FR-E800

INVERTER

INSTRUCTION MANUAL (COMMUNICATION)

COMPACT, HIGH FUNCTIONALITY INVERTERS

28.10.2020
Version D

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CHAPTER 1 Introduction

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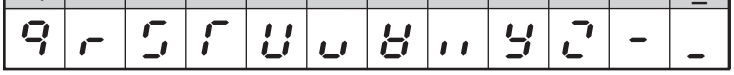
1 Introduction

The contents described in this chapter must be read before using this product.
Always read the instructions before use.

◆ Abbreviations

Item	Description
PU	Operation panel, parameter unit (FR-PU07), LCD operation panel (FR-LU08), and enclosure surface operation panel (FR-PA07)
Parameter unit	Parameter unit (FR-PU07), LCD operation panel (FR-LU08), and enclosure surface operation panel (FR-PA07)
Inverter	Mitsubishi Electric inverter FR-E800 series
E800	Standard model (RS-485 + SIL2/PLd functional safety)
E800-E	Ethernet model (Ethernet + SIL2/PLd functional safety)
E800-SCE	Safety communication model (Ethernet + SIL3/PLe functional safety)
FM type inverter	Standard model with terminal FM (pulse output)
AM type inverter	Standard model with terminal AM (voltage output)
Vector control compatible option	FR-A8AP E kit
Pr.	Parameter number (Number assigned to function)
PU operation	Operation using the PU (operation panel / parameter unit)
External operation	Operation using the control circuit signals
Combined operation	Combined operation using the PU (operation panel / parameter unit) and External operation
Mitsubishi Electric standard efficiency motor	SF-JR
Mitsubishi Electric constant-torque motor	SF-HRCA
Mitsubishi Electric high-performance energy-saving motor	SF-PR
Mitsubishi Electric high-performance energy-saving motor with encoder	SF-PR-SC
Mitsubishi Electric Vector control dedicated motor	SF-V5RU
Mitsubishi Electric geared motor	GM-[]
Mitsubishi Electric inverter-driven geared motor for encoder feedback control	GM-DZ, GM-DP

◆ Digital characters and their corresponding printed equivalents

0	1	2	3	4	5	6	7	8	9	A	B	C
D	E	F	G	H	I	J	K	L	M	N	O	P
Q	R	S	T	U	V	W	X	Y	Z	-	_	
												

◆ Trademarks

- Ethernet is a registered trademark of Fuji Xerox Corporation in Japan.
- MODBUS is a registered trademark of SCHNEIDER ELECTRIC USA, INC.
- BACnet is a registered trademark of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).
- DeviceNet and EtherNet/IP are registered trademarks of ODVA (Open DeviceNet Vendor Association, INC).
- PROFIBUS and PROFINET are either trademarks or registered trademarks of PROFIBUS & PROFINET International.
- CC-Link IE TSN and CC-Link IE Field Network Basic are registered trademarks of CC-Link Partner Association.

- Other company and product names herein are the trademarks and registered trademarks of their respective owners.

◆ Notes on descriptions in this Instruction Manual

- Connection diagrams in this Instruction Manual appear with the control logic of the input terminals as sink logic, unless otherwise specified. (Refer to the FR-E800 Instruction Manual (Connection) for the switching of the control logic of the inverter.)

◆ Precautions

- Some of the communication protocols and the plug-in options cannot be used together as shown in the following table. For the application and protocol settings, refer to page 151.

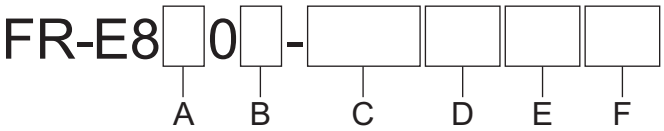
	CC-Link IE TSN	CC-Link IE Field Network Basic	BACnet/IP	EtherNet/IP	PROFINET	CC-Link (when the FR-A8NC E kit is installed)	PROFIBUS-DP (when the FR-A8NP E kit is installed)	DeviceNet (when the FR-A8ND E kit is installed)
CC-Link IE TSN	—	×		×	×	×		
CC-Link IE Field Network Basic	×	—				×		
BACnet/IP			—		×			
EtherNet/IP	×			—	×			
PROFINET	×		×	×	—			
CC-Link (when the FR-A8NC E kit is installed)	×	×				—	×	×
PROFIBUS-DP (when the FR-A8NP E kit is installed)						×	—	×
DeviceNet (when the FR-A8ND E kit is installed)						×	×	—

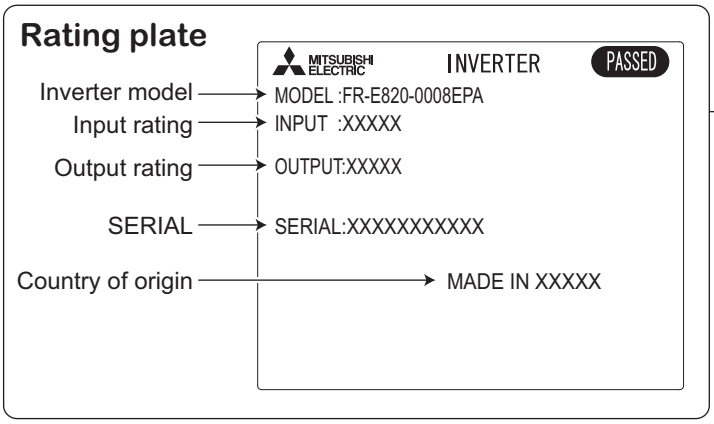
NOTE

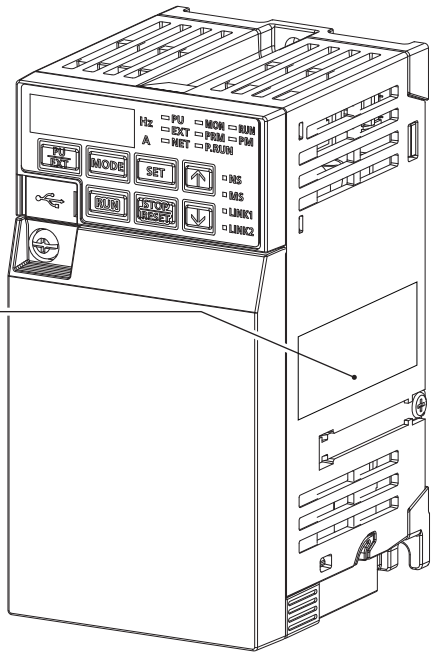
- FR Configurator2 can be used for any communication protocol or plug-in option.

1.1 Product checking

◆ Inverter model







- A: The voltage class is shown.

Symbol	Voltage class
2	200 V class
4	400 V class
6	575 V class

- B: The number of phases of the power source is shown.

Symbol	Description
None	Three-phase input
S	Single-phase input

- C: The inverter rated capacity or the inverter rated current is shown.

Symbol	Description
0.1K to 7.5K	Inverter ND rated capacity (kW)
0008 to 0330	Inverter ND rated current (A)

- D: The communication type and the functional safety specification are shown.

Symbol	Communication / functional safety
None	Standard model (RS-485 + SIL2/PLd)
E	Ethernet model (Ethernet + SIL2/PLd)
SCE	Safety communication model (Ethernet + SIL3/PLe)

- E: The output specification for monitoring and the rated frequency are shown for the standard model, and the communication protocol group is shown for the Ethernet model and the safety communication model.

Symbol	Monitoring/protocol specification	Rated frequency	Control logic
-1	Pulse (terminal FM)	60 Hz	Sink logic
-4	Voltage (terminal AM)	50 Hz	Source logic
-5	Voltage (terminal AM)	60 Hz	Sink logic
PA	Protocol group A (CC-Link IE TSN, CC-Link IE Field Network Basic, MODBUS/TCP, EtherNet/IP, and BACnet/IP)	60 Hz	Sink logic
PB	Protocol group B (CC-Link IE TSN, CC-Link IE Field Network Basic, MODBUS/TCP, PROFINET)	50 Hz	Source logic

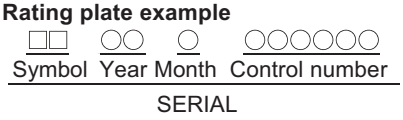
- F: Availability of circuit board coating / plated conductors is shown.

Symbol	Circuit board coating*1	Plated conductor
None	Without coating	Without plated conductors
-60	With coating	Without plated conductors

*1 Conforming to IEC 60721-3-3 3C2

◆ How to read the SERIAL number

Rating plate example



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

1.2 Related manuals

The manuals related to the FR-E800 inverter are as follows.

Name	Manual number
FR-E800 Inverter Safety Guideline	IB-0600857ENG
FR-E860 Inverter Safety Guideline	IB-0600862ENG
FR-E800-E Inverter Safety Guideline	IB-0600860ENG
FR-E860-E Inverter Safety Guideline	IB-0600863ENG
FR-E800-SCE Inverter Safety Guideline	IB-0600921ENG
FR-E860-SCE Inverter Safety Guideline	IB-0600924ENG
FR-E800 Instruction Manual (Connection)	IB-0600865ENG
FR-E860 Instruction Manual (Connection)	IB-0600906ENG
FR-E800 Instruction Manual (Function)	IB-0600868ENG
FR-E800 Instruction Manual (Maintenance)	IB-0600874ENG
FR-E800 Instruction Manual (Functional Safety)	BCN-A23488-000
FR-E800-SCE Instruction Manual (Functional safety)	BCN-A23488-004
FR Configurator2 Instruction Manual	IB-0600516ENG
PLC Function Programming Manual	IB-0600492ENG

CHAPTER 2 Ethernet Communication

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2 Ethernet Communication

2.1 Outline

◆Precautions for communication

- To maintain the security (confidentiality, integrity, and availability) of the inverter and the system against unauthorized access, DoS[*1] attacks, computer viruses, and other cyberattacks from external devices via network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions. We shall have no responsibility or liability for any problems involving inverter trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.
- Depending on the network environment, the inverter may not operate as intended due to delays or disconnection in communication. Carefully consider what type of environment the inverter will be used in and any safety issues related to its use.

*1 DoS: A denial-of-service (DoS) attack disrupts services by overloading systems or exploiting vulnerabilities, resulting in a denial-of-service (DoS) state.

◆Ethernet communication specifications

The communication specification varies depending on the specification of the master or the communication protocol.

Item	Description
Category	100BASE-TX/10BASE-T
Data transmission speed	100 Mbps (100BASE-TX) / 10 Mbps (10BASE-T)
Transmission method	Baseband
Maximum segment length	100 m between the hub and the inverter
Number of cascade connection stages	Up to 2 (100BASE-TX) / up to 4 (10BASE-T)
Topology	Line, star, or a combination of line and star
Interface	RJ-45
Number of interfaces available	2
IP version	IPv4

◆Operation status LEDs

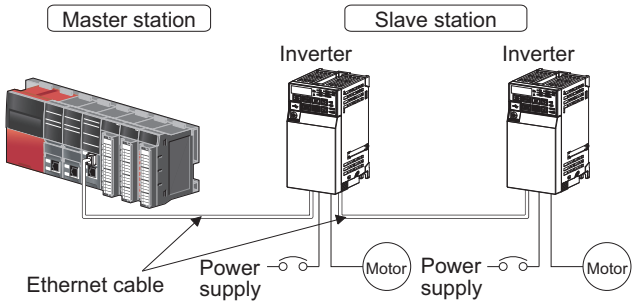
LED name	Description	LED status	Remarks
NS	Communication status	OFF	Duplicate IP address not detected
		Red	Duplicate IP address detected
MS	Inverter status	OFF	Power-OFF / during inverter reset
		Green	Operating properly
		Red	Fault detected
LINK1	Connector for communication (PORT1) status	OFF	Power-OFF/link-down
		Blinking green	Link-up (Data reception in progress)
		Solid green	Link-up
LINK2	Connector for communication (PORT2) status	OFF	Power-OFF/link-down
		Blinking green	Link-up (Data reception in progress)
		Solid green	Link-up
NET	SLMP command request message reception status	OFF	Power-OFF / inverter identification disabled / inverter identification paused
		Blinking green	Inverter identification in progress[*1]
		Solid green	Network operation mode

*1 While "1 (initial value)" is set in **Pr.1399 Inverter identification enable/disable selection**, this LED blinks when the MAC/IP address of the inverter match to the MAC/IP address specified by using engineering software such as FR Configurator2.

2.2 Wiring

2.2.1 System configuration example

1. Select the connection method. (refer to page 11).
2. Prepare the equipment required for wiring. (Refer to page 11.)
3. Turn OFF the power of the programmable controller and the inverter.
4. Connect the master station and the inverters with Ethernet cables. (Refer to page 13.)



2.2.2 Network configuration

◆ Network topology

The network can be wired into star topology or line topology. A network can consist of a combination of star and line topologies.

Item	Description
Star topology	Modules are configured into a star using a switching hub and Ethernet cables. Slave stations can be easily added in a star topology. Furthermore, data link continues among normally-operating stations in a star topology.
Line topology	Modules are configured into a line with Ethernet cables. A switching hub is not required.

◆ Station number and connection position

Modules can be connected in any order regardless of the station number.

◆ Replacing CC-Link IE TSN devices

For star topology, slave stations can be replaced without powering off the whole system.

NOTE

- Refer to the Master Module User's Manual for detailed network configurations.

2.2.3 Network components

◆ Connection cable

Use Ethernet cables compliant with the following standards.

Ethernet cable	Connector	Type
Category 5 or higher straight cable (double shielded / STP)	RJ-45 connector	The following conditioning cables: • IEEE 802.3 (100BASE-TX) • ANSI/TIA/EIA-568-B (Category 5)

- Recommended product (as of April 2019)

Model	Manufacturer
SC-E5EW series*1	Mitsubishi Electric System & Service Co., Ltd.

*1 SC-E5EW cable is for in-enclosure and indoor uses. SC-E5EW-L cable is for outdoor use.

NOTE

- Depending on the cable connector shape, the cable may not be connected to the inverter.

◆ Hubs

Use hubs that meet the following conditions. Operation is not guaranteed if the hubs do not meet these conditions.

- Compliance with the IEEE 802.3 (100BASE-TX)
- Support of the auto MDI/MDI-X function
- Support of the auto-negotiation function
- Switching hub (layer 2 switch)*1

*1 A repeater hub is not available.

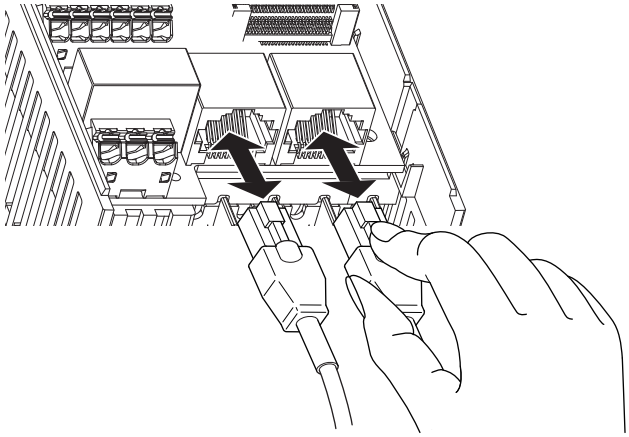
Industrial switching hub

Model	Manufacturer
NZ2EHG-T8N	Mitsubishi Electric Corporation
NZ2EHG-T8 (discontinued product)	Mitsubishi Electric Corporation
DT135TX	Mitsubishi Electric System & Service Co., Ltd.

2.3 Ethernet cable connection

This section explains Ethernet cable connection and the relevant precautions. For the details of the network configuration and the cables and hubs used for wiring, refer to page 11 onwards.

2.3.1 Wiring method



◆ Reinstallation

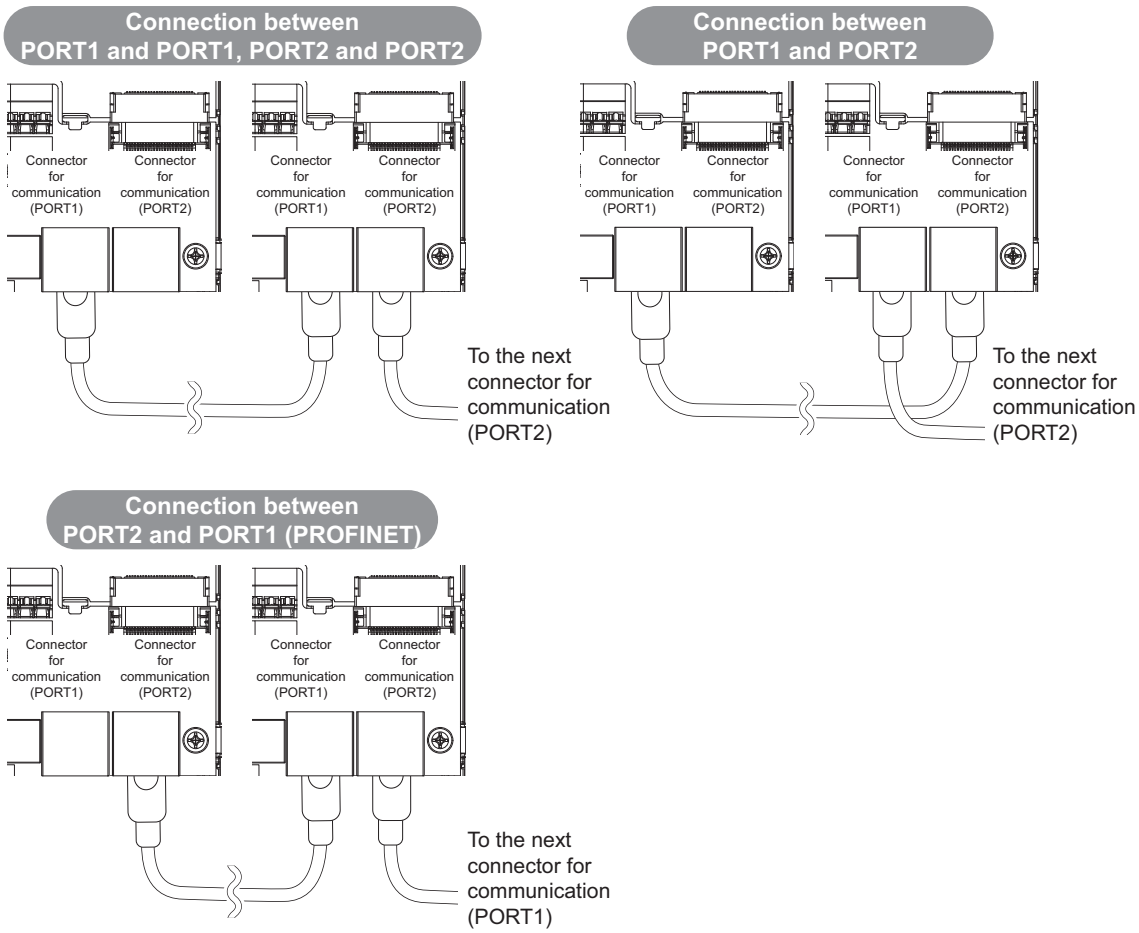
1. Turn OFF the power of the programmable controller and the inverter.
2. Remove the inverter front cover.
3. Check the orientation of the connectors. Insert the connector part of the Ethernet cable to the communication connector until it clicks.

◆ Disconnection

1. Turn OFF the power of the programmable controller and the inverter.
2. Remove the inverter front cover.
3. Hold down the latch on the Ethernet cable connector, and pull out the cable while holding the latch.

NOTE

- There is no need to distinguish between PORT1 and PORT2 on the inverter (except for PROFINET).
  - When only one connector is used in star topology, either PORT1 or PORT2 is applicable. (Use PORT1 for PROFINET.)
  - When using two connectors for line topology, an Ethernet cable can be connected to the connectors in any combination. For example, the cable can be connected across two of PORT1 or across PORT1 and PORT2. (For PROFINET, use PORT1 for connection with the master, and use PORT2 for connection with PORT1 of the adjacent inverter.)



2.3.2 Wiring precautions

This section explains Ethernet cable connection and the relevant precautions.

◆ Handling of the Ethernet cable

- Do not touch the conductors of the cable or the connector on the inverter. Keep the conductors free of dust or dirt. If oil from your hand, dirt or dust is attached to the core, it can increase transmission loss, arising a problem in data link.
- Check the following:
  Is any Ethernet cable disconnected?
  Is any of the Ethernet cables shorted?
  Are the connectors securely connected?
- Do not use Ethernet cables with broken latches. Doing so may cause the cable to unplug or malfunction.
- The maximum station-to-station distance is 100 m. However, the distance may be shorter depending on the operating environment of the cable. For details of the cable, contact your cable manufacturer.

◆ Connecting and disconnecting of the Ethernet cable

Hold the connector part when connecting and disconnecting the Ethernet cable. Pulling a cable connected to the inverter may damage the inverter or cable, or result in malfunction due to poor contact.

◆ Network configuration

Check the network configuration before wiring, and perform correct wiring. For example, using ring topology may cause system failure.

2.4 Initial setting for Ethernet communication

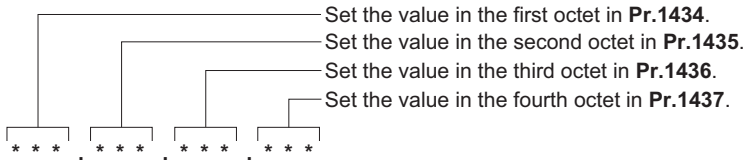
Use the following parameters to perform required settings for Ethernet communication between the inverter and other devices. To make communication between other devices and the inverter, perform the initial settings of the inverter parameters to match the communication specifications of the devices. Data communication cannot be made if the initial settings are not made or if there is any setting error.

Pr.	Name	Initial value	Setting range	Description
1434 **N600**[*1]	**IP address 1 (Ethernet)**	192	0 to 255	Enter the IP address of the inverter to be connected to Ethernet.
1435 **N601**[*1]	**IP address 2 (Ethernet)**	168		
1436 **N602**[*1]	**IP address 3 (Ethernet)**	50		
1437 **N603**[*1]	**IP address 4 (Ethernet)**	1		

*1 The setting is applied after an inverter reset or next power-ON.

◆IP address (Pr.1434 to Pr.1437)

Enter the IP address of the inverter to be connected to Ethernet in **Pr.1434 to Pr.1437**. (Enter the IP address assigned by the network administrator.)



2.5 CC-Link IE TSN

2.5.1 Outline

CC-Link IE TSN

Data can be transmitted to IT systems while performing real-time cyclic communication control.

◆ CC-Link IE TSN authentication classes

- Devices (nodes) and switches on the CC-Link IE TSN network are classified into different authentication classes according to their functionality and performance. There are two authentication classes: A and B. For details of the authentication class of each product, check the information on the web site of the CC-Link Partner Association, or refer to catalogs and manuals of each product. Different functions and system configurations are available depending on the authentication class of the devices to be used. For example, use authentication class B devices to construct a high-speed motion control system. For details of system construction such as mixing devices of both class A and class B, check the manuals of the applicable master device.

◆ Communication specifications

The communication specification varies depending on the specification of the master.

Item		Description
Transmission speed		100 Mbps (10 Mbps is not supported.)
Minimum synchronization cycle		5000.00 µs
Authentication class		Authentication class A
Communication method		Time sharing method
Synchronization function		Conforms to IEEE 1588v2
Maximum number of connected units		121 units (sum of master and slave stations)
Maximum number of branches		No upper limit on the same Ethernet network
Connection cable		Ethernet cable (IEEE 802.3 100BASE-TX compliant cable or ANSI/TIA/EIA-568-B (Category 5) compliant shielded 4-pair branched cable)
Topology		Line, star, or a combination of line and star*1
Node type		Slave station
Maximum cyclic size (of one node)	RX	32 bits
	RY	32 bits
	RWr	32 words
	RWw	32 words

*1 Ring topology will be supported later.

NOTE

- To use the CC-Link IE TSN, do not install the FR-A8NC to the inverter. (Installing the FR-A8NC E kit disables CC-Link IE TSN.)

◆ Operation status LEDs

LED name	Description	LED status	Remarks
NS	Communication status	OFF	Power-OFF
		Blinking green	Data transmission not performed
		Solid green	Data transmission in progress
		Blinking red	Communication interrupted
		Solid red	Duplicate IP address detected
MS	Inverter status	OFF	Power-OFF / during inverter reset
		Green	Operating properly
		Red	Fault detected
LINK1	Connector for communication (PORT1) status	OFF	Power-OFF/link-down
		Blinking green	Link-up (Data reception in progress)
		Solid green	Link-up
LINK2	Connector for communication (PORT2) status	OFF	Power-OFF/link-down
		Blinking green	Link-up (Data reception in progress)
		Solid green	Link-up

◆ Network configuration

Master station	Slave station	
	FR-E800 (authentication class A) only	Mixture of FR-E800 (authentication class A) and FR-A800-GN or other device (authentication class B)
MELSEC iQ-R series master/local module RJ71GN11-T2 or a master station that supports both 1 Gbps and 100 Mbps communication speeds	Line topology, star topology, or a combination of line and star Set 100 Mbps for the communication speed of the master station.	Star topology or a combination of line and star (Line topology only is not supported.) Connection sequence: Master station → Slave station (authentication class B) → General-purpose switching hub → FR-E800 (authentication class A) Line topology is available for connection starting from the FR-E800.
MELSEC iQ-F series master/local module FX5-CCLGN-MS or a master station that supports 1 Gbps communication speed only	Star topology or a combination of line and star (Line topology only is not supported.) Connection sequence: Master station → General-purpose switching hub → FR-E800 (authentication class A) Line topology is available for connection starting from the FR-E800.	

Master station	Slave station	
	FR-E800 (authentication class A) only	Mixture of FR-E800 (authentication class A) and FR-A800-GN, AC servo, or other device (authentication class B)
MELSEC iQ-R series Motion module RD78G[]/GH[]	Star topology or a combination of line and star (Line topology only is not supported.) Connection sequence: Master station → General-purpose switching hub → FR-E800 (authentication class A) Line topology is available for connection starting from the FR-E800.	Combination of line topology and star topology (Line topology only or star topology only is not supported.) Connection sequence: Master station → Slave station (authentication class B) → General-purpose switching hub → FR-E800 (authentication class A) Line topology is available for connection starting from the FR-E800.

NOTE

- The data size must not exceed 2k bytes for cyclic transmission of all slave stations in the authentication class A region of the connection.
  When all slave stations are FR-E800 inverters (authentication class A), up to 10 inverters can be connected. For details, refer to the Master Module User's Manual.

■ Related manuals

Name	Manual number
MELSEC iQ-R CC-Link IE TSN User's Manual (Startup)	SH-082127ENG
MELSEC iQ-R CC-Link IE TSN User's Manual (Application)	SH-082129ENG
MELSEC iQ-F FX5 User's Manual (CC-Link IE TSN)	SH-082215ENG
MELSEC iQ-R Motion Module User's Manual (Startup)	IB-0300406ENG
MELSEC iQ-R Motion Module User's Manual (Application)	IB-0300411ENG

2.5.2 CC-Link IE TSN configuration

◆ Procedure

The following shows the procedure to connect the inverter with a Mitsubishi Electric master device.

■ Before communication

1. Connect each unit with an Ethernet cable. (Refer to page 13.)
2. Enter the IP address (**Pr.1434 to Pr.1437**). (Refer to page 15.)
3. Set "45238" (CC-Link IE TSN) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. (Refer to page 23.)
   In the initial status, **Pr.1429** = "45238" (CC-Link IE TSN) and setting is not required.
4. Reset the inverter, or turn OFF and then ON the power.

■ Registering a profile

1. Start the engineering software (GX Works3).
2. On the menu bar, select [Tool] > [Profile Management] > [Register...].
3. Select a CSP+ file to be registered on the "Register Profile" screen, and click the [Register] button.

NOTE

- A profile is a compressed file (such as *.zip, *.ipar, and *.cspp). Register a profile without decompressing the file.
- Profile registration is not required for the next time onwards.

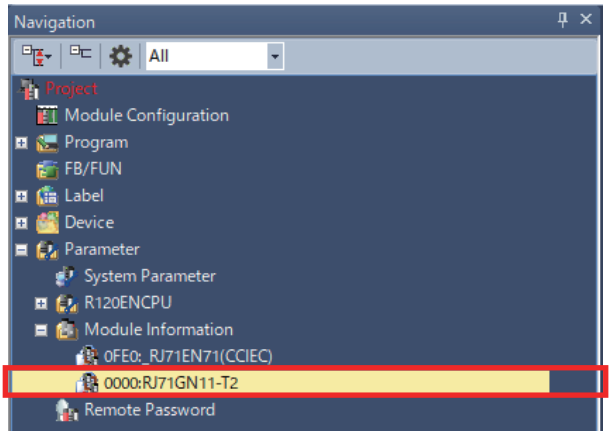
■ Creating a project file

1. For information on creating and opening a project, go to [Help] > [GX Works3 Help].

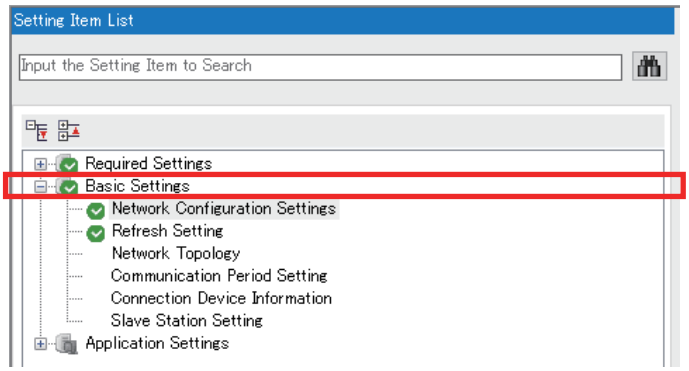
■ Detecting an Inverter

Detection is not possible when the data link is not established with the master module. For details, refer to the Master Module User's Manual.

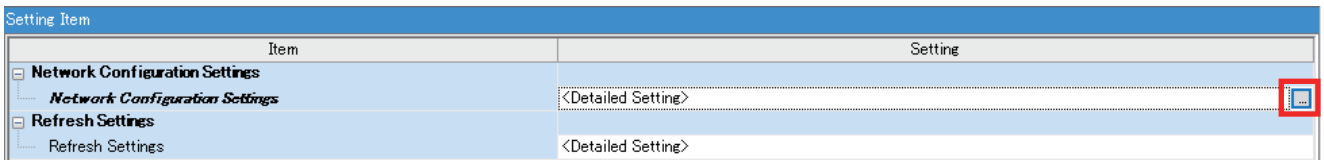
1. In the "Navigation" window, select [Parameter] > [Module Information] then select the module name.



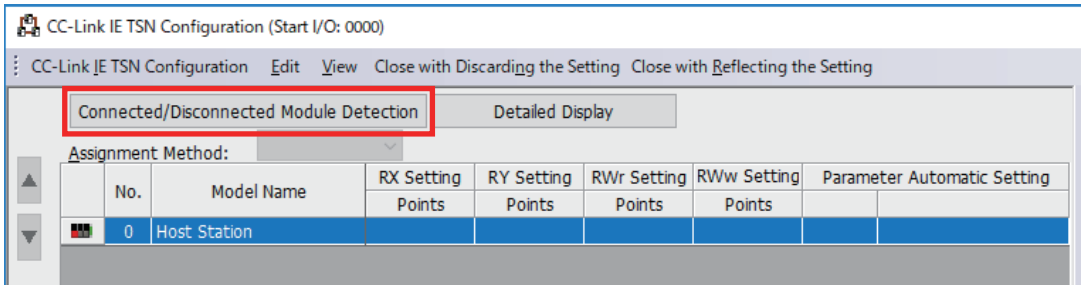
2. Select [Basic Settings] in the "Setting Item List" window.



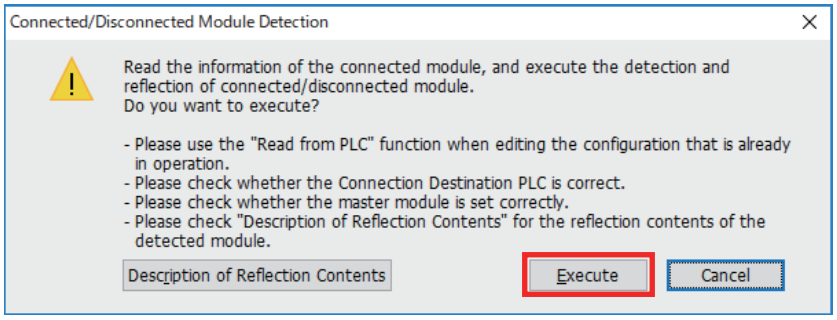
3. In the "Setting Item" window, go to [Network Configuration Settings] then click [...] next to the [Detailed Setting] field.



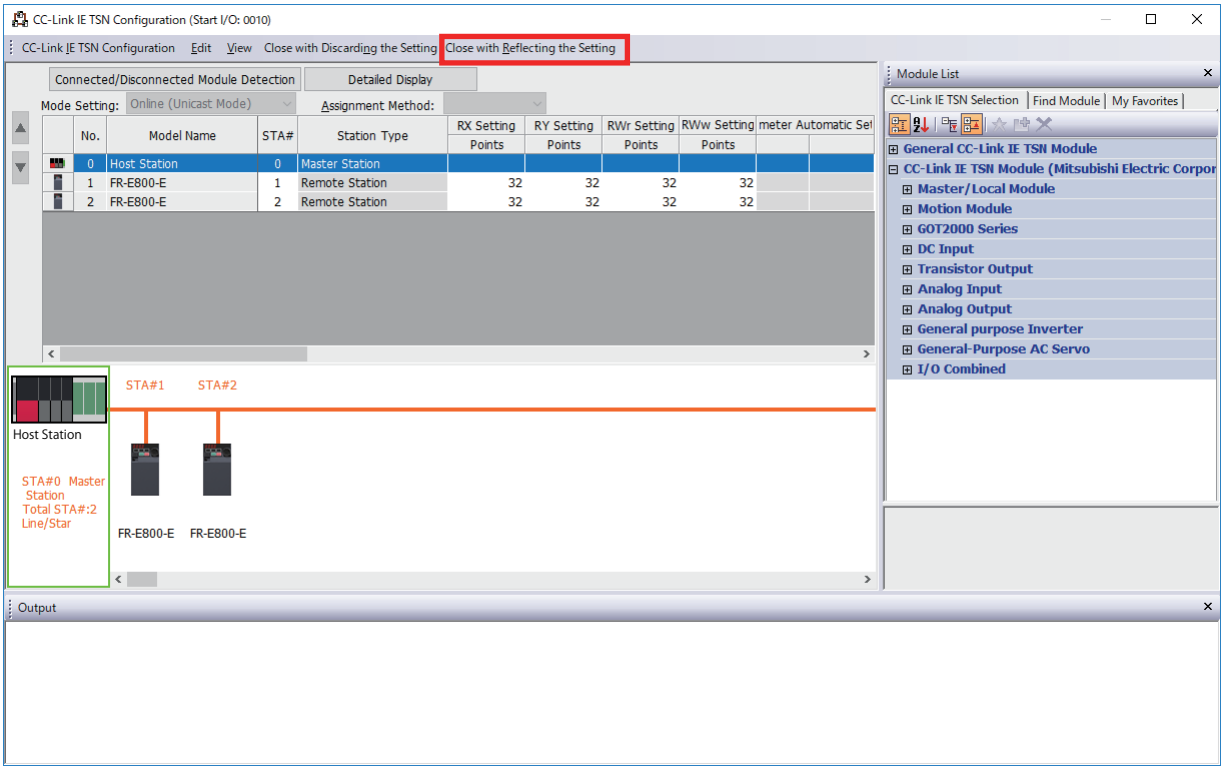
4. Click [Connected/Disconnected Module Detection] in the "CC-Link IE TSN configuration" window.



5. Read the cautions in the "Connected/Disconnected Module Detection" window and click [Execute].

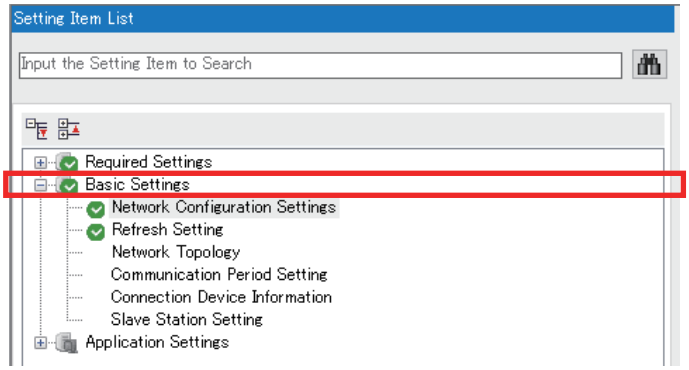


6. The FR-E800-E or the FR-E800-SCE will appear on the screen when it is detected. (FR-E800-E inverters are displayed in the following example.) Click [Close with Reflecting the Setting] to close the window.

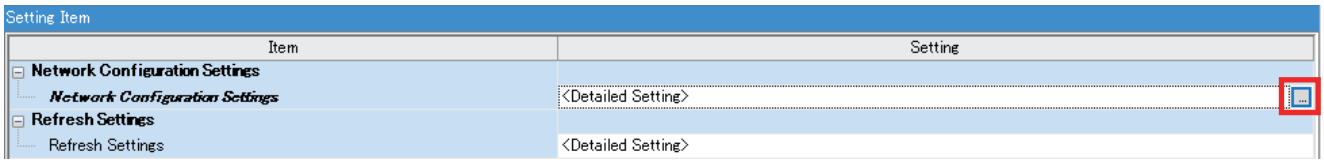


■ System setting window (communication speed setting of the master: 1 Gbps)

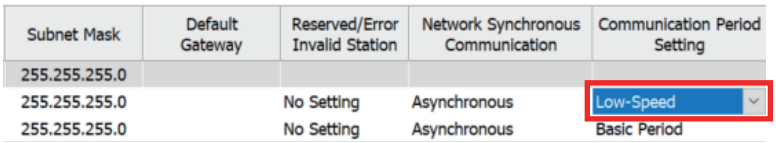
1. Select [Basic Settings] in the "Setting Item List" window.



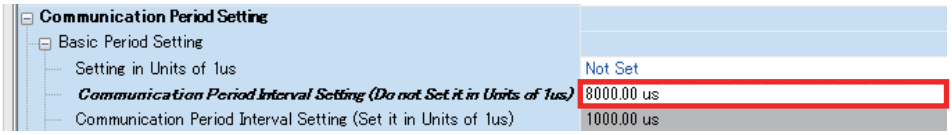
2. In the "Setting Item" window, go to [Network Configuration Settings] then click [...] next to the [Detailed Setting] field.



3. In the "CC-Link IE TSN Configuration" window, set "Low-Speed" for [Communication Period Setting].

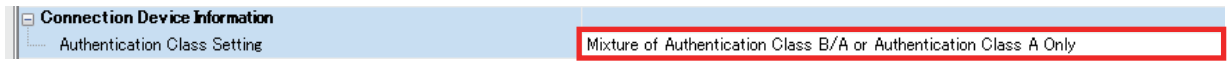


4. Set "5000.00 µs" or larger value for [Communication Period Interval Setting (Do not Set it in Units of 1us)].

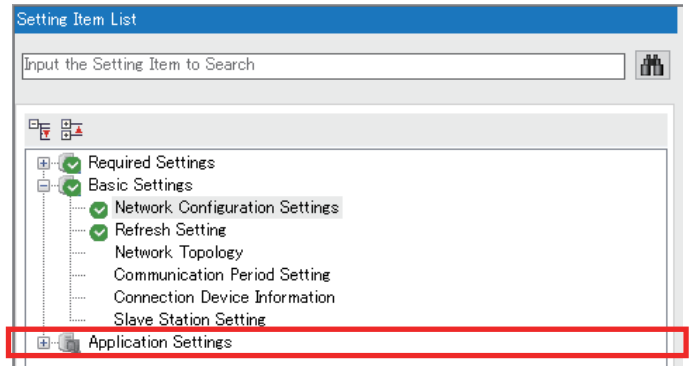


5. Set "200.00 µs" for [System Reservation Time].

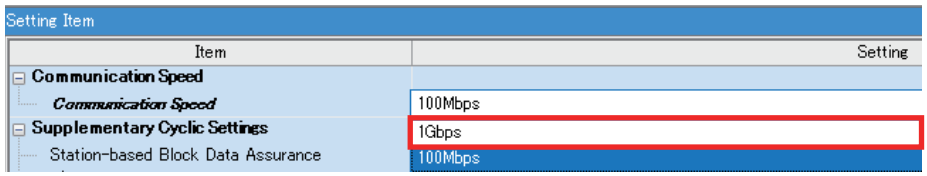
6. Set "Mixture of Authentication Class B/A or Authentication Class A Only" for [Authentication Class Setting].



7. Select [Application Settings] in the "Setting Item List" window.

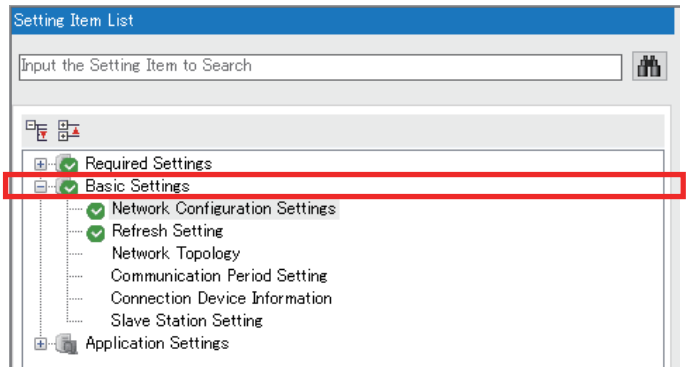


8. Set "1 Gbps" for [Communication Speed].

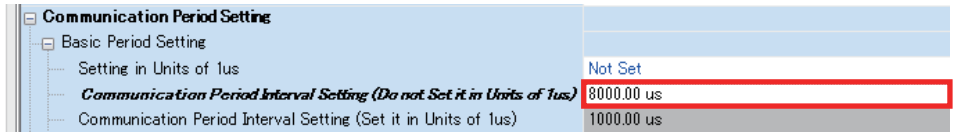


■ System setting window (communication speed setting of the master: 100 Mbps)

1. Select [Basic Settings] in the "Setting Item List" window.

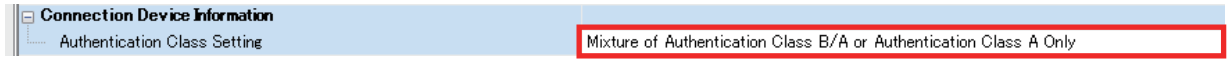


2. Set "5000.00 µs" or larger value for [Communication Period Interval Setting (Do not Set it in Units of 1us)].

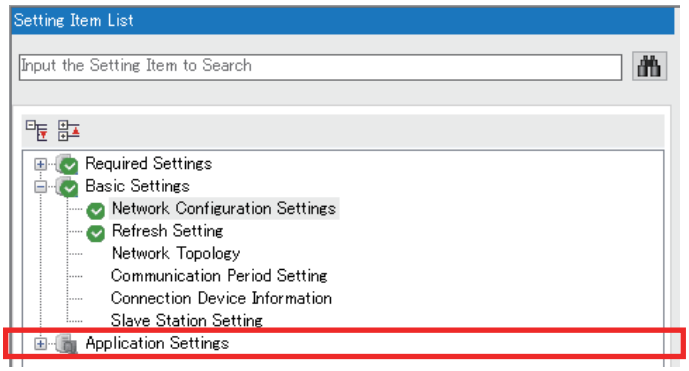


3. Set "200.00 µs" for [System Reservation Time].

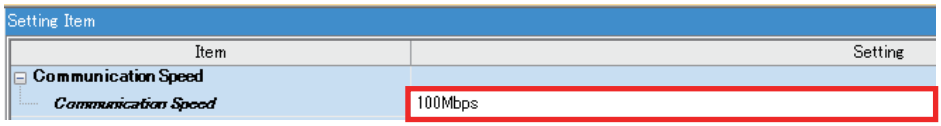
4. Set "Mixture of Authentication Class B/A or Authentication Class A Only" for [Authentication Class Setting].



5. Select [Application Settings] in the "Setting Item List" window.



6. Set "100 Mbps" for [Communication Speed].



■ Checking communication

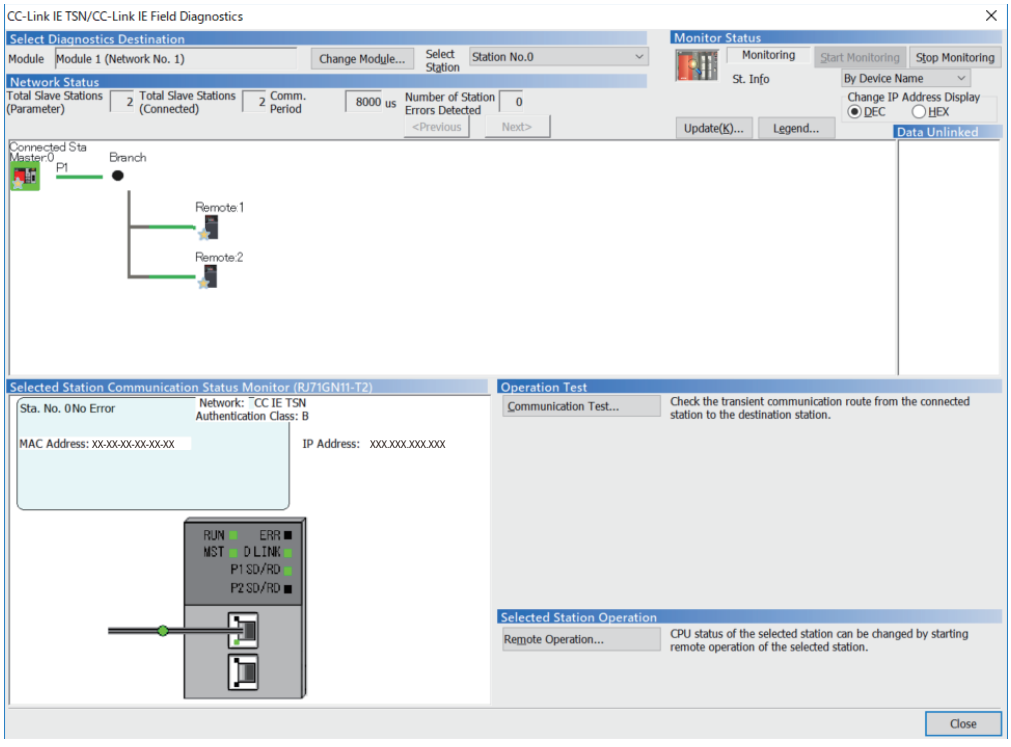
The following table shows the status of the LEDs when the programmable controller and the inverter are connected successfully. Check the [CC Link IE TSN / CC Link IE Field Diagnostics] window to confirm that the communication is established between them.

NS	MS	LINK1	LINK2
Solid green	Solid green	Blinking green*1	

*1 The LED on either LINK1 or LINK2 will blink depending on the port (port 1 or 2) the Ethernet cable is connected to.

NOTE

- If the FR-E800-(SC)E cannot be detected, on the menu bar select [Diagnostics (D)] → [CC Link IE TSN / CC Link IE Field Diagnostics]. The "CC Link IE TSN / CC Link IE Field Diagnostics" window will be displayed. Broken or disconnected wires can be detected.
- The network configuration diagram is displayed in star topology even if the devices are connected in line topology.



2.5.3 Initial setting for CC-Link IE TSN

Use the following parameters to perform required settings for Ethernet communication between the inverter and other devices. To make communication between other devices and the inverter, perform the initial settings of the inverter parameters to match the communication specifications of the devices. Data communication cannot be made if the initial settings are not made or if there is any setting error.

Pr.	Name	Initial value	Setting range	Description
1427 N630[*1]	**Ethernet function selection 1**	5001	502, 5000 to 5002, 5006 to 5008, 5010 to 5013, 9999, 34962[*3], 44818[*2], 45237, 45238, 47808[*2], 61450	Set the application, protocol, etc.
1428 N631[*1]	**Ethernet function selection 2**	45237		
1429 N632[*1]	**Ethernet function selection 3**	45238		
1430 N633[*1]	**Ethernet function selection 4**	9999		

*1 The setting is applied after an inverter reset or next power-ON.
*2 The setting is available only for the FR-E800-EPA and the FR-E800-SCEPA.
*3 The setting is available only for the FR-E800-EPB and the FR-E800-SCEPB.

◆ Ethernet function selection (Pr.1427 to Pr.1430)

To select CC-Link IE TSN for the application, set "45238" (CC-Link IE TSN) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. In the initial status, **Pr.1429** = "45238" (CC-Link IE TSN) and setting is not required.

NOTE

- Change the setting if selected communication protocols cannot be used together. (Refer to page 5 and page 151.)

2.5.4 Parameters related to CC-Link IE TSN

The following parameters are used for CC-Link IE TSN communication. Set the parameters as required.

Pr.	Name	Initial value	Setting range	Description
541 N100	**Frequency command sign selection**	0	0	Signed frequency command value
			1	Unsigned frequency command value
544 N103[*1]	**CC-Link extended setting**	0	0, 1, 12, 14, 18, 100, 112, 114, 118	Use this parameter to extend the function of the remote registers for the CC-Link IE TSN.
1426 N641[*1]	**Link speed and duplex mode selection**	0	0 to 4	Set the communication speed and the communication mode (full-duplex/half-duplex).
1442 N660[*1]	**IP filter address 1 (Ethernet)**	0	0 to 255	Set the range of connectable IP addresses for the network devices. (When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.)
1443 N661[*1]	**IP filter address 2 (Ethernet)**	0		
1444 N662[*1]	**IP filter address 3 (Ethernet)**	0		
1445 N663[*1]	**IP filter address 4 (Ethernet)**	0		
1446 N664[*1]	**IP filter address 2 range specification (Ethernet)**	9999	0 to 255, 9999	
1447 N665[*1]	**IP filter address 3 range specification (Ethernet)**	9999		
1448 N666[*1]	**IP filter address 4 range specification (Ethernet)**	9999		
804 D400	**Torque command source selection**	0	0, 1, 3 to 6	In the torque control mode, the torque command source can be selected.
810 H700	**Torque limit input method selection**	0	0 to 2	The torque limit input method can be selected.

*1 The setting is applied after an inverter reset or next power-ON.

NOTE

- For CC-Link IE TSN, do not change initial values of **Pr.1449 to Pr.1454** used to specify the Ethernet IP address range for command source selection as the IP address is not used. Setting a value other than the initial value in any of the above parameters may cause an Ethernet communication fault (E.EHR). If the fault occurs, reset the setting of the relevant parameter to the initial value, or set "9999" in **Pr.1432 Ethernet communication check time interval**.

◆CC-Link extended setting (Pr.544)

- Use this parameter to select the function of the remote registers for the CC-Link IE TSN.

Pr.544 setting	Description	
0 (initial value), 1, 12, 14, 18	Compatible with the octuple setting of CC-Link Ver.2	
100, 112, 114, 118	Compatible with the octuple setting of CC-Link Ver.2	PLC function*1

*1 Refer to the PLC Function Programming Manual.

