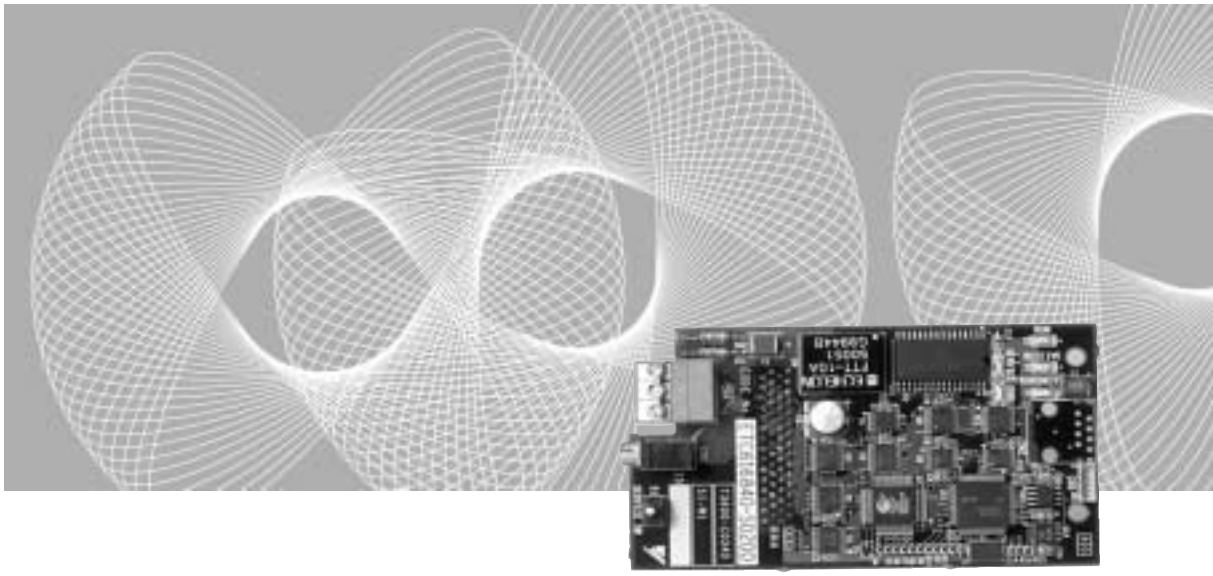
Varispeed SERIES OPTION CARD

LONWORKS COMMUNICATIONS INTERFACE CARD

USER'S MANUAL

Model: SI-J



YASKAWA

MANUAL NO. SIBP C730600 07A

Introduction

This manual describes the operation and specifications of the LONWORKS SI-J Communications Interface Card (here after called “SI-J”), 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-J.

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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- Windows95, Windows98, and Windows2000 are registered trademarks of Microsoft Corporation.

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Revision History

1 Overview

SI-J is an interface card 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-J 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.

1.1 General Specifications

Table 1 General Specifications

Item	Explanation
Name	LONWORKS Communications Interface Card
Model	SI-J
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 Communications Specifications

Table 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.

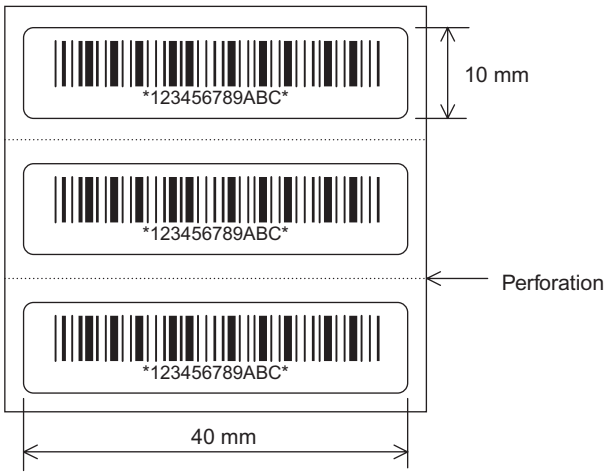
Item	Method
Is there any discrepancy between the shipment and what was ordered?	Check the information printed on the Card. (Refer to 2.1.)
Has the product been damaged in any way?	Inspect the entire exterior of the Card for any damage that may have occurred during shipping.
Are the contents of the package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

