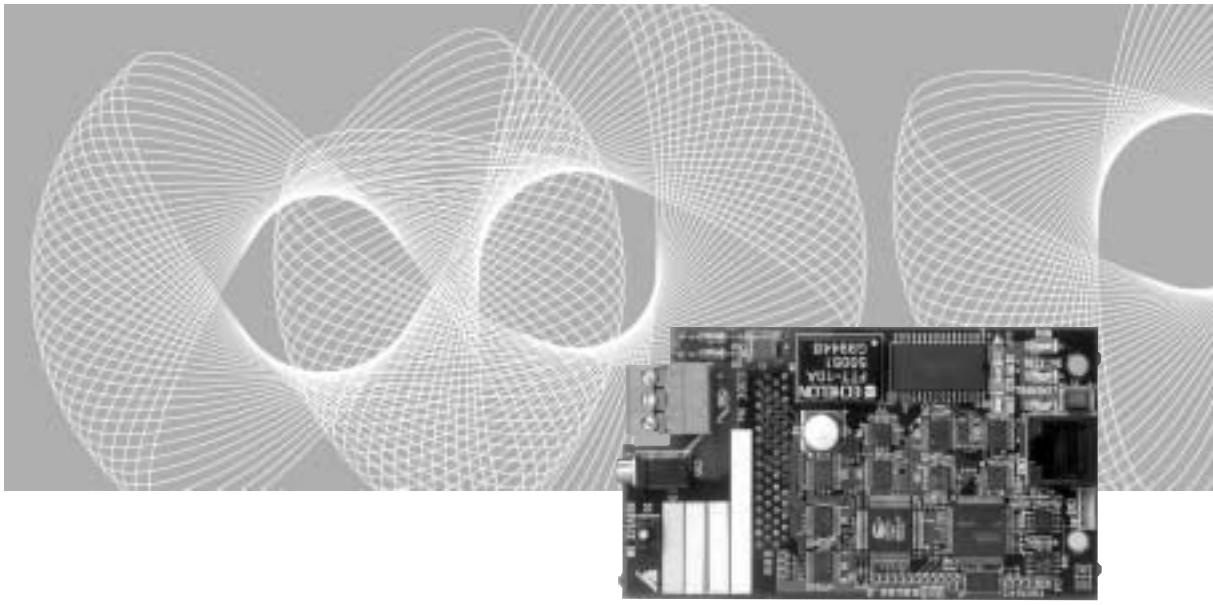
Varispeed SERIES OPTION CARD

LONWORKS COMMUNICATIONS INTERFACE CARD

USER'S MANUAL

Model: SI-W1



YASKAWA

MANUAL NO. SIBP C730600 06A

Introduction

This manual describes the operation and specifications of the LONWORKS SI-W1 Communications Interface Card (here after called “SI-W1”), which connects to the field network for exchanging data. Be sure that you have read and understood this manual before attempting to operate the SI-W1.

For details on operating the Inverter itself, refer to the relevant Varispeed manual.

Yaskawa Electric Corporation

General Precautions

- The diagrams in this manual may be indicated without covers or safety shields in order to show details. Be sure to restore covers or shields before operating the Inverter, and operate the Inverter according to the instructions provided in this manual.
- The products and specifications described in this manual or the contents and presentation of the manual may be changed without notice to improve the product and/or the manual.
- When ordering a new copy of the manual due to damage or loss, contact your Yaskawa representative or the nearest Yaskawa sales office and provide the manual number shown on the front cover.
- Any modifications to the product by the customer invalidate the warranty, and Yaskawa accepts no responsibility for the results of any modifications.

Safety Precautions

Carefully read this manual and all other documentation provided with the product before attempting to install, operate, inspect, or perform maintenance on the product. Within this manual, safety-related precautions are classified a “warnings” and “cautions.”

⚠ 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 less serious or minor injury, or damage to the equipment.

Failure to heed even a precaution classified as a caution can result in serious consequences depending on the situation. All precautions contain important information, so make sure that they are followed carefully.

IMPORTANT — Indicates important information that the user should make careful note of, even though it is not classified as a caution.

■ Confirmations upon Delivery

⚠ CAUTION
• Never use an Option Card that is damaged or missing components. Doing so can result in injury.

■ Installation and Wiring

⚠ WARNING
• Never touch the inside of the Inverter with your hands. Doing so can result in electric shock. • Before installing or removing the Option Card, or performing wiring operations, always turn OFF the power to the Inverter and wait until the specified period of time has elapsed after all the Inverter indicators have turned OFF. (The time is shown on the Inverter's front cover.) Failure to do so can result in electric shock. • Do not allow cables to be damaged, subjected to stress, placed under heavy objects, or pinched. Doing so can result in electric shock, faulty operation, or damage to the equipment.

⚠ CAUTION
• Never touch the Option Card terminals directly with your hands. Doing so can result in damage from static electricity. • Insert the connectors securely. Failure to do so can result in injury, damage, or faulty operation of devices.

■ Settings

⚠ CAUTION
• Do not carelessly change the Inverter's settings. Doing so can result in injury or damage of devices.

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- LONWORKS and LonTalk are registered trademarks of the Echolon.
- Windows95, Windows98, and Windows2000 are registered trademarks of Microsoft Corporation.

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1

Overview

1.1 Features

The SI-W1 is an SI-W1 that conforms to the LonTalk protocol and connects a General-purpose Vector-control Varispeed-series Inverter to a LONWORKS network using the LonTalk protocol for data communications.
Mounting the SI-W1 to a Varispeed-series Inverter enables various applications, such as monitoring run/stop status and operating conditions from devices conforming to the LonTalk protocol, and changing and referencing Inverter constant settings.
Option Cards can be installed in the following Inverters.

- Varispeed F7: Standard series, 200/400-V Class Inverter, software No. S1011 or later.
- Varispeed F7S: Standard series, 200/400-V Class Inverter, software No. S1020 or later.
- Varispeed G7: 400-V Class Inverter, software No. S1011 or later.
- Varispeed G7: Standard series, 200-V Class Inverter, software No. S5011 (or 1014) or later.

1.2 Specifications

1.2.1 General Specifications

Table 1.1 General Specifications

Item	Explanation
Name	LONWORKS Communications Interface Card
Model	SI-W1
Dimensions	60 × 105 mm (W × H)
Operating environment	Same as for Inverter.
Node type	Host application node
Supported Inverters	Varispeed F7 and G7 Series

1.2.2 Communications Specifications

Table 1.2 Communications Specifications

Item	Explanation
Baud rate	78K bps
IC for communications	TMPN3120FE3M Neuron Chip
Communications driver	FTT-10A (Free topology)
Communications protocol	Conforming to LonTalk protocol.
Network variables	Total: 56 Standard (SNVT): Based on Variable Speed Motor Drive Functional Profile Version 1.1
Alias network variables	Total: 20

1.3 Checking the Product

Check the following items as soon as the product is delivered.

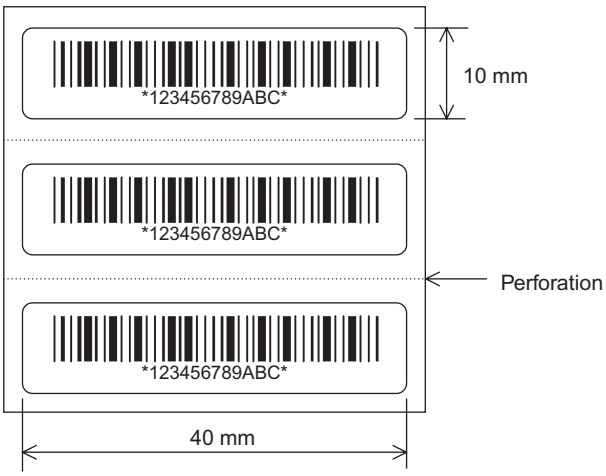
Item	Method
Is there any discrepancy between the shipment and what was ordered?	Check the information printed on the Card. (Refer to 2.1.)
Has the product been damaged in any way?	Inspect the entire exterior of the Card for any damage that may have occurred during shipping.
Are the contents of the package correct?	Check the contents shown in the table below.

1.3.1 Contents of Package

Name	Qty	Remarks
SI-W1 Card	1	Main product
Labels	3	Bar code labels with neuron ID
Manual	1	Operating precautions and information

1.3.2 Label Specifications

Bar code standard: Code 39



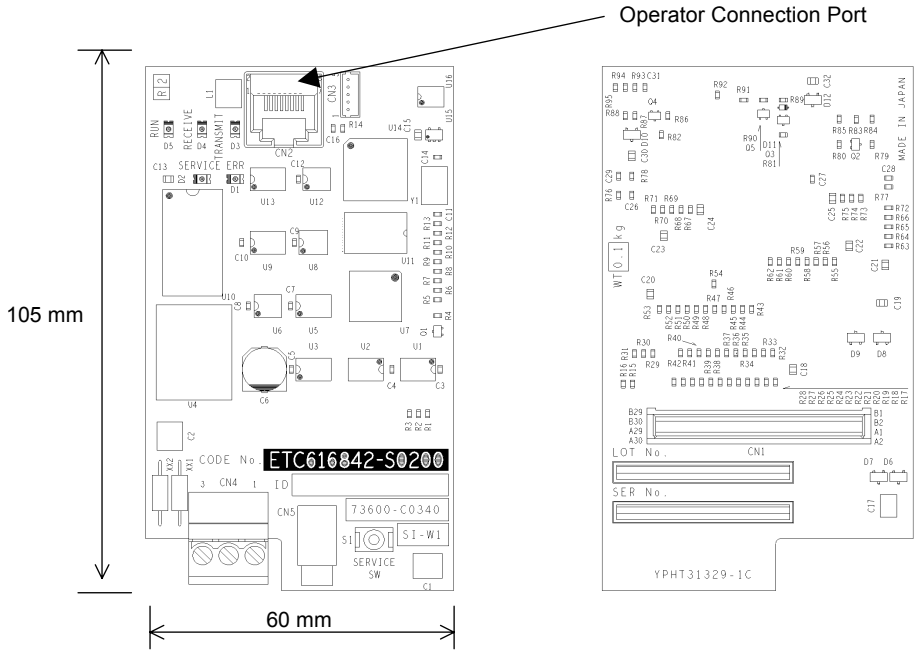
If you find any irregularities in the above items, contact your Yaskawa representative or the agency where you purchased the product immediately.

2

Component Names and Settings

2.1 External Dimensions and Component Names

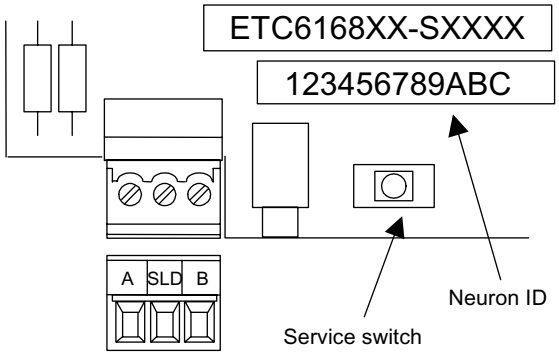
2.1.1 Names of Components on Option Card



2.2 Terminal Block

The terminal block connects to the communications lines.

Terminal No.	Name	Explanation
1	A	Signal line
2	SLD	Communica-tions shield
3	B	Signal line



2.3 Service Switch

This is the neuron ID output switch. When it is pressed, the neuron ID is output to the network.

2.3.1 Initializing Bind Data

When the Inverter's power is turned ON while the service switch is pressed, the bind data is cleared and the configuration property settings are initialized.

2.4 LED Indicators

Name	Color	Lit	Flashing	OFF
RUN	Green	Normal	System error	Power not being supplied. Hardware error
RECEIVE	Green	Hardware error	Receiving	Local node not receiving data.
TRANSMIT	Green	Hardware error	Sending	Not sending.
ERR	Red	System error	CALL or BUS	Normal
SERVICE	Yellow	Service switch pressed. Hardware error	Not configured.	Normal

2.5 Neuron ID

The neuron ID of the neuron chip installed on the product is inscribed on the service switch. Also labels with the neuron ID in bar code format are packed with the product.

2.6 XIF Files and Resource Files

XIF files and special resource files are not included with the product. For inquiries regarding these files, contact your Yaskawa representative or the agency where you purchased the product. XIF files can be browsed from the following Yaskawa's e-mechatronics site.

http://www.e-mechatronics.com/en/inverter/index.html

3

Installation and Wiring

3.1 Installing the SI-W1

Using the following procedure, mount theSI-W1 after removing the Inverter's Digital Operator and front cover.

1. Turn OFF the Inverter's main-circuit power supply.
2. After the time indicated on the Inverter's front cover has elapsed, remove the front cover and check to make sure that the CHARGE lamp has turned OFF.
3. Remove the Inverter's Option Card clip (i.e., the clip that prevents the Option Card from rising). The clip can be easily removed by grasping the protruding portion of the clip and pulling it out.
4. Place the SI-W1's spacer mounting holes into the spacers for the Option Card on the Inverter's control panel.
5. Align the SI-W1 connector (CN1) with the Option Card connector (2CN), and then pass the spacers through the SI-W1. When passing the spacers through the holes, press firmly until the Card clicks into place.
6. After the SI-W1 has been installed, insert the Option Card clip in order to prevent the SI-W1 from rising at the connector side.
7. Replace the Inverter's front cover.

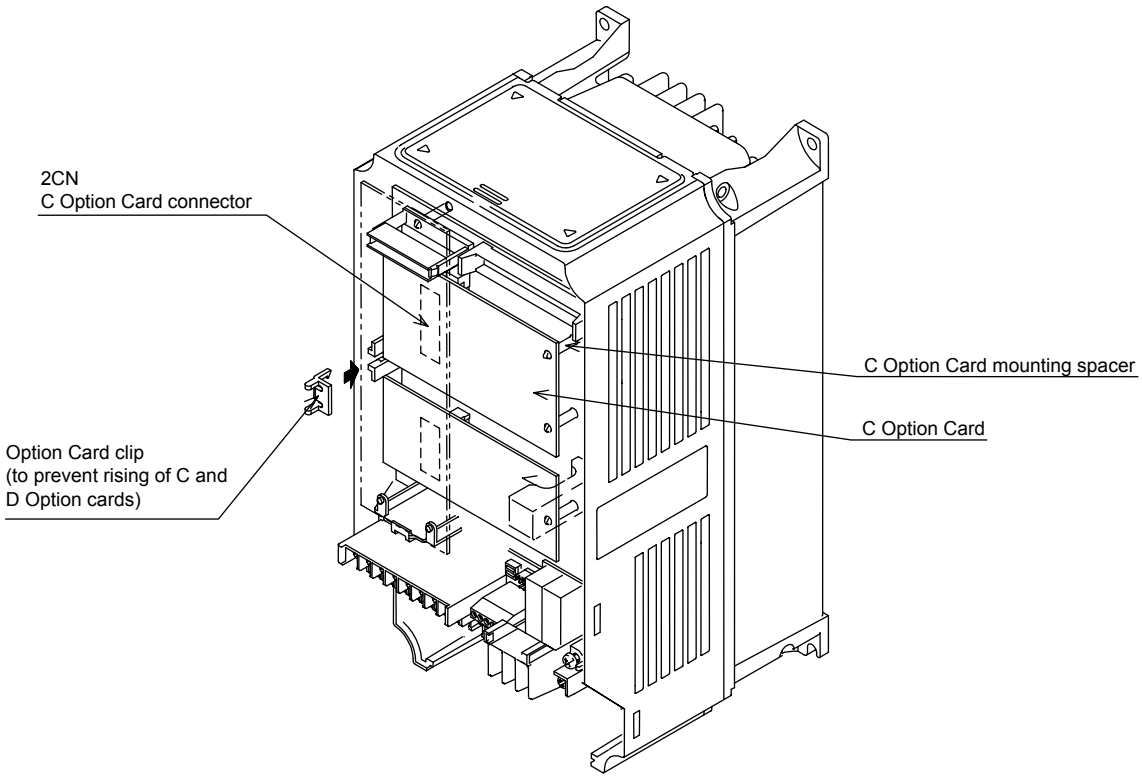


Fig. 3.1 Installation of SI-W1

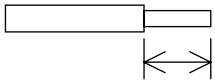
3.2 Wiring LONWORKS Communications Cables

3.2.1 Wiring Procedure

Use the following procedure to wire LONWORKS communications cables to the terminal block.

- Using a thin standard screwdriver, loosen the terminal screws.
- Insert the electrical wires from below the terminal block.
- Securely tighten the terminal screws (to a torque of 0.22 to 0.25 N·m) so that the power line will not become disconnected.

For communications cables, use special shielded twisted-pair cables for LONmark communications.



IMPORTANT

Install LONWORKS communications cables apart from main-circuit wiring and other electrical and power lines.

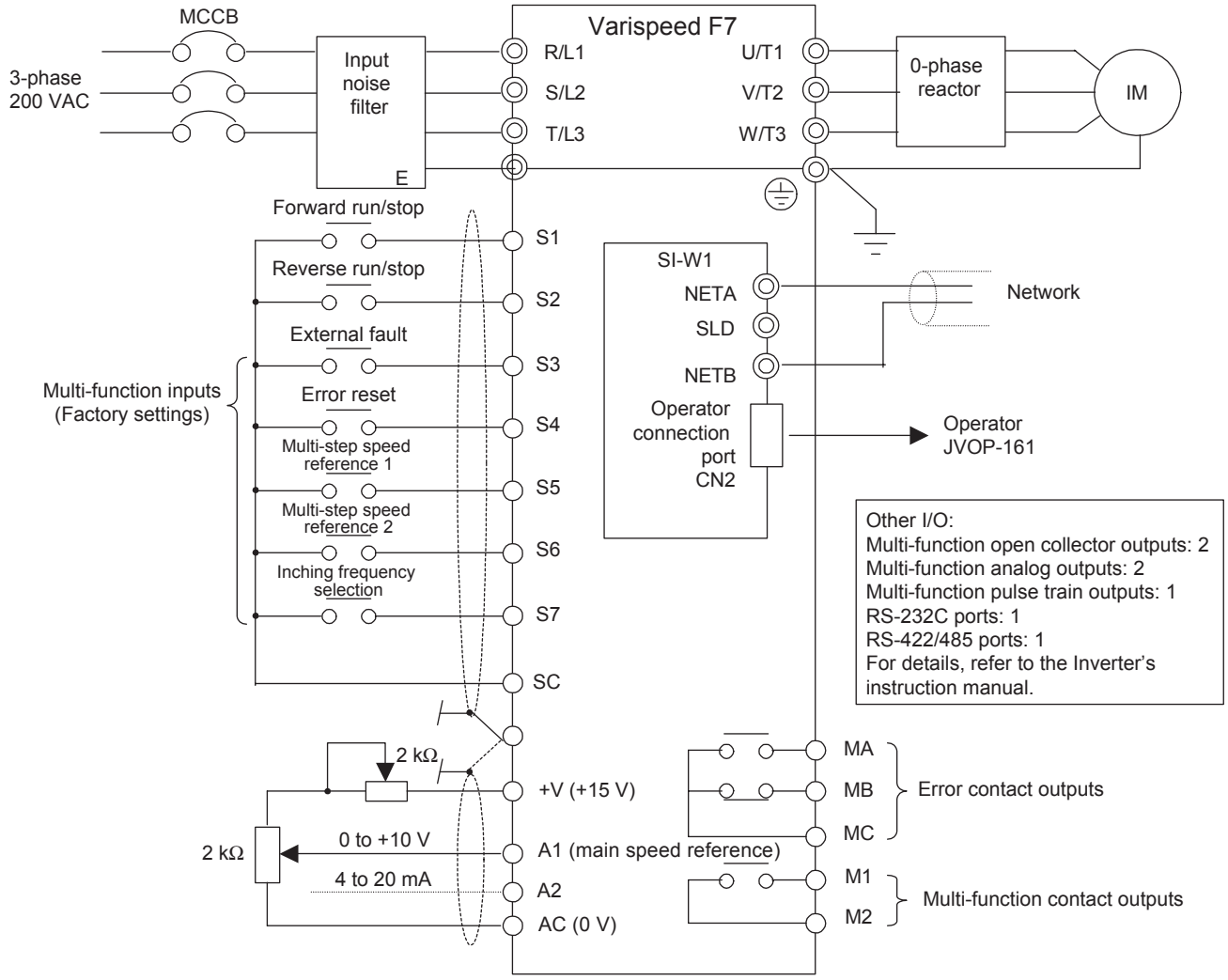
3.2.2 Wiring Diagram

The diagram below provides a basic overview of the Inverter's wiring. For details, refer to the instruction manual for the Inverter. To reduce Inverter noise, be sure to install the noise filters and insert a 0-phase reactor at I/O lines. If these noise reduction measures are not implemented, communications may be adversely effected by noise.

IMPORTANT

Select noise filters and a 0-phase reactor in the following specifications. Refer to the Inverter catalog for more information.

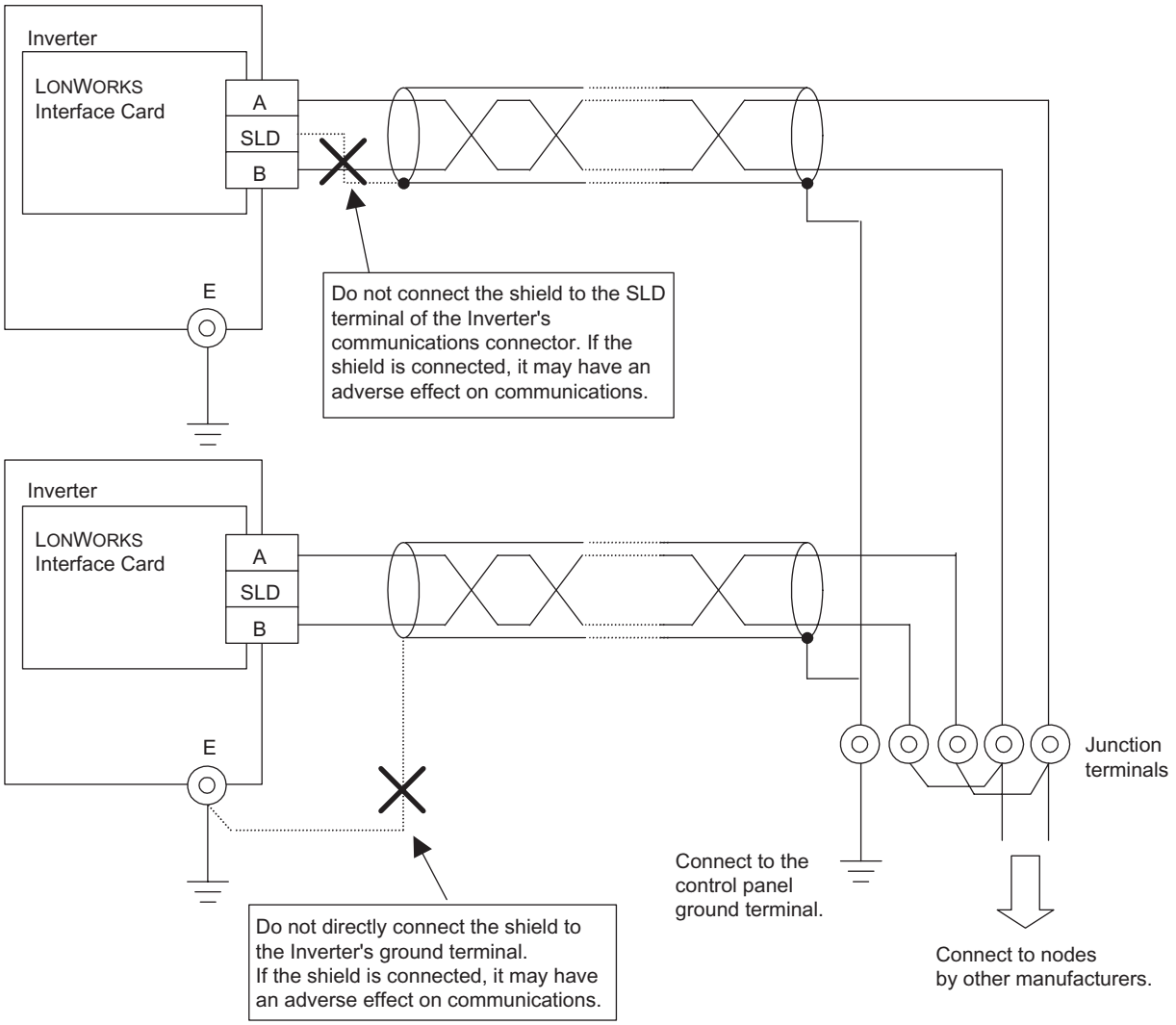
- Noise filters (input): LNFD Series
- 0-phase reactor (output): Type F6045GB or F11080GB



Varispeed F7 200 V Class, 3.7 kW (CIMR-F7A23P7) Example

3.2.3 Communications Wiring Example

The following diagram is an example of communications wiring around the Inverters.