◆Frequency command with sign (Pr.541)

- The start command (forward/reverse rotation) can be inverted by adding a plus or minus sign to the value of the frequency command sent through the CC-Link IE TSN.
- The **Pr.541 Frequency command sign selection** setting is applied to the frequency command from RWw1. (Refer to page 28.)

Rotations per minute (machine speed) setting using Pr.37 and Pr.53	Pr.541 setting	Sign	Setting range	Actual frequency command
Disabled	0	Without	0 to 59000	0 to 590.00 Hz
	1	With	-32768 to 32767 (two's complement)	-327.68 to 327.67 Hz
Enabled	0	Without	0 to 65535	The rotation speed command or the machine speed command is selected depending on the **Pr.37 and Pr.53** settings. (1 increments)
	1	With	-32768 to 32767 (two's complement)	

- Relationship between the start command and sign (**Pr.541** = "1")

Start command	Sign of the frequency command	Actual operation command
Forward rotation	+	Forward rotation
	-	Reverse rotation
Reverse rotation	+	Reverse rotation
	-	Forward rotation

NOTE

- When **Pr.541** = "1" (with sign)
  - When EEPROM write is specified by turning ON of RYE, write mode error (error code H01) will occur.
  - When both RYD and RYE are turned ON, RYD has precedence.
  - When power is turned ON (inverter reset), the initial setting status of the sign bit is "positive" and the set frequency is 0 Hz. (The motor does not operate at the frequency set before turning OFF the power (inverter reset).)
  - When set frequency is written with the instruction code of HED or HEE, the sign of the frequency command is not changed.

◆I/O signal list

- Remote I/O signals

Device No.*7	Signal	Refer to page
RYn0	Forward rotation command*2	26
RYn1	Reverse rotation command*2	26
RYn2	High-speed operation command (terminal RH function)*1	26
RYn3	Middle-speed operation command (terminal RM function)*1	26
RYn4	Low-speed operation command (terminal RL function)*1	26

Device No.*7	Signal	Refer to page
RXn0	Forward running	27
RXn1	Reverse running	27
RXn2	Running (terminal RUN function)*3	27
RXn3	Up to frequency*2	27
RXn4	Overload warning*2	27

Device No.[*7]	Signal	Refer to page
RYn5	Jog operation selection 2[*2]	26
RYn6	Second function selection[*2]	26
RYn7	Current input selection[*2]	26
RYn8	**Pr.185** assignment function (NET X1)[*5]	26
RYn9	Output stop (terminal MRS function)[*1]	26
RYnA	**Pr.186** assignment function (NET X2)[*5]	27
RYnB	**Pr.184** assignment function (RES)[*5]	27
RYnC	Monitor command	27
RYnD	Frequency setting command (RAM)	27
RYnE	Frequency setting command (RAM, EEPROM)	27
RYnF	Instruction code execution request	27
RY(n+1)0 to RY(n+1)7	Reserved	—
RY(n+1)8	Not used (initial data process completion flag)	—
RY(n+1)9	Not used (initial data process request flag)	—
RY(n+1)A	Error reset request flag	27
RY(n+1)B	**Pr.187** assignment function (NET X3)[*5]	27
RY(n+1)C	**Pr.188** assignment function (NET X4)[*5]	27
RY(n+1)D	**Pr.189** assignment function (NET X5)[*5]	27
RY(n+1)E	Reserved	—
RY(n+1)F		

Device No.[*7]	Signal	Refer to page
RXn5	**Pr.193** assignment function (NET Y1)[*6]	27
RXn6	Frequency detection (terminal FU function)[*3]	27
RXn7	Fault (terminal ABC function)[*3]	27
RXn8	**Pr.194** assignment function (NET Y2)[*6]	27
RXn9	**Pr.313** assignment function (DO0)[*4]	27
RXnA	**Pr.314** assignment function (DO1)[*4]	27
RXnB	**Pr.315** assignment function (DO2)[*4]	27
RXnC	Monitoring	28
RXnD	Frequency setting completion (RAM)	28
RXnE	Frequency setting completion (RAM, EEPROM)	28
RXnF	Instruction code execution completed	28
RX(n+1)0 to RX(n+1)5	Reserved	—
RX(n+1)6	**Pr.195** assignment function (NET Y3)[*6]	28
RX(n+1)7	**Pr.196** assignment function (NET Y4)[*6]	28
RX(n+1)8	Not used (initial data process request flag)	—
RX(n+1)9	Not used (initial data process completion flag)	—
RX(n+1)A	Error status flag	28
RX(n+1)B	Remote station ready	28
RX(n+1)C to RX(n+1)F	Reserved	—

*1 These signals are set in the initial setting. Using **Pr.180 to Pr.183**, input signals assigned to the device numbers can be changed.
For details of **Pr.180 to Pr.183**, refer to the FR-E800 Instruction Manual (Function).

*2 The signals are fixed. They cannot be changed using parameters.

*3 These signals are set in the initial setting. Using **Pr.190 to Pr.192**, output signals assigned to the device numbers can be changed.
For details of **Pr.190 to Pr.192**, refer to the FR-E800 Instruction Manual (Function).

*4 Output signals can be assigned using **Pr.313 to Pr.315**.
For details, refer to the description of **Pr.190 to Pr.196 (Output terminal function selection)** in the FR-E800 Instruction Manual (Function).

*5 Input signals can be assigned using **Pr.184 to Pr.189**.
For details, refer to the description of **Pr.184 to Pr.189 (Input terminal function selection)** in the FR-E800 Instruction Manual (Function).

*6 Output signals can be assigned using **Pr.193 to Pr.196**.
For details, refer to the description of **Pr.193 to Pr.196 (Output terminal function selection)** in the FR-E800 Instruction Manual (Function).

*7 "n" indicates a value determined by the station number.

- Remote registers

Address[*4]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	28
RWwn+1	Set frequency (0.01 Hz increments)[*2]		28
RWwn+2	Link parameter extended setting	Instruction code	28
RWwn+3	Data to be written		28
RWwn+4	Monitor code 3		28
RWwn+5	Monitor code 4		28
RWwn+6	Monitor code 5		28
RWwn+7	Monitor code 6		28
RWwn+8	Fault history No.	H00	28
RWwn+9	PID set point (0.01% increments)[*1]		29
RWwn+A	PID measured value (0.01% increments)[*1]		29
RWwn+B	PID deviation (0.01% increments)[*1]		29

Address[*4]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value[*3]		29
RWrn+1	Second monitor value[*3]		29
RWrn+2	Reply code 2	Reply code 1	29
RWrn+3	Data to be read		29
RWrn+4	Third monitor value[*3]		29
RWrn+5	Fourth monitor value[*3]		29
RWrn+6	Fifth monitor value[*3]		29
RWrn+7	Sixth monitor value[*3]		29
RWrn+8	Fault history No.	Fault record (fault data)	29
RWrn+9	Fault record (output frequency)		29
RWrn+A	Fault record (output current)		29
RWrn+B	Fault record (output voltage)		29

Address*4	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn+C	Torque command or torque limit		29, 34
RWwn+D	H00 (Free)		—
RWwn+E			
RWwn+F			
RWwn+10	Link parameter extended setting	Instruction code	29
RWwn+11	Data to be written		29
RWwn+12	Link parameter extended setting	Instruction code	29
RWwn+13	Data to be written		29
RWwn+14	Link parameter extended setting	Instruction code	29
RWwn+15	Data to be written		29
RWwn+16	Link parameter extended setting	Instruction code	29
RWwn+17	Data to be written		29
RWwn+18	Link parameter extended setting	Instruction code	29
RWwn+19	Data to be written		29
RWwn+1A	H00 (Free)		—
RWwn+1B			
RWwn+1C			
RWwn+1D			
RWwn+1E			
RWwn+1F			

Address*4	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn+C	Fault record (energization time)		30
RWrn+D	H00 (Free)		—
RWrn+E			
RWrn+F			
RWrn+10	Reply code		30
RWrn+11	Data to be read		30
RWrn+12	Reply code		30
RWrn+13	Data to be read		30
RWrn+14	Reply code		30
RWrn+15	Data to be read		30
RWrn+16	Reply code		30
RWrn+17	Data to be read		30
RWrn+18	Reply code		30
RWrn+19	Data to be read		30
RWrn+1A	H00 (Free)		—
RWrn+1B			
RWrn+1C			
RWrn+1D			
RWrn+1E			
RWrn+1F			

*1 When **Pr.128** = "50, 51, 60, or 61", the register is valid. When **Pr.128** = "1000 to 2011", the register is valid depending on the setting in **Pr.609 or Pr.610**.

*2 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**.

*3 When the output frequency or the set frequency is selected as the monitor item, rotations per minute or machine speed may be displayed depending on the **Pr.37** and **Pr.53** settings.

*4 "n" indicates a value determined by the station number.

◆ Details of the I/O signals

The device numbers described in this section are for the station number 1. For the station number 2 and later, the device numbers are different. (Refer to the manual for the CC-Link master module for the correspondence between device numbers and station numbers.)

■ Output signals (from the master module to the inverter)

Output signals from the master module are as follows. (Input signals to the inverter)

Device No.	Signal	Description	
RY0	Forward rotation command*2	0: Stop command 1: Forward rotation start	When "1" is set, a start command is input to the inverter. When "1" is set in RY0 and RY1, a stop command is input.
RY1	Reverse rotation command*2	0: Stop command 1: Reverse rotation start	
RY2	High-speed operation command (terminal RH function)*1	Functions assigned to terminals RH, RM, and RL are activated.	
RY3	Middle-speed operation command (terminal RM function)*1		
RY4	Low-speed operation command (terminal RL function)*1		
RY5	JOG operation selection 2*2	JOG2 signal	
RY6	Second function selection*2	RT signal	
RY7	Current input selection*2	AU signal	
RY8	— (terminal NET X1 function)*3	The function assigned to **Pr.185** is activated.	
RY9	Output stop (terminal MRS function)*1	The function assigned to terminal MRS is activated.	

Device No.	Signal	Description
RYA	— (terminal NET X2 function)*3	The function assigned to **Pr.186** is activated.
RYB	— (Function of terminal RES)*3	The function assigned to **Pr.184** is activated.
RYC	Monitor command	When "1" is set in RYC, the monitored value is set in the remote register RWr0, 1, 4 to 7, and "1" is set in RXC (device for the Monitoring signal). While "1" is set in RYC, the monitored data is always updated.
RYD	Frequency setting command / torque command (RAM)	When "1" is set in RYD, the set frequency / torque command (RWw1) is written to the RAM of the inverter.*4 After the writing completes, "1" is set in the frequency setting / torque command completion (RXD). Under Real sensorless vector control, Vector control, and PM sensorless vector control, the following value is also written to RAM at the same time. • During torque control*6: Torque command value • During speed control: Torque limit value
RYE	Frequency setting command / torque command (RAM, EEPROM)	When "1" is set in RYE, the set frequency / torque command (RWw1) is written to the RAM and EEPROM of the inverter. After the writing completes, "1" is set in the frequency setting / torque command completion (RXE). Under Real sensorless vector control, vector control, and PM sensorless vector control, the following value is also written to RAM and EEPROM at the same time. • During torque control*6: Torque command value • During speed control: Torque limit value To change the frequency consecutively, be sure to write data to the inverter RAM.
RYF	Instruction code execution request	At the ON edge of RYF, processing corresponding to the instruction codes set to RWw2, 10, 12, 14, 16, and 18 are executed. "1" is set in the instruction code execution completed (RXF) after completion of instruction codes. When an instruction code execution error occurs, a value other than "0" is set in the reply code (RWr2, 10, 12, 14, 16, or 18).
RY1A	Error reset request flag	When "1" is set in RY1A at an inverter fault, the inverter is reset, and then "0" is set in the error status flag (RX1A).*5
RY1B	— (terminal NET X3 function)*3	Functions assigned to **Pr.187 to Pr.189** are activated.
RY1C	— (terminal NET X4 function)*3	
RY1D	— (terminal NET X5 function)*3	

*1 These signals are set in the initial setting. Using **Pr.180 to Pr.183**, input signals assigned to the device numbers can be changed. Some signals are not controllable via network depending on the settings of **Pr.338 and Pr.339**. For details of **Pr.180 to Pr.183, Pr.338, and Pr.339**, refer to the FR-E800 Instruction Manual (Function).

*2 The signals are fixed. They cannot be changed using parameters.

*3 No signal is assigned in the initial setting. Use **Pr.184 to Pr.189** to assign signals to RY8, RYA, RYB, and RY1B to RY1D.
For details, refer to the description of **Pr.184 to Pr.189 (Input terminal function selection)** in the FR-E800 Instruction Manual (Function).

*4 While "1" is set in the frequency setting command (RYD), the set frequency (RWw1) is always applied.

*5 Refer to page 195 for operation conditions of inverter reset.

*6 Torque control cannot be performed with a PM motor.

■ Input signals (from the inverter to the master module)

Input signals to the master module are as follows. (Output signals from the inverter)

Device No.	Signal	Description
RX0	Forward running	0: Other than forward running (during stop or reverse rotation) 1: Forward running
RX1	Reverse running	0: Other than reverse running (during stop or forward rotation) 1: Reverse running
RX2	Running (terminal RUN function)*1	The function assigned to terminal RUN is activated.
RX3	Up to frequency*2	SU signal
RX4	Overload warning*2	OL signal
RX5	— (terminal NET Y1 function)*4	The function assigned to **Pr.193** is activated.
RX6	Frequency detection (terminal FU function)*1	Functions assigned to terminals FU, A, B, and C are activated.
RX7	Fault (terminal ABC function)*1	
RX8	— (terminal NET Y2 function)*4	The function assigned to **Pr.194** is activated.
RX9	— (DO0 function)*3	Functions assigned to **Pr.313 to Pr.315** are activated.
RXA	— (DO1 function)*3	
RXB	— (DO2 function)*3	

Device No.	Signal	Description
RXC	Monitoring	After "1" is set in the monitor command (RYC), and the monitored value is set in the remote register Rwr0, 1, 4 to 7, "1" is set for this signal. When "0" is set in the monitor command (RYC), "0" is set for this signal.
RXD	Frequency setting / torque command completed (RAM)	After "1" is set in the frequency setting command / torque command (RYD), and the frequency setting / torque command is written to the RAM of the inverter, "1" is set for this signal. When "0" is set in the frequency setting command / torque command (RYD), "0" is set for this signal.
RXE	Frequency setting / torque command completed (RAM, EEPROM)	After "1" is set in the frequency setting command / torque command (RYE), and the frequency setting / torque command is written to the RAM and EEPROM of the inverter, "1" is set for this signal. When "0" is set in the frequency setting command / torque command (RYE), "0" is set for this signal.
RXF	Instruction code execution completed	After "1" is set in the instruction code execution request (RYF) and the processes corresponding to the instruction codes (RWw2, 10, 12, 14, 16 and 18) are executed, "1" is set for this signal. When "0" is set in the instruction code execution request (RYF), "0" is set for this signal.
RX16	— (terminal NET Y3 function)*4	Functions assigned to **Pr.195 and Pr.196** are activated.
RX17	— (terminal NET Y4 function)*4	
RX1A	Error status flag	When an inverter error occurs (protective function is activated), "1" is set for this signal.
RX1B	Remote station ready	When the inverter is ready for communication upon completion of initial setting after power-ON or a hardware reset, "1" is set for this signal. When an inverter error occurs (protective function is activated), "0" is set in this signal.

*1 These signals are set in the initial setting. Using **Pr.190 to Pr.192**, output signals assigned to the device numbers can be changed.
For details of **Pr.190 to Pr.192**, refer to the FR-E800 Instruction Manual (Function).

*2 The signals are fixed. They cannot be changed using parameters.

*3 No signal is assigned in the initial setting. Use **Pr.313 to Pr.315** to assign signals to RX9 to RXB.
For details, refer to the description of **Pr.190 to Pr.196 (Output terminal function selection)** in the FR-E800 Instruction Manual (Function).

*4 No signal is assigned in the initial setting. Use **Pr.193 to Pr.196** to assign signals to RX5, RX8, RX16, and RX17.
For details, refer to the description of **Pr.193 to Pr.196 (Output terminal function selection)** in the FR-E800 Instruction Manual (Function).

◆ Details of the remote register

■ Remote register (from the master module to the inverter)

- Remote register description

Device No.	Signal	Description
RWw0	Monitor code 1, 2	Set the monitor code to be monitored (refer to page 32). When "1" is set in RYC, data of specified monitor items will be stored in RWr0/RWr1.
RWw1	Set frequency*1*2	Specify the set frequency or rotations per minute (machine speed). At this time, whether to write to the RAM or EEPROM is decided with the RYD and RYE settings. After setting the set frequency in this register, set "1" in RYD or RYE to write the frequency. After writing of frequency is completed, "1" is set in RXD or RXE in response to the input command. The setting range is 0 to 590.00 Hz (0.01 Hz increments). Write "59000" when setting 590.00 Hz.
RWw2	Link parameter extended setting / instruction code	Set an instruction code (refer to page 30) for an operation such as operation mode switching, parameter read/write, error reference, and error clear. Set "1" in RYF to execute the corresponding instruction after completing the register setting. "1" is set in RXF after completing the execution of the instruction. The upper 8 bits are used for the link parameter extended setting. Example) When reading **Pr.160**, instruction code is H0200.
RWw3	Data to be written	Set data for the instruction code set in RWw2 (when required). Set "1" in RYF after setting RWw2 and this register. Set "0" when the write code is not required.
RWw4	Monitor code 3	Set the monitor code to be monitored. By setting "1" in RYC after setting, the specified monitor data is stored in RWr4 to RWr7.
RWw5	Monitor code 4	
RWw6	Monitor code 5	
RWw7	Monitor code 6	
RWw8	Fault history No.	Set the individual fault number of the fault history that you want to read. Fault records can be read back to the ninth fault in past. (The value in the lower 8 bits is fixed to H00.) Upper 8 bits: H00 (latest fault) to H09 (ninth fault in past) When H0A to HFF is set to the lower 8 bits, "0" is returned.

Device No.	Signal	Description	
RWw9	PID set point*3	Set the PID action set point. Setting range: 0 to 100.00%	• Input a value 100 times greater than the value to be set. For example, enter "10000" when setting 100.00%. • For details of PID control, refer to the FR-E800 Instruction Manual (Function).
RWwA	PID measured value*3	Set the PID measured value. Setting range: 0 to 100.00%	
RWwB	PID deviation*3	Set the PID deviation. Setting range: -100.00% to 100.00%	
RWwC	Torque command value	When **Pr.804** = "3 or 5" during torque control under Real sensorless vector control or Vector control, torque command values can be specified. The value is written to the inverter either by RYD or RYE. The values in **Pr.805 and Pr.806** are updated at the same time. The setting range and the setting increment depend on the **Pr.804** setting. If the data outside the range is set, the previous setting is retained.	
	Torque limit value	Set **Pr.804** = "3 or 5" and **Pr.810 Torque limit input method selection** = "2" to specify the torque limit value during speed control under Real sensorless vector control, Vector control, or PM sensorless vector control. The value is written to the inverter either by RYD or RYE. The values in **Pr.805 and Pr.806** are updated at the same time. The setting range and the setting increment depend on the **Pr.804** setting (absolute value). If the data outside the range is set, the previous setting is retained.	
RWw10, RWw12, RWw14, RWw16, RWw18	Link parameter extended setting / instruction code	Set an instruction code (refer to page 30) for an operation such as operation mode switching, parameter read/write, error reference, and error clear. The instructions are executed in the following order by setting "1" in RYF after completing the register setting: RWw2, 10, 12, 14, 16, then 18. After completing the execution up to RWw18, "1" is set in RXF. Set HFFFF to disable an instruction by RWw10 to 18. (The instruction code of RWw2 is always executed.) The upper 8 bits are used for the link parameter extended setting. Example) When reading **Pr.160**, instruction code is H0200.	
RWw11, RWw13, RWw15, RWw17, RWw19	Data to be written	Set the data specified by the instruction code of RWw10, 12, 14, 16, and 18 (when required). RWw10 and 11, 12 and 13, 14 and 15, 16 and 17, and 18 and 19 correspond each other. Set "1" in RYF after setting the instruction codes (RWw10, 12, 14, 16, and 18) and the corresponding register. Set "0" when the write data is not required.	

*1 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**. For details, refer to the FR-E800 Instruction Manual (Function).

*2 When **Pr.541 Frequency command sign selection** = "1", the set frequency is a signed value. When the setting value is negative, the command is the inverse from the start command.
Setting range: -327.68 Hz to 327.67 Hz (-327.68 to 327.67), 0.01 Hz increments.
For the details, refer to page 24.

*3 When **Pr.128** = "50, 51, 60, or 61", the register is valid. When **Pr.128** = "1000 to 2011", the register is valid depending on the setting in **Pr.609 or Pr.610**. If the data outside the range is set, the previous setting is retained. For details of **Pr.128**, refer to the FR-E800 Instruction Manual (Function).

■ Remote register (from the inverter to the master module)

- Remote register description

Device No.	Signal	Description
RWr0	First monitor value*1*2	When "1" is set in RYC, the monitor value is set to the lower 8 bits of the monitor code (RWw0).
RWr1	Second monitor value (output frequency*1*2)	When "0" is set to the upper 8 bits of the monitor code (RWw0), the current output frequency is set. When "1" is set in RYC while a value other than "0" is set to the upper 8 bits of the monitor code (RWw0), the monitor value is set to the upper 8 bits of the monitor code (RWw0).
RWr2	Reply code 1	Lower 8 bits of RWr2. When "1" is set in RYD or RYE, the reply code for the frequency setting command (torque command / torque limit) is set. (Refer to page 30.)
	Reply code 2	Upper 8 bits of RWr2. When "1" is set in RYF, the reply code corresponding to the instruction code RWw2 is set. (Refer to page 30.)
RWr3	Data to be read	In a normal reply, a replay code for the instruction code is set.
RWr4	Third monitor value*1*2	When "1" is set in RYC, the monitor value specified to the corresponding monitor code (RWw4 to RWw7) is stored.
RWr5	Fourth monitor value*1*2	
RWr6	Fifth monitor value*1*2	
RWr7	Sixth monitor value*1*2	
RWr8	Fault record (fault data)	The data of the fault record No. specified in RWw8 is stored in the lower 8 bits. The specified fault record No. will be echoed back to the upper 8 bits.
RWr9	Fault record (output frequency)	The output frequency of the fault history No. specified in RWw8 is stored.
RWrA	Fault record (output current)	The output current of the fault history No. specified in RWw8 is always stored.
RWrB	Fault record (output voltage)	The output voltage of the fault history No. specified in RWw8 is always stored.

Device No.	Signal	Description
RWrC	Fault record (energization time)	The energization time at the fault is always stored for the fault record No. specified in RWw8.
RWr10 to RWr19	Reply code	When "1" is set in RYF, the reply codes corresponding to the instruction code RWw10, 12, 14, 16, and 18 are set. The value "0" is set for a normal reply, and a value other than "0" is set for faults with data, mode, and others. (Refer to page 30.)
	Data to be read	In a normal reply, a replay code for the instruction code is set.

*1 When the output frequency or the set frequency is selected as the monitor item, rotations per minute or machine speed may be displayed depending on the **Pr.37** and **Pr.53** settings.

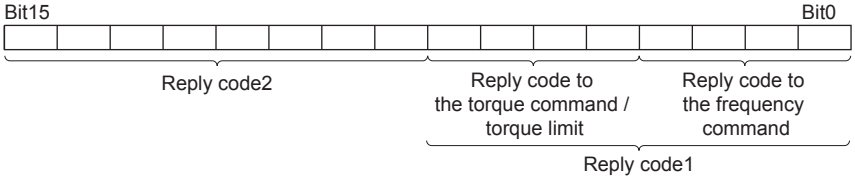
*2 Use **Pr.290** to enable display of negative numbers during monitoring.

- Reply code description

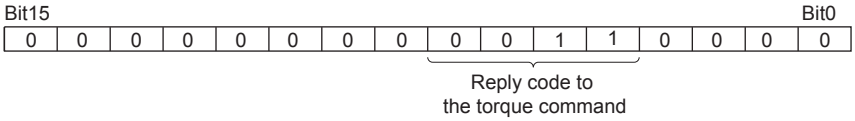
  The reply to the instruction execution command is set in RWr2, 10, 12, 14, 16, and 18. After the frequency setting (RYD or RYE) or execution of instruction code (RYF), check the reply code (RWr2) in the remote register.

	Data	Item	Fault description	Remarks
Reply code	H0000	Normal	No fault (Instruction codes are executed without any fault.)	Reply code to RWw10, 12, 14, 16, 18
	H0001	Write mode fault	Parameter write is attempted when the inverter is not in the stop status in the Network operation mode.	
	H0002	Parameter selection fault	Unregistered code is set.	
	H0003	Setting range fault	Set data exceeds the permissible range.	
Reply code 1*1	H00	Normal	No fault (Instruction codes are executed without any fault.)	Reply code to RWr2
	H01	Write mode fault	Parameter write is attempted when the inverter is not in the stop status in the Network operation mode.	
	H03	Frequency command (torque command / torque limit) setting range error	The value outside the range is set.	
Reply code 2	H00	Normal	No fault (Instruction codes are executed without any fault.)	
	H01	Write mode fault	Parameter write is attempted when the inverter is not in the stop status in the Network operation mode.	
	H02	Parameter selection fault	Unregistered code is set.	
	H03	Setting range fault	Set data exceeds the permissible range.	

*1 The contents of the reply code 1 are changed when torque commands are given or the torque is limited. The upper 4 bits of the reply code 1 are used as the reply code to the torque command / torque limit, and the lower 4 bits are used as the reply code to the frequency command.



Example) When the torque command is out of the setting range, the data is H0030.

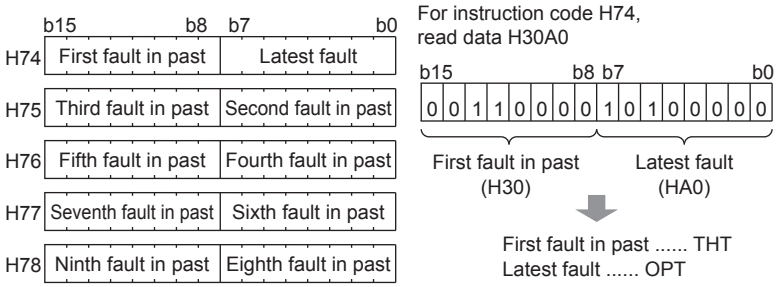


■ Instruction code

Set instruction codes using the remote register (RWw). (Refer to page 28.)

The definition read by the instruction code is stored in the remote register (RWr). (Refer to page 29.)

Item	Read/ write	Instruction code	Data description
Operation mode	Read	H7B	H0000: Network operation H0001: External operation, External JOG operation H0002: PU operation, External/PU combined operation 1 or 2, PUJOG operation
	Write	HFB	H0000: Network operation H0001: External operation H0002: PU operation (when **Pr.79** = "6")

<table>
<tr><th colspan="2">Item</th><th>Read/ write</th><th>Instruction code</th><th>Data description</th></tr>
<tr><td rowspan="8">Monitor</td><td>Output frequency / rotations per minute (machine speed)*1*2</td><td>Read</td><td>H6F</td><td>H0000 to HFFFF
Output frequency in 0.01 Hz increments
(The display can be changed to the rotations per minute (machine speed) using Pr.37 and Pr.53. Refer to the FR-E800 Instruction Manual (Function).)</td></tr>
<tr><td>Output current</td><td>Read</td><td>H70</td><td>H0000 to HFFFF
Output current (hexadecimal) in 0.01/0.1 A increments*4</td></tr>
<tr><td>Output voltage</td><td>Read</td><td>H71</td><td>H0000 to HFFFF
Output voltage (hexadecimal) in 0.1 V increments</td></tr>
<tr><td>Special monitor*2</td><td>Read</td><td>H72</td><td>H0000 to HFFFF: Monitor data selected in the instruction code HF3</td></tr>
<tr><td rowspan="2">Special monitor selection No.</td><td>Read</td><td>H73</td><td rowspan="2">H01 to HFF: Monitor selection data
Refer to the monitor code description on page 32.</td></tr>
<tr><td>Write</td><td>HF3*3</td></tr>
<tr><td>Fault record</td><td>Read</td><td>H74 to H78</td><td>H0000 to HFFFF: Two fault records per code
For data codes and details of fault records, refer to the FR-E800 Instruction Manual (Function).
 
</td></tr>
<tr><td colspan="2">Set frequency (RAM)</td><td rowspan="2">Read</td><td>H6D</td><td rowspan="2">Read the set frequency or rotations per minute (machine speed) from the RAM or EEPROM. H0000 to HE678: Set frequency in 0.01 Hz increments
(The display can be changed to the rotations per minute (machine speed) using Pr.37 and Pr.53. (Refer to the FR-E800 Instruction Manual (Function).)</td></tr>
<tr><td colspan="2">Set frequency (EEPROM)</td><td>H6E</td></tr>
<tr><td colspan="2">Set frequency (RAM)*5</td><td>Write</td><td>HED</td><td rowspan="2">Write the set frequency or rotations per minute (machine speed) into the RAM or EEPROM. H0000 to HE678 (0 to 590.00 Hz): Frequency in 0.01 Hz increments.
(The display can be changed to the rotations per minute (machine speed) using Pr.37 and Pr.53. Refer to the FR-E800 Instruction Manual (Function).)
To change the set frequency consecutively, write data to the RAM of the inverter. (Instruction code: HED)</td></tr>
<tr><td colspan="2">Set frequency (RAM and EEPROM)*5</td><td>Write</td><td>HEE</td></tr>
<tr><td colspan="2" rowspan="2">Parameter</td><td>Read</td><td>H00 to H63</td><td rowspan="2">• Refer to the instruction codes in the FR-E800 Instruction Manual (Function) and write and/or read parameter values as required. Writing to Pr.77 and Pr.79 is disabled. When setting Pr.100 and later, set the link parameter extended setting.
• 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 the RAM. (For the details, refer to page 190.)</td></tr>
<tr><td>Write</td><td>H80 to HE3</td></tr>
<tr><td colspan="2">Fault history clear</td><td>Write</td><td>HF4</td><td>H9696: Fault history is cleared.</td></tr>
<tr><td colspan="2">Parameter clear / All parameter clear</td><td>Write</td><td>HFC</td><td>All parameters return to initial values. Whether to clear communication parameters or not can be selected according to the data.
• Parameter clear
H9696: Communication parameters are cleared.
H5A5A*6: Communication parameters are not cleared.
• All parameter clear
H9966: Communication parameters are cleared.
H55AA*6: Communication parameters are not cleared.
For the details of whether or not to clear parameters, refer to the FR-E800 Instruction Manual (Function). When clear is performed with H9696 or H9966, communication related parameter settings also return to the initial values. When resuming the operation, set the parameters again. Performing a clear will clear the instruction code HEC, HF3, and HFF settings.</td></tr>
<tr><td colspan="2">Inverter reset</td><td>Write</td><td>HFD</td><td>H9696: Resets the inverter.</td></tr>
<tr><td colspan="2" rowspan="2">Second parameter changing*7</td><td>Read</td><td>H6C</td><td rowspan="2">Read or write of bias and gain parameters (instruction codes H5E to H61 and HDE to HE1 with the link parameter extended setting = "1", H11 to H23 and H91 to HA3 with the link parameter extended setting = "9").
H00: Frequency*8
H01: Parameter-set analog value
H02: Analog value input from terminal</td></tr>
<tr><td>Write</td><td>HEC</td></tr>
</table>

*1 When "100" is set in **Pr.52 Operation panel main monitor selection**, the frequency setting value is monitored during a stop, and the output frequency is monitored during running.
*2 Use **Pr.290** to enable display of negative numbers during monitoring.
*3 Write data is in hexadecimal, and only two digits are valid. (The upper two digits are ignored.)
*4 Differs depending on the capacity.
*5 Setting from the remote register (RWw1) is also available.
*6 Turning OFF the power supply while clearing parameters with H5A5A or H55AA returns the communication parameter settings to the initial settings.
*7 Reading or writing is available when the link parameter extended setting = "1 or 9".
*8 The gain frequency can be also written using **Pr.125** (instruction code: H99) or **Pr.126** (instruction code: H9A).

NOTE

- When a 32-bit parameter setting or monitor item is read and the value to be read exceeds HFFFF, HFFFF is returned.

■ Monitor code

Various data of the inverter can be monitored by setting the special monitor selection No. of the instruction code and setting the monitor code in the remote registers, RWw0 and RWw4 to 7.

- Use the monitor code (RWw0) to set the first monitor value (RWr0) in the lower 8 bits, and the second monitor value (RWr1) in the upper 8 bits.
  (Example) The monitor code (RWw0) will be H0602 to set the output current as the first monitor value (RWr0) and set the running speed as the second monitor value (RWr1).
- The values for the monitor code 3 (RWw4) to the monitor code 6 (RWw7) can be selected.

Monitor code	Second monitor (upper 8 bits)	First monitor and third–sixth monitor (lower 8 bits)	Unit
H00	Output frequency	None (monitor value fixed to "0")	0.01 Hz
H01	Output frequency		0.01 Hz
H02	Output current		0.01 A
H03	Output voltage		0.1 V
. . .	. . .		. . .

NOTE

- The monitor codes from H01 onwards and their contents are the same as those of the RS-485 communication dedicated monitor. For details of the monitor codes or monitor items, refer to the monitor display section in the FR-E800 Instruction Manual (Function).
- When the remote registers RWw0 and RWw4 to RWw7 are used for monitoring, H00 (output frequency), H01 (output frequency), and H05 (set frequency) always indicate the frequency regardless of the settings in **Pr.37 and Pr.53**.

◆ Communication speed and full-duplex/half-duplex selection (Pr.1426)

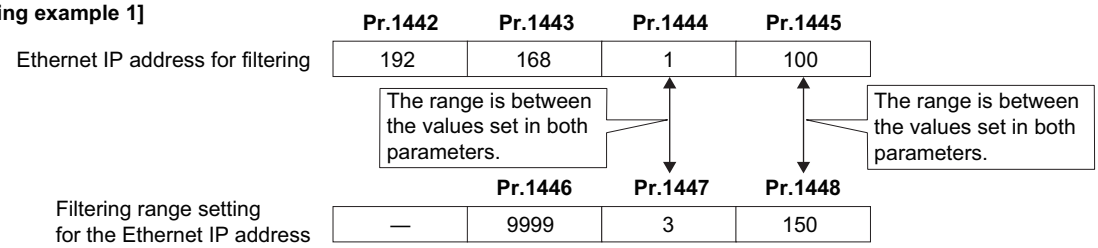
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

Pr.1426 setting	Communication speed	Full-duplex/half-duplex system	Remarks
0 (initial value)	Automatic negotiation	Automatic negotiation	The communication speed and the communication mode (half-duplex/full-duplex) are automatically negotiated to ensure the optimum setting. To set automatic negotiation, auto negotiation setting is required also in the master station.
1	100 Mbps	Full duplex	—
2	100 Mbps	Half duplex	—
3	10 Mbps	Full duplex	The communication speed is fixed at 100 Mbps. Do not set 10 Mbps.
4	10 Mbps	Half duplex	

◆ IP filtering function (Ethernet) (Pr.1442 to Pr.1448)

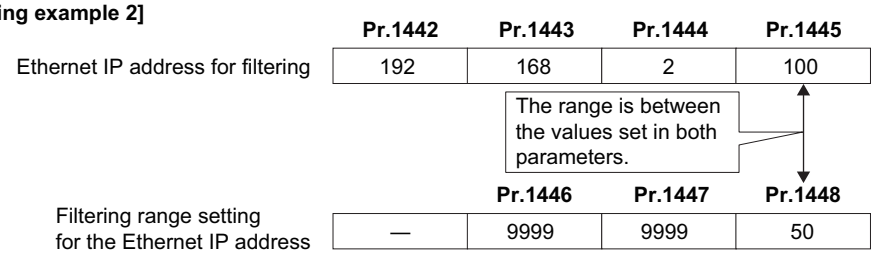
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either of the settings can be larger than the other in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**.)

[Setting example 1]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.x (1 to 3).xxx (100 to 150)".

[Setting example 2]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.2.xxx (50 to 100)".

- When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.
- When "9999 (initial value)" is set in **Pr.1446 to Pr.1448**, the range is invalid.

⚠ CAUTION

- The IP filtering function (Ethernet) (**Pr.1442 to Pr.1448**) is provided as a means to prevent unauthorized access, DoS attacks, computer viruses, or other cyberattacks from external devices, but the function does not prevent such access completely. In order to protect the inverter and the system against unauthorized access by external systems, take additional security measures. We shall have no responsibility or liability for any problems involving inverter trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks. The following are examples of measures to prevent them.
  - Install a firewall.
  - Install a personal computer as a relay station, and control the relaying of transmission data using an application program.
  - Install an external device as a relay station to control access rights. (For the details of external devices used to control access rights, contact the distributors of the external devices.)

◆ Torque command / torque limit by CC-Link IE TSN

Torque commands can be given or the torque can be limited by CC-Link IE TSN communication under Real sensorless vector control, Vector control, or PM sensorless vector control. The value is used to limit the torque during speed control, and to give a torque command during torque control. To limit the torque, set **Pr.810** = "2". The torque command / torque limit setting method can be selected using **Pr.804 Torque command source selection**. (Torque control cannot be performed with a PM motor.)

Pr.	Name	Initial value	Setting range	Description
804	Torque command source selection	0	0	Torque command given by analog input via terminal 4
			1	Torque command / torque limit by CC-Link IE TSN • Torque command / torque limit (-400% to 400%) by the parameter setting (**Pr.805** or **Pr.806**)*1*2
			3	Torque command / torque limit by CC-Link IE TSN • Torque command / torque limit (-400% to 400%) by the parameter setting (**Pr.805** or **Pr.806**)*1*2 • Setting is available using the remote register RWw1 or RWwC (-400% to 400%).*2
			4	Torque command given by 16-bit digital input (FR-A8AX)
			5	Torque command / torque limit by CC-Link IE TSN • Torque command / torque limit (-327.68% to 327.67%) by the parameter setting (**Pr.805** or **Pr.806**)*1*2 • Setting is available using the remote register RWw1 or RWwC (-327.68% to 327.67%).*2
			6	Torque command / torque limit by CC-Link IE TSN • Torque command / torque limit (-327.68% to 327.67%) by the parameter setting (**Pr.805** or **Pr.806**)*1*2
810	Torque limit input method selection	0	0	Internal torque limit (torque limited by parameter settings)
			1	External torque limit (torque limited by terminal 4)
			2	Internal torque limit 2 (torque limited by CC-Link IE TSN)

*1 They can also be set using the operation panel or parameter unit.

*2 When a negative value is set as the torque limit, the torque is limited by the absolute value.

■ List of I/O devices whose function is changed according to the control method

I/O device	V/F control / Advanced magnetic flux vector control	Real sensorless vector control / Vector control / PM sensorless vector control	
		Speed control	Torque control*3
RYD	Frequency setting command (RAM)	Frequency setting / torque limit command (RAM)	Torque command (RAM)
RYE	Frequency setting command (RAM, EEPROM)	Frequency setting / torque limit command (RAM, EEPROM)	Torque command (RAM, EEPROM)
RXD	Frequency setting completion (RAM)	Frequency setting / torque limit completion (RAM)	Torque command completion (RAM)
RXE	Frequency setting completion (RAM, EEPROM)	Frequency setting / torque limit completion (RAM, EEPROM)	Torque command completion (RAM, EEPROM)
RWw1	Set frequency	Set frequency	—
RWwC	—	Torque limit*1*2	Torque command*1

*1 Set **Pr.804** = "3 or 5".

*2 Set **Pr.810** = "2".

*3 Torque control cannot be performed with a PM motor.

■ Torque command setting method and the parameter for speed limit

Pr.804 setting	Torque command setting method (any one of the following)	Parameter for speed limit
3, 5	• Set the torque command value in RWwn+C, and "1" in RYD or RYE. • Set H08 in the link parameter extended setting, the instruction code H85 and H86 in RWwn+2, the torque command value in RWwn+3, and "1" in RYF. (Writing in **Pr.805** or **Pr.806**)	**Pr.807**
1, 6	Set H08 in the link parameter extended setting, the instruction code H85 and H86 in RWwn+2, the torque command value in RWwn+3, and "1" in RYF. (Writing in **Pr.805** or **Pr.806**)	
0, 4	Torque command cannot be given by CC-Link IE TSN.	

■ Torque limit setting method

Pr.804 setting	Pr.810 setting	Torque limit setting method (any one of the following)
3, 5	2	• Set the torque limit value in RWwn+C, and "1" in RYD or RYE. • Set H08 in the link parameter extended setting, the instruction code H85 and H86 in RWwn+2, the torque limit value in RWwn+3, and "1" in RYF. (Writing in **Pr.805** or **Pr.806**)
1, 6		Set H08 in the link parameter extended setting, the instruction code H85 and H86 in RWwn+2, the torque limit value in RWwn+3, and "1" in RYF. (Writing in **Pr.805** or **Pr.806**)

■ Relationship between the Pr.804 setting, the setting range, and the actual torque command / torque limit (when setting is made from CC-Link IE TSN communication)

Pr.804 setting	Setting range	Actual torque command	Actual torque limit
1, 3	600 to 1400 (1% increments)*1	-400 to 400%	0 to 400%
5, 6	-32768 to 32767 (two's complement)*1	-327.68 to 327.67%	0 to 327.67%

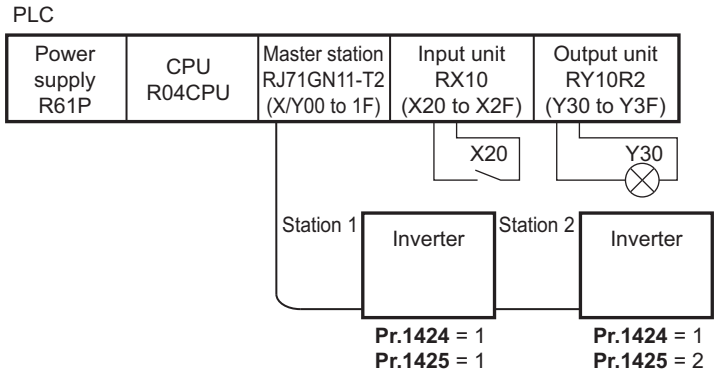
*1 The torque limit setting is defined as an absolute value.

◆ Programming examples

The following explains the programming examples for controlling the inverter with sequence programs.

Item	Sample program	Refer to page
Reading the inverter status	Reading the inverter status from the buffer memory of the master station	37
Setting the operation mode	Selecting the Network operation mode	37
Setting the operation commands	Commanding the forward rotation and middle speed signals	38
Setting the monitoring function	Monitoring the output frequency	38
Reading a parameter value	Reading the value of **Pr.7 Acceleration time**	39
Writing a parameter value	Setting 3.0 seconds in **Pr.7 Acceleration time**	39
Frequency setting (speed setting)	Setting to 50.00 Hz	40
Reading the fault records	Reading the inverter faults	41
Inverter reset	Resetting the inverter when an inverter error occurs	41

- System configuration for programming example



- Setting network parameters of the master station

  In the programming example, network parameters are set as follows.

Item	Setting condition
Station type	CC-Link IE TSN (master station)
Start I/O	0000
Network number setting	1
Quantity	2
Network configuration	Refer to the following.
Refresh setting	Refer to the following.

- Network configuration (assignment method: start/end)

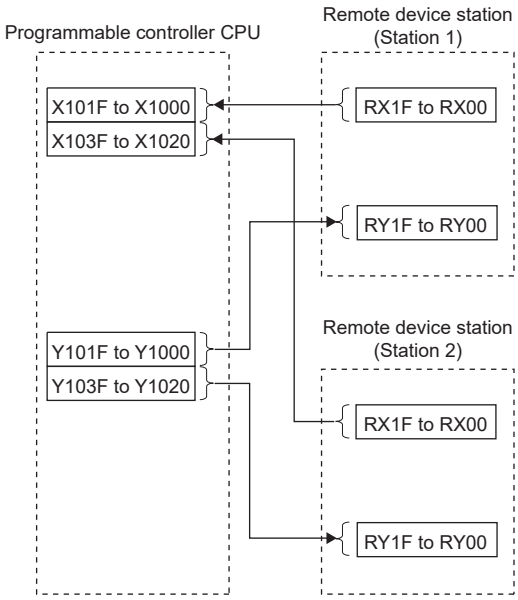
Item		Setting condition	
		Module 1	Module 2
Station number		1	2
Station type		Remote device station	Remote device station
RX/RY setting	Start	0000	0020
	End	001F	003F
RWw/RWr setting	Start	0000	0020
	End	001F	003F
Reserved station / error invalid station		No setting	No setting

- Refresh settings (assignment method: start/end)

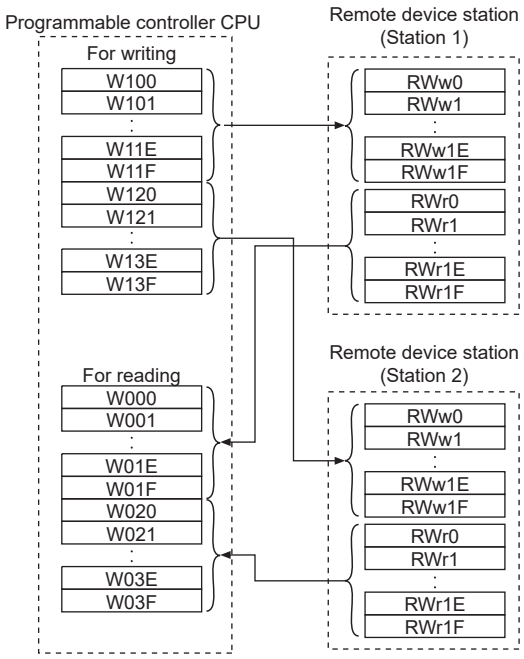
Link side			Master side		
Device name	Start	End	Device name	Start	End
SB	0000	013F	SB	0000	013F
SW	0000	013F	SW	0000	013F
RX	0000	003F	X	1000	103F
RY	0000	003F	Y	1000	103F
RWr	0000	003F	W	000000	00003F
RWw	0000	003F	W	000100	00013F

■ Schematic diagrams of remote I/O and remote register devices

- Remote I/O (RX and RY) transmitted between the programmable controller CPU and remote device stations

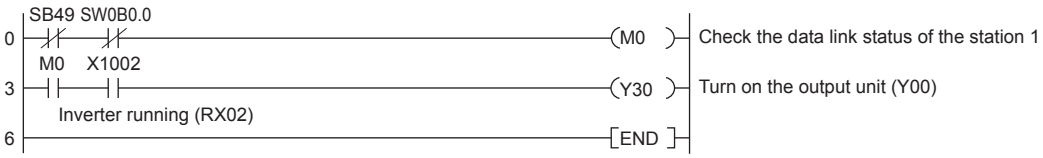


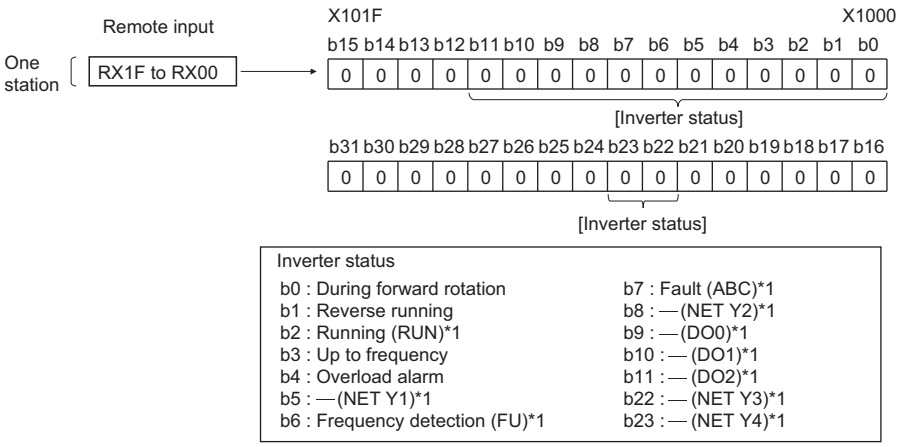
- Remote register areas (RWw and RWr) transmitted between the programmable controller CPU and the remote device stations



■Programming example for reading the inverter status

The following program turns ON the signal Y00 of the output unit when the station 1 inverter starts running.





*1 These signals are assigned in the initial status. Use **Pr.190 to Pr.196 and Pr.313 to Pr.315 (Output terminal function selection)** to change the output signals.

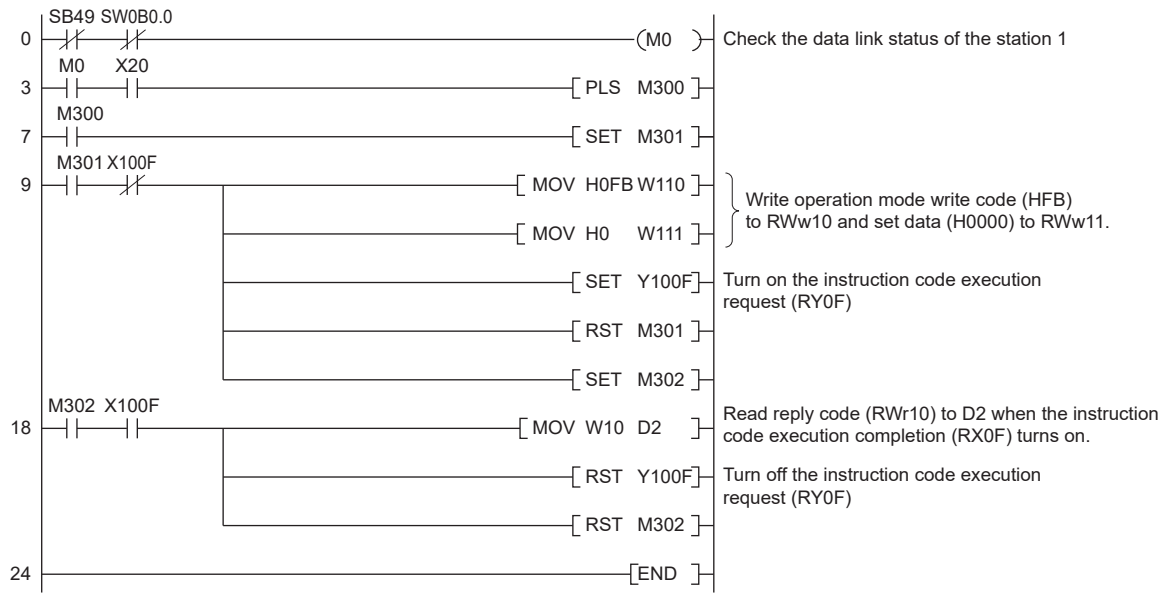
■Programming example for setting the operation mode

The following explains a program to write various data to the inverter.

The following program changes the operation mode of the station 1 inverter to network operation.

