MITSUBISHI ELECTRIC

800 series

INVERTER

Plug-in option

FR-A8NL

INSTRUCTION MANUAL

LonWorks®

communication function

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Thank you for choosing this Mitsubishi inverter plug-in option.
This Instruction Manual provides handling information and precautions for use of this product. Incorrect handling might cause an unexpected fault. Before using this product, always read this Instruction Manual carefully to use this product correctly.
Please forward this Instruction Manual to the end user.

Safety instructions

Do not attempt to install, operate, maintain or inspect the product until you have read through this Instruction Manual and appended documents carefully and can use the equipment correctly. Do not use this product until you have a full knowledge of the equipment, safety information and instructions. In this Instruction Manual, the safety instruction levels are classified into "WARNING" and "CAUTION".

⚠WARNING **Incorrect handling may cause hazardous conditions, resulting in death or severe injury.**

⚠CAUTION **Incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause only material damage.**

The ⚠CAUTION level may even lead to a serious consequence according to conditions. Both instruction levels must be followed because these are important to personal safety.

◆ **Electric shock prevention**

⚠WARNING

- While the inverter power is ON, do not remove the front cover or the wiring cover. Do not run the inverter with the front cover or the wiring cover removed. Otherwise you may access the exposed high voltage terminals or the charging part of the circuitry and get an electric shock.
- Do not remove the inverter front cover even if the power supply is disconnected. The only exception for this would be when performing wiring and periodic inspection. You may accidentally touch the charged inverter circuits and get an electric shock.
- Before wiring or inspection, LED indication of the inverter unit operation panel must be switched OFF. Any person who is involved in wiring or inspection shall wait for at least 10 minutes after the power supply has been switched OFF and check that there is no residual voltage using a tester or the like. For some time after the power-OFF, a high voltage remains in the smoothing capacitor, and it is dangerous.
- Any person who is involved in wiring or inspection of this equipment shall be fully competent to do the work.
- The plug-in option must be installed before wiring. Otherwise you may get an electric shock or be injured.
- Do not touch the plug-in option or handle the cables with wet hands. Otherwise you may get an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise you may get an electric shock.

◆ **Injury prevention**

⚠CAUTION

- The voltage applied to each terminal must be the ones specified in the Instruction Manual. Otherwise a burst, damage, etc. may occur.
- The cables must be connected to the correct terminals. Otherwise a burst, damage, etc. may occur.
- The polarity (+ and -) must be correct. Otherwise a burst or damage may occur.
- While power is ON or for some time after power OFF, do not touch the inverter as it will be extremely hot. Touching these devices may cause a burn.

◆ **Additional instructions**

The following instructions must be also followed. If the product is handled incorrectly, it may cause an unexpected fault, injury, or electric shock.

⚠ CAUTION

Transportation and mounting

- Do not install or operate the plug-in option if it is damaged or has parts missing.
- Do not stand or rest heavy objects on the product.
- The mounting orientation must be correct.
- Foreign conductive objects must be prevented from entering the inverter. That includes screws and metal fragments or other flammable substance such as oil.
- If halogen-based materials (fluorine, chlorine, bromine, iodine, etc.) infiltrate into a Mitsubishi product, the product will be damaged. Halogen-based materials are often included in fumigant, which is used to sterilize or disinfest wooden packages. When packaging, prevent residual fumigant components from being infiltrated into Mitsubishi products, or use an alternative sterilization or disinfection method (heat disinfection, etc.) for packaging. Sterilization of disinfection of wooden package should also be performed before packaging the product.

Trial run

- Before starting operation, each parameter must be confirmed and adjusted. A failure to do so may cause some machines to make unexpected motions.

⚠ WARNING

Usage

- Do not modify the equipment.
- Do not perform parts removal which is not instructed in this manual. Doing so may lead to fault or damage of the product.

⚠ CAUTION

Usage

- When parameter clear or all parameter clear is performed, the required parameters must be set again before starting operations because all parameters return to their initial values.
- To avoid damage due to static electricity, static electricity in your body must be discharged before you touch the product.

Maintenance, inspection and parts replacement

- Do not carry out a megger (insulation resistance) test.

Disposal

- The product must be treated as industrial waste.

General instruction

- Many of the diagrams and drawings in this Instruction Manual show the inverter without a cover or partially open for explanation. Never operate the inverter in this manner. The cover must be reinstalled and the instructions in the Instruction Manual must be followed when operating the inverter.

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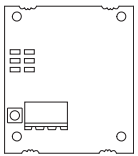
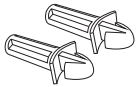
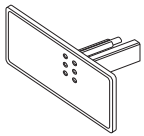
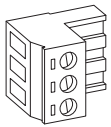
1 PRE-OPERATION INSTRUCTIONS

1.1 Unpacking and product confirmation

Take the plug-in option out of the package, check the product name, and confirm that the product is as you ordered and intact. This product is a plug-in option for the FR-A800/F800 series inverter.

1.1.1 Product confirmation

Check the enclosed items.

Plug-in option .....1 	Mounting screw (M3 × 8 mm) .....2 (Refer to page 14.) 	Spacer .....2 (Refer to page 14.) 	Communication option LED display cover .....1 (Refer to page 13.) 
Terminal block .....1 (Refer to page 19.) 	Neuron® ID bar code sticker .....1 (Since one bar code sticker is for maker duplicate, three stickers are provided.)		

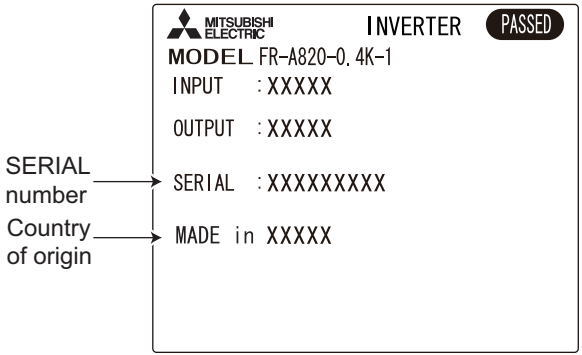
NOTE

- Echelon, LONWORKS, LonMaker, LONMARK, and Neuron are registered trademarks of Echelon Corporation in the U.S.A. and other countries. Company and product names herein are the trademarks and registered trademarks of their respective owners.

1.1.2 SERIAL number check

The FR-A8NL can be used for the inverter models listed below with the following SERIAL number or later. Check the SERIAL number indicated on the inverter rating plate or package.

Rating plate example



□	○	○	○○○○○○
Symbol	Year	Month	Control number
SERIAL			

The SERIAL consists of one symbol, two characters indicating the production year and month, and six characters indicating the control number.
The last digit of the production year is indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), or Z (December).

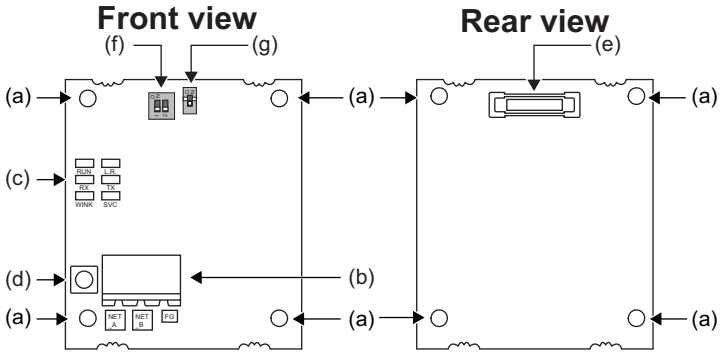
FR-A800 series

Model	Country of origin indication	SERIAL number
FR-A820-00046(0.4K) to 04750(90K) FR-A840-00023(0.4K) to 06830(280K) FR-A842-07700(315K) to 12120(500K) FR-A846-00023(0.4K) to 03610(132K)	MADE in Japan	□6Y○○○○○○ or later
	MADE in China	□6Z○○○○○○ or later

FR-F800 series

Model	Country of origin indication	SERIAL number
FR-F820-00046(0.75K) to 04750(110K) FR-F840-00023(0.75K) to 06830(315K) FR-F842-07700(355K) to 12120(560K)	MADE in Japan	□6Y○○○○○○ or later
	MADE in China	□6Z○○○○○○ or later

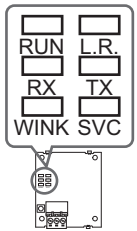
1.2 Component names



Symbol	Name	Description	Refer to page
a	Mounting hole	Fixes the option to the inverter with screws, or installs spacers.	14
b	Connector for communication	Mount the accessory terminal block to connect to the network.	19
c	Operation status indication LED	Lit/flicker/off of the LED indicate inverter operation status.	10
d	Service switch	Press when making an initial setting with the network management computer.	–
e	Connector	Connect to the inverter option connector.	14
f	Switch for manufacturer setting (SW2)	Switch for manufacturer setting. Do not change from the initially set status (OFF ).	–
g	Switch for manufacturer setting (SW3)	Switch for manufacturer setting. Do not change from the initially set status (OFF ).	–

1.3 Operation status indication LED

Operation status indication LEDs indicate the operating status of the option unit according to the indication status.
Check the position of LEDs on **page 9**.

	Name	Function	LED status	Status
	RUN	Display the unit operation status.	ON	Normal operation
			OFF	Alarm (watchdog timer expiration etc.) detection
	L.R.	Display the handshaking status with the inverter.	ON	Normal operation
			OFF	Alarm detection
	RX	Display the receiving status of packet from the network.	ON (for about 50 ms)	Receiving
			OFF	Stop receiving
	TX*1	Display the transmission status of packet to the network.	ON (for about 50 ms)	Transmitting
			OFF	Stop transmission
	WINK	Display the receiving status of WINK message from the network.	Flicker three times	Receiving WINK message
			OFF	Stop
	SVC	Display the status of node and service switch.	ON	Service switch pressed status
			Flicker	Unconfigured status
			OFF	Configured status

*1 TX LED turns ON when the inverter autonomously sends data due to heartbeat and event driven functions even when the communication cable is not wired.

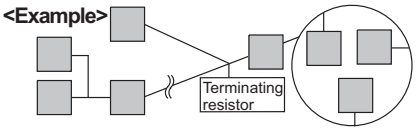
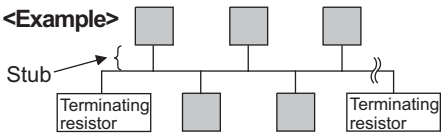
1.4 Specifications

1.4.1 Inverter option specifications

Type		Inverter plug-in option type (can be mounted/dismounted to/from the inverter front face)
Number of nodes occupied		One inverter occupies one node.
Connection cable	**Free topology**	Twisted pair cable equivalent to EBT0.65 mm × 1 p*1
	Bus topology	Twisted pair cable equivalent to EBT1.3 mm × 1 p*2

*1 Commercially available product: F-LINK-L(1F) by Fujikura Ltd.
*2 Commercially available product: F-LINK-L 1.25(1S) by Fujikura Ltd.

1.4.2 Communication specifications

Number of units connected		64 units maximum including the inverter in the same segment.	
Communication speed		78 kbps	
Maximum cable length		Free topology (connect a terminating resistor at any one point) Maximum: 500 m <Example>  	Bus topology (connect a terminating resistor at both ends) Maximum: 2700 m (The total length of each node stub should be 3 m maximum.) <Example> 
Event reception and transmission	**Event reception**	Number of events receivable at a time : 20 Reception time per event : 100 ms maximum (when not conflicting with event transmission)	
	Event transmission	Transmission time per event • Without bind: 200 ms • With bind : [retry interval time] × [number of retries]	

2 INSTALLATION

2.1 Pre-installation instructions

Check that the inverter's input power and the control circuit power are both OFF.

⚠ CAUTION

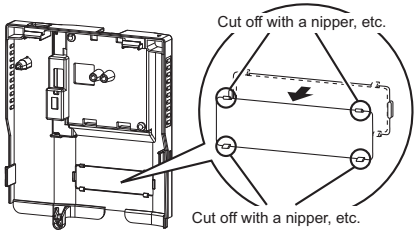
- **With input power ON, do not install or remove the plug-in option. Otherwise, the inverter and plug-in option may be damaged.**
- **To avoid damage due to static electricity, static electricity in your body must be discharged before you touch the product.**

2.2 Installation procedure

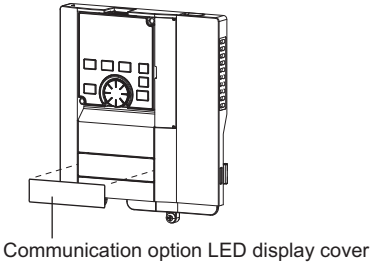
◆ Installing the communication option LED display cover

(1) Remove the inverter front cover. (Refer to Chapter 2 of the Instruction Manual (Detailed) of the inverter for details on how to remove the front cover.)
Mount the cover for displaying the operation status indication LED for the communication option on the inverter front cover.

(2) Cut off hooks on the rear of the inverter front cover with nipper, etc. and open the window for fitting the LED display cover.



(3) Fit the communication option LED display cover to the front side of the front cover. Align the LED display cover with the LED position on the circuit board of the option. Push the LED display cover until it is fixed with the hooks.

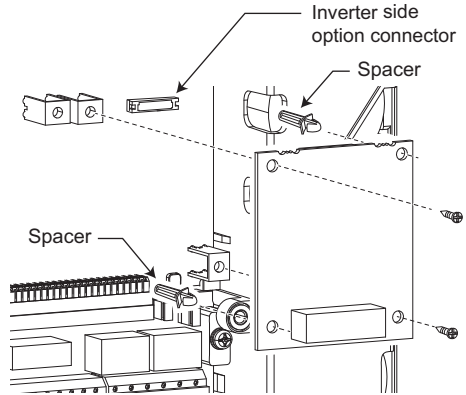


⚠CAUTION

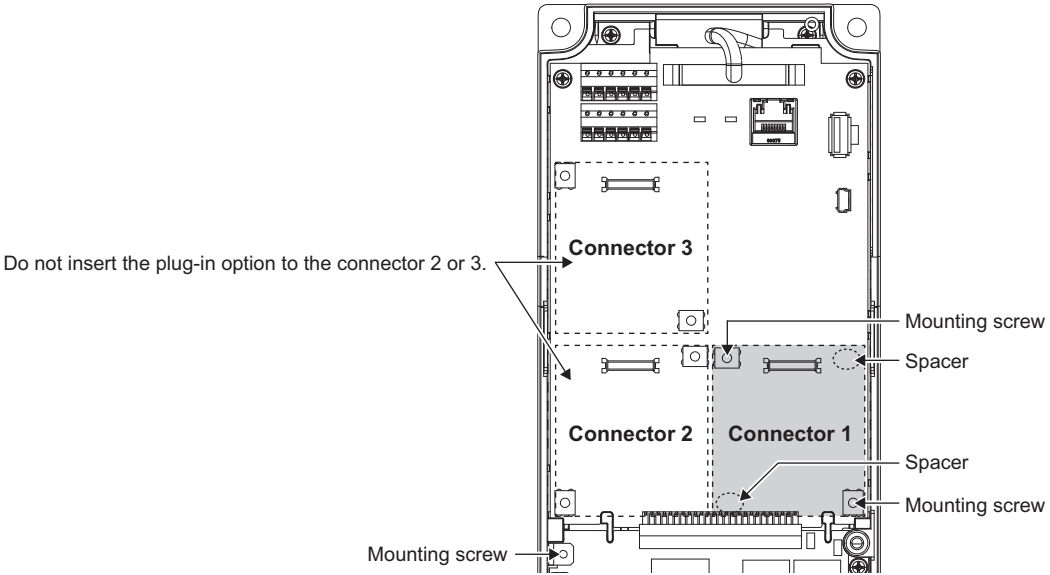
- **Take care not to hurt your hand and such with portions left by cutting hooks of the rear of the front cover.**

◆ Installing the option

(1) For the two mounting holes (as shown in the next page) that will not be tightened with mounting screws, insert spacers.
(2) Fit the connector of the plug-in option to the guide of the connector on the inverter unit side, and insert the plug-in option as far as it goes. (Insert it to the inverter option connector 1.)
(3) Fit the two locations, the left and right, of the plug-in option securely to the inverter unit by screwing in the supplied mounting screws (tightening torque 0.33 N·m to 0.40 N·m). If the screw holes do not line up, the connector may not be inserted deep enough. Check the connector.



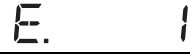
Example of installation to connector 1



Insertion positions for screws and spacers

NOTE

- When mounting/removing the plug-in option, hold the sides of the option. Do not press on the parts on the option circuit board. Stress applied to the parts by pressing, etc. may cause a failure.
- Caution must be applied to mounting screws falling off when removing and mounting the plug-in option.
- When using this plug-in option, insert it to the inverter option connector 1. If it is inserted to the option connector 2 or 3, the protective function (E.2 or E.3) is activated and the inverter will not operate.
  Even if the option is inserted to the option connector 1, when the inverter cannot recognize that the option is mounted due to improper installation, etc., the protective function (E.1) is activated.

Mounted position	Fault indication
Option connector 1	
Option connector 2	
Option connector 3	

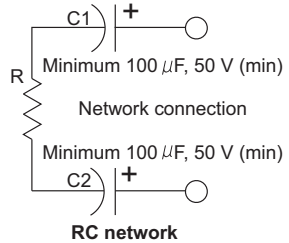
- When removing the plug-in option, remove the two screws on the left and right, then pull it straight out. Pressure applied to the connector and to the option board may break the option.