1. For communications cables, use special shielded twisted-pair cables for LONWORKS communications.
2. Securely ground the control panel.
3. Connect the shield ground for communications as far away as possible from the Inverters.

4

Basic Operation

4.1 Run Command and Frequency Reference Rights

Run commands and frequency references can be provided to the Inverter via the Operator, external terminals, or communications, but only one of these methods is enabled at any given time and the other two are disabled. The method that is enabled at any one time is determined by Inverter constants.

The default setting is for both run commands and frequency references to be provided by external terminals.

4.1.1 Selecting the Method

■ Selecting by Inverter Constants

Run command and frequency reference rights can be selected by changing Inverter constants b1-01 (reference selection) and b1-02 (operation method selection) as shown below.

Constant	Operator	External Terminals	MEMOBUS	LON Communications
Reference Selection (b1-01)	0	1 (Default)	2	3
Operation Method Selection (b1-02)	0	1 (Default)	2	3

■ Selecting from the Network (1)

Run command and frequency reference rights can be selected by setting the nciOpMode from 0 to 3 (default: 0), regardless of the Inverter constant setting.

nciOpMode Set Value	0 (Default)	1	2	3
Frequency Reference Rights	b1-01 set value	Communications	b1-01 set value	Communications
Run Command Rights	b1-02 set value	b1-02 set value	Communications	Communications

■ Selecting from the Network (2)

Run command and frequency reference rights can be selected by using nviWriteParam and nviWriteParamVal to change Inverter constants b1-01 and b1-02.

■ Procedure

Changing frequency reference rights from external terminals to communications:

1. Set 0180 hex (the b1-01 register number) for nviWriteParam.
2. Set 3 (reference rights: communications) for nviWriteParamVal.
3. If the setting is changed normally, 3 (the data written in step 2 above) will be set.
4. If the setting cannot be changed normally, an error code will be set in nvoErrCode.

■ Selecting from Control Circuit Terminals (S3 to S7)

Run command and frequency reference rights can be selected by using the Inverter's control circuit terminals (S3 to S7).

■ Procedure

1. Set b1-01 (reference selection) to 0 (Operator) or 1 (control circuit terminals).
2. Set b1-02 (operation method selection) to 0 (Operator) or 1 (control circuit terminals).
3. Set any of H1-01 to H1-05 (multi-function contact input terminals S3 to S7 function selection) to 2 (Option Card/Inverter selection).

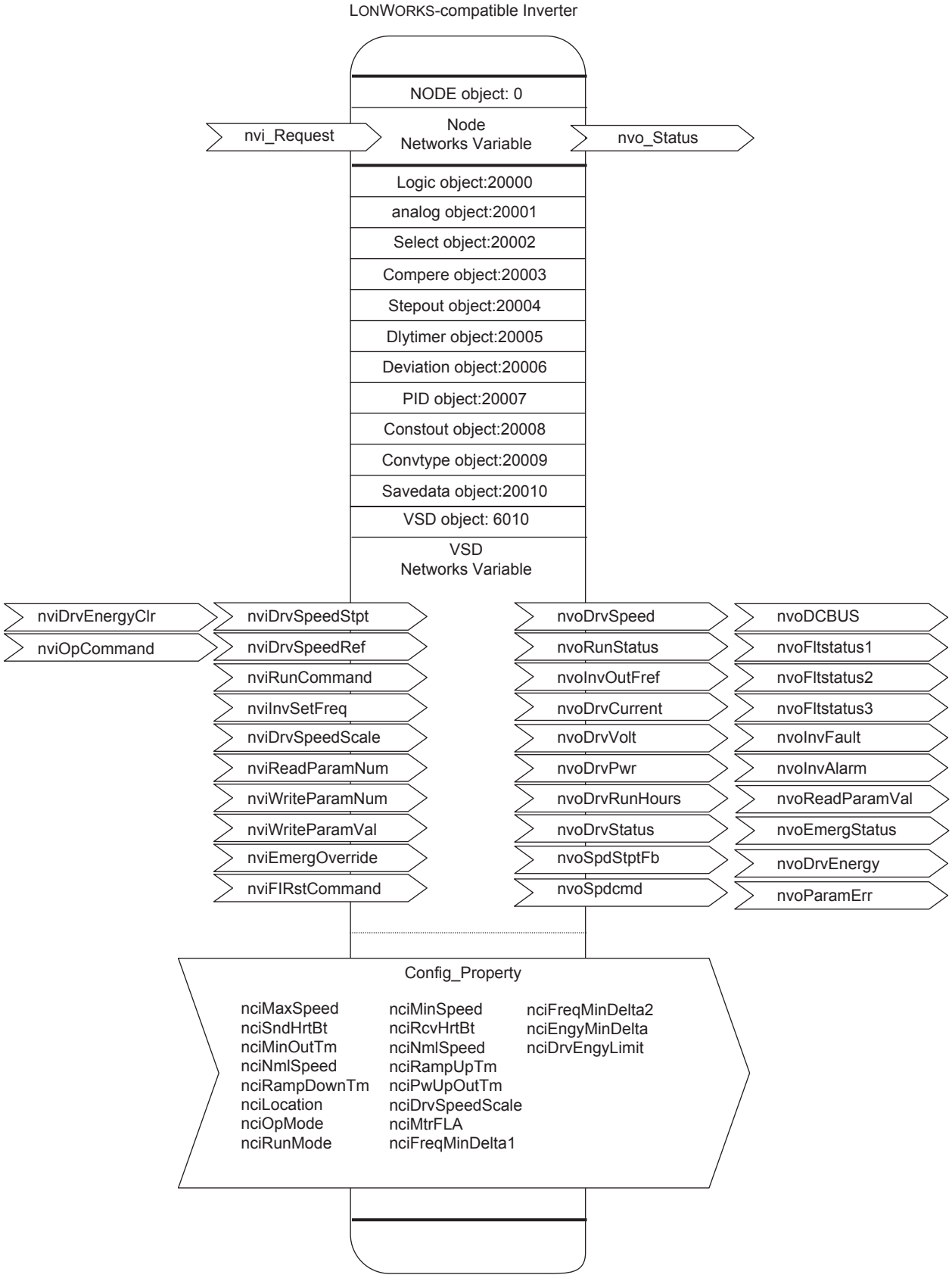
Terminal Status	Frequency Reference and Run Command Selection
OFF	Inverter: Frequency reference and run command rights determined according to parameter (b1-01 and b1-02) set values.
ON	Communications Option Card (SI-W1) (Frequency references and run commands from the network are enabled.)

5

Network Variables

5.1 LONWORKS-compatible Inverter and Network Variable

The relationship between LONWORKS-compatible Inverter and network variable is shown below.



5.2 Node Objects

5.2.1 Object Requests

Input: SNVT_obj_request nviRequest

Requests the status of individual objects in a node.

Member Name	Explanation	
object_id	Object ID number	
	0	Entire node
	1	VSD
	2	logic[0]
	3	logic[1]
	4	logic[2]
	5	logic[3]
	6	logic[4]
	7	logic[5]
	8	logic[6]
	9	logic[7]
	10	Analog[0]
	11	Analog[1]
	12	Analog[2]
	13	Analog[3]
	14	Analog[4]
	15	Analog[5]
	16	Analog[6]
	17	Analog[7]
	18	Analog[8]
	19	Analog[9]
	20	Select[0]
	21	Select[1]
	22	Select[2]
	23	Select[3]
	24	Select[4]
	25	Select[5]
	26	Select[6]
	27	Select[7]
	28	Compare[0]
	29	Compare[1]
	30	Compare[2]
	31	Compare[3]
	32	Compare[4]
	33	Compare[5]
	34	Compare[6]

(cont'd)

Member Name	Explanation		
object_id	35	Compare[7]	
	36	Stepout[0]	
	37	Dlytimer[0]	
	38	Dlytimer[1]	
	39	Deviation[0]	
	40	Pidmodule[0]	
	41	Pidmodule[1]	
	42	Pidmodule[2]	
	43	Pidmodule[3]	
	44	Constout[0]	
	45	Constout[1]	
	46	Constout[2]	
	47	Constout[3]	
	48	Constout[4]	
	49	Constout[5]	
	50	Convtype[0]	
	51	Convtype[1]	
	52	Convtype[2]	
	53	Convtype[3]	
	54	Savedata[0]	
	55	Savedata[1]	
	56	Savedata[2]	
	57	Savedata[3]	
	Other than above.	invalid_id	
object_request	0	RQ_NORMAL	Enables object.
	1	RQ_DISABLED	Disables object.
	2	RQ_UPDATE_STATUS	Not supported. (Returns normal response.)
	3	RQ_SELF_TEST	Not supported. (Returns normal response.)
	4	RQ_UPDATE_ALARM	Not supported. (Returns normal response.)
	5	RQ_REPORT_MASK	Not supported. (Returns invalid_request.)
	6	RQ_OVERRIDE	Not supported. (Returns invalid_request.)
	7	RQ_ENABLE	Enables object.
	8	RQ_RMV_OVERRIDE	Not supported. (Returns invalid_request.)
	9	RQ_CLEAR_STATUS	Not supported. (Returns invalid_request.)
	10	RQ_CLEAR_ALARM	Not supported. (Returns invalid_request.)
	11	RQ_ALARM_NOTIFY_ENABLED	Not supported. (Returns invalid_request.)
	12	RQ_ALARM_NOTIFY_DISABLED	Not supported. (Returns invalid_request.)
	13	RQ_MANUAL_CTRL	Not supported. (Returns invalid_request.)
	14	RQ_REMOTE_CTRL	Not supported. (Returns invalid_request.)
	15	RQ_PROGRAM	Not supported. (Returns invalid_request.)
	0xff	RQ_NUL	Not supported. (Returns invalid_request.)

5.2.2 Object Status

Input: SNVT_obj_status nviStatus

Displays the status of objects in a node.

Member Name		Explanation
object_id		Object ID (object request reference)
bit 31	invalid_id	Turns ON if the object_id specified by nviRequest is invalid.
bit 30	invalid_request	Turns ON if the object_request specified by nviRequest is invalid.
bit 29	disabled	Indicates whether or not a given object is enabled for operation. Turns ON when an object is disabled.
bit 28	out_of_limits	Not supported. (Always 0.)
bit 27	open_circuit	Not supported. (Always 0.)
bit 26	out_of_service	Not supported. (Always 0.)
bit 25	mechanical_fault	Not supported. (Always 0.)
bit 24	feedback_failure	Not supported. (Always 0.)
bit 23	over_range	Not supported. (Always 0.)
bit 22	under_range	Not supported. (Always 0.)
bit 21	electrical_fault	Not supported. (Always 0.)
bit 20	unable_to_measure	Not supported. (Always 0.)
bit 19	comm_failure	Not supported. (Always 0.)
bit 18	fail_self_test	Not supported. (Always 0.)
bit 17	self_test_in_progress	Not supported. (Always 0.)
bit 16	locked_out	Not supported. (Always 0.)
bit 15	manual_control	Not supported. (Always 0.)
bit 14	in_alarm	Not supported. (Always 0.)
bit 13	in_override	Not supported. (Always 0.)
bit 12	report_mask	Not supported. (Always 0.)
bit 11	programming_mode	Not supported. (Always 0.)
bit 10	programming_fail	Not supported. (Always 0.)
bit 9	alarm_notify_disabled	Not supported. (Always 0.)
bits 8 to 0	reserved	Always 0.

5.3 VSD Input Network Variables

5.3.1 Drive Speed Setpoint (Inverter Speed Operation Command)

Input: SNVT_switch nviDrvSpeedStpt;

This network variable sets Inverter run/stop commands and frequency references.

State	Value	Command
0	NA	Inverter stop
1	0.0	Zero-speed operation
1	1 to 200	0.5 to 100.0 %
1	201 to 255	100.0 %
FF (-1)	NA	Disable

Defaults: state = FF; value = 0

After the power is turned ON, "CALL" is displayed at the Operator until data is received.

Also, when a receive heartbeat time is set, a communications error is generated and "bUS" is displayed at the Operator if no data is received within that time period.

Frequency reference = nviDrvSpeedStpt (%) × nviDrvSpeedScale (%) × nciNmlFreq (Hz)

Note: When values greater than the maximum output frequency and less than 400 Hz are set, operation is executed at the maximum output frequency. Values greater than 400 Hz are not set in the Inverter.

Related network variables, configuration properties:

nciRcvHrtBt

5.3.2 Drive Frequency Reference (Hz) (Inverter Frequency Reference)

Input: SNVT_freq_hz nviInvSetFreq;

This network variable sets Inverter frequency reference values in Hz.

> Note: When values greater than the maximum output frequency and less than 400 Hz are set, operation is executed at the maximum output frequency. Values greater than 400 Hz are not set in the Inverter.

Setting range: 0.0 to 6,553.5 Hz (Effective range: 0.0 to 400.0 Hz)

Default: nciInvSetFreq set value

Frequency reference values are restricted by the maximum output frequency and the upper limit frequency that have been set for the Inverter.

After the power is turned ON, "CALL" is displayed at the Operator until data is received. Also, when a receive heartbeat time is set, a communications error is generated and "bUS" is displayed at the Operator if no data is received within that time period.

Frequency reference = nviInvSetFreq (Hz)

Related network variables, configuration properties:

nciRcvHrtBt, nciInvSetFreq

5.3.3 Drive Speed SetFreq (%) (Inverter Speed Reference)

Input: SNVT_lev_percent nviDrvSpeedRef;

This network variable sets Inverter speed reference values in percentages.

> Note: When values greater than the maximum output frequency and less than 400 Hz are set, operation is executed at the maximum output frequency. Values greater than 400 Hz are not set in the Inverter.

Setting range: -163.840 to 163.835 % (Effective range: 0.0 to frequency conversion value 400.0 Hz)

Default: nciDrvspeedRef set value

After the power is turned ON, "CALL" is displayed at the Operator until data is received. Also, when a receive heartbeat time is set, a communications error is generated and "bUS" is displayed at the Operator if no data is received within that time period.

Speed reference value = nviDrvSpeedRef (%) × nviDrvSpeedScale (%) × nciNmlFreq (Hz)

Related network variables, configuration properties:

nciRcvHrtBt

5.3.4 Drive Run Reference (Inverter Run Reference)

Input: SNVT_switch nviRunCommand;

This network variable sets Inverter run and stop commands.

State	Value	Command
0	NA	Inverter stop
1	NA	Inverter run
FF (Default)	NA	Inverter stop

Defaults: state = FF; value = 0

After the power is turned ON, "CALL" is displayed at the Operator until data is received. Also, when a receive heartbeat time is set, a communications error is generated and "bUS" is displayed at the Operator if no data is received within that time period.

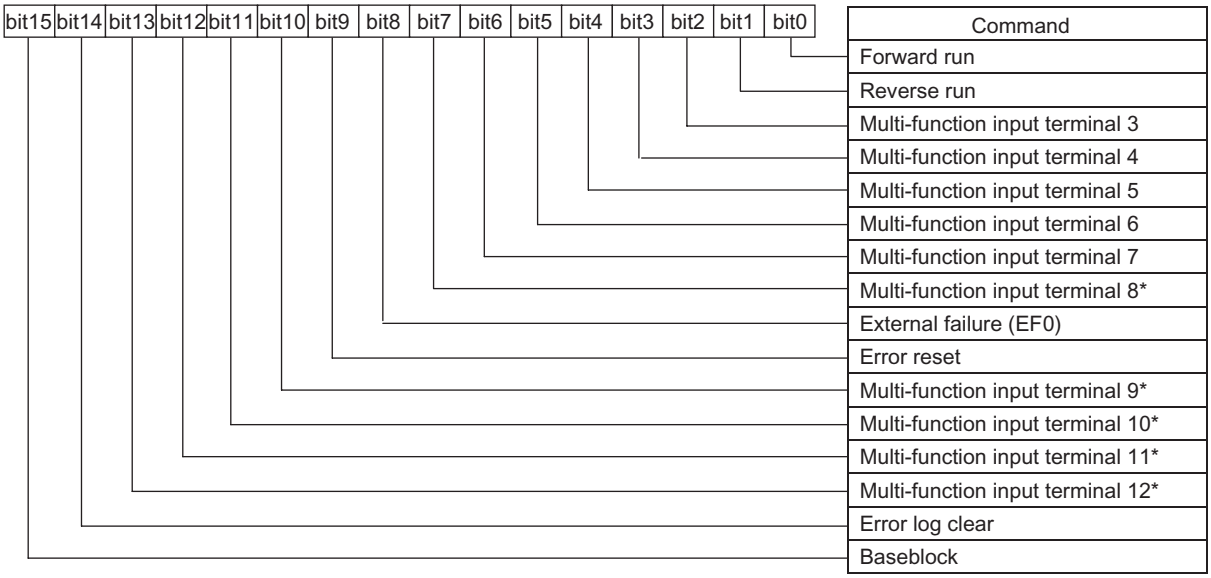
Related network variables, configuration properties:

nciRcvHrtBt

5.3.5 Drive Operation Commands (Inverter Control Commands)

Input: SNVT_state nviOpCommands;

These network variables can control operations such as Inverter running and stopping.



There is a logical OR relationship between commands using these variables and other run command-related network variables and multi-function control terminals.

Default: 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

* Multi-function input terminals 8 to 12 are supported by only the Varispeed G7 Series. They are not used by the Varispeed F7 Series.

5.3.6 Drive Speed Setpoint Scaling (Inverter Speed Scaling)

Input: SNVT_lev_percent nviDrvSpeedScale;

This network variable is used for adjusting the motor rotation direction and speed.

Frequency reference = nviDrvSpeedStpt (or nviDrvspeedfref) × nviDrvSpeedScale × nciNml-freq

Data range: -163.840 % to 163.830 % (0.005 %). 163.835 % is taken as 100 %.

Default: nciDrvSpeedScale set value

Related network variables, configuration properties:

nciRcvHrtBt

5.3.7 Drive Emergency (Inverter Emergency Stop)

Input: SNVT_hvac_emerg nviEmergOverride;

This network variable executes Inverter emergency stops from the network. When an emergency stop is executed, "EF0" is displayed at the Inverter.

Data range: 0, 4, FF (0: Emergency stop clear; 4: Emergency stop; FF: Disabled)

Default: FF

0: Emergency stop clear; 4: Emergency stop; FF: Disabled

5.3.8 Drive Failure Reset Command (Inverter Error Reset)

Input: SNVT_switch nviFltRstCommand;

This network variable performs a reset from the network when an Inverter error occurs.

Data range: value · · · NA, state · · · –1,0,1

Default: value · · · 0, state · · · –1

Errors are cleared in state1, and not in 0 or –1.

5.3.9 Drive Energy Clear (Cumulative Power Value Clear)

Input: SNVT_switch nviDrvEnergyClr;

This network variable clears accumulated power values.

Data range: value · · · NA, state · · · –1 (FF hex),0,1

Default: value · · · 0, state · · · –1 (FF hex)

Accumulated power values are cleared in state1, and not in 0 or –1 (FF hex).

Related network variables, configuration properties:

nvoDrvEnergy, nciDrvEngylimit, nciEngyMinDelta

5.3.10 Drive Parameter Read (Inverter Constant Read Request)

Input: SNVT_count nviReadParamNum;

This network variable is used to read Inverter constants. Set the register number of the constant that is to be read. After the Inverter receives the data, it sets the data for that register number in nvoReadParamVal to be output.

Data range: 0000 to FFFF hex

Default: 0

For register numbers, refer to the Inverter instruction manual.

Related network variables, configuration properties:

nviWriteParamNum, nvoReadParamVal, nvoParamErr

5.3.11 Drive Parameter Write (Inverter Constant Write Request)

Input SNVT_count nviWriteParamNum;

This network variable is used to write inverter constants. Set the register number of the constant that is to be written. Then set the changed data in nviWriteParamVal. After the Inverter receives the data, it sets the data for that register number in nvoReadParamVal to be output.

Note: If no data is set in nviWriteParamVal within 30 seconds after this network variable has been set, an error code is stored in nvoParamErr and the data set in nviWriteParamNum is changed to 0.

Data range: 0000 to FFFF hex

Default: 0

Related network variables, configuration properties:

nviReadParamNum, nvoWriteParamVal, nvoParamErr

5.3.12 Drive Parameter Write Data (Inverter Constant Write Data)

Input: SNVT_count_inc nviWriteParamVal;

This network variable is used to write inverter constants. Set the constant data that is to be changed. After the Inverter receives the new constant data, it makes the change and then sets the changed constant data in nvoReadParamVal to be output.

Data range: -32,768 to 32,767

Default: 0

Related network variables, configuration properties:

nviReadParamNum, nvoWriteParamNum, nvoParamErr

Run Command and Frequency Reference Combinations and Priority

The Inverter provides multiple network variables for run commands and frequency references, but they can only be used one at a time. This section describes various combinations of network variables and their orders of priority.

