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Σ-Ⅱ Series SGM□H/SGDM

DIGITAL OPERATOR
OPERATION MANUAL

Type: JUSP-OP02A-2

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.



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Safety Information

The following conventions are used to indicate precautions in this manual.

Failure to heed precautions provided in this manual can result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.

⚠ WARNING Indicates precautions that, if not heeded, could possibly result in loss of life or serious injury.

⚠ CAUTION Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

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Visual Aids

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

IMPORTANT Indicates important information that should be memorized, including precautions such as alarm displays to avoid damaging the devices.

◀EXAMPLE▶ Indicates application examples.



Indicates supplemental information.

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Overview

■ This manual describes the operation of the Hand-held Digital Operator for the Σ-II Series SGM□H/SGDM Servodrives.

Related Manuals

■ Refer to the following manuals as required.

■ Read this manual carefully to ensure the proper use of Σ-II Series Servodrives. Also, keep this manual in a safe place so that it can be referred to whenever necessary.

Manual Name	Manual Number	Contents
Σ–II Series SGM□H/SGDM User's Manual Servo Selection and Data Sheets	SIE-S800-31.1	Describes the procedure used to select Σ–II Series Servodrives and capacities.
Σ–II Series SGM□H/SGDM User's Manual Design and Maintenance	SIE-S800-31.2	Provides information on the installation, wiring, functions maintenance and inspection of Σ–II Series Servodrives.
Σ Series/Σ-II Series Servopack Personal Computer Monitoring Software Operation Manual	SIE-S800-35	Describes the applications and operation of software for the Σ–II Series Servodrive monitoring devices for use on personal computers.

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Using This Manual

■ Intended Audience

This manual is intended for the following users.

- Those performing trial operation or adjustments of Σ-II Series Servodrives.
- Those maintaining or inspecting Σ-II Series Servodrives.

■ Description of Technical Terms

In this manual, the following terms are defined as follows:

- **Design and Maintenance Manual** = Σ-II Series SGM□H/SGDM User's Manual Design and Maintenance
- **Servomotor** = Σ-II Series SGMAH/SGMPH/SGMGH/SGMSH Servomotor.
- **Servopack** = Σ-II Series SGDM Servopack.
- **Servodrive** = A set including a Servomotor and Servo Amplifier.
- **Servo System** = A servo control system that includes the combination of a Servodrive with a host computer and peripheral devices.

■ Indication of Reverse Signals

In this manual, the names of reverse signals (ones that are valid when low) are written with a forward slash (/) before the signal name.

Examples:

- $\overline{\text{S-ON}}$ = /S-ON
- $\overline{\text{P-CON}}$ = /P-CON

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Safety Precautions

The following precautions are for checking products upon delivery, installation, wiring, operation, maintenance and inspections.

■ Checking Products upon Delivery

⚠ CAUTION

- Always use the Servomotor and Servopack in one of the specified combinations.
  Not doing so may cause fire or malfunction.

■ Installation

⚠ CAUTION

- Never use the product in an environment subject to water, corrosive gases, inflammable gases, or combustibles
  Doing so may result in electric shock or fire.

■ Operation

⚠ WARNING

- Never touch any rotating motor parts while the motor is running.
  Doing so may result in injury.
- Make sure the ambient temperature is 0 to +55°C and the storage temperature is −20 to 70°C.

⚠ CAUTION

- Before starting operation with a machine connected, change the settings to match the user's constants of the machine.
  Doing so may result in injury.

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General Precautions

Note the following to ensure safe application.
• The drawings presented in this manual are sometimes shown without covers or protective guards. Always replace the cover or protective guard as specified first, and then operate the products in accordance with the manual. • The drawings presented in this manual are typical examples and may not match the product you received. • This manual is subject to change due to product improvement, specification modification, and manual improvement. When this manual is revised, the manual code is updated and the new manual is published as a next edition. The edition number appears on the front and back covers. • If the manual must be ordered due to loss or damage, inform your nearest Yaskawa representative or one of the offices listed on the back of this manual. • Yaskawa will not take responsibility for the results of unauthorized modifications of this product. Yaskawa shall not be liable for any damages or troubles resulting from unauthorized modification.

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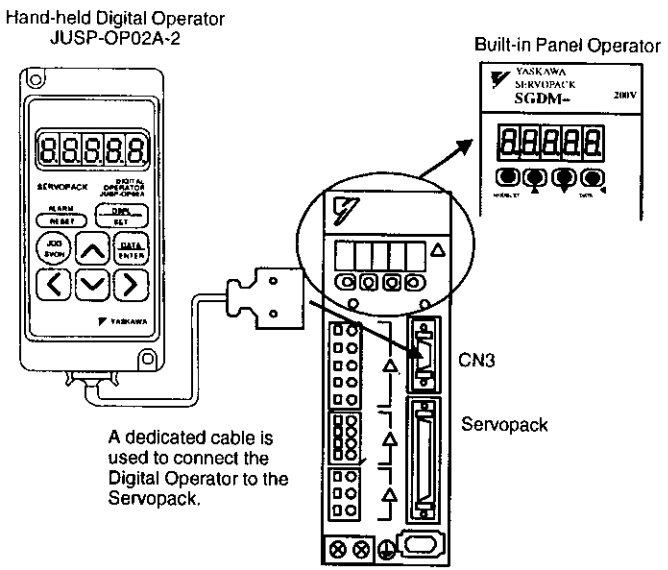
1 Basic Operation

This section provides information on the basic operation of the Digital Operator for setting operating conditions.

1.1 Connecting the Digital Operator

There are two types of Digital Operator. One is a built-in operator incorporating a panel indicator and switches located on the front panel of the Servopack. This type of Digital Operator is also called a Panel Operator. The other one is a hand-held operator (i.e., the JUSP-OP02A-2 Digital Operator), which can be connected to the Servopack through connector CN3 of the Servopack.

There is no need to turn OFF the Servopack to connect this hand-held operator to the Servopack. Refer to the following illustrations to connect the hand-held Digital Operator to the Servopack.



IMPORTANT If the Hand-held Digital Operator is connected to the Servopack, the built-in Panel Operator does not display anything.

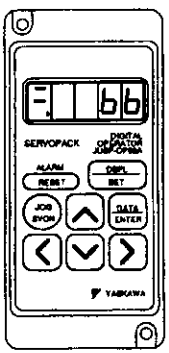
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1.2 Functions

The Digital Operator can be used user constant settings, operating references, and status displays.

This section provides information on the keys and their functions available from the initial displays.

Hand-held Digital Operator



Key	Name		Function
ALARM RESET	RESET Key		Press this key to reset the servo alarm.
DSPL SET	DSPL/SET Key		• Press this key to select the status display mode, auxiliary function mode, user constant setting mode, or monitor mode. • This key is used for data selection in user constant setting mode.
DATA ENTER	DATA/ENTER Key		Press this key to set each user constant or display the set value of each user constant.
∧	Value Change/JOG Key	Up Cursor Key	Press this key to increase the set value. This key is used as a forward start key in JOG operation.
∨		Down Cursor Key	Press this key to decrease the set value. This key is used as a reverse start key in JOG operation.
>	Digit Select Key	Right Cursor Key	• Press this key to select the digit to be changed. The selected digit flashes. • Press the Right Cursor Key to shift to the next digit on the right. • Press the Left Cursor Key to shift to the next digit on the left.
<		Left Cursor Key	
JOG SVON	SVON Key		Press this key to perform the JOG operation with the Digital Operator.

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1.3 Resetting Servo Alarms

Servo alarms can be reset using the Digital Operator.

Press the RESET Key in status display mode.

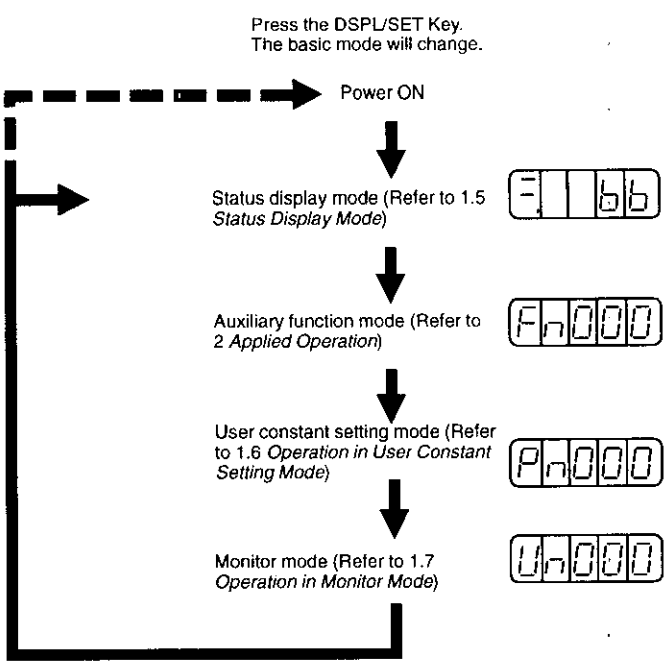
IMPORTANT If an alarm is ON, reset the alarm after eliminating the cause of the alarm. Refer to 9.2 *Troubleshooting* in the Design and Maintenance Manual.

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1.4 Basic Mode Selection

The basic mode selection of the Digital Operator is used for indicating the status of the Servopack in operation and setting a variety of user constants and operation references.

The status display, auxiliary function, user constant setting, and monitor modes are the basic modes. As shown below, the mode is selected in the following order by pressing the key.



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1.5 Status Display Mode

In status display mode, bit data and codes are displayed to indicate the status of the Servopack.

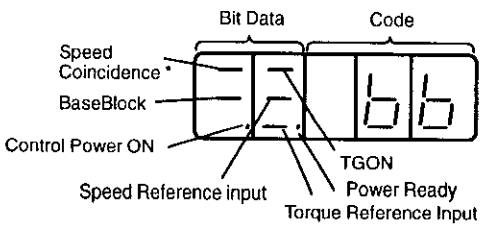
■ Selecting Status Display Mode

The Digital Operator goes into status display mode when the Digital Operation is turned ON.

■ Items Indicated in Status Display Mode

The displayed contents in the status display mode are different for the speed and torque control mode and the position control mode.

Speed and Torque Control Mode



* This indicator is always lit when the Servopack is in torque control mode.

The following tables list bit data items, codes, and their meanings.

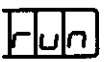
Table 1.1 Bit Data and Meanings in Speed and Torque Control Mode

Bit Data	Meaning
Control Power ON	Lit when Servopack control power is ON.
Baseblock	Lit for baseblock. Not lit when servo is ON.
Speed Coincidence	Lit when the difference between the motor speed and reference speed is below preset value. Preset value: Set in Pn503 (10 r/min is factory setting).
/TGON	Lit if motor speed exceeds preset value. Not lit if motor speed is below preset value. Preset value: Set in Pn502 (20 r/min is factory setting)
Speed Reference Input	Lit if input speed reference exceeds preset value. Not lit if input speed reference is below preset value. Specified value: Set in Pn502 (20 r/min is factory setting)

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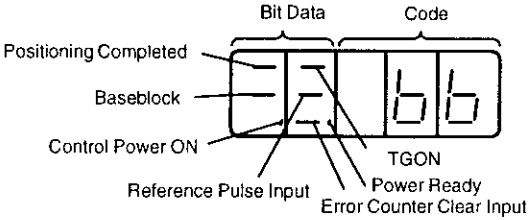
Bit Data	Meaning
Torque Reference Input	Lit if input torque reference exceeds preset value. Not lit if input torque reference is below preset value. Preset value: 10% rated torque is standard setting
Power Ready	Lit when the main power supply circuit is normal. Not lit when the main power supply circuit is OFF.