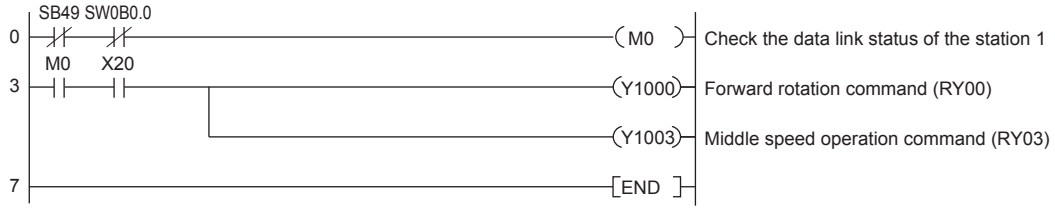
- Operation mode write code: HFB (hexadecimal)
- Network operation set data: H0000 (hexadecimal) (Refer to page 30.)

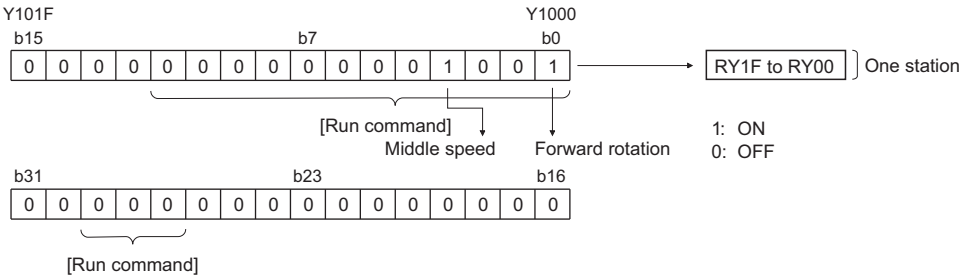
- The reply code to the instruction code execution is set in D2. (Refer to page 30 for the reply code (RWr10).)



■ Programming example for setting the operation commands

The following program gives a forward rotation command and middle-speed operation command to the station 1 inverter.





Run command	
b0 : Forward rotation command	b8 : — (NET X1)*1
b1 : Reverse rotation command	b9 : Output stop (MRS)*1
b2 : High-speed operation command (RH)*1	b10 : — (NET X2)*1
b3 : Middle-speed operation command (RM)*1	b11 : — (RES)*1
b4 : Low-speed operation command (RL)*1	b27 : — (NET X3)*1
b5 : JOG operation selection 2	b28 : — (NET X4)*1
b6 : Second function selection	b29 : — (NET X5)*1
b7 : Current input selection	

*1 These signals are assigned in the initial status. Use **Pr.180 to Pr.189 (Input terminal function selection)** to change the input signals. Some signals are not controllable by a command from the programmable controller depending on the setting. (For details, refer to the Instruction Manual (Function).)

■ Programming example for monitoring the output frequency

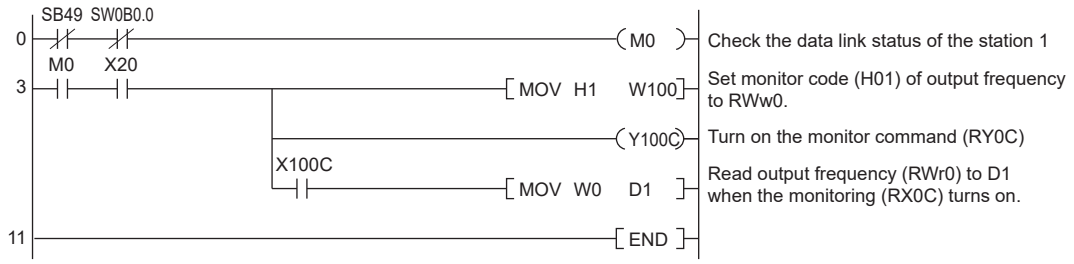
The following explains a program to read monitor functions of the inverter.

The following program reads the output frequency of the station 1 inverter to output to D1.

Output frequency read code: H0001 (hexadecimal)

For the monitor codes, refer to page 32.

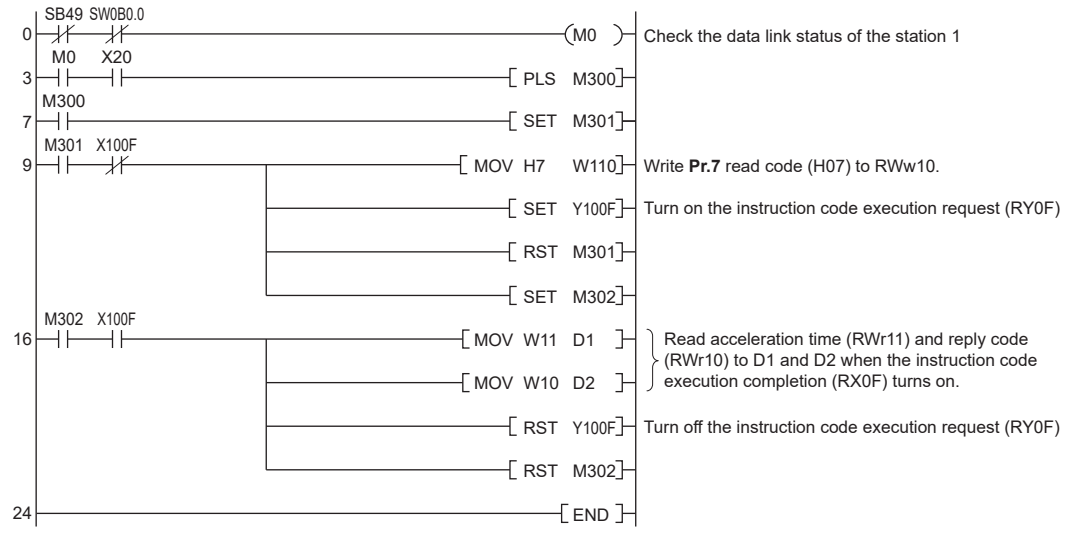
Example) The output frequency of 60 Hz is indicated as "H1770 (6000)".



■ Programming example for the parameter reading

The following program reads **Pr.7 Acceleration time** of the station 1 inverter to output to D1.

- **Pr.7 Acceleration time** reading instruction code: H07 (hexadecimal)
- For the instruction codes of parameters, refer to the Instruction Manual (Function).
- The reply code to the instruction code execution is set in D2. (Refer to page 30 for the reply code (RWr10).)



NOTE

- For the parameter assigned the number of 100 or higher, change the link parameter extended setting (set it to the one other than H00). For the setting values, refer to the parameter list of the Instruction Manual (Function).

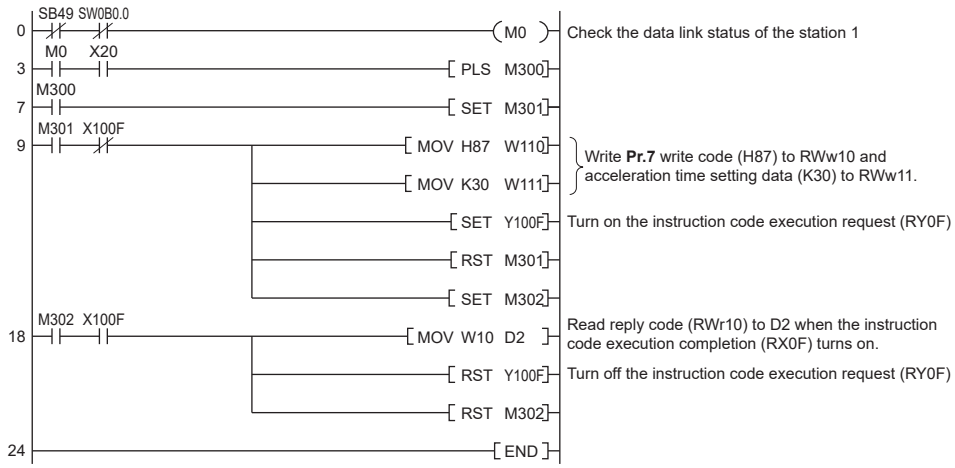
■ Programming example for the parameter writing

The following program changes the setting value in **Pr.7 Acceleration time** of the station 1 inverter to 3.0 seconds.

- Acceleration time writing instruction code: H87 (hexadecimal)
- Acceleration time setting data: K30 (decimal)

For the instruction codes of parameters, refer to the Instruction Manual (Function).

The reply code to the instruction code execution is set in D2. (Refer to page 30 for the reply code (RWr10).)



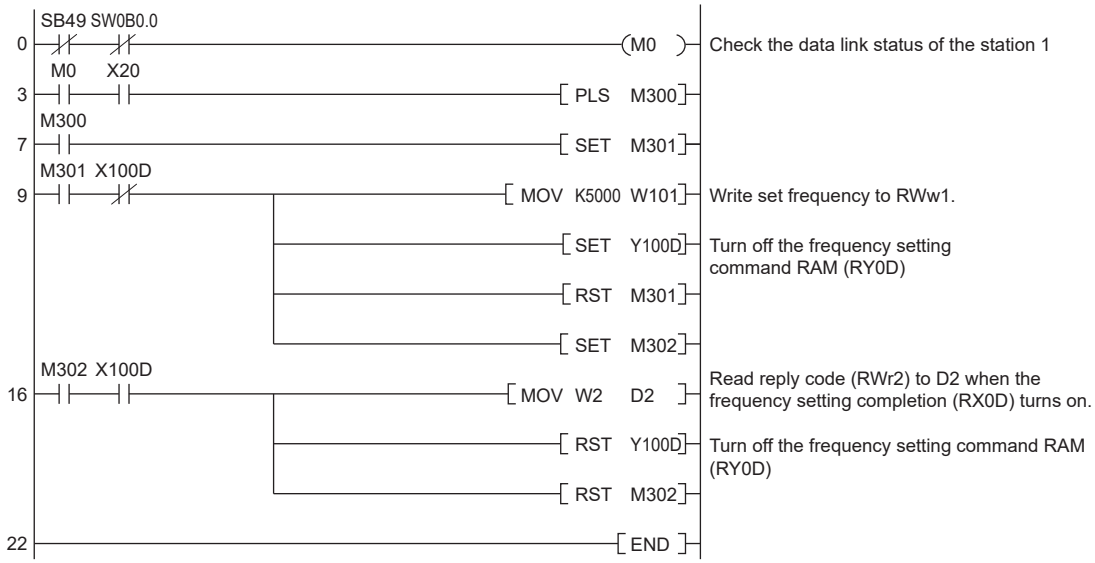
NOTE

- For the parameter assigned the number of 100 or higher, change the link parameter extended setting (set it to the one other than H00). For the setting values, refer to the parameter list of the Instruction Manual (Function).
- For other functions, refer to the instruction codes (refer to page 30).

■ Programming example for frequency setting

The following program changes the frequency setting of the station 1 inverter to 50.00 Hz.

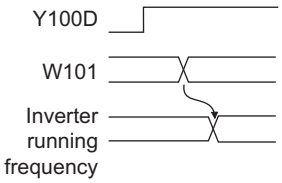
- Set frequency: K5000 (decimal)
- The reply code to the instruction code execution is set in D2. (Refer to page 30 for the reply code (RWr2).)



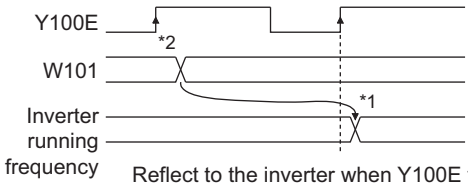
NOTE

- To change the set frequency continuously from a programmable controller, check that the frequency setting complete (for example, X100D) turns ON, and the reply code from the remote register is H0000. Then change the setting data (for example, W101) continuously.
- To write the set frequency to the EEPROM, change the following points in the program shown above.
  - Frequency setting command (from Y100D to Y100E)
  - Frequency setting completion (from X100D to X100E)

<Timing chart when writing to RAM>



<Timing chart when writing to EEPROM>



*1 To the EEPROM, a writing is performed only once after the command Y100E turns ON.

*2 If the set data is changed at the command Y100E ON, the change is not applied to the inverter.

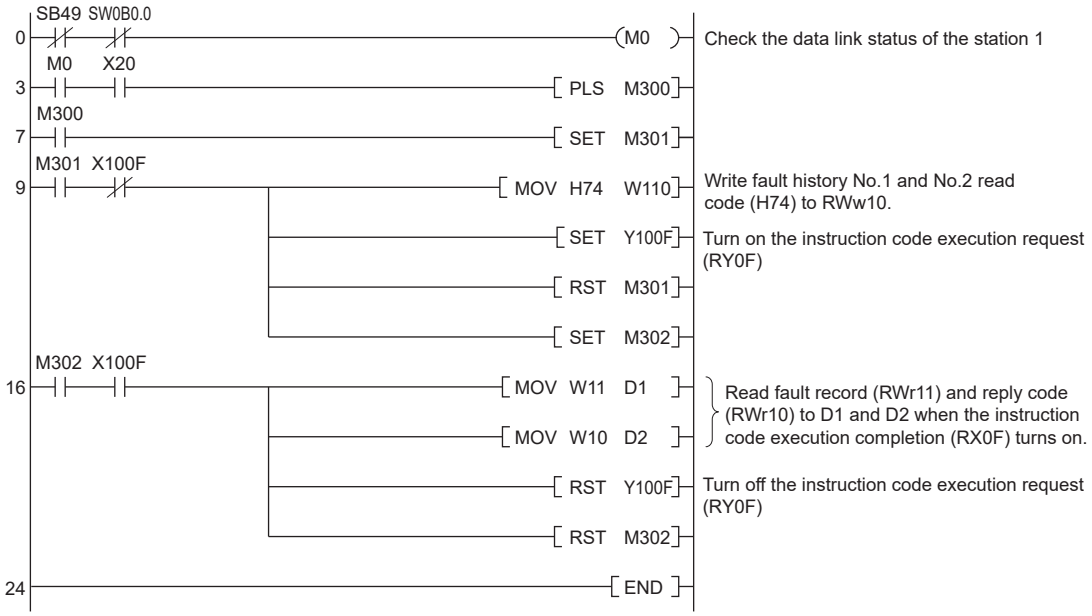
■Programming example for the fault record reading

The following program reads the fault records of the station 1 inverter to output to D1.

- Fault history No. 1 and 2 reading instruction code: H74 (hexadecimal)

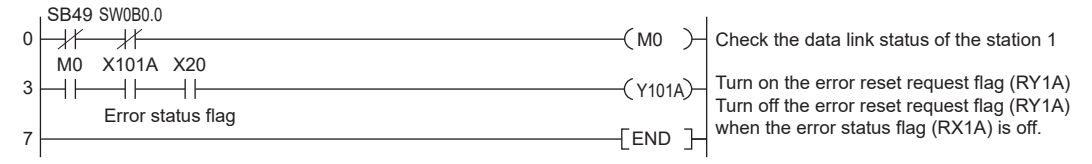
For the error codes, refer to the Instruction Manual (Maintenance).

The reply code to the instruction code execution is set in D2. (Refer to page 30 for the reply code (RWr10).)



■Programming example for resetting the inverter at an inverter fault

The following program resets the station 1 inverter at an inverter fault.



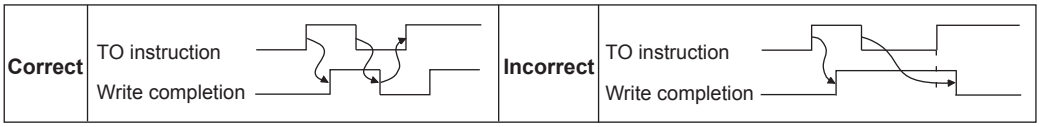
NOTE

- The inverter reset with the flag RY1A shown above is enabled at an inverter fault only.
- When **Pr.349 Communication reset selection** = "0", inverter reset is available independently of the operation mode.
- When using the instruction code execution request (RY0F) with the instruction code (HFD) and data (H9696) to reset the inverter, set a value other than "0" in **Pr.340 Communication startup mode selection** or change the operation mode to the Network operation mode. (For the program example, refer to page 37.)
- Refer to page 195 for operation conditions of inverter reset.

◆ Instructions

■ Programming instructions

- Since the buffer memory data of the master station is kept transferred (refreshed) to/from the inverters, the TO instruction need not be executed every scan in response to data write or read requests. The execution of the TO instruction every scan does not pose any problem.
- If the FROM/TO instruction is executed frequently, data may not be written reliably. When transferring data between the inverter and sequence program via the buffer memory, perform the handshake to confirm that data has been written without error.



■ Operating and handling instructions

- The commands only from the programmable controller can be accepted during CC-Link IE TSN communication. The run command from external and parameter unit is ignored.
- If multiple inverters have the same station number, the communication cannot be performed properly.
- If the programmable controller (master station) is reset during operation through the CC-Link IE TSN or if the programmable controller is powered off, data communication stops and the inverter protective function (E.EHR) is activated. To reset the programmable controller (master station), switch the operation mode to the External operation once, then reset the programmable controller.
- When **Pr.340** = "0", any inverter whose main power is restored is reset to return to the External operation mode. To resume the Network operation, therefore, set the operation mode to the Network operation using the sequence program. Set a value other than "0" in **Pr.340** to start in the Network operation mode after inverter reset. (For details of **Pr.340**, refer to the FR-E800 Instruction Manual (Function).)

■ Troubleshooting

Description	Point to be checked
Communication is not established.	Check that the communication speed is not set to 10 Mbps.
Operation mode does not switch to the Network operation mode.	Check that the Ethernet cable is installed correctly. (Check for contact fault, break in the cable, etc.)
	Check that the inverter is in the External operation mode.
	Check that the operation mode switching program is running.
	Check that the operation mode switching program has been written correctly.
Inverter does not start in the Network operation mode.	Check that the inverter starting program is running.
	Check that the inverter starting program has been written correctly.
	Check that **Pr.338 Communication operation command source** is not set to External.

2.6 CC-Link IE Field Network Basic

2.6.1 Outline

The CC-Link IE Field Network Basic enables CC-Link IE communication using the general-purpose Ethernet-based technology. The CC-Link IE Field Network Basic is suited to small-scale equipment for which high-speed control is not necessary, and can coexist with the standard Ethernet TCP/IP (HTTP, FTP, etc.).

◆Communication specifications

The communication specification varies depending on the specification of the master.

Item		Description
Transmission speed		100 Mbps (10 Mbps is not supported.)
Communication method		UDP
Number of connectable units		Master: 1 Slave: up to 64 stations (16 stations × 4 groups)*2
Connection cable		Ethernet cable (IEEE 802.3 100BASE-TX compliant cable or ANSI/TIA/EIA-568-B (Category 5) compliant shielded 4-pair branched cable)
Topology		Line, star, or a combination of line and star
Number of occupied stations		One station occupied
Maximum number of links per station	RX	64 (8 bytes)
	RY	64 (8 bytes)
	RWr	32 (64 bytes)
	RWw	32 (64 bytes)
Reference response time*1		Within 15 ms

*1 The reference response time is the period from when the inverter receives a command from the master until the inverter returns the response to the master.

*2 The specification differs depending on the date of manufacture of the inverter. Refer to page 198 and check the SERIAL number.

NOTE

- To use the CC-Link IE Field Network Basic, do not install the FR-A8NC E kit to the inverter. (Doing so disables communication through the CC-Link IE Field Network Basic.)

2.6.2 CC-Link IE Field Network Basic configuration

◆Procedure

The following shows the procedure to connect the inverter with a Mitsubishi Electric master device.

■Before communication

1. Connect each unit with an Ethernet cable. (Refer to page 13.)
2. Enter the IP address (**Pr.1434 to Pr.1437**). (Refer to page 15.)
3. Set "61450" (CC-Link IE Field Network Basic) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. (Refer to page 46.)
   (Example: **Pr.1429** = "45238" (CC-Link IE TSN) (initial value) → "61450" (CC-Link IE Field Network Basic))
   When **Pr.1429** = "45238 (initial value)" (CC-Link IE TSN), change the value to "61450" (CC-Link IE Filed Network Basic). When "45238" is set in the parameter, "61450" becomes invalid.
4. Reset the inverter, or turn OFF and then ON the power.

■ Registering a profile

1. Start the engineering software (GX Works3).
2. On the menu bar, select [Tool] > [Profile Management] > [Register...].
3. Select a CSP+ file to be registered on the "Register Profile" screen, and click the [Register] button.

NOTE

- A profile is a compressed file (such as *.zip, *.ipar, and *.cspp). Register a profile without decompressing the file.
- Profile registration is not required for the next time onwards.

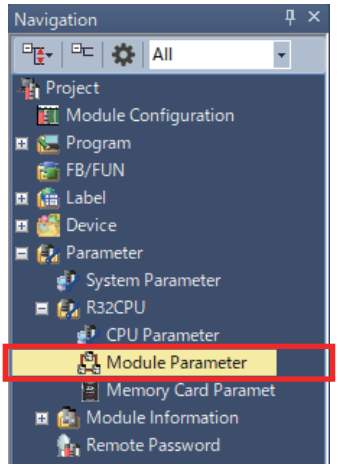
■ Creating a project file

1. For information on creating and opening a project, go to [Help] > [GX Works3 Help].

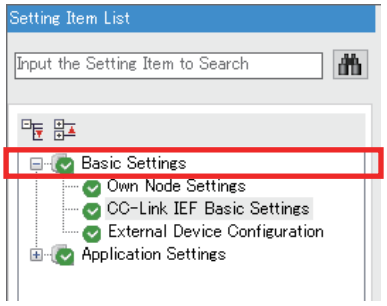
■ Detecting an Inverter

Detection is not possible when the data link is not established with the master module. For details, refer to the Master Module User's Manual.

1. In the "Navigation" window, select [Parameter] > [Module Parameter].

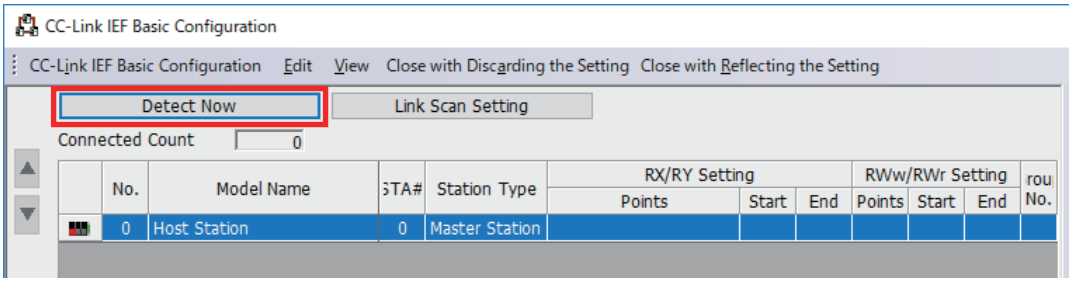


2. Select [Basic Settings] in the "Setting Item List" window.

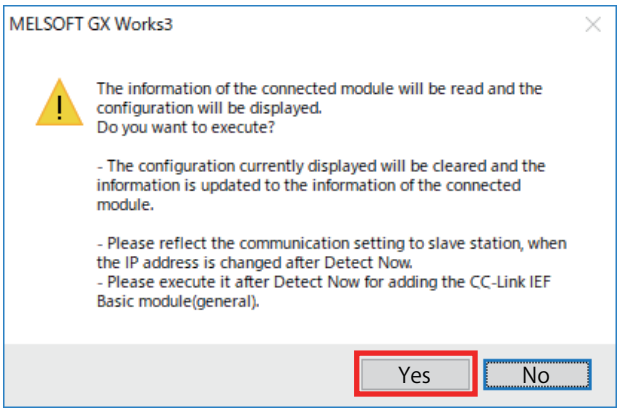


3. In the "CC-Link IEF Basic Configuration" window, go to [Network Configuration Settings] then click [...] next to the [Detailed Setting] field.

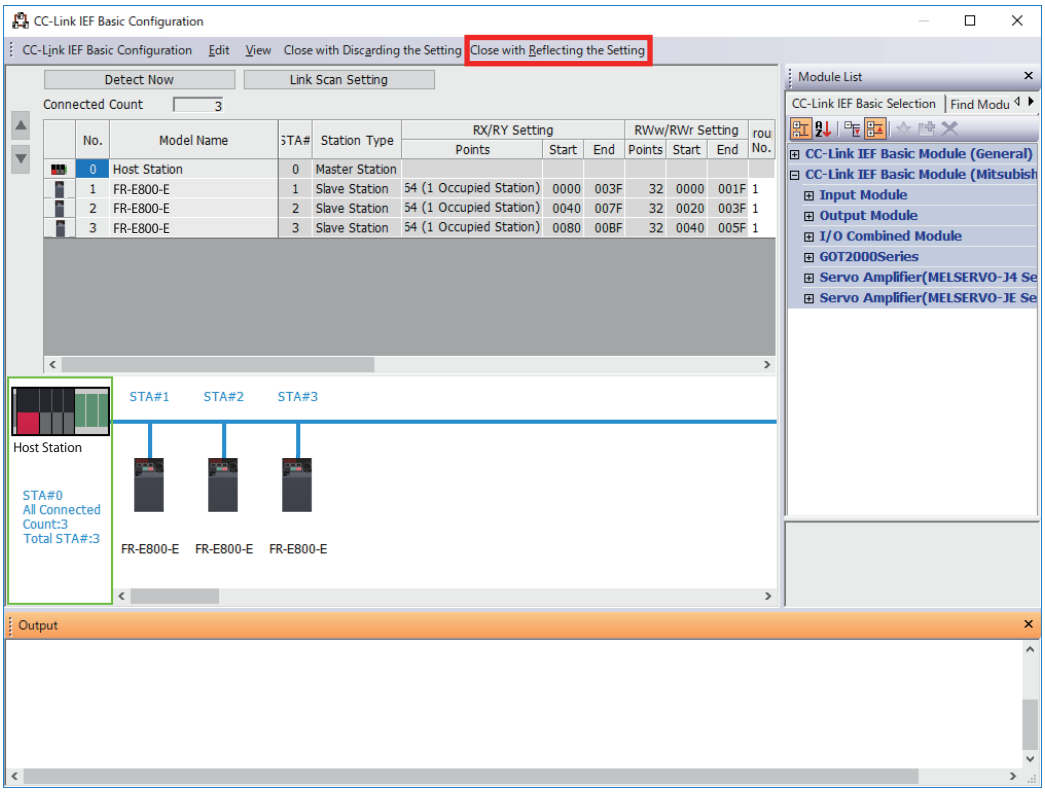
4. In the "CC-Link IEF Basic Configuration" window, click [Detect Now].



5. Check the "MELSOFT GX Works3" dialog, and click [Yes].



6. The FR-E800-E or the FR-E800-SCE will appear on the screen when it is detected. (FR-E800-E inverters are displayed in the following example.) Click [Close with Reflecting the Setting] to close the window.



■Checking communication

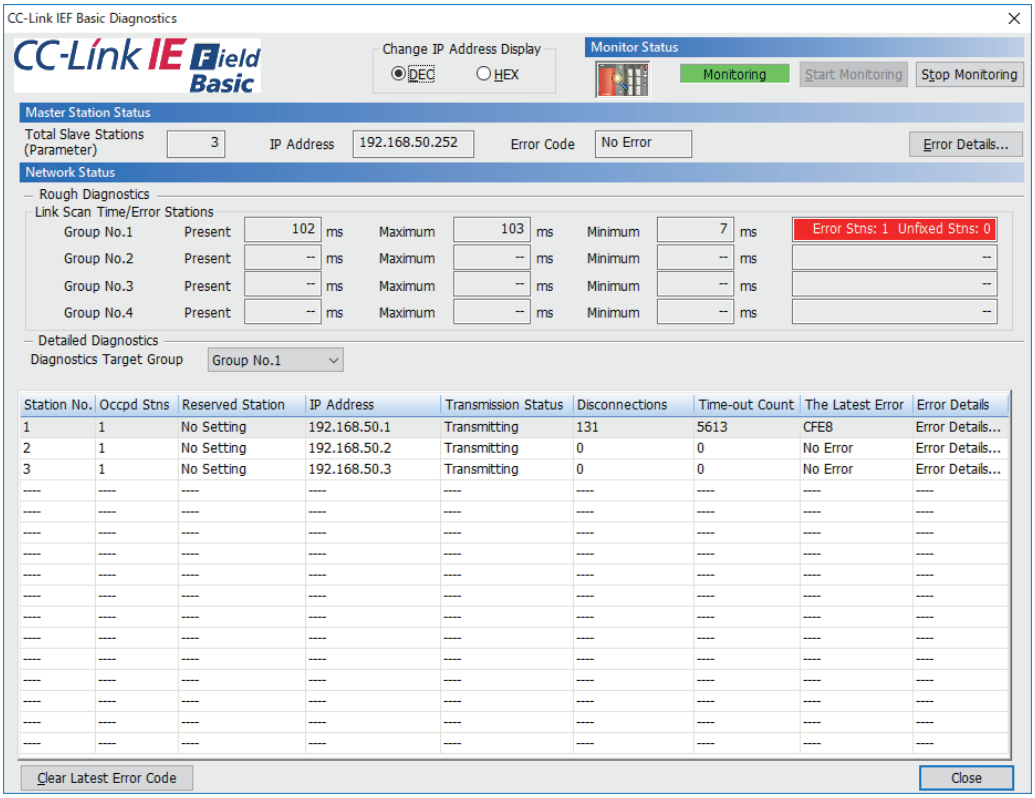
The following table shows the status of the LEDs when the programmable controller and the inverter are connected successfully. Check the [CC Link IEF Basic Diagnostics] window to confirm that the communication is established between them.

NS	MS	LINK1	LINK2
OFF	Solid green	Blinking green*1	

*1 The LED on either LINK1 or LINK2 will blink depending on the port (port 1 or 2) the Ethernet cable is connected to.

NOTE

- If the FR-E800-(SC)E cannot be detected, on the menu bar select [Diagnostics (D)] > [CC Link IEF Basic Diagnostics]. The "CC Link IEF Basic Diagnostics" window will be displayed. The network status or fault records can be checked.



2.6.3 Initial setting for CC-Link IE Field Network Basic

Use the following parameters to perform required settings for Ethernet communication between the inverter and other devices. To make communication between other devices and the inverter, perform the initial settings of the inverter parameters to match the communication specifications of the devices. Data communication cannot be made if the initial settings are not made or if there is any setting error.

Pr.	Name	Initial value	Setting range	Description
1427 N630[*1]	**Ethernet function selection 1**	5001	502, 5000 to 5002, 5006 to 5008, 5010 to 5013, 9999, 34962[*3], 44818[*2], 45237, 45238, 47808[*2], 61450	Set the application, protocol, etc.
1428 N631[*1]	**Ethernet function selection 2**	45237		
1429 N632[*1]	**Ethernet function selection 3**	45238		
1430 N633[*1]	**Ethernet function selection 4**	9999		
1432 N644	**Ethernet communication check time interval**	1.5 s	0	Ethernet communication is available, but the inverter output is shut off in the NET operation mode.
			0.1 to 999.8 s	Set the interval of the communication check (signal loss detection) time for all devices with IP addresses in the range specified for Ethernet command source selection (**Pr.1449 to Pr.1454**). If a no-communication state persists for longer than the permissible time, the inverter output will be shut off.
			9999	No communication check (signal loss detection)

Pr.	Name	Initial value	Setting range	Description
1449 N670*1	Ethernet command source selection IP address 1	0	0 to 255	To limit the network devices that send the operation or speed command through the Ethernet network, set the range of IP addresses of the devices. When **Pr.1449 to Pr.1452** = "0 (initial value)", no IP address is specified for command source selection via Ethernet. In this case, operation commands cannot be sent via Ethernet.
1450 N671*1	Ethernet command source selection IP address 2	0		
1451 N672*1	Ethernet command source selection IP address 3	0		
1452 N673*1	Ethernet command source selection IP address 4	0		
1453 N674*1	Ethernet command source selection IP address 3 range specification	9999	0 to 255, 9999	
1454 N675*1	Ethernet command source selection IP address 4 range specification	9999		

*1 The setting is applied after an inverter reset or next power-ON.
*2 The setting is available only for the FR-E800-EPA and the FR-E800-SCEPA.
*3 The setting is available only for the FR-E800-EPB and the FR-E800-SCEPB.

NOTE

- The monitor items and parameter settings can be read during communication with the **Pr.1432 Ethernet communication check time interval** = "0 (initial value)" setting, but such operation will become faulty once the operation mode is changed to the NET operation mode. When the NET operation mode is selected as the start-up operation mode, communication is performed once, then an Ethernet communication fault (E.EHR) occurs.
  To perform operation or parameter writing via communication, set **Pr.1432** to "9999" or a value larger than the communication cycle or retry time setting. (Refer to page 48.)
- When the CC-Link IE Field Network Basic is used, a communication error (E.EHR) occurs regardless of the **Pr.1432 Ethernet communication check time interval** setting in the following cases: the data addressed to the own station is not received for the predetermined timeout period or longer, or the status bit of the cyclic transmission addressed to the own station turns OFF (when the master inverter gives a command to stop the cyclic transmission). (For the details of the timeout period, status bit of the cyclic transmission, and command to stop the cyclic transmission, refer to the User's Manual of the master device which supports the CC-Link IE Field Network Basic.)

◆ Ethernet function selection (Pr.1427 to Pr.1430)

To select the CC-Link IE Field Network Basic for the application, set "61450" (CC-Link IE Field Network Basic) in any parameter from **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. When **Pr.1429** = "45238 (initial value)" (CC-Link IE TSN), change the value to "61450" (CC-Link IE Filed Network Basic). When "45238" is set in the parameter, "61450" becomes invalid.

NOTE

- Change the setting if selected communication protocols cannot be used together. (Refer to page 5 and page 151.)

◆ Ethernet IP address for command source selection (Pr.1449 to Pr.1454)

- To limit the network devices that send the operation or speed command through the Ethernet network, set the range of IP addresses of the devices.
- When **Pr.1449 to Pr.1452** = "0 (initial value)", no IP address is specified for command source selection via Ethernet. In this case, operation commands cannot be sent via Ethernet.

- The setting range for command source selection depends on the settings in **Pr.1451** and **Pr.1453**, and **Pr.1452** and **Pr.1454**. (Either of the settings can be larger than the other in **Pr.1451** and **Pr.1453**, and **Pr.1452** and **Pr.1454**.)

[Setting example 1]

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	1	100
			Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	—	—	3	150

The range is between the values set in both parameters.

The range is between the values set in both parameters.

In this case, the IP address range for command source selection via Ethernet communication is "192.168.x (1 to 3).xxx (100 to 150)".

[Setting example 2]

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	2	100
			Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	—	—	9999	50

The range is between the values set in both parameters.

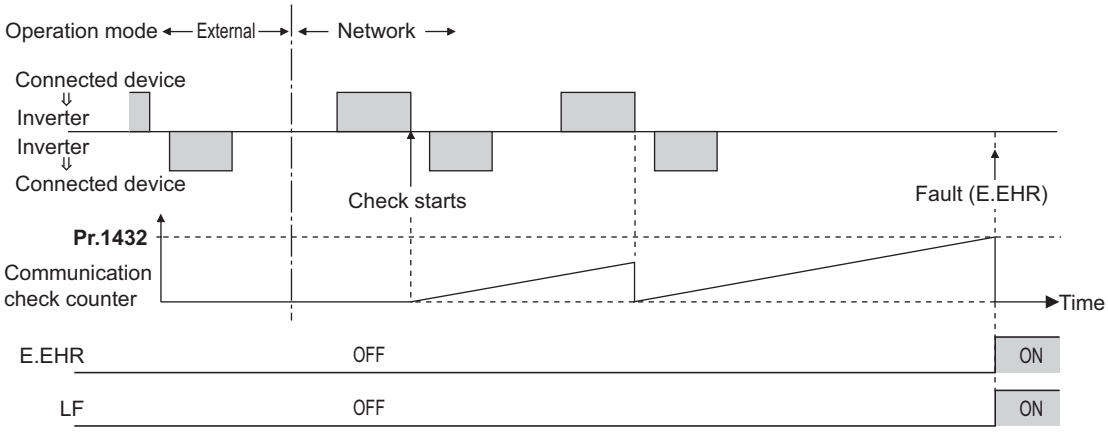
In this case, the IP address range in which Ethernet communication is permitted is "192.168.2.xxx (50 to 100)".

- When "9999 (initial value)" is set in **Pr.1453 or Pr.1454**, the range is invalid.

◆ Ethernet communication check time interval (Pr.1432)

- If a signal loss (communication stop) is detected between the inverter and all the devices with IP addresses in the range for Ethernet command source selection (**Pr.1449 to Pr.1454**) as a result of a signal loss detection, a communication error (E.EHR) occurs and the inverter output will be shut off.
- When "9999" is set in **Pr.1432**, the communication check (signal loss detection) will not be performed.
- The monitor items and parameter settings can be read via Ethernet when "0" is set in **Pr.1432**, but a communication error (E.EHR) occurs instantly when the operation mode is switched to the Network operation.
- A signal loss detection is made when any of 0.1 s to 999.8 s is set in **Pr.1432**. In order to enable the signal loss detection, data must be sent by connected devices at an interval equal to or less than the time set for the communication check. (The inverter makes a communication check (clearing of communication check counter) regardless of the station number setting of the data sent from the master).
- Communication check is started at the first communication when the inverter operates in the Network operation mode and the command source is specified as communication via the Ethernet connector.

Example) When **Pr.1432** = 0.1 to 999.8 s



2.6.4 Parameters related to CC-Link IE Field Network Basic

The following parameters are used for CC-Link IE Field Network Basic communication. Set the parameters as required.

Pr.	Name	Initial value	Setting range	Description
541 **N100**	**Frequency command sign selection**	0	0	Signed frequency command value
			1	Unsigned frequency command value
544 **N103**[*1]	**CC-Link extended setting**	0	0, 1, 12, 14, 18, 100, 112, 114, 118	The function of the remote registers can be extended when the CC-Link IE Field Network Basic is used.
1426 **N641**[*1]	**Link speed and duplex mode selection**	0	0 to 4	Set the communication speed and the communication mode (full-duplex/half-duplex).
1442 **N660**[*1]	**IP filter address 1 (Ethernet)**	0	0 to 255	Set the range of connectable IP addresses for the network devices. (When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.)
1443 **N661**[*1]	**IP filter address 2 (Ethernet)**	0		
1444 **N662**[*1]	**IP filter address 3 (Ethernet)**	0		
1445 **N663**[*1]	**IP filter address 4 (Ethernet)**	0		
1446 **N664**[*1]	**IP filter address 2 range specification (Ethernet)**	9999	0 to 255, 9999	
1447 **N665**[*1]	**IP filter address 3 range specification (Ethernet)**	9999		
1448 **N666**[*1]	**IP filter address 4 range specification (Ethernet)**	9999		
804 **D400**	**Torque command source selection**	0	0, 1, 3 to 6	In the torque control mode, the torque command source can be selected.
810 **H700**	**Torque limit input method selection**	0	0 to 2	The torque limit input method can be selected.

*1 The setting is applied after an inverter reset or next power-ON.

◆ CC-Link extended setting (Pr.544)

- Use this parameter to select the function of the remote registers for the CC-Link IE Field Network Basic.

Pr.544 setting	Description		Refer to page
0 (initial value)	Compatible with CC-Link Ver.1		50
1	Compatible with CC-Link Ver.1		51
12	Compatible with the double setting of CC-Link Ver.2		51
14	Compatible with the quadruple setting of CC-Link Ver.2		52
18	Compatible with the octuple setting of CC-Link Ver.2		52
100	Compatible with CC-Link Ver.1	PLC function	—[*1]
112	Compatible with the double setting of CC-Link Ver.2		
114	Compatible with the quadruple setting of CC-Link Ver.2		
118	Compatible with the octuple setting of CC-Link Ver.2		

*1 Refer to the PLC Function Programming Manual.

◆ Frequency command with sign (Pr.541)

- The start command (forward/reverse rotation) can be inverted by adding a plus or minus sign to the value of the frequency command sent through the CC-Link IE Field Network Basic.

- The **Pr.541 Frequency command sign selection** setting is applied to the frequency command from RWw1. (Refer to page 56.)

Rotations per minute (machine speed) setting using Pr.37 and Pr.53	Pr.541 setting	Sign	Setting range	Actual frequency command
Disabled	0	Without	0 to 59000	0 to 590.00 Hz
	1	With	-32768 to 32767 (two's complement)	-327.68 to 327.67 Hz
Enabled	0	Without	0 to 65535	The rotation speed command or the machine speed command is selected depending on the **Pr.37 and Pr.53** settings. (1 increments)
	1	With	-32768 to 32767 (two's complement)	

- Relationship between the start command and sign (**Pr.541** = "1")

Start command	Sign of the frequency command	Actual operation command
Forward rotation	+	Forward rotation
	-	Reverse rotation
Reverse rotation	+	Reverse rotation
	-	Forward rotation

NOTE

- When **Pr.541** = "1" (with sign)
  - When EEPROM write is specified by turning ON of RYE, write mode error (error code H01) will occur.
  - When both RYD and RYE are turned ON while both of them are enabled (**Pr.544** ≠ "0"), RYD has precedence.
  - When power is turned ON (inverter reset), the initial setting status of the sign bit is "positive" and the set frequency is 0 Hz. (The motor does not operate at the frequency set before turning OFF the power (inverter reset).)
  - When set frequency is written with the instruction code of HED or HEE, the sign of the frequency command is not changed.

◆I/O signal list

■When Pr.544 = "0" (compatible with CC-Link Ver.1)

- Remote I/O signals

Device No.*7	Signal	Refer to page
RYn0	Forward rotation command*2	54
RYn1	Reverse rotation command*2	54
RYn2	High-speed operation command (terminal RH function)*1	54
RYn3	Middle-speed operation command (terminal RM function)*1	54
RYn4	Low-speed operation command (terminal RL function)*1	54
RYn5	JOG operation selection 2*2	54
RYn6	Second function selection*2	54
RYn7	Current input selection*2	54
RYn8	**Pr.185** assignment function (NET X1)*5	54
RYn9	Output stop (terminal MRS function)*1	54
RYnA	**Pr.186** assignment function (NET X2)*5	54
RYnB	**Pr.184** assignment function (RES)*5	54
RYnC	Monitor command	54
RYnD	Frequency setting command (RAM)	54
RYnE	Frequency setting command (RAM, EEPROM)	54
RYnF	Instruction code execution request	54
RY(n+1)0 to RY(n+1)7	Reserved	—

Device No.*7	Signal	Refer to page
RXn0	Forward running	55
RXn1	Reverse running	55
RXn2	Running (terminal RUN function)*3	55
RXn3	Up to frequency*2	55
RXn4	Overload warning*2	55
RXn5	**Pr.193** assignment function (NET Y1)*6	55
RXn6	Frequency detection (terminal FU function)*3	55
RXn7	Fault (terminal ABC function)*3	55
RXn8	**Pr.194** assignment function (NET Y2)*6	55
RXn9	**Pr.313** assignment function (DO0)*4	55
RXnA	**Pr.314** assignment function (DO1)*4	55
RXnB	**Pr.315** assignment function (DO2)*4	55
RXnC	Monitoring	55
RXnD	Frequency setting completion (RAM)	55
RXnE	Frequency setting completion (RAM, EEPROM)	55
RXnF	Instruction code execution completed	55
RX(n+1)0 to RX(n+1)5	Reserved	—
RX(n+1)6	**Pr.195** assignment function (NET Y3)*6	55
RX(n+1)7	**Pr.196** assignment function (NET Y4)*6	55

Device No.[*7]	Signal	Refer to page
RY(n+1)8	Not used (initial data process completion flag)	—
RY(n+1)9	Not used (initial data process request flag)	—
RY(n+1)A	Error reset request flag	54
RY(n+1)B	**Pr.187** assignment function (NET X3)[*5]	54
RY(n+1)C	**Pr.188** assignment function (NET X4)[*5]	54
RY(n+1)D	**Pr.189** assignment function (NET X5)[*5]	54
RY(n+1)E	Reserved	—
RY(n+1)F		

Device No.[*7]	Signal	Refer to page
RX(n+1)8	Not used (initial data process request flag)	—
RX(n+1)9	Not used (initial data process completion flag)	—
RX(n+1)A	Error status flag	55
RX(n+1)B	Remote station ready	55
RX(n+1)C to RX(n+1)F	Reserved	—

*1 These signals are set in the initial setting. Using **Pr.180 to Pr.183**, input signals assigned to the device numbers can be changed. For details of **Pr.180 to Pr.183**, refer to the FR-E800 Instruction Manual (Function).

*2 The signals are fixed. They cannot be changed using parameters.

*3 These signals are set in the initial setting. Using **Pr.190 to Pr.192**, output signals assigned to the device numbers can be changed. For details of **Pr.190 to Pr.192**, refer to the FR-E800 Instruction Manual (Function).

*4 Output signal can be assigned using **Pr.313 to Pr.315**. For details, refer to the description of **Pr.190 to Pr.196 (Output terminal function selection)** in the FR-E800 Instruction Manual (Function).

*5 Input signals can be assigned using **Pr.184 to Pr.189**. For details, refer to the description of **Pr.184 to Pr.189 (Input terminal function selection)** in the FR-E800 Instruction Manual (Function).

*6 Output signals can be assigned using **Pr.193 to Pr.196**. For details, refer to the description of **Pr.193 to Pr.196 (Output terminal function selection)** in the FR-E800 Instruction Manual (Function).

*7 "n" indicates a value determined by the station number.

- Remote registers

Address[*5]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	55
RWwn+1	Set frequency (0.01 Hz increments) / torque command[*2*3]		56
RWwn+2	H00 (arbitrary)[*1]	Instruction code	56
RWwn+3	Data to be written		56

Address[*5]	Description	Refer to page
RWrn	First monitor value[*4]	57
RWrn+1	Second monitor value[*4]	57
RWrn+2	Reply code	57
RWrn+3	Data to be read	57

*1 The upper 8 bits always contains H00 even a different value is set.

*2 When **Pr.804** = "3 or 5" during torque control under Real sensorless vector control or Vector control, a torque command value is set in RWwn+1.

*3 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**.

*4 When the output frequency or the set frequency is selected as the monitor item, rotations per minute or machine speed may be displayed depending on the **Pr.37** and **Pr.53** settings.

*5 "n" indicates a value determined by the station number.

■When Pr.544 = "1" (compatible with CC-Link Ver.1)

- Remote I/O signals

  Settings are the same as those when **Pr.544** = "0". (Refer to page 50.)

- Remote registers

Address[*4]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	55
RWwn+1	Set frequency (0.01 Hz increments) / torque command[*1*2]		56
RWwn+2	Link parameter extended setting	Instruction code	56
RWwn+3	Data to be written		56

Address[*4]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value[*3]		57
RWrn+1	Second monitor value[*3]		57
RWrn+2	Reply code 2	Reply code 1	57
RWrn+3	Data to be read		57

*1 When **Pr.804** = "3 or 5" during torque control under Real sensorless vector control or Vector control, a torque command value is set in RWwn+1.

*2 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**.

*3 When the output frequency or the set frequency is selected as the monitor item, rotations per minute or machine speed may be displayed depending on the **Pr.37** and **Pr.53** settings.

*4 "n" indicates a value determined by the station number.

■When Pr.544 = "12" (Compatible with the double setting of CC-Link Ver.2)

- Remote I/O signals

  Settings are the same as those when **Pr.544** = "0". (Refer to page 50.)

- Remote registers

Address[*4]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	55
RWwn+1	Set frequency (0.01 Hz increments) / torque command[*1][*2]		56
RWwn+2	Link parameter extended setting	Instruction code	56
RWwn+3	Data to be written		56
RWwn+4	Monitor code 3		56
RWwn+5	Monitor code 4		56
RWwn+6	Monitor code 5		56
RWwn+7	Monitor code 6		56

Address[*4]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value[*3]		57
RWrn+1	Second monitor value[*3]		57
RWrn+2	Reply code 2	Reply code 1	57
RWrn+3	Data to be read		57
RWrn+4	Third monitor value[*3]		57
RWrn+5	Fourth monitor value[*3]		57
RWrn+6	Fifth monitor value[*3]		57
RWrn+7	Sixth monitor value[*3]		57

*1 When **Pr.804** = "3 or 5" during torque control under Real sensorless vector control or Vector control, a torque command value is set in RWwn+1.
*2 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**.
*3 When the output frequency or the set frequency is selected as the monitor item, rotations per minute or machine speed may be displayed depending on the **Pr.37** and **Pr.53** settings.
*4 "n" indicates a value determined by the station number.

■ When Pr.544 = "14" (Compatible with the quadruple setting of CC-Link Ver.2)

- Remote I/O signals

  Settings are the same as those when **Pr.544** = "0". (Refer to page 50.)

- Remote registers

Address[*4]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	55
RWwn+1	Set frequency (0.01 Hz increments)[*2]		56
RWwn+2	Link parameter extended setting	Instruction code	56
RWwn+3	Data to be written		56
RWwn+4	Monitor code 3		56
RWwn+5	Monitor code 4		56
RWwn+6	Monitor code 5		56
RWwn+7	Monitor code 6		56
RWwn+8	Fault record No.	H00	56
RWwn+9	PID set point (0.01% increments)[*1]		56
RWwn+A	PID measured value (0.01% increments)[*1]		56
RWwn+B	PID deviation (0.01% increments)[*1]		56
RWwn+C	Torque command or torque limit		56, 62
RWwn+D	H00 (Free)		—
RWwn+E			
RWwn+F			

Address[*4]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value[*3]		57
RWrn+1	Second monitor value[*3]		57
RWrn+2	Reply code 2	Reply code 1	57
RWrn+3	Data to be read		57
RWrn+4	Third monitor value[*3]		57
RWrn+5	Fourth monitor value[*3]		57
RWrn+6	Fifth monitor value[*3]		57
RWrn+7	Sixth monitor value[*3]		57
RWrn+8	Fault record No.	Fault record (fault data)	57
RWrn+9	Fault record (output frequency)		57
RWrn+A	Fault record (output current)		57
RWrn+B	Fault record (output voltage)		57
RWrn+C	Fault record (energization time)		57
RWrn+D	H00 (Free)		—
RWrn+E			
RWrn+F			

*1 When **Pr.128** = "50, 51, 60, or 61", the register is valid. When **Pr.128** = "1000 to 2011", the register is valid depending on the setting in **Pr.609 or Pr.610**.
*2 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**.
*3 When the output frequency or the set frequency is selected as the monitor item, rotations per minute or machine speed may be displayed depending on the **Pr.37** and **Pr.53** settings.
*4 "n" indicates a value determined by the station number.

■ When Pr.544 = "18" (Compatible with the octuple setting of CC-Link Ver.2)

- Remote I/O signals

  Settings are the same as those when **Pr.544** = "0". (Refer to page 50.)