3.1 System configuration example

(1) Mount the communication option (FR-A8NL) on the inverter. (Refer to page 14.)

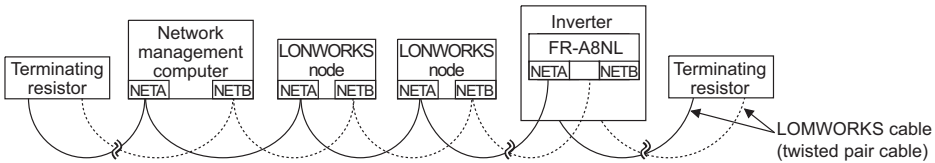
(2) Connect the LONWORKS node, option unit, network management computer, and terminating resistor with the cable for LONWORKS communication.
Select a terminating resistor so that resistance values of R of the RC network are the same as shown below.
- Free topology (Refer to page 11.).....R = 52.3 Ω ±1% 1/8 W
- Bus topology (Refer to page 11.).....R = 105 Ω ±1% 1/8 W

(3) Install the network management tool on the network management computer to assign the network address and bind (association function) the network variable, etc. to the LONWORKS node.



RC network

(Example) Bus topology (without stub)

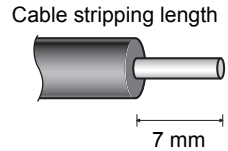


NOTE

- The network management tool is not included with this product. Please purchase it separately.
  For the network management tool, LonMaker by Echelon Co. is recommended.
- When the option unit has been replaced because of a fault or others, perform "Commission" or "Replace" from the network management tool after switching on the inverter. After performing "Commission" or "Replace", reset the inverter (switch power off once, then on again or turn the RES signal on).
- Use the network management computer in the earthed status. Use the isolated power supply if the computer cannot be earthed (grounded).

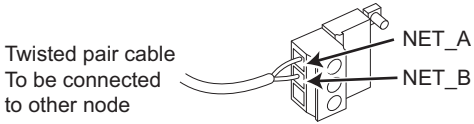
3.2 Wiring

(1) Strip off the sheath of the cable for LONWORKS communication. If the length of the sheath peeled is too long, a short circuit may occur among neighboring wires. If the length is too short, wires might come off. Use the recommended cables. (Refer to **page 11**.)

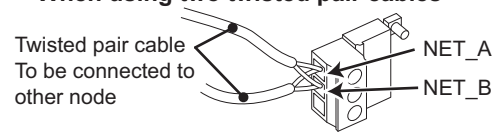


(2) Loosen the terminal screw and insert the cable into the terminal. Tighten the fastening screws to the recommended tightening torques. Leave the other end of the cable unconnected.

<When using one twisted pair cable>



<When using two twisted pair cables>

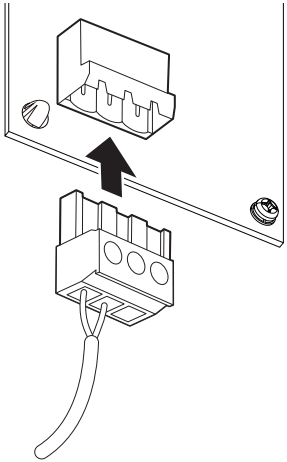


Screw size	Tightening torque	Cable size	Screwdriver
M3	0.5 N·m to 0.6 N·m	0.3 mm^2 to 0.75 mm^2	Small ⊖ flat-blade screwdriver (Tip thickness: 0.4 mm / tip width: 2.5 mm)

NOTE

- Change the number of twisted pair cables to insert in NET_A and NET_B according to the system used.
- Undertightening can cause cable disconnection or malfunction. Overtightening can cause a short circuit or malfunction due to damage to the screw or unit.

(3) Connect the terminal block to the connector for communication of the communication option.



⚠ CAUTION

- **After wiring, wire offcuts must not be left in the inverter. They may cause an error, failure or malfunction.**

4.1 Parameter list

The following parameters are used for the communication option (FR-A8NL).
For the parameter details, which depend on the applicable model of the inverter, refer to the Instruction Manual (Detailed) of the inverter.

Pr.	Pr. group	Name	Setting range	Minimum setting increments	Initial value	Refer to page
79	D000	Operation mode selection	0 to 4, 6, 7	1	0	21
338	D010	Communication operation command source	0, 1	1	0	*4
339	D011	Communication speed command source	0, 1, 2	1	0	*4
340*3	D001*3	Communication startup mode selection	0, 1, 2, 10, 12	1	0	21
342	N001	Communication EEPROM write selection	0, 1	1	0	*4
349*1	N010*1	Communication reset selection	0, 1	1	0	29
387*1	N211*1	Initial communication delay time	0 to 120 s	0.1 s	0 s	80
388*1	N212*1	Send time interval at heart beat	0 to 999.8 s	0.1 s	0 s	84
389*1	N213*1	Minimum sending time at heart beat	0 to 999.8 s	0.1 s	0.5 s	84
390*2	N214*2	% setting reference frequency	1 to 590 Hz	0.01 Hz	60 Hz	82
391*1	N215*1	Receive time interval at heart beat	0 to 999.8 s	0.1 s	0 s	95
392*1	N216*1	Event driven detection width	0.00 to 163.83%	0.01%	0%	101
500*1	N011*1	Communication error execution waiting time	0 to 999.8 s	0.1 s	0 s	24
501*1	N012*1	Communication error occurrence count display	0	1	0	25
502	N013	Stop mode selection at communication error	0 to 4	1	0	25
550*3	D012*3	NET mode operation command source selection	0, 1, 9999	1	9999	*4
779	N014	Operation frequency during communication error	0 to 590 Hz, 9999	0.01 Hz	9999	25

*1 The parameter can be displayed when the FR-A8NL is installed.
*2 The parameter can be displayed even when the FR-A8NL is not installed for the FR-F800 series inverters.
*3 The setting is applied after an inverter reset or power-ON.
*4 For the parameter details, refer to the Instruction Manual (Detailed) of the inverter.

4.2 Operation mode setting

4.2.1 Operation mode switching and communication startup mode (Pr.79, Pr.340)

◆ Operation mode switching conditions

Check the following before switching the operation mode.

- The inverter is at a stop;
- Both the STF and STR signals are off; and
- The **Pr.79 Operation mode selection** setting is correct.
  (Check the setting on the operation panel of the inverter.)

◆ Operation mode selection at power ON and at restoration from instantaneous power failure

The operation mode at power ON and at restoration from instantaneous power failure can be selected.
Set a value other than "0" in **Pr.340 Communication startup mode selection** to select the network operation mode.
After started in network operation mode, parameter write from the network is enabled.

NOTE

- Change of the **Pr.340** setting is valid when powering on or resetting the inverter.
- **Pr.340** can be changed with the operation panel independently of the operation mode.
- Ensure that the communication setting of the inverter is completed before setting **Pr.340** ≠ "0".
- Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.79, Pr.340**.

Pr.340 setting	Pr.79 setting	Operation mode at power ON or power restoration	Operation mode switchover
0 (initial value)	0 (initial value)	External operation mode	Switching among the External, PU, and NET operation mode is enabled.*1, *4
	1	PU operation mode	PU operation mode fixed
	2	External operation mode	Switching between the External and Net operation mode is enabled.*4 Switching to the PU operation mode is disallowed.
	3, 4	External/PU combined operation mode	Operation mode switching is disallowed.
	6	External operation mode	Switching among the External, PU, and NET operation mode is enabled while running.*4
	7	X12 (MRS) signal ON: external operation mode	Switching among the External, PU, and NET operation mode is enabled.*1, *4
		X12 (MRS) signal OFF: external operation mode	External operation mode fixed (Forcibly switched to External operation mode.)
1, 2*2	0	NET operation mode	Same as when **Pr.340** = "0"
	1	PU operation mode	
	2	NET operation mode	
	3, 4	External/PU combined operation mode	
	6	NET operation mode	
	7	X12 (MRS) signal ON..... NET operation mode	
		X12 (MRS) signal OFF.....external operation mode	

Pr.340 setting	Pr.79 setting	Operation mode at power ON or power restoration	Operation mode switchover
10, 12*2	0	NET operation mode	Switching between the PU and NET operation mode is enabled.*3, *4
	1	PU operation mode	Same as when **Pr.340** = "0"
	2	NET operation mode	NET operation mode fixed
	3, 4	External/PU combined operation mode	Same as when **Pr.340** = "0"
	6	NET operation mode	Switching between the PU and NET operation mode is enabled while running.*3, *4
	7	External operation mode	Same as when **Pr.340** = "0"

*1 Operation mode cannot be directly changed between the PU operation mode and Network operation mode.

*2 The **Pr.340** settings "2 or 12" are mainly used for communication operation using the inverter RS-485 terminal.
When a value other than "9999" (selection of automatic restart after instantaneous power failure) is set in **Pr.57 Restart coasting time**, the inverter will resume the same operation state which was in before after power has been restored from an instantaneous power failure.
When **Pr.340** = "1 or 10", a start command turns off if power failure has occurred and then restored during a start command is on.

*3 Switching between the PU and NET operation modes is available with the key on the operation panel or the X65 signal.

*4 Refer to **page 42** and **page 73** for a switching method from the network.

4.3 Operation at communication error occurrence

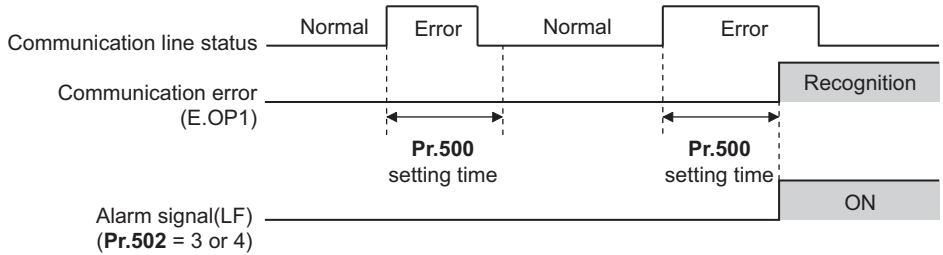
4.3.1 Operation selection at communication error occurrence (Pr.500 to Pr.502, Pr.779)

You can select operations at communication error occurrences by setting **Pr.500 to Pr.502, Pr.779** under network operation.

◆ Waiting time for the communication line error output after a communication error

Waiting time for the communication error output after a communication line error occurrence can be set.

Pr.	Name	Setting range	Minimum setting increments	Initial value
500	Communication error execution waiting time	0 to 999.8 s	0.1 s	0 s

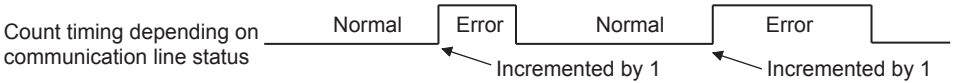


When a communication line error occurs and lasts longer than the time set in **Pr.500**, it is recognized as a communication error. If the communication returns to normal within the time, it is not recognized as a communication error, and the operation continues.

◆ Displaying and clearing the communication error count

The cumulative count of communication error occurrences can be displayed. Write "0" to clear this cumulative count.

Pr.	Name	Setting range	Minimum setting increments	Initial value
501	Communication error occurrence count display	0	1	0



At the point of communication line error occurrence, **Pr.501 Communication error occurrence count display** is incremented by 1.

The cumulative count of communication error occurrences is counted from 0 to 65535. When the count exceeds 65535, the displayed value is cleared and the counting starts over from 0 again.

NOTE

- Communication error count is temporarily stored in the RAM memory. The error count is stored in EEPROM only once per hour. If power reset or converter reset is performed, **Pr.501** setting will be the one that is last stored to EEPROM depending on the reset timing.

◆ Inverter operation at a communication error occurrence

How the inverter operates at a communication line error or an option unit fault can be set.

Pr.	Name	Setting range	Description
502	Stop mode selection at communication error	0 (Initial Value), 1, 2, 3, 4	Refer to page 26.
779*1	Operation frequency during communication error	0 to 590 Hz	When a communication error occurs, the inverter operates at the set frequency.
		9999 (Initial Value)	The inverter operates at the frequency set before the communication error occurs.

*1 Valid when **Pr.502** = "3 or 4".

◆ About setting

• Operation at an error occurrence

Fault description	Pr.502 setting	Operation	Indication	Fault output
Communication line	0	Continued*1	Normal*1	Not output*1
	1			
	2			
	3			
	4			
Communication option	0, 3	Output shutoff	"E. 1"	Provided
	1, 2	Output to decelerate and stop the motor	"E. 1" after stop	Provided after stop
	4	Continued	"CF" warning	Not output

*1 When the communication returns to normal within the time period set in **Pr.500**, the communication option error (E.OP1) does not occur.

• Operation after the time in **Pr.500** elapses after an error occurrence

Fault description	Pr.502 setting	Operation	Indication	Fault output
Communication line	0	Output shutoff	"E.OP1"	Provided
	1	Output to decelerate and stop the motor	"E.OP1" after stop	Provided after stop
	2			Not output
	3	Continues operation with the **Pr.779** setting.*3	Normal	
	4		"CF" warning	
Communication option itself	0, 3	Output stop status continues.*2	"E.1" kept*2	Kept provided*2
	1, 2			
	4	Continued	"CF" warning	Not output

*2 When an error occurs, the inverter outputs a command to decelerate the motor or shuts off the output, and outputs the fault, independently of the **Pr.500** setting.

*3 Under position control, the operation is continued to the target position.

• Operation at error removal

Fault description	Pr.502 setting	Operation	Indication	Fault output
Communication line	0	Output stop status continues.	"E.OP1" kept	Kept provided
	1			
	2	Restart*4	Normal	Not output
	3	Normal		
	4			
Communication option itself	0, 3	Output stop status continues.	"E. 1" kept	Kept provided
	1, 2			
	4	Continued	"CF" warning	Not output

*4 When the communication error is removed during deceleration, the motor re-accelerates.
Under position control, the motor does not re-accelerates even when the communication error is removed during deceleration.

NOTE

- The protective function [E.OP1 (fault data: HA1)] is activated at error occurrences on the communication line. The protective function [E.1 (fault data: HF1)] is activated at error occurrences in the communication circuit inside the option.
- Fault output indicates the fault (ALM) signal and fault bit output.
- When the fault output setting is active, fault records are stored in the faults history. (A fault record is written to the faults history at a fault output.)
  When the fault output setting is not active, fault record is overwritten to the faults history temporarily but not stored. After the error is removed, the fault indication is reset, changing the display back to normal, and the last fault is displayed in the faults history.
- When **Pr.502** ≠ "0", the normal deceleration time setting (setting in **Pr.8**, **Pr.44**, **Pr.45**, or the like) is applied as the deceleration time.
- The acceleration time at a restart is the ordinary acceleration time setting (e.g. **Pr.7, Pr.44**).
- When the **Pr.502** setting is "2, 3, or 4", the operation/speed command at a restart is the one given before the error occurrence.
- When a communication line error occurs at the **Pr.502** setting of "2", removing the error during deceleration causes acceleration to restart at that point. (Acceleration is not restarted if the error is that of the option unit itself.)

⚠CAUTION

- **When Pr.502 = "3" and a communication line error occurs, or Pr.502 = "4" and a communication line error or a communication option fault occurs, the operation continues. When setting "3 or 4" in Pr.502, provide a safety stop countermeasure other than via communication. For example, input a signal through an external terminal (RES, MRS, or X92) or press the PU stop on the operation panel.**

4.3.2 Fault and measures

◆ Inverter operation in each operation mode at error occurrences

Location	Status		Operation mode		
			Network operation	External operation	PU operation
Inverter	Inverter operation		Output shutoff	Output shutoff	Output shutoff
	Data communication		Continued	Continued	Continued
Communication line	Inverter operation		Output shutoff*1	Continued	Continued
	Data communication		Stop	Stop	Stop
Communication option	Communication option connection error	Inverter operation	Output shutoff*1	Output shutoff*1	Output shutoff*1
		Data communication	Continued	Continued	Continued
	Error of communication option itself	Inverter operation	Output shutoff*1	Continued	Continued
		Data communication	Stop	Stop	Stop

*1 Depends on the **Pr.502** setting.

◆ Measures at error occurrences

Fault indication	Fault description	Measures
E.OP1	Communication line error	• Check the LED status of the option unit and remove the cause of the alarm (Refer to page 10 for LED indication status). • Inspect the master.
E.1	Option fault	• Insert the communication option to the inverter option connector 1. • Check the connection between the inverter and option unit for poor contact, etc. and remove the cause of the error.

*1 When faults other than the above are displayed, refer to the Instruction Manual (Detailed) of the inverter and remove the cause of the error.

4.4 Inverter reset

◆ Operation conditions of inverter reset

Which resetting method is allowed or not allowed in each operation mode is described below.

Resetting method			Operation mode		
			Network operation	External operation	PU operation
Reset from the network	Inverter reset (Command request network variable) (Refer to page 71.)*1		Allowed	Disallowed	Disallowed
	Error reset at inverter fault (Inverter input signal network variable) (Refer to page 56.)*2	**Pr.349** = 0	Allowed	Allowed	Allowed
		Pr.349 = 1		Disallowed	Disallowed
Turn on the inverter RES signal (terminal RES)			Allowed	Allowed	Allowed
Switch off inverter power			Allowed	Allowed	Allowed
Reset from the PU/DU	Inverter reset		Allowed	Allowed	Allowed
	Reset at inverter fault		Allowed	Allowed	Allowed

*1 Inverter reset can be made any time.
*2 Reset can be made only when the protective function of the inverter is activated.

