |
| <ol> <li>If vibration is generated, execute custom tuning.</li> <li>Lower the gain until there is no vibration by executing custom tuning.</li> </ol>                                                                                                                                                                             |
| Note: While tuning, you can read the precautions related to the process.<br>Click the Precautions button provided in each tuning window.                                                                                                                                                                                          |
| Cancel                                                                                                                                                                                                                                                                                                                            |

4. Click the Execute Button.

| Tuning AXIS#00                                            |
|-----------------------------------------------------------|
| Set the moment of inertia (mass) ratio before Precautions |
| Moment of inertia (mass) ratio identification             |
| Pn103 - Moment of Inertia Ratio                           |
|                                                           |
| 100 % <u>Edit</u>                                         |
| •                                                         |
| Autotuning                                                |
| Reference input from host controller                      |
| Position Reference Input                                  |
|                                                           |
| Advanced adjustment Finish                                |

5. Set the conditions as required.



#### 5.4.4 Operating Procedure

### ① Speed Loop Setting Area

Make the speed loop settings in this area.

If the speed loop response is too bad, it will not be possible to measure the moment of inertia ratio accurately.

The values for the speed loop response that are required for moment of inertia estimation are set for the default settings. It is normally not necessary to change these settings. If the default speed loop gain is too high for the machine (i.e., if vibration occurs), lower the setting. It is not necessary to increase the setting any farther.

### Identification Start Level Group

This is the setting of the moment of inertia calculation starting level.

If the load is large or the machine has low rigidity, the torque limit may be applied, causing moment of inertia estimation to fail.

If that occurs, estimation may be possible if you double the setting of the start level.

3 Edit Buttons

Click the button to display a dialog box to change the settings related to the speed loop or estimation start level.

④ Help Button

Click this button to display guidelines for setting the reference conditions. Make the following settings as required.

- Operate the motor to measure the load moment of inertia of the machine in comparison with the rotor moment of inertia.
- Set the operation mode, reference pattern (maximum acceleration rate, maximum speed, and maximum travel distance), and speed loop-related parameters.
- Correct measurement of the moment of inertia ratio may not be possible depending on the settings. Set suitable settings using the measurement results as reference.

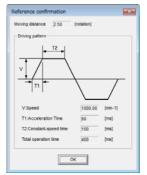
### S Reference Selection Area

Either select the reference pattern for estimation processing from the box, or set the values in the **Detailed Setting** Group. Generally speaking, the larger the maximum acceleration rate is, the more accurate the moment of inertia estimation will be.

Set the maximum acceleration range within the possible range of movement considering the gear ratio, e.g., the pulley diameters or ball screw pitch.

#### 6 Confirm Button

Click this button to display the Reference Confirmation Dialog Box.

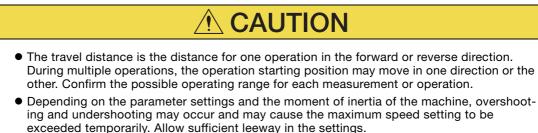


#### ⑦ Detailed Setting Area

You can change the settings by moving the bars or directly inputting the settings to create the required reference pattern.

- Next Button
- Click this button to display the Reference Transmission Dialog Box.
- ③ Cancel Button

Click this button to return to the Tuning Dialog Box.



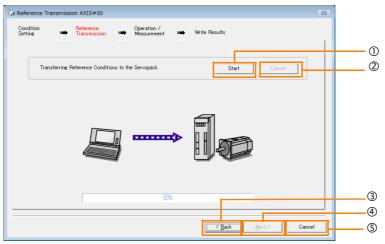
### Information When Measurement Is Not Correct

Estimating the moment of inertia ratio cannot be performed correctly if the torque limit is activated. Adjust the limits or reduce the acceleration rate in the reference selection so that the torque limit is not activated.

#### 6. Click the Next Button.

The Reference Transmission Dialog Box will be displayed.

### 7. Click the Start Button.



#### ① Start Button

The reference conditions will be transferred to the SERVOPACK. A progress bar will show the progress of the transfer.

2 Cancel Button

The **Cancel** Button is enabled only while data is being transferred to the SERVOPACK. You cannot use it after the transfer has been completed.

③ Back Button

This button returns you to the Condition Setting Dialog Box. It is disabled while data is being transferred.

④ Next Button

This button is enabled only when the data has been transferred correctly. You cannot use it if an error occurs or if you cancel the transfer before it is completed.

Click the **Next** Button to display the Operation/Measurement Dialog Box.

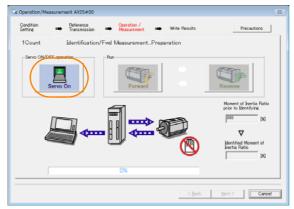
S Cancel Button

This button cancels processing and returns you to the Tuning Dialog Box.

#### 8. Click the Next Button.

The Operation/Measurement Dialog Box will be displayed.

#### 9. Click the Servo On Button.



### 5.4.4 Operating Procedure

#### 10. Click the Forward Button.

The shaft will rotate in the forward direction and the measurement will start. After the measurement and data transfer have been completed, the **Reverse** Button will be displayed in color.

#### 11. Click the Reverse Button.



The shaft will rotate in the reverse direction and the measurement will start. After the measurement and data transfer have been completed, the **Forward** Button will be displayed in color.



#### 12. Repeat steps 8 to 9 until the Next Button is enabled.

Measurements are performed from 2 to 7 times and then verified. The number of measurements is displayed in upper left corner of the dialog box. A progress bar at the bottom of the dialog box will show the progress of the transfer each time.

13. When the measurements have been completed, click the Servo On Button to turn OFF the servo.

### 14. Click the Next Button.

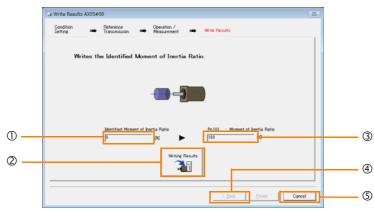
The Write Results Dialog Box will be displayed.

Information If you click the **Next** Button before you turn OFF the servo, the following Dialog Box will be displayed. Click the **OK** Button to turn OFF the servo.

| Moment of Inertia Identification |
|----------------------------------|
| 1 turns the Servo OFF.           |
| OK Cancel                        |

5.4.4 Operating Procedure

15. Click the Writing Results Button.



#### ① Identified Moment of Inertia Ratio Box

The moment of inertia ratio that was found with operation and measurements is displayed here.

<sup>(2)</sup> Writing Results Button

If you click this button, Pn103 (Moment of Inertia Ratio) in the SERVOPACK is set to the value that is displayed for the identified moment of inertia ratio.

#### ③ Pn103: Moment of Inertia Ratio Box

The value that is set for the parameter is displayed here.

After you click the **Writing Results** Button, the value that was found with operation and measurements will be displayed as the new setting.

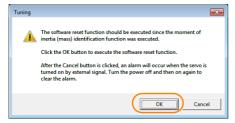
④ Back Button

This button is disabled.

S Cancel Button

This button will return you to the Tuning Dialog Box.

- 16. Confirm that the Identified Moment of Inertia Ratio Box and the Pn103: Moment of Inertia Ratio Box show the same value and then click the Finish Button.
- 17. Click the OK Button.



18. Click the Execute Button.

| ① Software Reset Common for the Unit                                                                                                         | × |
|----------------------------------------------------------------------------------------------------------------------------------------------|---|
| The software reset function will be executed.<br>The Servopack will stop responding for approximately 5<br>seconds after the fuction begins. |   |
| Execute                                                                                                                                      |   |
| 0%                                                                                                                                           |   |
|                                                                                                                                              |   |

If the setting of the moment of inertia ratio (Pn103) was changed, the new value will be saved and the Tuning Dialog Box will be displayed again.

This concludes the procedure to estimate the moment of inertia ratio.

5.5.1 Outline

# 5.5 Autotuning without Host Reference

This section describes autotuning without a host reference.

| Important | <ul> <li>Autotuning without a host reference performs adjustments based on the setting of the speed loop gain (Pn100). Therefore, precise adjustments cannot be made if there is vibration when adjustments are started. Make adjustments after lowering the speed loop gain (Pn100) until vibration is eliminated.</li> <li>If you change the machine load conditions or drive system after you execute autotuning without a host reference and then you execute autotuning without a host reference with moment of inertia estimation specified, use the following parameter settings. If you execute autotuning without a host reference for any other conditions, the machine may vibrate and may be damaged.</li> <li>Pn070 = n. 	D00 (Do not use predictive control or quadrant projection correction) Pn160 = n. DD00 (Do not use anti-resonance control.)</li> <li>Pn408 = n.00D0 (Disable friction compensation, first stage notch filter, and second stage</li> </ul> |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | <ul> <li>notch filter.)</li> <li>Note: If you are using the Digital Operator and the above parameters are not displayed, change the parameter display setting to display all parameters (Pn00B = n.□□□1) and then turn the power supply OFF and ON again.</li> <li>Automatic adjustment of predictive control, quadrant projection correction, model following control, and vibration suppression is not possible.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

### 5.5.1 Outline

For autotuning without a host reference, operation is automatically performed by the SERVO-PACK for round-trip (forward and reverse) operation to adjust for machine characteristics during operation. A reference from the host controller is not used.

The following items are adjusted automatically.

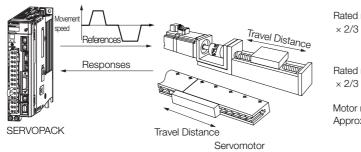
- Moment of inertia ratio
- Gains (e.g., speed loop gain and position loop gain)
- Filters (torque reference filter and notch filters)
- Friction compensation
- Anti-resonance control

Refer to the following section for details on the parameters that are adjusted. 5.5.7 Related Parameters on page 5-28

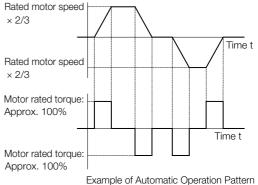
| Maximum speed          | Rated motor speed × $\frac{2}{3}$                                                                                                                                                                |                                                                                                                     |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Acceleration<br>Torque | Rated motor torque: Approx. 100%<br>Note: The acceleration torque depends on the setting of the influence of the moment of inertia ratio<br>(Pn103), machine friction, and external disturbance. |                                                                                                                     |
|                        | Rotary Servomotors                                                                                                                                                                               | You can set the desired travel distance. The default setting is for a value equivalent to 3 motor shaft rotations.  |
| Travel Distance        | Direct Drive Servomotors                                                                                                                                                                         | You can set the desired travel distance. The default setting is for a value equivalent to 0.3 rotations.            |
|                        | Linear Servomotors                                                                                                                                                                               | You can set the desired travel distance in increments of 1,000 reference units. (The default setting is for 90 mm.) |

The motor is operated with the following specifications.

5.5.2 Restrictions



Note: Execute autotuning without a host reference after jogging to a position that ensures a suitable range of motion.



- Autotuning without a host reference requires operating the motor and therefore presents hazards. Observe the following precaution.
  - Confirm safety around moving parts.

This function involves automatic operation with vibration. Make sure that you can perform an emergency stop (to turn OFF the power supply) at any time. There will be movement in both directions within the set range of movement. Check the range of movement and the directions and implement protective controls for safety, such as the overtravel functions.

### 5.5.2 Restrictions

The following restrictions apply to autotuning without a host reference.

If you cannot use autotuning without a host reference because of these restrictions, use autotuning with a host reference or custom tuning. Refer to the following sections for details.  $\boxed{3}$  5.6 Autotuning with a Host Reference on page 5-29

5.7 Custom Tuning on page 5-36

### Systems for Which Execution Cannot Be Performed

- · When the machine system can move only in one direction
- When the range of motion is 0.5 rotations or less

# Systems for Which Adjustments Cannot Be Made Accurately

- When a suitable range of motion is not possible
- · When the moment of inertia changes within the set operating range
- When the machine has high friction
- When the rigidity of the machine is low and vibration occurs when positioning is performed
- When the position integration function is used
- When proportional control is used

Note: If you specify calculating the moment of inertia, an error will occur if V\_PPI in the servo command output signals (SVCMD\_IO) changes to specify the proportional action during moment of inertia estimation.

· When mode switching is used

Note: If you specify moment of inertia estimation, mode switching will be disabled and PI control will be used while the moment of inertia is being calculated. Mode switching will be enabled after moment of inertia estimation has been completed.

- When speed feedforward or torque feedforward is input
- When the positioning completed width (Pn522) is too narrow

5

5.5.3 Applicable Tools

### Preparations

Always check the following before you execute autotuning without a host reference.

- The main circuit power supply must be ON.
- There must be no overtravel.
- The servo must be OFF.
- The control method must not be set to torque control.
- The first gains must be selected.
- The test without a motor function must be disabled (Pn00C =  $n.\Box\Box\Box$ ).
- There must be no alarms or warnings.
- There must be no hard wire base block (HWBB).
- The parameters must not be write prohibited.
- If you execute autotuning without a host reference during speed control, set the mode to 1.
- Predictive control and quadrant projection correction must be disabled (Pn070 =  $n.\Box\Box00$ ).

Information If you start autotuning without a host reference while the SERVOPACK is in speed control for mode 2 or 3, the SERVOPACK will change to position control automatically to perform autotuning without a host reference. The SERVOPACK will return to speed control after autotuning has been completed.

### 5.5.3 Applicable Tools

The following table lists the tools that you can use to perform autotuning without a host reference and the applicable tool functions.

| Tool             | Function        | Operating Procedure Reference                                                 |
|------------------|-----------------|-------------------------------------------------------------------------------|
| Digital Operator | Fn201           | Σ-7-Series Digital Operator Operating<br>Manual (Manual No.: SIEP S800001 33) |
| SigmaWin+        | Tuning - Tuning | 5.5.4 Operating Procedure on page 5-20                                        |

### 5.5.4 Operating Procedure

Use the following procedure to perform autotuning without a host reference.



- If you specify not estimating the moment of inertia, set the moment of inertia ratio (Pn103) correctly. If the setting greatly differs from the actual moment of inertia ratio, normal control of the machine may not be possible, and vibration may result.
  - If you are using an MP3000-series Controller for phase control, set the mode selection to 1. If 2 or 3 is selected for the mode, correct phase control may not be possible.

- 1. Confirm that the moment of inertia ratio (Pn103) is set correctly.
- 2. Click the *P* Servo Drive Button in the workspace of the Main Window of the SigmaWin+.
- **3.** Select Tuning in the Menu Dialog Box. The Tuning Dialog Box will be displayed. Click the **Cancel** Button to cancel tuning.
- 4. Click the Execute Button.

| WARNING This function executes turing for the Servopack. Using this function while the motor is running is dangerous. Be sure to                                                                                                                                                                                   |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| This function executes tuning for the Servopack. Using this function while the motor is running is dangerous. Be sure to                                                                                                                                                                                           |   |
| carefully read the SigmaWin+ Operation Manual before executing this function. Special care must be taken for the following.                                                                                                                                                                                        |   |
| -Safety Precautions><br>1. Before executing this function, make sure that the emergency stop (power off) can be activated when needed.<br>The response speed may change considerably during tuning.<br>Before executing this function, make sure that the emergency stop (power off) can be activated when needed. | _ |
| 2. Confirm the safety of the area adjoining the drive unit.<br>Before executing this function, always confirm that the area within the motor motion range<br>and direction is clear for safe operation. Provide protective devices to ensure safety in<br>the event of overtraveling or other unexpected movement. |   |
| <ol> <li>Always confirm that there is no position error before running the motor.</li> <li>Be sure to return to the origin and reset the position proving logaration.</li> <li>Running the motor without resetting the origin can lead to an overrun and is extremely dangerous.</li> </ol>                        |   |
| 4. When the moment of inertia (mass) identification function is used for a vertical axis, check the safety of the system.<br>When the moment of inertia (mass) identification function is used for a vertical axis,<br>confirm that the axis level does not drop when the servo is turned off.                     |   |
| <turning precautions=""><br/>5. Set the moment of inertia (mass) ratio first.<br/>The moment of interta (mass) ratio must be set to achieve correct tuning.<br/>Be sure to set the ratio. The setting can be performed from the Tuning window.</turning>                                                           |   |
| <ol> <li>If vibration is generated, execute custom tuning.</li> <li>Lower the gain until there is no vibration by executing custom tuning.</li> </ol>                                                                                                                                                              |   |
| Note: While tuning, you can read the precautions related to the process.<br>Click the Precautions button provided in each tuning window.                                                                                                                                                                           |   |
| Execute                                                                                                                                                                                                                                                                                                            |   |

5. Select the No Reference Input Option in the Autotuning Area and then click the Autotuning Button.

| Tuning AXIS#00                                                         | ×           |
|------------------------------------------------------------------------|-------------|
| Set the moment of inertia (mass) ratio before<br>executing autotuning. | Precautions |
| Moment of inertia (mass) ratio identification                          |             |
| Pn103 : Moment of Inertia Ratio                                        |             |
| Autotuning                                                             |             |
| Postion Reference Input                                                |             |
| Advanced adjustment                                                    | Finish      |

Information

When the following dialog box is displayed, click the **OK** Button and then confirm that the correct moment of inertia ratio is set in Pn103 (Moment of Inertia Ratio).

| Tuning                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                            |
| The moment of inertia (mass) ratio has never been changed from the default<br>setting.<br>Set a correct moment of inertia (mass) ratio in the Moment of Inertia (Mass) Setting<br>window before starting luning.<br>If an incorrect moment of inertia (mass) ratio is set, vibration may be generated<br>during luning.<br>Do you want to continue tuning? |
| Cancel                                                                                                                                                                                                                                                                                                                                                     |

#### 5.5.4 Operating Procedure

6. Set the conditions in the Switching the load moment of inertia (load mass) identification Box, the Mode selection Box, the Mechanism selection Box, and the Distance Box, and then click the Next Button.

|    | Set conditions.                                                                                                                                                                                                                   |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Γ  | Switching the load moment of intertia (load mass) identification                                                                                                                                                                  |
|    | 1:A moment of inertia is not presumed.                                                                                                                                                                                            |
|    | Mode selection                                                                                                                                                                                                                    |
|    | 2:For positioning                                                                                                                                                                                                                 |
|    | A gain adjustment specialized for positioning will be executed. In addition, the<br>following automatic adjustments can be executed. Model following control, notch<br>filter, anti-resonance control, and vibration suppression. |
| Г  | Mechanism selection                                                                                                                                                                                                               |
|    | 2:Ball screw mechanism or linear motor                                                                                                                                                                                            |
|    | Executes adjustment suitable for relatively high-rigidity mechanism, such as a ball<br>screw or linear motor. Select this type if there is no applicable mechanism.                                                               |
|    | 766         x 1000 =         786000         [reference units]           (-99990)         (Setting invalid range : -131 - 131)         3.0         [Rotation]                                                                      |
| L  | Start tuning using the default settings.                                                                                                                                                                                          |
|    |                                                                                                                                                                                                                                   |
| is | tance Box                                                                                                                                                                                                                         |
| et |                                                                                                                                                                                                                                   |

Minimum setting increment for travel distance: 1,000 [reference units] Negative values are for reverse operation and positive values are for forward operation from the current position.

Default settings:

Rotary Servomotors: Approx. 3 rotations Direct Drive Servomotors: Approx. 0.3 rotations

Linear Servomotors: Approx 90 mm Set the distance to the following values or higher. To ensure tuning precision, we recommend that you use approximately the default distance setting.

Rotary Servomotors: 0.5 rotations Direct Drive Servomotors: 0.05 rotations Linear Servomotors: 5 mm

# • Switching the load moment of inertia (load mass) identification Box

Specify whether to estimate the moment of inertia. 0: A moment of inertia is presumed. (default setting) 1: A moment of inertia is not presumed.

#### Mode selection Box

| Set the mode.                                                 |                                                                                                                                                                                                                                              |  |
|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Mode Selection                                                | Description                                                                                                                                                                                                                                  |  |
| 1: Standard                                                   | Standard gain adjustment is per-<br>formed. In addition to gain adjust-<br>ment, notch filters and anti-resonance<br>control are automatically adjusted.                                                                                     |  |
| 2: For positioning                                            | Tuning is performed for positioning<br>applications. In addition to gain<br>adjustment, model following control,<br>notch filters, anti-resonance control,<br>and vibration suppression are auto-<br>matically adjusted.                     |  |
| 3: For positioning<br>especially to pre-<br>vent overshooting | Tuning is performed for positioning<br>applications with emphasis on elimi-<br>nating overshooting. In addition to<br>gain adjustment, notch filters, anti-<br>resonance control, and vibration sup-<br>pression are automatically adjusted. |  |

#### Mechanism selection Box

Select the type according to the machine element to drive.

If there is noise or if the gain does not increase, better results may be obtained by changing the rigidity type. Select the type according to the following guidelines.

| Mechanism<br>Selection                          | Description                                                                                                                                                                          |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1: Belt mechanism                               | Tuning is performed for a mecha-<br>nism with relatively low rigidity, e.g.,<br>a belt.                                                                                              |
| 2: Ball screw mech-<br>anism or linear<br>motor | Tuning is performed for a mecha-<br>nism with relatively high rigidity, e.g.,<br>a ball screw or Linear Servomotor.<br>Use this setting if there is no other<br>appropriate setting. |
| 3: Rigid model                                  | Tuning is performed for a mecha-<br>nism with high rigidity, e.g., a rigid<br>body system.                                                                                           |

#### • Tuning parameters Box

Specify the parameters to use for tuning. If you select the **Start tuning using the default set-tings** Check Box, the tuning parameters will be returned to the default settings before tuning is started.

5.5.4 Operating Procedure

7. Click the Servo ON Button.

| Autotuning - Automatic s            | setting AXIS#00                        |
|-------------------------------------|----------------------------------------|
| Waiting for execution               | Servo ON/OFF operation                 |
| measurement                         | Tuning                                 |
| Gain search<br>behaviour evaluation | Start tuning                           |
|                                     | Mechanism selection                    |
|                                     | 2:Ball screw mechanism or linear motor |
| Notch filter                        | 786000 [reference units]               |
| Anti-res Adj<br>Vib Suppress        | 3.0 [Rotation]                         |
| Precautions                         | < Back Finish Cancel                   |

8. Click the Start tuning Button.

| Autotuning - Automatic s                     | setting AXIS#00                                                           |
|----------------------------------------------|---------------------------------------------------------------------------|
| Waiting for execution                        | Servo ON/OFF operation Servo OFF Servo ON                                 |
| Gain search<br>behaviour evaluation          | Tuning                                                                    |
|                                              | Mechanism selection<br>2:Ball screw mechanism or linear motor<br>Distance |
| Notch filter<br>Anti-res Adj<br>Vib Suppress | 786000         [reference units]           3.0         [Rotation]         |
| Precautions                                  | < Back Finish Cancel                                                      |

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### 5.5.5 Troubleshooting Problems in Autotuning without a Host Reference

9. Confirm safety around moving parts and click the Yes Button.



The motor will start operating and tuning will be executed.

Vibration that occurs during tuning will be detected automatically and suitable settings will be made for that vibration. When the settings have been completed, the indicators for the functions that were used will light at the lower left of the dialog box.

| Autotuning - Automatic s            | setting AXIS#00                                  |
|-------------------------------------|--------------------------------------------------|
| Waiting for execution               | Servo ON/OFF operation                           |
| Oscillation level measurement       |                                                  |
| Gain search<br>behaviour evaluation | Cancel                                           |
|                                     | 2:For positioning<br>Mechanism selection         |
|                                     | 2:Ball screw mechanism or linear motor           |
| Notch filter<br>Anti-res Adj        | Distance 786000 [reference units] 3.0 [Rotation] |
| ÖVib Suppress                       | ja.u eritabilig                                  |
| Precautions                         | < Back Finish Cancel                             |

### 10. When tuning has been completed, click the Finish Button.

The results of tuning will be set in the parameters and you will return to the Tuning Dialog Box.

This concludes the procedure to perform autotuning without a host reference.

# 5.5.5 Troubleshooting Problems in Autotuning without a Host Reference

The following tables give the causes of and corrections for problems that may occur in autotuning without a host reference.

### Autotuning without a Host Reference Was Not Performed

| Possible Cause                                                            | Corrective Action                                              |
|---------------------------------------------------------------------------|----------------------------------------------------------------|
| Main circuit power supply is OFF.                                         | Turn ON the main circuit power supply.                         |
| An alarm or warning occurred.                                             | Remove the cause of the alarm or warning.                      |
| Overtraveling occurred.                                                   | Remove the cause of overtraveling.                             |
| The second, third, or fourth gains were selected with the gain selection. | Select the first gains.                                        |
| The HWBB was activated.                                                   | Release the HWBB.                                              |
| The setting of the travel distance is too small.                          | Set the travel distance again in step 6 of the proce-<br>dure. |

### When an Error Occurs during Execution of Autotuning without a Host Reference

| Error                                                                                                                                                                                                                   | Possible Cause                                                                                                                                                                                                                                | Corrective Action                                                                                                                                            |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| The gain adjustments<br>were not successfully<br>completed.                                                                                                                                                             | <ul> <li>Increase the setting of the poss-<br/>completed width (Pn522).</li> <li>Change the mode from 2 to 3.</li> <li>If machine vibration occurs, su<br/>the vibration with the anti-reso<br/>control function and the vibration</li> </ul> |                                                                                                                                                              |  |
| An error occurred during<br>calculation of the<br>moment of inertia.                                                                                                                                                    | Refer to the following section for troubleshooting information.<br><i>G</i>                                                                                                                                                                   |                                                                                                                                                              |  |
| Positioning was not<br>completed within<br>approximately 10 sec-<br>onds after position<br>adjustment was com-<br>pleted.<br>The positioning completed width is too<br>narrow or proportional control is being<br>used. |                                                                                                                                                                                                                                               | <ul> <li>Increase the setting of the positioning completed width (Pn522).</li> <li>Set V_PPI to 0 in the servo command output signals (SVCMD_IO).</li> </ul> |  |

### When an Error Occurs during Calculation of Moment of Inertia

| Possible Cause                                                                                                                                                                  | Corrective Action                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The SERVOPACK started calculating the moment of inertia but the calculation was not completed.                                                                                  | <ul><li>Increase the setting of the speed loop gain (Pn100).</li><li>Increase the stroke (travel distance).</li></ul>                                                  |
| The moment of inertia fluctuated greatly and did not converge within 10 tries.                                                                                                  | Set Pn103 (Moment of Inertia Ratio) from the machine specifications and specify not estimating the moment of inertia.                                                  |
| Low-frequency vibration was detected.                                                                                                                                           | Double the setting of moment of inertia calculation starting level (Pn324).                                                                                            |
| The torque limit was reached.                                                                                                                                                   | <ul> <li>If you are using the torque limit, increase the torque limit.</li> <li>Double the setting of moment of inertia calculation starting level (Pn324).</li> </ul> |
| The speed control section changed to proportional control during calculation of the moment of inertia, e.g., V_PPI in the servo command output signals (SVCMD_IO) was set to 1. | Use PI control when calculating the moment of inertia.                                                                                                                 |

### ◆ Adjustment Results Are Not Satisfactory for Position Control

You may be able to improve the adjustment results by changing the settings of the positioning completed width (Pn522) and the electronic gear ratio (Pn20E/Pn210).

If satisfactory results are still not possible, adjust the overshoot detection level (Pn561). That may improve the adjustment results.

- Pn561 = 100% (default setting)
- This will allow tuning with overshooting that is equivalent to the positioning completed width. • Pn561 = 0%
  - This will allow tuning to be performed without overshooting within the positioning completed width, but the positioning completed width may be extended.

|       | Overshoot Detection Level |              |                 | Speed Posit  | ion Torque     |
|-------|---------------------------|--------------|-----------------|--------------|----------------|
| Pn561 | Setting Range             | Setting Unit | Default Setting | When Enabled | Classification |
|       | 0 to 100                  | 1%           | 100             | Immediately  | Setup          |

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5.5.6 Automatically Adjusted Function Settings

### 5.5.6 Automatically Adjusted Function Settings

You can specify whether to automatically adjust the following functions during autotuning.

### Automatic Notch Filters

Normally, set Pn460 to n. D1DD (Adjust automatically) (default setting).

Vibration will be detected during autotuning without a host reference and a notch filter will be adjusted.

Set Pn460 to n.  $\Box 0 \Box \Box$  (Do not adjust automatically) only if you do not change the setting of the notch filter before you execute this function.

| P     | Parameter                                                                                                                                                                        | Function                                                                                                                                                                            | When Enabled | Classification |
|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------|
| Pn460 | n.□□□0                                                                                                                                                                           | Do not adjust the first stage notch filter auto-<br>matically during execution of autotuning with-<br>out a host reference, autotuning with a host<br>reference, and custom tuning. |              |                |
|       | n.□□□1<br>(default setting)                                                                                                                                                      | Adjust the first stage notch filter automatically<br>during execution of autotuning without a host<br>reference, autotuning with a host reference,<br>and custom tuning.            | Immediately  | Tuning         |
|       | Do not adjust the second stage notch filter<br>automatically during execution of autotuning<br>without a host reference, autotuning with a<br>host reference, and custom tuning. | Infinediately                                                                                                                                                                       | Turning      |                |
|       | n.□1□□<br>(default setting)                                                                                                                                                      | Adjust the second stage notch filter automati-<br>cally during execution of autotuning without a<br>host reference, autotuning with a host refer-<br>ence, and custom tuning.       |              |                |

### Anti-Resonance Control Adjustment

This function reduces low vibration frequencies, for which the notch filters cannot be used.

Normally, set Pn160 to n. DD1D (Adjust automatically) (default setting).

Vibration will be detected during autotuning without a host reference and anti-resonance control will be automatically adjusted.

| P      | arameter                    | Function                                                                                                                                                                      | When Enabled | Classification |
|--------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------|
| Pn160  | n.000                       | Do not adjust anti-resonance control automat-<br>ically during execution of autotuning without a<br>host reference, autotuning with a host refer-<br>ence, and custom tuning. | Immediately  | Tuping         |
| FIII00 | n.□□1□<br>(default setting) | Adjust anti-resonance control automatically<br>during execution of autotuning without a host<br>reference, autotuning with a host reference,<br>and custom tuning.            | inineciately | Tuning         |

### Friction Compensation

Friction compensation compensates for changes in the following conditions.

- Changes in the viscous resistance of the lubricant, such as grease, on the sliding parts of the machine
- · Changes in the friction resistance resulting from variations in the machine assembly
- Changes in the friction resistance due to aging

The conditions for applying friction compensation depend on the mode selection.

| Mode Selection Settings                            | Friction Compensation                                                                 |  |
|----------------------------------------------------|---------------------------------------------------------------------------------------|--|
| 1: Standard                                        | Based on the setting of Pn408 = n.X□□□<br>(Friction Compensation Function Selection)* |  |
| 2: For position control                            | - Adjusted with friction compensation.                                                |  |
| 3: For position control (emphasis on overshooting) |                                                                                       |  |

5.5.6 Automatically Adjusted Function Settings

| Parameter |                              | Function                       | When Enabled | Classification |  |
|-----------|------------------------------|--------------------------------|--------------|----------------|--|
| Pn408     | n. 0□□□<br>(default setting) | Disable friction compensation. | Immediately  | Setup          |  |
|           | n. 1000                      | Enable friction compensation.  |              |                |  |

\* Refer to the following manual for details.

Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

### ◆ Feedforward

If Pn140 is set to n.0 [1] (Do not use model following control and speed/torque feedforward together (default setting)) and tuning is performed with the mode selection set to 2 or 3, feed-forward (Pn109), the speed feedforward input (VFF), and the torque feedforward input (TFF) will be disabled.

To use the speed feedforward input (VFF), the torque feedforward input (TFF), and model following control from the host controller in the system, set Pn140 to n.1DDD (Use model following control and speed/torque feedforward together).

| Parameter |                             | Function                                                                  | When Enabled                    | Classification |
|-----------|-----------------------------|---------------------------------------------------------------------------|---------------------------------|----------------|
| Pp140     | n.0□□□<br>(default setting) | Do not use model following control and speed/torque feedforward together. | Immodiately                     | Tupipa         |
| Pn140     | n.1000                      | Use model following control and speed/torque feedforward together.        | <ul> <li>Immediately</li> </ul> | Tuning         |

Refer to the following manual for information on the torque feedforward input (TFF) and the speed feedforward input (VFF).

Σ-7-Series MECHATROLINK-III Communications Standard Servo Profile Command Manual (Manual No.: SIEP S800001 31)



When model following control is used with the feedforward function, it is used to make optimum feedforward settings in the SERVOPACK. Therefore, model following control is not normally used together with either the speed feedforward input (VFF) or torque feedforward input (TFF) from the host controller. However, model following control can be used with the speed feedforward input (VFF) or torque feedforward input (TFF) if required. An unsuitable feedforward input may result in overshooting.

5.5.7 Related Parameters

### 5.5.7 Related Parameters

The following parameters are automatically adjusted or used as reference when you execute autotuning without a host reference.

Do not change the settings while autotuning without a host reference is being executed.

| Parameter | Name                                                    | Automatic Changes |
|-----------|---------------------------------------------------------|-------------------|
| Pn100     | Speed Loop Gain                                         | Yes               |
| Pn101     | Speed Loop Integral Time Constant                       | Yes               |
| Pn102     | Position Loop Gain                                      | Yes               |
| Pn103     | Moment of Inertia Ratio                                 | Yes               |
| Pn121     | Friction Compensation Gain                              | Yes               |
| Pn123     | Friction Compensation Coefficient                       | Yes               |
| Pn124     | Friction Compensation Frequency Correction              | No                |
| Pn125     | Friction Compensation Gain Correction                   | Yes               |
| Pn401     | First Stage First Torque Reference Filter Time Constant | Yes               |
| Pn408     | Torque-Related Function Selections                      | Yes               |
| Pn409     | First Stage Notch Filter Frequency                      | Yes               |
| Pn40A     | First Stage Notch Filter Q Value                        | Yes               |
| Pn40C     | Second Stage Notch Filter Frequency                     | Yes               |
| Pn40D     | Second Stage Notch Filter Q Value                       | Yes               |
| Pn160     | Anti-Resonance Control-Related Selections               | Yes               |
| Pn161     | Anti-Resonance Frequency                                | Yes               |
| Pn163     | Anti-Resonance Damping Gain                             | Yes               |
| Pn531     | Program Jogging Travel Distance                         | No                |
| Pn533     | Program Jogging Movement Speed for Rotary Servomotor    | No                |
| Pn585     | Program Jogging Movement Speed for Linear Servomotor    | No                |
| Pn534     | Program Jogging Acceleration/Deceleration Time          | No                |
| Pn535     | Program Jogging Waiting Time                            | No                |
| Pn536     | Program Jogging Number of Movements                     | No                |

Yes: The parameter is automatically set.

No: The parameter is not automatically set, but the setting is read during execution.

5.6.1 Outline

# 5.6 Autotuning with a Host Reference

This section describes autotuning with a host reference.



Autotuning with a host reference makes adjustments based on the set speed loop gain (Pn100). Therefore, precise adjustments cannot be made if there is vibration when adjustments are started. Make adjustments after lowering the speed loop gain (Pn100) until vibration is eliminated.

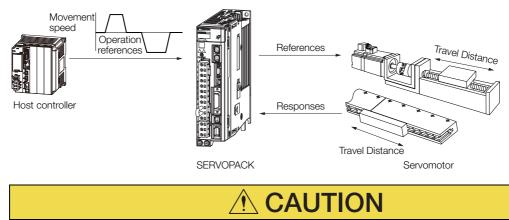
### 5.6.1 Outline

Autotuning with a host reference automatically makes optimum adjustments for operation references from the host controller.

The following items are adjusted automatically.

- Gains (e.g., speed loop gain and position loop gain)
- Filters (torque reference filter and notch filters)
- Friction compensation
- Anti-resonance control
- Vibration suppression

Refer to the following section for details on the parameters that are adjusted. 5.6.7 Related Parameters on page 5-35



• Because autotuning with a host reference adjusts the SERVOPACK during automatic operation, vibration or overshooting may occur. To ensure safety, make sure that you can perform an emergency stop at any time.

#### 5.6.2 Restrictions

### 5.6.2 Restrictions

# Systems for Which Adjustments Cannot Be Made Accurately

Adjustments will not be made correctly for autotuning with a host reference in the following cases. Use custom tuning.

- When the travel distance for the reference from the host controller is equal to or lower than the setting of the positioning completed width (Pn522)
- Rotary Servomotors: When the movement speed for the reference from the host controller is equal to or lower than the setting of the rotation detection level (Pn502)
- Linear Servomotors: When the movement speed for the reference from the host controller is equal to or lower than the setting of the zero speed level (Pn581)
- When the time required to stop is 10 ms or less
- When the rigidity of the machine is low and vibration occurs when positioning is performed
- When the position integration function is used
- When proportional control is used
- When mode switching is used
- When the positioning completed width (Pn522) is too narrow

Refer to the following sections for details on custom tuning.

5.7 Custom Tuning on page 5-36

### Preparations

Always check the following before you execute autotuning with a host reference.

- The servo must be in ready status.
- There must be no overtravel.
- The servo must be OFF.
- Position control must be selected if power is supplied to the motor (i.e., when the servo is ON).
- The first gains must be selected.
- The test without a motor function must be disabled (Pn00C =  $n.\Box\Box\Box$ ).
- There must be no warnings.
- The parameters must not be write prohibited.
- Predictive control and quadrant projection correction must be disabled (Pn070 = n.□□00).

### 5.6.3 Applicable Tools

The following table lists the tools that you can use to perform autotuning with a host reference and the applicable tool functions.

| Tool             | Function        | Operating Procedure Reference                                                   |
|------------------|-----------------|---------------------------------------------------------------------------------|
| Digital Operator | Fn202           | Ω-7-Series Digital Operator Operating Man-<br>ual (Manual No.: SIEP S800001 33) |
| SigmaWin+        | Tuning - Tuning | 5.6.4 Operating Procedure on page 5-30                                          |

### 5.6.4 Operating Procedure

Use the following procedure to perform autotuning with a host reference.



• If you are using an MP3000-Series Controller for phase control, set the mode selection to 1. If 2 or 3 is selected for the mode, correct phase control may not be possible.

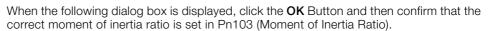
- **1.** Confirm that the moment of inertia ratio (Pn103) is set correctly.
- 2. Click the *P* Servo Drive Button in the workspace of the Main Window of the SigmaWin+.
- **3.** Select Tuning in the Menu Dialog Box. The Tuning Dialog Box will be displayed. Click the **Cancel** Button to cancel tuning.
- 4. Click the Execute Button.

| Tuning                                                                                                                                                                                                                                                                                                             | × |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|                                                                                                                                                                                                                                                                                                                    |   |
| This function executes tuning for the Servopack. Using this function while the motor is running is dangerous. Be sure to<br>carefully read the SigmaWin+ Operation Manual before executing this function. Special care must be taken for the following.                                                            |   |
| -Safety Precautions><br>1. Before executing this function, make sure that the emergency stop (power off) can be activated when needed.<br>The response speed may change considerably during tuning.<br>Before executing this function, make sure that the emergency stop (power off) can be activated when needed. | _ |
| 2. Confirm the safety of the area adjoining the drive unit.<br>Before executing this function, always confirm that the area within the motor motion range<br>and direction is clear for safe operation. Provide protective devices to ensure safety in<br>the event of overtraveling or other unexpected movement. |   |
| <ol> <li>Always confirm that there is no position error before running the notion.</li> <li>Be sare to return to the origin and reset the position information operation.</li> <li>Running the motor without resetting the origin can lead to an overrun and is extremely dangerous.</li> </ol>                    |   |
| 4. When the moment of inertia (mass) identification function is used for a vertical axis, check the safety of the system.<br>When the moment of inertia (mass) identification function is used for a vertical axis,<br>confirm that the axis level does not drop when the serve is turned off.                     |   |
| <turning precautions=""><br/>5. Set he moment of inertia (mass) rato frst.<br/>The moment of inertia (mass) rato must be set to achieve correct tuning.<br/>Be sure to set the ratio. The setting can be performed from the Tuning window.</turning>                                                               |   |
| <ol> <li>If vibration is generated, execute custom tuning.</li> <li>Lower the gain until there is no vibration by executing custom tuning.</li> </ol>                                                                                                                                                              |   |
| Note: While tuning, you can read the precautions related to the process.<br>Click the Precautions button provided in each tuning window.                                                                                                                                                                           |   |
| Execute                                                                                                                                                                                                                                                                                                            |   |

5. Select the **Position reference input** Option in the **Autotuning** Area and then click the **Autotuning** Button.

| Tuning AXIS#00                                                      | ×           |
|---------------------------------------------------------------------|-------------|
| Set the moment of inertia (mass) ratio before executing autotuning. | Precautions |
| Moment of inertia (mass) ratio identification                       |             |
| Pn103 : Moment of Inertia Ratio                                     |             |
| Execute.                                                            |             |
| 202 % Edit                                                          |             |
| .↓                                                                  |             |
| Autotuning                                                          |             |
| Reference input from host controller<br>Position Reference Input    |             |
| C No Reference input                                                |             |
|                                                                     |             |
| Advanced adjustment                                                 | Finish      |

Information



| Tuning                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                              |
| The moment of inertia (mass) ratio has never been changed from the default<br>setting.<br>Set a correct moment of inertia (mass) ratio in the Moment of Inertia (Mass) Setting<br>window before starting funning.<br>If an incorrect moment of inertia (mass) ratio is set, vibration may be generated<br>during funning.<br>Do you want to continue tuning? |
| Cancel                                                                                                                                                                                                                                                                                                                                                       |

#### 5.6.4 Operating Procedure

6. Set the conditions in the Mode selection Box and the Mechanism selection Box, and then click the Next Button.

If you select the **Start tuning using the default settings** Check Box in the **Tuning parameters** Area, the tuning parameters will be returned to the default settings before tuning is started.

Mode selection Box

| Г | Mode selection                                                                                                                                                                                                                       |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | 2:For positioning                                                                                                                                                                                                                    |
|   | A gain adjustment specialized for positioning will be executed. In<br>addition, the following automatic adjustments can be executed: Model<br>following control, notch filter, anti-resonance control, and vibration<br>suppression. |
|   | Mechanism selection                                                                                                                                                                                                                  |
|   | 2:Ball screw mechanism or linear motor                                                                                                                                                                                               |
|   | Executes adjustment suitable for relatively high-rigidity mechanism,<br>such as a ball screw or linear motor. Select this type if there is no<br>applicable mechanism.                                                               |
|   | - Tuning parameters                                                                                                                                                                                                                  |
| ĺ | Start tuning using the default settings.                                                                                                                                                                                             |
|   | Next > Cancel                                                                                                                                                                                                                        |

• Tuning parameters Box Specify the parameters to use for tuning. If you select the Start tuning using the default settings Check Box, the tuning parameters will be returned to the default settings before tuning is started.

| Set the mode.                                                 |                                                                                                                                                                                                                                              |  |
|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Mode Selection                                                | Description                                                                                                                                                                                                                                  |  |
| 1: Standard                                                   | Standard gain adjustment is per-<br>formed. In addition to gain adjust-<br>ment, notch filters and anti-<br>resonance control are automatically<br>adjusted.                                                                                 |  |
| 2: For positioning                                            | Tuning is performed for positioning<br>applications. In addition to gain<br>adjustment, model following control,<br>notch filters, anti-resonance control,<br>and vibration suppression are auto-<br>matically adjusted.                     |  |
| 3: For positioning<br>especially to pre-<br>vent overshooting | Tuning is performed for positioning<br>applications with emphasis on elimi-<br>nating overshooting. In addition to<br>gain adjustment, notch filters, anti-<br>resonance control, and vibration sup-<br>pression are automatically adjusted. |  |

#### Mechanism selection Box

Select the type according to the machine element to drive.

If there is noise or if the gain does not increase, better results may be obtained by changing the rigidity type. Select the type according to the following guidelines.

| Mechanism<br>Selection                        | Description                                                                                                                                                                          |
|-----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1: Belt mechanism                             | Tuning is performed for a mecha-<br>nism with relatively low rigidity, e.g.,<br>a belt.                                                                                              |
| 2: Ball screw<br>mechanism or linear<br>motor | Tuning is performed for a mecha-<br>nism with relatively high rigidity, e.g.,<br>a ball screw or Linear Servomotor.<br>Use this setting if there is no other<br>appropriate setting. |
| 3: Rigid model                                | Tuning is performed for a mecha-<br>nism with high rigidity, e.g., a rigid<br>body system.                                                                                           |

7. Click the Yes Button.



5.6.4 Operating Procedure

8. Input the correct moment of inertia ratio and click the Next Button.

| [ 🖫 Autotuning - Moment of Inertia Ratio Setting AXI 🗪                          |  |  |  |
|---------------------------------------------------------------------------------|--|--|--|
|                                                                                 |  |  |  |
| If Moment of Inertia Ratio is not correctly set, vibration may be<br>generated. |  |  |  |
| Is Moment of Inertia Ratio correctly set?                                       |  |  |  |
| Pn103 : Moment of Inertia Ratio (0 - 20000)                                     |  |  |  |
| [%]                                                                             |  |  |  |
|                                                                                 |  |  |  |
| < Back Next > Cancel                                                            |  |  |  |
|                                                                                 |  |  |  |

**9.** Turn ON the servo, enter a reference from the host controller, and then click the **Start tuning** Button.

| SAutotuning - Automatic s                                                                        | etting AXIS#00                                                                                                 | ×            |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------|
| Waiting for execution<br>Oscillation level<br>measurement<br>Gain search<br>behaviour evaluation | Tuning<br>Turn the servo on, input the reference from the host<br>controller, and then click the Start button. | $\mathbf{D}$ |
| Tuning completed                                                                                 | Mode selection<br>2:For positioning                                                                            |              |
| Notch filter<br>Anti-res Adj<br>Vib Suppress                                                     | ∠r-or positioning<br>Mechanism selection<br>2:Ball screw mechanism or linear motor                             |              |
| Precautions                                                                                      | < Back Finish Cancel                                                                                           |              |

10. Confirm safety around moving parts and click the Yes Button.



The motor will start operating and tuning will be executed.

Vibration that occurs during tuning will be detected automatically and suitable settings will be made for that vibration. When the settings have been completed, the indicators for the functions that were used will light at the lower left of the dialog box.

| SAUTOTUNING - AUTOMATIC S           | setting AXIS#00                                            |
|-------------------------------------|------------------------------------------------------------|
| Waiting for execution               | Tuning Executing tuning (Input the reference.)             |
| Oscillation level<br>measurement    | Cancel                                                     |
| Gain search<br>behaviour evaluation |                                                            |
| Notch filter                        | Mode selection<br>2:For positioning<br>Mechanism selection |
| Anti-res Adj<br>Vib Suppress        | 2:Ball screw mechanism or linear motor                     |
| Precautions                         | < Back Finish Cancel                                       |

5.6.5 Troubleshooting Problems in Autotuning with a Host Reference

### **11.** When tuning has been completed, click the **Finish** Button.

The results of tuning will be set in the parameters and you will return to the Tuning Dialog Box.

This concludes the procedure to perform autotuning with a host reference.

# 5.6.5 Troubleshooting Problems in Autotuning with a Host Reference

The following tables give the causes of and corrections for problems that may occur in autotuning with a host reference.

### Autotuning with a Host Reference Was Not Performed

| Possible Cause                                                            | Corrective Action                         |
|---------------------------------------------------------------------------|-------------------------------------------|
| Main circuit power supply is OFF.                                         | Turn ON the main circuit power supply.    |
| An alarm or warning occurred.                                             | Remove the cause of the alarm or warning. |
| Overtraveling occurred.                                                   | Remove the cause of overtraveling.        |
| The second, third, or fourth gains were selected with the gain selection. | Select the first gains.                   |
| The HWBB was activated.                                                   | Release the HWBB.                         |

### Troubleshooting Errors

| Error                                                                                                                   | Possible Cause                                                                                          | Corrective Action                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The gain adjustments were not successfully completed.                                                                   | Machine vibration<br>occurs or positioning<br>completion is not stable<br>when the Servomotor<br>stops. | <ul> <li>Increase the setting of the positioning completed width (Pn522).</li> <li>Change the mode from 2 to 3.</li> <li>If machine vibration occurs, suppress the vibration with the anti-resonance control function and the vibration suppression function.</li> </ul> |
| Positioning was not<br>completed within<br>approximately 10<br>seconds after posi-<br>tion adjustment was<br>completed. | The positioning com-<br>pleted width is too nar-<br>row or proportional<br>control is being used.       | <ul> <li>Increase the setting of the positioning completed width (Pn522).</li> <li>Set V_PPI to 0 in the servo command output signals (SVCMD_IO).</li> </ul>                                                                                                             |

### ◆ Adjustment Results Are Not Satisfactory for Position Control

You may be able to improve the adjustment results by changing the settings of the positioning completed width (Pn522) and the electronic gear ratio (Pn20E/Pn210).

If satisfactory results are still not possible, adjust the overshoot detection level (Pn561). That may improve the adjustment results.

- Pn561 = 100% (default setting)
- This will allow tuning with overshooting that is equivalent to the positioning completed width. • Pn561 = 0%

This will allow tuning to be performed without overshooting within the positioning completed width, but the positioning completed width may be extended.

|       | Overshoot Detection | n Level      |                 | Speed Posit  | ion Torque     |
|-------|---------------------|--------------|-----------------|--------------|----------------|
| Pn561 | Setting Range       | Setting Unit | Default Setting | When Enabled | Classification |
|       | 0 to 100            | 1%           | 100             | Immediately  | Setup          |

### 5.6.6 Automatically Adjusted Function Settings

These function settings are the same as for autotuning without a host reference. Refer to the following section.

5.5.6 Automatically Adjusted Function Settings on page 5-26

5.6.7 Related Parameters

### 5.6.7 Related Parameters

The following parameters are automatically adjusted or used as reference when you execute autotuning with a host reference.

Do not change the settings while autotuning with a host reference is being executed.

| Parameter | Name                                                    | Automatic Changes |
|-----------|---------------------------------------------------------|-------------------|
| Pn100     | Speed Loop Gain                                         | Yes               |
| Pn101     | Speed Loop Integral Time Constant                       | Yes               |
| Pn102     | Position Loop Gain                                      | Yes               |
| Pn103     | Moment of Inertia Ratio                                 | No                |
| Pn121     | Friction Compensation Gain                              | Yes               |
| Pn123     | Friction Compensation Coefficient                       | Yes               |
| Pn124     | Friction Compensation Frequency Correction              | No                |
| Pn125     | Friction Compensation Gain Correction                   | Yes               |
| Pn401     | First Stage First Torque Reference Filter Time Constant | Yes               |
| Pn408     | Torque-Related Function Selections                      | Yes               |
| Pn409     | First Stage Notch Filter Frequency                      | Yes               |
| Pn40A     | First Stage Notch Filter Q Value                        | Yes               |
| Pn40C     | Second Stage Notch Filter Frequency                     | Yes               |
| Pn40D     | Second Stage Notch Filter Q Value                       | Yes               |
| Pn160     | Anti-Resonance Control-Related Selections               | Yes               |
| Pn161     | Anti-Resonance Frequency                                | Yes               |
| Pn163     | Anti-Resonance Damping Gain                             | Yes               |

Yes: The parameter is automatically set.

No: The parameter is not automatically set, but the setting is read during execution.

5

5.7.1 Outline

# 5.7 Custom Tuning

This section describes custom tuning.

### 5.7.1 Outline

You can use custom tuning to manually adjust the servo during operation using a speed or position reference input from the host controller. You can use it to fine-tune adjustments that were made with autotuning.

The following items are adjusted automatically.

- · Gains (e.g., speed loop gain and position loop gain)
- Filters (torque reference filter and notch filters)
- Friction compensation
- Anti-resonance control

Refer to the following section for details on the parameters that are adjusted. 5.7.7 Related Parameters on page 5-44

There are two adjustment methods that you can use for custom tuning.

 Tuning Mode 0 (Setting Servo Gains Giving Priority to Stability) or 1 (Setting Servo Gains Giving Priority to Good Response)

These modes allow you to set stable control conditions for multiple servo gains by manipulating only one tuning level. Automatic setting of notch filters and anti-resonance control is provided if vibration is detected. Manual anti-resonance control adjustment is also possible during custom tuning.

 Tuning Mode 2 (Setting Servo Gains Giving Priority to Position Control Applications) or 3 (Setting Servo Gains Giving Priority to Preventing Overshooting in Position Control Applications)

Two tuning levels are manipulated to reduce positioning time even further and set multiple servo gains.

Model following control is used to reduce the positioning time. If vibration is detected, notch filters and anti-resonance control are automatically adjusted, and friction compensation is automatically set. Manual anti-resonance control adjustment and vibration suppression are also possible during custom tuning.

# **A CAUTION**

• Vibration or overshooting may occur during custom tuning. To ensure safety, make sure that you can perform an emergency stop at any time.

### 5.7.2 Preparations

Always check the following before you execute custom tuning.

- The test without a motor function must be disabled (Pn00C =  $n.\Box\Box\Box$ ).
- If speed control is used, tuning mode 0 or 1 must be set.
- The parameters must not be write prohibited.
- Predictive control and quadrant projection correction must be disabled (Pn070 =  $n.\Box\Box00$ ).

## 5.7.3 Applicable Tools

The following table lists the tools that you can use to perform custom tuning and the applicable tool functions.

| Tool             | Function        | Operating Procedure Reference                                                   |
|------------------|-----------------|---------------------------------------------------------------------------------|
| Digital Operator | Fn203           | Ω Σ-7-Series Digital Operator Operating<br>Manual (Manual No.: SIEP S800001 33) |
| SigmaWin+        | Tuning – Tuning | I 5.7.4 Operating Procedure on page 5-37                                        |

## 5.7.4 Operating Procedure

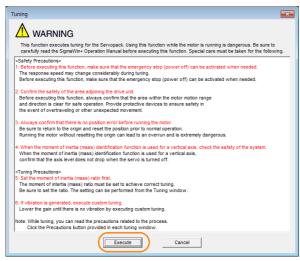
Use the following procedure to perform custom tuning.

### WARNING • Before you execute custom tuning, check the information provided in the SigmaWin+ operating manual. Observe the following precautions. • Make sure that you can perform an emergency stop at any time. When custom tuning is started, several parameters will be overwritten with the recommended settings, which may greatly affect the response before and after execution. Make sure that you can perform an emergency stop at any time. Set the moment of inertia correctly before you execute custom tuning. If the setting greatly differs from the actual moment of inertia, vibration may occur. If you change the feedforward level, the new setting will not be used immediately. It will be used • after positioning is completed. CAUTION • If you are using an MP3000-series Controller for phase control, set the tuning mode to 0 or 1. If 2 or 3 is selected for the tuning mode, correct phase control may not be possible.

- 1. Confirm that the moment of inertia ratio (Pn103) is set correctly.
- 2. Click the *P* Servo Drive Button in the workspace of the Main Window of the SigmaWin+.
- **3.** Select Tuning in the Menu Dialog Box. The Tuning Dialog Box will be displayed. Click the **Cancel** Button to cancel tuning.

5.7.4 Operating Procedure

4. Click the Execute Button.



5. Click the Advanced adjustment Button.

| Tuning AXIS#00                                            |
|-----------------------------------------------------------|
| Set the moment of inertia (mass) ratio before Precautions |
| Moment of inertia (mass) ratio identification             |
| Pn103 : Moment of Inertia Ratio                           |
| Execute.                                                  |
| 100 % <u>Edit</u>                                         |
| Autotuning                                                |
| Reference input from host controller                      |
|                                                           |
| C No Reference Input                                      |
| Advanced adjustment Finish                                |

Information

When the following dialog box is displayed, click the **OK** Button and then confirm that the correct moment of inertia ratio is set in Pn103 (Moment of Inertia Ratio).

| Tuning                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                            |
| The moment of inertia (mass) ratio has never been changed from the default<br>setting.<br>Set a correct moment of inertia (mass) ratio in the Moment of Inertia (Mass) Setting<br>window before starting turing.<br>If an incorrect moment of Inertia (mass) ratio is set, vibration may be generated<br>during turing.<br>Do you want to continue tuning? |
| OK Cancel                                                                                                                                                                                                                                                                                                                                                  |

6. Click the Custom tuning Button.

| Tuning                                         |             |
|------------------------------------------------|-------------|
| Click the button of the function to be execute | d.          |
| Manually adjust gain and vibration.            |             |
| Suppress vibration by decreasing gain whe      | en stopped. |

7. Set the Tuning mode Box and Mechanism selection Box, and then click the Next Button.

| Custom Tuning - Mode selection AXIS#00                                                                                                                                                                                                                                                                                                                                         | Tuning mode Box                                                                                     |                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Tuning mode-                                                                                                                                                                                                                                                                                                                                                                   | Mode Selection                                                                                      | Description                                                                                                                                                                                                                     |
| 2:Set servo gains for positioning application.      O:Set servo gains with priority given to stability.     Overshoot will rarely occur since priority is given to stability. In addition     to gain adjustments, the notch filter and anti-resonance control (except     for torque (force) control) can be adjusted.     1:Set servo gains with priority given to response. | 0: Set servo gains<br>with priority given<br>to stability.                                          | This setting gives priority to stability<br>and preventing overshooting. In addi-<br>tion to gain adjustment, notch filters<br>and anti-resonance control (except<br>during torque control) are automatically<br>adjusted.      |
| Overshoot may occur since priority is given to responsiveness. In<br>addition to gain adjustments, the notch filter and anti-resonance control<br>(except for torque (force) control) can be adjusted.                                                                                                                                                                         | 1: Set servo gains<br>with priority given<br>to response.                                           | Overshooting may occur because pri-<br>ority is given to response. In addition to<br>gain adjustment, notch filters and anti-<br>resonance control (except during<br>torque control) are automatically<br>adjusted.             |
| Executes adjustment suitable for relatively high-rigidity mechanism, such     as a ball screw or linear motor. Select this type if there is no applicable     option     Friction compensation                                                                                                                                                                                 | 2: Set servo gains<br>for positioning<br>application.                                               | Tuning is performed for positioning<br>applications. In addition to gain adjust-<br>ment, notch filters, anti-resonance<br>control, and vibration suppression are<br>adjusted.                                                  |
| Next > Cancel                                                                                                                                                                                                                                                                                                                                                                  | 3: Set servo gains<br>especially to pre-<br>vent overshooting<br>during positioning<br>application. | Tuning is performed for positioning<br>applications with emphasis on elimi-<br>nating overshooting. In addition to gain<br>adjustment, notch filters, anti-reso-<br>nance control, and vibration suppres-<br>sion are adjusted. |

#### Mechanism Selection Box

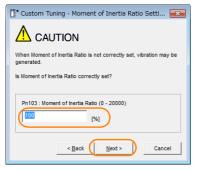
Select the type according to the machine element to drive.

If there is noise or if the gain does not increase, better results may be obtained by changing the rigidity type. Select the type according to the following guidelines.

| Mechanism Selection                     | Description                                                                                                                                                            |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1: Belt mechanism                       | Tuning is performed for a mechanism with relatively low rigidity, e.g., a belt.                                                                                        |
| 2: Ball screw mechanism or Linear motor | Tuning is performed for a mechanism with relatively high rigidity, e.g., a ball screw or Linear Servomotor. Use this setting if there is no other appropriate setting. |
| 3: Rigid body system                    | Tuning is performed for a mechanism with high rigidity, e.g., a rigid body system.                                                                                     |

Information The tuning modes that you can select depend on the SERVOPACK setting.

8. If the moment of inertia ratio is not set correctly, correct the setting and then click the Next Button.



5

5.7.4 Operating Procedure

**9.** Turn ON the servo, enter a reference from the host controller, and then click the **Start tuning** Button.

Tuning Mode 0 or 1

| Tuning mode                                                              | 0 : Set servo gains with priority given to stability. |              | Tuning r         |
|--------------------------------------------------------------------------|-------------------------------------------------------|--------------|------------------|
| Mechanism selection                                                      | 2 : Ball screw mechanism or linear motor              |              | Mechan           |
| Friction compensation                                                    | Enable                                                |              | Friction         |
| Gain status                                                              | 1 gain                                                |              | Gain sta         |
| Tuning level adjustmen<br>Setting the tuning level<br>too high can cause |                                                       | Start tuning | FF le            |
| too nigh can cause<br>vibration or abnormal<br>noise.                    | Auto-setting<br>Notch filter<br>1 stepinactive        | Vib Detect   | FB Is<br>oversho |
| vibration or abnormal<br>noise.                                          | Auto-setting<br>Noto-filer                            | Vb Defect    | FB le            |

#### uning - Adust AXIS#00 2 : Set servo gains for p 2 : Ball screw mechanism or linear motor Enable 1 gair Funing level Set the tuning level and start the Notch filte 1 step 2 ster Anti-res Ctrl Ad Anti-res Ctrl Adi Anti-res Ad Vib Suppres Vib Suppress To Autotuning Cor Cancel

### **10.** Use the $\blacktriangle$ and $\blacktriangledown$ Buttons to change the tuning level.

Click the **Back** Button during tuning to restore the setting to its original value. The tuning level will return to the value from before when custom tuning was started.

#### Tuning Mode 0 or 1

Increase the tuning level until overshooting occurs.

|                                                                                                                      | 0 : Set servo gains with priority given to stability.                                                                                                                                |                  |
|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Mechanism selection                                                                                                  | 2 : Ball screw mechanism or linear motor                                                                                                                                             |                  |
| Friction compensation                                                                                                | Enable                                                                                                                                                                               |                  |
| Gain status                                                                                                          | 1 gain                                                                                                                                                                               |                  |
| Tuning level adjustmer<br>Setting the tuning level<br>to high can cause<br>vibration or sbnormal<br>noise.<br>Finish | Tuning level<br>Set the tuning level<br>Tuning level<br>Tuning level<br>Tuning level<br>Tuning level<br>Tuning level<br>Tuning level<br>Tuning level<br>Tuning level<br>Tuning level | Back             |
|                                                                                                                      | Auto-setting<br>Notch fiter Vibration not detected<br>1 step inactive Cancel                                                                                                         | Vib Detect       |
|                                                                                                                      | Anti-res Ctrl Adj Vibration not detected Anti-res Adj inactive Concel                                                                                                                | Anti-res Ctrl Ad |

Tuning Mode 2 or 3

Tuning Mode 2 or 3

Increase the feedforward level until overshooting occurs and then increase the feedback level until overshooting is eliminated. Repeat these changes to make the adjustment.

| Custom Tuning - Ac       | lust AXIS#00                                     | ×                 |
|--------------------------|--------------------------------------------------|-------------------|
| Tuning mode              | 2 : Set servo gains for positioning application. |                   |
| Mechanism selection      | 2 : Ball screw mechanism or linear motor         |                   |
| Friction compensation    | Enable                                           |                   |
| Gain status              | 1 gain                                           |                   |
|                          | Tuning level                                     |                   |
| FF level adjustment      | Set the tuning level.<br>Feed forward level (FF) | Back              |
| Increase until           |                                                  |                   |
| overshooting occurs.     | <b>T</b>                                         |                   |
| <del></del>              | Feedback level (FB)                              |                   |
| FB level adjustment      |                                                  |                   |
| Increase until           | (1 - 2000)                                       |                   |
| overshooting disappears. | Auto-setting                                     |                   |
| 1 1                      | Notch filter Vibration not detected              | Vib Detect        |
|                          | 1 step inactive                                  |                   |
| Response level OK?       | 2 step inactive Cancel                           |                   |
| No                       |                                                  |                   |
| Yes                      | Anti-res Ctrl Adj Vibration not detected         |                   |
| <b>V</b>                 | Anti-res Adj inactive Cancel                     | Anti-res Ctrl Adj |
| Finish                   | Vib Suppression                                  |                   |
|                          | Frequency 1 inactive Cancel                      | Vib Suppress      |
| Precautions              | < Back To Autotuning Completed.                  | Cancel            |

Information

The new feedforward level will not be used until the positioning completed signal is output.

- **11.** You can set the functions to suppress vibration (notch filters, automatic anti-resonance setting, anti-resonance control adjustment, and autotuning with a host reference) as required.
  - Refer to the following section for details.
  - Vibration Suppression Functions on page 5-42

5.7.4 Operating Procedure

**12.** When tuning has been completed, click the Completed Button. The values that were changed will be saved in the SERVOPACK and you will return to the Tuning Dialog Box.

| Tuning mode                                                                                                 | 0 : Set servo gains with priority given to stability.                            |
|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Mechanism selection                                                                                         | 2 : Ball screw mechanism or linear motor                                         |
| Friction compensation                                                                                       | Enable                                                                           |
| Gain status                                                                                                 | 1 cain                                                                           |
| Guin status                                                                                                 | Tuning level                                                                     |
| Tuning level adjustmer<br>Setting the tuning level<br>too high can cause<br>vibration or abnormal<br>noise. | Set the tuning level.<br>Tuning level Back                                       |
|                                                                                                             |                                                                                  |
|                                                                                                             | Auto-setting<br>Notch filter Vibration not detected Vib Detect<br>1 stepinactive |
|                                                                                                             | Notch filter Vibration not detected Vib Detect                                   |
|                                                                                                             | Notch filter Vibration not detected Vib Detect                                   |

This concludes the procedure to set up custom tuning.

5

5.7.4 Operating Procedure

# **Vibration Suppression Functions**

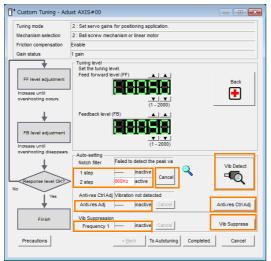
#### Notch Filters and Automatic Anti-resonance Setting

If the vibration frequency that occurs when you increase the servo gains is at 1,000 Hz or higher, notch filters are effective to suppress vibration. If the vibration is between 100 Hz and 1,000 Hz, anti-resonance control is effective.

### Automatic Setting

To set vibration suppression automatically, use the parameters to enable notch filters and automatic anti-resonance control setting.

The notch filter frequency (stage 1 or 2) or anti-resonance control frequency that is effective for the vibration that was detected during tuning will be automatically set.



#### Auto-setting Cancel Buttons

The automatically set notch filter frequencies or the anti-resonance control frequencies may not always suppress vibration. Click the **Cancel** Button to reset the notch filter frequencies or the anti-resonance control frequencies to the values from just before these frequencies were set automatically.

When they are reset, vibration detection will start again.

• Vib Detect Button

While the notch filter or anti-resonance control adjustment automatic setting function is enabled, you can click the **Vib Detect** Button to manually detect vibration. When you click the **Vib Detect** Button, the SERVOPACK will detect vibration at that time, and set the notch filter frequency (stage 1 or 2) or anti-resonance control frequency that is effective for the detected vibration. You can also perform manual vibration detection even when the SERVOPACK does not detect vibration.

#### • Anti-res Ctrl Adj Button

You can use the **Anti-res Ctrl Adj** Button to execute the anti-resonance control function if fine-tuning is required. Refer to the following section.

5.8 Anti-Resonance Control Adjustment on page 5-45

Vib Suppress Button

Click the **Vib Suppress** Button to suppress low and transient vibration (oscillation) of approximately 1 Hz to 100 Hz that occurs during positioning. Refer to the following section.

5.9 Vibration Suppression on page 5-50

#### Autotuning with a Host Reference

You can perform autotuning with a host reference. Refer to the following section for details. 5.6 Autotuning with a Host Reference on page 5-29

5.7.5 Automatically Adjusted Function Settings

# 5.7.5 Automatically Adjusted Function Settings

You cannot use vibration suppression functions at the same time. Other automatic function settings are the same as for autotuning without a host reference. Refer to the following section.  $\boxed{3}$  5.5.6 Automatically Adjusted Function Settings on page 5-26

# 5.7.6 Tuning Example for Tuning Mode 2 or 3

| Step | Measurement Display Examples                                                    | Operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | Position<br>deviation<br>Reference<br>speed<br>Positioning<br>completion signal | The positioning time is measured after the moment of inertia<br>ratio (Pn103) is set correctly.<br>Tuning is completed if the specifications are met.<br>The tuning results are saved in the SERVOPACK.                                                                                                                                                                                                                                                                                                                                                    |
| 2    |                                                                                 | The positioning time will be reduced if the feedforward level is<br>increased.<br>Tuning is completed if the specifications are met. The tuning<br>results are saved in the SERVOPACK.<br>If overshooting occurs before the specifications are met, pro-<br>ceed to step 3.                                                                                                                                                                                                                                                                                |
| 3    |                                                                                 | Overshooting will be reduced if the feedback level is increased.<br>If the overshooting is eliminated, proceed to step 4.                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 4    |                                                                                 | The graph shows overshooting that occurred when the feed-<br>forward level was increased even more after step 3. In this<br>state, overshooting occurs, but the positioning settling time<br>is shorter. Tuning is completed if the specifications are met.<br>The tuning results are saved in the SERVOPACK. If over-<br>shooting occurs before the specifications are met, repeat<br>steps 3 and 4.<br>If vibration occurs before the overshooting is eliminated, the<br>vibration is suppressed with the notch filters and anti-reso-<br>nance control. |
| 5    | _                                                                               | The tuning results are saved in the SERVOPACK.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

5.7.7 Related Parameters

# 5.7.7 Related Parameters

The following parameters are automatically adjusted or used as reference when you execute custom tuning.

| Parameter | Name                                                    | Automatic Changes |
|-----------|---------------------------------------------------------|-------------------|
| Pn100     | Speed Loop Gain                                         | Yes               |
| Pn101     | Speed Loop Integral Time Constant                       | Yes               |
| Pn102     | Position Loop Gain                                      | Yes               |
| Pn103     | Moment of Inertia Ratio                                 | No                |
| Pn121     | Friction Compensation Gain                              | Yes               |
| Pn123     | Friction Compensation Coefficient                       | Yes               |
| Pn124     | Friction Compensation Frequency Correction              | No                |
| Pn125     | Friction Compensation Gain Correction                   | Yes               |
| Pn401     | First Stage First Torque Reference Filter Time Constant | Yes               |
| Pn408     | Torque-Related Function Selections                      | Yes               |
| Pn409     | First Stage Notch Filter Frequency                      | Yes               |
| Pn40A     | First Stage Notch Filter Q Value                        | Yes               |
| Pn40C     | Second Stage Notch Filter Frequency                     | Yes               |
| Pn40D     | Second Stage Notch Filter Q Value                       | Yes               |
| Pn140     | Model Following Control-Related Selections              | Yes               |
| Pn141     | Model Following Control Gain                            | Yes               |
| Pn142     | Model Following Control Gain Correction                 | Yes               |
| Pn143     | Model Following Control Bias in the Forward Direction   | Yes               |
| Pn144     | Model Following Control Bias in the Reverse Direction   | Yes               |
| Pn145     | Vibration Suppression 1 Frequency A                     | No                |
| Pn146     | Vibration Suppression 1 Frequency B                     | No                |
| Pn147     | Model Following Control Speed Feedforward Compensation  | Yes               |
| Pn160     | Anti-Resonance Control-Related Selections               | Yes               |
| Pn161     | Anti-Resonance Frequency                                | Yes               |
| Pn163     | Anti-Resonance Damping Gain                             | Yes               |

Do not change the settings while custom tuning is being executed.

Yes: The parameter is automatically set.

No: The parameter is not automatically set, but the setting is read during execution.

5.8.1 Outline

# 5.8 Anti-Resonance Control Adjustment

This section describes anti-resonance control.

# 5.8.1 Outline

Anti-resonance control increases the effectiveness of vibration suppression after custom tuning.

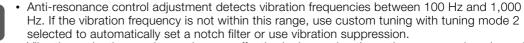
Anti-resonance control is effective for suppression of continuous vibration frequencies from 100 to 1,000 Hz that occur when the control gain is increased. Vibration can be eliminated by setting vibration frequencies through automatic detection or by manually setting them to adjust the damping gain. Input an operation reference and execute this anti-resonance control adjustment when there is vibration.

Anti-resonance control is automatically set by autotuning without a host reference or autotuning with a host reference. Use anti-resonance control adjustment only if fine-tuning is required or readjustment is required as a result of a failure to detect vibration.

Perform custom tuning if required to increase the response after performing anti-resonance control adjustment. If the control gain is increased, e.g., when custom tuning is performed, vibration may occur again. If that occurs, perform anti-resonance control adjustment again to fine-tune the parameters.

# 

- Related parameters will be set automatically when anti-resonance control adjustment is executed. This may greatly affect the response before and after execution. Make sure that you can perform an emergency stop at any time.
- Before you execute anti-resonance control adjustment, set the correct moment of inertia ratio (Pn103). If the setting greatly differs from the actual moment of inertia ratio, normal control of the machine may not be possible, and vibration may occur.



Vibration reduction can be made more effective by increasing the anti-resonance damping gain (Pn163), but the vibration may become larger if the damping gain is too high. Increase the damping gain by approximately 0% to 200% in 10% increments while checking the effect on vibration. If vibration reduction is still insufficient at a gain of 200%, cancel the setting, and lower the control gain by using a different method, such as custom tuning.

# 5.8.2 Preparations

0

Always check the following before you execute anti-resonance control adjustment.

- The test without a motor function must be disabled (Pn00C =  $n.\Box\Box\Box$ ).
- The control method must not be set to torque control.
- The parameters must not be write prohibited.

5.8.3 Applicable Tools

# 5.8.3 Applicable Tools

The following table lists the tools that you can use to perform anti-resonance control adjustment and the applicable tool functions.

| Tool             | Function        | Operating Procedure Reference                                                     |
|------------------|-----------------|-----------------------------------------------------------------------------------|
| Digital Operator | Fn204           | Ω Σ-7-Series Digital Operator Operating Man-<br>ual (Manual No.: SIEP S800001 33) |
| SigmaWin+        | Tuning - Tuning | I 5.8.4 Operating Procedure on page 5-46                                          |

# 5.8.4 Operating Procedure

To execute anti-resonance control adjustment, an operation reference is input, and the adjustment is executed while vibration is occurring.

The following methods can be used to execute anti-resonance control adjustment.

- To automatically detect the vibration frequency
- To manually set the vibration frequency

Use the following procedure to perform anti-resonance control.

| <ul> <li>Before you execute anti-resonance control adjustment, check the information provided in the SigmaWin+ operating manual. Observe the following precautions.</li> <li>Make sure that you can perform an emergency stop at any time. Parameters will be set automatically when anti-resonance control adjustment is executed. This may greatly affect the response before and after execution. Make sure that you can perform an emergency stop (to turn OFF the power supply) at any time.</li> <li>Set the moment of inertia correctly before you execute anti-resonance control adjustment. If the setting greatly differs from the actual moment of inertia, effective vibration reduction may not be possible.</li> <li>If you have already performed anti-resonance control adjustment and then you change the frequency, the current anti-resonance control effect may be lost. Caution is particularly required when automatically detecting the vibration frequency.</li> <li>If effective vibration reduction is not achieved even after you execute anti-resonance control adjustment, cancel the function and lower the control gain by using a different method, such as custom tuning.</li> <li>Perform custom tuning separately if required to increase the response after performing anti-resonance control adjustment. If the servo gain is increased, e.g., when custom tuning is performed, vibration may occur again. If that occurs, perform and lower control adjustment again to fine-tune the parameters.</li> </ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

5.8.4 Operating Procedure

**1.** Perform steps 1 to 7 of the procedure for custom tuning. Refer to the following section for details.

5.7.4 Operating Procedure on page 5-37

2. Click the Anti-res Ctrl Adj Button.

The rest of the procedure depends on whether you know the vibration frequency.

| Tuning mode                                                                                               | 0 : Set servo gains with priority given to stability.                                                                                           |      |
|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Mechanism selection                                                                                       | 2 : Ball screw mechanism or linear motor                                                                                                        |      |
| Friction compensation                                                                                     | Enable                                                                                                                                          |      |
| Gain status                                                                                               | 1 gain                                                                                                                                          |      |
| Tuning level adjustmen<br>Setting the tuning level<br>to high can cause<br>vibration or shormal<br>noise. | Tuning level and start the tuning.<br>Tuning level                                                                                              | ning |
|                                                                                                           | Auto-setting<br>Notch filter Vib Det                                                                                                            | ect  |
|                                                                                                           | 1 step inactive Cancel Anti-res Cri Adj in inactive Cancel Anti-res Cri Adj in inactive Cancel Anti-res Cri Adj in inactive Cancel Anti-res Cri |      |

**3.** If you do not know the vibration frequency, click the **Auto Detect** Button. If you know the vibration frequency, click the **Manual Set** Button.

To Automatically Detect the Vibration Frequency

Set frequenc

4

л

The frequency will be set.

ual Set

88886

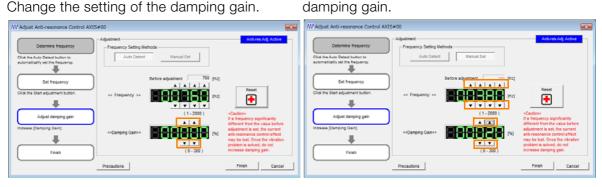
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| Determine frequency                                                | Adjustment       | thods                  | Anti-res Adj: Inactive                                                                                                      |
|--------------------------------------------------------------------|------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Tick the Auto Detect button to<br>sutomatically set the frequency. | Auto Detect      | Manual Set             |                                                                                                                             |
| Set frequency                                                      | ר                | Before adjustment [Hz] |                                                                                                                             |
| Click the Start adjustment button.                                 | << Frequency >>  |                        | Start adjustment                                                                                                            |
| Adjust damping gain                                                |                  | (1-2000)               | <caution><br/>If a frequency significantly<br/>different from the value before<br/>adjustment is set, the current</caution> |
| Finish                                                             | <-Damping Gain>> | (0-300)                | anti-resonance control effect<br>may be lost. Once the vibration<br>problem is solved, do not<br>increase damping gain.     |
|                                                                    | Precautions      |                        | Finish Cancel                                                                                                               |

To Manually Set the Vibration Frequency

- 4. Click the Start adjustment Button.
- 5. Use the ▲ and ▼ Buttons in the Adjustment Area to change the settings. Click the **Reset** Button during tuning to restore the setting to its original value. The tuning level will return to the value from before when custom tuning was started.

To Automatically Detect the Vibration Frequency To Manually Set the Vibration Frequency Change the settings of the frequency and damping gain.



#### 5.8.5 Related Parameters

#### 6. When the adjustment has been completed, click the Finish Button.

The values that were changed will be saved in the SERVOPACK and you will return to the Tuning Dialog Box.

|                                                                     | Adjustment            |                           | Anti-res Adj Active                                                                                |
|---------------------------------------------------------------------|-----------------------|---------------------------|----------------------------------------------------------------------------------------------------|
| Determine frequency                                                 | - Frequency Setting M | ethods                    |                                                                                                    |
| Click the Auto Detect button to<br>automatically set the frequency. | Auto Detect           | Manual Set                |                                                                                                    |
| Set frequency                                                       | ſ                     | Before adjustment 760 pig | a .                                                                                                |
| Click the Start adjustment button.                                  | << Frequency >>       |                           | t] Reset                                                                                           |
|                                                                     |                       | (1-2000)                  | «Caufion»                                                                                          |
| Adjust damping gain                                                 |                       | (1-200)<br>A              | If a frequency significantly                                                                       |
| Increase (Damping Gain).                                            | «Damping Gain»»       |                           | different from the value before<br>adjustment is set, the current<br>anti-resonance control effect |
| Finah                                                               | <u>۱</u>              | (0-300)                   | may be lost. Once the vibration<br>problem is solved, do not<br>increase damping gain.             |

This concludes the procedure to set up anti-resonance control.

### 5.8.5 Related Parameters

The following parameters are automatically adjusted or used as reference when you execute anti-resonance control adjustment.

Do not change the settings while anti-resonance control adjustment is being executed.

| Parameter Name                                  |                                                  | Automatic Changes |
|-------------------------------------------------|--------------------------------------------------|-------------------|
| Pn160 Anti-Resonance Control-Related Selections |                                                  | Yes               |
| Pn161                                           | Yes                                              |                   |
| Pn162 Anti-Resonance Gain Correction            |                                                  | No                |
| Pn163                                           | Anti-Resonance Damping Gain                      | Yes               |
| Pn164                                           | Anti-Resonance Filter Time Constant 1 Correction | No                |
| Pn165                                           | Anti-Resonance Filter Time Constant 2 Correction | No                |

Yes: The parameter is automatically set.

No: The parameter is not automatically set, but the setting is read during execution.

# 5.8.6 Suppressing Different Vibration Frequencies with Anti-resonance Control

When you use anti-resonance control and increase the control gain, for some mechanism, vibration can occur at a higher frequency than the frequency for which vibration was suppressed. If this occurs, you can suppress vibration for more than one frequency by adjusting Pn166 (Anti-Resonance Damping Gain 2).

Information

#### tion Guidelines for Vibration That Can Be Suppressed

- Anti-resonance frequency (Pn161): fa [Hz], Another vibration frequency that occurs when the control gain is increased: fb [Hz]
- Vibration frequencies: 100 Hz to 1,000 Hz
- Range of different vibration frequencies:  $1 < (fb/fa) \le 3$  to 4

# **Required Parameter Settings**

The following parameter settings are required to use anti-resonance control for more than one vibration frequency.

|                                | Parameter                   | I                                  | Description     |          | Wher<br>Enable  |                |
|--------------------------------|-----------------------------|------------------------------------|-----------------|----------|-----------------|----------------|
| Pn160                          | n.□□□0<br>(default setting) | Do not use anti-resonance control. |                 |          | After<br>restar | Setun          |
|                                | n.🗆 🗆 🗆 1                   | Use anti-resonance co              | ontrol.         |          | Testai          |                |
| Anti-Resonance Frequency Speed |                             |                                    |                 |          |                 | n Torque       |
| Pn161                          | Setting Range               | Setting Unit                       | Default Setting | When Ena | abled           | Classification |
|                                | 10 to 20,000                | 0.1 Hz                             | 1000            | Immedia  | ately           | Tuning         |
|                                | Anti-Resonance Ga           | ain Correction                     |                 | Speed    | Positic         | n Torque       |
| Pn162                          | Setting Range               | Setting Unit                       | Default Setting | When Ena | abled           | Classification |
|                                | 1 to 1,000                  | 1%                                 | 100             | Immedia  | ately           | Tuning         |
|                                | Anti-Resonance Da           | amping Gain                        |                 | Speed    | Positic         | n Torque       |
| Pn163                          | Setting Range               | Setting Unit                       | Default Setting | When Ena | abled           | Classification |
|                                | 0 to 300                    | 1%                                 | 0               | Immedia  | ately           | Tuning         |
|                                | Anti-Resonance Fi           | ter Time Constant 1 C              | orrection       | Speed    | Positic         | n Torque       |
| Pn164                          | Setting Range               | Setting Unit                       | Default Setting | When Ena | abled           | Classification |
|                                | -1,000 to 1,000             | 0.01 ms                            | 0               | Immedia  | ately           | Tuning         |
|                                | Anti-Resonance Fi           | ter Time Constant 2 C              | orrection       | Speed    | Positic         | n Torque       |
| Pn165                          | Setting Range               | Setting Unit                       | Default Setting | When Ena | abled           | Classification |
|                                | -1,000 to 1,000             | 0.01 ms                            | 0               | Immedia  | ately           | Tuning         |
|                                | Anti-Resonance Da           | amping Gain 2                      |                 | Speed    | Positic         | n Torque       |
| Pn166                          | Setting Range               | Setting Unit                       | Default Setting | When Ena | abled           | Classification |
|                                | 0 to 1,000                  | 1%                                 | 0               | Immedia  | ately           | Tuning         |

## Adjustment Procedure for Suppressing Different Vibration Frequencies with Anti-resonance Control

Use the following procedure to make adjustments to suppress different vibration frequencies with anti-resonance control.

| Step | Operation                                                                                                                                                                                                                                                                                                     |  |  |  |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|
| 1    | Use the gain adjustment and anti-resonance control.<br>Refer to the following section for details.<br>3.8.4 Operating Procedure on page 5-46                                                                                                                                                                  |  |  |  |
| 2    | 2 If there is vibration at a higher frequency than the vibration suppressed with anti-resonance control in step 1, adjust Pn166 (Anti-Resonance Damping Gain 2).                                                                                                                                              |  |  |  |
| 3    | Adjust Pn166 (Anti-Resonance Damping Gain 2) while checking to see if vibration reduction is effective.<br>To adjust Pn166 (Anti-Resonance Damping Gain 2), increase the setting by 10% at a time starting from the value that resulted in Pn163 (Anti-Resonance Damping Gain) from the adjustment in step 1. |  |  |  |
| 4    | If the vibration disappears, the adjustment is completed.<br>However, if the vibration does not disappear even when you adjust Pn166 (Anti-Resonance<br>Damping Gain 2), reduce the tuning level or feedback level until vibration does not occur.                                                            |  |  |  |

5.9.1 Outline

# 5.9 Vibration Suppression

This section describes vibration suppression.

# 5.9.1 Outline

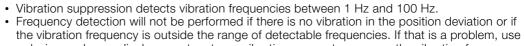
Important

You can use vibration suppression to suppress transient vibration at a low frequency from 1 Hz to 100 Hz, which is generated mainly when the machine vibrates during positioning. This is effective for vibration frequencies for which notch filters and anti-resonance control adjustment are not effective.

Vibration suppression is automatically set by autotuning without a host reference or autotuning with a host reference. Use vibration suppression only if fine-tuning is required or readjustment is required as a result of a failure to detect vibration. To execute vibration suppression, input an operation reference and execute the function when there is vibration.

Perform custom tuning if required to increase the response after performing vibration suppression.

| <ul> <li>Related parameters will be set automatically when vibration suppression is executed. This may greatly affect the response before and after execution. Make sure that you can perform an emergency stop at any time.</li> </ul>                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| • Before you execute vibration suppression, set the correct moment of inertia ratio (Pn103) with autotuning without a host reference or another method. If the setting greatly differs from the actual moment of inertia ratio, normal control of the machine may not be possible, and vibration may occur. |
| <ul> <li>If you execute vibration suppression when you are using an MP3000-Series Controller for<br/>phase control, correct phase control may not be possible.</li> </ul>                                                                                                                                   |



a device such as a displacement meter or vibration sensor to measure the vibration frequency.If an automatically detected vibration frequency is not suppressed, the actual frequency and the detected frequency may be different. Fine-tune the detected frequency if necessary.

# Items That Influence Performance

If continuous vibration occurs while the Servomotor is stopping, vibration suppression cannot be used to suppress the vibration effectively. In this case, use anti-resonance control adjustment or custom tuning.

# **Detection of Vibration Frequencies**

Frequency detection may not be possible if vibration does not appear in the position deviation or the vibration that results from the position deviation is too small. You can adjust the detection sensitivity by changing the setting of the residual vibration detection width (Pn560), which is set as a percentage of the positioning completed width (Pn522). Perform the detection of vibration frequencies again after adjusting the setting of Pn560.

|       | Residual Vibration D | Detection Width |                 | Positi       | on             |
|-------|----------------------|-----------------|-----------------|--------------|----------------|
| Pn560 | Setting Range        | Setting Unit    | Default Setting | When Enabled | Classification |
|       | 1 to 3,000           | 0.1%            | 400             | Immediately  | Setup          |

Note: As a guideline, change the setting 10% at a time. If the setting of this parameter is lowered, the detection sensitivity will be increased. Vibration may not be detected accurately if the setting is too small.

Information The vibration frequencies that are automatically detected may vary somewhat with each positioning operation. Perform positioning several times and make adjustments while checking the effect of vibration suppression.

## 5.9.2 Preparations

Always check the following before you execute vibration suppression.

- Position control must be used.
- The test without a motor function must be disabled (Pn00C =  $n.\Box\Box\Box$ ).
- The parameters must not be write prohibited.