Table 1.2 Codes and Meanings in Speed and Torque Control Mode

Code	Meaning
	**Baseblock** Servo OFF (motor power OFF)
	**Run** Servo ON (motor power ON)
	**Forward Run Prohibited** P-OT (CN1-42) is OFF. Refer to *5.1.2 Setting the Overtravel Limit Setting* in the Design and Maintenance Manual.
	**Reverse Run Prohibited** N-OT (CN1-43) is OFF. Refer to *5.1.2 Setting the Overtravel Limit Setting* in the Design and Maintenance Manual.
	**Alarm Status** Displays the alarm number.
 :	Refer to *9.2 Troubleshooting* in the Design and Maintenance Manual.

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Position Control Mode



The following tables list bit data items, codes, and their meanings.

Table 1.3 Bit Data and Meanings in Position Control Mode

Bit Data	Meaning
Control Power ON	Lit when Servopack control power ON.
Baseblock	Lit for baseblock. Not lit at servo ON.
Positioning Completed	Lit if error between position reference and actual motor position is below preset value. Not lit if error between position reference and actual motor position exceeds preset value. Preset value: Set in PN500 (7 pulses is factory setting)
/TGON	Lit if motor speed exceeds preset value. Not lit if motor speed is below preset value. Preset value: Set in Pn502 (20 r/min is factory setting)
Reference Pulse Input	Lit if reference pulse is input Not lit if no reference pulse is input.
Error Counter Clear Input	Lit when error counter clear signal is input. Not lit when error counter clear signal is not input.
Power Ready	Lit when the main power supply circuit is normal. Not lit when the main power supply circuit is OFF.

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Table 1.4 Codes and Meanings in Position Control Mode

Code	Meaning
	**Baseblock** Servo OFF (motor power OFF)
	**Run** Servo ON (motor power ON)
	**Forward Run Prohibited** P-OT (CN1-42) is OFF. Refer to *5.1.2 Setting the Overtravel Limit Setting* in the Design and Maintenance Manual.
	**Reverse Run Prohibited** N-OT (CN1-43) is OFF. Refer to *5.1.2 Setting the Overtravel Limit Setting* in the Design and Maintenance Manual.
	**Alarm Status** Displays the alarm number. Refer to *9.2 Troubleshooting* in the Design and Maintenance Manual..
	

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1.6 Operation in User Constant Setting Mode

Functions can be selected or adjusted by setting user constants. There are two types of user constants. One type requires value setting and the other requires function selection. These two types use different setting methods.

With value setting, a user constant is set to a value within the specified range of the user constant. With function selection, the functions allocated to each digit of the seven-segment LED panel indicator (five digits) can be selected. Refer to *4 List of User Constants*.

■ Changing Constant Settings

The constant settings can be used for changing constant data. Check the permitted range of the constants in *4 List of User Constants*, before changing the data.

The example below shows how to change user constant Pn507 from 100 to 85.

1. Press DSPL/SET Key to select the user constant setting mode.



2. Select the user constant number to set. (Pn507 is selected in this example.)

   Press the Left or Right Cursor Key to select the digit. The selected digit will flash.
   Press the Up or Down Cursor Key to change the value.

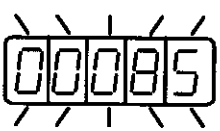
3. Press the DATA/ENTER Key to display the current data for the user constant selected at step 2.



4. Change to the required data.

   Press the Left or Right Cursor Key to select the digit. The selected digit will flash.
   Press the Up or Down Cursor Key to change the value.
   Continue pressing the key until "00085" is displayed.

5. Press the DATA/ENTER Key to store the data. The display will flash.



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6. Press the DATA/ENTER Key again to return to the user constant number display.



This procedure has changed the setting of the user constant Pn507 from 100 to 85.

Repeat steps 2. to 6. as often as required.

INFO User constant numbers that are not defined are skipped during Operator operations.

■ Function Selection User Constants

Types of Function Selection User Constants

The following table shows user the constants used for selecting Servopack functions.

Category	User Constant No.	Name	Factory Setting	Remarks
Function Selection Constants	Pn000	Function Selection Basic Switches	0000	(See 1.)
	Pn001	Function Selection Application Switches 1	0000	(See 1.)
	Pn002	Function Selection Application Switches 2	0000	(See 1.)
	Pn003	Function Selection Application switches 3	0002	
Gain-related Constants	Pn10B	Gain-related Application Switches	0000	(See 2.)
	Pn110	Online Autotuning Switches	0010	(See 2.)
Position Control-related Constant	Pn200	Position Control Reference Selection Switches	0000	(See 1.)
Sequence-related Constants	Pn50A	Input Signal Selections 1	2100	(See 1.)
	Pn50B	Input Signal Selections 2	6543	(See 1.)
	Pn50C	Input Signal Selections 3	8888	(See 1.)
	Pn50D	Input Signal Selections 4	8888	(See 1.)
	Pn50E	Output Signal Selections 1	3211	(See 1.)
	Pn50F	Output Signal Selections 2	0000	(See 1.)
	Pn510	Output Signal Selections 3	0000	(See 1.)

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IMPORTANT

1. After changing these user constants, turn OFF the main circuit and control power supplies and then turn them ON again to enable the new settings.
2. Pn10B.1 and Pn110.0 require the power to be reset as described above

User constant settings are displayed in two patterns as shown below.

User constants for function selection		.... Hexadecimal display for each digit
User constants for constant settings		.... Decimal display in five digits

Since each digit in the function selection user constants has a significant meaning, the value can only be changed for each individual digit. Each digit displays a value within its own setting range.

Definition of Display for Function Selection User Constants

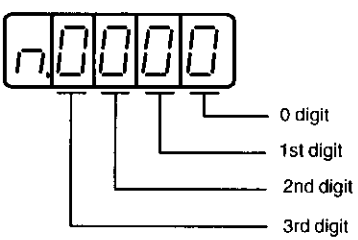
Each digit of the function selection user constants has a unique meaning.

For example, the rightmost digit of user constant Pn000 is expressed as "Pn000.0".

IMPORTANT

Each digit of the function selection user constants is defined as shown below. The user constant display example shows how user constants are displayed in digits for set values.

Set Value



Displaying User Contents

Pn000.0: Indicates the value for the 0 digit of user constant Pn000.

Pn000.1: Indicates the value for the 1st digit of user constant Pn000.

Pn000.2: Indicates the value for the 2nd digit of user constant Pn000.

Pn000.3: Indicates the value for the 3rd digit of user constant Pn000.

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■ Changing Function Selection User Constant Settings

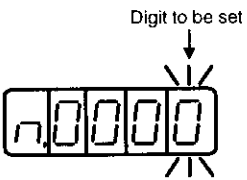
1. Press the DSPL/SET Key to select the constant setting mode.



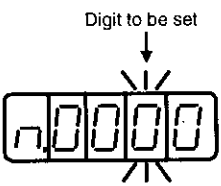
2. Select the user constant number to be set.

   Press the Left or Right Cursor Key to select the digit. The selected digit will flash. Press the Up or Down Cursor Key to change the value. (Pn000 is selected in this example.)

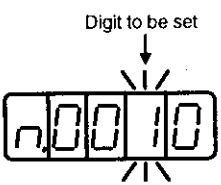
3. Press the DATA/ENTER Key to display the current data of the user constant selected in the above step 2.



4. Press the Left or Right Cursor Key to select the digit.

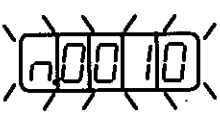


5. Press the Up or Down Cursor Key to select the value defined as a function setting for the selected digit.



   Repeat the above steps 4. and 5. for changing the data as required.

6. Press the DATA/ENTER Key to save the data. The display will flash.



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7. Press the DATA/ENTER Key once more to return to the user constant number display.



This has changed the 1st digit of user constant Pn000 to "1".

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1.7 Operation in Monitor Mode

The monitor mode can be used for monitoring the reference values, I/O signal status, and Servopack internal status.

The monitor mode can be set during motor operation.

■ Using the Monitor Mode

The example below shows how to display the contents of monitor number Un000 as "1500" when the Servomotor rotates at 1500 r/min.

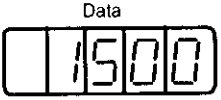
1. Press the DSPL/SET Key to select the monitor mode.



2. Press the Up or Down Cursor Key to select the monitor number to be displayed.

3. Press the DATA/ENTER Key to display the monitor number selected in the above step 2.

Data



4. Press the DATA/ENTER Key once more to return to the monitor number display.



This is how to display 1500, the contents of monitor number Un000.

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■ Contents of Monitor Mode Display

The following table shows contents of the monitor mode display.

Monitor Number	Monitor Display	Unit	Remarks
Un000	Actual motor speed	r/min	
Un001	Input speed reference	r/min	*3
Un002	Internal torque reference	%	Value for rated torque
Un003	Rotation angle 1	pulses	Number of pulses from the origin
Un004	Rotation angle 2	deg	Angle (electrical angle) from the origin
Un005	Input signal monitor	–	*1
Un006	Output signal monitor	–	*1
Un007	Input reference pulse speed	r/min	*4
Un008	Error counter value	reference unit	Positional error*4
Un009	Accumulated load rate	%	Value for the rated torque as 100% Displays effective torque in 10 cycle.
Un00A	Regenerative load rate	%	Value for the processable regenerative power as 100% Displays regenerative consumption power in 10 cycle.
Un00B	Power consumed by DB resistance	%	Value for the processable power when dynamic brake is applied as 100% Displays DB power consumption in 10-s cycle.
Un00C	Input reference pulse counter	–	In hexadecimal*2, *4
Un00D	Feedback pulse counter	–	In hexadecimal

* 1. Refer to *Sequence I/O Signal Monitor* on the next page.

* 2. Refer to *Reference Pulse/Feedback Pulse Counter Monitor Display.*

* 3. Displayed only in speed control mode.

* 4. Displayed only in position control mode.

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■ Sequence I/O Signal Monitor Display

The following section describes the monitor display for sequence I/O signals.