■ Contents of Package

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

■ Label Specifications

Bar code standard: Code 39

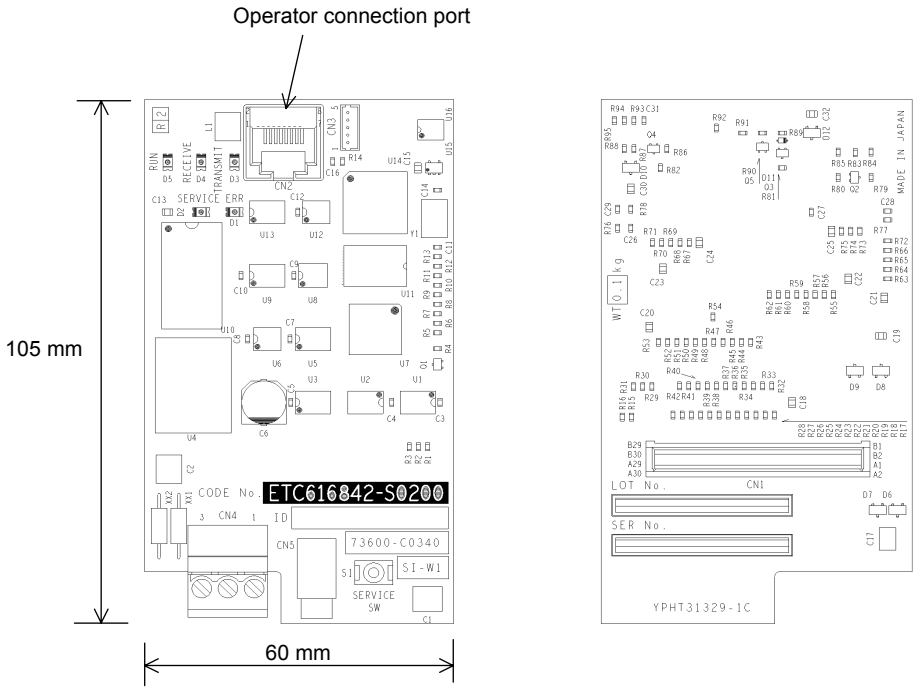


If you find any irregularities in the above items, contact your Yaskawa representative or the agency where you purchased the product immediately.

2 Component Names and Settings

2.1 External Dimensions and Component Names

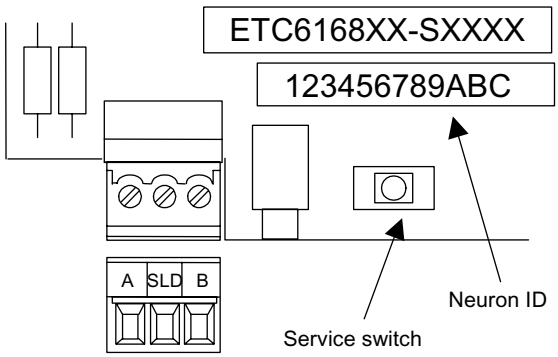
■ Names of Components on Option Card



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.

■ 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-J

Using the following procedure, mount the SI-J 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-J's spacer mounting holes into the spacers for the Option Card on the Inverter's control panel.
5. Align the SI-J connector (CN1) with the Option Card connector (2CN), and then pass the spacers through the SI-J. When passing the spacers through the holes, press firmly until the Card clicks into place.
6. After the SI-J has been installed, insert the Option Card clip in order to prevent the SI-J from rising at the connector side.
7. Replace the Inverter's front cover.

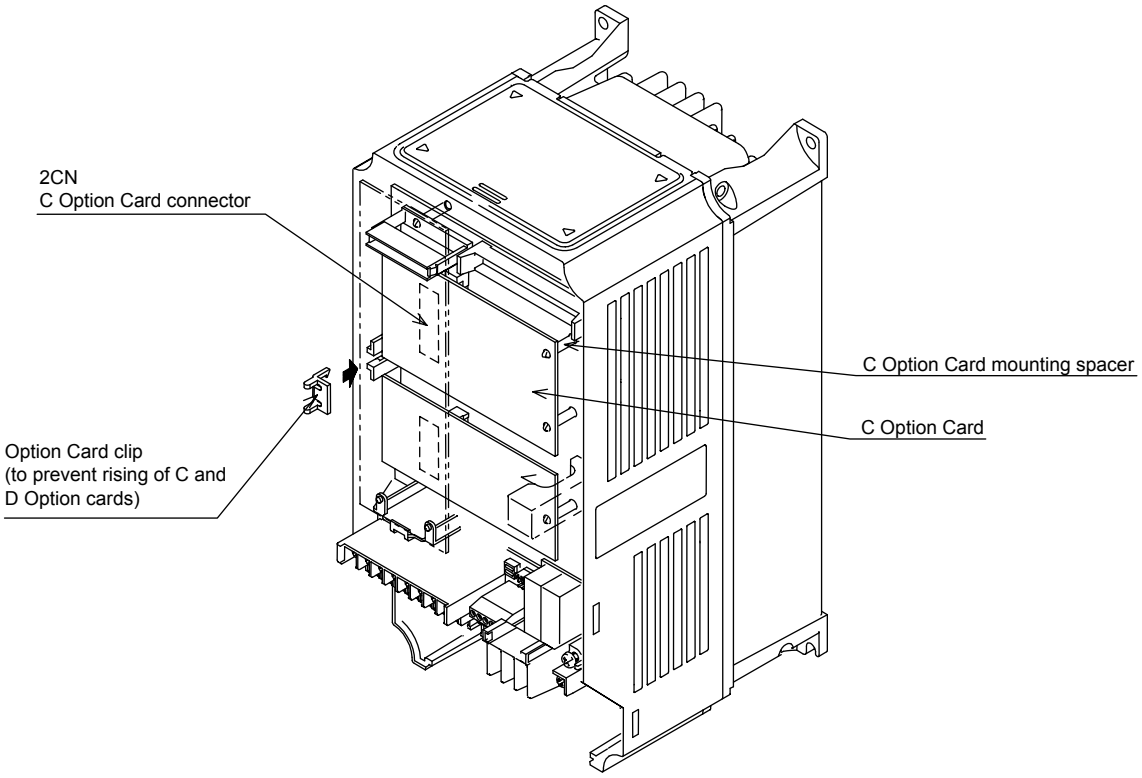


Fig. 1 Installation of SI-J

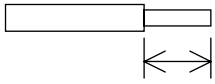
3.2 Wiring LONWORKS Communications Cables

■ 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.