# 5.9.3 Applicable Tools

The following table lists the tools that you can use to perform vibration suppression and the applicable tool functions.

| Tool             | Function        | Operating Procedure Reference                                                     |
|------------------|-----------------|-----------------------------------------------------------------------------------|
| Digital Operator | Fn205           | Ω Σ-7-Series Digital Operator Operating Man-<br>ual (Manual No.: SIEP S800001 33) |
| SigmaWin+        | Tuning - Tuning | 5.9.4 Operating Procedure on page 5-51                                            |

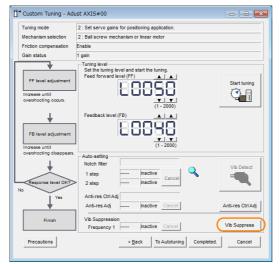
## 5.9.4 Operating Procedure

Use the following procedure to perform vibration suppression.

1. Perform steps 1 to 7 of the procedure for custom tuning. Refer to the following section for details.

5.7.4 Operating Procedure on page 5-37

2. Click the Vib Suppress Button.



**3.** Click the Import Button or click ▲ and ▼ Button to manually adjust the set frequency. When you click the Import Button, the residual vibration frequency in the motor is read as the set frequency. (The frequency can be read only when the residual vibration frequency is between 1.0 and 100.0.)

#### 5.9.4 Operating Procedure



Frequency detection will not be performed if there is no vibration or if the vibration frequency is outside the range of detectable frequencies. If a vibration frequency is not detected, provide a means of measuring the vibration frequency.

| Vibration Suppression AXIS                                                                                                                                                                                                                                                    | #00                                                                            | <b>—</b>                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------|
| Determine the frequency<br>for setting.<br>Click the thread button.<br>Manual setting is also possible.<br>Set the frequency.<br>Click the Set button.<br>If the vibraiton problem could not<br>be solved.<br>This with the frequency and<br>then click the Set button again. | Adjustment<br>Residual Vibration Frequency<br>Set frequency<br>( 1.0 - 100.0 ) | Vib Suppression: inactive |
|                                                                                                                                                                                                                                                                               | Precautions                                                                    | Finish Cancel             |

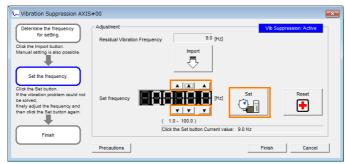
#### 4. Click the Set Button.



No settings related to vibration suppression are changed during operation. If the Servomotor does not stop within approximately 10 seconds after changing the setting, an update timeout will occur. The setting will be automatically returned to the previous value.

| Vibration Suppression AXIS                                                                                                                                                                                | #00                                                                                                       | × |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|---|
| Cetermine the frequency<br>for setting.<br>Click the Import button.<br>Manual setting is also possible.<br>Set the frequency.<br>Click the Set buttor.<br>If the Valeta concellen could not<br>be solved. | Adjustment Vb Suppression Active Residual Vibration Frequency 9.0 [Hz] Import Set frequency Set frequency |   |
| Finish                                                                                                                                                                                                    | ( 1.0 - 100 0)<br>Current value: 9.0 Hz<br>Precautions                                                    | ] |

If the vibration is not eliminated, use the  $\blacktriangle$  and  $\blacktriangledown$  Buttons for the set frequency to fine-tune the value and click the **Set** Button again.



Click the **Reset** Button during adjustment to restore the setting to its original value. The status from before when adjustment was started will be restored.

5. When the vibration has been eliminated, click the Finish Button. The updated value will be saved in the SERVOPACK.



Vibration suppression will be enabled in step 5. The motor response, however, will change when the Servomotor comes to a stop with no reference input.

This concludes the procedure to set up vibration suppression.

# 5.9.5 Setting Combined Functions

You can also use the feedforward function when you execute vibration suppression.

In the default settings, feedforward (Pn109), the speed feedforward input (VFF), and the torque feedforward input (TFF) are disabled.

To use the speed feedforward input (VFF), the torque feedforward input (TFF), and model following control from the host controller in the system, set Pn140 to n.1 []] (Use model following control and speed/torque feedforward together).

| Parameter |                            | Function                                                                  | When Enabled  | Classification |
|-----------|----------------------------|---------------------------------------------------------------------------|---------------|----------------|
| Pn140     | n.0□□□<br>(defaultsetting) | Do not use model following control and speed/torque feedforward together. | - Immediately | Tuning         |
| Pn140     | n.1000                     | Use model following control and speed/<br>torque feedforward together.    |               |                |

Refer to the following manual for information on the torque feedforward input (TFF) and the speed feedforward input (VFF).

Σ-7-Series MECHATROLINK-III Communications Standard Servo Profile Command Manual (Manual No.: SIEP S800001 31)

When model following control is used with the feedforward function, it is used to make optimum feedforward settings in the SERVOPACK. Therefore, model following control is not normally used together with either the speed feedforward input (VFF) or torque feedforward input (TFF) from the host controller. However, model following control can be used with the speed feedforward input (VFF) or torque feedforward input (TFF) if required. An unsuitable feedforward input may result in overshooting.

# 5.9.6 Related Parameters

The following parameters are automatically adjusted or used as reference when you execute vibration suppression.

Do not change the settings while vibration suppression is being executed.

| Parameter | Name                                                   | Automatic Changes |
|-----------|--------------------------------------------------------|-------------------|
| Pn140     | Model Following Control-Related Selections             | Yes               |
| Pn141     | Model Following Control Gain                           | Yes               |
| Pn142     | Model Following Control Correction                     | No                |
| Pn143     | Model Following Control Bias in the Forward Direction  | No                |
| Pn144     | Model Following Control Bias in the Reverse Direction  | No                |
| Pn145     | Vibration Suppression 1 Frequency A                    | Yes               |
| Pn146     | Vibration Suppression 1 Frequency B                    | Yes               |
| Pn147     | Model Following Control Speed Feedforward Compensation | No                |
| Pn14A     | Vibration Suppression 2 Frequency                      | No                |
| Pn14B     | Vibration Suppression 2 Correction                     | No                |

Yes: The parameter is automatically set.

No: The parameter is not automatically set, but the setting is read during execution.

# 5.10 Additional Adjustment Functions

This section describes the functions that you can use to make adjustments after you perform autotuning without a host reference, autotuning with a host reference, and custom tuning.

| Function                   | Applicable Control Methods                         | Reference                                                                                     |  |  |
|----------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------|--|--|
| Mode (Gain) Switching      | Position control, speed control, or torque control | G Chapter 6 Adjusting the Feed Shaft Servo<br>Gain for Cutting Applications                   |  |  |
| Friction compensation      | Position control or speed control                  |                                                                                               |  |  |
| Current gain level setting | Position control or speed control                  | $\Sigma$ -7-Series $\Sigma$ -7S SERVOPACK with                                                |  |  |
| Backlash compensation      | Position control                                   | MECHATROLINK-III Communications<br>References Product Manual (Manual<br>No.: SIEP S800001 28) |  |  |

# Adjusting the Feed Shaft Servo Gain for Cutting Applications

6

This chapter describes servo gain adjustments with a cutting application that are necessary for high-speed, highprecision trajectory tracking.

| 6.1 | Introduction to Feed Shaft Servo Gain Adjustment 6-2 |                                                                                                                                                                                   |  |  |  |  |  |  |
|-----|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|
| 6.2 | Flow                                                 | of Feed Shaft Servo Gain Adjustments 6-3                                                                                                                                          |  |  |  |  |  |  |
| 6.3 | Pre-a                                                | djustment Checks 6-4                                                                                                                                                              |  |  |  |  |  |  |
|     | 6.3.1<br>6.3.2                                       | Selection of Speed Loop Control Method6-4<br>Setting the Moment of Inertia Ratio6-4                                                                                               |  |  |  |  |  |  |
| 6.4 | Mode                                                 | e (Gain) Selection6-5                                                                                                                                                             |  |  |  |  |  |  |
|     | 6.4.1<br>6.4.2<br>6.4.3                              | Mode (Gain) Selection Specifications       6-5         Servo Command I/O Signals (SVCMD_IO)       6-6         Confirming the Set Gain Bank       6-6                              |  |  |  |  |  |  |
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|     | 6.5.1<br>6.5.2<br>6.5.3                              | Parameters That Are Adjusted for Cutting<br>Feeding (G01) and Rapid Feeding (G00)6-7<br>Cutting Feed (G01) Servo Gain Adjustment6-9<br>Rapid Feed (G00) Servo Gain Adjustment6-14 |  |  |  |  |  |  |

# 6.1 Introduction to Feed Shaft Servo Gain Adjustment

To adjust the feed shaft servo gains, we recommend that you use custom tuning and prioritize stable high-speed high-precision trajectory tracking.

The following servo gains are adjusted with a position reference or speed reference input from the host controller while the machine is in operation.

- Gains (e.g., speed loop gain and position loop gain)
- Filters (torque reference filter and notch filters)
- Anti-resonance control

If you perform the above servo gain adjustments, the effects given in the following table will occur. Adjust the gains while checking for these effects.

| Items Affected by Servo<br>Gain Adjustment                | Adjustment Methods                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Servo gain adjustment<br>(vibration limit servo gains)    | <ul> <li>Check the vibration limit of vibration resulting from high servo gains. For suppressible vibrations, apply the vibration suppression functions of the SERVOPACK as necessary.</li> <li>Check the tuning level when vibrations cannot be suppressed.</li> </ul>                                    |
| Servo gains for allowable torque ripple at constant speed | The torque ripple (which results in vibration) at constant speed must not<br>be great. As a guideline for the allowable range, make sure that the servo<br>gain maintains the torque ripple within 5% of the rated torque.                                                                                 |
| Other items to check                                      | <ul> <li>Extreme overshooting must not occur during acceleration or deceleration.</li> <li>Torque must not become saturated during acceleration or deceleration.</li> <li>Acceleration/deceleration time</li> <li>There must be no fluctuation in the speed when operating at a constant speed.</li> </ul> |

Set the tuning level for the servo gains (speed loop gain and position loop gain) to the smaller of the following two values to provide a leeway in stability.

70% to 80% of the vibration limit servo gain

· Servo gains for allowable torque ripple at constant speed

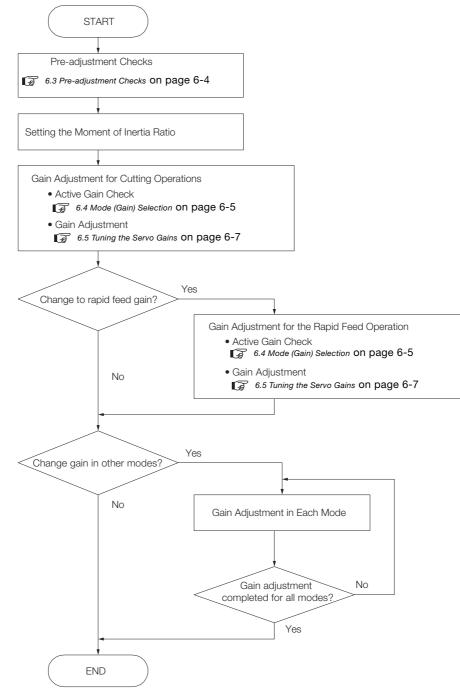
To prevent distortion in arcs and other interpolation trajectories for the feed shaft in a cutting application, the interpolation shafts must all have the same tuning level.

Therefore, you must change the tuning levels of other interpolation shafts so that they are the same as any shaft with a low tuning level.

Check the other check items in the above table at the final tuning level to complete the adjustments.

The tuning level must be set to between 40 and 100.

# 6.2 Flow of Feed Shaft Servo Gain Adjustments



The flow of adjusting the servo gains of a feed shaft is given below.

6.3.1 Selection of Speed Loop Control Method

# 6.3 Pre-adjustment Checks

# 6.3.1 Selection of Speed Loop Control Method

Make sure that Pn10B is set to n. DD1D (I-P control).

The speed loop control methods include PI control and I-P control. For feed shafts in cutting applications, we recommend setting I-P control.

| Parameter |                             | Description | When Enabled  | Classification |
|-----------|-----------------------------|-------------|---------------|----------------|
|           | n.□□0□<br>(default setting) | PI control  | After startup | Setup          |
|           | n.0010                      | I-P control |               |                |

# 6.3.2 Setting the Moment of Inertia Ratio

Before you adjust the servo gains, set the motor and load moment of inertia ratio (Pn103).

The setting for Pn103 (Moment of Inertia Ratio) is calculated by dividing the load moment of inertia (total moment of inertia for ball screws, couplings, moving tables, etc.) calculated at the motor shaft by the motor moment of inertia.

If the load moment of inertia changes (e.g., if the mass of the table load changes), set the parameter to the lowest load moment of inertia that occurs.

Use one of the following methods to set the load moment of inertia.

- Manually set Pn103 to the calculated value.
- Use the Load Moment (Mass) Ratio Estimation function of the SigmaWin+ to automatically set the load moment ratio.

Note: 1. You can also estimate the moment of inertia during custom tuning.

- 2. Refer to the following manual for the usage methods for moment of inertia (mass) ratio estimation.
  - Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

|       | Moment of Inertia R | atio         | Speed Position  | Torque       |                     |
|-------|---------------------|--------------|-----------------|--------------|---------------------|
| Pn103 | Setting Range       | Setting Unit | Default Setting | When Enabled | Classifica-<br>tion |
|       | 0 to 20,000         | 1%           | 100             | Immediately  | Tuning              |

# 6.4 Mode (Gain) Selection

# 6.4.1 Mode (Gain) Selection Specifications

This SERVOPACK lets you perform gain selection for feed shafts that combine cutting operation, rapid feed operation, and other shaft feeding, as well as with operations performed when stopped.

You can use controls to improve operation performance in cutting operations and rapid feeding.

Set controls with the following parameters.

- Pn070 = n.□□□X
- Pn070 = n.□□X□
- Pn071 = n.□□□X

Use G-SEL in SVCMD\_IO to select the mode and gain bank.

## Setting the Controls for Each Mode (Shaft Operations)

Use the mode (gain) selection to select the gain bank to use for shaft operations and to set parameters related to controls.

Refer to the following table to select the gain bank to use for shaft operations and set parameters that are related to controls as required.

If high-speed, high-precision trajectory tracing is necessary, enable predictive control, quadrant projection correction, model following control, and speed feedforward (Pn109).

|                          | SVCMD_IO (Output) |        |                          | ıt)           | Control Functions  |                                     |                                                       |  |
|--------------------------|-------------------|--------|--------------------------|---------------|--------------------|-------------------------------------|-------------------------------------------------------|--|
|                          | G-SEL             |        |                          |               | Control + unctions |                                     |                                                       |  |
| Shaft                    | Bit 11            | Bit 10 | Bit 9                    | Bit 8         | Pn070 = n.□□□X     | Pn070 = n.□□X□                      | Pn071 = n.□□□X                                        |  |
| Operation                | Operating<br>Mode |        | Gain Se                  | election      | Predictive Control | Quadrant Projec-<br>tion Correction | Speed Feedfor-<br>ward (Pn109) and<br>Model Following |  |
| Cutting                  | (                 | )      |                          | bank 0<br>ed) | 0 or 1             | 0 or 2                              | _                                                     |  |
| Rapid<br>feeding         | -                 | 1      | Gain b<br>(fix           | bank 1<br>ed) | _                  | _                                   | 0, 1, or 2                                            |  |
| Other<br>opera-<br>tion* | 2                 | 2      | Select gain bank 0 to 3. |               | _                  | _                                   | -                                                     |  |

\* You can freely select the gain bank, but you cannot use predictive control, quadrant projection correction, model following control, or speed feedforward (Pn109) for other operations.

| P     | arameter                    | Function                                | When Enabled        | Classification |
|-------|-----------------------------|-----------------------------------------|---------------------|----------------|
|       | n.□□□0<br>(default setting) | Disable predictive control.             |                     | Setup          |
|       | n.0001                      | Enable predictive control.              |                     |                |
| Pn070 | n.□□0□<br>(default setting) | Disable quadrant projection correction. | After startup       |                |
|       | n.0010                      | Enable quadrant projection correction.  |                     |                |
| Pn071 | n.□□□0<br>(default setting) | No function.                            |                     |                |
|       | n.0001                      | Use speed feedforward.                  | After startup Setup |                |
|       | n.🗆 🗆 🗆 2                   | Use model following.                    |                     |                |

#### Related Parameters

6.4.2 Servo Command I/O Signals (SVCMD\_IO)

## Gain Adjustment in Each Gain Bank

Perform adjustments that are appropriate to each operation for the gain banks given in the following table.

| Parameter Name                              | Gain Bank |       |       |       |  |  |
|---------------------------------------------|-----------|-------|-------|-------|--|--|
| i arameter name                             | 0         | 1     | 2     | 3     |  |  |
| Speed Loop Gain (Kv)                        | Pn100     | Pn104 | Pn12B | Pn12E |  |  |
| Speed Loop Integral Time Con-<br>stant (Ti) | Pn101     | Pn105 | Pn12C | Pn12F |  |  |
| Position Loop Gain (Kp)                     | Pn102     | Pn106 | Pn12D | Pn130 |  |  |
| Torque Reference Filter (Tf)                | Pn401     | Pn412 | Pn413 | Pn414 |  |  |

# 6.4.2 Servo Command I/O Signals (SVCMD\_IO)

You can use G-SEL (4 bits from bit 8 to bit 11) in the MECHATROLINK-III servo command I/O signals (SVCMD\_IO) to select the operating mode and gain bank. Refer to the following section for details.

 $\fbox{3}$  Setting the Controls for Each Mode (Shaft Operations) on page 6-5

The allocations in G\_SEL are given in the following table.

| Bit 7     | Bit 6  | Bit 5    | Bit 4  | Bit 3    | Bit 2  | Bit 1   | Bit 0  |
|-----------|--------|----------|--------|----------|--------|---------|--------|
| N_CL      | P_CL   | P_PPI    | V_PPI  |          | Reserv | ed (0). |        |
| Bit 15    | Bit 14 | Bit 13   | Bit 12 | Bit 11   | Bit 10 | Bit 9   | Bit 8  |
|           | Reserv | red (0). |        |          | G-8    | SEL     |        |
| Bit 23    | Bit 22 | Bit 21   | Bit 20 | Bit 19   | Bit 18 | Bit 17  | Bit 16 |
| DIL 20    |        | DILZI    |        | DICTO    | DIL TO | DILTI   | DIL TO |
| Reserved. | SO3    | SO2      | SO1    |          | BANK   | (_SEL   |        |
|           |        |          | i      |          | 1      |         |        |
| Bit 31    | Bit 30 | Bit 29   | Bit 28 | Bit 27   | Bit 26 | Bit 25  | Bit 24 |
|           |        |          | Reserv | red (0). |        |         |        |

# 6.4.3 Confirming the Set Gain Bank

You can use the SigmaWin+ tracing function to check if the gain bank that is set for each operation mode functions correctly.

Measure the trace data for the active gains, and make sure that the correct gain bank is selected for all operations.

The numbers of the active gains on the trace displays that correspond to the set gain banks are given in the following table.

| Gain Bank   | Active Gain Num-<br>ber |
|-------------|-------------------------|
| Gain bank 0 | 1                       |
| Gain bank 1 | 2                       |
| Gain bank 2 | 3                       |
| Gain bank 3 | 4                       |

6.5.1 Parameters That Are Adjusted for Cutting Feeding (G01) and Rapid Feeding (G00)

# 6.5 Tuning the Servo Gains

# 6.5.1 Parameters That Are Adjusted for Cutting Feeding (G01) and Rapid Feeding (G00)

| mo pure |                                  |                                                                                                                                                                             | g tablo.     |                |
|---------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------|
| F       | Parameter                        | Description                                                                                                                                                                 | When Enabled | Classification |
|         | n.□□□0<br>(default set-<br>ting) | Do not use anti-resonance control.                                                                                                                                          |              |                |
|         | n.0001                           | Use anti-resonance control.                                                                                                                                                 |              |                |
| Pn160   | n.□□0□                           | Do not adjust anti-resonance control auto-<br>matically during execution of autotuning<br>without a host reference, autotuning with a<br>host reference, and custom tuning. | Immediately  | Tuning         |
|         | n.□□1□<br>(default set-<br>ting) | Adjust anti-resonance control automatically<br>during execution of autotuning without a host<br>reference, autotuning with a host reference,<br>and custom tuning.          |              |                |
| Pn408   | n.□□□0<br>(default set-<br>ting) | Disable first stage notch filter.                                                                                                                                           | Immediately  | Setup          |
|         | n.0001                           | Enable first stage notch filter.                                                                                                                                            |              |                |

The parameters that require adjustment are given in the following table.

|        | Speed Loop Gain                    |                              |                      | Speed Posit             | tion Torque    |
|--------|------------------------------------|------------------------------|----------------------|-------------------------|----------------|
| Pn100  | Setting Range                      | Setting Unit                 | Default Setting      | When Enabled            | Classification |
|        | 10 to 20,000                       | 0.1 Hz                       | 400                  | Immediately             | Tuning         |
|        | Speed Loop Integ                   | ral Time Constant            |                      | Speed Posi              | tion Torque    |
| Pn101  | Setting Range                      | Setting Unit                 | Default Setting      | When Enabled            | Classification |
|        | 15 to 51,200                       | 0.01 ms                      | 2,000                | Immediately             | Tuning         |
|        | Position Loop Gai                  | n                            |                      | Speed Posit             | tion Torque    |
| Pn102  | Setting Range                      | Setting Unit                 | Default Setting      | When Enabled            | Classification |
|        | 10 to 20,000                       | 0.1/s                        | 400                  | Immediately             | Tuning         |
|        | Moment of Inertia                  | Ratio                        |                      | Speed Posit             | tion Torque    |
| Pn103  | Setting Range                      | Setting Unit                 | Default Setting      | When Enabled            | Classification |
|        | 0 to 20,000                        | 1%                           | 100                  | Immediately             | Tuning         |
|        | Second Speed Lo                    | op Gain                      |                      | Speed Posit             | tion Torque    |
| Pn104  | Setting Range                      | Setting Unit                 | Default Setting      | When Enabled            | Classification |
|        | 10 to 20,000                       | 0.1 Hz                       | 400                  | Immediately             | Tuning         |
|        | Second Speed Lo                    | op Integral Time C           | Speed Posit          | tion Torque             |                |
| Pn105  | Setting Range                      | Setting Unit                 | Default Setting      | When Enabled            | Classification |
|        | 15 to 51,200                       | 0.01 ms                      | 2,000                | Immediately             | Tuning         |
|        | Second Position L                  | oop Gain                     |                      | Speed Posit             | tion Torque    |
| Pn106  | Setting Range                      | Setting Unit                 | Default Setting      | When Enabled            | Classification |
|        | 10 to 20,000                       | 0.1/s                        | 400                  | Immediately             | Tuning         |
|        | Anti-Resonance C                   | ontrol-Related Sele          | ections              | Speed Posit             | tion Torque    |
| Pn160  | Setting Range                      | Setting Unit                 | Default Setting      | When Enabled            | Classification |
| FIIIOU |                                    |                              |                      |                         |                |
| FIIIOU | 0000 to 0011                       | _                            | 0010                 | Immediately             | Tuning         |
| FIIIOU | 0000 to 0011<br>Anti-resonance Fre | -<br>equency                 | 0010                 | Immediately Speed Posit | <u> </u>       |
| Pn161  |                                    | –<br>equency<br>Setting Unit | 0010 Default Setting |                         | Ũ              |

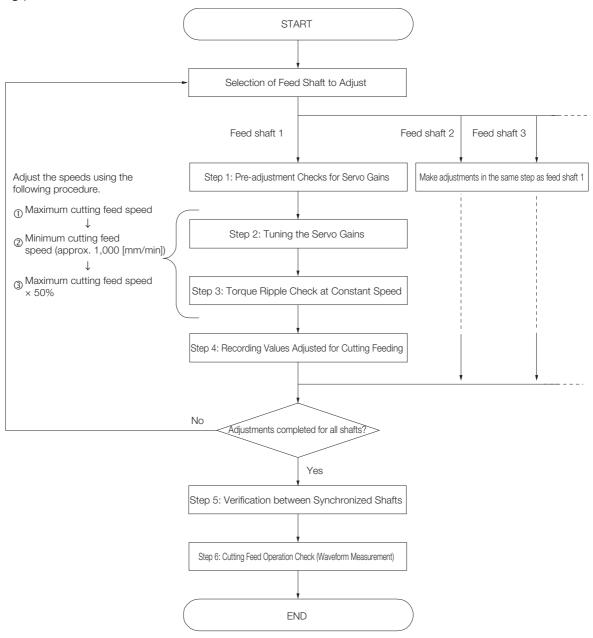
Continued on next page.

6.5.1 Parameters That Are Adjusted for Cutting Feeding (G01) and Rapid Feeding (G00)

|       |                      |                     |                      | Continued fi | rom previous page. |
|-------|----------------------|---------------------|----------------------|--------------|--------------------|
|       | Anti-resonance Da    | mping Gain          |                      | Speed        | Position Torque    |
| Pn163 | Setting Range        | Setting Unit        | Default Setting      | When Enabled | Classification     |
|       | 0 to 300             | 1%                  | 0                    | Immediately  | Tuning             |
|       | First Stage First To | orque Reference Fil | Iter Time Constant   | Speed        | Position Torque    |
| Pn401 | Setting Range        | Setting Unit        | Default Setting      | When Enabled | Classification     |
|       | 0 to 65,535          | 0.01 ms             | 100                  | Immediately  | Tuning             |
|       | Torque-Related Fu    | nction Selections   |                      | Speed        | Position Torque    |
| Pn408 | Setting Range        | Setting Unit        | Default Setting      | When Enabled | Classification     |
|       | 0000 to 1111         | _                   | 0000                 | _            | Setup              |
|       | First Stage Notch    | Filter Frequency    |                      | Speed        | Position Torque    |
| Pn409 | Setting Range        | Setting Unit        | Default Setting      | When Enabled | Classification     |
|       | 50 to 5,000          | 1 Hz                | 5,000                | Immediately  | Tuning             |
|       | First Stage Notch    | Filter Q Value      |                      | Speed        | Position Torque    |
| Pn40A | Setting Range        | Setting Unit        | Default Setting      | When Enabled | Classification     |
|       | 50 to 1,000          | 0.01                | 70                   | Immediately  | Tuning             |
|       | Second Stage Not     | ch Filter Frequency | y                    | Speed        | Position Torque    |
| Pn40C | Setting Range        | Setting Unit        | Default Setting      | When Enabled | Classification     |
|       | 50 to 5,000          | 1 Hz                | 5,000                | Immediately  | Tuning             |
|       | Second Stage Not     | ch Filter Q Value   |                      | Speed        | Position Torque    |
| Pn40D | Setting Range        | Setting Unit        | Default Setting      | When Enabled | Classification     |
|       | 50 to 1,000          | 0.01                | 70                   | Immediately  | Tuning             |
|       | First Stage Second   | d Torque Reference  | e Filter Time Consta | ant Speed    | Position Torque    |
| Pn412 | Setting Range        | Setting Unit        | Default Setting      | When Enabled | Classification     |
|       | 0 to 65,535          | 0.01 ms             | 100                  | Immediately  | Tuning             |

# 6.5.2 Cutting Feed (G01) Servo Gain Adjustment

This section describes the servo gain adjustment procedure for cutting feeding. Use the following procedure.



## Step 1: Pre-adjustment Checks for Servo Gains

Step 1 is used to perform pre-adjustment checks for servo gains.

#### 1. Confirmation of Control Method

Check that Pn10B is set to n. D10 (Speed Control Method: I-P Control). For ordinary and cutting application feed shafts, we recommend that you use I-P control for speed control

#### 2. Confirmation of Resonance and Anti-resonance Frequencies in Mechanical Analysis

When applying vibration suppression controls (anti-resonance control, torque reference filter, and notch filter), refer to the measurement data for resonance and anti-resonance frequencies during mechanical analysis to perform adjustments.

Perform mechanical analysis as necessary, and confirm the results. Refer to the following manual for details on mechanical analysis.

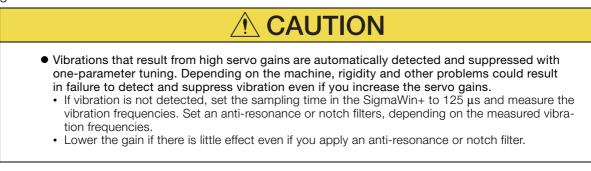
Ω Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

#### 3. Confirmation of Operation Programs for Adjustments

In these adjustments, run adjustment programs with host command while adjusting the gains.

## Step 2: Tuning the Servo Gains

In step 2, vibration suppression is performed using vibration suppression controls (anti-resonance control, torque reference filter, and notch filter) as necessary while increasing servo gains.

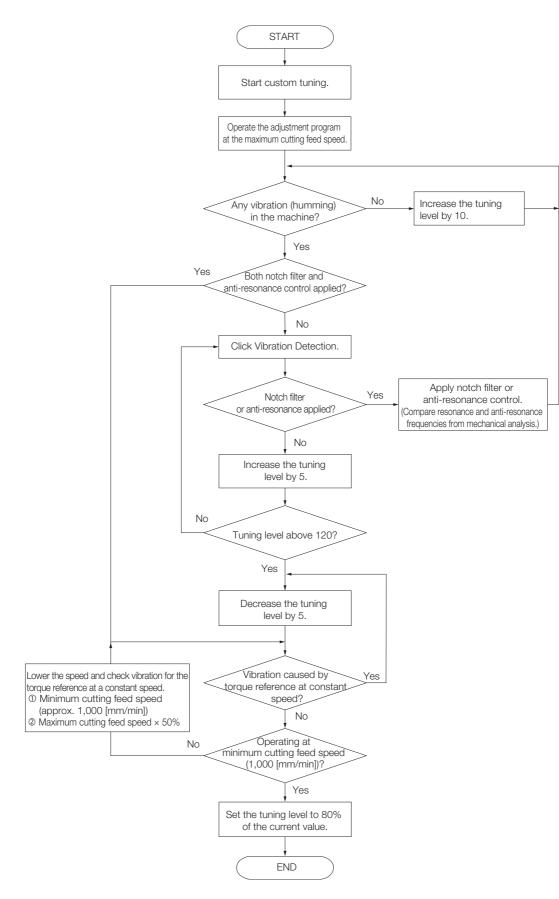


A procedure flowchart for step 2 servo gain adjustment is provided below.

To adjust the servo gains, custom tuning is performed from the SigmaWin+. Refer to the following manual for details on custom tuning.

Note: 1. Set the tuning mode to 1 (Set high-response priority servo gain).

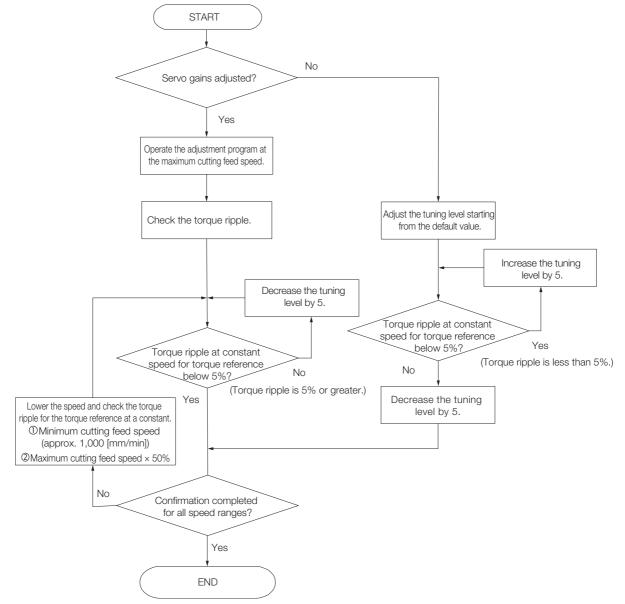
2. Torque ripple tends to increase as the speed slows, so check the torque ripple at the minimum cutting feed speed after the tuning level is established. If the torque ripple exceeds 5% of the rated torque, lower the tuning level.



## Step 3: Torque Ripple Check at Constant Speed

In step 3, the torque ripple (which is a cause of vibration) is adjusted at a constant speed so that it is within 5% of the rated torque (the allowable range).

A flowchart of the procedure to confirm the torque ripple at a constant speed is given below. For confirmation, perform custom tuning on the SigmaWin+.



# Step 4: Recording Adjusted Servo Gain Values for Cutting Feeding

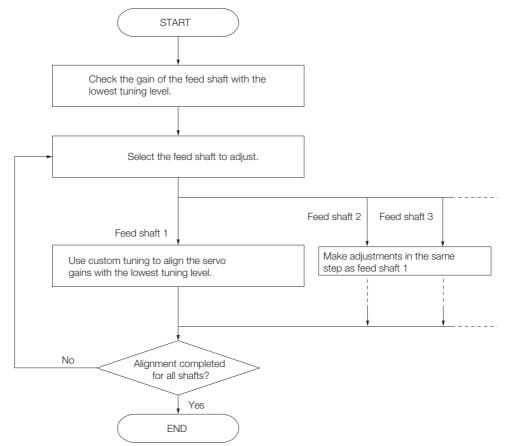
In step 4, the final adjusted values from steps 2 and 3 are recorded for all shafts. The values must be recorded in the following parameters.

- Pn100 (Speed Loop Gain)
- Pn101 (Speed Loop Integral Time Constant)
- Pn102 (Position Loop Gain)
- Pn401 (First Stage First Torque Reference Filter Time Constant)

Perform step 1 through 4 for the other shafts.

## Step 5: Verification between Synchronized Shafts

In step 5, the related gain parameters are aligned between shafts that require synchronization. A flowchart of the procedure for aligning the synchronized shafts is provided below.



### Step 6: Cutting Feed Operation Check (Waveform Measurement)

In step 6, a check is made to make sure that no operation problems were caused by changing the tuning levels of other synchronized shafts to the lowest tuning level among all the synchronized shafts. The items to confirm are as follows:

Confirm operation at all speeds (cutting feed maximum speed, minimum speed, and maximum speed  $\times$  50%).

- There must be no vibration for the torque reference at a constant speed. (This applies to the items affected by step 2 adjustments.)
- The torque ripple for the torque reference at a constant speed must be 5% or less of the rated torque. (This applies to the items affected by step 3 adjustments.)
- The torque reference must not become saturated during acceleration or deceleration.
- Extreme overshooting must not occur in the position deviation during acceleration or deceleration.

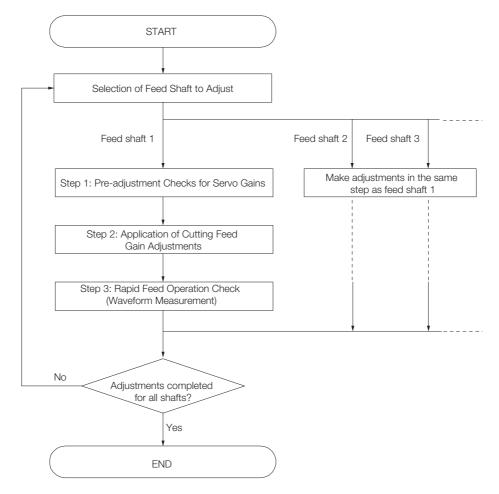
6.5.3 Rapid Feed (G00) Servo Gain Adjustment

# 6.5.3 Rapid Feed (G00) Servo Gain Adjustment

This section describes the servo gain adjustment procedure for rapid feeding. Use the following procedure.

After you complete the adjustments for the first shaft, make similar adjustments for the other shafts.

Perform the adjustment operations for steps 1 through 3.



### Step 1: Pre-adjustment Checks for Servo Gains

Step 1 is used to perform pre-adjustment checks for servo gains.

• Confirmation of Operation Programs for Adjustments In these adjustments, run adjustment programs with host command while adjusting the gains.

# Step 2: Application of Cutting Feed Gain Adjustments

In step 2, set the feed shaft parameters (Pn100, Pn101, Pn102, and Pn401) for cutting feed servo gain adjustment to the gain bank parameters (Pn104, Pn105, Pn106, and Pn412) used in rapid feed operations.

If you do not switch the gain bank during rapid feed operations (i.e., when the gain bank used in cutting feeding and the gain bank used in rapid feeding are the same), these settings are not necessary. Proceed to step 3.

### Step 3: Rapid Feed Operation Check (Waveform Confirmation)

In step 3, make sure that there are no problems during rapid feed operations. The items to confirm are as follows:

- The torque reference must not become saturated during acceleration or deceleration.
- Extreme overshooting must not occur in the position deviation during acceleration or deceleration.

# Servo Gain Adjustments for High-speed and High-precision Control

This chapter describes servo gain adjustments that facilitate faster and more-precise operations for machines. It describes how to perform faster and more-precise operations after making adjustments in ordinary tuning or in servo gain tuning for cutting application feed shafts.

| 7.1 | Param                            | neter Adjustments for Predictive Control7-2                                                                 |
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#### 7.1.1 Overview of Predictive Control

# 7.1 Parameter Adjustments for Predictive Control

The related parameter settings and adjustment procedures necessary to use predictive control for cutting applications are given below.

Applying predictive control has the following merits.

- · Shorter positioning times
- Improved trajectory tracking

Note: Predictive control is only enabled during cutting operations.

# 7.1.1 Overview of Predictive Control

Predictive control can be used only during cutting operations (operating mode 0). During cutting operations (operating mode 0), gain bank 0 is selected unconditionally.

You can use predictive control to diminish servo tracking errors such as corner undercutting, arc radius reductions, and overshooting, and to improve trajectory tracking.

## 7.1.2 Related Parameters

The parameters related to predictive control are given in the following tables.

|       | Parameter Description            |                                                   |                 | When Enabled  | Classification      |  |
|-------|----------------------------------|---------------------------------------------------|-----------------|---------------|---------------------|--|
| Pn070 | n.□□□0<br>(default setting)      | Disable predictive cor                            | ntrol.          | After startup | Setup               |  |
|       | n.0001                           | Enable predictive con                             | trol.           |               |                     |  |
|       | n.□□□2<br>(default setting)      | Tp = 0.001                                        |                 | After startup | Setup               |  |
| Pn150 | n.□□□3                           | Tp = 0.002                                        |                 |               |                     |  |
|       | n.□□1□<br>(default setting)      | Kp interlocking prediction parameter set-<br>ting |                 | After startup | Setup               |  |
|       | Predictive Control Equivalent Kp |                                                   |                 |               | 1                   |  |
| Pn153 | Setting Range                    | Setting Unit                                      | Default Setting | When Enabled  | Classifica-<br>tion |  |
|       | 10 to 300                        | 1%                                                | 100             | Immediately   | Tuning              |  |
|       | Predictive Control               | Speed Feedforward C                               | Position        | ו             |                     |  |
| Pn154 | Setting Range                    | Setting Unit                                      | Default Setting | When Enabled  | Classifica-<br>tion |  |
|       | 0 to 5,000                       | 0.1%                                              | 0               | Immediately   | Tuning              |  |

7.1.3 Effects of Related Parameters

# 7.1.3 Effects of Related Parameters

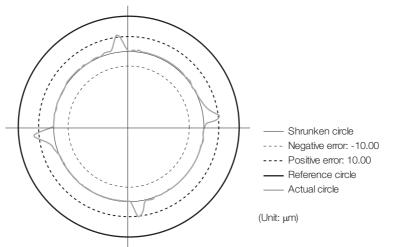
| Parameter Number | Parameter Name                                                                          | Effects                                                                                                                                                                                                                                           |
|------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pn070 = n.□□□X   | Function Selection<br>during Cutting Feeding,<br>Enable/Disable Predic-<br>tive Control | Using predictive control will normally shorten positioning time or improve trajectory tracking.                                                                                                                                                   |
| Pn153            | Predictive Control<br>Equivalent Kp Ratio                                               | If arc reduction occurs, increase the setting of this parameter<br>by 10 at a time. As you increase the setting, the constant<br>deviation for a constant speed reference will decrease, but if<br>the setting is too high, vibration will occur. |
| Pn154            | Predictive Control<br>Speed Feedforward<br>Gain                                         | Increase the setting of this parameter to reduce corner over-<br>shooting. However, this tends to cause arc radius reduction.<br>(This can improve the response to the position reference.)                                                       |

The effects of the related parameters are described below.

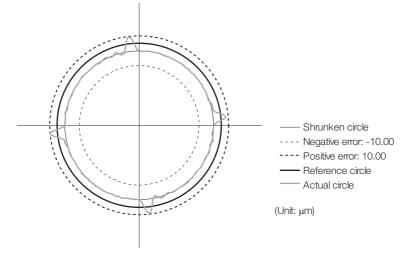
# 7.1.4 Adjustment Methods

The servo gain adjustments must be completed to prepare for this adjustment.

**1.** Measure the circular trajectory, and check for any radius errors (arc reductions or expansions).



2. If arc reduction occurs in comparison with the reference circle, increase the predictive control equivalent Kp ratio (Pn153) by 10 at a time, and measure the circular trajectory.

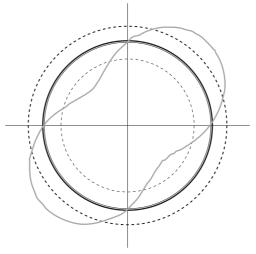


#### 7.1.4 Adjustment Methods

#### 3. After the arc reduction is mostly eliminated, check for overshooting.

During cutting feed feeding, check the position deviation near where the motor stops. If there is overshooting that is greater than the required specifications, increase the predictive control speed feedforward gain (Pn154) by 10 at a time and measure the amount of overshooting. Excessive overshooting tends to cause arc radius reduction.

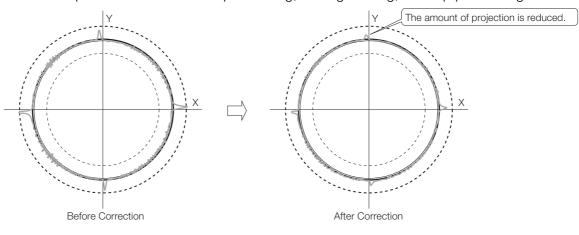
Note: When you adjust the predictive control, the value of the Pn153 (Predictive Control Equivalent Ratio) must be the same for all shafts. Differences in values may result in the distortion illustrated in the following figure.



7.2.1 Related Parameters

# 7.2 Adjustments for Friction Compensation

If the amount of quadrant projection when executing arc cutting programs exceeds the allowable range, you can make adjustments with this function to reduce the amount of projection. Friction compensation is useful in rapid feeding, cutting feeding, and tap processing.



# 7.2.1 Related Parameters

|       | Parameter                   | Function                       |                 | When Enabled   | Classification      |
|-------|-----------------------------|--------------------------------|-----------------|----------------|---------------------|
| Pn408 | n.0□□□<br>(default setting) | Disable friction compensation. |                 | Immediately    | Setup               |
|       | n.1000                      | Enable friction compe          | nsation.        |                |                     |
|       | Friction Compens            | ation Gain                     |                 | Speed Position |                     |
| Pn121 | Setting Range               | Setting Unit                   | Default Setting | When Enabled   | Classifica-<br>tion |
|       | 10 to 1,000                 | 1%                             | 100             | Immediately    | Tuning              |
|       | Friction Compens            | ation Coefficient              |                 | Speed Position |                     |
| Pn123 | Setting Range               | Setting Unit                   | Default Setting | When Enabled   | Classifica-<br>tion |
|       | 0 to 100                    | 1%                             | 0               | Immediately    | Tuning              |
|       | Friction Compens            | ation Frequency Corre          | ction           | Speed Position |                     |
| Pn124 | Setting Range               | Setting Unit                   | Default Setting | When Enabled   | Classifica-<br>tion |
|       | -10,000 to 10,000           | 0.1 Hz                         | 0               | Immediately    | Tuning              |
|       | Friction Compens            | ation Gain Correction          |                 | Speed Position |                     |
| Pn125 | Setting Range               | Setting Unit                   | Default Setting | When Enabled   | Classifica-<br>tion |
|       | 1 to 1,000                  | 1%                             | 100             | Immediately    | Tuning              |

The parameters related to friction compensation are given in the following tables.

7.2.2 Effects of Related Parameters

# 7.2.2 Effects of Related Parameters

| Parameter<br>Number | Parameter Name                                     | Recommended<br>Value | Description                                                                                                                                                  |
|---------------------|----------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pn121               | Friction Compen-<br>sation Gain                    | 100 to 1,000 [%]     | This gain is used for friction compensation.                                                                                                                 |
| Pn123               | Friction Compen-<br>sation Coefficient             | 50 to 100 [%]        | The product of the friction estimate and Pn123 is added<br>to the torque reverence as the friction compensation<br>amount.                                   |
| Pn124               | Friction Compen-<br>sation Frequency<br>Correction | 0 [Hz]               | Set the frequency correction for the friction component.<br>Normally, no adjustment is required.                                                             |
| Pn125               | Friction Compen-<br>sation Gain Correc-<br>tion    | Pn103 + 100 [%]      | This is the inertia ratio that is used for friction compen-<br>sation.<br>For example, if Pn103 (Moment of Inertia Ratio) = 86<br>[%], set Pn125 to 186 [%]. |

The effects of the related parameters are described below.

## 7.2.3 Adjustment Methods

The procedure to use friction compensation to make adjustments that reduce projection during arc quadrant switching is given below.

## **Pre-adjustment Checks**

Before adjusting friction compensation, confirm that the following setting and adjustments are completed.

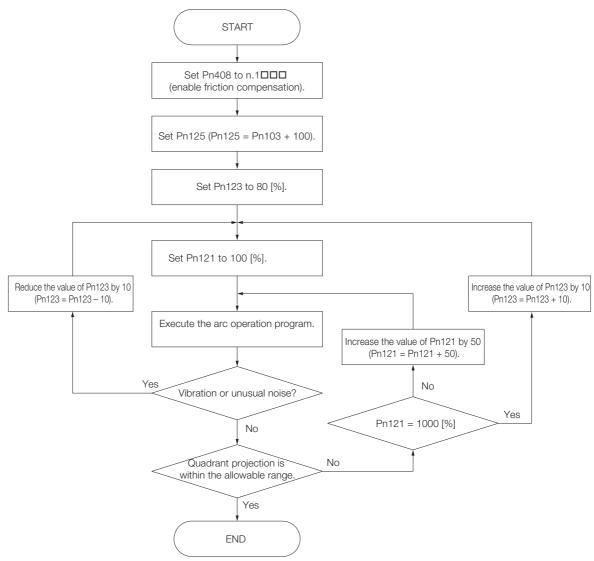
- Setting the moment of inertia ratio (Pn103)
- Adjustment of cutting feed gain (Pn100, etc.)
- · Adjustment of anti-resonance control (if adjustment is necessary)
- Adjustment of predictive control (if adjustment is necessary)

7.2.3 Adjustment Methods

# **Adjustment Flowchart**

An adjustment flowchart is provided below.

The setting of the parameters related to friction compensation do not have to be the same for all shafts.



# Monitoring

8

This chapter provides information on monitoring SERVO-PACK product information and SERVOPACK status.

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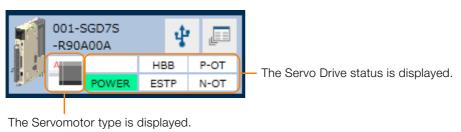
8.1.1 Servo Drive Status

# 8.1 Monitoring SERVOPACK Status

## 8.1.1 Servo Drive Status

Use the following procedure to display the Servo Drive status.

• Start the SigmaWin+. The Servo Drive status will be automatically displayed when you go online with a SERVOPACK.



# 8.1.2 Monitoring Status and Operations

Use the following procedure to display the Motion Monitor and Status Monitor for the SERVO-PACK.

• Select Monitor in the SigmaWin+ Menu Dialog Box.

| h                                     |                      |        | YASK                        | AWA SigmaWin | + Ver.7             | - |
|---------------------------------------|----------------------|--------|-----------------------------|--------------|---------------------|---|
| 💾 🖳 🕮                                 | Monitor              |        |                             |              |                     |   |
|                                       | Operation            |        |                             |              |                     |   |
|                                       | Control              | 1/F 🗸  | Item 🗸                      | Unit         | 0001-5V2·           |   |
| 0001-SV2                              | Condion              | -/·    | 1.cem                       | onic         | Axis A              |   |
| -020L2                                | POS SPO TRQ          | Common | Mctor rotating speed        | min-1        | 0                   |   |
| POWER ESTP N-OT                       | SPO                  | Common | Speed reference             | min-1        | 0                   |   |
|                                       | POS SPO TRO          | Common | Input reference pulse speed | min-1        | 0                   |   |
|                                       | POS SPO TRO          | Common | Position error amount       | reference ur | 0                   |   |
|                                       | POS SPO TRO          | Common | Accumulated load ratio      | 96           | 0                   |   |
|                                       | POS SPO TRO          | Common | Regenerative load ratio     | %            | 0                   |   |
|                                       | POS SPO TRO          | Common | Power consumed by DB resi   | %            | 0                   |   |
|                                       | POS SPO TRQ          | Common | Current Alarm State         | -            | Normal              |   |
|                                       | Status 1/O<br>Status |        |                             |              |                     |   |
|                                       | Control              | 1/F 🖌  | Item 🗸                      |              | 0001-SV2-<br>Axis A |   |
|                                       | POS SPO TRO          | Common | Dynamic Brake (DB)          | ON(ALL)      | ON                  |   |
|                                       | POS SPO TRQ          | Common | Origin not Passed           | -            | OFF                 |   |
|                                       | POS                  | Common | /COIN                       | -            | OFF                 |   |
|                                       | SPC                  | Common | /V-CMP                      | -            | OFF                 |   |
|                                       | POS SPO TRO          | Common | /S-RDY                      | -            | OFF                 |   |
|                                       | TRQ                  | Common | /VLT                        | -            | OFF                 |   |
|                                       | POS SPO TRO          | Common | Brake Interlock (/BK)       | ON(ALL)      | ON                  |   |
| · · · · · · · · · · · · · · · · · · · | POS SPO TRQ          | Common | /WARN                       | -            | OFF                 |   |
| o <sub>†</sub> - ⊠†                   |                      |        |                             |              |                     |   |

# **Monitor Items**

The items that you can monitor on the Status Monitor Window and Motion Monitor Window are listed below.

#### Status Monitor Window

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Monitor Items                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul> <li>Main Circuit</li> <li>Encoder (PGRDY)</li> <li>Motor Power (Request)</li> <li>Motor Power ON</li> <li>Dynamic Brake (DB)</li> <li>Rotation (Movement)<br/>Direction</li> <li>Mode Switch</li> <li>Speed Reference (V-Ref)</li> <li>Torque Reference (T-Ref)</li> <li>Position Reference<br/>(PULS)</li> <li>Position Reference<br/>Direction</li> <li>Surge Current Limiting<br/>Resistor Short Relay</li> <li>Regenerative Error<br/>Detection</li> <li>AC Power ON</li> <li>Overcurrent</li> <li>Origin Not Passed</li> </ul> | <ul> <li>/S-ON (Servo ON Input Signal)</li> <li>/P-CON (Proportional Control Input<br/>Signal)</li> <li>P-OT (Forward Drive Prohibit Input<br/>Signal)</li> <li>N-OT (Reverse Drive Prohibit Input<br/>Signal)</li> <li>/P-CL (Forward External Torque Limit<br/>Signal)</li> <li>/N-CL (Reverse External Torque Limit<br/>Signal)</li> <li>/ALM-RST (Alarm Reset Input Signal)</li> <li>SEN (Absolute Data Request Input<br/>Signal)</li> <li>/G-SEL (Gain Selection Input Signal)</li> <li>/P-DET (Polarity Detection Input Signal)</li> <li>/DEC (Origin Return Deceleration<br/>Switch Input Signal)</li> <li>/EXT1 (External Latch Input 1 Signal)</li> <li>/EXT2 (External Latch Input 3 Signal)</li> <li>FSTP (Forced Stop Input Signal)</li> </ul> | <ul> <li>ALM (Servo Alarm Output<br/>Signal)</li> <li>/COIN (Positioning Com-<br/>pletion Output Signal)</li> <li>/V-CMP (Speed Coinci-<br/>dence Detection Output<br/>Signal)</li> <li>/TGON (Rotation Detec-<br/>tion Output Signal)</li> <li>/S-RDY (Servo Ready Out-<br/>put Signal)</li> <li>/CLT (Torque Limit Detec-<br/>tion Output Signal)</li> <li>/CLT (Speed Limit Detec-<br/>tion Output Signal)</li> <li>/VLT (Speed Limit Detec-<br/>tion Output Signal)</li> <li>/KK (Brake Output Signal)</li> <li>/WARN (Warning Output<br/>Signal)</li> <li>/NEAR (Near Output Sig-<br/>nal)</li> <li>PAO (Encoder Divided<br/>Pulse Output Phase A Sig-<br/>nal)</li> <li>PEO (Encoder Divided<br/>Pulse Output Phase B Sig-<br/>nal)</li> <li>PCO (Encoder Divided<br/>Pulse Output Phase C Sig-<br/>nal)</li> <li>/PM (Preventative Mainte-<br/>nance Output Signal)</li> </ul> |

#### Motion Monitor Window

| Monitor Items                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| <ul> <li>Current Alarm State</li> <li>Motor Speed</li> <li>Speed Reference</li> <li>Internal Torque Reference</li> <li>Angle of Rotation 1 (number of<br/>encoder pulses from origin within one<br/>encoder rotation)</li> <li>Angle of Rotation 2 (angle from origin<br/>within one encoder rotation)</li> <li>Input Reference Pulse Speed</li> <li>Deviation Counter (Position Deviation)</li> <li>Cumulative Load</li> <li>Regenerative Load</li> <li>Power Consumption</li> <li>Consumed Power</li> <li>Cumulative Power Consumption</li> <li>DB Resistor Consumption Power</li> </ul> | <ul> <li>Absolute Encoder Multiturn Data</li> <li>Absolute Encoder Position within One Rotation</li> <li>Absolute Encoder (Lower)</li> <li>Absolute Encoder (Upper)</li> <li>Reference Pulse Counter</li> <li>Feedback Pulse Counter</li> <li>Fully Closed Feedback Pulse Counter</li> <li>Total Operating Time</li> <li>Clearance Offset Reference</li> <li>Gap (1 reference unit)</li> <li>Gap (AD value)</li> </ul> |  |  |

8.2.1 Using the SigmaWin+

# 8.2 Monitoring Machine Operation Status and Signal Waveforms

To monitor waveforms, use the SigmaWin+ trace function or a measuring instrument, such as a memory recorder.

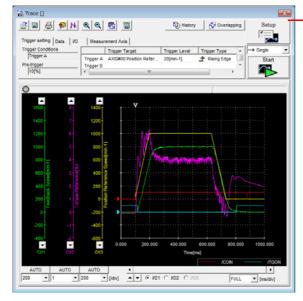
# 8.2.1 Using the SigmaWin+

This section describes how to trace data and I/O with the SigmaWin+.

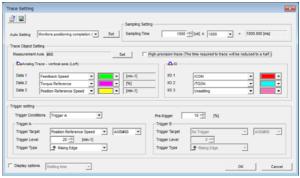
Refer to the following manual for detailed operating procedures for the SigmaWin+.

## **Operating Procedure**

- 1. Click the <u>I</u> Servo Drive Button in the workspace of the Main Window of the SigmaWin+.
- **2.** Select Trace in the Menu Dialog Box. The Trace Dialog Box will be displayed.



Click this button to display the Trace Setting Dialog Box shown below, and set the data to trace and the trace conditions.



# **Trace Objects**

You can trace the following items.

Data Tracing

| Trace Objects                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                       |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| <ul> <li>Torque Reference</li> <li>Feedback Speed</li> <li>Reference Speed</li> <li>Position Reference Speed</li> <li>Position Error (Deviation)</li> <li>Position Amplifier Error (Deviation)</li> <li>Motor - Load Position Deviation</li> <li>Speed Feedforward</li> <li>Torque Feedforward</li> </ul> | <ul> <li>Effective (Active) Gain</li> <li>Main Circuit DC Voltage</li> <li>External Encoder Speed</li> <li>Control Mode</li> <li>Amount of Quadrant Projection Correction</li> <li>Clearance Offset Reference</li> <li>Gap</li> </ul> |  |  |

#### I/O Tracing

|                  | Trace Objects                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Input<br>Signals | <ul> <li>/S-ON (Servo ON Input Signal)</li> <li>/P-CON (Proportional Control Input Signal)</li> <li>P-OT (Forward Drive Prohibit Input Signal)</li> <li>N-OT (Reverse Drive Prohibit Input Signal)</li> <li>/ALM-RST (Alarm Reset Input Signal)</li> <li>/P-CL (Forward External Torque/Force Limit Input Signal)</li> <li>/N-CL (Reverse External Torque/Force Limit Input Signal)</li> <li>/N-CL (Reverse External Torque/Force Limit Input Signal)</li> <li>/P-DET (Polarity Detection Input Signal)</li> <li>/DEC (Origin Return Deceleration Switch Input Signal)</li> <li>/EXT1 (External Latch Input 1 Signal)</li> <li>/EXT2 (External Latch Input 3 Signal)</li> <li>/EXT3 (External Latch Input 3 Signal)</li> <li>SEN (Absolute Data Request Input Signal)</li> <li>/HWBB1 (Hard Wire Base Block Input 1 Signal)</li> </ul> | Output<br>Signals  | <ul> <li>ALM (Servo Alarm Output Signal)</li> <li>/COIN (Positioning Completion Output Signal)</li> <li>/V-CMP (Speed Coincidence Detection Output Signal)</li> <li>/TGON (Rotation Detection Output Signal)</li> <li>/TGON (Rotation Detection Output Signal)</li> <li>/S-RDY (Servo Ready Output Signal)</li> <li>/CLT (Torque Limit Detection Output Signal)</li> <li>/VLT (Speed Limit Detection Output Signal)</li> <li>/NEAR (Near Output Signal)</li> <li>/NEAR (Near Output Signal)</li> <li>PAO (Encoder Divided Pulse Output Phase A Signal)</li> <li>PCO (Encoder Divided Pulse Output Phase B Signal)</li> <li>PCO (Encoder Divided Pulse Output Phase C Signal)</li> </ul> |  |
|                  | <ul> <li>/HWBB2 (Hard Wire Base Block Input 2<br/>Signal)</li> <li>CLCCMD (Clearance Control Reference<br/>Input Signal)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Internal<br>Status | <ul> <li>ACON (Main Circuit ON Signal)</li> <li>PDETCMP (Polarity Detection Completed Signal)</li> <li>DEN (Position Reference Distribution Completed Signal)</li> <li>PSET (Positioning Completion Output Signal)</li> <li>CMDRDY (Command Ready Signal)</li> <li>CLCRUN (Clearance Control Operation Output Signal)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |

#### Using a Measuring Instrument 8.2.2

Connect a measuring instrument, such as a memory recorder, to the analog monitor connector (CN5) on the SERVOPACK to monitor analog signal waveforms. The measuring instrument is not provided by Yaskawa.

Refer to the following manual for details on connection.

Ω Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

### Setting the Monitor Object

Use Pn006 = n. DXX and Pn007 = n. DXX (Analog Monitor 1 and 2 Signal Selections) to set the items to monitor.

| Line Color         | Signal           | Parameter Setting |
|--------------------|------------------|-------------------|
| White              | Analog monitor 1 | Pn006 = n.□□XX    |
| Red                | Analog monitor 2 | Pn007 = n.□□XX    |
| Black (2<br>lines) | GND              | -                 |

#### 8.2 Monitoring Machine Operation Status and Signal Waveforms

#### 8.2.2 Using a Measuring Instrument

| Der         |                                            |                                                  | Description                                                                                                          |                                                             |
|-------------|--------------------------------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Par         | ameter                                     | Monitor Signal                                   | Output Unit                                                                                                          | Remarks                                                     |
|             | n.□□00<br>(default<br>setting of<br>Pn007) | Motor Speed                                      | <ul> <li>Rotary Servomotor: 1 V/1,000 min<sup>-1</sup></li> <li>Linear Servomotor: 1 V/1,000 mm/s</li> </ul>         | -                                                           |
|             | n.□□01                                     | Speed Reference                                  | <ul> <li>Rotary Servomotor:1 V/1,000 min<sup>-1</sup></li> <li>Linear Servomotor:1 V/1,000 mm/s</li> </ul>           | _                                                           |
|             | n.□□02<br>(default<br>setting of<br>Pn006) | Torque Reference                                 | 1 V/100% rated torque                                                                                                | -                                                           |
|             | n.□□03                                     | Position Deviation                               | 0.05 V/Reference unit                                                                                                | 0 V for speed or torque control                             |
|             | n.□□04                                     | Position Amplifier Devi-<br>ation                | 0.05 V/encoder pulse unit                                                                                            | Position deviation<br>after electronic gear<br>conversion   |
|             | n.□□05                                     | Position Command<br>Speed                        | <ul> <li>Rotary Servomotor:1 V/1,000 min<sup>-1</sup></li> <li>Linear Servomotor:1 V/1,000 mm/s</li> </ul>           | -                                                           |
|             | n.□□06                                     | Reserved parameter (Do not change.)              | -                                                                                                                    | -                                                           |
| Pn006<br>or | n.□□07                                     | Motor - Load Position<br>Deviation               | 0.01 V/Reference unit                                                                                                | _                                                           |
| Pn007       | n.□□08                                     | Positioning Completion                           | Positioning completed: 5 V<br>Positioning not completed: 0 V                                                         | Completion is indi-<br>cated by the output voltage.         |
|             | n.□□09                                     | Speed Feedforward                                | <ul> <li>Rotary Servomotor:1 V/1,000 min<sup>-1</sup></li> <li>Linear Servomotor:1 V/1,000 mm/s</li> </ul>           | -                                                           |
|             | n.□□0A                                     | Torque Feedforward                               | 1 V/100% rated torque                                                                                                | _                                                           |
|             | n.ロロ0B                                     | Active Gain*                                     | <ul> <li>First gains: 1 V</li> <li>Second gains: 2 V</li> <li>Third gains: 3 V</li> <li>Fourth gains: 4 V</li> </ul> | The gain that is active is indicated by the output voltage. |
|             | n.□□0C                                     | Completion of Position<br>Reference Distribution | Distribution completed: 5 V<br>Distribution not completed: 0 V                                                       | Completion is indi-<br>cated by the output voltage.         |
|             | n.□□0D                                     | External Encoder<br>Speed                        | 1 V/1,000 min <sup>-1</sup>                                                                                          | Value calculated at the motor shaft                         |
|             | n.□□10                                     | Main Circuit DC Voltage                          | 1 V/100 V (main circuit DC voltage)                                                                                  | -                                                           |
|             | n.□□34                                     | Clearance Offset Refer-<br>ence-Gap Deviation    | 0.05 V/Reference unit                                                                                                | -                                                           |
|             | n.□□35                                     | Gap                                              | 0.01 V/Reference unit                                                                                                | -                                                           |
|             | n.□□47                                     | Amount of Quadrant<br>Projection Correction      | 1 V/100% rated torque                                                                                                | _                                                           |

\* Refer to the following manual for details. Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

### Changing the Monitor Factor and Offset

You can change the monitor factors and offsets for the output voltages for analog monitor 1 and analog monitor 2. The relationships to the output voltages are as follows:

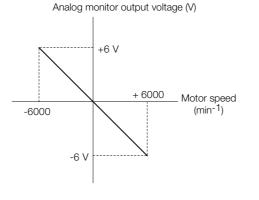
| Analog monitor 1 $= (-1) \times \langle $ output voltage | Analog Monitor 1 Signal      | Analog Monitor 1                   | Analog Monitor 1       |
|----------------------------------------------------------|------------------------------|------------------------------------|------------------------|
|                                                          | Selection (Pn006 = n.□□XX) × | Magnification (Pn552) <sup>+</sup> | Offset Voltage (Pn550) |
| Analog monitor 2 $= (-1) \times (-1)$                    | Analog Monitor 2 Signal ×    | Analog Monitor 2 <sub>+</sub>      | Analog Monitor 2       |
|                                                          | Selection (Pn007 = n.□□XX)   | Magnification (Pn553)              | Offset Voltage (Pn551) |

The following parameters are set.

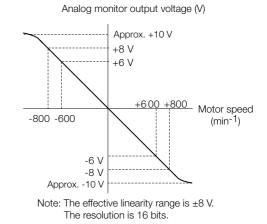
|       | Analog Monitor 1 Of                                               | fset Voltage | Speed           | osition Torque |                |
|-------|-------------------------------------------------------------------|--------------|-----------------|----------------|----------------|
| Pn550 | Setting Range                                                     | Setting Unit | Default Setting | When Enabled   | Classification |
|       | -10,000 to 10,000                                                 | 0.1 V        | 0               | Immediately    | Setup          |
|       | Analog Monitor 2 Offset Voltage     Speed     Position     Torque |              |                 |                |                |
| Pn551 | Setting Range                                                     | Setting Unit | Default Setting | When Enabled   | Classification |
|       | -10,000 to 10,000                                                 | 0.1 V        | 0               | Immediately    | Setup          |
|       | Analog Monitor 1 Magnification Speed Position Torque              |              |                 |                |                |
| Pn552 | Setting Range                                                     | Setting Unit | Default Setting | When Enabled   | Classification |
|       | -10,000 to 10,000                                                 | ×0.01        | 100             | Immediately    | Setup          |
|       | Analog Monitor 2 Magnification Speed Position Torque              |              |                 |                |                |
| Pn553 | Setting Range                                                     | Setting Unit | Default Setting | When Enabled   | Classification |
|       | -10,000 to 10,000                                                 | ×0.01        | 100             | Immediately    | Setup          |

• Example • Example for Setting the Item to Monitor to the Motor Speed (Pn006 =  $n.\Box\Box00$ )

When Pn552 = 100 (Setting Unit: ×0.01)



When Pn552 = 1,000 (Setting Unit: ×0.01)



Adjusting the Analog Monitor Output

You can manually adjust the offset and gain for the analog monitor outputs for the torque reference monitor and motor speed monitor.

The offset is adjusted to compensate for offset in the zero point caused by output voltage drift or noise in the monitoring system.

The gain is adjusted to match the sensitivity of the measuring system.

The offset and gain are adjusted at the factory. You normally do not need to adjust them.

#### Adjustment Example

An example of adjusting the output of the motor speed monitor is provided below.

| Offset Adju                   | stment          | Gain Adju                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | stment        |  |
|-------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--|
| Analog monitor output voltage |                 | Analog monitor output voltage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |               |  |
| Item                          | Specification   | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Specification |  |
| Offset Adjustment Range       | -2.4 V to 2.4 V | Gain Adjustment Range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 100 ±50%      |  |
| Adjustment Unit               | 18.9 mV/LSB     | Adjustment Unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.4%/LSB      |  |
|                               |                 | <ul> <li>The gain adjustment range is made using a 1009 put value (gain adjustment of 0) as the reference with an adjustment range of 50% to 150%.</li> <li>A setting example is given below.</li> <li>Setting the Adjustment Value to -125 100 + (-125 × 0.4) = 50 [%] Therefore, the monitor output voltage goes to 8 of the original value.</li> <li>Setting the Adjustment Value to 125 100 + (125 × 0.4) = 150 [%] Therefore, the monitor output voltage goes to 100 + (125 × 0.4) = 150 [%] Therefore, the monitor output voltage goes to 100 + (125 × 0.4) = 150 [%]</li> </ul> |               |  |

**Information** • The adjustment values do not use parameters, so they will not change even if the parameter settings are initialized.

- Adjust the offset with the measuring instrument connected so that the analog monitor output value goes to zero. The following setting example achieves a zero output.
  - While power is not supplied to the Servomotor, set the monitor signal to the torque reference.
  - In speed control, set the monitor signal to the position deviation.

#### Preparations

Always check the following before you adjust the analog monitor output.

• The parameters must not be write prohibited.

#### ♦ Applicable Tools

You can use the following tools to adjust analog monitor outputs. The function that is used is given for each tool.

Offset Adjustment

| Tool             | Function                                      | Operating Procedure Reference                                                   |
|------------------|-----------------------------------------------|---------------------------------------------------------------------------------|
| Digital Operator | Fn00C                                         | Ω Σ-7-Series Digital Operator Operating Manual<br>(Manual No.: SIEP S800001 33) |
| SigmaWin+        | Setup - Analog Monitor Out-<br>put Adjustment | Operating Procedure on page 8-9                                                 |

· Gain Adjustment

| Tool             | Function                                      | Operating Procedure Reference                                                   |
|------------------|-----------------------------------------------|---------------------------------------------------------------------------------|
| Digital Operator | Fn00D                                         | Ω Σ-7-Series Digital Operator Operating Manual<br>(Manual No.: SIEP S800001 33) |
| SigmaWin+        | Setup - Analog Monitor Out-<br>put Adjustment | Operating Procedure on page 8-9                                                 |

#### Operating Procedure

Use the following procedure to adjust the analog monitor output.

- 1. Click the <u>I</u> Servo Drive Button in the workspace of the Main Window of the SigmaWin+.
- **2.** Select Adjust the Analog Monitor Output in the Menu Dialog Box. The Adjust the Analog Monitor Output Dialog Box will be displayed.
- 3. Click the Zero Adjustment or Gain Adjustment Tab.

| San Adjust the Analog Monitor Output AXIS#00       |
|----------------------------------------------------|
|                                                    |
| Zero Adjustment Gain Adjustment                    |
| Channel CH1                                        |
| 0 -1 Qt                                            |
| Monitor Signal Torque reference (1 V/100% rated to |

**4.** While watching the analog monitor, use the +1 and -1 Buttons to adjust the offset. There are two channels: CH1 and CH2. If necessary, click the down arrow on the **Channel** Box and select the channel.

| Search Adjust the Analog Monitor Output AXIS#00    |
|----------------------------------------------------|
|                                                    |
| Zero Adjustment Gain Adjustment                    |
| Analog Monitor Output Offset                       |
| Channel CH1                                        |
| 0 Offset +1 ᠿ↑                                     |
| Monitor Signal Torque reference (1 V/100% rated to |

This concludes adjusting the analog monitor output.

8.3.1 Analog Monitors

# 8.3 Monitoring the Clearance Control Status

You can monitor the following signals related to clearance control through analog monitors or through MECHATROLINK-III communications option monitors.

# 8.3.1 Analog Monitors

| Parameter      |        | Description                              | Output Unit              |  |
|----------------|--------|------------------------------------------|--------------------------|--|
| Pn006<br>Pn007 | n.□□34 | Clearance Offset Reference-Gap Deviation | 0.05 V/Reference<br>unit |  |
|                | n.□□35 | Gap                                      | 0.01 V/Reference<br>unit |  |

### 8.3.2 Option Monitors with MECHATROLINK-III Communications

| Parameter      |          | Signal                                 | Output Unit                                                                                                           |  |
|----------------|----------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--|
| Pn824<br>Pn825 | 004A hex | Clearance Control Operation<br>Monitor | Bit $0 = 0$ : Clearance control operation<br>is disabled.<br>Bit $0 = 1$ : Clearance control operation<br>is enabled. |  |
|                | 004B hex | Gap Monitor                            | 1 reference unit                                                                                                      |  |

# 8.3.3 Monitoring with SigmaWin+ Waveform Traces

| Name                       | Unit             |
|----------------------------|------------------|
| Clearance Offset Reference | 1 reference unit |
| Gap                        | 1 reference unit |

# 8.3.4 Monitoring with SigmaWin+ I/O Tracing

| Signal                               | Selected Data Name                               | Meaning                                                                                              |
|--------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Clearance Control Com-<br>mand Bit   | Clearance Control Command (Input)<br>(CLCCMD)    | Low: Disable clearance control.<br>High: Enable clearance control.                                   |
| Clearance Control Opera-<br>tion Bit | Clearance Control Operation (Output)<br>(CLCRUN) | Low: Clearance control operation is<br>disabled.<br>High: Clearance control operation is<br>enabled. |

# Maintenance



This chapter provides information on the meaning of, causes of, and corrections for alarms and warnings.

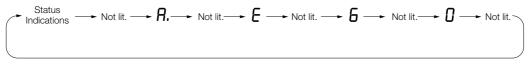
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| 9.3 | Troubleshooting Based on the Operation and Conditions of the Servomotor9-49 |

# 9.1 Alarm Displays

If an error occurs in the SERVOPACK, an alarm number will be displayed on the panel display.

If there is an alarm, the display will change in the following order.

Example: Alarm A.E60



This section provides a list of the alarms that may occur and the causes of and corrections for those alarms.

# 9.1.1 List of Alarms

The list of alarms gives the alarm name, alarm meaning, alarm stopping method, and alarm reset possibility in order of the alarm numbers.

### Servomotor Stopping Method for Alarms

Refer to the following manual for information on the stopping method for alarms. Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

## Alarm Reset Possibility

Yes: You can use an alarm reset to clear the alarm. However, this assumes that the cause of the alarm has been removed.

No: You cannot clear the alarm.

## List of Alarms

| Alarm<br>Number | Alarm Name                            | Alarm Meaning                                                                                                                                                                    | Servo-<br>motor<br>Stop-<br>ping<br>Method | Alarm<br>Reset<br>Possi-<br>ble? |
|-----------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------|
| A.020           | Parameter Checksum<br>Error           | There is an error in the parameter data in the SERVOPACK.                                                                                                                        | Gr.1                                       | No                               |
| A.021           | Parameter Format Error                | There is an error in the parameter data format in the SERVOPACK.                                                                                                                 | Gr.1                                       | No                               |
| A.022           | System Checksum Error                 | There is an error in the parameter data in the SERVOPACK.                                                                                                                        | Gr.1                                       | No                               |
| A.024           | System Alarm                          | An internal program error occurred in the SER-<br>VOPACK.                                                                                                                        | Gr.1                                       | No                               |
| A.025           | System Alarm                          | An internal program error occurred in the SER-<br>VOPACK.                                                                                                                        | Gr.1                                       | No                               |
| A.030           | Main Circuit Detector<br>Error        | There is an error in the detection data for the main circuit.                                                                                                                    | Gr.1                                       | Yes                              |
| A.040           | Parameter Setting Error               | A parameter setting is outside of the setting range.                                                                                                                             | Gr.1                                       | No                               |
| A.041           | Encoder Output Pulse<br>Setting Error | The setting of Pn212 (Number of Encoder Output<br>Pulses) or Pn281 (Encoder Output Resolution) is<br>outside of the setting range or does not satisfy<br>the setting conditions. | Gr.1                                       | No                               |

| Continued from | i previous | page. |
|----------------|------------|-------|
|----------------|------------|-------|

| Alarm<br>Number | Alarm Name                                                          | Alarm Meaning                                                                                                                                                                                                                                                                       | Servo-<br>motor<br>Stop-<br>ping<br>Method | Alarm<br>Reset<br>Possi-<br>ble? |
|-----------------|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------|
| A.042           | Parameter Combination<br>Error                                      | The combination of some parameters exceeds the setting range.                                                                                                                                                                                                                       | Gr.1                                       | No                               |
| A.044           | Semi-Closed/Fully-Closed<br>Loop Control Parameter<br>Setting Error | The settings of the Option Module and Pn002 = n.XDDD (External Encoder Usage) do not match.                                                                                                                                                                                         | Gr.1                                       | No                               |
| A.04A           | Parameter Setting Error 2                                           | There is an error in the bank members or bank data settings.                                                                                                                                                                                                                        | Gr.1                                       | No                               |
| A.050           | Combination Error                                                   | The capacities of the SERVOPACK and Servomo-<br>tor do not match.                                                                                                                                                                                                                   | Gr.1                                       | Yes                              |
| A.051           | Unsupported Device<br>Alarm                                         | An unsupported device was connected.                                                                                                                                                                                                                                                | Gr.1                                       | No                               |
| A.070           | Motor Type Change<br>Detected                                       | The connected motor is a different type of motor from the previously connected motor.                                                                                                                                                                                               | Gr.1                                       | No                               |
| A.080           | Linear Encoder Pitch Set-<br>ting Error                             | The setting of Pn282 (Linear Encoder Scale Pitch) has not been changed from the default setting.                                                                                                                                                                                    | Gr.1                                       | No                               |
| A.0b0           | Invalid Servo ON Com-<br>mand Alarm                                 | The SV_ON (Servo ON) command was sent from<br>the host controller after a utility function that turns<br>ON the Servomotor was executed.                                                                                                                                            | Gr.1                                       | Yes                              |
| A.100           | Overcurrent Detected                                                | An overcurrent flowed through the power transistor or the heat sink overheated.                                                                                                                                                                                                     | Gr.1                                       | No                               |
| A.101           | Motor Overcurrent<br>Detected                                       | The current to the motor exceeded the allowable current.                                                                                                                                                                                                                            | Gr.1                                       | No                               |
| A.300           | Regeneration Error                                                  | There is an error related to regeneration.                                                                                                                                                                                                                                          | Gr.1                                       | Yes                              |
| A.320           | Regenerative Overload                                               | A regenerative overload occurred.                                                                                                                                                                                                                                                   | Gr.2                                       | Yes                              |
| A.330           | Main Circuit Power Supply<br>Wiring Error                           | <ul> <li>The AC power supply input setting or DC power<br/>supply input setting is not correct.</li> <li>The power supply wiring is not correct.</li> </ul>                                                                                                                         | Gr.1                                       | Yes                              |
| A.400           | Overvoltage                                                         | The main circuit DC voltage is too high.                                                                                                                                                                                                                                            | Gr.1                                       | Yes                              |
| A.410           | Undervoltage                                                        | The main circuit DC voltage is too low.                                                                                                                                                                                                                                             | Gr.2                                       | Yes                              |
| A.510           | Overspeed                                                           | The motor exceeded the maximum speed.                                                                                                                                                                                                                                               | Gr.1                                       | Yes                              |
| A.511           | Encoder Output Pulse<br>Overspeed                                   | <ul> <li>Rotary Servomotor: The pulse output speed for<br/>the setting of Pn212 (Number of Encoder Out-<br/>put Pulses) was exceeded.</li> <li>Linear Servomotor: The motor speed upper<br/>limit for the setting of Pn281 (Encoder Output<br/>Resolution) was exceeded.</li> </ul> | Gr.1                                       | Yes                              |
| A.520           | Vibration Alarm                                                     | Abnormal oscillation was detected in the motor speed.                                                                                                                                                                                                                               | Gr.1                                       | Yes                              |
| A.521           | Autotuning Alarm                                                    | Vibration was detected during autotuning for the tuning-less function.                                                                                                                                                                                                              | Gr.1                                       | Yes                              |
| A.550           | Maximum Speed Setting<br>Error                                      | The setting of Pn385 (Maximum Motor Speed) is greater than the maximum motor speed.                                                                                                                                                                                                 | Gr.1                                       | Yes                              |
| A.710           | Instantaneous Overload                                              | The Servomotor was operating for several sec-<br>onds to several tens of seconds under a torque<br>that largely exceeded the rating.                                                                                                                                                | Gr.2                                       | Yes                              |
| A.720           | Continuous Overload                                                 | The Servomotor was operating continuously under a torque that exceeded the rating.                                                                                                                                                                                                  | Gr.1                                       | Yes                              |
| A.730<br>A.731  | Dynamic Brake Overload                                              | When the dynamic brake was applied, the rota-<br>tional or linear kinetic energy exceeded the<br>capacity of the dynamic brake resistor.                                                                                                                                            | Gr.1                                       | Yes                              |
| A.740           | Inrush Current Limiting<br>Resistor Overload                        | The main circuit power supply was frequently turned ON and OFF.                                                                                                                                                                                                                     | Gr.1                                       | Yes                              |

9

Servo-Alarm motor Alarm Reset Alarm Name Alarm Meaning Stop-Number Possiping ble? Method Internal Temperature Error The surrounding temperature of the control PCB A.7A1 1 (Control Board Tempera-Gr.2 Yes is abnormal. ture Error) Internal Temperature Error The surrounding temperature of the power PCB A.7A2 2 (Power Board Tempera-Gr.2 Yes is abnormal. ture Error) Internal Temperature Sen-An error occurred in the temperature sensor cir-A.7A3 Gr.2 No sor Error cuit. SERVOPACK Built-in Fan A.7Ab The fan inside the SERVOPACK stopped. Gr.1 Yes Stopped The power supplies to the encoder all failed and A.810 Encoder Backup Alarm Gr 1 No the position data was lost. There is an error in the checksum results for A.820 Encoder Checksum Alarm Gr.1 No encoder memory. The battery voltage was lower than the specified A.830 **Encoder Battery Alarm** level after the control power supply was turned Gr.1 Yes ON. A.840 Encoder Data Alarm There is an internal data error in the encoder. Gr.1 No The encoder was operating at high speed when A.850 **Encoder Overspeed** Gr.1 No the power was turned ON. A.860 **Encoder Overheated** The internal temperature of encoder is too high. Gr.1 No A.861 Motor Overheated The internal temperature of motor is too high. Gr.1 No A.890 Encoder Scale Error Gr.1 A failure occurred in the linear encoder. No A.891 Encoder Module Error An error occurred in the linear encoder. Gr.1 No A.8A0 External Encoder Error An error occurred in the external encoder. Gr.1 Yes External Encoder Module A.8A1 An error occurred in the Serial Converter Unit. Gr 1 Yes Frror External Incremental A.8A2 An error occurred in the external encoder. Gr.1 Yes Encoder Sensor Error External Absolute Encoder An error occurred in the position data of the A.8A3 Gr.1 Yes Position Error external encoder. External Encoder Over-An overspeed error occurred in the external A.8A5 Gr.1 Yes encoder. speed External Encoder Over-An overheating error occurred in the external A.8A6 Gr 1 Yes heated encoder. A.b33 Current Detection Error 3 An error occurred in the current detection circuit. Gr.1 No MECHATROLINK Commu-ASIC error 1 occurred in MECHATROLINK com-A.b6A Gr.1 No nications ASIC Error 1 munications. MECHATROLINK Commu-ASIC error 2 occurred in MECHATROLINK com-A.b6b Gr.2 No munications. nications ASIC Error 2 Internal program error 0 occurred in the SERVO-A.bF0 Gr.1 System Alarm 0 No PACK. Internal program error 1 occurred in the SERVO-A.bF1 Gr.1 No System Alarm 1 PACK. Internal program error 2 occurred in the SERVO-A.bF2 Gr.1 System Alarm 2 No PACK. Internal program error 3 occurred in the SERVO-A.bF3 System Alarm 3 Gr.1 No PACK. Internal program error 4 occurred in the SERVO-A.bF4 System Alarm 4 Gr.1 No PACK. Internal program error 5 occurred in the SERVO-A.bF5 System Alarm 5 Gr.1 No PACK.

Continued from previous page.

#### 9.1 Alarm Displays

9.1.1 List of Alarms

| Continued | from | previous | page. |
|-----------|------|----------|-------|
|-----------|------|----------|-------|

| Alarm<br>Number | Alarm Name                                                                                                                                                            | Alarm Meaning                                                                                                                                                                | Servo-<br>motor<br>Stop-<br>ping<br>Method | Alarm<br>Reset<br>Possi-<br>ble? |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------------------|
| A.bF6           | System Alarm 6                                                                                                                                                        | Internal program error 6 occurred in the SERVO-<br>PACK.                                                                                                                     | Gr.1                                       | No                               |
| A.bF7           | System Alarm 7                                                                                                                                                        | Internal program error 7 occurred in the SERVO-<br>PACK.                                                                                                                     | Gr.1                                       | No                               |
| A.bF8           | System Alarm 8                                                                                                                                                        | Internal program error 8 occurred in the SERVO-<br>PACK.                                                                                                                     | Gr.1                                       | No                               |
| A.C10           | Servomotor Out of Control                                                                                                                                             | The Servomotor ran out of control.                                                                                                                                           | Gr.1                                       | Yes                              |
| A.C20           | Phase Detection Error                                                                                                                                                 | The detection of the phase is not correct.                                                                                                                                   | Gr.1                                       | No                               |
| A.C21           | Polarity Sensor Error                                                                                                                                                 | An error occurred in the polarity sensor.                                                                                                                                    | Gr.1                                       | No                               |
| A.C22           | Phase Information Dis-<br>agreement                                                                                                                                   | The phase information does not match.                                                                                                                                        | Gr.1                                       | No                               |
| A.C50           | Polarity Detection Failure                                                                                                                                            | The polarity detection failed.                                                                                                                                               | Gr.1                                       | No                               |
| A.C51           | Overtravel Detected<br>during Polarity Detection                                                                                                                      | The overtravel signal was detected during polarity detection.                                                                                                                | Gr.1                                       | Yes                              |
| A.C52           | Polarity Detection Not<br>Completed                                                                                                                                   | The servo was turned ON before the polarity was detected.                                                                                                                    | Gr.1                                       | Yes                              |
| A.C53           | Out of Range of Motion for<br>Polarity Detection                                                                                                                      | The travel distance exceeded the setting of Pn48E (Polarity Detection Range).                                                                                                | Gr.1                                       | No                               |
| A.C54           | Polarity Detection Failure<br>2                                                                                                                                       | The polarity detection failed.                                                                                                                                               | Gr.1                                       | No                               |
| A.C80           | Encoder Clear Error or<br>Multiturn Limit Setting<br>Error                                                                                                            | The multiturn data for the absolute encoder was not correctly cleared or set.                                                                                                | Gr.1                                       | No                               |
| A.C90           | Encoder CommunicationsCommunications between the encoder and SER-<br>VOPACK is not possible.                                                                          |                                                                                                                                                                              | Gr.1                                       | No                               |
| A.C91           | Encoder Communications<br>Position Data Acceleration<br>Rate Error                                                                                                    | An error occurred in calculating the position data of the encoder.                                                                                                           | Gr.1                                       | No                               |
| A.C92           | Encoder Communications<br>Timer Error                                                                                                                                 | An error occurred in the communications timer between the encoder and SERVOPACK.                                                                                             | Gr.1                                       | No                               |
| A.CA0           | Encoder Parameter Error                                                                                                                                               | The parameters in the encoder are corrupted.                                                                                                                                 | Gr.1                                       | No                               |
| A.Cb0           | Encoder Echoback Error                                                                                                                                                | The contents of communications with the encoder are incorrect.                                                                                                               | Gr.1                                       | No                               |
| A.CC0           | Multiturn Limit Disagree-<br>ment                                                                                                                                     | Different multiturn limits have been set in the encoder and the SERVOPACK.                                                                                                   | Gr.1                                       | No                               |
| A.CF1           | Reception Failed Error in<br>Feedback Option Module<br>Communications                                                                                                 |                                                                                                                                                                              | Gr.1                                       | No                               |
| A.CF2           | Timer Stopped Error in<br>Feedback Option Module<br>CommunicationsAn error occurred in the timer for communica-<br>tions with the Feedback Option Module.             |                                                                                                                                                                              | Gr.1                                       | No                               |
| A.d00           | Position Deviation Over-<br>flowThe setting of Pn520 (Position Deviation Overflow<br>Alarm Level) was exceeded by the position devia-<br>tion while the servo was ON. |                                                                                                                                                                              | Gr.1                                       | Yes                              |
| A.d01           | Position Deviation Over-<br>flow Alarm at Servo ON                                                                                                                    | The servo was turned ON after the position devi-<br>ation exceeded the setting of Pn526 (Position<br>Deviation Overflow Alarm Level at Servo ON)<br>while the servo was OFF. | Gr.1                                       | Yes                              |

Continued on next page.