Input Signal Monitor Display



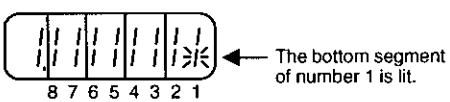
LED Number	Input Terminal Name	Factory Setting
1	SI0 (CN1–40)	/S–ON
2	SI1 (CN1–41)	/P–CON
3	SI2 (CN1–42)	P–OT
4	SI3 (CN1–43)	N–OT
5	SI4 (CN1–44)	/ALM–RST
6	SI5 (CN1–45)	/P–CL
7	SI6 (CN1–46)	/N–CL
8	(CN1–4)	SEN

Note Refer to *5.3.3 Input Circuit Signal Allocation* in the Design and Maintenance Manual for details on input terminals.

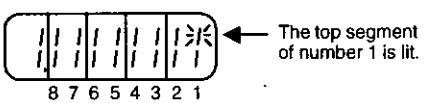
Input signals are allocated as shown above and displayed on the panel display of the Servopack or the Digital Operator. They are indicated by ON/OFF display of seven-segment LEDs in top and bottom rows. These segments turn ON depending on the input signals (ON for Low level and OFF for High level).

◀EXAMPLE▶

- When /S-ON signal is ON (Servo ON at Low signal)

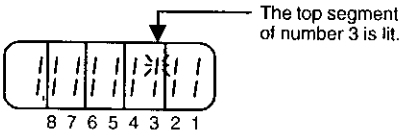


- When /S-ON signal is OFF



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- When P-OT signal operates (Operates at High signal)



Output Signal Monitor Display



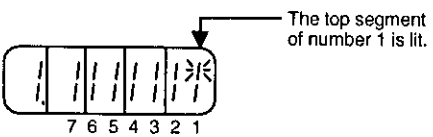
LED Number	Output Terminal Name	Factory Setting
1	(CN1–31,32)	ALM
2	SO1 (CN1–25,26)	/COIN or /V–CMP
3	SO2 (CN1–27,28)	/TGON
4	SO3 (CN1–29,30)	/S–RDY
5	(CN1–37)	ALO1
6	(CN1–38)	ALO2
7	(CN1–39)	ALO3

Note Refer to *5.3.4 Output Circuit Signal Allocation* in the Design and Maintenance Manual for details on output terminals.

Output signals are allocated as shown above and displayed on the panel display of the Servopack or the Digital Operator. They are indicated by ON/OFF display of seven-segment LEDs in top and bottom rows. These segments turn ON depending on the output signals (ON for Low level and OFF for High level).

◀EXAMPLE▶

- When ALM signal operates (alarm at High)



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■ Reference Pulse/Feedback Pulse Counter Monitor Display

The monitor display of reference pulse counter and feedback pulse counter is expressed in 32-bit hexadecimal.
The display procedure is as follows:

1. Press the DSPL/SET Key to select the monitor mode.
2. Press the Up or Down Cursor Key to select "Un00C" or "Un00D".
3. Presss the DATA/ENTER Key to display the data for the monitor number selected in the above step.



4. Press the Up or Down Cursor Key to alternately display the leftmost 16-bit data and rightmost 16-bit data.



Leftmost 16-bit Data Rightmost 16-bit Data

5. Press both the Up and Down Cursor Keys simultaneously to clear the 32-bit counter data.
6. Press the DATA/ENTER Key once more to return to the monitor number display.

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2 Application Procedures

This section describes the basic procedures using the Digital Operator to run and adjust the motor.

Read the basic operations described in *section* 1 before proceeding to this section.

User constants for applied operation can be set in the auxiliary function mode. The following table shows the user constants in the auxiliary function mode.

User Constant Number	Function	Remarks
Fn000	Alarm traceback data display	
Fn001	Rigidity setting during online autotuning	(See note.)
Fn002	JOG mode operation	
Fn003	Zero-point search mode	
Fn004	(Reserved constant)	
Fn005	User constant settings initialization	(See note.)
Fn006	Alarm traceback data clear	(See note.)
Fn007	Writing to EEPROM the inertia ratio data obtained from online autotuning	(See note.)
Fn008	Absolute encoder multi-turn reset and encoder alarm reset	(See note.)
Fn009	Automatic tuning of analog (speed, torque) reference offset	(See note.)
Fn00A	Manual adjustment of speed reference offset	(See note.)
Fn00B	Manual adjustment of torque reference offset	(See note.)
Fn00C	Manual zero-adjustment of analog monitor output	(See note.)
Fn00D	Manual gain-adjustment of analog monitor output	(See note.)
Fn00E	Automatic offset-adjustment of motor current detection signal	(See note.)
Fn00F	Manual offset-adjustment of motor current detection signal	(See note.)
Fn010	Password setting (protects from user constant changes)	
Fn011	Motor model display	
Fn012	Software version display	
Fn013*	Multiturn limit setting change when a Multiturn Limit Disagreement Alarm (A.CC) occurs.	

* This user constant is supported by the new version of the SGDM Servopacks (SGDM-□DA) only.

Note These user constants and those indicated as Pn□□□ are displayed as shown below if their passwords are set (Fn010). These user constants cannot be changed

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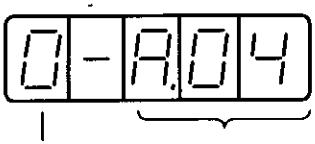
Flashing for one second

2.1 Displaying Alarm Traceback Data

The alarm traceback mode can display up to ten alarms that have occurred, thus making it possible to check what kind of alarms have been generated.

The alarm traceback data is not cleared on alarm reset or when the Servopack power is turned OFF. This does not adversely affect operation.

The data can be cleared using the special "clear alarm traceback mode." Refer to 2.6 *Clearing Alarm Traceback Data* for details.



Alarm Sequence Number
The higher the number, the older the alarm data.

Alarm Code
See the table of alarms.

■ Checking Alarms

Follow the procedure below to determine which alarms have been generated.

1. Press the DSPL/SET Key to select the "Displaying alarm traceback data (Fn000)" in the auxiliary function mode.



Alarm Traceback Display

2. Press the DATA/ENTER Key, and the alarm traceback data will be displayed.
3. Press the Up Cursor Key or Down Cursor Key to scroll the alarm sequence numbers up or down and display information on previous alarms.

   The higher the left-hand digit (alarm sequence number), the older the alarm data.

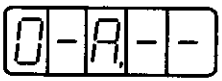
   For descriptions of alarms, refer to *3 Alarm Displays.*

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The following are Operator-related alarms which are not recorded in the traceback data.

	Digital Operator transmission error 1
	Digital Operator transmission error 2

The display will be as shown below while no alarm is detected.



INFO Alarm traceback data will not be updated when the same alarm occurs more than once.

2.2 Machine Rigidity Setting for Online Autotuning

The machine rigidity setting for online autotuning is used to set the servo system target speed loop gain and position loop gain. As shown in the following table, any of ten levels can be selected for the machine rigidity setting.

Machine Rigidity Setting Fn001	Position Loop Gain [S^{-1}] Pn102	Speed Loop Gain [Hz] Pn100	Speed Loop Integral Time Constant [0.01ms] Pn101	Torque Reference Filter Time Constant [0.01ms] Pn401
1	15	15	6000	250
2	20	20	4500	200
3	30	30	3000	130
4	40	40	2000	100
5	60	60	1500	70
6	85	85	1000	50
7	120	120	800	30
8	160	160	600	20
9	200	200	500	15
10	250	250	400	10

Note The machine rigidity is factory preset to 4.

As the machine rigidity setting is increased, the servo system loop gain will increase and the positioning time will decreased. If the setting is increased too much, however, it may cause the machine to vibrate. If vibration occurs, decrease the set value.

The user constants in the above table are automatically changed according to the machine rigidity setting.



If the above user constants Pn102, Pn100, Pn101, and Pn401 are manually set and the online autotuning function is enabled, tuning will be executed with the manual settings taken as the target values.

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■ Changing the Machine Rigidity Setting

The machine rigidity setting is changed using the auxiliary function mode's user constant Fn001.

Follow the procedure given below to change the setting.

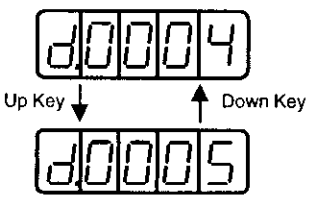
1. Press the DSPL/SET Key to select auxiliary function mode "Fn001."



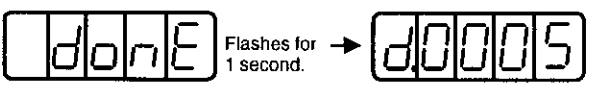
2. Press the DATA/ENTER Key. The following display will appear.



3. Press the Up or Down Cursor Key to set the rigidity.



4. Press the DSPL/SET Key. The following display will flash for one second and then the rigidity setting will be changed.



5. Press the DATA/ENTER Key to return to the auxiliary function mode display.



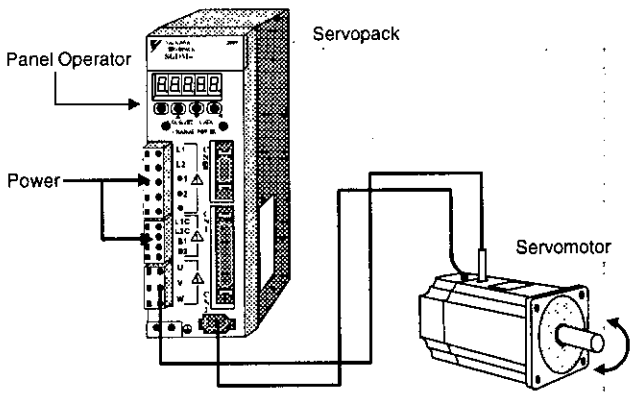
This completes the procedure for changing the machine rigidity setting for online autotuning.

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2.3 Jog Mode Operation

The motor can be operated using only the Digital Operator. During machine setup or trial operation, the motor's rotation direction can be checked and the speed can be set without connecting the motor to a host controller.

For instructions on setting the motor's rotation speed, refer to *1.6 Operation in User Constant Setting Mode* in this manual and to *5.3.2 Jog Speed* in the Design and Maintenance Manual.



IMPORTANT

When user constant Fn002 is used for Jog mode operation, the forward run prohibited (/P-OT) and reverse run prohibited (/N-OT) signals will be disabled.
The JOG operation cannot be performed when the servo ON signal is input from the CN1 or masked with the user constant Pn50A.

The procedure for using the Digital Operator is as follows:

1. Press the DSPL/SET Key to select Fn002 in the auxiliary function mode.



2. Press the DATA/ENTER Key to select the Digital Operator operation mode. Operation is now possible using the Digital Operator.

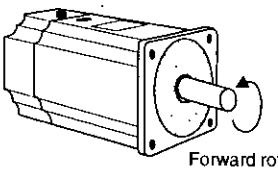


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3. Press the SVON Key to set the servo ON state (motor power turned ON).



4. Press the Up or Down Cursor Key. The motor will keep rotating while the key is pressed.



5. Press the DSPL/SET Key and the display will revert to Fn002. This sets the servo OFF state (motor power turned OFF). Servo OFF is possible even if the SVON Key is pressed.



This ends the operation mode of the Digital Operator.