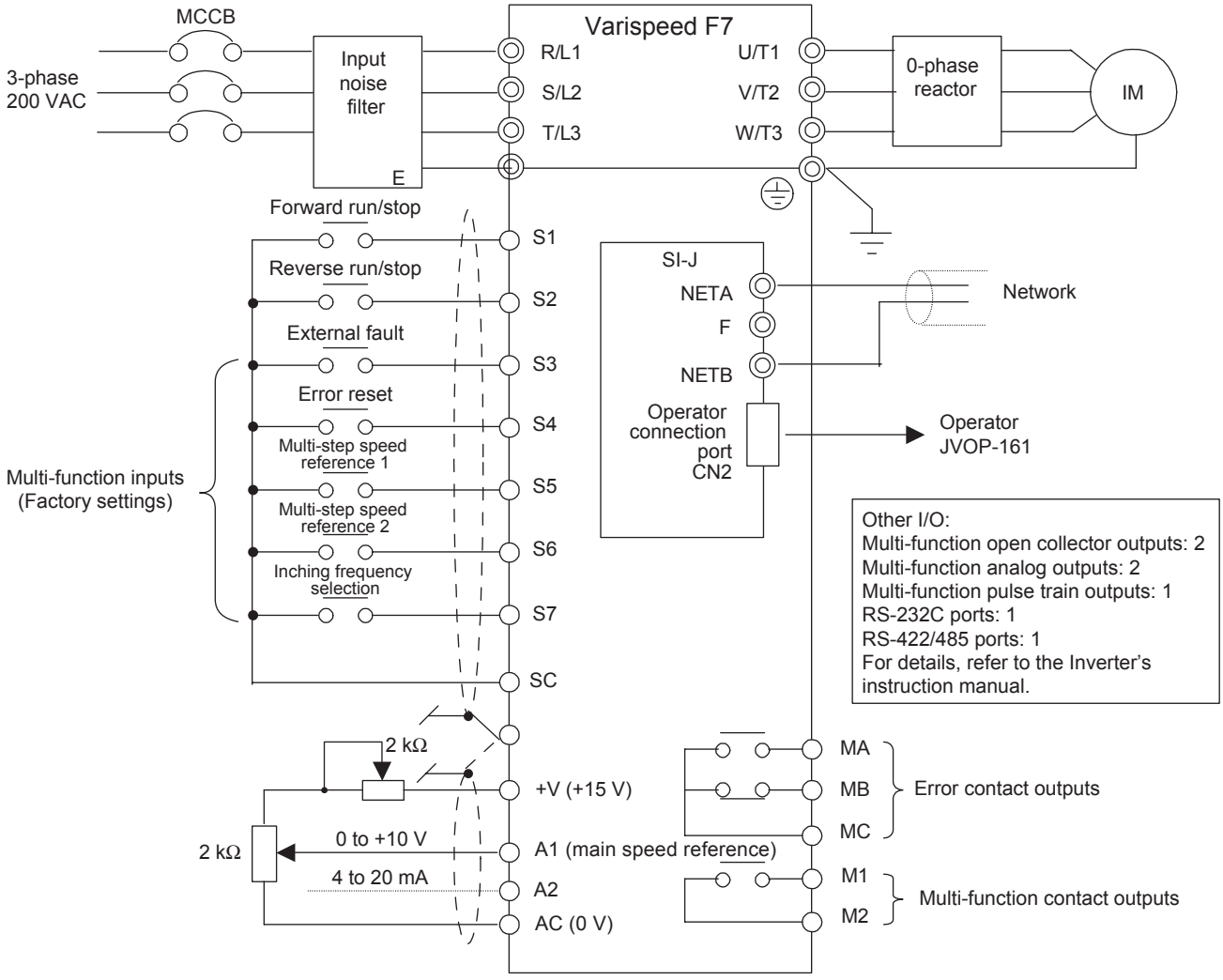


IMPORTANT

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

■ Wiring Diagram

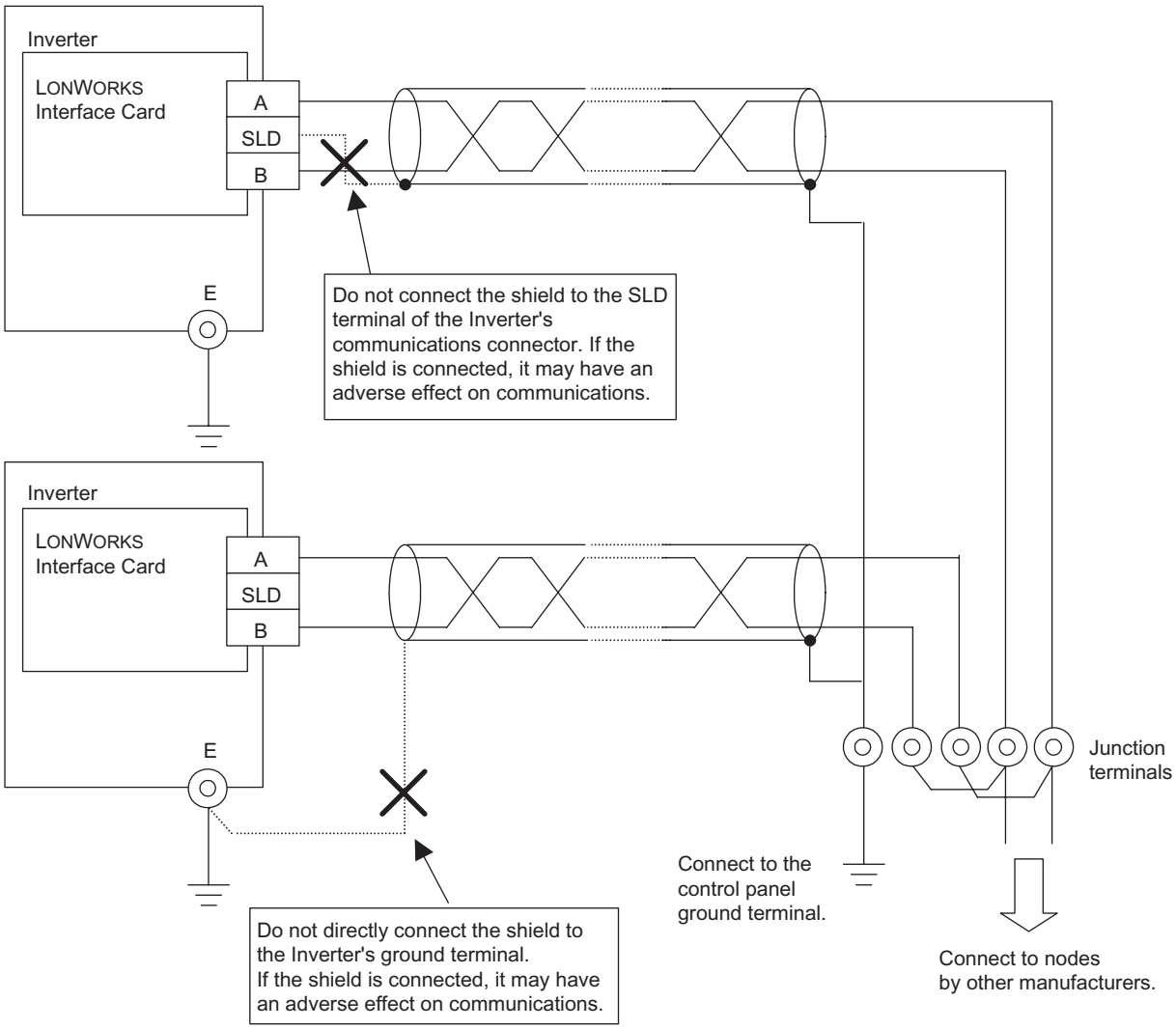
The diagram below provides a basic overview of the Inverter's wiring. For details, refer to the instruction manual for the Inverter. To reduce Inverter noise, it is recommended that noise filters be installed at I/O lines, and that a 0-phase reactor be inserted. If these noise reduction measures are not implemented, communications may be adversely effected by noise. Refer to the Inverter catalog for information on selecting noise filters and a 0-phase reactor.



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

■ 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.

■ 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).