Continued from previous page. Servo-Alarm motor Alarm Reset Alarm Name Alarm Meaning Stop-Number Possiping ble? Method If position deviation remains in the deviation counter, the setting of Pn529 or Pn584 (Speed Position Deviation Over-Limit Level at Servo ON) limits the speed when A.d02 flow Alarm for Speed Limit the servo is turned ON. This alarm occurs if a Gr.2 Yes position reference is input and the setting of at Servo ON Pn520 (Position Deviation Overflow Alarm Level) is exceeded before the limit is cleared. There was too much position deviation between Motor-Load Position Devi-A.d10 the motor and load during fully-closed loop con-Gr.2 Yes ation Overflow trol. The position feedback data exceeded A.d30 Position Data Overflow Gr.1 No ±1,879,048,192. The difference between the clearance offset ref-Clearance Position Devia-A.d40 erence and gap exceeded Pn6FC (Clearance Gr.1 Yes tion Error Position Deviation Error Level). A synchronization error occurred during **MECHATROLINK Internal** A.E02 MECHATROLINK communications with the SER-Gr.1 Yes Synchronization Error 1 VOPACK. **MECHATROLINK Trans-**The setting of the MECHATROLINK communica-A.E40 mission Cycle Setting Gr.2 Yes tions transmission cycle is not correct. Frror **MECHATROLINK Commu-**The setting of the MECHATROLINK communica-A.E41 nications Data Size Set-Gr.2 Yes tions data size is not correct. ting Error **MECHATROLINK Station** The setting of the MECHATROLINK station A.E42 Gr.2 No Address Setting Error address is not correct. MECHATROLINK Syn-A synchronization error occurred during A.E50\* Gr.2 Yes chronization Error MECHATROLINK communications. MECHATROLINK Syn-Synchronization failed during MECHATROLINK A.E51 Gr.2 Yes chronization Failed communications. Reception Error in Communications errors occurred continuously A.E60\* MECHATROLINK Commu-Gr 2 Yes during MECHATROLINK communications. nications Synchronization Interval An error occurred in the transmission cycle A.E61 Error in MECHATROLINK Gr.2 Yes during MECHATROLINK communications. Transmission Cycle MECHATROLINK Syn-Synchronization frames were continuously not A.E63 chronization Frame Not received during MECHATROLINK communica-Gr.2 Yes Received tions. Safety Option Module A.E71 Detection of the Safety Option Module failed. Gr.1 No **Detection Failure** Feedback Option Module A.E72 Gr.1 Detection of the Feedback Option Module failed. No **Detection Failure** Unsupported Safety An unsupported Safety Option Module was con-A.E74 Gr. 1 No **Option Module** nected. Safety Function Signal An error occurred in the input timing of the safety A.Eb1 Gr.1 No Input Timing Error function signal. A.EC8 Gate Drive Error 1 Gr.1 An error occurred in the gate drive circuit. No A.FC9 Gate Drive Frror 2 An error occurred in the gate drive circuit. Gr.1 No Command Execution Tim-A timeout error occurred for a MECHATROLINK A.Ed1 Gr.2 Yes eout command. The voltage was low for more than one second Power Supply Line Open A.F10 for phase R, S, or T when the main power supply Gr.2 Yes Phase

was ON.

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| Continued from previous page.                  |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Alarm Name                                     | Alarm Meaning                                                                                                                                                                       | Servo-<br>motor<br>Stop-<br>ping<br>Method                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Alarm<br>Reset<br>Possi-<br>ble?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |
| Servomotor Main Circuit<br>Cable Disconnection | The Servomotor did not operate or power was<br>not supplied to the Servomotor even though the<br>SV_ON (Servo ON) command was input when the<br>Servomotor was ready to receive it. | Gr.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Yes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
|                                                |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|                                                |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| System Alarm                                   | An internal program error occurred in the SER-                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
| System Alann                                   | VOPACK.                                                                                                                                                                             | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|                                                |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|                                                |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| Digital Operator Commu-<br>nications Error 1   | Communications were not possible between the                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | No                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
| Digital Operator Commu-<br>nications Error 2   | the SERVOPACK (e.g., a CPU error occurred).                                                                                                                                         | _                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | INO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
|                                                | Servomotor Main Circuit<br>Cable Disconnection<br>System Alarm<br>Digital Operator Commu-<br>nications Error 1<br>Digital Operator Commu-                                           | Alarm NameAlarm MeaningServomotor Main Circuit<br>Cable DisconnectionThe Servomotor did not operate or power was<br>not supplied to the Servomotor even though the<br>SV_ON (Servo ON) command was input when the<br>Servomotor was ready to receive it.System AlarmAn internal program error occurred in the SER-<br>VOPACK.Digital Operator Commu-<br>nications Error 1Communications were not possible between the<br>Digital Operator Commu-<br>the SERVOPACK (e.g., a CPU error occurred). | Alarm NameAlarm MeaningServo-<br>motor<br>Stop-<br>ping<br>MethodServomotor Main Circuit<br>Cable DisconnectionThe Servomotor did not operate or power was<br>not supplied to the Servomotor even though the<br>SV_ON (Servo ON) command was input when the<br>Servomotor was ready to receive it.Gr.1System AlarmAn internal program error occurred in the SER-<br>VOPACK.–Digital Operator Commu-<br>nications Error 1Communications were not possible between the<br>Digital Operator (model: JUSP-OP05A-1-E) and<br>the SERVOPACK (e.g., a CPU error occurred).– |  |

\* These alarms are not stored in the alarm history. They are only displayed on the panel display.

 Note: The A.Eb0, A.Eb2 to A.Eb9, and A.EC0 to A.EC2 alarms can occur when a Safety Module is connected.

 Refer to the following manual for details.

 M

 AC Servo Drive Σ-V-Series/Σ-V-Series for Large-Capacity Models/Σ-7-Series User's Manual Safety Module (Manual No.: SIEP C720829 06)

# 9.1.2 Troubleshooting Alarms

The causes of and corrections for the alarms are given in the following table. Contact your Yaskawa representative if you cannot solve a problem with the correction given in the table.

| Alarm Number:<br>Alarm Name                                                                                    | Possible Cause                                                                                                                                           | Confirmation                                                                                                                                               | Correction                                                                                                                                              | Reference |
|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                                                                                                                | The power supply voltage suddenly dropped.                                                                                                               | Measure the power supply voltage.                                                                                                                          | Set the power supply volt-<br>age within the specified<br>range, and initialize the<br>parameter settings.                                              | *1        |
|                                                                                                                | The power supply<br>was shut OFF while<br>writing parameter set-<br>tings.                                                                               | Check the timing of shutting OFF the power supply.                                                                                                         | Initialize the parameter settings and then set the parameters again.                                                                                    | *1        |
| <b>A.020:</b><br>Parameter                                                                                     | The number of times<br>that parameters were<br>written exceeded the<br>limit.                                                                            | Check to see if the<br>parameters were fre-<br>quently changed from<br>the host controller.                                                                | The SERVOPACK may be<br>faulty. Replace the SER-<br>VOPACK.<br>Reconsider the method<br>for writing the parame-<br>ters.                                | -         |
| Checksum Error<br>(There is an error<br>in the parameter<br>data in the SER-<br>VOPACK.)                       | A malfunction was<br>caused by noise from<br>the AC power supply,<br>ground, static elec-<br>tricity, or other source.                                   | Turn the power supply<br>to the SERVOPACK<br>OFF and ON again. If<br>the alarm still occurs,<br>noise may be the<br>cause.                                 | Implement countermea-<br>sures against noise.                                                                                                           | *1        |
|                                                                                                                | Gas, water drops, or<br>cutting oil entered the<br>SERVOPACK and<br>caused failure of the<br>internal components.                                        | Check the installation conditions.                                                                                                                         | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                | -         |
|                                                                                                                | A failure occurred in the SERVOPACK.                                                                                                                     | Turn the power supply<br>to the SERVOPACK<br>OFF and ON again. If<br>the alarm still occurs,<br>the SERVOPACK may<br>have failed.                          | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                | -         |
| A.021:<br>Parameter For-<br>mat Error<br>(There is an error<br>in the parameter<br>data format in the          | The software version<br>of the SERVOPACK<br>that caused the alarm<br>is older than the soft-<br>ware version of the<br>parameters specified<br>to write. | Read the product infor-<br>mation to see if the soft-<br>ware versions are the<br>same. If they are differ-<br>ent, it could be the<br>cause of the alarm. | Write the parameters from<br>another SERVOPACK with<br>the same model and the<br>same software version,<br>and then turn the power<br>OFF and ON again. | *1        |
| data format in the SERVOPACK.)                                                                                 | A failure occurred in the SERVOPACK.                                                                                                                     | -                                                                                                                                                          | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                | -         |
|                                                                                                                | The power supply voltage suddenly dropped.                                                                                                               | Measure the power supply voltage.                                                                                                                          | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                | -         |
| A.022:<br>System Check-<br>sum Error<br>(There is an error<br>in the parameter<br>data in the SER-<br>VOPACK.) | The power supply<br>was shut OFF while<br>setting a utility func-<br>tion.                                                                               | Check the timing of shutting OFF the power supply.                                                                                                         | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                | -         |
|                                                                                                                | A failure occurred in the SERVOPACK.                                                                                                                     | Turn the power supply<br>to the SERVOPACK<br>OFF and ON again. If<br>the alarm still occurs,<br>the SERVOPACK may<br>have failed.                          | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                | -         |

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|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------|
| Alarm Number:<br>Alarm Name                                                                       | Possible Cause                                                                                                                                                                                          | Confirmation                                                                                                                    | Correction                                                                                      | Reference |
| A.024:<br>System Alarm<br>(An internal pro-<br>gram error<br>occurred in the<br>SERVOPACK.)       | A failure occurred in the SERVOPACK.                                                                                                                                                                    | _                                                                                                                               | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                        | -         |
| A.025:<br>System Alarm<br>(An internal pro-<br>gram error<br>occurred in the<br>SERVOPACK.)       | A failure occurred in the SERVOPACK.                                                                                                                                                                    | -                                                                                                                               | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                        | -         |
| A.030:<br>Main Circuit<br>Detector Error                                                          | A failure occurred in the SERVOPACK.                                                                                                                                                                    | _                                                                                                                               | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                        | -         |
|                                                                                                   | The SERVOPACK and<br>Servomotor capaci-<br>ties do not match<br>each other.                                                                                                                             | Check the combination<br>of the SERVOPACK and<br>Servomotor capacities.                                                         | Select a proper combina-<br>tion of SERVOPACK and<br>Servomotor capacities.                     | page 1-4  |
|                                                                                                   | A failure occurred in the SERVOPACK.                                                                                                                                                                    | -                                                                                                                               | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                        | -         |
| A.040:                                                                                            | A parameter setting is outside of the setting range.                                                                                                                                                    | Check the setting<br>ranges of the parame-<br>ters that have been<br>changed.                                                   | Set the parameters to values within the setting ranges.                                         | -         |
| Parameter Set-<br>ting Error<br>(A parameter set-<br>ting is outside of<br>the setting<br>range.) | The electronic gear ratio is outside of the setting range.                                                                                                                                              | Check the electronic<br>gear ratio. The ratio<br>must be within the fol-<br>lowing range: 0.001 <<br>(Pn20E/Pn210) <<br>64,000. | Set the electronic gear<br>ratio in the following<br>range: 0.001 < (Pn20E/<br>Pn210) < 64,000. | *1        |
|                                                                                                   | The size relationship<br>between Pn6F2 (Max-<br>imum Clearance Off-<br>set) and Pn6F4<br>(Minimum Clearance<br>Offset) is not correct.                                                                  | Check the size relation-<br>ship between Pn6F2<br>and Pn6F4.                                                                    | Change the setting so<br>that Pn6F2 is larger than<br>Pn6F4.                                    | -         |
|                                                                                                   | The first, second, or<br>third switching Kp<br>ratio (Pn6E9, Pn6EC,<br>or Pn6EF) is set to 0.                                                                                                           | Check the settings of<br>Pn6E9, Pn6EC, and<br>Pn6EF                                                                             | Set Pn6E9, Pn6EC, and<br>Pn6EF to values other<br>than 0.                                       | -         |
| A.041:<br>Encoder Output<br>Pulse Setting<br>Error                                                | The setting of Pn212<br>(Number of Encoder<br>Output Pulses) or<br>Pn281 (Encoder Out-<br>put Resolution) is out-<br>side of the setting<br>range or does not sat-<br>isfy the setting condi-<br>tions. | Check the setting of Pn212 or Pn281.                                                                                            | Set Pn212 or Pn281 to an appropriate value.                                                     | *1        |

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| Alarm Number:                                                                        | Possible Cause                                                                                                                                                             | Confirmation                                                                                                                                               | Correction                                                                                                                       | Reference |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------|
| Alarm Name                                                                           | The speed of program<br>jogging went below<br>the setting range<br>when the electronic<br>gear ratio (Pn20E/<br>Pn210) or the Servo-<br>motor was changed.                 | Check to see if the detection conditions <sup>*2</sup> are satisfied.                                                                                      | Decrease the setting of<br>the electronic gear ratio<br>(Pn20E/Pn210).                                                           | *1        |
| A.042:<br>Parameter Com-<br>bination Error                                           | The speed of program<br>jogging went below<br>the setting range<br>when Pn533 or Pn585<br>(Program Jogging<br>Movement Speed)<br>was changed.                              | Check to see if the detection conditions <sup>*2</sup> are satisfied.                                                                                      | Increase the setting of<br>Pn533 or Pn585.                                                                                       | *1        |
|                                                                                      | The movement speed<br>of advanced autotun-<br>ing went below the<br>setting range when<br>the electronic gear<br>ratio (Pn20E/ Pn210)<br>or the Servomotor<br>was changed. | Check to see if the detection conditions <sup>*3</sup> are satisfied.                                                                                      | Decrease the setting of<br>the electronic gear ratio<br>(Pn20E/Pn210).                                                           | *1        |
| A.044:<br>Semi-Closed/<br>Fully-Closed<br>Loop Control<br>Parameter<br>Setting Error | The setting of the<br>Fully-Closed Module<br>does not match the<br>setting of Pn002 =<br>n.X□□□ (External<br>Encoder Usage).                                               | Check the setting of Pn002 = $n.X\square\square\square$ .                                                                                                  | Make sure that the setting<br>of the Fully-closed Mod-<br>ule agrees with the setting<br>of Pn002 = $n.X\square\square\square$ . | *1        |
| A.04A:<br>Parameter Set-                                                             | For 4-byte parameter<br>bank members, there<br>are two consecutive<br>members with nothing<br>registered.                                                                  | -                                                                                                                                                          | Change the number of<br>bytes for bank members<br>to an appropriate value.                                                       | -         |
| ting Error 2                                                                         | The total amount of<br>bank data exceeds 64<br>(Pn900 × Pn901 ><br>64).                                                                                                    | _                                                                                                                                                          | Reduce the total amount of bank data to 64 or less.                                                                              | -         |
| A.050:<br>Combination<br>Error                                                       | The SERVOPACK and<br>Servomotor capaci-<br>ties do not match<br>each other.                                                                                                | Check the capacities to<br>see if they satisfy the<br>following condition:<br>$1/4 \le \frac{\text{Servomotor capacity}}{\text{SERVOPACK capacity}} \le 4$ | Select a proper combina-<br>tion of the SERVOPACK<br>and Servomotor capaci-<br>ties.                                             | page 1-4  |
| (The capacities of<br>the SERVOPACK<br>and Servomotor<br>do not match.)              | A failure occurred in the encoder.                                                                                                                                         | Replace the encoder<br>and check to see if the<br>alarm still occurs.                                                                                      | Replace the Servomotor or encoder.                                                                                               | -         |
|                                                                                      | A failure occurred in the SERVOPACK.                                                                                                                                       | -                                                                                                                                                          | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                         | -         |
| A.051:                                                                               | The motor parameter<br>file was not written to<br>the linear encoder.<br>(This applies only<br>when not using a<br>Serial Converter Unit.)                                 | Check to see if the<br>motor parameter file<br>was written to the lin-<br>ear encoder.                                                                     | Write the motor parame-<br>ter file to the linear<br>encoder.                                                                    | *1        |
| Unsupported<br>Device Alarm                                                          | An unsupported Serial<br>Converter Unit or<br>encoder (e.g., an<br>external encoder) is<br>connected to the<br>SERVOPACK.                                                  | Check the product combination specifica-tions.                                                                                                             | Change to a correct com-<br>bination of models.                                                                                  | -         |

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|-------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Alarm Number:<br>Alarm Name                                                                                 | Possible Cause                                                                                                                                         | Confirmation                                                                                                                                                                                                 | Correction                                                                                                                                                    | Reference |
| A.070:<br>Motor Type<br>Change Detected<br>(The connected<br>motor is a differ-                             | A Rotary Servomotor<br>was removed and a<br>Linear Servomotor<br>was connected.                                                                        | _                                                                                                                                                                                                            | Set the parameters for a<br>Linear Servomotor and<br>reset the motor type<br>alarm. Then, turn the<br>power supply to the SER-<br>VOPACK OFF and ON<br>again. | page 9-40 |
| ent type of motor<br>from the previ-<br>ously connected<br>motor.)                                          | A Linear Servomotor<br>was removed and a<br>Rotary Servomotor<br>was connected.                                                                        | -                                                                                                                                                                                                            | Set the parameters for a<br>Rotary Servomotor and<br>reset the motor type<br>alarm. Then, turn the<br>power supply to the SER-<br>VOPACK OFF and ON<br>again. | page 9-40 |
| A.080:<br>Linear Encoder<br>Pitch Setting<br>Error                                                          | The setting of Pn282<br>(Linear Encoder Scale<br>Pitch) has not been<br>changed from the<br>default setting.                                           | Check the setting of Pn282.                                                                                                                                                                                  | Correct the setting of Pn282.                                                                                                                                 | *1        |
| A.0b0:<br>Invalid Servo ON<br>Command Alarm                                                                 | The SV_ON (Servo<br>ON) command was<br>sent from the host<br>controller after a util-<br>ity function that turns<br>ON the Servomotor<br>was executed. | _                                                                                                                                                                                                            | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. Or, execute a<br>software reset.                                                               | *1        |
|                                                                                                             | The Main Circuit<br>Cable is not wired<br>correctly or there is<br>faulty contact.                                                                     | Check the wiring.                                                                                                                                                                                            | Correct the wiring.                                                                                                                                           | *1        |
|                                                                                                             | There is a short-circuit<br>or ground fault in a<br>Main Circuit Cable.                                                                                | Check for short-circuits<br>across Servomotor<br>phases U, V, and W, or<br>between the ground<br>and Servomotor phases<br>U, V, and W.                                                                       | The cable may be short-<br>circuited. Replace the<br>cable.                                                                                                   | *1        |
| A.100:<br>Overcurrent                                                                                       | There is a short-circuit<br>or ground fault inside<br>the Servomotor.                                                                                  | Check for short-circuits<br>across Servomotor<br>phases U, V, and W, or<br>between the ground<br>and Servomotor phases<br>U, V, or W.                                                                        | The Servomotor may be faulty. Replace the Servo-<br>motor.                                                                                                    | *1        |
| Detected<br>(An overcurrent<br>flowed through<br>the power tran-<br>sistor or the heat<br>sink overheated.) | There is a short-circuit<br>or ground fault inside<br>the SERVOPACK.                                                                                   | Check for short-circuits<br>across the Servomotor<br>connection terminals U,<br>V, and W on the SER-<br>VOPACK, or between<br>the ground and termi-<br>nals U, V, or W.                                      | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                      | *1        |
|                                                                                                             | The regenerative<br>resistor is not wired<br>correctly or there is<br>faulty contact.                                                                  | Check the wiring.                                                                                                                                                                                            | Correct the wiring.                                                                                                                                           | *1        |
|                                                                                                             | The dynamic brake<br>(DB, emergency stop<br>executed from the<br>SERVOPACK) was<br>frequently activated,<br>or a DB overload<br>alarm occurred.        | Check the power con-<br>sumed by the DB resis-<br>tor to see how<br>frequently the DB is<br>being used. Or, check<br>the alarm display to see<br>if a DB overload alarm<br>(A.730 or A.731) has<br>occurred. | Change the SERVOPACK<br>model, operating meth-<br>ods, or the mechanisms<br>so that the dynamic brake<br>does not need to be used<br>so frequently.           | -         |

Maintenance

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| Alarm Number:<br>Alarm Name                                                                                 | Possible Cause                                                                                     | Confirmation                                                                                                                                                    | Correction                                                                                                                                                                 | Reference |
|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                                                                                                             | The regenerative pro-<br>cessing capacity was<br>exceeded.                                         | Check the regenerative<br>load ratio in the Sig-<br>maWin+ Motion Monitor<br>Tab Page to see how<br>frequently the regenera-<br>tive resistor is being<br>used. | Recheck the operating conditions and load.                                                                                                                                 | *4        |
| A.100:<br>Overcurrent                                                                                       | The SERVOPACK regenerative resis-<br>tance is too small.                                           | Check the regenerative<br>load ratio in the Sig-<br>maWin+ Motion Monitor<br>Tab Page to see how<br>frequently the regenera-<br>tive resistor is being<br>used. | Change the regenerative<br>resistance to a value<br>larger than the SERVO-<br>PACK minimum allowable<br>resistance.                                                        | *4        |
| Detected<br>(An overcurrent<br>flowed through<br>the power tran-<br>sistor or the heat<br>sink overheated.) | A heavy load was<br>applied while the Ser-<br>vomotor was stopped<br>or running at a low<br>speed. | Check to see if the operating conditions exceed Servo Drive specifications.                                                                                     | Reduce the load applied<br>to the Servomotor. Or,<br>increase the operating<br>speed.                                                                                      | _         |
|                                                                                                             | A malfunction was caused by noise.                                                                 | Improve the noise envi-<br>ronment, e.g. by<br>improving the wiring or<br>installation conditions,<br>and check to see if the<br>alarm still occurs.            | Implement countermea-<br>sures against noise, such<br>as correct wiring of the<br>FG. Use an FG wire size<br>equivalent to the SERVO-<br>PACK's main circuit wire<br>size. | _         |
|                                                                                                             | A failure occurred in the SERVOPACK.                                                               | -                                                                                                                                                               | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                      | -         |

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|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Alarm Number:<br>Alarm Name                                                                                           | Possible Cause                                                                                     | Confirmation                                                                                                                                                            | Correction                                                                                                                                                                 | Reference    |
|                                                                                                                       | The Main Circuit<br>Cable is not wired<br>correctly or there is<br>faulty contact.                 | Check the wiring.                                                                                                                                                       | Correct the wiring.                                                                                                                                                        | *1           |
|                                                                                                                       | There is a short-circuit<br>or ground fault in a<br>Main Circuit Cable.                            | Check for short-circuits<br>across cable phases U,<br>V, and W, or between<br>the ground and cable<br>phases U, V, and W.                                               | The cable may be short-<br>circuited. Replace the<br>cable.                                                                                                                | *1           |
|                                                                                                                       | There is a short-circuit<br>or ground fault inside<br>the Servomotor.                              | Check for short-circuits<br>across Servomotor<br>phases U, V, and W, or<br>between the ground<br>and Servomotor phases<br>U, V, or W.                                   | The Servomotor may be faulty. Replace the Servo-<br>motor.                                                                                                                 | *1           |
| A.101:<br>Motor Overcur-<br>rent Detected<br>(The current to<br>the motor<br>exceeded the<br>allowable cur-<br>rent.) | There is a short-circuit<br>or ground fault inside<br>the SERVOPACK.                               | Check for short-circuits<br>across the Servomotor<br>connection terminals U,<br>V, and W on the SER-<br>VOPACK, or between<br>the ground and termi-<br>nals U, V, or W. | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                                   | *1           |
|                                                                                                                       | A heavy load was<br>applied while the Ser-<br>vomotor was stopped<br>or running at a low<br>speed. | Check to see if the<br>operating conditions<br>exceed Servo Drive<br>specifications.                                                                                    | Reduce the load applied<br>to the Servomotor. Or,<br>increase the operating<br>speed.                                                                                      | -            |
|                                                                                                                       | A malfunction was caused by noise.                                                                 | Improve the noise envi-<br>ronment, e.g. by<br>improving the wiring or<br>installation conditions,<br>and check to see if the<br>alarm still occurs.                    | Implement countermea-<br>sures against noise, such<br>as correct wiring of the<br>FG. Use an FG wire size<br>equivalent to the SERVO-<br>PACK's main circuit wire<br>size. | -            |
|                                                                                                                       | A failure occurred in the SERVOPACK.                                                               | -                                                                                                                                                                       | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                      | -            |

Continued from previous page.

| Alarm Number:<br>Alarm Name            | Possible Cause                                                                                                                                                                                                                                      | Confirmation                                                                                                                                      | Correction                                                                                                                                                                                                             | Reference |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                                        | Pn600 (Regenerative<br>Resistor Capacity) is<br>not set to 0 and an<br>External Regenerative<br>Resistor is not con-<br>nected to one of the<br>following SERVO-<br>PACKs: SGD7S-<br>R70A, -R90A,-1R6A,<br>-2R8A, -R70F, -R90F,<br>-2R1F, or -2R8F. | Check it see if an Exter-<br>nal Regenerative Resis-<br>tor is connected and<br>check the setting of<br>Pn600.                                    | Connect an External<br>Regenerative Resistor, or<br>set Pn600 (Regenerative<br>Resistor Capacity) to 0<br>(setting unit: ×10 W) if no<br>Regenerative Resistor is<br>required.                                         | *1        |
|                                        | An External Regener-<br>ative Resistor is not<br>connected to one of<br>the following SERVO-<br>PACKs: SGD7S-<br>470A, -550A, -590A,<br>or -780A.                                                                                                   | Check to see if an<br>External Regenerative<br>Resistor or a Regenera-<br>tive Resistor Unit is con-<br>nected and check the<br>setting of Pn600. | Connect an External<br>Regenerative Resistor and<br>set Pn600 to an appropri-<br>ate value, or connect a<br>Regenerative Resistor<br>Unit and set Pn600 to 0.                                                          | *1        |
| <b>A.300:</b><br>Regeneration<br>Error | The jumper between<br>the regenerative resis-<br>tor terminals (B2 and<br>B3) was removed<br>from one of the fol-<br>lowing<br>SERVOPACKs:<br>SGD7S-3R8A, -5R5A,<br>-7R6A, -120A, -180A,<br>-200A, or -330A.                                        | Check to see if the<br>jumper is connected<br>between power supply<br>terminals B2 and B3.                                                        | Correctly connect a jumper.                                                                                                                                                                                            | *1        |
|                                        | The External Regener-<br>ative Resistor is not<br>wired correctly, or was<br>removed or discon-<br>nected.                                                                                                                                          | Check the wiring of the<br>External Regenerative<br>Resistor.                                                                                     | Correct the wiring of the<br>External Regenerative<br>Resistor.                                                                                                                                                        | *1        |
|                                        | A failure occurred in the SERVOPACK.                                                                                                                                                                                                                | _                                                                                                                                                 | While the main circuit<br>power supply is OFF, turn<br>the control power supply<br>to the SERVOPACK OFF<br>and ON again. If an alarm<br>still occurs, the SERVO-<br>PACK may be faulty.<br>Replace the SERVO-<br>PACK. | -         |

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| Alarm Number:<br>Alarm Name        | Possible Cause                                                                                                                                                      | Confirmation                                                                                                                            | Correction                                                                                                                                                                               | Reference |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                                    | The power supply voltage exceeded the specified range.                                                                                                              | Measure the power supply voltage.                                                                                                       | Set the power supply volt-<br>age within the specified<br>range.                                                                                                                         | -         |
|                                    | The external regener-<br>ative resistance value<br>or regenerative resis-<br>tor capacity is too<br>small, or there has<br>been a continuous<br>regeneration state. | Check the operating<br>conditions or the<br>capacity using the Sig-<br>maJunmaSize+ Capac-<br>ity Selection Software or<br>other means. | Change the regenerative<br>resistance value or capac-<br>ity.<br>Reconsider the operating<br>conditions using the Sig-<br>maJunmaSize+ Capacity<br>Selection Software or<br>other means. | *4        |
|                                    | There was a continu-<br>ous regeneration state<br>because a negative<br>load was continu-<br>ously applied.                                                         | Check the load applied to the Servomotor during operation.                                                                              | Reconsider the system<br>including the servo,<br>machine, and operating<br>conditions.                                                                                                   | -         |
| A.320:<br>Regenerative<br>Overload | The setting of Pn600<br>(Regenerative Resis-<br>tor Capacity) is<br>smaller than the<br>capacity of the Exter-<br>nal Regenerative<br>Resistor.                     | Check it see if a Regen-<br>erative Resistor is con-<br>nected and check the<br>setting of Pn600.                                       | Correct the setting of Pn600.                                                                                                                                                            | *1        |
|                                    | The setting of Pn603<br>(Regenerative Resis-<br>tance) is smaller than<br>the capacity of the<br>External Regenerative<br>Resistor.                                 | Check to see if a<br>Regenerative Resistor is<br>connected and check<br>the setting of Pn603.                                           | Correct the setting of Pn603.                                                                                                                                                            | *1        |
|                                    | The external regener-<br>ative resistance is too<br>high.                                                                                                           | Check the regenerative resistance.                                                                                                      | Change the regenerative<br>resistance to a correct<br>value or use an External<br>Regenerative Resistor of<br>an appropriate capacity.                                                   | *4        |
|                                    | A failure occurred in the SERVOPACK.                                                                                                                                | _                                                                                                                                       | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                                                 | -         |

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| Alarm Number:<br>Alarm Name                                                                                                                                                                                                                                                                                | Possible Cause                                                                                                 | Confirmation                                                                                                                      | Correction                                                                                                                                                                                                             | Reference |
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|                                                                                                                                                                                                                                                                                                            | The regenerative<br>resistor was discon-<br>nected when the<br>SERVOPACK power<br>supply voltage was<br>high.  | Measure the resistance<br>of the regenerative<br>resistor using a measur-<br>ing instrument.                                      | If you are using the regen-<br>erative resistor built into<br>the SERVOPACK, replace<br>the SERVOPACK.<br>If you are using an Exter-<br>nal Regenerative Resis-<br>tor, replace the External<br>Regenerative Resistor. | -         |
| 4 000-                                                                                                                                                                                                                                                                                                     | DC power was sup-<br>plied when an AC<br>power supply input<br>was specified in the<br>settings.               | Check the power sup-<br>ply to see if it is a DC<br>power supply.                                                                 | Correct the power supply setting to match the actual power supply.                                                                                                                                                     | *1        |
| A.330:<br>Main Circuit<br>Power Supply<br>Wiring Error<br>(Detected when<br>the main circuit                                                                                                                                                                                                               | AC power was sup-<br>plied when a DC<br>power supply input<br>was specified in the<br>settings.                | Check the power sup-<br>ply to see if it is an AC<br>power supply.                                                                | Correct the power supply setting to match the actual power supply.                                                                                                                                                     | *1        |
| the main circuit<br>power supply is<br>turned ON.)<br>Pn600 (Regenerative<br>Resistor Capacity) is<br>not set to 0 and an<br>External Regenerative<br>Resistor is not con-<br>nected to one of the<br>following<br>SERVOPACKs:<br>SGD7S-R70A, -R90A,<br>-1R6A, -2R8A, -R70F,<br>-R90F, -2R1F, or<br>-2R8F. | Check it see if an Exter-<br>nal Regenerative Resis-<br>tor is connected and<br>check the setting of<br>Pn600. | Connect an External<br>Regenerative Resistor, or<br>if an External Regenera-<br>tive Resistor is not<br>required, set Pn600 to 0. | *1                                                                                                                                                                                                                     |           |
|                                                                                                                                                                                                                                                                                                            | A failure occurred in the SERVOPACK.                                                                           | -                                                                                                                                 | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                                                                               | -         |

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| Alarm Number:<br>Alarm Name                                                                                 | Possible Cause                                                                               | Confirmation                                                                                      | Correction                                                                                                                                                                                                                | Reference |
|                                                                                                             | The power supply voltage exceeded the specified range.                                       | Measure the power supply voltage.                                                                 | Set the AC/DC power supply voltage within the specified range.                                                                                                                                                            | -         |
|                                                                                                             | The power supply is<br>not stable or was<br>influenced by a light-<br>ning surge.            | Measure the power supply voltage.                                                                 | Improve the power sup-<br>ply conditions, install a<br>surge absorber, and then<br>turn the power supply<br>OFF and ON again. If an<br>alarm still occurs, the<br>SERVOPACK may be<br>faulty. Replace the SER-<br>VOPACK. | -         |
| A.400:<br>Overvoltage<br>(Detected in the                                                                   | The voltage for AC<br>power supply was too<br>high during accelera-<br>tion or deceleration. | Check the power sup-<br>ply voltage and the<br>speed and torque<br>during operation.              | Set the AC power supply voltage within the speci-<br>fied range.                                                                                                                                                          | -         |
| main circuit<br>power supply<br>section of the<br>SERVOPACK.)                                               | The external regener-<br>ative resistance is too<br>high for the operating<br>conditions.    | Check the operating conditions and the regenerative resistance.                                   | Select a regenerative<br>resistance value that is<br>appropriate for the oper-<br>ating conditions and load.                                                                                                              | *4        |
|                                                                                                             | The moment of inertia ratio or mass ratio exceeded the allow-able value.                     | Check to see if the<br>moment of inertia ratio<br>or mass ratio is within<br>the allowable range. | Increase the deceleration time, or reduce the load.                                                                                                                                                                       | _         |
|                                                                                                             | A failure occurred in the SERVOPACK.                                                         | _                                                                                                 | While the main circuit<br>power supply is OFF, turn<br>the control power supply<br>to the SERVOPACK OFF<br>and ON again. If an alarm<br>still occurs, the SERVO-<br>PACK may be faulty.<br>Replace the SERVO-<br>PACK.    | -         |
|                                                                                                             | The power supply voltage went below the specified range.                                     | Measure the power supply voltage.                                                                 | Set the power supply volt-<br>age within the specified<br>range.                                                                                                                                                          | -         |
|                                                                                                             | The power supply voltage dropped during operation.                                           | Measure the power supply voltage.                                                                 | Increase the power supply capacity.                                                                                                                                                                                       | -         |
| A.410:<br>Undervoltage<br>(Detected in the<br>main circuit<br>power supply<br>section of the<br>SERVOPACK.) | A momentary power interruption occurred.                                                     | Measure the power supply voltage.                                                                 | If you have changed the<br>setting of Pn509 (Momen-<br>tary Power Interruption<br>Hold Time), decrease the<br>setting.                                                                                                    | *1        |
|                                                                                                             | The SERVOPACK fuse is blown out.                                                             | -                                                                                                 | Replace the SERVO-<br>PACK and connect a<br>reactor to the DC reactor<br>terminals ( $\ominus$ 1 and $\ominus$ 2) on<br>the SERVOPACK.                                                                                    | -         |
|                                                                                                             | A failure occurred in the SERVOPACK.                                                         | -                                                                                                 | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                                                                                  | -         |

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| Alarm Number:<br>Alarm Name                                                                                                                          | Possible Cause                                                                                                                     | Confirmation                                                                                                                                  | Correction                                                                                                                                                                                       | Reference        |
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|                                                                                                                                                      | The order of phases<br>U, V, and W in the<br>motor wiring is not<br>correct.                                                       | Check the wiring of the Servomotor.                                                                                                           | Make sure that the Servo-<br>motor is correctly wired.                                                                                                                                           | -                |
| A.510:<br>Overspeed<br>(The motor                                                                                                                    | A reference value that<br>exceeded the over-<br>speed detection level<br>was input.                                                | Check the input refer-<br>ence.                                                                                                               | Reduce the reference value. Or, adjust the gain.                                                                                                                                                 |                  |
| exceeded the maximum speed.)                                                                                                                         | The motor exceeded the maximum speed.                                                                                              | Check the waveform of the motor speed.                                                                                                        | Reduce the speed refer-<br>ence input gain and<br>adjust the servo gain. Or,<br>reconsider the operating<br>conditions.                                                                          | -                |
|                                                                                                                                                      | A failure occurred in the SERVOPACK.                                                                                               | -                                                                                                                                             | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                                                         | -                |
| A.511:                                                                                                                                               | The encoder output<br>pulse frequency<br>exceeded the limit.                                                                       | Check the encoder out-<br>put pulse setting.                                                                                                  | Decrease the setting of<br>Pn212 (Number of<br>Encoder Output Pulses)<br>or Pn281 (Encoder Out-<br>put Resolution).                                                                              | *1               |
| Encoder Output<br>Pulse Overspeed                                                                                                                    | The encoder output<br>pulse frequency<br>exceeded the limit<br>because the motor<br>speed was too high.                            | Check the encoder out-<br>put pulse setting and<br>the motor speed.                                                                           | Reduce the motor speed.                                                                                                                                                                          | -                |
|                                                                                                                                                      | Abnormal oscillation<br>was detected in the<br>motor speed.                                                                        | Check for abnormal<br>motor noise, and check<br>the speed and torque<br>waveforms during oper-<br>ation.                                      | Reduce the motor speed.<br>Or, reduce the setting of<br>Pn100 (Speed Loop<br>Gain).                                                                                                              | *1               |
| A.520:<br>Vibration Alarm                                                                                                                            | The setting of Pn103<br>(Moment of Inertia<br>Ratio) is greater than<br>the actual moment of<br>inertia or was greatly<br>changed. | Check the moment of inertia ratio or mass ratio.                                                                                              | Set Pn103 (Moment of<br>Inertia Ratio) to an appro-<br>priate value.                                                                                                                             | page 5-11        |
|                                                                                                                                                      | The vibration detec-<br>tion level (Pn312 or<br>Pn384) is not suitable.                                                            | Check that the vibra-<br>tion detection level<br>(Pn312 or Pn384) is<br>suitable.                                                             | Set a suitable vibration detection level (Pn312 or Pn384).                                                                                                                                       | *1               |
| A.521:<br>Autotuning Alarm<br>(Vibration was<br>detected while<br>executing the<br>custom tuning,<br>Easy FFT, or the<br>tuning-less func-<br>tion.) | The Servomotor<br>vibrated considerably<br>while performing the<br>tuning-less function.                                           | Check the waveform of the motor speed.                                                                                                        | Reduce the load so that<br>the moment of inertia ratio<br>is within the allowable<br>value. Or increase the<br>load level or reduce the<br>rigidity level in the tuning-<br>less level settings. | *1               |
|                                                                                                                                                      | The Servomotor<br>vibrated considerably<br>while performing cus-<br>tom tuning or Easy<br>FFT.                                     | Check the waveform of the motor speed.                                                                                                        | Check the operating pro-<br>cedure of corresponding<br>function and implement<br>corrections.                                                                                                    | page 5-36,<br>*1 |
| A.550:<br>Maximum Speed<br>Setting Error                                                                                                             | The setting of Pn385<br>(Maximum Motor<br>Speed) is greater than<br>the maximum speed.                                             | Check the setting of<br>Pn385, and the upper<br>limits of the maximum<br>motor speed setting<br>and the encoder output<br>resolution setting. | Set Pn385 to a value that does not exceed the max-<br>imum motor speed.                                                                                                                          | *1               |

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| Alarm Number:                                                                                                                      | Continued from previous pa                                                                                                                                                    |                                                                                                         |                                                                                                                                                                                                                            |           |  |
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| Alarm Number:<br>Alarm Name                                                                                                        | Possible Cause                                                                                                                                                                | Confirmation                                                                                            | Correction                                                                                                                                                                                                                 | Reference |  |
|                                                                                                                                    | The wiring is not cor-<br>rect or there is a faulty<br>contact in the motor<br>or encoder wiring.                                                                             | Check the wiring.                                                                                       | Make sure that the Servo-<br>motor and encoder are<br>correctly wired.                                                                                                                                                     | *1        |  |
|                                                                                                                                    | Operation was per-<br>formed that exceeded<br>the overload protec-<br>tion characteristics.                                                                                   | Check the motor over-<br>load characteristics and<br>Run command.                                       | Reconsider the load and operating conditions. Or, increase the motor capacity.                                                                                                                                             | -         |  |
| A.710:<br>Instantaneous<br>Overload<br>A.720:                                                                                      | An excessive load<br>was applied during<br>operation because the<br>Servomotor was not<br>driven due to<br>mechanical problems.                                               | Check the operation reference and motor speed.                                                          | Correct the mechanical problem.                                                                                                                                                                                            | -         |  |
| Continuous<br>Overload                                                                                                             | There is an error in the<br>setting of Pn282 (Lin-<br>ear Encoder Scale<br>Pitch).                                                                                            | Check the setting of Pn282.                                                                             | Correct the setting of Pn282.                                                                                                                                                                                              | *1        |  |
|                                                                                                                                    | There is an error in the<br>setting of Pn080 =<br>n.□□X□ (Motor<br>Phase Sequence<br>Selection).                                                                              | Check the setting of Pn080 = $n.\Box\Box X\Box$ .                                                       | Set Pn080 = n.□□X□ to<br>an appropriate value.                                                                                                                                                                             | *1        |  |
|                                                                                                                                    | A failure occurred in the SERVOPACK.                                                                                                                                          | -                                                                                                       | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                                                                                   | -         |  |
|                                                                                                                                    | The Servomotor was rotated by an external force.                                                                                                                              | Check the operation status.                                                                             | Implement measures to<br>ensure that the motor will<br>not be rotated by an<br>external force.                                                                                                                             | -         |  |
| A.730 and A.731:<br>Dynamic Brake<br>Overload<br>(An excessive<br>power consump-<br>tion by the<br>dynamic brake<br>was detected.) | When the Servomo-<br>tor was stopped with<br>the dynamic brake,<br>the rotational or linear<br>kinetic energy<br>exceeded the capac-<br>ity of the dynamic<br>brake resistor. | Check the power con-<br>sumed by the DB resis-<br>tor to see how<br>frequently the DB is<br>being used. | <ul> <li>Reconsider the following:</li> <li>Reduce the Servomotor command speed.</li> <li>Decrease the moment of inertia ratio or mass ratio.</li> <li>Reduce the frequency of stopping with the dynamic brake.</li> </ul> | -         |  |
|                                                                                                                                    | A failure occurred in the SERVOPACK.                                                                                                                                          | _                                                                                                       | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                                                                                   | -         |  |
| A.740:<br>Inrush Current<br>Limiting Resistor<br>Overload<br>(The main circuit<br>power supply<br>was frequently                   | The allowable fre-<br>quency of the inrush<br>current limiting resis-<br>tor was exceeded<br>when the main circuit<br>power supply was<br>turned ON and OFF.                  | _                                                                                                       | Reduce the frequency of<br>turning the main circuit<br>power supply ON and<br>OFF.                                                                                                                                         | -         |  |
| turned ON and OFF.)                                                                                                                | A failure occurred in the SERVOPACK.                                                                                                                                          | -                                                                                                       | The SERVOPACK may be<br>faulty. Replace the SER-<br>VOPACK.                                                                                                                                                                | -         |  |

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| Alarm Number:<br>Alarm Name                                                                                           | Possible Cause                                                                                                                | Confirmation                                                                                                                                                                | Correction                                                                                                 | Reference |
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|                                                                                                                       | The surrounding tem-<br>perature is too high.                                                                                 | Check the surrounding<br>temperature using a<br>thermostat. Or, check<br>the operating status<br>with the SERVOPACK<br>installation environment<br>monitor.                 | Decrease the surround-<br>ing temperature by<br>improving the SERVO-<br>PACK installation condi-<br>tions. | *1        |
|                                                                                                                       | An overload alarm<br>was reset by turning<br>OFF the power sup-<br>ply too many times.                                        | Check the alarm display to see if there is an overload alarm.                                                                                                               | Change the method for resetting the alarm.                                                                 | -         |
| A.7A1:<br>Internal Tempera-<br>ture Error 1<br>(Control Board<br>Temperature<br>Error)                                | There was an exces-<br>sive load or operation<br>was performed that<br>exceeded the regen-<br>erative processing<br>capacity. | Use the accumulated<br>load ratio to check the<br>load during operation,<br>and use the regenera-<br>tive load ratio to check<br>the regenerative pro-<br>cessing capacity. | Reconsider the load and operating conditions.                                                              | -         |
|                                                                                                                       | The SERVOPACK<br>installation orientation<br>is not correct or there<br>is insufficient space<br>around the SERVO-<br>PACK.   | Check the SERVOPACK installation conditions.                                                                                                                                | Install the SERVOPACK according to specifica-<br>tions.                                                    | *1        |
|                                                                                                                       | A failure occurred in the SERVOPACK.                                                                                          | -                                                                                                                                                                           | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                   | -         |
|                                                                                                                       | The surrounding tem-<br>perature is too high.                                                                                 | Check the surrounding<br>temperature using a<br>thermostat. Or, check<br>the operating status<br>with the SERVOPACK<br>installation environment<br>monitor.                 | Decrease the surround-<br>ing temperature by<br>improving the SERVO-<br>PACK installation condi-<br>tions. | *1        |
|                                                                                                                       | An overload alarm<br>was reset by turning<br>OFF the power sup-<br>ply too many times.                                        | Check the alarm display<br>to see if there is an<br>overload alarm.                                                                                                         | Change the method for resetting the alarm.                                                                 | _         |
| A.7A2:<br>Internal Tempera-<br>ture Error 2<br>(Power Board<br>Temperature<br>Error)                                  | There was an exces-<br>sive load or operation<br>was performed that<br>exceeded the regen-<br>erative processing<br>capacity. | Use the accumulated<br>load ratio to check the<br>load during operation,<br>and use the regenera-<br>tive load ratio to check<br>the regenerative pro-<br>cessing capacity. | Reconsider the load and operating conditions.                                                              | -         |
|                                                                                                                       | The SERVOPACK<br>installation orientation<br>is not correct or there<br>is insufficient space<br>around the SERVO-<br>PACK.   | Check the SERVOPACK installation conditions.                                                                                                                                | Install the SERVOPACK according to specifica-<br>tions.                                                    | *1        |
|                                                                                                                       | A failure occurred in the SERVOPACK.                                                                                          | -                                                                                                                                                                           | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                   | _         |
| A.7A3:<br>Internal Tempera-<br>ture Sensor Error<br>(An error<br>occurred in the<br>temperature sen-<br>sor circuit.) | A failure occurred in the SERVOPACK.                                                                                          | _                                                                                                                                                                           | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                   | -         |

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| Alarm Number:<br>Alarm Name                                                                                    | Possible Cause                                                                                                                                | Confirmation                                                                | Correction                                                                                                                                                                                                                                                                                                                                                                                     | Reference    |
| A.7Ab:<br>SERVOPACK<br>Built-in Fan<br>Stopped                                                                 | The fan inside the<br>SERVOPACK<br>stopped.                                                                                                   | Check for foreign matter inside the SERVOPACK.                              | Remove foreign matter<br>from the SERVOPACK. If<br>an alarm still occurs, the<br>SERVOPACK may be<br>faulty. Replace the SER-<br>VOPACK.                                                                                                                                                                                                                                                       | -            |
|                                                                                                                | The power to the absolute encoder was turned ON for the first time.                                                                           | Check to see if the<br>power supply was<br>turned ON for the first<br>time. | Set up the encoder.                                                                                                                                                                                                                                                                                                                                                                            | *1           |
| A.810:                                                                                                         | The Encoder Cable<br>was disconnected<br>and then connected<br>again.                                                                         | Check to see if the<br>power supply was<br>turned ON for the first<br>time. | Check the encoder con-<br>nection and set up the<br>encoder.                                                                                                                                                                                                                                                                                                                                   | *1           |
| Encoder Backup<br>Alarm<br>(Detected at the<br>encoder, but only<br>when an abso-<br>lute encoder is<br>used.) | Power is not being<br>supplied both from<br>the control power<br>supply (+5 V) from the<br>SERVOPACK and<br>from the battery<br>power supply. | Check the encoder<br>connector battery and<br>the connector status.         | Replace the battery or<br>implement similar mea-<br>sures to supply power to<br>the encoder, and set up<br>the encoder.                                                                                                                                                                                                                                                                        | *1           |
|                                                                                                                | A failure occurred in the absolute encoder.                                                                                                   | _                                                                           | If the alarm still occurs<br>after setting up the<br>encoder again, replace<br>the Servomotor.                                                                                                                                                                                                                                                                                                 | -            |
|                                                                                                                | A failure occurred in the SERVOPACK.                                                                                                          | _                                                                           | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                                                                                                                                                                                                                                                       | -            |
| <b>A.820:</b><br>Encoder Check-<br>sum Alarm<br>(Detected at the<br>encoder.)                                  | A failure occurred in the encoder.                                                                                                            | _                                                                           | <ul> <li>When Using an Absolute Encoder</li> <li>Set up the encoder again.</li> <li>If the alarm still occurs, the Servomotor may be faulty. Replace the Servomotor.</li> <li>When Using a Singleturn Absolute Encoder or Incremental Encoder</li> <li>The Servomotor may be faulty. Replace the Servomotor.</li> <li>The linear encoder may be faulty. Replace the linear encoder.</li> </ul> | *1           |
|                                                                                                                | A failure occurred in the SERVOPACK.                                                                                                          | -                                                                           | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                                                                                                                                                                                                                                                       | -            |
| A.830:<br>Encoder Battery                                                                                      | The battery connec-<br>tion is faulty or a bat-<br>tery is not connected.                                                                     | Check the battery con-<br>nection.                                          | Correct the battery con-<br>nection.                                                                                                                                                                                                                                                                                                                                                           | *1           |
| Alarm<br>(The absolute<br>encoder battery<br>voltage was lower                                                 | The battery voltage is lower than the specified value (2.7 V).                                                                                | Measure the battery voltage.                                                | Replace the battery.                                                                                                                                                                                                                                                                                                                                                                           | *1           |
| voltage was lower<br>than the speci-<br>fied level.)                                                           | A failure occurred in the SERVOPACK.                                                                                                          | -                                                                           | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                                                                                                                                                                                                                                                       | -            |

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| Alarm Number:<br>Alarm Name                                      | Possible Cause                                                                                                                          | Confirmation                                                    | Correction                                                                                                                                                                                       | Reference |
|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                                                                  | The encoder malfunc-<br>tioned.                                                                                                         | _                                                               | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the Servomotor or<br>linear encoder may be<br>faulty. Replace the Servo-<br>motor or linear encoder. | -         |
|                                                                  | An error occurred in reading data from the linear encoder.                                                                              | -                                                               | The linear encoder is not<br>mounted within an appro-<br>priate tolerance. Correct<br>the mounting of the linear<br>encoder.                                                                     | -         |
| A.840:<br>Encoder Data<br>Alarm<br>(Detected at the<br>encoder.) | Excessive speed<br>occurred in the linear<br>encoder.                                                                                   | -                                                               | Control the motor speed<br>within the range specified<br>by the linear encoder<br>manufacturer and then<br>turn ON the control power<br>supply.                                                  | -         |
|                                                                  | The encoder malfunc-<br>tioned due to noise.                                                                                            | _                                                               | Correct the wiring around<br>the encoder by separating<br>the Encoder Cable from<br>the Servomotor Main Cir-<br>cuit Cable or by ground-<br>ing the encoder.                                     | -         |
|                                                                  | The polarity sensor is not wired correctly.                                                                                             | Check the wiring of the polarity sensor.                        | Correct the wiring of the polarity sensor.                                                                                                                                                       | -         |
|                                                                  | The polarity sensor failed.                                                                                                             | _                                                               | Replace the polarity sen-<br>sor.                                                                                                                                                                | -         |
|                                                                  | Rotary Servomotor:<br>The Servomotor<br>speed was 200 min <sup>-1</sup><br>or higher when the<br>control power supply<br>was turned ON. | Check the motor speed<br>when the power supply<br>is turned ON. | Reduce the Servomotor<br>speed to a value less than<br>200 min <sup>-1</sup> , and turn ON<br>the control power supply.                                                                          | -         |
| A.850:<br>Encoder Over-<br>speed<br>(Detected at the             | Linear Servomotor:<br>The Servomotor<br>exceeded the speci-<br>fied speed when the<br>control power supply<br>was turned ON.            | Check the motor speed<br>when the power supply<br>is turned ON. | Control the motor speed<br>within the range specified<br>by the linear encoder<br>manufacturer and then<br>turn ON the control power<br>supply.                                                  | -         |
| encoder when<br>the control power<br>supply is turned<br>ON.)    | A failure occurred in the encoder.                                                                                                      | -                                                               | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the Servomotor or<br>linear encoder may be<br>faulty. Replace the Servo-<br>motor or linear encoder. | -         |
|                                                                  | A failure occurred in the SERVOPACK.                                                                                                    | _                                                               | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.<br>Continued o                             | -         |

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| Alarm Number:<br>Alarm Name                                                                                                                   | Possible Cause                                                                                | Confirmation                                                                                                                  | Correction                                                                                                                                                                                                          | Reference    |
| A.860:<br>Encoder Over-                                                                                                                       | The surrounding air temperature around the Servomotor is too high.                            | Measure the surround-<br>ing air temperature<br>around the Servomotor.                                                        | Reduce the surrounding<br>air temperature of the<br>Servomotor to 40°C or<br>less.                                                                                                                                  | -            |
| heated<br>(Detected when a<br>Rotary Servomo-<br>tor, Absolute Lin-                                                                           | The Servomotor load is greater than the rated load.                                           | Use the accumulated load ratio to check the load.                                                                             | Operate the Servo Drive<br>so that the motor load<br>remains within the speci-<br>fied range.                                                                                                                       | page 8-2     |
| ear Encoder, or<br>Direct Drive Ser-<br>vomotor is con-<br>nected. However,<br>this alarm is not<br>detected for<br>SGMCS<br>Servomotors with | A failure occurred in the encoder.                                                            | _                                                                                                                             | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the Servomotor or<br>absolute linear encoder<br>may be faulty. Replace the<br>Servomotor or absolute<br>linear encoder. | -            |
| Incremental<br>Encoders.)<br>(Detected at the<br>encoder.)                                                                                    | A failure occurred in the SERVOPACK.                                                          | -                                                                                                                             | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                               | -            |
|                                                                                                                                               | The surrounding tem-<br>perature around the<br>Servomotor is too<br>high.                     | Measure the surround-<br>ing temperature around<br>the Servomotor.                                                            | Reduce the surrounding<br>air temperature of the<br>Servomotor to 40° or less.                                                                                                                                      | -            |
|                                                                                                                                               | The motor load is greater than the rated load.                                                | Check the load with the accumulated load ratio on the Motion Monitor Tab Page on the Sig-maWin+.                              | Operate the Servo Drive<br>so that the motor load<br>remains within the speci-<br>fied range.                                                                                                                       | page 8-2     |
| A.861:<br>Motor Over-<br>heated                                                                                                               | A failure occurred in<br>the Serial Converter<br>Unit.                                        | -                                                                                                                             | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the Serial Con-<br>verter Unit may be faulty.<br>Replace the Serial Con-<br>verter Unit.                                | -            |
|                                                                                                                                               | A failure occurred in the SERVOPACK.                                                          | -                                                                                                                             | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                               | -            |
| A.890:<br>Encoder Scale<br>Error                                                                                                              | A failure occurred in the linear encoder.                                                     | -                                                                                                                             | The linear encoder may be faulty. Replace the linear encoder.                                                                                                                                                       | -            |
| A.891:<br>Encoder Module<br>Error                                                                                                             | A failure occurred in the linear encoder.                                                     | _                                                                                                                             | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the linear encoder<br>may be faulty. Replace the<br>linear encoder.                                                     | -            |
| A.8A0:<br>External Encoder<br>Error                                                                                                           | Setting the origin of<br>the absolute linear<br>encoder failed<br>because the motor<br>moved. | Before you set the ori-<br>gin, use the fully-closed<br>feedback pulse counter<br>to confirm that the<br>motor is not moving. | The motor must be stopped while setting the origin position.                                                                                                                                                        | *1           |
|                                                                                                                                               | A failure occurred in the external encoder.                                                   | -                                                                                                                             | Replace the external encoder.                                                                                                                                                                                       | -            |

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Maintenance

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| Alarm Number:<br>Alarm Name                                 | Possible Cause                                                                                | Confirmation                                     | Correction                                                                                                                                                                                                              | Reference |
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| A.8A1:                                                      | A failure occurred in the external encoder.                                                   | -                                                | Replace the external encoder.                                                                                                                                                                                           | -         |
| External Encoder<br>Module Error                            | A failure occurred in<br>the Serial Converter<br>Unit.                                        | -                                                | Replace the Serial Con-<br>verter Unit.                                                                                                                                                                                 | -         |
| A.8A2:<br>External Incre-<br>mental Encoder<br>Sensor Error | A failure occurred in the external encoder.                                                   | -                                                | Replace the external encoder.                                                                                                                                                                                           | -         |
| A.8A3:<br>External Abso-<br>lute Encoder<br>Position Error  | A failure occurred in the external absolute encoder.                                          | _                                                | The external absolute<br>encoder may be faulty.<br>Refer to the encoder<br>manufacturer's instruc-<br>tion manual for correc-<br>tions.                                                                                 | -         |
| A.8A5:<br>External Encoder<br>Overspeed                     | An overspeed error<br>was detected in the<br>external encoder.                                | Check the maximum speed of the external encoder. | Keep the external<br>encoder below its maxi-<br>mum speed.                                                                                                                                                              | -         |
| A.8A6:<br>External Encoder<br>Overheated                    | An overheating error<br>was detected in the<br>external encoder.                              | -                                                | Replace the external encoder.                                                                                                                                                                                           | -         |
| A.b33:<br>Current Detec-<br>tion Error 3                    | A failure occurred in the current detection circuit.                                          | _                                                | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                   | -         |
| A.b6A:<br>MECHATROLINK<br>Communications<br>ASIC Error 1    | There is a fault in the<br>SERVOPACK<br>MECHATROLINK<br>communications sec-<br>tion.          | -                                                | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                   | -         |
| A.b6b:<br>MECHATROLINK<br>Communications<br>ASIC Error 2    | A malfunction<br>occurred in the<br>MECHATROLINK<br>communications sec-<br>tion due to noise. | _                                                | <ul> <li>Implement the following countermeasures against noise.</li> <li>Check the MECHATROLINK Communications Cable and FG wiring.</li> <li>Attach a ferrite core to the MECHATROLINK Communications Cable.</li> </ul> | -         |
|                                                             | There is a fault in the<br>SERVOPACK<br>MECHATROLINK<br>communications sec-<br>tion.          | _                                                | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                   | -         |
| <b>A.bF0:</b><br>System Alarm 0                             | A failure occurred in the SERVOPACK.                                                          | -                                                | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                   | -         |
| A.bF1:<br>System Alarm 1                                    | A failure occurred in the SERVOPACK.                                                          | -                                                | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                   | -         |

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| Alarm Number:<br>Alarm Name     | Possible Cause                       | Confirmation | Correction                                                                                                                                            | Reference    |
| A.bF2:<br>System Alarm 2        | A failure occurred in the SERVOPACK. | _            | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK. | -            |
| <b>A.bF3:</b><br>System Alarm 3 | A failure occurred in the SERVOPACK. | _            | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK. | -            |
| A.bF4:<br>System Alarm 4        | A failure occurred in the SERVOPACK. | _            | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK. | -            |
| A.bF5:<br>System Alarm 5        | A failure occurred in the SERVOPACK. | -            | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK. | -            |
| <b>A.bF6:</b><br>System Alarm 6 | A failure occurred in the SERVOPACK. | _            | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK. | -            |
| A.bF7:<br>System Alarm 7        | A failure occurred in the SERVOPACK. | -            | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK. | -            |
| A.bF8:<br>System Alarm 8        | A failure occurred in the SERVOPACK. | _            | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK. | -            |

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| Alarm Number:                                                                 |                                                                                                                                       |                                                                                                                                                                                |                                                                                                                                                                                                                              |           |
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| Alarm Name                                                                    | Possible Cause                                                                                                                        | Confirmation                                                                                                                                                                   | Correction                                                                                                                                                                                                                   | Reference |
|                                                                               | The order of phases<br>U, V, and W in the<br>motor wiring is not<br>correct.                                                          | Check the Servomotor wiring.                                                                                                                                                   | Make sure that the Servo-<br>motor is correctly wired.                                                                                                                                                                       | -         |
| A.C10:                                                                        | There is an error in the<br>setting of Pn080 =<br>n. \Box X (Motor<br>Phase Sequence<br>Selection).                                   | Check the setting of Pn080 = $n.\Box\BoxX\Box$ .                                                                                                                               | Set Pn080 = n.□□X□ to<br>an appropriate value.                                                                                                                                                                               | *1        |
| Servomotor Out<br>of Control<br>(Detected when<br>the servo is<br>turned ON.) | A failure occurred in the encoder.                                                                                                    | _                                                                                                                                                                              | If the motor wiring is cor-<br>rect and an alarm still<br>occurs after turning the<br>power supply OFF and<br>ON again, the Servomotor<br>or linear encoder may be<br>faulty. Replace the Servo-<br>motor or linear encoder. | -         |
|                                                                               | A failure occurred in the SERVOPACK.                                                                                                  | -                                                                                                                                                                              | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                        | -         |
|                                                                               | The linear encoder signal level is too low.                                                                                           | Check the voltage of the linear encoder signal.                                                                                                                                | Fine-tune the mounting of<br>the scale head. Or,<br>replace the linear<br>encoder.                                                                                                                                           | -         |
| A.C20:<br>Phase Detection<br>Error                                            | The count-up direc-<br>tion of the linear<br>encoder does not<br>match the forward<br>direction of the Mov-<br>ing Coil in the motor. | Check the setting of<br>Pn080 = $n.\Box\Box X\Box$<br>(Motor Phase Sequence<br>Selection). Check the<br>installation orientation<br>for the linear encoder<br>and Moving Coil. | Change the setting of<br>Pn080 = $n.\Box\Box X\Box$ .<br>Correctly reinstall the lin-<br>ear encoder or Moving<br>Coil.                                                                                                      | *1        |
|                                                                               | The polarity sensor<br>signal is being<br>affected by noise.                                                                          | -                                                                                                                                                                              | Correct the FG wiring.<br>Implement countermea-<br>sures against noise for the<br>polarity sensor wiring.                                                                                                                    | -         |
|                                                                               | The polarity sensor is<br>protruding from the<br>Magnetic Way of the<br>motor.                                                        | Check the polarity sen-<br>sor.                                                                                                                                                | Correctly reinstall the<br>Moving Coil or Magnetic<br>Way of the motor.                                                                                                                                                      | -         |
| <b>A.C21:</b><br>Polarity Sensor<br>Error                                     | The setting of Pn282<br>(Linear Encoder Scale<br>Pitch) is not correct.                                                               | Check the setting of<br>Pn282 (Linear Encoder<br>Scale Pitch).                                                                                                                 | Check the specifications of the linear encoder and set a correct value.                                                                                                                                                      | *1        |
|                                                                               | The polarity sensor is not wired correctly.                                                                                           | Check the wiring of the polarity sensor.                                                                                                                                       | Correct the wiring of the polarity sensor.                                                                                                                                                                                   | -         |
|                                                                               | The polarity sensor failed.                                                                                                           | _                                                                                                                                                                              | Replace the polarity sen-<br>sor.                                                                                                                                                                                            | -         |
| A.C22:<br>Phase Informa-<br>tion Disagree-<br>ment                            | The SERVOPACK<br>phase information is<br>different from the lin-<br>ear encoder phase<br>information.                                 | -                                                                                                                                                                              | Perform polarity detec-<br>tion.                                                                                                                                                                                             | *1        |

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| Alarm Number:<br>Alarm Name               | Possible Cause                               | Confirmation                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Correction                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reference |
|                                           | The parameter set-<br>tings are not correct. | Check the linear<br>encoder specifications<br>and feedback signal<br>status.                                                                                                                                                                                                                                                                                                                                                                                    | The settings of Pn282<br>(Linear Encoder Scale<br>Pitch) and Pn080 =<br>n. $\Box$ X $\Box$ (Motor Phase<br>Sequence Selection) may<br>not match the installa-<br>tion. Set the parameters<br>to correct values.                                                                                                                                                                                                                                                          | *1        |
|                                           | y Detec-                                     | Check to make sure<br>that the frame grounds<br>of the Serial Converter<br>Unit and Servomotor<br>are connected to the<br>FG terminal on the SER-<br>VOPACK and that the<br>FG terminal on the SER-<br>VOPACK is connected<br>to the frame ground on<br>the power supply.<br>And, confirm that the<br>shield is properly pro-<br>cessed on the Linear<br>Encoder Cable. Check<br>to see if the detection<br>reference is repeatedly<br>output in one direction. | Implement appropriate<br>countermeasures against<br>noise for the Linear<br>Encoder Cable.                                                                                                                                                                                                                                                                                                                                                                               | _         |
| A.C50:<br>Polarity Detec-<br>tion Failure |                                              | _                                                                                                                                                                                                                                                                                                                                                                                                                                                               | The polarity cannot be<br>properly detected if the<br>detection reference is 0<br>and the speed feedback<br>is not 0 because of an<br>external force, such as<br>cable tension, applied to<br>the Moving Coil. Imple-<br>ment measures to reduce<br>the external force so that<br>the speed feedback goes<br>to 0. If the external force<br>cannot be reduced,<br>increase the setting of<br>Pn481 (Polarity Detection<br>Speed Loop Gain).                              | _         |
|                                           |                                              | Check the linear<br>encoder scale pitch to<br>see if it is within 100<br>μm.                                                                                                                                                                                                                                                                                                                                                                                    | If the linear encoder scale<br>pitch is 100 μm or higher,<br>the SERVOPACK cannot<br>detect the correct speed<br>feedback. Use a linear<br>encoder scale pitch with<br>higher resolution. (We rec-<br>ommend a pitch of 40 μm<br>or less.) Or, increase the<br>setting of Pn485 (Polarity<br>Detection Reference<br>Speed). However,<br>increasing the setting of<br>Pn485 will increase the<br>Servomotor movement<br>range that is required for<br>polarity detection. | _         |

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| Alarm Number:<br>Alarm Name                                          | Possible Cause                                                                                                                                                                | Confirmation                   | Correction                                                                                                                                                                                                                                                           | Reference |
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| A.C51:<br>Overtravel<br>Detected during<br>Polarity Detection        | The overtravel signal was detected during polarity detection.                                                                                                                 | Check the overtravel position. | Wire the overtravel sig-<br>nals. Execute polarity<br>detection at a position<br>where an overtravel sig-<br>nal would not be<br>detected.                                                                                                                           | *1        |
| A.C52:<br>Polarity Detec-<br>tion Not Com-<br>pleted                 | The servo was turned<br>ON when using an<br>absolute linear<br>encoder, Pn587 was<br>set to n. DDD (Do<br>not detect polarity),<br>and the polarity had<br>not been detected. | _                              | When using an absolute<br>linear encoder, set Pn587<br>to n.                                                                                                                                                                                                         | -         |
| A.C53:<br>Out of Range of<br>Motion for Polar-<br>ity Detection      | The travel distance<br>exceeded the setting<br>of Pn48E (Polarity<br>Detection Range) in<br>the middle of detec-<br>tion.                                                     | _                              | Increase the setting of<br>Pn48E (Polarity Detection<br>Range). Or, increase the<br>setting of Pn481 (Polarity<br>Detection Speed Loop<br>Gain).                                                                                                                     | -         |
| A.C54:<br>Polarity Detec-<br>tion Failure 2                          | An external force was<br>applied to the Servo-<br>motor.                                                                                                                      | _                              | Increase the setting of<br>Pn495 (Polarity Detection<br>Confirmation Force Refer-<br>ence). Increase the setting<br>of Pn498 (Polarity Detec-<br>tion Allowable Error<br>Range). Increasing the<br>allowable error will also<br>increase the motor tem-<br>perature. | -         |
| A.C80:<br>Encoder Clear<br>Error or Multiturn<br>Limit Setting Error | A failure occurred in the encoder.                                                                                                                                            | _                              | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the Servomotor or<br>linear encoder may be<br>faulty. Replace the Servo-<br>motor or linear encoder.                                                                     | -         |
|                                                                      | A failure occurred in the SERVOPACK.                                                                                                                                          | _                              | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                                                                | -         |

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| Alarm Number:<br>Alarm Name                                                            | Possible Cause                                                                                                                                                                                                                                        | Confirmation                                                   | Correction                                                                                                                                                                   | Reference |
|                                                                                        | There is a faulty con-<br>tact in the connector<br>or the connector is<br>not wired correctly for<br>the encoder.                                                                                                                                     | Check the condition of the encoder connector.                  | Reconnect the encoder connector and check the encoder wiring.                                                                                                                | *1        |
|                                                                                        | There is a cable dis-<br>connection or short-<br>circuit in the encoder.<br>Or, the cable imped-<br>ance is outside the<br>specified values.                                                                                                          | Check the condition of the Encoder Cable.                      | Use the Encoder Cable within the specified specifications.                                                                                                                   | -         |
| A.C90:<br>Encoder Commu-<br>nications Error                                            | One of the following<br>has occurred: corro-<br>sion caused by<br>improper tempera-<br>ture, humidity, or gas,<br>a short-circuit caused<br>by entry of water<br>drops or cutting oil, or<br>faulty contact in con-<br>nector caused by<br>vibration. | Check the operating environment.                               | Improve the operating<br>environmental, and<br>replace the cable. If the<br>alarm still occurs, replace<br>the SERVOPACK.                                                    | *1        |
|                                                                                        | A malfunction was caused by noise.                                                                                                                                                                                                                    | _                                                              | Correct the wiring around<br>the encoder by separating<br>the Encoder Cable from<br>the Servomotor Main Cir-<br>cuit Cable or by ground-<br>ing the encoder.                 | *1        |
|                                                                                        | A failure occurred in the SERVOPACK.                                                                                                                                                                                                                  | _                                                              | Connect the Servomotor<br>to another SERVOPACK,<br>and turn ON the control<br>power supply. If no alarm<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK. | -         |
|                                                                                        | Noise entered on the signal lines because the Encoder Cable is bent or the sheath is damaged.                                                                                                                                                         | Check the condition of<br>the Encoder Cable and<br>connectors. | Check the Encoder Cable to see if it is installed correctly.                                                                                                                 | *1        |
| A.C91:<br>Encoder Commu-<br>nications Posi-<br>tion Data<br>Acceleration Rate<br>Error | The Encoder Cable is<br>bundled with a high-<br>current line or<br>installed near a high-<br>current line.                                                                                                                                            | Check the installation<br>condition of the<br>Encoder Cable.   | Confirm that there is no<br>surge voltage on the<br>Encoder Cable.                                                                                                           | -         |
|                                                                                        | There is variation in<br>the FG potential<br>because of the influ-<br>ence of machines on<br>the Servomotor side,<br>such as a welder.                                                                                                                | Check the installation<br>condition of the<br>Encoder Cable.   | Properly ground the machine to separate it from the FG of the encoder.                                                                                                       | -         |

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Alarm Number: **Possible Cause** Confirmation Correction Reference Alarm Name Noise entered on the Implement countermea-\*1 signal line from the sures against noise for the \_ encoder. encoder wiring. Reduce machine vibra-Excessive vibration or Check the operating tion. shock was applied to conditions. Correctly install the Serthe encoder. vomotor or linear encoder. Turn the power supply to A.C92: the SERVOPACK OFF and Encoder Commu-ON again. If an alarm still A failure occurred in nications Timer occurs, the Servomotor or \_ the encoder. Error linear encoder may be faulty. Replace the Servomotor or linear encoder. Turn the power supply to the SERVOPACK OFF and A failure occurred in ON again. If an alarm still occurs, the SERVOPACK the SERVOPACK. may be faulty. Replace the SERVOPACK. Turn the power supply to the SERVOPACK OFF and ON again. If an alarm still A failure occurred in occurs, the Servomotor or the encoder. linear encoder may be faulty. Replace the Servo-A.CA0: Encoder Paramemotor or linear encoder. ter Error Turn the power supply to the SERVOPACK OFF and A failure occurred in ON again. If an alarm still the SERVOPACK. occurs, the SERVOPACK may be faulty. Replace the SERVOPACK.

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| Alarm Name                                       |                                                                                                                                                            | Confirmation                                                   | Correction                                                                                                                                                                                               | Reference |  |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--|
|                                                  | The encoder is wired incorrectly or there is faulty contact.                                                                                               | Check the wiring of the encoder.                               | Make sure that the encoder is correctly wired.                                                                                                                                                           | *1        |  |
|                                                  | The specifications of<br>the Encoder Cable are<br>not correct and noise<br>entered on it.                                                                  | _                                                              | Use a shielded twisted-<br>pair wire cable or a<br>screened twisted-pair<br>cable with conductors of<br>at least 0.12 mm <sup>2</sup> .                                                                  | -         |  |
|                                                  | The Encoder Cable is too long and noise entered on it.                                                                                                     | _                                                              | <ul> <li>Rotary Servomotors:<br/>The Encoder Cable wir-<br/>ing distance must be 50<br/>m max.</li> <li>Linear Servomotors:<br/>The Encoder Cable wir-<br/>ing distance must be 20<br/>m max.</li> </ul> | -         |  |
| A.Cb0:<br>Encoder Echo-<br>back Error            | There is variation in<br>the FG potential<br>because of the influ-<br>ence of machines on<br>the Servomotor side,<br>such as a welder.                     | Check the condition of<br>the Encoder Cable and<br>connectors. | Properly ground the machine to separate it from the FG of the encoder.                                                                                                                                   | -         |  |
|                                                  | Excessive vibration or shock was applied to the encoder.                                                                                                   | Check the operating conditions.                                | Reduce machine vibra-<br>tion.<br>Correctly install the Ser-<br>vomotor or linear encoder.                                                                                                               | -         |  |
|                                                  | A failure occurred in the encoder.                                                                                                                         | -                                                              | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the Servomotor or<br>linear encoder may be<br>faulty. Replace the Servo-<br>motor or linear encoder.         | -         |  |
|                                                  | A failure occurred in the SERVOPACK.                                                                                                                       | _                                                              | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                    | -         |  |
| <b>A.CC0:</b><br>Multiturn Limit<br>Disagreement | When using a Direct<br>Drive Servomotor, the<br>setting of Pn205 (Mul-<br>titurn Limit) does not<br>agree with the<br>encoder.                             | Check the setting of Pn205.                                    | Correct the setting of<br>Pn205 (0 to 65,535).                                                                                                                                                           | *1        |  |
|                                                  | The multiturn limit of<br>the encoder is differ-<br>ent from that of the<br>SERVOPACK. Or, the<br>multiturn limit of the<br>SERVOPACK has<br>been changed. | Check the setting of<br>Pn205 in the SERVO-<br>PACK.           | Change the setting if the alarm occurs.                                                                                                                                                                  | *1        |  |
|                                                  | A failure occurred in the SERVOPACK.                                                                                                                       | _                                                              | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.<br>Continued o                                     | -         |  |

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| Alarm Number:<br>Alarm Name                                                                                                                                                                            | Possible Cause                                                                                                                | Confirmation                                                                                                   | Correction                                                                                                                                                                                                                                      | Reference |
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|                                                                                                                                                                                                        | The cable between<br>the Serial Converter<br>Unit and SERVOPACK<br>is not wired correctly<br>or there is a faulty<br>contact. | Check the wiring of the external encoder.                                                                      | Correctly wire the cable<br>between the Serial Con-<br>verter Unit and SERVO-<br>PACK.                                                                                                                                                          | *1        |
| A.CF1:<br>Reception Failed<br>Error in Feed-                                                                                                                                                           | A specified cable is<br>not being used<br>between Serial Con-<br>verter Unit and SER-<br>VOPACK.                              | Check the wiring speci-<br>fications of the external<br>encoder.                                               | Use a specified cable.                                                                                                                                                                                                                          | -         |
| back Option<br>Module Commu-<br>nications                                                                                                                                                              | The cable between<br>the Serial Converter<br>Unit and SERVOPACK<br>is too long.                                               | Measure the length of<br>the cable that connects<br>the Serial Converter<br>Unit.                              | The length of the cable<br>between the Serial Con-<br>verter Unit and SERVO-<br>PACK must be 20 m or<br>less.                                                                                                                                   | -         |
|                                                                                                                                                                                                        | The sheath on cable<br>between the Serial<br>Converter Unit and<br>SERVOPACK is bro-<br>ken.                                  | Check the cable that<br>connects the Serial<br>Converter Unit.                                                 | Replace the cable<br>between the Serial Con-<br>verter Unit and SERVO-<br>PACK.                                                                                                                                                                 | -         |
| A.CF2:<br>Timer Stopped<br>Error in Feed-<br>back Option<br>Module Commu-<br>nications                                                                                                                 | Noise entered the cable between the Serial Converter Unit and SERVOPACK.                                                      | _                                                                                                              | Correct the wiring around<br>the Serial Converter Unit,<br>e.g., separate I/O signal<br>lines from the Main Circuit<br>Cables or ground.                                                                                                        | -         |
|                                                                                                                                                                                                        | A failure occurred in<br>the Serial Converter<br>Unit.                                                                        | _                                                                                                              | Replace the Serial Con-<br>verter Unit.                                                                                                                                                                                                         | -         |
|                                                                                                                                                                                                        | A failure occurred in the SERVOPACK.                                                                                          | -                                                                                                              | Replace the SERVO-<br>PACK.                                                                                                                                                                                                                     | -         |
|                                                                                                                                                                                                        | The Servomotor U, V,<br>and W wiring is not<br>correct.                                                                       | Check the wiring of the<br>Servomotor's Main Cir-<br>cuit Cables.                                              | Make sure that there are<br>no faulty contacts in the<br>wiring for the Servomotor<br>and encoder.                                                                                                                                              | -         |
|                                                                                                                                                                                                        | The position com-<br>mand speed is too<br>fast.                                                                               | Reduce the position<br>command speed and<br>try operating the SER-<br>VOPACK.                                  | Reduce the position refer-<br>ence speed or the refer-<br>ence acceleration rate, or<br>reconsider the electronic<br>gear ratio.                                                                                                                | *1        |
| A.d00:<br>Position Devia-<br>tion Overflow<br>(The setting of<br>Pn520 (Position<br>Deviation Over-<br>flow Alarm Level)<br>was exceeded by<br>the position devi-<br>ation while the<br>servo was ON.) | The acceleration of<br>the position reference<br>is too high.                                                                 | Reduce the reference<br>acceleration and try<br>operating the SERVO-<br>PACK.                                  | Reduce the acceleration<br>of the position reference<br>using a MECHATROLINK<br>command. Or, smooth the<br>position reference accel-<br>eration by selecting the<br>position reference filter<br>(ACCFIL) using a<br>MECHATROLINK com-<br>mand. | _         |
|                                                                                                                                                                                                        | The setting of Pn520<br>(Position Deviation<br>Overflow Alarm Level)<br>is too low for the<br>operating conditions.           | Check Pn520 (Position<br>Deviation Overflow<br>Alarm Level) to see if it<br>is set to an appropriate<br>value. | Optimize the setting of Pn520.                                                                                                                                                                                                                  | page 5-7  |
|                                                                                                                                                                                                        | A failure occurred in the SERVOPACK.                                                                                          | _                                                                                                              | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                                           | -         |

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| Alarm Number:<br>Alarm Name                                                        | Possible Cause                                                                                                                                                                                                                                                                                                                                           | Confirmation                                                                              | Correction                                                                                                                                                                | Reference |
| A.d01:<br>Position Devia-<br>tion Overflow<br>Alarm at Servo<br>ON                 | The servo was turned<br>ON after the position<br>deviation exceeded<br>the setting of Pn526<br>(Position Deviation<br>Overflow Alarm Level<br>at Servo ON) while the<br>servo was OFF.                                                                                                                                                                   | Check the position<br>deviation while the<br>servo is OFF.                                | Optimize the setting of<br>Pn526 (Position Deviation<br>Overflow Alarm Level at<br>Servo ON).                                                                             |           |
| A.d02:<br>Position Devia-<br>tion Overflow<br>Alarm for Speed<br>Limit at Servo ON | If position deviation<br>remains in the devia-<br>tion counter, the set-<br>ting of Pn529 or<br>Pn584 (Speed Limit<br>Level at Servo ON)<br>limits the speed when<br>the servo is turned<br>ON. This alarm occurs<br>if a position reference<br>is input and the set-<br>ting of Pn520 (Posi-<br>tion Deviation<br>Overflow Alarm Level)<br>is exceeded. | _                                                                                         | Optimize the setting of<br>Pn520 (Position Deviation<br>Overflow Alarm Level). Or,<br>adjust the setting of<br>Pn529 or Pn584 (Speed<br>Limit Level at Servo ON).         | page 5-7  |
| A.d10:<br>Motor-Load Posi-<br>tion Deviation<br>Overflow                           | The motor direction<br>and external encoder<br>installation orientation<br>are backward.                                                                                                                                                                                                                                                                 | Check the motor direc-<br>tion and the external<br>encoder installation ori-<br>entation. | Install the external<br>encoder in the opposite<br>direction, or change the<br>setting of Pn002 =<br>n.XDDD (External<br>Encoder Usage) to<br>reverse the direction.      | *1        |
|                                                                                    | There is an error in the connection between the load (e.g., stage) and external encoder coupling.                                                                                                                                                                                                                                                        | Check the coupling of the external encoder.                                               | Check the mechanical coupling.                                                                                                                                            | -         |
| <b>A.d30:</b><br>Position Data<br>Overflow                                         | The position data<br>exceeded<br>±1,879,048,192.                                                                                                                                                                                                                                                                                                         | Check the input refer-<br>ence pulse counter.                                             | Reconsider the operating specifications.                                                                                                                                  | -         |
| A.d40:<br>Clearance<br>Position Deviation<br>Error                                 | The difference<br>between the clear-<br>ance offset reference<br>and gap exceeded<br>Pn6FC (Clearance<br>Position Deviation<br>Error Level).                                                                                                                                                                                                             | Check the amount of deviation during clear-<br>ance control.                              | Operate the system so<br>that deviation does not<br>exceed the setting of<br>Pn6FC. Or, set the clear-<br>ance position deviation<br>error level to the optimum<br>level. | -         |
|                                                                                    | Wiring of the gap sen-<br>sor is incorrect.                                                                                                                                                                                                                                                                                                              | Check the wiring of the gap sensor.                                                       | Correctly wire the gap sensor.                                                                                                                                            | -         |
|                                                                                    | A failure occurred in the gap sensor.                                                                                                                                                                                                                                                                                                                    | Check the output volt-<br>age from the gap sen-<br>sor.                                   | Replace the gap sensor if the output is not correct.                                                                                                                      | -         |
|                                                                                    | A failure occurred in the SERVOPACK.                                                                                                                                                                                                                                                                                                                     | -                                                                                         | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                                                  | -         |

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| Alarm Number:<br>Alarm Name                                            | Possible Cause                                                                                                                                                                              | Confirmation                                                                                            | Correction                                                                                                                                                                              | Reference |
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| A.E02:                                                                 | The MECHATROLINK transmission cycle fluctuated.                                                                                                                                             | _                                                                                                       | Remove the cause of transmission cycle fluctu-<br>ation at the host control-<br>ler.                                                                                                    | _         |
| MECHATROLINK<br>Internal Synchro-<br>nization Error 1                  | A failure occurred in the SERVOPACK.                                                                                                                                                        | _                                                                                                       | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                   | -         |
| A.E40:<br>MECHATROLINK<br>Transmission<br>Cycle Setting<br>Error       | The setting of<br>MECHATROLINK<br>transmission cycle is<br>outside of the speci-<br>fied range.                                                                                             | Check the setting of the MECHATROLINK trans-<br>mission cycle.                                          | Set the MECHATROLINK transmission cycle to an appropriate value.                                                                                                                        | -         |
| A.E41:<br>MECHATROLINK<br>Communications<br>Data Size Setting<br>Error | The number of trans-<br>mission bytes set on<br>DIP switch S3 is not<br>correct.                                                                                                            | Check the<br>MECHATROLINK com-<br>munications data size of<br>the host controller.                      | Reset DIP switch S3 to<br>change the number of<br>transmission bytes to an<br>appropriate value.                                                                                        | *1        |
| A.E42:<br>MECHATROLINK<br>Station Address<br>Setting Error             | The station address is outside of the setting range.                                                                                                                                        | Check rotary switches<br>S1 and S2 to see if the<br>station address is<br>between 03 and EF.            | Check the setting of the<br>station address of the<br>host controller, and reset<br>rotary switches S1 and S2<br>to change the address to<br>an appropriate value<br>between 03 and EF. | *1        |
|                                                                        | Two or more stations<br>on the communica-<br>tions network have<br>the same address.                                                                                                        | Check to see if two or<br>more stations on the<br>communications net-<br>work have the same<br>address. | Check the setting of the<br>station address of the<br>host controller, and reset<br>rotary switches S1 and S2<br>to change the address to<br>an appropriate value<br>between 03 and EF. | *1        |
| A.E50 <sup>*5</sup> :                                                  | The WDT data in the host controller was not updated normally.                                                                                                                               | Check to see if the WDT data is being updated at the host controller.                                   | Correctly update the WDT data at the host controller.                                                                                                                                   | _         |
| MECHATROLINK<br>Synchronization<br>Error                               | A failure occurred in the SERVOPACK.                                                                                                                                                        | -                                                                                                       | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                   | -         |
| A.E51:<br>MECHATROLINK<br>Synchronization<br>Failed                    | The WDT data at the<br>host controller was<br>not updated correctly<br>at the start of syn-<br>chronous communi-<br>cations, so<br>synchronous commu-<br>nications could not be<br>started. | Check to see if the WDT<br>data is being updated in<br>the host controller.                             | Correctly update the WDT data at the host controller.                                                                                                                                   | -         |
|                                                                        | A failure occurred in the SERVOPACK.                                                                                                                                                        | _                                                                                                       | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                   | -         |

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| Alarm Number:<br>Alarm Name                                                   | Possible Cause                                                      | Confirmation                                                   | Continued from pre                                                                                                                                                                                                                         | Reference |
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|                                                                               | MECHATROLINK wir-<br>ing is not correct.                            | Check the<br>MECHATROLINK wir-<br>ing.                         | Correct the<br>MECHATROLINK Com-<br>munications Cable wiring.<br>Correctly connect the ter-<br>minator.                                                                                                                                    | -         |
| A.E60 <sup>*5</sup> :<br>Reception Error in<br>MECHATROLINK<br>Communications | A MECHATROLINK<br>data reception error<br>occurred due to<br>noise. | _                                                              | Implement countermea-<br>sures against noise.<br>(Check the<br>MECHATROLINK Com-<br>munications Cable and<br>FG wiring, and implement<br>measures such as attach-<br>ing a ferrite core to the<br>MECHATROLINK Com-<br>munications Cable.) | -         |
|                                                                               | A failure occurred in the SERVOPACK.                                | _                                                              | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                                      | -         |
| A.E61:<br>Synchronization                                                     | The MECHATROLINK transmission cycle fluctuated.                     | Check the setting of the MECHATROLINK trans-<br>mission cycle. | Remove the cause of transmission cycle fluctu-<br>ation at the host control-<br>ler.                                                                                                                                                       | -         |
| Interval Error in<br>MECHATROLINK<br>Transmission<br>Cycle                    | A failure occurred in the SERVOPACK.                                | _                                                              | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                                      | -         |
|                                                                               | MECHATROLINK wir-<br>ing is not correct.                            | Check the Servomotor wiring.                                   | Correct the<br>MECHATROLINK Com-<br>munications Cable wiring.                                                                                                                                                                              | -         |
| A.E63:<br>MECHATROLINK<br>Synchronization<br>Frame Not<br>Received            | A MECHATROLINK<br>data reception error<br>occurred due to<br>noise. | _                                                              | Implement countermea-<br>sures against noise.<br>(Check the<br>MECHATROLINK Com-<br>munications Cable and<br>FG wiring, and implement<br>measures such as attach-<br>ing a ferrite core to the<br>MECHATROLINK Com-<br>munications Cable.) | -         |
|                                                                               | A failure occurred in the SERVOPACK.                                | -                                                              | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                                      | -         |

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| Alarm Number:<br>Alarm Name                                                                                                                                                  | Possible Cause                                                                                                                 | Confirmation                                                                            | Correction                                                                                                                                                                                                                                                                                     | Reference |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                                                                                                                                                                              | There is a faulty con-<br>nection between the<br>SERVOPACK and the<br>Safety Option Module.                                    | Check the connection<br>between the SERVO-<br>PACK and the Safety<br>Option Module.     | Correctly connect the Safety Option Module.                                                                                                                                                                                                                                                    | _         |
| A.E71:<br>Safety Option<br>Module Detec-<br>tion Failure                                                                                                                     | The Safety Option<br>Module was discon-<br>nected.                                                                             | _                                                                                       | Execute Fn014 (Reset<br>Option Module Configura-<br>tion Error) from the Digital<br>Operator or SigmaWin+<br>and then turn the power<br>supply to the SERVO-<br>PACK OFF and ON again.                                                                                                         | *1        |
|                                                                                                                                                                              | A failure occurred in the Safety Option Module.                                                                                | -                                                                                       | Replace the Safety Option Module.                                                                                                                                                                                                                                                              | _         |
|                                                                                                                                                                              | A failure occurred in the SERVOPACK.                                                                                           | -                                                                                       | Replace the SERVO-<br>PACK.                                                                                                                                                                                                                                                                    | -         |
|                                                                                                                                                                              | There is a faulty con-<br>nection between the<br>SERVOPACK and the<br>Feedback Option<br>Module.                               | Check the connection<br>between the SERVO-<br>PACK and the Feed-<br>back Option Module. | Correctly connect the<br>Feedback Option Module.                                                                                                                                                                                                                                               | _         |
| A.E72:<br>Feedback Option<br>Module Detec-<br>tion Failure                                                                                                                   | The Feedback Option<br>Module was discon-<br>nected.                                                                           | -                                                                                       | Reset the Option Module<br>configuration error and<br>turn the power supply to<br>the SERVOPACK OFF and<br>ON again.                                                                                                                                                                           | *1        |
|                                                                                                                                                                              | A failure occurred in<br>the Feedback Option<br>Module.                                                                        | -                                                                                       | Replace the Feedback<br>Option Module.                                                                                                                                                                                                                                                         | _         |
|                                                                                                                                                                              | A failure occurred in the SERVOPACK.                                                                                           | _                                                                                       | Replace the SERVO-<br>PACK.                                                                                                                                                                                                                                                                    | -         |
| A.E74:<br>Unsupported                                                                                                                                                        | A failure occurred in the Safety Option Module.                                                                                | -                                                                                       | Replace the Safety Option Module.                                                                                                                                                                                                                                                              | -         |
| Safety Option<br>Module                                                                                                                                                      | An unsupported<br>Safety Option Module<br>was connected.                                                                       | Refer to the catalog of<br>the connected Safety<br>Option Module.                       | Connect a compatible<br>Safety Option Module.                                                                                                                                                                                                                                                  | -         |
| A.Eb1:<br>Safety Function<br>Signal Input Tim-<br>ing Error                                                                                                                  | The delay between<br>activation of the<br>/HWBB1 and<br>/HWBB2 input sig-<br>nals for the HWBB<br>was ten second or<br>longer. | Measure the time delay<br>between the /HWBB1<br>and /HWBB2 signals.                     | The output signal circuits<br>or devices for /HWBB1<br>and /HWBB2 or the SER-<br>VOPACK input signal cir-<br>cuits may be faulty.<br>Alternatively, the input sig-<br>nal cables may be discon-<br>nected. Check to see if<br>any of these items are<br>faulty or have been dis-<br>connected. | _         |
|                                                                                                                                                                              | A failure occurred in the SERVOPACK.                                                                                           | -                                                                                       | Replace the SERVO-<br>PACK.                                                                                                                                                                                                                                                                    | _         |
| A.EC8:<br>Gate Drive Error 1<br>(An error<br>occurred in the<br>gate drive circuit.)<br>A.EC9:<br>Gate Drive Error 2<br>(An error<br>occurred in the<br>gate drive circuit.) | A failure occurred in the SERVOPACK.                                                                                           | -                                                                                       | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                                                                                          | -         |

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| Continued from previous page.                                                                                                                                                                                               |                                                                                                                                                  |                                                                                                                                                                                                                                                                                 |                                                                                                                                                       |           |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--|
| Alarm Number:<br>Alarm Name                                                                                                                                                                                                 | Possible Cause                                                                                                                                   | Confirmation                                                                                                                                                                                                                                                                    | Correction                                                                                                                                            | Reference |  |
|                                                                                                                                                                                                                             |                                                                                                                                                  | Check the motor status when the command is executed.                                                                                                                                                                                                                            | Execute the SV_ON or<br>SENS_ON command only<br>when the motor is not<br>operating.                                                                   | -         |  |
| A.Ed1:<br>Command Exe-<br>cution Timeout                                                                                                                                                                                    | A timeout error<br>occurred for a<br>MECHATROLINK<br>command.                                                                                    | <ul> <li>For fully-closed loop<br/>control, check the<br/>status of the external<br/>encoder when the<br/>command is exe-<br/>cuted.</li> <li>For other types of<br/>control, check the<br/>status of the linear<br/>encoder when the<br/>command is exe-<br/>cuted.</li> </ul> | Execute the SENS_ON<br>command only when an<br>external encoder (e.g., a<br>linear encoder) is con-<br>nected.                                        | -         |  |
|                                                                                                                                                                                                                             | The three-phase power supply wiring is not correct.                                                                                              | Check the power sup-<br>ply wiring.                                                                                                                                                                                                                                             | Make sure that the power supply is correctly wired.                                                                                                   | *1        |  |
| A.F10:<br>Power Supply                                                                                                                                                                                                      | The three-phase<br>power supply is<br>unbalanced.                                                                                                | Measure the voltage for<br>each phase of the<br>three-phase power sup-<br>ply.                                                                                                                                                                                                  | Balance the power supply by changing phases.                                                                                                          | -         |  |
| Line Open Phase<br>(The voltage was<br>low for more than<br>one second for<br>phase R, S, or T<br>when the main<br>power supply<br>was ON.)                                                                                 | A single-phase power<br>supply was input with-<br>out specifying a sig-<br>nal-phase AC power<br>supply input (Pn00B =<br>$n.\Box 1\Box \Box$ ). | Check the power sup-<br>ply and the parameter<br>setting.                                                                                                                                                                                                                       | Match the parameter set-<br>ting to the power supply.                                                                                                 | *1        |  |
|                                                                                                                                                                                                                             | A failure occurred in the SERVOPACK.                                                                                                             | _                                                                                                                                                                                                                                                                               | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK. | _         |  |
| A.F50:<br>Servomotor Main<br>Circuit Cable Dis-                                                                                                                                                                             | A failure occurred in the SERVOPACK.                                                                                                             | -                                                                                                                                                                                                                                                                               | The SERVOPACK may be faulty. Replace the SER-<br>VOPACK.                                                                                              | -         |  |
| connection<br>(The Servomotor<br>did not operate or<br>power was not<br>supplied to the<br>Servomotor even<br>though the<br>SV_ON (Servo<br>ON) command<br>was input when<br>the Servomotor<br>was ready to<br>receive it.) | The wiring is not cor-<br>rect or there is a faulty<br>contact in the motor<br>wiring.                                                           | Check the wiring.                                                                                                                                                                                                                                                               | Make sure that the Servo-<br>motor is correctly wired.                                                                                                | *1        |  |

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| Alarm Number:<br>Alarm Name                                                                                                                                                                                                  | Possible Cause                                   | Confirmation        | Correction                                                                                                                                                                   | Reference |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| FL-1 <sup>*5</sup> :<br>System Alarm<br>FL-2 <sup>*5</sup> :<br>System Alarm<br>FL-3 <sup>*5</sup> :<br>System Alarm<br>FL-4 <sup>*5</sup> :<br>System Alarm<br>FL-5 <sup>*5</sup> :<br>System Alarm<br>FL-6 <sup>*5</sup> : | A failure occurred in the SERVOPACK.             | _                   | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                        | _         |
| System Alarm                                                                                                                                                                                                                 | There is a faulty con-<br>tact between the Digi- | Check the connector | Disconnect the connec-                                                                                                                                                       |           |
| CPF00:<br>Digital Operator<br>Communications                                                                                                                                                                                 | tal Operator and the SERVOPACK.                  | contact.            | tor and insert it again. Or, replace the cable.                                                                                                                              | -         |
| Error 1                                                                                                                                                                                                                      | A malfunction was caused by noise.               | -                   | Keep the Digital Operator<br>or the cable away from<br>sources of noise.                                                                                                     | _         |
| <b>CPF01:</b><br>Digital Operator<br>Communications<br>Error 2                                                                                                                                                               | A failure occurred in the Digital Operator.      | _                   | Disconnect the Digital<br>Operator and then con-<br>nect it again. If an alarm<br>still occurs, the Digital<br>Operator may be faulty.<br>Replace the Digital Oper-<br>ator. | -         |
|                                                                                                                                                                                                                              | A failure occurred in the SERVOPACK.             | -                   | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                        | -         |

Ω Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

\*2. Detection Conditions
Rotary Servomotor If either of the following conditions is detected, an alarm will occur.