When the Digital Operator is used to operate the motor, the motor's rotation speed can be changed by the following user constant:

User constant: Pn304; unit: r/min; standard setting: 500

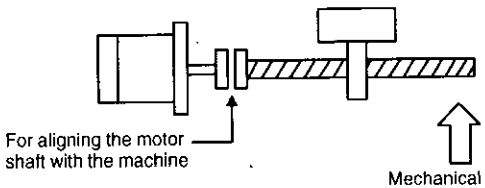
INFO The rotation direction depends on the rotation direction set in user constant Pn000.0. The above example shows the case where Pn000.0 is set to "0," i.e., the factory setting.

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2.4 Origin Search Mode

The origin search mode is designed to position the origin pulse position of the encoder and to clamp at the position. This mode is used when the motor shaft needs to be aligned to the machine. Execute the origin search without connecting the couplings.

The speed for executing the origin search is 60 r/min.



2

Follow the procedure below to execute the origin search.

1. Press the DSPL/SET Key to select the auxiliary function mode.



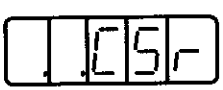
2. Select the user constant Fn003. Press the Left or Right Cursor Key to select the digit. Press the Up or Down Cursor Key to change the value.



3. Press the DATA/ENTER Key, and the display will be as shown below.

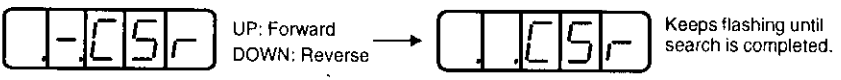


4. Press the SVON Key, and the display will be as shown below. Now it is ready for executing the origin search.



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5. Hold down the Up or Down Cursor Key to execute the origin search.
   When the user constant is set to Pn000.0 = 0 (default), pressing the Up Cursor Key will rotate the motor in the forward direction. Pressing the Down Cursor Key will rotate the motor in the reverse direction. When the user constant is set to Pn000.0 = 1, the rotation of the motor is reversed.



6. Press the DATA/ENTER Key to return to the auxiliary function mode display.



This completes the origin search execution.

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2.5 Initializing User Constant Settings

This function is used when returning to the standard settings (factory settings) after changing user constant settings.

IMPORTANT Initialize the user constant settings with the servo OFF.

Follow the procedure below to initialize user constant settings.

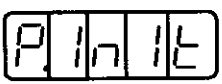
1. Press the DSPL/SET Key to select the auxiliary function mode.



2. Select the user constant Fn005. Press the Left or Right Cursor Key to select the digit. Press the Up or Down Cursor Key to change the value.



3. Press the DATA/ENTER Key, and the display will be as shown below.



4. Press the DSPL/SET Key, and the display will be as shown below. The user constants will be initialized.



5. Press the DATA/ENTER Key to return to the auxiliary function mode display.



This completes the initialization of user constant settings.

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INFO

User constants will not be initialized by pressing the DSPL/SET or MODE/SET Key with the servo ON.
After initialization, turn the power OFF and then back ON.

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2.6 Clearing Alarm Traceback Data

This procedure clears the alarm history, which stores the alarms generated in the Servopack. Each alarm in the alarm history is set to A.– –, which is not an alarm code. Refer to *2.1 Displaying Alarm Traceback Data* for details.

Follow the procedure below to clear the alarm traceback data.

1. Press the DSPL/SET Key to select the auxiliary function mode.



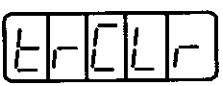
2. Select the user constant Fn006.

   Press the Left or Right Cursor Key to select the digit.

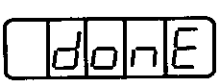
   Press the Up or Down Cursor Key to change the value.



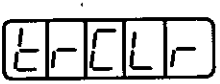
3. Press the DATA/ENTER Key, and the display will be as shown below.



4. Press the DSPL/SET Key to clear the alarm traceback data. The following display will flash for one second, and, after the alarm traceback data is cleared, the display will return to the one in the above step 3.



Flashing for one second →



5. Presss the DATA/ENTER Key to return to the user constant code display.



This completes the alarm traceback data clearing procedure.

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2.7 Saving Inertia Ratio Data

With autotuning online, a latest load inertia value is always calculated and the data is refreshed so that speed loop gain reaches the target value that has been set. When the Servopack is turned OFF, the calculated data is lost and the factory setting is again used as the initial value when the power supply is next turned ON.

To save the online autotuning results as the initial value for the next time the power is turned ON, it is necessary to use user constant Fn007 in the auxiliary function mode. The user constant that is changed by this operation is Pn103 (inertia ratio).

The inertia ratio is expressed as the percentage (%) of the load inertia.

The value set in Pn103 is used to calculate the load inertia at the time of online autotuning.

Pn103	Inertia ratio	Unit	Setting range	Factory Setting	Speed/torque control, Position control
		%	0 to 10000	0	

$$\text{Inertia ratio} = \frac{\text{Load converted to shaft moment of inertia } (J_L)}{\text{Servomotor moment of inertia } (J_M)} \times 100\ [\%]$$

The inertia ratio is factory-set to 0%.

IMPORTANT

When manually adjusting the servo gain, be sure to set the inertia ratio in Pn103. If the Pn103 is not set correctly, the speed loop gain (unit: Hz) set in Pn100 will also be incorrect.

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■ Saving the Inertia Ratio Data Obtained from Online Autotuning

The procedure for saving the data is as follows:

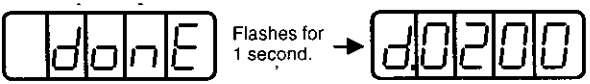
1. Press the DSPL/SET Key to select Fn007 in the auxiliary function mode.



2. Press the DATA/ENTER Key. If the inertia ratio is 200%, for example, it will be displayed as shown below.



3. Press the DSPL/SET Key. The following display will flash for one second, and the inertia ratio value will be saved.



4. Press the DATA/ENTER Key to return to the auxiliary function mode display.



This completes the procedure for saving the results of the online autotuning. After the power supply is turned OFF, these results will be used as the initial values for the inertia ratio set in Pn103 when the power is next turned ON again.

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2.8 Absolute Encoder Multi-turn Reset and Alarm Reset

Perform the setup operation for the absolute encoder in the following cases:

- When the machine is first started up.
- When an encoder backup alarm is generated.
- When the Servopack power supply is turned OFF and the encoder cable is disconnected.

INFO The absolute encoder setup operation is possible only with the servo OFF. Complete the setup processing before turning ON the power supply.

■ Absolute Encoder Setup (Initialization) Procedure

1. Press the DSPL/SET Key to select the auxiliary function mode.



2. Select user constant Fn008. Press the Left or Right Cursor Key to select the digit to set, and then press the Up or Down Cursor Key to change the number.

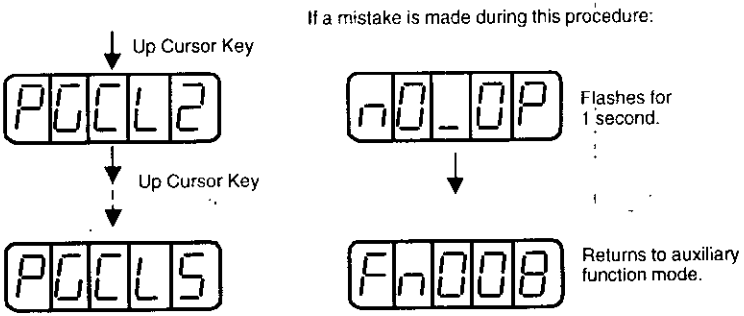


3. Press the DATA/ENTER Key. The following display will appear.

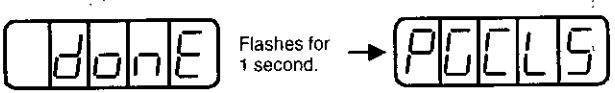


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4. Press the Up Cursor Key to further change the display as shown below. Continue pressing the Up Cursor Key until "PGCL5" is displayed. If you make a mistake during this procedure, "nO_OP" will flash for one second and then the display will return to the auxiliary function mode display. If that occurs, begin the procedure again from step 3 above.



5. When "PGCL5" is displayed, press the DSPL/SET Key. The display will change as shown below, and the absolute encoder's multi-turn data will be cleared.



6. Press the DATA/ENTER Key to return to the auxiliary function mode.



This completes the absolute encoder's setup operation. Turn the power supply OFF and then back ON again.

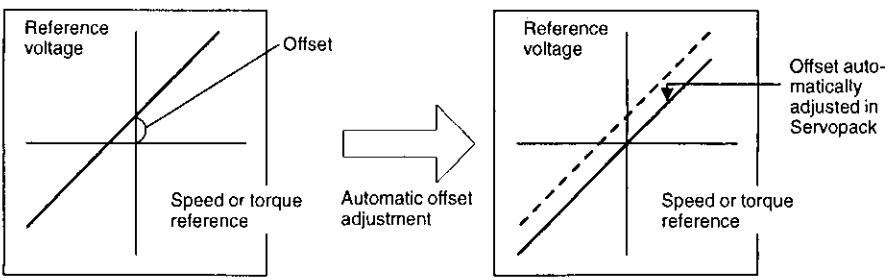
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2.9 Automatic Adjustment of the Speed and Torque Reference Offset

When speed and torque control are used, the motor may rotate slowly even when 0 V is specified as the analog reference voltage. This occurs when the host controller or external circuit has a small offset (measured in mV) in the reference voltage.

The reference offset automatic adjustment mode automatically measures the offset and adjusts the reference voltage. It adjusts both the speed and torque references.

The following diagram illustrates automatic adjustment of an offset in the reference voltage by the Servopack.



After completion of offset automatic adjustment, the amount of offset is stored in the Servopack.

The amount of offset can be checked in the speed reference offset manual adjustment mode.

Refer to the following sections.

- *2.10 Manual Adjustment of the Speed Reference Offset*
- *2.11 Manual Adjustment of the Torque Reference Offset*

The reference offset automatic adjustment mode cannot be used for setting the error pulses to zero for a stopped Servopack when a position loop is formed with a host controller.

Refer to *2.10 Manual Adjustment of the Speed Reference Offset* and *2.11 Manual Adjustment of the Torque Reference Offset* for details.

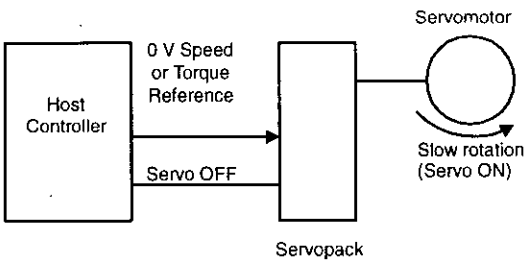
The zero-clamp speed control function is available to force the motor to stop while the zero speed reference is given. Refer to *5.4.3 Using the Zero Clamp Function* in the Design and Maintenance Manual.

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IMPORTANT Automatic adjustment of the speed/torque reference offset must be performed under the servo OFF state.

Follow the procedure below for automatic adjustment of the speed/torque reference offset.

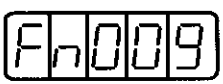
1. Input the (intended) 0 V reference voltage from the host controller or external circuit.