- Network Variable Combinations for Run Commands and Frequency References

	Combination 1	Combination 2	Combination 3
Frequency (speed) reference	nviInvSetFreq	nviDrvSpeedStpt (value)	nviDrvSpeedFref
Run command	nviRunCommand	nviDrvSpeedStpt (state)	nviRunCommand

- Order of priority

  Combination 1 > Combination 2 > Combination 3 (Default: All disabled)

- Precautions when Making the Settings
  - Combination 1

    Set the network variables as follows:
    nviDrvSpeedStpt (state) = FF
    nviDrvSpeedRef = 7FFF
    Do not execute binding for these network variables.
  - Combination 2

    Set the network variables as follows:
    nviInvSetFreq = 7FFF (default)
    nviDrvSpeedRef = 7FFF (default)
    nviRunCommand (state) =FF (default)
    Do not execute binding for these network variables.
  - Combination 3

    Set the network variables as follows:
    nviDrvSpeedStpt (state) = FF
    nviInvSetFreq = 7FFF
    Do not execute binding for these network variables.

5.4 VSD Output Network Variables

5.4.1 Drive Speed Feedback (%) (Inverter Speed Monitoring)

Output: SNVT_lev_percent nvoDrvSpeed;

This network variable outputs the Inverter's output frequency as a percentage of the standard motor frequency.

Data range: -163.840 % to 163.830 % (0.005 %)

Output Timing	Explanation
Event driven	Sent to network when data is changed.
nciSndHrtBt	When a send heartbeat time is set, the data is output within that time period.
nciMinOutTm	When a minimum output refresh time has been set, data that is changed during the specified time period is not output until that time period has elapsed.
nciFreqMinDelta	Output when outside of the change range that has been set.

Service type

Default: Authentication type

5.4.2 Drive Run Status (Inverter Run Monitoring)

Output: SNVT_switch nvoRunStatus;

This network variable monitors Inverter run and stop status.

State	Value	Command
0	NA	Inverter stopped
1	NA	Inverter running
FF (Default)	NA	None

Default: State = 0

Output Timing	Explanation
Event driven	Sent to network when data is changed.
nciSndHrtBt	When a send heartbeat time is set, the data is output within that time period.

Service type

Default: Authentication type

Output timing: Event driven, nciSndHrtBt

5.4.3 Drive Output Frequency (Inverter Output Frequency Monitoring)

Output: SNVT_freq_hz nvoInvOutFreq;

This network variable outputs Inverter output frequency.

Data range: 0 to 6553.4Hz (0.1Hz)

Output Timing	Explanation
Event driven	Sent to network when data is changed.
nciSndHrtBt	When a send heartbeat time is set, the data is output within that time period.
nciMinOutTm	When a minimum output refresh time has been set, data that is changed during the specified time period is not output until that time period has elapsed.
nciFrefMinDelta2	Output when outside of the change range that has been set.

Service type

Default: Authentication type

5.4.4 Drive Output Current (Output Current Monitoring)

Output: SNVT_amp nvoDrvCurrent;

This network variable outputs Inverter output current.

Data range: 0 to 3,276.6 A

Output Timing	Explanation
Event driven	Sent to network when data is changed.
nciSndHrtBt	When a send heartbeat time is set, the data is output within that time period.
nciMinOutTm	When a minimum output refresh time has been set, data that is changed during the specified time period is not output until that time period has elapsed.

Service type

Default: Authentication type

5.4.5 Drive Output Voltage (Output Voltage Monitoring)

Output: SNVT_volt nvoDrvVolt;

This network variable outputs Inverter output voltage.

Data range: 0 to 3276.7 V (Unit: 0.1 V)

Output Timing	Explanation
Event driven	Sent to network when data is changed.
nciSndHrtBt	When a send heartbeat time is set, the data is output within that time period.
nciMinOutTm	When a minimum output refresh time has been set, data that is changed during the specified time period is not output until that time period has elapsed.

Service type

Default: Authentication type

5.4.6 Drive DC Voltage (Main-circuit DC Voltage Monitoring)

Output: SNVT_volt nvoDCBusVolt;

This network variable outputs main-circuit DC voltage.

Data range: 0 to 3276.7 V (Unit: 0.1 V)

Output Timing	Explanation
Event driven	Sent to network when data is changed.
nciSndHrtBt	When a send heartbeat time is set, the data is output within that time period.
nciMinOutTm	When a minimum output refresh time has been set, data that is changed during the specified time period is not output until that time period has elapsed.

Service type

Default: Authentication type

5.4.7 Drive Output Power (Output Power Monitoring)

Output: network output SNVT_power_kilo nvoDrvPwr;

This network variable outputs Inverter output power.

Data range: 0 to 6,553.4 kW (Unit: 0.1 kW)

Output Timing	Explanation
Event driven	Sent to network when data is changed.
nciSndHrtBt	When a send heartbeat time is set, the data is output within that time period.
nciMinOutTm	When a minimum output refresh time has been set, data that is changed during the specified time period is not output until that time period has elapsed.

Service type

Default: Authentication type

5.4.8 Cumulative Drive Energy (Cumulative Power Monitoring)

Output: SNVT_elec_kwh_l nvoDrvEnergy;

This network variable outputs Inverter cumulative power.

Cumulative power value = Previous cumulative power value + [Present output power data × (Present output power value acquire time – Previous output power value acquire time)]

Cumulative period: 100 ms ± 10 % (Varies slightly depending on the amount of data sent and received in the network.)

Data range: 0 to 429,496,729.4 kwh (Unit: 0.1 kwh)

Output Timing	Explanation
Event driven	Sent to network when data is changed.
nciSndHrtBt	When a send heartbeat time is set, the data is output within that time period.
nciMinOutTm	When a minimum output refresh time has been set, data that is changed during the specified time period is not output until that time period has elapsed.
nciEngyMinDelta	Output when changed outside of fixed change range.

Service type

Default: Authentication type

Related network variables, configuration properties:

nviDrvEnergyClr, nciDrvEngylimit, nciEngyMinDelta

IMPORTANT

Do not use this monitoring for accounting system etc which calculates the charges for power.

5.4.9 Drive Total Running Hours (Total Running Hours Monitoring)

Output: SNVT_time_hour nvoDrvRunHours;

This network variable outputs the Inverter's accumulated running time.

Data range: 0 to 65,534 hours (Unit: 1 hour)

The data is invalid when set to FFFF = 65,535 hours.

Output Timing	Explanation
Event driven	Sent to the network when the data is changed by more than 1 hour.

Service type

Default: Authentication type

5.4.10 Drive Fault Status (Inverter Fault Monitoring)

Output: SNVT_switch nvoInvFault;

This network variable is used to monitor Inverter fault status.

State	Value	Command
0	NA	Inverter normal (after fault cleared)
1	NA	Inverter fault occurring
FF (Default)	NA	Inverter normal (from turning ON power until fault occurs)

Default: State = FF

Output Timing	Explanation
Event driven	Sent when fault occurs and when fault is cleared.

Service type

Default: Authentication type

5.4.11 Drive Alarm Status (Inverter Alarm Monitoring)

Output: SNVT_switch nvoInvAlarm;

This network variable is used to monitor Inverter alarm status.

State	Value	Command
0	NA	Inverter normal (after alarm cleared)
1	NA	Inverter alarm occurring
FF (Default)	NA	Inverter normal (from turning ON power until alarm occurs)

Default: State = FF

Output Timing	Explanation
Event driven	Sent when alarm occurs and when alarm is cleared.

Service type

Default: Authentication type

5.4.12 Drive Parameter Read Data (Inverter Constant Read Data)

Input: SNVT_count_inc nvoReadParamVal;

This network variable is used for setting and outputting data for constant numbers requested by nviReadParamNum.

Data range: -32,768 to 32,767

Default: 0

Output Timing	Explanation
Event driven	The constant data is sent after normal reception of nviReadParamNum.

Related network variables, configuration properties:

nviReadParamNum, nviWriteParamNum, nviWriteParamVal

5.4.13 Drive Parameter Error (Inverter Constant Access Error)

Input: SNVT_count nvoParamErr;

An error code is set at this network variable when inappropriate data is set for nviReadParam-Num, nviWriteParamNum, or nviWriteParamVal, or when an Inverter constant access-related error occurs.

Error Codes

Table 5.1 Error Codes

Error Code	Explanation
0 (00h)	Normal
2 (02h)	Invalid register number • An attempt was made to access a non-existent register number.
33 (21h)	Data setting error • A simple upper limit or lower limit error has occurred in the control data or when writing constants. • When writing constants, the constant setting was invalid.
34 (22h)	Write mode error • An attempt was made to change a constant during operation. • An attempt was made to write read-only data.
35 (23h)	Writing during main circuit undervoltage (UV) error • An attempt was made to change a constant during a UV (main circuit undervoltage) alarm.
36 (24h)	An attempt was made to change a constant while it was being processed at the Inverter.
255 (FFh)	Command input time over • More than 30 seconds elapsed at the input interval for nvoWriteParamNum or nvoWriteParamVal.

Output Timing	Explanation
Event driven	Constant data is sent after normal reception of nviReadParamNum.

Related network variables, configuration properties:

nviReadParamNum, nviWriteParamNum, nviWriteParamVal

5.4.14 Drive Speed Setpoint Feedback 1 (Inverter Speed Reference Monitor 1)

Output: SNVT_lev_percent nvoSpdStptFb;

This network variable sets and outputs speed reference values from the network.

Data range: 0 to 163.830 % (0.005 %)

Output Timing	Explanation
Event driven	Constant data is sent after normal reception of nviReadParamNum.

Service type

Default: Authentication type

5.4.15 Drive Speed Setpoint Feedback 2 (Inverter Speed Reference Monitor 2)

Input: SNVT_lev_percent nvoSpdCmd;

This network variable sets and outputs speed reference values that are set for the Inverter. It outputs reference values from the places that have frequency reference rights (i.e., external terminals, Operator, or communications).

Data range: 0 to 163.835 % (0.005 %)

Output Timing	Explanation
Event driven	Constant data is sent after normal reception of nviReadParamNum.

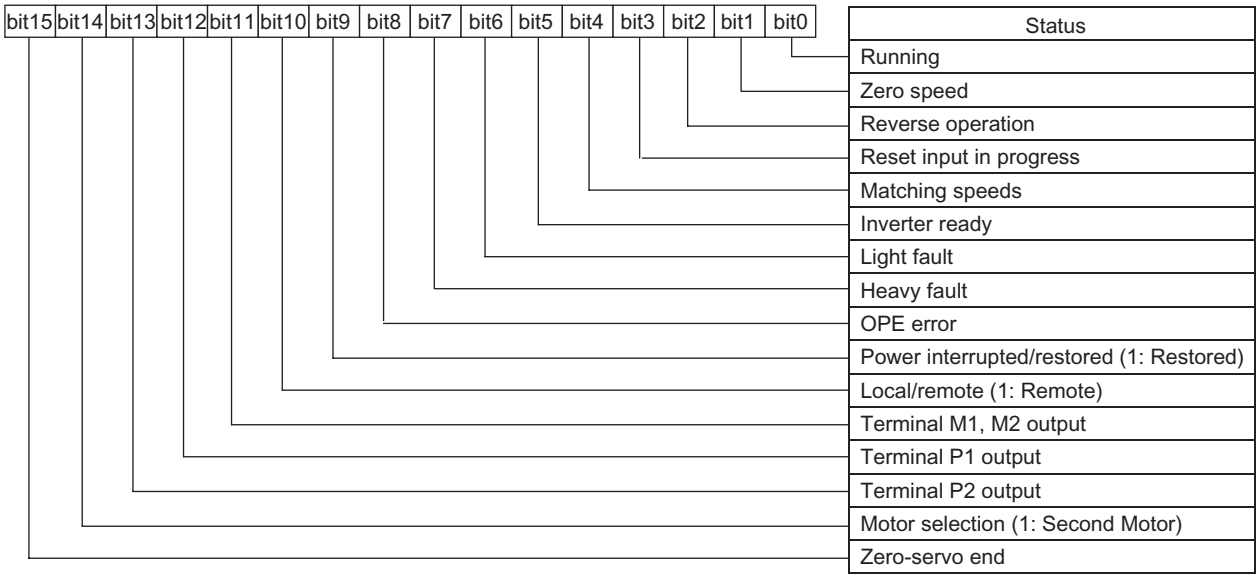
Service type

Default: Authentication type

5.4.16 Drive Status (Inverter Status Monitoring)

Output: SNVT_state nvoDrvStatus;

This network variable is used to output Inverter status.



Output Timing	Explanation
Event driven	Sent when status is changed.

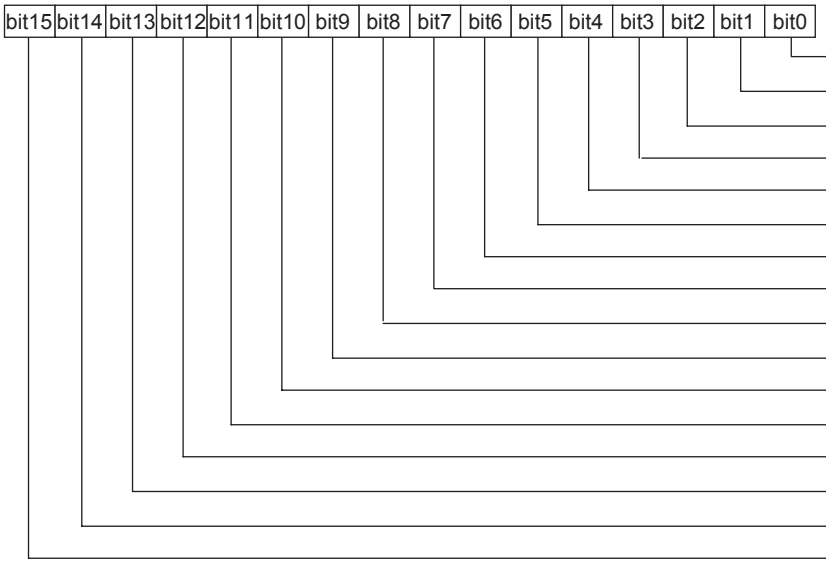
Service type

Default: Authentication type

5.4.17 Drive Fault Status 1 (Inverter Fault Status Monitor 1)

Output: SNVT_state nvoFltStatus1;

This network variable is used to output Inverter fault status.



Display	Fault Contents
PUF	Blown fuse
Uu1	Main circuit voltage low
Uu2	Control power supply voltage low
Uu3	MC fault
-	Not used.
GF	Ground fault
oC	Overcurrent
ou	Overvoltage
oh	Inverter overheating
oh1	Inverter overheating
oL1	Motor overload
oL2	Inverter overload
oL3	Overtorque 1
oL4	Overtorque 2
rr	Control transistor fault
rh	Control resistor overheating

Output Timing	Explanation
Event driven	Sent when any of the above faults occurs.

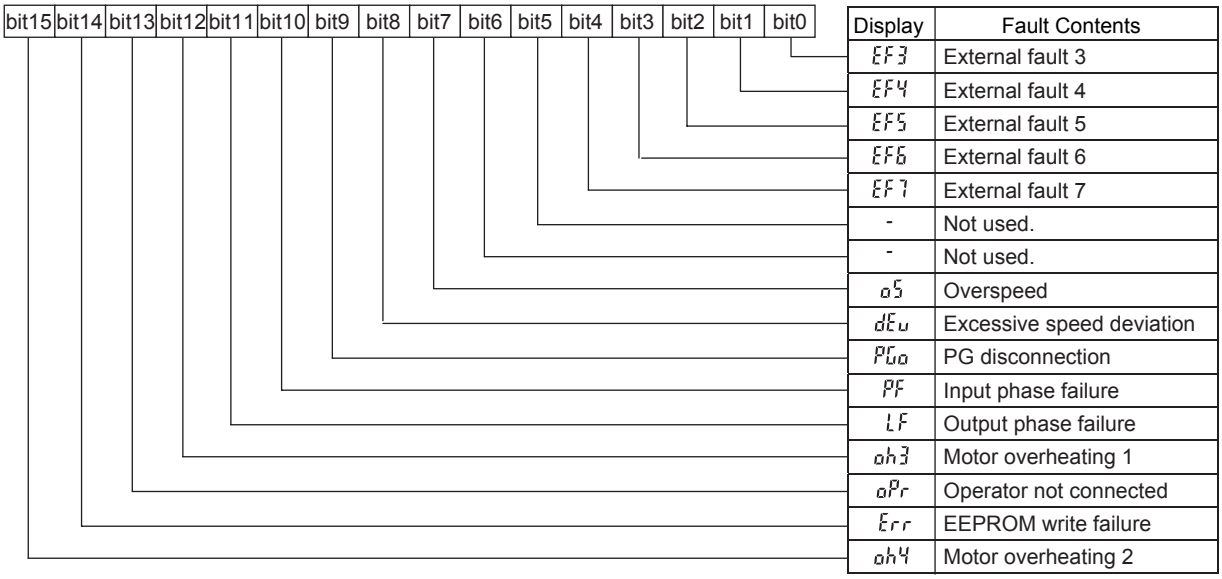
Service type

Default: Authentication type

5.4.18 Drive Fault Status 2 (Inverter Fault Status Monitor 2)

Output: SNVT_state nvoFltStatus2;

This network variable is used to output Inverter fault status.



Display	Fault Contents
EF3	External fault 3
EF4	External fault 4
EF5	External fault 5
EF6	External fault 6
EF7	External fault 7
-	Not used.
-	Not used.
oS	Overspeed
dEv	Excessive speed deviation
PGo	PG disconnection
PF	Input phase failure
LF	Output phase failure
oh3	Motor overheating 1
oPr	Operator not connected
Err	EEPROM write failure
oh4	Motor overheating 2

Output Timing	Explanation
Event driven	Sent when any of the above faults occurs.

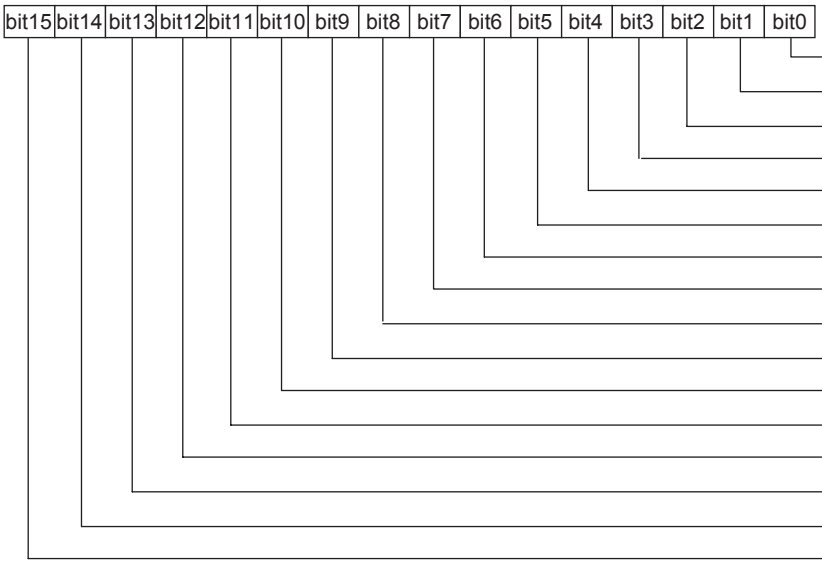
Service type

Default: Authentication type

5.4.19 Drive Fault Status 3 (Inverter Fault Status Monitor 3)

Output: SNVT_state nvoFltStatus3;

This network variable is used to output Inverter fault status.



Display	Fault Contents
cE	MEMOBUS transfer fault
bUS	LONWORKS transfer fault
-	Not used.
-	Not used.
cF	Control fault
cuE	Zero-server fault
EF0	External fault
-	PID feedback loss
UL3	Undertorque detection 1
UL4	Undertorque detection 2
oL	Overload during HSB
-	Not used.
-	Not used.
-	Not used.
-	Not used.
cPF	Hardware fault

Output Timing	Explanation
Event driven	Sent when any of the above faults occurs.

Service type

Default: Authentication type

5.4.20 Drive Emerg Status (Inverter Emergency Stop Status)

Output: SNVT_hvac_emerg nvoEmergStatus;

This network variable monitors Inverter run and stop status.

Data	Name	Explanation
0	EMERG_NORMAL	Normal
4	EMERG_SHUTDOWN	Emergency stop
FF (Default)	EMERG_NUL	-

Default: State = FF

Output Timing	Explanation
Event driven	Sent when any of the above heavy faults occurs.

Service type

Default: Authentication type

5.5 Setting Inverter Constants from the Network

5.5.1 Reading Inverter Constants

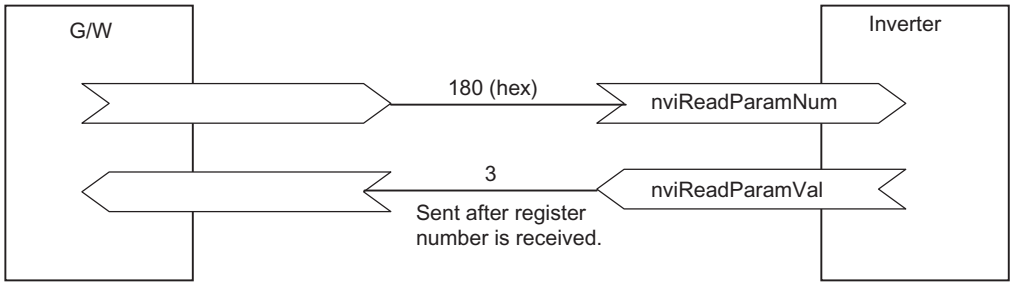
1. Set to nviReadParamNum, in hexadecimal, the register number of the Inverter constant that is to be read.
2. When the nviReadParamNum data is refreshed, the Inverter will set the data contents of the applicable Inverter constant in nvoReadParamVal for output.
3. If invalid data is set in nviReadParamNum due to, for example, the register number for a non-existent Inverter constant being specified, an error code will be set in nvoParamErr for output. (Refer to "5.4.13 Drive Parameter Error (Inverter Constant Access Error).")

Example: Reading the Setting for b1-01 (Reference Selection)

Conditions

Frequency selection (b1-01): 180 hex

b1-01 setting: 3 (Communications)



Use the MEMOBUS register number listed on the Inverter instructions for the Inverter constant.

5.5.2 Writing Inverter Constants

1. Set to nviWriteParamNum, in hexadecimal, the register number of the Inverter constant that is to be changed.
2. Enter the settings in nviWriteParamVal. (If the nviWriteParamVal data is not received within 30 seconds after the nviWriteParamNum data is received, the Inverter will discard the nviWriteParamNum data.)
3. When the Inverter receives nviWriteParamNum and nviWriteParamVal, it processes the Inverter constant change. When the change is completed normally, the changed data is then set in nvoReadParamVal for output.
4. If the settings cannot be changed due to, for example, the register number for a non-existent Inverter constant being specified, an error code will be set in nvoParamErr for output. (Refer to "5.4.13 Drive Parameter Error (Inverter Constant Access Error).")