• Pn533 [min<sup>-1</sup>] × 
$$\frac{\text{Encoder resolution}}{6 \times 10^5} \le \frac{\text{Pn20E}}{\text{Pn210}}$$
  
• Maximum motor speed [min<sup>-1</sup>] ×  $\frac{\text{Encoder resolution}}{\text{Approx. } 3.66 \times 10^{12}} \ge \frac{\text{Pn20E}}{\text{Pn210}}$ 

• Linear Servomotor If either of the following conditions is detected, an alarm will occur.

| Pn585 [mm/s]              |  | Resolution of Serial Converter Unit | / | Pn20E |
|---------------------------|--|-------------------------------------|---|-------|
| Linear encoder pitch [µm] |  | 10                                  |   | Pn210 |
| Pn385 [100 mm/s]          |  | Resolution of Serial Converter Unit |   | Pn20E |
| Linear encoder pitch [µm] |  | Approx. 6.10 ×10 <sup>5</sup>       |   | Pn210 |

#### \*3. Detection Conditions

· Rotary Servomotor

If either of the following conditions is detected, an alarm will occur.

• Rated motor speed [min<sup>-1</sup>] 
$$\times 1/3 \times \frac{\text{Encoder resolution}}{6 \times 10^5} \leq \frac{\text{Pn20E}}{\text{Pn210}}$$

• Maximum motor speed [min<sup>-1</sup>] 
$$\times \frac{\text{Encoder resolution}}{\text{Approx. 3.66} \times 10^{12}} \ge \frac{\text{Pn20E}}{\text{Pn210}}$$

Linear Servomotor
 If either of the following conditions is detected, an alarm will occur.

| • — | Rated motor speed [mm/s] $\times$ 1/3<br>Linear encoder pitch [µm] | × | Resolution of Serial Converter Unit<br>10                             | ≤ | Pn20E<br>Pn210 |
|-----|--------------------------------------------------------------------|---|-----------------------------------------------------------------------|---|----------------|
| •_  | Pn385 [100 mm/s]<br>Linear encoder pitch [µm]                      | × | Resolution of Serial Converter Unit<br>Approx. 6.10 × 10 <sup>5</sup> | ≥ | Pn20E<br>Pn210 |

\*4. Refer to the following manual for details.

Ω Σ-7-Series Peripheral Device Selection Manual (Manual No.: SIEP S800001 32)

\*5. These alarms are not stored in the alarm history. They are only displayed on the panel display.

9.2.1 List of Warnings

# 9.2 Warning Displays

If a warning occurs in the SERVOPACK, a warning number will be displayed on the panel display. Warnings are displayed to warn you before an alarm occurs.

This section provides a list of warnings and the causes of and corrections for warnings.

## 9.2.1 List of Warnings

The list of warnings gives the warning name and warning meaning in order of the warning numbers.

| Warning<br>Number | Warning Name                                                           | Meaning                                                                                                                                                                                                    | Resetting             |
|-------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A.900             | Position Deviation Over-<br>flow                                       | The position deviation exceeded the parameter settings (Pn520 $\times$ Pn51E/100).                                                                                                                         | Required.             |
| A.901             | Position Deviation Over-<br>flow Alarm at Servo ON                     | The position deviation exceeded the parameter settings (Pn526 $\times$ Pn528/100) when the servo was turned ON.                                                                                            | Required.             |
| A.90A             | Gap Sensor Signal AD<br>Error                                          | The gap was 0 or lower during clearance control.                                                                                                                                                           | Required.             |
| A.90b             | Clearance Position Devia-<br>tion Overflow                             | The difference between the clearance offset refer-<br>ence and gap exceeded Pn6F0 (Clearance Position<br>Deviation Overflow Level).                                                                        | Required.             |
| A.910             | Overload                                                               | This warning occurs before an overload alarm (A.710 or A.720) occurs. If the warning is ignored and operation is continued, an alarm may occur.                                                            | Required.             |
| A.911             | Vibration                                                              | Abnormal vibration was detected during motor<br>operation. The detection level is the same as A.520.<br>Set whether to output an alarm or a warning by set-<br>ting Pn310 (Vibration Detection Selection). | Required.             |
| A.912             | Internal Temperature<br>Warning 1 (Control Board<br>Temperature Error) | The surrounding temperature of the control PCB is abnormal.                                                                                                                                                | Required.             |
| A.913             | Internal Temperature<br>Warning 2 (Power Board<br>Temperature Error)   | The surrounding temperature of the power PCB is abnormal.                                                                                                                                                  | Required.             |
| A.920             | Regenerative Overload                                                  | This warning occurs before an A.320 alarm (Regen-<br>erative Overload) occurs. If the warning is ignored<br>and operation is continued, an alarm may occur.                                                | Required.             |
| A.921             | Dynamic Brake Overload                                                 | This warning occurs before an A.731 alarm<br>(Dynamic Brake Overload) occurs. If the warning is<br>ignored and operation is continued, an alarm may<br>occur.                                              | Required.             |
| A.923             | SERVOPACK Built-in Fan<br>Stopped                                      | The fan inside the SERVOPACK stopped.                                                                                                                                                                      | Required.             |
| A.930             | Absolute Encoder Battery<br>Error                                      | This warning occurs when the voltage of absolute encoder's battery is low.                                                                                                                                 | Required.             |
| A.942             | Speed Ripple Compensa-<br>tion Information Disagree-<br>ment           | The speed ripple compensation information stored<br>in the encoder does not agree with the speed ripple<br>compensation information stored in the SERVO-<br>PACK.                                          | Required.             |
| A.94A             | Data Setting Warning 1<br>(Parameter Number Error)                     | There is an error in the parameter number for a Data Setting Warning 1 (Parameter Number) command.                                                                                                         | Automatically reset.* |
| A.94b             | Data Setting Warning 2<br>(Out of Range)                               | The command data is out of range.                                                                                                                                                                          | Automatically reset.* |
| A.94C             | Data Setting Warning 3<br>(Calculation Error)                          | A calculation error was detected.                                                                                                                                                                          | Automatically reset.* |

9.2.1 List of Warnings

Continued from previous page.

| Warning<br>Number | Warning Name                                             | Meaning                                                                                                                                              | Resetting             |
|-------------------|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| A.94d             | Data Setting Warning 4<br>(Parameter Size)               | The data sizes do not match.                                                                                                                         | Automatically reset.* |
| A.94E             | Data Setting Warning 5<br>(Latch Mode Error)             | A latch mode error was detected.                                                                                                                     | Required.             |
| A.95A             | Command Warning 1<br>(Unsatisfied Command<br>Conditions) | A command was sent when the conditions for send-<br>ing a command were not satisfied.                                                                | Automatically reset.* |
| A.95b             | Command Warning 2<br>(Unsupported Command)               | An unsupported command was sent.                                                                                                                     | Automatically reset.* |
| A.95d             | Command Warning 4<br>(Command Interference)              | There was command interference, particularly latch command interference.                                                                             | Automatically reset.* |
| A.95E             | Command Warning 5<br>(Subcommand Not Possi-<br>ble)      | The subcommand and main command interfere with each other.                                                                                           | Automatically reset.* |
| A.95F             | Command Warning 6<br>(Undefined Command)                 | An undefined command was sent.                                                                                                                       | Automatically reset.* |
| A.960             | MECHATROLINK Com-<br>munications Warning                 | A communications error occurred during MECHATROLINK communications.                                                                                  | Required.             |
| A.971             | Undervoltage                                             | This warning occurs before an A.410 alarm (Under-<br>voltage) occurs. If the warning is ignored and opera-<br>tion is continued, an alarm may occur. | Required.             |
| A.97A             | Command Warning 7<br>(Phase Error)                       | A command that cannot be executed in the current phase was sent.                                                                                     | Automatically reset.* |
| A.97b             | Data Clamp Out of Range                                  | The set command data was clamped to the mini-<br>mum or maximum value of the allowable setting<br>range.                                             | Automatically reset.* |
| A.9A0             | Overtravel                                               | Overtravel was detected while the servo was ON.                                                                                                      | Required.             |
| A.9b0             | Preventative Mainte-<br>nance Warning                    | One of the consumable parts has reached the end of its service life.                                                                                 | Required.             |

\* If using the commands for the MECHATROLINK-III standard servo profile, the warning will automatically be cleared after the correct command is received. If you use MECHATROLINK-II-compatible profile commands, send an ALM\_CLR (Clear Warning or Alarm) command to clear the warning.

Note: 1. A warning code is not output unless you set Pn001 to n.1 [] (Output both alarm codes and warning codes).

2. Use Pn008 = n.□X□□ (Warning Detection Selection) to control warning detection. However, the following warnings are not affected by the setting of Pn008 = n.□X□□ and other parameter settings are required in addition to Pn008 = n.□X□□.

| Warning                              | Parameters That Must Be Set to Select Warning Detection                                                                                                    | Reference |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| A.90A or A.90b                       | $Pn6E8 = n.\square\square X \square$ (Clearance Control Warning Selection Switch) (Not affected by the setting of $Pn008 = n.\square X \square \square$ .) | -         |
| A.911                                | $Pn310 = n.\Box\Box\BoxX$ (Vibration Detection Selection)                                                                                                  | -         |
| A.923                                | − (Not affected by the setting of Pn008 = $n.\Box X \Box \Box$ .)                                                                                          | -         |
| A.930                                | Pn008 = n. DDX (Low Battery Voltage Alarm/Warning Selection)                                                                                               | -         |
| A.942                                | Pn423 = n. DDXD (Speed Ripple Compensation Information Dis-<br>agreement Warning Detection Selection)                                                      | -         |
| A.94A to A.960 and<br>A.97A to A.97b | Pn800=n.                                                                                                                                                   | page 10-3 |
| A.971                                | $Pn008 = n.\square\square\squareX$ (Low Battery Voltage Alarm/Warning Selection)<br>(Not affected by the setting of $Pn008 = n.\squareX\square\square$ .)  | -         |
| A.9A0                                | $Pn00D = n.X\square\square\square$ (Overtravel Warning Detection Selection) (Not affected by the setting of $Pn008 = n.\squareX\square\square$ .)          | -         |
| A.9b0                                | Pn00F = n.                                                                                                                                                 | -         |

Refer to the following manual for details on the following parameters: A.911, A.930, A.942, A.971, A.9A0,

and A.9b0. Ω Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

# 9.2.2 Troubleshooting Warnings

The causes of and corrections for the warnings are given in the following table. Contact your Yaskawa representative if you cannot solve a problem with the correction given in the table.

| Warning Number:<br>Warning Name                               | Possible Cause                                                                                                                       | Confirmation                                                                                                                   | Correction                                                                                                                                                                                                                                                                                                                | Reference |
|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                                                               | The Servomotor<br>U, V, and W wiring<br>is not correct.                                                                              | Check the wiring of the<br>Servomotor's Main Cir-<br>cuit Cables.                                                              | Make sure that there are no faulty connections in the wiring for the Servomotor and encoder.                                                                                                                                                                                                                              | -         |
|                                                               | A SERVOPACK gain is too low.                                                                                                         | Check the SERVO-<br>PACK gains.                                                                                                | Increase the servo gain,<br>e.g., by using autotuning<br>without a host reference.                                                                                                                                                                                                                                        | page 5-18 |
| <b>A.900:</b><br>Position Deviation<br>Overflow               | The acceleration<br>of the position ref-<br>erence is too high.                                                                      | Reduce the reference<br>acceleration and try<br>operating the SERVO-<br>PACK.                                                  | Reduce the acceleration of<br>the position reference using<br>a MECHATROLINK com-<br>mand. Or, smooth the posi-<br>tion reference acceleration<br>by selecting the position<br>reference filter (ACCFIL)<br>using a MECHATROLINK<br>command.                                                                              | -         |
|                                                               | The excessive<br>position deviation<br>alarm level (Pn520<br>$\times$ Pn51E/100) is<br>too low for the<br>operating condi-<br>tions. | Check excessive posi-<br>tion deviation alarm<br>level (Pn520 × Pn51E/<br>100) to see if it is set to<br>an appropriate value. | Optimize the settings of<br>Pn520 and Pn51E.                                                                                                                                                                                                                                                                              | page 5-7  |
|                                                               | A failure occurred<br>in the SERVO-<br>PACK.                                                                                         | -                                                                                                                              | Turn the power supply to<br>the SERVOPACK OFF and<br>ON again. If an alarm still<br>occurs, the SERVOPACK<br>may be faulty. Replace the<br>SERVOPACK.                                                                                                                                                                     | -         |
| A.901:<br>Position Deviation<br>Overflow Alarm at<br>Servo ON | The position devi-<br>ation exceeded<br>the parameter set-<br>tings (Pn526 ×<br>Pn528/100) when<br>the servo was<br>turned ON.       | _                                                                                                                              | Optimize the setting of<br>Pn528 (Position Deviation<br>Overflow Warning Level at<br>Servo ON).                                                                                                                                                                                                                           | -         |
| A.90A:<br>Gap Sensor Signal                                   | The gap was 0 or<br>lower during<br>clearance control.                                                                               | See if the gap is 0 or<br>lower.                                                                                               | <ul> <li>Operate the system so<br/>that the gap does not<br/>become 0 or less.</li> <li>Adjust the clearance con-<br/>trol feedback offset from<br/>the SigmaWin+, or per-<br/>form Fn009 on the Digital<br/>Operator. Also, correctly<br/>set Pn6F6 (AD Input Gain)<br/>and Pn6F8 (AD Zero Cor-<br/>rection).</li> </ul> | -         |
| AD Error                                                      | Wiring of the gap<br>sensor is incor-<br>rect.                                                                                       | Check the wiring of the gap sensor.                                                                                            | Correctly wire the gap sen-<br>sor.                                                                                                                                                                                                                                                                                       | -         |
|                                                               | A failure occurred<br>in the gap sensor.                                                                                             | Check the output volt-<br>age from the gap sen-<br>sor.                                                                        | Replace the gap sensor if the output is not correct.                                                                                                                                                                                                                                                                      | -         |
|                                                               | A failure occurred<br>in the SERVO-<br>PACK.                                                                                         | -                                                                                                                              | The SERVOPACK may be faulty. Replace the SERVO-<br>PACK.                                                                                                                                                                                                                                                                  | -         |

Continued from previous page.

| Warning Number:                                                          | Possible Cause                                                                                                                                     | Confirmation                                                                                             | Correction                                                                                     | Reference  |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|------------|
| Warning Name                                                             |                                                                                                                                                    | Commation                                                                                                | Correction                                                                                     | nelelelice |
| A.90b:                                                                   | The difference<br>between the<br>clearance offset<br>reference and gap<br>exceeded Pn6F0<br>(Clearance Posi-<br>tion Deviation<br>Overflow Level). | Check the amount of deviation during clear-<br>ance control.                                             | Operate the system so that<br>Pn6F0 is not exceeded. Or,<br>set Pn6F0 to the optimum<br>value. | -          |
| Clearance Position<br>Deviation Overflow                                 | Wiring of the gap<br>sensor is incor-<br>rect.                                                                                                     | Check the wiring of the gap sensor.                                                                      | Correctly wire the gap sen-<br>sor.                                                            | -          |
|                                                                          | A failure occurred in the gap sensor.                                                                                                              | Check the output volt-<br>age from the gap sen-<br>sor.                                                  | Replace the gap sensor if the output is not correct.                                           | -          |
|                                                                          | A failure occurred<br>in the SERVO-<br>PACK.                                                                                                       | -                                                                                                        | The SERVOPACK may be faulty. Replace the SERVO-<br>PACK.                                       | -          |
|                                                                          | The wiring is not<br>correct or there is<br>a faulty contact in<br>the motor or<br>encoder wiring.                                                 | Check the wiring.                                                                                        | Make sure that the Servo-<br>motor and encoder are cor-<br>rectly wired.                       | -          |
|                                                                          | Operation was<br>performed that<br>exceeded the<br>overload protec-<br>tion characteris-<br>tics.                                                  | Check the motor over-<br>load characteristics and<br>Run command.                                        | Reconsider the load and operating conditions. Or, increase the motor capacity.                 | -          |
| A.910:<br>Overload (warning<br>before an A.710 or<br>A.720 alarm occurs) | An excessive load<br>was applied<br>during operation<br>because the Ser-<br>vomotor was not<br>driven because of<br>mechanical prob-<br>lems.      | Check the operation reference and motor speed.                                                           | Remove the mechanical problem.                                                                 | -          |
|                                                                          | The overload<br>warning level<br>(Pn52B) is not<br>suitable.                                                                                       | Check that the overload<br>warning level (Pn52B) is<br>suitable.                                         | Set a suitable overload warning level (Pn52B).                                                 | *          |
|                                                                          | A failure occurred<br>in the SERVO-<br>PACK.                                                                                                       | _                                                                                                        | The SERVOPACK may be faulty. Replace the SERVO-<br>PACK.                                       | -          |
|                                                                          | Abnormal vibra-<br>tion was detected<br>during motor<br>operation.                                                                                 | Check for abnormal<br>motor noise, and check<br>the speed and torque<br>waveforms during oper-<br>ation. | Reduce the motor speed.<br>Or, reduce the servo gain<br>with custom tuning.                    | page 5-36  |
| A.911:<br>Vibration                                                      | The setting of<br>Pn103 (Moment of<br>Inertia Ratio) is<br>greater than the<br>actual moment of<br>inertia or was<br>greatly changed.              | Check the moment of inertia ratio or mass ratio.                                                         | Set Pn103 (Moment of Iner-<br>tia Ratio) to an appropriate<br>value.                           | page 5-11  |
|                                                                          | The vibration<br>detection level<br>(Pn312 or Pn384)<br>is not suitable.                                                                           | Check that the vibration detection level (Pn312 or Pn384) is suitable.                                   | Set a suitable vibration<br>detection level (Pn312 or<br>Pn384).                               | *          |

Continued on next page.

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| Warning Number:<br>Warning Name                                                         | Possible Cause                                                                                                                     | Confirmation                                                                                                                                                                | Correction                                                                                          | Reference |
|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------|
|                                                                                         | The surrounding<br>temperature is too<br>high.                                                                                     | Check the surrounding<br>temperature using a<br>thermostat. Or, check<br>the operating status<br>with the SERVOPACK<br>installation environ-<br>ment monitor.               | Decrease the surrounding<br>temperature by improving<br>the SERVOPACK installa-<br>tion conditions. | *         |
|                                                                                         | An overload alarm<br>was reset by turn-<br>ing OFF the power<br>supply too many<br>times.                                          | Check the alarm display<br>to see if there is an<br>overload alarm.                                                                                                         | Change the method for resetting the alarm.                                                          | -         |
| A.912:<br>Internal Tempera-<br>ture Warning 1<br>(Control Board Tem-<br>perature Error) | There was an<br>excessive load or<br>operation was<br>performed that<br>exceeded the<br>regenerative pro-<br>cessing capacity.     | Use the accumulated<br>load ratio to check the<br>load during operation,<br>and use the regenera-<br>tive load ratio to check<br>the regenerative pro-<br>cessing capacity. | Reconsider the load and operating conditions.                                                       | -         |
|                                                                                         | The SERVOPACK<br>installation orien-<br>tation is not cor-<br>rect or there is<br>insufficient space<br>around the SER-<br>VOPACK. | Check the SERVO-<br>PACK installation con-<br>ditions.                                                                                                                      | Install the SERVOPACK according to specifications.                                                  | *         |
|                                                                                         | A failure occurred<br>in the SERVO-<br>PACK.                                                                                       | -                                                                                                                                                                           | The SERVOPACK may be faulty. Replace the SERVO-<br>PACK.                                            | _         |
|                                                                                         | The surrounding<br>temperature is too<br>high.                                                                                     | Check the surrounding<br>temperature using a<br>thermostat. Or, check<br>the operating status<br>with the SERVOPACK<br>installation environ-<br>ment monitor.               | Decrease the surrounding<br>temperature by improving<br>the SERVOPACK installa-<br>tion conditions. | *         |
|                                                                                         | An overload alarm<br>was reset by turn-<br>ing OFF the power<br>supply too many<br>times.                                          | Check the alarm display<br>to see if there is an<br>overload alarm.                                                                                                         | Change the method for resetting the alarm.                                                          | -         |
| A.913:<br>Internal Tempera-<br>ture Warning 2<br>(Power Board Tem-<br>perature Error)   | There was an<br>excessive load or<br>operation was<br>performed that<br>exceeded the<br>regenerative pro-<br>cessing capacity.     | Use the accumulated<br>load ratio to check the<br>load during operation,<br>and use the regenera-<br>tive load ratio to check<br>the regenerative pro-<br>cessing capacity. | Reconsider the load and operating conditions.                                                       | -         |
|                                                                                         | The SERVOPACK<br>installation orien-<br>tation is not cor-<br>rect or there is<br>insufficient space<br>around the SER-<br>VOPACK. | Check the SERVO-<br>PACK installation con-<br>ditions.                                                                                                                      | Install the SERVOPACK according to specifications.                                                  | *         |
|                                                                                         | A failure occurred<br>in the SERVO-<br>PACK.                                                                                       | _                                                                                                                                                                           | The SERVOPACK may be faulty. Replace the SERVO-<br>PACK.                                            | -         |

Continued from previous page.

| Warning Number:<br>Warning Name                                                                                                                                      | Possible Cause                                                                                                                                                                                            | Confirmation                                                                                                                              | Correction                                                                                                                                                                                                                               | Reference |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                                                                                                                                                                      | The power supply voltage exceeded the specified range.                                                                                                                                                    | Measure the power supply voltage.                                                                                                         | Set the power supply volt-<br>age within the specified<br>range.                                                                                                                                                                         | -         |
| A.920:<br>Regenerative Over-<br>load (warning before<br>an A.320 alarm<br>occurs)                                                                                    | There is insuffi-<br>cient external<br>regenerative resis-<br>tance, regenera-<br>tive resistor<br>capacity, or SER-<br>VOPACK capac-<br>ity, or there has<br>been a continuous<br>regeneration<br>state. | Check the operating<br>conditions or the<br>capacity using the Sig-<br>maJunmaSize+ Capac-<br>ity Selection Software<br>or another means. | Change the regenerative<br>resistance value, regenera-<br>tive resistance capacity, or<br>SERVOPACK capacity.<br>Reconsider the operating<br>conditions using the Sigma-<br>JunmaSize+ Capacity<br>Selection Software or other<br>means. | _         |
|                                                                                                                                                                      | There was a con-<br>tinuous regenera-<br>tion state because<br>a negative load<br>was continuously<br>applied.                                                                                            | Check the load applied<br>to the Servomotor<br>during operation.                                                                          | Reconsider the system<br>including the servo,<br>machine, and operating<br>conditions.                                                                                                                                                   | -         |
|                                                                                                                                                                      | The Servomotor<br>was rotated by an<br>external force.                                                                                                                                                    | Check the operation status.                                                                                                               | Implement measures to<br>ensure that the motor will<br>not be rotated by an exter-<br>nal force.                                                                                                                                         | -         |
| A.921:<br>Dynamic Brake<br>Overload (warning<br>before an A.731<br>alarm occurs)                                                                                     | When the Servo-<br>motor was<br>stopped with the<br>dynamic brake,<br>the rotational or<br>linear kinetic<br>energy exceeded<br>the capacity of the<br>dynamic brake<br>resistor.                         | Check the power con-<br>sumed by the DB resis-<br>tor to see how<br>frequently the DB is<br>being used.                                   | <ul> <li>Reconsider the following:</li> <li>Reduce the Servomotor command speed.</li> <li>Decrease the moment of inertia or mass.</li> <li>Reduce the frequency of stopping with the dynamic brake.</li> </ul>                           | -         |
|                                                                                                                                                                      | A failure occurred<br>in the SERVO-<br>PACK.                                                                                                                                                              | _                                                                                                                                         | The SERVOPACK may be faulty. Replace the SERVO-<br>PACK.                                                                                                                                                                                 | -         |
| A.923:<br>SERVOPACK Built-<br>in Fan Stopped                                                                                                                         | The fan inside the<br>SERVOPACK<br>stopped.                                                                                                                                                               | Check for foreign mat-<br>ter inside the SERVO-<br>PACK.                                                                                  | Remove foreign matter from<br>the SERVOPACK. If an<br>alarm still occurs, the SER-<br>VOPACK may be faulty.<br>Replace the SERVOPACK.                                                                                                    | -         |
| A.930:<br>Absolute Encoder<br>Battery Error (The<br>absolute encoder<br>battery voltage was<br>lower than the spec-<br>ified level.) (Detected<br>only when an abso- | The battery con-<br>nection is faulty or<br>a battery is not<br>connected.                                                                                                                                | Check the battery con-<br>nection.                                                                                                        | Correct the battery connec-<br>tion.                                                                                                                                                                                                     | *         |
|                                                                                                                                                                      | The battery volt-<br>age is lower than<br>the specified value<br>(2.7 V).                                                                                                                                 | Measure the battery voltage.                                                                                                              | Replace the battery.                                                                                                                                                                                                                     | *         |
| lute encoder is con-<br>nected.)                                                                                                                                     | A failure occurred<br>in the SERVO-<br>PACK.                                                                                                                                                              | -                                                                                                                                         | The SERVOPACK may be faulty. Replace the SERVO-<br>PACK.                                                                                                                                                                                 | -         |

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| Warning Number: Describle Cause Confirmation Correction Deformation    |                                                                                                              |                                                    |                                                                                                                                                                                                                             |           |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Warning Number.<br>Warning Name                                        | Possible Cause                                                                                               | Confirmation                                       | Correction                                                                                                                                                                                                                  | Reference |
|                                                                        | The speed ripple                                                                                             | -                                                  | Reset the speed ripple<br>compensation value on the<br>SigmaWin+.                                                                                                                                                           | *         |
| A.942:<br>Speed Ripple Com-<br>pensation Informa-<br>tion Disagreement | compensation<br>information stored<br>in the encoder<br>does not agree<br>with the speed<br>ripple compensa- | -                                                  | Set Pn423 to n. $\Box$ $\Box$ $\Box$ $\Box$ (Do not detect A.942 alarms).<br>However, changing the setting may increase the speed ripple.                                                                                   | *         |
|                                                                        | tion information<br>stored in the SER-<br>VOPACK.                                                            | _                                                  | Set Pn423 to n. DDD<br>(Disable speed ripple com-<br>pensation). However,<br>changing the setting may<br>increase the speed ripple.                                                                                         | *         |
| A.94A:<br>Data Setting Warn-<br>ing 1 (Parameter<br>Number Error)      | An invalid param-<br>eter number was<br>used.                                                                | Check the command that caused the warn-ing.        | Use the correct parameter number.                                                                                                                                                                                           | page 9-49 |
| A.94b:<br>Data Setting Warn-<br>ing 2 (Out of Range)                   | The set com-<br>mand data was<br>clamped to the<br>minimum or maxi-<br>mum value of the<br>setting range.    | Check the command that caused the warn-ing.        | Set the parameter within the setting range.                                                                                                                                                                                 | page 9-49 |
| A.94C:<br>Data Setting Warn-<br>ing 3 (Calculation<br>Error)           | The calculation result of the set-<br>ting is not correct.                                                   | Check the command that caused the warn-<br>ing.    | Set the parameter within the setting range.                                                                                                                                                                                 | page 9-49 |
| A.94d:<br>Data Setting Warn-<br>ing 4 (Parameter<br>Size)              | The parameter<br>size set in the<br>command is not<br>correct.                                               | Check the command that caused the warn-<br>ing.    | Set the correct parameter size.                                                                                                                                                                                             | page 9-49 |
| A.94E:<br>Data Setting Warn-<br>ing 5 (Latch Mode<br>Error)            | A latch mode error<br>was detected.                                                                          | Check the command<br>that caused the warn-<br>ing. | Change the setting of<br>Pn850 or the LT_MOD data<br>for the LTMOD_ON com-<br>mand sent by the host con-<br>troller to an appropriate<br>value.<br>(The applies when using the<br>MECHATROLINK-II-com-<br>patible profile.) | page 9-49 |
| A.95A:<br>Command Warning<br>1 (Unsatisfied Com-<br>mand Conditions)   | The command conditions are not satisfied.                                                                    | Check the command that caused the warn-ing.        | Send the command after the command conditions are satisfied.                                                                                                                                                                | page 9-49 |
| A.95b:<br>Command Warning<br>2 (Unsupported<br>Command)                | An unsupported command was received.                                                                         | Check the command that caused the warn-ing.        | Do not send unsupported commands.                                                                                                                                                                                           | page 9-49 |
| A.95d:<br>Command Warning<br>4 (Command Inter-<br>ference)             | The command<br>sending condi-<br>tions for latch-<br>related com-<br>mands was not<br>satisfied.             | Check the command that caused the warn-ing.        | Send the command after<br>the command conditions<br>are satisfied.                                                                                                                                                          | page 9-49 |
| A.95E:<br>Command Warning<br>5 (Subcommand<br>Not Possible)            | The command<br>sending condi-<br>tions for subcom-<br>mands was not<br>satisfied.                            | Check the command<br>that caused the warn-<br>ing. | Send the command after the conditions are satisfied.                                                                                                                                                                        | page 9-49 |

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|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Warning Number:<br>Warning Name                         | Possible Cause                                                                                            | Confirmation                                | Correction                                                                                                                                                                                                                                                                           | Reference |
| A.95F:<br>Command Warning<br>6 (Undefined Com-<br>mand) | An undefined<br>command was<br>sent.                                                                      | Check the command that caused the warn-ing. | Do not send undefined commands.                                                                                                                                                                                                                                                      | page 9-49 |
|                                                         | The<br>MECHATROLINK<br>Communications<br>Cable is not wired<br>correctly.                                 | Check the wiring condi-<br>tions.           | Correct the<br>MECHATROLINK communi-<br>cations cable wiring.                                                                                                                                                                                                                        | *         |
| A.960:<br>MECHATROLINK<br>Communications<br>Warning     | A<br>MECHATROLINK<br>data reception<br>error occurred<br>due to noise.                                    | Confirm the installation conditions.        | <ul> <li>Implement the following countermeasures against noise.</li> <li>Check the MECHATROLINK Communications Cable and FG wiring and implement countermeasures to prevent noise from entering.</li> <li>Attach a ferrite core to the MECHATROLINK Communications Cable.</li> </ul> | -         |
|                                                         | A failure occurred<br>in the SERVO-<br>PACK.                                                              | _                                           | The SERVOPACK may be faulty. Replace the SERVO-<br>PACK.                                                                                                                                                                                                                             | -         |
|                                                         | For a 200-V SER-<br>VOPACK, the AC<br>power supply volt-<br>age dropped<br>below 140 V.                   | Measure the power supply voltage.           | Set the power supply volt-<br>age within the specified<br>range.                                                                                                                                                                                                                     | -         |
|                                                         | For a 100-V SER-<br>VOPACK, the AC<br>power supply volt-<br>age dropped<br>below 60 V.                    | Measure the power supply voltage.           | Set the power supply volt-<br>age within the specified range.                                                                                                                                                                                                                        | -         |
| A.971:<br>Undervoltage                                  | The power supply voltage dropped during operation.                                                        | Measure the power supply voltage.           | Increase the power supply capacity.                                                                                                                                                                                                                                                  | -         |
|                                                         | A momentary<br>power interrup-<br>tion occurred.                                                          | Measure the power supply voltage.           | If you have changed the<br>setting of Pn509 (Momen-<br>tary Power Interruption Hold<br>Time), decrease the setting.                                                                                                                                                                  | *         |
|                                                         | The SERVOPACK fuse is blown out.                                                                          | _                                           | Replace the SERVOPACK and connect a reactor.                                                                                                                                                                                                                                         | *         |
|                                                         | A failure occurred<br>in the SERVO-<br>PACK.                                                              | _                                           | The SERVOPACK may be faulty. Replace the SERVO-<br>PACK.                                                                                                                                                                                                                             | _         |
| <b>A.97A:</b><br>Command Warning<br>7 (Phase Error)     | A command that<br>cannot be exe-<br>cuted in the cur-<br>rent phase was<br>sent.                          | _                                           | Send the command after the command conditions are satisfied.                                                                                                                                                                                                                         | _         |
| A.97b:<br>Data Clamp Out of<br>Range                    | The set com-<br>mand data was<br>clamped to the<br>minimum or maxi-<br>mum value of the<br>setting range. | -                                           | Set the command data within the setting ranges.                                                                                                                                                                                                                                      | -         |

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| Warning Number:<br>Warning Name                                | Possible Cause                                                                  | Confirmation                                                            | Correction                                                                                                                                                                                                                                                                                                                                                                                                         | Reference |
|----------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| A.9A0:<br>Overtravel (Over-<br>travel status was<br>detected.) | Overtravel was<br>detected while the<br>servo was ON.                           | Check the status of the overtravel signals on the input signal monitor. | <ul> <li>Even if an overtravel signal<br/>is not shown by the input<br/>signal monitor, momentary<br/>overtravel may have been<br/>detected. Take the following<br/>precautions.</li> <li>Do not specify move-<br/>ments that would cause<br/>overtravel from the host<br/>controller.</li> <li>Check the wiring of the<br/>overtravel signals.</li> <li>Implement countermea-<br/>sures against noise.</li> </ul> | *         |
| A.9b0:<br>Preventative Mainte-<br>nance Warning                | One of the con-<br>sumable parts has<br>reached the end<br>of its service life. | _                                                                       | Replace the part. Contact your Yaskawa representa-<br>tive for replacement.                                                                                                                                                                                                                                                                                                                                        | *         |

\* Refer to the following manual for details.

 Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

# 9.3 Troubleshooting Based on the Operation and Conditions of the Servomotor

This section provides troubleshooting based on the operation and conditions of the Servomotor, including causes and corrections.

Turn OFF the Servo System before troubleshooting the items shown in bold lines in the table.

| Problem           | Possible Cause                                                                                                          | Confirmation                                                                                       | Correction                                                                                                                                                                                                | Reference   |
|-------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
|                   | The control power supply is not turned ON.                                                                              | Measure the voltage<br>between control power<br>supply terminals.                                  | Correct the wiring so that the control power supply is turned ON.                                                                                                                                         | -           |
|                   | The main circuit power sup-<br>ply is not turned ON.                                                                    | Measure the voltage across the main circuit power input terminals.                                 | Correct the wiring so<br>that the main circuit<br>power supply is turned<br>ON.                                                                                                                           | -           |
|                   | The I/O signal connector<br>(CN1) pins are not wired cor-<br>rectly or are disconnected.                                | Check the wiring condi-<br>tion of the I/O signal con-<br>nector (CN1) pins.                       | Correct the wiring of the I/O signal connector (CN1) pins.                                                                                                                                                | page 3-4, * |
|                   | The wiring for the Servomo-<br>tor Main Circuit Cables or<br>Encoder Cable is discon-<br>nected.                        | Check the wiring condi-<br>tions.                                                                  | Wire the cable cor-<br>rectly.                                                                                                                                                                            | -           |
|                   | There is an overload on the Servomotor.                                                                                 | Operate the Servomotor<br>with no load and check<br>the load status.                               | Reduce the load or<br>replace the Servomo-<br>tor with a Servomotor<br>with a larger capacity.                                                                                                            | -           |
|                   | The type of encoder that is being used does not agree with the setting of $Pn002 = n.\Box X \Box \Box$ (Encoder Usage). | Check the type of the encoder that is being used and the setting of $Pn002 = n.\Box X \Box \Box$ . | Set Pn002 = $n.\Box X \Box \Box$<br>according to the type of<br>the encoder that is<br>being used.                                                                                                        | *           |
| Servomotor        | There is a mistake in the<br>input signal allocations<br>(Pn50A, Pn50B, Pn511, and<br>Pn516).                           | Check the input signal<br>allocations (Pn50A,<br>Pn50B, Pn511, and<br>Pn516).                      | Correctly allocate the<br>input signals (Pn50A,<br>Pn50B, Pn511, and<br>Pn516).                                                                                                                           | *           |
| Does Not<br>Start | The SV_ON command was not sent.                                                                                         | Check the commands sent from the host con-<br>troller.                                             | Send the SV_ON com-<br>mand from the host controller.                                                                                                                                                     | -           |
|                   | The SENS_ON (Turn ON Sensor) command was not sent.                                                                      | Check the commands sent from the host con-<br>troller.                                             | Send the commands to the SERVOPACK in the correct sequence.                                                                                                                                               | -           |
|                   | The P-OT (Forward Drive<br>Prohibit) or N-OT (Reverse<br>Drive Prohibit) signal is still<br>OFF.                        | Check the P-OT and N-<br>OT signals.                                                               | Turn ON the P-OT and N-OT signals.                                                                                                                                                                        | *           |
|                   | The safety input signals<br>(/HWBB1 or /HWBB2) were<br>not turned ON.                                                   | Check the /HWBB1 and /HWBB2 input signals.                                                         | Turn ON the /HWBB1<br>and /HWBB2 input sig-<br>nals. If you are not<br>using the safety func-<br>tion, connect the Safety<br>Jumper Connector<br>(provided as an acces-<br>sory) to CN8.                  | *           |
|                   | The FSTP (Forced Stop<br>Input) signal is still OFF.                                                                    | Check the FSTP signal.                                                                             | <ul> <li>Turn ON the FSTP signal.</li> <li>If you will not use the function to force the motor to stop, set Pn516 = n. DDX (FSTP (Forced Stop Input) Signal Allocation) to disable the signal.</li> </ul> | *           |

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|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Problem                                                 | Possible Cause                                                                                                     | Confirmation                                                                                                                                                        | Correction                                                                                                                                                                                             | Reference |
|                                                         | A failure occurred in the SER-<br>VOPACK.                                                                          | _                                                                                                                                                                   | Replace the SERVO-<br>PACK.                                                                                                                                                                            | -         |
|                                                         |                                                                                                                    | Check the setting of<br>Pn080 =n.□□□X (Polar-<br>ity Sensor Selection).                                                                                             | Correct the parameter setting.                                                                                                                                                                         | *         |
| Servomotor<br>Does Not<br>Start                         | The polarity detection was not executed.                                                                           | Check the inputs to the<br>SV_ON (Servo ON) com-<br>mand.                                                                                                           | <ul> <li>If you are using an incremental linear encoder, send the SV_ON command from the host controller.</li> <li>If you are using an absolute linear encoder, execute polarity detection.</li> </ul> | *         |
|                                                         | There is a mistake in the Ser-<br>vomotor wiring.                                                                  | Check the wiring.                                                                                                                                                   | Wire the Servomotor correctly.                                                                                                                                                                         | -         |
|                                                         | There is a mistake in the wir-<br>ing of the encoder or Serial<br>Converter Unit.                                  | Check the wiring.                                                                                                                                                   | Wire the Serial Con-<br>verter Unit correctly.                                                                                                                                                         | -         |
|                                                         | There is a mistake in the lin-<br>ear encoder wiring.                                                              | Check the wiring.                                                                                                                                                   | Wire the cable cor-<br>rectly.                                                                                                                                                                         | -         |
| Servomotor<br>Moves<br>Instanta-                        | The setting of Pn282 (Linear Encoder Scale Pitch) is not correct.                                                  | Check the setting of Pn282.                                                                                                                                         | Correct the setting of Pn282.                                                                                                                                                                          | *         |
| neously,<br>and Then<br>Stops                           | The count-up direction of the linear encoder does not match the forward direction of the Moving Coil in the motor. | Check the directions.                                                                                                                                               | Change the setting of<br>Pn080 = $n.\Box\Box X\Box$<br>(Motor Phase<br>Sequence Selection).<br>Place the linear<br>encoder and motor in<br>the same direction.                                         | *         |
|                                                         | Polarity detection was not performed correctly.                                                                    | Check to see if electrical<br>angle 2 (electrical angle<br>from polarity origin) at any<br>position is between ±10°.                                                | Correct the settings for<br>the polarity detection-<br>related parameters.                                                                                                                             | -         |
| Servomotor<br>Speed Is<br>Unstable                      | There is a faulty connection in the Servomotor wiring.                                                             | The connector connec-<br>tions for the power line<br>(U, V, and W phases) and<br>the encoder or Serial<br>Converter Unit may be<br>unstable. Check the wir-<br>ing. | Tighten any loose ter-<br>minals or connectors<br>and correct the wiring.                                                                                                                              | -         |
|                                                         | A failure occurred in the SER-<br>VOPACK.                                                                          | -                                                                                                                                                                   | Replace the SERVO-<br>PACK.                                                                                                                                                                            | -         |
| Servomotor<br>Moves with-<br>out a Refer-<br>ence Input | The count-up direction of the linear encoder does not match the forward direction of the Moving Coil in the motor. | Check the directions.                                                                                                                                               | Change the setting of<br>Pn080 = n. $\Box$ X<br>(Motor Phase<br>Sequence Selection).<br>Match the linear<br>encoder direction and<br>Servomotor direction.                                             | *         |
|                                                         | Polarity detection was not performed correctly.                                                                    | Check to see if electrical<br>angle 2 (electrical angle<br>from polarity origin) at any<br>position is between ±10°.                                                | Correct the settings for the polarity detection-related parameters.                                                                                                                                    | _         |

| Problem                              | Possible Cause                                                                                                        | Confirmation                                                                                                                                                                                                                                          | Correction                                                                                                                                                                                                              | Reference |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                                      | The setting of Pn001 =<br>n.□□□X (Motor Stopping<br>Method for Servo OFF and<br>Group 1 Alarms) is not suit-<br>able. | Check the setting of Pn001 = $n.\Box\Box\BoxX$ .                                                                                                                                                                                                      | Set Pn001 = n.□□□X<br>correctly.                                                                                                                                                                                        | -         |
| Dynamic<br>Brake Does<br>Not Operate | The dynamic brake resistor is disconnected.                                                                           | Check the moment of<br>inertia, motor speed, and<br>dynamic brake frequency<br>of use. If the moment of<br>inertia, motor speed, or<br>dynamic brake frequency<br>of use is excessive, the<br>dynamic brake resis-<br>tance may be discon-<br>nected. | Replace the SERVO-<br>PACK. To prevent dis-<br>connection, reduce the<br>load.                                                                                                                                          | -         |
|                                      | There was a failure in the dynamic brake drive circuit.                                                               | _                                                                                                                                                                                                                                                     | There is a defective<br>component in the<br>dynamic brake circuit.<br>Replace the SERVO-<br>PACK.                                                                                                                       | -         |
|                                      | The Servomotor vibrated considerably while perform-<br>ing the tuning-less function with the default settings.        | Check the waveform of the motor speed.                                                                                                                                                                                                                | Reduce the load so<br>that the moment of<br>inertia ratio or mass<br>ratio is within the allow-<br>able value, or increase<br>the load level or reduce<br>the rigidity level in the<br>tuning-less level set-<br>tings. | *         |
|                                      | The machine mounting is not secure.                                                                                   | Check to see if there are<br>any loose mounting<br>screws.                                                                                                                                                                                            | Tighten the mounting screws.                                                                                                                                                                                            | -         |
|                                      | The machine mounting is not secure.                                                                                   | Check to see if there is misalignment in the coupling.                                                                                                                                                                                                | Align the coupling.                                                                                                                                                                                                     | -         |
|                                      |                                                                                                                       | Check to see if the coupling is balanced.                                                                                                                                                                                                             | Balance the coupling.                                                                                                                                                                                                   | -         |
|                                      | The bearings are defective.                                                                                           | Check for noise and vibration around the bearings.                                                                                                                                                                                                    | Replace the Servomo-<br>tor.                                                                                                                                                                                            | -         |
| Abnormal<br>Noise from<br>Servomotor | There is a vibration source at the driven machine.                                                                    | Check for any foreign<br>matter, damage, or defor-<br>mation in the machine's<br>moving parts.                                                                                                                                                        | Consult with the machine manufacturer.                                                                                                                                                                                  | -         |
|                                      | Noise interference occurred because of incorrect I/O signal cable specifications.                                     | Check the I/O signal<br>cables to see if they sat-<br>isfy specifications. Use<br>shielded twisted-pair<br>cables or screened<br>twisted-pair cables with<br>conductors of at least<br>0.12 mm <sup>2</sup> (stranded wire).                          | Use cables that satisfy the specifications.                                                                                                                                                                             | -         |
|                                      | Noise interference occurred because an I/O signal cable is too long.                                                  | Check the lengths of the I/O signal cables.                                                                                                                                                                                                           | The I/O signal cables<br>must be no longer than<br>3 m.                                                                                                                                                                 | -         |
|                                      | Noise interference occurred<br>because of incorrect Encoder<br>Cable specifications.                                  | Check the Encoder Cable<br>to see if it satisfies speci-<br>fications. Use shielded<br>twisted-pair cables or<br>screened twisted-pair<br>cables with conductors of<br>at least 0.12 mm <sup>2</sup><br>(stranded wire).                              | Use cables that satisfy the specifications.                                                                                                                                                                             | -         |

**G** Maintenance

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|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Problem                              | Possible Cause                                                                                                                    | Confirmation                                                                                                                                                                                                                                                                      | Correction                                                                                                                                                                                                                                                                                                             | Reference |
|                                      | Noise interference occurred<br>because the Encoder Cable<br>is too long.                                                          | Check the length of the<br>Encoder Cable.                                                                                                                                                                                                                                         | <ul> <li>Rotary Servomotors:<br/>The Encoder Cable<br/>length must be 50 m<br/>max.</li> <li>Linear Servomotors:<br/>Make sure that the<br/>Serial Converter Unit<br/>cable is no longer<br/>than 20 m and that<br/>the Linear Encoder<br/>Cable and the Sensor<br/>Cable are no longer<br/>than 15 m each.</li> </ul> | -         |
|                                      | Noise interference occurred because the Encoder Cable is damaged.                                                                 | Check the Encoder Cable<br>to see if it is pinched or<br>the sheath is damaged.                                                                                                                                                                                                   | Replace the Encoder<br>Cable and correct the<br>cable installation envi-<br>ronment.                                                                                                                                                                                                                                   | -         |
|                                      | The Encoder Cable was sub-<br>jected to excessive noise interference.                                                             | Check to see if the<br>Encoder Cable is bundled<br>with a high-current line or<br>installed near a high-cur-<br>rent line.                                                                                                                                                        | Correct the cable lay-<br>out so that no surge is<br>applied by high-current<br>lines.                                                                                                                                                                                                                                 | -         |
| Abnormal<br>Noise from<br>Servomotor | There is variation in the FG<br>potential because of the<br>influence of machines on the<br>Servomotor side, such as a<br>welder. | Check to see if the machines are correctly grounded.                                                                                                                                                                                                                              | Properly ground the machines to separate them from the FG of the encoder.                                                                                                                                                                                                                                              | -         |
|                                      | There is a SERVOPACK pulse counting error due to noise.                                                                           | Check to see if there is<br>noise interference on the<br>signal line from the<br>encoder.                                                                                                                                                                                         | Implement counter-<br>measures against noise<br>for the encoder wiring.                                                                                                                                                                                                                                                | -         |
|                                      | The encoder was subjected to excessive vibration or shock.                                                                        | Check to see if vibration<br>from the machine<br>occurred. Check the Ser-<br>vomotor installation<br>(mounting surface preci-<br>sion, securing state, and<br>alignment).<br>Check the linear encoder<br>installation (mounting sur-<br>face precision and secur-<br>ing method). | Reduce machine vibra-<br>tion. Improve the<br>mounting state of the<br>Servomotor or linear<br>encoder.                                                                                                                                                                                                                | -         |
|                                      | A failure occurred in the encoder.                                                                                                | -                                                                                                                                                                                                                                                                                 | Replace the Servomo-<br>tor.                                                                                                                                                                                                                                                                                           | -         |
|                                      | A failure occurred in the Serial Converter Unit.                                                                                  | -                                                                                                                                                                                                                                                                                 | Replace the Serial Con-<br>verter Unit.                                                                                                                                                                                                                                                                                | -         |
|                                      | A failure occurred in the linear encoder.                                                                                         | _                                                                                                                                                                                                                                                                                 | Replace the linear encoder.                                                                                                                                                                                                                                                                                            | -         |

|                                                             | 1                                                                                           | Continued from previous page                                              |                                              |           |  |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------|-----------|--|
| Problem                                                     | Possible Cause                                                                              | Confirmation                                                              | Correction                                   | Reference |  |
|                                                             | The servo gains are not bal-<br>anced.                                                      | Check to see if the servo<br>gains have been cor-<br>rectly tuned.        | Perform autotuning without a host reference. | page 5-18 |  |
| Servomotor                                                  | The setting of Pn100 (Speed Loop Gain) is too high.                                         | Check the setting of<br>Pn100.<br>The default setting is Kv =<br>40.0 Hz. | Set Pn100 to an appro-<br>priate value.      | -         |  |
| Vibrates at<br>Frequency<br>of Approx.<br>200 to 400<br>Hz. | The setting of Pn102 (Posi-<br>tion Loop Gain) is too high.                                 | Check the setting of<br>Pn102.<br>The default setting is Kp<br>= 40.0/s.  | Set Pn102 to an appro-<br>priate value.      | -         |  |
|                                                             | The setting of Pn101 (Speed<br>Loop Integral Time Con-<br>stant) is not appropriate.        | Check the setting of<br>Pn101.<br>The default setting is Ti =<br>20.0 ms. | Set Pn101 to an appro-<br>priate value.      | -         |  |
|                                                             | The setting of Pn103<br>(Moment of Inertia Ratio or<br>Mass Ratio) is not appropri-<br>ate. | Check the setting of Pn103.                                               | Set Pn103 to an appro-<br>priate value.      | -         |  |
|                                                             | The servo gains are not bal-<br>anced.                                                      | Check to see if the servo gains have been cor-<br>rectly tuned.           | Perform autotuning without a host reference. | page 5-18 |  |
|                                                             | The setting of Pn100 (Speed Loop Gain) is too high.                                         | Check the setting of<br>Pn100.<br>The default setting is Kv =<br>40.0 Hz. | Set Pn100 to an appro-<br>priate value.      | -         |  |
| Large Motor<br>Speed                                        | The setting of Pn102 (Posi-<br>tion Loop Gain) is too high.                                 | Check the setting of<br>Pn102.<br>The default setting is Kp<br>= 40.0/s.  | Set Pn102 to an appro-<br>priate value.      | -         |  |
| Overshoot<br>on Starting<br>and Stop-<br>ping               | The setting of Pn101 (Speed<br>Loop Integral Time Con-<br>stant) is not appropriate.        | Check the setting of<br>Pn101.<br>The default setting is Ti =<br>20.0 ms. | Set Pn101 to an appro-<br>priate value.      | _         |  |
| -                                                           | The setting of Pn103<br>(Moment of Inertia Ratio or<br>Mass Ratio) is not appropri-<br>ate. | Check the setting of Pn103.                                               | Set Pn103 to an appro-<br>priate value.      | -         |  |
|                                                             | The torque reference is saturated.                                                          | Check the waveform of the torque reference.                               | Use the mode switch.                         | -         |  |
|                                                             | The force limits (Pn483 and Pn484) are set to the default values.                           | The default values of the force limits and Pn483 = 30% and Pn484 = 30%.   | Set Pn483 and Pn484 to appropriate values.   | *         |  |

Continued from previous page.

|                                                                      |                                                                                                                                   | Continued from previous pa                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                        |           |  |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--|
| Problem                                                              | Possible Cause                                                                                                                    | Confirmation                                                                                                                                                                                                                                                                    | Correction                                                                                                                                                                                                                                                                                                             | Reference |  |
|                                                                      | Noise interference occurred<br>because of incorrect Encoder<br>Cable specifications.                                              | Check the Encoder Cable<br>to see if it satisfies speci-<br>fications. Use shielded<br>twisted-pair cables or<br>screened twisted-pair<br>cables with conductors of<br>at least 0.12 mm <sup>2</sup><br>(stranded wire).                                                        | Use cables that satisfy the specifications.                                                                                                                                                                                                                                                                            | -         |  |
| Absolute<br>Encoder<br>Position                                      | Noise interference occurred<br>because the Encoder Cable<br>is too long.                                                          | Check the length of the<br>Encoder Cable.                                                                                                                                                                                                                                       | <ul> <li>Rotary Servomotors:<br/>The Encoder Cable<br/>length must be 50 m<br/>max.</li> <li>Linear Servomotors:<br/>Make sure that the<br/>Serial Converter Unit<br/>cable is no longer<br/>than 20 m and that<br/>the Linear Encoder<br/>Cable and the Sensor<br/>Cable are no longer<br/>than 15 m each.</li> </ul> | _         |  |
| Deviation<br>Error (The<br>position<br>that was                      | Noise interference occurred because the Encoder Cable is damaged.                                                                 | Check the Encoder Cable<br>to see if it is pinched or<br>the sheath is damaged.                                                                                                                                                                                                 | Replace the Encoder<br>Cable and correct the<br>cable installation envi-<br>ronment.                                                                                                                                                                                                                                   | -         |  |
| saved in the<br>host con-<br>troller when<br>the power<br>was turned | Replace the Encoder Cable<br>and correct the cable instal-<br>lation environment.                                                 | Check to see if the<br>Encoder Cable is bundled<br>with a high-current line or<br>installed near a high-cur-<br>rent line.                                                                                                                                                      | Correct the cable lay-<br>out so that no surge is<br>applied by high-current<br>lines.                                                                                                                                                                                                                                 | -         |  |
| OFF is dif-<br>ferent from<br>the posi-<br>tion when<br>the power    | There is variation in the FG<br>potential because of the<br>influence of machines on the<br>Servomotor side, such as a<br>welder. | Check to see if the machines are correctly grounded.                                                                                                                                                                                                                            | Properly ground the machines to separate them from the FG of the encoder.                                                                                                                                                                                                                                              | -         |  |
| was next<br>turned ON.)                                              | There is a SERVOPACK pulse counting error due to noise.                                                                           | Check to see if there is<br>noise interference on the<br>I/O signal line from the<br>encoder or Serial Con-<br>verter Unit.                                                                                                                                                     | Implement counter-<br>measures against noise<br>for the encoder or<br>Serial Converter Unit<br>wiring.                                                                                                                                                                                                                 | -         |  |
|                                                                      | The encoder was subjected to excessive vibration or shock.                                                                        | Check to see if vibration<br>from the machine<br>occurred.<br>Check the Servomotor<br>installation (mounting sur-<br>face precision, securing<br>state, and alignment).<br>Check the linear encoder<br>installation (mounting sur-<br>face precision and secur-<br>ing method). | Reduce machine vibra-<br>tion. Improve the<br>mounting state of the<br>Servomotor or linear<br>encoder.                                                                                                                                                                                                                | -         |  |
|                                                                      | A failure occurred in the encoder.<br>A failure occurred in the SER-                                                              | -                                                                                                                                                                                                                                                                               | Replace the Servomo-<br>tor or linear encoder.<br>Replace the SERVO-                                                                                                                                                                                                                                                   | -         |  |
|                                                                      | VOPACK.                                                                                                                           | -                                                                                                                                                                                                                                                                               | PACK.                                                                                                                                                                                                                                                                                                                  | -         |  |

| Problem                                                                                                                                                              | Possible Cause                                                                              | Confirmation                                                                                                   | Continued from pre                                                                                                                                           | Reference |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Absolute<br>Encoder<br>Position                                                                                                                                      | I USSIDIE Gause                                                                             | Check the error detec-<br>tion section of the host<br>controller.                                              | Correct the error detec-<br>tion section of the host<br>controller.                                                                                          | -         |
| Deviation<br>Error (The<br>position<br>that was                                                                                                                      |                                                                                             | Check to see if the host<br>controller is executing<br>data parity checks.                                     | Perform parity checks<br>for the multiturn data or<br>absolute encoder posi-<br>tion data.                                                                   | -         |
| saved in the<br>host con-<br>troller when<br>the power<br>was turned<br>OFF is dif-<br>ferent from<br>the posi-<br>tion when<br>the power<br>was next<br>turned ON.) | Host Controller Multiturn<br>Data or Absolute Encoder<br>Position Data Reading Error        | Check for noise interfer-<br>ence in the cable<br>between the SERVO-<br>PACK and the host con-<br>troller.     | Implement counter-<br>measures against noise<br>and then perform parity<br>checks again for the<br>multiturn data or abso-<br>lute encoder position<br>data. | -         |
|                                                                                                                                                                      |                                                                                             | Check the external power supply (+24 V) voltage for the input signals.                                         | Correct the external<br>power supply (+24 V)<br>voltage for the input<br>signals.                                                                            | -         |
|                                                                                                                                                                      | The P-OT/N-OT (Forward<br>Drive Prohibit or Reverse<br>Drive Prohibit) signal was<br>input. | Check the operating con-<br>dition of the overtravel<br>limit switches.                                        | Make sure that the overtravel limit switches operate correctly.                                                                                              | -         |
|                                                                                                                                                                      |                                                                                             | Check the wiring of the overtravel limit switches.                                                             | Correct the wiring of the overtravel limit switches.                                                                                                         | *         |
|                                                                                                                                                                      |                                                                                             | Check the settings of the overtravel input signal allocations (Pn50A/ Pn50B).                                  | Set the parameters to correct values.                                                                                                                        | *         |
|                                                                                                                                                                      |                                                                                             | Check for fluctuation in<br>the external power supply<br>(+24 V) voltage for the<br>input signals.             | Eliminate fluctuation<br>from the external power<br>supply (+24 V) voltage<br>for the input signals.                                                         | -         |
| Overtravel                                                                                                                                                           | The P-OT/N-OT (Forward<br>Drive Prohibit or Reverse<br>Drive Prohibit) signal mal-          | Check to see if the opera-<br>tion of the overtravel limit switches is unstable.                               | Stabilize the operating condition of the over-<br>travel limit switches.                                                                                     | -         |
| Occurred                                                                                                                                                             | functioned.                                                                                 | Check the wiring of the<br>overtravel limit switches<br>(e.g., check for cable<br>damage and loose<br>screws). | Correct the wiring of the overtravel limit switches.                                                                                                         | -         |
|                                                                                                                                                                      | There is a mistake in the allo-<br>cation of the P-OT or N-OT<br>(Forward Drive Prohibit or | Check to see if the P-OT signal is allocated in Pn50A = $n.X\square\square\square$ .                           | If another signal is allo-<br>cated in Pn50A =<br>$n.X\square\square\square$ , allocate the<br>P-OT signal instead.                                          | *         |
|                                                                                                                                                                      | Reverse Drive Prohibit) sig-<br>nal in Pn50A = n.X□□□ or<br>Pn50B = n.□□□X.                 | Check to see if the N-OT signal is allocated in Pn50B = $n.\square\square\squareX$ .                           | If another signal is allo-<br>cated in Pn50B =<br>n.□□□X, allocate the<br>N-OT signal instead.                                                               | *         |
|                                                                                                                                                                      | The selection of the Servo-<br>motor stopping method is                                     | Check the servo OFF<br>stopping method set in<br>Pn001 = $n.\Box\BoxX$ or<br>Pn001 = $n.\Box\BoxX\Box$ .       | Select a Servomotor<br>stopping method other<br>than coasting to a stop.                                                                                     | *         |
|                                                                                                                                                                      | not correct.                                                                                | Check the torque control stopping method set in Pn001 = $n.\Box\BoxX$ or Pn001 = $n.\Box\BoxX\Box$ .           | Select a Servomotor<br>stopping method other<br>than coasting to a stop.                                                                                     | *         |

|                                             |                                                                                                                                   |                                                                                                                                                                                                                                                                                 | Continued from pre                                                                                                                                                                                                                                                                                                     |           |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Problem                                     | Possible Cause                                                                                                                    | Confirmation                                                                                                                                                                                                                                                                    | Correction                                                                                                                                                                                                                                                                                                             | Reference |
| Improper<br>Stop Posi-<br>tion for          | The limit switch position and dog length are not appropri-<br>ate.                                                                | -                                                                                                                                                                                                                                                                               | Install the limit switch at the appropriate position.                                                                                                                                                                                                                                                                  | -         |
| Overtravel<br>(OT) Signal                   | The overtravel limit switch position is too close for the coasting distance.                                                      | -                                                                                                                                                                                                                                                                               | Install the overtravel limit switch at the appropriate position.                                                                                                                                                                                                                                                       | -         |
|                                             | Noise interference occurred<br>because of incorrect Encoder<br>Cable specifications.                                              | Check the Encoder Cable<br>to see if it satisfies speci-<br>fications. Use shielded<br>twisted-pair cables or<br>screened twisted-pair<br>cables with conductors of<br>at least 0.12 mm <sup>2</sup><br>(stranded wire).                                                        | Use cables that satisfy the specifications.                                                                                                                                                                                                                                                                            | -         |
|                                             | Noise interference occurred<br>because the Encoder Cable<br>is too long.                                                          | Check the length of the<br>Encoder Cable.                                                                                                                                                                                                                                       | <ul> <li>Rotary Servomotors:<br/>The Encoder Cable<br/>length must be 50 m<br/>max.</li> <li>Linear Servomotors:<br/>Make sure that the<br/>Serial Converter Unit<br/>cable is no longer<br/>than 20 m and that<br/>the Linear Encoder<br/>Cable and the Sensor<br/>Cable are no longer<br/>than 15 m each.</li> </ul> | -         |
|                                             | Noise interference occurred because the Encoder Cable is damaged.                                                                 | Check the Encoder Cable to see if it is pinched or the sheath is damaged.                                                                                                                                                                                                       | Replace the Encoder<br>Cable and correct the<br>cable installation envi-<br>ronment.                                                                                                                                                                                                                                   | -         |
| Position<br>Deviation<br>(without<br>Alarm) | The Encoder Cable was sub-<br>jected to excessive noise<br>interference.                                                          | Check to see if the<br>Encoder Cable is bundled<br>with a high-current line or<br>installed near a high-cur-<br>rent line.                                                                                                                                                      | Correct the cable lay-<br>out so that no surge is<br>applied by high-current<br>lines.                                                                                                                                                                                                                                 | -         |
|                                             | There is variation in the FG<br>potential because of the<br>influence of machines on the<br>Servomotor side, such as a<br>welder. | Check to see if the machines are correctly grounded.                                                                                                                                                                                                                            | Properly ground the machines to separate them from the FG of the encoder.                                                                                                                                                                                                                                              | -         |
|                                             | There is a SERVOPACK pulse counting error due to noise.                                                                           | Check to see if there is<br>noise interference on the<br>I/O signal line from the<br>encoder or Serial Con-<br>verter Unit.                                                                                                                                                     | Implement counter-<br>measures against noise<br>for the encoder wiring<br>or Serial Converter Unit<br>wiring.                                                                                                                                                                                                          | -         |
|                                             | The encoder was subjected to excessive vibration or shock.                                                                        | Check to see if vibration<br>from the machine<br>occurred.<br>Check the Servomotor<br>installation (mounting sur-<br>face precision, securing<br>state, and alignment).<br>Check the linear encoder<br>installation (mounting sur-<br>face precision and secur-<br>ing method). | Reduce machine vibra-<br>tion. Improve the<br>mounting state of the<br>Servomotor or linear<br>encoder.                                                                                                                                                                                                                | -         |
|                                             | The coupling between the machine and Servomotor is not suitable.                                                                  | Check to see if position<br>offset occurs at the cou-<br>pling between machine<br>and Servomotor.                                                                                                                                                                               | Correctly secure the coupling between the machine and Servomotor.                                                                                                                                                                                                                                                      | -         |

Continued from previous page.

|                                |                                                                                                                 |                                                                                                                                                                                                                              | Continued from pre                                                                                                                                      |           |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Problem                        | Possible Cause                                                                                                  | Confirmation                                                                                                                                                                                                                 | Correction                                                                                                                                              | Reference |
| Position<br>Deviation          | Noise interference occurred because of incorrect I/O signal cable specifications.                               | Check the I/O signal<br>cables to see if they sat-<br>isfy specifications. Use<br>shielded twisted-pair<br>cables or screened<br>twisted-pair cables with<br>conductors of at least<br>0.12 mm <sup>2</sup> (stranded wire). | Use cables that satisfy the specifications.                                                                                                             | -         |
| (without<br>Alarm)             | Noise interference occurred because an I/O signal cable is too long.                                            | Check the lengths of the I/O signal cables.                                                                                                                                                                                  | The I/O signal cables<br>must be no longer than<br>3 m.                                                                                                 | -         |
|                                | An encoder fault occurred.<br>(The pulse count does not<br>change.)                                             | -                                                                                                                                                                                                                            | Replace the Servomo-<br>tor or linear encoder.                                                                                                          | -         |
|                                | A failure occurred in the SER-<br>VOPACK.                                                                       | -                                                                                                                                                                                                                            | Replace the SERVO-<br>PACK.                                                                                                                             | -         |
|                                | The surrounding air tempera-<br>ture is too high.                                                               | Measure the surrounding air temperature around the Servomotor.                                                                                                                                                               | Reduce the surround-<br>ing air temperature to<br>40°C or less.                                                                                         | -         |
|                                | The surface of the Servomo-<br>tor is dirty.                                                                    | Visually check the surface for dirt.                                                                                                                                                                                         | Clean dirt, dust, and oil from the surface.                                                                                                             | -         |
| Servomotor<br>Overheated       | There is an overload on the Servomotor.                                                                         | Check the load status with a monitor.                                                                                                                                                                                        | If the Servomotor is<br>overloaded, reduce the<br>load or replace the<br>Servo Drive with a<br>SERVOPACK and Ser-<br>vomotor with larger<br>capacities. | -         |
|                                | Polarity detection was not performed correctly.                                                                 | Check to see if electrical angle 2 (electrical angle from polarity origin) at any position is between $\pm 10^{\circ}$ .                                                                                                     | Correct the settings for<br>the polarity detection-<br>related parameters.                                                                              | -         |
|                                | Clearance control is disabled<br>with the Clearance Control<br>Selection Switch (Pn6E8 =<br>$n.\Box\Box\Box$ ). | The Clearance Control<br>Selection Switch is set to<br>disable clearance control<br>(Pn6E8 = n.□□□X).                                                                                                                        | Set the Clearance Control Selection Switch to enable clearance control (Pn6E8 = $n.\Box\Box\Box$ 1).                                                    | -         |
| Clearance<br>control is<br>not | CLC_OFS (offset reference)<br>in the CLC_CTRL (Clearance<br>Control) command is 0.                              | Check CLC_OFS (offset reference) in CLC_CTRL.                                                                                                                                                                                | Set CLC_OFS (offset reference) to the value of the offset.                                                                                              | page 4-6  |
| executed.                      | Pn6F2 (Maximum Clearance Offset) is 0.                                                                          | Check Pn6F2 (Maximum Clearance Offset).                                                                                                                                                                                      | Set Pn6F2 (Maximum Clearance Offset).                                                                                                                   | page 4-7  |
|                                | Pn6F4 (Minimum Clearance Offset) is 0.                                                                          | Check Pn6F4 (Minimum<br>Clearance Offset).                                                                                                                                                                                   | Set Pn6F4 (Minimum<br>Clearance Offset).                                                                                                                | page 4-7  |

Continued from previous page.

Refer to the following manual for details.
 Σ-7-Series Σ-7S SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

# **Parameter Lists**

Parameter Recording Table ..... 10-56

10.3

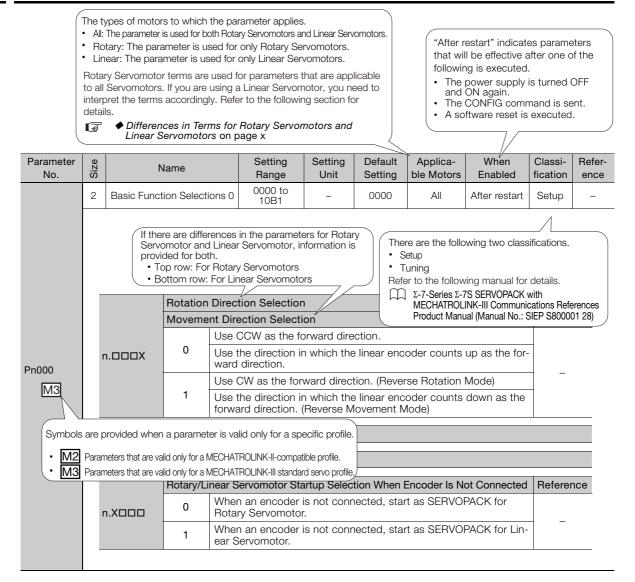
This chapter provides information on the parameters.

-10

10.1.1 Interpreting the Parameter Lists

# **10.1 List of Servo Parameters**

# 10.1.1 Interpreting the Parameter Lists



#### List of Servo Parameters 10.1.2

The following table lists the parameters.