2. Press the DSPL/SET Key to select the auxiliary function mode.



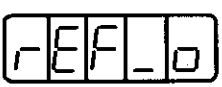
3. Select the user constant Fn009.



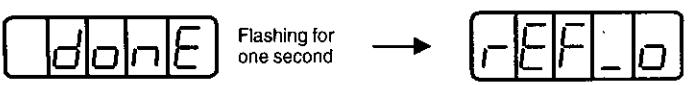
Press the Left or Right Cursor Key to select the digit.

Press the Up or Down Key to change the value.

4. Press the DATA/ENTER Key, and the display will be as shown below.



5. Press the DSPL/SET Key, and the following display will flash for one second. The reference offset will be automatically adjusted.



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6. Press the DATA/ENTER Key to return to the auxiliary function mode display.



This completes the speed/torque reference offset automatic adjustment.

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2.10 Manual Adjustment of the Speed Reference Offset

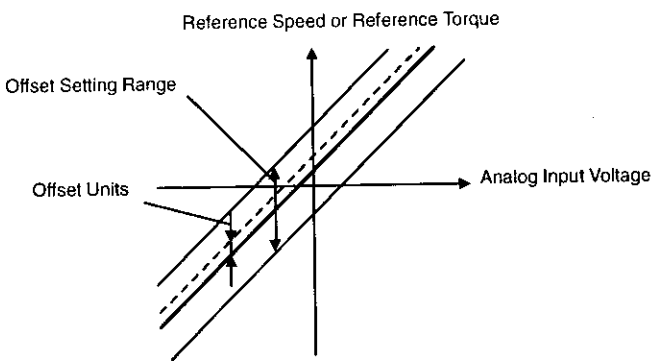
Manual adjustment of the speed/torque reference offset is very convenient in the following situations:

- If a loop is formed with the host controller and the error is zeroed when servo lock is stopped.
- To deliberately set the offset to some value.

This mode can also be used to check the data set in the reference offset automatic adjustment mode.

In principle, this mode operates in the same way as the reference offset automatic adjustment mode, except that the amount of offset is directly input during the adjustment. The offset amount can be set in the speed reference, or in the torque reference shown in *2.11 Manual Adjustment of the Torque Reference Offset*.

The offset setting range and setting units are as follows:



Offset Setting Range	Offset Setting Range
Speed Reference: −1023 to +1023	Speed Reference: 0.46 mV/LSB
Torque Reference: −128 to +127	Torque Reference: 14.7 mV/LSB

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Follow the procedure below for manual adjustment of the speed reference offset.

1. Press the DSPL/SET Key to select the auxiliary function mode.



2. Select the user constant Fn00A.

   Press the Left or Right Cursor Key to select the digit.

   Press the Up or Down Cursor Key to change the value.



3. Press the DATA/ENTER Key, and the display will be as shown below. The manual adjustment mode for the speed reference offset will be entered.



4. Turn ON the Servo ON (/S-ON) signal. The display will be as shown below.



5. Press the Left or Right Cursor Key to display the speed reference offset.



6. Press the Up or Down Cursor Key to adjust the amount of offset (adjustment of the speed reference offset).

7. Press the Left or Right Cursor Key to return to the display shown in the above step 4.

8. Press the DATA/ENTER Key to return to the auxiliary function mode display.



This completes the speed reference offset manual adjustment.

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2.11 Manual Adjustment of the Torque Reference Offset

Manual adjustment of the torque reference offset is used for the speed/torque control mode. Refer to *2.10 Manual Adjustment of the Speed and Torque Reference Offsets.*

Follow the procedure below for manual adjustment of the torque reference offset.

1. Press the DSPL/SET Key to select the auxiliary function mode.



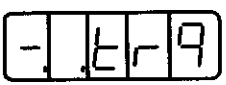
2. Select the user constant Fn00B.

   Press the Left or Right Cursor Key to select the digit.

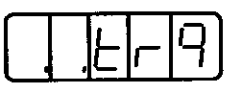
   Press the Up or Down Cursor Key to change the value.



3. Press the DATA/ENTER Key, and the display will be as shown below. The manual adjustment mode for the torque reference offset will be entered.



4. Turn ON the Servo ON (/S-ON) signal. The display will be as shown below.



5. Press the Left or Right Cursor Key to display the torque reference offset amount.



6. Press the Up or Down Cursor Key to adjust the offset amount (adjustment of torque reference offset).

7. Press the Left or Right Cursor Key, and the display will be as shown in the above step 4.

8. Press the DATA/ENTER Key to return to the auxiliary function mode display.

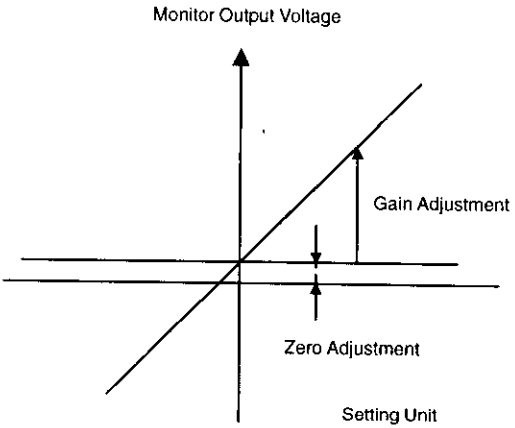


This completes the torque reference offset manual adjustment.

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2.12Manual Zero Adjustment for Analog Monitor Output

Motor speed, torque reference, and position error can be monitored through the analog monitor output. Refer to *6.5 Analog Monitor* in the Design and Maintenance Manual. Use the manual zero adjustment function to compensate for the output voltage drift or the zero point drift caused by noise entering the monitor system. The gain adjustment function can be changed to match the sensitivity of the measuring system.



	Setting Unit
Zero Setting Range: ±2V	→ 17 mV/LSB
Gain Setting Range: 50 to 150%	→ 0.4 %/LSB

INFO The output voltage of the analog monitor is ±8 V. The output voltage will be reversed if ±8 V is exceeded.

Follow the procedure below to execute the manual zero adjustment of analog monitor output.

1. Press the DSPL/SET Key to select the auxiliary function mode.

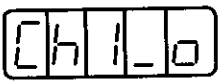


2. Select the user constant Fn00C. Press the Left or Right Cursor Key to select the digit. Press the Up or Down Cursor Key to change the value.

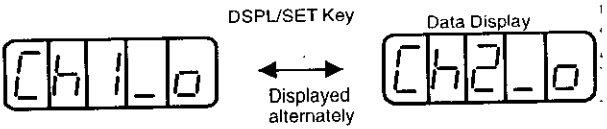


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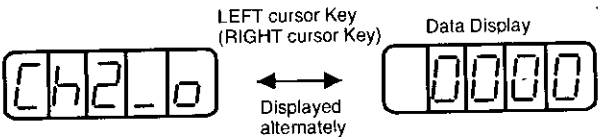
3. Press the DATA/ENTER Key, and the display will be as shown below.



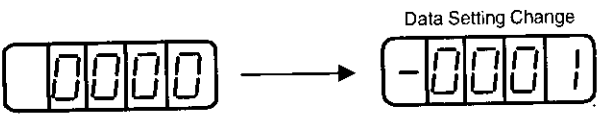
4. Press the DSPL/SET Key, and the monitor output for the two channels will be displayed alternately as shown below.



5. Press the Left or Right Cursor Key to display the analog monitor output data. Pressing the Left or Right Cursor Key again will return to the display shown in the above step 3 or 4.



6. Press the Up or Down Cursor Key to perform zero adjustment of the analog monitor output.



7. When zero adjustment has been completed for the two channels, press the DATA/ENTER Key to return to the auxiliary function mode display.



This completes the manual zero adjustment of the analog monitor output.

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2.13 Manual Gain Adjustment of Analog Monitor Output

Refer to *2.12 Manual Zero Adjustment for Analog Monitor Output* for information on manually adjusting the gain of the analog monitor output. Only the procedure is provided here.

Follow the procedure below to execute the manual gain adjustment of analog monitor output.

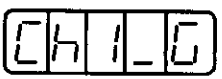
1. Press the DSPL/SET Key to select the auxiliary function mode.



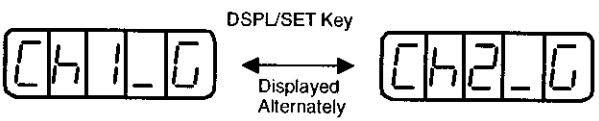
2. Select the user constant Fn00D. Press the Left or Right Cursor Key to select the digit. Press the Up or Down Cursor Key to change the value.



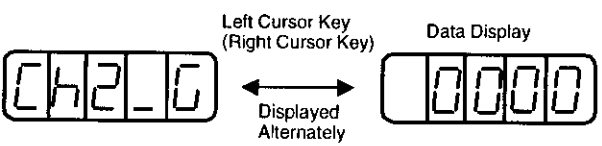
3. Press the DATA/ENTER Key, and the display will be as shown below.



4. Press the DSPL/SET Key, and the monitor output for the two channels will be displayed alternately as shown below.

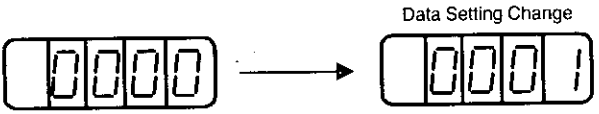


5. Press the Left or Right Cursor Key to display the analog monitor gain coefficient. Pressing the Left or Right Cursor Key again will return to the display shown in the above step 3 or 4.



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6. Press the Up or Down Cursor Key to adjust the gain for the analog monitor output.



7. When the gain adjustment has been completed for the two channels, press the DATA/ENTER Key to return to the auxiliary function mode display.



This completes the manual gain adjustment of the analog monitor output.

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2.14 Automatic Adjustment of the Motor Current Detection Offset

Motor current detection offset adjustment is performed at Yaskawa before shipping. Basically, the user need not perform this adjustment. Perform this adjustment only to reduce excessive torque ripple caused by current offset. The following sections describe automatic and manual adjustment of the current detection offset.

IMPORTANT If this function, is executed carelessly, it may worsen the characteristics. Use this function only when torque ripple is noticeably higher than other Servopacks.

INFO Automatic adjustment is possible only with power supplied to the main circuits and with the servo OFF.

Follow the procedure below to perform automatic adjustment of the current detection offset.

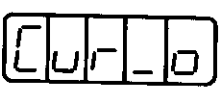
1. Press the DSPL/SET Key to select the auxiliary function mode.



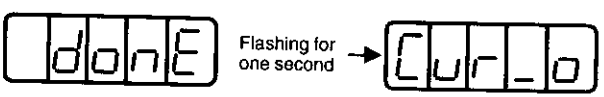
2. Select the user constant Fn00E. Press the Left or Right Cursor Key to select the digit. Press the Left or Right Cursor Key to change the value.