IMPORTANT

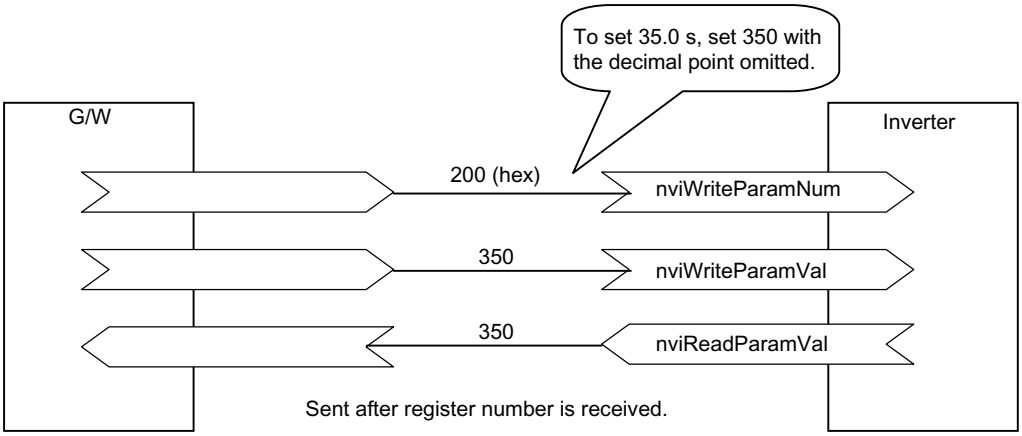
Sending data to nviWriteParamNum and nviWriteParamVal must be done in the order described in 1) and 2) above. If the order is reversed, the intended settings will not be made and unintended settings may be made instead.

Example: Changing the c1-01 (Ramp Up Time) Setting

Condition:

Ramp up time (c1-01): 200 hex

c1-01 setting: Changed from 10.0 s to 35.0 s.



Note: Refer to the *Table 5.1 Error Codes* for error codes.

6

Drive Configuration Properties

6.1 Drive-related Network Configuration Properties

6.1.1 Maximum Motor Speed

network input config SNVT_lev_percent nciMaxSpeed;

Set the motor frequency reference upper limit with the maximum output frequency (E1-04) taken as 100 %. This value will be saved in Inverter constant d2-01 (frequency reference upper limit). It will not be saved during operation.

Set the minimum speed and the maximum speed as follows:

0 ≤ minimum speed ≤ maximum speed ≤ 110.000

Setting range: 0.000 to 110.000 %

Default: 100.000 %

SCPT Reference: SCPTmaxSetpoint (50).

6.1.2 Minimum Motor Speed

network input config SNVT_lev_percent nciMinSpeed;

Set the motor frequency reference lower limit with the maximum output frequency (E1-04) taken as 100 %. This value will be saved in Inverter constant d2-02 (frequency reference lower limit).

Set the minimum speed and the maximum speed as follows:

0 ≤ minimum speed ≤ maximum speed ≤ 110.000

Setting range: 0 to 40.000 %

Default: 0 (%)

SCPT Reference: SCPTminSetpoint (53)

6.1.3 Send Heartbeat Time

network input config SNVT_time_sec nciSndHrtBt;

Set the scheduled output time for the output network variable. When this setting is made, the monitor data is output in fixed cycles.

Setting range: 0.0 to 6,553.5 s (0.1 s) *6,553.5 s is handled as 0 s.

Default: 0 (Invalid)

SCPT Reference: SCPTmaxSendTime (49)

6.1.4 Nominal Motor Speed in RPM (Motor's Rated Rotation Frequency)

network input config SNVT_rpm nciNmlSpeed;

Set the motor's rated rotation frequency.

Setting range: 0 to 65,534 min^{-1} ($1min^{-1}$)

Default: 1,800 min^{-1}

SCPT Reference: SCPTnomRPM (158)

6.1.5 Nominal Motor Frequency (Motor's Rated Frequency)

network input config SNVT_freq_hz nciNmlFreq;

Set the motor's rated frequency.

Setting range: 0 to 100 Hz (1 Hz)

Default: 60 Hz

SCPT Reference: SCPTnomFreq (159)

6.1.6 Drive Ramp Up Time (Inverter Acceleration Time)

network input config SNVT_time_sec nciRampUpTm;

Set the motor ramp up time. This value is saved in the Inverter constant C1-01.

Setting range: 0.0 to 6,000.0 s (0.1 s)

Default: 10.0 s

SCPT Reference: SCPTrampUpTm (160)

6.1.7 Minimum Ramp Down Time (Minimum Deceleration Time)

network input config SNVT_time_sec nciRampDownTm;

Set the motor ramp down time. This value is saved in the Inverter constant C1-02.

Setting range: 0.0 to 6000.0 s (0.1 s)

Default: 10.0 s

SCPT Reference: SCPTrampDownTm (161).14

6.1.8 Receive Heartbeat Time

network input config SNVT_time_sec nciRcvHrtBt;

Set the maximum reception interval for nviDrvSpeedStpt. A communications error "bUS" will be displayed if data is not received within this set time period.

Setting range: 0.0 to 6,553.4 s (0.1 s).
If the set value is 0, no communications "bUS" error is detected.

Default: 0 (Invalid)

SCPT Reference: SCPTmaxRcvTime (48)

6.1.9 Minimum Send Time

network input config SNVT_time_sec nciMinOutTm;

Set the minimum output time for monitor data. The monitor data will be output after the set time has elapsed following a change to the data.

Setting range: 0.0 to 6,553.4 s (0.1 s).
When the set value is 0, monitor data output is event driven.

Default: 0.5 s

SCPT Reference: SCPTminSendTime (52).

6.1.10 Location Label

network input config SNVT_str_asc nciLocation;

Information regarding the physical position of a node can be set separately from the neuron ID (6 bytes).

Setting range: 0 to 31 bytes

Default:: ¥0 (Null)

SCPT Reference: SCPT_location (17)

6.1.11 Power Delay Timer

network input config SNVT_time_sec nciPwUpOutTm;

Set the delay time from when the power is turned ON until network variable output is started.

Setting range: 0 to 65534 (1 s)

Default: FFFF (Invalid)

SCPT Reference: SCPT_Pwrupdelay (72)

6.1.12 Output Frequency Monitor Minimum Change Range Setting 1: nciFreqMinDelta1

network input config SNVT_lev_percent nciDrvSpeedScale;

Set the minimum output change range for nvoDrvSpeed.

Set the value for when the power is turned ON.

Setting range: -163.840 % to 163.830 (0.005 %).

If the set value is 7FFF, it is set as invalid data.

Default: 0 (%)

SCPT Reference: SCPTdefScale (162)

6.1.13 Output Frequency Monitor Minimum Change Range Setting 2: nciFreqMinDelta2

network input config SNVT_ freq_hz nciInvSetFreq;

Set the minimum output change range for nvoInvOutFreq.

Setting range: 0.0 to 400.0 (Hz)

If the set value is 7FFF, it is set as invalid data.

Default: 7FFF (Invalid)

6.1.14 nviDrvSpeedScale Default

network input config SNVT_lev_percent nciDrvSpeedScale;

Set the value for nviDrvSpeedScale for when the power is turned ON.

Setting range: -163.840 % to 163.835 (0.005 %).

If the set value is 7FFF = +163.835 %, it is set as invalid data.

Default: 100 (%)

SCPT Reference: SCPTdefScale (162)

6.1.15 nviInvSetFreq Default

network input config SNVT_ freq_hz nciInvSetFreq;

Set the value for nviInvSetFreq for when the power is turned ON.

Setting range: 0.0 to 6553.5 (Hz)

If the set value is FFFF, it is set as invalid data.

Default: FFFF (Invalid)

SCPT Reference: SCPTdefScale (162)

6.1.16 nviDrvSpeedRef Default

network input config SNVT_lev_percent nciDrvSpeedRef;

Set the value for nviDrvSpeedRef for when the power is turned ON.

Setting range: -163.840 % to 163.835 (0.005 %).

If the set value is 7FFF = +163.835 %, it is set as invalid data.

Default: 7FFF (Invalid)

6.1.17 Cumulative Power Monitor Upper Limit: nciDrvEngylimit

network input config SNVT_elec_kwh_l nciDrvEngylimit;

Set the cumulative power monitor (nvoDrvEnergy) upper limit. When the cumulative power monitor value exceeds this set value, the accumulation will start over from 0. (Example: If the set value is 1,000.0, the next number after 999.9 will be 0.)

Setting range: -214,748,364.8 to 214,748,364.6 kwh

Invalid value: 0x7FFFFFFF (214,748,364.7)

If the set value is invalid, the nvoDrvEnergy value accumulates until the maximum value.

If the set value is for less than 0, it is treated as 0 and the cumulative power value does not accumulate.

Default: 0x7FFFFFFF (214,748,364.7) (Invalid)

6.1.18 Cumulative Power Monitor Minimum Change Range Setting

network input config SNVT_elec_kwh_l nciEngyMinDelta;

Set the minimum change range for the output from the cumulative power monitor (nvoDrvEnergy).

Setting range: -214,748,364.8 to 214,748,364.6 kwh
Valid range: 0.1 to 214,748,364.6
No value greater than nvoDrvEngylimit can be set.

If nciDrvEngylimit ≤ nciEngyMinDelta, the data will be ignored and the set value will not be changed.

Default: Invalid value

6.1.19 Reference Selection Mode

network input config SNVT_count nciOpMode;

Run command and frequency reference rights can be selected and switched from the network. The selection can be changed as shown below by setting nciOpMode (default: 0) from 0 to 3.

nciOpMode Set Value	0 (Default)	1	2	3
Reference selection	b1-01 set value	Communications	b1-01 set value	Communications
Operation method selection	b1-02 set value	b1-02 set value	Communications	Communications

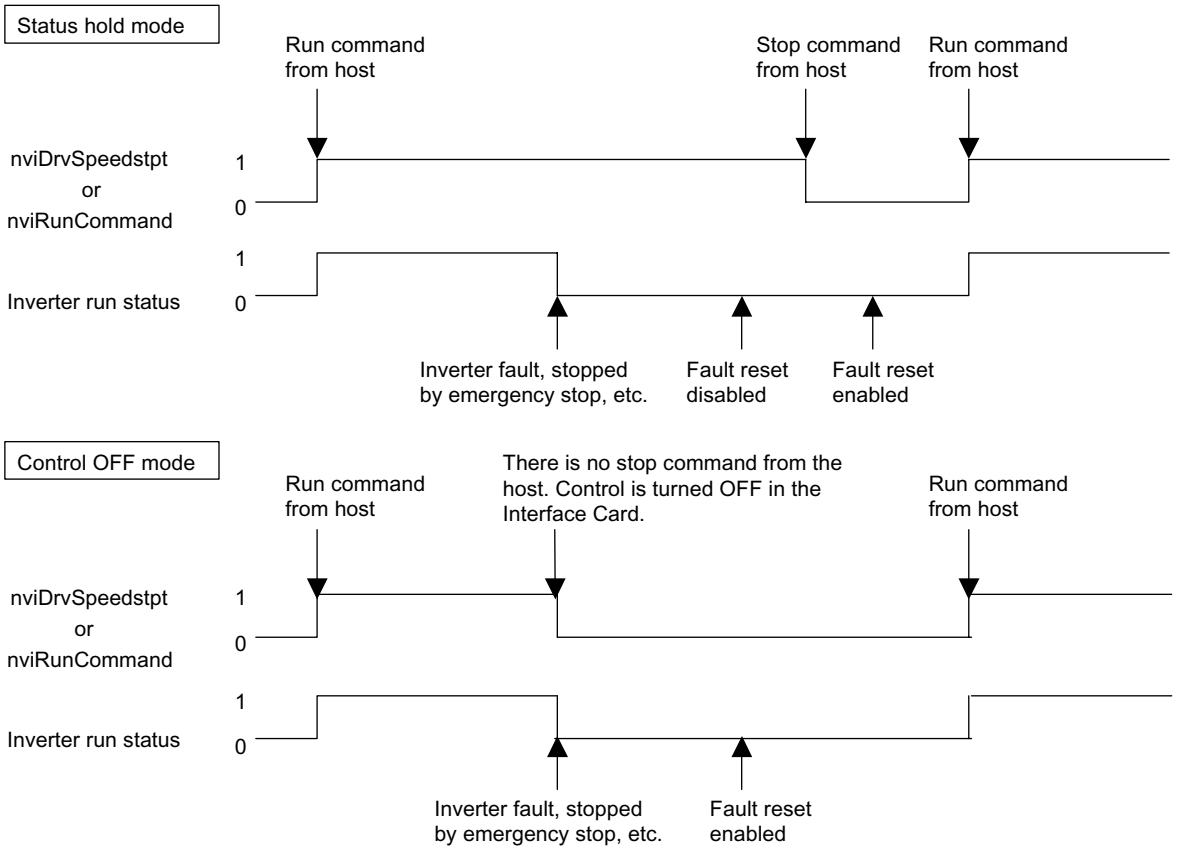
6.1.20 Run Command Status Mode

network input config SNVT_switch nciDrvRunMode;

If the Inverter is stopped during operation for some reason other than a stop command from the network, determine whether the run command is to be forced OFF in the SI-W1 from communications or whether the run command status is to be held as is.

State	Value	Command
0	NA	Status hold
1	NA	OFF
FF (Default)	NA	Status hold

Default: State = 0 x FF



7

Fault Diagnosis

7.1 Fault Detection

The SI-W1 has a diagnosis function separate from that of the Inverter. When a fault is detected, the Inverter is notified and stopped. (With faults for which the stop method can be selected, the Inverter is stopped according to the settings.) The contents of faults are displayed at the Digital Operator.

Display	Explanation	Probable Cause	Countermeasure
bUS	Communications error: Communications error detected when specified data cannot be received within the receive heartbeat time.	−	Check communications devices and signals.
CPF00	Digital Operator communications error 1: Cannot communicate with Digital Operator although 5 seconds have elapsed since the power was turned ON.	Faulty contact at Digital Operator connector.	Remove the Digital Operator and then re-mount it.
		SI-W1 control circuit defect	Replace the SI-W1.
CPF01	Digital Operator communications error 2: Cannot communicate with Digital Operator although 5 seconds have elapsed since the power was turned ON.	Faulty contact at Digital Operator connector.	Remove the Digital Operator and then re-mount it.
		SI-W1 control circuit defect	Replace the SI-W1.
CPF03	EEPROM defect	−	Turn the power ON and OFF.
		Power was turned OFF during EEPROM writing.	Initialize the SI-W1.
		Control circuit error	Replace the SI-W1.
CPF20	SI-W1 fault	Fault at SI-W1 connector	Turn OFF the power and reinstall the SI-W1.
CPF21	SI-W1 self-diagnosis fault	Access failure between CPU and neuron chip	Turn the power ON and OFF.
		SI-W1 failure	Replace the SI-W1.
CPF22	SI-W1 model code fault	−	
CPF23	SI-W1 reciprocal diagnosis fault	Access failure between SI-W1 and Inverter	Replace the SI-W1.

7.2 Alarm Detection

When an warning alarm is detected, once the cause of the alarm is removed the original status is automatically restored without generating a fault.

Display	Explanation	Probable Cause	Countermeasure
bUS	Communications error: Communications error detected when specified data cannot be received within the receive heartbeat time.	−	Check communications devices and signals.
CALL	Waiting for communications: Data cannot be received normally when power is turned ON.	−	Check communications devices and signals.

8

Function Modules

8.1 Functions

A Digital Operator JVOP-161 or a parameter setting tool for a personal computer is required to use the functions described in this chapter. Contact your Yaskawa representative or the agency where you purchased the product for inquiries regarding the parameter setting tool. The digital operator JVOP-160 is not compatible.

Hardware Requirements for Parameter Setting Tool

Personal computer: DOS/V

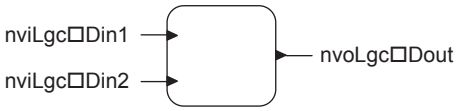
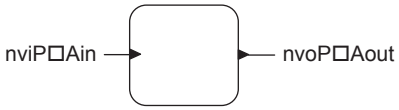
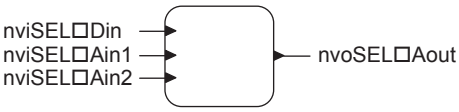
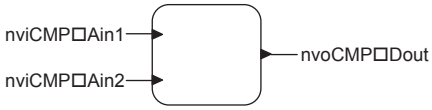
Operating System: Microsoft Windows95, 98, or 2000

CPU: One compatible with the recommended system

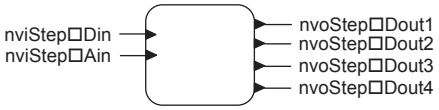
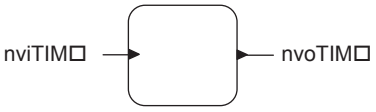
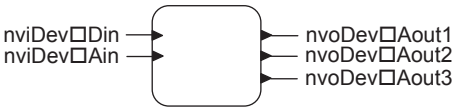
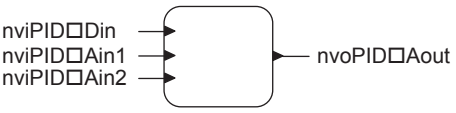
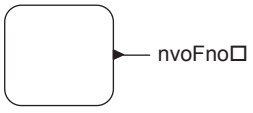
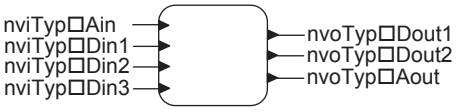
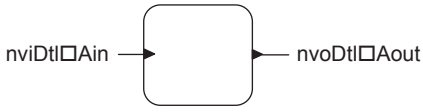
Memory: 128 MB or more (recommended)

Others: RS-232C port

8.1.1 List of Functions

Function Name	Display on Operator	Function Image	Explanation
Logic Operation	LgC-□ □: 0 to 7 No. of modules: 8		The following operation modes can be selected by setting PA□01. • 0: AND • 1: OR • 2: Inversion (INV) • 3: Non-equivalence (EQ)
Analog Operation	ANA-□ □: 0 to 9 No. of modules: 10		The following operation modes can be selected by setting PB□02. • 0: Ratio/Bias (R/B) • 1: Analog scheduler (ANA/SCH) • 2: Variation ratio limitter (LIM) • 3: Primary delay filter (FIL)
Selection Operation	SEL-□ □: 0 to 7 No. of modules: 8		The following operation modes can be selected by setting PC□01. • 0: State data based select (SEL) The data of either nviSEL□Ain1 or nviSEL□Ain2 is output according to the state data of nviSEL□Din. • 1: High select (Hi) The larger of two values is output. • 2: Low select (Lo) The smaller of two values is output.
Comparison Operation	Cp-□ □: 0 to 7 No. of modules: 8		The following operation modes can be selected by setting Pd□01. • 0: Forward operation The output turns ON when nviCMP□Ain1 ≥ nviCMP□Ain2. • 1: Reversed operation The output turns ON when nviCMP□Ain1 ≤ nviCMP□Ain2.

(cont'd)

Function Name	Display on Operator	Function Image	Explanation
Step Output Operation	SP-☐ ☐: 0 No. of modules: 1		The following operation modes can be selected by setting PE☐01. • 0: First In Last Out (FILO) The outputs nvoStep☐Dout1 through 4 turn ON or OFF according to the value of nviStep☐Ain in FILO order. • 1: First In First Out (FIFO) The output nvoStep☐Dout1 through 4 turn ON or OFF according to the value of nviStep☐Ain in FIFO order.
Delay Timer	dt-☐ ☐: 0 and 1 No. of modules: 2		The following operation modes can be selected by setting PF☐00. • 0: ON delay The output nvoTIM☐ turns ON when the set time period has passed after the input nviTIM☐ turned ON. • 1: OFF delay The output nvoTIM☐ turns OFF when the set time period has passed after the input nviTIM☐ turned OFF.
Deviation Output Operation	dv-☐ ☐: 0 No. of modules: 1		The following operation modes can be selected by setting PG☐01. • 0: Outputs with 3 deviations Three data with the bias set in the data of nviDev☐Ain are output. • 1: Outputs with 2 deviations Two data with the bias set in the data of nviDev☐Ain are output.
PID	pid-☐ ☐: 0 to 3 No. of modules: 4		The following operation modes can be selected by setting PH☐01. • 0: Forward operation PI control on forward operation using the input feedback nviPID☐Ain1. • 1: Reverse operation PI control on reversed operation using the input feedback nviPID☐Ain1.
Constant Output	fno-☐ ☐: 0 to 5 No. of modules: 6		The data set in the parameter PJ☐01 is output.
Variable Type Conversion	typ-☐ ☐: 0 to 3 No. of modules: 4		The following operation modes can be selected by setting PL☐02. • 0: ANA → ANA • 1: ANA → DIG • 2: DIG → ANA
Save Data	dtl-☐ ☐: 0 to 3 No. of modules: 4		The data is saved in EEPROM when inputting data. The saved data will not be cleared whenever the power turns OFF.

8.1.2 Items Common to Functions

■ Sending Data

- Each Function Module outputs a response data according to its own function using an output network variable after receiving an input network variable.
- The output method of output network variables for each module can be changed using the common configuration properties nciAoutMinOutTm and nciAoutSendHrtBt, and the minDelta prepared at each module.

■ Configuration Properties Common to All Function Modules

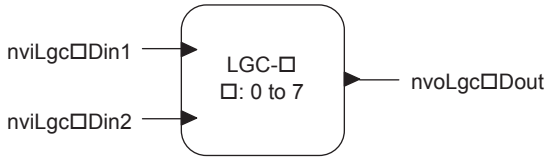
Configuration Property	Explanation	Applicable NVs
nciAoutMinOutTm	Sets a minimum output time of analog data. An analog data is output after the set time period has passed following a change in the data.	ANA data of each Function
nciAoutSendHrtBt	Sets a cycle time to output an analog data. Analog data are output in the set cycle time.	ANA data of each Function
nciDoutSendHrtBt	Sets a cycle time to output the output network variables whose variable type is SNVT_switch. DIG data are output in the set cycle time.	DIG data of each Function

■ Configuration Properties for Each Function Module

Configuration Property	Explanation	Applicable Function
nciPID0MinDelta to nciPID3MinDelta	Sets an minimum delta of analog data.	PID Function

8.2 Logic Operation Function

8.2.1 Function Block Image



Number of modules: 8 (0 to 7)

8.2.2 Network Variables and Parameters

The Logic Operation Function is used to carry out an operation in a number of stages according to the amount of data stored in the input network variable and saves the result in the network variable.

■ Network Variables

Network Variable	Variable Type	Type Change	Name and Function
nviLgc□Din1	SNVT_switch	Impossible	DIG input 1
nviLgc□Din2	SNVT_switch	Impossible	DIG input 2
nvoLgc□Dout	SNVT_switch	Impossible	DIG output Outputs the result of logic operation. When ON: state = 1, value = 100.0 Whe OFF: state = 0, value = 0.0

■ Parameter

Parameter	Name	Explanation	Default
pa□01	Operation mode selection	0: AND 1: OR 2: Inversion (INV) 3: Non-equivalence (EQ)	1

8.2.3 Operation

The Logic Operation Function has four operation modes. Select a mode by setting the parameter PA□01.

The table below shows the output conditions of each operation mode.