Note: Do not change the following parameters from their default settings. • Reserved parameters

- Parameters not given in this manualParameters that are not valid for the Servomotor that you are using, as given in the parameter table

| Parameter<br>No. | Size | Name                  |                    | Setting<br>Range                                                                  | Setting<br>Unit                                                                                             | Default<br>Setting | Applicable<br>Motors | When<br>Enabled | Classi-<br>fication | Refer-<br>ence |      |
|------------------|------|-----------------------|--------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|--------------------|----------------------|-----------------|---------------------|----------------|------|
|                  | 2    | Basic Fund<br>tions 0 | ction Sele         | C-                                                                                | 0000 to<br>10B1                                                                                             | -                  | 0000                 | All             | After<br>restart    | Setup          | -    |
|                  | _    |                       |                    |                                                                                   |                                                                                                             |                    |                      |                 |                     |                |      |
|                  |      |                       | Rotation           | n Dire                                                                            | ction Selectio                                                                                              | n                  |                      |                 |                     |                | ance |
|                  |      |                       | Moveme             | ent Di                                                                            | rection Select                                                                                              | ion                |                      |                 |                     | neiere         | ince |
|                  |      | n.000X                |                    | Use                                                                               | CCW as the f                                                                                                | orward dir         | ection.              |                 |                     |                |      |
|                  | 1    |                       | 0                  | Use the direction in which the linear encoder counts up as the forward direction. |                                                                                                             |                    |                      |                 |                     | - *1           | *1   |
|                  |      |                       |                    | Use                                                                               | Use CW as the forward direction. (Reverse Rotation Mode)                                                    |                    |                      |                 |                     | .1             |      |
| Pn000            |      |                       | 1                  |                                                                                   | Use the direction in which the linear encoder counts down as the forward direction. (Reverse Movement Mode) |                    |                      |                 |                     |                |      |
|                  | I    | n.🗆🗆 X 🗆              | Reserve            | d par                                                                             | ameter (Do no                                                                                               | ot change.         | )                    |                 |                     |                |      |
|                  | 1    | n.¤X¤¤                | Reserve            | d par                                                                             | ameter (Do no                                                                                               | ot change.         | )                    |                 |                     |                |      |
|                  |      |                       | Rotary/L<br>nected | inea                                                                              | Servomotor                                                                                                  | Startup Se         | election W           | hen Encoder     | Is Not Con-         | Refere         | ence |
|                  | 1    | n.XDDD                | 0                  | When an encoder is not connected, start as SERVOPACK for Rotary Servomotor.       |                                                                                                             |                    |                      |                 | *1                  |                |      |
|                  |      |                       | 1                  |                                                                                   | en an encoder<br>Servomotor.                                                                                | is not cor         | inected, st          | art as SERVC    | PACK for Lin        |                |      |

| Parameter<br>No. | Size | N                         | lame            |                                                                                                                            | Setting<br>Range                 | Setting<br>Unit         | Default<br>Setting                                            | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
|------------------|------|---------------------------|-----------------|----------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------|---------------------------------------------------------------|----------------------|------------------|---------------------|----------------|
|                  | 2    | Application<br>Selections | n Function<br>1 |                                                                                                                            | 0000 to<br>1142                  | _                       | 0000                                                          | All                  | After<br>restart | Setup               | -              |
|                  |      |                           | Motor St        | onni                                                                                                                       | ng Method for                    | r Servo Ol              | F and Gr                                                      | oup 1 Alarms         |                  | Refere              | ence           |
|                  |      |                           | 0               |                                                                                                                            | p the motor by                   |                         |                                                               |                      |                  |                     |                |
|                  |      | n.□□□X                    | 1               |                                                                                                                            | p the motor by<br>dynamic brake  |                         | ing dynam                                                     | ic brake and         | then release     | *1                  |                |
|                  |      |                           | 2               | Coa                                                                                                                        | ast the motor t                  | o a stop w              | vithout the                                                   | dynamic brak         | æ.               |                     |                |
|                  |      |                           | Overtrave       | el St                                                                                                                      | opping Metho                     | d                       |                                                               |                      |                  | Refere              | ence           |
|                  |      | n.□□X□                    | 0               | Apply the dynamic brake or coast the motor to a stop (use the stopping method set in Pn001 = $n.\square\square\squareX$ ). |                                  |                         |                                                               |                      |                  |                     |                |
|                  |      |                           | 1               |                                                                                                                            | elerate the mo<br>maximum toro   |                         |                                                               |                      |                  |                     |                |
| Pn001            |      |                           | 2               |                                                                                                                            | elerate the mo<br>maximum toro   |                         |                                                               |                      | in Pn406 as      | *1                  |                |
|                  |      |                           | 3               | Decelerate the motor to a stop using the deceleration time set in Pn30A and then servo-lock the motor.                     |                                  |                         |                                                               |                      |                  |                     |                |
|                  |      |                           | 4               |                                                                                                                            | elerate the mo<br>0A and then le |                         |                                                               | he deceleratio       | on time set in   |                     |                |
|                  |      |                           | Main Circ       | cuit I                                                                                                                     | Power Supply                     | AC/DC In                | put Select                                                    | ion                  |                  | Refere              | ence           |
|                  |      |                           | 0               |                                                                                                                            | ut AC power as<br>L3 terminals ( |                         |                                                               |                      | ng the L1, L2    | ,                   |                |
|                  |      | n.¤X¤¤                    | 1               | and                                                                                                                        | ut DC power as                   | s or the B <sup>-</sup> | $\stackrel{\cdot}{\ominus}$ and $\stackrel{\cdot}{\ominus}$ 2 |                      | 0                | *1                  |                |
|                  |      | n.XDDD                    | Reserved        | l par                                                                                                                      | ameter (Do no                    | ot change.              | )                                                             |                      |                  |                     |                |
|                  | '    |                           |                 |                                                                                                                            |                                  |                         |                                                               |                      |                  |                     |                |

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| Parameter<br>No. | Size | 1                                      | lame     |                                                                                  | Setting<br>Range                              | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled              | Classi-<br>fication | Refe<br>enc |  |
|------------------|------|----------------------------------------|----------|----------------------------------------------------------------------------------|-----------------------------------------------|-----------------|--------------------|----------------------|------------------------------|---------------------|-------------|--|
|                  | 2    | 2 Application Function<br>Selections 2 |          |                                                                                  | 0000 to<br>4213                               | -               | 0011               | -                    | After<br>restart             | Setup               | _           |  |
|                  |      |                                        | Option   |                                                                                  | INK Comman                                    |                 |                    | ed Control           | Applicable<br>Motors         | Refere              | ence        |  |
|                  |      | n.🗆🗆 🗆 X                               | 0        | Reserved setting (Do not use.)<br>Use TLIM as the torgue limit.                  |                                               |                 |                    |                      |                              |                     | *2          |  |
|                  |      |                                        | 2        | Reserved setting (Do not use.)                                                   |                                               |                 |                    |                      | All                          | *2                  |             |  |
|                  |      |                                        | 3        |                                                                                  | erved setting                                 |                 | ,                  |                      |                              |                     |             |  |
|                  |      |                                        | Torque C | rque Control Option                                                              |                                               |                 |                    |                      | Applicable<br>Motors         | Refere              | ence        |  |
|                  |      | n.🗆🗆 X 🗆                               | 0        | Rese                                                                             | erved setting                                 | (Do not us      | e.)                |                      |                              |                     |             |  |
|                  |      |                                        | 1        |                                                                                  | the speed lim<br>ed limit.                    | VLIM) as the    | All                | *2                   |                              |                     |             |  |
| Pn002            |      |                                        | Encoder  | Encoder Usage                                                                    |                                               |                 |                    |                      | Applicable<br>Motors Referen |                     | ence        |  |
|                  |      | n.¤X¤¤                                 | 0        | Use the encoder according to encoder specifica-<br>tions.                        |                                               |                 |                    | All                  |                              |                     |             |  |
|                  |      |                                        | 1        | Use the encoder as an incremental encoder.                                       |                                               |                 |                    |                      |                              | *1                  | *1          |  |
|                  |      |                                        | 2        | Use<br>enco                                                                      | the encoder as a single-turn absolute<br>der. |                 |                    |                      | Rotary                       |                     |             |  |
|                  |      |                                        | External | External Encoder Usage                                                           |                                               |                 |                    |                      | Applicable<br>Motors         | Refere              | ence        |  |
|                  |      |                                        | 0        | Do r                                                                             | not use an ext                                | ernal enco      | der.               |                      |                              |                     |             |  |
|                  |      | n.X000                                 | 1        | The external encoder moves in the forward direc-<br>tion for CCW motor rotation. |                                               |                 |                    |                      |                              |                     |             |  |
|                  |      |                                        | 2        | Rese                                                                             | erved setting                                 | (Do not us      | e.)                |                      | Rotary                       | *1                  |             |  |
|                  |      |                                        | 3        |                                                                                  | external enco<br>for CCW mot                  |                 |                    | erse direc-          |                              |                     |             |  |
|                  |      |                                        | 4        | Dee                                                                              | erved setting                                 | Denetue         | c )                |                      |                              |                     |             |  |

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|                  |      | -                                                                                   |                                            |                                                       | Continued from previous page |                          |                              |                  |                     |                |  |  |
|------------------|------|-------------------------------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------|------------------------------|--------------------------|------------------------------|------------------|---------------------|----------------|--|--|
| Parameter<br>No. | Size | N                                                                                   | lame                                       | Setting<br>Range                                      | Setting<br>Unit              | Default<br>Setting       | Applicable<br>Motors         | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |  |  |
|                  | 2    | Application<br>Selections                                                           |                                            | 0000 to<br>105F                                       | -                            | 0002                     | All                          | Immedi-<br>ately | Setup               | page<br>8-5    |  |  |
|                  | ,    |                                                                                     |                                            |                                                       |                              |                          |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | Analog Mo                                  | Analog Monitor 1 Signal Selection                     |                              |                          |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 00                                         | Motor speed (1<br>Motor speed (1                      | ,                            | ,                        |                              |                  |                     |                |  |  |
|                  |      |                                                                                     |                                            | Speed reference (1 V/1,000 min <sup>-1</sup> )        |                              |                          |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 01                                         | Speed reference (1 V/1,000 mm/s)                      |                              |                          |                              |                  |                     |                |  |  |
|                  |      |                                                                                     |                                            | Torque reference (1 V/100% rated torque)              |                              |                          |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 02                                         | Force reference (1 V/100% rated force)                |                              |                          |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 03                                         | Position deviation                                    | on (0.05 V/                  | reference                | unit)                        |                  |                     |                |  |  |
|                  |      |                                                                                     |                                            | Position amplifie                                     | er deviation                 | n (after eleo            | ctronic gear) (              | 0.05 V/encc      | der pulse           | unit)          |  |  |
|                  |      |                                                                                     | 04                                         | Position amplifie pulse unit)                         | er deviation                 | n (after elec            | ctronic gear) (              | 0.05 V/linea     | r encoder           |                |  |  |
|                  |      |                                                                                     | 05                                         | Position referen                                      | ce speed (                   | 1 V/1,000                | min⁻¹)                       |                  |                     |                |  |  |
|                  |      |                                                                                     | 05                                         | Position reference speed (1 V/1,000 mm/s)             |                              |                          |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 06                                         | Reserved setting (Do not use.)                        |                              |                          |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 07                                         | Load-motor position deviation (0.01 V/reference unit) |                              |                          |                              |                  |                     |                |  |  |
|                  | 08   | Positioning completion (positioning completed: 5 V, positioning not completed: 0 V) |                                            |                                                       |                              |                          |                              |                  |                     |                |  |  |
| Pn006            |      | n.🗆🗆 XX                                                                             | 09                                         | Speed feedforw                                        | ard (1 V/1                   | ,000 min <sup>-1</sup> ) |                              |                  |                     |                |  |  |
| 11000            |      |                                                                                     | 09                                         | Speed feedforward (1 V/1,000 mm/s)                    |                              |                          |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | Torque feedforward (1 V/100% rated torque) |                                                       |                              |                          |                              |                  |                     |                |  |  |
|                  |      |                                                                                     |                                            | 0A Force feedforward (1 V/100% rated force)           |                              |                          |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 0B                                         | Active gain (1st                                      | gain: 1 V,                   | 2nd gain: 2              | 2 V, 3rd gain:               | 3 V, 4th gair    | n: 4 V)             |                |  |  |
|                  |      |                                                                                     | 0C                                         | Completion of p<br>pleted: 0 V)                       | osition ref                  | erence dis <sup>.</sup>  | tribution (com               | pleted: 5 V,     | not com-            |                |  |  |
|                  |      |                                                                                     | 0D                                         | External encode                                       | er speed (1                  | V/1,000 r                | nin <sup>-1</sup> : value at | the motor s      | shaft)              |                |  |  |
|                  |      |                                                                                     | 0E                                         | Reserved setting                                      | g (Do not i                  | use.)                    |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 0F                                         | Reserved setting                                      | g (Do not i                  | use.)                    |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 10                                         | Main circuit DC                                       | voltage                      |                          |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 11 to 33                                   | Reserved setting                                      | g (Do not i                  | use.)                    |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 34                                         | Difference betwo<br>unit)                             | een cleara                   | nce offset               | reference and                | d gap (0.05 \    | //1 referen         | ce             |  |  |
|                  |      |                                                                                     | 35                                         | Gap (0.01 V/1 re                                      | eference u                   | nit)                     |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 36 to 46                                   | Reserved setting                                      | g (Do not i                  | use.)                    |                              |                  |                     |                |  |  |
|                  |      |                                                                                     | 47                                         | Quadrant project                                      | tion corre                   | ction amou               | unt (1 V/100%                | rated torqu      | e)                  |                |  |  |
|                  |      |                                                                                     | 48 to 5F                                   | Reserved setting                                      | g (Do not i                  | use.)                    |                              |                  |                     |                |  |  |
|                  |      | n.🗆X🗆 🗆                                                                             | Reserved                                   | parameter (Do no                                      | ot change                    | )                        |                              |                  |                     |                |  |  |
|                  |      | n.XDDD                                                                              | Reserved                                   | parameter (Do no                                      | ot change                    | )                        |                              |                  |                     |                |  |  |
|                  |      |                                                                                     |                                            |                                                       |                              |                          |                              |                  |                     |                |  |  |

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| Parameter | (D)  |                           |                                     | Setting                                                                                                                        | Setting      | Default                | Applicable                   | tinued fron<br>When | Classi-     | Refer       |  |
|-----------|------|---------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------|------------------------------|---------------------|-------------|-------------|--|
| No.       | Size | N                         | ame                                 | Range                                                                                                                          | Unit         | Setting                | Motors                       | Enabled             | fication    | ence        |  |
|           | 2    | Application<br>Selections |                                     | 0000 to<br>105F                                                                                                                | _            | 0000                   | All                          | Immedi-<br>ately    | Setup       | page<br>8-5 |  |
|           |      | Selections                | 1                                   | 1031                                                                                                                           |              |                        |                              | aleiy               |             | 0-0         |  |
|           | 1    |                           | Analog Mo                           | nitor 2 Signal Se                                                                                                              | election     |                        |                              |                     |             |             |  |
|           |      |                           | 00                                  | Motor speed (1                                                                                                                 | V/1,000 m    | nin <sup>-1</sup> )    |                              |                     |             |             |  |
|           |      |                           | 00                                  | Motor speed (1                                                                                                                 | V/1,000 m    | nm/s)                  |                              |                     |             |             |  |
|           |      |                           | 01                                  | Speed reference                                                                                                                | e (1 V/1,00  | 00 min <sup>-1</sup> ) |                              |                     |             |             |  |
|           |      |                           |                                     | Speed reference (1 V/1,000 mm/s)                                                                                               |              |                        |                              |                     |             |             |  |
|           |      |                           | 02                                  | Torque reference (1 V/100% rated torque)                                                                                       |              |                        |                              |                     |             |             |  |
|           |      |                           |                                     | Force reference (1 V/100% rated force)                                                                                         |              |                        |                              |                     |             |             |  |
|           |      |                           | 03                                  | Position deviation (0.05 V/reference unit)<br>Position amplifier deviation (after electronic gear) (0.05 V/encoder pulse unit) |              |                        |                              |                     |             |             |  |
|           |      |                           | 04                                  |                                                                                                                                |              |                        |                              |                     |             |             |  |
|           |      |                           |                                     | Position amplifie<br>pulse unit)                                                                                               | er deviation | i (alter ele           | ctronic gear) (              | 0.05 V/IIIIea       | rencoder    |             |  |
|           |      |                           | 05                                  | Position referen                                                                                                               | ce speed (   | 1 V/1,000              | min <sup>-1</sup> )          |                     |             |             |  |
|           |      |                           |                                     | Position referen                                                                                                               | •            |                        | mm/s)                        |                     |             |             |  |
|           |      |                           | 06                                  | Reserved settin                                                                                                                |              |                        |                              |                     |             |             |  |
|           |      |                           | 07                                  | Load-motor pos                                                                                                                 |              | `                      |                              | /                   |             |             |  |
|           |      |                           | 08                                  | Positioning completion (positioning completed: 5 V, positioning not com-<br>pleted: 0 V)                                       |              |                        |                              |                     |             |             |  |
| Pn007     |      | n.🗆🗆 XX                   | 09                                  | Speed feedforw                                                                                                                 | vard (1 V/1  | ,000 min <sup>-1</sup> | )                            |                     |             |             |  |
|           |      |                           |                                     | Speed feedforward (1 V/1,000 mm/s)                                                                                             |              |                        |                              |                     |             |             |  |
|           |      |                           | 0A                                  | Torque feedforv                                                                                                                |              |                        |                              |                     |             |             |  |
|           |      |                           |                                     | Force feedforwa                                                                                                                |              |                        | ,                            |                     |             |             |  |
|           |      |                           | 0B                                  | Active gain (1st                                                                                                               | -            | -                      | -                            | ÷                   |             |             |  |
|           |      |                           | 0C                                  | Completion of p<br>pleted: 0 V)                                                                                                | osition ref  | erence dis             | tribution (com               | ipleted: 5 V,       | not com-    |             |  |
|           |      |                           | 0D                                  | External encode                                                                                                                | er speed (1  | V/1,000 r              | min <sup>-1</sup> : value at | the motor s         | haft)       |             |  |
|           |      |                           | 0E                                  | Reserved settin                                                                                                                | g (Do not ı  | use.)                  |                              |                     |             |             |  |
|           |      |                           | 0F                                  | Reserved settin                                                                                                                | g (Do not ı  | use.)                  |                              |                     |             |             |  |
|           |      |                           | 10                                  | Main circuit DC                                                                                                                | v            |                        |                              |                     |             |             |  |
|           |      |                           | 11 to 33                            | Reserved settin                                                                                                                | • •          |                        |                              |                     |             |             |  |
|           |      |                           | 34                                  | Difference betw<br>unit)                                                                                                       | een cleara   | nce offset             | reference and                | d gap (0.05 \       | //1 referer | ice         |  |
|           |      |                           | 35                                  | Gap (0.01 V/1 r                                                                                                                | eference u   | nit)                   |                              |                     |             |             |  |
|           |      |                           | 36 to 46                            | Reserved settin                                                                                                                | g (Do not ı  | use.)                  |                              |                     |             |             |  |
|           |      |                           | 47                                  | Quadrant projec                                                                                                                | ction corre  | ction amou             | unt (1 V/100%                | rated torqu         | e)          |             |  |
|           |      |                           | 48 to 5F                            | Reserved settin                                                                                                                | g (Do not ı  | use.)                  |                              |                     |             |             |  |
|           |      | n.¤X¤¤                    | Reserved                            | parameter (Do n                                                                                                                | ot change    | )                      |                              |                     |             |             |  |
|           | 1    | n.XDDD                    | Reserved parameter (Do not change.) |                                                                                                                                |              |                        |                              |                     |             |             |  |
|           | -    |                           |                                     |                                                                                                                                | en ango      |                        |                              |                     |             |             |  |

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| Parameter<br>No. | Size | N                         | ame                                | Setting<br>Range                                                                                                                                                                                                                                                         | Setting<br>Unit                                                                                                                             | Default<br>Setting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Cor<br>Applicable<br>Motors                                                                                 | tinued from<br>When<br>Enabled                                                   | n previous<br>Classi-<br>fication | s page<br>Refer<br>ence |  |  |  |
|------------------|------|---------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------|-------------------------|--|--|--|
|                  | 2    | Application<br>Selections | 1 Function<br>8                    | 0000 to<br>7121                                                                                                                                                                                                                                                          | -                                                                                                                                           | 4000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Rotary                                                                                                      | After<br>restart                                                                 | Setup                             | _                       |  |  |  |
|                  |      |                           | Low Batte                          | ery Voltage Alarm                                                                                                                                                                                                                                                        | /Warning                                                                                                                                    | Selection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                             |                                                                                  | Refere                            | ence                    |  |  |  |
|                  |      | n.□□□X                    |                                    | Output alarm (A.8<br>Output warning (A                                                                                                                                                                                                                                   | ,                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 0                                                                                                           |                                                                                  | *1                                |                         |  |  |  |
|                  |      |                           | Function                           | Selection for Und                                                                                                                                                                                                                                                        | ervoltage                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                             |                                                                                  | Refere                            | ence                    |  |  |  |
| D=000            |      |                           | 0                                  | Do not detect und                                                                                                                                                                                                                                                        | dervoltage                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                             |                                                                                  |                                   |                         |  |  |  |
| Pn008            |      | n.🗆🗆 X 🗆                  |                                    | Detect undervolta                                                                                                                                                                                                                                                        | 0                                                                                                                                           | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                             |                                                                                  | *1                                |                         |  |  |  |
|                  |      |                           |                                    | Detect undervolta<br>Pn425 (i.e., only ir                                                                                                                                                                                                                                |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | torque with F                                                                                               | n424 and                                                                         |                                   |                         |  |  |  |
|                  |      |                           | Warning [                          | Detection Selection                                                                                                                                                                                                                                                      | on                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                             |                                                                                  | Refere                            | ence                    |  |  |  |
|                  |      | n.¤X¤¤                    |                                    |                                                                                                                                                                                                                                                                          |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                             |                                                                                  |                                   |                         |  |  |  |
|                  |      |                           | 1                                  | 1 Do not detect warnings except for A.971.                                                                                                                                                                                                                               |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                             |                                                                                  |                                   |                         |  |  |  |
|                  |      | n.XDDD                    | Reserved                           | parameter (Do no                                                                                                                                                                                                                                                         | ot change                                                                                                                                   | .)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                             |                                                                                  |                                   |                         |  |  |  |
|                  | 2    | Application<br>Selections | Function<br>A                      | 0000 to<br>0044                                                                                                                                                                                                                                                          | -                                                                                                                                           | 0001                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | All                                                                                                         | After<br>restart                                                                 | Setup                             | _                       |  |  |  |
|                  |      | n.000X                    | Motor Sto<br>0<br>1<br>2<br>3<br>4 | Apply the dynamistopping Method fc<br>Apply the dynamistopping method<br>Decelerate the m<br>the maximum tord<br>status after stopp<br>Decelerate the m<br>the maximum tord<br>Decelerate the m<br>Pn30A. Use the s<br>stopping.<br>Decelerate the m<br>Pn30A and then I | c brake or<br>set in PnC<br>otor to a s<br>que. Use the<br>ing.<br>otor to a s<br>que and the<br>otor to a s<br>setting of F<br>otor to a s | coast the<br>$001 = n.\square$<br>top using the setting of<br>top using the let the<br>top using the let the<br>top using the let the let the let the<br>top using the let the | □□X).<br>the torque set<br>of Pn001 = n.<br>the torque set<br>motor coast.<br>the decelerati<br>□□□X for th | t in Pn406 as<br>DDX for th<br>t in Pn406 as<br>on time set ir<br>e status after | ופ<br>אין<br>אין<br>ר             |                         |  |  |  |
| Pn00A            |      |                           | Stopping                           | Method for Force                                                                                                                                                                                                                                                         | ed Stops                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                             |                                                                                  | Refere                            | ence                    |  |  |  |
|                  |      |                           | 0                                  | Apply the dynami stopping method                                                                                                                                                                                                                                         | c brake or<br>set in Pn0                                                                                                                    | 01 = n. <b>□</b> [                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ⊐□X).                                                                                                       |                                                                                  |                                   |                         |  |  |  |
|                  |      |                           | 1                                  | Decelerate the m<br>the maximum tore<br>status after stopp                                                                                                                                                                                                               | que. Use t                                                                                                                                  | top using t<br>he setting (                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | he torque set<br>of Pn001 = n.                                                                              | t in Pn406 as<br>□□□X for th                                                     | ie                                |                         |  |  |  |
|                  |      | n.00X0                    | 2                                  | Decelerate the m<br>the maximum tor                                                                                                                                                                                                                                      |                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                             | t in Pn406 as                                                                    | *]                                |                         |  |  |  |
|                  |      |                           |                                    | <b>D I I I</b>                                                                                                                                                                                                                                                           | otor to a s                                                                                                                                 | top using t                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | he decelerati                                                                                               | on time set in                                                                   | e set in<br>s after               |                         |  |  |  |
|                  |      |                           | 3                                  | Decelerate the m<br>Pn30A. Use the s<br>stopping.                                                                                                                                                                                                                        | setting of F                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                             |                                                                                  |                                   |                         |  |  |  |
|                  |      |                           | 3                                  | Pn30A. Use the s                                                                                                                                                                                                                                                         | etting of F<br>otor to a s                                                                                                                  | top using t                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                             |                                                                                  |                                   |                         |  |  |  |
|                  |      | n.0X00                    | 4                                  | Pn30A. Use the s<br>stopping.<br>Decelerate the m                                                                                                                                                                                                                        | etting of F<br>otor to a s<br>et the mo                                                                                                     | top using t<br>tor coast.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                             |                                                                                  |                                   |                         |  |  |  |

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|------------------|------|---------------------------|-----------------|----------------------------------------|-------------------------------|--------------------------|--------------------|----------------------|------------------|---------------------|----------------|--|--|--|
| Parameter<br>No. | Size | N                         | lame            |                                        | Setting<br>Range              | Setting<br>Unit          | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |  |  |  |
|                  | 2    | Application<br>Selections | n Function<br>B |                                        | 0000 to<br>1121               | -                        | 0001               | All                  | After<br>restart | Setup               | _              |  |  |  |
|                  |      |                           | Operator        | Para                                   | meter Display                 | v Selectior              | 1                  |                      |                  | Refere              | nce            |  |  |  |
|                  |      | n.🗆 🗆 🗆 X                 | 0               |                                        | lay only setup                |                          |                    |                      |                  |                     |                |  |  |  |
|                  |      |                           | 1               | Disp                                   | lay all parame                | ters.                    |                    |                      |                  | *1                  |                |  |  |  |
|                  |      |                           | Motor Sto       |                                        | ng Method for                 | •                        |                    |                      |                  | Refere              | nce            |  |  |  |
| D.00D            |      | ~ 00/0                    | 0               |                                        | o the motor by                | 0                        |                    |                      |                  |                     |                |  |  |  |
| Pn00B            |      | n.□□X□                    | 1               | stop                                   | ly the dynamic pping method s | set in Pn00              | 01 = n.□□          | I□X).                | op (use the      | *1                  |                |  |  |  |
|                  |      |                           | 2               | Set                                    | the stopping n                | nethod wit               | h Pn00A =          | = n.□□□X.            |                  |                     |                |  |  |  |
|                  |      |                           | Power In        | put S                                  | election for T                | hree-phas                | e SERVOR           | PACK                 |                  | Refere              | nce            |  |  |  |
|                  |      | n.¤X¤¤                    |                 |                                        | a three-phase                 |                          |                    |                      |                  |                     |                |  |  |  |
|                  |      |                           |                 |                                        | a three-phase<br>bly input.   | power su                 | pply input         | as a single-pl       | hase power       | *1                  |                |  |  |  |
|                  |      | n.X000                    | Reserved        | l para                                 | ameter (Do no                 | t change.)               | 1                  |                      |                  |                     |                |  |  |  |
|                  |      |                           |                 |                                        |                               |                          |                    |                      |                  |                     |                |  |  |  |
|                  | 2    | Application<br>Selections |                 |                                        | 0000 to<br>0131               | -                        | 0000               | -                    | After<br>restart | Setup               | *1             |  |  |  |
|                  |      | Colocitorio               |                 |                                        | 0101                          |                          |                    |                      | rootart          |                     |                |  |  |  |
|                  |      |                           |                 |                                        |                               |                          |                    |                      |                  |                     |                |  |  |  |
|                  |      |                           | Function        | Sele                                   | ection for Test               | without a                | Motor              |                      |                  | Applica<br>Motor    |                |  |  |  |
|                  |      | n.DDDX                    | 0               |                                        |                               |                          |                    |                      |                  |                     |                |  |  |  |
|                  |      |                           | 1               | 1 Enable tests without a motor.        |                               |                          |                    |                      |                  |                     |                |  |  |  |
|                  |      |                           | Encoder         | Res                                    | olution for Tes               | ts without               | a Motor            |                      | Applica<br>Motor |                     |                |  |  |  |
| Pn00C            |      |                           | 0               | 0 Use 13 bits.                         |                               |                          |                    |                      |                  |                     |                |  |  |  |
| 1 11000          |      | n.¤¤X¤                    | 1               | Use                                    | e 20 bits.                    |                          |                    |                      |                  | Rotar               | v              |  |  |  |
|                  |      |                           | 2               |                                        | e 22 bits.                    |                          |                    |                      |                  | , in the team       | ,              |  |  |  |
|                  |      |                           | 3               | Use                                    | e 24 bits.                    |                          |                    |                      |                  |                     |                |  |  |  |
|                  |      |                           | Encoder         | Туре                                   | e Selection for               | Tests wit                | hout a Mo          | tor                  |                  | Applica<br>Motor    | ble<br>s       |  |  |  |
|                  |      | n.¤X¤¤                    | 0               | Use                                    | an increment                  | al encoder               |                    |                      |                  | All                 |                |  |  |  |
|                  |      |                           | 1               | Use                                    | e an absolute e               | encoder.                 |                    |                      |                  |                     |                |  |  |  |
|                  |      | n.XDDD                    | Reserved        | d par                                  | rameter (Do no                | ot change                | )                  |                      |                  |                     |                |  |  |  |
|                  |      | Application               | n Eurotion      |                                        | 0000 to                       |                          |                    |                      | After            |                     |                |  |  |  |
|                  | 2    | Selections                | D               |                                        | 1001                          | -                        | 0000               | All                  | restart          | Setup               | *1             |  |  |  |
|                  |      |                           |                 |                                        |                               |                          |                    |                      |                  |                     |                |  |  |  |
|                  |      | n.DDDX                    | Reserved        | d par                                  | ameter (Do no                 | ot change                | .)                 |                      |                  |                     |                |  |  |  |
|                  |      | n.🗆🗆 X 🗆                  | Reserved        | d par                                  | ameter (Do no                 | ot change                | )                  |                      |                  |                     |                |  |  |  |
| Dn00D            |      |                           |                 |                                        |                               |                          |                    |                      |                  |                     |                |  |  |  |
| Pn00D            |      | n.¤X¤¤                    | Reserved        | Overtravel Warning Detection Selection |                               |                          |                    |                      |                  |                     |                |  |  |  |
| Pn00D            |      | n.¤X¤¤                    |                 | el W                                   | arning Detecti                | on Select                | on                 |                      |                  |                     |                |  |  |  |
| Pn00D            |      | n.¤X¤¤                    |                 | el Wa                                  | `                             | on Select<br>ertravel wa | on                 |                      |                  |                     |                |  |  |  |

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|                  | Continued from previous page. |                                                                    |                                           |                                     |                 |                    |                      |                  |                     |                |  |  |  |
|------------------|-------------------------------|--------------------------------------------------------------------|-------------------------------------------|-------------------------------------|-----------------|--------------------|----------------------|------------------|---------------------|----------------|--|--|--|
| Parameter<br>No. | Size                          | N                                                                  | lame                                      | Setting<br>Range                    | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |  |  |  |
|                  | 2                             | Application<br>Selections                                          | n Function<br>F                           | 0000 to<br>2011                     | _               | 0000               | All                  | After<br>restart | Setup               | _              |  |  |  |
|                  |                               |                                                                    |                                           |                                     |                 |                    |                      |                  |                     |                |  |  |  |
|                  |                               |                                                                    | Preventat                                 | tive Maintenance                    | Warning S       | election           |                      |                  | Reference           | e              |  |  |  |
|                  |                               | n.🗆🗆 🗆 X                                                           |                                           | o not detect preve                  |                 |                    | -                    |                  | *1                  |                |  |  |  |
| Pn00F            | _                             |                                                                    | 1 C                                       | Detect preventative                 | maintena        | nce warnir         | igs.                 |                  |                     |                |  |  |  |
|                  |                               | n.🗆🗆 X 🗆                                                           | Reserved                                  | parameter (Do no                    | ot change       | )                  |                      |                  |                     |                |  |  |  |
|                  | [                             | n.¤X¤¤                                                             | Reserved                                  | parameter (Do no                    | ot change       | )                  |                      |                  |                     |                |  |  |  |
|                  | ļ                             | n.XDDD                                                             | Reserved                                  | Reserved parameter (Do not change.) |                 |                    |                      |                  |                     |                |  |  |  |
|                  |                               |                                                                    |                                           |                                     |                 |                    |                      | [                |                     |                |  |  |  |
| Pn021            | 2                             | Reserved p<br>not change                                           | parameter (<br>e.)                        | Do _                                | -               | 0000               | All                  | -                | -                   | -              |  |  |  |
|                  | 2                             | Function S<br>during Cut                                           | election<br>ting Feedir                   | 0000 to<br>0021                     | -               | 0000               | All                  | After<br>restart | Setup               | page<br>7-2    |  |  |  |
|                  |                               | Predictive Control Selection (during Cutting Feed)                 |                                           |                                     |                 |                    |                      |                  |                     |                |  |  |  |
|                  | Ī                             |                                                                    | Predictive                                | Control Selection                   | (during Cu      | tting Feed         | )                    |                  |                     |                |  |  |  |
|                  |                               | n.🗆🗆 🛛 X                                                           | 0                                         | Disable predictive                  | control.        |                    |                      |                  |                     |                |  |  |  |
|                  |                               |                                                                    | 1                                         | Enable predictive                   | control.        |                    |                      |                  |                     |                |  |  |  |
| Pn070            | Ī                             | Selection Switch for Quadrant Projection Correction during Cutting |                                           |                                     |                 |                    |                      |                  |                     |                |  |  |  |
| 111070           |                               | n.🗆 🗆 X 🗆                                                          | 0 Disable quadrant projection correction. |                                     |                 |                    |                      |                  |                     |                |  |  |  |
|                  |                               |                                                                    | 1 Reserved setting (Do not use.)          |                                     |                 |                    |                      |                  |                     |                |  |  |  |
|                  | -                             |                                                                    | 2 Enable quadrant projection correction.  |                                     |                 |                    |                      |                  |                     |                |  |  |  |
|                  | [                             | n.¤X¤¤                                                             | Reserved parameter (Do not change.)       |                                     |                 |                    |                      |                  |                     |                |  |  |  |
|                  |                               | n.XDDD                                                             | Reserved                                  | parameter (Do not                   | change.)        |                    |                      |                  |                     |                |  |  |  |
|                  | -                             |                                                                    |                                           |                                     |                 |                    |                      |                  | 1                   | [              |  |  |  |
|                  | 2                             | Rapid Fee<br>Selection                                             | d Function                                | 0000 to<br>0022                     | -               | 0000               | All                  | After<br>restart | Setup               | -              |  |  |  |
|                  |                               |                                                                    |                                           |                                     |                 |                    |                      |                  |                     |                |  |  |  |
|                  |                               |                                                                    |                                           | lethod Selection                    |                 |                    |                      |                  |                     |                |  |  |  |
|                  |                               | n.🗆 🗆 🗆 X                                                          |                                           | No function.                        |                 |                    |                      |                  |                     |                |  |  |  |
|                  |                               | /                                                                  | 1                                         | Use feedforward (                   | ,               |                    |                      |                  |                     |                |  |  |  |
| Pn071            |                               |                                                                    | 2                                         | Use model followi                   | 0               |                    |                      |                  |                     |                |  |  |  |
|                  |                               | n.🗆 🗆 X 🗆                                                          | Reserved                                  | parameter (Do not                   | change.)        |                    |                      |                  |                     |                |  |  |  |
|                  |                               | n.🗆X🗆                                                              | Reserved                                  | parameter (Do not                   | change.)        |                    |                      |                  |                     |                |  |  |  |
|                  |                               | n.XDDD Reserved parameter (Do not change.)                         |                                           |                                     |                 |                    |                      |                  |                     |                |  |  |  |
|                  |                               |                                                                    |                                           |                                     |                 |                    |                      |                  |                     |                |  |  |  |

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|------------------|---------------------|---------------------------|---------------------------------------------------------------------|------------------|-----------------|--------------------|----------------------|------------------|---------------------|----------------|--|--|
| Parameter<br>No. | Size                | Ν                         | Jame                                                                | Setting<br>Range | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |  |  |
|                  | 2                   | Application<br>Selections | n Function                                                          | 0000 to<br>1111  | -               | 0000               | Linear               | After<br>restart | Setup               | _              |  |  |
|                  |                     |                           |                                                                     |                  |                 |                    |                      | - ootai t        |                     |                |  |  |
|                  |                     |                           | Polarity Sens                                                       | sor Selection    |                 |                    |                      |                  | Refere              | nce            |  |  |
|                  | r                   | 1.000X                    |                                                                     | e polarity senso |                 |                    |                      |                  | *1                  |                |  |  |
|                  | -                   |                           | 1 Do                                                                | not use polarity | / sensor.       |                    |                      |                  |                     |                |  |  |
|                  |                     |                           | Motor Phase                                                         | Sequence Sel     | ection          |                    |                      |                  | Reference           |                |  |  |
| Pn080            | r                   | n.00X0                    |                                                                     | a phase-A lead   |                 |                    |                      |                  | *1                  |                |  |  |
|                  |                     |                           | 1 Set                                                               | a phase-B lead   | d as a pha      | se sequen          | ce of U, V, an       | d W.             | -                   |                |  |  |
|                  | r                   | n.0X00                    | Reserved pa                                                         | rameter (Do no   | t change.)      | I                  |                      |                  |                     |                |  |  |
|                  |                     |                           | Calculation N                                                       | Method for Max   | imum Spe        | ed or End          | oder Output          | Pulses           | Refere              | ence           |  |  |
|                  | r                   | n.X000                    | 0 Cal                                                               | d maximum        | — page -        | 11.2               |                      |                  |                     |                |  |  |
|                  |                     |                           | 1 Cal<br>set                                                        | page             |                 |                    |                      |                  |                     |                |  |  |
|                  | 2                   | Application<br>Selections | n Function<br>81                                                    | 0000 to<br>1111  | -               | 0000               | All                  | After<br>restart | Setup               | *1             |  |  |
|                  |                     |                           |                                                                     |                  |                 |                    |                      |                  |                     |                |  |  |
|                  | 1                   |                           | Phase-C Pu                                                          | lse Output Sele  | ection          |                    |                      |                  |                     |                |  |  |
|                  |                     | n.DDDX                    | 0 Οι                                                                |                  |                 |                    |                      |                  |                     |                |  |  |
| Pn081            |                     |                           | 1 Output phase-C pulses in both the forward and reverse directions. |                  |                 |                    |                      |                  |                     |                |  |  |
|                  |                     | n.DDXD                    | Reserved pa                                                         |                  |                 |                    |                      |                  |                     |                |  |  |
|                  | 1                   | n.¤X¤¤                    | Reserved parameter (Do not change.)                                 |                  |                 |                    |                      |                  |                     |                |  |  |
|                  |                     | n.X000                    | Reserved pa                                                         | arameter (Do no  | ot change.      | )                  |                      |                  |                     |                |  |  |
| Pn100            | 2                   | Speed Loo                 | op Gain                                                             | 10 to 20,000     | 0.1 Hz          | 400                | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn101            | 2                   | Speed Loo<br>Time Cons    | op Integral<br>stant                                                | 15 to 51,200     | 0.01 ms         | 2000               | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn102            | 2                   | Position L                | oop Gain                                                            | 10 to 20,000     | 0.1/s           | 400                | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn103            | 2                   | Moment o                  | f Inertia Ratio                                                     | 0 to 20,000      | 1%              | 100                | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn104            | 2                   | Gain                      | peed Loop                                                           | 10 to 20,000     | 0.1 Hz          | 400                | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn105            | 2                   | Integral Ti               | peed Loop<br>me Constant                                            | 15 to 51,200     | 0.01 ms         | 2000               | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn106            | 2                   | Second Po<br>Gain         | osition Loop                                                        | 10 to 20,000     | 0.1/s           | 400                | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn109            | 2                   | Feedforwa                 |                                                                     | 0 to 100         | 1%              | 0                  | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn10A            | 2                   | Feedforwa<br>Constant     | ard Filter Time                                                     | 0 to 6,400       | 0.01 ms         | 0                  | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |

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|------------------|------|---------------------------|--------------------------|-------------------------------------------|--------------------------|--------------------|----------------------|------------------|---------------------|----------------|--|
| Parameter<br>No. | Size | N                         | ame                      | Setting<br>Range                          | Setting<br>Unit          | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |  |
|                  | 2    | Gain Applic<br>tions      | cation Selec             | - 0000 to<br>5334                         | -                        | 0004               | All                  | _                | Setup               | _              |  |
|                  |      |                           | Mode Swi                 | tching Selection                          |                          |                    |                      | When<br>Enabled  | d Refere            | ence           |  |
|                  |      |                           |                          | Use the internal to<br>level setting: Pn1 |                          | rence as th        | e condition          |                  |                     |                |  |
|                  |      |                           | 1                        | Jse the speed ret<br>ing: Pn10D).         |                          |                    | ,                    |                  |                     |                |  |
|                  |      | n.000X                    | 1                        | Jse the speed ret<br>ing: Pn181).         |                          |                    | ,                    | Immedi           |                     |                |  |
|                  |      |                           | 2                        | Jse the accelerat setting: Pn10E).        |                          |                    | ,                    | ately            | *1                  |                |  |
| Pn10B            |      |                           | :                        | Jse the accelerat setting: Pn182).        |                          |                    |                      |                  |                     |                |  |
|                  |      |                           | 3                        | Use the position of<br>ing: Pn10F).       |                          |                    | lition (level set    | :-               |                     |                |  |
|                  |      |                           | 4                        | Do not use mode                           |                          |                    |                      |                  |                     |                |  |
|                  |      |                           | •                        | PI control Metho                          | bd                       |                    |                      | When<br>Enabled  | d Refere            | ence           |  |
|                  |      | n.□□X□                    | 1                        | -P control                                |                          |                    |                      | After<br>restart | *1                  |                |  |
|                  |      |                           |                          | Reserved settings                         |                          |                    |                      | _                |                     |                |  |
|                  |      | n.¤X¤¤                    |                          | parameter (Do no                          |                          | ,                  |                      |                  |                     |                |  |
|                  |      | n.XDDD                    | Reserved                 | parameter (Do no                          | ot change                | .)                 |                      |                  |                     |                |  |
| Pn10C            | 2    | Mode Swit<br>for Torque   |                          | 0 to 800                                  | 1%                       | 200                | All                  | Immedi-<br>ately | Tuning              | *1             |  |
| Pn10D            | 2    | Mode Swit<br>for Speed    | ching Level<br>Reference | 0 to 10,000                               | 1 min <sup>-1</sup>      | 0                  | Rotary               | Immedi-<br>ately | Tuning              | *1             |  |
| Pn10E            | 2    | Mode Swit<br>for Acceler  | ching Level<br>ation     | 0 to 30,000                               | 1 min <sup>-1</sup> /s   | 0                  | Rotary               | Immedi-<br>ately | Tuning              | *1             |  |
| Pn10F            | 2    | Mode Swit<br>for Positior | ching Level<br>Deviation | 0 to 10,000                               | 1 refer-<br>ence<br>unit | 0                  | All                  | Immedi-<br>ately | Tuning              | *1             |  |
| Pn11F            | 2    | Position Int<br>Constant  | egral Time               | 0 to 50,000                               | 0.1 ms                   | 0                  | All                  | Immedi-<br>ately | Tuning              | *1             |  |
| Pn121            | 2    | Friction Co<br>Gain       | mpensatior               | 10 to 1,000                               | 1%                       | 100                | All                  | Immedi-<br>ately | Tuning              | *1             |  |
| Pn123            | 2    | Coefficient               |                          | 010100                                    | 1%                       | 0                  | All                  | Immedi-<br>ately | Tuning              | *1             |  |
| Pn124            | 2    | Frequency                 |                          | 10,000                                    | 0.1 Hz                   | 0                  | All                  | Immedi-<br>ately | Tuning              | *1             |  |
| Pn125            | 2    | Friction Co<br>Gain Corre | mpensatior<br>ction      | 1 to 1,000                                | 1%                       | 100                | All                  | Immedi-<br>ately | Tuning              | *1             |  |
| Pn12B            | 2    |                           | d Loop Gai               | ,                                         | 0.1 Hz                   | 400                | All                  | Immedi-<br>ately | Tuning              | -              |  |
| Pn12C            | 2    | gral Time C               |                          | <sup>-</sup> 15 to 51,200                 | 0.01 ms                  | 2,000              | All                  | Immedi-<br>ately | Tuning              | _              |  |
| Pn12D            | 2    | Third Posit<br>Gain       | •                        | 10 to 20,000                              | 0.1/s                    | 400                | All                  | Immedi-<br>ately | Tuning              | -              |  |
| Pn12E            | 2    | Fourth Spe<br>Gain        |                          | 10 to 20,000                              | 0.1 Hz                   | 400                | All                  | Immedi-<br>ately | Tuning              | -              |  |
| Pn12F            | 2    | 0                         | ne Constan               | t 15 to 51,200                            | 0.01 ms                  | 2,000              | All                  | Immedi-<br>ately | Tuning              | -              |  |
| Pn130            | 2    | Fourth Pos<br>Gain        | шоп соор                 | 10 to 20,000                              | 0.1/s                    | 400                | All                  | Immedi-<br>ately | Tuning              | -              |  |
| Pn13D            | 2    | Current Ga                | in Level                 | 100 to 2,000                              | 1%                       | 2000               | All                  | Immedi-<br>ately | Tuning              | *1             |  |

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|------------------|------|--------------------------------------|-----------------------------------|------------------------------------------------------------|-----------------|--------------------|----------------------|------------------|---------------------|----------------|--|--|
| Parameter<br>No. | Size | N                                    | ame                               | Setting<br>Range                                           | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |  |  |
|                  | 2    | Model Folletrol-Relate               | owing Con-<br>d Selections        | 0000 to<br>s 1120                                          | -               | 0000               | All                  | Immedi-<br>ately | Tuning              | -              |  |  |
|                  |      |                                      |                                   | I                                                          |                 |                    |                      |                  |                     |                |  |  |
|                  |      | n.DDDX                               | Reserved                          | parameter (Do n                                            | ot change       | .)                 |                      |                  |                     |                |  |  |
|                  |      |                                      | Vibration                         | Suppression Sele                                           | ection          |                    |                      |                  | Referer             | ice            |  |  |
|                  |      | n.🗆 🗆 X 🗆                            |                                   | o not perform vib                                          |                 |                    |                      |                  | _                   |                |  |  |
| Pn140            |      |                                      |                                   | erform vibration s                                         |                 |                    | 1 .                  | ,                | *1                  |                |  |  |
| F11140           |      |                                      | 2 P                               | erform vibration s                                         | uppressior      | n for two s        | pecific frequei      | ncies.           |                     |                |  |  |
|                  |      | n.¤X¤¤                               | Reserved                          | parameter (Do n                                            | ot change       | .)                 |                      |                  |                     |                |  |  |
|                  |      |                                      |                                   | Speed Feedforward (VFF)/Torque Feedforward (TFF) Selection |                 |                    |                      |                  |                     |                |  |  |
|                  |      | n.XDDD                               |                                   | Do not use mode<br>ward together.                          | I following     | control an         | d speed/torqu        | ue feedfor-      |                     |                |  |  |
|                  |      | 11.7000                              | 1                                 | Use model follow together.                                 | ing control     | and speed          | d/torque feed        | forward          | - page 5-           | 25             |  |  |
|                  |      | togethel.                            |                                   |                                                            |                 |                    |                      |                  |                     |                |  |  |
| Pn141            | 2    | Model Foll<br>trol Gain              | owing Con-                        | 10 to 20,000                                               | 0.1/s           | 500                | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn142            | 2    | Model Foll<br>trol Gain C            | owing Con-<br>orrection           | 500 to 2,000                                               | 0.1%            | 1000               | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn143            | 2    |                                      | owing Con-<br>the Forwar          |                                                            | 0.1%            | 1000               | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn144            | 2    |                                      | owing Con-<br>the Revers          |                                                            | 0.1%            | 1000               | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn145            | 2    | Vibration S<br>Frequency             | Suppression<br>A                  | <sup>1</sup> 10 to 2,500                                   | 0.1 Hz          | 500                | All                  | Immedi-<br>ately | Tuning              | page<br>5-50   |  |  |
| Pn146            | 2    | Vibration S<br>Frequency             | Suppression<br>B                  | <sup>1</sup> 10 to 2,500                                   | 0.1 Hz          | 700                | All                  | Immedi-<br>ately | Tuning              | page<br>5-50   |  |  |
| Pn147            | 2    | Model Foll<br>trol Speed<br>Compensa | owing Con-<br>Feedforwai<br>ation | rd 0 to 10,000                                             | 0.1%            | 1000               | All                  | Immedi-<br>ately | Tuning              | *1             |  |  |
| Pn14A            | 2    | Vibration S<br>Frequency             | Suppression                       | <sup>2</sup> 10 to 2,000                                   | 0.1 Hz          | 800                | All                  | Immedi-<br>ately | Tuning              | page<br>5-50   |  |  |
| Pn14B            | 2    | Vibration S<br>Correction            | Suppression                       | <sup>2</sup> 10 to 1,000                                   | 1%              | 100                | All                  | Immedi-<br>ately | Tuning              | page<br>5-50   |  |  |
|                  | 2    | Control-Re<br>tions                  | elated Selec                      | - 0000 to<br>0021                                          | -               | 0021               | All                  | After<br>restart | Tuning              | -              |  |  |
|                  |      |                                      |                                   |                                                            |                 |                    |                      |                  |                     |                |  |  |
|                  | 1    |                                      | Model Fol                         | lowing Control T                                           | pe Select       | ion                |                      |                  | Refere              | ence           |  |  |
|                  |      | n.🗆🗆 🗆 X                             |                                   | Use model follow                                           |                 |                    |                      |                  |                     |                |  |  |
| Pn14F            |      |                                      | 1                                 | *                                                          |                 |                    |                      |                  |                     |                |  |  |
|                  |      | n.DDXD                               | Reserved                          | parameter (Do n                                            | ot change       | .)                 |                      |                  |                     | _              |  |  |
|                  |      | n.🗆X🗆                                | Reserved                          | parameter (Do n                                            | ot change       | .)                 |                      |                  |                     |                |  |  |
|                  | [    | n.XDDD                               | Reserved                          | parameter (Do n                                            | ot change       | .)                 |                      |                  |                     |                |  |  |
|                  | -    |                                      |                                   |                                                            |                 |                    |                      |                  |                     |                |  |  |

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|------------------|------|-------------------------------------------------------------|-------------------------|--------------------------------|-----------------|--------------------|----------------------|------------------|---------------------|----------------|--|--|--|--|
| Parameter<br>No. | Size | N                                                           | lame                    | Setting<br>Range               | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |  |  |  |  |
|                  | 2    | Predictive<br>Selection                                     |                         | 0000 to<br>0014                | -               | 0012               | All                  | After<br>restart | Setup               | page<br>7-2    |  |  |  |  |
|                  |      |                                                             |                         |                                |                 |                    |                      |                  |                     |                |  |  |  |  |
|                  |      |                                                             | Predictive Co           | ntrol Model Re                 | sponse Tir      | ne Consta          | nt Selection         |                  |                     |                |  |  |  |  |
|                  |      |                                                             |                         | served setting                 |                 | ,                  |                      |                  |                     |                |  |  |  |  |
|                  |      | n.000X                                                      |                         | Reserved setting (Do not use.) |                 |                    |                      |                  |                     |                |  |  |  |  |
|                  |      |                                                             |                         | Tp = 0.001                     |                 |                    |                      |                  |                     |                |  |  |  |  |
|                  |      |                                                             |                         | Tp = 0.002                     |                 |                    |                      |                  |                     |                |  |  |  |  |
| Pn150            |      |                                                             | 4 Re                    | Reserved setting (Do not use.) |                 |                    |                      |                  |                     |                |  |  |  |  |
|                  |      |                                                             | Predictive Co           | Control Selection              |                 |                    |                      |                  |                     |                |  |  |  |  |
|                  |      | n.🗆🗆 X 🗆                                                    | 0 Re                    | Reserved setting (Do not use.) |                 |                    |                      |                  |                     |                |  |  |  |  |
|                  |      |                                                             | 1 Kp                    | interlocking pr                | ediction pa     | arameter s         | etting               |                  |                     |                |  |  |  |  |
|                  |      |                                                             | Posonuod par            | ameter (Do not                 | change)         |                    |                      |                  |                     |                |  |  |  |  |
|                  | _    | n.¤X¤¤                                                      | neserveu par            | ameter (D0 not                 | change.)        |                    |                      |                  |                     |                |  |  |  |  |
|                  |      | n.XDDD                                                      | Reserved par            | ameter (Do not                 | change.)        |                    |                      |                  |                     |                |  |  |  |  |
|                  |      |                                                             |                         |                                |                 |                    |                      |                  |                     |                |  |  |  |  |
| Pn151            | 2    | Predictive<br>Acceleration<br>tion Gain                     | Control<br>on/Decelera- | 0 to 300                       | 1%              | 100                | All                  | Immedi-<br>ately | Tuning              | _              |  |  |  |  |
| Pn152            | 2    | Predictive<br>Weight Ra                                     |                         | 0 to 300                       | 1%              | 100                | All                  | Immedi-<br>ately | Tuning              | -              |  |  |  |  |
| Pn153            | 2    | Predictive<br>Equivalent                                    |                         | 10 to 300                      | 1%              | 100                | All                  | Immedi-<br>ately | Tuning              | page<br>7-2    |  |  |  |  |
| Pn154            | 2    | Predictive<br>Speed Fee<br>Gain                             |                         | 0 to 5,000                     | 0.1%            | 0                  | All                  | Immedi-<br>ately | Tuning              | page<br>7-2    |  |  |  |  |
| Pn155            | 2    | Predictive<br>Torque Fe<br>Gain                             |                         | 0 to 5,000                     | 0.1%            | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |  |  |  |  |
| Pn156            | 2    | Predictive<br>Torque Fe<br>ter Time C                       | edforward Fil-          | 0 to 65,535                    | 0.01 ms         | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |  |  |  |  |
| Pn157            | 2    | Predictive<br>Parameter                                     |                         | 0 to 100                       | 0.1             | 80                 | All                  | Immedi-<br>ately | Tuning              | -              |  |  |  |  |
| Pn158            | 2    | Predictive<br>Parameter                                     |                         | 0 to 5,000                     | 0.1             | 0                  | All                  | Immedi-<br>ately | Tuning              | -              |  |  |  |  |
| Pn159            | 2    | Predictive<br>Parameter                                     |                         | -90 to 1,000                   | 0.01            | 0                  | All                  | Immedi-<br>ately | Tuning              | -              |  |  |  |  |
| Pn15A            | 2    | Predictive Control<br>Equivalent Kp Fine-Tun-<br>ing Amount |                         | -10,000 to<br>32,767           | 0.1/s           | 0                  | All                  | Immedi-<br>ately | Tuning              | -              |  |  |  |  |

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|------------------|----------------|----------------------------|------------------------------|---------------------------------------------------------------|---------------------|--------------------|----------------------|------------------|---------------------|----------------|
| Parameter<br>No. | Size           | N                          | ame                          | Setting<br>Range                                              | Setting<br>Unit     | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
|                  | 2              |                            | nance Con-<br>d Selections   | 0000 to<br>0011                                               | -                   | 0010               | All                  | Immedi-<br>ately | Tuning              | -              |
|                  |                |                            | Anti-Reso                    | nance Control Se                                              | election            |                    |                      |                  | Refere              | ence           |
|                  |                | n.🗆🗆 🗆 X                   |                              | Do not use anti-re<br>Jse anti-resonanc                       |                     | ontrol.            |                      |                  | — page {            | 5-45           |
|                  |                |                            | Anti-Reso                    | nance Control Ac                                              | ljustment           | Selection          |                      |                  | Refere              | ence           |
| Pn160            |                | n.00X0                     | 0 t                          | Do not adjust anti<br>ion of autotuning<br>reference, and cu  | without a           | host refere        |                      |                  | st                  |                |
|                  |                |                            | 1 8                          | Adjust anti-resona<br>autotuning withou<br>ence, and custom   | t a host re         |                    |                      |                  | page (              | 0-20           |
|                  |                | n.¤X¤¤                     | Reserved                     | parameter (Do no                                              | ot change.          | )                  |                      |                  |                     |                |
|                  |                | n.XDDD                     |                              |                                                               |                     |                    |                      |                  |                     |                |
| Pn161            | 2              | Anti-Resor                 | nance Fre-                   | 10 to 20,000                                                  | 0.1 Hz              | 1000               | All                  | Immedi-<br>ately | Tuning              | page<br>5-45   |
| Pn162            | 2              | Anti-Resor<br>Correction   |                              | 1 to 1,000                                                    | 1%                  | 100                | All                  | Immedi-<br>ately | Tuning              | page<br>5-45   |
| Pn163            | 2              | Anti-Resor<br>ing Gain     | nance Damp                   | 0- 0 to 300                                                   | 1%                  | 0                  | All                  | Immedi-<br>ately | Tuning              | page<br>5-45   |
| Pn164            | 2              |                            | nance Filter<br>stant 1 Cor- | -1,000 to<br>1,000                                            | 0.01 ms             | 0                  | All                  | Immedi-<br>ately | Tuning              | page<br>5-45   |
| Pn165            | 2              |                            | nance Filter<br>stant 2 Cor- | -1,000 to<br>1,000                                            | 0.01 ms             | 0                  | All                  | Immedi-<br>ately | Tuning              | page<br>5-45   |
| Pn166            | 2              | Anti-Resor<br>ing Gain 2   | nance Damp                   | 0- 0 to 1,000                                                 | 1%                  | 0                  | All                  | Immedi-<br>ately | Tuning              | page<br>5-45   |
| Pn181            | 2              | Mode Swit<br>for Speed     | ching Level<br>Reference     | 0 to 10,000                                                   | 1 mm/s              | 0                  | Linear               | Immedi-<br>ately | Tuning              | *1             |
| Pn182            | 2              | Mode Swit<br>for Acceler   | ching Level<br>ation         | 0 to 30,000                                                   | 1 mm/s <sup>2</sup> | 0                  | Linear               | Immedi-<br>ately | Tuning              | *1             |
| Pn205            | 2              | Multiturn L                | imit                         | 0 to 65,535                                                   | 1 rev               | 65535              | Rotary               | After<br>restart | Setup               | *1             |
|                  | 2              | Position Co<br>tion Select | ontrol Func-<br>ions         | 0000 to<br>2210                                               | _                   | 0010               | All                  | After<br>restart | Setup               | _              |
|                  |                | n.DDDX                     | Reserved                     | parameter (Do no                                              | ot change.          | )                  |                      |                  |                     |                |
|                  |                | n.DDXD                     |                              | parameter (Do no                                              |                     | ,                  |                      |                  |                     |                |
|                  |                | n.OXOO                     | Reserved                     | parameter (Do no                                              | ot change.          | )                  |                      |                  |                     |                |
|                  |                |                            |                              | · ·                                                           |                     |                    |                      |                  | Refe                | er-            |
| Pn207            |                |                            |                              | sitioning Comple                                              |                     | , 0                | •                    | 0                | enc                 |                |
|                  |                |                            | 0 5                          | Output when the a<br>same or less than<br>Width).             |                     |                    |                      |                  |                     |                |
|                  |                | n.X000                     | 1 0                          | Output when the a<br>or less than the se<br>and the reference | ettina of Pi        | 1522 (Posi         | tionina Comp         | leted Width)     | *1                  |                |
|                  |                |                            | 2 0                          | Output when the a<br>or less than the se<br>and the reference | etting of Pi        | n522 (Posi         |                      |                  | 1                   |                |
|                  |                |                            | · ·                          |                                                               |                     |                    |                      |                  |                     |                |

|                  |      |                           |                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                    |                                                                                                                       |                                            | Con                  | itinued from     | n previou           | s page.        |
|------------------|------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------------|------------------|---------------------|----------------|
| Parameter<br>No. | Size | N                         | ame                                                                                                                                                                                                                                               | Setting<br>Range                                                                                                                                                                                                                   | Setting<br>Unit                                                                                                       | Default<br>Setting                         | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
| Pn20A            | 4    | Number of<br>Encoder S    | External<br>cale Pitches                                                                                                                                                                                                                          | 4 to<br>1,048,576                                                                                                                                                                                                                  | 1 scale<br>pitch/<br>revolu-<br>tion                                                                                  | 32768                                      | Rotary               | After<br>restart | Setup               | *1             |
| Pn20E            | 4    | Electronic<br>(Numerato   |                                                                                                                                                                                                                                                   | 1 to<br>1,073,741,824                                                                                                                                                                                                              | 1                                                                                                                     | 16                                         | All                  | After<br>restart | Setup               | *1             |
| Pn210            | 4    | Electronic<br>(Denomina   |                                                                                                                                                                                                                                                   | 1 to<br>1,073,741,824                                                                                                                                                                                                              | 1                                                                                                                     | 1                                          | All                  | After<br>restart | Setup               | *1             |
| Pn212            | 4    | Number of<br>Output Pul   | Encoder<br>Ises                                                                                                                                                                                                                                   | 16 to<br>1,073,741,824                                                                                                                                                                                                             | 1 P/Rev                                                                                                               | 2048                                       | Rotary               | After<br>restart | Setup               | *1             |
|                  | 2    | Fully-close<br>Selections |                                                                                                                                                                                                                                                   | 0000 to<br>1003                                                                                                                                                                                                                    | -                                                                                                                     | 0000                                       | Rotary               | After<br>restart | Setup               | *1             |
| Pn22A<br>Pn230   | 2    |                           | Reserved par         Reserved par         Fully-closed         0       Use         1       Use         ontrol Expan-         on Selections         Backlash Cor         0       Cor         1       Cor         Reserved par         Reserved par | rameter (Do no<br>rameter (Do no<br>rameter (Do no<br>Control Speed<br>e motor encode<br>e external enco<br>0000 to<br>0001<br>mpensation Di<br>mpensate forwanpensate rever<br>rameter (Do no<br>rameter (Do no<br>rameter (Do no | ot change.<br>I Feedbac<br>or speed.<br>der speed.<br>der speed<br>rection<br>ard referen<br>ot change.<br>ot change. | ) k Selectio k Selectio 0000 ces. ces. ) ) | n<br>All             | After<br>restart | Setup               | *1             |
| Pn231            | 4    | Backlash (                | Compensation                                                                                                                                                                                                                                      | -500,000 to<br>500,000                                                                                                                                                                                                             | 0.1 ref-<br>erence<br>units                                                                                           | 0                                          | All                  | Immedi-<br>ately | Setup               | *1             |
| Pn233            | 2    | Backlash (<br>tion Time ( | Compensa-<br>Constant                                                                                                                                                                                                                             | 0 to 65,535                                                                                                                                                                                                                        | 0.01 ms                                                                                                               | 0                                          | All                  | Immedi-<br>ately | Setup               | *1             |
| Pn281            | 2    | Encoder O<br>tion         | utput Resolu-                                                                                                                                                                                                                                     | 1 to 4,096                                                                                                                                                                                                                         | 1 edge/<br>pitch                                                                                                      | 20                                         | All                  | After<br>restart | Setup               | *1             |
| Pn282            | 4    | Linear Enc<br>Pitch       | oder Scale                                                                                                                                                                                                                                        | 0 to<br>6,553,600                                                                                                                                                                                                                  | 0.01<br>μm                                                                                                            | 0                                          | Linear               | After<br>restart | Setup               | *1             |
| Pn304            | 2    | Jogging Sp                | beed                                                                                                                                                                                                                                              | 0 to 10,000                                                                                                                                                                                                                        | Rotary:<br>1 min <sup>-1</sup><br>Direct<br>Drive:<br>0.1<br>min <sup>-1</sup>                                        | 500                                        | Rotary               | Immedi-<br>ately | Setup               | *1             |
| Pn305            | 2    | Soft Start /<br>Time      | Acceleration                                                                                                                                                                                                                                      | 0 to 10,000                                                                                                                                                                                                                        | 1 ms                                                                                                                  | 0                                          | All                  | Immedi-<br>ately | Setup               | *2             |
| Pn306            | 2    | Soft Start I<br>Time      | Deceleration                                                                                                                                                                                                                                      | 0 to 10,000                                                                                                                                                                                                                        | 1 ms                                                                                                                  | 0                                          | All                  | Immedi-<br>ately | Setup               | *2             |
| Pn308            | 2    | Speed Fee<br>Time Cons    | edback Filter<br>stant                                                                                                                                                                                                                            | 0 to 65,535                                                                                                                                                                                                                        | 0.01 ms                                                                                                               | 0                                          | All                  | Immedi-<br>ately | Setup               | *1             |
| Pn30A            | 2    |                           | on Time for<br>and Forced                                                                                                                                                                                                                         | 0 to 10,000                                                                                                                                                                                                                        | 1 ms                                                                                                                  | 0                                          | All                  | Immedi-<br>ately | Setup               | *1             |

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| 0011111000 |      | proviouo | page. |

|                  |      |                                                           | _           |                                     |                     |                    |                      | itinued from     | i previou:          |                |
|------------------|------|-----------------------------------------------------------|-------------|-------------------------------------|---------------------|--------------------|----------------------|------------------|---------------------|----------------|
| Parameter<br>No. | Size | Name                                                      |             | Setting<br>Range                    | Setting<br>Unit     | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
| Pn30C            | 2    | Speed Feedforward<br>Average Movement<br>Time             | ł           | 0 to 5,100                          | 0.1 ms              | 0                  | All                  | Immedi-<br>ately | Setup               | *1             |
|                  | 2    | Vibration Detection<br>Selections                         |             | 0000 to<br>0002                     | -                   | 0000               | All                  | Immedi-<br>ately | Setup               | *1             |
|                  |      | N.DDDX                                                    | -           | ection Selection<br>not detect vibr |                     |                    |                      |                  |                     |                |
| Pn310            |      | 1                                                         |             | put a warning                       | · /                 |                    |                      |                  |                     |                |
| 111010           |      | 2                                                         | Out         | put an alarm (/                     | 4.520) if vi        | bration is o       | detected.            |                  |                     |                |
|                  |      | n.□□X□ Reserve                                            | ed pa       | rameter (Do no                      | ot change.          | )                  |                      |                  |                     |                |
|                  |      | n.□X□□ Reserve                                            | ed pa       | rameter (Do no                      | ot change.          | )                  |                      |                  |                     |                |
|                  |      | n.XDDD Reserve                                            | ed pa       | rameter (Do no                      | ot change.          | )                  |                      |                  |                     |                |
|                  | -    |                                                           |             |                                     |                     |                    |                      |                  |                     |                |
| Pn311            | 2    | Vibration Detection sitivity                              | Sen-        | 50 to 500                           | 1%                  | 100                | All                  | Immedi-<br>ately | Tuning              | *1             |
| Pn312            | 2    | Vibration Detection<br>Level                              |             | 0 to 5,000                          | 1 min <sup>-1</sup> | 50                 | Rotary               | Immedi-<br>ately | Tuning              | *1             |
| Pn316            | 2    | Maximum Motor Sp                                          | beed        | 0 to 65,535                         | 1 min <sup>-1</sup> | 10000              | Rotary               | After<br>restart | Setup               | *1             |
| Pn324            | 2    | Moment of Inertia C<br>culation Starting Le               | Cal-<br>vel | 0 to 20,000                         | 1%                  | 300                | All                  | Immedi-<br>ately | Setup               | page<br>5-25   |
| Pn383            | 2    | Jogging Speed                                             |             | 0 to 10,000                         | 1 mm/s              | 50                 | Linear               | Immedi-<br>ately | Setup               | *1             |
| Pn384            | 2    | Vibration Detection<br>Level                              |             | 0 to 5,000                          | 1 mm/s              | 10                 | Linear               | Immedi-<br>ately | Tuning              | *1             |
| Pn385            | 2    | Maximum Motor Sp                                          |             | 1 to 100                            | 100<br>mm/s         | 50                 | Linear               | After<br>restart | Setup               | *1             |
| Pn401            | 2    | First Stage First Tor<br>Reference Filter Tin<br>Constant |             | 0 to 65,535                         | 0.01 ms             | 100                | All                  | Immedi-<br>ately | Tuning              | *1             |
| Pn402            | 2    | Forward Torque Lin                                        | nit         | 0 to 800                            | 1%*3                | 800                | Rotary               | Immedi-<br>ately | Setup               | *1             |
| Pn403            | 2    | Reverse Torque Lin                                        | nit         | 0 to 800                            | 1%*3                | 800                | Rotary               | Immedi-<br>ately | Setup               | *1             |
| Pn404            | 2    | Forward External To<br>Limit                              | orque       | 0 to 800                            | 1%*3                | 100                | All                  | Immedi-<br>ately | Setup               | *1             |
| Pn405            | 2    | Reverse External To<br>Limit                              | rque        | 0 to 800                            | 1%*3                | 100                | All                  | Immedi-<br>ately | Setup               | *1             |
| Pn406            | 2    | Emergency Stop To                                         | orque       | 0 to 800                            | 1% <sup>*3</sup>    | 800                | All                  | Immedi-<br>ately | Setup               | *1             |
| Pn407            | 2    | Speed Limit during<br>Torque Control                      |             | 0 to 10,000                         | 1 min <sup>-1</sup> | 10000              | Rotary               | Immedi-<br>ately | Setup               | *1             |

|                  |       |                                        |                                |         |                                  |                 |                    | Cont                 | inued from       | i previou:          | s page         |
|------------------|-------|----------------------------------------|--------------------------------|---------|----------------------------------|-----------------|--------------------|----------------------|------------------|---------------------|----------------|
| Parameter<br>No. | Size  | N                                      | ame                            |         | Setting<br>Range                 | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
|                  | 2     | Torque-Rel<br>tion Select              |                                |         | 0000 to<br>1111                  | -               | 0000               | All                  | -                | Setup               | Ι              |
|                  |       |                                        |                                |         |                                  |                 |                    |                      |                  |                     |                |
|                  |       |                                        | Notch Filt                     | ter S   | election 1                       |                 |                    |                      | When<br>Enabled  | Refere              | nce            |
|                  |       | n.□□□X                                 | 0                              |         | ble first stage                  |                 |                    |                      | Immedi<br>ately  | - *1                |                |
|                  |       |                                        | 1                              | Enai    | ble first stage                  | noton filte     | ſ.                 |                      | -                |                     | _              |
|                  |       |                                        | Speed Lir                      |         |                                  |                 |                    |                      | When<br>Enabled  | d Refere            | nce            |
|                  |       |                                        | 0                              | setti   | ng of Pn407 a                    | as the spe      | ed limit.          | speed and the        |                  |                     |                |
| D . 400          |       | n.DDXD                                 |                                |         | the smaller of ng of Pn480 a     |                 |                    | speed and the        | After            | *1                  |                |
| Pn408            |       |                                        |                                |         | the smaller of<br>ed and the set |                 |                    |                      | restart          | 1                   |                |
|                  |       |                                        |                                |         | the smaller of<br>ed and the set |                 |                    |                      |                  |                     |                |
|                  |       |                                        | Notch Filt                     | ter S   | election 2                       |                 |                    |                      | When             | Refere              | nce            |
|                  | n.¤X¤ |                                        | 0                              |         | ble second st                    | 0               |                    |                      | Immedi           | - *1                |                |
|                  |       |                                        | 1                              | Enal    | ble second sta                   | age notch       | filter.            |                      | ately            |                     |                |
|                  |       | n.X000                                 | Friction C                     | omp     | pensation Fun                    | ction Sele      | ection             |                      | When<br>Enabled  | Refere              | nce            |
|                  |       | 11.7000                                | 0                              |         | ble friction co                  | •               |                    |                      | Immedi<br>ately  | - *1,<br>page       |                |
|                  |       |                                        |                                | -       |                                  |                 |                    |                      |                  |                     |                |
| Pn409            | 2     | First Stage<br>Frequency               |                                | ∋r      | 50 to 5,000                      | 1 Hz            | 5000               | All                  | Immedi-<br>ately | Tuning              | *1             |
| Pn40A            | 2     | First Stage<br>Q Value                 | Notch Filte                    | ər      | 50 to 1,000                      | 0.01            | 70                 | All                  | Immedi-<br>ately | Tuning              | *1             |
| Pn40B            | 2     | First Stage<br>Depth                   | Notch Filte                    | ər      | 0 to 1,000                       | 0.001           | 0                  | All                  | Immedi-<br>ately | Tuning              | *1             |
| Pn40C            | 2     | Second State<br>ter Frequer            | age Notch                      | Fil-    | 50 to 5,000                      | 1 Hz            | 5000               | All                  | Immedi-<br>ately | Tuning              | *1             |
| Pn40D            | 2     | Second Stater Q Value                  |                                | Fil-    | 50 to 1,000                      | 0.01            | 70                 | All                  | Immedi-<br>ately | Tuning              | *1             |
| Pn40E            | 2     | Second Stater Depth                    | age Notch                      | Fil-    | 0 to 1,000                       | 0.001           | 0                  | All                  | Immedi-<br>ately | Tuning              | *1             |
| Pn40F            | 2     | Second St<br>Torque Ref<br>Frequency   | age Secon<br>erence Filte      | d<br>ər | 100 to 5,000                     | 1 Hz            | 5000               | All                  | Immedi-<br>ately | Tuning              | *1             |
| Pn410            | 2     | Second St<br>Notch Filte               | age Secon<br>r Q Value         | d       | 50 to 100                        | 0.01            | 50                 | All                  | Immedi-<br>ately | Tuning              | *1             |
| Pn412            | 2     | First Stage<br>Torque Ref<br>Time Cons | Second<br>erence Filte<br>tant | ər      | 0 to 65,535                      | 0.01 ms         | 100                | All                  | Immedi-<br>ately | Tuning              | *1             |
| Pn413            | 2     | First Stag<br>Torque Re<br>ter Time (  | eference F                     | il-     | 0 to 65,535                      | 0.01 ms         | 100                | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn414            | 2     | First Stag<br>Torque Re<br>ter Time (  | eference F                     | -il-    | 0 to 65,535                      | 0.01 ms         | 100                | All                  | Immedi-<br>ately | Tuning              | _              |

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|                  |      |                                           |                              |                                      |                 |                    | Cor                  | ntinued from     | i previou           | s page        |
|------------------|------|-------------------------------------------|------------------------------|--------------------------------------|-----------------|--------------------|----------------------|------------------|---------------------|---------------|
| Parameter<br>No. | Size | N                                         | ame                          | Setting<br>Range                     | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer<br>ence |
|                  | 2    | Torque-Rel<br>tion Select                 | ated Func-<br>ions 2         | 0000 to<br>1111                      | -               | 0000               | All                  | Immedi-<br>ately | Setup               | *1            |
|                  |      |                                           |                              |                                      |                 |                    |                      | ,                |                     |               |
|                  |      |                                           | Notch Filter                 | Selection 3                          |                 |                    |                      |                  |                     |               |
|                  |      | n.🗆🗆 🗆 X                                  | 0 Dis                        | able third stage                     | e notch filt    | er.                |                      |                  |                     |               |
|                  |      |                                           | 1 En                         | able third stage                     | e notch filte   | ər.                |                      |                  |                     |               |
| Pn416            |      |                                           | Notch Filter                 |                                      |                 |                    |                      |                  |                     |               |
| 111410           |      | n.□□X□                                    |                              | able fourth stag<br>able fourth stag | 0               |                    |                      |                  |                     |               |
|                  |      |                                           | Notch Filter                 | Selection 5                          |                 |                    |                      |                  |                     |               |
|                  |      | n.¤X¤¤                                    |                              | able fifth stage                     |                 |                    |                      |                  |                     |               |
|                  |      |                                           | 1 En                         | able fifth stage                     | notch filte     | r.                 |                      |                  |                     |               |
|                  |      | n.XDDD                                    | Reserved pa                  | rameter (Do no                       | ot change       | .)                 |                      |                  |                     |               |
|                  |      | 1                                         |                              | 1                                    | 1               | ſ                  | 1                    | 1                | 1                   |               |
| Pn417            | 2    | Third Stage<br>Frequency                  | e Notch Filter               | 50 to 5,000                          | 1 Hz            | 5000               | All                  | Immedi-<br>ately | Tuning              | *1            |
| Pn418            | 2    | Third Stage<br>Q Value                    | e Notch Filter               | 50 to 1,000                          | 0.01            | 70                 | All                  | Immedi-<br>ately | Tuning              | *1            |
| Pn419            | 2    | Third Stage<br>Depth                      | e Notch Filter               | 0 to 1,000                           | 0.001           | 0                  | All                  | Immedi-<br>ately | Tuning              | *1            |
| Pn41A            | 2    | Fourth Stag<br>ter Frequer                | ge Notch Fil-<br>ncy         | 50 to 5,000                          | 1 Hz            | 5000               | All                  | Immedi-<br>ately | Tuning              | *1            |
| Pn41B            | 2    | Fourth Stag<br>ter Q Value                | ge Notch Fil-                | 50 to 1,000                          | 0.01            | 70                 | All                  | Immedi-<br>ately | Tuning              | *1            |
| Pn41C            | 2    | Fourth Stag<br>ter Depth                  | ge Notch Fil-                | 0 to 1,000                           | 0.001           | 0                  | All                  | Immedi-<br>ately | Tuning              | *1            |
| Pn41D            | 2    | Fifth Stage<br>Frequency                  | Notch Filter                 | 50 to 5,000                          | 1 Hz            | 5000               | All                  | Immedi-<br>ately | Tuning              | *1            |
| Pn41E            | 2    | Fifth Stage<br>Q Value                    | Notch Filter                 | 50 to 1,000                          | 0.01            | 70                 | All                  | Immedi-<br>ately | Tuning              | *1            |
| Pn41F            | 2    | Fifth Stage<br>Depth                      | Notch Filter                 | 0 to 1,000                           | 0.001           | 0                  | All                  | Immedi-<br>ately | Tuning              | *1            |
|                  | 2    | Speed Ripp<br>sation Sele                 | ple Compen-<br>ections       | 0000 to<br>1111                      | -               | 0000               | Rotary               | -                | Setup               | *1            |
|                  |      |                                           |                              |                                      |                 |                    |                      |                  |                     |               |
|                  |      |                                           | Speed Rippl                  | e Compensatio                        | on Functio      | on Selectio        | on                   |                  | Whe<br>Enab         |               |
|                  |      | n.🗆🗆 🗆 X                                  | 0 Dis                        | able speed ripp                      | ole compe       | nsation.           |                      |                  | Imme                |               |
|                  |      |                                           | 1 En                         | able speed ripp                      | le compe        | nsation.           |                      |                  | ate                 | У             |
|                  |      |                                           | Speed Rippl<br>tion Selectio | e Compensatio                        | on Informa      | ation Disa         | greement Wa          | rning Detec-     | - Whe<br>Enab       |               |
| Pn423            |      | n.🗆🗆 X 🗆                                  |                              | tect A.942 aları                     | ms.             |                    |                      |                  | Afte                |               |
|                  |      |                                           | 1 Do                         | not detect A.9                       | 42 alarms       |                    |                      |                  | resta               | art           |
|                  |      |                                           | Speed Rippl                  | e Compensatio                        | on Enable       | Condition          | Selection            |                  | Whe                 |               |
|                  |      | n.¤X¤¤                                    | 0 Sp                         | eed reference                        |                 |                    |                      |                  | Afte                |               |
|                  |      |                                           | 1 Mc                         | tor speed                            |                 |                    |                      |                  | resta               | art           |
|                  |      | n.XDDD                                    | Reserved pa                  | rameter (Do no                       | ot change       | .)                 |                      |                  |                     |               |
|                  |      | Torrest                                   | it at Main O                 | 1                                    |                 |                    |                      | loose e d'       |                     |               |
| Pn424            | 2    | cuit Voltage                              | •                            | 0 to 100                             | 1%*3            | 50                 | All                  | Immedi-<br>ately | Setup               | *1            |
| Pn425            | 2    | Release Tir<br>Limit at Ma<br>Voltage Dro |                              | 0 to 1,000                           | 1 ms            | 100                | All                  | Immedi-<br>ately | Setup               | *1            |
|                  |      |                                           |                              | 1                                    | 1               | 1                  | 1                    | 1                | 1                   |               |

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10-19

| Parameter                                                                                                         | Size                                                                    | N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ame                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Setting                                                                                                                                                                                                                               | Setting                                                                                                         | Default                                                                | Applicable                                                                                       | When                                                                                                                                                                                      | n previou<br>Classi-                                                                           | Refer                               |
|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-------------------------------------|
| No.                                                                                                               | S                                                                       | Torque Fee                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Range                                                                                                                                                                                                                                 | Unit                                                                                                            | Setting                                                                | Motors                                                                                           | Enabled                                                                                                                                                                                   | fication                                                                                       | ence                                |
| Pn426                                                                                                             | 2                                                                       | Average M<br>Time                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0 to 5,100                                                                                                                                                                                                                            | 0.1 ms                                                                                                          | 0                                                                      | All                                                                                              | Immedi-<br>ately                                                                                                                                                                          | Setup                                                                                          | *1                                  |
| Pn427                                                                                                             | 2                                                                       | sation Ena                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0 to 10,000                                                                                                                                                                                                                           | 1 min <sup>-1</sup>                                                                                             | 0                                                                      | Rotary Ser-<br>vomotor                                                                           | Immedi-<br>ately                                                                                                                                                                          | Tuning                                                                                         | *1                                  |
| Pn456                                                                                                             | 2                                                                       | Sweep Tor<br>ence Ampl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | que Refer-<br>litude                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1 to 800                                                                                                                                                                                                                              | 1%                                                                                                              | 15                                                                     | All                                                                                              | Immedi-<br>ately                                                                                                                                                                          | Tuning                                                                                         | *1                                  |
|                                                                                                                   | 2                                                                       | Notch Filte<br>Selections                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | er Adjustmen<br>1                                                                                                                                                                                                                                                                                                                                                                                                                                         | t 0000 to<br>0101                                                                                                                                                                                                                     | _                                                                                                               | 0101                                                                   | All                                                                                              | Immedi-<br>ately                                                                                                                                                                          | Tuning                                                                                         | *1,<br>page<br>5-18<br>page<br>5-36 |
|                                                                                                                   | _                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                       |                                                                                                                 |                                                                        |                                                                                                  |                                                                                                                                                                                           |                                                                                                |                                     |
|                                                                                                                   |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                           | r Adjustment Se                                                                                                                                                                                                                       |                                                                                                                 |                                                                        |                                                                                                  |                                                                                                                                                                                           |                                                                                                |                                     |
|                                                                                                                   |                                                                         | n.DDDX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0 t                                                                                                                                                                                                                                                                                                                                                                                                                                                       | o not adjust the<br>uning without a h<br>uning.                                                                                                                                                                                       | first stage<br>ost referer                                                                                      | notch filter<br>nce, autotu                                            | r automatically<br>ining with a ho                                                               | y during exe<br>ost reference                                                                                                                                                             | cution of a<br>e, and cust                                                                     | iuto-<br>tom                        |
|                                                                                                                   |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1 A                                                                                                                                                                                                                                                                                                                                                                                                                                                       | djust the first sta<br>ithout a host refe                                                                                                                                                                                             |                                                                                                                 |                                                                        |                                                                                                  |                                                                                                                                                                                           |                                                                                                |                                     |
| Pn460                                                                                                             |                                                                         | n.DDXD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Reserved r                                                                                                                                                                                                                                                                                                                                                                                                                                                | parameter (Do no                                                                                                                                                                                                                      | ot change.                                                                                                      | )                                                                      |                                                                                                  |                                                                                                                                                                                           |                                                                                                |                                     |
|                                                                                                                   |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                       | •                                                                                                               |                                                                        |                                                                                                  |                                                                                                                                                                                           |                                                                                                |                                     |
|                                                                                                                   |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                           | r Adjustment Se                                                                                                                                                                                                                       |                                                                                                                 | age notch                                                              | filter automat                                                                                   | ically during                                                                                                                                                                             | execution                                                                                      | of                                  |
|                                                                                                                   |                                                                         | n.¤X¤¤                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0 a                                                                                                                                                                                                                                                                                                                                                                                                                                                       | utotuning withou<br>ustom tuning.                                                                                                                                                                                                     |                                                                                                                 |                                                                        |                                                                                                  |                                                                                                                                                                                           |                                                                                                |                                     |
|                                                                                                                   |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>1</b> ir                                                                                                                                                                                                                                                                                                                                                                                                                                               | djust the second<br>ng without a host<br>uning.                                                                                                                                                                                       |                                                                                                                 |                                                                        |                                                                                                  |                                                                                                                                                                                           |                                                                                                |                                     |
|                                                                                                                   |                                                                         | ·                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                       |                                                                                                                 |                                                                        |                                                                                                  |                                                                                                                                                                                           |                                                                                                |                                     |
|                                                                                                                   | _                                                                       | n.XOOO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Reserved p                                                                                                                                                                                                                                                                                                                                                                                                                                                | parameter (Do no                                                                                                                                                                                                                      | ot change.                                                                                                      | )                                                                      |                                                                                                  |                                                                                                                                                                                           |                                                                                                |                                     |
| Pn480                                                                                                             | 2                                                                       | Speed Lim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | it during                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0 to 10,000                                                                                                                                                                                                                           | ot change.<br>1 mm/s                                                                                            | )<br>10000                                                             | Linear                                                                                           | Immedi-<br>ately                                                                                                                                                                          | Setup                                                                                          | *1                                  |
|                                                                                                                   | 2                                                                       | Speed Lim                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | it during<br>trol                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                       |                                                                                                                 | ,                                                                      | Linear                                                                                           |                                                                                                                                                                                           | Setup                                                                                          | *1                                  |
| Pn481                                                                                                             |                                                                         | Speed Lim<br>Force Con<br>Polarity De                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | it during<br>trol<br>etection<br>op Gain<br>etection<br>op Integral                                                                                                                                                                                                                                                                                                                                                                                       | 0 to 10,000                                                                                                                                                                                                                           | 1 mm/s<br>0.1 Hz                                                                                                | 10000                                                                  |                                                                                                  | ately<br>Immedi-                                                                                                                                                                          |                                                                                                | *1                                  |
| Pn481<br>Pn482                                                                                                    | 2                                                                       | Speed Lim<br>Force Con<br>Polarity De<br>Speed Loc<br>Polarity De<br>Speed Loc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | it during<br>trol<br>ptection<br>pp Gain<br>etection<br>pp Integral<br>stant                                                                                                                                                                                                                                                                                                                                                                              | 0 to 10,000<br>10 to 20,000                                                                                                                                                                                                           | 1 mm/s<br>0.1 Hz                                                                                                | 10000<br>400                                                           | Linear                                                                                           | ately<br>Immedi-<br>ately<br>Immedi-                                                                                                                                                      | Tuning                                                                                         | *1<br>-<br>-<br>*1                  |
| Pn481<br>Pn482<br>Pn483                                                                                           | 2                                                                       | Speed Lim<br>Force Con<br>Polarity De<br>Speed Loc<br>Polarity De<br>Speed Loc<br>Time Cons                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | it during<br>trol<br>etection<br>pp Gain<br>etection<br>pp Integral<br>stant<br>orce Limit                                                                                                                                                                                                                                                                                                                                                                | 0 to 10,000<br>10 to 20,000<br>15 to 51,200                                                                                                                                                                                           | 1 mm/s<br>0.1 Hz<br>0.01 ms                                                                                     | 10000<br>400<br>3000                                                   | Linear                                                                                           | ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-                                                                                                                                  | Tuning                                                                                         | -                                   |
| Pn481<br>Pn482<br>Pn483<br>Pn484                                                                                  | 2<br>2<br>2                                                             | Speed Lim<br>Force Con<br>Polarity De<br>Speed Loo<br>Time Cons<br>Forward Fo<br>Reverse Fo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | it during<br>trol<br>op Gain<br>etection<br>op Integral<br>stant<br>orce Limit<br>orce Limit                                                                                                                                                                                                                                                                                                                                                              | 0 to 10,000<br>10 to 20,000<br>15 to 51,200<br>0 to 800<br>0 to 800                                                                                                                                                                   | 1 mm/s<br>0.1 Hz<br>0.01 ms<br>1%* <sup>3</sup>                                                                 | 10000<br>400<br>3000<br>30                                             | Linear<br>Linear<br>Linear                                                                       | ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately                                                                                                                         | Tuning<br>Tuning<br>Setup                                                                      | - *1                                |
| Pn481<br>Pn482<br>Pn483<br>Pn484<br>Pn485                                                                         | 2<br>2<br>2<br>2                                                        | Speed Lim<br>Force Con<br>Polarity De<br>Speed Loo<br>Time Cons<br>Forward Fo<br>Reverse Fo<br>Polarity De<br>ence Spee                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | it during<br>trol<br>op Gain<br>op Gain<br>op Integral<br>stant<br>orce Limit<br>orce Limit<br>orce Limit<br>orce Limit<br>orce Refe<br>d                                                                                                                                                                                                                                                                                                                 | 0 to 10,000<br>10 to 20,000<br>15 to 51,200<br>0 to 800<br>0 to 800<br>r- 0 to 100                                                                                                                                                    | 1 mm/s<br>0.1 Hz<br>0.01 ms<br>1% <sup>*3</sup><br>1% <sup>*3</sup>                                             | 10000<br>400<br>3000<br>30<br>30                                       | Linear<br>Linear<br>Linear<br>Linear                                                             | ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately                                                                                                     | Tuning<br>Tuning<br>Setup<br>Setup                                                             | -<br>-<br>*1<br>*1                  |
| Pn481<br>Pn482<br>Pn483<br>Pn484<br>Pn485<br>Pn486                                                                | 2<br>2<br>2<br>2<br>2<br>2                                              | Speed Lim<br>Force Con<br>Polarity De<br>Speed Loc<br>Time Cons<br>Forward Fo<br>Reverse Fo<br>Polarity De<br>ence Spee<br>Polarity De<br>ence Acce<br>Deceleratio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | it during<br>trol<br>etection<br>op Gain<br>etection<br>op Integral<br>stant<br>orce Limit<br>orce Limit<br>etection Refe<br>detection Refe<br>leration/<br>on Time<br>etection Con-                                                                                                                                                                                                                                                                      | 0 to 10,000<br>10 to 20,000<br>15 to 51,200<br>0 to 800<br>0 to 800<br>r <sup>-</sup> 0 to 100<br>r <sup>-</sup> 0 to 100                                                                                                             | 1 mm/s<br>0.1 Hz<br>0.01 ms<br>1% <sup>*3</sup><br>1% <sup>*3</sup><br>1 mm/s                                   | 10000<br>400<br>3000<br>30<br>30<br>20                                 | Linear<br>Linear<br>Linear<br>Linear<br>Linear                                                   | ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately                                                                                 | Tuning<br>Tuning<br>Setup<br>Setup<br>Tuning                                                   | -<br>+1<br>*1                       |
| Pn481<br>Pn482<br>Pn483<br>Pn484<br>Pn485<br>Pn485<br>Pn486<br>Pn487                                              | 2<br>2<br>2<br>2<br>2<br>2<br>2                                         | Speed Lim<br>Force Con<br>Polarity De<br>Speed Loc<br>Time Cons<br>Forward Fo<br>Reverse Fo<br>Polarity De<br>ence Spee<br>Polarity De<br>ence Acce<br>Deceleratio<br>Polarity De<br>stant Spee                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | it during<br>trol<br>etection<br>pp Gain<br>etection<br>pp Integral<br>stant<br>corce Limit<br>prce Limit<br>etection Refe<br>leration/<br>on Time<br>etection Con-<br>ed Time                                                                                                                                                                                                                                                                            | 0 to 10,000<br>10 to 20,000<br>15 to 51,200<br>0 to 800<br>0 to 800<br>r <sup>-</sup> 0 to 100<br>r <sup>-</sup> 0 to 100<br>· 0 to 300                                                                                               | 1 mm/s<br>0.1 Hz<br>0.01 ms<br>1%* <sup>3</sup><br>1%* <sup>3</sup><br>1 mm/s<br>1 ms                           | 10000<br>400<br>3000<br>30<br>30<br>20<br>25                           | Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear                                         | ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-                                                                      | Tuning<br>Tuning<br>Setup<br>Setup<br>Tuning<br>Tuning                                         | -<br>*1<br>*1<br>-                  |
| Pn481<br>Pn482<br>Pn483<br>Pn484<br>Pn485<br>Pn485<br>Pn486<br>Pn487<br>Pn488                                     | 2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2                     | Speed Lim<br>Force Con<br>Polarity De<br>Speed Loc<br>Time Cons<br>Forward Fo<br>Reverse Fo<br>Polarity De<br>ence Spee<br>Polarity De<br>ence Acce<br>Deceleratio<br>Polarity De<br>stant Spee                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | it during<br>trol<br>op Gain<br>op Gain<br>op Integral<br>stant<br>orce Limit<br>orce Limit | 0 to 10,000<br>10 to 20,000<br>15 to 51,200<br>0 to 800<br>0 to 800<br>1-<br>0 to 100<br>0 to 100<br>0 to 300<br>-<br>0 to 300                                                                                                        | 1 mm/s<br>0.1 Hz<br>0.01 ms<br>1%* <sup>3</sup><br>1 %* <sup>3</sup><br>1 mm/s<br>1 ms<br>1 ms                  | 10000<br>400<br>3000<br>30<br>30<br>20<br>25<br>0                      | Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear                               | ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately                                         | Tuning<br>Tuning<br>Setup<br>Setup<br>Tuning<br>Tuning<br>Tuning                               | -<br>*1<br>*1<br>-<br>-             |
| Pn480<br>Pn481<br>Pn482<br>Pn483<br>Pn483<br>Pn484<br>Pn485<br>Pn486<br>Pn487<br>Pn488<br>Pn488<br>Pn488<br>Pn488 | 2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2                | Speed Lim<br>Force Con<br>Polarity De<br>Speed Loc<br>Time Cons<br>Forward Fo<br>Reverse Fo<br>Polarity De<br>ence Spee<br>Polarity De<br>ence Acce<br>Deceleratio<br>Polarity De<br>stant Spee<br>Polarity De<br>ence Waiti<br>Polarity De<br>ence Waiti                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | it during<br>trol<br>op Gain<br>op Gain<br>op Integral<br>stant<br>orce Limit<br>orce Limit | 0 to 10,000         10 to 20,000         15 to 51,200         0 to 800         0 to 800         r         0 to 100         r         0 to 100         r         0 to 300         r         50 to 500         1 to 65,535              | 1 mm/s<br>0.1 Hz<br>0.01 ms<br>1%* <sup>3</sup><br>1 ms<br>1 ms<br>1 ms<br>1 ms                                 | 10000<br>400<br>3000<br>30<br>30<br>20<br>25<br>0<br>100               | Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear                     | ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately                                         | Tuning<br>Tuning<br>Setup<br>Setup<br>Tuning<br>Tuning<br>Tuning<br>Tuning                     | -<br>*1<br>*1<br>-<br>-             |
| Pn481<br>Pn482<br>Pn483<br>Pn484<br>Pn485<br>Pn485<br>Pn486<br>Pn487<br>Pn488<br>Pn488                            | 2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2      | Speed Lim         Force Con         Polarity De         Speed Loc         Polarity De         Speed Loc         Time Cons         Forward For         Reverse For         Polarity De         ence Speed         Polarity De         ence Acce         Deceleration         Polarity De         ence Waitii         Polarity De         Polarity De | it during<br>trol<br>etection<br>op Gain<br>etection<br>op Integral<br>stant<br>orce Limit<br>orce Limit<br>etection Refe<br>leration/<br>on Time<br>etection Con-<br>stection Refe<br>ng Time<br>etection Refe                                                                                                                                                                                                                                           | 0 to 10,000         10 to 20,000         15 to 51,200         0 to 800         0 to 800         0 to 100         r-         0 to 100         r-         0 to 300         r-         50 to 500         1 to 65,535         0 to 20,000 | 1 mm/s<br>0.1 Hz<br>0.01 ms<br>1%* <sup>3</sup><br>1 ms <sup>*3</sup><br>1 mm/s<br>1 ms<br>1 ms<br>1 ms<br>1 ms | 10000<br>400<br>3000<br>30<br>30<br>20<br>25<br>0<br>100<br>10         | Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear           | ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately                     | Tuning<br>Tuning<br>Setup<br>Setup<br>Tuning<br>Tuning<br>Tuning<br>Tuning<br>Tuning           | -<br>*1<br>*1<br>-<br>-<br>-<br>-   |
| Pn481<br>Pn482<br>Pn483<br>Pn484<br>Pn485<br>Pn486<br>Pn486<br>Pn487<br>Pn488<br>Pn488<br>Pn48E<br>Pn490          | 2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2 | Speed Lim         Force Con         Polarity De         Speed Loc         Time Cons         Forward For         Reverse For         Polarity De         ence Speed         Polarity De         ence Acce         Deceleration         Polarity De         ence Maiti         Polarity De         Firmation F         ence                                                                                                                                                                       | it during<br>trol<br>prection<br>p Gain<br>etection<br>p Integral<br>etection<br>porce Limit<br>orce Limit<br>etection Refe<br>deration/<br>etection Refe<br>ng Time<br>etection Refe<br>ng Time<br>etection<br>etection Loac<br>etection Con-<br>orce Refer-<br>etection Allov                                                                                                                                                                           | 0 to 10,000         10 to 20,000         15 to 51,200         0 to 800         0 to 800         0 to 100         r <sup>-</sup> 0 to 100         r <sup>-</sup> 0 to 300         r <sup>-</sup> 1 to 65,535         0 to 20,000       | 1 mm/s<br>0.1 Hz<br>0.01 ms<br>1%* <sup>3</sup><br>1 ms/s<br>1 ms<br>1 ms<br>1 ms<br>1 ms<br>1 ms<br>1 ms       | 10000<br>400<br>3000<br>30<br>30<br>20<br>25<br>0<br>100<br>100<br>100 | Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear<br>Linear | ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi-<br>ately | Tuning<br>Tuning<br>Setup<br>Setup<br>Tuning<br>Tuning<br>Tuning<br>Tuning<br>Tuning<br>Tuning | -<br>*1<br>*1<br>-<br>-<br>-<br>-   |

Continued from previous page.