3. Press the DATA/ENTER Key, and the display will be as shown below.

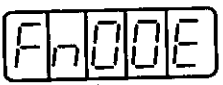


4. Press the DSPL/SET Key. The display will change as shown below and offset will be automatically adjusted.



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5. Press the DATA/ENTER Key to return to the auxiliary function mode display.



This completes the automatic adjustment of the motor current detection offset.

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2.15 Manual Adjustment of the Motor Current Detection Offset

The offset of the motor current detection signal is adjusted at the factory. Further adjustment is normally not required. Adjust the offset only to reduce torque ripple caused by current offset or when higher accuracy is required.
Follow the procedure below to perform manual adjustment of the current detection offset.

IMPORTANT

1. If this function is executed carelessly, it may worsen the characteristics.
2. When making manual adjustments, run the motor at a speed of approximately 100 r/min, and adjust the Operator until the torque monitor ripple is minimized. (Refer to *6.5 Analog Monitor* in the Design and Maintenance Manual.) Adjust the U-phase and V-phase offsets alternately several times until these offsets are well balanced.

Follow the procedure below to manually adjust the current detection offset.

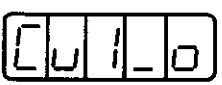
1. Press the DSPL/SET Key to select the auxiliary function mode.



2. Select the user constant Fn00F. Press the Left or Right Cursor Key to select the digit. Press the Up or Down Cursor Key to change the value.



3. Press the DATA/ENTER Key, and the display will be as shown below.

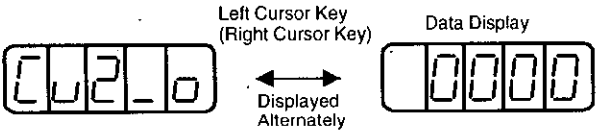


4. Press the DSPL/SET Key to switch between the U-phase (Cu1_0) and V-phase (Cu2_0) current detection offset adjustment mode.

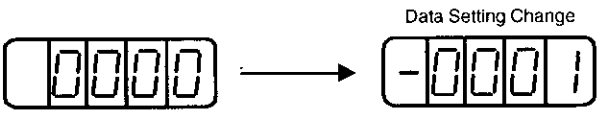


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5. Press the Left or Right Cursor Key to display the current detection data. Pressing the Left or Right Cursor Key again will return to the display shown in the above step 3 or 4.



6. Press the Up or Down Cursor Key to adjust the offset. Carefully adjust the offset while monitoring the torque reference monitor signal.



7. When the current offset adjustment has been completed for the U-phase (Cu1_0) and V-phase (Cu2_0), press the DATA/ENTER Key to return to the auxiliary function mode display.



This completes the manual adjustment of the motor current detection offset.

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2.16 Password Setting (Write Prohibited Setting)

The password setting is used for preventing careless changes of the user constant. User constants Pn□□□ and some of Fn□□□ become write prohibited by setting the password.

Password setting values are as follows:

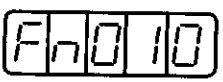
- 0000: Write enabled (Releases write prohibited mode.)
- 0001: Write prohibited (User constants become write enabled from the next power ON.)

Follow the procedure below to set the password.

1. Press the DSPL/SET Key to select the auxiliary function mode.



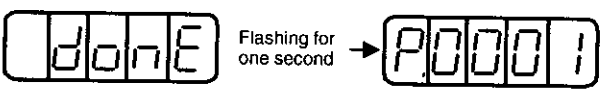
2. Select the user constant Fn010. Press the Left or Right Cursor Key to select the digit. Press the Up or Down Cursor Key to change the value.



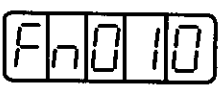
3. Press the DATA/ENTER Key, and the display will be as shown below.



4. Input the password (0001) and press the DSPL/SET Key. The display will change as shown below and the password will be registered.



5. Press the DATA/ENTER Key to return to the auxiliary function mode display.



This completes the password setting. The newly set password will become valid from the next time the power is turned ON.

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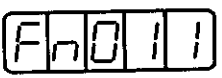
2.17 Checking the Motor Model

This display mode is used for motor maintenance. The motor model check mode set in user constant Fn011 will be entered. This function can also be used to check the specification codes of Servopacks made with special specifications. Follow the procedure below to check the motor model.

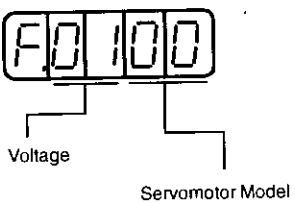
1. Press the DSPL/SET Key to select the auxiliary function mode.



2. Select the user constant Fn011. Press the Left or Right Cursor Key to select the digit. Press the Up or Down Key to change the value.



3. Press the DATA/ENTER Key to display the Servomotor model and voltage code.



Voltage

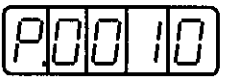
Code	Voltage
00	100 VAC or 140 VDC
01	200 VAC or 280 VDC
02	Reserved

Servomotor Model

Code	Servomotor Model
00	SGMAH
01	SGMPH
02	SGMSH
03	SGMGH-□A (1500 r/min)
04	SGMGH-□B (1000 r/min)
05	Reserved

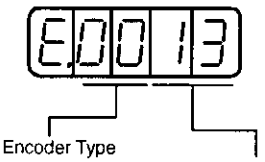
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4. Press the DSPL/SET Key to display the Servomotor capacity.



Capacity unit: Displayed value × 10 (W)
In this example, the capacity is 100 W.

5. Press the DSPL/SET Key to display the encoder type and resolution code.



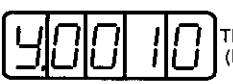
Encoder Type

Code	Type
00	Incremental encoder
01	Absolute encoder

Encoder Resolution

Code	Resolution
13	13 bits
16	16 bits
17	17 bits
20	Reserved

6. Press the DSPL/SET Key to display the Servopack's special specification code (Y-specification code).



This example shows specification code "Y10" (Indicated in decimal).

7. Press the DATA/ENTER Key to return to the auxiliary function mode display. Pressing the DATA/ENTER Key after the above display 3 to 5 will also return to the auxiliary function mode display.



This ends checking motor type procedure.

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2.18 Checking the Servopack's Software Version

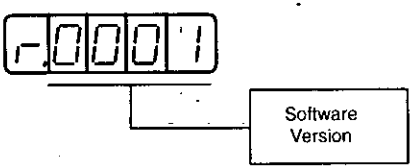
This mode is used for the motor maintenance.

Set Fn012 to select the software-version check mode.

Follow the procedure below to check the software version.

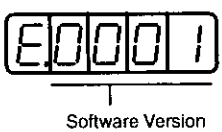
1. Select the user constant Fn012.
2. Press the DATA/ENTER Key, and the Servopack software version will be displayed.

Software Version Display

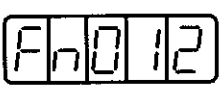


3. Press the DSPL/SET Key, and the software version of the encoder mounted on the motor will be displayed.

Software Version Display



4. Press the DATA/ENTER Key to return to the user constant code display.



This completes the checking software version procedure.

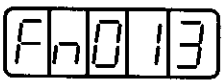
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2.19 Changing the Multiturn Limit Setting

1. Press the DSPL/SET Key to select the auxiliary function mode.



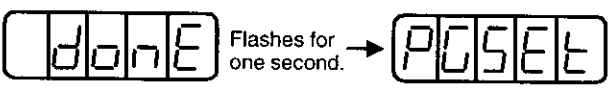
2. Select the user function Fn013. Press the Left or Right Cursor Key to select the digit to set, and then press the Up or Down Cursor Key to change the number.



3. Press the DATA/ENTER Key. The following display will appear.



4. Press the DSPL/SET Key. The following display will appear and the multiturn limit setting in the absolute encoder will be changed.



5. Press the DATA/ENTER Key to return to the auxiliary function mode.



This completes the procedure to change the multiturn limit setting in the absolute encoder. Turn the power supply OFF and then back ON.

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3 Alarm/Warning Displays

3.1 Alarm Displays

A summary of alarm displays, alarm names, and alarm meanings is given in the following table.

Alarm Display	Alarm Name	Meaning
A.02	User Constant Breakdown*2	EEPROM data of Servopack is abnormal.
A.03	Main Circuit Detector Error	Detection data for power circuit is abnormal.
A.04	User Constant Setting Error*2	The user constant setting is outside the allowable setting range.
A.05	Combination Error	Servopack and Servomotor capacities do no match each other.
A.10	Overcurrent or Heat Sink Overheated*2	An overcurrent flowed through the IGBT. Heat sink of Servopack was overheated.
A.30	Regeneration Error Detected	• Regenerative circuit is faulty • Regenerative resistor is faulty.
A.32	Regenerative Overload	Regenerative energy exceeds regenerative resistor capacity.
A.40	Overvoltage	Main circuit DC voltage is excessively high.
A.41	Undervoltage	Main circuit DC voltage is excessively low.
A.51	Overspeed	Rotational speed of the motor is excessively high.
A.71	Overload: High Load	The motor was operating for several seconds to several tens of seconds under a torque largely exceeding ratings.
A.72	Overload: Low Load	The motor was operating continuously under a torque largely exceeding ratings
A.73	Dynamic Brake Overload	When the dynamic brake was applied, rotational energy exceeded the capacity of dynamic brake resistor.
A.74	Overload of Surge Current Limit Resistor	The main circuit power was frequently turned ON and OFF.
A.7A	Heat Sink Overheated *1	The heat sink of Servopack overheated.

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Alarm Display	Alarm Name	Meaning
A.81	Absolute Encoder Backup Error*2	All the power supplies for the absolute encoder have failed and position data was cleared.
A.82	Encoder Checksum Error*2	The checksum results of encoder memory is abnormal.
A.83	Absolute Encoder Battery Error	Battery voltage for the absolute encoder has dropped.
A.84	Absolute Encoder Data Error*2	Received absolute data is abnormal.
A.85	Absolute Encoder Overspeed	The encoder was rotating at high speed when the power was turned ON.
A.86	Encoder Overheated	The internal temperature of encoder is too high.
A.b1	Reference Speed Input Read Error	The A/D converter for reference speed input is faulty.
A.b2	Reference Torque Input Read Error	The A/D converter for reference torque input is faulty.
A.bF	System Alarm*2	A system error occurred in the Servopack.
A.C1	Servo Overrun Detected	The Servomotor ran out of control.
A.C8	Absolute Encoder Clear Error and Multi-turn Limit Setting Error*2	The multi-turn for the absolute encoder was not properly cleared or set.
A.C9	Encoder Communications Error*2	Communications between Servopack and encoder is not possible.
A.CA	Encoder Parameter Error*2	Encoder parameters are faulty.
A.Cb	Encoder Echoback Error*2	Contents of communications with encoder is incorrect.
A.CC	Multiturn Limit Disagreement*3	Different multiturn limits have been set in the encoder and Servopack.
A.d0	Position Error Pulse Overflow	Position error pulse exceeded user constant (Pn505).
A.F1	Power Line Open Phase	One phase is not connected in the main power supply
CPF00 CPF01	Digital Operator Transmission Error	Digital Operator (JUSP-OP02A-2) fails to communicate with Servopack (e.g., CPU error).
A.– –	Not an error	Normal operation status

* 1. This alarm display appears only within the range of 30 W to 1000 W.