Operation	Set Value in PA□01	Input				Output	
		nviLgc□Din1 (SNVT_switch)		nviLgc□Din2 (SNVT_switch)		nviLgc□Dout (SNVT_switch)	
		value	state	value	state	value	state
AND	0	NA	1	NA	1	100	1
		NA	1	NA	0 or -1	0	0
		NA	0 or -1	NA	1	0	0
		NA	0 or -1	NA	0 or -1	0	0
OR	1	NA	1	NA	1	100	1
		NA	1	NA	0 or -1	100	1
		NA	0 or -1	NA	1	100	1
		NA	0 or -1	NA	0 or -1	0	0
Non-equivalence (EQ)	2	NA	1	NA	1	100	1
		NA	1	NA	0	0	0
		NA	0	NA	1	0	0
		NA	0	NA	0	100	1
		NA	–1	NA	–1	0	0
Inversion (INV)	3	NA	1	-	-	0	0
		NA	0	-	-	100	1
		NA	–1	-	-	0	0

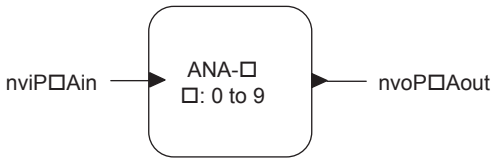
Note: □: Indicates the module number 0 to 7.

Data is sent in event-driven timing. So, data is sent when the state changes.

Any modification of the parameter settings is immediately reflected in the operation results in the output network variable.

8.3 Analog Operation Function

8.3.1 Function Image



Number of modules: 10 (0 to 9)

8.3.2 Network Variables and Parameters

The Analog Operation Function is used to carry out an operation in a number of stages or steps according to the amount of data stored in the input network variable and saves the result in the output network variable.

■ Network Variables

Network Variable	Variable Type	Type Change	Function
nviP□Ain	SNVT_lev_percent	Possible	Executes the operation on the base of the data set in this variable according to the operation mode.
nvoP□Aout	SNVT_lev_percent	Possible	Outputs the operation result.

■ Parameters

Parameter	Name	Explanation	Default
pb□00	Variable type	Indicates the variable type of nviP□Ain. Impossible to set from the Operator.	0
pb□01	Variable type	Indicates the variable type of nvoP□Aout. Impossible to set from the Operator.	0
pb□02	Operation mode selection	0: Ratio/Bias 1: Scheduler 2: Variation ratio limit 3: Primary delay filter	1
pb□03	Output cycle	Operation output cycle of nvoP□Aout	1.0 s
pb□04	Variation ratio limit value	Limits the variation of nvoP□Aout.	0
pb□05	Delay time	Used for operation with primary delay filter.	0
pb□06	Operation after initialization	0: Calculates as the previous output was 0. 1: Outputs the input value as it is.	0
pb□07	Ratio	Sets a inclination when pb□02 = 0.	1.0
pb□08	Bias	Sets the bias when pb□02 = 0.	0
pb□11	Reference point 1X coordinates	Sets the coordinate value x (input).	0
pb□12	Reference point 2X coordinates	Sets the coordinate value x (input).	0
pb□13	Reference point 3X coordinates	Sets the coordinate value x (input).	0
pb□14	Reference point 4X coordinates	Sets the coordinate value x (input).	0
pb□15	Reference point 5X coordinates	Sets the coordinate value x (input).	0
pb□16	Reference point 6X coordinates	Sets the coordinate value x (input).	0
pb□17	Reference point 7X coordinates	Sets the coordinate value x (input).	0
pb□18	Reference point 8X coordinates	Sets the coordinate value x (input).	0
pb□21	Reference point 1Y coordinates	Sets the coordinate value y (input).	0
pb□22	Reference point 2Y coordinates	Sets the coordinate value y (input).	0
pb□23	Reference point 3Y coordinates	Sets the coordinate value y (input).	0
pb□24	Reference point 4Y coordinates	Sets the coordinate value y (input).	0
pb□25	Reference point 5Y coordinates	Sets the coordinate value y (input).	0
pb□26	Reference point 6Y coordinates	Sets the coordinate value y (input).	0
pb□27	Reference point 7Y coordinates	Sets the coordinate value y (input).	0
pb□28	Reference point 8Y coordinates	Sets the coordinate value y (input).	0

8.3.3 Operation

The Analog Operation Function has four operation modes that can be selected by setting parameter pb□02.

The table below shows the output conditions of each operation mode.

Operation Function	Related Parameters	Explanation	Setting
Ratio/Bias	pb□02	Operation mode selection	0
	pb□07	Ratio	-3276.8 to 3276.7
	pb□08	Bias	-*
Analog Scheduler	pb□02	Operation mode selection	1
	pb□11 to □18	Coordinate value x (input)	-*
	pb□21 to □28	Coordinate value y (output)	-*
Variation Ratio Limitter	pb□02	Operation mode selection	2
	pb□03	Output cycle	0.1 to 60.0 sec
	pb□04	Variation ratio limit value	-*
	pb□06	Operation after initialization	0 or 1
Primary Delay Filter	pb□02	Operation mode selection	3
	pb□03	Output cycle	0.1 to 60.0 sec
	pb□05	Delay time	0 to 65534 sec
	pb□06	Operation after initialization	0 or 1

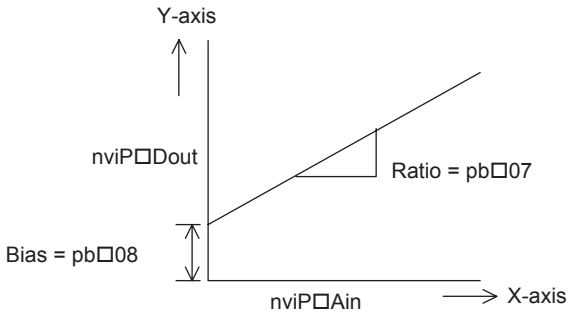
* Depends on variable types.

■ Sending Data

The data are sent in event-driven timing or using nciAoutSndHrtBt and nciMinSendTim.

■ Ratio/Bias

The data in the input network variable is calculated using the following equation, and the result is sent to the output network variable.

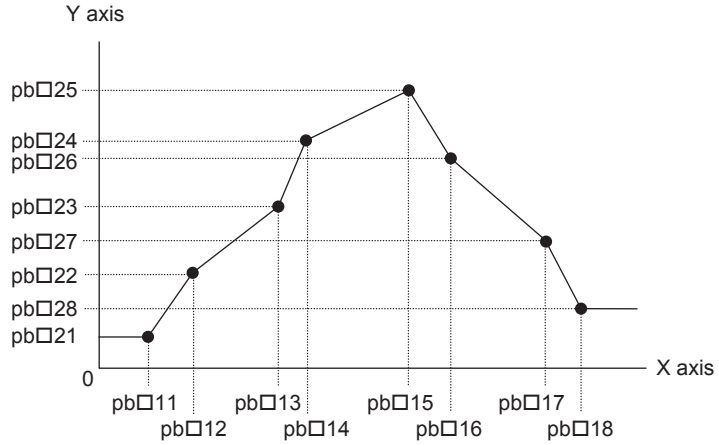


Equation

nviP□Dout = pb□07 × nviP□Ain + pb□08

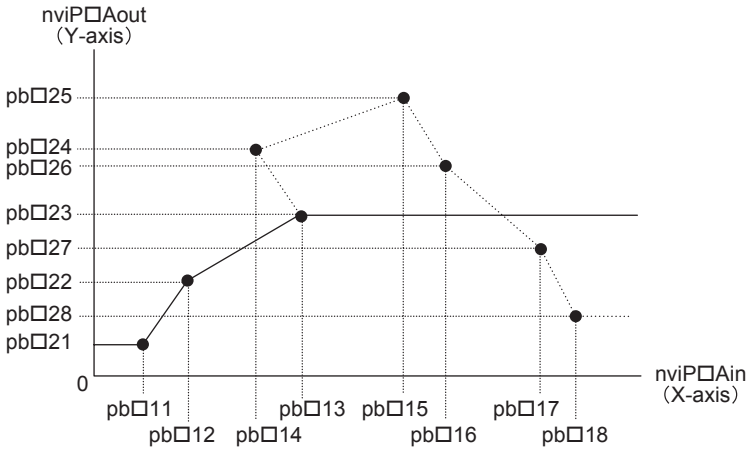
■ Analog Scheduler

The analog data of input network variable are compensated using a line graph shown below, and the compensated result is sent to the output network variable.



- Be sure to set the analog input data parameters pb□11 to pb□18 in ascending order.
- If any of the parameters pb□11to pb□18 are not set in ascending order, only the setting values of the parameters set in ascending order become valid and the others become invalid. Also at that time, the result from the nviP□Aout are output and used with the values for the Y-axis set values in correspondence to the parameter set value set in ascending order.

Example: When pb□13 > pb□14, the line graph becomes as shown below. The set values of the parameters pb□14 downward are invalid, and the set value of pb□13 is used for operation.

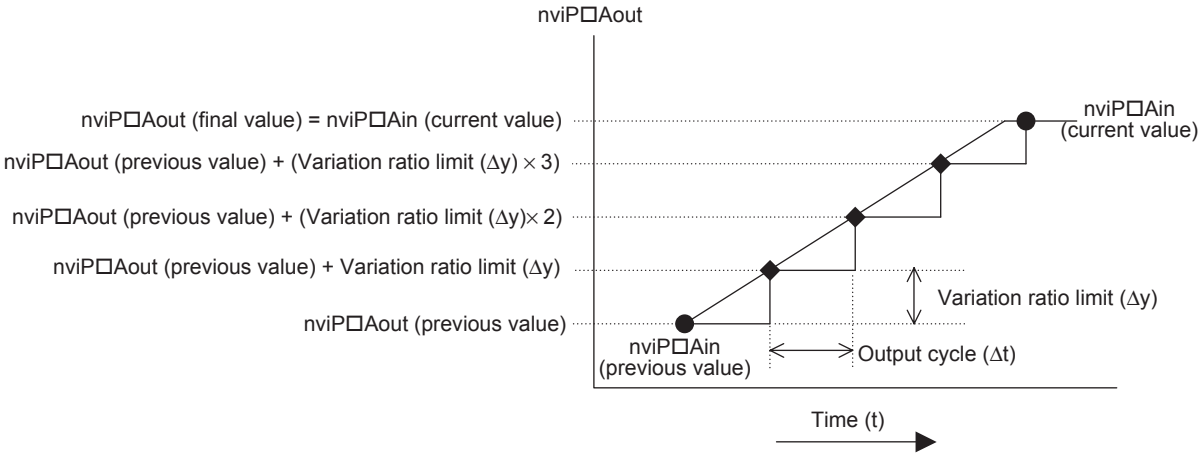


Note: 1. For the value of nviP□Ain, the value of nviP□Aout shown with a solid line is output.
2. As the parameter pb□14 was set out of ascending order, the set values of parameters pb□14 to pb□18 and pb□24 to pb□28 become invalid.
If the value of nviP□Ain is bigger than that of pb□13 in this case, nviP□Aout = pb□23.

- When the parameters pb□14 to pb□18 are set in ascending order:
If nviP□Ain < pb□11, nviP□Aout = pb□21
If nviP□Ain > pb□18, nviP□Aout = pb□28

■ Variation Ratio Limitter

The output variation ratio limit is executed on the analog data of input network variable as shown below, and the result is sent to the output network variable.



When the value of nviP□Ain changes from nviP□Ain (previous value) to nviP□Ain (current value), the variation ratio limit value is added to the value of nviP□Aout every output cycle so that the final value of nviP□Aout is equal to the current value of nviP□Ain.

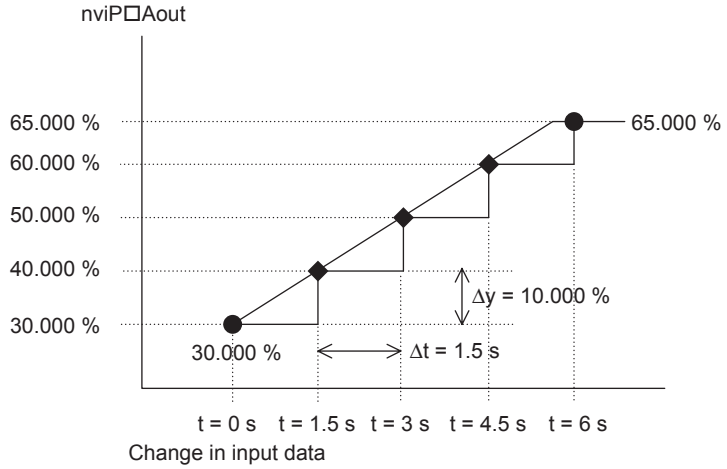
Example: nviP□Aout data process when the value of nviP□Ain changes from 30.000 to 65.000

Input and output network variable type: lev_percent

Parameter settings: As shown in the table below

Parameter	Explanation	Setting
pb□02	Operation mode selection	2
pb□03	Output cycle	1.5 sec
pb□04	Variation ratio limit value	10.000

After the value of nviP□Ain has changed from 30.000 to 65.000, the value of nviP□Aout becomes equal to the value of nviP□Ain in six seconds.



■ Primary Delay Filter

The data of input network variable is calculated using the equation below, and the result is sent to the output network variable.

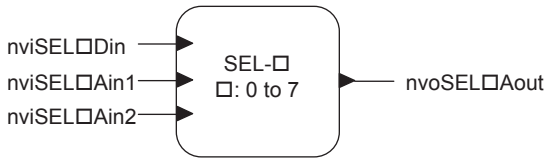
$$nviP\square Aout\ (t) = nviP\square Aout\ (t\text{-}1) + Ts / (Ts + T_L) \times (nviP\square Ain - nviP\square Aout\ (t\text{-}1))$$

nviP□Aout (t) : Current output value
nviP□Aout (t-1): Previous output value
nviP□Ain : Input value
Ts : Output cycle (pb□03)
T_L : Delay time (pb□05)

When $Ts > T_L$, it is judged as $Ts = T_L$.

8.4 Select Operation Function

8.4.1 Function Image



Number of modules: 8 (0 to 7)

8.4.2 Network Variables and Parameters

The Select Operation Function has three operation modes to be selected by setting the parameter pC□01.

■ Network Variables

Network Variable	Variable Type	Type Change	Name and Function
nviSEL□Din	SNVT_switch	Impossible	Executes the operation on the base of the data in this parameter according to the operation mode.
nviSEL□Ain1	SNVT_lev_percent	Possible	Input data 1
nviSEL□Ain2	SNVT_lev_percent	Possible	Input data 2
nvoSEL□Aout	SNVT_lev_percent	Possible	Outputs the selected data.

■ Parameters

Parameter	Name	Explanation	Default
pC□00	Variable type	Indicates the variable type of nviSEL□Ain1 and 2. Impossible to set from the Operator.	0
pC□01	Operation setting	0: State data based select 1: Hi select (Hi) 2: Lo select (Lo)	1

8.4.3 Operation

The Select Operation Function has three operation modes to be selected by setting the parameter PC□01.

The table below shows the input conditions of each operation mode

Function	pC□01 Setting	Input Condition		Output Data nvoSEL□Aout
State Data Based Select	0	nviSEL□Din (SNVT_switch)		–
		value	state	
		NA	1	nviSEL□Ain2
		NA	0	nviSEL□Ain1
		NA	-1	Holds the previous data
Hi Select	1	nviSEL□Ain1 ≥ nviSEL□Ain2		nviSEL□Ain1
		nviSEL□Ain1 < nviSEL□Ain2		nviSEL□Ain2
Lo Select	2	nviSEL□Ain1 < nviSEL□Ain2		nviSEL□Ain1
		nviSEL□Ain1 ≥ nviSEL□Ain2		nviSEL□Ain2

■ State Data Based Select

The data of either the input network variable nviSEL□Ain1 or nviSEL□Ain2 is selected according to the state data of nviSEL□Din, and the data of the selected input network variable is sent to the output network variable nvoSEL□Aout.

When nviSEL□Din (STATE) = 0, nvoSEL□Aout = nviSEL□Ain1

When nviSEL□Din (STATE) = 1, nvoSEL□Aout = nviSEL□Ain2

When nviSEL□Din (STATE) = -1, nvoSEL□Aout = nviSEL□Ain1

■ Hi Select

The two data of the input network variables nviSEL□Ain1 and nviSEL□Ain2 are compared, and the data of the bigger value is output to the output network variable nvoSEL□Aout.

The input network variable nviSEL□Din is not used.

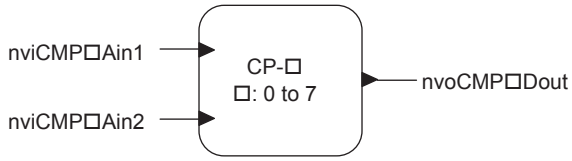
■ Lo Select

The two data of the input network variables nviSEL□Ain1 and nviSEL□Ain2 are compared, and the data of the smaller value is sent to the output network variable nvoSEL□Aout.

The input network variable nviSEL□Din is not used.

8.5 Comparison Operation Function

8.5.1 Function Image



Number of modules: 8 (0 to 7)

8.5.2 Network Variables and Parameters

The two data of the input network variable nviCMP□Ain2 is compared with that of nviCMP□Ain1. The result is sent to the output network variable according to the forward and the reverse operation.

■ Network Variables

Network Variable	Variable Type	Type Change	Name and Function
nviCMP□Ain1	SNVT_lev_percent	Possible	Base data for comparison
nviCMP□Ain2	SNVT_lev_percent	Possible	Data to compare
nvoCMP□Dout	SNVT_switch	Impossible	Outputs according to the operation mode.

■ Parameters

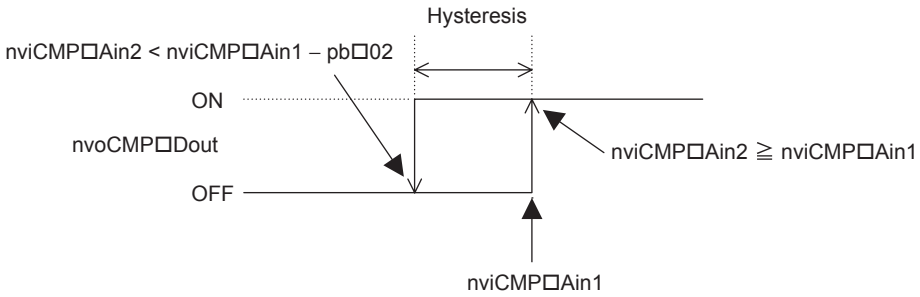
Parameter	Name	Explanation	Default
pd□00	Variable type	Indicates the variable type of nviCMP□Ain1 and nviCMP□Ain2. Impossible to set from the Operator	0
pd□01	Operation mode selection	0: Forward operation 1: Reverse operation	0
pd□02	Hysteresis	Sets the hysteresis of output variation	0

8.5.3 Operation

■ Forward Operation

When the value of nviCMP□Ain2 is greater than that of nviCMP□Ain1, then nvoCMP□Dout (STATE) = 1 (ON).

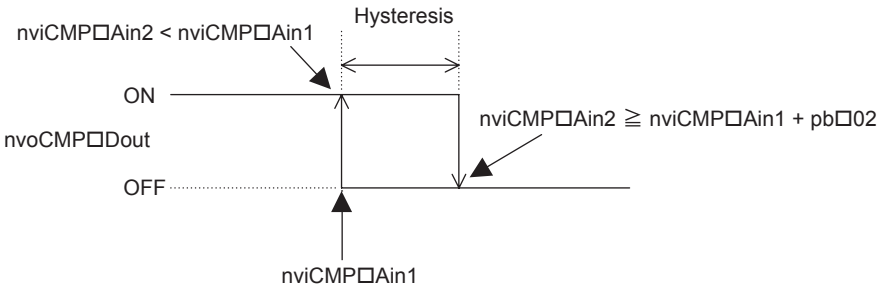
When the value of nviCMP□Ain2 is less than the value "nviCMP□Ain1– pb□02", nvoCMP□Dout (STATE) = 0 (OFF).



■ Reverse Operation

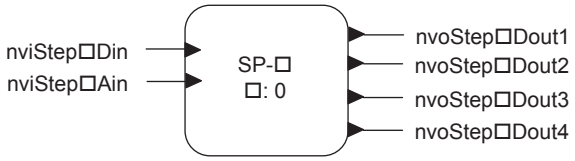
When the value of nviCMP□Ain2 is less than the value of nviCMP□Ain1, nvoCMP□Dout (STATE) = 1 (ON).

When the value of nviCMP□Ain2 is greater than the value "nviCMP□Ain1+ pb□02", nvoCMP□Dout (STATE) = 0 (OFF).



8.6 Step Output Operation Function

8.6.1 Function Image



Number of modules: 1 (0)

8.6.2 Network Variables and Parameters

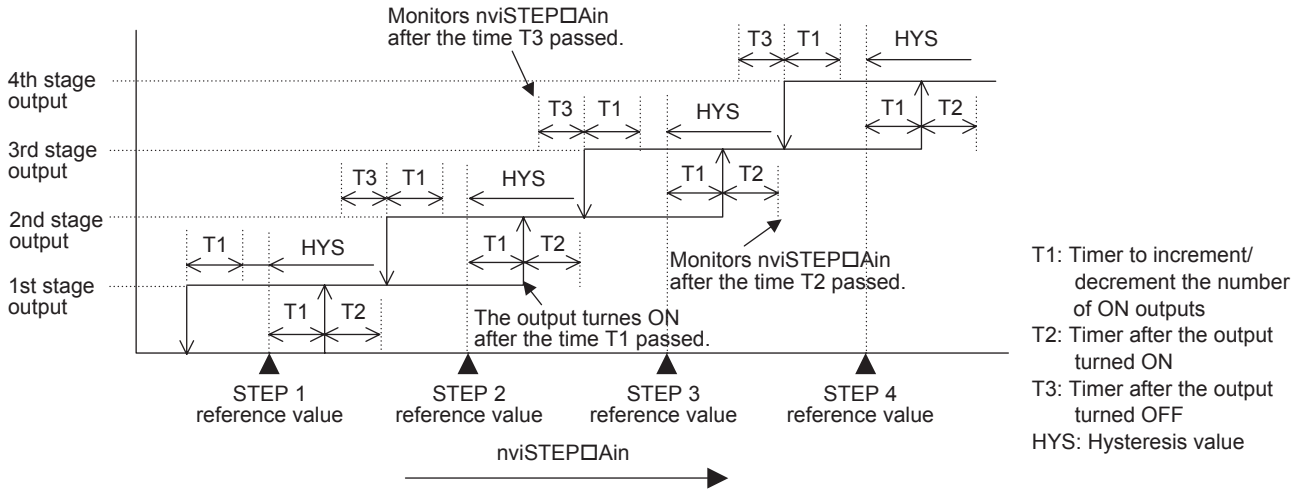
The Step Output Operation Function is used to carry out an operation in a number of stages according to the amount of data stored in the input network variable and saves the result in the output network variable.