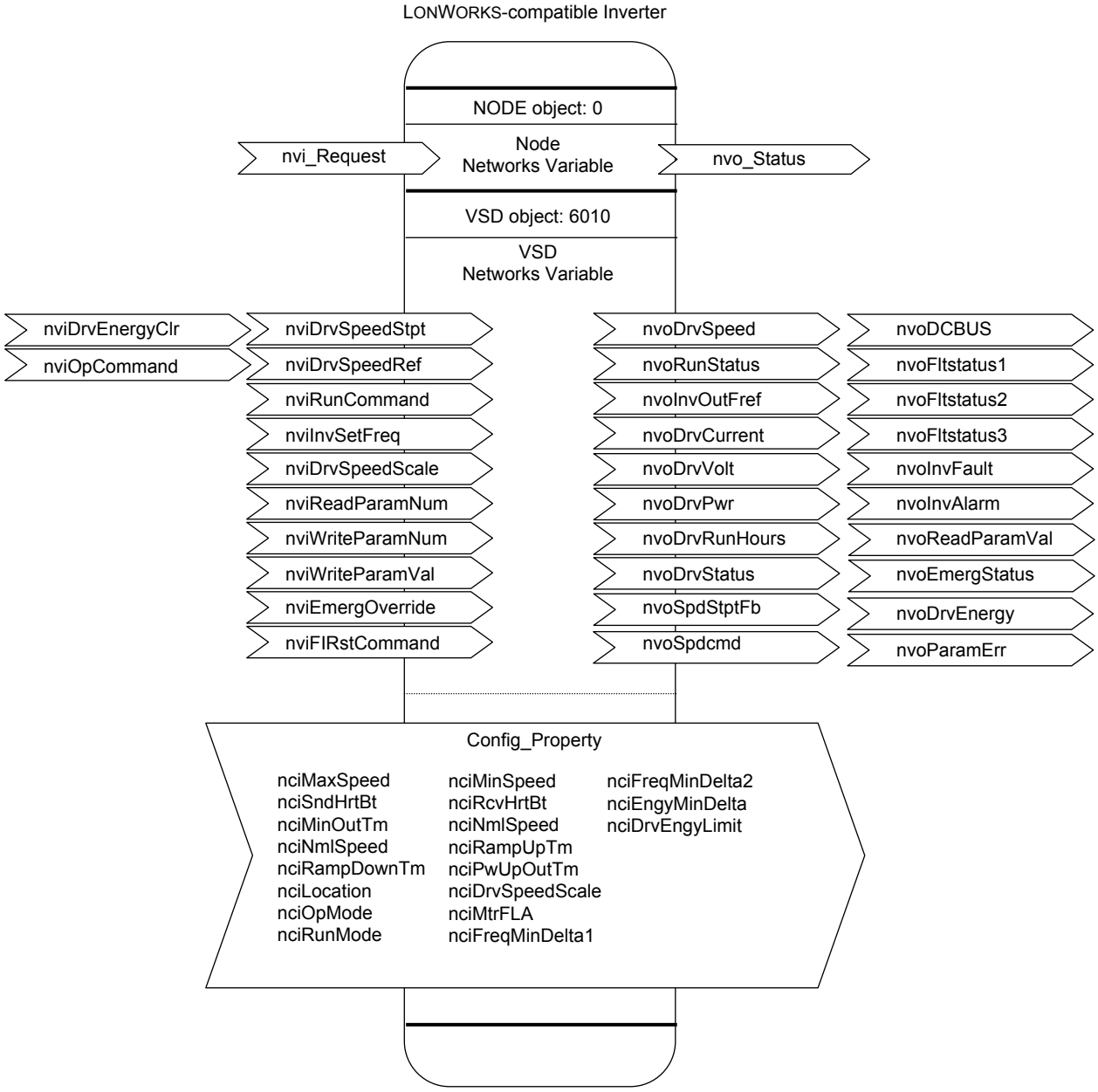
Procedure

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-J) (Frequency references and run commands from the network are enabled.)

5 Network Variables

5.1 LONWORKS-compatible Inverter and Network Variable



5.2 Node Objects

■ 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	
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.)

■ 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

■ 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

■ 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

■ 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

■ 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.

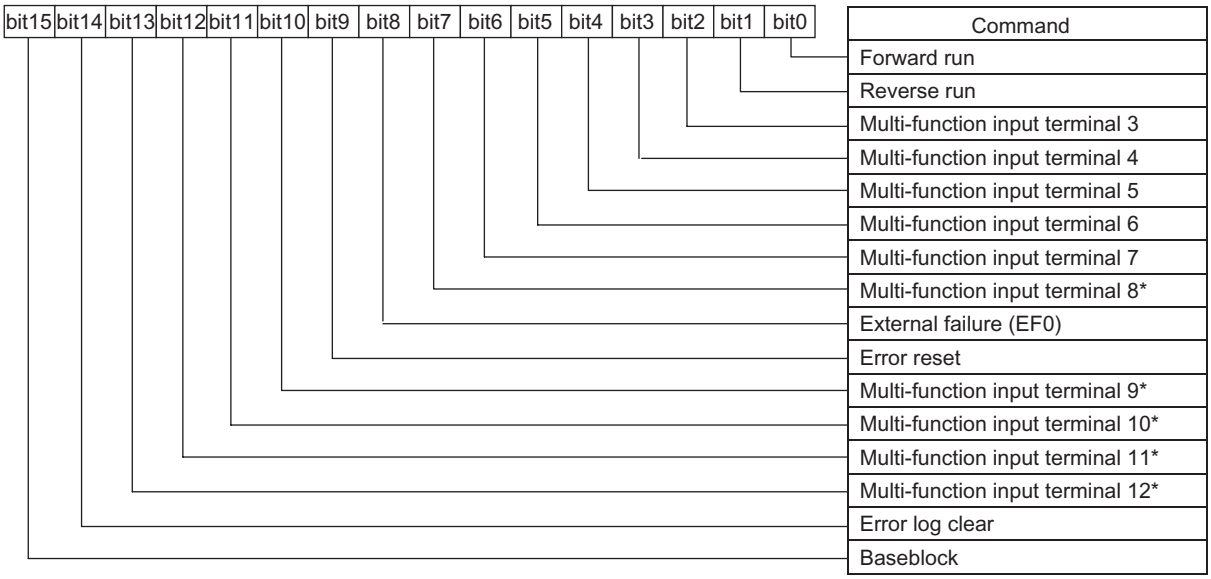
Related network variables, configuration properties:

nciRcvHrtBt

■ 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.

■ 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 × nciNmlfreq

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

■ 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

■ Drive Fault 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.

■ 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

■ 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

■ 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

■ 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

■ 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 the frequency is outside of the recently changed frequency range.

Service type

Default: Authentication type

■ 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

■ 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 the frequency is outside of the recently changed frequency range.

Service type

Default: Authentication type

■ 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

■ 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

■ Drive DC Voltage (DC Bus Voltage Monitoring)

Output: SNVT_volt nvoDCBusVolt;

This network variable outputs DC bus 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

■ 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

■ 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 as it is used to calculate the charges for power.

■ 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

■ 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

■ 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

■ 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

■ 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 nviReadParamNum, nviWriteParamNum, or nviWriteParamVal, or when an Inverter constant access-related error occurs.

Table 3 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

■ 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

■ 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.