* 2. These alarms are not reset for the alarm reset signal (/ALM-RST). Eliminate the cause of the alarm and then turn OFF the power supply to reset the alarms.

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* 3. This alarm will occur for the new version (SGDM-□DA) only.

3.2 Warning Displays

The relation between warning displays and warning code outputs are shown in the following table.

Warning Display	Warning Code Outputs			Warning Name	Meaning of Warning
	ALO1	ALO2	ALO3		
A.91	ON	OFF	OFF	Overload	This warning occurs before the overload alarms (A.71 or A.72) occur. If the warning is ignored and operation continues, an overload alarm may occur.
A.92	OFF	ON	OFF	Regenerative Overload	This warning occurs before the regenerative overload alarm (A.32) occurs. If the warning is ignored and operation continues, a regenerative overload alarm may occur.

Note OFF: Output transistor is OFF (high).
ON: Output transistor is ON (low).

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4 User Constants

4.1 User Constants

The following list shows user constants and their settings.

Category	User Constant No.	Name	Unit	Setting Range	Factory Setting
Function Selection Constants	Pn000	Function Selection Basic Switches (See note 3.)	–	–	0000
	Pn001	Function Selection Application Switches 1 (See notes 1 and 3.)	–	–	0000
	Pn002	Function Selection Application Switches 2 (See note 3.)	–	–	0000
	Pn003	Function Selection Application Switches 3	–	–	0002
	Pn004	Reserved constants (Do not change.) (See note 6.)	–	–	0000
	Pn005		–	–	0000
Gain Related Constants	Pn100	Speed Loop Gain	Hz	1 to 2000	40
	Pn101	Speed Loop Integral Time Constant	0.01 ms	15 to 51200	2000
	Pn102	Position Loop Gain	1/s	1 to 2000	40
	Pn103	Inertia Ratio	%	0 to 10000	0
	Pn104	2nd Speed Loop Gain	Hz	1 to 2000	40
	Pn105	2nd Speed Loop Integral Time Constant	0.01 ms	15 to 51200	2000
	Pn106	2nd Position Loop Gain	1/s	1 to 2000	40
	Pn107	Bias	r/min	0 to 450	0
	Pn108	Bias Width Addition	reference units	0 to 250	7
	Pn109	Feed-forward	%	0 to 100	0
	Pn10A	Feed-forward Filter Time Constant	0.01 ms	0 to 6400	0
	Pn10B	Gain-related Application Switches (See note 3.)	–	–	0000
	Pn10C	Mode Switch Torque Reference	%	0 to 800	200
	Pn10D	Mode Switch Speed Reference	r/min	0 to 10000	0

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Category	User Constant No.	Name	Unit	Setting Range	Factory Setting
Gain Related Constants (continued)	Pn10E	Mode Switch Acceleration	10 r/min/s	0 to 3000	0
	Pn10F	Mode Switch Error Pulse	reference units	0 to 10000	0
	Pn110	Online Autotuning Switches (See note 3.)	–	–	0010
	Pn111	Speed Feedback Compensation (See note 2.)	%	1 to 500	100
	Pn112	Reserved constants (Do not change.)	%	0 to 1000	100
	Pn113		–	0 to 10000	1000
	Pn114		–	0 to 1000	200
	Pn115		–	0 to 65535	32
	Pn116		–	0 to 65535	16
	Pn117		%	20 to 100	100
	Pn118		%	20 to 100	100
	Pn119		1/S	1 to 2000	50
	Pn11A		0.1%	1 to 2000	1000
	Pn11B		Hz	1 to 150	50
	Pn11C		Hz	1 to 150	70
	Pn11D		%	0 to 150	100
	Pn11E		%	0 to 150	100
	Pn11F		ms	0 to 2000	0
	Pn120		0.01ms	0 to 51200	0
	Pn121		Hz	10 to 250	50
	Pn122		Hz	0 to 250	0
	Pn123		%	0 to 100	0

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Category	User Constant No.	Name	Unit	Setting Range	Factory Setting
Position Related Constants	Pn200	Position Control Reference Selection Switches (See note 3.)	–	–	0000
	Pn201	PG Divider (See note 3.)	P/r	16 to 16384	16384
	Pn202	Electronic Gear Ratio (Numerator) (See note 3.)	–	1 to 65535	4
	Pn203	Electronic Gear Ratio (Denominator) (See note 3.)	–	1 to 65535	1
	Pn204	Position Reference Accel/Decel Constant	0.01 ms	0 to 6400	0
	Pn205	Multi-turn Limit Setting (See notes 1, 3 and 6.)	rev	0 to 65535	65535
	Pn206	Reserved constants (Do not change.) (See note 6.)	P/rev	513 to 65535	16384
	Pn207	Position Control Function Switches (See notes 3 and 6.)	–	–	0000
	Pn208	Position Reference Movement Averaging Time (See notes 3 and 6.)	0.01ms	0 to 6400	0
Speed Related Constants	Pn300	Speed Reference Input Gain	0.01 V/ rated speed	150 to 3000	600
	Pn301	Speed 1	r/min	0 to 10000	100
	Pn302	Speed 2	r/min	0 to 10000	200
	Pn303	Speed 3	r/min	0 to 10000	300
	Pn304	Jog Speed	r/min	0 to 10000	500
	Pn305	Soft Start Acceleration Time	ms	0 to 10000	0
	Pn306	Soft Start Deceleration Time	ms	0 to 10000	0
	Pn307	Speed Reference Filter Time Constant	0.01 ms	0 to 65535	40
	Pn308	Speed Feed-forward Filter Time Constant	0.01 ms	0 to 65535	0

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Category	User Constant No.	Name	Unit	Setting Range	Factory Setting
Torque Related Constants	Pn400	Torque Reference Input Gain	0.1 V/ rated torque	10 to 100	30
	Pn401	Torque Reference Filter Time Constant	0.01 ms	0 to 65535	100
	Pn402	Forward Torque Limit	%	0 to 800	800
	Pn403	Reverse Torque Limit	%	0 to 800	800
	Pn404	Forward External Torque Limit	%	0 to 800	100
	Pn405	Reverse External Torque Limit	%	0 to 800	100
	Pn406	Emergency Stop Torque	%	0 to 800	800
	Pn407	Speed Limit during Torque Control	r/min	0 to 10000	10000
	Pn408	Torque Function Switches (See note 6.)	–	–	0000 (0001)*7
	Pn409	Notch Filter Frequency (See note 6.)	Hz	50 to 2000	2000 (1500)*7
Sequence Related Constants	Pn500	Positioning Completed Width	reference units	0 to 250	7
	Pn501	Zero Clamp Level	r/min	0 to 10000	10
	Pn502	Rotation Detection Level	r/min	1 to 10000	20
	Pn503	Speed Coincidence Signal Output Width	r/min	0 to 100	10
	Pn504	NEAR Signal Width	reference units	1 to 250	7
	Pn505	Overflow Level	256 reference units	1 to 32767	1024
	Pn506	Brake Reference Servo OFF Delay Time	10 ms	0 to 50	0
	Pn507	Brake Reference Output Speed Level	r/min	0 to 10000	100
	Pn508	Timing for Brake Reference Output during Motor Operation	10 ms	10 to 100	50
	Pn509	Momentary Hold Time	ms	20 to 1000	20
	Pn50A	Input Signal Selections 1 (See note 3.)	–	–	2100
	Pn50B	Input Signal Selections 2 (See note 3.	–	–	6543
	Pn50C	Input Signal Selections 3 (See note 3.)	–	–	8888
	Pn50D	Input Signal Selections 4 (See note 3.)	–	–	8888
	Pn50E	Output Signal Selections 1 (See note 3.)	–	–	3211
	Pn50F	Output Signal Selections 2 (See note 3.)	–	–	0000
	Pn510	Output Signal Selections 3 (See note 3.)	–	–	0000

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Category	User Constant No.	Name	Unit	Setting Range	Factory Setting
Sequence Related Constants (continued)	Pn511	Reserved constant (Do not change.) (See note 6.)	–	–	8888
	Pn512	Output Signal Reversal Settings (See note 3 and 6.)	–	–	0000
Other Constants	Pn600	Regenerative Resistor Capacity (See note 4.)	10W	0 to capacity *5	0
	Pn601	Reserved constant (Do not change.)	–	0 to capacity *5	0

* 1. The multiturn limit must be changed only for special applications. Changing this limit inappropriate or unintentionally can be dangerous.

* 2. The setting of user constant Pn111 is valid only when user constant Pn110.1 is set to 0.

* 3. After changing these user constants, turn OFF the main circuit and control power supplies and then turn them ON again to enable the new settings.

* 4. Normally set to "0". When using an External Regenerative Resistor, set the capacity (W) of the regenerative resistor.

* 5. The upper limit is the maximum output capacity (W) of the Servo pack.

* 6. These user constants are supported by the new version of the SGDM Servopacks (SGDM-□DA) only.

* 7. These factory settings are for Servopacks SGDM-50ADA or more.

* 8. The setting of user constant Pn111 is valid only when user constant Pn110.1 is set to 0.

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4.2 Switches

The following list shows the switches and their factory settings.

User Constant	Digit Place	Name	Setting	Contents	Factory Setting
Pn000 Function Selection Basic Switches	0	Direction Selection	0	Sets CCW as forward direction.	0
			1	Sets CW as forward direction (reverse rotation mode).	
	1	Control Method Selection	0	Speed control (analog reference)	0
			1	Position control (pulse train reference)	
			2	Torque control (analog reference)	
			3	Internal set speed control (contact reference)	
			4	Internal set speed control (contact reference)/Speed control (analog reference)	
			5	Internal set speed control (contact reference)/Position control (pulse train reference)	
			6	Internal set speed control (contact reference)/Torque control (analog reference)	
			7	Position control (pulse train reference)/ Speed control (analog reference)	
			8	Position control (pulse train reference)/ Torque control (analog reference)	
			9	Torque control (analog reference)/ Speed control (analog reference)	
			A	Speed control (analog reference)/Zero clamp	
			B	Position control (pulse train reference)/ Position control (Inhibit)	
	2	Axis Address	0 to F	Sets Servopack axis address.	0
	3	Reserved		–	0

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User Constant	Digit Place	Name	Setting	Contents	Factory Setting
Pn001 Function Selection Application Switches	0	Servo OFF or Alarm Stop Mode	0	Stops the motor by applying dynamic brake (DB).	0
			1	Stops the motor by applying dynamic brake (DB) and then releases DB.	
			2	Makes the motor coast to a stop state without using the dynamic brake (DB).	
	1	Overtravel Stop Mode	0	Same setting as Pn001.0 (Stops the motor by applying DB or by coasting.)	0
			1	Sets the torque of Pn406 to the maximum value, decelerates the motor to a stop, and then sets it to servolock state.	
			2	Sets the torque of Pn406 to the maximum value, decelerates the motor to a stop, and then sets it to coasting state.	
	2	AC/DC Power Input Selection	0	Not applicable to DC power input: Input AC power supply through L1, L2, and (L3) terminals.	0
			1	Applicable to DC power input: Input DC power supply through (+)1 and (–) terminals.	
	3	Warning Code Output Selection	0	ALO1, ALO2, and ALO3 output only alarm codes.	0
			1	ALO1, ALO2, and ALO3 output both alarm codes and warning codes. While warning codes are output, ALM signal output remains ON (normal state).	