■ Network Variables

Network Variable	Variable Type	Type Change	Name and Function
nviSTEP□Din	SNVT_switch	Impossible	Output interlock state=0, -1: Interlock state=1: Release interlock
nviSTEP□Ain	SNVT_lev_percent	Possible	Input data Compares with the reference value, and outputs in order.
nvoSTEP□Dout1	SNVT_switch	Impossible	Step output 1 When ON: state=1, value=100.0 When OFF: state=0, value=0.0
nvoSTEP□Dout2	SNVT_switch	Impossible	Step output 2 When ON: state=1, value=100.0 When OFF: state=0, value=0.0
nvoSTEP□Dout3	SNVT_switch	Impossible	Step output 3 When ON: state=1, value=100.0 When OFF: state=0, value=0.0
nvoSTEP□Dout4	SNVT_switch	Impossible	Step output 4 When ON: state=1, value=100.0 When OFF: state=0, value=0.0

■ Parameters

Parameter	Name	Explanation	Default
pE□00	Variable type	Impossible to set from the Operator.	0
pE□01	Operation mode selection	0: FILO (First In Last Out, 1: FIFO (First In First Out)	0
pE□02	Hysteresis	Sets the hysteresis to the reference point to turn OFF the output signal.	0
pE□11	STEP 1 reference value	The reference value to turn ON the output signal.	0
pE□12	STEP 2 reference value	The reference value to turn ON the output signal.	0
pE□13	STEP 3 reference value	The reference value to turn ON the output signal.	0
pE□14	STEP 4 reference value	The reference value to turn ON the output signal.	0
pE□15	Timer to increment/decrement the number of ON outputs	When the value of nviSTEP□Ain is greater than the reference value or less than the value "Reference value - Hysteresis value," the timer starts counting and the number of ON outputs increases or decreases by 1 after the set time. (If the value of nviSTEP□Ain does not satisfy the conditions needed to start the timer, the timer is reset.)	10
pE□16	Timer after the output turned ON	The value of nviSTEP□Ain is discarded within this set time after the output has turned ON.	60
pE□17	Timer after the output turned OFF	The value of nviSTEP□Ain is discarded within this set time after the output has turned OFF.	30
pE□18	Base output position	Set the output network variable that turns ON first. 1: nvoSTEP□Dout1, 2: nvoSTEP□Dout2 3: nvoSTEP□Dout3, 4: nvoSTEP□Dout4	1



Note: The STEP reference values must be set in ascending order. When they are not set in ascending order, only the values that are set in ascending order are valid.
STEP 1 reference value < STEP 2 reference value < STEP 2 reference value < STEP 4 reference value

8.6.3 Operation

■ First In Last Out (FILO)

With this method, the nvoSTEP□Dout that was turned ON first is turned OFF last.

The nvoSTEP□Dout that turns ON first can be specified using the parameter pE□18 (base output position).

Example 1: Order of priority for output when the base position for output is 1.

Output Position	ON Output Order	OFF Output Order
nvoSTEP□Dout1	1	4
nvoSTEP□Dout2	2	3
nvoSTEP□Dout3	3	2
nvoSTEP□Dout4	4	1

Example 2: Order of output priority when the base output position is 2.

Output Position	ON Output Priority	OFF Output Priority
nvoSTEP□Dout1	3	2
nvoSTEP□Dout2	4	1
nvoSTEP□Dout3	1	4
nvoSTEP□Dout4	2	3

While the output is interlocked, all the outputs turns OFF. When the interlock is released, the output turns ON in order from the base output position.

■ First In First Out (FIFO)

With this method, the nvoSTEP□Dout that was turned ON first is turned OFF first.

Also after interlocking, the position of the signal to be turned ON first for the next operation is the next one for the position whose signal was last turned ON.

Example 1: Order of priority for output when the base position for output is 1.

Output Position	ON Output Priority	OFF Output Priority
nvoSTEP□Dout1	1	1
nvoSTEP□Dout2	2	2
nvoSTEP□Dout3	3	3
nvoSTEP□Dout4	4	4

Example 2: Output start position when interlocked (Base output position: 1).

STEP 1 reference value: 10.000 %

STEP 2 reference value: 30.000 %

STEP 3 reference value: 50.000 %

STEP 4 reference value: 70.000 %

Operation Pattern	Output Position	nvoSTEP□ Dout1	nvoSTEP□ Dout2	nvoSTEP□ Dout3	nvoSTEP□ Dout4	Data of nviSTEP□Ain
1	0-stage output	○	○	○	○	5.000 %
2	1-stage output	●	○	○	○	12.000 %
3	On being interlocked	○	○	○	○	35.000 %
4	1-stage output	○	●	○	○	35.000 %
5	2-stage output	○	●	●	○	35.000 %
6	3-stage output	○	●	●	●	50.000 %
7	On being interlocked	○	○	○	○	50.000 %
8	1-stage output	●	○	○	○	20.000 %
9	2-stage output	●	●	○	○	40.000 %
10	3-stage output	●	●	●	○	80.000 %
11	4-stage output	●	●	●	●	80.000 %
12	3-stage output	○	●	●	●	60.000 %
13	2-stage output	○	○	●	●	40.000 %
14	On being interlocked	○	○	○	○	40.000 %
15	1-stage output	●	○	○	○	40.000 %
16	2-stage output	●	●	○	○	40.000 %

●: Output signal ON, ○: Output signal OFF

The details of the operation pattern described in the table above are in order as follows.

1. All the output signals are OFF because the value of the data of nviSTEP□Ain is less than the STEP 1 reference value.
2. The output Dout1 turns ON first as the base output position is 1.
3. All the outputs are turned OFF by setting the interlock to 0.

4. The operation restarts when the interlock is released. The position that turns ON first is not the position set for the base output position but the output step next to the output (nvoSTEP□Dout1) that turned ON last before the outputs have been interlocked in pattern 3: nvoSTEP□Dout2.
5. As the value of nviSTEP□Ain increases, the nvoSTEP□Dout3 and nvoSTEP□Dout4 turn ON in order.
6. The operation pattern is the same as pattern 5.
7. All the outputs are turned OFF by setting the interlock to 0.
8. In the same way as in pattern 4, the operation restarts when the interlock is released. The position that turns ON first is not the position set for the base output position but the output next to the output (nvoSTEP□Dout4) that turned ON last before the outputs have been interlocked in pattern 7: nvoSTEP□Dout1.
9. As the value of nviSTEP□Ain increases, the nvoSTEP□Dout2, nvoSTEP□Dout3, and nvoSTEP□Dout4 turn ON in order.
10. The operation pattern is the same as pattern 5.
11. The operation pattern is the same as pattern 5.
12. The value of the input data of nviSTEP□Ain becomes less than the STEP 4 reference value. The output nvoSTEP□Dout1 that turned ON first among four outputs turns OFF first.
13. The value of nviSTEP□Ain becomes less than the STEP 3 reference value. The output nvoSTEP□Dout2 turns OFF.
14. All the outputs are turned OFF by setting the interlock to 0.
15. In the same way as in pattern 4 and 8, the operation restarts when the interlock is released. The position that turns ON first is not the position set for the base output position but the output next to the output (nvoSTEP□Dout4) that turned ON last before the outputs have been interlocked in process 11: nvoSTEP□Dout1.
16. The value of nviSTEP□Ain is not changed but more than the STEP 2 reference value. The nvoSTEP□Dout2 turns ON after the set time of the timer.

8.7 Delay Timer Function

8.7.1 Function Image

8.7.2 Network Variables and Parameters

■ Network Variables

Network Variable	Variable Type	Type Change	Name and Function
nviTIM□Din	SNVT_switch	Impossible	Timer start input state=-1: Output OFF state=0: Depends on the operation mode state=1: Depends on the operation mode
nvoTIM□Dout	SNVT_switch	Impossible	Output 1 When ON: state=1, value=100.0 When OFF: state=0, value=0.0

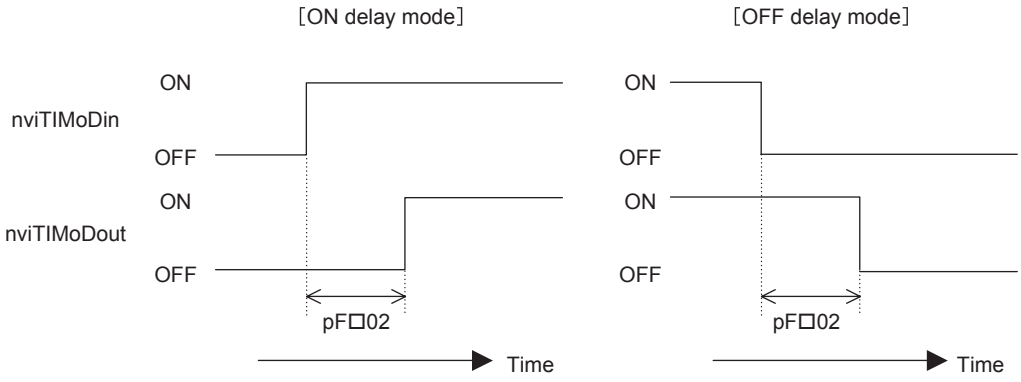
■ Parameters

Parameter	Name	Explanation	Default
pF□00	Operation mode selection	0: ON delay, 1: OFF delay	0
pF□01	ON delay time	Sets the ON delay time in units of 1 sec.	0
pF□02	OFF delay time	Sets the OFF delay time in units of 1 sec.	0
pF□04	Operation when the power turns ON	0: nvoTIM□Dout turns ON when the set delay time has passed after nviTIM□Din turned ON. 1: nvoTIM□Dout turns ON when nviTIM□Din turns ON without waiting for the set delay time.	0

8.7.3 Operation

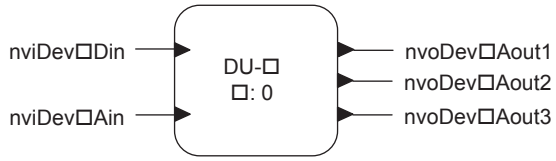
■ ON/OFF Delay

The ON/OFF Delay mode delays the timing to turn ON/OFF the output network variable nvoTIM□Dout according to the data of the input network variable nviTIM□Din for the set time period as shown in the following figure.



8.8 Deviation Output Function

8.8.1 Function Image



8.8.2 Network Variables and Parameters

The value of the deviation added to or subtracted from the analog data (set value) of the input network variable is sent to the output network variable.

■ Network Variables

Network Variable	Variable Type	Type Change	Name and Function
nviDev□Din	SNVT_switch	Impossible	Used for the operation mode “Outputs with 2 deviation”. Refer to 8.3.3 ■ Ratio/Bias.
nviDev□Ain	SNVT_lev_percent	Possible	Input data The base data for the data to be output
nviDev□Aout1	SNVT_lev_percent	Possible	The deviation is added to or subtracted from the value according to the operation mode, and the result is sent to the nviDev□Ain.
nvoDev□Aout2	SNVT_lev_percent	Possible	The deviation is added to or subtracted from the value according to the operation mode, and the result is sent to the nviDev□Ain.
nvoDev□Aout3	SNVT_lev_percent	Possible	The deviations is added to or subtracted from the value according to the operation mode, and the result is sent to the nviDev□Ain.

■ Parameters

Parameter	Name	Explanation	Default
pG□00	Variable type	Impossible to set from the Operator	0
pG□01	Operation mode selection	0: Outputs with 3 deviations 1: Outputs with 2 deviations	0
pG□11	Deviation a	Sets a deviation.	0
pG□12	Deviation b	Sets a deviation.	0
pG□13	Deviation c	Sets a deviation.	0

8.8.3 Operation

■ Outputs with 3 Deviations

Three deviations set in pG□11, pG□12, pG□13 are added to or subtracted from the data of nviDev□Ain as shown below, and the results are sent to nviDev□Aout1, 2, and 3. Each output network variable is calculated using the equation below.

nviDev□Aout1 = nviDev□Ain - pG□11

nvoDev□Aout2 = nviDev□Ain + pG□12

nvoDev□Aout3 = nviDev□Ain + pG□13

■ Outputs with 2 Deviations

Two output data are set as follows according to the status of nviDev□Din.

- When nviDev□Din = OFF,
  nviDev□Aout1 = 0 (Fixed)
  nvoDev□Aout2 = nviDev□Ain – pG□13
  nvoDev□Aout3 = nviDev□Ain
- When nviDev□Din = ON,
  nviDev□Aout1 = nviDev□Ain

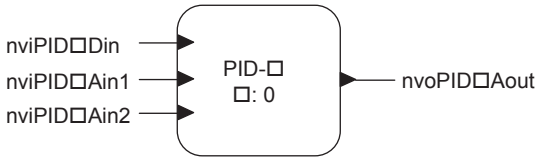
  nvoDev□Aout2 = nviDev□Ain + pG□11

  nvoDev□Aout3 = 100 (Fixed)

Note: If the result of the above operation becomes out of the effective data range, the maximum or minimum value will be output.

8.9 PID Function

8.9.1 Function Image



8.9.2 Network Variables and Parameters

The PID function executes PI control using the data of two input network variables, and sent to the output network variable.

■ Network Variables

Network Variable	Variable Type	Type Change	Name and Function
nviPID□Din	SNVT_switch	Impossible	Output interlock 0: Interlock 1: Start control
nviPID□Ain1	SNVT_lev_percent	Possible	Sets value data (SP)
nviPID□Ain2	SNVT_lev_percent	Possible	Process input value (Feedback data) (PV)
nvoPID□Aout	SNVT_lev_percent	Impossible	Outputs the output amount calculated on the base of feedback data. Output range: -5.00 to +105.00 %

■ Parameters

Parameter	Name	Explanation	Default
pH□00	Variable type	Impossible to set from the Operator	0
pH□01	Operation mode selection	0: Forward operation 1: Reversed operation	0
pH□02	Proportional band	0 to 6553.5 sec However, when the input network variable type is set to SNVT_flow or SNVT_ppm, the value below the decimal point is rounded up for operation.	1.0
pH□03	Integral time	0 to 6553.5 sec	1.0
pH□04	Output when interlocked	The value of the PID output when interlocked	0
pH□05	Reference point	The reference point to be used for operation	50

8.9.3 Operation

The PID output when interlocked can be calculated using the following equation.

Forward operation: $P = P_{(0)} - \{(100 / P_b) \times e_i\} - \{(100 \times \theta) / (T_i \times P_b)\} \times e_i$

Reverse operation: $P = P_{(0)} + \{(100 / P_b) \times e_i\} + \{(100 \times \theta) / (T_i \times P_b)\} \times e_i$

P: PID output (%) (-5 to +105%)

$P_{(0)}$: Reference point (pH□05)

P_b: Proportional band (pH□02)

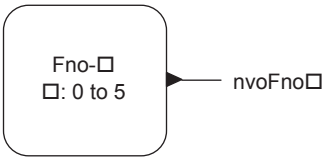
θ: Operation cycle (100 ms)

T_i: Integral time (pH□03)

e_i: Deviation (nviPID□Ain1 – nviPID□Ain2)

8.10 Constant Output Function

8.10.1 Function Image



8.10.2 Network Variables and Parameters

The data set in the parameter is output.

■ Network Variables

Network Variable	Variable Type	Type Change	Name and Function
nvoFno□Aout	SNVT_lev_percent	Possible	The data set in the parameter is output when the power turns ON.

■ Parameters

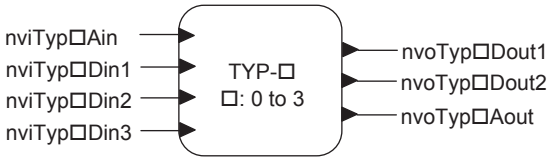
Parameter	Name	Explanation	Default
pj□00	Variable type	Impossible to change from the Operator	0
pj□01	Constant	Set a desired numerical value.	0

8.10.3 Operation

The constant set in the parameter is sent to the network variable.

8.11 Variable Type Conversion Function

8.11.1 Function Image



8.11.2 Network Variables and Parameters

The Variable Type Conversion Function converts DIGIN to ANAOUT, and ANA_IN to DIG_OUT.

■ Network Variables

Network Variable	Variable Type	Type Change	Name and Function
nviTyp□Din1	SNVT_switch	Impossible	–
nviTyp□Din2	SNVT_switch	Impossible	–
nviTyp□Din3	SNVT_switch	Impossible	–
nviTyp□Ain	SNVT_lev_percent	Possible	–
nvoTyp□Dout1	SNVT_switch	Impossible	DIG output 1 When ON: state=1, value=100.0 When OFF: state=0, value=0.0
nvoTyp□Dout2	SNVT_switch	Impossible	DIG output 2 When ON: state=1, value=100.0 When OFF: state=0, value=0.0
nvoTyp□Aout	SNVT_lev_percent	Possible	–

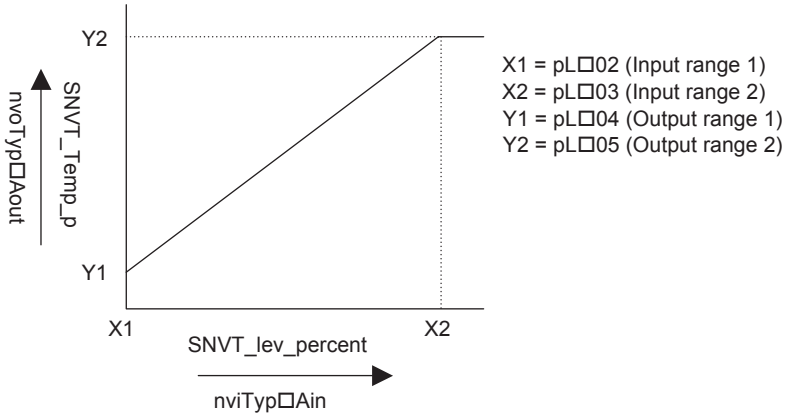
■ Parameters

Parameter	Name	Explanation	Default
pL□00	Variable type	Impossible to set from the Operator	0
pL□01	Variable type	Impossible to set from the Operator	0
pL□02	Input range 1	Sets the input range when converting from ANA to ANA.	0
pL□03	Input range 2	Sets the input range when converting from ANA to ANA.	0
pL□04	Output range 1	Set the output range when converting from ANA to ANA.	0
pL□05	Output range 2	Set the output range when converting from ANA to ANA.	0
pL□06	Operation mode selection	0: ANA → ANA 1: ANA → DIG 2: DIG → ANA	0
pL□10	Input reference data	The value to turn ON nvoTyp□Dout1 when converting from ANA to DIG	999
pL□11	Input reference data	The value to turn ON nvoTyp□Dout1 when converting from ANA to DIG	999
pL□12	Input reference data	The value to turn ON nvoTyp□Dout1 when converting from ANA to DIG	999
pL□13	Input reference data	The value to turn ON nvoTyp□Dout1 when converting from ANA to DIG	999
pL□14	Input reference data	The value to turn ON nvoTyp□Dout2 when converting from ANA to DIG	999
pL□15	Input reference data	The value to turn ON nvoTyp□Dout2 when converting from ANA to DIG	999
pL□16	Input reference data	The value to turn ON nvoTyp□Dout2 when converting from ANA to DIG	999
pL□17	Input reference data	The value to turn ON nvoTyp□Dout2 when converting from ANA to DIG	999
pL□18	Output reference data	The data to be sent if nviTyp□Din1=ON when converting from DIG to ANA	−
pL□19	Output reference data	The data to be sent if nviTyp□Din2=ON when converting from DIG to ANA	−
pL□20	Output reference data	The data to be sent if nviTyp□Din3=ON when converting from DIG to ANA	−

8.11.3 Operation

■ Conversion from ANA to ANA (pL□02 (operation mode selection) = 0)

- Example: Conversion from percent to Temp



■ Conversion from ANA to DIG (pL□02 (operation mode selection) = 1)

The value of nviTyp□Ain is compared with the set values of pL□10 to 17, and when the value of nviTyp□Ain agrees with a set value of pL□10 to 17, the Dout corresponding to the parameter of the agreed value turns ON.

If an invalid data is input, the outputs turn OFF.

- Example: Conversion from SNVT_lev_percent to SNVT_switch
  pL□10: 10.000 %, pL□11: 30.000%, pL□12: 50.000 %, pL□13: 70.000 %,
  pL□14: 20.000 %, pL□15: 40.000%, pL□16: 60.000 %, pL□17: 80.000 %

ON Output	Data of nviTyp□Ain (SNVT_lev_percent)									
	0	5	10	20	25	30	35	40	80	75
nvoTyp□Dout1	○	○	●	○	○	●	○	○	○	○
nvoTyp□Dout2	○	○	○	●	○	○	○	●	●	○

●:Output signal ON, ○: Output signal OFF

- Example: Conversion from SNVT_hvac_mode to SNVT_switch
  pL□10: 1 (HEAT), pL□11: 3 (COOL), pL□12: 0 (AUTO),
  pL□13: 2 (WRMUP), pL□14: 2 (WRMUP), pL□15: 6 (OFF),
  pL□16: 999, pL□17: 999

ON Output	Data of nviTyp□Ain (SNVT_hvac_mode)									
	0	4	6	2	1	6	2	7	3	FF
nvoTyp□Dout1	●	○	○	●	●	○	●	○	●	○
nvoTyp□Dout2	○	○	●	●	○	●	●	○	○	○

●: Output signal ON, ○: Output signal OFF

■ Convertion from DIG to ANA (pL□02 (operation mode selection) = 2

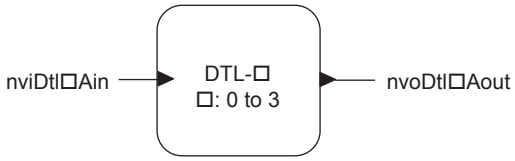
When nviTyp□Din1 is ON, the set value of pL□18 is output to nvoTyp□Aout.

When nviTyp□Din2 is ON, the set value of pL□19 is output to nvoTyp□Aout.

When nviTyp□Din3 is ON, the set value of pL□20 is output to nvoTyp□Aout.

8.12 Save Data Function

8.12.1 Function Image



8.12.2 Network Variables and Parameters

The Save Data function saves the input data at reception. The saved data is not cleared whenever the power turns OFF.

■ Network Variables

Network Variable	Variable Type	Type Change	Name and Function
nviDtl□Ain	SNVT_lev_percent	Possible	–
nvoDtl□Aout	SNVT_lev_percent	Possible	–

■ Parameters

Parameter	Name	Explanation	Default
po□00	Variable type	Impossible to set from the Operator	0

8.12.3 Operation

The analog input data is saved in the EEPROM to prevent the data from being lost during a power failure.

Usually, the data of nviDtl□Ain is sent to nvoDtl□Aout.

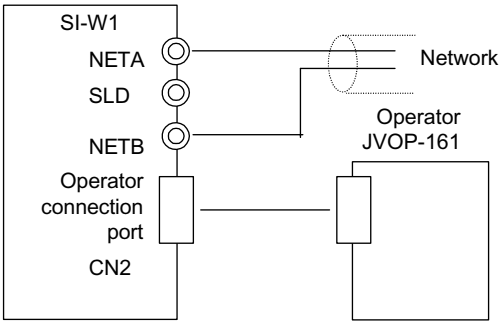
Do not change the input network variables of this function unless necessary because doing so will greatly shorten the life of EEPROM.