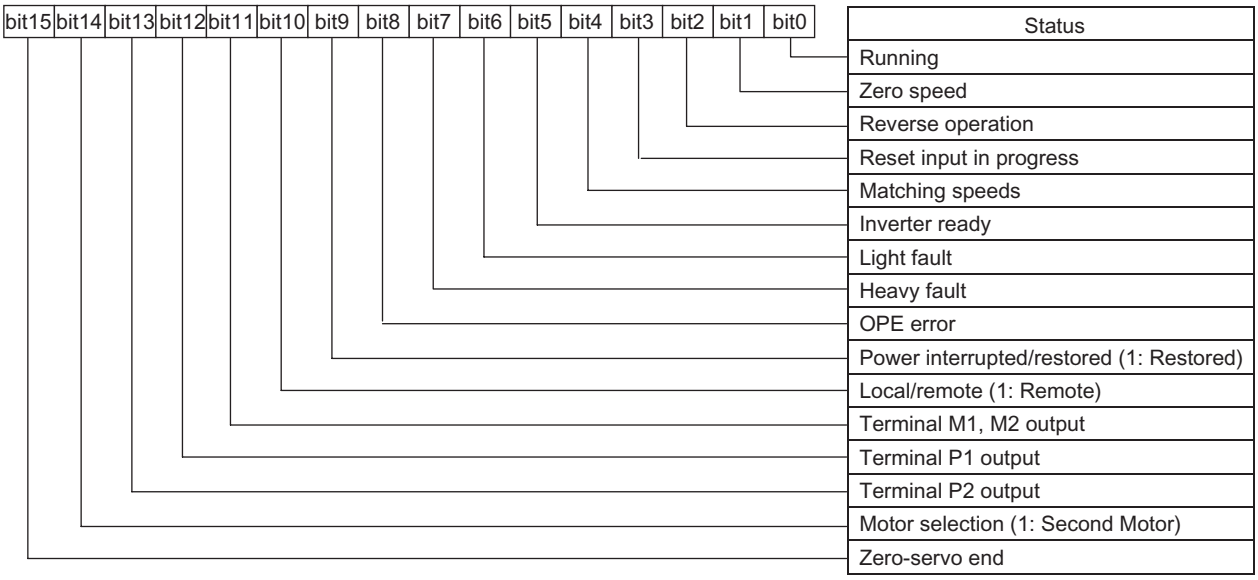
Service type

Default: Authentication type

■ 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.

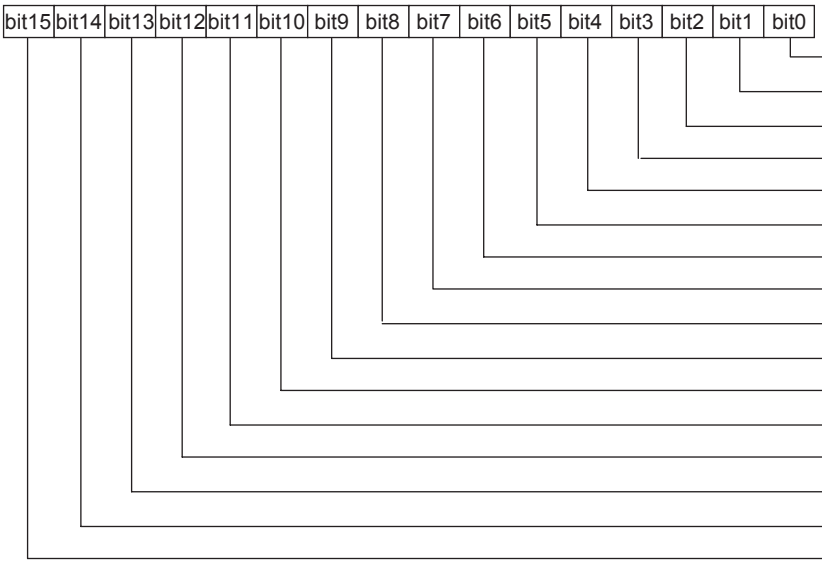
Service type

Default: Authentication type

■ 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.

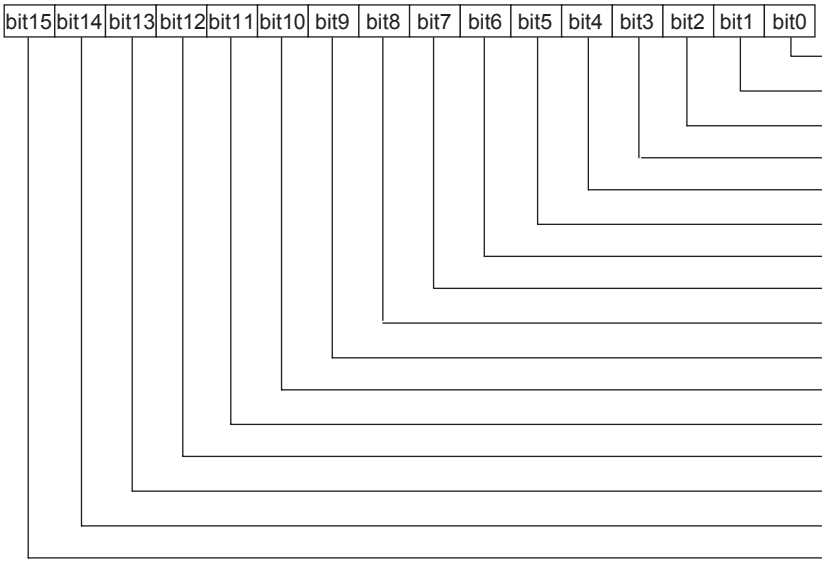
Service type

Default: Authentication type

■ 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.