- Remote registers

Address[*4]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	55
RWwn+1	Set frequency (0.01 Hz increments)[*2]		56

Address[*4]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value[*3]		57
RWrn+1	Second monitor value[*3]		57

Address[*4]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn+2	Link parameter extended setting	Instruction code	56
RWwn+3	Data to be written		56
RWwn+4	Monitor code 3		56
RWwn+5	Monitor code 4		56
RWwn+6	Monitor code 5		56
RWwn+7	Monitor code 6		56
RWwn+8	Fault record No.	H00	56
RWwn+9	PID set point (0.01% increments)[*1]		56
RWwn+A	PID measured value (0.01% increments)[*1]		56
RWwn+B	PID deviation (0.01% increments)[*1]		56
RWwn+C	Torque command or torque limit		56, 62
RWwn+D	H00 (Free)		—
RWwn+E	H00 (Free)		
RWwn+F	H00 (Free)		
RWwn+10	Link parameter extended setting	Instruction code	56
RWwn+11	Data to be written		56
RWwn+12	Link parameter extended setting	Instruction code	56
RWwn+13	Data to be written		56
RWwn+14	Link parameter extended setting	Instruction code	56
RWwn+15	Data to be written		56
RWwn+16	Link parameter extended setting	Instruction code	56
RWwn+17	Data to be written		56
RWwn+18	Link parameter extended setting	Instruction code	56
RWwn+19	Data to be written		56
RWwn+1A	H00 (Free)		—
RWwn+1B			
RWwn+1C			
RWwn+1D			
RWwn+1E			
RWwn+1F			

Address[*4]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn+2	Reply code 2	Reply code 1	57
RWrn+3	Data to be read		57
RWrn+4	Third monitor value[*3]		57
RWrn+5	Fourth monitor value[*3]		57
RWrn+6	Fifth monitor value[*3]		57
RWrn+7	Sixth monitor value[*3]		57
RWrn+8	Fault record No.	Fault record (fault data)	57
RWrn+9	Fault record (output frequency)		57
RWrn+A	Fault record (output current)		57
RWrn+B	Fault record (output voltage)		57
RWrn+C	Fault record (energization time)		57
RWrn+D	H00 (Free)		—
RWrn+E			
RWrn+F			
RWrn+10	Reply code		57
RWrn+11	Data to be read		57
RWrn+12	Reply code		57
RWrn+13	Data to be read		57
RWrn+14	Reply code		57
RWrn+15	Data to be read		57
RWrn+16	Reply code		57
RWrn+17	Data to be read		57
RWrn+18	Reply code		57
RWrn+19	Data to be read		57
RWrn+1A	H00 (Free)		—
RWrn+1B			
RWrn+1C			
RWrn+1D			
RWrn+1E			
RWrn+1F			

*1 When **Pr.128** = "50, 51, 60, or 61", the register is valid. When **Pr.128** = "1000 to 2011", the register is valid depending on the setting in **Pr.609 or Pr.610**.

*2 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**.

*3 When the output frequency or the set frequency is selected as the monitor item, rotations per minute or machine speed may be displayed depending on the **Pr.37** and **Pr.53** settings.

*4 "n" indicates a value determined by the station number.

◆ Details of the I/O signals

The device numbers described in this section are for the station number 1. For the station number 2 and later, the device numbers are different. (Refer to the manual for the CC-Link master module for the correspondence between device numbers and station numbers.)

■ Output signals (from the master module to the inverter)

Output signals from the master module are as follows. (Input signals to the inverter)

Device No.	Signal	Description	
RY0	Forward rotation command[*2]	0: Stop command 1: Forward rotation start	When "1" is set, a start command is input to the inverter. When "1" is set in RY0 and RY1, a stop command is input.
RY1	Reverse rotation command[*2]	0: Stop command 1: Reverse rotation start	
RY2	High-speed operation command (terminal RH function)[*1]	Functions assigned to **Pr.180 to Pr.182** are activated.	
RY3	Middle-speed operation command (terminal RM function)[*1]		
RY4	Low-speed operation command (terminal RL function)[*1]		
RY5	JOG operation selection 2[*2]	JOG2 signal	
RY6	Second function selection[*2]	RT signal	
RY7	Current input selection[*2]	AU signal	
RY8	— (terminal NET X1 function)[*3]	The function assigned to **Pr.185** is activated.	
RY9	Output stop (terminal MRS function)[*1]	The function assigned to **Pr.183** is activated.	
RYA	— (terminal NET X2 function)[*3]	The function assigned to **Pr.186** is activated.	
RYB	— (Function of terminal RES)[*3]	The function assigned to **Pr.184** is activated.	
RYC	Monitor command	When "1" is set in RYC, the monitored value is set in the remote register RWr0, 1, 4 to 7, and "1" is set in RXC (device for the Monitoring signal). While "1" is set in RYC, the monitored data is always updated.	
RYD[*5]	Frequency setting command / torque command (RAM)	When "1" is set in RYD, the set frequency / torque command (RWw1) is written to the RAM of the inverter.[*4] After the writing completes, "1" is set in the frequency setting / torque command completion (RXD). Under Real sensorless vector control, Vector control, and PM sensorless vector control, the following value is also written to RAM at the same time. • During torque control[*7]: Torque command value • During speed control: Torque limit value	
RYE[*5]	Frequency setting command / torque command (RAM, EEPROM)	When "1" is set in RYE, the set frequency / torque command (RWw1) is written to the RAM and EEPROM of the inverter. After the writing completes, "1" is set in the frequency setting / torque command completion (RXE). Under Real sensorless vector control, vector control, and PM sensorless vector control, the following value is also written to RAM and EEPROM at the same time. • During torque control[*7]: Torque command value • During speed control: Torque limit value To change the frequency consecutively, be sure to write data to the RAM of the inverter.	
RYF[*5]	Instruction code execution request	At the ON edge of RYF, processing corresponding to the instruction codes set to RWw2, 10, 12, 14, 16, and 18 are executed. "1" is set in the instruction code execution completed (RXF) after completion of instruction codes. When an instruction code execution error occurs, a value other than "0" is set in the reply code (RWr2, 10, 12, 14, 16, or 18).	
RY1A	Error reset request flag	When "1" is set in RY1A at an inverter fault, the inverter is reset, and then "0" is set in the error status flag (RX1A).[*6]	
RY1B	— (terminal NET X3 function)[*3]	Functions assigned to **Pr.187 to Pr.189** are activated.	
RY1C	— (terminal NET X4 function)[*3]		
RY1D	— (terminal NET X5 function)[*3]		

*1 These signals are set in the initial setting. Using **Pr.180 to Pr.183**, input signals assigned to the device numbers can be changed. Some signals are not controllable via network depending on the settings of **Pr.338 and Pr.339**. For details of **Pr.180 to Pr.183, Pr.338, and Pr.339**, refer to the FR-E800 Instruction Manual (Function).

*2 The signals are fixed. They cannot be changed using parameters.

*3 No signal is assigned in the initial setting. Use **Pr.184 to Pr.189** to assign signals to RY8, RYA, RYB, and RY1B to RY1D.
For details, refer to the description of **Pr.184 to Pr.189 (Input terminal function selection)** in the FR-E800 Instruction Manual (Function).

*4 While "1" is set in the frequency setting command (RYD), the set frequency (RWw1) is always applied.

*5 If "1" is set in these registers at the same time while **Pr.544** = "0", only one of these is executed.

*6 Refer to page 195 for operation conditions of inverter reset.
*7 Torque control cannot be performed with a PM motor.

■ Input signals (from the inverter to the master module)

Input signals to the master module are as follows. (Output signals from the inverter)

Device No.	Signal	Description
RX0	Forward running	0: Other than forward running (during stop or reverse rotation) 1: Forward running
RX1	Reverse running	0: Other than reverse running (during stop or forward rotation) 1: Reverse running
RX2	Running (terminal RUN function)*1	The function assigned to **Pr.190** is activated.
RX3	Up to frequency*2	SU signal
RX4	Overload warning*2	OL signal
RX5	— (terminal NET Y1 function)*4	The function assigned to **Pr.193** is activated.
RX6	Frequency detection (terminal FU function)*1	The function assigned to **Pr.191** is activated.
RX7	Fault (terminal ABC function)*1	The function assigned to **Pr.192** is activated.
RX8	— (terminal NET Y2 function)*4	The function assigned to **Pr.194** is activated.
RX9	— (DO0 function)*3	Functions assigned to **Pr.313 to Pr.315** are activated.
RXA	— (DO1 function)*3	
RXB	— (DO2 function)*3	
RXC	Monitoring	After "1" is set in the monitor command (RYC), and the monitored value is set in the remote register Rwr0, 1, 4 to 7, "1" is set for this signal. When "0" is set in the monitor command (RYC), "0" is set for this signal.
RXD	Frequency setting / torque command completed (RAM)	After "1" is set in the frequency setting command / torque command (RYD), and the frequency setting / torque command is written to the RAM of the inverter, "1" is set for this signal. When "0" is set in the frequency setting command / torque command (RYD), "0" is set for this signal.
RXE	Frequency setting / torque command completed (RAM, EEPROM)	After "1" is set in the frequency setting command / torque command (RYE), and the frequency setting / torque command is written to the RAM and EEPROM of the inverter, "1" is set for this signal. When "0" is set in the frequency setting command / torque command (RYE), "0" is set for this signal.
RXF	Instruction code execution completed	After "1" is set in the instruction code execution request (RYF) and the processes corresponding to the instruction codes (RWw2, 10, 12, 14, 16 and 18) are executed, "1" is set for this signal. When "0" is set in the instruction code execution request (RYF), "0" is set for this signal.
RX16	— (terminal NET Y3 function)*4	Functions assigned to **Pr.195 and Pr.196** are activated.
RX17	— (terminal NET Y4 function)*4	
RX1A	Error status flag	When an inverter error occurs (protective function is activated), "1" is set for this signal.
RX1B	Remote station ready	When the inverter is ready for communication upon completion of initial setting after power-ON or a hardware reset, "1" is set for this signal. When an inverter error occurs (protective function is activated), "0" is set for this signal.

*1 These signals are set in the initial setting. Using **Pr.190 to Pr.192**, output signals assigned to the device numbers can be changed.
For details of **Pr.190 to Pr.192**, refer to the FR-E800 Instruction Manual (Function).
*2 The signals are fixed. They cannot be changed using parameters.
*3 No signal is assigned in the initial setting. Use **Pr.313 to Pr.315** to assign signals to RX9 to RXB.
For details, refer to the description of **Pr.190 to Pr.196 (Output terminal function selection)** in the FR-E800 Instruction Manual (Function).
*4 No signal is assigned in the initial setting. Use **Pr.193 to Pr.196** to assign signals to RX5, RX8, RX16, and RX17.
For details, refer to the description of **Pr.193 to Pr.196 (Output terminal function selection)** in the FR-E800 Instruction Manual (Function).

◆ Details of the remote register

■ Remote register (from the master module to the inverter)

- Remote register description

Device No.	Signal	Description
RWw0	Monitor code 1, 2	Set the monitor code to be monitored (refer to page 60). When "1" is set in RYC, data of specified monitor items will be stored in RWr0/RWr1.

Device No.	Signal	Description	
RWw1	Set frequency*1*2	Specify the set frequency or rotations per minute (machine speed). At this time, whether to write to the RAM or EEPROM is decided with the RYD and RYE settings. After setting the set frequency in this register, set "1" in RYD or RYE to write the frequency. After writing of frequency is completed, "1" is set in RXD or RXE in response to the input command. The setting range is 0 to 590.00 Hz (0.01 Hz increments). Write "59000" when setting 590.00 Hz.	
	Torque command value	When **Pr.544 CC-Link extended setting** = "0, 1, or 12" and **Pr.804 Torque command source selection** = "3 or 5" during torque control under Real sensorless vector control or Vector control, torque command values are specified. The value is written to the inverter either by RYD or RYE. **Pr.805 Torque command value (RAM)** and **Pr.806 Torque command value (RAM, EEPROM)** are updated as well. The setting range and the setting increment depend on the **Pr.804** setting. (Refer to page 62.)	
RWw2	Link parameter extended setting / instruction code	Set an instruction code (refer to page 58) for an operation such as operation mode switching, parameter read/write, error reference, and error clear. Set "1" in RYF to execute the corresponding instruction after completing the register setting. "1" is set in RXF after completing the execution of the instruction. When a value other than "0" is set to **Pr.544**, upper 8 bits are used for the link parameter extended setting. Example) When reading **Pr.160**, instruction code is H0200.	
RWw3	Data to be written	Set the data specified by the instruction code of RWw2 (when required). Set "1" in RYF after setting RWw2 and this register. Set "0" when the write code is not required.	
RWw4	Monitor code 3	Set the monitor code to be monitored. By setting "1" in RYC after setting, the specified monitor data is stored in RWr4 to RWr7.	
RWw5	Monitor code 4		
RWw6	Monitor code 5		
RWw7	Monitor code 6		
RWw8	Fault record No.	Set the individual fault number of the fault history that you want to read. Fault records can be read back to the ninth fault in past. (The value in the lower 8 bits is fixed to H00.) Upper 8 bits: H00 (latest fault) to H09 (ninth fault in past) When H0A to HFF is set to the lower 8 bits, "0" is returned.	
RWw9	PID set point*3	Set the PID action set point. Setting range: 0 to 100.00%	• Input a value 100 times greater than the value to be set. For example, enter "10000" when setting 100.00%. • For details of PID control, refer to the FR-E800 Instruction Manual (Function).
RWwA	PID measured value*3	Set the PID measured value. Setting range: 0 to 100.00%	
RWwB	PID deviation*3	Set the PID deviation. Setting range: -100.00% to 100.00%	
RWwC	Torque command value	Set **Pr.544** = "14 or 18" and **Pr.804** = "3 or 5" to specify the torque command value during torque control under Real sensorless vector control or Vector control. The value is written to the inverter either by RYD or RYE. The values in **Pr.805 and Pr.806** are updated at the same time. The setting range and the setting increment depend on the **Pr.804** setting. If the data outside the range is set, the previous setting is retained.	
	Torque limit value	Set **Pr.544** = "14 or 18", **Pr.804** = "3 or 5", and **Pr.810 Torque limit input method selection** = "2" to specify the torque limit value during speed control under Real sensorless vector control, Vector control, or PM sensorless vector control. The value is written to the inverter either by RYD or RYE. The values in **Pr.805 and Pr.806** are updated at the same time. The setting range and the setting increment depend on the **Pr.804** setting (absolute value). If the data outside the range is set, the previous setting is retained.	
RWw10, RWw12, RWw14, RWw16, RWw18	Link parameter extended setting / instruction code	Set an instruction code (refer to page 58) for an operation such as operation mode switching, parameter read/write, error reference, and error clear. The instructions are executed in the following order by setting "1" in RYF after completing the register setting: RWw2, 10, 12, 14, 16, then 18. After completing the execution up to RWw18, "1" is set in RXF. Set HFFFF to disable an instruction by RWw10 to 18. (The instruction code of RWw2 is always executed.) The upper 8 bits are used for the link parameter extended setting. Example) When reading **Pr.160**, instruction code is H0200.	
RWw11, RWw13, RWw15, RWw17, RWw19	Data to be written	Set the data specified by the instruction code of RWw10, 12, 14, 16, and 18 (when required). RWw10 and 11, 12 and 13, 14 and 15, 16 and 17, and 18 and 19 correspond each other. Set "1" in RYF after setting the instruction codes (RWw10, 12, 14, 16, and 18) and the corresponding register. Set "0" when the write data is not required.	

*1 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**. For details, refer to the FR-E800 Instruction Manual (Function).

*2 When **Pr.541 Frequency command sign selection** = "1", the set frequency is a signed value. When the setting value is negative, the command is the inverse from the start command.
Setting range: -327.68 Hz to 327.67 Hz (-327.68 to 327.67), 0.01 Hz increments.
For the details, refer to page 49.

*3 When **Pr.128** = "50, 51, 60, or 61", the register is valid. When **Pr.128** = "1000 to 2011", the register is valid depending on the setting in **Pr.609 or Pr.610**. If the data outside the range is set, the previous setting is retained. For details of **Pr.128**, refer to the FR-E800 Instruction Manual (Function).

■ Remote register (from the inverter to the master module)

- Remote register description

Device No.	Signal	Description
RWr0	First monitor value*1*2	When "1" is set in RYC, the monitor value is set to the lower 8 bits of the monitor code (RWw0).
RWr1	Second monitor value (output frequency*1*2)	When "0" is set to the upper 8 bits of the monitor code (RWw0), the current output frequency is set. When "1" is set in RYC while a value other than "0" is set to the upper 8 bits of the monitor code (RWw0), the monitor value is set to the upper 8 bits of the monitor code (RWw0).
RWr2	Reply code (**Pr.544** ≠ 0)	When "1" is set in RYD or RYE, the reply code for the frequency setting command is set. When "1" is set in RYF, the reply code corresponding to the instruction code RWw2 is set. The value "0" is set for a normal reply, and a value other than "0" is set for errors with data, mode, and other. (Refer to page 57.)
	Reply code 1 (**Pr.544** ≠ 0)	Lower 8 bits of RWr2. When "1" is set in RYD or RYE, the reply code for the frequency setting command (torque command / torque limit) is set. (Refer to page 57.)
	Reply code 2 (**Pr.544** ≠ 0)	Upper 8 bits of RWr2. When "1" is set in RYF, the reply code corresponding to the instruction code RWw2 is set. (Refer to page 57.)
RWr3	Data to be read	In a normal reply, a replay code for the instruction code is set.
RWr4	Third monitor value*1*2	When "1" is set in RYC, the monitor value specified to the corresponding monitor code (RWw4 to RWw7) is stored.
RWr5	Fourth monitor value*1*2	
RWr6	Fifth monitor value*1*2	
RWr7	Sixth monitor value*1*2	
RWr8	Fault record (fault data)	The data of the fault record No. specified in RWw8 is stored in the lower 8 bits. The specified fault record No. will be echoed back to the upper 8 bits.
RWr9	Fault record (output frequency)	The output frequency of the fault history No. specified in RWw8 is stored.
RWrA	Fault record (output current)	The output current of the fault history No. specified in RWw8 is always stored.
RWrB	Fault record (output voltage)	The output voltage of the fault history No. specified in RWw8 is always stored.
RWrC	Fault record (energization time)	The energization time at the fault is always stored for the fault record No. specified in RWw8.
RWr10 to RWr19	Reply code	When "1" is set in RYF, the reply codes corresponding to the instruction code RWw10, 12, 14, 16, and 18 are set. The value "0" is set for a normal reply, and a value other than "0" is set for faults with data, mode, and others. (Refer to page 57.)
	Data to be read	In a normal reply, a replay code for the instruction code is set.

*1 When the output frequency or the set frequency is selected as the monitor item, rotations per minute or machine speed may be displayed depending on the **Pr.37** and **Pr.53** settings.

*2 Use **Pr.290** to enable display of negative numbers during monitoring.

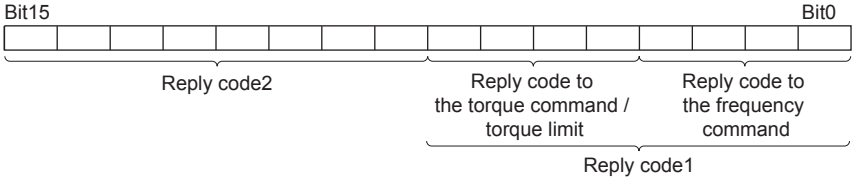
- Reply code description

  The reply to the instruction execution command is set in RWr2, 10, 12, 14, 16, and 18. After the frequency setting (RYD or RYE) or execution of instruction code (RYF), check the reply code (RWr2) in the remote register.

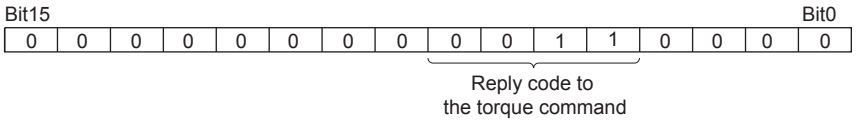
Item	Data	Item	Fault record	Remarks
Reply code	H0000	Normal	No fault (Instruction codes are executed without any fault.)	• Reply code to RWr2 when **Pr.544** = "0". • Reply code to RWw10, 12, 14, 16, and 18 when **Pr.544** = "18".
	H0001	Write mode fault	Parameter write is attempted when the inverter is not in the stop status in the Network operation mode.	
	H0002	Parameter selection fault	Unregistered code is set.	
	H0003	Setting range fault	Set data exceeds the permissible range.	

Item	Data	Item	Fault record	Remarks
Reply code 1*1	H00	Normal	No fault (Instruction codes are executed without any fault.)	Reply code to RWr2 when **Pr.544** ≠ "0".
	H01	Write mode fault	Parameter write is attempted when the inverter is not in the stop status in the Network operation mode.	
	H03	Frequency command (torque command / torque limit) setting range error	The value outside the range is set.	
Reply code 2	H00	Normal	No fault (Instruction codes are executed without any fault.)	
	H01	Write mode fault	Parameter write is attempted when the inverter is not in the stop status in the Network operation mode.	
	H02	Parameter selection fault	Unregistered code is set.	
	H03	Setting range fault	Set data exceeds the permissible range.	

*1 The contents of the reply code 1 are changed when torque commands are given or the torque is limited. (when **Pr.544** = "14 or 18").
The upper 4 bits of the reply code 1 are used as the reply code to the torque command / torque limit, and the lower 4 bits are used as the reply code to the frequency command.



Example) When the torque command is out of the setting range, the data is H0030.

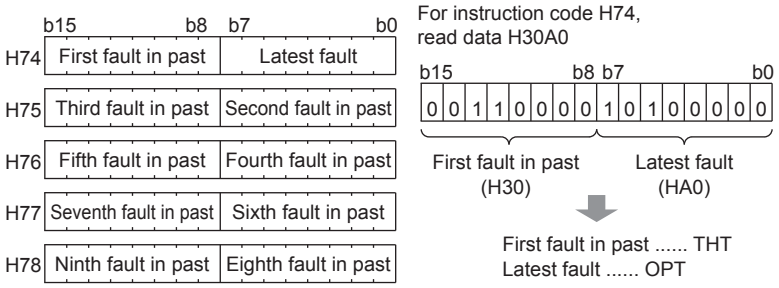


■ Instruction code

Set instruction codes using the remote register (RWw). (Refer to page 55.)

The definition read by the instruction code is stored in the remote register (RWr). (Refer to page 57.)

Item	Read/ write	Instruction code	Data description
Operation mode	Read	H7B	H0000: Network operation H0001: External operation, External JOG operation H0002: PU operation, External/PU combined operation 1 or 2, PUJOG operation
	Write	HFB	H0000: Network operation H0001: External operation H0002: PU operation (when **Pr.79** = "6")

Item		Read/ write	Instruction code	Data description
Monitor	Output frequency / rotations per minute (machine speed)[*1][*2]	Read	H6F	H0000 to HFFFF: Output frequency in 0.01 Hz increments (The display can be changed to the rotations per minute (machine speed) using **Pr.37** and **Pr.53**. Refer to the FR-E800 Instruction Manual (Function).)
	Output current	Read	H70	H0000 to HFFFF: Output current (hexadecimal) in 0.01/0.1 A increments[*4]
	Output voltage	Read	H71	H0000 to HFFFF: Output voltage (hexadecimal) in 0.1 V increments
	Special monitor[*2]	Read	H72	H0000 to HFFFF: Monitor data selected in the instruction code HF3
	Special monitor selection No.	Read	H73	H01 to HFF: Monitor selection data Refer to the monitor code description on page 60.
		Write	HF3[*3]	
	Fault record	Read	H74 to H78	H0000 to HFFFF: Two fault records per code For data codes and details of fault records, refer to the FR-E800 Instruction Manual (Function). 
Set frequency (RAM)		Read	H6D	Read the set frequency or rotations per minute (machine speed) from the RAM or EEPROM. H0000 to HE678: Set frequency in 0.01 Hz increments (The display can be changed to the rotations per minute (machine speed) using **Pr.37** and **Pr.53**. Refer to the FR-E800 Instruction Manual (Function).) • When **Pr.544** = "0, 1, or 12" and **Pr.804** = "3 or 5" during torque control under Real sensorless vector control or Vector control, torque command values are read. The setting range depends on the **Pr.804** setting.
Set frequency (EEPROM)			H6E	
Set frequency (RAM)[*5]		Write	HED	Write the set frequency or rotations per minute (machine speed) into the RAM or EEPROM. H0000 to HE678 (0 to 590.00 Hz): frequency in 0.01 Hz increments (The display can be changed to the rotations per minute (machine speed) using **Pr.37 and Pr.53**. Refer to the FR-E800 Instruction Manual (Function).) • To change the set frequency consecutively, write data to the inverter RAM. (Instruction code: HED) • When **Pr.544** = "0, 1, or 12" and **Pr.804** = "3 or 5" during torque control under Real sensorless vector control or Vector control, torque commands are given. The setting range depends on the **Pr.804** setting.
Set frequency (RAM and EEPROM)[*5]		Write	HEE	
Parameter		Read	H00 to H6B	• Refer to the instruction codes in the FR-E800 Instruction Manual (Function) and write and/or read parameter values as required. Writing to **Pr.77 and Pr.79** is disabled. When setting **Pr.100** and later, set the link parameter extended setting. • 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 the RAM. (For details, refer to page 190.)
		Write	H80 to HEB	
Fault history clear		Write	HF4	H9696: Fault history is cleared.
Parameter clear / All parameter clear		Write	HFC	All parameters return to initial values. Whether to clear communication parameters or not can be selected according to the data. • Parameter clear H9696: Communication parameters are cleared. H5A5A[*6]: Communication parameters are not cleared. • All parameter clear H9966: Communication parameters are cleared. H55AA[*6]: Communication parameters are not cleared. For the details of whether or not to clear parameters, refer to the FR-E800 Instruction Manual (Function). When clear is performed with H9696 or H9966, communication related parameter settings also return to the initial values. When resuming the operation, set the parameters again. Performing a clear will clear the instruction code HEC, HF3, and HFF settings.
Inverter reset		Write	HFD	H9696: Resets the inverter.

Item	Read/ write	Instruction code	Data description
Link parameter extended setting*7	Read	H7F	Parameter settings are changed according to the instruction code settings. For details of the settings, refer to instruction code list in the FR-E800 Instruction Manual (Function).
	Write	HFF	
Second parameter changing*8	Read	H6C	Read or write of bias and gain parameters (instruction codes H5E to H61 and HDE to HE1 with the link parameter extended setting = "1", H11 to H23 and H91 to HA3 with the link parameter extended setting = "9"). H00: Frequency*9 H01: Parameter-set analog value H02: Analog value input from terminal
	Write	HEC	

*1 When "100" is set in **Pr.52 Operation panel main monitor selection**, the frequency setting value is monitored during a stop, and the output frequency is monitored during running.
*2 Use **Pr.290** to enable display of negative numbers during monitoring.
*3 Write data is in hexadecimal, and only two digits are valid. (The upper two digits are ignored.)
*4 The increment differs according to the inverter capacity.
*5 Setting from the remote register (RWw1) is also available.
*6 Turning OFF the power supply while clearing parameters with H5A5A or H55AA returns the communication parameter settings to the initial settings.
*7 Setting is available only when **Pr.544** = "0". Use RWw2 or RWw10, 12, 14, 16, and 18 for setting when **Pr.544** ≠ "0". (Refer to page 56.)
*8 Reading or writing is available when the link parameter extended setting = "1 or 9".
*9 The gain frequency can be also written using **Pr.125** (instruction code: H99) or **Pr.126** (instruction code: H9A).

NOTE

- When a 32-bit parameter setting or monitor item is read and the value to be read exceeds HFFFF, HFFFF is returned.

■ Monitor code

Various data of the inverter can be monitored by setting the special monitor selection No. of the instruction code and setting the monitor code in the remote registers, RWw0 and RWw4 to 7.

- Use the monitor code (RWw0) to set the first monitor value (RWr0) in the lower 8 bits, and the second monitor value (RWr1) in the upper 8 bits.
  (Example) The monitor code (RWw0) will be H0602 to set the output current as the first monitor value (RWr0) and set the running speed as the second monitor value (RWr1).
- When **Pr.544** = "12, 14, or 18", the values for the monitor code 3 (RWw4) to the monitor code 6 (RWw7) can be selected.

Monitor code	Second monitor (upper 8 bits)	First monitor and third–sixth monitor (lower 8 bits)	Unit
H00	Output frequency	None (monitor value fixed to "0")	0.01 Hz
H01	Output frequency		0.01 Hz
H02	Output current		0.01 A
H03	Output voltage		0.1V
. . .	. . .		. . .

NOTE

- The monitor codes from H01 onwards and their contents are the same as those of the RS-485 communication dedicated monitor. For details of the monitor codes or monitor items, refer to the monitor display section in the FR-E800 Instruction Manual (Function).
- When the remote registers RWw0 and RWw4 to RWw7 are used for monitoring, H00 (output frequency), H01 (output frequency), and H05 (set frequency) always indicate the frequency regardless of the settings in **Pr.37 and Pr.53**.

◆ Communication speed and full-duplex/half-duplex selection (Pr.1426)

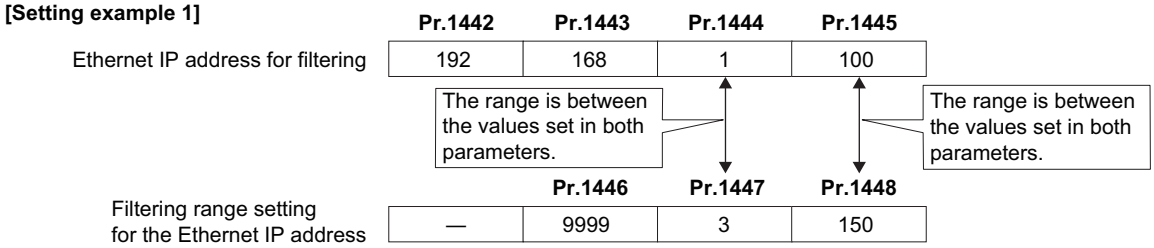
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

Pr.1426 setting	Communication speed	Full-duplex/half-duplex system	Remarks
0 (initial value)	Automatic negotiation	Automatic negotiation	The communication speed and the communication mode (half-duplex/full-duplex) are automatically negotiated to ensure the optimum setting. To set automatic negotiation, auto negotiation setting is required also in the master station.
1	100 Mbps	Full duplex	—
2	100 Mbps	Half duplex	—
3	10 Mbps	Full duplex	The communication speed is fixed at 100 Mbps. Do not set 10 Mbps.
4	10 Mbps	Half duplex	

◆ IP filtering function (Ethernet) (Pr.1442 to Pr.1448)

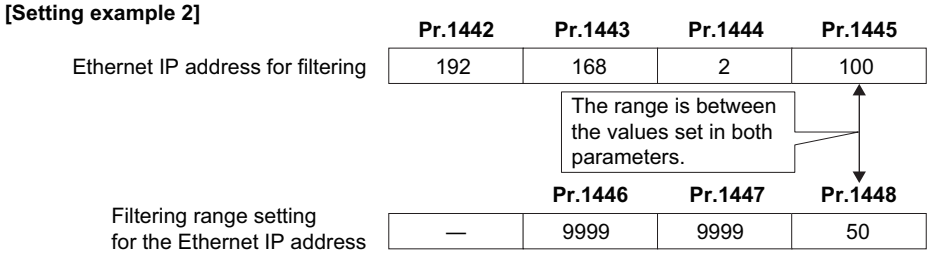
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either of the settings can be larger than the other in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**.)

[Setting example 1]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.x (1 to 3).xxx (100 to 150)".

[Setting example 2]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.2.xxx (50 to 100)".

- When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.
- When "9999 (initial value)" is set in **Pr.1446 to Pr.1448**, the range is invalid.

⚠CAUTION

- The IP filtering function (Ethernet) (**Pr.1442 to Pr.1448**) is provided as a means to prevent unauthorized access, DoS attacks, computer viruses, or other cyberattacks from external devices, but the function does not prevent such access completely. In order to protect the inverter and the system against unauthorized access by external systems, take additional security measures. We shall have no responsibility or liability for any problems involving inverter trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks. The following are examples of measures to prevent them.
  - Install a firewall.
  - Install a personal computer as a relay station, and control the relaying of transmission data using an application program.
  - Install an external device as a relay station to control access rights. (For the details of external devices used to control access rights, contact the distributors of the external devices.)

◆ Torque command / torque limit using the CC-Link IE Field Network Basic

Torque commands can be given or the torque can be limited on the CC-Link IE Field Network Basic under Real sensorless vector control, Vector control, or PM sensorless vector control. The value is used to limit the torque during speed control, and to give a torque command during torque control. To limit the torque, set **Pr.810 Torque limit input method selection** = "2". The torque command / torque limit setting method can be selected using **Pr.804 Torque command source selection**. (Torque control cannot be performed with a PM motor.)

Pr.	Name	Initial value	Setting range	Description
804	Torque command source selection	0	0	Torque command given by analog input via terminal 4
			1	Torque command / torque limit using the CC-Link IE Field Network Basic • Torque command / torque limit (-400% to 400%) by the parameter setting (**Pr.805** or **Pr.806**)*1*2
			3	Torque command / torque limit using the CC-Link IE Field Network Basic • Torque command / torque limit (-400% to 400%) by the parameter setting (**Pr.805** or **Pr.806**)*1*2 • Setting is available using the remote register RWw1 or RWwC (-400% to 400%).*2
			4	Torque command given by 16-bit digital input (FR-A8AX)
			5	Torque command / torque limit using the CC-Link IE Field Network Basic • Torque command / torque limit (-327.68% to 327.67%) by the parameter setting (**Pr.805** or **Pr.806**) (-327.68% to 327.67%)*1*2 • Setting is available using the remote register RWw1 or RWwC (-327.68% to 327.67%).*2
			6	Torque command / torque limit using the CC-Link IE Field Network Basic • Torque command / torque limit (-327.68% to 327.67%) by the parameter setting (**Pr.805** or **Pr.806**)*1*2
810	Torque limit input method selection	0	0	Internal torque limit (torque limited by parameter settings)
			1	External torque limit (torque limited by terminal 4)
			2	Internal torque limit 2 (torque limited by CC-Link IE Field Network Basic)

*1 They can also be set using the operation panel or parameter unit.

*2 When a negative value is set as the torque limit, the torque is limited by the absolute value.

■ List of I/O devices whose function is changed according to the parameter settings and the control method

Pr.544 setting	I/O device	V/F control / Advanced magnetic flux vector control	Real sensorless vector control / Vector control / PM sensorless vector control	
			Speed control	Torque control*3
—	RYD	Frequency setting command (RAM)	Frequency setting / torque limit command (RAM)	Torque command (RAM)
—	RYE	Frequency setting command (RAM, EEPROM)	Frequency setting / torque limit command (RAM, EEPROM)	Torque command (RAM, EEPROM)
—	RXD	Frequency setting completion (RAM)	Frequency setting / torque limit completion (RAM)	Torque command completion (RAM)
—	RXE	Frequency setting completion (RAM, EEPROM)	Frequency setting / torque limit completion (RAM, EEPROM)	Torque command completion (RAM, EEPROM)
0, 1, 12	RWw1	Set frequency	Set frequency	Torque command*1
14, 18				—
0, 1, 12	RWwC	—	—	—
14, 18			Torque limit*1*2	Torque command*1

*1 Set **Pr.804** = "3 or 5".

*2 Set **Pr.810** = "2".

*3 Torque control cannot be performed with a PM motor.

■Torque command setting method and the parameter for speed limit

Pr.804 setting	Pr.544 setting	Torque command setting method (any one of the following)	Parameter for speed limit
3, 5	0, 1, 12	• Set the torque command value in RWwn+1, and "1" in RYD or RYE. • Set the instruction code HED or HEE in RWwn+2, the torque command value in RWwn+3, and "1" in RYF. (The torque command value can be read using the instruction code H6D or H6E.) • Set H08 in the link parameter extended setting, the instruction code H85 and H86 in RWwn+2, the torque command value in RWwn+3, and "1" in RYF. (Writing in **Pr.805** or **Pr.806**)	**Pr.808, Pr.809**
	14, 18	• Set the torque command value in RWwn+C, and "1" in RYD or RYE. • Set H08 in the link parameter extended setting, the instruction code H85 and H86 in RWwn+2, the torque command value in RWwn+3, and "1" in RYF. (Writing in **Pr.805** or **Pr.806**)	**Pr.807**
1, 6	0, 1, 12, 14, 18	Set H08 in the link parameter extended setting, the instruction code H85 and H86 in RWwn+2, the torque command value in RWwn+3, and "1" in RYF. (Writing in **Pr.805** or **Pr.806**)	
0, 4	—	Torque command using the CC-Link IE Field Network Basic is not available.	

■Torque limit setting method

Pr.804 setting	Pr.810 setting	Pr.544 setting	Torque limit setting method (any one of the following)
3, 5	2	14, 18	• Set the torque limit value in RWwn+C, and "1" in RYD or RYE. • Set H08 in the link parameter extended setting, the instruction code H85 and H86 in RWwn+2, the torque limit value in RWwn+3, and "1" in RYF. (Writing in **Pr.805** or **Pr.806**)
1, 6		0, 1, 12, 14, 18	Set H08 in the link parameter extended setting, the instruction code H85 and H86 in RWwn+2, the torque limit value in RWwn+3, and "1" in RYF. (Writing in **Pr.805** or **Pr.806**)

■Relationship between the Pr.804 setting, the setting range, and the actual torque command / torque limit (when setting is made from CC-Link IE Field Network Basic communication)

Pr.804 setting	Setting range	Actual torque command	Actual torque limit
1, 3	600 to 1400 (1% increments)*1	-400 to 400%	0 to 400%
5, 6	-32768 to 32767 (two's complement)*1	-327.68 to 327.67%	0 to 327.67%

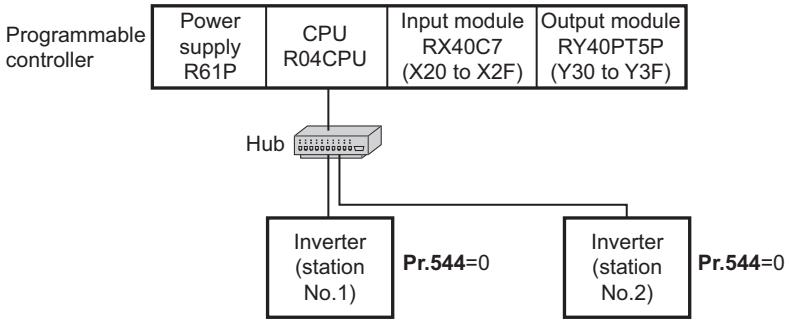
*1 The torque limit setting is defined as an absolute value.

◆Programming examples

The following explains the programming examples for controlling the inverter with sequence programs.

Item	Program example	Refer to page
Reading the inverter status	Reading the inverter status from the buffer memory of the master station	65
Setting the operation mode	Selecting the Network operation mode	65
Setting the operation commands	Commanding the forward rotation and middle speed signals	66
Setting the monitoring function	Monitoring the output frequency	66
Reading a parameter value	Reading the value of **Pr.7 Acceleration time**	67
Writing a parameter value	Setting 3.0 seconds in **Pr.7 Acceleration time**	67
Frequency setting (speed setting)	Setting to 50.00 Hz	68
Reading the fault records	Reading the inverter faults	69
Inverter reset	Resetting the inverter when an inverter error occurs	69

- System configuration example (when the MELSEC iQ-R series programmable controller is used)



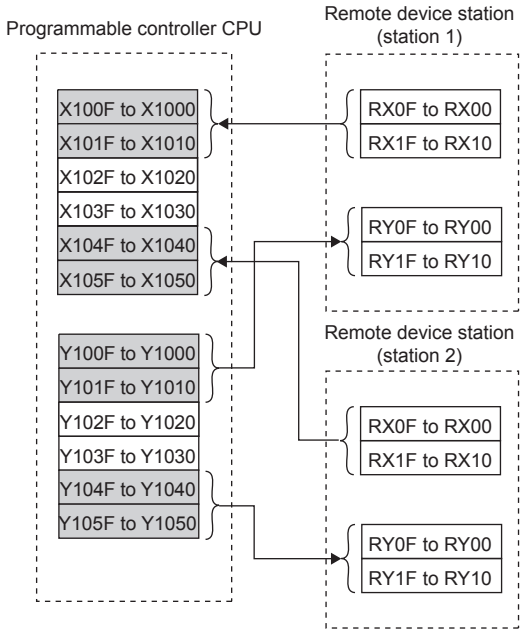
- Setting network parameters of the master station

  In the programming example, network parameters are set as follows.

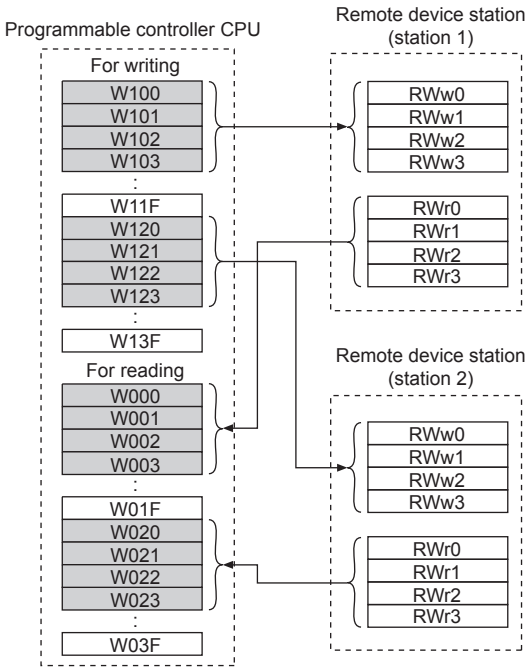
Item	Setting condition
Station type	CC-Link IE Field Network Basic (master station)
Start I/O	0000
Quantity	2
Remote input (RX)	X1000
Remote output (RY)	Y1000
Remote register (RWr)	W0
Remote register (RWw)	W100
Retry count	3

■ Schematic diagrams of remote I/O and remote register devices

- The following diagram shows the remote I/O (RX and RY) transmitted between the programmable controller CPU and remote device stations. Shaded areas show the devices actually used.

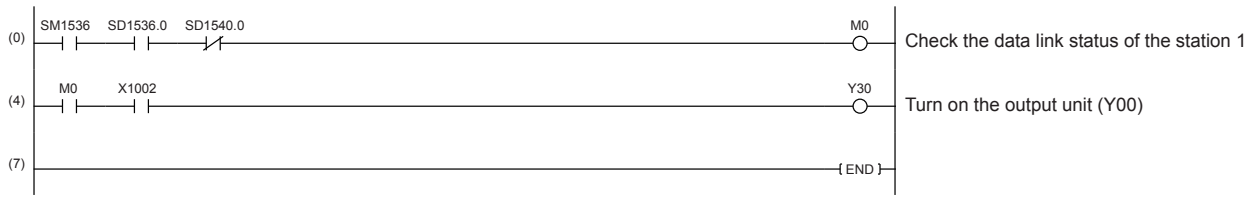


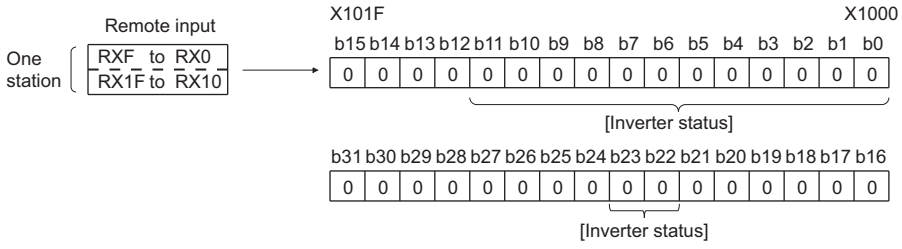
- The following diagram shows the remote register areas (RWw and RWr) transmitted between the programmable controller CPU and remote device stations. Shaded areas show the devices actually used.



■ Programming example for reading the inverter status

The following program turns ON the signal Y00 of the output unit when the station 1 inverter starts running.





Inverter status

b0 : During forward rotation	b7 : Fault (ABC)*1
b1 : Reverse running	b8 : — (NET Y2)*1
b2 : Running (RUN)*1	b9 : — (DO0)*1
b3 : Up to frequency	b10 : — (DO1)*1
b4 : Overload alarm	b11 : — (DO2)*1
b5 : — (NET Y1)*1	b22 : — (NET Y3)*1
b6 : Frequency detection (FU)*1	b23 : — (NET Y4)*1

*1 These signals are assigned in the initial status. Use **Pr.190 to Pr.196 and Pr.313 to Pr.315 (Output terminal function selection)** to change the output signals.

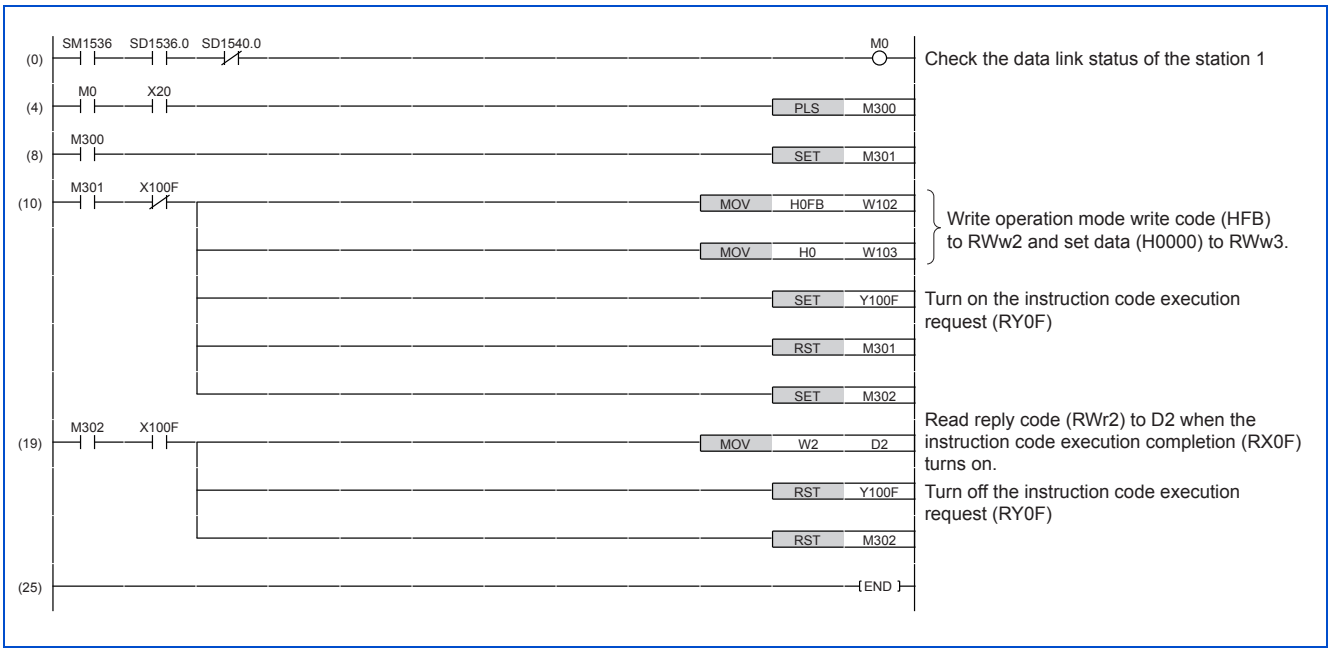
■ Programming example for setting the operation mode

The following explains a program to write various data to the inverter.

The following program changes the operation mode of the station 1 inverter to network operation.

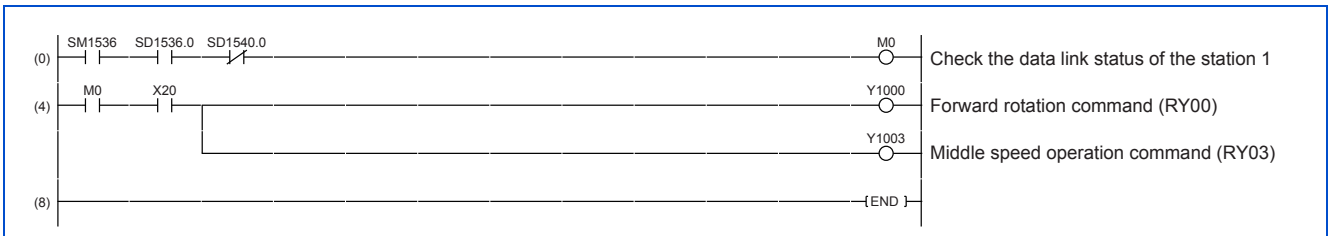
- Operation mode write code: HFB (hexadecimal)
- Network operation set data: H0000 (hexadecimal) (Refer to page 58.)

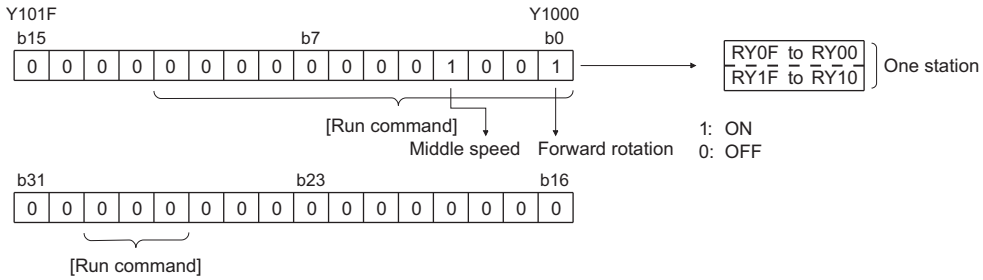
- The reply code to the instruction code execution is set in D2. (Refer to page 57.)



■ Programming example for setting the operation commands

The following program gives a forward rotation command and middle-speed operation command to the station 1 inverter.





Run command	
b0 : Forward rotation command	b8 : — (NET X1)*1
b1 : Reverse rotation command	b9 : Output stop (MRS)*1
b2 : High-speed operation command (RH)*1	b10 : — (NET X2)*1
b3 : Middle-speed operation command (RM)*1	b11 : — (RES)*1
b4 : Low-speed operation command (RL)*1	b27 : — (NET X3)*1
b5 : JOG operation selection 2	b28 : — (NET X4)*1
b6 : Second function selection	b29 : — (NET X5)*1
b7 : Current input selection	

*1 These signals are assigned in the initial status. Use **Pr.180 to Pr.189 (Input terminal function selection)** to change the input signals. Some signals are not controllable by a command from the programmable controller depending on the setting. (For details, refer to the Instruction Manual (Function).)

■ Programming example for monitoring the output frequency

The following explains a program to read monitor functions of the inverter.

The following program reads the output frequency of the station 1 inverter to output to D1.