NOTE

- When a communication line error has occurred, reset cannot be made from the network.
- The inverter is set to the External operation mode if it has been reset in Network operation mode in the initial status. To resume the network operation, the inverter must be switched to the Network operation mode again. Set a value other than "0" in **Pr.340** to start in the Network operation mode. (Refer to page 21.)
- The inverter cannot be controlled for about 1 s after release of a reset command.

◆ Error reset operation selection at inverter fault

When used with the communication option (FR-A8NL), an error reset command*1 from network can be made invalid in the external operation mode or PU operation mode.

Pr.	Name	Initial value	Setting range	Function
349	Communication reset selection	0	0	Error reset is enabled independently of operation mode.
			1	Error reset is enabled only in the network operation mode.

*1 InvilnvAlarmReset (Refer to page 56.)

4.5 Frequency and speed settings

- For the output/set frequency monitor, frequency setting, and parameter setting through the FR-A8NL, the unit of 0.01 Hz is always applied regardless of the **Pr.37 Speed display** setting. The setting unit for the running speed (actual speed) monitor depends on the **Pr.37** and **Pr.144 Speed setting switchover** settings as shown in the following table. (The initial values are shown within the thick lines.)

Pr.37 setting	Pr.144 setting	Output frequency monitor	Set frequency monitor	Running speed (actual speed) monitor	Frequency setting, parameter setting
0 (initial value)	0	0.01 Hz	0.01 Hz	1 r/min*1, *2	0.01 Hz
	2 to 12	0.01 Hz	0.01 Hz	1 r/min*1, *2	0.01 Hz
	102 to 112	0.01 Hz	0.01 Hz	1 r/min*1, *2	0.01 Hz
1 to 9998	0	0.01 Hz	0.01 Hz	1 (machine speed*1)	0.01 Hz
	2 to 12	0.01 Hz	0.01 Hz	1 (machine speed*1)	0.01 Hz
	102 to 112	0.01 Hz	0.01 Hz	1 r/min*1, *2	0.01 Hz

*1 Running speed r/min conversion formula: ..... frequency × 120 / number of motor poles **(Pr.144)**
Machine speed conversion formula: .....**Pr.37**× frequency / **Pr.505 Speed setting reference**
For **Pr.144** in the above formula, the value is "**Pr.144** - 100" when "102 to 112" is set in **Pr.144**; and the value is "4" when **Pr.37** = 0 and **Pr.144** = 0. **Pr.505** is always set as frequency (Hz).

*2 Use **Pr.811 Set resolution switchover** to change the increment from 1 r/min to 0.1 r/min. (**Pr.811** is only available for the FR-A800 series.)

- When setting a speed through the FR-A8NL, the speed is calculated with the **Pr.144** setting as shown below.

Speed value (1 r/min*4) = frequency × 120 / number of motor poles (**Pr.144***3)

*3 When **Pr.144** = "102 to 112," the formula is calculated with the value of (**Pr.144** - 100). When **Pr.144** = "0", the formula is calculated with 4 poles.

*4 The **Pr.811** setting is invalid. The unit 1 r/min is always applied. (**Pr.811** is only available for the FR-A800 series.)

NOTE

- To apply the unit 1 r/min to the running speed (actual speed) monitor, set the initial values in **Pr.37** and **Pr.811**.
- Refer to the Instruction Manual (Detailed) of the inverter for the details of **Pr.37**, **Pr.144**, **Pr.505** and **Pr.811**.

5.1 XIF file

Using the configuration software, network setting is easily done.
To use the configuration software, an XIF file is necessary. XIF file is used to recognize device features and functions.
For details of installation and XIF file usage, refer to the configuration software manual.

XIF file can be downloaded from the web site.

Mitsubishi Electric FA Site
www.MitsubishiElectric.co.jp/fa

The download is free.
Contact your sales representative for details.

NOTE

- Since memory for write enable application is not installed in the inverter, Mitsubishi does not provide application files (file extensions such as .nxe, .apb).

5.2 Output from the inverter to the network

Main items to be output from the inverter (FR-A8NL) to the network and their descriptions are explained below.

Item	Description	Refer to page
Object status	You can check the condition of the node	43
Speed monitor	You can monitor the output frequency in 0.005% increments.	46
Inverter output signal	You can monitor the output terminal status of the inverter.	48
Output frequency monitor	You can monitor the output frequency in 0.1/0.01 Hz or 0.005% increments.	51, 52, 70
Output current monitor	You can monitor the output current in 0.1 A increments.	53
Output voltage monitor	You can monitor the output voltage in 0.1 V increments.	53
Actual operation time monitor	You can monitor the actual operation time of the inverter.	53
Cumulative power monitor	You can monitor the cumulative power of the inverter.	54
Fault occurrence definition	At inverter fault occurrence, you can confirm the fault definition.	57
Product information	You can output the maker name and type as a character string.	60
Emergency stop status	You can confirm the emergency stop status of the inverter.	62
Fault status	You can check whether the inverter is in the fault status or not.	63
Monitor data	You can check the monitor value corresponding to the monitor code set.	69
Command reply	You can check the replies to command requests, such as operation mode selection, parameter write, and inverter reset, from the inverter in ASCII code.	77
Command reply (binary)	You can check the replies to command requests, such as operation mode selection, parameter write, and inverter reset, from the inverter in binary code. A command reply in binary code requires less communication data amount than a command reply in ASCII code does.	78

NOTE

- Refer to the Instruction Manual (Detailed) of the inverter for functions controllable from the network in each operation mode.

5.3 Input from the network to the inverter

Main items which can be commanded from the network to the inverter and their descriptions are explained below.

Item	Description	Refer to page
Object request	You can make a request to know the object status.	42
Start and stop/simple speed setting	You can perform start/stop and simple frequency setting.	44
Speed adjustment	You can perform frequency setting in 0.005% increments.	45
Inverter input signal	You can execute functions assigned to the inverter input terminals.	47
Set frequency write destination selection	You can select either of RAM or EEPROM as the write destination of set frequencies.	49
Set frequency	You can set the set frequency in 0.1/0.01 Hz or 0.005% increments.	50, 69
Fault reset	You can reset the inverter at an inverter fault occurrence.	56
Emergency stop command	You can make an emergency stop of the inverter.	61
PID set point	You can input the set point for PID control.	65
PID measured value	You can input the current measured value for PID control.	66
PID deviation	You can input the current deviation for PID control.	67
Monitor code	You can input a code to select a monitor type.	68
Command request	You can make command requests, such as operation mode selection, parameter write, inverter reset, to the inverter in ASCII code.	71
Command request (binary)	You can make command requests, such as operation mode selection, parameter write, or inverter reset, to the inverter in binary code. A command request in binary code requires less communication data amount than a command request in ASCII code does.	72
Initial communication delay time	You can set the time from when the inverter starts until when data is sent to the network.	80
Forward/reverse rotation prevention	You can prevent rotation in the wrong direction.	81
% setting reference frequency	You can set the reference frequency of set frequency (nviInvSetFreqP) and output frequency (nvoInvOutFreqP).	82

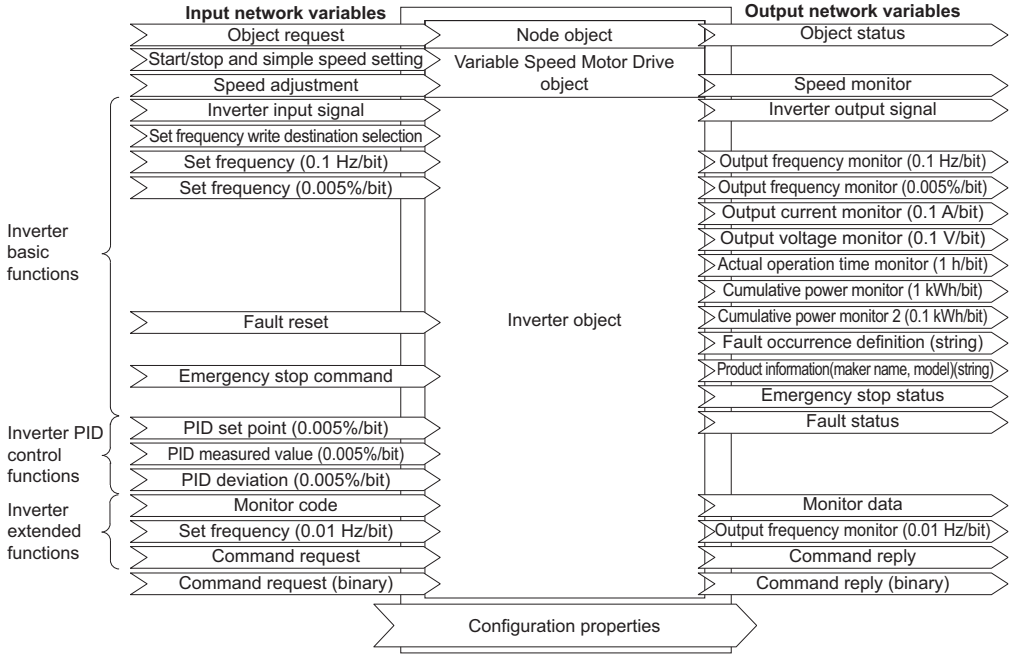
Item	Description	Refer to page
Maximum frequency	You can set the maximum frequency of the inverter.	83
Minimum frequency	You can set the minimum frequency of the inverter.	83
Heartbeat send time interval	You can set the heartbeat send time interval of output network variables.	84
Minimum heartbeat send time	You can set the minimum heartbeat send time of output network variables.	84
Acceleration time	You can set the motor acceleration time.	87
Deceleration time	You can set the motor deceleration time.	88
PID action selection	You can choose the operation of PID control.	89
PID proportional band	You can set the proportional band for PID control.	92
PID integral time	You can set the integral time for PID control.	92
PID differential time	You can set the differential time for PID control.	93
PID manipulated bias	You can set the manipulated variable at 0%.	93
PID manipulated gain	You can set the manipulated variable at 100%.	94
Heartbeat receive time interval	You can set the heartbeat receive time interval of input network variables.	95
Maximum speed	You can set the maximum speed of the inverter.	97
Minimum speed	You can set the minimum speed of the inverter.	98
Reference speed setting	You can set the reference speed of maximum speed, minimum speed, speed adjustment, speed monitor.	99
Reference frequency setting	You can set the reference frequency of maximum speed, minimum speed, speed adjustment, speed monitor.	100
Default value of speed adjustment	You can set the default value of speed adjustment.	100
Event driven detection width	You can set the event driven detection width of the monitor related output network variables.	101

NOTE

- Refer to the Instruction Manual (Detailed) of the inverter for functions controllable from the network in each operation mode.

6.1 Object map

This chapter describes detailed object definitions for use of LONWORKS system.



6.2 Network variable list

No.	Type*3	Function	Network variables		In/ out	Setting value storage location	Size (byte)	Initial value	Refer to page
			Variables	Name					
1	SN	Object request	SNVT_obj_request	nviRequest	In	–	3	H0	42
2	SN	Object status	SNVT_obj_status	nvoStatus	Out		6	H0	43
3	SN	Start/stop and simple speed setting	SNVT_switch	nviDrvSpeedStpt	In		2	state=H0 value=0	44
4	SN	Speed adjustment	SNVT_lev_percent	nviDrvSpeedScale	In		2	100.00%	45
5	SN	Speed monitor	SNVT_lev_percent	nvoDrvSpeed	Out		2	0.000%	46
6	SN	Inverter input signal	SNVT_state	nviInvInputSig	In		2	0	47
7	SN	Inverter output signal	SNVT_state	nvoInvOutputSig	Out		2	H8000	48
8	SN	Set frequency write destination selection	SNVT_switch	nviInvSetFreqSw	In		2	state=H0 value=0	49
9	SN	Set frequency (0.1 Hz/bit)*1	SNVT_freq_hz	nviInvSetFreq	In	RAM/ EEPROM of the inverter	2	H7FFF	50
10	SN	Set frequency (0.005%/bit)	SNVT_lev_percent	nviInvSetFreqP	In		2	100.00%	50
11	SN	Output frequency monitor (0.1 Hz/bit)*1	SNVT_freq_hz	nvoInvOutFreq	Out	–	2	0.0 Hz	51
12	SN	Output frequency monitor (0.005%/bit)	SNVT_lev_percent	nvoInvOutFreqP	Out		2	0.000%	52
13	SN	Output current monitor (0.1 A/bit)*1	SNVT_amp	nvoDrvCurnt	Out		2	0.0 A	53
14	SN	Output voltage monitor (0.1 V/bit)*1	SNVT_volt	nvoDrvVolt	Out		2	0.0 V	53
15	SN	Actual operation time monitor (1 h/bit)	SNVT_time_hour	nvoDrvRunHours	Out	EEPROM of the inverter	2	0 h	53
16	SN	Cumulative power monitor(1 kWh/bit)	SNVT_elec_kwh	nvoDrvRunPower	Out		2	0 kWh	54

No.	Type*3	Function	Network variables		In/ out	Setting value storage location	Size (byte)	Initial value	Refer to page
			Variables	Name					
17	SN	Fault reset	SNVT_switch	nviInvAlarmReset	In	–	2	state=H0 value=H0	56
18	SN	Fault occurrence definition (string)	SNVT_str_asc	nvoInvAlarmStr	Out		31	0	57
19	SN	Product information (maker name, type) (string)	SNVT_str_asc	nvoInvTypeInfo	Out		31	MITSUBISHI FR-A8NL	60
20	SN	Emergency stop command	SNVT_hvac_emerg	nviEmergOverride	In		1	H0	61
21	SN	Emergency stop status	SNVT_hvac_emerg	nvoEmergStatus	Out		1	H0	62
22	SN	Fault status	SNVT_switch	nvoDrvAlarm	Out		2	state=H0 value=H0	63
23	SN	PID set point (0.005%/bit)	SNVT_lev_percent	nviInvPIDTarget	In		2	0.000%	65
24	SN	PID measured value (0.005%/bit)	SNVT_lev_percent	nviInvPIDValue	In		2	0.000%	66
25	SN	PID deviation (0.005%/bit)	SNVT_lev_percent	nviInvPIDDev	In		2	0.000%	67
26	SN	Monitor code	SNVT_count	nviInvMonCode	In		2	0	68
27	SN	Monitor data	SNVT_count	nvoInvMonData	Out		2	0	69
28	SN	Set frequency (0.01 Hz/bit)	SNVT_count	nviInvSetFreq2	In	RAM/ EEPROM of the inverter	2	0.00 Hz	69
29	SN	Output frequency monitor (0.01 Hz/bit)	SNVT_count	nvoInvOutFreq2	Out	–	2	0.00 Hz	70
30	SN	Command request	SNVT_str_asc	nviInvCmdReq	In		31	0	71
31	SN	Command reply	SNVT_str_asc	nvoInvCmdReply	Out		31	0	77
32	SC	Initial communication delay time (0.1 s/bit)	SNVT_time_sec	nciPwUpOutTm	In	**Pr.387**	2	0 s	80

No.	Type*3	Function	Network variables		In/ out	Setting value storage location	Size (byte)	Initial value	Refer to page
			Variables	Name					
33	SC	Forward/reverse rotation prevention	SNVT_count	nciInvFwdRevLock	In	**Pr.78**	2	*2	81
34	SC	% set reference frequency (0.1 Hz/bit)*1	SNVT_freq_hz	nciInvSetFreqBas	In	**Pr.390**	2	60 Hz	82
35	SC	Maximum frequency (0.1 Hz/bit)*1	SNVT_freq_hz	nciInvMaxFreq	In	**Pr.1**/**Pr.18**	2	*2	83
36	SC	Minimum frequency (0.1 Hz/bit)*1	SNVT_freq_hz	nciInvMinFreq	In	**Pr.2**	2	*2	83
37	SC	Heartbeat send time interval (0.1 s/bit)	SNVT_time_sec	nciSndHrtBt	In	**Pr.388**	2	0 s	84
38	SC	Minimum heartbeat send time (0.1 s/bit)	SNVT_time_sec	nciMinOutTm	In	**Pr.389**	2	0.5 s	84
39	SC	Acceleration time (0.1 s/bit)	SNVT_time_sec	nciRampUpTm	In	**Pr.7**	2	*2	87
40	SC	Deceleration time (0.1 s/bit)	SNVT_time_sec	nciRampDownTm	In	**Pr.8**	2	*2	88
41	SC	PID action selection	SNVT_count	nciInvPIDSwitch	In	**Pr.128**	2	*2	89
42	SC	PID proportional band (0.1%/bit)	SNVT_count	nciInvPIDPro	In	**Pr.129**	2	*2	92
43	SC	PID integral time (0.1 s/bit)	SNVT_time_sec	nciInvPIDIntTm	In	**Pr.130**	2	*2	92
44	SC	PID differential time (0.1 s/bit)*1	SNVT_time_sec	nciInvPIDDiffTm	In	**Pr.134**	2	*2	93
45	SC	PID manipulated variable bias (0.1 Hz/bit)*1	SNVT_freq_hz	nciInvPIDOpeBias	In	**C2 (Pr.902)**	2	*2	93
46	SC	PID manipulated variable gain (0.1 Hz/bit)*1	SNVT_freq_hz	nciInvPIDOpeGain	In	**Pr.125 (Pr.903)**	2	*2	94
47	SC	Heartbeat receive time interval (0.1 s/bit)	SNVT_time_sec	nciRcvHrtBt	In	**Pr.391**	2	0 s	95
48	SC	Maximum speed (0.005%/bit)	SNVT_lev_percent	nciMaxSpeed	In	**Pr.1**/**Pr.18**	2	*2	97
49	SC	Minimum speed (0.005%/bit)	SNVT_lev_percent	nciMinSpeed	In	**Pr.2**	2	*2	98
50	SC	Reference speed setting (1 r/min/bit)	SNVT_rpm	nciNmlSpeed	In	**Pr.390**	2	1800 r/min	99

No.	Type*3	Function	Network variables		In/ out	Setting value storage location	Size (byte)	Initial value	Refer to page
			Variables	Name					
51	SC	Reference frequency setting (0.1 Hz/bit)*1	SNVT_freq_hz	nciNmlFreq	In	**Pr.390**	2	60 Hz	100
52	SC	Speed adjustment default value	SNVT_lev_percent	nciDrvSpeedScale	In	—	2	100.00%	100
53	SC	Event driven detection width (0.005%/bit)	SNVT_lev_percent	nciInvEvtDuty	In	**Pr.392**	2	0%	101
54	SN	Cumulative power monitor 2 (0.1 kWh/bit)	SNVT_elec_kwh_l	nvoDrvRunPower_l	Out	EEPROM of the inverter	4	0 kWh	55
55	SN	Command request (binary)	SNVT_preset	nviInvCmdBinReq	In	—	14	0	72
56	SN	Command reply (binary)	SNVT_preset	nvoInvCmdBinRply	Out	—	14	0	78
57 to 62		System reserved							

*1 Displayed in 0.01 increments on the operation panel (FR-DU08).
*2 Refer to the Instruction Manual (Detailed) of the inverter for the corresponding parameter initial values.
*3 SN denotes "SNVT" (standard network variable). SC denotes "SCPT" (configuration property).