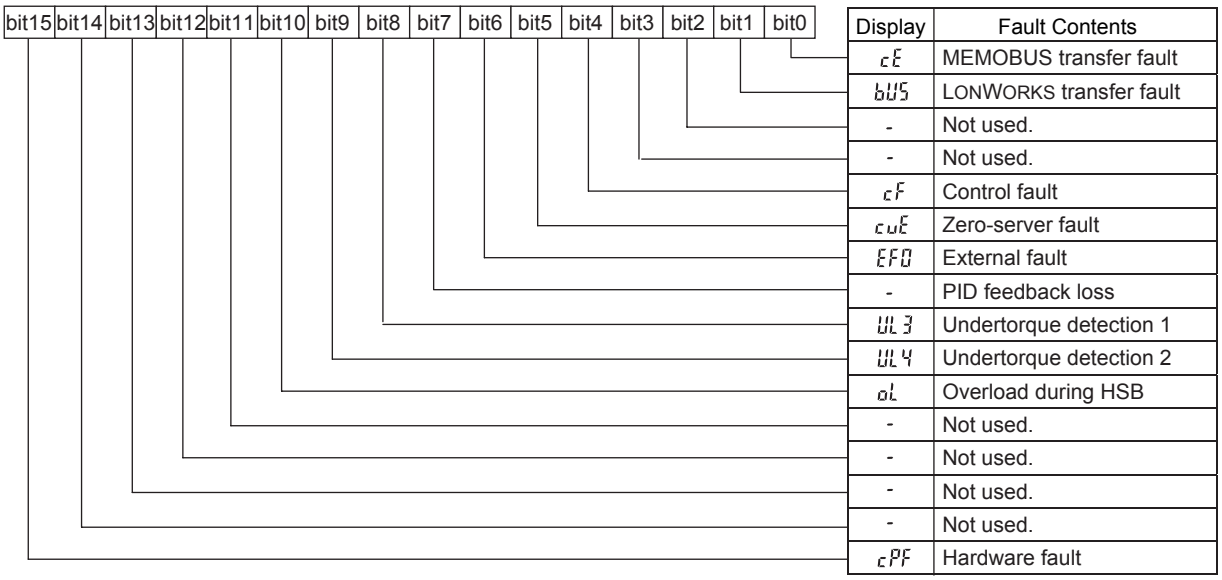
Service type

Default: Authentication type

■ 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

■ 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

■ Reading Inverter Constants

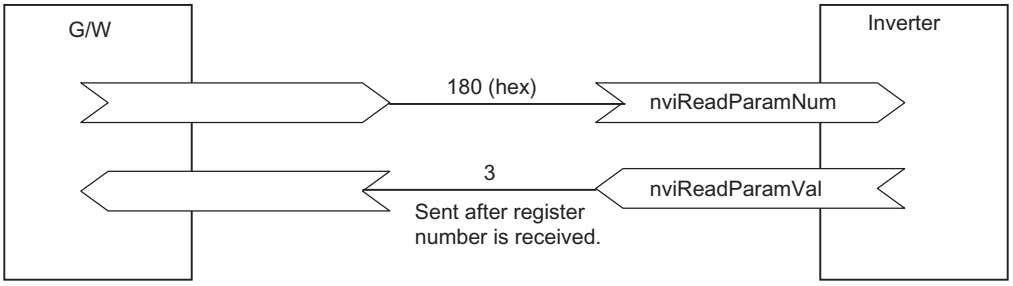
1. Set to nviReadParamNum, in hexadecimal, the register number of the Inverter constant that is to be read.
2. When the nviReadParamNum data is refreshed, the Inverter will set the data contents of the applicable Inverter constant in nvoReadParamVal for output.
3. If invalid data is set in nviReadParamNum 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 "■ 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.

■ 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 "■ Drive Parameter Error (Inverter Constant Access Error).")

IMPORTANT

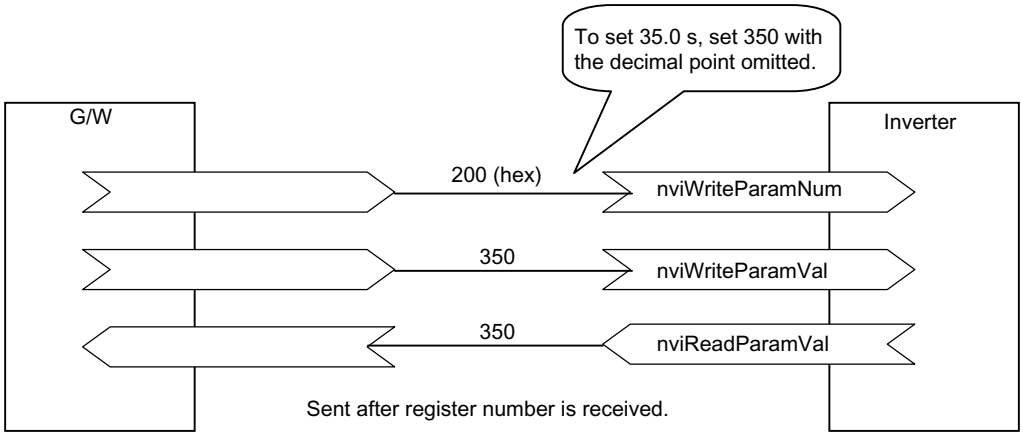
Sending data to nviWriteParamNum and nviWriteParamVal must be done in the order described in 1) and 2) above. If the order is reversed, the intended settings will not be made and unintended settings may be made instead.