Appendix A

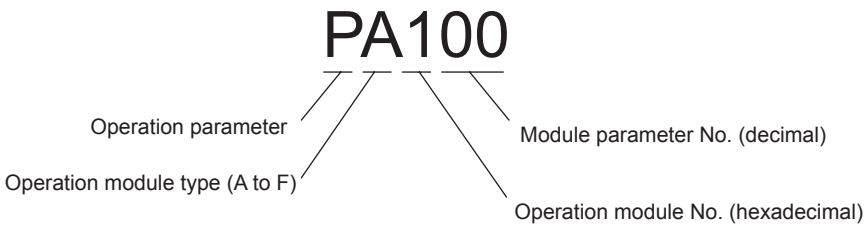
A

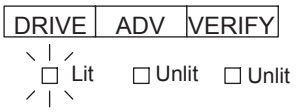
A.1 Digital Operator (JVOP-161) Operation Procedures

A.1.1 Connection of Digital Operator



A.1.2 Digital Operator Display





Interface card in online status

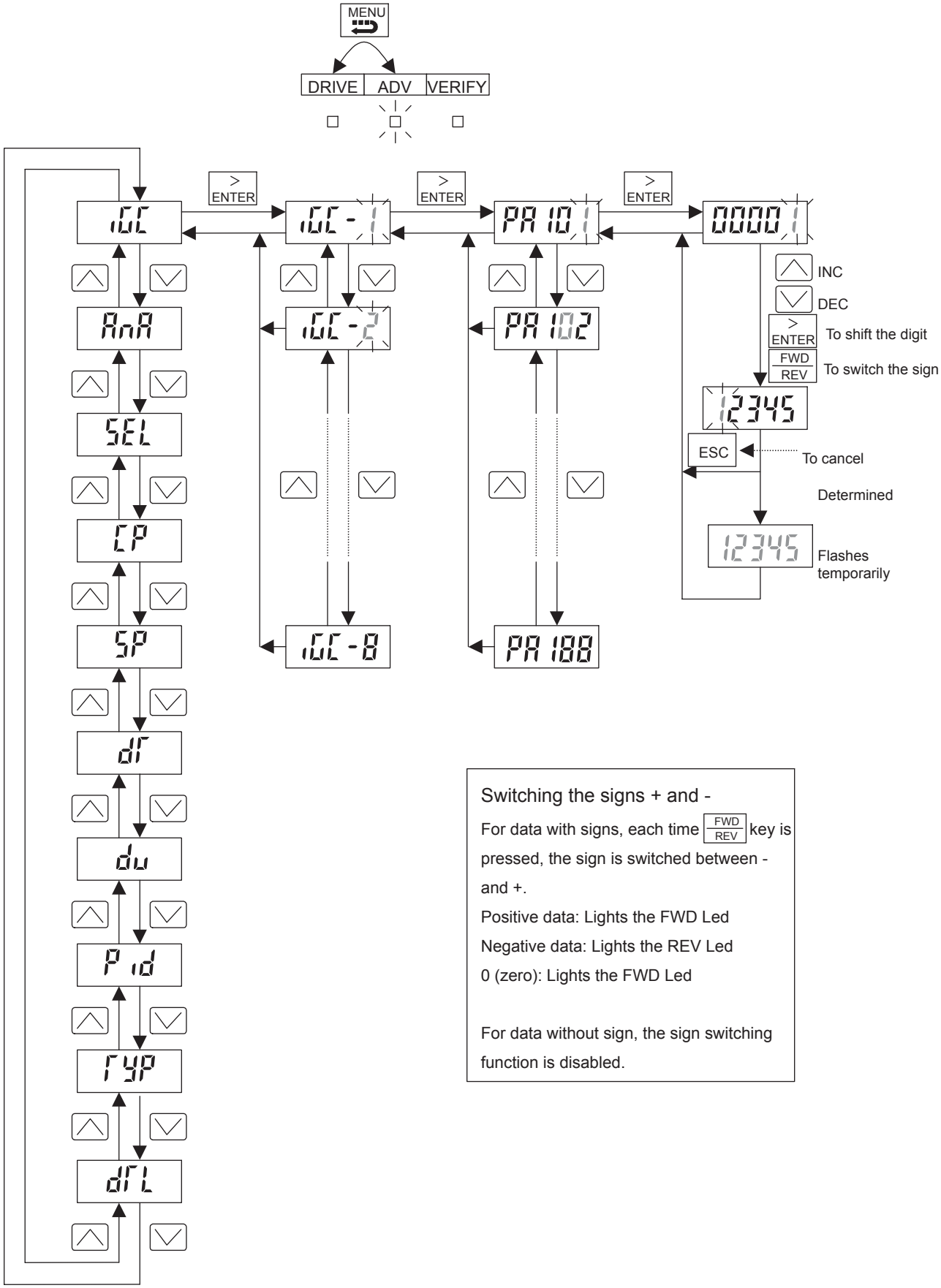
Interface card in offline status

Network in unconfigured status

Interface card in standby status for communications

Interface card in error status

Interface card in communications error status



Switching the signs + and -

For data with signs, each time FWD/REV key is pressed, the sign is switched between - and +.

Positive data: Lights the FWD Led

Negative data: Lights the REV Led

0 (zero): Lights the FWD Led

For data without sign, the sign switching function is disabled.

A.2 DDC Function Parameter List

Table A.1 Parameters for Operation Modules

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Logic Operation LGC	LgC-0	Operation mode selection	pa000	1	0: AND, 1: OR, 2: INV, 3: EQ	1001h
	LgC-1	Operation mode selection	pa100	1	0: AND, 1: OR, 2: INV, 3: EQ	1002h
	LgC-2	Operation mode selection	pa200	1	0: AND, 1: OR, 2: INV, 3: EQ	1003h
	LgC-3	Operation mode selection	pa300	1	0: AND, 1: OR, 2: INV, 3: EQ	1004h
	LgC-4	Operation mode selection	pa400	1	0: AND, 1: OR, 2: INV, 3: EQ	1005h
	LgC-5	Operation mode selection	pa500	1	0: AND, 1: OR, 2: INV, 3: EQ	1006h
	LgC-6	Operation mode selection	pa600	1	0: AND, 1: OR, 2: INV, 3: EQ	1007h
	LgC-7	Operation mode selection	pa700	1	0: AND, 1: OR, 2: INV, 3: EQ	1008h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Analog Operation AnA	ANA-0	Variable type	pb000	0	For nviP1Ain, Setting range: 0 to 5 *	1110h
		Variable type	pb001	0	For nvoP1Aout, Setting range: 0 to 5 *	1111h
		Operation mode selection	pb002	1	0: R/B, 1: ANA/SCH, 2: LIM, 3: FIL	1112h
		Output cycle	pb003	1.0	Setting range: 0.1 to 60.0 sec	1113h
		Variation ratio limitter	pb004	0	Units: Depends on the setting of pb001	1114h
		Delay time	pb005	0	Setting range: 0 to 65534 sec	1115h
		Operation after initialization	pb006	0	Valid when pb002 is set to 2 or 3 Setting range: 0 or 1	1116h
		Ratio	pb007	1.0	Setting range: 0.1 to 6553.4 sec	1117h
		Bias	pb008	0	Units: Depends on the setting of pb001 When pb001 = 5: -32768 to 32767	1118h
		Reference point 1X coordinates	pb011	0	Units: Depends on the setting of pb000 When pb000 = 5: -32768 to 32767	1119h
		Reference point 2X coordinates	pb012	0		111Ah
		Reference point 3X coordinates	pb013	0		111Bh
		Reference point 4X coordinates	pb014	0		111Ch
		Reference point 5X coordinates	pb015	0		111Dh
		Reference point 6X coordinates	pb016	0		111Eh
		Reference point 7X coordinates	pb017	0		111Fh
		Reference point 8X coordinates	pb018	0		1120h
		Reference point 1Y coordinates	pb021	0	Units: Depends on the setting of pb001 When pb001 = 5: -32768 to 32767	1121h
		Reference point 2Y coordinates	pb022	0		1122h
		Reference point 3Y coordinates	pb023	0		1123h
		Reference point 4Y coordinates	pb024	0		1124h
		Reference point 5Y coordinates	pb025	0		1125h
		Reference point 6Y coordinates	pb026	0		1126h
		Reference point 7Y coordinates	pb027	0		1127h
		Reference point 8Y coordinates	pb028	0		1128h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Analog Operation AnA	ANA-1	Variable type	pb100	0	For nviP1Ain, Setting range: 0 to 5 *	1129h
		Variable type	pb101	0	For nvoP1Aout, Setting range: 0 to 5 *	112Ah
		Operation mode selection	pb102	1	0: R/B, 1: ANA/SCH, 2: LIM, 3: FIL	112Bh
		Output cycle	pb103	1.0	Setting range: 0.1 to 60.0 sec	112Ch
		Variation ratio limitter	pb104	0	Units: Depends on the setting of pb101	112Dh
		Delay time	pb105	0	Setting range: 0 to 65534 sec	112Eh
		Operation after initialization	pb106	0	Valid when pb102 is set to 2 or 3 Setting range: 0 or 1	112Fh
		Ratio	pb107	1.0	Setting range: 0.1 to 6553.4 sec	1130h
		Bias	pb108	0	Units: Depends on the setting of pb101 When pb101 = 5: -32768 to 32767	1131h
		Reference point 1X coordinates	pb111	0	Units: Depends on the setting of pb100 When pb100 = 5: -32768 to 32767	1132h
		Reference point 2X coordinates	pb112	0		1133h
		Reference point 3X coordinates	pb113	0		1134h
		Reference point 4X coordinates	pb114	0		1135h
		Reference point 5X coordinates	pb115	0		1136h
		Reference point 6X coordinates	pb116	0		1137h
		Reference point 7X coordinates	pb117	0		1138h
		Reference point 8X coordinates	pb118	0		1139h
		Reference point 1Y coordinates	pb121	0	Units: Depends on the setting of pb101 When pb101 = 5: -32768 to 32767	113Ah
		Reference point 2Y coordinates	pb122	0		113Bh
		Reference point 3Y coordinates	pb123	0		113Ch
		Reference point 4Y coordinates	pb124	0		113Dh
		Reference point 5Y coordinates	pb125	0		113Eh
		Reference point 6Y coordinates	pb126	0		113Fh
		Reference point 7Y coordinates	pb127	0		1140h
		Reference point 8Y coordinates	pb128	0		1141h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Analog Operation AnA	ANA-2	Variable type	pb200	0	For nviP2Ain, Setting range: 0 to 5 *	1142h
		Variable type	pb201	0	For nvoP2Aout, Setting range: 0 to 5 *	1143h
		Operation mode selection	pb202	1	0: R/B, 1: ANA/SCH, 2: LIM, 3: FIL	1144h
		Output cycle	pb203	1.0	Setting range: 0.1 to 60.0 sec	1145h
		Variation ratio limitter	pb204	0	Units: Depends on the setting of pb201	1146h
		Delay type	pb205	0	Setting range: 0 to 65534 sec	1147h
		Operation after initialization	pb206	0	Valid when pb 202 is set to 2 or 3 Setting range: 0 or 1	1148h
		Ratio	pb207	1.0	Setting range: 0.1 to 6553.4 sec	1149h
		Bias	pb208	0	Units: Depends on the setting of pb201 When pb201 = 5: -32768 to 32767	114Ah
		Reference point 1X coordinates	pb211	0	Units: Depends on the setting of pb200 When pb200 = 5: -32768 to 32767	114Bh
		Reference point 2X coordinates	pb212	0		114Ch
		Reference point 3X coordinates	pb213	0		114Dh
		Reference point 4X coordinates	pb214	0		114Eh
		Reference point 5X coordinates	pb215	0		114Fh
		Reference point 6X coordinates	pb216	0		1150h
		Reference point 7X coordinates	pb217	0		1151h
		Reference point 8X coordinates	pb218	0		1152h
		Reference point 1Y coordinates	pb221	0	Units: Depends on the setting of pb201 When pb201 = 5: -32768 to 32767	1153h
		Reference point 2Y coordinates	pb222	0		1154h
		Reference point 3Y coordinates	pb223	0		1155h
		Reference point 4Y coordinates	pb224	0		1156h
		Reference point 5Y coordinates	pb225	0		1157h
		Reference point 6Y coordinates	pb226	0		1158h
		Reference point 7Y coordinates	pb227	0		1159h
		Reference point 8Y coordinates	pb228	0		115Ah

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Analog Operation AnA	ANA-3	Variable type	pb300	0	For nviP1Ain, Setting range: 0 to 5 *	115Bh
		Variable type	pb301	0	For nvoP1Aout, Setting range: 0 to 5 *	115Ch
		Operation mode selection	pb302	1	0: R/B, 1: ANA/SCH, 2: LIM, 3: FIL	115Dh
		Output cycle	pb303	1.0	Setting range: 0.1 to 60.0 sec	115Eh
		Variation ratio limitter	pb304	0	Units: Depends on the setting of pb301	115Fh
		Delay time	pb305	0	Setting range: 0 to 65534 sec	1160h
		Operation after initialization	pb306	0	Valid when pb302 is set to 2 or 3 Setting range: 0 or 1	1161h
		Ratio	pb307	1.0	Setting range: 0.1 to 6553.4 sec	1162h
		Bias	pb308	0	Units: Depends on the setting of pb301 When pb301 = 5: -32768 to 32767	1163h
		Reference point 1X coordinates	pb311	0	Units: Depends on the setting of pb300 When pb300 = 5: -32768 to 32767	1164h
		Reference point 2X coordinates	pb312	0		1165h
		Reference point 3X coordinates	pb313	0		1166h
		Reference point 4X coordinates	pb314	0		1167h
		Reference point 5X coordinates	pb315	0		1168h
		Reference point 6X coordinates	pb316	0		1169h
		Reference point 7X coordinates	pb317	0		116Ah
		Reference point 8X coordinates	pb318	0		116Bh
		Reference point 1Y coordinates	pb321	0	Units: Depends on the setting of pb301 When pb301 = 5: -32768 to 32767	116Ch
		Reference point 2Y coordinates	pb322	0		116Dh
		Reference point 3Y coordinates	pb323	0		116Eh
		Reference point 4Y coordinates	pb324	0		116Fh
		Reference point 5Y coordinates	pb325	0		1170h
		Reference point 6Y coordinates	pb326	0		1171h
		Reference point 7Y coordinates	pb327	0		1172h
		Reference point 8Y coordinates	pb328	0		1173h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Analog Operation AnA	ANA-4	Variable type	pb400	0	For nviP1Ain, Setting range: 0 to 5 *	1174h
		Variable type	pb401	0	For nvoP1Aout, Setting range: 0 to 5 *	1175h
		Operation mode selection	pb402	1	0: R/B, 1: ANA/SCH, 2: LIM, 3: FIL	1176h
		Output cycle	pb403	1.0	Setting range: 0.1 to 60.0 sec	1177h
		Variation ratio limitter	pb404	0	Units: Depends on the setting of pb401	1178h
		Delay time	pb405	0	Setting range: 0 to 65534 sec	1179h
		Operation after initialization	pb406	0	Valid when pb402 is set to 2 or 3 Setting range: 0 or 1	117Ah
		Ratio	pb407	1.0	Setting range: 0.1 to 6553.4 sec	117Bh
		Bias	pb408	0	Units: Depends on the setting of pb401 When pb401 = 5: -32768 to 32767	117Ch
		Reference point 1X coordinates	pb411	0	Units: Depends on the setting of pb400 When pb400 = 5: -32768 to 32767	117Dh
		Reference point 2X coordinates	pb412	0		117Eh
		Reference point 3X coordinates	pb413	0		117Fh
		Reference point 4X coordinates	pb414	0		1180h
		Reference point 5X coordinates	pb415	0		1181h
		Reference point 6X coordinates	pb416	0		1182h
		Reference point 7X coordinates	pb417	0		1183h
		Reference point 8X coordinates	pb418	0		1184h
		Reference point 1Y coordinates	pb421	0	Units: Depends on the setting of pb401 When pb401 = 5: -32768 to 32767	1185h
		Reference point 2Y coordinates	pb422	0		1186h
		Reference point 3Y coordinates	pb423	0		1187h
		Reference point 4Y coordinates	pb424	0		1188h
		Reference point 5Y coordinates	pb425	0		1189h
		Reference point 6Y coordinates	pb426	0		118Ah
		Reference point 7Y coordinates	pb427	0		118Bh
		Reference point 8Y coordinates	pb428	0		118Ch

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Analog Operation AnA	ANA-5	Variable type	pb500	0	For nviP1Ain, Setting range: 0 to 5 *	118Dh
		Variable type	pb501	0	For nvoP1Aout, Setting range: 0 to 5 *	118Eh
		Operation mode selection	pb502	1	0: R/B, 1: ANA/SCH, 2: LIM, 3: FIL	118Fh
		Output cycle	pb503	1.0	Setting range: 0.1 to 60.0 sec	1190h
		Variation ratio limitter	pb504	0	Units: Depends on the setting of pb501	1191h
		Delay time	pb505	0	Setting range: 0 to 65534 sec	1192h
		Operation after initialization	pb506	0	Valid when pb502 is set to 2 or 3 Setting range: 0 or 1	1193h
		Ratio	pb507	1.0	Setting range: 0.1 to 6553.4 sec	1194h
		Bias	pb508	0	Units: Depends on the setting of pb501 When pb501 = 5: -32768 to 32767	1195h
		Reference point 1X coordinates	pb511	0	Units: Depends on the setting of pb500 When pb500 = 5: -32768 to 32767	1196h
		Reference point 2X coordinates	pb512	0		1197h
		Reference point 3X coordinates	pb513	0		1198h
		Reference point 4X coordinates	pb514	0		1199h
		Reference point 5X coordinates	pb515	0		119Ah
		Reference point 6X coordinates	pb516	0		119Bh
		Reference point 7X coordinates	pb517	0		119Ch
		Reference point 8X coordinates	pb518	0		119Dh
		Reference point 1Y coordinates	pb521	0	Units: Depends on the setting of pb501 When pb501 = 5: -32768 to 32767	119Eh
		Reference point 2Y coordinates	pb522	0		119Fh
		Reference point 3Y coordinates	pb523	0		11A0h
		Reference point 4Y coordinates	pb524	0		11A1h
		Reference point 5Y coordinates	pb525	0		11A2h
		Reference point 6Y coordinates	pb526	0		11A3h
		Reference point 7Y coordinates	pb527	0		11A4h
		Reference point 8Y coordinates	pb528	0		11A5h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Analog Operation AnA	ANA-6	Variable type	pb600	0	For nviP1Ain, Setting range: 0 to 5 *	11A6h
		Variable type	pb601	0	For nvoP1Aout, Setting range: 0 to 5 *	11A7h
		Operation mode selection	pb602	1	0: R/B, 1: ANA/SCH, 2: LIM, 3: FIL	11A8h
		Output cycle	pb603	1.0	Setting range: 0.1 to 60.0 sec	11A9h
		Variation ratio limitter	pb604	0	Units: Depends on the setting of pb601	11AAh
		Delay time	pb605	0	Setting range: 0 to 65534 sec	11ABh
		Operation after initialization	pb606	0	Valid when pb602 is set to 2 or 3 Setting range: 0 or 1	11ACh
		Ratio	pb607	1.0	Setting range: 0.1 to 6553.4 sec	11ADh
		Bias	pb608	0	Units: Depends on the setting of pb601 When pb601 = 5: -32768 to 32767	11AEh
		Reference point 1X coordinates	pb611	0	Units: Depends on the setting of pb600 When pb600 = 5: -32768 to 32767	11AFh
		Reference point 2X coordinates	pb612	0		11B0h
		Reference point 3X coordinates	pb613	0		11B1h
		Reference point 4X coordinates	pb614	0		11B2h
		Reference point 5X coordinates	pb615	0		11B3h
		Reference point 6X coordinates	pb616	0		11B4h
		Reference point 7X coordinates	pb617	0		11B5h
		Reference point 8X coordinates	pb618	0		11B6h
		Reference point 1Y coordinates	pb621	0	Units: Depends on the setting of pb601 When pb601 = 5: -32768 to 32767	11B7h
		Reference point 2Y coordinates	pb622	0		11B8h
		Reference point 3Y coordinates	pb623	0		11B9h
		Reference point 4Y coordinates	pb624	0		11BAh
		Reference point 5Y coordinates	pb625	0		11BBh
		Reference point 6Y coordinates	pb626	0		11BCh
		Reference point 7Y coordinates	pb627	0		11BDh
		Reference point 8Y coordinates	pb628	0		11BEh