NOTE

- Write conditions of configuration property is same as those of the inverter parameter. Write conditions are restricted by **Pr.77 Parameter write selection**. When writing to configuration property during inverter operation, set "2" in **Pr.77**. Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.77**.

6.3 LONWORKS object

6.3.1 Setting range of object ID

The setting values of object ID are 0 to 4 and are as listed below.
When any values 5 to 65535 are set for object ID, invalid_id bit of object status (nvoStatus) becomes 1 and a command set for object request is made invalid. (Refer to **page 43**.)

Object ID	Description
0	Node object
1	Variable speed motor drive object [LONMARK object]
2	Inverter basic function
3	Inverter PID control function
4	Inverter extended function

6.3.2 Object request (network input SNVT_obj_request nviRequest)

You can make a request to get the object status.

Member name		Description		Initial value
object_id		Stores the object ID.		H0
object_request	H0	RQ_NORMAL	In external operation mode*3, it shifts to the network operation mode.	
	H1	RQ_DISABLED	Makes the inverter object invalid.	
	H2	RQ_UPDATE_STATUS	Update object status (nvoStatus).	
	H3	RQ_SELF_TEST	Not supported.*1	
	H4	RQ_UPDATE_ALARM	Updates in_alarm bit of the object status (nvoStatus).	
	H5	RQ_REPORT_MASK	Changes bit (invalid_id, invalid_request, disabled, manual_control, in_alarm, in_override, report_mask) supported by object status (nvoStatus) to "1".	
	H6	RQ_OVERRIDE	Not supported.*1	
	H7	RQ_ENABLE	Makes the inverter object valid.	
	H8	RQ_RMV_OVERRIDE	Not supported.*1	
	H9	RQ_CLEAR_STATUS	Clears all bits of the object status (nvoStatus) to "0".	
	HA	RQ_CLEAR_ALARM	Clears in_alarm bit of object status (nvoStatus) to "0".*2	
	HB	RQ_ALARM_NOTIFY_ENABLED	Not supported.*1	
	HC	RQ_ALARM_NOTIFY_DISABLED		
	HD	RQ_MANUAL_CTRL	Shifts the inverter to the external operation mode.	
	HE	RQ_REMOTE_CTRL	Shifts the inverter to the network operation mode.	
	HF	RQ_PROGRAM	Not supported.*1	
	HFF	RQ_NUL	Nothing is done.	
	—	Other than the above	Not supported.*1	

*1 Changes the invalid_request of the object status (nvoStatus) to "1" when data is set. (Refer to **page 43**.)
*2 Use fault reset (nviInvAlarmReset) to reset the fault status of the inverter. (Refer to **page 56**.)
*3 Can also be switched from switchover mode.
(For details of switchover mode, refer to the Instruction Manual (Detailed) of the inverter.)

6.3.3 Object status (network output SNVT_obj_status nvoStatus)

You can indicate the condition of the node.

Member name	Description	Initial value
object_id	The setting value of object request (nviRequest) written to object_id is displayed.	H0
invalid_id	Changes to "1" if an illegal object ID is specified in object_id of the object request (nviRequest),	
invalid_request	Changes to "1" if object_request not supported by the object request (nviRequest) is set.	
disabled	Changes to "1" if the object of the inverter is invalid.	
out_of_limits	Not supported.*1	
open_circuit		
out_of_service		
Mechanical_fault		
feedback_failure		
over_range		
under_range		
electrical_fault		
unable_to_measure		
comm_failure		
fail_self_test		
self_test_in_progress		
locked_out		
manual_control	Changes to "1" if the operation mode of the inverter is other than the network operation mode.	
in_alarm	Changes to "1" during the inverter is in the fault status.	
in_override	Changes to "1" if the operation mode of the inverter is network operation mode and run command and speed command are not given via the network.	
report_mask	Not supported.*1	
programming_mode		
programming_fail		
alarm_notify_disabled		
reset_complete		

*1 "0" is always set in the unsupported functions bit position.

6.4 Variable speed motor drive object

6.4.1 Start/stop and simple speed setting (network input SNVT_switch nviDrvSpeedStpt)

You can set "start/stop" and "simple setting of set frequency".

- Set start/stop in state.
  The rotation direction (forward/reverse rotation) is determined by whether "speed adjustment (nviDrvSpeedScale)" is positive or negative. (Refer to **page 45**.)
- Set simple speed setting in value.
  As the set frequency, set its ratio to "speed adjustment (nviDrvSpeedScale)" (0.5% increments).

nviDrvSpeedStpt		Operation*1	
State	**Value**	**nviInvSetFreq = "H7FFF"**	**nviInvSetFreq = "0 Hz to 590 Hz"**
H0 (initial value)	NA	Stop	
H1	0 (initial value)	Run at a 0% frequency.	
	0.5 to 100%	Run at a 0.5 to 100% frequency. (nciNmlFreq × nviDrvSpeedStpt × nviDrvSpeedScale)	Run at an nviInvSetFreq frequency.
H2 to HFF	NA	No operation	

*1 Operation of nviDrvSpeedStpt differs according to nviInvSetFreq. (Refer to **page 50**.)

NOTE

- The variable is initialized to "HFF" at power-on or if it is not updated at the "heartbeat receive time interval (nciRcvHrtBt)" (refer to **page 95**).
- The inverter operates at 100% frequency even if the value exceeding "100%" is set when state = "H1".
- Updating nviDrvSpeedScale resets the start command depending on the state of nviDrvSpeedStpt.

6.4.2 Speed adjustment (0.005% increments) (network input SNVT_lev_percent nviDrvSpeedScale)

You can set the set frequency in 0.005% increments on the assumption that the frequency set in "reference frequency setting (nciNmiFreq) is 100%. (Refer to **page 100**.)

- When the state of nviDrvSpeedStpt is H1, the motor is placed in forward rotation status if nviDrvSpeed Scale value is positive and placed in reverse rotation status if the value is negative.
- When state of nviDrvSpeedStpt is H0, the motor is at a stop status.

Data name	Initial value	Range	Increments
nviDrvSpeedScale	100.00% (NciDrvSpeedScale value) (Refer to **page 100**)	-163.840% to 163.830%	0.005%/bit

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

The frequency to be written to the inverter actually is as shown in the following formula.

Set frequency = | (reference frequency setting × speed adjustment × simple speed setting) |

Example:
When "Simple speed setting (nviDrvSpeed Stpt.value)" = 50%, "Reference frequency setting (nciNmlFreq)" = 60.0 Hz, and "Speed adjustment (nviDrvSpeedScale)" = -150%, output frequency is (60.00 Hz × (-150%) × 50%) = -45 Hz. Therefore, a reverse command of 45 Hz is given.

NOTE

- The variable is initialized to "100.00%" at power-on or if it is not updated within the set "heartbeat receive time interval (nciRcvHrtBt)". (Refer to **page 95**.)
- Control cannot be exercised at less than the minimum frequency resolution (0.01 Hz) of the inverter.
- To make the change of "reference frequency setting (nciNmlFreq)" reflected to the operation speed, a value is need to be written to speed adjustment (nviDrvSpeedScale)

6.4.3 Speed monitor (0.005% increments) (network output SNVT_lev_percent nvoDrvSpeed)

You can set the frequency command in 0.005% increments on the assumption that the frequency set in "reference frequency setting (nciNmiFreq)" is 100%. (Refer to **page 100**.)

- A positive value indicates the motor is in the forward rotation status and a negative value indicates that the motor is in the reverse rotation status.

Data name	Initial value	Range	Increments
nvoDrvSpeed	0.000%	-163.840% to 163.830%	0.005%/bit

- Data send event .....When data changes in 0.005% increments
- Data send timing .....As set in **Pr.388 Send time interval at heart beat** and **Pr. 389 Minimum sending time at heart beat**. (Refer to **page 84**.)

Output frequency is as shown in the following formula.

Output frequency = | (reference frequency setting × speed monitor × simple speed setting)*1|

*1 Refer to **page 100** for reference frequency setting and **page 44** for simple speed setting.

Example:
When "reference frequency setting (nciNmlFreq)" = 60.0 Hz and "speed setting monitor (nvoDrvSpeed)" = -150%, "simple speed setting (nviDrvSpeedStpt.value)" = 50%, output frequency is (60.0 Hz × (-150%) × 50%) = -45 Hz.
Therefore, a reverse rotation of 45 Hz is given.

NOTE

- Monitoring is disabled at less than the minimum frequency resolution (0.01 Hz) of the inverter.

6.5 Inverter basic functions

6.5.1 Inverter input signal (network input SNVT_state nviInvInputSig)

A 16-bit-wide input signal to the inverter.

- The initial value of all bits are "0".
- Data acceptance timing..... At network variable receive (nv_update_occurs event)

Bit	Signal name	Description	
0	Forward rotation command*2	0: Stop command 1: Forward rotation start	A start command is input to the inverter when the bit is 1. A stop command is given when both bits are 1.
1	Reverse rotation command*2	0: Stop command 1: Reverse rotation start	
2	High-speed operation command (terminal RH function)*1	Functions assigned to terminals RH, RM, RL, JOG, RT, AU, CS, MRS, STOP, and RES are activated.	
3	Middle-speed operation command (terminal RM function)*1		
4	Low-speed operation command (terminal RL function)*1		
5	JOG operation command (terminal JOG function)*1		
6	Second function selection (terminal RT function)*1		
7	Current input selection (terminal AU function)*1		
8	Selection of automatic restart after instantaneous power failure (terminal CS function)*1		
9	Output stop (terminal MRS function)*1		
10	Start self-holding selection (terminal STOP function)*1		
11	Inverter reset (RES terminal function)*1		
12 to 15	Not used	System reserved	

*1 Signal names are initial values. Using **Pr.180** to **Pr.180**, you can change input signal functions. Note that some of signals do not accept a command from the network according to the **Pr.338** and **Pr.339** settings. Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.180** to **Pr.189**, **Pr.338** and **Pr.339**.

*2 The signals set in Bit 0 and Bit 1 cannot be changed. Even if a setting is changed with **Pr.178** or **Pr.179**, the changed setting becomes invalid. Refer to the Instruction Manual (Detailed) of the inverter for the details of **Pr.178** and **Pr.179**

6.5.2 Inverter output signal (network output SNVT_state nvoInvOutputSig)

A 16-bit-wide output signal to the inverter.

- Data send timing .....As set in **Pr.388 Send time interval at heart beat** and **Pr. 389 Minimum sending time at heart beat**. (Refer to **page 84**.)

Bit	Signal name	Description
0	During forward running	0: Other than during forward running (during stop, during reverse running) 1: During forward running
1	During reverse running	0: Other than during reverse running (during stop, during forward running) 1: During reverse running
2	During running (terminal RUN function)*1	Functions assigned to terminals RUN, SU, OL, IPF, FU, ABC1 and ABC2 are activated.
3	Up to frequency (terminal SU function)*1	
4	Overload alarm (terminal OL function)*1	
5	Instantaneous power failure (terminal IPF function)*1	
6	Frequency detection (terminal FU function)*1	
7	Fault (terminal ABC1 function)*1	
8	— (terminal ABC2 function)*1	
9 to 13	Not used	System reserved
14	Error status flag	The bit is 1 when the output stops due to the occurrence of an inverter fault.*2
15	Ready signal	The bit is 1 when the inverter becomes ready for operation after power-ON.*3

*1 Signal names are initial values. Using **Pr.190** to **Pr.196**, you can change output signal functions.
Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.190** to **Pr.196**.

*2 When the retry function is used, the signal turns on according to the retry setting. Refer to the Instruction Manual (Detailed) of the inverter for the retry function.

*3 The value in the bit turns to 1 when power is supplied to the control circuit only.

6.5.3 Set frequency write destination selection (network input SNVT_switch nviInvSetFreqSw)

When writing the set frequency of any of the following network variables, you can select either of the internal memories of the inverter, RAM and EEPROM, as the write destination.

Target network variables	Increments	Refer to page
nviInvSetFreq	0.1 Hz	50
nviInvSetFreqP	0.005%	50
nviInvSetFreq2	0.01 Hz	69

State	Value	Write destination	Operation
H0 (initial value)	Don't care (not used/initial value: 0)	RAM	Switching power OFF erases the written values. You can prevent the write life of the EEPROM from becoming shorter.
H1		RAM, EEPROM	Switching power OFF does not erase the written value.
H2 to HFF		—	Invalid

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

NOTE

- When changing the set frequency frequently, set "RAM write."
  With "write to EEPROM" being selected, frequent setting of the set frequency will shorten the life of the EEPROM.

6.5.4 Set frequency (0.1 Hz increments) (network input SNVT_freq_hz nviInvSetFreq)

The set frequency can be set in 0.1 Hz increments.

Data name	Initial value	Range	Increments
nviInvSetFreq	H7FFF	0.0 Hz to 590.0 Hz, H7FFF	0.1 Hz/bit

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

NOTE

- When H7FFF is set, the set frequency is as set in "start/stop/simple speed setting (nviDrvSpeedStpt)". (Refer to page 44.)
- H7FFF is not reflected as the actual set frequency value.
- Regardless of the **Pr. 37** and **Pr. 144** settings, the value is always set in frequency (Hz).

6.5.5 Set frequency (0.005% increments) (network input SNVT_lev_percent nviInvSetFreqP)

You can monitor the output frequency of the inverter in 0.005% increments on the assumption that the frequency set in "% set reference frequency (nciInvSetFreqBas)" is 100%. (Refer to page 82.)

Data name	Initial value	Range	Increments
nviInvSetFreqP	100.000%	0.000% to 163.830%	0.005%/bit

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

Example:
When "% set reference frequency (nciInvSetFreqBas)" = 60.0 Hz and "set frequency (nviInvSetFreqP)" = 50.000%, set frequency = 60 × 0.5 = 30 Hz.

NOTE

- Control cannot be exercised at less than the minimum frequency resolution (0.01 Hz) of the inverter.

6.5.6 Output frequency monitor (0.1 Hz increments) (network output SNVT_freq_hz nvoInvOutFreq)

You can monitor the output frequency of the inverter in 0.1 Hz increments.

Data name	Initial value	Range	Increments
nvoInvOutFreq	0.0 Hz	0.0Hz to 590.0 Hz	0.1 Hz/bit

- Data send event .....When data changes in 0.1 Hz increments
- Data send timing .....As set in **Pr.388 Send time interval at heart beat** and **Pr.388 Minimum sending time at heart beat**. (Refer to **page 84**.)

NOTE

- This variable is similar to "output frequency monitor (0.005% increments)" but may sometimes differ from it in data send timing since they are different in mutual resolution. (Refer to **page 52**.)
- Regardless of the **Pr. 37** and **Pr.144** settings, the value is always displayed in frequency (Hz).

6.5.7 Output frequency monitor (0.005% increments) (network output SNVT_lev_percent nvoInvOutFreqP)

You can monitor the output frequency of the inverter in 0.005% increments on the assumption that the frequency set in "% set reference frequency (nciInvSetFreqBas) " is 100%. (Refer to page 82.)

Data name	Initial value	Range	Increments
nvoInvOutFreqP	0.000%	0.000% to 163.830%	0.005%/bit

- Data send event .....When data changes in 0.005% increments
- Data send timing .....As set in **Pr.388 Send time interval at heart beat** and **Pr.389 Minimum sending time at heart beat** at heart beat. (Refer to page 84.)