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 *Table 3 Error Codes* for error codes.

6 Drive Configuration Properties

6.1 Drive-related Network Configuration Properties

■ 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).

■ 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)

■ 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)

■ 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)

■ 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)

■ 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)

■ 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

■ 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 error "bUS" is detected.

Default: 0 (Invalid)

SCPT Reference: SCPTmaxRcvTime (48)

■ 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).

■ 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)

■ 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)

■ 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)

■ 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)

■ 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)

■ 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)

■ 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)

■ 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)

■ 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 (nvo-DrvEnergy).

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

■ 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

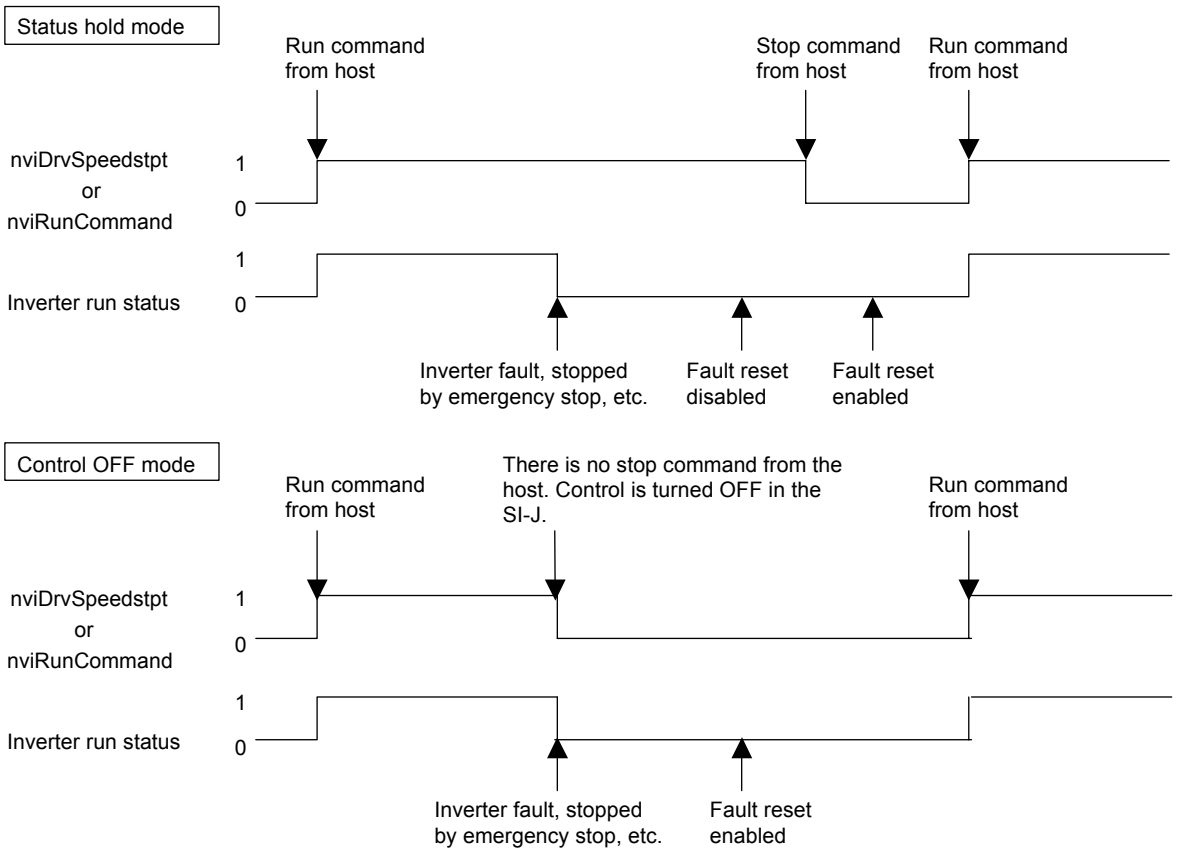
■ Run Command Status Mode

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-J 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-J 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-J control circuit defect	Replace the SI-J.
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-J control circuit defect	Replace the SI-J.
CPF03	EEPROM defect	−	Turn the power ON and OFF.
		Power was turned OFF during EEPROM writing.	Initialize the SI-J.
		Control circuit error	Replace the SI-J.
CPF20	SI-J fault	Fault at SI-J connector	Turn OFF the power and reinstall the SI-J.
CPF21	SI-J self-diagnosis fault	Access failure between CPU and neuron chip	Turn the power ON and OFF.
		SI-J failure	Replace the SI-J.
CPF22	SI-J model code fault	−	
CPF23	SI-J reciprocal diagnosis fault	Access failure between SI-J and Inverter	Replace the SI-J.

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.

Revision History

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

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In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.

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