|                  |      |                            |                                          |                   |                 |                    | Cor                  | tinued from      | i previou           | s page.        |
|------------------|------|----------------------------|------------------------------------------|-------------------|-----------------|--------------------|----------------------|------------------|---------------------|----------------|
| Parameter<br>No. | Size | N                          | ame                                      | Setting<br>Range  | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
|                  | 2    | Acceleration<br>Correction |                                          | 0000 to<br>0001   | -               | 0000               | All                  | After<br>restart | Setup               | -              |
|                  |      |                            |                                          |                   | -               |                    | <b>2</b>             |                  |                     |                |
|                  |      |                            | 1                                        | Rate Correction   |                 | •                  |                      |                  |                     |                |
|                  |      | n.🗆🗆 🛛 X                   |                                          | able acceleration |                 |                    | . ,                  |                  |                     |                |
| Pn4B0            |      |                            | 1 Ena                                    | able acceleration | on rate cor     | rection qu         | adrant project       | tion correction  | on (automa          | atic).         |
|                  |      | n.DDXD                     | Reserved par                             | ameter (Do not    | change.)        |                    |                      |                  |                     |                |
|                  |      | n.¤X¤¤                     | Reserved para                            | ameter (Do not    | change.)        |                    |                      |                  |                     |                |
|                  |      | n.X000                     | Reserved par                             | ameter (Do not    | change.)        |                    |                      |                  |                     |                |
| Pn4B1            | 2    | Number of<br>Compensa      |                                          | 1 to 65,535       | -               | 1                  | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn4B2            | 2    | Forward Co<br>Torque       | ompensation                              | 0 to 30,000       | 0.01%           | 0                  | All                  | Immedi-<br>ately | Tuning              | -              |
| Pn4B3            | 2    | Ratio                      | ffset Position                           | 0 to 100          | 1%              | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn4B4            | 2    | Forward O                  | Torque                                   | 0 to 30,000       | 0.01%           | 0                  | All                  | Immedi-<br>ately | Tuning              | -              |
| Pn4B5            | 2    |                            | rward Com-<br>Position Ratio             | 0 to 600          | 1%              | 0                  | All                  | Immedi-<br>ately | Tuning              | -              |
| Pn4B6            | 2    | Second Fo                  | rward Com-<br>Torque                     | 0 to 30,000       | 0.01%           | 0                  | All                  | Immedi-<br>ately | Tuning              | -              |
| Pn4B7            | 2    | Number of<br>Compensa      |                                          | 1 to 65,535       | -               | 1                  | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn4B8            | 2    | Reverse Co<br>Torque       | ompensation                              | 0 to 30,000       | 0.01%           | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn4B9            | 2    | Reverse O<br>Ratio         | fset Position                            | 0 to 100          | 1%              | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn4BA            | 2    | Reverse O                  |                                          | 0 to 30,000       | 0.01%           | 0                  | All                  | Immedi-<br>ately | Tuning              | -              |
| Pn4BB            | 2    |                            | everse Com-<br>Position Ratio            | 0 to 600          | 1%              | 0                  | All                  | Immedi-<br>ately | Tuning              | -              |
| Pn4BC            | 2    | pensation                  | 1                                        | 0 to 30,000       | 0.01%           | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn4BD            | 2    |                            | ompensation<br>ection Func-<br>cient a   | 0 to 65,535       | -               | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn4BE            | 2    |                            | ompensation<br>ection Func-<br>cient b   | 0 to 65,535       | -               | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn4BF            | 2    |                            | ompensation<br>rrection Func-<br>cient a | 0 to 10,000       | 0.01            | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn4C0            | 2    |                            | ompensation<br>rection Func-<br>cient b  | 0 to 10,000       | 0.01            | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn4C1            | 2    |                            | ompensation<br>ection Func-<br>cient a   | 0 to 65,535       | -               | 0                  | All                  | Immedi-<br>ately | Tuning              | -              |
| Pn4C2            | 2    |                            | ompensation<br>ection Func-<br>cient b   | 0 to 65,535       | -               | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn4C3            | 2    |                            | ompensation<br>rrection Func-<br>cient a | 0 to 10,000       | 0.01            | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |
| Pn4C4            | 2    |                            | ompensation<br>rection Func-<br>cient b  | 0 to 10,000       | 0.01            | 0                  | All                  | Immedi-<br>ately | Tuning              | _              |

Continued on next page.

| Parameter |      |                                   |                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                | itinued from                                                                                                                              | · · · · · · · · · · · · · · · · · · · |                |
|-----------|------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|----------------|
| No.       | Size | N                                 | lame                                                                                                                                                                                                                     | Setting<br>Range                                                                                                                                                                                                                                                                                                     | Setting<br>Unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Default<br>Setting                                                                                                                                                                                                                                                                                                                                                            | Applicable<br>Motors                                                                                                                                                                                                                           | When<br>Enabled                                                                                                                           | Classi-<br>fication                   | Refer-<br>ence |
| Pn4C5     | 2    |                                   |                                                                                                                                                                                                                          | 0 to 30,000                                                                                                                                                                                                                                                                                                          | 0.01%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0                                                                                                                                                                                                                                                                                                                                                                             | All                                                                                                                                                                                                                                            | Immedi-<br>ately                                                                                                                          | Tuning                                | -              |
| Pn4C6     | 2    |                                   |                                                                                                                                                                                                                          | 0 to 30,000                                                                                                                                                                                                                                                                                                          | 0.01%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0                                                                                                                                                                                                                                                                                                                                                                             | All                                                                                                                                                                                                                                            | Immedi-<br>ately                                                                                                                          | Tuning                                | _              |
| Pn502     | 2    | Rotation D                        | etection Level                                                                                                                                                                                                           | 1 to 10,000                                                                                                                                                                                                                                                                                                          | 1 min <sup>-1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20                                                                                                                                                                                                                                                                                                                                                                            | Rotary                                                                                                                                                                                                                                         | Immedi-<br>ately                                                                                                                          | Setup                                 | *1             |
| Pn503     | 2    | Speed Coi<br>Detection S<br>Width | ncidence<br>Signal Output                                                                                                                                                                                                | 0 to 100                                                                                                                                                                                                                                                                                                             | 1 min <sup>-1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10                                                                                                                                                                                                                                                                                                                                                                            | Rotary                                                                                                                                                                                                                                         | Immedi-<br>ately                                                                                                                          | Setup                                 | *1             |
| Pn506     | 2    | Brake Refe<br>OFF Delay           | erence-Servo<br>Time                                                                                                                                                                                                     | 0 to 50                                                                                                                                                                                                                                                                                                              | 10 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0                                                                                                                                                                                                                                                                                                                                                                             | All                                                                                                                                                                                                                                            | Immedi-<br>ately                                                                                                                          | Setup                                 | *1             |
| Pn507     | 2    | Brake Refe<br>put Speed           | erence Out-<br>Level                                                                                                                                                                                                     | 0 to 10,000                                                                                                                                                                                                                                                                                                          | 1 min <sup>-1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100                                                                                                                                                                                                                                                                                                                                                                           | Rotary                                                                                                                                                                                                                                         | Immedi-<br>ately                                                                                                                          | Setup                                 | *1             |
| Pn508     | 2    | Servo OFF<br>mand Wait            | -Brake Com-<br>ting Time                                                                                                                                                                                                 | 10 to 100                                                                                                                                                                                                                                                                                                            | 10 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 50                                                                                                                                                                                                                                                                                                                                                                            | All                                                                                                                                                                                                                                            | Immedi-<br>ately                                                                                                                          | Setup                                 | *1             |
| Pn509     | 2    | Momentar<br>ruption Ho            | y Power Inter-<br>Id Time                                                                                                                                                                                                | 20 to 50,000                                                                                                                                                                                                                                                                                                         | 1 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 20                                                                                                                                                                                                                                                                                                                                                                            | All                                                                                                                                                                                                                                            | Immedi-<br>ately                                                                                                                          | Setup                                 | *1             |
|           | 2    | Input Signa                       | al Selections                                                                                                                                                                                                            | 0000 to<br>FFF2                                                                                                                                                                                                                                                                                                      | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1881                                                                                                                                                                                                                                                                                                                                                                          | All                                                                                                                                                                                                                                            | After<br>restart                                                                                                                          | Setup                                 | _              |
|           |      | n.DDDX                            | •                                                                                                                                                                                                                        | rameter (Do no                                                                                                                                                                                                                                                                                                       | Ū                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ,                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                |                                                                                                                                           |                                       |                |
|           |      | n.000X<br>n.00X0<br>n.0X00        | Reserved par                                                                                                                                                                                                             | rameter (Do no<br>rameter (Do no<br>rameter (Do no                                                                                                                                                                                                                                                                   | ot change.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | )                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                |                                                                                                                                           |                                       |                |
|           |      | n.DDXD                            | Reserved part                                                                                                                                                                                                            | rameter (Do no                                                                                                                                                                                                                                                                                                       | ot change.<br>ot change.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | )                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                |                                                                                                                                           | Refere                                | ence           |
|           |      | n.DDXD                            | Reserved par<br>Reserved par<br>P-OT (Forwa                                                                                                                                                                              | rameter (Do no                                                                                                                                                                                                                                                                                                       | ot change.<br>ot change.<br>pit) Signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | )<br>)<br>Allocation                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                | closed).                                                                                                                                  | Refere                                | ence           |
|           |      | n.DDXD                            | Reserved par<br>Reserved par<br>P-OT (Forwar<br>0 Enable                                                                                                                                                                 | rameter (Do no<br>rameter (Do no<br>rd Drive Prohib                                                                                                                                                                                                                                                                  | ot change.<br>ot change.<br>oit) Signal<br>when CN1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | )<br>)<br>Allocation<br>-13 input :                                                                                                                                                                                                                                                                                                                                           | signal is ON (                                                                                                                                                                                                                                 | ·                                                                                                                                         | Refere                                | ence           |
|           |      | n.DDXD                            | Reserved par<br>Reserved par<br>P-OT (Forwa<br>0 Enable<br>1 Enable                                                                                                                                                      | rameter (Do no<br>rameter (Do no<br>rd Drive Prohit<br>forward drive                                                                                                                                                                                                                                                 | ot change.<br>ot change.<br>oit) Signal<br>when CN1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | )<br>Allocation<br>-13 input si<br>-7 input si                                                                                                                                                                                                                                                                                                                                | signal is ON (<br>gnal is ON (cl                                                                                                                                                                                                               | osed).                                                                                                                                    | Refere                                | ence           |
| Def04     |      | n.DDXD                            | Reserved par<br>Reserved par<br>P-OT (Forwa<br>0 Enable<br>1 Enable<br>2 Enable                                                                                                                                          | rameter (Do no<br>rameter (Do no<br>rd Drive Prohit<br>forward drive<br>forward drive                                                                                                                                                                                                                                | ot change.<br>ot change.<br>ot) Signal<br>when CN1<br>when CN1<br>when CN1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | )<br>Allocation<br>-13 input<br>-7 input si<br>-8 input si                                                                                                                                                                                                                                                                                                                    | signal is ON (<br>gnal is ON (cl<br>gnal is ON (cl                                                                                                                                                                                             | osed).<br>osed).                                                                                                                          | Refere                                | ence           |
| Pn50A     |      | n.DDXD                            | Reserved par<br>Reserved par<br>P-OT (Forwar<br>0 Enable<br>1 Enable<br>2 Enable<br>3 Enable                                                                                                                             | rameter (Do no<br>rameter (Do no<br>rd Drive Prohib<br>forward drive<br>forward drive<br>forward drive                                                                                                                                                                                                               | ot change.<br>ot change.<br>oit) Signal<br>when CN1<br>when CN1<br>when CN1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | )<br>Allocation<br>-13 input<br>-7 input si<br>-8 input si<br>-9 input si                                                                                                                                                                                                                                                                                                     | signal is ON (<br>gnal is ON (cl<br>gnal is ON (cl<br>gnal is ON (cl                                                                                                                                                                           | osed).<br>osed).<br>osed).                                                                                                                | Refere                                | nce            |
| Pn50A     |      | n.DDXD                            | Reserved par<br>Reserved par<br>P-OT (Forwar<br>0 Enable<br>1 Enable<br>2 Enable<br>3 Enable<br>4 Enable<br>5 Enable                                                                                                     | rameter (Do no<br>rameter (Do no<br>rd Drive Prohit<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive                                                                                                                                                            | ot change.<br>ot change.<br>oit) Signal<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Allocation<br>-13 input<br>-7 input si<br>-8 input si<br>-9 input si<br>-10 input<br>-11 input                                                                                                                                                                                                                                                                                | signal is ON (<br>gnal is ON (cl<br>gnal is ON (cl<br>gnal is ON (cl<br>signal is ON (<br>signal is ON (                                                                                                                                       | osed).<br>osed).<br>osed).<br>closed).<br>closed).                                                                                        | Refere                                | ence           |
| Pn50A     |      | n.DDXD                            | Reserved par<br>Reserved par<br>P-OT (Forwar<br>0 Enable<br>1 Enable<br>2 Enable<br>3 Enable<br>4 Enable<br>5 Enable<br>6 Enable                                                                                         | rameter (Do no<br>rameter (Do no<br>rd Drive Prohib<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive                                                                                                                                           | ot change.<br>ot change.<br>oit) Signal<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Allocation<br>-13 input si<br>-7 input si<br>-8 input si<br>-9 input si<br>-10 input si<br>-11 input si<br>-12 input si                                                                                                                                                                                                                                                       | signal is ON (<br>gnal is ON (cl<br>gnal is ON (cl<br>gnal is ON (cl<br>signal is ON (cl<br>signal is ON (<br>signal is ON (                                                                                                                   | osed).<br>osed).<br>osed).<br>closed).<br>closed).                                                                                        | Refere                                | ence           |
| Pn50A     |      | n.DDXD                            | Reserved par<br>Reserved par<br>P-OT (Forwar<br>0 Enable<br>1 Enable<br>2 Enable<br>3 Enable<br>4 Enable<br>5 Enable<br>6 Enable                                                                                         | rameter (Do no<br>rameter (Do no<br>rd Drive Prohit<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive                                                                                                                                                            | ot change.<br>ot change.<br>oit) Signal<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Allocation<br>-13 input si<br>-7 input si<br>-8 input si<br>-9 input si<br>-10 input si<br>-11 input si<br>-12 input si                                                                                                                                                                                                                                                       | signal is ON (<br>gnal is ON (cl<br>gnal is ON (cl<br>gnal is ON (cl<br>signal is ON (cl<br>signal is ON (<br>signal is ON (                                                                                                                   | osed).<br>osed).<br>osed).<br>closed).<br>closed).                                                                                        |                                       | ence           |
| Pn50A     |      | n.□□X□                            | Reserved par<br>Reserved par<br>P-OT (Forwar<br>0 Enable<br>1 Enable<br>2 Enable<br>3 Enable<br>4 Enable<br>5 Enable<br>6 Enable<br>7 Set the<br>8 Set the                                                               | rameter (Do no<br>rameter (Do no<br>rd Drive Prohit<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>signal to alwa                                                                                                                         | ot change.<br>ot change.<br>oit) Signal<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>ys prohibit<br>ys enable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Allocation<br>-13 input si<br>-7 input si<br>-9 input si<br>-10 input si<br>-11 input<br>-12 input<br>t forward c<br>forward dr                                                                                                                                                                                                                                               | signal is ON (<br>gnal is ON (cl<br>gnal is ON (cl<br>gnal is ON (cl<br>signal is ON (<br>signal is ON (<br>signal is ON (<br>rive.                                                                                                            | osed).<br>osed).<br>osed).<br>closed).<br>closed).<br>closed).                                                                            | Refere                                | ence           |
| Pn50A     |      | n.□□X□                            | Reserved par<br>Reserved par<br>P-OT (Forwar<br>0 Enable<br>1 Enable<br>2 Enable<br>3 Enable<br>4 Enable<br>5 Enable<br>6 Enable<br>7 Set the<br>8 Set the                                                               | rameter (Do no<br>rameter (Do no<br>rd Drive Prohit<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive                                                                                                                                           | ot change.<br>ot change.<br>oit) Signal<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>when CN1<br>ys prohibit<br>ys enable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Allocation<br>-13 input si<br>-7 input si<br>-9 input si<br>-10 input si<br>-11 input<br>-12 input<br>t forward c<br>forward dr                                                                                                                                                                                                                                               | signal is ON (<br>gnal is ON (cl<br>gnal is ON (cl<br>gnal is ON (cl<br>signal is ON (<br>signal is ON (<br>signal is ON (<br>rive.                                                                                                            | osed).<br>osed).<br>osed).<br>closed).<br>closed).<br>closed).                                                                            |                                       | ence           |
| Pn50A     |      | n.□□X□                            | Reserved parP-OT (Forwar0Enable1Enable2Enable3Enable4Enable5Enable6Enable7Set the8Set the9EnableAEnable                                                                                                                  | rameter (Do no<br>rameter (Do no<br>rd Drive Prohit<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>signal to alwa<br>forward drive<br>signal to alwa<br>forward drive<br>forward drive                                                                     | ot change.<br>ot cha | Allocation<br>-13 input si<br>-7 input si<br>-9 input si<br>-10 input si<br>-11 input si<br>-12 input si<br>t forward dr<br>-13 input si<br>-7 input si                                                                                                                                                                                                                       | signal is ON (c<br>gnal is ON (cl<br>gnal is ON (cl<br>gnal is ON (cl<br>signal is ON (c<br>signal is ON (c<br>signal is ON (c<br>lrive.<br>tive.<br>signal is OFF<br>gnal is OFF (c                                                           | osed).<br>osed).<br>osed).<br>closed).<br>closed).<br>closed).<br>(open).                                                                 |                                       | ence           |
| Pn50A     |      | n.□□X□                            | Reserved part<br>Reserved part<br>P-OT (Forwar<br>0 Enable<br>1 Enable<br>2 Enable<br>3 Enable<br>4 Enable<br>5 Enable<br>6 Enable<br>7 Set the<br>8 Set the<br>9 Enable<br>A Enable<br>B Enable                         | rameter (Do no<br>rameter (Do no<br>rd Drive Prohit<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>signal to alwa<br>forward drive<br>signal to alwa<br>forward drive<br>forward drive<br>forward drive<br>forward drive                                                    | ot change.<br>ot cha | Allocation<br>-13 input si<br>-7 input si<br>-9 input si<br>-10 input si<br>-11 input si<br>-12 input si<br>t forward ci<br>forward di<br>-13 input si<br>-7 input si<br>-8 input si                                                                                                                                                                                          | signal is ON (<br>gnal is ON (cl<br>gnal is ON (cl<br>gnal is ON (cl<br>signal is ON (cl<br>signal is ON (cl<br>signal is ON (cl<br>signal is ON (cl<br>rive.<br>signal is OFF (cl<br>gnal is OFF (cl<br>gnal is OFF (cl                       | osed).<br>osed).<br>osed).<br>closed).<br>closed).<br>closed).<br>(open).<br>open).                                                       |                                       | ence           |
| Pn50A     |      | n.□□X□                            | Reserved part<br>Reserved part<br>P-OT (Forwar<br>0 Enable<br>1 Enable<br>2 Enable<br>3 Enable<br>4 Enable<br>5 Enable<br>6 Enable<br>7 Set the<br>8 Set the<br>9 Enable<br>B Enable<br>C Enable                         | rameter (Do no<br>rameter (Do no<br>rd Drive Prohit<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>signal to alwa<br>signal to alwa<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive                  | ot change.<br>ot cha | Allocation<br>-13 input si<br>-7 input si<br>-9 input si<br>-10 input si<br>-11 input si<br>-12 input si<br>-12 input si<br>-13 input si<br>-8 input si<br>-8 input si<br>-9 input si                                                                                                                                                                                         | signal is ON (c<br>gnal is ON (cl<br>gnal is ON (cl<br>gnal is ON (cl<br>signal is ON (cl<br>signal is ON (cl<br>signal is ON (cl<br>signal is ON (cl<br>rive.<br>signal is OFF (cl<br>gnal is OFF (cl<br>gnal is OFF (cl<br>gnal is OFF (cl   | osed).<br>osed).<br>osed).<br>closed).<br>closed).<br>closed).<br>(open).<br>open).<br>open).                                             |                                       | nce            |
| Pn50A     |      | n.□□X□                            | Reserved part<br>Reserved part<br>P-OT (Forwar<br>0 Enable<br>1 Enable<br>2 Enable<br>3 Enable<br>4 Enable<br>5 Enable<br>6 Enable<br>7 Set the<br>8 Set the<br>9 Enable<br>A Enable<br>B Enable<br>C Enable<br>D Enable | rameter (Do no<br>rameter (Do no<br>rd Drive Prohit<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>signal to alwa<br>forward drive<br>signal to alwa<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive | ot change.<br>ot cha | Allocation<br>-13 input si<br>-7 input si<br>-9 input si<br>-10 input si<br>-11 input si<br>-12 input si<br>-12 input si<br>-7 input si<br>-7 input si<br>-8 input si<br>-9 input si<br>-9 input si<br>-10 input                                                                                                                                                              | signal is ON (c<br>gnal is ON (cl<br>gnal is ON (cl<br>gnal is ON (cl<br>signal is ON (c<br>signal is ON (c<br>signal is ON (c<br>signal is ON (c<br>signal is OFF (c<br>gnal is OFF (c<br>gnal is OFF (c<br>signal is OFF (c                  | osed).<br>osed).<br>osed).<br>closed).<br>closed).<br>closed).<br>closed).<br>(open).<br>open).<br>open).<br>open).<br>(open).            |                                       | ence           |
| Pn50A     |      | n.□□X□                            | Reserved part<br>P-OT (Forwar<br>0 Enable<br>1 Enable<br>2 Enable<br>3 Enable<br>4 Enable<br>5 Enable<br>6 Enable<br>7 Set the<br>8 Set the<br>9 Enable<br>A Enable<br>B Enable<br>C Enable<br>D Enable<br>E Enable      | rameter (Do no<br>rameter (Do no<br>rd Drive Prohit<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>signal to alwa<br>signal to alwa<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive<br>forward drive                  | ot change.<br>ot cha | <ul> <li>Allocation</li> <li>-13 input</li> <li>-7 input si</li> <li>-9 input si</li> <li>-10 input si</li> <li>-11 input</li> <li>-12 input</li> <li>t forward cd</li> <li>forward dd</li> <li>-13 input si</li> <li>-9 input si</li> <li>-9 input si</li> <li>-10 input si</li> <li>-9 input si</li> <li>-9 input si</li> <li>-10 input si</li> <li>-10 input si</li> </ul> | signal is ON (c<br>gnal is ON (cl<br>gnal is ON (cl<br>gnal is ON (cl<br>signal is OFF)<br>gnal is OFF (cl<br>gnal is OFF (cl<br>gnal is OFF)<br>signal is OFF | osed).<br>osed).<br>osed).<br>closed).<br>closed).<br>closed).<br>closed).<br>(open).<br>open).<br>open).<br>open).<br>(open).<br>(open). |                                       | nce            |

Continued from previous page.

| Parameter<br>No. | Size | ١         | lame         | Setting<br>Range                     | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refe<br>enc |  |  |  |  |
|------------------|------|-----------|--------------|--------------------------------------|-----------------|--------------------|----------------------|------------------|---------------------|-------------|--|--|--|--|
|                  | 2    |           | al Selection |                                      | _               | 8882               | All                  | After<br>restart | Setup               | -           |  |  |  |  |
|                  |      | 2         |              |                                      |                 |                    |                      | Tootart          |                     |             |  |  |  |  |
|                  |      |           |              | verse Drive Proh                     | ibit) Signal    | Allocation         |                      |                  | Refere              | ance        |  |  |  |  |
|                  |      |           | · · ·        | Enable reverse d                     | , ,             |                    |                      | N (closed).      | TICICIO             |             |  |  |  |  |
|                  |      |           |              | Enable reverse d                     |                 |                    | -                    |                  |                     |             |  |  |  |  |
|                  |      |           | 2            | Enable reverse d                     | rive when (     | CN1-8 inpu         | it signal is ON      | I (closed).      |                     |             |  |  |  |  |
|                  |      |           | 3            | Enable reverse d                     | rive when (     | CN1-9 inpu         | it signal is ON      | I (closed).      |                     |             |  |  |  |  |
|                  |      |           | 4            | Enable reverse d                     | rive when (     | CN1-10 inp         | out signal is O      | N (closed).      |                     |             |  |  |  |  |
|                  |      |           |              | Enable reverse d                     |                 |                    |                      |                  |                     |             |  |  |  |  |
|                  |      |           |              | Enable reverse d                     |                 |                    | -                    | N (closed).      |                     |             |  |  |  |  |
|                  |      | n.🗆🗆 X    |              | Set the signal to                    |                 |                    |                      |                  | *1                  |             |  |  |  |  |
|                  |      |           |              | Set the signal to                    | -               |                    |                      |                  |                     |             |  |  |  |  |
|                  |      |           |              | Enable reverse d                     |                 |                    | ÷                    |                  |                     |             |  |  |  |  |
|                  |      |           |              | Enable reverse d                     |                 | •                  | 0                    | ,                |                     |             |  |  |  |  |
|                  |      |           |              | Enable reverse d<br>Enable reverse d |                 | •                  | -                    |                  |                     |             |  |  |  |  |
|                  |      |           |              | Enable reverse d                     |                 |                    |                      |                  |                     |             |  |  |  |  |
|                  |      |           |              | Enable reverse d                     |                 |                    | 0                    | ,                |                     |             |  |  |  |  |
|                  |      |           |              | Enable reverse d                     |                 |                    | 0                    | <b>N N N</b>     |                     |             |  |  |  |  |
|                  |      |           |              |                                      |                 |                    |                      |                  |                     |             |  |  |  |  |
| n50B             |      | n.🗆 🗆 X 🗆 | Reserved     | parameter (Do n                      | lot change      | .)                 |                      |                  | 1                   |             |  |  |  |  |
|                  |      |           |              | rward External T                     |                 |                    | -                    | n                | Refere              | ence        |  |  |  |  |
|                  |      |           |              | Active when CN1                      |                 | -                  |                      |                  |                     |             |  |  |  |  |
|                  |      |           |              | Active when CN1                      |                 | 0                  | . ,                  |                  |                     |             |  |  |  |  |
|                  |      |           |              | Active when CN1                      |                 | -                  |                      |                  |                     |             |  |  |  |  |
|                  |      |           |              | Active when CN1                      |                 | -                  |                      |                  |                     |             |  |  |  |  |
|                  |      |           |              | Active when CN1<br>Active when CN1   |                 | •                  | · ,                  |                  |                     |             |  |  |  |  |
|                  |      |           |              | Active when CN1                      |                 | -                  |                      |                  |                     |             |  |  |  |  |
|                  |      | n.¤X¤¤    |              | The signal is alwa                   | •               |                    | <b>v</b> (closed).   |                  |                     |             |  |  |  |  |
|                  |      |           |              | The signal is alwa                   |                 | ).                 |                      |                  | *1                  |             |  |  |  |  |
|                  |      |           |              | Active when CN1                      |                 |                    | F (open).            |                  |                     |             |  |  |  |  |
|                  |      |           |              | Active when CN1                      |                 |                    |                      |                  |                     |             |  |  |  |  |
|                  |      |           | В            | Active when CN1                      | -8 input si     | gnal is OFF        | open).               |                  |                     |             |  |  |  |  |
|                  |      |           | С            | Active when CN1                      | -9 input si     | gnal is OFF        | open).               |                  |                     |             |  |  |  |  |
|                  |      |           | D            | Active when CN1                      | -10 input s     | signal is OF       | F (open).            |                  |                     |             |  |  |  |  |
|                  |      |           | E            | Active when CN1                      | -11 input s     | signal is OF       | F (open).            |                  |                     |             |  |  |  |  |
|                  |      |           | F            | Active when CN1                      | -12 input s     | signal is OF       | FF (open).           |                  |                     |             |  |  |  |  |
|                  |      |           |              |                                      |                 |                    |                      |                  |                     |             |  |  |  |  |
|                  |      |           | /N-CL (Re    | everse External T                    | orque Lim       | t Input) Si        | gnal Allocatic       | n                | Refere              | ence        |  |  |  |  |

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|                  |                                                                                                                                                                     |                                                                                                                                                                            |                                                                                                                                                        |         |                                       |                    |                    | Cor                                 | tinued from      | previou             | s page.        |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------------------------------|--------------------|--------------------|-------------------------------------|------------------|---------------------|----------------|
| Parameter<br>No. | Size                                                                                                                                                                | N                                                                                                                                                                          | lame                                                                                                                                                   |         | Setting<br>Range                      | Setting<br>Unit    | Default<br>Setting | Applicable<br>Motors                | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
|                  | 2                                                                                                                                                                   | Output Sig                                                                                                                                                                 | gnal Selec-                                                                                                                                            |         | 0000 to<br>6666                       | -                  | 0000               | All                                 | After<br>restart | Setup               | -              |
|                  |                                                                                                                                                                     |                                                                                                                                                                            | 1                                                                                                                                                      |         |                                       |                    |                    |                                     | Tootart          |                     |                |
|                  |                                                                                                                                                                     |                                                                                                                                                                            | · · ·                                                                                                                                                  | 1       | oning Comple                          | •                  | , 0                |                                     |                  | Refere              | ence           |
|                  |                                                                                                                                                                     |                                                                                                                                                                            | 0                                                                                                                                                      |         | abled (the abov                       | Ū                  |                    | ,                                   |                  |                     |                |
|                  |                                                                                                                                                                     | n.DDDX                                                                                                                                                                     | 1                                                                                                                                                      |         | put the signal                        |                    |                    | •                                   |                  |                     |                |
|                  |                                                                                                                                                                     |                                                                                                                                                                            | 2                                                                                                                                                      |         | put the signal                        |                    |                    |                                     |                  | *1                  |                |
|                  |                                                                                                                                                                     |                                                                                                                                                                            | 4 to 6                                                                                                                                                 |         | put the signal served setting (       |                    |                    | GNT-20 Outp                         | ut terminai.     |                     |                |
| D 545            |                                                                                                                                                                     |                                                                                                                                                                            | 4100                                                                                                                                                   | nea     | served setting (                      | DO HOL US          | e.)                |                                     |                  |                     |                |
| Pn50E            |                                                                                                                                                                     |                                                                                                                                                                            | /V-CMP                                                                                                                                                 | <u></u> | ed Coincidend                         |                    |                    | , 0                                 |                  | Refere              | ence           |
|                  |                                                                                                                                                                     | n.□□X□       0 to 6       The allocations are the same as the /COIN (Positioning Comption) signal allocations.         /TGON (Rotation Detection Output) Signal Allocation |                                                                                                                                                        |         |                                       |                    |                    |                                     |                  |                     |                |
|                  |                                                                                                                                                                     |                                                                                                                                                                            |                                                                                                                                                        |         |                                       |                    |                    |                                     |                  |                     | ence           |
|                  |                                                                                                                                                                     | n.¤X¤¤                                                                                                                                                                     | 0 to 6                                                                                                                                                 |         | e allocations are<br>) signal allocat |                    | e as the /C        | OIN (Position                       | ing Comple-      | *1                  |                |
|                  |                                                                                                                                                                     |                                                                                                                                                                            | /S-RDY                                                                                                                                                 | (Ser\   | vo Ready) Sigr                        | al Allocat         | ion                |                                     |                  | Refere              | ence           |
|                  |                                                                                                                                                                     | n.X000                                                                                                                                                                     | /S-RDY (Servo Ready) Signal Allocation           0 to 6         The allocations are the same as the /COIN (Positioning Completion) signal allocations. |         |                                       |                    |                    |                                     |                  | *1                  |                |
|                  |                                                                                                                                                                     |                                                                                                                                                                            |                                                                                                                                                        |         |                                       |                    |                    |                                     |                  |                     |                |
|                  | 2                                                                                                                                                                   | Output Sig<br>tions 2                                                                                                                                                      | gnal Selec-                                                                                                                                            |         | 0000 to<br>6666                       | -                  | 0100               | All                                 | After<br>restart | Setup               | -              |
|                  |                                                                                                                                                                     |                                                                                                                                                                            |                                                                                                                                                        |         |                                       |                    |                    |                                     |                  |                     |                |
|                  |                                                                                                                                                                     |                                                                                                                                                                            | /CLT (To                                                                                                                                               | raue    | Limit Detectio                        | on Output)         | Signal All         | ocation                             |                  | Refere              | ence           |
|                  |                                                                                                                                                                     |                                                                                                                                                                            | 0                                                                                                                                                      | r ·     | abled (the abov                       | • •                | •                  |                                     |                  |                     |                |
|                  |                                                                                                                                                                     |                                                                                                                                                                            | 1                                                                                                                                                      | Out     | put the signal                        | from the C         | N1-1 or C          | N1-2 output                         | terminal.        |                     |                |
|                  |                                                                                                                                                                     | n.🗆🗆 🛛 X                                                                                                                                                                   | 2                                                                                                                                                      | Out     | put the signal                        | from the C         | N1-23 or           | CN1-24 outp                         | ut terminal.     | *1                  |                |
|                  |                                                                                                                                                                     |                                                                                                                                                                            | 3                                                                                                                                                      | Out     | put the signal                        | from the C         | N1-25 or           | CN1-26 outp                         | ut terminal.     |                     |                |
|                  |                                                                                                                                                                     |                                                                                                                                                                            | 4 to 6                                                                                                                                                 | Res     | served setting (                      | Do not us          | e.)                |                                     |                  |                     |                |
| Pn50F            |                                                                                                                                                                     |                                                                                                                                                                            | /VLT (Sp                                                                                                                                               | eed     | Limit Detection                       | n) Signal <i>I</i> | Allocation         |                                     |                  | Refere              | ence           |
|                  |                                                                                                                                                                     |                                                                                                                                                                            |                                                                                                                                                        |         |                                       |                    |                    | as the /CLT (Torque Limit Detection |                  |                     |                |
|                  | n.□X□□       /BK (Brake Output) Signal Allocation         0 to 6       The allocations are the same as the /CLT (Torque Limit Detection Output) signal allocations. |                                                                                                                                                                            |                                                                                                                                                        |         |                                       |                    |                    |                                     |                  | Refere              | ence           |
|                  |                                                                                                                                                                     |                                                                                                                                                                            |                                                                                                                                                        |         |                                       |                    |                    |                                     | mit Detection    | *1                  |                |
|                  |                                                                                                                                                                     |                                                                                                                                                                            | /WARN (                                                                                                                                                | Warı    | ning Output) S                        | ignal Allo         | cation             |                                     |                  | Refere              | ence           |
|                  |                                                                                                                                                                     | n.XDDD                                                                                                                                                                     | 0 to 6                                                                                                                                                 |         | e allocations are<br>put) signal allo |                    | e as the /C        | CLT (Torque Li                      | mit Detection    | *1                  |                |
|                  |                                                                                                                                                                     |                                                                                                                                                                            |                                                                                                                                                        |         |                                       |                    |                    |                                     |                  | don nov             |                |

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| Parameter<br>No. | Size | N                     | ame                                 |                                                                 | Setting<br>Range | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |  |
|------------------|------|-----------------------|-------------------------------------|-----------------------------------------------------------------|------------------|-----------------|--------------------|----------------------|------------------|---------------------|----------------|--|
|                  | 2    | Output Sig<br>tions 3 | nal Selec-                          |                                                                 | 0000 to<br>0666  | -               | 0000               | All                  | After<br>restart | Setup               | -              |  |
|                  |      |                       | /NEAR (I                            | IEAR (Near Output) Signal Allocation                            |                  |                 |                    |                      |                  |                     |                |  |
|                  |      |                       | 0                                   | 1                                                               | abled (the abov  |                 |                    | ot used).            |                  |                     |                |  |
|                  |      | n.DDDX                | 1                                   | Output the signal from the CN1-1 or CN1-2 output terminal.      |                  |                 |                    |                      |                  |                     |                |  |
| D. 544           |      |                       | 2                                   | Output the signal from the CN1-23 or CN1-24 output terminal. *1 |                  |                 |                    |                      |                  |                     |                |  |
| Pn510            |      |                       | 3                                   | Out                                                             | put the signal   | from the C      | N1-25 or           | CN1-26 outp          | ut terminal.     |                     |                |  |
|                  |      |                       | 4 to 6                              | Res                                                             | served setting ( | Do not us       | e.)                |                      |                  |                     |                |  |
|                  |      | n.🗆 🗆 X 🗆             | Reserve                             | d pai                                                           | rameter (Do no   | ot change       | )                  |                      |                  |                     |                |  |
|                  |      | n.¤X¤¤                | Reserved parameter (Do not change.) |                                                                 |                  |                 |                    |                      |                  |                     |                |  |
|                  |      | n.X000                | Reserve                             | d pai                                                           | rameter (Do no   | ot change       | )                  |                      |                  |                     |                |  |
|                  |      |                       |                                     |                                                                 |                  |                 |                    |                      |                  |                     |                |  |

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|                  |      | _               |                                                                          |                                                                                                                                                                                                                                                                            | -                                                                                                                                                                      |                                                                                                                                    | Con                                                                                                                                    | tinued fron      | n previou           | s page         |
|------------------|------|-----------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|----------------|
| Parameter<br>No. | Size | N               | lame                                                                     | Setting<br>Range                                                                                                                                                                                                                                                           | Setting<br>Unit                                                                                                                                                        | Default<br>Setting                                                                                                                 | Applicable<br>Motors                                                                                                                   | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
|                  | 2    | Input Sign<br>5 | al Selectio                                                              | ns 0000 to<br>FFFF                                                                                                                                                                                                                                                         | -                                                                                                                                                                      | 6543                                                                                                                               | All                                                                                                                                    | After<br>restart | Setup               | *1             |
|                  |      | n.000X          | /DEC (O<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>A<br>B<br>C | igin Return Dece<br>Active when CN1<br>Active when CN1<br>Active when CN1<br>Active when CN1<br>Active when CN1<br>Active when CN1<br>Active when CN1<br>The signal is alwa<br>Active when CN1<br>Active when CN1<br>Active when CN1<br>Active when CN1<br>Active when CN1 | -13 input s<br>-7 input sig<br>-8 input sig<br>-9 input sig<br>-10 input s<br>-11 input s<br>-12 input s<br>ys active.<br>ys inactive<br>-13 input sig<br>-8 input sig | ignal is ON<br>gnal is ON<br>gnal is ON<br>ignal is ON<br>ignal is ON<br>ignal is ON<br>ignal is OFF<br>gnal is OFF<br>gnal is OFF | I (closed).<br>(closed).<br>(closed).<br>(closed).<br>I (closed).<br>I (closed).<br>I (closed).<br>I (closed).<br>F (open).<br>(open). | ation            |                     |                |
| Pn511            |      |                 | D<br>E<br>F                                                              | Active when CN1<br>Active when CN1<br>Active when CN1<br>Active when CN1                                                                                                                                                                                                   | -10 input s<br>-11 input s                                                                                                                                             | ignal is OF<br>ignal is OF                                                                                                         | F (open).<br>F (open).                                                                                                                 |                  |                     |                |
|                  |      |                 | /EXT1 (E                                                                 | xternal Latch Inpu                                                                                                                                                                                                                                                         | ıt 1) Signal                                                                                                                                                           | Allocation                                                                                                                         | 1                                                                                                                                      |                  |                     |                |
|                  |      |                 | 0 to 3                                                                   | The signal is always                                                                                                                                                                                                                                                       | iys inactive                                                                                                                                                           |                                                                                                                                    |                                                                                                                                        |                  |                     |                |
|                  |      |                 | 4                                                                        | Active when CN1                                                                                                                                                                                                                                                            | -10 input s                                                                                                                                                            | ignal is ON                                                                                                                        | l (closed).                                                                                                                            |                  |                     |                |
|                  |      |                 | 5                                                                        | Active when CN1                                                                                                                                                                                                                                                            | -11 input s                                                                                                                                                            | ignal is ON                                                                                                                        | I (closed).                                                                                                                            |                  |                     |                |
|                  |      | n.🗆🗆 X 🗆        | 6                                                                        | Active when CN1                                                                                                                                                                                                                                                            | -12 input s                                                                                                                                                            | ignal is ON                                                                                                                        | I (closed).                                                                                                                            |                  |                     |                |
|                  |      |                 | D                                                                        | Active when CN1                                                                                                                                                                                                                                                            | -10 input s                                                                                                                                                            | ignal is OF                                                                                                                        | F (open).                                                                                                                              |                  |                     |                |
|                  |      |                 | E                                                                        | Active when CN1                                                                                                                                                                                                                                                            |                                                                                                                                                                        | -                                                                                                                                  |                                                                                                                                        |                  |                     |                |
|                  |      |                 | F                                                                        | Active when CN1                                                                                                                                                                                                                                                            | -12 input s                                                                                                                                                            | ignal is OF                                                                                                                        | F (open).                                                                                                                              |                  |                     |                |
|                  |      |                 | 7 to C                                                                   | The signal is always                                                                                                                                                                                                                                                       | iys inactive                                                                                                                                                           |                                                                                                                                    |                                                                                                                                        |                  |                     |                |
|                  |      |                 | /EXT2 (E                                                                 | xternal Latch Inpu                                                                                                                                                                                                                                                         | ıt 2) Signal                                                                                                                                                           | Allocation                                                                                                                         | 1                                                                                                                                      |                  |                     |                |
|                  |      | n.¤X¤¤          | 0 to F                                                                   | The allocations a cations.                                                                                                                                                                                                                                                 | re the same                                                                                                                                                            | e as the /E                                                                                                                        | XT1 (External                                                                                                                          | Latch Input      | 1) signal a         | allo-          |
|                  |      |                 | /EXT3 (E                                                                 | xternal Latch Inpu                                                                                                                                                                                                                                                         | ıt 3) Signal                                                                                                                                                           | Allocation                                                                                                                         | 1                                                                                                                                      |                  |                     |                |
|                  |      | n.XDDD          | 0 to F                                                                   | The allocations a cations.                                                                                                                                                                                                                                                 | re the same                                                                                                                                                            | e as the /E                                                                                                                        | XT1 (External                                                                                                                          | Latch Input      | 1) signal a         | allo-          |

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|           |        |                                                                                                                          |                                                   |       |                 |            |            | 001          | tinued from      | i picvicu | 5 pug |
|-----------|--------|--------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------|-----------------|------------|------------|--------------|------------------|-----------|-------|
| Parameter | Size   | N                                                                                                                        | ame                                               |       | Setting         | Setting    | Default    | Applicable   | When             | Classi-   | Refer |
| No.       | Ω<br>Ω |                                                                                                                          |                                                   |       | Range           | Unit       | Setting    | Motors       | Enabled          | fication  | ence  |
|           | 2      | Output Sig<br>Settings                                                                                                   | inal Inverse                                      | )     | 0000 to<br>1111 | -          | 0000       | All          | After<br>restart | Setup     | *1    |
|           |        |                                                                                                                          | 1                                                 |       |                 |            |            |              |                  |           |       |
|           |        |                                                                                                                          | <u> </u>                                          | •     | I Inversion for |            | nd CN1-2   | Terminals    |                  |           |       |
|           |        | n.🗆 🗆 🗆 X                                                                                                                | 0                                                 |       | signal is not i |            |            |              |                  |           |       |
|           |        |                                                                                                                          | 1                                                 | The   | signal is inver | ted.       |            |              |                  |           |       |
|           |        |                                                                                                                          | Output S                                          | igna  | I Inversion for | CN1-23 a   | and CN1-2  | 4 Terminals  |                  |           |       |
| Pn512     |        | n.🗆🗆 X 🗆                                                                                                                 | 0                                                 | The   | signal is not i | nverted.   |            |              |                  |           |       |
|           |        |                                                                                                                          | 1                                                 | The   | signal is inver | ted.       |            |              |                  |           |       |
|           |        |                                                                                                                          |                                                   |       |                 |            |            |              |                  |           |       |
|           |        | Output Signal Inversion for CN1-25 and CN1-26 Terminals           n.□X□□         0           The signal is not inverted. |                                                   |       |                 |            |            |              |                  |           |       |
|           |        | n.¤X¤¤                                                                                                                   | 1                                                 |       | 0               |            |            |              |                  |           |       |
|           |        |                                                                                                                          | I                                                 | The   | signal is inver | tea.       |            |              |                  |           |       |
|           |        | n.XDDD                                                                                                                   | Reserved                                          | l par | ameter (Do no   | ot change. | )          |              |                  |           |       |
|           |        |                                                                                                                          |                                                   |       |                 |            |            |              |                  |           |       |
|           | 2      | Output Sig<br>tions 4                                                                                                    | inal Selec-                                       |       | 0000 to<br>0666 | -          | 0000       | All          | After<br>restart | Setup     | _     |
|           |        |                                                                                                                          |                                                   |       |                 |            |            |              |                  |           |       |
|           |        |                                                                                                                          | <b>D</b>                                          |       |                 |            | <b>\</b>   |              |                  |           |       |
|           |        | n.🗆 🗆 🛛 X                                                                                                                | Reserved                                          | ı par | ameter (Do no   | ot change. | )          |              |                  |           |       |
|           |        | n.🗆🗆 X 🗆                                                                                                                 | Reserved                                          | l par | ameter (Do no   | ot change. | )          |              |                  |           |       |
| D 514     |        |                                                                                                                          | /PM (Pre                                          | venta | ative Maintena  | ance Outp  | ut) Signal | Allocation   |                  | Refere    | ence  |
| Pn514     |        |                                                                                                                          | 0 Disabled (the above signal output is not used). |       |                 |            |            |              |                  |           |       |
|           |        | n.¤X¤¤                                                                                                                   | 1                                                 | Out   | put the signal  | from the C | N1-1 or C  | N1-2 output  | terminal.        |           |       |
|           |        |                                                                                                                          | 2                                                 |       |                 |            |            |              |                  | *1        |       |
|           |        |                                                                                                                          | 3                                                 |       | put the signal  |            |            | CN1-26 outpu | ut terminal.     |           |       |
|           |        |                                                                                                                          | 4 to 6                                            | Res   | erved setting ( | Do not us  | e.)        |              |                  |           |       |
|           | 1      |                                                                                                                          |                                                   |       |                 |            |            |              |                  |           |       |
|           |        | n.XDDD                                                                                                                   | Reserved                                          | l par | ameter (Do no   | ot change. | )          |              |                  |           |       |

|                     |          |                                                                                                      |                                                                                               |                                             |                                                |                            | Con                  | tinued from                                              | n previou:          | s page                             |
|---------------------|----------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------|------------------------------------------------|----------------------------|----------------------|----------------------------------------------------------|---------------------|------------------------------------|
| Parameter<br>No.    | Size     | 1                                                                                                    | Name                                                                                          | Setting<br>Range                            | Setting<br>Unit                                | Default<br>Setting         | Applicable<br>Motors | When<br>Enabled                                          | Classi-<br>fication | Refer-<br>ence                     |
|                     | 2        | Input Sigr                                                                                           | nal Selections                                                                                | 0000 to<br>FFFF                             | _                                              | 8888                       | All                  | After<br>restart                                         | Setup               | _                                  |
|                     |          | ,                                                                                                    |                                                                                               |                                             |                                                |                            |                      | Tootart                                                  |                     |                                    |
|                     |          |                                                                                                      | FSTP (Force                                                                                   | ed Stop Input) Si                           | gnal Alloc                                     | ation                      |                      |                                                          | Refere              | ence                               |
|                     |          |                                                                                                      | 0 E                                                                                           | nable drive wher                            | n CN1-13                                       | input signa                | al is ON (close      | ed).                                                     |                     |                                    |
|                     |          |                                                                                                      |                                                                                               | nable drive wher                            |                                                |                            |                      | ,                                                        |                     |                                    |
|                     |          |                                                                                                      |                                                                                               | nable drive wher                            |                                                |                            |                      | ,                                                        |                     |                                    |
|                     |          |                                                                                                      |                                                                                               | nable drive wher                            |                                                | 1 0                        | 1                    | ,                                                        |                     |                                    |
|                     |          |                                                                                                      |                                                                                               | nable drive wher                            |                                                |                            | ,                    | ,                                                        |                     |                                    |
|                     |          |                                                                                                      |                                                                                               | nable drive wher                            |                                                |                            | ,                    | ,                                                        |                     |                                    |
|                     |          |                                                                                                      |                                                                                               | nable drive when                            |                                                |                            | ```                  | ,                                                        |                     |                                    |
|                     | n        | .000X                                                                                                | / s                                                                                           | Set the signal to a top).                   |                                                |                            |                      |                                                          | *1                  |                                    |
| Pn516               |          |                                                                                                      | ° r                                                                                           | Set the signal to a notor to stop).         | -                                              |                            |                      | 0                                                        |                     |                                    |
|                     |          |                                                                                                      |                                                                                               | nable drive wher                            |                                                |                            | · ·                  | ,                                                        |                     |                                    |
|                     |          |                                                                                                      |                                                                                               | nable drive wher                            |                                                | 1 0                        |                      |                                                          |                     |                                    |
|                     |          |                                                                                                      |                                                                                               | nable drive when                            |                                                |                            |                      |                                                          |                     |                                    |
|                     |          |                                                                                                      |                                                                                               | nable drive when                            |                                                |                            |                      |                                                          |                     |                                    |
|                     |          |                                                                                                      |                                                                                               | Enable drive wher<br>Enable drive wher      |                                                |                            |                      |                                                          |                     |                                    |
|                     |          |                                                                                                      |                                                                                               | Enable drive when                           |                                                |                            |                      | ,                                                        |                     |                                    |
|                     |          |                                                                                                      |                                                                                               |                                             |                                                | input signe                |                      |                                                          |                     |                                    |
|                     | n        |                                                                                                      | Reserved pa                                                                                   | arameter (Do not                            | t change.)                                     |                            |                      |                                                          |                     |                                    |
|                     | n        | .0X00                                                                                                | Reserved pa                                                                                   | arameter (Do not                            | t change.)                                     |                            |                      |                                                          |                     |                                    |
|                     |          | ·                                                                                                    |                                                                                               |                                             |                                                |                            |                      |                                                          |                     |                                    |
|                     | <u>n</u> | .X000                                                                                                | Reserved pa                                                                                   | arameter (Do not                            | t change.)                                     |                            |                      |                                                          |                     |                                    |
|                     |          |                                                                                                      |                                                                                               |                                             |                                                |                            |                      |                                                          |                     |                                    |
| Pn518 <sup>*4</sup> | -        | Safety Mo<br>Paramete                                                                                | odule-Related<br>ers                                                                          | _                                           | -                                              | -                          | All                  | -                                                        | -                   | -                                  |
| Pn51B               | 4        | Motor-Los<br>Deviation<br>Detection                                                                  |                                                                                               | 0 to<br>1,073,741,824                       | 1 refer-<br>ence<br>unit                       | 1000                       | Rotary               | Immedi-<br>ately                                         | Setup               | *1                                 |
| Pn51E               | 2        | Position E<br>flow Warr                                                                              | Deviation Over<br>hing Level                                                                  | - 10 to 100                                 | 1%                                             | 100                        | All                  | Immedi-<br>ately                                         | Setup               | page<br>9-40                       |
| Pn520               | 4        | Position [<br>flow Alarr                                                                             | Deviation Over<br>n Level                                                                     | - 1 to<br>1,073,741,823                     | 1 refer-<br>ence<br>unit                       | 524288<br>0                | All                  | Immedi-<br>ately                                         | Setup               | page<br>5-7,<br>page<br>9-2        |
| Pn522               | 4        | Positionin<br>Width                                                                                  | ig Completed                                                                                  | 0 to<br>1,073,741,824                       | 1 refer-<br>ence<br>unit                       | 7                          | All                  | Immedi-<br>ately                                         | Setup               | *1                                 |
|                     | 1        | -                                                                                                    | al Width 1 to 1 reference unit                                                                |                                             |                                                | All Immedi-<br>ately       | Setup                |                                                          |                     |                                    |
| Pn524               | 4        | Near Sigr                                                                                            | nal Width                                                                                     |                                             | ence                                           | 107374<br>1824             | All                  |                                                          | Setup               | *1                                 |
| Pn524<br>Pn526      | 4        | Position [                                                                                           | Deviation Over<br>n Level at                                                                  | 1,073,741,824                               | ence                                           |                            | All                  |                                                          | Setup<br>Setup      |                                    |
|                     |          | Position I<br>flow Alarr<br>Servo ON<br>Position I                                                   | Deviation Over<br>n Level at<br>Deviation Over<br>ning Level at                               | 1,073,741,824<br>- 1 to<br>1,073,741,823    | ence<br>unit<br>1 refer-<br>ence               | 1824<br>524288             |                      | ately<br>Immedi-                                         |                     | page<br>5-7                        |
| Pn526               | 4        | Position I<br>flow Alarr<br>Servo ON<br>Position I<br>flow Warr<br>Servo ON<br>Speed Lir<br>Servo ON | Deviation Over<br>n Level at<br>Deviation Over<br>hing Level at<br>mit Level at               | 1,073,741,824<br>1 to<br>1,073,741,823<br>- | ence<br>unit<br>1 refer-<br>ence<br>unit       | 1824<br>524288<br>0        | All                  | ately<br>Immedi-<br>ately<br>Immedi-                     | Setup               | page<br>5-7<br>page<br>5-7         |
| Pn526<br>Pn528      | 4        | Position I<br>flow Alarr<br>Servo ON<br>Position I<br>flow Warr<br>Servo ON<br>Speed Lir<br>Servo ON | Deviation Over<br>n Level at<br>Deviation Over<br>hing Level at<br>mit Level at<br>per Fully- | 1,073,741,824<br>1,073,741,823<br>10 to 100 | ence<br>unit<br>1 refer-<br>ence<br>unit<br>1% | 1824<br>524288<br>0<br>100 | All                  | ately<br>Immedi-<br>ately<br>Immedi-<br>ately<br>Immedi- | Setup               | page<br>5-7<br>page<br>5-7<br>page |

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| Parameter<br>No. | Size | N                                     | ame                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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                                                                                  | Default<br>Setting                                                                                                     | Applicable<br>Motors                                                                                                                            | When<br>Enabled                                                                                                  | Classi-<br>fication                                                                    | Refer-<br>ence                                   |
| Pn52C            | 2    | Base Curre<br>at Motor O<br>Detection | ent Derating<br>verload                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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                                                                                  | 100                                                                                                                    | All                                                                                                                                             | After<br>restart                                                                                                 | Setup                                                                                  | *1                                               |
|                  | 2    | Program Jo<br>Related Se              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0000 to<br>0005                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | - 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| Pn530            |      | n.□□□X<br>n.□□X□<br>n.□X□□<br>n.X□□□  | 0         (Wi<br>mo           1         (Wi<br>mo           2         (Wi<br>mo           3         (Wi<br>mo           4         (Wi<br>mo           5         (Mi<br>mo           7         (Wi<br>mo           8         (Wi<br>mo           9         (Wi<br>mo           1         (Wi<br>mo           1         (Wi<br>mo           1         (Wi<br>mo           1         (Wi<br>mo           1         (Wi<br>in F<br>Pn:           1         (Wi<br>in F<br>Pn:           1         (Wi<br>in F<br>Pn:           2         (Wi<br>in F<br>Pn:           1         (Wi<br>in F<br>Pn:           2         (Wi<br>in F<br>Pn:           2         (Wi<br>in F<br>Pn:           3         (Wi<br>in F<br>Pn:           3         (Wi<br>in F<br>Pn:           4         (Wi<br>in F<br>Pn:           5         (Wi<br>in F<br>Pn:           6         (Wi<br>in F<br>Pn:           7         (Wi<br>in F<br>Pn:           8         (Wi<br>in F<br>Pn:           8         (Wi in F<br>Pn:           8         (Wi in F<br>Pn: | iging Operation<br>aiting time in Provements | $h535 \rightarrow Fc$<br>536<br>$h535 \rightarrow Fc$<br>536<br>$h535 \rightarrow Fc$<br>536<br>$h535 \rightarrow Fc$<br>536<br>$h535 \rightarrow Fc$<br>536<br>$h535 \rightarrow Fc$<br>536<br>$h535 \rightarrow Fc$<br>$rave by trave h535 \rightarrow Fcrave by traveh535 \rightarrow Fcrave by traveh535 \rightarrow Fcrave by traveh535 \rightarrow Fch535 \rightarrow Fc$ | everse by t<br>prward by t<br>everse by t<br>prward by t<br>prward by t<br>rel distance<br>everse by t<br>rel distance | travel distance<br>travel distance<br>travel distance<br>travel distance<br>travel distance<br>aravel distance<br>in Pn531) ×<br>ravel distance | e in Pn531) ><br>e in Pn531 -<br>Number of n | < Number<br>< Number<br>< Number<br>< Number<br>< Number<br>> Waiting t<br>> Waiting t | of<br>of<br>of<br>of<br>of<br>ime<br>s in<br>ime |
| Pn531            | 4    | Program Jo<br>Distance                | ogging Travel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1 to<br>1,073,741,824                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 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                                                                                  | 32768                                                                                                                  | All                                                                                                                                             | Immedi-<br>ately                                                                                                 | Setup                                                                                  | *1                                               |
| Pn533            | 2    | Program Jo<br>ment Spee               | ogging Move-<br>d                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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| Pn534            | 2    | Program Jo<br>eration/Deo<br>Time     | ogging Accel-<br>celeration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          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| Pn535            | 2    | Program Jo<br>ing Time                | ogging Wait-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| Pn536            | 2    | ber of Mov                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| Pn550            | 2    | Analog Mo<br>Voltage                  | nitor 1 Offset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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                                                                                  | 0                                                                                                                      | All                                                                                                                                             | Immedi-<br>ately                                                                                                 | Setup                                                                                  | page<br>8-4                                      |
| Pn551            | 2    | Analog Mo<br>Voltage                  | nitor 2 Offset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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| Pn552            | 2    | Analog Mo<br>nification               | nitor 1 Mag-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| Pn553            | 2    | Analog Mo<br>nification               | nitor 2 Mag-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| Pn55A            | 2    | Power Con<br>Monitor Un               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| Pn560            | 2    | Residual Vi<br>Detection V            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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                                                                                  | 400                                                                                                                    | All                                                                                                                                             | Immedi-<br>ately                                                                                                 | Setup                                                                                  | page<br>5-50                                     |
| Pn561            | 2    | Overshoot<br>Level                    | Detection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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                                                                                  | 100                                                                                                                    | All                                                                                                                                             | Immedi-<br>ately                                                                                                 | Setup                                                                                  | page<br>5-18,<br>page<br>5-29                    |

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|---------------------------------|------|--------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------|--------------------|----------------------|------------------|---------------------|----------------|
| Parameter<br>No.                | Size | Name                                                         |                                | Setting<br>Range                                                                                         | Setting<br>Unit                  | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
| Pn581                           | 2    | Zero Speed Leve                                              | I                              | 1 to 10,000                                                                                              | 1 mm/s                           | 20                 | Linear               | Immedi-<br>ately | Setup               | *1             |
| Pn582                           | 2    | Speed Coinciden<br>Detection Signal<br>Width                 |                                | 0 to 100                                                                                                 | 1 mm/s                           | 10                 | Linear               | Immedi-<br>ately | Setup               | *1             |
| Pn583                           | 2    | Brake Reference<br>put Speed Level                           | Out-                           | 0 to 10,000                                                                                              | 1 mm/s                           | 10                 | Linear               | Immedi-<br>ately | Setup               | *1             |
| Pn584                           | 2    | Speed Limit Leve<br>Servo ON                                 | l at                           | 0 to 10,000                                                                                              | 1 mm/s                           | 10000              | Linear               | Immedi-<br>ately | Setup               | page<br>5-7    |
| Pn585                           | 2    | Program Jogging<br>ment Speed                                | Move-                          | 1 to 10,000                                                                                              | 1 mm/s                           | 50                 | Linear               | Immedi-<br>ately | Setup               | *1             |
| Pn586                           | 2    | Motor Running C<br>Ratio                                     | ooling                         | 0 to 100                                                                                                 | 1%/<br>Max.<br>speed             | 0                  | Linear               | Immedi-<br>ately | Setup               | Ι              |
|                                 | 2    | Polarity Detection<br>Execution Selecti<br>Absolute Linear E | on for                         | 0000 to<br>0001                                                                                          | _                                | 0000               | Linear               | Immedi-<br>ately | Setup               | -              |
| Pn587                           |      | n.□□□X 0<br>1<br>n.□□X□ Rese<br>n.□X□□ Rese                  | Do no<br>Detection<br>rved par | ction Selection<br>ot detect polar<br>ct polarity.<br>rameter (Do no<br>rameter (Do no<br>rameter (Do no | ity.<br>ot change.<br>ot change. | )                  |                      |                  | Referen<br>*1       |                |
| Pn600                           | 2    | Regenerative Res<br>Capacity <sup>*5</sup>                   | sistor                         | Depends on model. <sup>*6</sup>                                                                          | 10 W                             | 0                  | All                  | Immedi-<br>ately | Setup               | *1             |
| Pn601                           | 2    | Dynamic Brake R<br>tor Allowable Ene<br>Consumption          |                                | 0 to 65,535                                                                                              | 10 J                             | 0                  | All                  | After<br>restart | Setup               | *7             |
| Pn603                           | 2    | Regenerative Restance                                        | sis-                           | 0 to 65,535                                                                                              | 10 m $\Omega$                    | 0                  | All                  | Immedi-<br>ately | Setup               | *1             |
| Pn604                           | 2    | Dynamic Brake R<br>tance                                     | lesis-                         | 0 to 65,535                                                                                              | 10 m $\Omega$                    | 0                  | All                  | After<br>restart | Setup               | *7             |
| Pn621 to<br>Pn628 <sup>*4</sup> | _    | Safety Module-Re<br>Parameters                               | elated                         | _                                                                                                        | _                                | _                  | All                  | _                | _                   | _              |

Continued from previous page.

| Parameter | Size | N                                  | lame                    |                    | Setting                     | Setting                      | Default      | Applicable     | tinued fron<br>When | Classi-  | Refer-       |
|-----------|------|------------------------------------|-------------------------|--------------------|-----------------------------|------------------------------|--------------|----------------|---------------------|----------|--------------|
| No.       | Si   |                                    |                         |                    | Range                       | Unit                         | Setting      | Motors         | Enabled             | fication | ence         |
|           | 2    | Clearance<br>Selection<br>Switches | Control<br>Application  |                    | 0000 to<br>0131             | -                            | 0000         | All            | After<br>restart    | Setup    | page<br>4-1  |
|           | -    |                                    | Clearance               | - Contro           | ol Selection                | Switch                       |              |                |                     |          |              |
|           |      | n.000X                             | 0                       |                    | e clearance                 |                              |              |                |                     | _        |              |
|           |      |                                    | 1                       |                    | clearance                   |                              |              |                |                     |          |              |
|           |      |                                    | Clearance               | e Contro           | ol Warning S                | Selection S                  | witch        |                |                     |          |              |
|           |      |                                    | 0                       | Enable             |                             | of AD error                  | s and clea   | arance positio | n deviation         |          |              |
| Pn6E8     |      | n.DDXD                             | 1                       |                    | e detection                 | of AD erro                   | r.           |                |                     |          |              |
|           |      |                                    | 2                       |                    | e detection                 | •                            |              |                |                     |          |              |
|           |      |                                    | 3                       | Disable<br>overflo |                             | of AD erro                   | rs and clea  | arance positio | on deviation        |          |              |
|           |      |                                    | Clearance               | e Contro           | ol Gap Sens                 | or Selection                 | on Switch    |                |                     |          |              |
|           |      | n.¤X¤¤                             | 0                       |                    | e motor's C<br>p will widen |                              | on direction | n as the direc | tion in which       | <br>I    |              |
|           |      | /                                  | 1                       | Use th             |                             | CW rotatio                   | on directio  | n as the direc | tion in which       | 1        |              |
|           |      | n.XDDD                             | Reserved                | 0                  | eter (Do not                |                              |              |                |                     | _        |              |
|           |      |                                    | 110501V04               | param              |                             | onange.)                     |              |                |                     | _        |              |
| Pn6E9     | 2    | First Stage<br>Kp Ratio            | e Switching             | C                  | ) to 1,000                  | 1%                           | 100          | All            | Immedi-<br>ately    | Tuning   | page<br>4-10 |
| Pn6EA     | 4    | Second S<br>ing Kp De              | tage Switcł<br>viation  |                    | 0 to<br>3,388,608           | 1 refer-<br>ence<br>unit     | 0            | All            | Immedi-<br>ately    | Tuning   | page<br>4-10 |
| Pn6EC     | 2    | Second S<br>ing Kp Ra              | tage Switcł<br>tio      | <sup>л-</sup> С    | ) to 1,000                  | 1%                           | 100          | All            | Immedi-<br>ately    | Tuning   | page<br>4-10 |
| Pn6ED     | 4    | Third Stag<br>Kp Deviati           | e Switching             | g<br>8             | 0 to<br>3,388,608           | 1 refer-<br>ence<br>unit     | 0            | All            | Immedi-<br>ately    | Tuning   | page<br>4-10 |
| Pn6EF     | 2    | Third Stag<br>Kp Ratio             | ge Switching            | g C                | ) to 1,000                  | 1%                           | 100          | All            | Immedi-<br>ately    | Tuning   | page<br>4-10 |
| Pn6F0     | 4    | Clearance<br>Deviation             | Position<br>Overflow Le | evel 8             | 0 to<br>3,388,608           | 1 refer-<br>ence<br>unit     | 0            | All            | Immedi-<br>ately    | Setup    | page<br>4-7  |
| Pn6F2     | 4    | Maximum<br>Offset                  | Clearance               | 1(                 | 0 to<br>6,777,216           | 1 refer-<br>ence<br>unit     | 0            | All            | Immedi-<br>ately    | Setup    | page<br>4-7  |
| Pn6F4     | 4    | Minimum<br>set                     | Clearance (             |                    | 0 to<br>6,777,216           | 1 refer-<br>ence<br>unit     | 0            | All            | Immedi-<br>ately    | Setup    | page<br>4-7  |
| Pn6F6     | 4    | AD Input (                         | Gain                    | 1,                 | 0 to<br>073,741,8<br>24     | 0.1<br>pulse/<br>AD<br>value | 0            | All            | Immedi-<br>ately    | Setup    | page<br>4-9  |
| Pn6F8     | 2    | AD Zero A                          | djustment               |                    | -4,095 to<br>4,095          | AD<br>Value                  | 0            | All            | Immedi-<br>ately    | Setup    | page<br>4-9  |
| Pn6F9     | 2    | Position L<br>tial Time (          | oop Differe<br>Constant | n- 0               | to 51,200                   | 0.01 ms                      | 0            | All            | Immedi-<br>ately    | Tuning   | _            |
| Pn6FA     | 2    |                                    | edback Filt             | er 0               | to 51,200                   | 0.01 ms                      | 0            | All            | Immedi-<br>ately    | Tuning   | _            |
| Pn6FC     | 4    | Clearance<br>Deviation             | Position<br>Error Level | 1,                 | 0 to<br>073,741,8<br>24     | 1 refer-<br>ence<br>unit     | 524288<br>0  | All            | Immedi-<br>ately    | Setup    | page<br>4-7  |

Parameter Lists

|                  |      |                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                         | Con                                             | itinued from                            | n previou:          | s page.        |
|------------------|------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-----------------------------------------|---------------------|----------------|
| Parameter<br>No. | Size | N                                    | ame                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Setting<br>Range                                                                               | Setting<br>Unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Default<br>Setting                                                                                                                                                                                                                      | Applicable<br>Motors                            | When<br>Enabled                         | Classi-<br>fication | Refer-<br>ence |
|                  | 2    | Communic<br>trols                    | ations Con-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0000 to<br>1FF3                                                                                | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1040                                                                                                                                                                                                                                    | All                                             | Immedi-<br>atelv                        | Setup               | -              |
| Pn800            | 2    |                                      | MECH→TROI         0       Do no         1       Ignor         2       Ignor         3       Ignor         0       Do no         3       Ignor         0       Do no         1       Ignor         2       Ignor         1       Ignor         2       Ignor         3       Ignor         4       Ignor         5       Ignor         6       Ignor         7       Ignor         8       Ignor         9       Ignor         C       Ignor         C       Ignor         C       Ignor         E       Ignor         Reserved part       Ignor | IFF3<br>INK Communi<br>ot mask.<br>e MECHATROI<br>e WDT errors (<br>e both MECHA<br>s (A.E50). | LINK comr<br>A.E50).<br>TROLINK<br>warnings (A<br>and A.95E<br>ons warnin<br>and A.96E<br>and A.96E<br>and A.96E<br>and A.96E<br>and A.96E<br>and A.96E<br>and A.96E<br>and A.97A,<br>and A.97A,<br>A.97A,<br>A.97A,<br>A.97A,<br>A.97A,<br>A.97A,<br>A.97A,<br>A.97A,<br>A.97A,<br>A. | heck Mas<br>nunication<br>communic<br>A.94 D).<br>95 D).<br>1 warnings<br>ngs (A.96 D<br>1 warnings<br>96 Warnin<br>3 warnings<br>96 warnin<br>A.97A and<br>97b warnin<br>and A.97t<br>and A.97t<br>and A.97t<br>and A.97t<br>and A.97t | k for Debugg<br>s errors (A.E6<br>ations errors | ately<br>ing<br>50).<br>(A.E60) and<br> |                     |                |
|                  |      | n.XDDD<br>M3 <sup>*8</sup>           | 0 Retai                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | n warnings for<br>matically clear                                                              | debugging                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | J.                                                                                                                                                                                                                                      |                                                 | ecification).                           |                     | -              |
|                  | 2    | Application<br>Selections<br>Limits) | 6 (Software                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0000 to<br>0103                                                                                | _                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0003                                                                                                                                                                                                                                    | All                                             | Immedi-<br>ately                        | Setup               | *1             |
| Pn801            |      | n.000X                               | 1 Disat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | it Selection<br>le both forward<br>ole forward soft<br>ole reverse soft<br>ole both forward    | ware limit<br>ware limit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                         |                                                 |                                         |                     | -              |
|                  |      | n.🗆🗆 X                               | Reserved par                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | rameter (Do no                                                                                 | ot change.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | )                                                                                                                                                                                                                                       |                                                 |                                         |                     |                |
|                  |      |                                      | Coffuerralis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | it Check for D                                                                                 | oforenee                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                         |                                                 |                                         |                     |                |
|                  |      | n.¤X¤¤                               | 0 Do no                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | it Check for R<br>ot perform soft<br>rm software lin                                           | ware limit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                         |                                                 |                                         |                     | -              |
|                  |      | n.XDDD                               | Reserved par                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | rameter (Do no                                                                                 | ot change.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | )                                                                                                                                                                                                                                       |                                                 |                                         |                     | I              |
| Pn803            | 2    | Origin Ran                           | ge                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0 to 250                                                                                       | 1 refer-<br>ence<br>unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 10                                                                                                                                                                                                                                      | All                                             | Immedi-<br>ately                        | Setup               | *2             |

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|-------------------|--------------|
|-------------------|--------------|

|                     |      |                                       |                      |           |                                       |                                                  |                    |                      | tinued fron                     |                     |                |
|---------------------|------|---------------------------------------|----------------------|-----------|---------------------------------------|--------------------------------------------------|--------------------|----------------------|---------------------------------|---------------------|----------------|
| Parameter<br>No.    | Size | N                                     | ame                  |           | Setting<br>Range                      | Setting<br>Unit                                  | Default<br>Setting | Applicable<br>Motors | When<br>Enabled                 | Classi-<br>fication | Refer-<br>ence |
| Pn804               | 4    | Forward So                            | oftware L            | imit      | -1,073,741,823<br>to<br>1,073,741,823 | 1 refer-<br>ence<br>unit                         | 107374<br>1823     | All                  | Immedi-<br>ately                | Setup               | *1             |
| Pn806               | 4    | Reverse So                            | oftware L            | .imit     | -1,073,741,823<br>to<br>1,073,741,823 | 1 refer-<br>ence<br>unit                         | -10737<br>41823    | All                  | Immedi-<br>ately                | Setup               | *1             |
| Pn808               | 4    | Absolute E<br>Offset                  | ncoder C             | Drigin    | -1,073,741,823<br>to<br>1,073,741,823 | 1 refer-<br>ence<br>unit                         | 0                  | All                  | Immedi-<br>ately *9             | Setup               | *1             |
| Pn80A               | 2    | First Stage<br>eration Co             |                      | ccel-     | 1 to 65,535                           | 10,000<br>refer-<br>ence<br>units/s <sup>2</sup> | 100                | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| Pn80B               | 2    | Second St<br>Acceleratio              | age Line<br>on Const | ar<br>ant | 1 to 65,535                           | 10,000<br>refer-<br>ence<br>units/s <sup>2</sup> | 100                | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| Pn80C               | 2    | Acceleration                          |                      | ant       | 0 to 65,535                           | 100 ref-<br>erence<br>units/s                    | 0                  | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| Pn80D               | 2    | First Stage<br>Deceleratio            |                      | ant       | 1 to 65,535                           | 10,000<br>refer-<br>ence<br>units/s <sup>2</sup> | 100                | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| Pn80E               | 2    | Second St<br>Deceleratio              |                      |           | 1 to 65,535                           | 10,000<br>refer-<br>ence<br>units/s <sup>2</sup> | 100                | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| Pn80F               | 2    | Deceleration<br>Switching             |                      | ant       | 0 to 65,535                           | 100 ref-<br>erence<br>units/s                    | 0                  | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| Pn810               | 2    | Exponentia<br>tion/Decele             |                      |           | 0 to 65,535                           | 100 ref-<br>erence<br>units/s                    | 0                  | All                  | Immedi-<br>ately <sup>*11</sup> | Setup               | *2             |
| Pn811               | 2    | Exponentia<br>tion/Decele<br>Constant |                      |           | 0 to 5,100                            | 0.1 ms                                           | 0                  | All                  | Immedi-<br>ately <sup>*11</sup> | Setup               | *2             |
| Pn812               | 2    | Movement<br>Time                      | Average              |           | 0 to 5,100                            | 0.1 ms                                           | 0                  | All                  | Immedi-<br>ately <sup>*11</sup> | Setup               | *2             |
| Pn814               | 4    | External Po<br>Final Trave            |                      |           | -1,073,741,823<br>to<br>1,073,741,823 | 1 refer-<br>ence<br>unit                         | 100                | All                  | Immedi-<br>ately                | Setup               | *2             |
|                     | 2    | Origin Retu<br>tings                  | urn Mode             | e Set-    | 0000 to<br>0001                       | -                                                | 0000               | All                  | Immedi-<br>ately                | Setup               | *12            |
|                     | _    |                                       |                      |           |                                       |                                                  |                    |                      |                                 |                     | _              |
|                     |      |                                       |                      |           | Direction                             | rootian                                          |                    |                      |                                 |                     |                |
| Pn816               |      | n.000X                                | 0                    |           | n in forward di                       |                                                  |                    |                      |                                 |                     | _              |
| M2 *13              |      | n.DDXD                                |                      |           | rameter (Do no                        |                                                  | .)                 |                      |                                 |                     | i              |
|                     |      | n.¤X¤¤                                | Reserve              | ed pai    | rameter (Do no                        | ot change.                                       | .)                 |                      |                                 |                     | i              |
|                     |      | n.XDDD                                | Reserve              | ed pai    | rameter (Do no                        | ot change.                                       | .)                 |                      |                                 |                     | 1              |
| <b>Pn817</b><br>*14 | 2    | Origin App<br>1                       | roach Sp             | beed      | 0 to 65,535                           | 100 ref-<br>erence<br>units/s                    | 50                 | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| <b>Pn818</b><br>*15 | 2    | Origin App<br>2                       | roach Sp             | beed      | 0 to 65,535                           | 100 ref-<br>erence<br>units/s                    | 5                  | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| Pn819               | 4    | Final Trave<br>Origin Retu            |                      | e for     | -1,073,741,823<br>to                  | 1 refer-<br>ence                                 | 100                | All                  | Immedi-<br>ately                | Setup               | *2             |

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|                  |      |                          |               |                                       |                          |                    | Con                  | itinued fron     | n previous          | s page         |
|------------------|------|--------------------------|---------------|---------------------------------------|--------------------------|--------------------|----------------------|------------------|---------------------|----------------|
| Parameter<br>No. | Size | N                        | lame          | Setting<br>Range                      | Setting<br>Unit          | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
|                  | 2    | Input Sign<br>Selections | al Monitor    | 0000 to<br>7777                       | -                        | 0000               | All                  | Immedi-<br>ately | Setup               | *12            |
|                  |      |                          | 10.10.0       |                                       |                          |                    |                      |                  |                     | -              |
|                  |      |                          | IO12 Signa    |                                       |                          |                    |                      |                  |                     |                |
|                  |      |                          |               | not map.                              | out torming              | 1                  |                      |                  |                     | -              |
|                  |      |                          |               | nitor CN1-7 inpu                      |                          |                    |                      |                  |                     | -              |
|                  |      | n.🗆 🗆 🗆 X                |               | nitor CN1-8 inpu                      |                          |                    |                      |                  |                     | -              |
|                  |      |                          |               | nitor CN1-9 inpu                      |                          |                    |                      |                  |                     | -              |
| Pn81E            |      |                          |               | onitor CN1-10 inp                     |                          |                    |                      |                  |                     | -              |
| *12              |      |                          |               | onitor CN1-11 inp                     |                          |                    |                      |                  |                     | -              |
| M2 *13           |      |                          |               | onitor CN1-12 inp                     |                          |                    |                      |                  |                     | -              |
|                  |      |                          | IO13 Signa    | al Manning                            |                          |                    |                      |                  |                     |                |
|                  |      | n.🗆🗆 X 🗆                 |               | e mappings are t                      | he same a                | s the IO12         | signal mappi         | inas.            |                     |                |
|                  |      |                          |               |                                       |                          |                    |                      |                  |                     | -              |
|                  |      | n.¤X¤¤                   | IO14 Signa    |                                       |                          |                    |                      |                  |                     |                |
|                  |      |                          | 0 to 7 Th     | e mappings are t                      | he same a                | is the IO12        | signal mappi         | ings.            |                     | _              |
|                  |      | X                        | IO15 Signa    | al Mapping                            |                          |                    |                      |                  |                     | Ī              |
|                  |      | n.XDDD                   | 0 to 7 Th     | e mappings are t                      | he same a                | s the IO12         | signal mappi         | ings.            |                     | -              |
|                  | -    |                          |               |                                       |                          |                    |                      |                  |                     | _              |
|                  | 2    |                          | I Data Alloca |                                       | _                        | 0010               | All                  | After            | Setup               | *12            |
|                  |      | tions                    |               | 1111                                  |                          |                    |                      | restart          |                     |                |
|                  |      |                          |               |                                       |                          |                    |                      |                  |                     |                |
|                  | [    |                          | Option Fie    | ld Allocation                         |                          |                    |                      |                  |                     | Ī              |
|                  |      | n.🗆🗆 🛛 X                 | 0 Dis         | able option field                     | allocation.              |                    |                      |                  |                     | -              |
| Pn81F            |      |                          | 1 En          | able option field                     | allocation.              |                    |                      |                  |                     | _              |
| *12              | 1    |                          | Position C    | ontrol Command                        | TFF/TLIN                 | Allocatio          | n                    |                  |                     | [              |
| M2 *13           |      | n.🗆 🗆 X 🗆                | 0 Dis         | able allocation.                      |                          |                    |                      |                  |                     | -              |
|                  |      |                          | 1 En          | able allocation.                      |                          |                    |                      |                  |                     | -              |
|                  |      | n.¤X¤¤                   | Beserved      | parameter (Do no                      | ot change                | )                  |                      |                  |                     | -              |
|                  |      |                          | -             | · · · · · ·                           |                          |                    |                      |                  |                     | -              |
|                  |      | n.XDDD                   | Reserved      | parameter (Do no                      | ot change.               | .)                 |                      |                  |                     |                |
|                  | 1    |                          |               |                                       |                          |                    |                      |                  |                     |                |
|                  |      |                          |               |                                       | 1                        |                    |                      |                  | 1                   |                |
| D.000            |      | <b>E</b>                 | -1-1-1- 0     | -2,147,483,648                        | 1 refer-                 | <u> </u>           | <b>.</b>             | Immedi-          | 0.1                 |                |
| Pn820            | 4    | Forward L                | atching Area  |                                       | 1 refer-<br>ence<br>unit | 0                  | All                  | Immedi-<br>ately | Setup               | *2             |
| Pn820<br>Pn822   | 4    |                          | atching Area  | to<br>2,147,483,647<br>-2,147,483,648 | ence                     | 0                  | All                  |                  | Setup<br>Setup      | *2             |

Continued from previous page.

| Parameter<br>No. | Size |           | Name                                                | Setting<br>Range           | Setting<br>Unit   | Default<br>Setting | Applicable<br>Motors | Whe<br>Enab |      | Classi-<br>fication | Refe<br>ence |
|------------------|------|-----------|-----------------------------------------------------|----------------------------|-------------------|--------------------|----------------------|-------------|------|---------------------|--------------|
| 110.             | 2    | Option N  | Ionitor 1 Selec-                                    | 0000 to                    | Office            | 0000               | Motors               | Imme        | edi- |                     | *2           |
|                  | 2    | tion      |                                                     | FFFF                       | -                 | 0000               | _                    | ate         | ly   | Setup               | • 2          |
|                  |      | Setting   |                                                     |                            | Monitor           |                    |                      |             | Арр  | licable Mo          | otors        |
|                  | Н    | igh-Speed | Monitor Regior                                      | <u>ו</u>                   |                   |                    |                      |             |      |                     |              |
|                  | 0    | 000 hex   | Motor speed [1                                      | 000000 hex/o               | verspeed          | detection s        | speed]               |             |      | All                 |              |
|                  | 0    | 001 hex   | Speed referenc                                      | e [1000000 he              | ex/overspe        | ed detecti         | on speed]            |             |      | All                 |              |
|                  | 0    | 002 hex   | Torque [100000                                      | 0 hex/maximu               | um torque]        |                    |                      |             |      | All                 |              |
|                  | 0    | 003 hex   | Position deviati                                    | on (lower 32 b             | its) [refere      | nce units]         |                      |             |      | All                 |              |
|                  | 0    | 004 hex   | Position deviati                                    | on (upper 32 k             | oits) [refere     | ence units]        |                      |             |      | All                 |              |
|                  | 0    | 00A hex   | Encoder count                                       | (lower 32 bits)            | [reference        | e units]           |                      |             |      | All                 |              |
|                  | 0    | 00B hex   | Encoder count                                       | (upper 32 bits             | ) [referenc       | e units]           |                      |             |      | All                 |              |
|                  | 0    | 00C hex   | FPG count (low                                      | er 32 bits) [ref           | erence un         | its]               |                      |             |      | All                 |              |
|                  | 0    | 00D hex   | FPG count (upp                                      | oer 32 bits) [re           | ference un        | iits]              |                      |             |      | All                 |              |
|                  | L    | ow-Speed  | Monitor Region                                      | I                          |                   |                    |                      |             |      |                     |              |
|                  | 0    | 010 hex   | Un000: Motor s                                      | speed [min <sup>-1</sup> ] |                   |                    |                      |             |      | All                 |              |
|                  | 0    | 011 hex   | Un001: Speed                                        | Reference [mi              | ח <sup>-1</sup> ] |                    |                      |             |      | All                 |              |
|                  | 0    | 012 hex   | Un002: Torque                                       |                            |                   |                    |                      |             |      | All                 |              |
|                  | _    |           | Un003: Rotatio                                      |                            |                   | sesl               |                      |             |      |                     |              |
|                  |      |           | Number of enc                                       | oder pulses fro            |                   |                    | encoder rotat        | ion         |      |                     |              |
|                  | 0    | 013 hex   | displayed in de<br>Un003: Rotatio<br>Linear encoder | nal Angle 1 [lir           |                   |                    | loved in decir       | mal         |      | All                 |              |
|                  |      |           | Un004: Rotatio                                      | •                          |                   | ungin uisp         | nayeu in uecii       | IIdi        |      |                     |              |
|                  |      |           | Electrical angle                                    |                            |                   |                    |                      |             |      |                     |              |
|                  | 0    | 014 hex   | Un004: Electric<br>Electrical angle                 |                            |                   |                    |                      |             |      | All                 |              |
| n824             | 0    | 015 hex   | Un005: Input S                                      | . ,                        | 5                 |                    |                      |             |      | All                 |              |
| M3 *8            | 0    | 016 hex   | Un006: Output                                       | 0                          | r                 |                    |                      |             |      | All                 |              |
| IVI5             | 0    | 017 hex   | Un007: Input R                                      | 0                          |                   |                    |                      |             |      | All                 |              |
|                  |      | 018 hex   | Un008: Position                                     |                            |                   | its]               |                      |             |      | All                 |              |
|                  |      | 019 hex   | Un009: Accum                                        |                            |                   |                    |                      |             |      | All                 |              |
|                  |      | 01A hex   | Un00A: Regene                                       |                            |                   |                    |                      |             |      | All                 |              |
|                  |      | 01B hex   | Un00B: Dynam                                        |                            |                   | Consump            | tion [%]             |             |      | All                 |              |
|                  |      | 01C hex   | Un00C: Input F                                      |                            |                   |                    | 5 3                  |             |      | All                 |              |
|                  |      | 01D hex   | Un00D: Feedba                                       |                            |                   | -                  |                      |             |      | All                 |              |
|                  | 0    | 01E hex   | Un00E: Fully-cl<br>resolution]                      |                            |                   |                    |                      | coder       |      | Rotary              |              |
|                  | 0    | 023 hex   | Initial multiturn                                   | data [Rev]                 |                   |                    |                      |             |      | Rotary              |              |
|                  | 0    | 024 hex   | Initial increment                                   | al data [pulse:            | s]                |                    |                      |             |      | Rotary              |              |
|                  | 0    | 025 hex   | Initial absolute                                    | position data (            | lower 32 b        | oits) (pulses      | sl                   |             |      | Linear              |              |
|                  | 0    | 026 hex   | Initial absolute                                    | oosition data (            | upper 32 l        | oits) [pulse       | s]                   |             |      | Linear              |              |
|                  | 0    | 040 hex   | Un025: SERVO                                        | PACK Installat             | ion Enviro        | nment Mo           | nitor                |             |      | All                 |              |
|                  | 0    | 041 hex   | Un026: Servorr                                      | otor Installatio           | n Environi        | ment Moni          | tor                  |             |      | All                 |              |
|                  | 0    | 042 hex   | Un027: Built-in                                     | Fan Remainin               | g Life Rati       | 0                  |                      |             |      | All                 |              |
|                  | 0    | 043 hex   | Un028: Capaci                                       | tor Remaining              | Life Ratio        |                    |                      |             |      | All                 |              |
|                  |      | 044 hex   | Un029: Surge F                                      | 0                          |                   | ning Life R        | atio                 |             |      | All                 |              |
|                  |      | 045 hex   | Un02A: Dynam                                        |                            |                   | 0                  |                      |             |      | All                 |              |
|                  |      | 046 hex   | Un032: Instanta                                     |                            |                   | <u> </u>           |                      |             |      | All                 |              |
|                  |      | 047 hex   | Un033: Power                                        |                            |                   |                    |                      |             |      | All                 |              |
|                  |      | 048 hex   | Un034: Cumula                                       | •                          | nsumptio          | า                  |                      |             |      | All                 |              |
|                  |      | 04A hex   | Clearance cont operation is dis                     | rol operation r            | nonitor (Bi       | t 0 = 0: Cle       |                      | ol          |      | All                 |              |
|                  |      | 04B hex   | enabled.)<br>Gap monitor [re                        |                            |                   |                    |                      |             |      | All                 |              |