Output frequency read code: H0001 (hexadecimal)

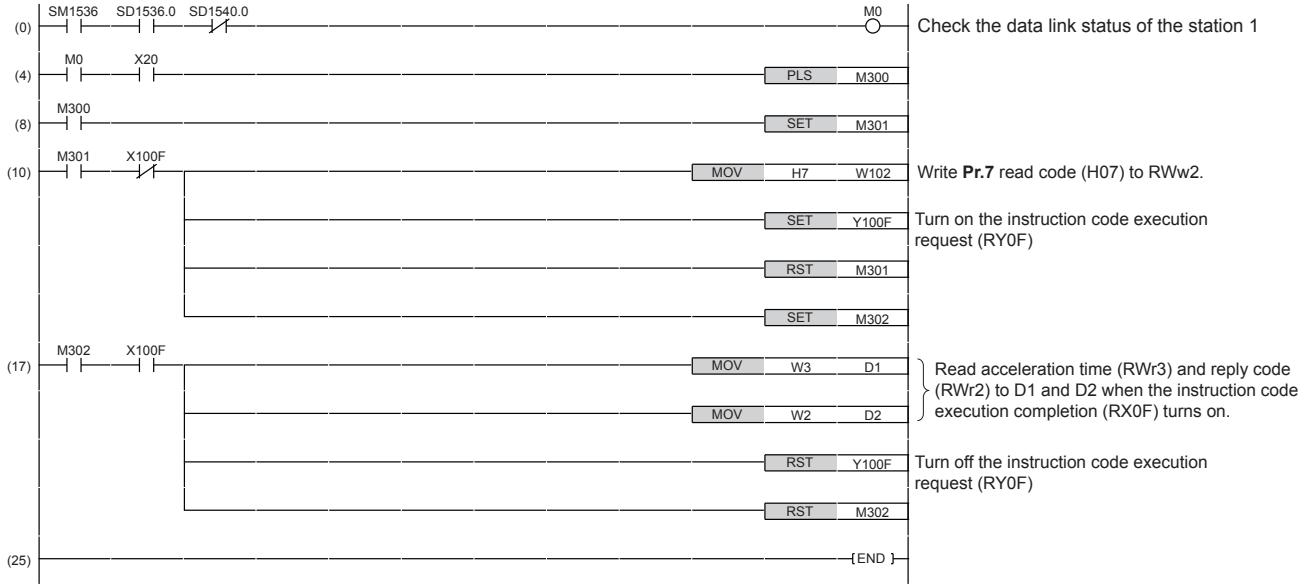
For the monitor codes, refer to page 60.

Example) The output frequency of 60 Hz is indicated as "H1770 (6000)".

■ Programming example for the parameter reading

The following program reads **Pr.7 Acceleration time** of the station 1 inverter to output to D1.

- **Pr.7 Acceleration time** reading instruction code: H07 (hexadecimal)
- For the instruction codes of parameters, refer to the Instruction Manual (Function).
- The reply code to the instruction code execution is set in D2. (Refer to page 57.)



NOTE

- For the parameter assigned the number of 100 or higher, change the link parameter extended setting (set it to the one other than H00). For the setting values, refer to the parameter list of the Instruction Manual (Function).

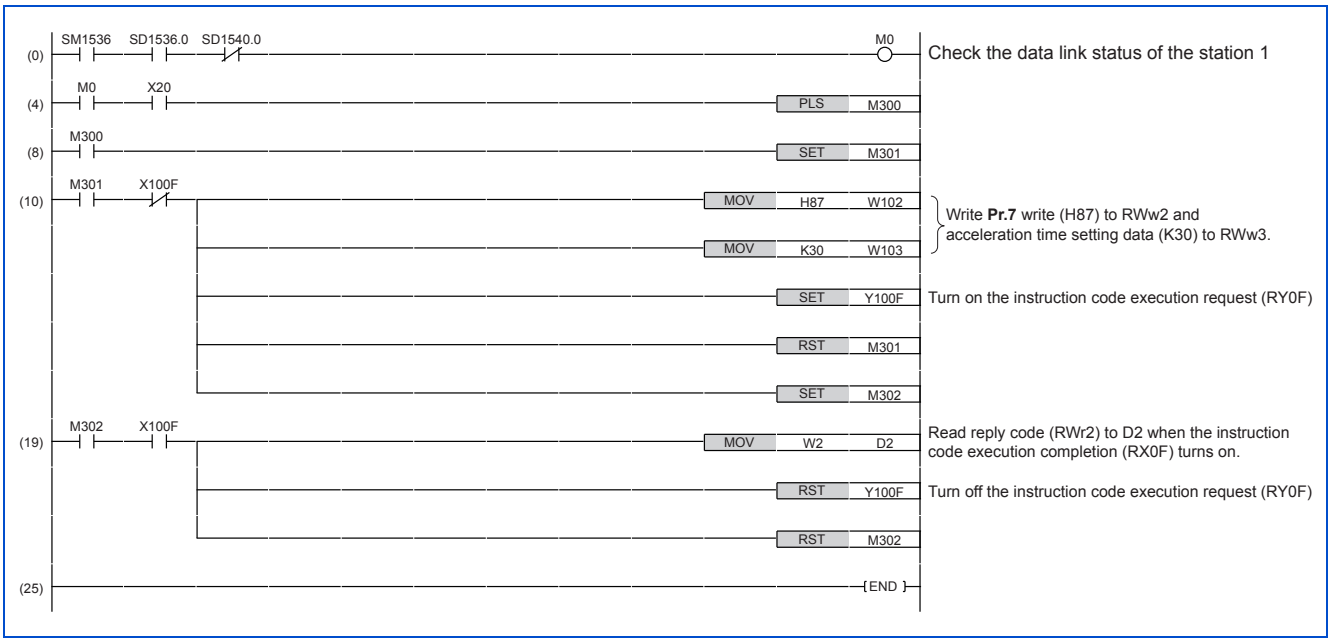
■ Programming example for the parameter writing

The following program changes the setting value in **Pr.7 Acceleration time** of the station 1 inverter to 3.0 seconds.

- Acceleration time writing instruction code: H87 (hexadecimal)
- Acceleration time setting data: K30 (decimal)

For the instruction codes of parameters, refer to the Instruction Manual (Function).

The reply code to the instruction code execution is set in D2. (Refer to page 57.)



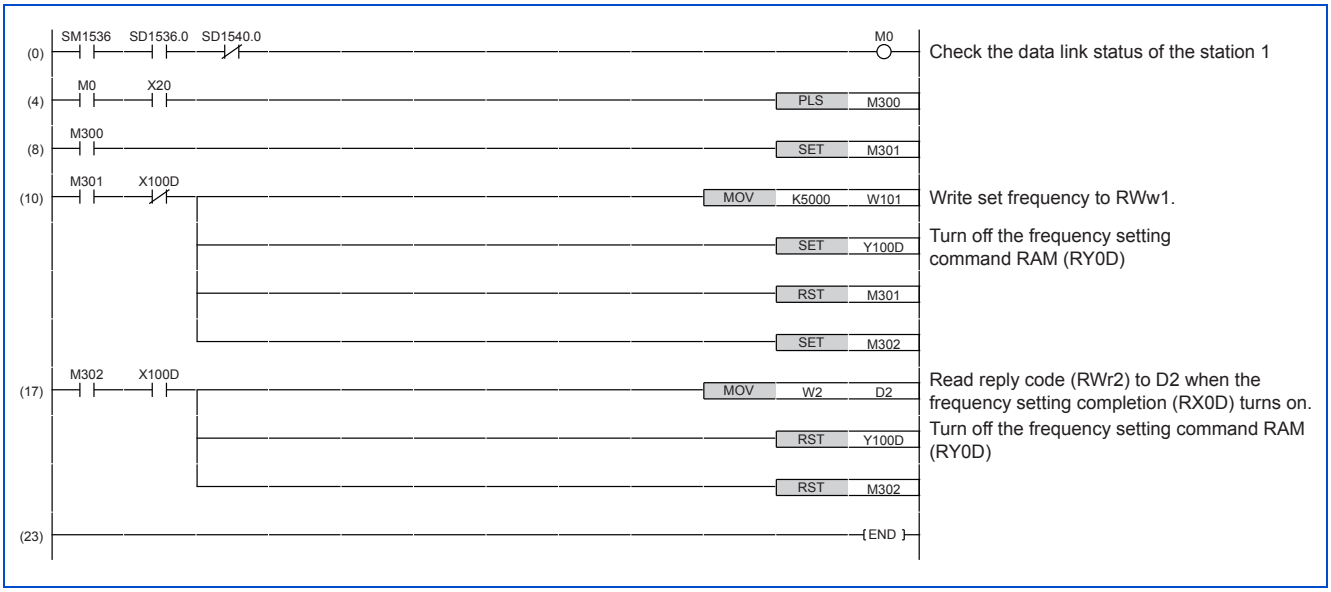
NOTE

- For the parameter assigned the number of 100 or higher, change the link parameter extended setting (set it to the one other than H00). For the setting values, refer to the parameter list of the Instruction Manual (Function).
- For other functions, refer to the instruction codes (refer to page 58).

■ Programming example for frequency setting

The following program changes the frequency setting of the station 1 inverter to 50.00 Hz.

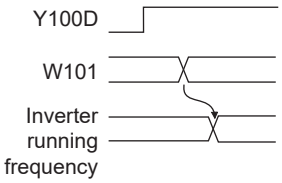
- Set frequency: K5000 (decimal)
- The reply code to the instruction code execution is set in D2. (Refer to page 57.)



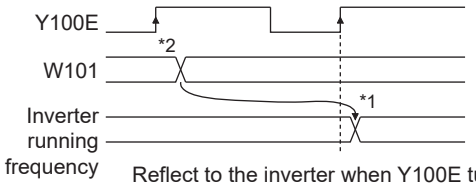
NOTE

- To change the set frequency continuously from a programmable controller, check that the frequency setting complete (for example, X100D) turns ON, and the reply code from the remote register is H0000. Then change the setting data (for example, W101) continuously.
- To write the set frequency to the EEPROM, change the following points in the program shown above.
  - Frequency setting command (from Y100D to Y100E)
  - Frequency setting completion (from X100D to X100E)

<Timing chart when writing to RAM>



<Timing chart when writing to EEPROM>



*1 To the EEPROM, a writing is performed only once after the command Y100E turns ON.

*2 If the set data is changed at the command Y100E ON, the change is not applied to the inverter.

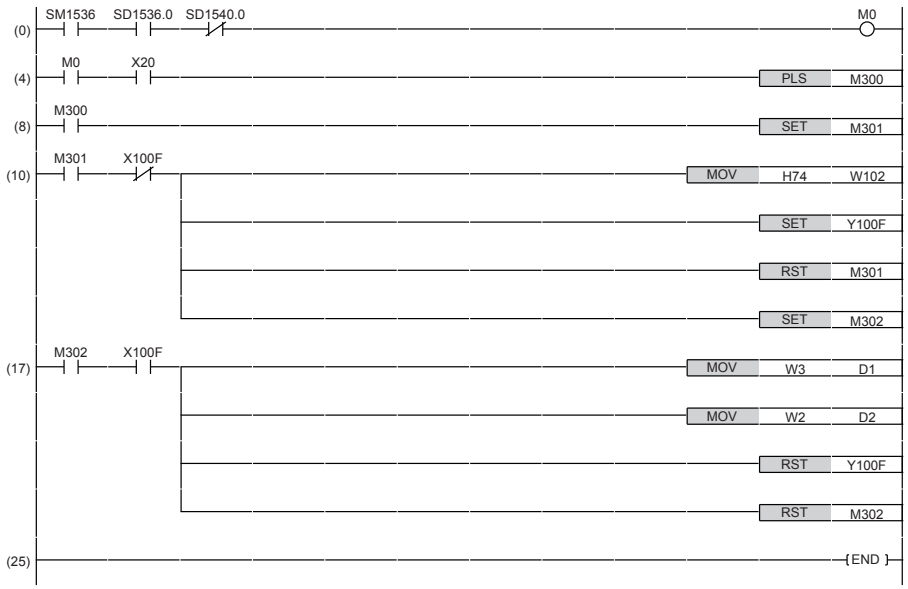
■ Programming example for the fault record reading

The following program reads the fault records of the station 1 inverter to output to D1.

- Fault history No. 1 and 2 reading instruction code: H74 (hexadecimal)

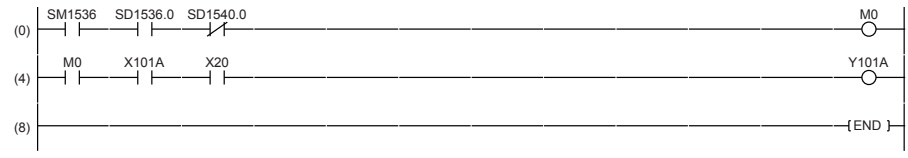
For the error codes, refer to the Instruction Manual (Maintenance).

The reply code to the instruction code execution is set in D2. (Refer to page 57.)



■ Programming example for resetting the inverter at an inverter fault

The following program resets the station 1 inverter at an inverter fault.



NOTE

- The inverter reset with the flag RY1A shown above is enabled at an inverter fault only.
- When **Pr.349 Communication reset selection** = "0", inverter reset is available independently of the operation mode.
- When using the instruction code execution request (RY0F) with the instruction code (HFD) and data (H9696) to reset the inverter, set a value other than "0" in **Pr.340 Communication startup mode selection** or change the operation mode to the Network operation mode. (For the program example, refer to page 65.)
- Refer to page 195 for operation conditions of inverter reset.

◆ Instructions

■ Operating and handling instructions

- The inverter only accepts the commands from the programmable controller during operation using the CC-Link IE Field Network Basic. The run command from external and parameter unit is ignored.
- If multiple inverters have the same station number, the communication cannot be performed properly.
- The inverter protective function (E.EHR) is activated if data communication stops for more than the time set in **Pr.1432 Ethernet communication check time interval** due to a programmable controller fault, an open Ethernet cable etc. during CC-Link IE Field Network Basic operation.
- If the programmable controller (master station) is reset during operation through the CC-Link IE Field Network Basic or if the programmable controller is powered off, data communication stops and the inverter protective function (E.EHR) is activated. To reset the programmable controller (master station), switch the operation mode to the External operation once, then reset the programmable controller.
- When **Pr.340** = "0", any inverter whose main power is restored is reset to return to the External operation mode. To resume the Network operation, therefore, set the operation mode to the Network operation using the sequence program.
  Set a value other than "0" in **Pr.340** to start in the Network operation mode after inverter reset. (For details of **Pr.340**, refer to the FR-E800 Instruction Manual (Function).)

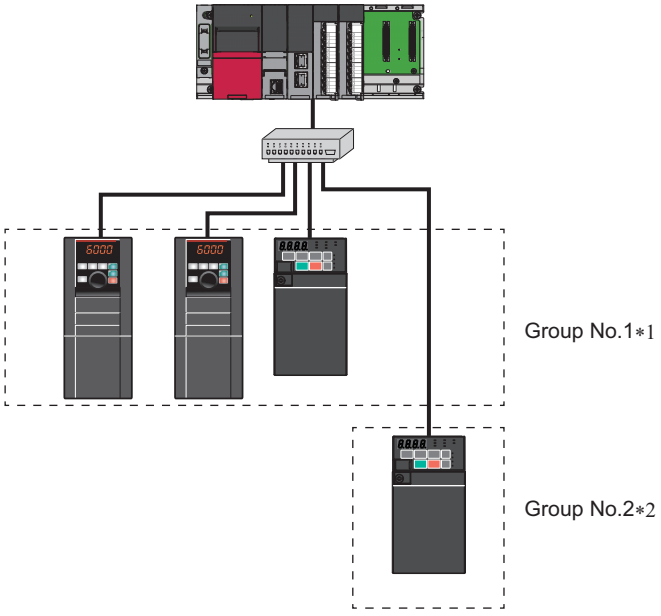
■ Troubleshooting

Description	Point to be checked
Communication is not established.	Check that the communication speed is not set to 10 Mbps.
Operation mode does not switch to the Network operation mode.	Check that the Ethernet cable is installed correctly. (Check for contact fault, break in the cable, etc.)
	Check that the inverter is in the External operation mode.
	Check that the operation mode switching program is running.
	Check that the operation mode switching program has been written correctly.
Inverter does not start in the Network operation mode.	Check that the inverter starting program is running.
	Check that the inverter starting program has been written correctly.
	Check that **Pr.338 Communication operation command source** is not set to External.

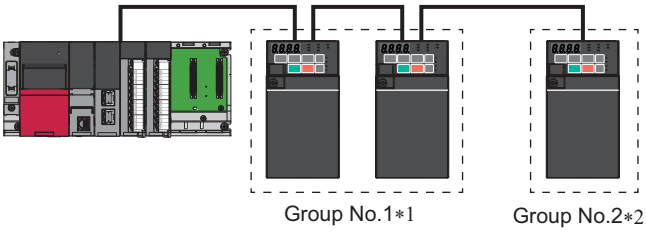
2.6.5 Group number setting

Set a group number to each slave station to divide slave stations into groups and perform cyclic transmission by the group. By grouping the slaves by their reference response times, cyclic transmission can be performed smoothly regardless of the differences of the reference response times. (Refer to the CC-Link IE Field Network Basic Reference Manual (SH-081684ENG) for the details.)

- Star topology



- Line topology



*1 The number of occupied stations for one group is up to 16.
*2 Up to four groups can be organized.

2.7 MODBUS/TCP

2.7.1 Outline

The MODBUS/TCP protocol allows transmission of MODBUS messages via Ethernet communication.

◆ Communication specifications

The communication specifications are shown in the following table.

Item		Description
Communication protocol		MODBUS/TCP protocol
Conforming standard		OPEN MODBUS/TCP SPECIFICATION
Time delay setting		Not available
Maximum number of connections		3
Topology		Line, star, or a combination of line and star
Slave function (server)	Number of simultaneously acceptable request messages	1 to 3

2.7.2 Initial setting for MODBUS/TCP

Use the following parameters to perform required settings for Ethernet communication between the inverter and other devices. To make communication between other devices and the inverter, perform the initial settings of the inverter parameters to match the communication specifications of the devices. Data communication cannot be made if the initial settings are not made or if there is any setting error.

Pr.	Name	Initial value	Setting range	Description
1427 N630[*1]	**Ethernet function selection 1**	5001	502, 5000 to 5002, 5006 to 5008, 5010 to 5013, 9999, 34962[*3], 44818[*2], 45237, 45238, 47808[*2], 61450	Set the application, protocol, etc.
1428 N631[*1]	**Ethernet function selection 2**	45237		
1429 N632[*1]	**Ethernet function selection 3**	45238		
1430 N633[*1]	**Ethernet function selection 4**	9999		
1432 N644	**Ethernet communication check time interval**	1.5 s	0	Ethernet communication is available, but the inverter output is shut off in the NET operation mode.
			0.1 to 999.8 s	Set the interval of the communication check (signal loss detection) time for all devices with IP addresses in the range specified for Ethernet command source selection (**Pr.1449 to Pr.1454**). If a no-communication state persists for longer than the permissible time, the inverter output will be shut off.
			9999	No communication check (signal loss detection)
1449 N670[*1]	**Ethernet command source selection IP address 1**	0	0 to 255	To limit the network devices that send the operation or speed command through the Ethernet network, set the range of IP addresses of the devices. When **Pr.1449 to Pr.1452** = "0 (initial value)", no IP address is specified for command source selection via Ethernet. In this case, operation commands cannot be sent via Ethernet.
1450 N671[*1]	**Ethernet command source selection IP address 2**	0		
1451 N672[*1]	**Ethernet command source selection IP address 3**	0		
1452 N673[*1]	**Ethernet command source selection IP address 4**	0		
1453 N674[*1]	**Ethernet command source selection IP address 3 range specification**	9999	0 to 255, 9999	
1454 N675[*1]	**Ethernet command source selection IP address 4 range specification**	9999		

*1 The setting is applied after an inverter reset or next power-ON.

*2 The setting is available only for the FR-E800-EPA and the FR-E800-SCEPA.

*3 The setting is available only for the FR-E800-EPB and the FR-E800-SCEPB.

NOTE

- The monitor items and parameter settings can be read during communication with the **Pr.1432 Ethernet communication check time interval** = "0 (initial value)" setting, but such operation will become faulty once the operation mode is changed to the NET operation mode. When the NET operation mode is selected as the start-up operation mode, communication is performed once, then an Ethernet communication fault (E.EHR) occurs.
  To perform operation or parameter writing via communication, set **Pr.1432** to "9999" or a value larger than the communication cycle or retry time setting. (Refer to page 73.)

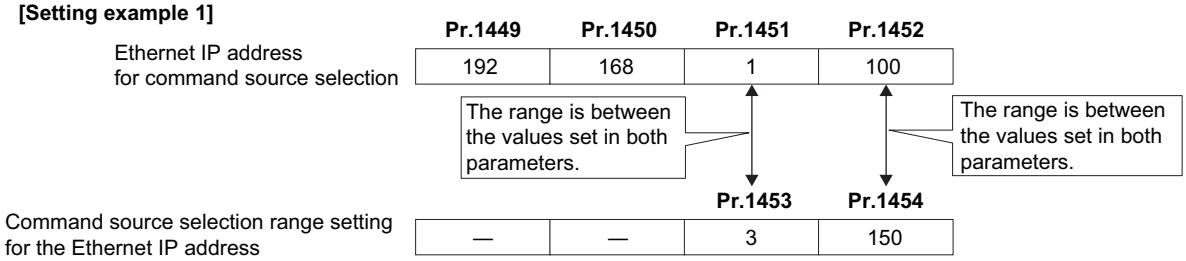
◆ Ethernet function selection (Pr.1427 to Pr.1430)

To select MODBUS/TCP for the application, set "502" (MODBUS/TCP) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. (Refer to page 151.)

◆ Ethernet IP address for command source selection (Pr.1449 to Pr.1454)

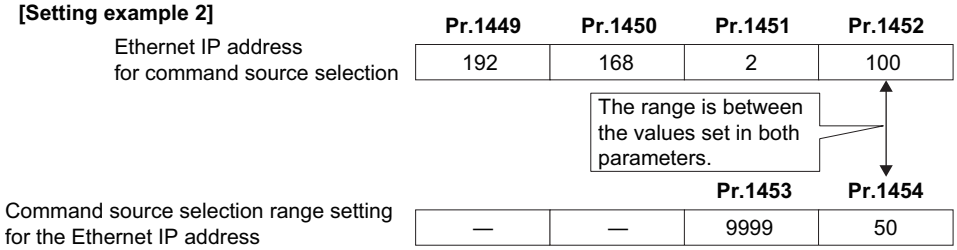
- To limit the network devices that send the operation or speed command through the Ethernet network, set the range of IP addresses of the devices.
- When **Pr.1449 to Pr.1452** = "0 (initial value)", no IP address is specified for command source selection via Ethernet. In this case, operation commands cannot be sent via Ethernet.
- The setting range for command source selection depends on the settings in **Pr.1451** and **Pr.1453**, and **Pr.1452** and **Pr.1454**. (Either of the settings can be larger than the other in **Pr.1451** and **Pr.1453**, and **Pr.1452** and **Pr.1454**.)

[Setting example 1]



In this case, the IP address range for command source selection via Ethernet communication is "192.168.x (1 to 3).xxx (100 to 150)".

[Setting example 2]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.2.xxx (50 to 100)".

- When "9999 (initial value)" is set in **Pr.1453 or Pr.1454**, the range is invalid.

NOTE

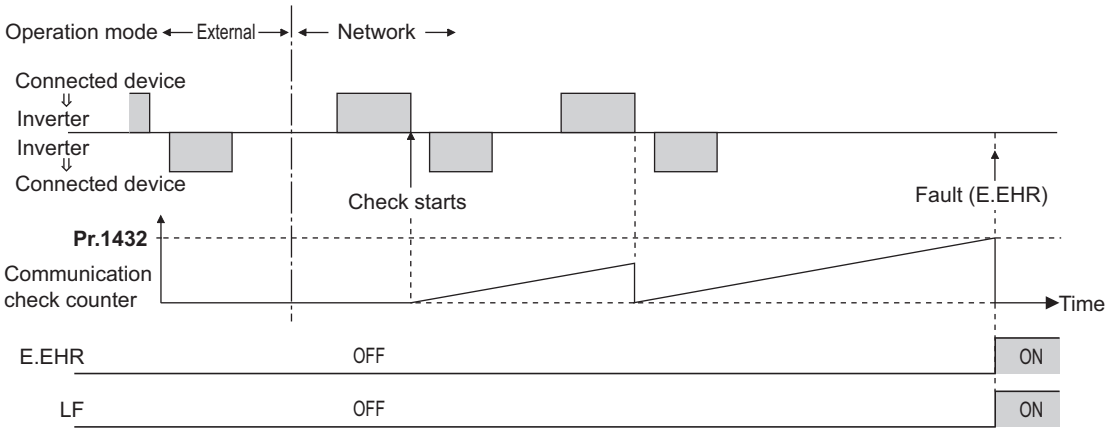
- When four or more clients attempt a connection to the inverter, the connection attempted from outside of the IP address range set for Ethernet command source selection will be forced to be closed in order from the oldest.

◆ Ethernet communication check time interval (Pr.1432)

- If a signal loss (communication stop) is detected between the inverter and all the devices with IP addresses in the range for Ethernet command source selection (**Pr.1449 to Pr.1454**) as a result of a signal loss detection, a communication error (E.EHR) occurs and the inverter output will be shut off.
- When "9999" is set in **Pr.1432**, the communication check (signal loss detection) will not be performed.
- The monitor items and parameter settings can be read via Ethernet when "0" is set in **Pr.1432**, but a communication error (E.EHR) occurs instantly when the operation mode is switched to the Network operation.

- A signal loss detection is made when any of 0.1 s to 999.8 s is set in **Pr.1432**. In order to enable the signal loss detection, data must be sent by connected devices at an interval equal to or less than the time set for the communication check. (The inverter makes a communication check (clearing of communication check counter) regardless of the station number setting of the data sent from the master).
- Communication check is started at the first communication when the inverter operates in the Network operation mode and the command source is specified as communication via the Ethernet connector.

Example) When **Pr.1432** = 0.1 to 999.8 s



2.7.3 Parameters related to MODBUS/TCP

The following parameters are used for MODBUS/TCP communication. Set the parameters as required.

Pr.	Name	Initial value	Setting range	Setting range
1426 **N641**[*1]	**Link speed and duplex mode selection**	0	0 to 4	Set the communication speed and the communication mode (full-duplex/half-duplex).
1442 **N660**[*1]	**IP filter address 1 (Ethernet)**	0	0 to 255	Set the range of connectable IP addresses for the network devices. (When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.)
1443 **N661**[*1]	**IP filter address 2 (Ethernet)**	0		
1444 **N662**[*1]	**IP filter address 3 (Ethernet)**	0		
1445 **N663**[*1]	**IP filter address 4 (Ethernet)**	0		
1446 **N664**[*1]	**IP filter address 2 range specification (Ethernet)**	9999	0 to 255, 9999	
1447 **N665**[*1]	**IP filter address 3 range specification (Ethernet)**	9999		
1448 **N666**[*1]	**IP filter address 4 range specification (Ethernet)**	9999		

*1 The setting is applied after an inverter reset or next power-ON.

◆ Communication speed and full-duplex/half-duplex selection (Pr.1426)

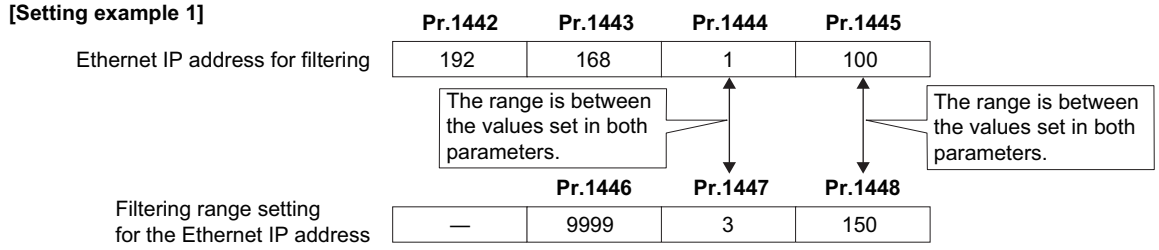
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

Pr.1426 setting	Communication speed	Full-duplex/half-duplex system	Remarks
0 (initial value)	Automatic negotiation	Automatic negotiation	The communication speed and the communication mode (half-duplex/full-duplex) are automatically negotiated to ensure the optimum setting. To set automatic negotiation, auto negotiation setting is required also in the master station.
1	100 Mbps	Full duplex	—
2	100 Mbps	Half duplex	—
3	10 Mbps	Full duplex	—
4	10 Mbps	Half duplex	—

◆ IP filtering function (Ethernet) (Pr.1442 to Pr.1448)

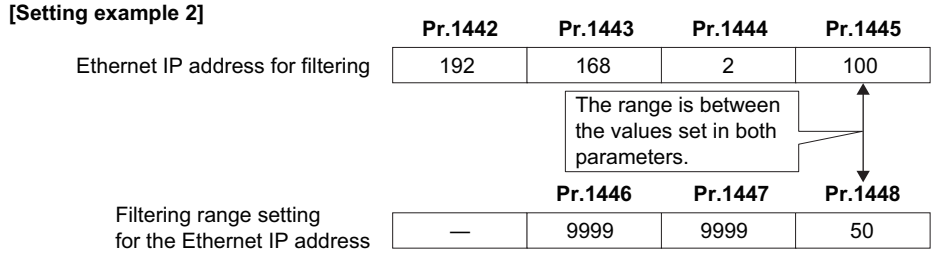
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either of the settings can be larger than the other in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**.)

[Setting example 1]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.x (1 to 3).xxx (100 to 150)".

[Setting example 2]



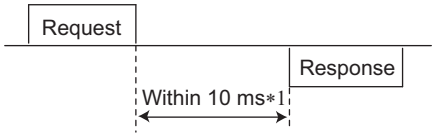
In this case, the IP address range in which Ethernet communication is permitted is "192.168.2.xxx (50 to 100)".

- When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.
- When "9999 (initial value)" is set in **Pr.1446 to Pr.1448**, the range is invalid.

⚠CAUTION

- The IP filtering function (Ethernet) (**Pr.1442 to Pr.1448**) is provided as a means to prevent unauthorized access, DoS attacks, computer viruses, or other cyberattacks from external devices, but the function does not prevent such access completely. In order to protect the inverter and the system against unauthorized access by external systems, take additional security measures. We shall have no responsibility or liability for any problems involving inverter trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks. The following are examples of measures to prevent them.
  - Install a firewall.
  - Install a personal computer as a relay station, and control the relaying of transmission data using an application program.
  - Install an external device as a relay station to control access rights. (For the details of external devices used to control access rights, contact the distributors of the external devices.)

◆ Message format



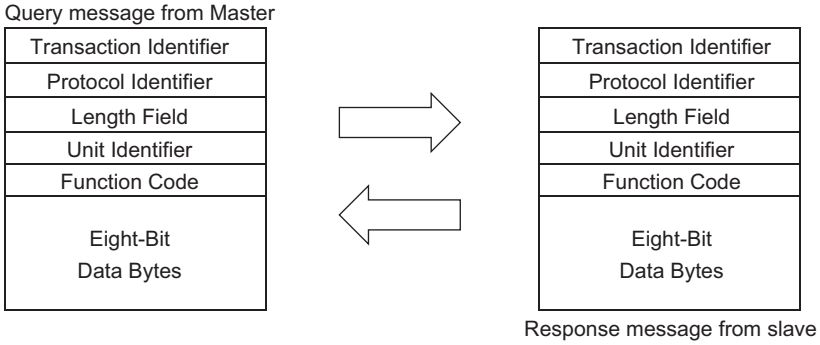
*1 The chart shows the performance when the inverter is connected to a master on a 1:1 basis. (It takes 10 ms or more for Parameter clear, All parameter clear, or accessing multiple registers.)

- Query
  A message is sent to the slave (the inverter) having the address specified by the master.
- Normal response
  After the query from the master is received, the slave executes the request function, and returns the corresponding normal response to the master.
- Error Response
  When an invalid function code, address or data is received by the slave, the error response is returned to the master.
  This response is appended with an error code that indicates the reason why the request from the master could not be executed.

◆ Message frame (protocol)

- Communication method

  Basically, the master sends a query message (inquiry), and slaves return a response message (response). At normal communication, the transaction identifier, protocol identifier, unit identifier, and function code are copied as they are, and at erroneous communication (illegal function code or data code), bit 7 (= H80) of the function code is turned ON, and the error code is set at data bytes.



Message frames have the six message fields shown in the figures above.

- Details of protocol

  The following table explains the six message fields.

Transaction identifier	Protocol identifier	Length field	Unit identifier	Function	Data
2 × 8 bits	2 × 8 bits	2 × 8 bits	8 bits	8 bits	n × 8 bits

Message field	Description
Transaction identifier	The master adds the data for the purpose of transaction control. The same data is returned in the response from the slave.
Protocol identifier	Fixed to 0. (When the slave receives data other than 0, it does not send the response message.) "0" is returned in the response from the slave.
Length field	The data length from the unit identifier to the data is stored in byte.
Unit identifier	Fixed to 255
Function code	"1 to 255" can be set as the function code in the single-byte (8-bit) length filed. The master sets the function to be sent to the slave as the request, and the slave performs the requested operation. Refer to the function code list for details of the supported function codes. An error response is generated when a function code other than those in the function code list is set. The normal response from the slave contains the function code set by the master. The error response contains H80 and the function code.
Data	The format changes according the function code. (Refer to page 77.) The data, for example, includes the byte count, number of bytes, and accessing content of holding registers.

◆ Function code list

Function name	Read/write	Code	Outline	Message format reference page
Read holding registers	Read	H03	The data of the holding registers is read. The various data of the inverter can be read from MODBUS registers. System environmental variable (Refer to page 81.) Monitor code (Refer to the FR-E800 Instruction Manual (Function).) Fault history (Refer to page 84.) Model information monitor (Refer to page 84.) Inverter parameters (Refer to page 83.)	page 77
Write Single Register	Write	H06	Data is written to a holding register. Data can be written to MODBUS registers to output instructions to the inverter or set parameters. System environmental variable (Refer to page 81.) Inverter parameters (Refer to page 83.)	page 78
Diagnostics	Read	H08	Functions are diagnosed. (communication check only) A communication check can be made since the query message is sent and the query message is returned as it is as the return message (subfunction code H00 function). Subfunction code H00 (Return query data).	page 78

Function name	Read/write	Code	Outline	Message format reference page
Write Multiple Registers	Write	H10	Data is written to multiple consecutive holding registers. Data can be written to consecutive multiple MODBUS registers to output instructions to the inverter or set parameters. System environmental variable (Refer to page 81.) Inverter parameters (Refer to page 83.)	page 79
Read holding register access log	Read	H46	The number of registers that were successfully accessed by the previous communication is read. Queries by function codes H03, H06, and H10 are supported. The number and start address of holding registers successfully accessed by the previous communication are returned. "0" is returned for both the number and start address for queries other than function code H03, H06, and H10. When the connection is closed, the data in the log is cleared.	page 80

◆Read holding registers (reading data of holding registers) (H03 or 03)

- Query message

a. Transaction identifier		b. Protocol identifier		c. Length field		d. Unit identifier	e. Function code	f. Starting address		g. Quantity of registers	
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H03 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)

- Normal response (Response message)

a. Transaction identifier		b. Protocol identifier		c. Length field		d. Unit identifier	e. Function code	h. Byte Count	i. Register Value		
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H03 (8 bits)	(8 bits)	H (8 bits)	L (8 bits)	... (n × 16 bits)

- Query message setting

Message		Description
a	Transaction identifier	The master adds the data for the purpose of transaction control. The same data is returned in the response from the slave.
b	Protocol identifier	Fixed to 0. (When the slave receives data other than 0, it does not send the response message.) "0" is returned in the response from the slave.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	Fixed to 255
e	Function code	Set H03.
f	Starting address	Set the holding register address from which to start reading the data. Starting address = start register address (decimal) - 40001 For example, when starting register address 0001 is set, the data of holding register address 40002 is read.
g	Quantity of registers	Set the number of holding registers for reading data. Data can be read from up to 125 registers.

- Content of normal response

Message		Description
h	Byte count	The setting range is H02 to HFA (2 to 250). Twice the number of reads specified by (g) is set.
i	Register value	The amount of data specified by (g) is set. Read data is output Hi bytes first followed by Lo bytes, and is arranged as follows: data of start address, data of start address+1, data of start address+2, and so forth.

■Example) Read the register values of 41004 (Pr.4) to 41006 (Pr.6) from the inverter.

Query message

Transaction identifier		Protocol identifier		Length field		Unit identifier	Function code	Starting address		Quantity of registers	
*1	*1	H00 (8 bits)	H00 (8 bits)	H00 (8 bits)	H06 (8 bits)	HFF (8 bits)	H03 (8 bits)	H03 (8 bits)	HEB (8 bits)	H00 (8 bits)	H03 (8 bits)

*1 A given value is set.

Normal response (Response message)

Transaction identifier		Protocol identifier		Length field		Unit identifier	Function code	Byte count	Register value		
*1	*1	H00 (8 bits)	H00 (8 bits)	H00 (8 bits)	H09 (8 bits)	HFF (8 bits)	H03 (8 bits)	H06 (8 bits)	H17 (8 bits)	H70 (8 bits)	H0B (8 bits)

*1 The values are the same as those in the query message.

Read value

Register 41004 **(Pr.4)**: H1770 (60.00 Hz)

Register 41005 **(Pr.5)**: H0BB8 (30.00 Hz)

Register 41006 **(Pr.6)**: H03E8 (10.00 Hz)

◆Write single register (writing data to holding registers) (H06 or 06)

- The content of the system environmental variables and inverter parameters (refer to page 81) assigned to the holding register area can be written. Query message

a. Transaction identifier		b. Protocol identifier		c. Length field		d. Unit identifier	e. Function code	f. Register Address		g. Register Value	
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H06 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)

- Normal response (Response message)

a. Transaction identifier		b. Protocol identifier		c. Length field		d. Unit identifier	e. Function code	f. Register Address		g. Register Value	
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H06 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)

- Query message setting

Message		Description
a	Transaction identifier	The master adds the data for the purpose of transaction control. The same data is returned in the response from the slave.
b	Protocol identifier	Fixed to 0. (When the slave receives data other than 0, it does not send the response message.) "0" is returned in the response from the slave.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	Fixed to 255
e	Function code	Set H06.
f	Register address	Set the holding register address to write data to. Register address = holding register address (decimal) - 40001 For example, when register address 0001 is set, data is written to holding register address 40002.
g	Register value	Set the data to write to the holding register. Write data is fixed at 2 bytes.

- Content of normal response

  With a normal response, the contents in the response are the same as those in (a) to (g) of the query message.

■Example) Write 60 Hz (H1770) to register 40014 (running frequency RAM) in the inverter.

Query message

Transaction identifier		Protocol identifier		Length field		Unit identifier	Function code	Register address		Register value	
*1	*1	H00 (8 bits)	H00 (8 bits)	H00 (8 bits)	H06 (8 bits)	HFF (8 bits)	H06 (8 bits)	H00 (8 bits)	H0D (8 bits)	H17 (8 bits)	H70 (8 bits)

*1 A given value is set.

Normal response (Response message)

The same data as those in the query message

◆Diagnostics (diagnosis of functions) (H08 or 08)

- A communication check can be made since the query message is sent and the query message is returned as it is as the return message (subfunction code H00 function).

  Subfunction code H00 (Return query data)

- Query message

a. Transaction identifier		b. Protocol identifier		c. Length field		d. Unit identifier	e. Function code	f. Sub-function		g. Data	
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H08 (8 bits)	H00 (8 bits)	H00 (8 bits)	H (8 bits)	L (8 bits)

- Normal response (Response message)

a. Transaction identifier		b. Protocol identifier		c. Length field		d. Unit identifier	e. Function code	f. Sub-function		g. Data	
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H08 (8 bits)	H00 (8 bits)	H00 (8 bits)	H (8 bits)	L (8 bits)

- Query message setting

Message		Description
a	Transaction identifier	The master adds the data for the purpose of transaction control. The same data is returned in the response from the slave.
b	Protocol identifier	Fixed to 0. (When the slave receives data other than 0, it does not send the response message.) "0" is returned in the response from the slave.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	Fixed to 255
e	Function code	Set H08.
f	Sub-function	Set H0000.
g	Data	Any 2-byte long data can be set. The setting range is H0000 to HFFFF.

- Content of normal response

  With a normal response, the contents in the response are the same as those in (a) to (g) of the query message.

◆Write multiple registers (writing data to multiple holding registers) (H10 or 16)

- Data can be written to multiple holding registers.
- Query message

a. Transaction identifier		b. Protocol identifier		c. Length field		d. Unit identifier	e. Function code	f. Starting address		g. Quantity of registers		h. Byte Count	i. Register Value		
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H10 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H (8 bits)	L (8 bits)	... (n × 2 × 8 bits)

- Normal response (Response message)

a. Transaction identifier		b. Protocol identifier		c. Length field		d. Unit identifier	e. Function code	f. Starting address		g. Quantity of registers	
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H10 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)

- Query message setting

Message		Description
a	Transaction identifier	The master adds the data for the purpose of transaction control. The same data is returned in the response from the slave.
b	Protocol identifier	Fixed to 0. (When the slave receives data other than 0, it does not send the response message.) "0" is returned in the response from the slave.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	Fixed to 255
e	Function code	Set H10.
f	Starting address	Set the holding register address from which to start writing the data. Starting address = start register address (decimal) - 40001 For example, when starting address 0001 is set, data is written to holding register 40002.
g	Quantity of registers	Set the number of holding registers for writing data. Data can be written to up to 125 registers.
h	Byte count	The setting range is H02 to HFA (2 to 250). Set the value set in (g) multiplied by 2.
i	Register value	The amount of data specified by (g) is set. Write data is output Hi bytes first followed by Lo bytes, and is arranged as follows: data of start address, data of start address+1, data of start address+2, and so forth.

- Content of normal response

  With a normal response, the contents in the response are the same as those in (a) to (g) of the query message.

■ Example) Write 0.5 s (H05) to register 41007 (Pr.7) and 1 s (H0A) to register 41008 (Pr.8) in the inverter.

Query message

Transaction identifier		Protocol identifier		Length field		Unit identifier	Function code	Starting address		Quantity of registers		Byte count	Register value		
*1	*1	H00 (8 bits)	H00 (8 bits)	H00 (8 bits)	H0B (8 bits)	HFF (8 bits)	H10 (8 bits)	H03 (8 bits)	HEE (8 bits)	H00 (8 bits)	H02 (8 bits)	H04 (8 bits)	H00 (8 bits)	H05 (8 bits)	H00 (8 bits)

*1 A given value is set.

Normal response (Response message)

Transaction identifier		Protocol identifier		Length field		Unit identifier	Function code	Starting address		Quantity of registers	
*1	*1	H00 (8 bits)	H00 (8 bits)	H00 (8 bits)	H06 (8 bits)	HFF (8 bits)	H10 (8 bits)	H03 (8 bits)	HEE (8 bits)	H00 (8 bits)	H02 (8 bits)

*1 The values are the same as those in the query message.

◆ Read holding register access log (H46 or 70)

- Queries by function codes H03, H06, and H10 are supported.
  The number and start address of holding registers successfully accessed by the previous communication are returned.
  "0" is returned for both the number and start address for queries other than the function codes above.
- Query message

a. Transaction identifier		b. Protocol identifier		c. Length field		d. Unit identifier	e. Function code
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H46 (8 bits)

- Normal response (Response message)

a. Transaction identifier		b. Protocol identifier		c. Length field		d. Unit identifier	e. Function code	f. Starting address		g. No. of Points	
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H46 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)

- Query message setting

Message		Description
a	Transaction identifier	The master adds the data for the purpose of transaction control. The same data is returned in the response from the slave.
b	Protocol identifier	Fixed to 0. (When the slave receives data other than 0, it does not send the response message.) "0" is returned in the response from the slave.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	Fixed to 255
e	Function code	Set H46.

- Content of normal response

Message		Description
f	Starting address	The start address of the holding register that was successfully accessed is returned. Starting address = start register address (decimal) - 40001 For example, when starting address 0001 is returned, the holding register address that was successfully accessed is 40002.
g	No. of points	The number of holding registers that were successfully accessed is returned.

■ Example) Read the successful register start address and the number of successful accesses from the inverter.

Query message

Transaction identifier		Protocol identifier		Length field		Unit identifier	Function code
*1	*1	H00 (8 bits)	H00 (8 bits)	H00 (8 bits)	H02 (8 bits)	HFF (8 bits)	H46 (8 bits)

*1 A given value is set.

Normal response (Response message)

Transaction identifier		Protocol identifier		Length field		Unit identifier	Function code	Starting address		No. of points	
*1	*1	H00 (8 bits)	H00 (8 bits)	H00 (8 bits)	H06 (8 bits)	HFF (8 bits)	H10 (8 bits)	H03 (8 bits)	HEE (8 bits)	H00 (8 bits)	H02 (8 bits)

*1 The values are the same as those in the query message.

The number of holding registers that were successfully accessed was returned as two with the start address 41007 **(Pr.7)**.

◆ Error response

- An error response is returned if the query message received from the master contains an illegal function, address or data.
- Error response (Response message)

a. Transaction identifier		b. Protocol identifier		c. Length field		d. Unit identifier	e. Function code	Exception code
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H80 + Function (8 bits)	(8 bits)

Message		Description
a	Transaction identifier	The master adds the data for the purpose of transaction control. The same data is returned in the response from the slave.
b	Protocol identifier	Fixed to 0. (When the slave receives data other than 0, it does not send the response message.) "0" is returned in the response from the slave.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	Fixed to 255
e	Function code	The function code requested by the master and H80 is set.
f	Exception code	The codes in the following table are set.

- Error code list

Code	Error item	Error description
01	ILLEGAL FUNCTION	The query message from the master has a function code that cannot be handled by the slave.
02	ILLEGAL DATA ADDRESS*1	The query message from the master has a register address that cannot be handled by the slave. (No parameter, parameter cannot be read, parameter cannot be written)
03	ILLEGAL DATA VALUE	The query message from the master has data that cannot be handled by the slave. (Out of parameter write range, a mode is specified, or other error)
06	SLAVE DEVICE BUSY	The request message cannot be processed because the slave is executing another operation.

*1 An error response is not returned in the following cases:

(a) Function code H03 (reading data of holding registers)

When the quantity of registers is specified as one or more and there are one or more holding registers from which data can be read.

(b) Function code H10 (writing data to multiple holding registers)

When the quantity of registers is specified as one or more and there are one or more holding registers to which data can be written.

In other words, when function code H03 or H10 is used and multiple holding registers are accessed, an error response is not returned even if a nonexistent holding register or holding register that cannot be read or written from/to is accessed.

NOTE

- An error response is returned if none of the accessed holding registers exist. When an accessed holding register does not exist, the read value is 0 and the written data is invalid.

◆ MODBUS register

- The following shows the MODBUS registers for system environment variables (read/write), monitor codes (read), parameters (read/write), fault history data (read/write), and model information monitor items (read).
- System environment variables

Register	Definition	Read/write	Remarks
40002	Inverter reset	Write	Any value
40003	Parameter clear	Write	Set H965A.
40004	All parameter clear	Write	Set H99AA.
40006	Parameter clear*1	Write	Set H5A96.
40007	All parameter clear*1	Write	Set HAA99.
40008	Inverter status / control input command (extended)*2	Read/write	Refer to the following.

Register	Definition	Read/write	Remarks
40009	Inverter status / control input command*2	Read/write	Refer to the following.
40010	Operation mode / inverter setting*3	Read/write	Refer to the following.
40014	Running frequency (RAM value)	Read/write	(The display can be changed to the rotations per minute (machine speed) using **Pr.37 and Pr.53**. Refer to the FR-E800 Instruction Manual (Function).)
40015	Running frequency (EEPROM value)	Write	

*1 Settings in the communication parameters are not cleared.
*2 The data is written as a control input command for writing.
The data is read as the inverter status for reading.
*3 The data is written as an operation mode setting for writing.
The data is read as the operation mode status for reading.

- Inverter status / control input command, and inverter status / control input command (extended)

Bit	Definition	
	Control input command	Inverter status
0	Stop command	RUN (Inverter running)*2
1	Forward rotation command	Forward running
2	Reverse rotation command	Reverse running
3	RH (High-speed operation command)*1	Up to frequency
4	RM (Middle-speed operation command)*1	Overload warning
5	RL (Low-speed operation command)*1	0
6	JOG operation selection 2	FU (Output frequency detection)*2
7	Second function selection	ABC (Fault)*2
8	Terminal 4 input selection	0
9	—	Safety monitor output 2
10	MRS (Output stop)*1	0
11	—	0
12	RES (—)*1	0
13	—	0
14	—	0
15	—	Fault occurrence

Bit	Definition	
	Control input command	Inverter status
0	NET X1 (—)*1	NET Y1 (0)*2
1	NET X2 (—)*1	NET Y2 (0)*2
2	NET X3 (—)*1	NET Y3 (0)*2
3	NET X4 (—)*1	NET Y4 (0)*2
4	NET X5 (—)*1	0
5	—	0
6	—	0
7	—	0
8	—	0
9	—	0
10	—	0
11	—	0
12	—	0
13	—	0
14	—	0
15	—	0

*1 The signal within parentheses ( ) is assigned in the initial status. The description changes depending on the setting of **Pr.180 to Pr.189 (Input terminal function selection)**.
For details, refer to the description of **Pr.180 to Pr.189 (Input terminal function selection)** in the FR-E800 Instruction Manual (Function).
The signals assigned to the input terminals may be valid or invalid in the NET operation mode. (Refer to the FR-E800 Instruction Manual (Function).)
*2 The signal within parentheses ( ) is assigned in the initial status. The description changes depending on the setting of **Pr.190 to Pr.196 (Output terminal function selection)**.
For details, refer to the description of **Pr.190 to Pr.196 (Output terminal function selection)** in the FR-E800 Instruction Manual (Function).

- Operation mode / inverter setting

Mode	Read value	Write value
EXT	H0000	H0010*1
PU	H0001	H0011*1
EXT JOG	H0002	—
PU JOG	H0003	—
NET	H0004	H0014
PU + EXT	H0005	—

*1 Writing is available depending on the **Pr.79 and Pr.340** settings. For details, refer to the FR-E800 Instruction Manual (Function).
Restrictions in each operation mode conform with the computer link specification.

- Monitor code

  For details of the register numbers and the monitor items, refer to the description of **Pr.52** in the FR-E800 Instruction Manual (Function).

- Parameter

Pr.	Register	Name	Read/write	Remarks
0 to 999	41000 to 41999	For details on parameter names, refer to the parameter list in the FR-E800 Instruction Manual (Function).	Read/write	The parameter number + +41000 is the register number.
C2 (902)	41902	Terminal 2 frequency setting bias (frequency)	Read/write	
C3 (902)	42092	Terminal 2 frequency setting bias (analog value)	Read/write	Analog value (%) set in **C3 (902)**
	43902	Terminal 2 frequency setting bias (terminal analog value)	Read	Analog value (%) of the voltage (current) applied to terminal 2
125 (903)	41903	Terminal 2 frequency setting gain (frequency)	Read/write	
C4 (903)	42093	Terminal 2 frequency setting gain (analog value)	Read/write	Analog value (%) set in **C4 (903)**
	43903	Terminal 2 frequency setting gain (terminal analog value)	Read	Analog value (%) of the voltage (current) applied to terminal 2
C5 (904)	41904	Terminal 4 frequency setting bias (frequency)	Read/write	
C6 (904)	42094	Terminal 4 frequency setting bias (analog value)	Read/write	Analog value (%) set in **C6 (904)**
	43904	Terminal 4 frequency setting bias (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
126 (905)	41905	Terminal 4 frequency setting gain (frequency)	Read/write	
C7 (905)	42095	Terminal 4 frequency setting gain (analog value)	Read/write	Analog value (%) set in **C7 (905)**
	43905	Terminal 4 frequency setting gain (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C38 (932)	41932	Terminal 4 bias command (torque/ magnetic flux)	Read/write	
C39 (932)	42122	Terminal 4 bias (torque/magnetic flux)	Read/write	Analog value (%) set in **C39 (932)**
	43932	Terminal 4 bias (torque/magnetic flux) (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C40 (933)	41933	Terminal 4 gain command (torque/ magnetic flux)	Read/write	
C41 (933)	42123	Terminal 4 gain (torque/magnetic flux)	Read/write	Analog value (%) set in **C41 (933)**
	43933	Terminal 4 gain (torque/magnetic flux) (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C42 (934)	41934	PID display bias coefficient	Read/write	
C43 (934)	42124	PID display bias analog value	Read/write	Analog value (%) set in **C43 (934)**
	43934	PID display bias analog value (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C44 (935)	41935	PID display gain coefficient	Read/write	
C45 (935)	42125	PID display gain analog value	Read/write	Analog value (%) set in **C45 (935)**
	43935	PID display gain analog value (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
1000 to 1999	45000 to 45999	For details on parameter names, refer to the parameter list in the FR-E800 Instruction Manual (Function).	Read/write	The parameter number + 44000 is the register number.