Example:

When inverter output frequency = 90.0 Hz and % set reference frequency = 60.0 Hz,

$$\frac{90.0\ \text{Hz}}{60.0\ \text{Hz}} = 1.5$$

Therefore, the monitoring value is 150.000%.

NOTE

- Monitoring is disabled at less than the minimum frequency resolution (0.01 Hz) of the inverter.
- This variable is similar to "output frequency monitor (0.1 Hz increments)" but may sometimes differ from it in data send timing since they are different in mutual resolution. (Refer to page 51.)

6.5.8 Output current monitor (0.1 A increments) (network output SNVT_amp nvoDrvCurnt)

You can monitor the output current of the inverter in 0.1 A increments.

Data name	Initial value	Range	Increments
nvoDrvCurnt	0.0 A	0.0 A to 3276.7 A	0.1 A/bit

- Data send event .....When data changes in 0.1 A increments
- Data send timing .....As set in **Pr.388 Send time interval at heart beat** and **Pr.389 Minimum sending time at heart beat**. (Refer to **page 84**.)

6.5.9 Output voltage monitor (0.1 V increments) (network output SNVT_volt nvoDrvVolt)

You can monitor the output voltage of the inverter in 0.1 V increments.

Data name	Initial value	Range	Increments
nvoDrvVolt	0.0 V	0.0 V to 3276.7 V	0.1 V/bit

- Data send event .....When data changes in 0.1 V increments
- Data send timing .....As set in **Pr.388 Send time interval at heart beat** and **Pr.389 Minimum sending time at heart beat**. (Refer to **page 84**.)

6.5.10 Actual operation time monitor (1 h increments) (network output SNVT_time_hour nvoDrvRunHours)

You can monitor the actual operation time (cumulative inverter output time) of the inverter in 1 h increments.

Data name	Initial value	Range	Increments
nvoDrvRunHours	0 h	0 to 65534 h	1 h/bit

- Data send event .....When data changes in 1 h increments
- Data send timing .....As set in **Pr.388 Send time interval at heart beat** and **Pr.389 Minimum sending time at heart beat**. (Refer to **page 84**.)

6.5.11 Cumulative power monitor (1 kWh increments) (network output SNVT_elec_kwh nvoDrvRunPower)

You can monitor the cumulative power of the inverter in 1 kWh increments.
You can select monitoring data from either BCD code data or binary data according to **Pr.170 Watt-hour meter clear**. The initial value is binary data. (For details of **Pr.170**, refer to the Instruction Manual (Detailed) of the inverter.)

Data name	Initial value	Pr.170	Range	Increments
nvoDrvRunPower	0 kWh	10	0 to 9999 kWh (BCD code data)	1 kWh/bit*1
		9999 (initial value)	0 to 65535 kWh (binary data)	

*1 The digit of monitoring data shifts according to the **Pr. 891** setting. Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr. 891.**

NOTE

- When the numerical value exceeds the maximum value in the monitoring range, the value returns to 0 and is recounted from 0.

- Data send event .....When data changes in 1 kWh increments.
- Data send timing .....As set in **Pr.388 Send time interval at heart beat** and **Pr.389 Minimum sending time at heart beat**. (Refer to **page 84**.)

6.5.12 Cumulative power monitor 2 (0.1 kWh increments) (network output SNVT_elec_kwh_l nvoDrvRunPower_l)

You can monitor cumulative power of the inverter in 32-bit data and 0.1 kWh increments.

Data name	Initial value	Applicable motor capacity	Range	Increments
NvoDrvRunPower_l	0 kWh	55K or lower	0 to 42949672.9 kWh	0.1 kWh/bit
		75K or higher	0 to 214748364.6 kWh	

NOTE

- If the value exceeds the maximum value of the monitor range, the value returns to 0 and is recounted from 0.

- Data send event ..... at data change in 0.1 kWh increments
- Data send timing ..... depends on the settings of **Pr.388 Send time interval at heart beat** and **Pr.389 Minimum sending time at heart beat**. (Refer to page 84.)

6.5.13 Fault reset (network input SNVT_switch nviInvAlarmReset)

You can reset the inverter at inverter fault occurrence.

Data name	Initial value	Range		Operation
		state	value	
nviInvAlarmReset	H0	H0	Don't care (not used)	Without fault reset
		H1		Execute a fault reset.
		H2 to HFF		Invalid

- Data acceptance timing.....When network variables are being received and state = 1 (nv_update_occurs event)
- Setting "1" in **Pr. 349** disables the fault reset command in operations other than network operation.

NOTE

- You can reset the inverter at inverter fault occurrence. When the inverter is not during a fault, performing this operation does not reset the inverter.

6.5.14 Fault occurrence definition (network output SNVT_str_asc nvoInvAlarmStr)

At inverter fault occurrence, you can confirm the fault definition of the inverter with a character string.

- If an inverter fault occurs at power-on/inverter reset, data is not sent before the **Pr.387 Initial communication delay time** (nciPwUpOutTm) (Refer to page 80).
- The initial setting of +0 to +30 is 0.
- Data send timing ..... At inverter fault occurrence

Storage position	Definition (ASCII code)	
+0	(Fault code)	H
+1	E (H45)	
+2	. (H2E)	
+3	Character 1 (Character 1)	
+4	Character 2 (Character 2)	
+5	Character 3 (Character 3)	
+6 to +30	(H00)	L

Fault code correspondence table

Definition	+0	+1	+2	+3	+4	+5	+6 to +30
	Fault code	E	.	Character 1	Character 2	Character 3	-
OC1	H10	E(H45)	.(H2E)	O (H4F)	C (H43)	1 (H31)	(H00)
OC2	H11			O (H4F)	C (H43)	2 (H32)	
OC3	H12			O (H4F)	C (H43)	3 (H33)	
OV1	H20			O (H4F)	V (H56)	1 (H31)	
OV2	H21			O (H4F)	V (H56)	2 (H32)	
OV3	H22			O (H4F)	V (H56)	3 (H33)	
THT	H30			T (H54)	H (H48)	T (H54)	
THM	H31			T (H54)	H (H48)	M (H4D)	
FIN	H40			F (H46)	I (H49)	N (H4E)	
IPF	H50			I (H49)	P (H50)	F (H46)	
UVT	H51			U (H55)	V (H56)	T (H54)	
ILF	H52			I (H49)	L (H4C)	F (H46)	
OLT	H60			O H4F)	L (H4C)	T (H54)	
SOT	H61			S (H53)	O (HF4)	T (H54)	
LUP	H62			L (H4C)	U (H55)	P (H50)	
LDN	H63			L (H4C)	D (H44)	N (H4E)	
BE	H70			B (H42)	E (H45)	Space (H20)	
GF	H80			G (H47)	F (H46)	Space (H20)	

Definition	+0	+1	+2	+3	+4	+5	+6 to +30
	Fault code	E	.	Character 1	Character 2	Character 3	-
LF	H81			L (H4C)	F (H46)	Space (H20)	
OHT	H90			O (H4F)	H (H48)	T (H54)	
PTC	H91			P (H50)	T (H54)	C (H43)	
OPT	HA0			O (H4F)	P (H50)	T (H54)	
OP1	HA1			O (H4F)	P (H50)	1 (H31)	
OP2	HA2			O (H4F)	P (H50)	2 (H32)	
OP3	HA3			O (H4F)	P (H50)	3 (H33)	
E16	HA4			E (H45)	1 (H31)	6 (H36)	
E17	HA5			E (H45)	1 (H31)	7 (H37)	
E18	HA6			E (H45)	1 (H31)	8 (H38)	
E19	HA7			E (H45)	1 (H31)	9 (H39)	
E20	HA8			E (H45)	2 (H32)	0 (H30)	
PE	HB0			P (H50)	E (H45)	Space (H20)	
PUE	HB1			P (H50)	U (H55)	E (H45)	
RET	HB2	E(H45)	.(H2E)	R (H52)	E (H45)	T (H54)	(H00)
PE2	HB3			P (H50)	E (H45)	2 (H32)	
CPU	HC0			C (H43)	P (H50)	U (H55)	
CTE	HC1			C (H43)	T (H54)	E (H45)	
P24	HC2			P (H50)	2 (H32)	4 (H34)	
CDO	HC4			C (H43)	D (H44)	O (H4F)	
IOH	HC5			I (H49)	O (H4F)	H (H48)	
SER	HC6			S (H53)	E (H45)	R (H52)	
AIE	HC7			A (H41)	I (H49)	E (H45)	
USB	HC8			U (H55)	S (H53)	B (H42)	
SAF	HC9			S (H53)	A (H41)	F (H46)	
PBT	HCA			P (H50)	B (H42)	T (H54)	
OS	HD0			O (H4F)	S (H53)	Space (H20)	
OSD	HD1			O (H4F)	S (H53)	D (H44)	
ECT	HD2			E (H45)	C (H43)	T (H54)	
OD	HD3			O (H4F)	D (H44)	Space (H20)	

Definition	+0	+1	+2	+3	+4	+5	+6 to +30
	Fault code	E	.	Character 1	Character 2	Character 3	-
MB1	HD5	E(H45)	.(H2E)	M (H4D)	B (H42)	1 (H31)	(H00)
MB2	HD6			M (H4D)	B (H42)	2 (H32)	
MB3	HD7			M (H4D)	B (H42)	3 (H33)	
MB4	HD8			M (H4D)	B (H42)	4 (H34)	
MB5	HD9			M (H4D)	B (H42)	5 (H35)	
MB6	HDA			M (H4D)	B (H42)	6 (H36)	
MB7	HDB			M (H4D)	B (H42)	7 (H37)	
EP	HDC			E (H45)	P (H50)	Space (H20)	
MP	HDE			M (H4D)	P (H50)	Space (H20)	
IAH	HE1			I (H49)	A (H41)	H (H48)	
EHR	HE7			E (H45)	H (H48)	R (H52)	
E1	HF1			E (H45)	1 (H31)	Space (H20)	
E2	HF2			E (H45)	2 (H32)	Space (H20)	
E3	HF3			E (H45)	3 (H33)	Space (H20)	
E5	HF5			E (H45)	5 (H35)	Space (H20)	
E6	HF6			E (H45)	6 (H36)	Space (H20)	
E7	HF7			E (H45)	7 (H37)	Space (H20)	
E11	HFB			E (H45)	1 (H31)	1 (H31)	
E13	HFD			E (H45)	1 (H31)	3 (H33)	
E14	HFE			E (H45)	1 (H31)	4 (H34)	

*1 Value in parentheses is in ASCII code.

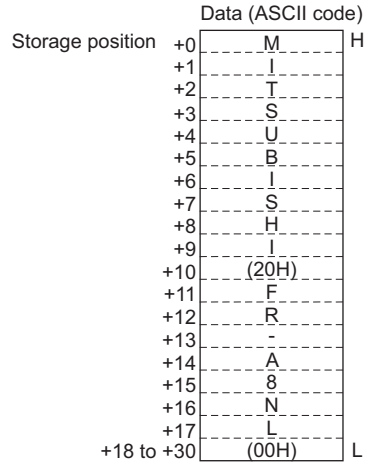
NOTE

- Output faults vary by the inverter. Refer to the Instruction Manual (Detailed) of the inverter for the details.
- E14 will occur when the option cannot recognize fault definitions.

6.5.15 Product information (maker name, type) (network output SNVT_str_asc nvoInvTypeInfo)

You can send the "maker name (MITSUBISHI)" and "model (FR-A8NL)" data as a character string (ASCII).
At power-ON or inverter reset, the data is sent after **Pr.387 Initial communication delay time** (nciPwUpOutTm). (Refer to **page 80**.)

- Data send timing ..... At power-ON and at inverter reset



6.5.16 Emergency stop command (network input SNVT_hvac_emerg nviEmergOverride)

You can give an emergency stop command during inverter operation.
If "EMERG_SHUTDOWN" is requested during inverter operation, the motor decelerates to a stop in any operation mode.

Data name	Initial value	Range	Description
nviEmergOverride	H0	H0	EMERG_NORMAL Emergency stop cancel
		H4	EMERG_SHUTDOWN Emergency stop
		HFF	EMERG_NUL Invalid (no operation)

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

(1) Emergency stop	(2) Emergency stop cancel
• The deceleration time depends on the **Pr.8**, **Pr.44**, and other settings. • When the inverter starts decelerating under the emergency stop command, "PS" appears in the display section of the operation panel (FR-DU08) and the inverter is put in an emergency stop status. • An emergency stop status cannot be canceled unless emergency stop cancel operation is performed. • During occurrence of a communication line error, an emergency stop command is not accepted. • During an inverter stop, an emergency stop command is invalid. • When the emergency stop command is given while position control is being performed, the excessive position fault (E.OD) does not occur. (FR-A800 series inverters) • When the emergency stop command is given while the multi-pump function is activated, motors driven by commercial power supply also decelerate to stop. (FR-F800 series inverters)	• During an inverter stop, turn OFF all start commands (forward rotation command, reverse rotation command) and request "EMERG_NORMAL". When the inverter recognizes this status, it cancels the emergency stop and also "PS" appears in the display section disappears. • During deceleration made under an emergency stop command, performing emergency stop cancel operation will not cancel an emergency stop immediately. Perform emergency stop cancel operation during an inverter stop.

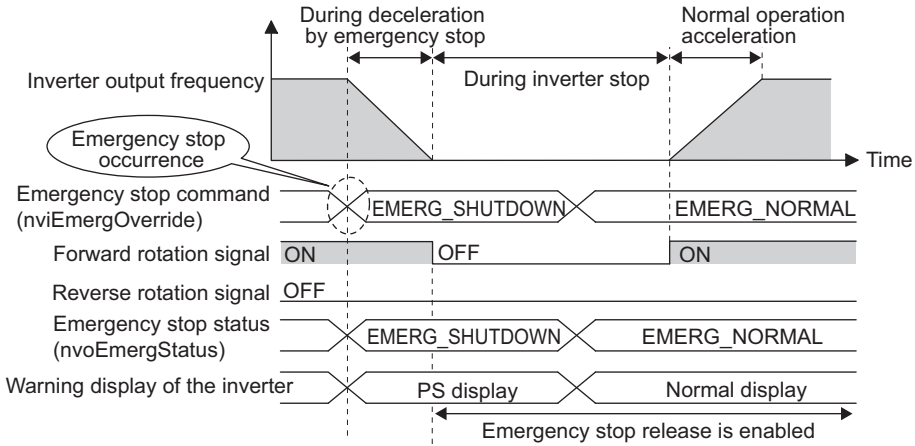
6.5.17 Emergency stop status (network output SNVT_hvac_emerg nvoEmergStatus)

The emergency stop status of the inverter can be checked.

Data name	Initial value	Range	Description
nvoEmergStatus	H0	H0	EMERG_NORMAL During normal or emergency stop cancel
		H4	EMERG_SHUTDOWN During emergency stop

- Data send event .....When the value data changes at emergency stop command receive
- Data send timing .....As set in **Pr.388 Send time interval at heart beat** and **Pr.389 Minimum sending time at heart beat**. (Refer to **page 84**.)

Emergency stop operation timing chart



6.5.18 Fault status (network output SNVT_switch nvoDrvAlarm)

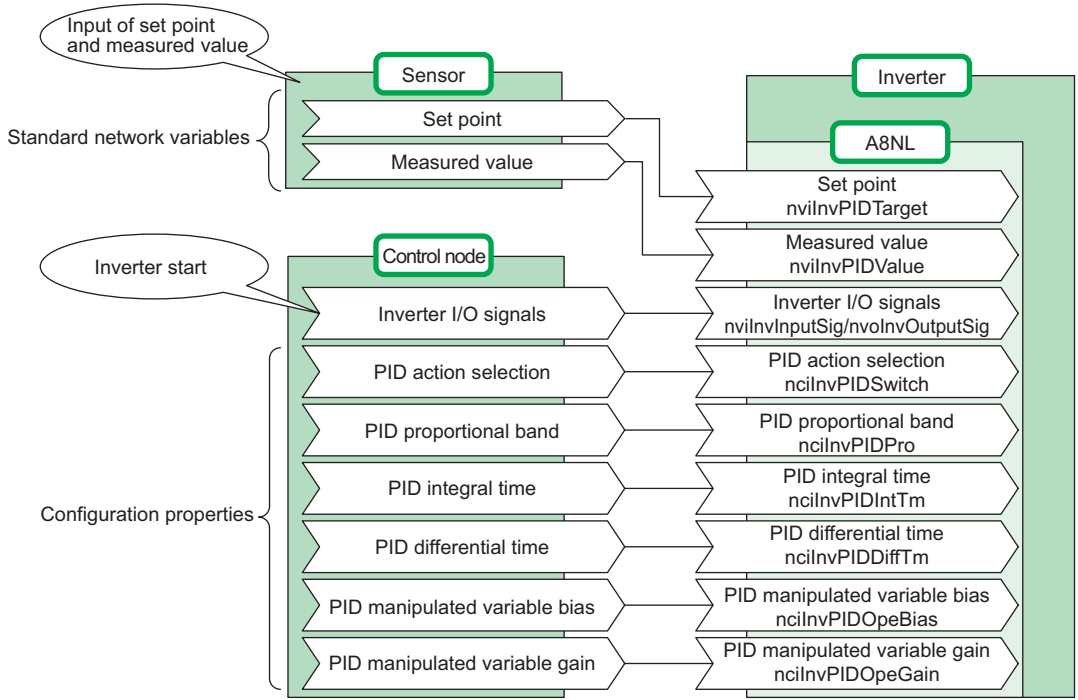
You can indicate the fault status of the inverter.