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User Constant	Digit Place	Name	Setting	Contents	Factory Setting
Pn002 Function Selection Application Switches	0	Speed Control Option (T-REF Terminal Allocation)	0	None	0
			1	Uses T-REF as an external torque limit input.	
			2	Uses T-REF as a torque feed-forward input.	
			3	Uses T-REF as a external torque limit when P-CL and N-CL are ON.	
	1	Torque Control Option (V-REF Terminal Allocation)	0	None	0
			1	Uses V-REF as an external speed limit input.	
	2	Absolute Encoder Usage	0	Uses absolute encoder as an absolute encoder.	0
			1	Uses absolute encoder as an incremental encoder.	
	3	Reserved constant (Do not change.)	0 to 4	–	0
Pn003 Function Selection Application Switches	0	Analog Monitor 1 Torque Reference Monitor	0	Motor speed: 1 V/1000 r/min.	2
	1	Analog Monitor 2 Speed Reference Monitor	1	Speed reference: 1 V/1000 r/min.	0
			2	Torque reference: 1 V/100%	
			3	Position error: 0.05 V/1 reference unit	
			4	Position error: 0.05 V/100 reference unit	
			5	Reference pulse frequency (converted to r/min): 1 V/1000 r/min.	
			6	Motor speed × 4: 1 V/250 r/min.	
			7	Motor speed × 8: 1 V/125 r/min.	
			8	Reserved constant (Do not change.)	
			9		
			A		
			B		
			C		
			D		
			E		
			F		
	2	Not used.		–	0
	3	Not used.		–	0

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User Constant	Digit Place	Name	Setting	Contents	Factory Setting
Pn10B Gain Application Switches	0	Mode Switch Selection	0	Uses internal torque reference as the condition (Level setting: Pn10C)	0
			1	Uses speed reference as the condition (Level setting: Pn10D)	
			2	Uses acceleration as the condition (Level setting: Pn10E)	
			3	Uses error pulse as the condition (Level setting: Pn10F)	
			4	No mode switch function available	
	1	Speed Loop Control Method	0	PI control	0
			1	IP control	
	2	Not used.	0	–	0
	3	Reserved constant (Do not change.)	0 to 2	–	0
Pn110 Online Autotuning Switches	0	Online Autotuning Method	0	Tunes only at the beginning of operation.	0
			1	Always tunes.	
			2	Does not perform autotuning.	
	1	Speed Feedback Compensation Selection	0	Enabled	1
			1	Disabled	
	2	Friction Compensation Selection	0	Friction compensation: Disabled	0
			1	Friction compensation: Small	
			2	Friction compensation: Large	
	3	Reserved constant (Do not change.)	0 to 3	–	0

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User Constant	Digit Place	Name	Setting	Contents	Factory Setting
Pn200 Position Control Refer-ences Selection Switches	0	Reference Pulse Form	0	Sign + pulse, positive logic	0
			1	CW + CCW, positive logic	
			2	A phase + B phase (x1), positive logic	
			3	A phase + B phase (x2), positive logic	
			4	A phase + B phase (x4), positive logic	
			5	Sign + pulse, negative logic	
			6	CW + CCW, negative logic	
			7	A phase + B phase (x1), negative logic	
			8	A phase + B phase (x2), negative logic	
			9	A phase + B phase (x4), negative logic	
	1	Error Counter Clear Signal Form	0	Clears error counter when the signal goes high.	0
			1	Clears error counter at the rising edge of the signal.	
			2	Clears error counter when the signal goes low.	
			3	Clears error counter at the falling edge of the signal.	
	2	Clear Operation	0	Clears error counter at the baseblock.	0
			1	Does not clear error counter. (Possible to clear error counter only with CLR signal.)	
			2	Clears error counter when an alarm occurs.	
	3	Filter Selection	0	Reference input filter for line driver signals.	0
			1	Reference input filter for open collector signals.	
Pn207*1 Position Control Function Switches	0	Position Reference Filter Selection	0	Acceleration/deceleration filter	0
			1	Average movement filter	
	1	Position Control Option	0	Disabled.	0
			1	Use V-REF as a speed feed-forward input.	
	2	Not used.		–	0
	3	Not used.		–	0
Pn408*1 Torque Function Switches	0	Notch Filter Selection	0	Disabled.	0 (1)*2
			1	Uses a notch filter for torque reference.	
	1	Not used.		–	0
	2	Not used.		–	0
	3	Not used.		–	0

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* 1. These user constants are supported by the new version of the SGDM Servopacks (SGDM-□DA) only.
* 2. This factory setting is for Servopacks SGDM-50ADA or more.

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4.3 Input Signal Selections

The following list shows input signal selections and their factory settings.

User Constant	Digit Place	Name	Setting	Contents	Factory Setting
Pn50A	0	Input Signal Allocation Mode	0	Sets the input signal allocation for the sequence to the same one as for the SGDB Servopack. (See note 1.)	0
			1	Possible to freely allocate the input signals.	
	1	/S-ON Signal Mapping (Servo ON when low.)	0	Inputs from the SI0 (CN1-40) input terminal.	0: SI0
			1	Inputs from the SI1 (CN1-41) input terminal.	
			2	Inputs from the SI2 (CN1-42) input terminal.	
			3	Inputs from the SI3 (CN1-43) input terminal.	
			4	Inputs from the SI4 (CN1-44) input terminal.	
			5	Inputs from the SI5 (CN1-45) input terminal.	
			6	Inputs from the SI6 (CN1-46) input terminal.	
			7	Set Signal ON.	
			8	Set Signal OFF.	
			9 (See note 2.)	Inputs the reverse signal from the SI0 (CN1-40) input terminal.	
			A (See note 2.)	Inputs the reverse signal from the SI1 (CN1-41) input terminal.	
			B (See note 2.)	Inputs the reverse signal from the SI2 (CN1-42) input terminal.	
			C (See note 2.)	Inputs the reverse signal from the SI3 (CN1-43) input terminal.	
			D (See note 2.)	Inputs the reverse signal from the SI4 (CN1-44) input terminal.	
			E (See note 2.)	Inputs the reverse signal from the SI5 (CN1-45) input terminal.	
			F (See note 2.)	Inputs the reverse signal from the SI6 (CN1-46) input terminal.	

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User Constant	Digit Place	Name	Setting	Contents	Factory Setting
Pn50A	2	/P-CON Signal Mapping (P control when low.)	0 to F (See note 2.)	Same as above.	1: SI1
	3	P-OT Signal Mapping (Overtravel when high.)	0 to F (See note 2.)	Same as above.	2: SI2
Pn50B	0	N-OT Signal Mapping (Overtravel when high.)	0 to F (See note 2.)	Same as above.	3: SI3
	1	/ALM-RST Signal Mapping (Alarm reset when low.)	0 to F (See note 2.)	Same as above.	4: SI4
	2	/P-CL Signal Mapping (Torque control when low.)	0 to F (See note 2.)	Same as above.	5: SI5
	3	/N-CL Signal Mapping (Torque control when low.)	0 to F (See note 2.)	Same as above.	6: SI6
Pn50C	0	/SPD-D Signal Mapping (Internal Set Speed Selection)	0 to F (See note 2.)	Same as above.	8: OFF
	1	/SPD-A Signal Mapping (Internal Set Speed Selection)	0 to F (See note 2.)	Same as above.	8: OFF
	2	/SPD-B Signal Mapping (Internal Set Speed Selection)	0 to F (See note 2.)	Same as above.	8: OFF
	3	/C-SEL Signal Mapping (Control Mode Switching)	0 to F (See note 2.)	Same as above.	8: OFF

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User Constant	Digit Place	Name	Setting	Contents	Factory Setting
Pn50D	0	/ZCLAMP Signal Mapping (Zero Clamping)	0 to F (See note 2.)	Same as above.	8: OFF
	1	/INHIBIT Signal Mapping (Disabling Reference Pulse)	0 to F (See note 2.)	Same as above.	8: OFF
	2	/G-SEL Signal Mapping (Gain Switching)	0 to F (See note 2.)	Same as above.	8: OFF
	3	(Reserved)	0 to F (See note 2.)	Same as above.	8: OFF

Note 1. When Pn50A.0 is set to 0 for the SGDB Servopack, only the following modes are compatible Pn50A 1=7, Pn50A 3=8, and Pn50B 0=8.

2. User constant settings 9 and A to F can be used for the new version of the SGDM Servopacks (SGDM-□DA) only

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4.4 Output Signal Selections

The following list shows output signal selections and their factory settings.

User Constant	Digit Place	Name	Setting	Contents	Factory Setting
Pn50E	0	/COIN Signal Mapping	0	Disabled.	1: SO1
			1	Outputs from the SO1 (CN1-25, 26) output terminal.	
			2	Outputs from the SO2 (CN1-27, 28) output terminal.	
			3	Outputs from the SO3 (CN1-29, 30) output terminal.	
	1	/V-CMP Signal Mapping	0 to 3	Same as above.	1: SO1
	2	/TGON Signal Mapping	0 to 3	Same as above.	2: SO2
	3	/S-RDY Signal Mapping	0 to 3	Same as above.	3: SO3
Pn50F	0	/CLT Signal Mapping	0 to 3	Same as above.	0: Not used
	1	/VLT Signal Mapping	0 to 3	Same as above.	
	2	/BK Signal Mapping	0 to 3	Same as above.	
	3	/WARN Signal Mapping	0 to 3	Same as above.	
Pn510	0	/NEAR Signal Mapping	0 to 3	Same as above.	0: Not used
	1	Reserved	0 to 3	Same as above.	
	2	Not used.	0	–	0
	3	Not used.	0	–	0
Pn512*	0	Output Signal Reversal for SO1 (CN1-25 and 26)	0	Output signal is not reversed.	0: Not reversed
			1	Output signal is reversed.	
	1	Output Signal Reversal for SO2 (CN1-27 and 28)	0	Output signal is not reversed.	0: Not reversed
			1	Output signal is reversed.	
	2	Output Signal Reversal for SO3 (CN1-29 and 30)	0	Output signal is not reversed.	0: Not reversed
			1	Output signal is reversed.	
	3	Not used.	–	–	0

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* These user constants are supported by the new version of the SGDM Servopacks (SGDM-□DA) only.

Note 1. When more than one signal is allocated to the same output circuit, data is output using OR logic.

2. Depending on the control mode, undetected signals are treated as OFF. For example, in the speed control mode, the /COIN signal is treated as OFF.

3. Types of /WARN signals: Overload and regenerative overload.

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OPERATION MANUAL

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