- Fault history

Register	Definition	Read/write	Remarks
40501	Fault record 1	Read/write	Being 2 bytes in length, the data is stored as H00○○. Refer to the lowest 1 byte for the error code. (For details on error codes, refer to the list of fault displays in the FR-E800 Instruction Manual (Maintenance).) The fault history is batch-cleared by writing to register 40501. Set any value as data.
40502	Fault record 2	Read	
40503	Fault record 3	Read	
40504	Fault record 4	Read	
40505	Fault record 5	Read	
40506	Fault record 6	Read	
40507	Fault record 7	Read	
40508	Fault record 8	Read	
40509	Fault record 9	Read	
40510	Fault record 10	Read	

- Product profile

Register	Definition	Read/write	Remarks
44001	Model (1st and 2nd characters)	Read	The model name can be read in ASCII code. "H20" (blank code) is set for blank area. Example) FR-E820-EPA : H46, H52, H2D, H45, H38, H32, H30, H2D, H45, H50, H41, H20...H20
44002	Model (3rd and 4th characters)	Read	
44003	Model (5th and 6th characters)	Read	
44004	Model (7th and 8th characters)	Read	
44005	Model (9th and 10th characters)	Read	
44006	Model (11th and 12th characters)	Read	
44007	Model (13th and 14th characters)	Read	
44008	Model (15th and 16th characters)	Read	
44009	Model (17th and 18th characters)	Read	
44010	Model (19th and 20th characters)	Read	
44011	Capacity (1st and 2nd characters)	Read	The capacity in the inverter model can be read in ASCII code. Data read is displayed in increments of 0.1 kW (rounded down to one decimal place). "H20" (blank code) is set for blank area. Example) 0.75K: " 7" (H20, H20, H20, H20, H20, H37)
44012	Capacity (3rd and 4th characters)	Read	
44013	Capacity (5th and 6th characters)	Read	

NOTE

- When a 32-bit parameter setting or monitor item is read and the value to be read exceeds HFFFF, HFFFF is returned.

2.8 BACnet/IP

2.8.1 Outline

Operation or parameter setting via communication is possible using the BACnet/IP through the Ethernet connector on the inverter.

◆Communication specifications

The specifications conform to the BACnet standard of the Ethernet physical medium.

Item	Description
Physical medium	Ethernet (ISO 8802-3)
Supported property of BACnet standard object type	Refer to page 90.
Supported BIBBs (Annex K)	Refer to page 95.
BACnet standardized device profile (Annex L)	Refer to page 95.
Segmentation	Not supported
Device address binding	Not supported
Topology	Line, star, or a combination of line and star

NOTE

- This product is classified as a BACnet Application Specific Controller (B-ASC).

2.8.2 Initial setting for BACnet/IP

Use the following parameters to perform required settings for Ethernet communication between the inverter and other devices. To make communication between other devices and the inverter, perform the initial settings of the inverter parameters to match the communication specifications of the devices. Data communication cannot be made if the initial settings are not made or if there is any setting error.

Pr.	Name	Initial value	Setting range	Setting range
1427 N630[*1]	**Ethernet function selection 1**	5001	502, 5000 to 5002, 5006 to 5008, 5010 to 5013, 9999, 34962[*3], 44818[*2], 45237, 45238, 47808[*2], 61450	Set the application, protocol, etc.
1428 N631[*1]	**Ethernet function selection 2**	45237		
1429 N632[*1]	**Ethernet function selection 3**	45238		
1430 N633[*1]	**Ethernet function selection 4**	9999		
1432 N644	**Ethernet communication check time interval**	1.5 s	0	Ethernet communication is available, but the inverter output is shut off in the NET operation mode.
			0.1 to 999.8 s	Set the interval of the communication check (signal loss detection) time for all devices with IP addresses in the range specified for Ethernet command source selection (**Pr.1449 to Pr.1454**). If a no-communication state persists for longer than the permissible time, the inverter output will be shut off.
			9999	No communication check (signal loss detection)

Pr.	Name	Initial value	Setting range	Setting range
1449 N670[*1]	**Ethernet command source selection IP address 1**	0	0 to 255	To limit the network devices that send the operation or speed command through the Ethernet network, set the range of IP addresses of the devices. When **Pr.1449 to Pr.1452** = "0 (initial value)", no IP address is specified for command source selection via Ethernet. In this case, operation commands cannot be sent via Ethernet with MODBUS/TCP protocol.
1450 N671[*1]	**Ethernet command source selection IP address 2**	0		
1451 N672[*1]	**Ethernet command source selection IP address 3**	0		
1452 N673[*1]	**Ethernet command source selection IP address 4**	0		
1453 N674[*1]	**Ethernet command source selection IP address 3 range specification**	9999	0 to 255, 9999	
1454 N675[*1]	**Ethernet command source selection IP address 4 range specification**	9999		

*1 The setting is applied after an inverter reset or next power-ON.
*2 The setting is available only for the FR-E800-EPA and the FR-E800-SCEPA.
*3 The setting is available only for the FR-E800-EPB and the FR-E800-SCEPB.

NOTE

- The monitor items and parameter settings can be read during communication with the **Pr.1432 Ethernet communication check time interval** = "0 (initial value)" setting, but such operation will become faulty once the operation mode is changed to the NET operation mode. When the NET operation mode is selected as the start-up operation mode, communication is performed once, then an Ethernet communication fault (E.EHR) occurs.
  To perform operation or parameter writing via communication, set **Pr.1432** to "9999" or a value larger than the communication cycle or retry time setting. (Refer to page 87.)

◆ Ethernet function selection (Pr.1427 to Pr.1430)

To select BACnet/IP for the application, set "47808" (BACnet/IP) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**.

NOTE

- Change the setting if selected communication protocols cannot be used together. (Refer to page 5 and page 151.)

◆ Ethernet IP address for command source selection (Pr.1449 to Pr.1454)

- To limit the network devices that send the operation or speed command through the Ethernet network, set the range of IP addresses of the devices.
- When **Pr.1449 to Pr.1452** = "0 (initial value)", no IP address is specified for command source selection via Ethernet. In this case, operation commands cannot be sent via Ethernet.

- The setting range for command source selection depends on the settings in **Pr.1451** and **Pr.1453**, and **Pr.1452** and **Pr.1454**. (Either of the settings can be larger than the other in **Pr.1451** and **Pr.1453**, and **Pr.1452** and **Pr.1454**.)

[Setting example 1]

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	1	100
			Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	—	—	3	150

The range is between the values set in both parameters.

The range is between the values set in both parameters.

In this case, the IP address range for command source selection via Ethernet communication is "192.168.x (1 to 3).xxx (100 to 150)".

[Setting example 2]

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	2	100
			Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	—	—	9999	50

The range is between the values set in both parameters.

In this case, the IP address range in which Ethernet communication is permitted is "192.168.2.xxx (50 to 100)".

- When "9999 (initial value)" is set in **Pr.1453 or Pr.1454**, the range is invalid.

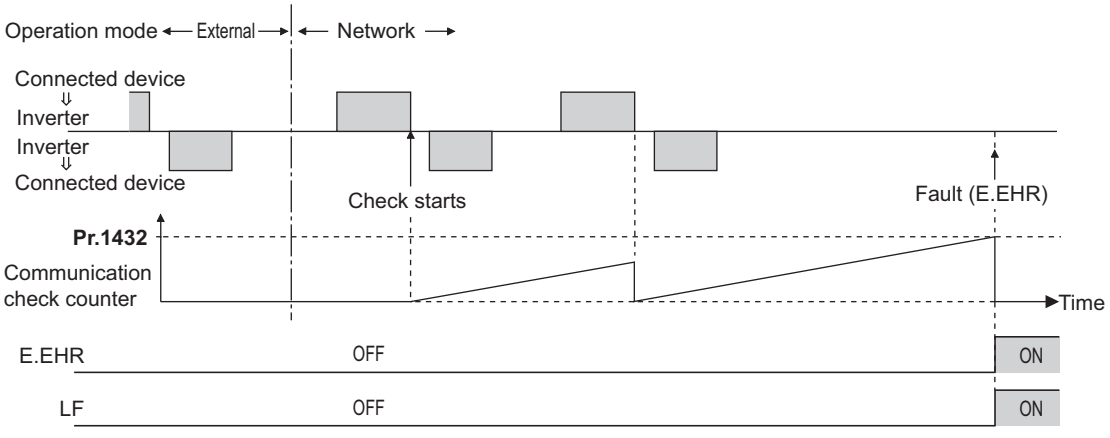
NOTE

- When BACnet/IP is used, do not include IP addresses of other inverters in the Ethernet IP address range set for command source selection. If an IP address of any other inverter falls within the range, the protective function (E.EHR) will be activated after the time period set in **Pr.1432** after power is supplied to the inverter.

◆ Ethernet communication check time interval (Pr.1432)

- If a signal loss (communication stop) is detected between the inverter and all the devices with IP addresses in the range for Ethernet command source selection (**Pr.1449 to Pr.1454**) as a result of a signal loss detection, a communication error (E.EHR) occurs and the inverter output will be shut off.
- When "9999" is set in **Pr.1432**, the communication check (signal loss detection) will not be performed.
- The monitor items and parameter settings can be read via Ethernet when "0" is set in **Pr.1432**, but a communication error (E.EHR) occurs instantly when the operation mode is switched to the Network operation.
- A signal loss detection is made when any of 0.1 s to 999.8 s is set in **Pr.1432**. In order to enable the signal loss detection, data must be sent by connected devices at an interval equal to or less than the time set for the communication check. (The inverter makes a communication check (clearing of communication check counter) regardless of the station number setting of the data sent from the master).
- Communication check is started at the first communication when the inverter operates in the Network operation mode and the command source is specified as communication via the Ethernet connector.

Example) When **Pr.1432** = 0.1 to 999.8 s



2.8.3 Parameters related to BACnet/IP

The following parameters are used for BACnet/IP communication. Set the parameters as required.

Pr.	Name	Initial value	Setting range	Description
390 **N054**	**% setting reference frequency**	60 Hz	1 to 590 Hz	Set a reference frequency of the set frequency.
728 **N052**	**Device instance number (Upper 3 digits)**	0	0 to 419 (0 to 418)	Device identifier When the figure obtained by combining the **Pr.728** and **Pr.729** settings is not within "0 to 4194302", the setting is out of range. (The setting range of **Pr.729** is "0 to 4302" when **Pr.728** = "419". The setting range of **Pr.728** is "0 to 418" when **Pr.729** = "4303" or more.)
729 **N053**	**Device instance number (Lower 4 digits)**	0	0 to 9999 (0 to 4302)	
1426 **N641**[*1]	**Link speed and duplex mode selection**	0	0 to 4	Set the communication speed and the communication mode (full-duplex/half-duplex).
1442 **N660**[*1]	**IP filter address 1 (Ethernet)**	0	0 to 255	Set the range of connectable IP addresses for the network devices. (When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.)
1443 **N661**[*1]	**IP filter address 2 (Ethernet)**	0		
1444 **N662**[*1]	**IP filter address 3 (Ethernet)**	0		
1445 **N663**[*1]	**IP filter address 4 (Ethernet)**	0		
1446 **N664**[*1]	**IP filter address 2 range specification (Ethernet)**	9999	0 to 255, 9999	
1447 **N665**[*1]	**IP filter address 3 range specification (Ethernet)**	9999		
1448 **N666**[*1]	**IP filter address 4 range specification (Ethernet)**	9999		

*1 The setting is applied after an inverter reset or next power-ON.

◆ Parameters for monitoring (Pr.52, Pr.774 to Pr.776, Pr.992, and Pr.1027 to Pr.1034)

- The following items related to BACnet/IP can be monitored.

Parameter setting for monitor item	Description
83	BACnet valid APDU counter (The count of valid APDU detection is displayed.)[*1]

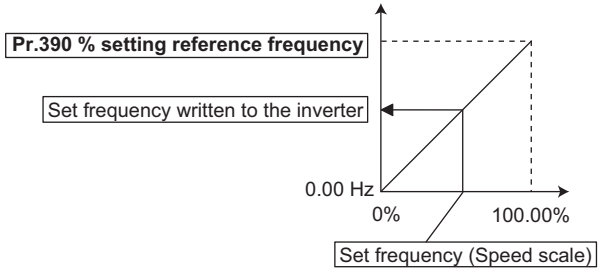
*1 When the count exceeds "9999", the monitor value is reset to "0".

NOTE

- For the description of other settings, refer to the FR-E800 Instruction Manual (Function).

◆ % setting reference frequency (Pr.390)

- Set a reference frequency of the set frequency. The setting value of **Pr.390 % setting reference frequency** is 100% reference. The reference to the frequency command is converted to the set frequency in the following formula.
  Set frequency = **% setting reference frequency** × Speed scale (Refer to page 91.)



NOTE

- The % setting reference frequency cannot be set at less than the minimum frequency resolution of the inverter.
- The set frequency is written to RAM.
- The set frequency is applied at the writing of Speed scale. (The set frequency is not applied at the setting of **Pr.390**.)

◆ Communication speed and full-duplex/half-duplex selection (Pr.1426)

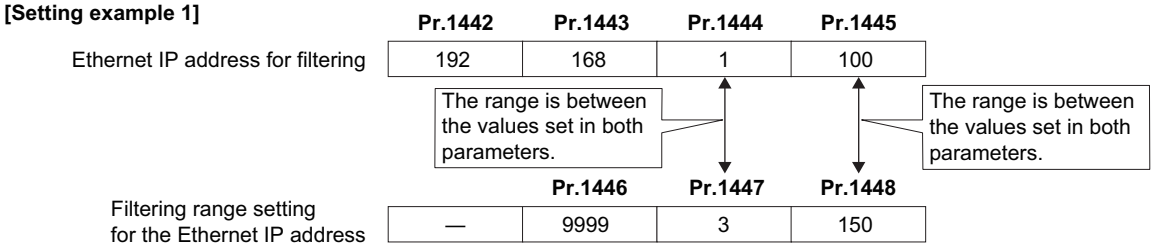
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

Pr.1426 setting	Communication speed	Full-duplex/half-duplex system	Remarks
0 (initial value)	Automatic negotiation	Automatic negotiation	The communication speed and the communication mode (half-duplex/full-duplex) are automatically negotiated to ensure the optimum setting. To set automatic negotiation, auto negotiation setting is required also in the master station.
1	100 Mbps	Full duplex	—
2	100 Mbps	Half duplex	—
3	10 Mbps	Full duplex	—
4	10 Mbps	Half duplex	—

◆ IP filtering function (Ethernet) (Pr.1442 to Pr.1448)

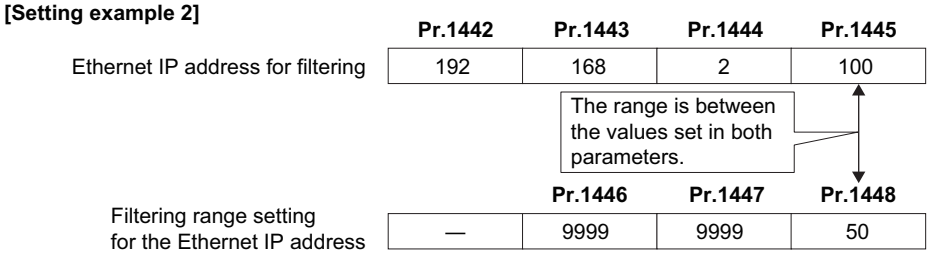
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either of the settings can be larger than the other in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**.)

[Setting example 1]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.x (1 to 3).xxx (100 to 150)".

[Setting example 2]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.2.xxx (50 to 100)".

- When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.

- When "9999 (initial value)" is set in **Pr.1446 to Pr.1448**, the range is invalid.

⚠CAUTION

- The IP filtering function (Ethernet) (**Pr.1442 to Pr.1448**) is provided as a means to prevent unauthorized access, DoS attacks, computer viruses, or other cyberattacks from external devices, but the function does not prevent such access completely. In order to protect the inverter and the system against unauthorized access by external systems, take additional security measures. We shall have no responsibility or liability for any problems involving inverter trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks. The following are examples of measures to prevent them.
  - Install a firewall.
  - Install a personal computer as a relay station, and control the relaying of transmission data using an application program.
  - Install an external device as a relay station to control access rights. (For the details of external devices used to control access rights, contact the distributors of the external devices.)

◆Supported property of BACnet standard object type

R: Read only, W: Read/Write (Commandable values not supported), C: Read/Write (Commandable values supported)

Property	Object support condition					
	Analog Input	Analog Value	Binary Input	Binary Output	Binary Value	Device
APDU Timeout						R
Application Software Version						R
Database Revision						R
Device Address Binding						R
Event State	R	R	R	R	R	
Firmware Revision						R
Max APDU Length Accepted						R
Max Info Frames						W
Max Master						W
Model Name						R
Number of APDU Retries						R
Object Identifier	R	R	R	R	R	R
Object List						R
Object Name	R	R	R	R	R	R
Object Type	R	R	R	R	R	R
Out Of Service	R	R	R	R	R	
Polarity			R	R		
Present Value	R	C*1	R	C	C*1	
Priority Array		R*2		R	R*2	
Protocol Object Types Supported						R
Protocol Revision						R
Protocol Services Supported						R
Protocol Version						R
Relinquish Default		R*2		R	R*2	
Segmentation Supported						R
Status Flags	R	R	R	R	R	
System Status						R
Unit	R	R				
Vendor Identifier						R
Vendor Name						R
Property List	R	R	R	R	R	R
Current Command Priority				R		

*1 This property is commandable for some instances of this object. Otherwise it is read/write.

*2 This property is supported only for instances of this object where the Present Value property is commandable.

◆ Supported BACnet object

- ANALOG INPUT

Object identifier	Object name	Present value access type*1	Description	Unit
1	Terminal 2	R	Represents actual input voltage (or input current) of terminal 2. (The range varies depending on the **Pr.73** and **Pr.267** settings. 0 to 10 V (0% to 100%), 0 to 5 V (0% to 100%), 0 to 20 mA (0% to100%))	percent (98)
2	Terminal 4	R	Represents actual input voltage of terminal 4. (The range varies depending on the **Pr.73** and **Pr.267** settings. 2 to 10 V (0% to 100%), 1 to 5 V (0% to 100%), 4 to 20 mA (0% to 100%))	percent (98)

*1 R: Read only, W: Read/Write (Commandable values not supported), C: Read/Write (Commandable values supported)

- ANALOG VALUE

Object identifier	Object name	Present value access type*1	Description	Unit
1	Output frequency	R	Represents the output frequency value.	hertz (27)
2	Output current	R	Represents the output current value.	amperes (3)
3	Output voltage	R	Represents the output voltage value.	volts (5)
6	Running speed	R	Represents the running speed value.	revolution-per-minute (104)
8	Converter output voltage	R	Represents the converter output voltage value.	volts (5)
14	Output power	R	Represents the output power value.	kilowatts (48)
17	Load meter	R	Represents the load meter value.	percent (98)
20	Cumulative energization time	R	Represents the cumulative energization time value.	hours (71)
23	Actual operation time	R	Represents the actual operation time value.	hours (71)
25	Cumulative power	R	Represents the cumulative power value.	kilowatt-hours (19)
52	PID set point	R	Represents the PID set point.	no-units (95)
54	PID deviation	R	Represents the PID deviation. (Minus display is available with reference to 0%, in 0.1% increment.)	no-units (95)
67	PID measured value2	R	Represents the PID measurement 2.	no-units (95)
200	Alarm history 1	R	Represents the fault history 1 (the latest fault) monitor.	no-units (95)
201	Alarm history 2	R	Represents the fault history 2 (second fault in past) monitor.	no-units (95)
202	Alarm history 3	R	Represents the fault history 3 (third fault in past) monitor.	no-units (95)
203	Alarm history 4	R	Represents the fault history 4 (fourth fault in past) monitor.	no-units (95)
300	Speed scale*2	C	Controls the ratio of the frequency command. (Setting range: 0.00 to 100.00) (Refer to page 88.)	percent (98)

Object identifier	Object name	Present value access type[*1]	Description	Unit
310	PID set point CMD[*2]	C	Set the PID action set point. • This object is the set point during PID operation if **Pr.128** = "60 or 61". (Setting range: 0.00 to 100.00)[*3] • This object is the set point during PID operation if **Pr.128** = "1000 or 1001" and **Pr.609** = "4". (Setting range: 0.00 to 100.00)[*3*4] • This object is the set point during PID operation if **Pr.128** = "2000 or 2001" (not applied to the frequency) and **Pr.609** = "4". (Setting range: 0.00 to 100.00)[*3*4]	no-units (95)
311	PID measured value CMD[*2]	C	Set the PID measured value. • This object is the measured value during PID operation if **Pr.128** = "60 or 61". (Setting range: 0.00 to 100.00)[*3] • This object is the measured value during PID operation if **Pr.128** = "1000 or 1001" and **Pr.610** = "4". (Setting range: 0.00 to 100.00)[*3] • This object is the measured value during PID operation if **Pr.128** = "2000 or 2001" (not applied to the frequency) and **Pr.610** = "4". (Setting range: 0.00 to 100.00)[*3]	no-units (95)
312	PID deviation CMD[*2]	C	Set the PID deviation. (0.01 increments) • This object is the deviation during PID operation if **Pr.128** = "50 or 51". (Setting range: -100.00 to 100.00) • This object is the deviation during PID operation if **Pr.128** = "1010 or 1011" and **Pr.609** = "4". (Setting range: -100.00 to 100.00) • This object is the deviation during PID operation if **Pr.128** = "2010 or 2011" (not applied to the frequency) and **Pr.609** = "4". (Setting range: -100.00 to 100.00)	percent (98)
398	Mailbox parameter	W	Access to the properties which are not defined as objects are available. (Refer to page 93.)	no-units (95)
399	Mailbox value	W		no-units (95)
10007	Acceleration time	W	Set **Pr.7 Acceleration time**.	seconds (73)
10008	Deceleration time	W	Set **Pr.8 Deceleration time**.	seconds (73)

*1 R: Read only, W: Read/Write (Commandable values not supported), C: Read/Write (Commandable values supported)
Values written to the objects that support the commandable values are stored in the Priority Array, even when "Write Access Denied" is returned due to inconsistency of the writing requirements such as the operating mode, on condition that the values are written within the setting range.

*2 If communication speed command source is other than NET, the setting value can be written, but not to be applied.

*3 When both **C42 and C44** ≠ "9999", the setting range is from the smaller coefficient to the larger coefficient of **C42 and C44**. Depending on the setting, the writing value and the reading value may not be the same at the minimum digit.

*4 When **Pr.133** ≠ "9999", the **Pr.133** setting is valid.

• BINARY INPUT

Object identifier	Object name	Present value access type[*1]	Description (0: inactive, 1: active)
0[*2]	Terminal DI0	R	Represents actual input of terminal DI0.
1[*2]	Terminal DI1	R	Represents actual input of terminal DI1.
105	Terminal ABC	R	Represents actual output of terminals A, B, and C.
107[*2]	Terminal SO	R	Represents actual output of terminal SO.

*1 R: Read only, W: Read/Write (Commandable values not supported), C: Read/Write (Commandable values supported)

*2 For the FR-E800-SCE inverters, no function is assigned.

• BINARY OUTPUT

Object identifier	Object name	Present value access type[*1]	Description (0: inactive, 1: active)
5	Terminal ABC CMD	C	Controls actual output of terminals A, B, and C. Control is available when **Pr.192 ABC terminal function selection** = "82 or 182"[*2].

*1 R: Read only, W: Read/Write (Commandable values not supported), C: Read/Write (Commandable values supported)
Values written to the objects that support the commandable values are stored in the Priority Array, even when "Write Access Denied" is returned due to inconsistency of the writing requirements such as the operating mode, on condition that the values are written within the setting range.

*2 Available regardless of the operation mode, operation command source, and speed command source.

- BINARY VALUE

Object identifier	Object name	Present value access type*1	Description
0	Inverter running	R	Represents inverter running (RUN signal) status.
11	Inverter operation ready	R	Represents inverter operation ready (RY signal) status.
98	Alarm output	R	Represents alarm output (LF signal) status.
99	Fault output	R	Represents fault output (ALM signal) status.
200	Inverter running reverse	R	Represents inverter reverse running status.
300*2	Control input instruction DI0	C	Controls the function assigned to terminal DI0. Setting 1 in this object turns ON the signal assigned to **Pr.178 DI0 terminal function selection**.
301*2	Control input instruction DI1	C	Controls the function assigned to terminal DI1. Setting 1 in this object turns ON the signal assigned to **Pr.179 DI1 terminal function selection**.
400	Run/Stop	C	Controls the start/stop command. The start command is written after the Speed scale is applied.*3 1: Start 0: Stop
401	Forward/Reverse	C	Controls the forward/reverse rotation.*3 1: Reverse rotation 0: Forward rotation
402	Fault reset	C	Clears fault output status. (Release of an inverter fault without inverter reset is available.)

*1 R: Read only, W: Read/Write (Commandable values not supported), C: Read/Write (Commandable values supported)
Values written to the objects that support the commandable values are stored in the Priority Array, even when "Write Access Denied" is returned due to inconsistency of the writing requirements such as the operating mode, on condition that the values are written within the setting range.

*2 For the FR-E800-SCE inverters, no function is assigned.

*3 If communication operation command source is other than NET, the setting value can be written, but not to be applied.

◆ Mailbox parameter / Mailbox value (BACnet registers)

- Access to the properties which are not defined as objects are available by using "Mailbox parameter" and "Mailbox value".
- To read a property, write the register of the intended property to "Mailbox parameter", and then read "Mailbox value". To write a property, write the register of the intended property to "Mailbox parameter", and then write a value to "Mailbox value".
- System environment variables

Register	Definition	Read/write	Remarks
40010	Operation mode / inverter setting	Read/write	The data is written as an operation mode setting for writing. The data is read as the operation mode status for reading.

[Operation mode / inverter setting]

Mode	Read value	Write value
EXT	H0000	H0010 *1
PU	H0001	H0011 *1
EXT JOG	H0002	—
PU JOG	H0003	—
NET	H0004	H0014
PU + EXT	H0005	—

*1 Writing is available depending on the **Pr.79 and Pr.340** settings. For details, refer to the FR-E800 Instruction Manual (Function).
Restrictions in each operation mode conform with the computer link specification.

- Monitor code

  For details of the register numbers and the monitor items, refer to the description of **Pr.52** in the FR-E800 Instruction Manual (Function).

- Parameter

Pr.	Register	Name	Read/write	Remarks
0 to 999	41000 to 41999	—	Read/write	The parameter number + +41000 is the register number.
C2 (902)	41902	Terminal 2 frequency setting bias (frequency)	Read/write	
C3 (902)	42092	Terminal 2 frequency setting bias (analog value)	Read/write	Analog value (%) set in **C3 (902)**
	43902	Terminal 2 frequency setting bias (terminal analog value)	Read	Analog value (%) of the voltage (current) applied to terminal 2
125 (903)	41903	Terminal 2 frequency setting gain (frequency)	Read/write	
C4 (903)	42093	Terminal 2 frequency setting gain (analog value)	Read/write	Analog value (%) set in **C4 (903)**
	43903	Terminal 2 frequency setting gain (terminal analog value)	Read	Analog value (%) of the voltage (current) applied to terminal 2
C5 (904)	41904	Terminal 4 frequency setting bias (frequency)	Read/write	
C6 (904)	42094	Terminal 4 frequency setting bias (analog value)	Read/write	Analog value (%) set in **C6 (904)**
	43904	Terminal 4 frequency setting bias (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
126 (905)	41905	Terminal 4 frequency setting gain (frequency)	Read/write	
C7 (905)	42095	Terminal 4 frequency setting gain (analog value)	Read/write	Analog value (%) set in **C7 (905)**
	43905	Terminal 4 frequency setting gain (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C38 (932)	41932	Terminal 4 bias command (torque)	Read/write	
C39 (932)	42122	Terminal 4 bias (torque)	Read/write	Analog value (%) set in **C39 (932)**
	43932	Terminal 4 bias (torque) (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C40 (933)	41933	Terminal 4 gain command (torque)	Read/write	
C41 (933)	42123	Terminal 4 gain (torque)	Read/write	Analog value (%) set in **C41 (933)**
	43933	Terminal 4 gain (torque) (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C42 (934)	41934	PID display bias coefficient	Read/write	
C43 (934)	42124	PID display bias analog value	Read/write	Analog value (%) set in **C43 (934)**
	43934	PID display bias analog value (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C44 (935)	41935	PID display gain coefficient	Read/write	
C45 (935)	42125	PID display gain analog value	Read/write	Analog value (%) set in **C45 (935)**
	43935	PID display gain analog value (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
1000 to 1999	45000 to 45999	—	Read/write	The parameter number + 44000 is the register number.

- Fault history

Register	Definition	Read/write	Remarks
40501	Fault record 1	Read/write	Being 2 bytes in length, the data is stored as H00○○. Refer to the lowest 1 byte for the error code. Performing write using the register 40501 batch-clears the fault history. Set any value as data.
40502	Fault record 2	Read	
40503	Fault record 3	Read	
40504	Fault record 4	Read	
40505	Fault record 5	Read	
40506	Fault record 6	Read	
40507	Fault record 7	Read	
40508	Fault record 8	Read	
40509	Fault record 9	Read	
40510	Fault record 10	Read	

- Product profile

Register	Definition	Read/write	Remarks
44001	Model (1st and 2nd characters)	Read	The model name can be read in ASCII code. "H20" (blank code) is set for blank area. Example) FR-E820-EPA: H46, H52, H2D, H45, H38, H32, H30, H2D, H45, H50, H41, H20...H20
44002	Model (3rd and 4th characters)	Read	
44003	Model (5th and 6th characters)	Read	
44004	Model (7th and 8th characters)	Read	
44005	Model (9th and 10th characters)	Read	
44006	Model (11th and 12th characters)	Read	
44007	Model (13th and 14th characters)	Read	
44008	Model (15th and 16th characters)	Read	
44009	Model (17th and 18th characters)	Read	
44010	Model (19th and 20th characters)	Read	
44011	Capacity (1st and 2nd characters)	Read	The inverter rated capacity can be read in ASCII code. Data read is displayed in increments of 0.1 kW (rounded down to one decimal place). "H20" (blank code) is set for blank area. Example) 0.75K: " 7" (H20, H20, H20, H20, H20, H37)
44012	Capacity (3rd and 4th characters)	Read	
44013	Capacity (5th and 6th characters)	Read	

NOTE

- When a 32-bit parameter setting or monitor item is read and the value to be read exceeds HFFFF, HFFFF is returned.

◆ANNEX A - PROTOCOL IMPLEMENTATION CONFORMANCE STATEMENT (NORMATIVE)

(This annex is part of this Standard and is required for its use.)

BACnet Protocol Implementation Conformance Statement

Date: 9th December 2019
Vendor Name: Mitsubishi Electric Corporation
Product Name: Inverter
Product Model Number: (FR-E800 series)
Application Software Version: 8650*
Firmware Revision: 1.00
BACnet Protocol Revision: 19

Product Description:

BACnet Standardized Device Profile (Annex L):

☐ BACnet Cross-Domain Advanced Operator Workstation (B-XAWS)
☐ BACnet Advanced Operator Workstation (B-AWS)
☐ BACnet Operator Workstation (B-OWS)
☐ BACnet Operator Display (B-OD)
☐ BACnet Advanced Life Safety Workstation (B-ALSWS)
☐ BACnet Life Safety Workstation (B-LSWS)
☐ BACnet Life Safety Annunciator Panel (B-LSAP)
☐ BACnet Advanced Access Control Workstation (B-AACWS)
☐ BACnet Access Control Workstation (B-ACWS)
☐ BACnet Access Control Security Display (B-ACSD)
☐ BACnet Building Controller (B-BC)

☐ BACnet Advanced Application Controller (B-AAC)
☒ BACnet Application Specific Controller (B-ASC)
☐ BACnet Smart Sensor (B-SS)
☐ BACnet Smart Actuator (B-SA)
☐ BACnet Advanced Life Safety Controller (B-ALSC)
☐ BACnet Life Safety Controller (B-LSC)
☐ BACnet Advanced Access Control Controller (B-AACC)
☐ BACnet Access Control Controller (B-ACC)
☐ BACnet Router (B-RTR)
☐ BACnet Gateway (B-GW)
☐ BACnet Broadcast Management Device (B-BBMD)
☐ BACnet Access Control Door Controller (B-ACDC)
☐ BACnet Access Control Credential Reader (B-ACCR)
☐ BACnet General (B-GENERAL)

List all BACnet Interoperability Building Blocks Supported (Annex K):
DS-RP-B, DS-WP-B, DM-DDB-B, DM-DOB-B, DM-DCC-B, DM-RD-B

Segmentation Capability:

☐ Able to transmit segmented messages Window Size _____
☐ Able to receive segmented messages Window Size _____

Standard Object Types Supported:
An object type is supported if it may be present in the device. For each standard Object Type supported provide the following data:

1. Whether objects of this type are dynamically creatable using the CreateObject service
2. Whether objects of this type are dynamically deletable using the DeleteObject service
3. List of the optional properties supported
4. List of all properties that are writable where not otherwise required by this standard
5. List of all properties that are conditionally writable where not otherwise required by this standard
6. List of proprietary properties and for each its property identifier, datatype, and meaning
7. List of any property range restrictions

Dynamic object creation and deletion is not supported.
To check the object types supported by the FR-E800-(SC)E, refer to page 91.

Data Link Layer Options:
☐ ARCNET (ATA 878.1), 2.5 Mb. (Clause 8)
☐ ARCNET (ATA 878.1), EIA-485 (Clause 8), baud rate(s)
☒ BACnet IP, (Annex J)
☐ BACnet IP, (Annex J), BACnet Broadcast Management Device (BBMD)
☐ BACnet IP, (Annex J), Network Address Translation (NAT Traversal)
☐ BACnet IPv6, (Annex U)
☐ BACnet IPv6, (Annex U), BACnet Broadcast Management Device (BBMD)
☐ BACnet/ZigBee (Annex O)

☐ ISO 8802-3, Ethernet (Clause 7)
☐ MS/TP master (Clause 9), baud rate(s):
☐ MS/TP slave (Clause 9), baud rate(s):
☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s):
☐ Point-To-Point, modem, (Clause 10), baud rate(s):
☐ Other:

Device Address Binding:
Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.) ☐ Yes ☒ No

Networking Options:
☐ Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc.
☐ Annex H, BACnet Tunneling Router over IP

Character Sets Supported:
Indicating support for multiple character sets does not imply that they can all be supported simultaneously.
☐ ISO 10646 (UTF-8) ☐ IBMTM/MicrosoftTM DBCS ☐ ISO 8859-1
☐ ISO 10646 (UCS-2) ☐ ISO 10646 (UCS-4) ☐ JIS X 0208

Gateway Options:
If this product is a communication gateway, describe the types of non-BACnet equipment/networks(s) that the gateway supports:

If this product is a communication gateway which presents a network of virtual BACnet devices, a separate PICS shall be provided that describes the functionality of the virtual BACnet devices. That PICS shall describe a superset of the functionality of all types of virtual BACnet devices that can be presented by the gateway.

Network Security Options:
☐ Non-secure Device - is capable of operating without BACnet Network Security
☐ Secure Device - is capable of using BACnet Network Security (NS-SD BIBB)
☐ Multiple Application-Specific Keys
☐ Supports encryption (NS-ED BIBB)
☐ Key Server (NS-KS BIBB)

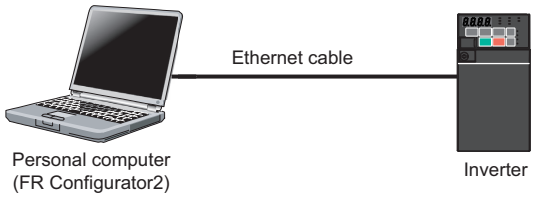
2.9 MELSOFT / FA product connection

2.9.1 Outline

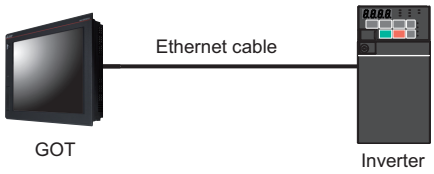
A computer (FR Configurator2), GOT, or a relay station (programmable controller) can be connected via Ethernet.

◆ System configuration

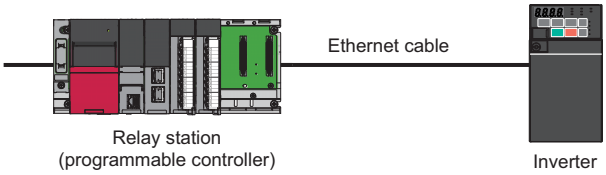
- Direct connection with a computer (FR Configurator2)



- Direct connection with GOT



- Connection using a relay station (programmable controller)



2.9.2 Initial setting for MELSOFT / FA product connection

Use the following parameters to perform required settings for Ethernet communication between the inverter and other devices. To make communication between other devices and the inverter, perform the initial settings of the inverter parameters to match the communication specifications of the devices. Data communication cannot be made if the initial settings are not made or if there is any setting error.

Pr.	Name	Initial value	Setting range	Description
1427 N630[*1]	**Ethernet function selection 1**	5001	502, 5000 to 5002, 5006 to 5008, 5010 to 5013, 9999, 34962[*3], 44818[*2], 45237, 45238, 47808[*2], 61450	Set the application, protocol, etc.
1428 N631[*1]	**Ethernet function selection 2**	45237		
1429 N632[*1]	**Ethernet function selection 3**	45238		
1430 N633[*1]	**Ethernet function selection 4**	9999		
1424 N650[*1]	**Ethernet communication network number**	1	1 to 239	Enter the network number.
1425 N651[*1]	**Ethernet communication station number**	1	1 to 120	Enter the station number.

*1 The setting is applied after an inverter reset or next power-ON.
*2 The setting is available only for the FR-E800-EPA and the FR-E800-SCEPA.
*3 The setting is available only for the FR-E800-EPB and the FR-E800-SCEPB.

NOTE

- Enable the PLC function (**Pr.414 PLC function operation selection** ≠ "0 (initial value)") to use FR Configurator2 (Developer). (For details of **Pr.414**, refer to the FR-E800 Instruction Manual (Function).)

◆ Ethernet function selection (Pr.1427 to Pr.1430)

To select MELSOFT / FA product connection for the application, set any value from "5000 to 5002" or "5006 to 5008" (MELSOFT / FA product connection) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. (For how to set the application value, refer to the Instruction Manual of the device connected via Ethernet.) (Refer to page 151.)

◆ Ethernet communication network number (Pr.1424), Ethernet communication station number (Pr.1425)

- When the MELSOFT / FA product connection, SLMP, or iQSS is selected for Ethernet communication, enter the Ethernet communication network number in **Pr.1424** and the Ethernet communication station number in **Pr.1425**.

2.9.3 Parameters related to MELSOFT / FA product connection

The following parameters are used for communication via MELSOFT / FA product. Set the parameters as required.

Pr.	Name	Initial value	Setting range	Description
1426 N641[*1]	**Link speed and duplex mode selection**	0	0 to 4	Set the communication speed and the communication mode (full-duplex/half-duplex).
1442 N660[*1]	**IP filter address 1 (Ethernet)**	0	0 to 255	Set the range of connectable IP addresses for the network devices. (When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.)
1443 N661[*1]	**IP filter address 2 (Ethernet)**	0		
1444 N662[*1]	**IP filter address 3 (Ethernet)**	0		
1445 N663[*1]	**IP filter address 4 (Ethernet)**	0		
1446 N664[*1]	**IP filter address 2 range specification (Ethernet)**	9999	0 to 255, 9999	
1447 N665[*1]	**IP filter address 3 range specification (Ethernet)**	9999		
1448 N666[*1]	**IP filter address 4 range specification (Ethernet)**	9999		

*1 The setting is applied after an inverter reset or next power-ON.

◆ Communication speed and full-duplex/half-duplex selection (Pr.1426)

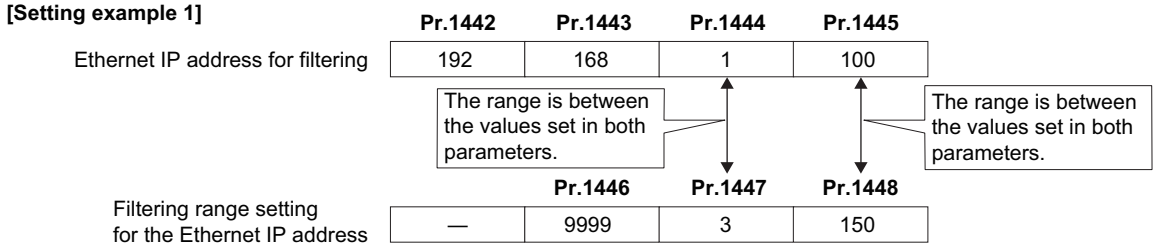
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

Pr.1426 setting	Communication speed	Full-duplex/half-duplex system	Remarks
0 (initial value)	Automatic negotiation	Automatic negotiation	The communication speed and the communication mode (half-duplex/full-duplex) are automatically negotiated to ensure the optimum setting. To set automatic negotiation, auto negotiation setting is required also in the master station.
1	100 Mbps	Full duplex	—
2	100 Mbps	Half duplex	—
3	10 Mbps	Full duplex	—
4	10 Mbps	Half duplex	—

◆ IP filtering function (Ethernet) (Pr.1442 to Pr.1448)

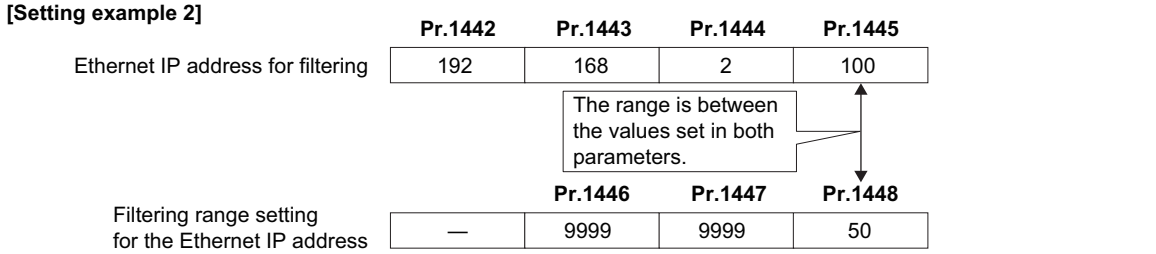
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either of the settings can be larger than the other in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**.)

[Setting example 1]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.x (1 to 3).xxx (100 to 150)".

[Setting example 2]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.2.xxx (50 to 100)".

- When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.
- When "9999 (initial value)" is set in **Pr.1446 to Pr.1448**, the range is invalid.

⚠CAUTION

- The IP filtering function (Ethernet) (**Pr.1442 to Pr.1448**) is provided as a means to prevent unauthorized access, DoS attacks, computer viruses, or other cyberattacks from external devices, but the function does not prevent such access completely. In order to protect the inverter and the system against unauthorized access by external systems, take additional security measures. We shall have no responsibility or liability for any problems involving inverter trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks. The following are examples of measures to prevent them.
  - Install a firewall.
  - Install a personal computer as a relay station, and control the relaying of transmission data using an application program.
  - Install an external device as a relay station to control access rights. (For the details of external devices used to control access rights, contact the distributors of the external devices.)

2.10 SLMP

2.10.1 Outline

SLMP is a common protocol for seamless communication between applications. Users do not have to be concerned with network layers or boundaries. SLMP communications are available among devices that can transfer messages by SLMP (programmable controllers, personal computers, HMIs and others). (For the details of the SLMP compatibility of external devices, refer to the Instruction Manual of external devices.)

2.10.2 Initial setting for SLMP

Use the following parameters to perform required settings for Ethernet communication between the inverter and other devices. To make communication between other devices and the inverter, perform the initial settings of the inverter parameters to match the communication specifications of the devices. Data communication cannot be made if the initial settings are not made or if there is any setting error.

Pr.	Name	Initial value	Setting range	Setting range
1427 N630[*1]	**Ethernet function selection 1**	5001	502, 5000 to 5002, 5006 to 5008, 5010 to 5013, 9999, 34962[*3], 44818[*2], 45237, 45238, 47808[*2], 61450	Set the application, protocol, etc.
1428 N631[*1]	**Ethernet function selection 2**	45237		
1429 N632[*1]	**Ethernet function selection 3**	45238		
1430 N633[*1]	**Ethernet function selection 4**	9999		
1424 N650[*1]	**Ethernet communication network number**	1	1 to 239	Enter the network number.
1425 N651[*1]	**Ethernet communication station number**	1	1 to 120	Enter the station number.

*1 The setting is applied after an inverter reset or next power-ON.
*2 The setting is available only for the FR-E800-EPA and the FR-E800-SCEPA.
*3 The setting is available only for the FR-E800-EPB and the FR-E800-SCEPB.

NOTE

- SLMP can be used only when the PLC function is enabled. Set **Pr.414 PLC function operation selection** ≠ "0 (initial setting)". (For details of **Pr.414**, refer to the FR-E800 Instruction Manual (Function).)
- The FR-E800-(SC)E only supports binary code. (ASCII code is not supported.)

◆ Ethernet function selection (Pr.1427 to Pr.1430)

To select SLMP for the application, set any value from "5010 to 5013" (SLMP) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. (Refer to page 151.)

◆ Ethernet communication network number (Pr.1424), Ethernet communication station number (Pr.1425)

- When the MELSOFT / FA product connection, SLMP, or iQSS is selected for Ethernet communication, enter the Ethernet communication network number in **Pr.1424** and the Ethernet communication station number in **Pr.1425**.

2.10.3 Parameters related to SLMP

The following parameters are used for SLMP communication. Set the parameters as required.

Pr.	Name	Initial value	Setting range	Setting range
1426 N641[*1]	**Link speed and duplex mode selection**	0	0 to 4	Set the communication speed and the communication mode (full-duplex/half-duplex).

Pr.	Name	Initial value	Setting range	Setting range
1442 N660[*1]	**IP filter address 1 (Ethernet)**	0	0 to 255	Set the range of connectable IP addresses for the network devices. (When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.)
1443 N661[*1]	**IP filter address 2 (Ethernet)**	0		
1444 N662[*1]	**IP filter address 3 (Ethernet)**	0		
1445 N663[*1]	**IP filter address 4 (Ethernet)**	0		
1446 N664[*1]	**IP filter address 2 range specification (Ethernet)**	9999	0 to 255, 9999	
1447 N665[*1]	**IP filter address 3 range specification (Ethernet)**	9999		
1448 N666[*1]	**IP filter address 4 range specification (Ethernet)**	9999		

*1 The setting is applied after an inverter reset or next power-ON.

◆ Communication speed and full-duplex/half-duplex selection (Pr.1426)

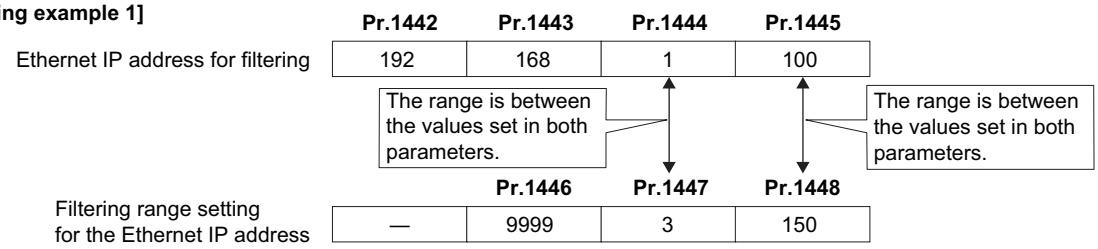
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

Pr.1426 setting	Communication speed	Full-duplex/half-duplex system	Remarks
0 (initial value)	Automatic negotiation	Automatic negotiation	The communication speed and the communication mode (half-duplex/full-duplex) are automatically negotiated to ensure the optimum setting. To set automatic negotiation, auto negotiation setting is required also in the master station.
1	100 Mbps	Full duplex	—
2	100 Mbps	Half duplex	—
3	10 Mbps	Full duplex	—
4	10 Mbps	Half duplex	—

◆ IP filtering function (Ethernet) (Pr.1442 to Pr.1448)

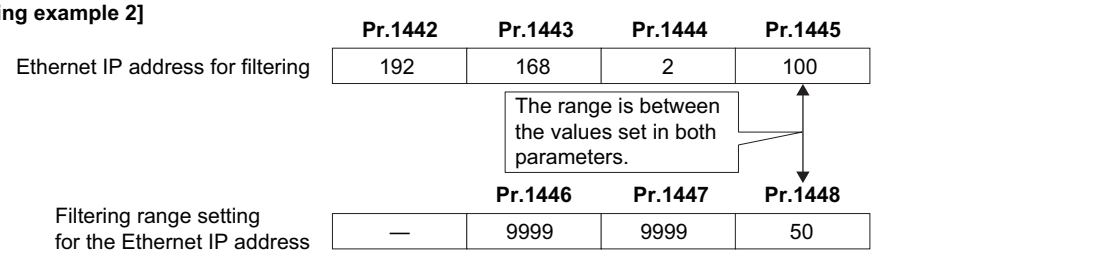
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either of the settings can be larger than the other in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**.)

[Setting example 1]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.x (1 to 3).xxx (100 to 150)".

[Setting example 2]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.2.xxx (50 to 100)".

- When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.

- When "9999 (initial value)" is set in **Pr.1446 to Pr.1448**, the range is invalid.