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Analog Operation AnA	ANA-7	Variable type	pb700	0	For nviP1Ain, Setting range: 0 to 5 *	11BFh
		Variable type	pb701	0	For nvoP1Aout, Setting range: 0 to 5 *	11C0h
		Operation mode selection	pb702	1	0: R/B, 1: ANA/SCH, 2: LIM, 3: FIL	11C1h
		Output cycle	pb703	1.0	Setting range: 0.1 to 60.0 sec	11C2h
		Variation ratio limitter	pb704	0	Units: Depends on the setting of pb701	11C3h
		Delay time	pb705	0	Setting range: 0 to 65534 sec	11C4h
		Operation after initialization	pb706	0	Valid when pb702 is set to 2 or 3 Setting range: 0 or 1	11C5h
		Ratio	pb707	1.0	Setting range: 0.1 to 6553.4 sec	11C6h
		Bias	pb708	0	Units: Depends on the setting of pb701 When pb701 = 5: -32768 to 32767	11C7h
		Reference point 1X coordinates	pb711	0	Units: Depends on the setting of pb700 When pb700 = 5: -32768 to 32767	11C8h
		Reference point 2X coordinates	pb712	0		11C9h
		Reference point 3X coordinates	pb713	0		11CAh
		Reference point 4X coordinates	pb714	0		11CBh
		Reference point 5X coordinates	pb715	0		11CCh
		Reference point 6X coordinates	pb716	0		11CDh
		Reference point 7X coordinates	pb717	0		11CEh
		Reference point 8X coordinates	pb718	0		11CFh
		Reference point 1Y coordinates	pb721	0	Units: Depends on the setting of pb701 When pb701 = 5: -32768 to 32767	11D0h
		Reference point 2Y coordinates	pb722	0		11D1h
		Reference point 3Y coordinates	pb723	0		11D2h
		Reference point 4Y coordinates	pb724	0		11D3h
		Reference point 5Y coordinates	pb725	0		11D4h
		Reference point 6Y coordinates	pb726	0		11D5h
		Reference point 7Y coordinates	pb727	0		11D6h
		Reference point 8Y coordinates	pb728	0		11D7h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Analog Operation AnA	ANA-8	Variable type	pb800	0	For nviP1Ain, Setting range: 0 to 5 *	11D8h
		Variable type	pb801	0	For nvoP1Aout, Setting range: 0 to 5 *	11D9h
		Operation mode selection	pb802	1	0: R/B, 1: ANA/SCH, 2: LIM, 3: FIL	11DAh
		Output cycle	pb803	1.0	Setting range: 0.1 to 60.0 sec	11DBh
		Variation ratio limitter	pb804	0	Units: Depends on the setting of pb801	11DCh
		Delay time	pb805	0	Setting range: 0 to 65534 sec	11DDh
		Operation after initialization	pb806	0	Valid when pb802 is set to 2 or 3 Setting range: 0 or 1	11DEh
		Ratio	pb807	1.0	Setting range: 0.1 to 6553.4 sec	11DFh
		Bias	pb808	0	Units: Depends on the setting of pb801 When pb801 = 5: -32768 to 32767	11E0h
		Reference point 1X coordinates	pb811	0	Units: Depends on the setting of pb800 When pb800 = 5: -32768 to 32767	11E1h
		Reference point 2X coordinates	pb812	0		11E2h
		Reference point 3X coordinates	pb813	0		11E3h
		Reference point 4X coordinates	pb814	0		11E4h
		Reference point 5X coordinates	pb815	0		11E5h
		Reference point 6X coordinates	pb816	0		11E6h
		Reference point 7X coordinates	pb817	0		11E7h
		Reference point 8X coordinates	pb818	0		11E8h
		Reference point 1Y coordinates	pb821	0	Units: Depends on the setting of pb801 When pb801 = 5: -32768 to 32767	11E9h
		Reference point 2Y coordinates	pb822	0		11EAh
		Reference point 3Y coordinates	pb823	0		11EBh
		Reference point 4Y coordinates	pb824	0		11ECh
		Reference point 5Y coordinates	pb825	0		11EDh
		Reference point 6Y coordinates	pb826	0		11EEh
		Reference point 7Y coordinates	pb827	0		11EFh
		Reference point 8Y coordinates	pb828	0		11F0h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Analog Operation AnA	ANA-9	Variable type	pb900	0	For nviP1Ain, Setting range: 0 to 5 *	11F1h
		Variable type	pb901	0	For nvoP1Aout, Setting range: 0 to 5 *	11F2h
		Operation mode selection	pb902	1	0: R/B, 1: ANA/SCH, 2: LIM, 3: FIL	11F3h
		Output cycle	pb903	1.0	Setting range: 0.1 to 60.0 sec	11F4h
		Variation ratio limitter	pb904	0	Units: Depends on the setting of pb901	11F5h
		Delay time	pb905	0	Setting range: 0 to 65534 sec	11F6h
		Operation after initialization	pb906	0	Valid when pb902 is set to 2 or 3 Setting range: 0 or 1	11F7h
		Ratio	pb907	1.0	Setting range: 0.1 to 6553.4 sec	11F8h
		Bias	pb908	0	Units: Depends on the setting of pb901 When pb901 = 5: -32768 to 32767	11F9h
		Reference point 1X coordinates	pb911	0	Units: Depends on the setting of pb900 When pb900 = 5: -32768 to 32767	11FAh
		Reference point 2X coordinates	pb912	0		11FBh
		Reference point 3X coordinates	pb913	0		11FCh
		Reference point 4X coordinates	pb914	0		11FDh
		Reference point 5X coordinates	pb915	0		11FEh
		Reference point 6X coordinates	pb916	0		11FFh
		Reference point 7X coordinates	pb917	0		1200h
		Reference point 8X coordinates	pb918	0		1201h
		Reference point 1Y coordinates	pb921	0	Units: Depends on the setting of pb901 When pb901 = 5: -32768 to 32767	1202h
		Reference point 2Y coordinates	pb922	0		1203h
		Reference point 3Y coordinates	pb923	0		1204h
		Reference point 4Y coordinates	pb924	0		1205h
		Reference point 5Y coordinates	pb925	0		1206h
		Reference point 6Y coordinates	pb926	0		1207h
		Reference point 7Y coordinates	pb927	0		1208h
		Reference point 8Y coordinates	pb928	0		1209h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Select Operation SEL	SEL-0	Variable type	pC000	0	Setting range: 0 to 5 *	120Ah
		Operation mode selection	pC001	1	0: SEL, 1: HI, 2: LO Cannot be input except for 0, 1, and 2.	120Bh
	SEL-1	Variable type	pC100	0	Setting range: 0 to 5 *	120Ch
		Operation mode selection	pC101	1	0: SEL, 1: HI, 2: LO Cannot be input except for 0, 1, and 2.	120Dh
	SEL-2	Variable type	pC200	0	Setting range: 0 to 5 *	120Eh
		Operation mode selection	pC201	1	0: SEL, 1: HI, 2: LO Cannot be input except for 0, 1, and 2.	120Fh
	SEL-3	Variable type	pC300	0	Setting range: 0 to 5 *	1210h
		Operation mode selection	pC301	1	0: SEL, 1: HI, 2: LO Cannot be input except for 0, 1, and 2.	1211h
	SEL-4	Variable type	pC400	0	Setting range: 0 to 5 *	1212h
		Operation mode selection	pC401	1	0: SEL, 1: HI, 2: LO Cannot be input except for 0, 1, and 2.	1213h
	SEL-5	Variable type	pC500	0	Setting range: 0 to 5 *	1214h
		Operation mode selection	pC501	1	0: SEL, 1: HI, 2: LO Cannot be input except for 0, 1, and 2.	1215h
	SEL-6	Variable type	pC600	0	Setting range: 0 to 5 *	1216h
		Operation mode selection	pC601	1	0: SEL, 1: HI, 2: LO Cannot be input except for 0, 1, and 2.	1217h
	SEL-7	Variable type	pC700	0	Setting range: 0 to 5 *	1218h
		Operation mode selection	pC701	1	0: SEL, 1: HI, 2: LO Cannot be input except for 0, 1, and 2.	1219h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Comparison Operation CP	CP-0	Variable type	pd000	0	Setting range: 0 to 5 *	121Ah
		Operation mode selection	pd001	0	0: Forward operation, 1: Reverse operation	121Bh
		Hysteresis	pd002	0	Units: Depends on the setting of pd000	121Ch
	CP-1	Variable type	pd100	0	Setting range: 0 to 5 *	121Dh
		Operation mode selection	pd101	0	0: Forward operation, 1: Reverse operation	121Eh
		Hysteresis	pd102	0	Units: Depends on the setting of pd100	121Fh
	CP-2	Variable type	pd200	0	Setting range: 0 to 5 *	1220h
		Operation mode selection	pd201	0	0: Forward operation, 1: Reverse operation	1221h
		Hysteresis	pd202	0	Units: Depends on the setting of pd200	1222h
	CP-3	Variable type	pd300	0	Setting range: 0 to 5 *	1223h
		Operation mode selection	pd301	0	0: Forward operation, 1: Reverse operation	1224h
		Hysteresis	pd302	0	Units: Depends on the setting of pd300	1225h
	CP-4	Variable type	pd400	0	Setting range: 0 to 5 *	1226h
		Operation mode selection	pd401	0	0: Forward operation, 1: Reverse operation	1227h
		Hysteresis	pd402	0	Units: Depends on the setting of pd400	1228h
	CP-5	Variable type	pd500	0	Setting range: 0 to 5 *	1229h
		Operation mode selection	pd501	0	0: Forward operation, 1: Reverse operation	122Ah
		Hysteresis	pd502	0	Units: Depends on the setting of pd500	122Bh
	CP-6	Variable type	pd600	0	Setting range: 0 to 5 *	122Ch
		Operation mode selection	pd601	0	0: Forward operation, 1: Reverse operation	122Dh
		Hysteresis	pd602	0	Units: Depends on the setting of pd600	122Eh
	CP-7	Variable type	pd700	0	Setting range: 0 to 5 *	122Fh
		Operation mode selection	pd701	0	0: Forward operation, 1: Reverse operation	1230h
		Hysteresis	pd702	0	Units: Depends on the setting of pd700	1231h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Step Output sp	sp-0	Variable type	pe000	0	Setting range: 0 to 5 *	1232h
		Operation mode selection	pe001	0	0: FILO, 1: FIFO	1233h
		Hysteresis	pe002	0	Units: Depends on the setting of pe000	1234h
		STEP 1 reference value	pe011	0		1235h
		STEP 2 reference value	pe012	0		1236h
		STEP 3 reference value	pe013	0		1237h
		STEP 4 reference value	pe014	0		1238h
		Timer to increment/decrement the number of ON outputs	pe015	10	Setting range: 0 to 65534 sec	1239h
		Timer after the output turned ON	pe016	60		123Ah
		Timer after the output turned OFF	pe017	30		123Bh
		Base output position	pe018	1	FILO setting range: 1 to 4	123Ch
Delay Timer dt	dt-0	Operation mode selection	pf000	0	0: ON delay 1: OFF delay	123Dh
		ON delay time	pf001	0	Setting range: 0 to 65534 sec	123Eh
		OFF delay time	pf002	0	Setting range: 0 to 65534 sec	123Fh
		Operation after initialization	pf004	0	0: ON delay valid 1: ON delay invalid	1240h
	dt-1	Operation mode selection	pf100	0	0: ON delay 1: OFF delay	1241h
		ON delay time	pf101	0	Setting range: 0 to 65534 sec	1242h
		OFF delay time	pf102	0	Setting range: 0 to 65534 sec	1243h
		Operation after initialization	pf104	0	0: ON delay valid 1: ON delay invalid	1244h
Deviation Output dv	dv-0	Variable type	pg000	0	Setting range: 0 to 5 *	1245h
		Operation mode selection	pg001	0	0: Outputs with 3 deviations 1: Outputs with 2 deviations	1246h
		Reserved	–	–	–	1247h
		Deviation a	pg011	0	Depends on the setting of pg000.	1248h
		Deviation b	pg012	0	Depends on the setting of pg000.	1249h
		Deviation c	pg013	0	Depends on the setting of pg000.	124Ah

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
PID Module pid	pid-0	Variable type	pH000	0	Setting range: 0 to 5 *	124Bh
		Operation mode selection	ph001	0	0: Forward operation 1: Reverse operation	124Ch
		Proportional band	pH002	1.0	Setting range: 0 to 6553.5 sec	124Dh
		Integral time	pH003	1.0	Setting range: 0 to 6553.5 sec	124Eh
		Output when interlocked	pH004	0	Setting range: 0 or 1	124Fh
		Reference point	pH005	50	Setting range: -5 to 105%	1250h
		Reserved	–	–	–	1251h
	pid-1	Variable type	pH100	0	Setting range: 0 to 5 *	1252h
		Operation mode selection	ph101	0	0: Forward operation 1: Reverse operation	1253h
		Proportional band	pH102	1.0	Setting range: 0 to 6553.5 sec	1254h
		Integral time	pH103	1.0	Setting range: 0 to 6553.5 sec	1255h
		Output when interlocked	pH104	0	Setting range: 0 or 1	1256h
		Reference point	pH105	50	Setting range: -5 to 105%	1257h
		Reserved	–	–	–	1258h
	pid-2	Variable type	pH200	0	Setting range: 0 to 5 *	1259h
		Operation mode selection	ph201	0	0: Forward operation 1: Reverse operation	125Ah
		Proportional band	pH202	1.0	Setting range: 0 to 6553.5 sec	125Bh
		Integral time	pH203	1.0	Setting range: 0 to 6553.5 sec	125Ch
		Output when interlocked	pH204	0	Setting range: 0 or 1	125Dh
		Reference point	pH205	50	Setting range: -5 to 105%	125Eh
		Reserved	–	–	–	125Fh
	pid-3	Variable type	pH300	0	Setting range: 0 to 5 *	1260h
		Operation mode selection	ph301	0	0: Forward operation 1: Reverse operation	1261h
		Proportional band	pH302	1.0	Setting range: 0 to 6553.5 sec	1262h
		Integral time	pH303	1.0	Setting range: 0 to 6553.5 sec	1263h
		Output when interlocked	pH304	0	Setting range: 0 or 1	1264h
		Reference point	pH305	50	Setting range: -5 to 105%	1265h
		Reserved	–	–	–	1266h

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Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Constant Output fno	fno-0	Variable type	pj000	0	Setting range: 0 to 5 *	1267h
		Constant	pj001	0	Depends on the setting of pj000	1268h
	fno-1	Variable type	pj100	0	Setting range: 0 to 5 *	1269h
		Constant	pj101	0	Depends on the setting of pj100	126Ah
	fno-2	Variable type	pj200	0	Setting range: 0 to 5 *	126Bh
		Constant	pj201	0	Depends on the setting of pj200	126Ch
	fno-3	Variable type	pj300	0	Setting range: 0 to 5 *	126Dh
		Constant	pj301	0	Depends on the setting of pj300	126Eh
	fno-4	Variable type	pj400	0	Setting range: 0 to 5 *	126Fh
		Constant	pj401	0	Depends on the setting of pj400	1270h
	fno-5	Variable type	pj500	0	Setting range: 0 to 5 *	1271h
		Constant	pj501	0	Depends on the setting of pj500	1272h
Variable Type Conversion typ	typ-0	Variable type	pl000	0	For nviTypAin, Setting range: 0 to 7 *	1273h
		Variable type	pl001	0	For nvoTypAout, Setting range: 0 to 7 *	1274h
		Input range 1	pl002	0	Units: Depends on the setting of pl000	1275h
		Input range 2	pl003	0		1276h
		Output range 1	pl004	0	Units: Depends on the setting of pl001	1277h
		Output range 2	pl005	0		1278h
		Operation mode selection (Output selection)	pl006	0	• 0: ANA → ANA • 1: ANA → DIG • 2: DIG → ANA	1279h
		Analog reference data	pl010	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl000.	127Ah
		Analog reference data	pl011	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl000.	127Bh
		Analog reference data	pl012	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl000.	127Ch
		Analog reference data	pl013	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl000.	127Dh
		Analog reference data	pl014	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl000.	127Eh
		Analog reference data	pl015	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl000.	127Fh
		Analog reference data	pl016	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl000.	1280h
		Analog reference data	pl017	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl000.	1281h
		Analog reference data	pl018	0	DIG_IN(1)=ON, D → A Units: Depends on the setting of pl001.	1282h
		Analog reference data	pl019	0	DIG_IN(2)=ON, D → A Units: Depends on the setting of pl001.	1283h
		Analog reference data	pl020	0	DIG_IN(3)=ON, D → A Units: Depends on the setting of pl001.	1284h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Variable Type Conversion typ	typ-1	Variable type	pl100	0	For nviTypAin, Setting range: 0 to 7 *	1285h
		Variable type	pl101	0	For nvoTypAout, Setting range: 0 to 7 *	1286h
		Input range 1	pl102	0	Units: Depends on the setting of pl100	1287h
		Input range 2	pl103	0		1288h
		Output range 1	pl104	0	Units: Depends on the setting of pl101	1289h
		Output range 2	pl105	0		128Ah
		Output selection	pl106	0	• 0: ANA → ANA • 1: ANA → DIG • 2: DIG → ANA	128Bh
		Analog reference data	pl110	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl100	128Ch
		Analog reference data	pl111	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl100	128Dh
		Analog reference data	pl112	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl100	128Eh
		Analog reference data	pl113	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl100	128Fh
		Analog reference data	pl114	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl100	1290h
		Analog reference data	pl115	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl100	1291h
		Analog reference data	pl116	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl100	1292h
		Analog reference data	pl117	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl100	1293h
		Analog reference data	pl118	0	DIG_IN(1)=ON, D → A Units: Depends on the setting of pl101	1294h
		Analog reference data	pl119	0	DIG_IN(2)=ON, D → A Units: Depends on the setting of pl101	1295h
		Analog reference data	pl120	0	DIG_IN(3)=ON, D → A Units: Depends on the setting of pl101	1296h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Variable Type Conversion typ	typ-2	Variable type	pl200	0	For nviTypAin, Setting range: 0 to 7 *	1297h
		Variable type	pl201	0	For nvoTypAout, Setting range: 0 to 7 *	1298h
		Input range 1	pl202	0	Units: Depends on the setting of pl200	1299h
		Input range 2	pl203	0		129Ah
		Output range 1	pl204	0	Units: Depends on the setting of pl201	129Bh
		Output range 2	pl205	0		129Ch
		Output selection	pl206	0	• 0: ANA → ANA • 1: ANA → DIG • 2: DIG → ANA	129Dh
		Analog reference data	pl210	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl200.	129Eh
		Analog reference data	pl211	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl200.	129Fh
		Analog reference data	pl212	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl200.	12A0h
		Analog reference data	pl213	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl200.	12A1h
		Analog reference data	pl214	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl200.	12A2h
		Analog reference data	pl215	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl200.	12A3h
		Analog reference data	pl216	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl200.	12A4h
		Analog reference data	pl217	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl200.	12A5h
		Analog reference data	pl218	0	DIG_IN(1)=ON, D → A Units: Depends on the setting of pl201.	12A6h
		Analog reference data	pl219	0	DIG_IN(2)=ON, D → A Units: Depends on the setting of pl201.	12A7h
		Analog reference data	pl220	0	DIG_IN(3)=ON, D → A Units: Depends on the setting of pl201.	12A8h

* Can only read, but not write from the Operator.

Table A.1 Parameters for Operation Modules (cont'd)

Function	Function No.	Parameter Name	Parameter No. (Pr. No.)	Default	Explanation	Register No.
Variable Type Conversion typ	typ-3	Variable type	pl300	0	For nviTypAin, Setting range: 0 to 7 *	12A9h
		Variable type	pl301	0	For nvoTypAout, Setting range: 0 to 7 *	12AAh
		Input range 1	pl302	0	Units: Depends on the setting of pl300	12ABh
		Input range 2	pl303	0		12ACh
		Output range 1	pl304	0	Units: Depends on the setting of pl301	12ADh
		Output range 2	pl305	0		12AEh
		Output selection	pl306	0	• 0: ANA → ANA • 1: ANA → DIG • 2: DIG → ANA	12AFh
		Analog reference data	pl310	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl300	12B0h
		Analog reference data	pl311	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl300	12B1h
		Analog reference data	pl312	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl300	12B2h
		Analog reference data	pl313	0	DIG_OUT(1)=ON, A → D Units: Depends on the setting of pl300	12B3h
		Analog reference data	pl314	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl300	12B4h
		Analog reference data	pl315	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl300	12B5h
		Analog reference data	pl316	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl300	12B6h
		Analog reference data	pl317	0	DIG_OUT(2)=ON, A → D Units: Depends on the setting of pl300	12B7h
		Analog reference data	pl318	0	DIG_IN(1)=ON, D → A Units: Depends on the setting of pl301	12B8h
		Analog reference data	pl319	0	DIG_IN(2)=ON, D → A Units: Depends on the setting of pl301	12B9h
		Analog reference data	pl320	0	DIG_IN(3)=ON, D → A Units: Depends on the setting of pl301	12BAh
Save Data dtl	dtl-0	Variable type	po000	0	Setting range: 0 to 5 *	12BBh
	dtl-1	Variable type	po100	0	Setting range: 0 to 5 *	12BCh
	dtl-2	Variable type	po200	0	Setting range: 0 to 5 *	12BDh
	dtl-3	Variable type	po300	0	Setting range: 0 to 5 *	12BEh

* Can only read, but not write from the Operator.

A.3 Standard Network Variable Types (SNVTs)

The following five standard network variable types can be selected from the Operator for SNVT regarded as the data.

Parameter Setting	Name	Variable Type	Descriptions
0	Percent (Humidity, frequency, etc.)	SNVT_lev_percent	SNVT #: 81 Measurement: Percent Level or Humidity Data type: Fixed Point Scalar - signed long Data size: 2 bytes Data range (Resolution): -163.84 to 163.83 % (0.005 %/bit). The value 0x7FFF represents invalid data.
1	Pressure	SNVT_Press	SNVT#: 30 Measurement: Gauge Pressure Data type: Fixed Point Scalar - signed long Data size: 2 bytes Data range (Resolution): -3,276.8 to 3,276.7 kilopascals (0.1 kPa)
2	Pressure	SNVT_Press_p	SNVT#: 113 Measurement: Gauge Pressure Data type: Fixed Point Scalar - signed long Data size: 2 bytes Data range (Resolution): -32,768 to 32,766 Pascals (1 Pa). The value 0x7FFF represents invalid data.
3	Flow	SNVT_flow	SNVT#: 15 Measurement: Flow Data type: Fixed Point Scalar - unsigned long Data size: 2 bytes Data range (Resolution): 0 to 65,534 liters/sec (1 liter/sec). The value 0xFFFF represents invalid data.
4	Temperature	SNVT_temp_p	SNVT#: 105 Measurement: Temperature Data type: Fixed Point Scalar - signed long Data size: 2 bytes Data range (Resolution): -273.17 to 327.66 degrees C (0.01 degrees C). The value 0x7FFF represents invalid data.
5	Concentration	SNVT_ppm	SNVT#: 29 Measurement: Concentration Data type: Fixed Point Scalar - unsigned long Data size: 2 bytes Data range (Resolution): 0 .. 65,535 parts per million (1 ppm) The value 0xFFFF (65,535) represents invalid data.

(cont'd)

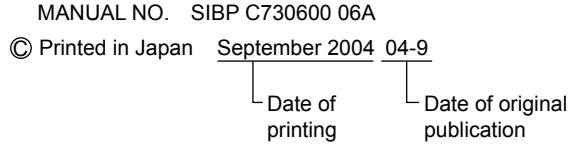
<table>
<tr><th>Parameter Setting</th><th>Name</th><th>Variable Type</th><th>Descriptions</th></tr>
<tr><td rowspan="2">6</td><td>HVAC mode</td><td>SNVT_HVAC_mode</td><td>SNVT#: 108
Contents: HVAC mode
Data type: Enumeration Scalar
Data size: 1 byte
Data range (Resolution): hvac_t Enumeration
Typedef File: SNVT_HV.H</td></tr>
<tr><td colspan="3">Enum Definitions
• Value Identifier
0 HVAC_AUTO: Controller automatically changes between application modes
1 HVAC_HEAT: Heating only
2 HVAC_MRNG_WRMUP: Application-specific morning warm-up
3 HVAC_COOL: Cooling only
4 HVAC_NIGHT_PURGE: Application-specific night purge
5 HVAC_PRE_COOL: Application-specific pre-cool
6 HVAC_OFF: Controller not controlling outputs
7 HVAC_TEST: Equipment being tested
8 HVAC_EMERG_HEAT: Emergency heat mode (heat pump)
9 HVAC_FAN_ONLY: Air not conditioned, fan turned on
10 HVAC_FREE_COOL: Cooling with compressor not running
11 HVAC_ICE: Ice-making mode
0xFF HVAC_NUL: Value not available</td></tr>
<tr><td rowspan="2">7</td><td>HVAC mode</td><td>SNVT_HVAC_state</td><td>SNVT#: 112
Contents: HVAC status
Data type: Structure
Data size: 12 bytes</td></tr>
<tr><td colspan="3">Structure
typedef struct {
hvac_t mode;
signed longheat_output_primary;
signed longheat_output_secondary;
signed longcool_output;
signed longecon_output;
signed longfan_output;
unsignedin_alarm;
} SNVT_hvac_status;

Field Definitions

Field Units Valid Range Notes
modehvac_tcompatible with SNVT_hvac_mode
heat_output_primarySNVT_lev_percent-163.83 .. +163.83% primary heat output
heat_output_secondarySNVT_lev_percent-163.83 .. +163.83% secondary heat output
cool_outputSNVT_lev_percent-163.83 .. +163.83% cooling output
econ_outputSNVT_lev_percent-163.83 .. +163.83% economizer output
fan_outputSNVT_lev_percent-163.83 .. +163.83% fan output
in_alarmboolean0 .. 11 means unit is in alarm</td></tr>
</table>

Revision History

The revision dates and numbers of the revised manuals are given on the bottom of the back cover.



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USER'S MANUAL

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