Parameter Lists

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|                  |      |                                  |                                  |                  |                                                  |                    | Con                  | itinuec      | d from | n previou           | s page         |
|------------------|------|----------------------------------|----------------------------------|------------------|--------------------------------------------------|--------------------|----------------------|--------------|--------|---------------------|----------------|
| Parameter<br>No. | Size | N                                | lame                             | Setting<br>Range | Setting<br>Unit                                  | Default<br>Setting | Applicable<br>Motors | Wh<br>Enat   | -      | Classi-<br>fication | Refer-<br>ence |
|                  |      |                                  |                                  |                  |                                                  |                    |                      |              |        |                     |                |
|                  |      | Setting                          |                                  |                  | Monitor                                          |                    |                      |              | Applic | able Mot            | ors            |
|                  |      | Communica                        | tions Module                     | Only             |                                                  |                    |                      |              |        |                     |                |
| Pn824            |      | 0080 hex                         | Previous value<br>pulses]        | e of latched fee | edback po                                        | sition (LPC        | S1) [encoder         |              |        | All                 |                |
|                  | =    | 0081 hex                         | Previous value pulses]           | e of latched fee | edback po                                        | sition (LPC        | S2) [encoder         |              |        | All                 |                |
| M3 *8            | -    | 0084 hex                         | Continuous La                    | atch Status (EX  | (STATUS)                                         |                    |                      |              |        | All                 |                |
|                  |      | All Areas                        |                                  |                  |                                                  |                    |                      |              |        |                     |                |
|                  | -    | Other<br>values                  | Reserved sett                    | ings (Do not us  | se.)                                             |                    |                      |              |        | All                 |                |
|                  | -    |                                  |                                  |                  |                                                  |                    |                      |              |        |                     |                |
|                  | 2    | Option Mo<br>tion                | nitor 2 Selec-                   | 0000 to<br>FFFF  | -                                                | 0000               | All                  | Imm<br>ate   |        | Setup               | *2             |
|                  |      |                                  |                                  |                  | 1                                                |                    |                      | 1            |        |                     |                |
| Pn825            | -    | 0000 hex to<br>0084 hex          | The settings                     | are the same     | as those f                                       | or the Opt         | on Monitor 1         | Select       | ion.   |                     |                |
|                  |      |                                  |                                  |                  | 1                                                | [                  |                      |              |        |                     |                |
| Pn827            | 2    | Linear Dec<br>Constant           | eleration<br>1 for Stopping      | 1 to 65,535      | 10,000<br>refer-<br>ence<br>units/s <sup>2</sup> | 100                | All                  | lmm<br>ately |        | Setup               | *2             |
| Pn829            | 2    | SVOFF Wa<br>SVOFF at<br>to Stop) | iiting Time (for<br>Deceleration | 0 to 65,535      | 10 ms                                            | 0                  | All                  | lmm<br>ately |        | Setup               | *2             |
|                  |      |                                  |                                  |                  |                                                  |                    |                      | Cor          | ntinue | d on nex            | t page         |

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| Parameter<br>No. | Size | N               | lame      |         | Setting<br>Range | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
|------------------|------|-----------------|-----------|---------|------------------|-----------------|--------------------|----------------------|------------------|---------------------|----------------|
|                  | 2    | Option Fie<br>1 | ld Alloca | tions   | 0000 to<br>1E1E  | -               | 1813               | All                  | After<br>restart | Setup               | *12            |
|                  |      |                 |           |         |                  |                 |                    |                      |                  |                     | _              |
|                  |      |                 | ACCFI     | L Alloc | ation (Option)   |                 |                    |                      |                  |                     |                |
|                  |      |                 | 0         |         | ate bits 0 and   |                 |                    |                      |                  |                     |                |
|                  |      |                 | 1         |         | ate bits 1 and 2 |                 |                    |                      |                  |                     |                |
|                  |      |                 | 2         |         | ate bits 2 and   |                 |                    |                      |                  |                     |                |
|                  |      |                 | 3         |         | ate bits 3 and 4 |                 |                    |                      |                  |                     | _              |
|                  |      |                 | 4         |         | ate bits 4 and   |                 |                    |                      |                  |                     |                |
|                  |      |                 | 5         | Alloca  | ate bits 5 and ( | 6 to ACCF       | IL.                |                      |                  |                     |                |
|                  |      | n.DDDX          | 6         | Alloca  | ate bits 6 and   | 7 to ACCF       | IL.                |                      |                  |                     |                |
|                  |      |                 | 7         | Alloca  | ate bits 7 and a | 8 to ACCF       | IL.                |                      |                  |                     |                |
|                  |      |                 | 8         | Alloca  | ate bits 8 and 9 | 9 to ACCF       | IL.                |                      |                  |                     |                |
|                  |      |                 | 9         | Alloca  | ate bits 9 and   | 10 to ACC       | FIL.               |                      |                  |                     |                |
| Pn82A            |      |                 | А         | Alloca  | ate bits 10 and  | 111 to AC       | CFIL.              |                      |                  |                     |                |
| *12              |      |                 | В         | Alloca  | ate bits 11 and  | 12 to AC        | CFIL.              |                      |                  |                     |                |
| M2 *13           |      |                 | С         | Alloca  | ate bits 12 and  | I 13 to AC      | CFIL.              |                      |                  |                     |                |
|                  |      |                 | D         | Alloca  | ate bits 13 and  | 14 to AC        | CFIL.              |                      |                  |                     |                |
|                  |      |                 | E         | Alloca  | ate bits 14 and  | I 15 to AC      | CFIL.              |                      |                  |                     | _              |
|                  |      |                 | ACCFI     | L Alloc | ation Enable/I   | Disable Se      | election           |                      |                  |                     |                |
|                  |      | n.🗆🗆 X 🗆        | 0         | Disab   | le ACCFIL allo   | cation.         |                    |                      |                  |                     |                |
|                  | -    |                 | 1         | Enabl   | e ACCFIL allo    | cation.         |                    |                      |                  |                     | _              |
|                  |      |                 | G SEL     | Alloca  | tion (Option)    |                 |                    |                      |                  |                     |                |
|                  |      | n.¤X¤¤          | 0 to E    | 1       | ettings are the  | same as         | for the AC         | CFIL allocatio       | ns.              |                     |                |
|                  |      |                 |           | 1       | 5                |                 |                    |                      |                  |                     | _              |
|                  |      |                 | G_SEL     | Alloca  | tion Enable/D    | isable Se       | lection            |                      |                  |                     |                |
|                  |      | n. XDDD         | 0         | Disab   | le G_SEL alloc   | cation.         |                    |                      |                  |                     | _              |
|                  |      |                 | 1         | Enabl   | e G_SEL alloc    | ation.          |                    |                      |                  |                     | _              |
|                  |      |                 |           |         |                  |                 |                    |                      |                  |                     |                |

Continued on next page.

| <b>D</b>         |      |            |                | 0.111              | 0.111           |                    |                      | tinued fron      | · ·                 |                |
|------------------|------|------------|----------------|--------------------|-----------------|--------------------|----------------------|------------------|---------------------|----------------|
| Parameter<br>No. | Size | М          | lame           | Setting<br>Range   | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
|                  | 2    |            | ld Allocations | 0000 to            | _               | 1D1C               | All                  | After            | Setup               | *12            |
|                  |      | 2          |                | 1F1F               |                 | _                  |                      | restart          |                     |                |
|                  |      |            |                | tion (Ontion)      |                 |                    |                      |                  |                     | -              |
|                  |      |            | V_PPI Alloca   | ate bit 0 to V_F   |                 |                    |                      |                  |                     |                |
|                  |      |            |                | ate bit 0 to $V_1$ |                 |                    |                      |                  |                     |                |
|                  |      |            |                | ate bit 1 to V_I   |                 |                    |                      |                  |                     | _              |
|                  |      |            |                | ate bit 3 to V_F   |                 |                    |                      |                  |                     | _              |
|                  |      |            |                | ate bit 4 to V_F   |                 |                    |                      |                  |                     | _              |
|                  |      |            | 5 Alloc        | ate bit 5 to V_F   | PPI.            |                    |                      |                  |                     | _              |
|                  |      |            | 6 Alloc        | ate bit 6 to V_F   | PPI.            |                    |                      |                  |                     | _              |
|                  |      | n.🗆🗆 🗆 X   | 7 Alloc        | ate bit 7 to V_F   | PPI.            |                    |                      |                  |                     | _              |
|                  |      |            | 8 Alloc        | ate bit 8 to V_F   | PPI.            |                    |                      |                  |                     | _              |
|                  |      |            | 9 Alloc        | ate bit 9 to V_F   | PPI.            |                    |                      |                  |                     | _              |
| Pn82B            |      |            | A Alloc        | ate bit 10 to V_   | _PPI.           |                    |                      |                  |                     | _              |
| FIIOZD           |      |            | B Alloc        | ate bit 11 to V_   | _PPI.           |                    |                      |                  |                     | _              |
| M2 *13           |      |            | C Alloc        | ate bit 12 to V    | _PPI.           |                    |                      |                  |                     | _              |
|                  |      |            |                | ate bit 13 to V    | -               |                    |                      |                  |                     | _              |
|                  |      |            |                | ate bit 14 to V    |                 |                    |                      |                  |                     | _              |
|                  |      |            | F Alloc        | ate bit 15 to V    | _PPI.           |                    |                      |                  |                     | _              |
|                  |      |            | V_PPI Alloca   | tion Enable/Di     | sable Sele      | ection             |                      |                  |                     |                |
|                  |      | n.🗆🗆 X 🗆   | 0 Disal        | ble V_PPI alloca   | ation.          |                    |                      |                  |                     | _              |
|                  |      |            | 1 Enab         | le V_PPI alloca    | tion.           |                    |                      |                  |                     | _              |
|                  | .    |            | I              |                    |                 |                    |                      |                  |                     | _              |
|                  |      | n.🗆X🗆 🗆    |                | location (Optic    |                 | <u> </u>           |                      |                  |                     |                |
|                  |      |            | 0 to F The     | settings are the   | same as         | for the V_F        | PPI allocations      | 8.               |                     | _              |
|                  |      |            | P PI CLR A     | location Enabl     | e/Disable       | Selection          |                      |                  |                     |                |
|                  |      | n.X000     | 1              | ble P_PI_CLR a     |                 |                    |                      |                  |                     |                |
|                  |      |            | 1 Enab         | le P_PI_CLR a      | llocation.      |                    |                      |                  |                     | _              |
|                  |      |            | i              |                    |                 |                    |                      |                  |                     |                |
|                  |      | Oution Fig |                | 0000 +-            |                 |                    |                      | A ft a u         |                     |                |
|                  | 2    | 3          | ld Allocations | 0000 to<br>1F1F    | -               | 1F1E               | All                  | After<br>restart | Setup               | *12            |
|                  |      |            |                |                    |                 |                    |                      |                  | 1                   | 1              |
|                  |      |            | P_CL Allocat   | ion (Option)       |                 |                    |                      |                  |                     |                |
|                  |      | n.🗆 🗆 🛛 X  |                | settings are the   | same as         | for the V_F        | PPI allocations      | 3.               |                     | -              |
|                  |      |            |                |                    |                 |                    |                      |                  |                     | _              |
|                  |      |            | P_CL Allocat   | ion Enable/Dis     | able Sele       | ction              |                      |                  |                     |                |
| Pn82C            |      | n.🗆🗆 X 🗆   | 0 Disal        | ole P_CL alloca    | ation.          |                    |                      |                  |                     | _              |
| *12              |      |            | 1 Enab         | le P_CL alloca     | tion.           |                    |                      |                  |                     | _              |
| M2 *13           | .    |            |                |                    |                 |                    |                      |                  |                     |                |
|                  |      | n.¤X¤¤     | N_CL Alloca    |                    |                 |                    |                      |                  |                     | _              |
|                  |      |            | 0 to F The     | settings are the   | same as         | ior the V_H        | -ri allocations      | ò.               |                     | _              |
|                  |      |            | N CL Alloca    | ion Enable/Dis     | sable Sele      | ction              |                      |                  |                     |                |
|                  |      | n.XDDD     |                | ble N_CL alloca    |                 |                    |                      |                  |                     |                |
|                  |      |            |                | le N_CL alloca     |                 |                    |                      |                  |                     | _              |
|                  |      |            |                | _== = 3            |                 |                    |                      |                  |                     |                |
|                  |      |            |                |                    |                 |                    |                      | 0 1              | d on nov            |                |

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| Parameter<br>No. | Size | N                | ame       |        | Setting<br>Range                     | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
|------------------|------|------------------|-----------|--------|--------------------------------------|-----------------|--------------------|----------------------|------------------|---------------------|----------------|
|                  | 2    | Option Fiel<br>4 | d Allocat | ions   | 0000 to<br>1F1C                      | -               | 0000               | All                  | After<br>restart | Setup               | *12            |
|                  |      |                  |           |        |                                      |                 |                    |                      |                  |                     |                |
|                  |      |                  | BANK_     | SEL1   | Allocation (Op                       | tion)           |                    |                      |                  |                     |                |
|                  |      |                  | 0         | Alloca | ate bits 0 to 3                      | to BANK_        | SEL1.              |                      |                  |                     | _              |
|                  |      |                  | 1         | Alloca | ate bits 1 to 4                      | to BANK_        | SEL1.              |                      |                  |                     | _              |
|                  |      |                  | 2         | Alloca | ate bits 2 to 5 t                    | to BANK_        | SEL1.              |                      |                  |                     | _              |
|                  |      |                  | 3         |        | ate bits 3 to 6 t                    | -               |                    |                      |                  |                     |                |
|                  |      |                  | 4         |        | ate bits 4 to 7 t                    |                 |                    |                      |                  |                     |                |
|                  |      | n.🗆 🗆 🗆 X        | 5         |        | ate bits 5 to 8 t                    |                 |                    |                      |                  |                     | _              |
|                  |      |                  | 6         |        | ate bits 6 to 9 t                    |                 |                    |                      |                  |                     | _              |
|                  |      |                  | 7         |        | ate bits 7 to 10                     |                 | -                  |                      |                  |                     | _              |
|                  |      |                  | 8         |        | ate bits 8 to 11                     |                 | -                  |                      |                  |                     | _              |
| Pn82D            |      |                  | 9         |        | ate bits 9 to 12                     |                 | -                  |                      |                  |                     | _              |
| M2 *13           |      |                  | A<br>B    |        | ate bits 10 to 1<br>ate bits 11 to 1 |                 |                    |                      |                  |                     |                |
| IVIZ 13          |      |                  | C         |        | ate bits 12 to 1                     |                 | -                  |                      |                  |                     |                |
|                  |      |                  | U         | AIIUC  |                                      | J LU DAIN       | \_0LL1.            |                      |                  |                     | _              |
|                  |      |                  | BANK_     | SEL1   | Allocation Ena                       | ble/Disab       | le Selectio        | on                   |                  |                     |                |
|                  |      | n.🗆🗆 X 🗆         | 0         | Disab  | ble BANK_SEL                         | 1 allocatio     | n.                 |                      |                  |                     | _              |
|                  |      |                  | 1         | Enab   | le BANK_SEL1                         | allocatior      | ۱.                 |                      |                  |                     |                |
|                  |      |                  |           |        |                                      |                 |                    |                      |                  |                     | _              |
|                  |      | n.¤X¤¤           | LT_DIS/   |        | Allocation (Op                       |                 |                    |                      |                  |                     |                |
|                  |      |                  | 0 to F    | The s  | settings are the                     | same as         | for the V_F        | PPI allocations      | 3.               |                     | _              |
|                  | ,    |                  |           |        |                                      |                 |                    |                      |                  |                     | _              |
|                  |      |                  |           |        | Allocation Ena                       |                 |                    | on                   |                  |                     |                |
|                  |      | n.XDDD           | 0         |        | ble LT_DISABLE                       |                 |                    |                      |                  |                     | _              |
|                  |      |                  | 1         | Enab   | le LT_DISABLE                        | allocatior      | 1.                 |                      |                  |                     | _              |
|                  |      |                  |           |        |                                      |                 |                    |                      |                  |                     |                |

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| Parameter<br>No. | Size | N                                                                                                         | lame                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Setting<br>Range                                                                                                                                                                                                                                                     | Setting<br>Unit                                                                                                                                                                                                                                                                 | Default<br>Setting                                                                                            | Applicable<br>Motors                            | When<br>Enabled                                                                       | Classi-<br>fication                   | Refer-<br>ence   |
|                  | 2    | Option Fie                                                                                                | ld Allocations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0000 to<br>1D1F                                                                                                                                                                                                                                                      | -                                                                                                                                                                                                                                                                               | 0000                                                                                                          | All                                             | After<br>restart                                                                      | Setup                                 | *12              |
|                  |      | -                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                 |                                                                                                               |                                                 |                                                                                       |                                       |                  |
|                  |      | n.DDDX                                                                                                    | Reserved pa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | rameter (Do no                                                                                                                                                                                                                                                       | ot change.                                                                                                                                                                                                                                                                      | )                                                                                                             |                                                 |                                                                                       |                                       | E                |
|                  |      | n.DDXD                                                                                                    | Reserved pa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | rameter (Do no                                                                                                                                                                                                                                                       | ot change.                                                                                                                                                                                                                                                                      | )                                                                                                             |                                                 |                                                                                       |                                       | ī                |
|                  |      |                                                                                                           | OUT SIGNA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | L Allocation (O                                                                                                                                                                                                                                                      | ption)                                                                                                                                                                                                                                                                          |                                                                                                               |                                                 |                                                                                       |                                       |                  |
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|                  |      |                                                                                                           | 2 Alloc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ate bits 2 to 4 t                                                                                                                                                                                                                                                    | to OUT_SI                                                                                                                                                                                                                                                                       | GNAL.                                                                                                         |                                                 |                                                                                       |                                       | _                |
|                  |      |                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ate bits 3 to 5 t                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                 |                                                                                                               |                                                 |                                                                                       |                                       | _                |
| Pn82E            |      |                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ate bits 4 to 6 t                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                 |                                                                                                               |                                                 |                                                                                       |                                       | _                |
|                  |      |                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ate bits 5 to 7 t                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                 |                                                                                                               |                                                 |                                                                                       |                                       |                  |
| M2 *13           |      | n.¤X¤¤                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ate bits 6 to 8 t<br>ate bits 7 to 9 t                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                 |                                                                                                               |                                                 |                                                                                       |                                       | _                |
|                  |      |                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ate bits 7 to 9<br>ate bits 8 to 10                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                 |                                                                                                               |                                                 |                                                                                       |                                       | _                |
|                  |      |                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ate bits 9 to 10                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                 |                                                                                                               |                                                 |                                                                                       |                                       | _                |
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|                  |      |                                                                                                           | D Alloc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ate bits 13 to 1                                                                                                                                                                                                                                                     | 5 to OUT                                                                                                                                                                                                                                                                        | _SIGNAL.                                                                                                      |                                                 |                                                                                       |                                       | _                |
|                  |      |                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                 |                                                                                                               | •                                               |                                                                                       |                                       |                  |
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|                  |      | n.XППП                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | L Allocation Er                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                 |                                                                                                               | ion                                             |                                                                                       |                                       | _                |
|                  |      | n.XDDD                                                                                                    | 0 Disat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ble OUT_SIGNA                                                                                                                                                                                                                                                        | AL allocatio                                                                                                                                                                                                                                                                    | on.                                                                                                           | ion                                             |                                                                                       |                                       | _                |
|                  |      | n.XDDD                                                                                                    | 0 Disat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                      | AL allocatio                                                                                                                                                                                                                                                                    | on.                                                                                                           | ion                                             |                                                                                       |                                       | _                |
|                  |      |                                                                                                           | 0 Disat<br>1 Enab                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ble OUT_SIGNA                                                                                                                                                                                                                                                        | AL allocatio                                                                                                                                                                                                                                                                    | on.<br>In.                                                                                                    |                                                 | After                                                                                 | 0.1                                   |                  |
|                  | 2    | n.XDDD<br>Motion Se                                                                                       | 0 Disat<br>1 Enab                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ble OUT_SIGNA                                                                                                                                                                                                                                                        | AL allocatio                                                                                                                                                                                                                                                                    | on.                                                                                                           | All                                             | After<br>restart                                                                      | Setup                                 | *2               |
|                  | 2    |                                                                                                           | 0 Disat<br>1 Enab                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ble OUT_SIGNA<br>le OUT_SIGNA                                                                                                                                                                                                                                        | AL allocatio                                                                                                                                                                                                                                                                    | on.<br>In.                                                                                                    |                                                 |                                                                                       | Setup                                 | *2               |
|                  | 2    |                                                                                                           | 0 Disat<br>1 Enab                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ble OUT_SIGNA<br>le OUT_SIGNA<br>0000 to<br>0001                                                                                                                                                                                                                     | AL allocatio                                                                                                                                                                                                                                                                    | on.<br>n.<br>0000                                                                                             | All                                             |                                                                                       | Setup                                 | *2               |
|                  | 2    |                                                                                                           | 0 Disat<br>1 Enab<br>ttings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ble OUT_SIGNA<br>le OUT_SIGNA<br>0000 to<br>0001<br>eration/Decele                                                                                                                                                                                                   | AL allocation                                                                                                                                                                                                                                                                   | on.<br>                                                                                                       | All                                             | restart                                                                               |                                       | *2               |
|                  | 2    |                                                                                                           | 0 Disat<br>1 Enab<br>ttings<br>Linear Accele                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Die OUT_SIGNA<br>Die OUT_SIGNA<br>0000 to<br>0001<br>eration/Decele<br>Pn80A to Pn80                                                                                                                                                                                 | AL allocation                                                                                                                                                                                                                                                                   | on.<br>                                                                                                       | All                                             | restart                                                                               |                                       | *2               |
|                  | 2    | Motion Se                                                                                                 | 0 Disat<br>1 Enab<br>ttings<br>Linear Accele<br>0 Use<br>ignor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Die OUT_SIGNA<br>Die OUT_SIGNA<br>0000 to<br>0001<br>Pration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84                                                                                                                                                        | AL allocation<br>L allocation<br>-<br>ration Cor<br>F and Pn8                                                                                                                                                                                                                   | on.<br>on.<br>0000<br>nstant Sele<br>327. (The s                                                              | All<br>ection<br>ettings of Pn8                 | restart<br>334 to Pn84                                                                | 0 are                                 | *2               |
| Pn833            | 2    | Motion Se                                                                                                 | 0     Disat       1     Enab       ttings     Image: Constraint of the second seco | Die OUT_SIGNA<br>Die OUT_SIGNA<br>0000 to<br>0001<br>Pration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84                                                                                                                                                        | AL allocation<br>L allocation<br>-<br>ration Cor<br>F and Pn8<br>0. (The se                                                                                                                                                                                                     | on.<br>in.<br>0000<br>hstant Sele<br>327. (The s<br>ttings of P                                               | All<br>ection<br>ettings of Pn8                 | restart<br>334 to Pn84                                                                | 0 are                                 | *2               |
| Pn833            | 2    | Motion Se<br>nX                                                                                           | 0     Disat       1     Enab       ttings       Linear Accele       0     Use lignor       1     Use lignor       1     Use lignor       1     Use lignor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ole OUT_SIGNA<br>le OUT_SIGNA<br>0000 to<br>0001<br>eration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84<br>ed.)<br>rameter (Do no                                                                                                                               | AL allocation<br>L allocation<br>ration Correst<br>F and Pn&<br>0. (The second<br>ot change.                                                                                                                                                                                    | on.<br>in.<br>0000<br>hstant Sele<br>327. (The s<br>ttings of P                                               | All<br>ection<br>ettings of Pn8                 | restart<br>334 to Pn84                                                                | 0 are                                 | *2               |
| Pn833            | 2    | Motion Se                                                                                                 | 0     Disat       1     Enab       1     Enab       ttings     Itinear Accele       0     Use lignor       1     Use lignor       1     Use lignor       1     Reserved pa       Reserved pa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ole OUT_SIGNA<br>le OUT_SIGNA<br>0000 to<br>0001<br>eration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84<br>ed.)<br>rameter (Do no<br>rameter (Do no                                                                                                             | AL allocation<br>L allocation<br>ration Correst<br>F and Pn&<br>0. (The second change.<br>bt change.                                                                                                                                                                            | on.<br>in.<br>0000<br>hstant Sele<br>327. (The s<br>ttings of P                                               | All<br>ection<br>ettings of Pn8                 | restart<br>334 to Pn84                                                                | 0 are                                 | *2               |
| Pn833            | 2    | Motion Se<br>nX                                                                                           | 0     Disat       1     Enab       1     Enab       ttings     Itinear Accele       0     Use lignor       1     Use lignor       1     Use lignor       1     Reserved pa       Reserved pa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ole OUT_SIGNA<br>le OUT_SIGNA<br>0000 to<br>0001<br>eration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84<br>ed.)<br>rameter (Do no                                                                                                                               | AL allocation<br>L allocation<br>ration Correst<br>F and Pn&<br>0. (The second change.<br>bt change.                                                                                                                                                                            | on.<br>in.<br>0000<br>hstant Sele<br>327. (The s<br>ttings of P                                               | All<br>ection<br>ettings of Pn8                 | restart<br>334 to Pn84                                                                | 0 are                                 | *2               |
| Pn833            | 2    | Motion Se                                                                                                 | 0     Disat       1     Enab       1     Enab       ttings     Itinear Accele       0     Use lignor       1     Use lignor       1     Use lignor       1     Reserved pa       Reserved pa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ole OUT_SIGNA<br>le OUT_SIGNA<br>0000 to<br>0001<br>eration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84<br>ed.)<br>rameter (Do no<br>rameter (Do no                                                                                                             | AL allocation<br>L allocation<br>ration Correst<br>F and Pn&<br>0. (The second change.<br>bt change.<br>bt change.                                                                                                                                                              | on.<br>in.<br>0000<br>hstant Sele<br>327. (The s<br>ttings of P                                               | All<br>ection<br>ettings of Pn8                 | restart<br>334 to Pn84                                                                | 0 are                                 | *2               |
|                  | 2    | Motion Se                                                                                                 | 0       Disate         1       Enable         1       Enable         ttings       Itinear Accele         0       Use I ignor         1       Use I ignor         1       Use I ignor         1       Use I ignor         Reserved pa       Reserved pa         Reserved pa       Exerved pa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ole OUT_SIGNA<br>le OUT_SIGNA<br>0000 to<br>0001<br>eration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84<br>ed.)<br>rameter (Do no<br>rameter (Do no                                                                                                             | AL allocation<br>L allocation<br>ration Correst<br>F and Pn8<br>0. (The second<br>ot change.<br>ot change.<br>t change.<br>10,000<br>refer-<br>ence                                                                                                                             | on.<br>in.<br>0000<br>hstant Sele<br>327. (The s<br>ttings of P                                               | All<br>ection<br>ettings of Pn8                 | restart<br>334 to Pn84                                                                | 0 are                                 | *2               |
| Pn833            |      | Motion Se<br>n                                                                                            | 0       Disate         1       Enable         1       Enable         ttings       Itinear Accele         0       Use I ignor         1       Use I ignor         1       Use I ignor         1       Use I ignor         Reserved pa       Reserved pa         Reserved pa       Exerved pa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ole OUT_SIGNA<br>le OUT_SIGNA<br>0000 to<br>0001<br>eration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84<br>ed.)<br>rameter (Do no<br>rameter (Do no<br>rameter (Do no                                                                                           | AL allocation<br>L allocation<br>ration Correst<br>F and Pn&<br>0. (The second<br>ot change.<br>ot change.<br>10,000<br>refer-<br>ence<br>units/s <sup>2</sup>                                                                                                                  | on.<br>in.<br>0000<br>instant Sele<br>327. (The s<br>ttings of P<br>)<br>)                                    | All<br>ection<br>ettings of Pn8<br>n80A to Pn80 | restart<br>334 to Pn84<br>0F and Pn82                                                 | 0 are<br>7 are                        | -<br>-<br>I<br>I |
| Pn834            | 4    | Motion Se<br>n.□□□X<br>n.□□X□<br>n.□X□<br>n.□X□<br>First Stage<br>eration Cc                              | 0       Disate         1       Enable         1       Enable         ttings       Itinear Accele         0       Use I ignor         1       Use I ignor         1       Use I ignor         1       Use I ignor         Reserved pa       Reserved pa         Reserved pa       Exerved pa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ole OUT_SIGNA<br>le OUT_SIGNA<br>0000 to<br>0001<br>eration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84<br>ed.)<br>rameter (Do no<br>rameter (Do no<br>rameter (Do no                                                                                           | AL allocation<br>L allocation<br>ration Correst<br>F and Pn8<br>0. (The second<br>ot change.<br>ot change.<br>t change.<br>10,000<br>refer-<br>ence                                                                                                                             | on.<br>in.<br>0000<br><b>Instant Sele</b><br>327. (The s<br>ttings of P<br>)<br>)<br>100                      | All<br>ection<br>ettings of Pn8<br>n80A to Pn80 | restart<br>334 to Pn84<br>DF and Pn82<br>Immedi-<br>ately *10                         | 0 are 7 are Setup                     | *2               |
|                  |      | Motion Se<br>n.□□□X<br>n.□□X□<br>n.□X□<br>r.□X□<br>First Stage<br>eration Co<br>Second S                  | 0       Disat         1       Enab         1       Enab         ttings       Image: Constant 2 mark         Linear Accele       0       Use I ignor         1       Use I ignor       Image: Constant 2 mark         Reserved pa       Reserved pa         E Linear Accele       Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0000 to<br>0000 to<br>0001<br>eration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84<br>ed.)<br>rameter (Do no<br>rameter (Do no<br>rameter (Do no<br>rameter (Do no                                                                                               | AL allocation<br>L allocation<br>ration Correst<br>F and Pn&<br>0. (The second<br>ot change.<br>ot change.<br>t change.<br>10,000<br>refer-<br>ence<br>units/s <sup>2</sup><br>10,000<br>refer-<br>ence                                                                         | on.<br>in.<br>0000<br>instant Sele<br>327. (The s<br>ttings of P<br>)<br>)                                    | All<br>ection<br>ettings of Pn8<br>n80A to Pn80 | restart<br>334 to Pn84<br>0F and Pn82<br>Immedi-<br>ately *10                         | 0 are<br>7 are                        | -<br>-<br>I<br>I |
| Pn834            | 4    | Motion Se<br>n.□□□X<br>n.□□X□<br>n.□X□<br>r.□X□<br>First Stage<br>eration Co<br>Second S                  | 0       Disat         1       Enab         1       Enab         ttings       Image: Constant 2         Linear Accele       0         Use       ignor         1       Use         ignor       1         Reserved pa       Reserved pa         Reserved pa       Reserved pa         e Linear Accelonstant 2       Enab         tage Linear       Image Linear                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ole OUT_SIGNA<br>le OUT_SIGNA<br>0000 to<br>0001<br>eration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84<br>ed.)<br>rameter (Do no<br>rameter (Do no | AL allocation<br>L allocation<br>allocation<br>ration Correst<br>F and Pn8<br>0. (The second<br>ot change.<br>ot change.<br>10,000<br>refer-<br>ence<br>units/s <sup>2</sup>                                                                                                    | on.<br>in.<br>0000<br><b>Instant Sele</b><br>327. (The s<br>ttings of P<br>)<br>)<br>100                      | All<br>ection<br>ettings of Pn8<br>n80A to Pn80 | restart<br>334 to Pn84<br>0F and Pn82<br>Immedi-<br>ately *10<br>Immedi-<br>ately *10 | 0 are 7 are Setup                     | *2               |
| Pn834<br>Pn836   | 4    | Motion Se<br>n.□□□X<br>n.□□X□<br>n.□X□<br>n.□X□<br>first Stage<br>eration Cc<br>Second Si<br>Acceleration | 0       Disat         1       Enab         1       Enab         ttings       Image: Constant 2         0       Use I ignor         1       Use I ignor         Reserved pa       Reserved pa         E Linear Accelonstant 2       Constant 2         tage Linear constant 2       Constant 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ole OUT_SIGNA<br>le OUT_SIGNA<br>0000 to<br>0001<br>eration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84<br>ed.)<br>rameter (Do no<br>rameter (Do no<br>rameter (Do no<br>rameter (Do no<br>20,971,520<br>1 to<br>20,971,520<br>0 to                             | AL allocation<br>L allocation<br>allocation<br>ration Correst<br>F and Pn&<br>0. (The second<br>ot change.<br>ot change.<br>t change.<br>ot change.<br>10,000<br>refer-<br>ence<br>units/s <sup>2</sup><br>10,000<br>refer-<br>ence<br>units/s <sup>2</sup><br>1 refer-<br>ence | on.<br>in.<br>0000<br><b>Instant Sele</b><br>327. (The s<br>ttings of P<br>)<br>)<br>100                      | All<br>ection<br>ettings of Pn8<br>n80A to Pn80 | restart<br>334 to Pn84<br>0F and Pn82<br>Immedi-<br>ately *10<br>Immedi-<br>ately *10 | 0 are 7 are Setup                     | *2               |
| Pn834            | 4    | Motion Se<br>n.□□□X<br>n.□□X□<br>n.□X□<br>n.X□□0<br>First Stage<br>eration Cc<br>Second S<br>Acceleration | 0       Disat         1       Enab         1       Enab         ttings       Image: Constant 2         0       Use I ignor         1       Use I ignor         Reserved pa       Reserved pa         E Linear Accelonstant 2       Constant 2         tage Linear constant 2       Constant 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Die OUT_SIGNA<br>Die OUT_SIGNA<br>0000 to<br>0001<br>Pration/Decele<br>Pr80A to Pr80<br>ed.)<br>Pr834 to Pr84<br>ed.)<br>rameter (Do no<br>rameter (Do no<br>rameter (Do no<br>1 to<br>20,971,520<br>1 to<br>20,971,520                                              | AL allocation<br>L allocation<br>allocation<br>ration Correst<br>F and Pn&<br>0. (The second<br>ot change.<br>ot change.<br>10,000<br>refer-<br>ence<br>units/s <sup>2</sup><br>1 refer-<br>ence<br>units/s <sup>2</sup>                                                        | on.<br>in.<br>0000<br>instant Sele<br>327. (The s<br>327. (The s<br>ittings of P<br>)<br>)<br>)<br>100<br>100 | All<br>ection<br>ettings of Pn8<br>n80A to Pn8C | restart<br>334 to Pn84<br>0F and Pn82<br>Immedi-<br>ately *10<br>Immedi-<br>ately *10 | 0 are 7 are Setup Setup               | *2               |
| Pn834<br>Pn836   | 4    | Motion Se<br>n.□□□X<br>n.□□X□<br>n.□X□<br>n.□X□<br>first Stage<br>eration Cc<br>Second Si<br>Acceleration | 0       Disat         1       Enab         1       Enab         ttings       Image: Constant 2         0       Use I ignor         1       Use I ignor         Reserved pa       Reserved pa         Reserved pa       Reserved pa         e Linear Accelonstant 2       Constant 2         tage Linear constant 2       Con Constant 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ole OUT_SIGNA<br>le OUT_SIGNA<br>0000 to<br>0001<br>eration/Decele<br>Pn80A to Pn80<br>ed.)<br>Pn834 to Pn84<br>ed.)<br>rameter (Do no<br>rameter (Do no<br>rameter (Do no<br>rameter (Do no<br>20,971,520<br>1 to<br>20,971,520<br>0 to                             | AL allocation<br>L allocation<br>allocation<br>ration Correst<br>F and Pn&<br>0. (The second<br>ot change.<br>ot change.<br>t change.<br>ot change.<br>10,000<br>refer-<br>ence<br>units/s <sup>2</sup><br>10,000<br>refer-<br>ence<br>units/s <sup>2</sup><br>1 refer-<br>ence | on.<br>in.<br>0000<br>instant Sele<br>327. (The s<br>327. (The s<br>ittings of P<br>)<br>)<br>)<br>100<br>100 | All<br>ection<br>ettings of Pn8<br>n80A to Pn8C | restart<br>334 to Pn84<br>0F and Pn82<br>Immedi-<br>ately *10<br>Immedi-<br>ately *10 | 0 are 7 are Setup Setup               | *2               |

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|           |     |          | 1     |

|                     | _                                                                                                                                        |                                                             |                                                                                      | _                                                                                                                                    |                       |                                                  |                    |                      | tinued fron                     |                     |                |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------------------------------------------|--------------------|----------------------|---------------------------------|---------------------|----------------|
| Parameter<br>No.    | Size                                                                                                                                     | Name                                                        |                                                                                      |                                                                                                                                      | Setting<br>Range      | Setting<br>Unit                                  | Default<br>Setting | Applicable<br>Motors | When<br>Enabled                 | Classi-<br>fication | Refer-<br>ence |
| Pn83C               | 4                                                                                                                                        | Second Stage Linear<br>Deceleration Constant 2              |                                                                                      |                                                                                                                                      | 1 to<br>20,971,520    | 10,000<br>refer-<br>ence<br>units/s <sup>2</sup> | 100                | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| Pn83E               | 4                                                                                                                                        | Deceleration Constant<br>Switching Speed 2                  |                                                                                      |                                                                                                                                      | 0 to<br>2,097,152,000 | 1 refer-<br>ence<br>unit/s                       | 0                  | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| Pn840               | 4                                                                                                                                        | Linear Deceleration<br>Constant 2 for Stopping              |                                                                                      |                                                                                                                                      | 1 to<br>20,971,520    | 10,000<br>refer-<br>ence<br>units/s <sup>2</sup> | 100                | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| Pn842<br>*14        | 4                                                                                                                                        | Second Origin<br>Approach Speed 1                           |                                                                                      |                                                                                                                                      | 0 to<br>20,971,520    | 100 ref-<br>erence<br>units/s                    | 0                  | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| <b>Pn844</b><br>*15 | 4                                                                                                                                        | Second Origin<br>Approach Speed 2                           |                                                                                      |                                                                                                                                      | 0 to<br>20,971,520    | 100 ref-<br>erence<br>units/s                    | 0                  | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | *2             |
| Pn846               | 2                                                                                                                                        | POSING Command<br>Scurve Acceleration/<br>Deceleration Rate |                                                                                      |                                                                                                                                      | 0 to 50               | 1%                                               | 0                  | All                  | Immedi-<br>ately <sup>*10</sup> | Setup               | _              |
| Pn850               | 2                                                                                                                                        | Number of Latch<br>Sequences                                |                                                                                      | 0 to 8                                                                                                                               | -                     | 0                                                | All                | Immedi-<br>ately     | Setup                           | *2                  |                |
| Pn851               | 2                                                                                                                                        | Continuous<br>Sequence                                      |                                                                                      |                                                                                                                                      | 0 to 255              | -                                                | 0                  | All                  | Immedi-<br>ately                | Setup               | *2             |
| Pn852               | 2                                                                                                                                        | Latch Sequence 1 to 4<br>Settings                           |                                                                                      |                                                                                                                                      | 0000 to<br>3333       | _                                                | 0000               | All                  | Immedi-<br>ately                | Setup               | *2             |
|                     | 0       Phas         1       EXT         2       EXT         3       EXT         n.□□X□       Latch Seque         0 to 3       The tion. |                                                             |                                                                                      |                                                                                                                                      |                       |                                                  |                    |                      |                                 |                     | <br>-<br>-<br> |
|                     |                                                                                                                                          | n.¤X¤¤                                                      | 0 to 3                                                                               | Latch Sequence 3 Signal Selection         0 to 3       The settings are the same as those for the Latch Sequence 1 Signal Sele tion. |                       |                                                  |                    |                      |                                 | nal Selec-          | _              |
|                     |                                                                                                                                          |                                                             | Latch Sequence 4 Signal Selection                                                    |                                                                                                                                      |                       |                                                  |                    |                      |                                 |                     |                |
|                     |                                                                                                                                          | n.X□□□                                                      | 0 to 3 The settings are the same as those for the Latch Sequence 1 Signal Selection. |                                                                                                                                      |                       |                                                  |                    |                      |                                 |                     | _              |
|                     |                                                                                                                                          |                                                             |                                                                                      |                                                                                                                                      |                       |                                                  |                    |                      |                                 | d on nex            |                |

|                  |                                                         |                        |                                                                                      |                                                                                                                                     |                 |                    | Cor                  | itinued fron     | n previou           | s page.        |  |
|------------------|---------------------------------------------------------|------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------|----------------------|------------------|---------------------|----------------|--|
| Parameter<br>No. | Size                                                    | N                      | lame                                                                                 | Setting<br>Range                                                                                                                    | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |  |
|                  | 2                                                       | Latch Seq<br>Settings  | uence 5 to 8                                                                         | 0000 to<br>3333                                                                                                                     | -               | 0000               | All                  | Immedi-<br>ately | Setup               | *2             |  |
|                  |                                                         |                        |                                                                                      |                                                                                                                                     |                 |                    |                      |                  |                     |                |  |
|                  |                                                         | n.000X                 | Latch Sequence 5 Signal Selection                                                    |                                                                                                                                     |                 |                    |                      |                  |                     |                |  |
|                  |                                                         |                        | 0 Phas                                                                               |                                                                                                                                     |                 |                    |                      |                  |                     | _              |  |
|                  |                                                         |                        |                                                                                      | 1 signal                                                                                                                            |                 |                    |                      |                  |                     | _              |  |
|                  |                                                         |                        |                                                                                      | 2 signal                                                                                                                            |                 |                    |                      |                  |                     | _              |  |
|                  |                                                         |                        | 3 EXT                                                                                | 3 signal                                                                                                                            |                 |                    |                      |                  |                     | _              |  |
| Pn853            |                                                         | n.DDXD                 | Latch Sequence 6 Signal Selection                                                    |                                                                                                                                     |                 |                    |                      |                  |                     |                |  |
| 11000            |                                                         |                        | 0 to 3 The tion.                                                                     | settings are the                                                                                                                    | e same as       | those for t        | he Latch Seq         | uence 5 Sigr     | nal Selec-          | _              |  |
|                  |                                                         |                        | Latch Sequence 7 Signal Selection                                                    |                                                                                                                                     |                 |                    |                      |                  |                     |                |  |
|                  |                                                         | n.¤X¤¤                 | 0 to 3 The tion.                                                                     | settings are the                                                                                                                    | e same as       | those for t        | he Latch Seq         | uence 5 Sigr     | nal Selec-          | _              |  |
|                  |                                                         |                        | Latch Sequence 8 Signal Selection                                                    |                                                                                                                                     |                 |                    |                      |                  |                     |                |  |
|                  |                                                         | n.XDDD                 | 0 to 3 The settings are the same as those for the Latch Sequence 5 Signal Selection. |                                                                                                                                     |                 |                    |                      |                  |                     |                |  |
|                  |                                                         |                        |                                                                                      |                                                                                                                                     |                 |                    |                      |                  |                     | _              |  |
|                  | 2                                                       | SVCMD_IC<br>Monitor Al | D Input Signal<br>locations 1                                                        | 0000 to<br>1717                                                                                                                     | -               | 0000               | All                  | Immedi-<br>ately | Setup               | *2             |  |
|                  | Input Signal Manitar Allocation for CN1 12 (SV(CMD, IO) |                        |                                                                                      |                                                                                                                                     |                 |                    |                      |                  |                     |                |  |
|                  |                                                         |                        |                                                                                      | out       Signal Monitor Allocation for CN1-13 (SVCMD_IO)         0       Allocate bit 24 (IO_STS1) to CN1-13 input signal monitor. |                 |                    |                      |                  |                     |                |  |
|                  |                                                         | n.000X                 |                                                                                      | Allocate bit 24 (IO_STST) to CNT-13 input signal monitor.<br>Allocate bit 25 (IO_STS2) to CN1-13 input signal monitor.              |                 |                    |                      |                  |                     |                |  |
|                  |                                                         |                        |                                                                                      | Allocate bit 26 (IO_STS2) to CN1-13 input signal monitor.                                                                           |                 |                    |                      |                  |                     |                |  |
|                  |                                                         |                        |                                                                                      | Allocate bit 27 (IO_STS4) to CN1-13 input signal monitor.                                                                           |                 |                    |                      |                  |                     | _              |  |
|                  |                                                         |                        |                                                                                      | Allocate bit 28 (IO_STS5) to CN1-13 input signal monitor.                                                                           |                 |                    |                      |                  |                     | -              |  |
|                  |                                                         |                        | 5 Alloc                                                                              | Allocate bit 29 (IO_STS6) to CN1-13 input signal monitor.                                                                           |                 |                    |                      |                  |                     |                |  |
| Pn860            |                                                         |                        | 6 Alloc                                                                              | Allocate bit 30 (IO_STS7) to CN1-13 input signal monitor.                                                                           |                 |                    |                      |                  |                     |                |  |
| *9               |                                                         |                        | 7 Alloc                                                                              | ate bit 31 (IO_                                                                                                                     | STS8) to C      | N1-13 inp          | ut signal mon        | iitor.           |                     | _              |  |
| M3 *8            |                                                         |                        | CN1-13 Input Signal Monitor Enable/Disable Selection                                 |                                                                                                                                     |                 |                    |                      |                  |                     |                |  |
|                  |                                                         | n.🗆🗆 X 🗆               |                                                                                      | ble allocation fo                                                                                                                   |                 |                    |                      |                  |                     | _              |  |
|                  |                                                         |                        | 1 Enable allocation for CN1-13 input signal monitor.                                 |                                                                                                                                     |                 |                    |                      |                  |                     |                |  |
|                  | [                                                       |                        | Input Signal Monitor Allocation for CN1-7 (SVCMD_IO)                                 |                                                                                                                                     |                 |                    |                      |                  |                     | [              |  |
|                  |                                                         | n.¤X¤¤                 | 0 to 7 The settings are the same as the CN1-13 allocations.                          |                                                                                                                                     |                 |                    |                      |                  |                     | _              |  |
|                  |                                                         |                        | CN1-7 Input Signal Monitor Enable/Disable Selection                                  |                                                                                                                                     |                 |                    |                      |                  |                     | I              |  |
|                  | r                                                       | n.X000                 |                                                                                      | 1 0                                                                                                                                 |                 |                    |                      |                  |                     | _              |  |
|                  |                                                         |                        | 1 Enat                                                                               | ole allocation fo                                                                                                                   | r CN1-7 ir      | iput signal        | monitor.             |                  |                     | _              |  |
|                  |                                                         |                        |                                                                                      |                                                                                                                                     |                 |                    |                      | Continue         |                     |                |  |

10.1.2 List of Servo Parameters

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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |      |                    |                |                 |            |             |                      | tinued fron | n previou | s page.        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|--------------------|----------------|-----------------|------------|-------------|----------------------|-------------|-----------|----------------|
| Pn861       Input Signal Monitor Allocation for CN1-9 (SVCMD_IO)         In                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                 | Size | N                  | lame           | •               |            |             | Applicable<br>Motors |             |           | Refer-<br>ence |
| PR861       Input Signal Monitor Allocation for CN1-8 (SVCMD_LO)         M3       **       Input Signal Monitor Allocation for CN1-8 (SVCMD_LO)         M3       **       Input Signal Monitor Allocation for CN1-8 input signal monitor.         1       Enable allocation for CN1-8 input signal monitor.         1       Enable allocation for CN1-8 input signal monitor.         1       Enable allocation for CN1-9 input signal monitor.         1       Enable allocation for CN1-19 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 (SVCMD_LO)         1       Input Signal Monitor Allocation for CN1-10 (SVCMD_LO)         1       Enable allocation for CN1-10 (SVCMD_LO)         1       Enable allocation for CN1-10 (SVCMD_LO)         1       Enable allocation for CN1-110 input signal monitor.         1       Enable allocation for CN1-110 input signal monitor.         1       Enable allocatin for CN1-110 input si                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                 | 2    | SVCMD_IC           | D Input Signal |                 | _          | 0000        | All                  |             | Setup     | *2             |
| Pn861       0 to 7       The settings are the same as the CN1-13 allocations.         Pn861       0       Disable allocation for CN1-6 input signal monitor.         1       Enable allocation for CN1-8 input signal monitor.         1       Enable allocation for CN1-8 input signal monitor.         1       Enable allocation for CN1-9 (SVCMD_IO)         0       0 to 7         1       Enable allocation for CN1-9 (SVCMD_IO)         0       0 to 7         1       Enable allocation for CN1-9 (SVCMD_IO)         0       Disable allocation for CN1-9 input signal monitor.         1       Enable allocation for CN1-10 (SVCMD_IO)         n.DDDX       Input Signal Monitor Allocation for CN1-10 (SVCMD_IO)         n.DDDX       0       Disable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.       Input Signal Monitor Allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.       Input Signal Monitor Allocation for CN1-13 allocations.         1       Input Signal Monitor Allocation for CN1-11 input signal monitor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 |      | WORLD A            | 1004110113 2   | 17.17           |            |             |                      | atory       |           |                |
| Pn861       0 to 7       The settings are the same as the CN1-13 allocations.         Pn861       0       Disable allocation for CN1-6 input signal monitor.         1       Enable allocation for CN1-8 input signal monitor.         1       Enable allocation for CN1-8 input signal monitor.         1       Enable allocation for CN1-9 (SVCMD_IO)         0       0 to 7         1       Enable allocation for CN1-9 (SVCMD_IO)         0       0 to 7         1       Enable allocation for CN1-9 (SVCMD_IO)         0       Disable allocation for CN1-9 input signal monitor.         1       Enable allocation for CN1-10 (SVCMD_IO)         n.DDDX       Input Signal Monitor Allocation for CN1-10 (SVCMD_IO)         n.DDDX       0       Disable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.       Input Signal Monitor Allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.       Input Signal Monitor Allocation for CN1-13 allocations.         1       Input Signal Monitor Allocation for CN1-11 input signal monitor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                 | 1    |                    | Input Signal M | Annitor Alloca  | tion for C |             |                      |             |           |                |
| Pn861 <ul> <li>CN1-8 input Signal Monitor Enable/Disable Selection             <ul> <li>In_IDXI</li> <li>Disable allocation for CN1-8 input signal monitor.</li> <li>Enable allocation for CN1-9 (SVCMD_IO)</li></ul></li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |      | n.🗆🗆 🗆 X           |                |                 |            |             |                      |             |           |                |
| Pn861       n.□□X□       0       Disable allocation for CN1-8 input signal monitor.         1       Enable allocation for CN1-8 input signal monitor.         1       Enable allocation for CN1-8 input signal monitor.         n.□X□□       Input Signal Monitor Allocation for CN1-9 (SVCMD_IO)         0       Disable allocation for CN1-9 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 (SVCMD_IO)         0       to 7       The settings are the same as the CN1-13 allocations.         0       Disable allocation for CN1-10 input signal monitor.       1         1       Enable allocation for CN1-11 input signal monitor.         1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |      |                    |                |                 |            |             |                      |             |           | -              |
| Image: State of the state | Dp961           |      |                    |                | •               |            |             |                      |             |           |                |
| MS       **       Input Signal Monitor Allocation for CN1-9 (SVCMD_IO)         n.□X□□       Input Signal Monitor Allocation for CN1-9 (sycMD_IO)       0         n.□X□□       0       Disable allocation for CN1-9 input signal monitor.         1       Enable allocation for CN1-9 input signal monitor.         2       SVCMD_IO Input Signal Monitor Allocation for CN1-9 input signal monitor.         1       Enable allocation for CN1-9 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.         1       Input Signal Monitor Allocation for CN1-10 (SVCMD_IO)         n.□□DX       Input Signal Monitor Enable/Disable Selection         n.□□DX       Input Signal Monitor Enable/Disable Selection         n.□DXD       0       Disable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-11 (SVCMD_IO)         n.□DXD       0       Disable allocation for CN1-13 allocations.         n.□DXD       Input Signal Monitor Enable/Disable Selection       n.         n.□DXD       0       To T The settings are the same as the CN1-13 allocations.         1       Enable allocation for CN1-11 input signal monitor.       1 <td< td=""><td>FIIOUI</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>_</td></td<>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | FIIOUI          |      |                    |                |                 |            |             |                      |             |           | _              |
| Pn862       Input Signal Monitor Allocation for CN1-19 input signal monitor.         1       Enable allocation for CN1-9 input signal monitor.         2       SVCMD_IO Input Signal Monitor Allocation for CN1-9 input signal monitor.         1       Enable allocation for CN1-9 input signal monitor.         2       SVCMD_IO Input Signal Monitor Allocation for CN1-9 input signal monitor.         1       Enable allocation for CN1-10 (SVCMD_IO)         0       0 to 7         10       The settings are the same as the CN1-13 allocations.         1       Enable allocation for CN1-10 (SVCMD_IO)         0       0 to 7         10       The settings are the same as the CN1-13 allocations.         1       Enable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-13 allocations.         1       Enable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-13 allocations.         1       Enable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         2       SVCMD_IO Input Signa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | M3 *8           |      |                    |                |                 |            | - 0         |                      |             |           | _              |
| Pn862       CN1-9 Input Signal Monitor Enable/Disable Selection<br><ul> <li>I Enable allocation for CN1-9 input signal monitor.</li> <li>I Enable allocation for CN1-9 input signal monitor.</li> </ul> <ul> <li>Pn862</li> <li>SVCMD_IO Input Signal Monitor Allocation for CN1-10 (SVCMD_IO)<br/>0 to 7 The settings are the same as the CN1-13 allocations.         </li> </ul> <ul> <li>Input Signal Monitor Allocation for CN1-10 input signal monitor.             </li> <li>Input Signal Monitor Allocation for CN1-10 input signal monitor.             </li> <li>I Enable allocation for CN1-10 input signal monitor.             </li> <li>I Enable allocation for CN1-10 input signal monitor.             </li> <li>I Enable allocation for CN1-10 input signal monitor.             </li> <li>I Enable allocation for CN1-10 input signal monitor.             </li> <li>I Enable allocation for CN1-10 input signal monitor.             </li> <li>I Enable allocation for CN1-11 input signal monitor.             </li> <li>I Enable allocation for CN1-11 input signal monitor.             </li> <li>I Enable allocation for CN1-11 input signal monitor.             </li> <li>I Enable allocation for CN1-11 input signal monitor.             </li> <li>I Enable allocation for CN1-11 input signal monitor.             </li> <li>I Enable allocation for CN1-11 input signal monitor.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |      | n.¤X¤¤             |                |                 |            |             |                      |             |           | L              |
| n.XIIIII       0       Disable allocation for CN1-9 input signal monitor.         1       Enable allocation for CN1-9 input signal monitor.         2       Monitor Allocations 3       0000 to<br>1717       -       0000       All       Immedi-<br>ately       setup       *2         n.IIIIX       Input Signal Monitor Allocation for CN1-10 (SVCMD_IO)<br>0 to 7       The settings are the same as the CN1-13 allocations.       *2         M3       *8       CN1-10 Input Signal Monitor Enable/Disable Selection<br>1       Enable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.       1       Enable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.       1       Enable allocation for CN1-10 input signal monitor.         n.IIIXII       0       Disable allocation for CN1-11 input signal monitor.       1       Enable allocation for CN1-11 input signal monitor.         n.IIIXIII       Pinet Signal Monitor Allocation for CN1-11 input signal monitor.       1       Enable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-11 input signal monitor.       1       Enable allocation for CN1-11 input signal monitor.         n.IIIIXII       0       Disable allocation for CN1-12 input signal monitor.       1       Enable allocation for CN1-12 (SVCMD_IO)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                 |      |                    | 0 to 7 The s   | ettings are the | same as    | the CN1-1   | 3 allocations.       |             |           | -              |
| 1       Enable allocation for CN1-9 input signal monitor.         2       SVCMD_IO Input Signal<br>Monitor Allocations 3       0000 to<br>1717       -       0000       All       Immedi-<br>ately       Setup       *2         n.□□DX       Input Signal Monitor Allocation for CN1-10 (SVCMD_IO)<br>0 to 7       The settings are the same as the CN1-13 allocations.       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       - <td></td> <td></td> <td></td> <td>CN1-9 Input</td> <td>Signal Monito</td> <td>r Enable/D</td> <td>isable Se</td> <td>ection</td> <td></td> <td></td> <td></td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |      |                    | CN1-9 Input    | Signal Monito   | r Enable/D | isable Se   | ection               |             |           |                |
| 2       SVCMD_IO Input Signal<br>Monitor Allocations 3       0000 to<br>1717       -       0000       All       Immedi-<br>ately       Setup       *2         n.□□□X       Input Signal Monitor Allocation for CN1-10 (SVCMD_IO)<br>0 to 7       The settings are the same as the CN1-13 allocations.       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       - <td></td> <td></td> <td>n.XDDD</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>_</td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |      | n.XDDD             |                |                 |            |             |                      |             |           | _              |
| 2       Monitor Allocations 3       1717       -       0000       All       ately       Setup       12         n.□□□X       Input Signal Monitor Allocation for CN1-10 (SVCMD_IO)       0       to 7       The settings are the same as the CN1-13 allocations.         M3       *8       CN1-10 Input Signal Monitor Enable/Disable Selection       n.□□X□       0       Disable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.       1       Enable allocation for CN1-11 (SVCMD_IO)       n.□□X□         n.□□X□□       Input Signal Monitor Allocation for CN1-11 input signal monitor.       1       Enable allocation for CN1-13 allocations.         M3       *8       CN1-11 Input Signal Monitor Enable/Disable Selection       n.□       1       Enable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-11 input signal monitor.       1       Enable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-12 (SVCMD_IO)       0       0       177       -       0000       All       Immediately       *2         Pn863       N       1       Enable allocation for CN1-12 (SVCMD_IO)       -       +2       *2         N       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)       0       0       0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |      |                    | 1 Enabl        | e allocation fo | r CN1-9 in | put signal  | monitor.             |             |           | -              |
| 2       Monitor Allocations 3       1717       -       0000       All       ately       Setup       12         n.□□□X       Input Signal Monitor Allocation for CN1-10 (SVCMD_IO)       0       to 7       The settings are the same as the CN1-13 allocations.         M3       *8       CN1-10 Input Signal Monitor Enable/Disable Selection       n.□□X□       0       Disable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.       1       Enable allocation for CN1-11 (SVCMD_IO)       n.□□X□         n.□□X□□       Input Signal Monitor Allocation for CN1-11 input signal monitor.       1       Enable allocation for CN1-13 allocations.         M3       *8       CN1-11 Input Signal Monitor Enable/Disable Selection       n.□       1       Enable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-11 input signal monitor.       1       Enable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-12 (SVCMD_IO)       0       0       177       -       0000       All       Immediately       *2         Pn863       N       1       Enable allocation for CN1-12 (SVCMD_IO)       -       +2       *2         N       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)       0       0       0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |      |                    |                |                 | 1          |             |                      |             |           | I              |
| Pn862       0 to 7       The settings are the same as the CN1-13 allocations.         Image: state of the state                                             |                 | 2    |                    |                |                 | -          | 0000        | All                  |             | Setup     | *2             |
| Pn862       0 to 7       The settings are the same as the CN1-13 allocations.         Image: state of the state                                             |                 |      |                    |                |                 |            |             |                      |             |           |                |
| Pn862       CN1-10 Input Signal Monitor Enable/Disable Selection         0       Disable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-10 input signal monitor.         1       Enable allocation for CN1-11 (SVCMD_IO)         0       0 to 7         1       Enable allocation for CN1-13 allocations.         1       Enable allocation for CN1-11 (SVCMD_IO)         0       0 to 7         1       Enable allocation for CN1-13 allocations.         1       Enable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 (SVCMD_IO)         0       to 7       The settings are the same as the CN1-13 allocations.         1       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)       *2         1       Input Signal Monitor Enable/Disable Selection       Disable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.       Disable allocation fo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                 |      | ~ <b>–</b> – – – V | Input Signal N | Monitor Alloca  | tion for C | N1-10 (SV   | CMD_IO)              |             |           |                |
| Pn862       n.□□X□       0       Disable allocation for CN1-10 input signal monitor.         M3*8       Input Signal Monitor Allocation for CN1-11 (SVCMD_IO)       n.□X□□       Input Signal Monitor Allocation for CN1-11 (SVCMD_IO)         n.□X□□       CN1-11 Input Signal Monitor Enable/Disable Selection       0       Disable allocation for CN1-11 input signal monitor.         N.□□□       CN1-11 Input Signal Monitor Enable/Disable Selection       0       Disable allocation for CN1-11 input signal monitor.         N.□□□       2       SVCMD_IO Input Signal Monitor Allocation for CN1-11 input signal monitor.       1       Enable allocation for CN1-12 input signal monitor.         Pn863       M3*8       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)       4       *2         Pn863       M3*8       Input Signal Monitor Enable/Disable Selection       2       Setup       *2         Pn863       M3*8       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)       0 to 7       The settings are the same as the CN1-13 allocations.         Pn863       M3*8       Input Signal Monitor Enable/Disable Selection       0       Disable allocation for CN1-12 input signal monitor.         Input Signal Monitor Input Signal Monitor CN1-12 input signal monitor.       Input Signal Monitor CN1-12 input signal monitor.       Input Signal Monitor CN1-12 input signal monitor.         M3*8       Input Signal Monitor CN1-12 input si                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |      |                    | 0 to 7 The s   | ettings are the | same as    | the CN1-1   | 3 allocations.       |             |           | _              |
| Pn862       n.□□X□       0       Disable allocation for CN1-10 input signal monitor.         M3*8       Input Signal Monitor Allocation for CN1-11 (SVCMD_IO)       n.□X□□       Input Signal Monitor Allocation for CN1-11 (SVCMD_IO)         n.□X□□       CN1-11 Input Signal Monitor Enable/Disable Selection       0       Disable allocation for CN1-11 input signal monitor.         N.□□□       CN1-11 Input Signal Monitor Enable/Disable Selection       0       Disable allocation for CN1-11 input signal monitor.         N.□□□       2       SVCMD_IO Input Signal Monitor Allocation for CN1-11 input signal monitor.       1       Enable allocation for CN1-12 input signal monitor.         Pn863       M3*8       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)       4       *2         Pn863       M3*8       Input Signal Monitor Enable/Disable Selection       2       Setup       *2         Pn863       M3*8       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)       0 to 7       The settings are the same as the CN1-13 allocations.         Pn863       M3*8       Input Signal Monitor Enable/Disable Selection       0       Disable allocation for CN1-12 input signal monitor.         Input Signal Monitor Input Signal Monitor CN1-12 input signal monitor.       Input Signal Monitor CN1-12 input signal monitor.       Input Signal Monitor CN1-12 input signal monitor.         M3*8       Input Signal Monitor CN1-12 input si                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 | 1    |                    | CN1-10 Input   | Signal Monit    | or Enable/ | Disable S   | election             |             |           |                |
| M3*8       Input Signal Monitor Allocation for CN1-11 (SVCMD_IO)         n.□X□□       Input Signal Monitor Allocation for CN1-11 (SVCMD_IO)         n.□X□□       0 to 7         The settings are the same as the CN1-13 allocations.         N.□X□□       0         Disable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-11 input signal monitor.         2       SVCMD_IO Input Signal 0000 to 1777         1       Enable allocation for CN1-12 (SVCMD_IO)         N.□□□X       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)         0       to to 7       The settings are the same as the CN1-13 allocations.         Pn863       CN1-12 Input Signal Monitor Enable/Disable Selection         n.□□□X       0       Disable allocation for CN1-12 input signal monitor.         1       Enable allocation for C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Pn862           |      | n.🗆🗆 X 🗆           |                | -               |            |             |                      |             |           | -              |
| Input Signal Monitor Allocation for CN1-11 (SVCMD_IO)         0 to 7       The settings are the same as the CN1-13 allocations.         N.III       CN1-11 Input Signal Monitor Enable/Disable Selection         0       Disable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         1       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)         N.IIIII       Notior Allocation for CN1-12 (SVCMD_IO)         0       to 7       The settings are the same as the CN1-13 allocations.         Pn863       Input Signal Monitor Enable/Disable Selection       0         N.IIIIXIII       O       Disable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.       1         1       Enable allocation for CN1-12 input signal monitor.       1         1       Enable allocation for CN1-12 input signal monitor.       1         1       Enable allocation for CN1-12 input signal monitor.       1         1       Enable allocation for CN1-12 in                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | MO *8           |      |                    | 1 Enabl        | e allocation fo | r CN1-10   | input signa | al monitor.          |             |           | _              |
| N.UXUU       0 to 7       The settings are the same as the CN1-13 allocations.         n.XUUU       0 to 7       The settings are the same as the CN1-13 allocations.         n.XUUU       0       Disable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-11 input signal monitor.         2       SVCMD_IO Input Signal Monitor Allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-12 (SVCMD_IO)         Monitor Allocations 4       1717         -       0000         All       Immediately         Setup       *2         N.IIIII       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)         0       0 to 7         The settings are the same as the CN1-13 allocations.         Pn863       CN1-12 Input Signal Monitor Enable/Disable Selection         n.IIIIX       0       Disable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input sig                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | IVIS °          | 1    |                    | Input Signal N | Monitor Alloca  | tion for C | N1-11 (SV   | CMD_IO)              |             |           | 1              |
| n.X□□□       0       Disable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-11 input signal monitor.         2       SVCMD_IO Input Signal Monitor Allocation for CN1-11 input signal monitor.         All       Immediately         Monitor Allocations 4       1717         -       0000         All       Immediately         Setup       *2         Imput Signal Monitor Allocation for CN1-12 (SVCMD_IO)         0 to 7       The settings are the same as the CN1-13 allocations.         Immediately       CN1-12 Input Signal Monitor Enable/Disable Selection         0       Disable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |      | n.🗆X🗆 🗆            | -              |                 |            |             |                      |             |           |                |
| n.X□□□       0       Disable allocation for CN1-11 input signal monitor.         1       Enable allocation for CN1-11 input signal monitor.         2       SVCMD_IO Input Signal Monitor Allocation for CN1-11 input signal monitor.         All       Immediately         Monitor Allocations 4       1717         -       0000         All       Immediately         Setup       *2         Imput Signal Monitor Allocation for CN1-12 (SVCMD_IO)         0 to 7       The settings are the same as the CN1-13 allocations.         Immediately       CN1-12 Input Signal Monitor Enable/Disable Selection         0       Disable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 | 1    |                    | CN1-11 Input   | Signal Monit    | or Enable/ | Disable S   | election             |             |           |                |
| 2       SVCMD_IO Input Signal Monitor Allocations 4       0000 to 1717       -       0000       All       Immediately       Setup       *2         n.       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)       0 to 7       The settings are the same as the CN1-13 allocations.       *2         M3       *8       CN1-12 Input Signal Monitor Enable/Disable Selection       0       Disable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.       1       Enable allocation for CN1-12 input signal monitor.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |      | n.XDDD             |                | -               |            |             |                      |             |           |                |
| Image: Pine Signal Monitor Allocations 4       1717       -       0000       All       ately       Setup       *2         Image: Pine Signal Monitor Allocation for CN1-12 (SVCMD_IO)       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |      |                    | 1 Enabl        | e allocation fo | r CN1-11   | input signa | al monitor.          |             |           | _              |
| Image: Pine Signal Monitor Allocations 4       1717       -       0000       All       ately       Setup       *2         Image: Pine Signal Monitor Allocation for CN1-12 (SVCMD_IO)       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                 |      |                    |                |                 |            |             |                      |             |           |                |
| n.□□□X       Input Signal Monitor Allocation for CN1-12 (SVCMD_IO)         0 to 7       The settings are the same as the CN1-13 allocations.         M3 *8       CN1-12 Input Signal Monitor Enable/Disable Selection         0       Disable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         n.□X□□       Reserved parameter (Do not change.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 | 2    |                    |                |                 | _          | 0000        | All                  |             | Setup     | *2             |
| n. □□□X       0 to 7       The settings are the same as the CN1-13 allocations.         Pn863       n. □□X□       CN1-12 Input Signal Monitor Enable/Disable Selection         M3 *8       0       Disable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         n.□X□□       Reserved parameter (Do not change.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |      |                    | 1004110113 4   | 17.17           |            |             |                      | atery       |           |                |
| n. □□□X       0 to 7       The settings are the same as the CN1-13 allocations.         Pn863       n. □□X□       CN1-12 Input Signal Monitor Enable/Disable Selection         M3 *8       0       Disable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         n.□X□□       Reserved parameter (Do not change.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 | 1    |                    | Input Signal M | Monitor Alloca  | tion for C | N1-12 (SV   |                      |             |           |                |
| Pn863       N.DDXD       CN1-12 Input Signal Monitor Enable/Disable Selection         0       Disable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         n.DXDD       Reserved parameter (Do not change.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                 |      | n.🗆🗆 🗆 X           |                |                 |            | ,           | _ ,                  |             |           |                |
| M3       *8       0       Disable allocation for CN1-12 input signal monitor.         1       Enable allocation for CN1-12 input signal monitor.         n.□X□□       Reserved parameter (Do not change.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Pn863           |      |                    |                |                 |            |             |                      |             |           | -              |
| 1     Enable allocation for CN1-12 input signal monitor.       n.□X□□     Reserved parameter (Do not change.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>•••</b>      |      |                    |                | -               |            |             |                      |             |           |                |
| n.□X□□ Reserved parameter (Do not change.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | M3 <sup>°</sup> |      |                    |                |                 |            |             |                      |             |           | -              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |      |                    | · · ·          |                 |            |             |                      |             |           | -              |
| n.XDDD Reserved parameter (Do not change.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                 |      | n.🗆X🗆 🗆            | Reserved par   | ameter (Do no   | ot change. | )           |                      |             |           |                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |      | n.XDDD             | Reserved par   | ameter (Do no   | ot change. | )           |                      |             |           |                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                 |      |                    |                |                 |            |             |                      |             |           |                |

Continued on next page.

#### 10.1.2 List of Servo Parameters

|                  |                                                                                                                                                                                                                             |                                                                                                                                 |                                                                                                                                                                                                                       |                                                                                                                                                                                                                                               |                                                                                                                                                                      |                                                                                                                       | Con                                                                                                                                                                              | tinued from                                                                                                                                         | n previou           | s page.                         |  |  |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------------------|--|--|
| Parameter<br>No. | Size                                                                                                                                                                                                                        | Name                                                                                                                            |                                                                                                                                                                                                                       | Setting<br>Range                                                                                                                                                                                                                              | Setting<br>Unit                                                                                                                                                      | Default<br>Setting                                                                                                    | Applicable<br>Motors                                                                                                                                                             | When<br>Enabled                                                                                                                                     | Classi-<br>fication | Refer-<br>ence                  |  |  |
|                  | 2                                                                                                                                                                                                                           | SVCMD_IO Output<br>nal Monitor Allocat<br>1                                                                                     | t Sig-<br>ions                                                                                                                                                                                                        | 0000 to<br>1717                                                                                                                                                                                                                               | -                                                                                                                                                                    | 0000                                                                                                                  | All                                                                                                                                                                              | Immedi-<br>ately                                                                                                                                    | Setup               | *2                              |  |  |
| Pn868            |                                                                                                                                                                                                                             | n.□□□X<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7                                                                                  | Alloc<br>Alloc<br>Alloc<br>Alloc<br>Alloc<br>Alloc<br>Alloc<br>Alloc<br>Alloc                                                                                                                                         | Al Monitor Alloc<br>ate bit 24 (IO_S<br>ate bit 25 (IO_S<br>ate bit 25 (IO_S<br>ate bit 26 (IO_S<br>ate bit 28 (IO_S<br>ate bit 28 (IO_S<br>ate bit 29 (IO_S<br>ate bit 30 (IO_S<br>ate bit 31 (IO_S<br>ate bit 31 (IO_S<br>ate bit 31 (IO_S) | STS1) to C<br>STS2) to C<br>STS3) to C<br>STS4) to C<br>STS5) to C<br>STS6) to C<br>STS6) to C<br>STS7) to C<br>STS8) to C<br>STS8) to C<br>STS8) to C<br>al Monitor | N1-1/CN1<br>N1-1/CN1<br>N1-1/CN1<br>N1-1/CN1<br>N1-1/CN1<br>N1-1/CN1<br>N1-1/CN1<br>N1-1/CN1<br>Enable/D<br>CN1-2 out | -2 output sig<br>-2 output sig<br><b>isable Selecti</b><br>out signal more | nal monitor.<br>nal monitor.<br>nal monitor.<br>nal monitor.<br>nal monitor.<br>nal monitor.<br>nal monitor.<br>nal monitor.<br><b>on</b><br>nitor. |                     | -<br>-<br>-<br>-<br>-<br>-<br>- |  |  |
|                  |                                                                                                                                                                                                                             | n.□X□□ Output<br>0 to 7                                                                                                         | Output Signal Monitor Allocation for CN1-23 and CN1-24 (SVCMD_IO)         0 to 7       The settings are the same as the CN1-1/CN1-2 allocations.         CN1-23/CN1-24 Output Signal Monitor Enable/Disable Selection |                                                                                                                                                                                                                                               |                                                                                                                                                                      |                                                                                                                       |                                                                                                                                                                                  |                                                                                                                                                     |                     |                                 |  |  |
|                  | ON1-23/CN1-24 Output Signal Monitor Enable/Disable Selection           0         Disable allocation for CN1-23/CN1-24 output signal monitor.           1         Enable allocation for CN1-23/CN1-24 output signal monitor. |                                                                                                                                 |                                                                                                                                                                                                                       |                                                                                                                                                                                                                                               |                                                                                                                                                                      |                                                                                                                       |                                                                                                                                                                                  |                                                                                                                                                     |                     |                                 |  |  |
|                  | 2                                                                                                                                                                                                                           | SVCMD_IO Output<br>nal Monitor Allocat<br>2                                                                                     | t Sig-<br>ions                                                                                                                                                                                                        | 0000 to<br>1717                                                                                                                                                                                                                               | _                                                                                                                                                                    | 0000                                                                                                                  | All                                                                                                                                                                              | Immedi-<br>ately                                                                                                                                    | Setup               | *2                              |  |  |
| Pn869            |                                                                                                                                                                                                                             | n.□□□X 0 to 7                                                                                                                   | The s                                                                                                                                                                                                                 | al Monitor Allo<br>settings are the<br>-26 Output Sig                                                                                                                                                                                         | e same as                                                                                                                                                            | the CN1-1                                                                                                             | /CN1-2 alloca                                                                                                                                                                    | ations.                                                                                                                                             |                     |                                 |  |  |
| M3 *8            |                                                                                                                                                                                                                             | n.□□X□ 0<br>1                                                                                                                   | Disat                                                                                                                                                                                                                 | ble allocation fo                                                                                                                                                                                                                             | or CN1-25                                                                                                                                                            | /CN1-26 o                                                                                                             | utput signal n                                                                                                                                                                   | nonitor.                                                                                                                                            |                     | _                               |  |  |
|                  |                                                                                                                                                                                                                             |                                                                                                                                 | · ·                                                                                                                                                                                                                   | rameter (Do no<br>rameter (Do no                                                                                                                                                                                                              |                                                                                                                                                                      | ,                                                                                                                     |                                                                                                                                                                                  |                                                                                                                                                     |                     |                                 |  |  |
| Pn880            | 2                                                                                                                                                                                                                           | Station Address M<br>tor (for maintenand<br>read only)                                                                          |                                                                                                                                                                                                                       | 03 to EF                                                                                                                                                                                                                                      | -                                                                                                                                                                    | 0                                                                                                                     | All                                                                                                                                                                              | Immedi-<br>ately                                                                                                                                    | Setup               | -                               |  |  |
| Pn881            | 2                                                                                                                                                                                                                           | Set Transmission E<br>Count Monitor [byth<br>(for maintenance, in<br>only)                                                      | es]                                                                                                                                                                                                                   | 17, 32, 48                                                                                                                                                                                                                                    | _                                                                                                                                                                    | 0                                                                                                                     | All                                                                                                                                                                              | Immedi-<br>ately                                                                                                                                    | Setup               | _                               |  |  |
| Pn882            | 2                                                                                                                                                                                                                           | Transmission Cycle Set-<br>ting Monitor [× 0.25 μs]<br>(for maintenance, read<br>only) 0 to FFFF – 0 All Immedi-<br>ately Setup |                                                                                                                                                                                                                       |                                                                                                                                                                                                                                               |                                                                                                                                                                      |                                                                                                                       |                                                                                                                                                                                  |                                                                                                                                                     |                     |                                 |  |  |
| Pn883            | 2                                                                                                                                                                                                                           | Communications C<br>Setting Monitor [tra<br>mission cycles] (fo<br>maintenance, read                                            | ans-<br>r                                                                                                                                                                                                             | 0 to 32                                                                                                                                                                                                                                       | -                                                                                                                                                                    | 0                                                                                                                     | All                                                                                                                                                                              | Immedi-<br>ately                                                                                                                                    | Setup               | -                               |  |  |

10.1.2 List of Servo Parameters

Continued from previous page.

| Parameter<br>No.  | Size |                       | Name                                           | Setting<br>Range                 | Setting<br>Unit | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication | Refer-<br>ence |
|-------------------|------|-----------------------|------------------------------------------------|----------------------------------|-----------------|--------------------|----------------------|------------------|---------------------|----------------|
|                   | 2    | Commun<br>trols 2     | ications Con-                                  | 0000 to<br>0001                  | -               | 0000               | All                  | Immedi-<br>ately | Setup               | *2             |
|                   | _    |                       |                                                |                                  |                 |                    |                      |                  |                     |                |
|                   |      |                       | MECHATROLI                                     |                                  |                 |                    |                      |                  |                     |                |
| Pn884             | n.   |                       |                                                | in the status so<br>ATROLINK cor |                 |                    |                      | ommand wh        | ena                 |                |
| M3 *8             |      |                       | 1 Apply                                        | the holding bra                  | ike when a      | a MECHAT           | ROLINK com           | munications      | error occu          | urs.           |
|                   | n.   |                       | Reserved para                                  | meter (Do not                    | change.)        |                    |                      |                  |                     |                |
|                   | n.   |                       | Reserved para                                  | meter (Do not                    | change.)        |                    |                      |                  |                     |                |
|                   | n.   | XDDD                  | Reserved para                                  | meter (Do not                    | change.)        |                    |                      |                  |                     |                |
|                   |      |                       |                                                |                                  |                 |                    |                      |                  |                     |                |
| Pn88A             | 2    | Monitor               | ROLINK<br>Error Counter<br>tenance, read       | 0 to 65,535                      | _               | 0                  | All                  | Immedi-<br>ately | Setup               | _              |
| Pn890 to<br>Pn8A6 | 4    | tor during            | d Data Moni-<br>g Alarm/Warn-<br>tenance, read | 0 to<br>FFFFFFFF                 | _               | 0                  | All                  | Immedi-<br>ately | Setup               | *2             |
| Pn8A8 to<br>Pn8BE | 4    | during Al             | e Data Monitor<br>arm/Warning<br>tenance, read | 0 to<br>FFFFFFFF                 | -               | 0                  | All                  | Immedi-<br>ately | Setup               | *2             |
| Pn900             | 2    | Number o<br>Banks     | of Parameter                                   | 0 to 16                          | _               | 0                  | All                  | After<br>restart | Setup               | *2             |
| Pn901             | 2    | Number (<br>Bank Me   | of Parameter<br>mbers                          | 0 to 15                          | -               | 0                  | All                  | After<br>restart | Setup               | *2             |
| Pn902 to<br>Pn910 | 2    | Paramete<br>ber Defin | er Bank Mem-<br>ition                          | 0000 to<br>08FF                  | -               | 0                  | All                  | After<br>restart | Setup               | *2             |
| Pn920 to<br>Pn95F | 2    |                       | er Bank Data<br>ed in nonvolatile              | 0000 to<br>FFFF                  | -               | 0                  | All                  | Immedi-<br>ately | Setup               | *2             |

Ω Σ-7-Series Σ-7Š SERVOPACK with MECHATROLINK-III Communications References Product Manual (Manual No.: SIEP S800001 28)

\*2. Refer to the following manual for details.

Ω Σ-7-Series AC Servo Drive MECHATROLINK-III Communications Standard Servo Profile Command Manual (Manual No.: SIEP S800001 31)

- \*3. Set a percentage of the motor rated torque.
- \*4. These parameters are for SERVOPACKs with a Safety Module. Refer to the following manual for details.

   <sup>Δ</sup> Σ-V-Series/Σ-V-Series for Large-Capacity Models/Σ-7-Series User's Manual Safety Module (Manual No.: SIEP C720829 06)
- \*5. Normally set this parameter to 0. If you use an External Regenerative Resistor, set the capacity (W) of the External Regenerative Resistor.
- \*6. The upper limit is the maximum output capacity (W) of the SERVOPACK.
- \*7. These parameters are for SERVOPACKs with the dynamic brake option. Refer to the following manual for details.

Ω Σ-7-Series AC Servo Drive Σ-7S/Σ-7W SERVOPACK with Dynamic Brake Hardware Option Specifications Product Manual (Manual No.: SIEP S800001 73)

- \*8. This parameter is valid only when the MECHATROLINK-III standard servo profile is used.
- \*9. The parameter setting is enabled after SENS\_ON command execution is completed.
- \*10.Change the setting when the reference is stopped (i.e., while DEN is set to 1). If you change the setting during operation, the reference output will be affected.

\*11. The settings are updated only if the reference is stopped (i.e., only if DEN is set to 1).

- \*12.Refer to the following manual for details.
  - Ω Σ-7-Series AC Servo Drive MECHATROLINK-II Communications Command Manual (Manual No.: SIEP S800001 30)
- \*13.This parameter is valid only when the MECHATROLINK-II-compatible profile is used.
- \*14.The setting of Pn842 is valid while Pn817 is set to 0.
- \*15.The setting of Pn844 is valid while Pn818 is set to 0.

#### 10.2.1 Interpreting the Parameter Lists

## 10.2 List of MECHATROLINK-III Common Parameters

## 10.2.1 Interpreting the Parameter Lists

(The types of motors to which the parameter applies.

• All: The parameter is used for both Rotary Servomotors and Linear Servomotors.

• Rotary: The parameter is used for only Rotary Servomotors.

• Linear: The parameter is used for only Linear Servomotors.

Rotary Servomotor terms are used for parameters that are applicable to all Servomotors. If you are using a Linear Servomotor, you need to interpret the terms accordingly. Refer to the following section for details.

| Parameter<br>No. | Size | Name            | Setting<br>Range      | Setting Unit<br>[Resolution] | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication |
|------------------|------|-----------------|-----------------------|------------------------------|--------------------|----------------------|------------------|---------------------|
| 61<br>PnAC2      | 4    | Speed Loop Gain | 1,000 to<br>2,000,000 | 0.001 Hz<br>[0.1 Hz]         | 40000              | All                  | Immedi-<br>ately | Tuning              |

You can set the parameter in increments of the setting unit.

•

Indicates when a change to the

"After restart" indicates parameters

that will be effective after one of the

• The power supply is turned OFF

The CONFIG command is sent.

A software reset is executed.

parameter will be effective.

following is executed.

and ON again.

However, if a unit is given in square brackets,

the setting is automatically converted to the resolution given in the square brackets.