Data name	Range		Operation
	State	Value	
nvoDrvAlarm	H0 (initial value)	Don't care (not used) (initial value: 0)	Inverter normal
	H1		During inverter fault

- Data send timing .....As set in **Pr.388 Send time interval at heart beat** and **Pr.389 Minimum sending time at heart beat**. (Refer to **page 84**.)

6.6 Inverter PID control functions

◆ System configuration example



6.6.1 PID set point (network input SNVT_lev_percent nviInvPIDTarget)

Enter the target value of air volume, temperature, etc. in 0.005% increments.

Data name	Initial value	Range	Increments
nviInvPIDTarget	0.000%	0.00% to 100.00%	0.005%/bit

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

Example:
When setting 30°C as the set point using a 10°C/0% and 50°C/100% detector,

$$\frac{(30\text{-}10)}{(50\text{-}10)} \times 100 = 50\%.$$ As the PID set point, input 50.00%.

NOTE

- Control cannot be exercised at less than the minimum resolution (0.01%) of the inverter.
- When the value outside of the range is input, the input value is made invalid and the inverter operates with the value set last time.

6.6.2 PID measured value (network input SNVT_lev_percent nviInvPIDValue)

Enter the measured value of air volume, temperature, etc. in 0.005% increments.

Data name	Initial value	Range	Increments
nviInvPIDValue	0.000%	0.00% to 100.00%	0.005%/bit

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

Example:
When the measured value is 25°C on a 10°C/0% and 50°C/100% detector,

$$\frac{(25\text{-}10)}{(50\text{-}10)} \times 100 = 37.5\%.$$ As the PID measured value, input 37.50%.

NOTE

- Control cannot be exercised at less than the minimum resolution (0.01%) of the inverter.
- When the value outside of the range is input, the input value is made invalid and the inverter operates with the value set last time.

6.6.3 PID deviation (network input SNVT_lev_percent nviInvPIDDev)

Input the set value of air volume, temperature, etc. in 0.005% increments.

Data name	Initial value	Range	Increments
nviInvPIDDev	0.000%	-100.00% to +100.00%	0.005%/bit

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

Example:
When the set point is 25°C and the current temperature is 30°C on a 10°C/0% and 50°C/100% detector (deviation: +5°C),

$$\frac{(30-25)}{(50-10)} \times 100 = 12.5\%.$$ As the PID deviation, input 12.50%.

NOTE

- Control cannot be exercised at less than the minimum resolution (0.01%) of the inverter.
- When the value outside of the range is input, the input value is made invalid and the inverter operates with the value set last time.

6.7 Inverter extended functions

6.7.1 Monitor code (network input SNVT_count nviInvMonCode)

Set the desired monitored item that you want to monitor.
The monitor value enters "monitor data (nvoInvMonData)". (Refer to page 69.)

Data Name	Initial value	Range	Increments
nviInvMonCode	H0	H0 to H0062	-

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

For the details of the monitor items, refer to the monitor display section in the Instruction Manual (Detailed) of the inverter.
The code number is obtained by converting the parameter setting to a hexadecimal value.
(Example) Electronic thermal relay load factor
Parameter setting: 10 ⇒ Code number: H000A

Code	Description	Increments
H0000	No monitoring	-
H0001	Output frequency	0.01 Hz
H0002	Output current	0.01 A/0.1 A
H0003	Output voltage	0.1 V
. . .	. . .	. . .

6.7.2 Monitor data (network output SNVT_count nvoInvMonData)

You can monitor the monitored item set in "monitor code (nviInvMonCode)". (Refer to page 68.)

Data name	Initial value	Range	Increments
nvoInvMonData	0	0 to 65535	Differs according to the monitor items (page 68).

- Data send event .....When the monitor value data changes
- Data send timing .....As set in **Pr.388 Send time interval at heart beat** and **Pr.389 Minimum sending time at heart beat**. (Refer to page 84.)

Example:
If the monitor value is 60.00 Hz, "6000" is displayed.

NOTE

- **Pr.290** and **Pr.1018** settings are invalid. Absolute values are displayed.

6.7.3 Set frequency (0.01 Hz increments) (network input SNVT_count nviInvSetFreq2)

You can set the set frequency in 0.01 Hz increments.

Data name	Initial value	Range	Increments
nviInvSetFreq2	0.00 Hz	0.00 Hz to 590.00 Hz	0.01 Hz/bit

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

Example:
If you want to set 120.00 Hz, set "12000", the value 100 times greater than the desired frequency.

NOTE

- Regardless of the **Pr. 37** and **Pr.144** settings, the value is always set in frequency (Hz).

6.7.4 Output frequency monitor (0.01 Hz increments) (network output SNVT_count nvoInvOutFreq2)

You can monitor the output frequency of the inverter in 0.01 Hz increments.

Data name	Initial value	Range	Increments
nvoInvOutFreq2	0.00 Hz	0.00 Hz to 590.00 Hz	0.01 Hz/bit

- Data send event .....When the data changes in 0.01 Hz increments
- Data send timing .....As set in **Pr.388 Send time interval at heart beat** and **Pr.389 Minimum sending time at heart beat**. (Refer to **page 84**.)

Example:
If the monitor value is 120.00 Hz, "12000", the value 100 times greater, is displayed.

NOTE

- Regardless of the **Pr.37** and **Pr.144** settings, the value is always set in frequency (Hz).

6.7.5 Command request (network input SNVT_str_asc nviInvCmdReq)

You can set the instruction code and written data for executing operation mode rewrite, parameter read and write, faults history reference, parameter clear, etc.
The format is as shown below. The data to be set are in ASCII code. The initial setting of +0 to +30 is 0.

Request flag	H01	Command request is made
	Other than H01	Command request is not made
Request code	Refer to the command list on the **page 73** to set the instruction code.	
Request data	Set the data at writing. (Set H0000 at reading.)	

- Data acceptance timing..... At network variable receive (nv_update_occurs event) and when request flag = 1

Storage position	Data (ASCII code)	
+0	Request flag	H
		L
+2	Request code	H
		L
+6	Request data	H
		L
+10 to +30	0	

Setting example 1

When writing "**Pr. 7 Acceleration time** = 10.0 s"

	Data (ASCII code)		
+0	0	(H30)	H
	1	(H31)	L
+2	0	(H30)	H
	0	(H30)	
	8	(H38)	
	7	(H37)	L
+6	0	(H30)	H
	0	(H30)	
	6	(H36)	
	4	(H34)	L
+10 to +30	0		

Setting example 2

When resetting the inverter

	Data (ASCII code)		
+0	0	(H30)	H
	1	(H31)	L
+2	0	(H30)	H
	0	(H30)	
	F	(H46)	
	D	(H44)	L
+6	9	(H39)	H
	6	(H36)	
	9	(H39)	
	6	(H36)	L
+10 to +30	0		

*1 Refer to **page 76** for the command processing procedure.

6.7.6 Command request (binary) (network input SNVT_preset nviInvCmdBinReq)

The actions that were unavailable with network variables can be set with binary data. Examples include the setting of instruction codes for operation mode change, parameter reading/writing, fault history reference, and parameter clear, and the setting of writing data. The format is as shown below. Data to be set are in binary code. A command request in binary code requires less communication data amount than a command request in ASCII code does. The initial setting of +0 to +13 is 0.

Function code	H02: LN_LEARN_VALUE	Command request is made.
	H02: Other than LN_LEARN_VALUE	Command request is not made.
Request code	Refer to the command list on **page 73** to set the instruction code.	
Writing data	Set the data at writing. (Set value is ignored during reading.)	

- Data acceptance timing..... At the network variable reception (nv_update_occurs event) while the function code = 2.

Storage position	Member	Content (binary data)	
+0	learn	Function code	
+1	selector	Invalid (Set value is ignored.)	H
		Request code	L
+3	value[0]	Invalid (Set value is ignored.)	H
	value[1]	Invalid (Set value is ignored.)	
	value[2]	Upper bytes of writing data	
	value[3]	Lower bytes of writing data	L
+7	day	Invalid (Set value is ignored.)	H
		Invalid (Set value is ignored.)	L
+9	hour	Invalid (Set value is ignored.)	
+10	minute	Invalid (Set value is ignored.)	
+11	second	Invalid (Set value is ignored.)	
+12	millisecond	Invalid (Set value is ignored.)	H
		Invalid (Set value is ignored.)	L

Setting example 1

When writing "**Pr.7 Acceleration time** = 10.0 s"

Storage position	Content (binary data)	
+0	H02	
+1	H00	H
	H87	L
+3	H00	H
	H00	
	H00	
	H64	L
+7	H00	H
	H00	L
+9	H00	
+10	H00	
+11	H00	
+12	H00	H
	H00	L

Setting example 2

When resetting the inverter

Storage position	Content (binary data)	
+0	H02	
+1	H00	H
	HFD	L
+3	H00	H
	H00	
	H96	
	H96	L
+7	H00	H
	H00	L
+9	H00	
+10	H00	
+11	H00	
+12	H00	H
	H00	L

*1 Refer to **page 76** for the command processing procedure.

◆ Command list

Item	Read/ write	Instruction code	Data description
Operation mode	Read	H007B	H0000: Network operation mode H0001: External operation mode, External JOG operation mode H0002: PU operation mode, External/PU combined operation modes 1 and 2, PUJOG operation mode
	Write	H00FB	H0000: Network operation mode H0001: External operation mode H0002: PU operation mode (**Pr.79** = "6", **Pr.340** = "10, 12")
Fault definition	Read	H0074 to H0077	H0000 to HFFFF: Last two fault definitions b15 b8 b7 b0 H0074: Second most recent fault / Most recent fault H0075: Fourth most recent fault / Third most recent fault H0076: Sixth most recent fault / Fifth most recent fault H0077: Eighth most recent fault / Seventh most recent fault Refer to the fault code correspondence table (page 57).
Set frequency (RAM)	Read	H006D	Read set frequency/speed from RAM or EEPROM. • H0000 to HFFFF: Set frequency....Increments 0.01 Hz (Regardless of the **Pr.37** and **Pr.144** settings, the value is always displayed in frequency (Hz).
Set frequency (EEPROM)		H006E	
Set frequency (RAM)	Write	H00ED	Write set frequency/speed to RAM or EEPROM. • H0000 to HE678 (0 to 590.00 Hz): Frequency .... Increments 0.01 Hz (Regardless of the **Pr.37** and **Pr.144** settings, the value is always set in frequency (Hz).) • To change the set frequency consecutively, write data to the inverter RAM. (Code number: HED)
Set frequency write (RAM and EEPROM)	Write	H00EE	

<table>
<tr><th>Item</th><th>Read/ write</th><th>Instruction code</th><th>Data description</th></tr>
<tr><td rowspan="2">Parameter</td><td>Read</td><td>H0000 to H006B</td><td rowspan="2">• Refer to the instruction code in the parameter list in the Instruction Manual (Detailed) of the inverter to read and write as required.
Write to Pr.77 and Pr.79 is disabled.
When setting Pr.100 and later, link parameter extended setting must be set.
• Set 65520 (HFFF0) as a parameter value "8888" and 65535 (HFFFF) as "9999".
• When changing the parameter values frequently, set "1" in Pr.342 to write them to RAM. (Refer to the Instruction Manual (Detailed) of the inverter for details.)</td></tr>
<tr><td>Write</td><td>H0080 to H00EB</td></tr>
<tr><td>Faults history batch clear</td><td>Write</td><td>H00F4</td><td>H9696: Clears the faults history as a batch</td></tr>
<tr><td>Parameter clear
All parameter clear</td><td>Write</td><td>H00FC</td><td>All parameters return to the initial values.
Whether to clear communication parameters or not can be selected according to data. (○: Clear, ×: Not clear)
Refer to the Instruction Manual (Detailed) of the inverter for parameter clear, all clear, and communication parameters.
<table>
<tr><th>Clear type</th><th>Data</th><th>Communication Pr.</th></tr>
<tr><td rowspan="2">Parameter clear</td><td>H9696</td><td>○*1</td></tr>
<tr><td>H5A5A</td><td>×*2</td></tr>
<tr><td rowspan="2">All parameter clear</td><td>H9966</td><td>○*1</td></tr>
<tr><td>H55AA</td><td>×*2</td></tr>
</table>
When clear is executed for H9696 or H9966, communication-related parameter settings also return to the initial values. When resuming operation, set the parameters again.
Executing clear will clear the instruction codes H00EC, H00F3, H00FF settings.</td></tr>
<tr><td>Inverter reset</td><td>Write</td><td>H00FD</td><td>H9696: Inverter reset.</td></tr>
</table>

Item	Read/ write	Instruction code	Data description
Link parameter extended setting	Read	H007F	Parameter description is changed according to the H00 to H0E setting. Refer to the instruction code of the Instruction Manual (Detailed) of the inverter for details of the values.
	Write	H00FF	
Second parameter changing*3	Read	H006C	When setting the bias / gain (**C2 to C19**, **C38 to C45**) parameters *4 H00: Frequency *5 H01: Analog value set in parameters H02: Analog value input from the terminal
	Write	H00EC	

*1 Communication parameters (**Pr.117 to Pr.124, Pr.331 to Pr.341, Pr.343, Pr.349, Pr.549 to Pr.551**) are also cleared.

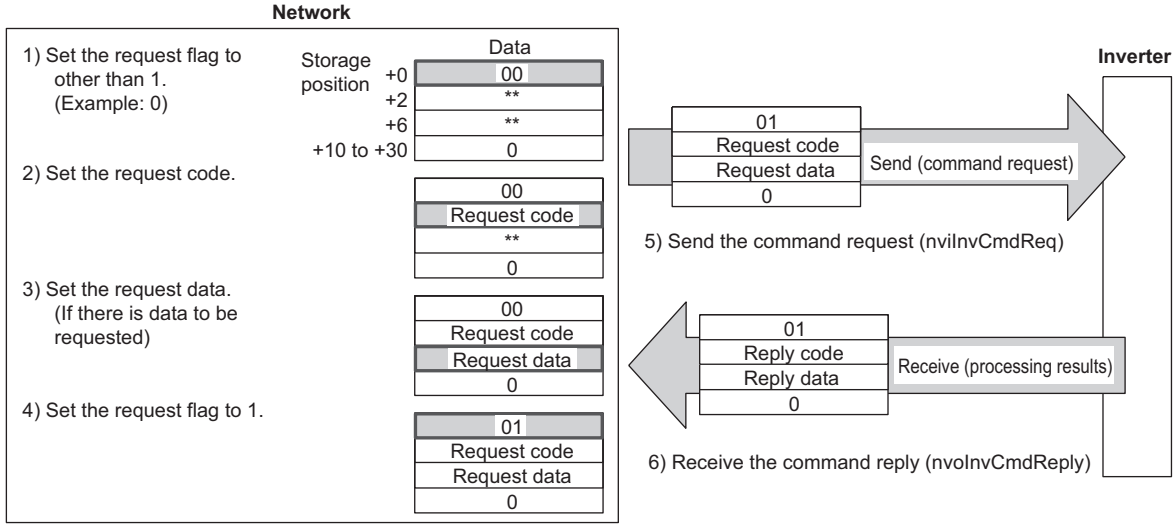
*2 Even if parameter clear is commanded with H5A5A or H55AA, turning OFF the power during the clearing process will return the communication parameters to initial values.

*3 This setting can be made when the link parameter extended setting = "1, 9".

*4 For the parameter details, refer to the Instruction Manual (Detailed) of the inverter.

*5 Gain frequencies can be written using **Pr.125** (instruction code H99) and **Pr.126** (instruction code H9A) also.

Command processing is performed in the following procedure.
(Example: command request (nviInvCmdReq) and command reply (nvoInvCmdReply))



6.7.7 Command reply (network output SNVT_str_asc nvoInvCmdReply)

Gives a reply to the command requested in "command request (nviInvCmdReq)" (refer to page 71). The data entered are the reply code and read data as the command processing results.
The format is as shown below. The data to be set are in ASCII code. The initial setting of +0 to +30 is 0.

Reply flag	H01	Reply to command request
Reply code (Results in response to the command request enter)	H0000	Normal completion of command
	Other than H0000	Command execution error
		H0001: Mode error (different operation mode)
		H0002: Instruction code error (specified instruction code does not exist)
		H0003: Data range error (data written is outside the range)
Reply data	The data is set at reading. (A given value is set at writing.)	

- Data send event ..... At command processing completion

Data (ASCII code)

Storage position			
+0	Request flag		H
			L
+2	Reply code		H
			L
+6	Reply data		H
			L
+10 to +30	0		

Setting example 1

When **Pr. 8 Deceleration time** with "5.0 s" set in is read

Data (ASCII code)

+0	0	(H30)	H
	1	(H31)	L
+2	0	(H30)	H
	0	(H30)	
	0	(H30)	
	0	(H30)	L
+6	0	(H30)	H
	0	(H30)	
	3	(H33)	
	2	(H32)	L
+10 to +30	0		

Setting example 2

When the most recent fault (E.THM) and second most recent fault in past (E.OC1) are read

Data (ASCII code)

+0	0	(H30)	H
	1	(H31)	L
+2	0	(H30)	H
	0	(H30)	
	0	(H30)	
	0	(H30)	L
+6	1	(H31)	H
	0	(H30)	
	3	(H33)	
	1	(H31)	L
+10 to +30	0		

*1 Refer to page 76 for the command processing procedure.