⚠CAUTION

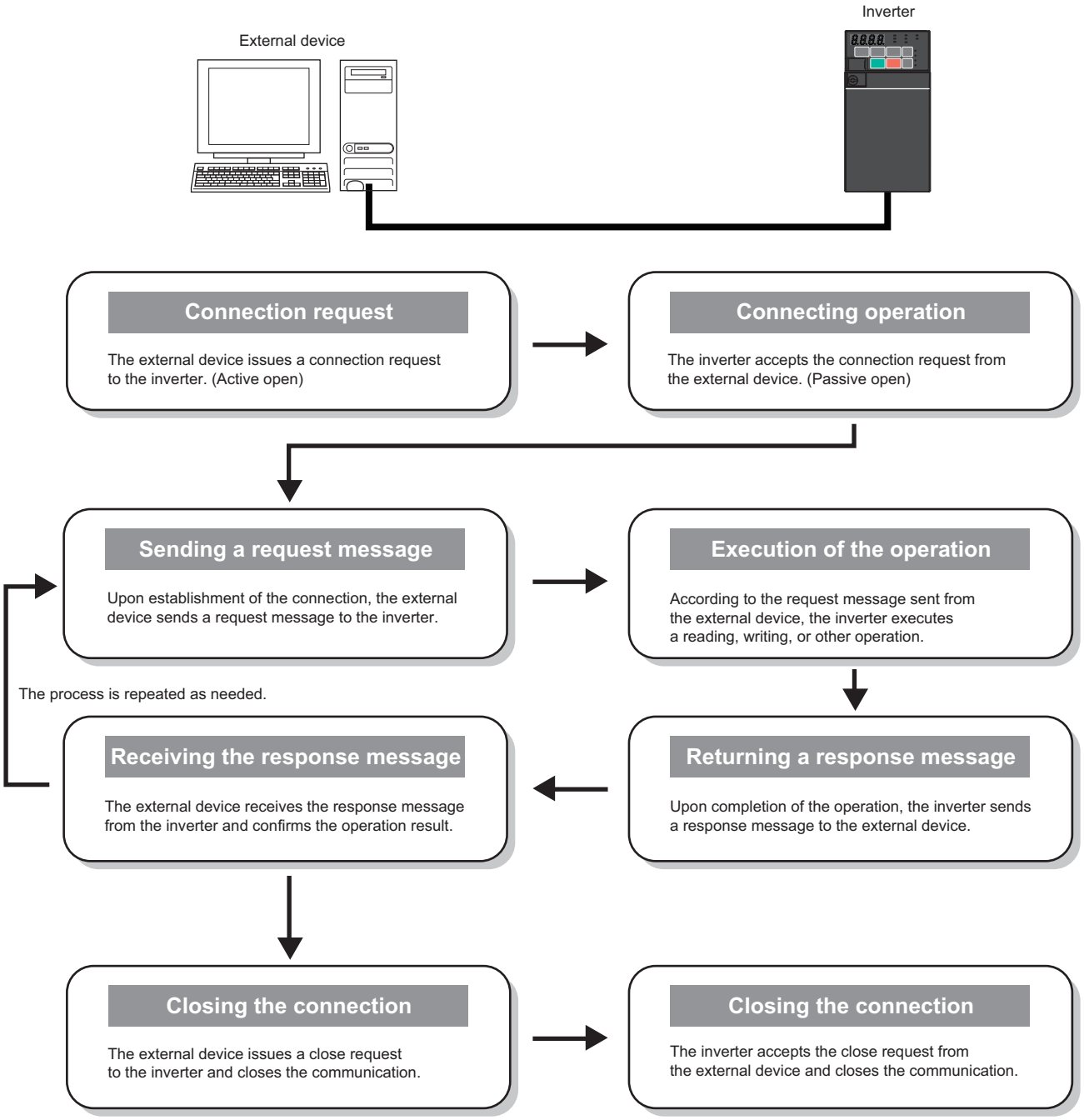
- The IP filtering function (Ethernet) (**Pr.1442 to Pr.1448**) is provided as a means to prevent unauthorized access, DoS attacks, computer viruses, or other cyberattacks from external devices, but the function does not prevent such access completely. In order to protect the inverter and the system against unauthorized access by external systems, take additional security measures. We shall have no responsibility or liability for any problems involving inverter trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks. The following are examples of measures to prevent them.
  - Install a firewall.
  - Install a personal computer as a relay station, and control the relaying of transmission data using an application program.
  - Install an external device as a relay station to control access rights. (For the details of external devices used to control access rights, contact the distributors of the external devices.)

◆ Communication procedure

- Using TCP/IP

  The following is the communication procedure when executing SLMP communication with TCP/IP.

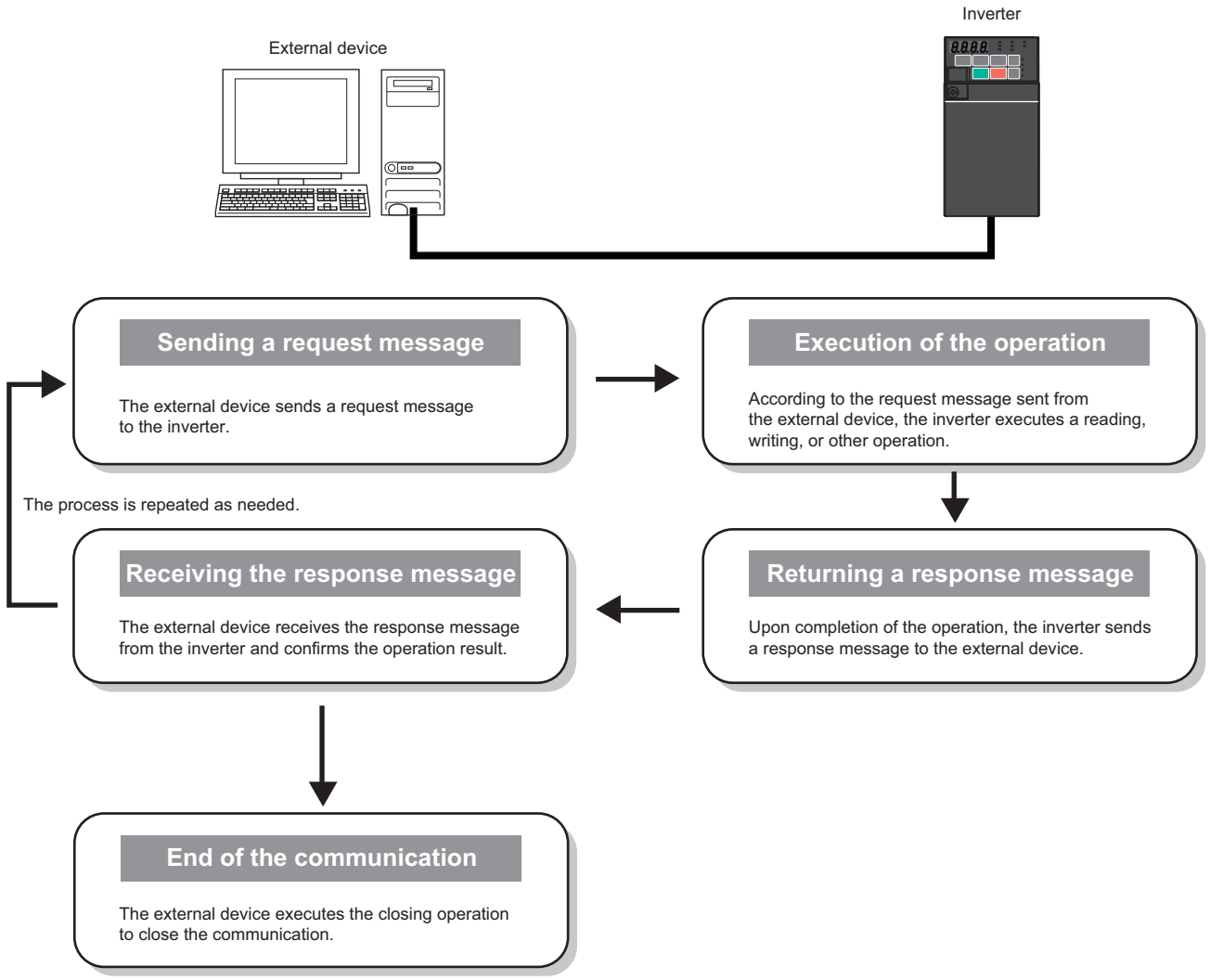
  With TCP/IP, connections are established when communication is executed, and whether data is received normally or not is checked to ensure reliability of data. However, the line load is higher as compared to UDP.



- Using UDP

  The following is the communication procedure when executing SLMP communication with UDP.

  With UDP, connections are not established when communication is executed, and whether data is received normally or not is not checked. Therefore, the line load is low. However, data is less reliable as compared to TCP/IP.



◆ Message format

- Request message format

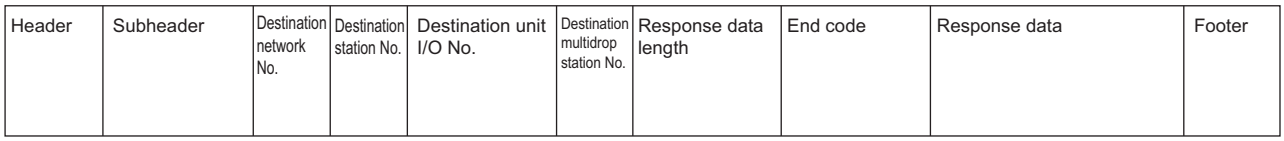
  The following is the format of a request message sent from the external device to the inverter. The request message data length is 2047 bytes at the maximum.

Header	Subheader	Destination network No.	Destination station No.	Destination unit I/O No.	Destination multidrop station No.	Request data length	Monitoring timer	Request data	Footer

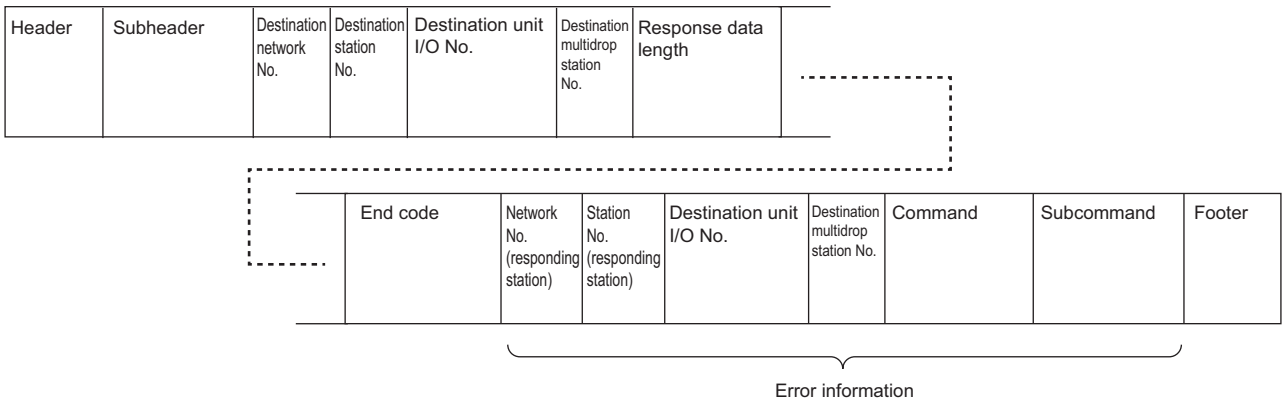
- Response message format

  The following is the format of a response message sent from the inverter to the external device. The response message data length is 2048 bytes at the maximum.

• Normal completion



• Failed completion



Item	Size	Endian	Description	
Header	—	—	Header for TCP/IP or UDP. The header is added by the external device before transmission.	
Subheader (QnA-compatible 3E frame)	2 bytes	Big	Request: H5000 Response: HD000	
Subheader (QnA-compatible 4E frame)	6 bytes		Request: H5400 + Serial No.[*1] + H0000 Response: HD400 + Serial No.[*1] + H0000	
Destination network No.	1 byte	—	Specify the network No. of the access destination. Use a hexadecimal value to specify the network number. Own station: H00 Other stations: H01 to HEF (1 to 239)	The own station has a network No. of H00 and a station No. of HFF. The other stations have other values. The request data addressed to the own station is received regardless of the network No. and station No. settings. The request data addressed to the other stations is received when the **Pr.1424** and **Pr.1425** settings are the same.
Destination station No.	1 byte	—	Specify the station No. of the access destination. Use a hexadecimal value to specify the station number. Own station: HFF (when the network No. is H00) Other stations: H01 to H78 (1 to 120)	
Destination unit I/O No.	2 bytes	Little	Fixed to H03FF	
Destination multidrop station No.	1 byte	—	Fixed to H00	
Request data length	2 bytes	Little	Specify the data length from the monitoring timer to the request data in hexadecimal. Example) 24 bytes: H1800	
Monitoring timer	2 bytes	Little	Set the waiting time until the inverter completes reading/writing after receiving a request message from the external device. When the inverter does not return the response message within the waiting time, the response message will be discarded. • H0000: Unlimited (until the execution is completed) • H0001 to HFFFF (1 to 65535): Waiting time (Unit: 0.25 s) Recommended setting • When the access destination is the own station: Monitoring, operation command, frequency setting (RAM): H1 to H40 (0.25 to 10 s) Parameter read/write, frequency setting (EEPROM): H1 to H40 (0.25 to 10 s) Parameter clear / All parameter clear: H15 to H40 (5.25 to 10 s) • When the access destination is any other station: Monitoring, operation command, frequency setting (RAM): H2 to H40 (0.5 to 60 s) Parameter read/write, frequency setting (EEPROM): H2 to H40 (0.5 to 60 s) Parameter clear / All parameter clear: H15 to H40 (5.25 to 60 s)	
Request data	Variable	Little	Specify the command, subcommand, and data that indicate the requested operation. (Refer to page 107.)	

Item	Size	Endian	Description
Response data length	2 bytes	Little	The data length from the end code to the response data (when completed) or error information (when failed) is stored in hexadecimal. (Unit: byte)
End code	2 bytes	Little	The command processing result is stored. The value "0" is stored for normal completion. The error code of the access destination (refer to page 115) is stored for failed completion.
Response data	Variable	Little	When the command is completed normally, data such as the read data corresponding to the command is stored.
Error information	9 bytes	—	The network No. (responding station) (1 byte), station No. (responding station) (1 byte), destination unit I/O No. (2 bytes), and destination multidrop station No. (1 byte) of the stations which respond errors are stored for failed completion. Numbers different from those in the request message may be stored because the information on the station with error response is stored. The command (2 bytes) and the subcommand (2 bytes) being issued when an error occurred are also stored.
Footer	—	—	Footer for TCP/IP or UDP. The footer is added by the external device before transmission.

*1 The serial No. is given by the external device for message recognition. If a request message with a serial No. is sent, the same serial No. will also be added on the response message. The serial No. is used when multiple request messages are sent from an external device to the same inverter.

◆ Command

- The following table lists the commands and subcommands. (When the inverter receives a command other than listed in the following table, it returns an error code (HC059).)

Category	Operation		Command	Subcommand	Description	Refer to page
Device	Read	In bit units	H0401	H0001	The inverter reads the value in bit devices (with consecutive device numbers) in 1-bit units.	112
		In word units	H0401	H0000	The inverter reads the value in bit devices (with consecutive device numbers) in 16-bit units.	
					The inverter reads the value in word devices (with consecutive device numbers) in 1-word units.	
	Write	In bit units	H1401	H0001	The inverter writes the value to bit devices (with consecutive device numbers) in 1-bit units.	112
		In word units	H1401	H0000	The inverter writes the value to bit devices (with consecutive device numbers) in 16-bit units.	
					The inverter writes the value to word devices (with consecutive device numbers) in 1-word units.	
	Read Random	In word units	H0403	H0000	The inverter reads the value in the devices with the specified numbers. The devices with non-consecutive numbers can be specified. The value is read from the word devices in 1-word or 2-word units.	112
	Write Random	In bit units	H1402	H0001	The inverter writes the value to the bit devices with the specified device numbers (each set of 1 bits has a device number). The devices with non-consecutive numbers can be specified.	113
		In word units	H1402	H0000	The inverter writes the value to the bit devices with the specified device numbers (each set of 16 bits has a device number). The devices with non-consecutive numbers can be specified.	
					The inverter writes the value to the word devices with the specified device numbers (each word or each set of two words has a device number). The devices with non-consecutive numbers can be specified.	
Remote Control	Remote Run		H1001	H0000	Remote Run is performed to the inverter.	114
	Remote Stop		H1002	H0000	Remote Stop is performed to the inverter.	114
	Read Type name		H0101	H0000	The model name and model code of the inverter are read.	114

◆ Device

- The following table lists the device codes and the range available for each command.

Device	Category	Device code	Range*1
Special relay (SM)	Bit	H91	Refer to the PLC Function Programming Manual.*2
Special register (SD)	Word	HA9	
Input (X)	Bit	H9C	H0 to H7F (hexadecimal)
Output (Y)	Bit	H9D	H0 to H7F (hexadecimal)
Internal relay (M)	Bit	H90	0 to 127 (decimal)

Device		Category	Device code	Range[*1]
Data register (D)		Word	HA8	0 to 255 (decimal)
Link register (W)		Word	HB4	8192
Timer (T)	Contact (TS)	Bit	HC1	0 to 15 (decimal)
	Coil (TC)		HC0	
	Current value (TN)	Word	HC2	
Retentive timer (S)	Contact (SS)	Bit	HC7	0 (Initial value. Up to 16 retentive timers can be used by PLC parameter assignment.)
	Coil (SC)		HC6	
	Current value (SN)	Word	HC8	
Counter (C)	Contact (CS)	Bit	HC4	0 to 15 (decimal)
	Coil (CC)		HC3	
	Current value (CN)	Word	HC5	

*1 If write/read is requested from/to any devices outside the range, the error code H4031 is returned. (Refer to page 115.)

*2 When setting the word unit of the special relay device, specify the device No. in the list of special relay as the first device No. For details of the special relay, refer to the PLC function programming manual. Otherwise, the data is not read/written correctly.

◆ Link register

The following shows the link registers for parameters (read/write), inverter status monitor items (read), preventive maintenance data (read), model information monitor items (read), and serial numbers (read).

- Parameter

Pr.	Register	Name	Read/write	Remarks
0 to 999	W0 to W999	For details on parameter names, refer to the parameter list in the FR-E800 Instruction Manual (Function).	Read/write	
C2 (902)	W902	Terminal 2 frequency setting bias (frequency)	Read/write	
C3 (902)	W4802	Terminal 2 frequency setting bias (analog value)	Read/write	Analog value (%) set in **C3 (902)**
	W4902	Terminal 2 frequency setting bias (terminal analog value)	Read	Analog value (%) of the voltage (current) applied to terminal 2
125 (903)	W903	Terminal 2 frequency setting gain (frequency)	Read/write	
C4 (903)	W4803	Terminal 2 frequency setting gain (analog value)	Read/write	Analog value (%) set in **C4 (903)**
	W4903	Terminal 2 frequency setting gain (terminal analog value)	Read	Analog value (%) of the voltage (current) applied to terminal 2
C5 (904)	W904	Terminal 4 frequency setting bias (frequency)	Read/write	
C6 (904)	W4804	Terminal 4 frequency setting bias (analog value)	Read/write	Analog value (%) set in **C6 (904)**
	W4904	Terminal 4 frequency setting bias (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
126 (905)	W905	Terminal 4 frequency setting gain (frequency)	Read/write	
C7 (905)	W4805	Terminal 4 frequency setting gain (analog value)	Read/write	Analog value (%) set in **C7 (905)**
	W4905	Terminal 4 frequency setting gain (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C39 (932)	W4832	Terminal 4 bias (torque/magnetic flux)	Read/write	Analog value (%) set in **C39 (932)**
	W4932	Terminal 4 bias (torque/magnetic flux) (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C41 (933)	W4833	Terminal 4 gain (torque/magnetic flux)	Read/write	Analog value (%) set in **C41 (933)**
	W4933	Terminal 4 gain (torque/magnetic flux) (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C43 (934)	W4834	PID display bias analog value	Read/write	Analog value (%) set in **C43 (934)**
	W4934	PID display bias analog value (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C45 (935)	W4835	PID display gain analog value	Read/write	Analog value (%) set in **C45 (935)**
	W4935	PID display gain analog value (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4

Pr.	Register	Name	Read/write	Remarks
1000 to 1499	W1000 to W1499	For details on parameter names, refer to the parameter list in the FR-E800 Instruction Manual (Function).	Read/write	

- Inverter status

Register	Monitor item	Read/ write
W5001	Output frequency/speed	Read
W5002	Output current	Read
W5003	Output voltage	Read
W5005	Set frequency / motor speed setting	Read
W5006	Operation speed	Read
W5007	Motor torque	Read
W5008	Converter output voltage	Read
W5009	Regenerative brake duty	Read
W5010	Electronic thermal O/L relay load factor	Read
W5011	Output current peak value	Read
W5012	Converter output voltage peak value	Read
W5014	Output power	Read
W5015	Input terminal status	Read
W5016	Output terminal status	Read
W5017	Load meter	Read
W5018	Motor excitation current	Read
W5020	Cumulative energization time	Read
W5023	Actual operation time	Read
W5024	Motor load factor	Read
W5025	Cumulative power	Read
W5032	Torque command	Read
W5033	Torque current command	Read
W5038	Trace status	Read

Register	Monitor item	Read/ write
W5040	PLC function user monitor 1	Read
W5041	PLC function user monitor 2	Read
W5042	PLC function user monitor 3	Read
W5045	Station number (CC-Link)	Read
W5050	Energy saving effect	Read
W5051	Cumulative energy saving	Read
W5052	PID set point	Read
W5053	PID measured value	Read
W5054	PID deviation	Read
W5058	Option input terminal status 1 (for communication)	Read
W5059	Option input terminal status 2 (for communication)	Read
W5060	Option output terminal status (for communication)	Read
W5061	Motor thermal load factor	Read
W5062	Inverter thermal load factor	Read
W5067	PID measured value 2	Read
W5077	32-bit cumulative energy (lower 16 bits)	Read
W5078	32-bit cumulative energy (upper 16 bits)	Read
W5079	32-bit cumulative energy (lower 16 bits)	Read
W5080	32-bit cumulative energy (upper 16 bits)	Read
W5083	BACnet valid APDU counter	Read
W5091	PID manipulated amount	Read
W5097	Dancer main speed setting	Read

- Preventive maintenance data

Register	Definition	Read/write	Remarks
W6000	Control method	Read	0x02: V/F control 0x04: Advanced magnetic flux vector control 0x08: Real sensorless vector control 0x09: Vector control 0x18: PM sensorless vector control

- Model information monitor

Register	Definition	Read/write	Remarks
W8001	Model (1st and 2nd characters)	Read	The inverter model can be read in ASCII code. "H20" (blank code) is set for blank area. Example) FR-E820-EPA: H46, H52, H2D, H45, H38, H32, H30, H2D, H45, H50, H41, H20...H20
W8002	Model (3rd and 4th characters)	Read	
W8003	Model (5th and 6th characters)	Read	
W8004	Model (7th and 8th characters)	Read	
W8005	Model (9th and 10th characters)	Read	
W8006	Model (11th and 12th characters)	Read	
W8007	Model (13th and 14th characters)	Read	
W8008	Model (15th and 16th characters)	Read	
W8009	Model (17th and 18th characters)	Read	
W8010	Model (19th and 20th characters)	Read	
W8011	Capacity (1st and 2nd characters)	Read	The capacity in the inverter model can be read in ASCII code. Data is read in increments of 0.1 kW, and rounds down to 0.01 kW increments. "H20" (blank code) is set for blank area. Example) 0.75K: " 7" (H20, H20, H20, H20, H20, H37)
W8012	Capacity (3rd and 4th characters)	Read	
W8013	Capacity (5th and 6th characters)	Read	

- Serial number

Register	Definition	Read/write	Remarks
W8101	Serial number (1st and 2nd characters)	Read	The serial number can be read in ASCII code.
W8102	Serial number (3rd and 4th characters)	Read	
W8103	Serial number (5th and 6th characters)	Read	
W8104	Serial number (7th and 8th characters)	Read	
W8105	Serial number (9th and 10th characters)	Read	
W8106	Serial number (11th and 12th characters)	Read	
W8107	Serial number (13th and 14th characters)	Read	
W8108	Serial number (15th and 16th characters)	Read	

NOTE

- When a 32-bit parameter setting or monitor item is read and the value to be read exceeds HFFFF, HFFFF is returned.

◆ Data specified in the command

- Device code

  A one byte numerical value is sent.

- Device No. (first device No.) specification

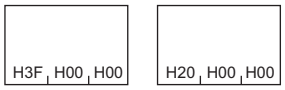
  The device No. is specified for reading/writing data.

  When consecutive devices are specified, the first device No. is specified. The device No. is specified in decimal or hexadecimal depending on the device type.

  A three byte numerical value is sent from the lower byte to the upper byte. If the device No. is a decimal value, convert it to a hexadecimal value.

  (Example) Device No. of Internal relay M63 / Input X20

M63 X20



  Internal relay M63 has a decimal device No. Convert the decimal value to a hexadecimal value H00003F. The value is sent in the order 3F, 00, and 00. The device No. of Input X20 is regarded as H000020 and sent in the order 20, 00, and 00.

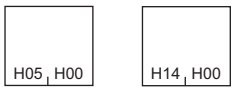
- Specification of the number of devices

  The number of devices is specified for reading/writing data.

  A two byte numerical value is sent from the lower byte to the upper byte.

  (Example) Number of devices: 5 / 20

5 devices 20 devices

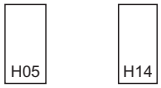


- Specification of the number of devices for bit access

  The number of devices is specified for reading/writing data in bit units. The number is used in the Write Random command (refer to page 113).

  (Example) Number of devices: 5 / 20

5 devices 20 devices



- Read data / write data

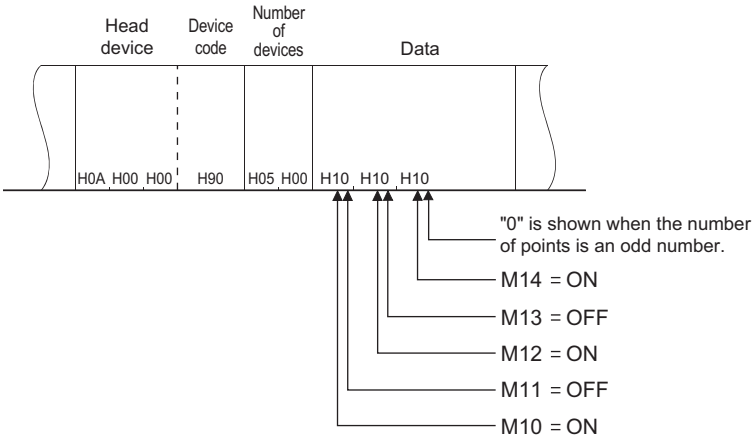
  The value read from the device is stored for reading. The value to be written to the device is stored for writing.

  The data is arranged differently between reading/writing in bit units (subcommand: H0001) and reading/writing in word units (subcommand: H0000).

  - In bit units (subcommand: H0001)

    Each device is specified in 4 bits. The data is sent from the upper bit for the device with the first device No. and the subsequent devices in order. The ON state is denoted as 1 and the OFF state is denoted as 0.

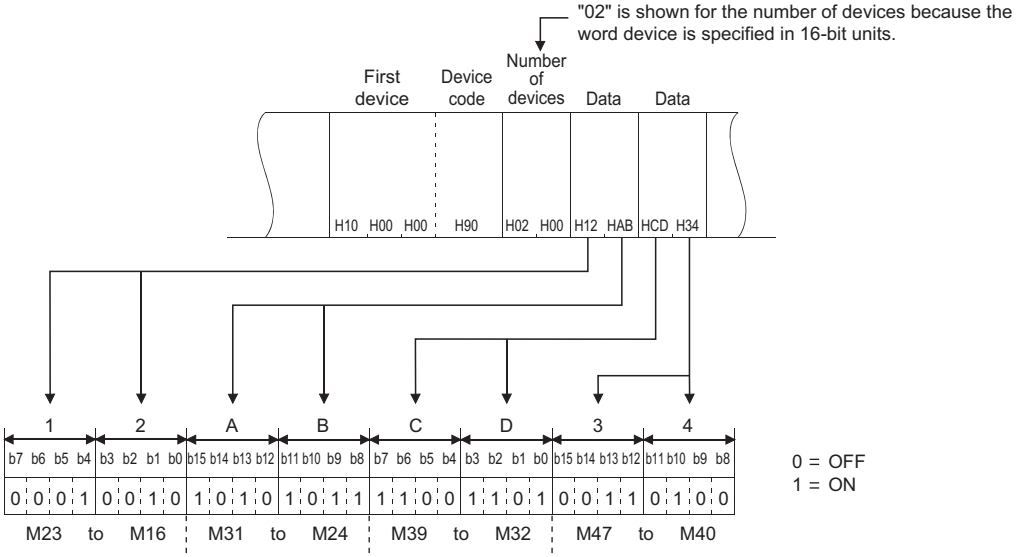
    (Example) ON/OFF state of five devices starting from M10



  - In word units (subcommand: H0000)

    When bit devices are used as word data, each device is specified in one bit. The data is stored from the lower byte (bit 0 to bit 7) to the upper byte (bit 8 to bit 15).

    (Example) ON/OFF state of 32 devices starting from M16

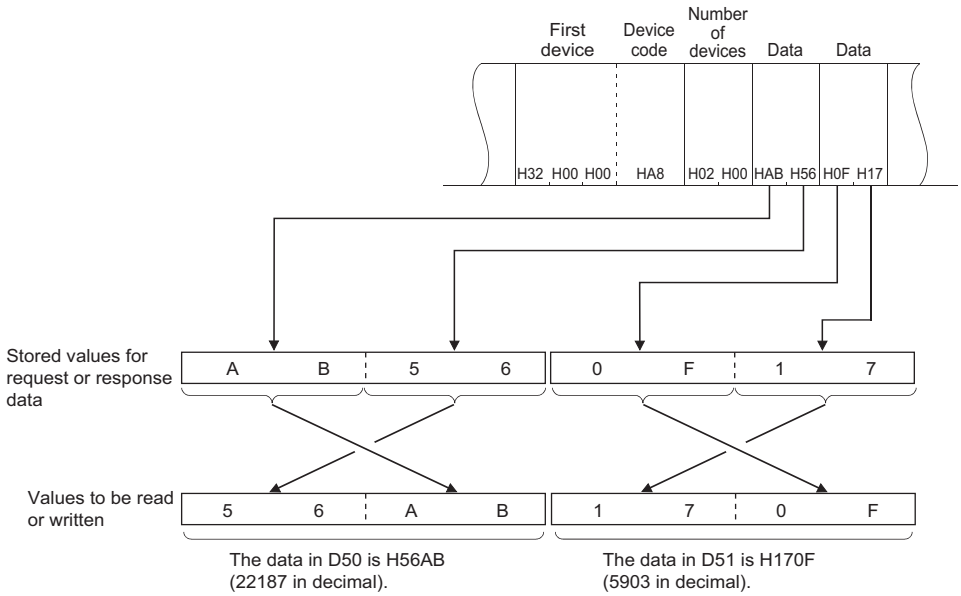


    When word devices are used, one word is specified in 16 bits as follows. The data is stored from the lower byte (bit 0 to bit 7) to the upper byte (bit 8 to bit 15).

    The user should switch the values in the upper and lower bytes in the response data for reading.

    The user should switch the write values in the upper and lower bytes to store them in the request data for writing.

    (Example) Data stored in D50/D51



◆ Details of commands

- Read

  The inverter reads the value in the specified devices.

  - Request data

H01 H04	Subcommand	First device No.	Device code	Number of devices

Item	Description
Subcommand	Specify the unit (bit/word) for reading.
First device No.	Specify the number of the first device. (Refer to page 110.)
Device code	Specify the type of target devices. (Refer to page 107.)
Number of devices	Specify the number of target devices.

  - Response data

    The value read from the device is stored in hexadecimal.

- Write

  The inverter writes the value to the specified devices.

  - Request data

H01 H14	Subcommand	First device No.	Device code	Number of devices	Write data

Item	Description
Subcommand	Specify the unit (bit/word) for writing.
First device No.	Specify the number of the first device. (Refer to page 110.)
Device code	Specify the type of the target devices. (Refer to page 107.)
Number of devices	Specify the number of target devices.
Data to be written	Specify the value to be written to all the devices specified by the Number of devices in the request data.

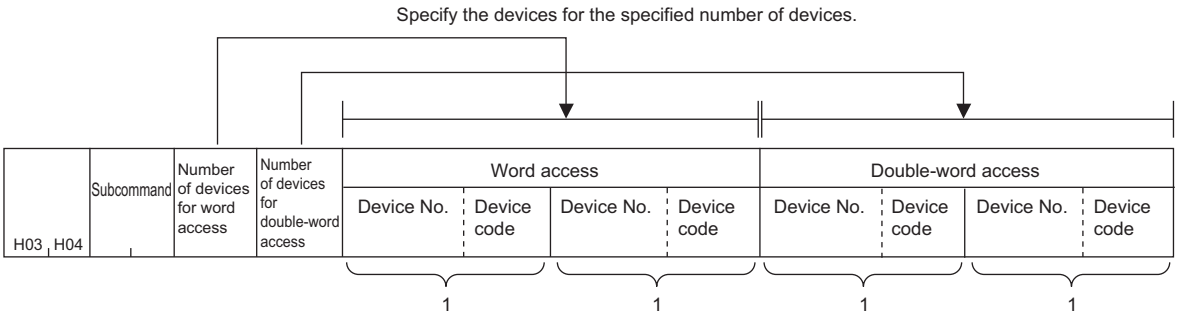
  - Response data

    None

- Read Random

  The inverter reads the value in the devices with the specified numbers. The devices with non-consecutive numbers can be specified.

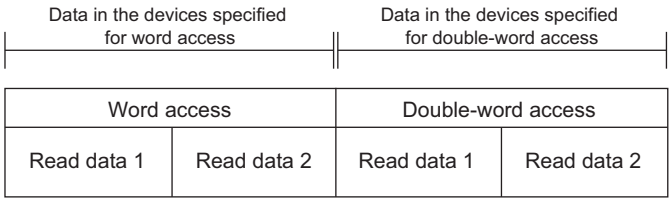
  - Request data



Item	Description
Subcommand	Specify the unit (bit/word) for reading.
Number of devices for word access	Specify the number of devices for one-word access. (bit device: 16 bits, word device: one word)
Number of devices for double-word access	Specify the number of devices for two-word access. (bit device: 32 bits, word device: two words)
Word access	Specify the devices according to the number set in the request data for word access. It is not necessary to specify the devices when "0" is set.
Double-word access	Specify the devices according to the number set in the request data for double word access. It is not necessary to specify the devices when "0" is set.
Device No.	Specify the device number of target devices. (Refer to page 110.)
Device code	Specify the type of target devices. (Refer to page 107.)

- Response data

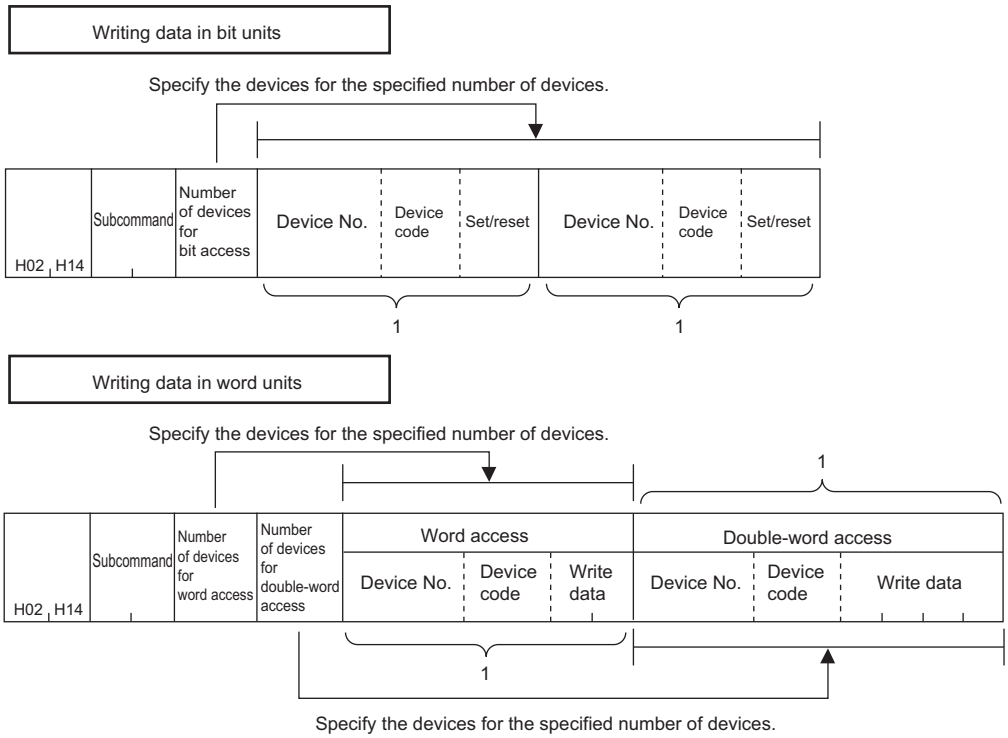
  The value read from the device is stored in hexadecimal.



- Write Random

  The inverter writes the value in the devices with the specified numbers. The devices with non-consecutive numbers can be specified.

  - Request data



Item	Description
Subcommand	Specify the unit (bit/word) for writing.
Number of devices for bit access	Specify the number of target devices.
Number of devices for word access	
Number of devices for double-word access	
Word access	Specify the devices according to the number set in the request data for word access. It is not necessary to specify the devices when "0" is set.
Double-word access	Specify the devices according to the number set in the request data for double word access. It is not necessary to specify the devices when "0" is set.
Device No.	Specify the device number of target devices. (Refer to page 110.)
Device code	Specify the type of the target devices. (Refer to page 107.)
Set/reset	Specify ON/OFF of the bit devices. • ON: H01 • OFF: H00

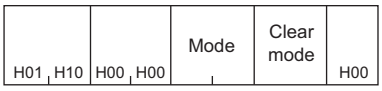
- Response data

  None

- Remote Run

  Remote Run is performed to the inverter.

  - Request data



Item	Description	
Mode	Forced execution of the remote RUN is not allowed.	H0100
	Forced execution of the remote RUN is allowed.	H0300
Clear mode	Devices are not cleared (initialized).	H00
	Devices are cleared.	H01, H02

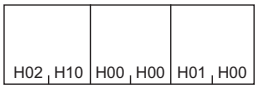
  - Response data

    None

- Remote Stop

  Remote Stop is performed to the inverter.

  - Request data



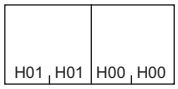
  - Response data

    None

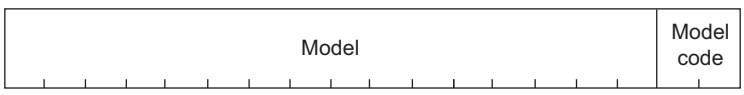
- Read Type Name

  The model name and model code of the inverter are read.

  - Request data



  - Response data



Item	Description
Model	The inverter model is stored. Up to 16 characters can be stored. If the model name is shorter than 16 characters, a space (H20) is stored instead of a character. (Example) FR-E800-E inverter: FR-E800-E
Model code	Fixed to H054F

◆ Error code

When the end code is other than "0" (failed completion), one of the error codes shown in the following table will be stored.

Error code	Fault indications.
H4031	The device outside of the range is specified.
H4080	Request data fault
H4A01	The network with the No. set in the routing parameter does not exist. (The destination network No., destination station No., or destination unit I/O No. is different from that of the target inverter.)
HC059	The command or subcommand is specified incorrectly. Or, an unspecified command is received.
HC05B	The inverter cannot read/write data from/to the specified device.
HC05C	The request message has an error.
HC060	The requested operation has an error. Example) Data is specified incorrectly for the bit device.
HC061	The request data length is inconsistent with the number of data.
HCEE1	The request message size exceeds the allowable range.
HCEE2	The response message size exceeds the allowable range.

2.11 EtherNet/IP

2.11.1 Outline

When the EtherNet/IP communication operation is performed through the Ethernet connector on the inverter, data such as parameters, command values, and feedback values are regarded as objects used for data communication between a master and slaves. Objects consist of the Class ID, object name, data type, access rule, etc. I/O message communication (cyclic) and explicit message communication (message) are available.

◆ Communication specifications

Item		Description
Maximum number of branches		No upper limit on the same Ethernet network
Connection cable		Ethernet cable (IEEE 802.3 100BASE-TX/10BASE-T compliant cable or ANSI/TIA/EIA-568-B (Category 5e) compliant shielded 4-pair branched cable)
Topology		Line, star, or a combination of line and star
Class 1 communication (I/O Message communication)	Communication method	Cyclic communication
	Number of connections	4
	Communication data size	6 bytes (For details, refer to description of Assembly Object (page 122).)
	Connection type (inverter to master)	Unicast or multicast
	Connection type (master to inverter)	Unicast
	Exclusive Owner connection	Connection point (inverter to master): Assembly input instance
		Connection point (master to inverter): Assembly output instance
	Input Only connection	Connection point (inverter to master): Assembly input instance
		Connection point (master to inverter): Assembly heartbeat instance (C5h)
	Listen Only connection	Connection point (inverter to master): Assembly input instance
		Connection point (master to inverter): Assembly heartbeat instance (C6h)
	RPI (cycle time)	4 to 100 ms
	Supported trigger type	Cyclic (repeated)
Class 3 communication (Explicit Message communication)	Communication method	Message communication
	Number of connections	2
	Connection type (inverter to master)	Unicast
	Connection type (master to inverter)	Unicast
UCMM communication (Explicit Message communication)	Communication method	Message communication
	Number of connections	2
	Connection type (inverter to master)	Unicast
	Connection type (master to inverter)	Unicast
Conformity test		CT16

◆ Operation status LEDs

LED name	Description	LED status	Remarks
NS	Communication status	OFF	Power-OFF / IP address not set
		Blinking green	Online, no connections established
		Solid green	Online, connections established
		Blinking red	Exclusive Owner connection timeout
MS	Inverter status	OFF	Power-OFF / during inverter reset
		Blinking green	Not set (status other than those indicated by OFF, solid green, blinking red, and solid red of the MS LED)
		Solid green	Operating properly (All I/O communications are in run state and Exclusive Owner connection state.)
		Blinking red	Warning or alarm output
		Solid red	Fault detected
LINK1	Connector for communication (PORT1) status	OFF	Power-OFF/link-down
		Blinking green	Link-up (Data reception in progress)
		Solid green	Link-up
LINK2	Connector for communication (PORT2) status	OFF	Power-OFF/link-down
		Blinking green	Link-up (Data reception in progress)
		Solid green	Link-up

◆ EDS file

An EDS file is available for download.

Mitsubishi Electric FA Global Website:
www.MitsubishiElectric.co.jp/fa
The download is free at the website above. For details, contact your sales representative.

NOTE

- The EDS file is used in engineering software. To install the EDS file properly, refer to the instruction manual of the applicable engineering software.

2.11.2 Initial setting for EtherNet/IP

Use the following parameters to perform required settings for Ethernet communication between the inverter and other devices. To make communication between other devices and the inverter, perform the initial settings of the inverter parameters to match the communication specifications of the devices. Data communication cannot be made if the initial settings are not made or if there is any setting error.

Pr.	Name	Initial value	Setting range	Description
1427 N630[*1]	Ethernet function selection 1	5001	502, 5000 to 5002, 5006 to 5008, 5010 to 5013, 9999, 34962[*3], 44818[*2], 45237, 45238, 47808[*2], 61450	Set the application, protocol, etc.
1428 N631[*1]	Ethernet function selection 2	45237		
1429 N632[*1]	Ethernet function selection 3	45238		
1430 N633[*1]	Ethernet function selection 4	9999		
1432 N644	Ethernet communication check time interval	1.5 s	0	Ethernet communication is available, but the inverter output is shut off in the NET operation mode.
			0.1 to 999.8 s	Set the interval of the communication check (signal loss detection) time for all devices with IP addresses in the range specified for Ethernet command source selection (**Pr.1449 to Pr.1454**). If a no-communication state persists for longer than the permissible time, the inverter output will be shut off.
			9999	No communication check (signal loss detection)

Pr.	Name	Initial value	Setting range	Description
1449 **N670**[*1]	Ethernet command source selection IP address 1	0	0 to 255	To limit the network devices that send the operation or speed command through the Ethernet network, set the range of IP addresses of the devices. When **Pr.1449 to Pr.1452** = "0 (initial value)", no IP address is specified for command source selection via Ethernet. In this case, operation commands cannot be sent via Ethernet.
1450 **N671**[*1]	Ethernet command source selection IP address 2	0		
1451 **N672**[*1]	Ethernet command source selection IP address 3	0		
1452 **N673**[*1]	Ethernet command source selection IP address 4	0		
1453 **N674**[*1]	Ethernet command source selection IP address 3 range specification	9999	0 to 255, 9999	
1454 **N675**[*1]	Ethernet command source selection IP address 4 range specification	9999		

*1 The setting is applied after an inverter reset or next power-ON.
*2 The setting is available only for the FR-E800-EPA and the FR-E800-SCEPA.
*3 The setting is available only for the FR-E800-EPB and the FR-E800-SCEPB.

NOTE

- The monitor items and parameter settings can be read during communication with the **Pr.1432 Ethernet communication check time interval** = "0 (initial value)" setting, but such operation will become faulty once the operation mode is changed to the NET operation mode. When the NET operation mode is selected as the start-up operation mode, communication is performed once, then an Ethernet communication fault (E.EHR) occurs.
- To perform operation or parameter writing via communication, set **Pr.1432** to "9999" or a value larger than the communication cycle or retry time setting. (Refer to page 119.)

◆ Ethernet function selection (Pr.1427 to Pr.1430)

To select EtherNet/IP for the application, set "44818" (EtherNet/IP) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. When **Pr.1429** = "45238 (initial value)" (CC-Link IE TSN), change the value to "44818" (EtherNet/IP). When "45238" is set in the parameter, "44818" becomes invalid.

NOTE

- Change the setting if selected communication protocols cannot be used together. (Refer to page 5 and page 151.)

◆ Ethernet IP address for command source selection (Pr.1449 to Pr.1454)

- To limit the network devices that send the operation or speed command through the Ethernet network, set the range of IP addresses of the devices.
- When **Pr.1449 to Pr.1452** = "0 (initial value)", no IP address is specified for command source selection via Ethernet. In this case, operation commands cannot be sent via Ethernet.

- The setting range for command source selection depends on the settings in **Pr.1451** and **Pr.1453**, and **Pr.1452** and **Pr.1454**. (Either of the settings can be larger than the other in **Pr.1451** and **Pr.1453**, and **Pr.1452** and **Pr.1454**.)

[Setting example 1]

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	1	100
			Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	—	—	3	150

The range is between the values set in both parameters.

The range is between the values set in both parameters.

In this case, the IP address range for command source selection via Ethernet communication is "192.168.x (1 to 3).xxx (100 to 150)".

[Setting example 2]

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	2	100
			Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	—	—	9999	50

The range is between the values set in both parameters.

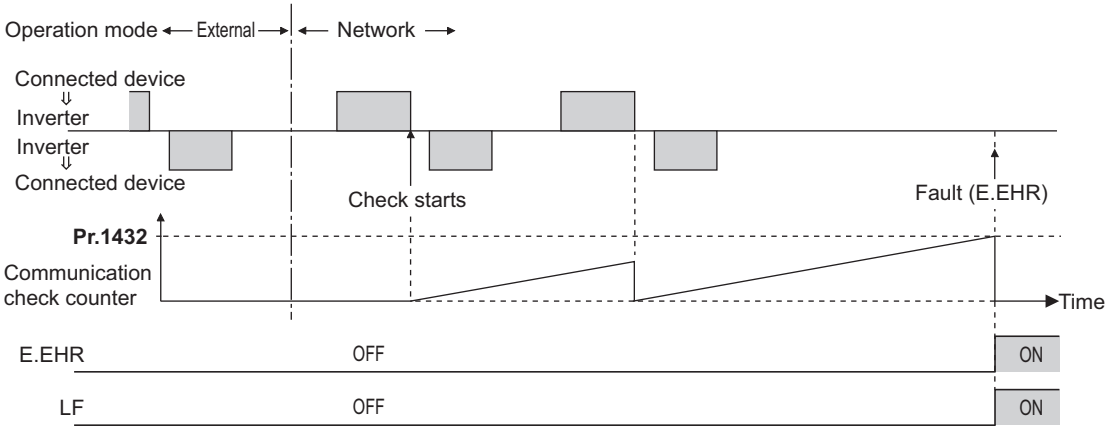
In this case, the IP address range in which Ethernet communication is permitted is "192.168.2.xxx (50 to 100)".

- When "9999 (initial value)" is set in **Pr.1453 or Pr.1454**, the range is invalid.

◆ Ethernet communication check time interval (Pr.1432)

- If a signal loss (communication stop) is detected between the inverter and all the devices with IP addresses in the range for Ethernet command source selection (**Pr.1449 to Pr.1454**) as a result of a signal loss detection, a communication error (E.EHR) occurs and the inverter output will be shut off.
- When "9999" is set in **Pr.1432**, the communication check (signal loss detection) will not be performed.
- The monitor items and parameter settings can be read via Ethernet when "0" is set in **Pr.1432**, but a communication error (E.EHR) occurs instantly when the operation mode is switched to the Network operation.
- A signal loss detection is made when any of 0.1 s to 999.8 s is set in **Pr.1432**. In order to enable the signal loss detection, data must be sent by connected devices at an interval equal to or less than the time set for the communication check. (The inverter makes a communication check (clearing of communication check counter) regardless of the station number setting of the data sent from the master).
- Communication check is started at the first communication when the inverter operates in the Network operation mode and the command source is specified as communication via the Ethernet connector.

Example) When **Pr.1432** = 0.1 to 999.8 s



2.11.3 Parameters related to EtherNet/IP

The following parameters are used for EtherNet/IP communication. Set the parameters as required.

Pr.	Name	Initial value	Setting range	Description
1426 **N641**[*1]	Link speed and duplex mode selection	0	0 to 4	Set the communication speed and the communication mode (full-duplex/half-duplex).
1442 **N660**[*1]	Ethernet IP filter address 1	0	0 to 255	Set the range of connectable IP addresses for the network devices. (When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.)
1443 **N661**[*1]	Ethernet IP filter address 2	0		
1444 **N662**[*1]	Ethernet IP filter address 3	0		
1445 **N663**[*1]	Ethernet IP filter address 4	0		
1446 **N664**[*1]	Ethernet IP filter address 2 range specification	9999	0 to 255, 9999	
1447 **N665**[*1]	Ethernet IP filter address 3 range specification	9999		
1448 **N666**[*1]	Ethernet IP filter address 4 range specification	9999		

*1 The setting is applied after an inverter reset or next power-ON.