### 10.2.2 List of MECHATROLINK-III Common Parameters

The following table lists the common MECHATROLINK-III parameters. These common parameters are used to make settings from the host controller via MECHATROLINK communications. Do not change the settings with the Digital Operator or any other device.

| Parameter<br>No. | Size | Name                                         | 9                       | Setting Range                         | Setting Unit<br>[Resolution] | Default<br>Setting | Applicable<br>Motors | When<br>Enabled                | Classi-<br>fication |
|------------------|------|----------------------------------------------|-------------------------|---------------------------------------|------------------------------|--------------------|----------------------|--------------------------------|---------------------|
|                  | 4    | Encoder Type<br>tion (read onl               | e Selec-<br>y)          | 0 to 1                                | -                            | _                  | All                  | _                              | -                   |
| 01<br>PnA02      |      | 0000 hex /                                   | Absolute                | encoder                               |                              |                    |                      |                                |                     |
| THAOL            |      | 0001 hex li                                  | ncrement                | tal encoder                           |                              |                    |                      |                                |                     |
|                  |      | Matau                                        |                         |                                       |                              |                    |                      |                                | _                   |
|                  | 4    | Motor Type S<br>(read only)                  | election                | 0 to 1                                | -                            | -                  | All                  | -                              |                     |
| 02<br>PnA04      |      | 0000 hex 1                                   | Rotary Se               | ervomotor                             |                              |                    |                      |                                | lo                  |
| FIIA04           |      |                                              | -                       | rvomotor                              |                              |                    |                      |                                | ormat               |
|                  |      | 1                                            |                         | Ι                                     | Γ                            |                    | Γ                    |                                | Device information  |
|                  | 4    | Semi-closed/<br>closed Select<br>(read only) | 'Fully-<br>tion         | 0 to 1                                | -                            | -                  | All                  | -                              | Devic               |
| 03<br>PnA06      |      |                                              |                         |                                       |                              |                    |                      |                                |                     |
| FIA00            |      |                                              | Semi-clos<br>Fully-clos |                                       |                              |                    |                      |                                |                     |
|                  |      | li                                           |                         |                                       |                              |                    |                      |                                |                     |
| 04<br>PnA08      | 4    | Rated Motor<br>(read only)                   | Speed                   | 0 to FFFFFFF                          | 1 min <sup>-1</sup>          | -                  | All                  | -                              | _                   |
| 05<br>PnA0A      | 4    | Maximum Ou<br>Speed (read                    | itput<br>only)          | 0 to FFFFFFFF                         | 1 min <sup>-1</sup>          | Ι                  | All                  | Ι                              |                     |
| 06<br>PnA0C      | 4    | Speed Multip<br>(read only)                  | olier                   | -1,073,741,823<br>to<br>1,073,741,823 | -                            | -                  | All                  | -                              |                     |
| 07<br>PnA0E      | 4    | Rated Torque<br>(read only)                  | 9                       | 0 to FFFFFFFF                         | 1 N∙m                        | -                  | All                  | -                              |                     |
| 08<br>PnA10      | 4    | Maximum Ou<br>Torque (read                   | itput<br>only)          | 0 to FFFFFFFF                         | 1 N•m                        | -                  | All                  | -                              | nation              |
| 09<br>PnA12      | 4    | Torque Multip<br>(read only)                 | olier                   | -1,073,741,823<br>to<br>1,073,741,823 | _                            | -                  | All                  | _                              | Device information  |
| 0A<br>PnA14      | 4    | Resolution<br>(read only)                    |                         | 0 to FFFFFFFF                         | 1 pulse/rev                  | -                  | Rotary               | _                              | Devic               |
| 0B<br>PnA16      | 4    | Scale Pitch                                  |                         | 0 to 65,536,000                       | 1 nm<br>[0.01 μm]            | 0                  | Linear               | After<br>restart <sup>*1</sup> | 1                   |
| 0C<br>PnA18      | 4    | Pulses per So<br>Pitch (read or              |                         | 0 to FFFFFFFF                         | 1 pulse/<br>pitch            | -                  | Linear               | -                              | ]                   |

Continued on next page.

|                  |      |                                                                                                                                       |                                     |                                       |                              | (                  | Continued fr         | rom previo                     | us page                |
|------------------|------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------------------|------------------------------|--------------------|----------------------|--------------------------------|------------------------|
| Parameter<br>No. | Size | Nam                                                                                                                                   | ne                                  | Setting Range                         | Setting Unit<br>[Resolution] | Default<br>Setting | Applicable<br>Motors | When<br>Enabled                | Classi-<br>fication    |
| 21<br>PnA42      | 4    | Electronic G<br>(Numerator)                                                                                                           |                                     | 1 to<br>1,073,741,824                 | -                            | 16                 | All                  | After<br>restart               |                        |
| 22<br>PnA44      | 4    | Electronic G<br>(Denominat                                                                                                            |                                     | 1 to<br>1,073,741,824                 | -                            | 1                  | All                  | After<br>restart               |                        |
| 23<br>PnA46      | 4    | Absolute Er<br>Origin Offse                                                                                                           |                                     | -1,073,741,823<br>to<br>1,073,741,823 | 1 reference<br>unit          | 0                  | All                  | Immedi-<br>ately <sup>*1</sup> |                        |
| 24<br>PnA48      | 4    | Multiturn Lin<br>Setting                                                                                                              | mit                                 | 0 to 65,535                           | 1 Rev                        | 65535              | Rotary               | After<br>restart               |                        |
|                  | 4    | Limit Setting                                                                                                                         | g                                   | 0 to 33 hex                           | -                            | 0000 hex           | All                  | After<br>restart               |                        |
|                  |      | Bit 0                                                                                                                                 | P-OT                                | (0: Enabled, 1: Di                    | isabled)                     |                    |                      |                                | Machine specifications |
|                  |      | Bit 1                                                                                                                                 | N-01                                | (0: Enabled, 1: D                     | isabled)                     |                    |                      |                                | cati                   |
| 25               |      | Bit 2                                                                                                                                 | Rese                                | rved.                                 |                              |                    |                      |                                | ecifi                  |
| PnA4A            |      | Bit 3                                                                                                                                 | Rese                                | rved.                                 |                              |                    |                      |                                | spe                    |
|                  |      | Bit 4                                                                                                                                 | P-SC                                | T (0: Disabled, 1:                    | Enabled)                     |                    |                      |                                | ine                    |
|                  |      | Bit 5                                                                                                                                 | N-SC                                | DT (0: Disabled, 1:                   | Enabled)                     |                    |                      |                                | ach                    |
|                  |      | Bits 6 to 31                                                                                                                          | Rese                                | rved.                                 |                              |                    |                      |                                | Σ                      |
|                  |      |                                                                                                                                       |                                     |                                       |                              |                    |                      |                                |                        |
|                  |      | 1                                                                                                                                     |                                     |                                       | 1                            | 1                  | I                    | 1                              |                        |
| 26<br>PnA4C      | 4    | Forward So<br>Limit                                                                                                                   | ftware                              | -1,073,741,823<br>to<br>1,073,741,823 | 1 reference<br>unit          | 10737418<br>23     | All                  | Immedi-<br>ately               |                        |
| 27<br>PnA4E      | 4    | Reserved p<br>(Do not cha                                                                                                             | arameter<br>.nge.)                  | -                                     | -                            | 0                  | All                  | Immedi-<br>ately               |                        |
| 28<br>PnA50      | 4    | Reverse So<br>Limit                                                                                                                   | ftware                              | -1,073,741,823<br>to<br>1,073,741,823 | 1 reference<br>unit          | -1073741<br>823    | All                  | Immedi-<br>ately               |                        |
| 29<br>PnA52      | 4    | Reserved p<br>(Do not cha                                                                                                             | arameter<br>inge.)                  | _                                     | _                            | 0                  | All                  | Immedi-<br>ately               | -                      |
|                  | 4    | Speed Unit<br>Selection <sup>*2</sup>                                                                                                 |                                     | 0 to 4                                | -                            | 0                  | All                  | After<br>restart               |                        |
|                  |      |                                                                                                                                       |                                     |                                       |                              |                    |                      |                                |                        |
|                  |      | 0000 hex                                                                                                                              | Reference                           | e units/s                             |                              |                    |                      |                                |                        |
| 41               |      | 0001 hex                                                                                                                              | Reference                           | e units/min                           |                              |                    |                      |                                |                        |
| PnA82            |      | 0002 hex                                                                                                                              | Percenta                            | ge (%) of rated spe                   | ed <sup>*3</sup>             |                    |                      |                                |                        |
|                  |      | 0003 hex                                                                                                                              | min <sup>-1*3</sup>                 |                                       |                              |                    |                      |                                |                        |
|                  |      | 0004 hex                                                                                                                              | Maximum                             | n motor speed/400                     | )00000 hex*4                 |                    |                      |                                |                        |
|                  |      |                                                                                                                                       |                                     |                                       |                              |                    |                      |                                | ings                   |
| 42<br>PnA84      | 4    | Speed Base<br>Selection <sup>*3,</sup><br>(Set the value<br>from the fol<br>formula: Sp<br>selection (4<br>$\times$ 10 <sup>n</sup> ) | *4<br>ue of n<br>lowing<br>eed unit | -3 to 3                               | _                            | 0                  | All                  | After<br>restart               | Unit settings          |
|                  | 4    | Position Un<br>Selection                                                                                                              | it                                  | 0                                     | -                            | 0                  | All                  | After<br>restart               |                        |
| 43<br>PnA86      |      | 0000 hex                                                                                                                              | Reference                           | e units                               |                              |                    |                      |                                |                        |
|                  |      |                                                                                                                                       |                                     |                                       |                              |                    |                      |                                |                        |

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| <b>D</b>         |      |                                                                                                                                                    |                      |                                  |                              |                    | Continued fr         |                  |                     |
|------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------|------------------------------|--------------------|----------------------|------------------|---------------------|
| Parameter<br>No. | Size | Name                                                                                                                                               |                      | Setting Range                    | Setting Unit<br>[Resolution] | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication |
| 44<br>PnA88      | 4    | Position Base U<br>Selection<br>(Set the value of<br>from the followi<br>formula: Positio<br>selection (43 Pr<br>× 10 <sup>n</sup> )               | f n<br>ng<br>n unit  | 0                                | -                            | 0                  | All                  | After<br>restart |                     |
|                  | 4    | Acceleration Ur<br>Selection                                                                                                                       | nit                  | 0                                | -                            | 0                  | All                  | After<br>restart |                     |
| 45               |      | Ocicculori                                                                                                                                         |                      |                                  |                              |                    | ļ                    | TOStart          | -                   |
| PnA8A            |      | 0000 hex Ref                                                                                                                                       | erence               | units/s <sup>2</sup>             |                              |                    |                      |                  |                     |
| 46<br>PnA8C      | 4    | Acceleration Ba<br>Unit Selection<br>(Set the value c<br>from the followi<br>formula: Accele<br>unit selection (2<br>PnA8A) × 10 <sup>n</sup> )    | of n<br>ng<br>ration | 4 to 6                           | _                            | 4                  | All                  | After<br>restart | -                   |
|                  | 4    | Torque Unit<br>Selection                                                                                                                           |                      | 1 to 2                           | _                            | 1                  | All                  | After<br>restart | -                   |
| 47               |      |                                                                                                                                                    |                      |                                  |                              |                    |                      |                  |                     |
| PnA8E            |      |                                                                                                                                                    |                      | ge (%) of rated tor              |                              |                    |                      |                  |                     |
|                  |      | 0002 hex Ma                                                                                                                                        | ximum                | n torque/4000000                 | ) hex*>                      |                    |                      |                  |                     |
| 48<br>PnA90      | 4    | Torque Base Un<br>Selection <sup>*5</sup><br>(Set the value of<br>from the following<br>formula: Torque<br>selection (47 Pr<br>× 10 <sup>n</sup> ) | of n<br>ng<br>e unit | -5 to 0                          | _                            | 0                  | All                  | After<br>restart | Unit settings       |
|                  | 4    | Supported Unit tems (read only                                                                                                                     | Sys-<br>)            | -                                | _                            | 0601011F<br>hex    | All                  | _                | - ⊃<br>-            |
|                  |      | Speed Units                                                                                                                                        |                      |                                  |                              |                    |                      |                  |                     |
|                  |      | Bit 0                                                                                                                                              | Re                   | ference units/s (1:              | Enabled)                     |                    |                      |                  |                     |
|                  |      | Bit 0                                                                                                                                              |                      | ference units/min                |                              |                    |                      |                  |                     |
|                  |      | Bit 2                                                                                                                                              |                      | rcentage (%) of rat              | ,                            | nabled)            |                      |                  |                     |
|                  |      | Bit 3                                                                                                                                              |                      | n <sup>-1</sup> (rpm) (1: Enable |                              |                    |                      |                  |                     |
|                  |      | Bit 4                                                                                                                                              |                      | aximum motor spe                 | ,                            | ex (1: Enable      | ed)                  |                  |                     |
|                  |      | Bits 5 to 7                                                                                                                                        | Re                   | served (0: Disable               | d).                          |                    |                      |                  |                     |
|                  |      | Position Units                                                                                                                                     |                      |                                  |                              |                    |                      |                  |                     |
| 49<br>Dr: 402    |      | Bit 8                                                                                                                                              | Re                   | ference units (1: E              | nabled)                      |                    |                      |                  |                     |
| PnA92            |      | Bits 9 to 15                                                                                                                                       |                      | served (0: Disable               | d)                           |                    |                      |                  |                     |
|                  |      | Acceleration Ur                                                                                                                                    |                      |                                  |                              |                    |                      |                  |                     |
|                  |      | Bit 16                                                                                                                                             |                      | ference units/s <sup>2</sup> (1  | •                            |                    |                      |                  |                     |
|                  |      | Bit 17                                                                                                                                             |                      | acceleration time                |                              | ach rated sp       | beed) (0: Disa       | bled)            |                     |
|                  |      | Bits 18 to 23                                                                                                                                      | Re                   | served (0: Disable               | d).                          |                    |                      |                  |                     |
|                  |      | Torque Units                                                                                                                                       |                      |                                  |                              |                    |                      |                  |                     |
|                  |      | Bit 24                                                                                                                                             |                      | m (0: Disabled)                  |                              |                    |                      |                  |                     |
|                  |      | Bit 25                                                                                                                                             |                      | rcentage (%) of rat              |                              | nabled)            |                      |                  |                     |
|                  |      | Bit 26                                                                                                                                             |                      | aximum torque/400                |                              |                    |                      |                  |                     |
|                  |      | Bits 27 to 31                                                                                                                                      | Re                   | served (0: Disable               | d).                          |                    |                      |                  |                     |
|                  |      |                                                                                                                                                    |                      |                                  |                              |                    |                      |                  |                     |

D1 Parameter Lists

| Parameter      | Size | Nam                           | е         | Setting Range         | Setting Unit                       | Default                            | Applicable | When                           | Class    |
|----------------|------|-------------------------------|-----------|-----------------------|------------------------------------|------------------------------------|------------|--------------------------------|----------|
| No.            |      |                               | -         |                       | [Resolution]                       | Setting                            | Motors     | Enabled                        | fication |
| 61<br>PnAC2    | 4    | Speed Loop                    | Gain      | 1,000 to<br>2,000,000 | 0.001 Hz<br>[0.1 Hz]               | 40000                              | All        | Immedi-<br>ately               |          |
| 62             | 4    | Speed Loop                    | Integral  | 150 to 510 000        | 1 µs                               | 20000                              | All        | Immedi-                        |          |
| PnAC4          | 4    | Time Consta                   | ant       | 150 to 512,000        | [0.01 ms]                          | 20000                              | All        | ately                          |          |
| 63<br>PnAC6    | 4    | Position Loc                  | p Gain    | 1,000 to<br>2,000,000 | 0.001/s<br>[0.1/s]                 | 40000                              | All        | Immedi-<br>ately               |          |
| 64             |      | Feedforward                   | l Com-    |                       |                                    |                                    |            | Immedi-                        | -        |
| PnAC8          | 4    | pensation                     | 00111     | 0 to 100              | 1%                                 | 0                                  | All        | ately                          |          |
| 65             | 4    | Position Loc<br>gral Time Co  |           | 0 to 5,000,000        | 1 μs<br>[0.1 ms]                   | 0                                  | All        | Immedi-                        |          |
| PnACA<br>66    |      | 0                             |           | 0 to                  |                                    |                                    |            | ately                          | -        |
| PnACC          | 4    | Positioning (<br>pleted Width |           | 0 to<br>1,073,741,824 | 1 reference<br>unit                | 7                                  | All        | Immedi-<br>ately               |          |
| 67             | 4    | Near Signal                   | Width     | 1 to                  | 1 reference                        | 10737418                           | All        | Immedi-                        |          |
| PnACE          | •    |                               |           | 1,073,741,824         | unit                               | 24                                 |            | ately                          | -        |
| 81<br>PnB02    | 4    | Exponential ation/Decele      | eration   | 0 to 510,000          | 1 μs<br>[0.1 ms]                   | 0                                  | All        | Immedi-<br>ately <sup>*6</sup> |          |
|                |      | Time Consta                   |           |                       |                                    |                                    |            | 2                              | -        |
| 82<br>PnB04    | 4    | Movement A<br>Time            | verage    | 0 to 510,000          | 1 μs<br>[0.1 ms]                   | 0                                  | All        | Immedi-<br>ately <sup>*6</sup> |          |
| 83             |      | External Pos                  | sitioning | -1,073,741,823        | 1 reference                        |                                    |            | Immedi-                        | 1        |
| PnB06          | 4    | Final Travel [                | Distance  | to<br>1,073,741,823   | unit                               | 100                                | All        | ately                          |          |
|                |      |                               |           | ,                     |                                    | × 5,000                            |            |                                | -        |
| 84             |      | Origin Appro                  | bach      | 0 to 3FFFFFF          | 0.1                                | reference<br>units/s               |            | Immedi-                        |          |
| PnB08          | 4    | Speed                         |           | hex                   | 10 <sup>-3</sup> min <sup>-1</sup> | con-<br>verted to                  | All        | ately                          |          |
|                |      |                               |           |                       |                                    | 10 <sup>-3</sup> min <sup>-1</sup> |            |                                |          |
|                |      |                               |           |                       |                                    | × 500 ref-                         |            |                                |          |
| 85             | 4    | Origin Retur                  | n Creep   | 0 to 3FFFFFFF         | 10 <sup>-3</sup> min <sup>-1</sup> | erence<br>units/s                  | All        | Immedi-                        | Tuning   |
| PnB0A          | 4    | Speed                         |           | hex                   | 10 5 mm                            | con-<br>verted to                  | All        | ately                          | 1        |
|                |      |                               |           |                       |                                    | 10 <sup>-3</sup> min <sup>-1</sup> |            |                                |          |
| 86             | 4    | Final Travel [                |           | -1,073,741,823<br>to  | 1 reference                        | 100                                | All        | Immedi-                        |          |
| PnB0C          | -    | for Origin Re                 | eturn     | 1,073,741,823         | unit                               | 100                                | 7 41       | ately                          |          |
|                | 4    | Fixed Monito                  | or Selec- | 0 to F                | -                                  | 1                                  | All        | Immedi-<br>ately               |          |
|                |      |                               |           |                       |                                    |                                    |            | atory                          | -        |
|                |      | 0000 hex                      | APOS      |                       |                                    |                                    |            |                                |          |
|                |      |                               | CPOS      |                       |                                    |                                    |            |                                |          |
|                |      | 0002 hex                      | PERR      |                       |                                    |                                    |            |                                |          |
|                |      | 0003 hex                      | LPOS1     |                       |                                    |                                    |            |                                |          |
|                |      | 0004 hex                      | LPOS2     |                       |                                    |                                    |            |                                |          |
|                |      | 0005 hex                      | FSPD      |                       |                                    |                                    |            |                                |          |
| ~ <del>~</del> |      | 0006 hex                      | CSPD      |                       |                                    |                                    |            |                                |          |
| 87<br>PnB0E    |      |                               | TRQ       |                       |                                    |                                    |            |                                |          |
| HDOL           |      |                               | ALARM     |                       |                                    |                                    |            |                                |          |
|                |      |                               | MPOS      |                       |                                    |                                    |            |                                |          |
|                |      |                               |           | (undefined value).    |                                    |                                    |            |                                |          |
|                |      |                               |           | (undefined value).    |                                    |                                    |            |                                |          |
|                |      |                               |           | ommon monitor 1)      |                                    |                                    |            |                                |          |
|                |      |                               |           | ommon monitor 2)      |                                    |                                    |            |                                |          |
|                |      | -                             | ,         | otional monitor 1)    |                                    |                                    |            |                                |          |
|                |      |                               |           | otional monitor 2)    |                                    |                                    |            |                                |          |
|                |      | OUDI HEX                      |           |                       |                                    |                                    |            |                                |          |

| Parameter<br>No. | Size | Nar                  | ne         | Setting Range     | Setting Unit<br>[Resolution] | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication        |
|------------------|------|----------------------|------------|-------------------|------------------------------|--------------------|----------------------|------------------|----------------------------|
|                  | 4    | Fixed Moni<br>tion 2 | tor Selec- | 0 to F            | _                            | 0                  | All                  | Immedi-<br>ately | eters                      |
| 88<br>PnB10      |      | 0000 to<br>000F hex  | The settin | gs are the same a | s those for Fixe             | ed Monitor S       | Selection 1.         |                  | Command-related parameters |

Continued from previous page.

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|                  |      |                                                                      |                                                                                                                                                                                          |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             | Continued fr                            |                 |                            |
|------------------|------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------|-----------------|----------------------------|
| Parameter<br>No. | Size | Nan                                                                  | ne                                                                                                                                                                                       | Setting Range                                                                                                                                                                              | Setting Unit<br>[Resolution]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Default<br>Setting          | Applicable<br>Motors                    | When<br>Enabled | Classi-<br>fication        |
|                  | 4    | SEL_MON<br>Monitor Se                                                | (CMN1)<br>lection 1                                                                                                                                                                      | 0 to 9                                                                                                                                                                                     | _                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0                           | All                                     | Immedi-         |                            |
|                  |      | 0000 hex<br>0001 hex<br>0002 hex<br>0003 hex<br>0004 hex<br>0005 hex | TPOS (tar<br>IPOS (refe<br>POS_OFF<br>TSPD (tar<br>SPD_LIM<br>TRQ_LIM<br>SV_STAT<br>Monitor D<br>Byte 1: Cl<br>00 hex:<br>01 hex:<br>02 hex:<br>03 hex:<br>03 hex:<br>01 hex:<br>01 hex: | get position in<br>prence position<br>SET (offset set<br>get speed)<br>(speed limit)<br>(torque limit)<br>(servo actual of<br>escription<br>urrent commun<br>Phase 0<br>Phase 1<br>Phase 2 | node<br>mode<br>node                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ate system)<br>dinate syste | m)                                      | ately           |                            |
|                  |      |                                                                      | Byte 3: Re<br>Byte 4: Ex                                                                                                                                                                 | eserved<br>kpansion signal                                                                                                                                                                 | monitor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             | Cattin                                  | -               |                            |
|                  |      |                                                                      | Bit                                                                                                                                                                                      | Name                                                                                                                                                                                       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | v Value                     | E Settin<br>Latch dete                  | -               |                            |
|                  |      |                                                                      | Bit 0                                                                                                                                                                                    | LT_RDY1                                                                                                                                                                                    | Processing statulatch detection f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | or                          | not yet pro                             |                 | eters                      |
| 89               |      |                                                                      |                                                                                                                                                                                          | _                                                                                                                                                                                          | LT_REQ1 in SVC<br>D_CTRL region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1                           | Processing<br>detection in<br>progress. |                 | parame                     |
| PnB12            |      | 0006 hex                                                             | D# 1                                                                                                                                                                                     |                                                                                                                                                                                            | Processing statulated and the state |                             | Latch dete<br>not yet pro<br>cessed.    |                 | I-related                  |
|                  |      |                                                                      | Bit 1                                                                                                                                                                                    | LT_RDY1                                                                                                                                                                                    | LT_REQ2 in SVC<br>D_CTRL region                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | CM- 1                       | Processing<br>detection in<br>progress. |                 | Command-related parameters |
|                  |      |                                                                      |                                                                                                                                                                                          |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0                           | Phase C                                 |                 | ŏ                          |
|                  |      |                                                                      | Bits 2                                                                                                                                                                                   |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1                           | External in<br>signal 1                 |                 |                            |
|                  |      |                                                                      | and 3                                                                                                                                                                                    | LT_SEL1R                                                                                                                                                                                   | Latch signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2                           | External in<br>signal 2<br>External in  |                 |                            |
|                  |      |                                                                      |                                                                                                                                                                                          |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3                           | signal 3                                | pul             |                            |
|                  |      |                                                                      |                                                                                                                                                                                          |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0                           | Phase C                                 |                 |                            |
|                  |      |                                                                      | Bits 4                                                                                                                                                                                   |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1                           | External in<br>signal 1                 |                 |                            |
|                  |      |                                                                      | and 5                                                                                                                                                                                    | LT_SEL2R                                                                                                                                                                                   | Latch signal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 2                           | External in<br>signal 2                 |                 |                            |
|                  |      |                                                                      |                                                                                                                                                                                          | Deserved (2)                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3                           | External in<br>signal 3                 | put             |                            |
|                  |      |                                                                      | Bit 6 Reserved (0).                                                                                                                                                                      |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |                                         |                 |                            |
|                  |      | 0007 hex                                                             | Reserved                                                                                                                                                                                 |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | c · · · · ·                 |                                         |                 |                            |
|                  |      | 0008 hex                                                             | - verted to 64-bit position reference data                                                                                                                                               |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |                                         |                 |                            |
|                  |      | 0009 hex                                                             | INIT_PGPOS (High)Upper 32 bits of initial encoder position converted to 64-bit position reference data                                                                                   |                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |                                         |                 |                            |

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| Parameter<br>No. | Size | Name                                                                     | Setting Range                                                                                                                                                                                                                                                                    | Setting Unit<br>[Resolution]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Default<br>Setting | Applicable<br>Motors | When<br>Enabled  | Classi-<br>fication        |
|------------------|------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------|------------------|----------------------------|
|                  | 4    | SEL_MON (CMN2)<br>Monitor Selection 2                                    | 2 0 to 9                                                                                                                                                                                                                                                                         | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0                  | All                  | Immedi-<br>ately |                            |
| 8A<br>PnB14      |      | 0000 to<br>0009 The set<br>hex                                           | tings are the same as                                                                                                                                                                                                                                                            | those for SEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | _MON Moni          | tor Selection        | 1.               |                            |
| 8B<br>PnB16      | 4    | Origin Detection<br>Width                                                | 0 to 250                                                                                                                                                                                                                                                                         | 1 reference<br>unit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 10                 | All                  | Immedi-<br>ately | _                          |
| 8C<br>PnB18      | 4    | Forward Torque Lir                                                       | nit 0 to 800                                                                                                                                                                                                                                                                     | 1%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100                | All                  | Immedi-<br>ately |                            |
| 8D<br>PnB1A      | 4    | Reverse Torque Lir                                                       | nit 0 to 800                                                                                                                                                                                                                                                                     | 1%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 100                | All                  | Immedi-<br>ately |                            |
| 8E<br>PnB1C      | 4    | Zero Speed Detection Range                                               | - 1,000 to 10,000,000                                                                                                                                                                                                                                                            | 10 <sup>-3</sup> min <sup>-1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 20000              | All                  | Immedi-<br>ately |                            |
| 8F<br>PnB1E      | 4    | Speed Coincidence<br>Signal Detection<br>Width                           | e 0 to 100,000                                                                                                                                                                                                                                                                   | 10 <sup>-3</sup> min <sup>-1</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10000              | All                  | Immedi-<br>ately | ameters                    |
|                  | 4    | Servo Command<br>Control Field Enab<br>Disable Selections<br>(read only) | e/ _                                                                                                                                                                                                                                                                             | _                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0FFF3F3F<br>hex    | All                  | _                | elated par                 |
| 90<br>PnB20      |      |                                                                          | CMD_PAUSE (1: Ena<br>CMD_CANCEL (1: Ena<br>STOP_MODE (1: Ena<br>ACCFIL (1: Enabled)<br>Reserved (0: Disable<br>LT_REQ1 (1: Enabled)<br>LT_REQ2 (1: Enabled)<br>LT_SEL2 (1: Enabled)<br>Reserved (0: Disabled<br>SEL_MON1 (1: Enat<br>SEL_MON2 (1: Enat<br>Reserved (0: Disabled) | inabled)         abled)         add)         add) |                    |                      |                  | Command-related parameters |

| Parameter<br>No. |      |                                                                   |                      |                              |                    |                      | · · · · · · · · · · · · · · · · · · · | us page.                   |
|------------------|------|-------------------------------------------------------------------|----------------------|------------------------------|--------------------|----------------------|---------------------------------------|----------------------------|
|                  | Size | Name                                                              | Setting Range        | Setting Unit<br>[Resolution] | Default<br>Setting | Applicable<br>Motors | When<br>Enabled                       | Classi-<br>fication        |
|                  | 4    | Servo Status Field<br>Enable/Disable<br>Selections (read<br>only) | _                    | 0                            | 0FFF3F33<br>hex    | All                  | _                                     |                            |
|                  |      |                                                                   |                      |                              |                    |                      | •                                     |                            |
|                  |      | Bit 0                                                             | CMD_PAUSE_CMP        | (1: Enabled)                 |                    |                      |                                       |                            |
|                  |      | Bit 1                                                             | CMD_CANCEL_CMI       |                              |                    |                      |                                       |                            |
|                  |      | Bit 2 and 3                                                       | Reserved (0: Disable | ed).                         |                    |                      |                                       |                            |
|                  |      | Bits 4 and 5                                                      | ACCFIL (1: Enabled)  |                              |                    |                      |                                       |                            |
|                  |      | Bits 6 and 7                                                      | Reserved (0: Disable | ed).                         |                    |                      |                                       |                            |
|                  |      | Bit 8                                                             | L_CMP1 (1: Enabled   | 1)                           |                    |                      |                                       |                            |
| 91               |      | Bit 9                                                             | L_CMP2 (1: Enabled   | ł)                           |                    |                      |                                       |                            |
| PnB22            |      | Bit 10                                                            | POS_RDY (1: Enable   | ed)                          |                    |                      |                                       |                            |
|                  |      | Bit 11                                                            | PON (1: Enabled)     |                              |                    |                      |                                       |                            |
|                  |      | Bit 12                                                            | M_RDY (1: Enabled)   |                              |                    |                      |                                       |                            |
|                  |      | Bit 13                                                            | SV_ON (1: Enabled)   |                              |                    |                      |                                       |                            |
|                  |      | Bits 14 and 15                                                    | Reserved (0: Disable | ed).                         |                    |                      |                                       | ers                        |
|                  |      | Bits 16 to 19                                                     | SEL_MON1 (1: Enab    |                              |                    |                      |                                       | met                        |
|                  |      | Bits 20 to 23                                                     | SEL_MON2 (1: Enab    |                              |                    |                      |                                       | araı                       |
|                  |      | Bits 24 to 27                                                     | SEL_MON3 (1: Enab    |                              |                    |                      |                                       | d p                        |
|                  |      | Bits 28 to 31                                                     | Reserved (0: Disable | ed).                         |                    |                      |                                       | elate                      |
|                  |      |                                                                   |                      |                              |                    |                      |                                       | Command-related parameters |
|                  | 4    | Output Bit Enable/<br>Disable Selections<br>(read only)           | -                    | -                            | 007F01F0<br>hex    | All                  | _                                     | Comm                       |
|                  |      |                                                                   |                      |                              |                    |                      |                                       |                            |
|                  |      | Bits 0 to 3                                                       | Reserved (0: Disable | ed).                         |                    |                      |                                       |                            |
|                  |      | Bit 4                                                             | V_PPI (1: Enabled)   |                              |                    |                      |                                       |                            |
|                  |      | Bit 5                                                             | P_PPI (1: Enabled)   |                              |                    |                      |                                       |                            |
|                  |      | Bit 6                                                             | P_CL (1: Enabled)    |                              |                    |                      |                                       |                            |
| 92               |      | Bit 7                                                             | N_CL (1: Enabled)    |                              |                    |                      |                                       |                            |
| PnB24            |      | Bit 8                                                             | G_SEL (1: Enabled)   |                              |                    |                      |                                       |                            |
|                  |      | Bits 9 to 11                                                      | G_SEL (0: Disabled)  |                              |                    |                      |                                       |                            |
|                  |      | Bits 12 to 15                                                     | Reserved (0: Disable | ed).                         |                    |                      |                                       |                            |
|                  |      | Bits 16 to 19                                                     | BANK_SEL (1: Enab    | led)                         |                    |                      |                                       |                            |
|                  |      | Bits 20 to 22                                                     | SO1 to SO3 (1: Ena   | bled)                        |                    |                      |                                       |                            |
|                  |      | Bit 23                                                            | Reserved (0: Disable | ed).                         |                    |                      |                                       |                            |
|                  |      | Bits 24 to 31                                                     | Reserved (0: Disable | ed).                         |                    |                      |                                       |                            |
|                  |      |                                                                   |                      |                              |                    |                      |                                       |                            |

Continued from previous page.

| Parameter<br>No. | Size | Name                                                 | Setting Range | Setting Unit<br>[Resolution] | Default<br>Setting | Applicable<br>Motors | When<br>Enabled | Classi-<br>fication        |
|------------------|------|------------------------------------------------------|---------------|------------------------------|--------------------|----------------------|-----------------|----------------------------|
|                  | 4    | Input Bit Enable/Di<br>able Selections (rea<br>only) |               | _                            | FF0FFEFE<br>hex    | All                  | _               |                            |
| 93<br>PnB26      | 4    | able Selections (rea                                 |               | ed).                         |                    | AII                  |                 | Command-related parameters |

Continued from previous page

\*1. The parameter setting is enabled after SENS\_ON command execution is completed.

\*2. When using fully-closed loop control, set the reference units/s.

\*3. If you set the Speed Unit Selection (parameter 41) to either 0002 hex or 0003 hex, set the Speed Base Unit Selection (parameter 42) to a number between -3 and 0.

\*4. If you set the Speed Unit Selection (parameter 41) to 0004 hex, set the Speed Base Unit Selection (parameter 42) to 0.

\*5. If you set the Torque Unit Selection (parameter 47) to 0002 hex, set the Torque Base Unit Selection (parameter 48) to 0.

\*6. Change the setting when the reference is stopped (i.e., while DEN is set to 1). If you change the setting during operation, the reference output will be affected.

## 10.3 Parameter Recording Table

Use the following table to record the settings of the parameters.

| Parameter<br>No. | Default Setting | Name                                           | When<br>Enabled |
|------------------|-----------------|------------------------------------------------|-----------------|
| Pn000            | 0000            | Basic Function Selections (                    | After restart   |
| Pn001            | 0000            | Application Function Selec-<br>tions 1         | After restart   |
| Pn002            | 0011            | Application Function Selec-<br>tions 2         | After restart   |
| Pn006            | 0002            | Application Function Selec-<br>tions 6         | Immediately     |
| Pn007            | 0000            | Application Function Selec-<br>tions 7         | Immediately     |
| Pn008            | 4000            | Application Function Selec-<br>tions 8         | After restart   |
| Pn00A            | 0001            | Application Function Selec-<br>tions A         | After restart   |
| Pn00B            | 0000            | Application Function Selec-<br>tions B         | After restart   |
| Pn00C            | 0000            | Application Function Selec-<br>tions C         | After restart   |
| Pn00D            | 0000            | Application Function Selec-<br>tions D         | After restart   |
| Pn00F            | 0000            | Application Function Selec-<br>tions F         | After restart   |
| Pn021            | 0000            | Reserved parameter                             | _               |
| Pn070            | 0000            | Function Selection during<br>Cutting Feeding   | After restart   |
| Pn071            | 0000            | Rapid Feed Function Selec tion                 | After restart   |
| Pn080            | 0000            | Application Function Selec-<br>tions 80        | After restart   |
| Pn081            | 0000            | Application Function Selec-<br>tions 81        | After restart   |
| Pn100            | 400             | Speed Loop Gain                                | Immediately     |
| Pn101            | 2000            | Speed Loop Integral Time<br>Constant           | Immediately     |
| Pn102            | 400             | Position Loop Gain                             | Immediately     |
| Pn103            | 100             | Moment of Inertia Ratio                        | Immediately     |
| Pn104            | 400             | Second Speed Loop Gain                         | Immediately     |
| Pn105            | 2000            | Second Speed Loop Inte-<br>gral Time Constant  | Immediately     |
| Pn106            | 400             | Second Position Loop Gair                      | Immediately     |
| Pn109            | 0               | Feedforward                                    | Immediately     |
| Pn10A            | 0               | Feedforward Filter Time<br>Constant            | Immediately     |
| Pn10B            | 0000            | Gain Application Selections                    | *1              |
| Pn10C            | 200             | Mode Switching Level for<br>Torque Reference   | Immediately     |
| Pn10D            | 0               | Mode Switching Level for<br>Speed Reference    | Immediately     |
| Pn10E            | 0               | Mode Switching Level for Acceleration          | Immediately     |
| Pn10F            | 0               | Mode Switching Level for<br>Position Deviation | Immediately     |

|                  |                 | Continued from                                                 | 1 0             |
|------------------|-----------------|----------------------------------------------------------------|-----------------|
| Parameter<br>No. | Default Setting | Name                                                           | When<br>Enabled |
| Pn11F            | 0               | Position Integral Time Con<br>stant                            | Immediately     |
| Pn121            | 100             | Friction Compensation Gai                                      | n Immediately   |
| Pn123            | 0               | Friction Compensation<br>Coefficient                           | Immediately     |
| Pn124            | 0               | Friction Compensation Fre<br>quency Correction                 | Inmediately     |
| Pn125            | 100             | Friction Compensation Gair<br>Correction                       | Immediately     |
| Pn12B            | 400             | Third Speed Loop Gain                                          | Immediately     |
| Pn12C            | 2000            | Third Speed Loop Integral<br>Time Constant                     | Immediately     |
| Pn12D            | 400             | Third Position Loop Gain                                       | Immediately     |
| Pn12E            | 400             | Fourth Speed Loop Gain                                         | Immediately     |
| Pn12F            | 2000            | Fourth Speed Loop Inte-<br>gral Time Constant                  | Immediately     |
| Pn130            | 400             | Fourth Position Loop Gain                                      | Immediately     |
| Pn13D            | 2000            | Current Gain Level                                             | Immediately     |
| Pn140            | 0100            | Model Following Control-<br>Related Selections                 | Immediately     |
| Pn141            | 500             | Model Following Control<br>Gain                                | Immediately     |
| Pn142            | 1000            | Model Following Control<br>Gain Correction                     | Immediately     |
| Pn143            | 1000            | Model Following Control<br>Bias in the Forward Direc-<br>tion  | Immediately     |
| Pn144            | 1000            | Model Following Control<br>Bias in the Reverse Direc-<br>tion  | Immediately     |
| Pn145            | 500             | Vibration Suppression 1<br>Frequency A                         | Immediately     |
| Pn146            | 700             | Vibration Suppression 1<br>Frequency B                         | Immediately     |
| Pn147            | 1000            | Model Following Control<br>Speed Feedforward Com-<br>pensation | Immediately     |
| Pn14A            | 800             | Vibration Suppression 2<br>Frequency                           | Immediately     |
| Pn14B            | 100             | Vibration Suppression 2<br>Correction                          | Immediately     |
| Pn14F            | 0021            | Control-Related Selections                                     | After restart   |
| Pn150            | 0012            | Predictive Control Selec-<br>tion Switches                     | After restart   |
| Pn151            | 100             | Predictive Control Acceler-<br>ation/Deceleration Gain         | Immediately     |
| Pn152            | 100             | Predictive Control Weight<br>Ratio                             | Immediately     |
| Pn153            | 100             | Predictive Control Equiva-<br>lent Kp Ratio                    | Immediately     |
| Pn154            | 0               | Predictive Control Speed<br>Feedforward Gain                   | Immediately     |
| Pn155            | 0               | Predictive Control Torque<br>Feedforward Gain                  | Immediately     |
|                  |                 |                                                                |                 |

DT Parameter Lists

| Deverenter       |                 |                                                                  | When          |
|------------------|-----------------|------------------------------------------------------------------|---------------|
| Parameter<br>No. | Default Setting | Name                                                             | Enabled       |
| Pn156            | 0               | Predictive Control Torque<br>Feedforward Filter Time<br>Constant | Immediately   |
| Pn157            | 80              | Predictive Control Parame-<br>ter Kph (C)                        | Immediately   |
| Pn158            | 0               | Predictive Control Parame-<br>ter Cd                             | Immediately   |
| Pn159            | 0               | Predictive Control Parame-<br>ter α                              | Immediately   |
| Pn15A            | 0               | Predictive Control Equiva-<br>lent Kp Fine-Tuning Amoun          | Immediately   |
| Pn160            | 0010            | Anti-Resonance Control-<br>Related Selections                    | Immediately   |
| Pn161            | 1000            | Anti-Resonance Frequency                                         | Immediately   |
| Pn162            | 100             | Anti-Resonance Gain Cor-<br>rection                              | Immediately   |
| Pn163            | 0               | Anti-Resonance Damping<br>Gain                                   | Immediately   |
| Pn164            | 0               | Anti-Resonance Filter Time<br>Constant 1 Correction              | Immediately   |
| Pn165            | 0               | Anti-Resonance Filter Time<br>Constant 2 Correction              | Immediately   |
| Pn166            | 0               | Anti-Resonance Damping<br>Gain 2                                 | Immediately   |
| Pn181            | 0               | Mode Switching Level for<br>Speed Reference                      | Immediately   |
| Pn182            | 0               | Mode Switching Level for<br>Acceleration                         | Immediately   |
| Pn205            | 65535           | Multiturn Limit                                                  | After restart |
| Pn207            | 0010            | Position Control Function<br>Selections                          | After restart |
| Pn20A            | 32768           | Number of External<br>Encoder Scale Pitches                      | After restart |
| Pn20E            | 16              | Electronic Gear Ratio<br>(Numerator)                             | After restart |
| Pn210            | 1               | Electronic Gear Ratio<br>(Denominator)                           | After restart |
| Pn212            | 2048            | Number of Encoder Output<br>Pulses                               | After restart |
| Pn22A            | 0000            | Fully-closed Control Selec-<br>tions                             | After restart |
| Pn230            | 0000            | Position Control Expansion<br>Function Selections                | After restart |
| Pn231            | 0               | Backlash Compensation                                            | Immediately   |
| Pn233            | 0               | Backlash Compensation<br>Time Constant                           | Immediately   |
| Pn281            | 20              | Encoder Output Resolution                                        | After restart |
| Pn282            | 0               | Linear Encoder Scale Pitch                                       | After restart |
| Pn304            | 500             | Jogging Speed                                                    | Immediately   |
| Pn305            | 0               | Soft Start Acceleration<br>Time                                  | Immediately   |
| Pn306            | 0               | Soft Start Deceleration<br>Time                                  | Immediately   |
| Pn308            | 0               | Speed Feedback Filter<br>Time Constant                           | Immediately   |

| Continued from previous page. |                 |                                                                  |                 |
|-------------------------------|-----------------|------------------------------------------------------------------|-----------------|
| Parameter<br>No.              | Default Setting | Name                                                             | When<br>Enabled |
| Pn30A                         | 0               | Deceleration Time for Servo<br>OFF and Forced Stops              | Immediately     |
| Pn30C                         | 0               | Speed Feedforward Aver-<br>age Movement Time                     | Immediately     |
| Pn310                         | 0000            | Vibration Detection Selec-<br>tions                              | Immediately     |
| Pn311                         | 100             | Vibration Detection Sensi-<br>tivity                             | Immediately     |
| Pn312                         | 50              | Vibration Detection Level                                        | Immediately     |
| Pn316                         | 10000           | Maximum Motor Speed                                              | After restart   |
| Pn324                         | 300             | Moment of Inertia Calcula-<br>tion Starting Level                | Immediately     |
| Pn383                         | 50              | Jogging Speed                                                    | Immediately     |
| Pn384                         | 10              | Vibration Detection Level                                        | Immediately     |
| Pn385                         | 50              | Maximum Motor Speed                                              | After restart   |
| Pn401                         | 100             | First Stage First Torque<br>Reference Filter Time Con-<br>stant  | Immediately     |
| Pn402                         | 800             | Forward Torque Limit                                             | Immediately     |
| Pn403                         | 800             | Reverse Torque Limit                                             | Immediately     |
| Pn404                         | 100             | Forward External Torque<br>Limit                                 | Immediately     |
| Pn405                         | 100             | Reverse External Torque<br>Limit                                 | Immediately     |
| Pn406                         | 800             | Emergency Stop Torque                                            | Immediately     |
| Pn407                         | 10000           | Speed Limit during Torque<br>Control                             | Immediately     |
| Pn408                         | 0000            | Torque-Related Function<br>Selections                            | *1              |
| Pn409                         | 5000            | First Stage Notch Filter Fre-<br>quency                          | Immediately     |
| Pn40A                         | 70              | First Stage Notch Filter Q<br>Value                              | Immediately     |
| Pn40B                         | 0               | First Stage Notch Filter<br>Depth                                | Immediately     |
| Pn40C                         | 5000            | Second Stage Notch Filter<br>Frequency                           | Immediately     |
| Pn40D                         | 70              | Second Stage Notch Filter<br>Q Value                             | Immediately     |
| Pn40E                         | 0               | Second Stage Notch Filter<br>Depth                               | Immediately     |
| Pn40F                         | 5000            | Second Stage Second<br>Torque Reference Filter Fre-<br>quency    | Immediately     |
| Pn410                         | 50              | Second Stage Second<br>Notch Filter Q Value                      | Immediately     |
| Pn412                         | 100             | First Stage Second Torque<br>Reference Filter Time Con-<br>stant | Immediately     |
| Pn413                         | 100             | First Stage Third Torque<br>Reference Filter Time Con-<br>stant  | Immediately     |
| Pn414                         | 100             | First Stage Fourth Torque<br>Reference Filter Time Con-<br>stant | Immediately     |

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| Continued from previous page. |                 |                                                                       |                 |  |
|-------------------------------|-----------------|-----------------------------------------------------------------------|-----------------|--|
| Parameter<br>No.              | Default Setting | Name                                                                  | When<br>Enabled |  |
| Pn416                         | 0000            | Torque-Related Function<br>Selections 2                               | Immediately     |  |
| Pn417                         | 5000            | Third Stage Notch Filter<br>Frequency                                 | Immediately     |  |
| Pn418                         | 70              | Third Stage Notch Filter Q<br>Value                                   | Immediately     |  |
| Pn419                         | 0               | Third Stage Notch Filter<br>Depth                                     | Immediately     |  |
| Pn41A                         | 5000            | Fourth Stage Notch Filter<br>Frequency                                | Immediately     |  |
| Pn41B                         | 70              | Fourth Stage Notch Filter Q<br>Value                                  | Immediately     |  |
| Pn41C                         | 0               | Fourth Stage Notch Filter<br>Depth                                    | Immediately     |  |
| Pn41D                         | 5000            | Fifth Stage Notch Filter Fre-<br>quency                               | Immediately     |  |
| Pn41E                         | 70              | Fifth Stage Notch Filter Q<br>Value                                   | Immediately     |  |
| Pn41F                         | 0               | Fifth Stage Notch Filter<br>Depth                                     | Immediately     |  |
| Pn423                         | 0000            | Speed Ripple Compensa-<br>tion Selections                             | *1              |  |
| Pn424                         | 50              | Torque Limit at Main Circuit<br>Voltage Drop                          | Immediately     |  |
| Pn425                         | 100             | Release Time for Torque<br>Limit at Main Circuit Voltage<br>Drop      | Immediately     |  |
| Pn426                         | 0               | Torque Feedforward Aver-<br>age Movement Time                         | Immediately     |  |
| Pn427                         | 0               | Speed Ripple Compensa-<br>tion Enable Speed                           | Immediately     |  |
| Pn456                         | 15              | Sweep Torque Reference<br>Amplitude                                   | Immediately     |  |
| Pn460                         | 0101            | Notch Filter Adjustment<br>Selections 1                               | Immediately     |  |
| Pn480                         | 10000           | Speed Limit during Force<br>Control                                   | Immediately     |  |
| Pn481                         | 400             | Polarity Detection Speed<br>Loop Gain                                 | Immediately     |  |
| Pn482                         | 3000            | Polarity Detection Speed<br>Loop Integral Time Con-<br>stant          | Immediately     |  |
| Pn483                         | 30              | Forward Force Limit                                                   | Immediately     |  |
| Pn484                         | 30              | Reverse Force Limit                                                   | Immediately     |  |
| Pn485                         | 20              | Polarity Detection Refer-<br>ence Speed                               | Immediately     |  |
| Pn486                         | 25              | Polarity Detection Refer-<br>ence Acceleration/Deceler-<br>ation Time | Immediately     |  |
| Pn487                         | 0               | Polarity Detection Con-<br>stant Speed Time                           | Immediately     |  |
| Pn488                         | 100             | Polarity Detection Reference Waiting Time                             | Immediately     |  |
| Pn48E                         | 10              | Polarity Detection Range                                              | Immediately     |  |
| Pn490                         | 100             | Polarity Detection Load<br>Level                                      | Immediately     |  |

|                  |                 | Continued from p                                                    |                 |
|------------------|-----------------|---------------------------------------------------------------------|-----------------|
| Parameter<br>No. | Default Setting | Name                                                                | When<br>Enabled |
| Pn495            | 100             | Polarity Detection Confir-<br>mation Force Reference                | Immediately     |
| Pn498            | 10              | Polarity Detection Allowable<br>Error Range                         | Immediately     |
| Pn49F            | 0               | Speed Ripple Compensa-<br>tion Enable Speed                         | Immediately     |
| Pn4B0            | 0000            | Acceleration Rate Correc-<br>tion Switch                            | After startup   |
| Pn4B1            | 1               | Number of Forward Com-<br>pensation Steps                           | Immediately     |
| Pn4B2            | 0               | Forward Compensation<br>Torque                                      | Immediately     |
| Pn4B3            | 0               | Forward Offset Position<br>Ratio                                    | Immediately     |
| Pn4B4            | 0               | Forward Offset Compensa-<br>tion Torque                             | Immediately     |
| Pn4B5            | 0               | Second Forward Compen-<br>sation Position Ratio                     | Immediately     |
| Pn4B6            | 0               | Second Forward Compen-<br>sation Torque                             | Immediately     |
| Pn4B7            | 1               | Number of Reverse Com-<br>pensation Steps                           | Immediately     |
| Pn4B8            | 0               | Reverse Compensation<br>Torque                                      | Immediately     |
| Pn4B9            | 0               | Reverse Offset Position<br>Ratio                                    | Immediately     |
| Pn4BA            | 0               | Reverse Offset Compensa-<br>tion Torque                             | Immediately     |
| Pn4BB            | 0               | Second Reverse Compen-<br>sation Position Ratio                     | Immediately     |
| Pn4BC            | 0               | Second Reverse Compen-<br>sation Torque                             | Immediately     |
| Pn4BD            | 0               | Forward Compensation<br>Steps Correction Function<br>Coefficient a  | Immediately     |
| Pn4BE            | 0               | Forward Compensation<br>Steps Correction Function<br>Coefficient b  | Immediately     |
| Pn4BF            | 0               | Forward Compensation<br>Torque Correction Function<br>Coefficient a | Immediately     |
| Pn4C0            | 0               | Forward Compensation<br>Torque Correction Function<br>Coefficient b | Immediately     |
| Pn4C1            | 0               | Reverse Compensation<br>Steps Correction Function<br>Coefficient a  | Immediately     |
| Pn4C2            | 0               | Reverse Compensation<br>Steps Correction Function<br>Coefficient b  | Immediately     |
| Pn4C3            | 0               | Reverse Compensation<br>Torque Correction Function<br>Coefficient a | Immediately     |
| Pn4C4            | 0               | Reverse Compensation<br>Torque Correction Function<br>Coefficient b | Immediately     |

Continued on next page.

| Parameter | Default Catting | Name                                                                                 | When          |
|-----------|-----------------|--------------------------------------------------------------------------------------|---------------|
| No.       | Default Setting | iname                                                                                | Enabled       |
| Pn4C5     | 0               | Forward Acceleration Rate<br>Correction Projection Cor-<br>rection Limit Clamp Value | Immediately   |
| Pn4C6     | 0               | Reverse Acceleration Rate<br>Correction Projection Cor-<br>rection Limit Clamp Value | Immediately   |
| Pn502     | 20              | Rotation Detection Level                                                             | Immediately   |
| Pn503     | 10              | Speed Coincidence Detec-<br>tion Signal Output Width                                 | Immediately   |
| Pn506     | 0               | Brake Reference-Servo<br>OFF Delay Time                                              | Immediately   |
| Pn507     | 100             | Brake Reference Output<br>Speed Level                                                | Immediately   |
| Pn508     | 50              | Servo OFF-Brake Com-<br>mand Waiting Time                                            | Immediately   |
| Pn509     | 20              | Momentary Power Interrup-<br>tion Hold Time                                          | Immediately   |
| Pn50A     | 1881            | Input Signal Selections 1                                                            | After restart |
| Pn50B     | 8882            | Input Signal Selections 2                                                            | After restart |
| Pn50E     | 0000            | Output Signal Selections 1                                                           | After restart |
| Pn50F     | 0100            | Output Signal Selections 2                                                           | After restart |
| Pn510     | 0000            | Output Signal Selections 3                                                           | After restart |
| Pn511     | 6543            | Input Signal Selections 5                                                            | After restart |
| Pn512     | 0000            | Output Signal Inverse Set-<br>tings                                                  | After restart |
| Pn514     | 0000            | Output Signal Selections 4                                                           | After restart |
| Pn516     | 8888            | Input Signal Selections 7                                                            | After restart |
| Pn51B     | 1000            | Motor-Load Position Devia-<br>tion Overflow Detection<br>Level                       | Immediately   |
| Pn51E     | 100             | Position Deviation Over-<br>flow Warning Level                                       | Immediately   |
| Pn520     | 5242880         | Position Deviation Over-<br>flow Alarm Level                                         | Immediately   |
| Pn522     | 7               | Positioning Completed<br>Width                                                       | Immediately   |
| Pn524     | 1073741824      | Near Signal Width                                                                    | Immediately   |
| Pn526     | 5242880         | Position Deviation Over-<br>flow Alarm Level at Servo<br>ON                          | Immediately   |
| Pn528     | 100             | Position Deviation Over-<br>flow Warning Level at Servo<br>ON                        | Immediately   |
| Pn529     | 10000           | Speed Limit Level at Servo<br>ON                                                     | Immediately   |
| Pn52A     | 20              | Multiplier per Fully-closed<br>Rotation                                              | Immediately   |
| Pn52B     | 20              | Overload Warning Level                                                               | Immediately   |
| Pn52C     | 100             | Base Current Derating at<br>Motor Overload Detection                                 | After restart |
| Pn530     | 0000            | Program Jogging-Related Selections                                                   | Immediately   |
| Pn531     | 32768           | Program Jogging Travel<br>Distance                                                   | Immediately   |

|                  |                 | Continued from p                                                           | nevious page.   |
|------------------|-----------------|----------------------------------------------------------------------------|-----------------|
| Parameter<br>No. | Default Setting | Name                                                                       | When<br>Enabled |
| Pn533            | 500             | Program Jogging Move-<br>ment Speed                                        | Immediately     |
| Pn534            | 100             | Program Jogging Accelera-<br>tion/Deceleration Time                        | Immediately     |
| Pn535            | 100             | Program Jogging Waiting<br>Time                                            | Immediately     |
| Pn536            | 1               | Program Jogging Number<br>of Movements                                     | Immediately     |
| Pn550            | 0               | Analog Monitor 1 Offset<br>Voltage                                         | Immediately     |
| Pn551            | 0               | Analog Monitor 2 Offset<br>Voltage                                         | Immediately     |
| Pn552            | 100             | Analog Monitor 1 Magnifi-<br>cation                                        | Immediately     |
| Pn553            | 100             | Analog Monitor 2 Magnifi-<br>cation                                        | Immediately     |
| Pn55A            | 1               | Power Consumption Moni-<br>tor Unit Time                                   | Immediately     |
| Pn560            | 400             | Residual Vibration Detec-<br>tion Width                                    | Immediately     |
| Pn561            | 100             | Overshoot Detection Level                                                  | Immediately     |
| Pn581            | 20              | Zero Speed Level                                                           | Immediately     |
| Pn582            | 10              | Speed Coincidence Detec-<br>tion Signal Output Width                       | Immediately     |
| Pn583            | 10              | Brake Reference Output<br>Speed Level                                      | Immediately     |
| Pn584            | 10000           | Speed Limit Level at Servo<br>ON                                           | Immediately     |
| Pn585            | 50              | Program Jogging Move-<br>ment Speed                                        | Immediately     |
| Pn586            | 0               | Motor Running Cooling<br>Ratio                                             | Immediately     |
| Pn587            | 0000            | Polarity Detection Execu-<br>tion Selection for Absolute<br>Linear Encoder | Immediately     |
| Pn600            | 0               | Regenerative Resistor<br>Capacity                                          | Immediately     |
| Pn601            | 0               | Dynamic Brake Resistor<br>Allowable Energy Con-<br>sumption                | After restart   |
| Pn603            | 0               | Regenerative Resistance                                                    | Immediately     |
| Pn604            | 0               | Dynamic Brake Resistance                                                   | After restart   |
| Pn6E8            | 0000            | Clearance Control Selection<br>Application Switches                        | After startup   |
| Pn6E9            | 100             | First Stage Switching Kp<br>Ratio                                          | Immediately     |
| Pn6EA            | 0               | Second Stage Switching<br>Kp Deviation                                     | Immediately     |
| Pn6EC            | 100             | Second Stage Switching<br>Kp Ratio                                         | Immediately     |
| Pn6ED            | 0               | Third Stage Switching Kp<br>Deviation                                      | Immediately     |
| Pn6EF            | 100             | Third Stage Switching Kp<br>Ratio                                          | Immediately     |
| Pn6F0            | 0               | Clearance Position Devia-<br>tion Overflow Level                           | Immediately     |

Parameter Lists

|                  | Continued from previous page. |                                                          |                                |  |
|------------------|-------------------------------|----------------------------------------------------------|--------------------------------|--|
| Parameter<br>No. | Default Setting               | Name                                                     | When<br>Enabled                |  |
| Pn6F2            | 0                             | Maximum Clearance Offset                                 | Immediately                    |  |
| Pn6F4            | 0                             | Minimum Clearance Offset                                 | Immediately                    |  |
| Pn6F6            | 0                             | AD Input Gain                                            | Immediately                    |  |
| Pn6F8            | 0                             | AD Zero Adjustment                                       | Immediately                    |  |
| Pn6F9            | 0                             | Position Loop Differential<br>Time Constant              | Immediately                    |  |
| Pn6FA            | 0                             | Analog Feedback Filter<br>Time Constant                  | Immediately                    |  |
| Pn6FC            | 5242880                       | Clearance Position Devia-<br>tion Error Level            | Immediately                    |  |
| Pn800            | 1040                          | Communications Controls                                  | Immediately                    |  |
| Pn801            | 0003                          | Application Function Selec-<br>tions 6 (Software Limits) | Immediately                    |  |
| Pn803            | 10                            | Origin Range                                             | Immediately                    |  |
| Pn804            | 1073741823                    | Forward Software Limit                                   | Immediately                    |  |
| Pn806            | -1073741823                   | Reverse Software Limit                                   | Immediately                    |  |
| Pn808            | 0                             | Absolute Encoder Origin<br>Offset                        | Immedi-<br>ately <sup>*2</sup> |  |
| Pn80A            | 100                           | First Stage Linear Accelera-<br>tion Constant            | Immedi-<br>ately <sup>*3</sup> |  |
| Pn80B            | 100                           | Second Stage Linear<br>Acceleration Constant             | Immedi-<br>ately <sup>*3</sup> |  |
| Pn80C            | 0                             | Acceleration Constant<br>Switching Speed                 | Immedi-<br>ately <sup>*3</sup> |  |
| Pn80D            | 100                           | First Stage Linear Decelera-<br>tion Constant            | Immedi-<br>ately <sup>*3</sup> |  |
| Pn80E            | 100                           | Second Stage Linear<br>Deceleration Constant             | Immedi-<br>ately <sup>*3</sup> |  |
| Pn80F            | 0                             | Deceleration Constant<br>Switching Speed                 | Immedi-<br>ately <sup>*3</sup> |  |
| Pn810            | 0                             | Exponential Acceleration/<br>Deceleration Bias           | Immedi-<br>ately <sup>*3</sup> |  |
| Pn811            | 0                             | Exponential Acceleration/<br>Deceleration Time Constant  | Immedi-<br>ately <sup>*3</sup> |  |
| Pn812            | 0                             | Movement Average Time                                    | Immedi-<br>ately <sup>*3</sup> |  |
| Pn814            | 100                           | External Positioning Final<br>Travel Distance            | Immedi-<br>ately <sup>*3</sup> |  |
| Pn816            | 0000                          | Origin Return Mode Set-<br>tings                         | Immedi-<br>ately <sup>*3</sup> |  |
| Pn817            | 50                            | Origin Approach Speed 1                                  | Immedi-<br>ately <sup>*3</sup> |  |
| Pn818            | 5                             | Origin Approach Speed 2                                  | Immedi-<br>ately <sup>*3</sup> |  |
| Pn819            | 100                           | Final Travel Distance for<br>Origin Return               | Immedi-<br>ately <sup>*3</sup> |  |
| Pn81E            | 0000                          | Input Signal Monitor Selec-<br>tions                     | Immediately                    |  |
| Pn81F            | 0010                          | Command Data Allocations                                 | After restart                  |  |
| Pn820            | 0                             | Forward Latching Area                                    | Immediately                    |  |
| Pn822            | 0                             | Reverse Latching Area                                    | Immediately                    |  |
| Pn824            | 0000                          | Option Monitor 1 Selection                               | Immediately                    |  |
|                  | 1                             |                                                          |                                |  |

| Parameter |                 | Continued from p                                             | When                           |
|-----------|-----------------|--------------------------------------------------------------|--------------------------------|
| No.       | Default Setting | Name                                                         | Enabled                        |
| Pn825     | 0000            | Option Monitor 2 Selection                                   | Immediately                    |
| Pn827     | 100             | Linear Deceleration Con-<br>stant 1 for Stopping             | Immedi-<br>ately <sup>*3</sup> |
| Pn829     | 0               | SVOFF Waiting Time (for<br>SVOFF at Deceleration to<br>Stop) | Immediately                    |
| Pn82A     | 1813            | Option Field Allocations 1                                   | After restart                  |
| Pn82B     | 1D1C            | Option Field Allocations 2                                   | After restart                  |
| Pn82C     | 1F1E            | Option Field Allocations 3                                   | After restart                  |
| Pn82D     | 0000            | Option Field Allocations 4                                   | After restart                  |
| Pn82E     | 0000            | Option Field Allocations 5                                   | After restart                  |
| Pn833     | 0000            | Motion Settings                                              | After restart                  |
| Pn834     | 100             | First Stage Linear Accelera-<br>tion Constant 2              | Immedi-<br>ately <sup>*3</sup> |
| Pn836     | 100             | Second Stage Linear<br>Acceleration Constant 2               | Immedi-<br>ately <sup>*3</sup> |
| Pn838     | 0               | Acceleration Constant<br>Switching Speed 2                   | Immedi-<br>ately <sup>*3</sup> |
| Pn83A     | 100             | First Stage Linear Decelera-<br>tion Constant 2              | Immedi-<br>ately <sup>*3</sup> |
| Pn83C     | 100             | Second Stage Linear<br>Deceleration Constant 2               | Immedi-<br>ately <sup>*3</sup> |
| Pn83E     | 0               | Deceleration Constant<br>Switching Speed 2                   | Immedi-<br>ately <sup>*3</sup> |
| Pn840     | 100             | Linear Deceleration Con-<br>stant 2 for Stopping             | Immedi-<br>ately <sup>*3</sup> |
| Pn842     | 0               | Second Origin Approach<br>Speed 1                            | Immedi-<br>ately <sup>*3</sup> |
| Pn844     | 0               | Second Origin Approach<br>Speed 2                            | Immedi-<br>ately <sup>*3</sup> |
| Pn846     | 0               | POSING Command Scurve<br>Acceleration/Deceleration<br>Rate   | Immedi-<br>ately <sup>*3</sup> |
| Pn850     | 0               | Number of Latch<br>Sequences                                 | Immediately                    |
| Pn851     | 0               | Continuous Latch<br>Sequence Count                           | Immediately                    |
| Pn852     | 0000            | Latch Sequence 1 to 4 Set-<br>tings                          | Immediately                    |
| Pn853     | 0000            | Latch Sequence 5 to 8 Set-<br>tings                          | Immediately                    |
| Pn860     | 0000            | SVCMD_IO Input Signal<br>Monitor Allocations 1               | Immediately                    |
| Pn861     | 0000            | SVCMD_IO Input Signal<br>Monitor Allocations 2               | Immediately                    |
| Pn862     | 0000            | SVCMD_IO Input Signal<br>Monitor Allocations 3               | Immediately                    |
| Pn863     | 0000            | SVCMD_IO Input Signal<br>Monitor Allocations 4               | Immediately                    |
| Pn868     | 0000            | SVCMD_IO Output Signal<br>Monitor Allocations 1              | Immediately                    |
| Pn869     | 0000            | SVCMD_IO Output Signal<br>Monitor Allocations 2              | Immediately                    |

Parameter Lists

Continued from previous page. Parameter When **Default Setting** Name No. Enabled Station Address Monitor Pn880 0 Immediately (for maintenance, read only) Set Transmission Byte Count Monitor [bytes] (for Pn881 0 Immediately maintenance, read only) Transmission Cycle Setting Pn882 0 Monitor  $[\times 0.25 \ \mu s]$  (for Immediately maintenance, read only) Communications Cycle Setting Monitor [transmis-Pn883 0 Immediately sion cycles] (for maintenance, read only) Pn884 0000 **Communications Controls 2** Immediately **MECHATROLINK Receive** Pn88A 0 Error Counter Monitor (for Immediately maintenance, read only) Command Data Monitor Pn890 to 0 during Alarm/Warning (for Immediately Pn8A6 maintenance, read only) Response Data Monitor Pn8A8 to 0 during Alarm/Warning (for Immediately Pn8BE maintenance, read only) Number of Parameter Pn900 0 After restart Banks Number of Parameter Bank Pn901 0 After restart Members Pn902 to Parameter Bank Member 0 After restart Pn910 Definition Parameter Bank Data (Not Pn920 to 0 saved in nonvolatile mem-Immediately Pn95F ory.) 01 Encoder Type Selection \_ PnA02 (read only) 02 Motor Type Selection \_ \_ PnA04 (read only) Semi-closed/Fully-closed 03 PnA06 Selection (read only) 04 Rated Motor Speed \_ PnA08 (read only) 05 Maximum Output Speed \_ PnA0A (read only) 06 Speed Multiplier (read only) \_ PnA0C 07 Rated Torque (read only) PnA0E 08 Maximum Output Torque PnA10 (read only) 09 \_ Torque Multiplier (read only) \_ PnA12 ΛA \_ Resolution (read only) PnA14 0B 0 Scale Pitch After restart PnA16 0C Pulses per Scale Pitch PnA18 (read only)

| Parameter          | Default Setting | Name                                                    | When                           |
|--------------------|-----------------|---------------------------------------------------------|--------------------------------|
| No.<br>21<br>PnA42 | 16              | Electronic Gear Ratio<br>(Numerator)                    | Enabled<br>After restart       |
| 22<br>PnA44        | 1               | Electronic Gear Ratio<br>(Denominator)                  | After restart                  |
| 23<br>PnA46        | 0               | Absolute Encoder Origin<br>Offset                       | Immedi-<br>ately <sup>*2</sup> |
| 24<br>PnA48        | 65535           | Multiturn Limit Setting                                 | After restart                  |
| 25<br>PnA4A        | 0000 hex        | Limit Setting                                           | After restart                  |
| 26<br>PnA4C        | 1073741823      | Forward Software Limit                                  | Immediately                    |
| 27<br>PnA4E        | 0               | Reserved (Do not change.)                               | Immediately                    |
| 28<br>PnA50        | -1073741823     | Reverse Software Limit                                  | Immediately                    |
| 29<br>PnA52        | 0               | Reserved (Do not change.)                               | Immediately                    |
| 41<br>PnA82        | 0               | Speed Unit Selection                                    | After restart                  |
| 42<br>PnA84        | 0               | Speed Base Unit Selection                               | After restart                  |
| 43<br>PnA86        | 0               | Position Unit Selection                                 | After restart                  |
| 44<br>PnA88        | 0               | Position Base Unit Selec-<br>tion                       | After restart                  |
| 45<br>PnA8A        | 0               | Acceleration Unit Selection                             | After restart                  |
| 46<br>PnA8C        | 4               | Acceleration Base Unit Selection                        | After restart                  |
| 47<br>PnA8E        | 1               | Torque Unit Selection                                   | After restart                  |
| 48<br>PnA90        | 0               | Torque Base Unit Selection                              | After restart                  |
| 49<br>PnA92        | 0601011F hex    | Supported Unit Systems (read only)                      | _                              |
| 61<br>PnAC2        | 40000           | Speed Loop Gain                                         | Immediately                    |
| 62<br>PnAC4        | 20000           | Speed Loop Integral Time<br>Constant                    | Immediately                    |
| 63<br>PnAC6        | 40000           | Position Loop Gain                                      | Immediately                    |
| 64<br>PnAC8        | 0               | Feedforward Compensation                                | Immediately                    |
| 65<br>PnACA        | 0               | Position Loop Integral Time<br>Constant                 | Immediately                    |
| 66<br>PnACC        | 7               | Positioning Completed<br>Width                          | Immediately                    |
| 67<br>PnACE        | 1073741824      | Near Signal Width                                       | Immediately                    |
| 81<br>PnB02        | 0               | Exponential Acceleration/<br>Deceleration Time Constant | Immedi-<br>ately <sup>*3</sup> |
| 82<br>PnB04        | 0               | Movement Average Time                                   | Immedi-<br>ately <sup>*3</sup> |

Parameter Lists

10

| Parameter   | Default Catting                                                                 | Name                                                                      | When        |
|-------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------|-------------|
| No.         | Default Setting                                                                 | Name Name                                                                 | Enabled     |
| 83<br>PnB06 | 100                                                                             | External Positioning Final<br>Travel Distance                             | Immediately |
| 84<br>PnB08 | × 5,000 reference<br>units/s converted to<br>10 <sup>-3</sup> min <sup>-1</sup> | Origin Approach Speed                                                     | Immediately |
| 85<br>PnB0A | × 500 reference<br>units/s converted to<br>10 <sup>-3</sup> min <sup>-1</sup>   | Origin Return Creep Speed                                                 | Immediately |
| 86<br>PnB0C | 100                                                                             | Final Travel Distance for<br>Origin Return                                | Immediately |
| 87<br>PnB0E | 1                                                                               | Fixed Monitor Selection 1                                                 | Immediately |
| 88<br>PnB10 | 0                                                                               | Fixed Monitor Selection 2                                                 | Immediately |
| 89<br>PnB12 | 0                                                                               | SEL_MON (CMN1) Monitor<br>Selection 1                                     | Immediately |
| 8A<br>PnB14 | 0                                                                               | SEL_MON (CMN2) Monitor<br>Selection 2                                     | Immediately |
| 8B<br>PnB16 | 10                                                                              | Origin Detection Width                                                    | Immediately |
| 8C<br>PnB18 | 100                                                                             | Forward Torque Limit                                                      | Immediately |
| 8D<br>PnB1A | 100                                                                             | Reverse Torque Limit                                                      | Immediately |
| 8E<br>PnB1C | 20000                                                                           | Zero Speed Detection<br>Range                                             | Immediately |
| 8F<br>PnB1E | 10000                                                                           | Speed Coincidence Signal<br>Detection Width                               | Immediately |
| 90<br>PnB20 | 0FFF3F3F hex                                                                    | Servo Command Control<br>Field Enable/Disable Selec-<br>tions (read only) | -           |
| 91<br>PnB22 | 0FFF3F33 hex                                                                    | Servo Status Field Enable/<br>Disable Selections (read<br>only)           | -           |
| 92<br>PnB24 | 007F01F0 hex                                                                    | Output Bit Enable/Disable<br>Selections (read only)                       | -           |
| 93<br>PnB26 | FF0FFEFE hex                                                                    | Input Bit Enable/Disable<br>Selections (read only)                        | -           |

\*1. The enable timing depends on the digit that is changed. Refer to the following section for details.

\*2. The parameter setting is enabled after SENS\_ON command execution is completed.

\*3. Change the setting when the reference is stopped (i.e., while DEN is set to 1). If you change the setting during operation, the reference output will be affected.

## Appendices

The appendix provides information on interpreting panel displays, and tables of corresponding SERVOPACK and SigmaWin+ function names.

| 11.1 | Corresp | onding SERVOPACK and SigmaWin+ Function Names 11-2        |
|------|---------|-----------------------------------------------------------|
|      | 11.1.1  | Corresponding SERVOPACK Utility Function                  |
|      |         | Names                                                     |
|      | 11.1.2  | Corresponding SERVOPACK Monitor Display<br>Function Names |

11.1.1 Corresponding SERVOPACK Utility Function Names

11.1 Corresponding SERVOPACK and SigmaWin+ Function Names

This section gives the names and numbers of the utility functions and monitor display functions used by the SERVOPACKs and the names used by the SigmaWin+.

## 11.1.1 Corresponding SERVOPACK Utility Function Names

| SigmaWin+                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | SERVOPACK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| Menu Bar<br>Button                                                                                                                                                                                                                            | Function Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fn No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Function Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
| Button Setup Parameters Tuning Monitoring Test Opera-                                                                                                                                                                                         | Origin Search                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fn003                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Origin Search                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |
|                                                                                                                                                                                                                                               | Absolute Encoder Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Fn008                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Reset Absolute Encoder                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |
|                                                                                                                                                                                                                                               | Adjust the Angles Magitar Output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Fn00C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Adjust Analog Monitor Output Offset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
|                                                                                                                                                                                                                                               | Adjust the Analog Monitor Output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Fn00D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Adjust Analog Monitor Output Gain                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
|                                                                                                                                                                                                                                               | Adjust the Mater Current Dates                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Fn00E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Autotune Motor Current Detection Signal Offset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
| Setup                                                                                                                                                                                                                                         | tion Signal Offsets                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Fn00F                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Manually Adjust Motor Current Detection Signal Offset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
|                                                                                                                                                                                                                                               | Clearance Control Feedback Off-<br>set Adjustment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Fn009                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Clearance Control Feedback Offset Adjustment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |
|                                                                                                                                                                                                                                               | Multiturn Limit Setting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Fn013                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Multiturn Limit Setting after Multiturn Limit Disagreement Alarm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |
|                                                                                                                                                                                                                                               | Reset Option Module Configura-<br>tion Error                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Fn014                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Reset Option Module Configuration Error                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |
|                                                                                                                                                                                                                                               | Initialize Vibration Detection Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Fn01B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Initialize Vibration Detection Level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
|                                                                                                                                                                                                                                               | Set Origin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Fn020                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Set Absolute Linear Encoder Origin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |
|                                                                                                                                                                                                                                               | Reset Motor Type Alarm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Fn021                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Reset Motor Type Alarm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |
|                                                                                                                                                                                                                                               | Software Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Fn030                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Software Reset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |
|                                                                                                                                                                                                                                               | Polarity Detection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Fn080                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Polarity Detection                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |
|                                                                                                                                                                                                                                               | Easy FFT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Fn206                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Easy FFT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                                                                                                                                                                                                                               | Initialize                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Fn005                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Initializing Parameters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |
| Parameters                                                                                                                                                                                                                                    | Function NameFn No.Function NameOrigin SearchFn003Origin SearchAbsolute Encoder ResetFn008Reset Absolute EncoderAdjust the Analog Monitor OutputFn000Adjust Analog Monitor Output OffsetAdjust the Analog Monitor OutputFn000Adjust Analog Monitor Output GainAdjust the Motor Current DetectionFn000Autotune Motor Current Detection SignalClearance Control Feedback Off-<br>set AdjustmentFn013Multiturn Limit Setting fn013Multiturn Limit SettingFn014Reset Option Module Configura-<br>tion ErrorFn0118Initialize Vibration Detection LevelFn0118Initialize Vibration Detection LevelSet OriginFn020Set Absolute Linear Encoder OriginReset Option Module Configura-<br>tion ErrorFn018Initialize Vibration Detection LevelSoftware ResetFn030Software ResetPolarity DetectionFn020Set Absolute Linear Encoder OriginReset Motor Type AlarmFn020Set Motor Type AlarmSoftware ResetFn030Software ResetPolarity DetectionFn020Keay FFTInitializeFn010Write Prohibition SettingsetsWrite Prohibition SettingFn020Autotuning without Host Reference<br>enceFn203Advanced Autotuning without ReferenceAutotuning with Host ReferenceFn203One-Parameter TuningAdjust Anti-resonance ControlFn204Adjust Anti-resonance ControlVibration SuppressionFn205Vibration Suppression<                                                                                                                                                            | Write Prohibition Setting                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |
|                                                                                                                                                                                                                                               | Setup Wizard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
| Parameters                                                                                                                                                                                                                                    | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Fn201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Advanced Autotuning without Reference                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
|                                                                                                                                                                                                                                               | Protection Name         Fn No.         Function Name           Origin Search         Fn003         Origin Search           Absolute Encoder Reset         Fn008         Reset Absolute Encoder           Adjust the Analog Monitor Output         Fn002         Adjust Analog Monitor Output Gain           Adjust the Analog Monitor Output         Fn002         Adjust Analog Monitor Output Gain           Adjust the Motor Current Detection Signal Offsets         Fn009         Clearance Control Feedback Offset Adjustment           Multiturn Limit Setting         Fn013         Multiturn Limit Setting after Multiturn Largreement Alarm           Reset Option Module Configuration Error         Fn018         Initialize Vibration Detection Level           Initialize Vibration Detection Level         Fn020         Set Absolute Linear Encoder Origin           Reset Option Module Configuration         Fn020         Set Absolute Linear Encoder Origin           Reset Option Module Configuration         Fn020         Set Absolute Linear Encoder Origin           Reset Option Module Configuration         Fn020         Set Absolute Linear Encoder Origin           Reset Option Module Configuration         Fn020         Set Absolute Linear Encoder Origin           Reset Option Module Configuration         Fn020         Software Reset         Fn020           Polarity Detection         Fn020 | Advanced Autotuning with Reference                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |
| Tuning                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | One-Parameter Tuning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |
|                                                                                                                                                                                                                                               | Adjust Anti-resonance Control                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fn204                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul> <li><b>Function Name</b></li> <li>Origin Search</li> <li>Reset Absolute Encoder</li> <li>Adjust Analog Monitor Output Offset</li> <li>Adjust Analog Monitor Output Gain</li> <li>Autotune Motor Current Detection Signal Offs</li> <li>Manually Adjust Motor Current Detection Signal Offset</li> <li>Clearance Control Feedback Offset Adjustment</li> <li>Multiturn Limit Setting after Multiturn Limit Dis agreement Alarm</li> <li>Reset Option Module Configuration Error</li> <li>Initialize Vibration Detection Level</li> <li>Set Absolute Linear Encoder Origin</li> <li>Reset Motor Type Alarm</li> <li>Software Reset</li> <li>Polarity Detection</li> <li>Easy FFT</li> <li>Initializing Parameters</li> <li>Write Prohibition Setting</li> <li>-</li> <li>Advanced Autotuning without Reference</li> <li>One-Parameter Tuning</li> <li>Adjust Anti-resonance Control</li> <li>Vibration Suppression</li> <li>-</li> <li>Display Servomotor Model</li> <li>Display Servomotor ID from Feedback Option Module</li> <li>Jog Program</li> <li>Display Alarm History</li> </ul> |  |  |
| ButtonIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII <tr< td=""><td>Vibration Suppression</td><td>Fn205</td><td>Vibration Suppression</td></tr<> | Vibration Suppression                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Fn205                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Vibration Suppression                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
|                                                                                                                                                                                                                                               | Moment of Inertia Estimation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Fn No.Function NameFn003Origin SearchFn008Reset Absolute EncoderFn00CAdjust Analog Monitor Output OffsetFn00DAdjust Analog Monitor Output GainFn00EAutotune Motor Current Detection SignFn00FManually Adjust Motor Current DetectionOffsetMonitor Output GainFn013Multiturn Limit Setting after Multiturn Limitagreement AlarmFn014Reset Option Module Configuration ErrorFn015Initialize Vibration Detection LevelFn020Set Absolute Linear Encoder OriginFn021Reset Motor Type AlarmFn030Software ResetFn030Polarity DetectionFn206Easy FFTFn005Initializing ParametersFn010Write Prohibition SettingFn201Advanced Autotuning without ReferenceFn203One-Parameter TuningFn204Adjust Anti-resonance ControlFn012Display Servomotor ModelFn012Display Servomotor ID from Feedback OFn014Display Servomotor ID from Feedback OFn015Display Servomotor ID from Feedback OFn016Display Alarm History | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |
|                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Fn011                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Display Servomotor Model                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
|                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Fn012                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Display Software Version                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |
| Monitoring                                                                                                                                                                                                                                    | Product Information                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Fn01E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Display SERVOPACK and Servomotor IDs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |
|                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Fn01F                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |
|                                                                                                                                                                                                                                               | Jog                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Fn002                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Jog                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
| tion                                                                                                                                                                                                                                          | Jog Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Fn004                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Jog Program                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |
| Alarma                                                                                                                                                                                                                                        | Alarm Display                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fn000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Display Alarm History                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |
| AidIIIIS                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Fn006                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Clear Alarm History                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |
| Solutions                                                                                                                                                                                                                                     | Mechanical Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |

11.1.2 Corresponding SERVOPACK Monitor Display Function Names

# 11.1.2 Corresponding SERVOPACK Monitor Display Function Names

| SigmaWin+          |                                                                                                                                                                                                                                                                                                         | SERVOPACK |                                                                                                                                                                                                                                                                                                                                           |  |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Menu Bar<br>Button | Name [Unit]                                                                                                                                                                                                                                                                                             | Un No.    | Name [Unit]                                                                                                                                                                                                                                                                                                                               |  |
|                    | Motor Speed [min <sup>-1</sup> ]                                                                                                                                                                                                                                                                        | Un000     | Motor Speed [min <sup>-1</sup> ]                                                                                                                                                                                                                                                                                                          |  |
|                    | Speed Reference [min <sup>-1</sup> ]                                                                                                                                                                                                                                                                    | Un001     | Speed Reference [min <sup>-1</sup> ]                                                                                                                                                                                                                                                                                                      |  |
|                    | Torque Reference [%]                                                                                                                                                                                                                                                                                    | Un002     | Torque Reference [%]<br>(percentage of rated torque)                                                                                                                                                                                                                                                                                      |  |
|                    | <ul> <li>Rotary Servomotors:<br/>Rotational Angle 1 [encoder<br/>pulses]<br/>(number of encoder pulses from<br/>origin within one encoder rotation)</li> <li>Linear Servomotors:<br/>Electrical Angle 1 [linear encoder<br/>pulses]<br/>(linear encoder pulses from the<br/>polarity origin)</li> </ul> | Un003     | <ul> <li>Rotary Servomotors:<br/>Rotational Angle 1 [encoder pulses]<br/>(number of encoder pulses from origin within<br/>one encoder rotation displayed in decimal)</li> <li>Linear Servomotors:<br/>Electrical Angle 1 [linear encoder pulses]<br/>(linear encoder pulses from the polarity origin<br/>displayed in decimal)</li> </ul> |  |
|                    | <ul> <li>Rotary Servomotors:<br/>Rotational Angle 2 [deg]<br/>(electrical angle from origin within<br/>one encoder rotation)</li> <li>Linear Servomotors:<br/>Electrical Angle 2 [deg]<br/>(electrical angle from polarity ori-<br/>gin)</li> </ul>                                                     | Un004     | <ul> <li>Rotary Servomotors:<br/>Rotational Angle 2 [deg]<br/>(electrical angle from polarity origin)</li> <li>Linear Servomotors:<br/>Electrical Angle 2 [deg]<br/>(electrical angle from polarity origin)</li> </ul>                                                                                                                    |  |
|                    | Input Reference Pulse Speed [min <sup>-1</sup> ]                                                                                                                                                                                                                                                        | Un007     | Input Reference Pulse Speed [min <sup>-1</sup> ]<br>(displayed only during position control)                                                                                                                                                                                                                                              |  |
|                    | Position Deviation [reference units]                                                                                                                                                                                                                                                                    | Un008     | Position Error Amount [reference units]<br>(displayed only during position control)                                                                                                                                                                                                                                                       |  |
| Button             | Accumulated Load Ratio [%]                                                                                                                                                                                                                                                                              | Un009     | Accumulated Load Ratio [%]<br>(percentage of rated torque: effective torque in<br>cycles of 10 seconds)                                                                                                                                                                                                                                   |  |
|                    | Regenerative Load Ratio [%]                                                                                                                                                                                                                                                                             | Un00A     | Regenerative Load Ratio [%]<br>(percentage of processable regenerative<br>power: regenerative power consumption in<br>cycles of 10 seconds)                                                                                                                                                                                               |  |
|                    | Dynamic Brake Resistor Power Con-<br>sumption [%]                                                                                                                                                                                                                                                       | Un00B     | Power Consumed by DB Resistance [%]<br>(percentage of processable power at DB acti-<br>vation: displayed in cycles of 10 seconds)                                                                                                                                                                                                         |  |
|                    | Input Reference Pulse Counter [ref-<br>erence units]                                                                                                                                                                                                                                                    | Un00C     | Input Reference Pulse Counter [reference units]                                                                                                                                                                                                                                                                                           |  |
|                    | Feedback Pulse Counter [encoder pulses]                                                                                                                                                                                                                                                                 | Un00D     | Feedback Pulse Counter [encoder pulses]                                                                                                                                                                                                                                                                                                   |  |
|                    | Fully-closed Loop Feedback Pulse<br>Counter [external encoder resolu-<br>tion]                                                                                                                                                                                                                          | Un00E     | Fully-closed Loop Feedback Pulse Counter<br>[external encoder resolution]                                                                                                                                                                                                                                                                 |  |
|                    | Upper Limit Setting of Motor Maxi-<br>mum Speed/Upper Limit Setting of<br>Encoder Output Resolution                                                                                                                                                                                                     | Un010*1   | Upper Limit Setting of Motor Maximum Speed/<br>Upper Limit Setting of Encoder Output Resolu-<br>tion                                                                                                                                                                                                                                      |  |
|                    | Total Operation Time [100 ms]                                                                                                                                                                                                                                                                           | Un012     | Total Operation Time [100 ms]                                                                                                                                                                                                                                                                                                             |  |
|                    | Feedback Pulse Counter [reference units]                                                                                                                                                                                                                                                                | Un013     | Feedback Pulse Counter [reference units]                                                                                                                                                                                                                                                                                                  |  |
|                    | Current Backlash Compensation<br>Value [0.1 reference units]                                                                                                                                                                                                                                            | Un030     | Current Backlash Compensation Value [0.1 reference units]                                                                                                                                                                                                                                                                                 |  |
|                    | Backlash Compensation Value Set-<br>ting Limit [0.1 reference units]                                                                                                                                                                                                                                    | Un031     | Backlash Compensation Value Setting Limit<br>[0.1 reference units]                                                                                                                                                                                                                                                                        |  |

Continued on next page.

11.1.2 Corresponding SERVOPACK Monitor Display Function Names

Continued from previous page.

|                                                                                                                                                  | SigmaWin+                                                         |         | SERVOPACK                                                                      |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|---------|--------------------------------------------------------------------------------|--|--|
| Menu Bar<br>Button                                                                                                                               | Name [Unit]                                                       | Un No.  | Name [Unit]                                                                    |  |  |
| Button<br>Motion<br>Monitor<br>Status<br>Monitor<br>Input Sig-<br>nal Moni-<br>tor<br>Output<br>Signal<br>Monitor<br>Signal<br>Monitor           | Power Consumption [W]                                             | Un032   | Power Consumption [W]                                                          |  |  |
|                                                                                                                                                  | Consumed Power [0.001 Wh]                                         | Un033   | Consumed Power [0.001 Wh]                                                      |  |  |
|                                                                                                                                                  | Cumulative Power Consumption [Wh]                                 | Un034   | Cumulative Power Consumption [Wh]                                              |  |  |
|                                                                                                                                                  | Absolute Encoder Multiturn Data                                   | Un040   | Absolute Encoder Multiturn Data                                                |  |  |
| Motion                                                                                                                                           | Position within One Rotation of Absolute Encoder [encoder pulses] | Un041   | Position within One Rotation of Absolute<br>Encoder [encoder pulses]           |  |  |
| Button<br>Motion<br>Monitor<br>Status<br>Monitor<br>Input Sig-<br>nal Moni-<br>tor<br>Output<br>Signal<br>Monitor<br>Signal<br>Monitor           | Lower Bits of Absolute Encoder<br>Position [encoder pulses]       | Un042   | Lower Bits of Absolute Encoder Position<br>[encoder pulses]                    |  |  |
|                                                                                                                                                  | Upper Bits of Absolute Encoder<br>Position [encoder pulses]       | Un043   | Upper Bits of Absolute Encoder Position<br>[encoder pulses]                    |  |  |
|                                                                                                                                                  | Clearance Offset Reference (Input)<br>[Reference Unit]            | Un114   | Clearance Offset Reference (Input) [Reference Unit]                            |  |  |
|                                                                                                                                                  | Gap (Output) [Reference Unit]                                     | Un115   | Gap (Output) [Reference Unit]                                                  |  |  |
|                                                                                                                                                  | Gap (Output) [AD Value]                                           | Un116   | Gap (Output) [AD Value]                                                        |  |  |
|                                                                                                                                                  | Polarity Sensor Signal Monitor                                    | Un011   | Polarity Sensor Signal Monitor                                                 |  |  |
|                                                                                                                                                  | Active Gain Monitor                                               | Un014   | Effective Gain Monitor (gain settings 1 = 1, gain settings 2 = 2)              |  |  |
| Monitor<br>Input Sig-<br>nal Moni-                                                                                                               | Safety I/O Signal Monitor                                         | Un015   | Safety I/O Signal Monitor                                                      |  |  |
| nal Moni-                                                                                                                                        | Input Signal Monitor                                              | Un005   | Input Signal Monitor                                                           |  |  |
| Signal                                                                                                                                           | Output Signal Monitor                                             | Un006   | Output Signal Monitor                                                          |  |  |
| Button<br>Motion<br>Monitor<br>Status<br>Monitor<br>Input Sig-<br>nal Moni-<br>tor<br>Output<br>Signal<br>Monitor<br>Output<br>Signal<br>Monitor | Installation Environment Monitor –<br>SERVOPACK                   | Un025   | SERVOPACK Installation Environment Monitor [%]                                 |  |  |
|                                                                                                                                                  | Installation Environment Monitor –<br>Servomotor*2                | Un026*2 | Servomotor Installation Environment Monitor [%]                                |  |  |
|                                                                                                                                                  | Service Life Prediction Monitor –<br>Built-in Fan                 | Un027   | Built-in Fan Remaining Life Ratio [%]                                          |  |  |
|                                                                                                                                                  | Service Life Prediction Monitor –<br>Capacitor                    | Un028   | Capacitor Remaining Life Ratio [%]                                             |  |  |
|                                                                                                                                                  | Service Life Prediction Monitor –<br>Surge Prevention Circuit     | Un029   | Surge Prevention Circuit Remaining Life Ratio [%]                              |  |  |
|                                                                                                                                                  | Service Life Prediction Monitor –<br>Dynamic Brake Circuit        | Un02A   | Dynamic Brake Circuit Remaining Life Ratio [%]                                 |  |  |
|                                                                                                                                                  | Motor Possilution                                                 | Un084   | Linear Encoder Pitch (Scale pitch = Un084 $\times$ 10 <sup>Un085</sup> [pm])   |  |  |
|                                                                                                                                                  | Motor – Resolution                                                | Un085   | Linear Encoder Pitch Exponent (Scale pitch = Un084 × 10 <sup>Un085</sup> [pm]) |  |  |
|                                                                                                                                                  | -                                                                 | Un020   | Rated Motor Speed [min-1]                                                      |  |  |
| _                                                                                                                                                | -                                                                 | Un021   | Maximum Motor Speed [min <sup>-1</sup> ]                                       |  |  |
|                                                                                                                                                  |                                                                   | 1       |                                                                                |  |  |

\*1. You can use Un010 to monitor the upper limit setting for the maximum motor speed or the upper limit setting for the encoder output resolution.

You can monitor the upper limit of the encoder output resolution setting (Pn281) for the current maximum motor speed setting (Pn385), or you can monitor the upper limit of the maximum motor speed setting for the current encoder output resolution setting.

Select which signal to monitor with Pn080 = n.X Output Pulses).

• If  $Pn080 = n.0 \square \square \square$ , the encoder output resolution (Pn281) that can be set is displayed.

• If  $Pn080 = n.1 \square \square \square$ , the maximum motor speed (Pn385) that can be set is displayed in mm/s.

\*2. This applies to the following motors. The display will show 0 for all other models. SGM7J, SGM7A, SGM7P, SGM7G, and SGMCV

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## $\Sigma$ -7-Series AC Servo Drive $\Sigma$ -7S SERVOPACK with FT/EX Specification for Cutting Application Feed Shaft Motor **Product Manual**

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