6.7.8 Command reply (binary) (network output SNVT_preset nvoInvCmdBinRply)

A reply to the command requested in "command request (binary) (nviInvCmdBinReq)" (refer to page 72) is given. The reply code and read data are included in the command processing results.
The format is as shown below. The data to be set are in binary code. A command reply in binary code requires less communication data amount than a command reply in ASCII code does. The initial values of +0 to +13 is 0.

Function code	H02: LN_LEARN_VALUE	Normal completion of command
	HFF: LN_NUL	Command execution error
Reply data	The data is set at reading. (A given value is set at writing.)	

◆ **Relationship between function codes and reply data**

Command execution results (function code)	Request code type set in nviInvCmdBinReq	Reply data content
H02 (Normal completion of command)	Read command	Read data
	Write command	Written data (echo back)
HFF (Command execution error)	Write command	H01: Mode error (The operation mode is different.)
	Read/write command	H02: Instruction code error (A non-existent instruction code is specified.)
	Write command	H03: Data range error (Out-of-range data is written.)

- Data transmission event.....At the completion of command processing

Storage position	Member	Content (binary data)	
+0	learn	Function code	
+1	selector	H00 (fixed)	H
		Echo back of the request code	L
+3	value[0]	H00 (fixed)	H
	value[1]	H00 (fixed)	
	value[2]	Upper bytes of reply data	
	value[3]	Lower bytes of reply data	L
+7	day	H00 (fixed)	H
		H00 (fixed)	L
+9	hour	H00 (fixed)	
+10	minute	H00 (fixed)	
+11	second	H00 (fixed)	
+12	millisecond	H00 (fixed)	H
		H00 (fixed)	L

Setting example 1

When **Pr.1 Maximum frequency** setting of "60.00 Hz" is read

Storage position	Content (binary data)	
+0	H02	
+1	H00	H
	H01	L
+3	H00	H
	H00	
	H17	
	H70	L
+7	H00	H
	H00	L
+9	H00	
+10	H00	
+11	H00	
+12	H00	H
	H00	L

Setting example 2

When out-of-range data, "0x7FFF," is written to **Pr.2 Minimum frequency**

Storage position	Content (binary data)	
+0	HFF	
+1	H00	H
	H82	L
+3	H00	H
	H00	
	H00	
	H03	L
+7	H00	H
	H00	L
+9	H00	
+10	H00	
+11	H00	
+12	H00	H
	H00	L

*1 Refer to **page 76** for the command processing procedure.

6.8 Configuration properties

6.8.1 Initial communication delay time (network input config SNVT_time_sec nciPwUpOutTm)

You can set the time from when the inverter starts until when data is sent to LONWORKS at power-ON or inverter reset.

NOTE

- The parameter setting becomes valid at power-ON or inverter reset.
- The delay time at power-ON and inverter reset is set, and this setting does not affect normal data transmission.

<table>
<tr><th colspan="2">Data name</th><th>Initial value</th><th>Range</th><th>Increments</th></tr>
<tr><td colspan="2">nciPwUpOutTm</td><td rowspan="3">0 s</td><td rowspan="3">0.0 s to 120.0 s</td><td rowspan="3">0.1 s/bit</td></tr>
<tr><th>Parameter</th><th>Name</th></tr>
<tr><td>387</td><td>Initial communication delay time</td></tr>
</table>

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

6.8.2 Forward/reverse rotation prevention (network input config SNVT_count nciInvFwdRevLock)

You can limit the rotation direction of the inverter. (Use this function to prevent a motor from rotating in the opposite direction in a system where the rotation direction is always the same, such as an air conditioning fan.)

Data name	Initial value	Range		Operation	Setting value storage location
		state	value		
nciInvFwdRevLock	Initial value of **Pr.78**	H0	Not used	Both forward rotation and reverse rotation enabled	**Pr.78**
		H1		Reverse rotation disabled	
		H2		Forward rotation disabled	

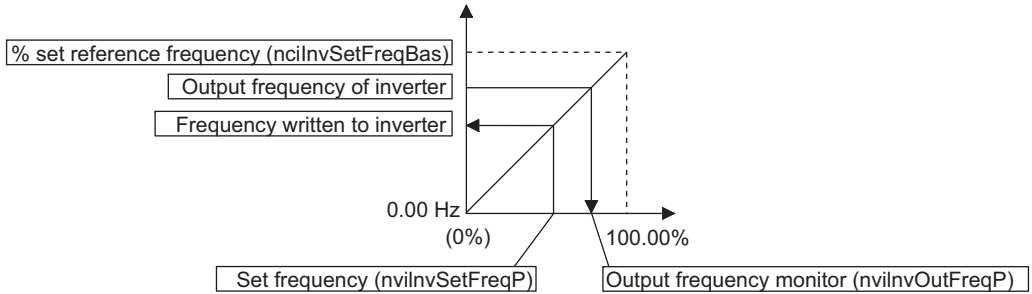
- Data acceptance timing..... At network variable receive (nv_update_occurs event)

NOTE

- Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.78**.

6.8.3 % set reference frequency (network input config SNVT_freq_hz nciInvSetFreqBas)

You can set the reference frequency of "set frequency (nviInvSetFreqP)" (refer to page 50) and "output frequency monitor (nvoInvOutFreqP)" (refer to page 52).
The % set reference frequency cannot be set at less than the minimum frequency resolution of the inverter.



Data name		Initial value	Range	Increments
nciInvSetFreqBas		60 Hz	1.0 Hz to 590.0 Hz	0.1 Hz/bit
Parameter	**Name**		1.00 Hz to 590.00 Hz	0.01 Hz
390	% setting reference frequency			

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

6.8.4 Maximum frequency (0.1 Hz increments) (network input config SNVT_freq_hz nciInvMaxFreq)

You can set the maximum frequency to be output by the motor to the inverter in 0.1 Hz increments.

Data name	Initial value	Range	Increments	Setting value storage location
nciInvMaxFreq	Initial value of **Pr.1**	0.0 Hz to 590.0 Hz	0.1 Hz/bit	**Pr.1**/**Pr.18**

- Data acceptance timing..... At network variable receive (nv_update_occurs event))

NOTE

- Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.1**, **Pr. 18**.

6.8.5 Minimum frequency (0.1 Hz increments) (network input config SNVT_freq_hz nciInvMinFreq)

You can set the minimum frequency to be output by the motor to the inverter in 0.1 Hz increments.

Data name	Initial value	Range	Increments	Setting value storage location
nciInvMinFreq	Initial value of **Pr.2**	0.0 Hz to 120.0 Hz	0.1 Hz/bit	**Pr.2**

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

NOTE

- Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.2**.

6.8.6 Heartbeat send time interval (network input config SNVT_time_sec nciSndHrtBt)

The time interval to transmit network variables to the network can be set.

Data name		Initial value	Range	Increments
nciSndHrtBt		0 s	0.0 s to 999.8 s	0.1 s/bit
Parameter	**Name**			
388	Send time interval at heart beat			

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

6.8.7 Minimum heartbeat send time (network input config SNVT_time_sec nciMinOutTm)

The minimum time interval to transmit network variables to the network can be set.

Data name		Initial value	Range	Increments
nciMinOutTm		0.5 s	0.0 s to 999.8 s	0.1 s/bit
Parameter	**Name**			
389	Minimum sending time at heart beat			

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

◆ Heartbeat send time (Pr.388, Pr.389)

Pr.388 setting	Pr.389 setting	Operation
0	0	Sends data when data send event occurs. Network variables outputting data frequently (frequent changes) causes network congestion. In such cases, adjust by setting **Pr.392 Event driven detection width**, **Pr.388** and **Pr.389**.
Other than 0	0	Checks presence or absence of data send event and sends data when an event occurs. Sends data after the heartbeat send time interval (**Pr.388** setting) has elapsed if there is no event.
0	Other than 0	Checks for presence or absence of data send event at interval of minimum heartbeat send time (**Pr.389** setting). Sends data if an event is present.
Pr.388>**Pr.389** (Other than 0)		Checks for presence or absence of data send event at an interval of minimum heartbeat send time (**Pr.389** setting). Sends data if an event presents. Sends data after the heartbeat send time interval (**Pr.388** setting) has elapsed if there is no event.
Pr.388≤**Pr.389** (Other than 0)		Sends data at an interval of minimum heartbeat send time (**Pr.389** setting) independently of presence and absence of data send event.

NOTE

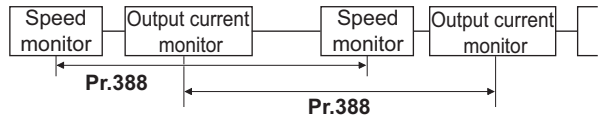
- At power-on and inverter reset, data is not sent before the **Pr.387 Initial communication delay time** (nciPwUpOutTm). (Refer to **page 80**.)

The network variables subject to the heartbeat send time

Function (increment)	Network variables		In/Out	Refer to page
	Variable	Name		
Speed monitor (0.005%/bit)	SNVT_lev_percent	nvoDrvSpeed	Out	46
Inverter output signal	SNVT_state	nvoInvOutputSig	Out	48
Output frequency monitor (0.1 Hz/bit)	SNVT_freq_hz	nvoInvOutFreq	Out	51
Output frequency monitor (0.005%/bit)	SNVT_lev_percent	nvoInvOutFreqP	Out	52
Output current monitor (0.1 A/bit)	SNVT_amp	nvoDrvCurnt	Out	53
Output voltage monitor (0.1 V/bit)	SNVT_volt	nvoDrvVolt	Out	53
Actual operation time monitor (1 h/bit)	SNVT_time_hour	nvoDrvRunHours	Out	53
Cumulative power monitor (1 kWh/bit)	SNVT_elec_kwh	nvoDrvRunPower	Out	54
Emergency stop status	SNVT_hvac_emerg	nvoEmergStatus	Out	62
Fault status	SNVT_switch	nvoDrvAlarm	Out	63
Monitor data	SNVT_count	nvoInvMonData	Out	69
Output frequency monitor (0.01 Hz/bit)	SNVT_count	nvoInvOutFreq2	Out	70
Cumulative power monitor 2 (0.1 kWh/bit)	SNVT_elec_kwh_l	nvoDrvRunPower_l	Out	55

NOTE

- The **Pr.388 (Pr.389)** setting determines the time interval between network variable transmissions. The number of monitors selected by a network administration tool, such as LonMaker, does not affect the time interval.
  For example, when the speed monitor and output current monitor are bound, the send time interval of the speed monitor is **Pr.388 (Pr.389)** and the send time interval of the output current monitor is also **Pr.388 (Pr.389)**.
  In addition, the actual send time interval is 1.1 s due to constraints of each data send time even when the **Pr.388 Send time interval at heart beat** is set to 1.0 s or less. (It takes 1.2 s when monitor data is set.)
  For a device that receives heartbeat messages, set a 0.5 ms or more longer time than the time set in **Pr.388**.



6.8.8 Acceleration time (network input config SNVT_time_sec nciRampUpTm)

The acceleration time taken for the motor to reach the set frequency (1 to 590 Hz) of **Pr.20 Acceleration/deceleration reference frequency** from 0 Hz can be set.

Data name	Initial value	**Pr.21** setting*1	Range	Increments	Setting value storage location
nciRampUpTm	Initial value of **Pr.7**	0 (initial value)	0.0 s to 3600.0 s	0.1 s/bit	**Pr.7**
		1	0.00 s to 655.35 s	0.01 s/bit	

*1 The minimum setting increment and the setting range change according to the **Pr.21 Acceleration/deceleration time increments** setting.

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

NOTE

- Refer to the Instruction Manual (Detailed) of the inverter for the details of **Pr.7** and **Pr.20**.

6.8.9 Deceleration time (network input config SNVT_time_sec nciRampDownTm)

The deceleration time taken for the motor to reach 0 Hz from the set frequency (1 to 590 Hz) of **Pr.20 Acceleration/deceleration reference frequency** can be set.

Data name	Initial value	Pr.21 setting*1	Range	Increments	Setting value storage location
nciRampDownTm	Initial value of **Pr.8**	0 (initial value)	0.0 s to 3600.0 s	0.1 s/bit	**Pr.8**
		1	0.00 s to 655.35 s	0.01 s/bit	

*1 The minimum setting increment and the setting range change according to the **Pr.21 Acceleration/deceleration time increments** setting.

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

- Refer to the Instruction Manual (Detailed) of the inverter for the details of **Pr.8** and **Pr.20**.

6.8.10 PID action selection (network input config SNVT_count nciInvPIDSwitch)

Whether or not the PID control will be executed can be set for the inverter

Data name	Initial value	Range	Increments	Setting value storage location
nciInvPIDSwitch	Initial value of **Pr.128**	0, 10, 11, 20, 21, 40 to 43, 50, 51, 60, 61, 70, 71, 80, 81, 90, 91, 100, 101, 1000, 1001, 1010, 1011, 2000, 2001, 2010, 2011	—	**Pr.128**

nciInvPIDSwitch setting		Set point input	Deviation and measured value input	Operation
state	value			
0	Don't care (not used)	—	—	PID invalid
10		Set point signal input (terminal 2)	Deviation value signal input (terminal 1)	PID reverse action
11				PID forward action
20			Measured value signal input (terminal 4)	PID reverse action
21				PID forward action
40 to 43		For details on dancer control, refer to the Instruction Manual (Detailed) of the inverter.		Dancer control
50*1		Set point communication input (network)	Deviation value communication input (network)	PID reverse action
51*1				PID forward action
60*1			Measured value communication input (network)	PID reverse action
61*1				PID forward action
70		—	Deviation value signal input (PLC function)	PID reverse action (with frequency reflected)
71		—		PID forward action (with frequency reflected)

nciInvPIDSwitch setting		Set point input	Deviation and measured value input	Operation
state	value			
80		Set point PLC input (PLC function)	Measured value signal input (PLC function)	PID reverse action (with frequency reflected)
81				PID forward action (with frequency reflected)
90		—	Deviation value signal input (PLC function)	PID reverse action (without frequency reflected)
91		—		PID forward action (without frequency reflected)
100	Don't care (not used)	Set point PLC input (PLC function)	Measured value signal input (PLC function)	PID reverse action (without frequency reflected)
101				PID forward action (without frequency reflected)
1000		Set point PLC input (According to the input selection*2)	Measured value signal input (According to the input selection*2)	PID reverse action
1001				PID forward action
1010		—	Deviation value signal input (According to the input selection*2)	PID reverse action
1011		—		PID forward action
2000		Set point PLC input (According to the input selection*2)	Measured value signal input (According to the input selection*2)	PID reverse action (without frequency reflected)
2001				PID forward action (without frequency reflected)
2010		—	Deviation value signal input (According to the input selection*2)	PID reverse action (without frequency reflected)
2011		—		PID forward action (without frequency reflected)

*1 Precautions for 50, 51, 60, 61 settings
·PID control is made valid independently of ON/OFF of the X14 terminal.
·Input the set point and setting value (deviation input) in % increments. At this time, the set frequency of **C2 (Pr.902) Terminal 2 frequency setting bias frequency** is equivalent to 0 % and the set frequency of **Pr.125 (Pr.903) Terminal 2 frequency setting gain frequency** is equivalent to 100%.
·The settings of **Pr.338 Communication operation command source** and **Pr.339 Communication speed command source** are made valid. (Refer to the Instruction Manual (Detailed) of the inverter for details.)
·When **Pr.79** = 6 (switchover mode), both PID function and switchover mode are made invalid.

*2 The input method can be selected using **Pr.609 PID set point/deviation input selection** or **Pr.610 PID measured value input selection**. (For the details, refer to the Instruction Manual (Detailed) of the inverter.)

- Data acceptance timing....At network variable receive when the inverter is at a stop (nv_update_occurs event)

NOTE

- Values input with network variables are used for the first PID function.
- For the setting values and usage of PID control function, refer to the Instruction Manual (Detailed) of the inverter.

6.8.11 PID proportional band (network input config SNVT_count nciInvPIDPro)

You can set the proportional band of the PID control of the inverter.
To disable integral control, set "0.0%" or "6553.5"

Data name	Initial value	Range	Increments	Setting value storage location
nciInvPIDPro	Initial value of **Pr.129**	0.0% to 1000.0%, 6553.5	0.1%/bit	**Pr.129**

- Data acceptance timing....At network variable receive when the inverter is at a stop (nv_update_occurs event)

Set the value 10 times greater than the desired value in nciInvPIDPro.
Example:
If you want to set 50.0%, set "500", the value 10 times greater than 50.0.

NOTE

- Values input with network variables are used for the first PID function.
- Refer to the Instruction Manual (Detailed) of the inverter for use of PID control function.

6.8.12 PID integral time (network input config SNVT_time_sec nciInvPIDIntTm)

You can set the integral time of the PID control of the inverter.
To disable integral control, set "0.0 s" or "6553.5".

Data name	Initial value	Range	Increments	Setting value storage location
nciInvPIDIntTm	Initial value of **Pr.130**	0.0 s to 3600.0 s, 6553.5	0.1 s/bit	**Pr.130**

- Data acceptance timing....At network variable receive when the inverter is at a stop (nv_update_occurs event)

NOTE

- Values input with network variables are used for the first PID function.
- Refer to the Instruction Manual (Detailed) of the inverter for use of PID control function.

6.8.13 PID differential time (network input config SNVT_time_sec nciInvPIDDiffTm)

You can set the differential time of the PID control of the inverter.
To disable differential control, set "0.0 s" or "6553.5".

Data name	Initial value	Range	Increments	Setting value storage location
nciInvPIDDiffTm	Initial value of **Pr.134**	0.0 s to 10.0 s, 6553.5	0.1 s/bit	**Pr.134**

- Data acceptance timing....At network variable receive when the inverter is at a stop (nv_update_occurs event)

NOTE

- Values input with network variables are used for the first PID function.
- Refer to the Instruction Manual (Detailed) of the inverter for use of PID control.

6.8.14 PID manipulated variable bias (0.1 Hz increments) (network input config SNVT_freq_hz nciInvPIDOpeBias)

You can set the manipulated variable of the inverter in 0.1 Hz increments when the deviation (difference between set point and measured value) under PID control is 0%.

Data name	Initial value	Range	Increments	Setting value storage location
nciInvPIDOpeBias	Initial value of **C2 (Pr.902)**	0.0 Hz to 590.0 Hz	0.1 Hz/bit	**C2 (Pr.902)**

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

NOTE

- Refer to the Instruction Manual (Detailed) of the inverter for use of PID control and details of **C2 (Pr.902)**.

6.8.15 PID manipulated variable gain (0.1 Hz increments) (network input config SNVT_freq_hz nciInvPIDOpeGain)

You can set the manipulated variable of the inverter in 0.1 Hz increments when the deviation (difference between set point and process variable) under PID control is 100%.

Data name	Initial value	Range	Increments	Setting value storage location
nciInvPIDOpeGain	Initial value of **Pr.125 (Pr.903)**	0.0 Hz to 590.0 Hz	0.1 Hz/bit	**Pr.125 (Pr.903)**

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

NOTE

- Refer to the Instruction Manual (Detailed) of the inverter for use of PID control and details of **Pr.125 (Pr.903)**.

6.8.16 Heartbeat receive time interval (network input config SNVT_time_sec nciRcvHrtBt)

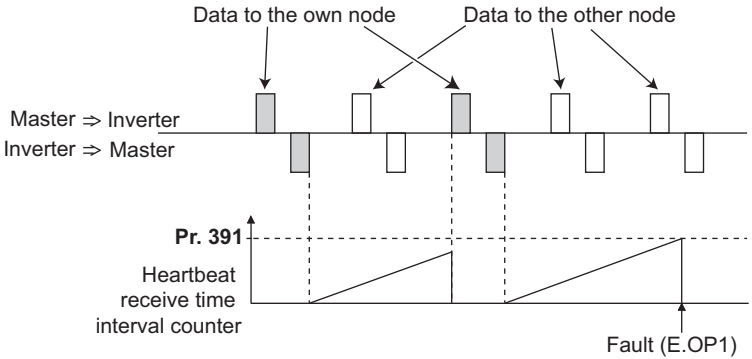
You can set the time interval at which input network variables data is received from the network.
When the receive interval time from the network has risen above the setting, it is considered as a communication line error, then "communication option fault (E.OP1)" is displayed and the inverter stops.

Data name		Initial value	Range	Increments
nciRcvHrtBt		0 s	0.0 s to 999.8 s	0.1 s/bit
Parameter	**Name**			
391	Receive time interval at heart beat			

- Data acceptance timing....At network variable receive (nv_update_occurs event)

NOTE

- For the data send to other nodes, the counters of heartbeat receive time interval are not cleared.



Network variables supported
The following network variables are subject to the receive interval time.

Function	Network variables		In/Out	Refer to page
	Variable	Name		
Start and stop/simple speed setting	SNVT_switch	nviDrvSpeedStpt	In	44
Speed adjustment	SNVT_lev_percent	nviDrvSpeedScale	In	45
Inverter input signal	SNVT_state	nviInvInputSig	In	47
Set frequency (0.1 Hz/bit)	SNVT_freq_hz	nviInvSetFreq	In	50
Set frequency (0.005%/bit)	SNVT_lev_percent	nviInvSetFreqP	In	50
PID set point (0.005%/bit)	SNVT_lev_percent	nviInvPIDTarget	In	65
PID measured value (0.005%/bit)	SNVT_lev_percent	nviInvPIDValue	In	66
PID deviation (0.005%/bit)	SNVT_lev_percent	nviInvPIDDev	In	67
Set frequency (0.01 Hz/bit)	SNVT_count	nviInvSetFreq2	In	69

NOTE

- The communication line error detection is invalid when **Pr. 502 Stop mode selection at communication error** = "3 or 4".

6.8.17 Maximum speed (0.005% increments) (network input config SNVT_lev_percent nciMaxSpeed)

You can set the maximum speed to be output by the inverter to the motor.
Set the speed in 0.005% increments using the setting value of "reference speed setting (nciNmlSpeed) (page 99)" or "reference frequency setting (nciNmlFreq) (page 100)" as reference.

Data name	Initial value	Range	Increments	Setting value storage location
nciMaxSpeed	Initial value of **Pr.1**	0.000% to 163.830%	0.005%/bit	**Pr.1**/**Pr.18**

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

NOTE

- Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.1** or **Pr.18**.
- The setting value exceeding 163.830% is made invalid.
- Control cannot be exercised at less than the minimum frequency resolution (0.01 Hz) of the inverter.

6.8.18 Minimum speed (0.005% increments) (network input config SNVT_lev_percent nciMinSpeed)

You can set the minimum speed to be output by the inverter to the motor.
Set the speed in 0.005% increments using the setting value of "reference speed setting (nciNmlSpeed) (**page 99**)" or "reference frequency setting (nciNmlFreq) (**page 100**)" as reference.

Data name	Initial value	Range	Increments	Setting value storage location
nciMinSpeed	Initial value of **Pr.2**	0.000% to 163.830%	0.005%/bit	**Pr.2**

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

NOTE

- Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.2**.
- The setting value exceeding 163.830% is made invalid.
- Control cannot be exercised at less than the minimum frequency resolution (0.01 Hz) of the inverter.

6.8.19 Reference speed setting (network input config SNVT_rpm nciNmlSpeed)

Set the speed used as the reference of "speed adjustment (nviDrvSpeedScale) (page 45)", "speed monitor (nvoDrvSpeed) (page 46)", "maximum speed (nciMaxSpeed) (page 97)" and "minimum speed (nciMinSpeed) (page 98)".

Data name	Initial value	Range	Increments	Setting value storage location
nciNmlSpeed	1800 r/min	30 r/min to 17700 r/min	1 r/min/bit	**Pr.390**

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

The setting of reference speed setting (nciNmlSpeed) is changed from speed increments to frequency increments, then written to **Pr.390**.

$$\text{Frequency} = \frac{\text{Number of motor poles} \times \text{speed}}{120}$$ (The calculation result is rounded down.)

- Set the number of motor poles in **Pr.144**. (2, 4, 6, 8, 10, 12 poles)
- When **Pr.144** = "0", it is considered as 4 poles.
- Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.144**.

NOTE

- Refer to page 82 for details of **Pr.390**.

6.8.20 Reference frequency setting (network input config SNVT_freq_hz nciNmlFreq)

Set the frequency used as the reference of "speed adjustment (nviDrvSpeedScale)" (page 45), "speed monitor (nvoDrvSpeed)" (page 46), "maximum speed (nciMaxSpeed)" (page 97) and "minimum speed (nciMinSpeed)" (page 98).

Data name	Initial value	Range	Increments	Setting value storage location
nciNmlFreq	60 Hz	1.0 Hz to 590.0 Hz	0.1 Hz/bit	**Pr.390**

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

NOTE

- Refer to page 82 for details of **Pr.390**.
- To make the change of "reference frequency setting (nciNmlFreq)" be reflected to the operation speed, a value is need to be written to speed adjustment (nviDrvSpeedScale)

6.8.21 Speed adjustment default value (network input config SNVT_lev_percent nciDrvSpeedScale)

You can set the default value of "speed adjustment (nviDrvSpeedScale)" (refer to page 45).

Data name	Initial value	Range	Increments	Setting value storage location
nciDrvSpeedScale	100.00%	-163.840% to 163.830%	0.005%/bit	—

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

NOTE

- Write and read the setting value from the network. You cannot read and write from the inverter.
- The value stored in the inverter is rounded up. For example, 1.005% is rounded up to 1.010%.

6.8.22 Event driven detection width (network input config SNVT_lev_percent nciInvEvtDuty)

The event driven detection width (varying width) can be set for the monitor-related output network variables.
The 100% reference value, which is used as the basis of the detection width, varies with the network variables.
This setting can reduce traffic jams caused by the occurrence of many send events due to consecutive value changes.

Data name		Initial value	Range	Increments
nciInvEvtDuty		0%	0.000% to 163.830%	0.005%/bit
Parameter	**Name**		0.00% to 163.83%	0.01%
392	Event driven detection width			

- Data acceptance timing..... At network variable receive (nv_update_occurs event)

NOTE

- Control cannot be executed at less than the minimum frequency resolution (0.01 Hz) of the inverter.
- The value stored in the inverter is rounded up. For example, 1.005% is rounded up to 1.010%.
- When the inverter operation status has changed, e.g. from a stop to startup or from running to a stop, the monitor value is output even when the value is within the event driven detection width.

(Example) When output frequency monitor = "100%", Pr.392 Event driven detection width = "100%", and Pr.390 % setting reference frequency = "60 Hz" (set frequency)
As the monitor is output once when starting from the stop status, the starting monitor output is 0.5 Hz when the starting frequency is set to 0.5 Hz. Therefore, the second monitor output is equal to or more than "0.5 Hz + 60 Hz (**Pr.390** setting × **Pr.392** setting)" = "60.5 Hz". (This is not the monitor output when the frequency reaches 60 Hz. Use the SU signal to detect output frequency, etc.)

◆ Network variables that allow setting of event driven detection width

Name of network variables	In/ Out	100% value	Formula of detection width (0.005% increments)	Refer to page
Speed monitor (0.005%/bit) SNVT_lev_percent nvoDrvSpeed	Out	—	As network variables supported and SNVT of detection width are the same type, set the value directly.	46
Output frequency monitor (0.1 Hz/bit) SNVT_freq_hz nvoInvOutFreq	Out	% set reference frequency	$\frac{\text{Varying width of frequency monitor value}}{\text{\% setting reference frequency}} \times 100\%$	51
Output frequency monitor (0.005%/bit) SNVT_lev_percent nvoInvOutFreqP	Out	—	As network variables supported and SNVT of detection width are the same type, set the value directly.	52
Output current monitor (0.1 A/bit) SNVT_amp nvoDrvCurnt	Out	Rated inverter current	$\frac{\text{Varying width of voltage monitor value}}{\text{Rated inverter current}} \times 100\%$	53
Output voltage monitor (0.1 V/bit) SNVT_volt nvoDrvVolt	Out	Rated inverter voltage (200 V class: 200 VAC, 400 V class: 400 VAC)	$\frac{\text{Varying width of monitor value}}{\text{Rated inverter current}} \times 100\%$	53
Monitor data SNVT_count nvoInvMonData	Out	The reference value of 100% differs according to the monitor description.*1	$\frac{\text{Varying width of monitor data value}}{\text{Reference value of each monitor}} \times 100\%$	69

Name of network variables	In/ Out	100% value	Formula of detection width (0.005% increments)	Refer to page
Output frequency monitor (0.01 Hz/bit) SNVT_count nvoInvOutFreq2	Out	% set reference frequency	$\frac{\text{Varying width of frequency monitor value}}{\text{\% setting reference frequency}} \times 100\%$	70
Cumulative power monitor 2 (0.1 kWh/bit) SNVT_elec_kwh_l nvoDrvRunPower_l	Out	Rated inverter power × 2	$\frac{\text{Varying width of cumulative power monitor value}}{\text{Rated inverter power} \times 2} \times 100\%$	55

Method for event driven detection... | Previous value - present value | . event driven detection width

*1 Refer to the monitor description list for full scale values of terminal FM/CA, or AM in the Instruction Manual (Detailed) of the inverter.

◆ Operation mode does not switch to Network operation mode.

- Check that the communication option (FR-A8NL) and LONWORKS dedicated cables are fitted properly. (Check for contact fault, break in the cable, etc.)
- Check that the node addresses are set to the correct positions.
- Check that operation mode switchover conditions are satisfied. (Refer to page 21.)
- Check that the operation mode switching network variable is running.
- Check that the operation mode switching network variable has been written correctly.

◆ The inverter does not start in Network operation mode.

- Check that the inverter starting network variable has been written correctly.
- Check that the inverter starting network variable is running.

◆ "E.OP1" or "E.1" is displayed.

- Refer to page 28.

Appendix 1 Setup example

The following is an example of procedure to perform LONWORKS communication with the FR-A8NL.

(1) Confirmation of installation and connection

1) Check that the FR-A8NL is mounted on the option connector of the inverter. (Refer to page 13.)

2) Check that the twisted pair cable is connected to NET_A and NET_B of the terminal block supplied securely. (Refer to page 18.)

3) Check that the terminating resistor is connected with a LONWOKRS cable. (Please fabricate a terminating resistor.) (Refer to page 17.)

(2) Parameter setting of the inverter
(when the network operation mode is always set)

1) Set "0" (simple mode + extended parameters display) in **Pr.160 User group read selection**.

2) Set a value other than "0" in **Pr.340 Communication startup mode selection**. (Refer to page 21.)

3) Set "0 or 2" in **Pr.79 Operation mode selection**. (Refer to page 21.)

NOTE

- By making parameter setting of 2) and 3) above, the inverter operates in network operation mode when the inverter power is switched on. (It is not necessary to change the operation mode with network variables.)

(3) Switch on the inverter power from off

Power on the inverter (inverter reset) again to change the mode to network operation mode.

(4) Perform LONWORKS communication setting

Perform LONWORKS communication setting with software necessary for LONWORKS communication such as "LonMaker ® Integration Tool Turbo Edition SR4". (For a setting method, refer to the manual of software used.) Communication setting is complete if "SERVICE" LED of the FR-A8NL is not flickering.

(5) Check the status of the network variables

1) Power on the inverter (inverter reset) again and reflect the current network variables of the inverter to LonMaker Browser.

2) Set LonMaker Browser to "Monitor All On" to turn on monitoring of the inverter network variables. (When "Monitor All off" is set, only the initial value of network variables the inverter sent to LonMaker Browser can be referred. To always check network variables, set "Monitor All On".)

(6) Setup is completed

Appendix 2 Example of inverter parameter clear

The following shows procedure to make LONWORKS communication again when inverter parameter clear is performed from LONWORKS communication.

(1) Perform parameter clear
Perform parameter clear via network or with the operation panel or parameter unit.
When performing with the operation panel or parameter unit, the procedure is the same as that of the inverter.

When performing via the network (LONWORKS), use the command request (SNVT_str_asc nviInvCmdReq) (refer to **page 71**) of network variables.

Data set by command request: Request flag = H01 Request code = H00FC Request data = H5A5A, H55AA

- Parameter for communication is also cleared when H9696 and H9966 are set as request data. (Refer to **page 74**.)
- When **Pr.79** = "2", resetting is necessary as the set value is cleared.

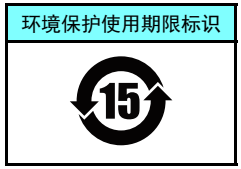
(2) Check the status of the network variables
Set LonMaker Browser to "Monitor All On" to turn on monitoring of the inverter network variables.
(When "Monitor All off" is set, only the initial value of network variables the inverter sent to LonMaker Browser can be referred. To always check network variables, set "Monitor All On".)

(3) LONWORKS communication resetting is complete.

Appendix 3 Restricted Use of Hazardous Substances in Electronic and Electrical Products

The mark of restricted use of hazardous substances in electronic and electrical products is applied to the product as follows based on the “Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products” of the People's Republic of China.

电器电子产品有害物质限制使用标识要求



本产品中所含有的有害物质的名称、含量、含有部件如下表所示。

• 产品中所含有害物质的名称及含量

部件名称*2	有害物质*1					
	铅(Pb)	汞(Hg)	镉(Cd)	六价铬(Cr(VI))	多溴联苯(PBB)	多溴二苯醚(PBDE)
电路板组件 （包括印刷电路板及其构成的零部件，如电阻、电容、集成电路、连接器等）、电子部件	×	○	×	○	○	○
金属壳体、金属部件	×	○	○	○	○	○
树脂壳体、树脂部件	○	○	○	○	○	○
螺丝、电线	○	○	○	○	○	○

上表依据SJ/T11364的规定编制。

○：表示该有害物质在该部件所有均质材料中的含量均在GB/T26572规定的限量要求以下。

×：表示该有害物质在该部件的至少一种均质材料中的含量超出GB/T26572规定的限量要求。

*1 即使表中记载为 ×，根据产品型号，也可能会有有害物质的含量为限制值以下的情况。

*2 根据产品型号，一部分部件可能不包含在产品中。

REVISIONS

*The manual number is given on the bottom left of the back cover.

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