◆ Communication speed and full-duplex/half-duplex selection (Pr.1426)

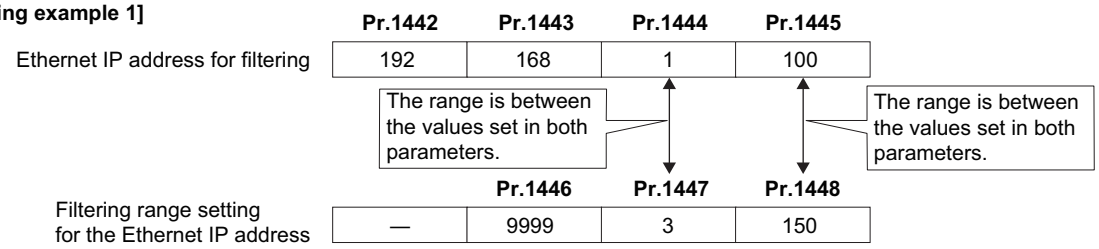
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

Pr.1426 setting	Communication speed	Full-duplex/half-duplex system	Remarks
0 (initial value)	Automatic negotiation	Automatic negotiation	The communication speed and the communication mode (half-duplex/full-duplex) are automatically negotiated to ensure the optimum setting. To set automatic negotiation, auto negotiation setting is required also in the master station.
1	100 Mbps	Full duplex	—
2	100 Mbps	Half duplex	—
3	10 Mbps	Full duplex	—
4	10 Mbps	Half duplex	—

◆ IP filtering function (Ethernet) (Pr.1442 to Pr.1448)

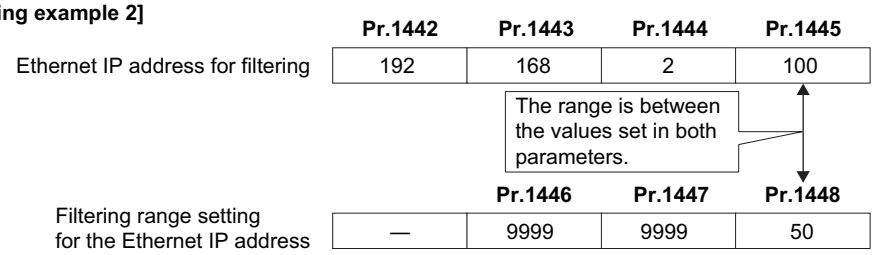
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either of the settings can be larger than the other in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**.)

[Setting example 1]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.x (1 to 3).xxx (100 to 150)".

[Setting example 2]



In this case, the IP address range in which Ethernet communication is permitted is "192.168.2.xxx (50 to 100)".

- When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.
- When "9999 (initial value)" is set in **Pr.1446 to Pr.1448**, the range is invalid.

⚠CAUTION

- The IP filtering function (Ethernet) (**Pr.1442 to Pr.1448**) is provided as a means to prevent unauthorized access, DoS attacks, computer viruses, or other cyberattacks from external devices, but the function does not prevent such access completely. In order to protect the inverter and the system against unauthorized access by external systems, take additional security measures. We shall have no responsibility or liability for any problems involving inverter trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks. The following are examples of measures to prevent them.
  - Install a firewall.
  - Install a personal computer as a relay station, and control the relaying of transmission data using an application program.
  - Install an external device as a relay station to control access rights. (For the details of external devices used to control access rights, contact the distributors of the external devices.)

2.11.4 Object map definitions

◆ Object model of EtherNet/IP communication

For EtherNet/IP communication, each node is modeled as collections of objects (abstraction of particular functions of the products). The following four terms are used to describe object.

Item	Description
Class	Collections of all objects which have same types of functions. Generalization of object.
Instance	Concrete expression of object.
Attribute	Expression of object characteristic.
Service	Function supported by object or class.

2.11.5 Object map

◆ Identity-Object (01h)

This object shows general information of the device.

■ Service

Class	Instance
Get_Attribute_Single Get_Attributes_All	Get_Attribute_Single Set_Attribute_Single Get_Attributes_All Reset (inverter reset)

■ Class attribute

No.	Name	Access	Type	Description
1	Revision	Get	UINT	0001h (Revision of the object)

■ Instance 1 attributes

No.	Name	Access	Type	Description
1	Vendor ID	Get	UINT	00A1h (Mitsubishi Electric)
2	Device Type	Get	UINT	0002h (AC Drive)
3	Product Code	Get	UINT	003Eh (Product code)
4	Revision	Get	Structure	Major revision and minor revision
	Major revision		USINT	0001h (Major revision number)
	Minor revision		USINT	0001h (Minor revision number)
5	Status	Get	WORD	Refer to "Status (Attribute 5)" on page 122.
6	Serial Number	Get	UDINT	Serial number of the inverter
7	Product Name	Get	SHORT_ STRING	FR-E800-(SC)E (product name)
11	Active language	Set	Structure	Active language
			USINT	e, n, g (English)
			USINT	
			USINT	
12	Supported Language List	Get	Structure array	List of languages supported by the host application
			USINT	e, n, g (English)
			USINT	
			USINT	

- Status (Attribute 5)

Bit	Name	Description
0	Module Owned	CIP connection established
1	—	Fixed to 0
2	Configured	Fixed to 1 (configured)
3	—	Fixed to 0
4 to 7	Extended Device Status	0000b: Unknown 0010b: Faulted I/O Connection (ExclusiveOwner connection timed out) 0011b: No I/O connection establish (I/O connection not established) 0100b: Non volatile configuration bad 0101b: Major fault (Bit 10 = 1) 0110b: Connection in Run mode (I/O connection established, with Run mode connection) 0111b: Connection in Idle mode (I/O connection established)
8	Minor Recoverable Fault	Warning or alarm
9	Minor Unrecoverable Fault	Fixed to 0
10	Major Recoverable Fault	Fault
11	Major Unrecoverable Fault	Fixed to 0
12 to 15	—	Fixed to 0

◆ Assembly Object (04h)

The Assembly object uses static assemblies and holds the Process Data sent/received by the inverter. All instances are predefined for specific drive profile parameters.

■ Service

Class	Instance
Get_Attribute_Single	Get_Attribute_Single Set_Attribute_Single

■ Class attribute

No.	Name	Access	Type	Description
1	Revision	Get	UINT	0002h (Revision of the object)
2	Max Instance	Get	UINT	(Highest instance number)

■ Instance attribute

No.	Name	Access	Type	Description
3*1	Data	Set	USINT array	Inverter I/O data

*1 The number corresponds to the instance number described in the output/input assembly.

■ Output assemblies (Consuming instances)

For definitions and mapping of data in this instance, refer to the data definitions of output assemblies on page 123.

- Instance 20 (14h) - Basic Speed Control Output

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	0	Fault reset	0	Run fwd
1	0x00							
2	Speed reference (Low byte)							
3	Speed reference (High byte)							

- Instance 21 (15h) - Extended Speed Control Output

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	NetRef	NetCtrl	0	0	Fault reset	Run rev	Run fwd
1	0x00							
2	Speed reference (Low byte)							
3	Speed reference (High byte)							

- Instance 22 (16h) - Speed and Torque Control Output

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	0	Fault reset	0	Run fwd
1	0x00							
2	Speed reference (Low byte)							
3	Speed reference (High byte)							
4	Torque reference (Low byte)							
5	Torque reference (High byte)							

- Instance 23 (17h) - Extended Speed and Torque Control Output

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	NetRef	NetCtrl	0	0	Fault reset	Run rev	Run fwd
1	0x00							
2	Speed reference (Low byte)							
3	Speed reference (High byte)							
4	Torque reference (Low byte)							
5	Torque reference (High byte)							

- Data definitions, output assemblies

  The following table indicates the mapping of the data in the consuming instances of the Assembly Object. For details, refer to the Control Supervisor Object (29h) on page 125, and AC/DC Drive Object (2Ah) on page 126.

Name	Object		Instance No.	Attribute	
	Name	No.		Name	No.
Run rev	Control Supervisor	29h	1	Run2	4
Run fwd	Control Supervisor	29h	1	Run1	3
Fault reset	Control Supervisor	29h	1	FaultRst	12
NetCtrl	Control Supervisor	29h	1	NetCtrl	5

Name	Object		Instance No.	Attribute	
	Name	No.		Name	No.
NetRef	AC/DC Drive	2Ah	1	NetRef	4
Speed reference	AC/DC Drive	2Ah	1	SpeedRef	8
Torque reference	AC/DC Drive	2Ah	1	TorqueRef	12

■ Input assemblies (Producing instances)

For definitions and mapping of data in this instance, refer to the data definitions of input assemblies on page 124.

- Instance 70 (46h) - Basic Speed Control Input

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	0	Running1	0	Faulted
1	0x00							
2	Speed actual (Low byte)							
3	Speed actual (High byte)							

- Instance 71 (47h) - Extended Speed Control Input

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	At reference	Ref from net	Ctrl from net	Ready	Running 2 (Rev)	Running1 (Fwd)	Warning	Faulted
1*1	Drive state							
2	Speed actual (Low byte)							
3	Speed actual (High byte)							

*1 For drive states and behavior, refer to the Control Supervisor Object (29h) or the instance attribute on page 125.

- Instance 72 (48h) - Speed and Torque Control Input

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	0	Running1	0	Faulted
1	0x00							
2	Speed actual (Low byte)							
3	Speed actual (High byte)							
4	Torque actual (Low byte)							
5	Torque actual (High byte)							

- Instance 73 (49h) - Extended Speed and Torque Control Input

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	At reference	Ref from net	Ctrl from net	Ready	Running 2 (Rev)	Running1 (Fwd)	Warning	Faulted
1*1	Drive state							
2	Speed actual (Low byte)							
3	Speed actual (High byte)							
4	Torque actual (Low byte)							
5	Torque actual (High byte)							

*1 For drive states and behavior, refer to the Control Supervisor Object (29h) or the instance attribute on page 125.

- Data definitions, input assemblies

  The following table indicates the mapping of the data in the producing instances of the Assembly Object. For details, refer to the Control Supervisor Object (29h) on page 125, and AC/DC Drive Object (2Ah) on page 126.

Name	Object		Instance No.	Attribute	
	Name	No.		Name	No.
Faulted	Control Supervisor	29h	1	Faulted	10
Warning	Control Supervisor	29h	1	Warning	11
Running1 (Fwd)	Control Supervisor	29h	1	Running1	7
Running2 (Rev)	Control Supervisor	29h	1	Running2	8
Ready	Control Supervisor	29h	1	Ready	9
Ctrl from net	Control Supervisor	29h	1	CtrlFromNet	15
Drive state	Control Supervisor	29h	1	State	6
Ref from net	AC/DC Drive	2Ah	1	RefFromNet	29
At reference	AC/DC Drive	2Ah	1	AtReference	3
Speed actual	AC/DC Drive	2Ah	1	SpeedActual	7

Name	Object		Instance No.	Attribute	
	Name	No.		Name	No.
Torque actual	AC/DC Drive	2Ah	1	TorqueActual	11

◆ Connection Management Object (06h)

This object is used to manage the characteristics of a communication connection.

■ Service

Class	Instance
—	Forward_Open Forward_Close

◆ Motor Data Object (28h)

This object serves as a database for motor parameters.

■ Service

Class	Instance
Get_Attribute_Single	Get_Attribute_Single Set_Attribute_Single

■ Class attribute

No.	Name	Access	Type	Description
1	Revision	Get	UINT	0001h (Revision of the object)

■ Instance attribute

No.	Name	Access	Type	Description
3[*1]	MotorType	Set[*2]	USINT	3: PM synchronous motor 7: Squirrel cage induction motor
6	Rated Current	Set	UINT	Rated motor current (0.1 A increments) Instance 1: **Pr.9** Instance 2: **Pr.51**
7	Rated Voltage	Set	UINT	Rated motor voltage (V) Instance 1: **Pr.83** Instance 2: **Pr.456**
9	RatedFreq	Set	UINT	Rated motor frequency (Hz) Instance 1: **Pr.84** Instance 2: **Pr.457**
12	PoleCount	Set	UINT	Number of motor poles Instance 1: **Pr.81** Instance 2: **Pr.454**
15	Rated Speed	Set	UINT	\Nominal speed (rpm) at rated frequency from nameplate[*3] Instance 1: **Pr.84** × 120/**Pr.81** Instance 2: **Pr.457** × 120/**Pr.454**

*1 Instances 1 and 2 are supported.

*2 Writing is enabled only when the setting is the same as that of the inverter.

*3 When **Pr.81 (Pr.454)** = "9999", the formula is calculated with 4 poles.

◆ Control Supervisor Object (29h)

This object has the management functions for devices "Hierarchy of Motor Control Devices".

■ Service

Class	Instance
Get_Attribute_Single	Get_Attribute_Single Set_Attribute_Single Reset (operation command clear, output shutoff)

■ Class attribute

No.	Name	Access	Type	Description
1	Revision	Get	UINT	0001h (Revision of the object)

■ Instance 1 attributes

No.	Name	Access	Type	Description
3	Run1*1	Set	BOOL	Forward rotation
4	Run2*1	Set	BOOL	Reverse rotation
5	NetCtrl	Set	BOOL	Operation command source 0: **Pr.338** = "1" 1: **Pr.338** = "0" The actual status of the operation command source can be monitored with Attribute 15.
6	State	Get	USINT	0: Vendor Specific (**Pr.502** = "2": communication fault detection enabled) 1: Startup (During inverter reset) 2: Not_Ready (Communication ready and main circuit power-OFF) 3: Ready (Operation ready) 4: Enabled (During acceleration, constant-speed operation, or reverse rotation deceleration) 5: Stopping (During deceleration) 6: Fault_Stop (Deceleration by setting **Pr.502** = "1") 7: Faulted (Fault)
7	Running1	Get	BOOL	0: During stop or reverse rotation 1: Forward running
8	Running2	Get	BOOL	0: During stop or forward running 1: Reverse running
9	Ready	Get	BOOL	0: RY signal is OFF 1: RY signal is ON
10	Faulted	Get	BOOL	0: No fault 1: Fault
11	Warning	Get	BOOL	0: Without warnings 1: With warnings
12	FaultRst	Set	BOOL	0: No reset 0→1: Protective function reset
15	CtrlFrom Net	Get	BOOL	Operation command source monitoring 0: Local control 1: Network control

*1 If both Run1 and Run2 are turned ON, the start signal is not changed. (The previous status remains unchanged.) If both Run1 and Run2 are turned ON in the Assembly Object (04h), the direction of rotation is not changed. That is because the start signal is not changed by giving a speed command to reverse the direction.

◆ AC/DC Drive Object (2Ah)

This object models the functions specific to an AC or DC Drive, for example speed and torque control.

■ Service

Class	Instance
Get_Attribute_Single	Get_Attribute_Single Set_Attribute_Single

■ Class attribute

No.	Name	Access	Type	Description
1	Revision	Get	UINT	0001h (Revision of the object)

■ Instance 1 attributes

No.	Name	Access	Type	Description
3	At Reference	Get	BOOL	During speed control 0: SU signal OFF 1: SU signal ON During torque control 0: The actual torque is out of the range of ±10% of the torque command value. 1: The actual torque is within the range of ±10% of the torque command value.

No.	Name	Access	Type	Description
4	NetRef	Set	BOOL	Speed/torque command source 0: **Pr.339** = "1" 1: **Pr.339** = "0 or 2" The actual status of the speed/torque command source can be monitored with Attribute 29.
6	DriveMode	Set*1	USINT	0: Vendor specific mode 1: Speed control without encoder 2: Speed control with encoder 3: Torque control
7	Speed Actual	Get	INT	Actual drive speed Unit: rpm / $2^{SpeedScale}$
8	SpeedRef	Set	INT	Speed setting value Unit: rpm / $2^{SpeedScale}$ Select whether or not to use a sign for the frequency command value using **Pr.541**.
9	Current Actual	Get	INT	Motor phase current Unit: 100mA / $2^{CurrentScale}$
11	Torque Actual	Get	INT	Actual torque Unit: N·m / $2^{TorqueScale}$
12	TorqueRef	Set	INT	Torque reference Unit: N·m / $2^{TorqueScale}$
15	Power Actual	Get	INT	Output power Unit: W / $2^{PowerScale}$
17	Output Voltage	Get	INT	Output voltage Unit: V / $2^{VoltageScale}$
18	AccelTime	Set	UINT	Acceleration time = **Pr.7 (Pr.44)** × **Pr.18/Pr.20** Time from 0 to HighSpdLimit Unit: ms
19	DecelTime	Set	UINT	Deceleration time = **Pr.8 (Pr.45)** × **Pr.18/Pr.20** Time from HighSpdLimit to 0 Unit: ms
20	LowSpd Limit	Set	UINT	Minimum speed limit Unit: rpm / $2^{SpeedScale}$
21	HighSpd Limit	Set	UINT	Maximum speed limit Unit: rpm / $2^{SpeedScale}$
22	SpeedScale	Set	SINT	Speed scaling factor
23	Current Scale	Set	SINT	Current scaling factor
24	Torque Scale	Set	SINT	Torque scaling factor
29	RefFromNet	Get	BOOL	Speed/torque command source monitoring 0: Local reference 1: Network reference

*1 Writing is enabled only when the setting is the same as that of the inverter.

◆ Inverter Configuration Object (64h)

This object is used to read and write inverter parameters, monitor data, and inverter control parameters.

■ Service

Class	Instance
—	Get_Attribute_Single Set_Attribute_Single

■ Instance

No.	Name	Access	Type	Description
12288 to 16383 (3000h to 3FFFh)	Inverter Parameters	Set/Get	UINT	The inverter parameter number*1 + 12288 (3000h) is the instance number.
16384 to 20479 (4000h to 4FFFh)	Monitor Data	Get	UINT	The monitor number*2 +16384 (4000h) is the instance number.
20480 to 24575 (5000h to 5FFFh)	Inverter Control Parameters	Set/Get	UINT	Inverter control parameter

*1 For the inverter parameter numbers, refer to the parameter list of the Instruction Manual (Function).

*2 For details of the monitor numbers and the monitor items, refer to the description of **Pr.52** in the FR-E800 Instruction Manual (Function).

- Inverter control parameters

Instance No.	Definition	Read/write	Remarks
20488 (5008h)	Inverter status / control input command (extended)*1	Read/write	Refer to the following.
20489 (5009h)	Inverter status / control input command*1	Read/write	Refer to the following.
20981 (51F5h)	Fault record 1	Read/write	Being 2 bytes in length, the data is stored as H00○○. Refer to the lowest 1 byte for the error code. (For details on error codes, refer to the list of fault displays in the Instruction Manual (Maintenance).) The fault history is batch-cleared by writing to 20981 (51F5h). Set any value as data.
20982 (51F6h)	Fault record 2	Read	
20983 (51F7h)	Fault record 3	Read	
20984 (51F8h)	Fault record 4	Read	
20985 (51F9h)	Fault record 5	Read	
20986 (51FAh)	Fault record 6	Read	
20987 (51FBh)	Fault record 7	Read	
20988 (51FCh)	Fault record 8	Read	
20989 (51FDh)	Fault record 9	Read	
20990 (51FEh)	Fault record 10	Read	

*1 The data is written as a control input command for writing.
The data is read as the inverter status for reading.

- Inverter status / control input command, and inverter status / control input command (extended)

Bit	Definition	
	Control input command	Inverter status
0	—	RUN (Inverter running)*2
1	—	During forward rotation
2	—	During reverse rotation
3	RH (High-speed operation command)*1	Up to frequency
4	RM (Middle-speed operation command)*1	Overload alarm
5	RL (Low-speed operation command)*1	0
6	JOG operation selection 2	FU (Output frequency detection)*2
7	Second function selection	ABC (Fault)*2
8	Terminal 4 input selection	0
9	—	Safety monitor output 2
10	MRS (Output stop)*1	0
11	—	0
12	RES (—)*1	0
13	—	0
14	—	0
15	—	Fault occurrence

Bit	Definition	
	Control input command	Inverter status
0	NET X1 (—)*1	NET Y1 (0)*2
1	NET X2 (—)*1	NET Y2 (0)*2
2	NET X3 (—)*1	NET Y3 (0)*2
3	NET X4 (—)*1	NET Y4 (0)*2
4	NET X5 (—)*1	0
5	—	0
6	—	0
7	—	0
8	—	0
9	—	0
10	—	0
11	—	0
12	—	0
13	—	0
14	—	0
15	—	0

*1 The signal within parentheses ( ) is assigned in the initial status. The function changes depending on the setting of **Pr.180 to Pr.189 (Input terminal function selection)**.
For details, refer to the description of **Pr.180 to Pr.189 (Input terminal function selection)** in the Instruction Manual (Function).
The signals assigned to the input terminals may be valid or invalid in the NET operation mode. (Refer to the Instruction Manual (Function).)

*2 The signal within parentheses ( ) is assigned in the initial status. The function changes depending on the setting of **Pr.190 to Pr.196 (Output terminal function selection)**.
For details, refer to the description of **Pr.190 to Pr.196 (Output terminal function selection)** in the Instruction Manual (Function).

■ Instance attribute

No.	Name	Access	Type	Description
100	Data	Set/Get	UINT	Inverter parameters, monitor data, and inverter control parameters.
101	Sub Data	Set/Get	UINT	Analog value (%) set in **C3 (Pr.902), C4 (Pr.903), C6 (Pr.904), C7 (Pr.905), C39 (Pr.932), C41 (Pr.933), C43 (Pr.934), and C45 (Pr.935)** Example) **C3 (Pr.902)**: Instance = 902 + 3000h, Attribute = 101

NOTE

- Values "8888" and "9999" displayed on the parameter unit indicate 65520 (0xFFF0) and 65535 (0xFFFF) respectively.

◆ TCP/IP Interface Object (F5h)

The object groups TCP/IP-related settings.

■ Service

Class	Instance
Get_Attribute_Single	Get_Attribute_All Get_Attribute_Single Set_Attribute_Single

■ Class attribute

No.	Name	Access	Type	Description
1	Revision	Get	UINT	0004h (Revision of the object)

■ Instance 1 attributes

No.	Name	Access	Type	Description
1	Status	Get	DWORD	Refer to "Status (Attribute 1)" on page 129.
2	Configuration Capability	Get	DWORD	80 (0050h): Refer to "Configuration Capability (Attribute 2)" on page 129.
3	Configuration Control	Set	DWORD	Refer to "Configuration Control (Attribute 3)" on page 130.
4	Physical Link Object	Get	Structure	Path size and Path
	Path size		UINT	0002h: Path to Ethernet Link Object
	Path		Padded EPATH	20 F6 24 03h: Path to Ethernet Link Object
5	Interface Configuration	Set	Structure	TCP/IP interface setting
	IP Address		UDINT	IP address (**Pr.1434 to Pr.1437**)
	Network Mask		UDINT	Subnet mask (**Pr.1438 to Pr.1441**)
	Gateway Address		UDINT	Default gateway (**Pr.442 to Pr.445**)
	Name Server		UDINT	Fixed to 0
	Name Server 2		UDINT	Fixed to 0
	Domain Name		STRING	Fixed to 0
6	Host Name	Set	STRING	Host name
13	Encapslation Inactivity Timeout	Set	UINT	0: Inactive 1 to 3600 s: TCP connection timeout after the message is received (Initial value: 120 s)

- Status (Attribute 1)

Bit	Name	Description
0 to 3	Interface Configuration Status	How to configure Attribute 5 0: Not configured 1: Configured by setting parameters, BOOTP, DHCP 2: Configured by hardware setting
4	—	Fixed to 0
5	Interface Configuration Pending	Attribute 5, setting change during pending. "1" is set when inverter reset is required to enable the setting change.
6 to 31	—	Fixed to 0

- Configuration Capability (Attribute 2)

Bit	Name	Description
0	BOOTP Client	0: Not supported 1: Supported
1	DNS Client	0: Not supported 1: Supported
2	DHCP Client	0: Not supported 1: Supported
3	DHCP-DNS Update	Fixed to 0
4	Configuration Settable	Attribute 5, access condition 0: Setting not allowed 1: Setting allowed

Bit	Name	Description
5	Hardware Configurable	Attribute 5, hardware configuration condition 0: Setting not allowed 1: Setting allowed
6	Interface Configuration Change Requires Reset	Attribute 5, change application condition 0: Immediately 1: After reset
7	AcdCapable	0: Not supported 1: Supported
8 to 31	—	Fixed to 0

- Configuration Control (Attribute 3)

Bit	Name	Description
0 to 3	Configuration Method	Network setting acquisition method after startup of the inverter 0: Parameter setting 1: BOOTP 2: DHCP
4 to 31	—	Fixed to 0

◆ Ethernet Link Object (F6h)

This object groups diagnostic information for the Ethernet interface.

■ Service

Class	Instance
Get_Attribute_All Get_Attribute_Single	Get_Attribute_All Get_Attribute_Single Set_Attribute_Single

■ Class attribute

No.	Name	Access	Type	Description
1	Revision	Get	UINT	0004h (Revision of the object)
2	Max Instance	Get	UINT	(Highest instance number)
3	Number of instances	Get	UINT	(Number of instances)

■ Instance attribute

No.	Name	Access	Type	Description
1*1	Interface Speed	Get	UDINT	10 or 100: Actual Ethernet interface speed (Mbps)
2*1	Interface Flags	Get	DWORD	Refer to "Interface Flags (Attribute 2)" on page 131.
3*1	Physical Address	Get	Array of 6 USINT	(MAC ID): Assigned MAC address
6*1	Interface Control	Set	Structure	Control Bits and Forced Interface Speed
	Control Bits		WORD	Refer to "Control Bits (Attribute 6)" on page 131.
	Forced Interface Speed		UINT	0, 10, or 100: Speed at which the interface shall be forced to operate. Returns 'Object state Conflict' if auto-negotiation is enabled.
7	Interface Type	Get	USINT	Instance 1, 2: 2 (Twisted pair cable) Instance 3: 1 (Embedded interface)
10	Interface Label	Get	SHORT_ STRING	Instance 1: Port 1 Instance 2: Port 2 Instance 3: Internal
11*1	Interface Capability	Get	Structure	Capability Bits and Speed/Duplex Options
	Capability Bits		DWORD	11 (000Bh): Refer to "Capability Bits (Attribute 11)" on page 131.
	Speed/Duplex Options		Structure	
			USINT	4: Number of arrays
			Structure array	
			UINT	10 or 100: Ethernet interface speed (Mbps)
			USINT	0: Half duplex 1: Full duplex

*1 Instances 1, 2, and 3 are supported.

- Interface Flags (Attribute 2)

Bit	Name	Description
0	Link status	IEEE 802.3 communication interface link status 0: Inactive 1: Active
1	Half/full duplex	Current duplex mode 0: Half duplex 1: Full duplex
2 to 4	Negotiation Status	Link auto-negotiation status 0 to 2: Disabled. 3: Successfully negotiated speed and duplex. 4: Auto-negotiation not attempted. Forced speed and duplex.
5	Manual Setting requires Reset	0: Immediately 1: After reset
6 to 31	—	Fixed to 0

- Control Bits (Attribute 6)

Bit	Name	Description
0	Auto-negotiate	0: Inactive 1: Active
1	Forced Duplex Mode	Duplex mode when Auto-negotiate (Bit 0) = 0 0: Half duplex 1: Full duplex
2 to 15	—	Fixed to 0

- Capability Bits (Attribute 11)

Bit	Name	Description
0	Manual Setting Requires Reset	Attribute 6, change application condition 0: Immediately (Instance 3) 1: After reset (Instance 1, 2)
1	Auto-negotiate	0: Not supported (Instance 3) 1: Not supported (Instance 1, 2)
2	Auto-MDIX	Fixed to 0 (not supported)
3	Manual Speed/Duplex	Fixed to 1 (supported)
4 to 31	—	Fixed to 0

NOTE

- When the data contains invalid data, an error response is returned. When the service was successfully executed by the specified object, "00h" is returned. When any value other than "00h" is returned, the requested service cannot be executed due to the reasons such as unknown path destination and invalid attribute data detection.

◆Programming examples

The following explains the programming examples for controlling the inverter with sequence programs.

■Programming example for forward rotation operation at 60 Hz

- Network setting and device examples

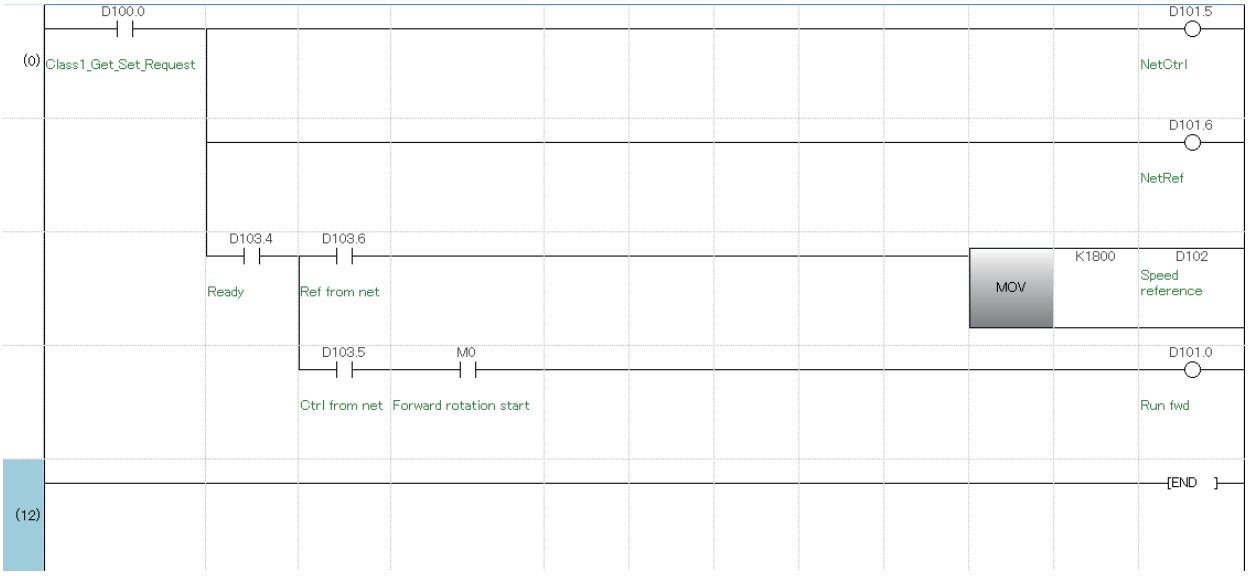
Data in D101 to D102 reflect the data for cyclic communication with inverters, either by data transmission to the buffer memory or using function blocks, according to the specification of the master module.

Device name	Description
M0	Forward rotation start
D100.0	Class1_Get_Set_Request
D101	Extended Speed Control Output_0
D101.0	Run fwd
D101.1	Run rev
D101.2	Fault reset
D101.3	—
D101.4	—
D101.5	NetCtrl
D101.6	NetRef
D101.7 to D101.F	—
D102	Speed reference
D103	Extended Speed Control Input_0
D103.0	Faulted
D103.1	Warning
D103.2	Running 1(Fwd)
D103.3	Running 2(Rev)
D103.4	Ready
D103.5	Ctrl from net
D103.6	Ref from net
D103.7	At reference
D103.8 to D103.F	—
D104	Speed actual

Turning ON D100.0 (Class1_Get_Set_Request) turns ON D101.5 (NetCtrl) and D101.6 (NetRef), enabling the control by the master via network.

- Rotation speed setting: Speed reference = 60 Hz = 1800 r/min

Turning ON M0 (Forward rotation start) turns ON D101.0 (Run fwd) to start forward rotation operation at 60 Hz.
Turning OFF M0 stops operation.



2.12 PROFINET

2.12.1 Outline

When the PROFINET communication operation is performed through the Ethernet connector on the inverter, data transmission is enabled for parameters, command data, and feedback data between a master and slaves.

◆ Communication specifications

The communication specification varies depending on the specification of the master.

Item	Description
Category	100BASE-TX
Transmission speed	100 Mbps (10 Mbps is not supported.)
Maximum number of branches	No upper limit on the same Ethernet network
Number of cascade connection stages	Maximum: 2
Connection cable	Ethernet cable (IEEE 802.3 100BASE-TX compliant cable or ANSI/TIA/EIA-568-B (Category 5e) compliant shielded 4-pair branched cable)
Topology	Line, star, or a combination of line and star
PROFINET communication specifications	PROFINET IO Device V2.35

◆ Operation status LEDs

LED name	Description	LED status	Remarks
NS	Communication status	OFF	Power-OFF / during inverter reset
		Blinking green	No connections established with the master
		Green	Connections established with the master
MS	Inverter status	OFF	Power-OFF / during inverter reset
		ON (green)	Operating properly
		Red	Fault detected
LINK1	Connector for communication (PORT1) status	OFF	Power-OFF/link-down
		Blinking green	Link-up (Data reception in progress)
		Solid green	Link-up
LINK2	Connector for communication (PORT2) status	OFF	Power-OFF/link-down
		Blinking green	Link-up (Data reception in progress)
		Solid green	Link-up

◆ GSDML file

A GSDML file is available for download.

Model	Classification	GSDML file
FR-E800-E	PROFINET	GSDML-V2.35-MitsubishiElectric-FR-E800-E-[yyyymmdd].xml
FR-E800-SCE		
FR-E800-SCE	PROFINET + PROFIsafe	GSDML-V2.35-MitsubishiElectric-FR-E800-SCE-[yyyymmdd].xml

([yyyymmdd]: revision date)

Mitsubishi Electric FA Global Website:

https://www.mitsubishielectric.co.jp/fa/download/software/detailsearch.do?mode=software&kisyu=/inv&shiryoid=0000000041&lang=1&select=0&softid=1&infostatus=3_2_2&viewradio=1&viewstatus=01_0_0_010_20&viewpos=720_0

The download is free at the website above. For details, contact your sales representative.

NOTE

- The GSDML file is used in engineering software. To install the GSDML file properly, refer to the instruction manual of the applicable engineering software.

2.12.2 PROFINET configuration

◆ Procedure

The procedure differs depending on the master device and the engineering software used. For details, refer to the Instruction Manual of the master device and the engineering software.

■ Before communication

1. Connect each unit with an Ethernet cable. (Refer to page 13.)
2. Set "34962" (PROFINET) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. (Refer to page 134.)
   (Example: **Pr.1429** = "45238" (CC-Link IE TSN) (initial value) → "34962" (PROFINET))
   When **Pr.1429** = "45238 (initial value)" (CC-Link IE TSN), change the value to "34962" (PROFINET). When "45238" is set in the parameter, "34962" becomes invalid.
3. Reset the inverter, or turn OFF and then ON the power.

■ Network configuration

1. Add the downloaded GSDML file to the engineering software.
2. Detect the inverters on the network using the engineering software.
3. Add the detected inverters to the network configuration settings.
4. Configure the module settings for the inverters.

■ Checking communication

The following table shows the status of the LEDs when communication is established between the programmable controller and the inverter.

NS	MS	LINK1	LINK2
Solid green	Solid green	Blinking green*1	

*1 The LED on either LINK1 or LINK2 will blink depending on the port (port 1 or 2) the Ethernet cable is connected to.

2.12.3 Initial setting for PROFINET

Use the following parameters to perform required settings for Ethernet communication between the inverter and other devices.

To make communication between other devices and the inverter, perform the initial settings of the inverter parameters to match the communication specifications of the devices. Data communication cannot be made if the initial settings are not made or if there is any setting error.

Pr.	Name	Initial value	Setting range	Description
1427 N630[*1]	**Ethernet function selection 1**	5001	502, 5000 to 5002, 5006 to 5008, 5010 to 5013, 9999, 34962[*3], 44818[*2], 45237, 45238, 47808[*2], 61450	Set the application, protocol, etc.
1428 N631[*1]	**Ethernet function selection 2**	45237		
1429 N632[*1]	**Ethernet function selection 3**	45238		
1430 N633[*1]	**Ethernet function selection 4**	9999		
1426 N641[*1]	**Link speed and duplex mode selection**	0	0 to 4	Set the communication speed and the communication mode (full-duplex/half-duplex).

*1 The setting is applied after an inverter reset or next power-ON.
*2 The setting is available only for the FR-E800-EPA and the FR-E800-SCEPA.
*3 The setting is available only for the FR-E800-EPB and the FR-E800-SCEPB.

NOTE

- For PROFINET, the IP filtering function (Ethernet) (**Pr.1442 to Pr.1448**) settings are invalid.
- For PROFINET, do not change initial values of **Pr.1449 to Pr.1454** used to specify the Ethernet IP address range for command source selection as the IP address is not used. Setting a value other than the initial value in any of the above parameters may cause an Ethernet communication fault (E.EHR). If the fault occurs, reset the setting of the relevant parameter to the initial value, or set "9999" in **Pr.1432 Ethernet communication check time interval**.

◆ Ethernet function selection (Pr.1427 to Pr.1430)

To select PROFINET for the application, set "34962" (PROFINET) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. When Pr.1429 = "45238 (initial value)" (CC-Link IE TSN), change the value to "34962" (PROFINET). When "45238" is set in the parameter, "34962" becomes invalid.

NOTE

- Change the setting if selected communication protocols cannot be used together. (Refer to page 5 and page 151.)

◆ Communication speed and full-duplex/half-duplex selection (Pr.1426)

Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

Pr.1426 setting	Communication speed	Full-duplex/half-duplex system	Remarks
0 (initial value)	Automatic negotiation	Automatic negotiation	The communication speed and the communication mode (half-duplex/full-duplex) are automatically negotiated to ensure the optimum setting. To set automatic negotiation, auto negotiation setting is required also in the master station.
1	100 Mbps	Full duplex	—
2	100 Mbps	Half duplex	—
3	10 Mbps	Full duplex	The communication speed is fixed at 100 Mbps. Do not set 10 Mbps.
4	10 Mbps	Half duplex	

2.12.4 Data Exchange

◆ Process Data (Cyclic Data Exchange)

Cyclic data transmission is enabled between the master and the inverter for the command data sent from the master and the feedback data sent from the inverter.

■ Telegram types

Select a telegram type according to the control mode.

Telegram	Description	Size (words)
1	Standard Telegram 1	2
100	Telegram 100 (Torque control)	3

Which telegram type is used, can be read using PROFIdrive parameter P922

NOTE

- Only one telegram module can be used at a time.

■ Data mapping

- Standard Telegram 1

Type	IO Data number	Name	Abbreviation	Data length (bit)
Setpoint Telegram (master to slave)	1	Control word 1	STW1	16
	2	Speed setpoint A	NSOLL_A	16
Actual Value Telegram (slave to master)	1	Status word 1	ZSW1	16
	2	Speed actual value A	NIST_A	16

- Telegram 100

Type	IO Data number	Name	Abbreviation	Data length (bit)
Setpoint Telegram (master to slave)	1	Control word 1	STW1	16
	2	Target torque	—	16
	3	Speed setpoint A	NSOLL_A	16
Actual Value Telegram (slave to master)	1	Status word 1	ZSW1	16
	2	Actual torque	—	16
	3	Speed actual value A	NIST_A	16

- Control word 1 (STW1) details

Bit	Name	Inverter operation
0	ON/OFF	0: OFF 1: ON
1	No Coast Stop/Coast Stop (output shutoff)	0: Output shutoff 1: Output shutoff release
2	No Quick Stop/Quick Stop (emergency stop)	0: Emergency stop 1: Emergency stop release
3	Enable/Disable Operation	0: Disabled 1: Enabled
4	—	Not used (fixed to "0")
5	Unfreeze/Freeze Ramp Generator (acceleration/deceleration stop)	0: Set frequency retained 1: Set frequency not retained Enabled when Telegram 1 is selected and bit 6 is ON.
6	Enable/Disable Setpoint (set frequency enabled)	0: NSOLL_A disabled (frequency setting / speed limit value = "0") 1: NSOLL_A enabled
7	Fault Acknowledge (0→1) (fault cleared)	When 20 ms or more elapses after the bit is turned ON, the fault buffer is cleared (the inverter fault is not cleared).
8	—	Not used (fixed to "0")
9	—	Not used (fixed to "0")
10	Control By PLC/No Control By PLC (DOIO data from programmable controller enabled)	0: STW1 disabled 1: STW1 enabled
11	Target torque enabled (Device-specific)	0: Target torque disabled (torque setting = "0") 1: Target torque enabled
12	Start command direction selection (Device-specific)	0: Forward rotation 1: Reverse rotation
13 to 15	—	Not used (fixed to "0")

- Status word 1 (ZSW1) details

Bit	Name	Inverter operation
0	Ready To Switch On/Not Ready To Switch On	0: During stop (Not Ready For Switching On) 1: During stop (Ready For Switching On)
1	Ready To Operate/Not Ready To Operate	0: During stop (Not Switched On) (not in standby condition) 1: During stop (Switched On) (in standby condition)
2	Operation Enabled (drive follows setpoint)/ Operation Disabled	0: During stop (Operation Disabled) 1: During operation (Operation Enabled)
3	Fault Present/No Fault	0: No fault 1: Fault state (fault code stored in Fault numbers (P947))
4	Coast Stop Not Activated/Coast Stop Activated (No OFF2/OFF2) (output shutoff)	0: Output shutoff release 1: Output shutoff
5	Quick Stop Not Activated/Quick Stop Activated (No OFF3/OFF3) (during emergency stop)	0: During emergency stop 1: Emergency stop release
6	Switching On Inhibited/Switching On Not Inhibited	0: During stop (initial state) (Switching On Not Inhibited) 1: During stop (initial state) (Switching On Inhibited)
7	Warning Present/No Warning	0: No warning or alarm 1: Warning or alarm state
8	—	Not used (fixed to "0")
9	Control Requested/No Control Requested	0: Operation commands not sent from the controller 1: Operation commands sent from the controller
10 to 15	—	Not used (fixed to "0")

- Speed setpoint A (NSOLL_A), Speed actual value A (NIST_A)

  Frequency setting and output frequency monitoring are available. The set frequency and the output frequency are calculated with the following formula relative to the inverter maximum frequency setting (**Pr.1 or Pr.18**). Calculated values are rounded down according to the effective number of digits.

  Set frequency (Hz) = (NSOLL_A / 0x4000) × inverter maximum frequency (**Pr.1 or Pr.18**)

  Output frequency (Hz) = (NIST_A / 0x4000) × inverter maximum frequency (**Pr.1 or Pr.18**)

Item	Description
Data type	N2
Range	-32768 (0x8000) to 32767 (0x7FFF) (-200% to 199.99%)
Reference	16384 (0x4000) = Inverter maximum frequency (**Pr.1 or Pr.18**)
Sign	Plus: forward rotation Minus: reverse rotation

NOTE

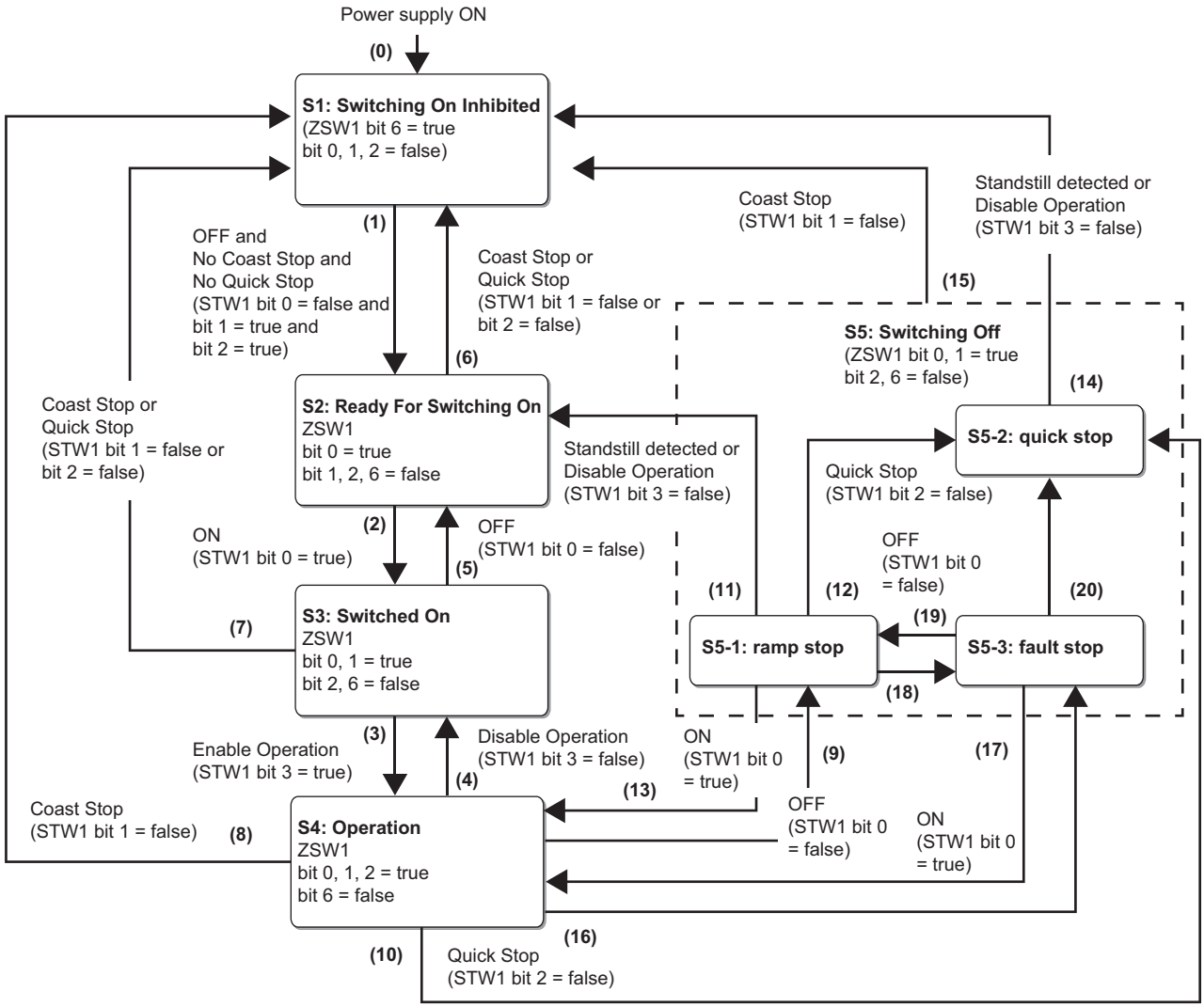
- When the HMS PROFINET network option A8NPRT is installed in the FR-A800 or FR-F800 inverter, **Pr.3 Base frequency** is used as reference. In the network configuration that includes the above, consider the difference of the reference value.

- Target torque, Actual torque

  The rated torque is regarded as 100%. Setting and monitoring is available in 1% increments.

  Target torque is clamped at -400% and 400%. The value is set in **Pr.805** (1000% reference) (RAM).

■ State transition diagram of the inverter



- Definition

Symbol	Name	Description	Inverter operation
S1	Switching On Inhibited	During stop (initial status)	Output shutoff
S2	Ready For Switching On	During stop (ready)	Output shutoff
S3	Switched On	During stop (standby)	
S4	Operation	During operation (enabled)	Start command ON
S5	Switching Off	Deceleration stop	
S5-1	ramp stop	Normal deceleration stop	Start command OFF, normal deceleration stop
S5-2	quick stop	Emergency stop	Start command OFF, normal deceleration stop
S5-3	fault stop	Deceleration stop due to a communication error	Deceleration stop due to a communication error (**Pr.502** = "1 or 2")

- Transition No.

Symbol	Description	Remarks
(0)	Power supply ON	
(1)	OFF command from the master	When the master is not the operation command source, status transition will not occur.
(2)	ON command from the master	
(3)	Enable operation command from the master	When the inverter is not in the drive enabled state, status transition will not occur.
(4)	Disable operation command from the master	
(5)	OFF command from the master	
(6)	Coast stop command from the master Quick stop command from the master	
(7)	Coast stop command from the master Quick stop command from the master	
(8)	Coast stop command from the master	
(9)	OFF command from the master	
(10)	Quick stop command from the master	
(11)	Motor stop Disable operation command from the master	
(12)	Quick stop command from the master	
(13)	ON command from the master	
(14)	Motor stop	
(15)	Coast stop command from the master	
(16)	Process data communication interrupted (**Pr.502** = "1 or 2")	
(17)	Process data communication restarted (**Pr.502** = "2")	
(18)	Process data communication interrupted (**Pr.502** = "1 or 2")	
(19)	Process data communication restarted (**Pr.502** = "2")	
(20)	Quick stop command from the master (**Pr.502** = "1")	When the process data communication with the master is not restarted, status transition will not occur.

- Command and control word 1 (STW1) combinations

Command	STW1				Operation	Transition No.
	Bit 3 (Enable Operation)	Bit 2 (No Quick Stop)	Bit 1 (No Coast Stop)	Bit 0 (ON)		
OFF	—	1	1	0	Transition to S2	(1)
ON	—	1	1	1	Transition to S3	(2)
Enable operation	1	1	1	1	Operation	(3)
Disable operation	0	1	1	1	Stop	(4)
Quick stop	—	0	—	—	Emergency stop (deceleration stop)	(6), (7)
Coast stop	—	—	0	—	Output shutoff (coasting to stop)	(6), (7)

Example) 50 Hz forward rotation command from the master to the slave

STW1 = 1135 (0x046F)

b15															b0
0	0	0	0	0	1	0	0	0	1	1	0	1	1	1	1

NSOLL_A = (5000 (50 Hz) × 16384 (0x4000)) / 12000 (**Pr.1** = 120 Hz) = 6827 (0x1AAB)

◆ Drive Profile Parameters (Acyclic Data Exchange)

PNU numbers 0 to 65535 are assigned to parameters used for PROFINET: PROFIdrive parameters, PROFINET parameters, inverter parameters, monitor data, and inverter control parameters.

■ PROFIdrive Parameters

The following parameters are implemented.

Group	PNU	Name	Access	Data Type	Description
PROFIdrive parameter	P915	Selection switch Setpoint telegram	R	Array[n] Unsigned16	Holds the configuration of the Setpoint telegram.
	P916	Selection switch Actual value telegram	R	Array[n] Unsigned16	Holds the configuration of the Actual value telegram.
	P922	Telegram Selection	R	Unsigned 16	Initial setting: Standard telegram 1. Reflects the latest accepted configuration data from the master.
	P944	Fault message counter	R	Unsigned16	Incremented by 1 when Fault numbers (P947) is changed.
	P947	Fault numbers	R	Array[8] Unsigned16	Holds up to eight fault codes which occurred after the power is turned ON. When the ninth fault occurs, the eighth fault is overwritten by the new data.
	P964	Drive Unit identification	R	Array[5] Unsigned16	Manufacturer ID: 021Ch (Mitsubishi Electric) Drive unit type: 0 Version (software): xxyy (decimal) Firmware date (year): 0000 (unsupported) Firmware date (day/month): 0000 (unsupported)
	P965	Profile identification number	R	OctetString 2	Byte 0: 3 (PROFIdrive profile) Byte 1: 42 (Version 4.2)
	P967	STW1	R	V2	Last control word received from the controller.
	P968	ZSW	R	V2	Current status word received from the inverter.
	P975	DO identification	R	Array[8] Unsigned16	Manufacturer ID: 021Ch (Mitsubishi Electric) Drive object type: 0 Version (software): xxyy (decimal) Firmware date (year): 0000 (unsupported) Firmware date (day/month): 0000 (unsupported) PROFIdrive DO type class: 1 (Axis) PROFIdrive DO sub class 1: 1 (Application Class 1 supported) Drive Object ID (DO-ID): 1 (Number of Drive Objects (DO))
	P980	Parameter Database Handling and Identification	R	Array[n] Unsigned16	PNU numbers of all existing parameters are saved in the subindices (profile parameters and regular inverter parameters). Arrays are assigned in the following order: PROFIdrive parameters, PROFINET parameters, inverter parameters, monitor data, and inverter control parameters. The first parameter of the list of defined parameters is marked by a subindex with the value "0".
Inverter parameter	P12288 to P16383	Inverter Parameters	R/W	Array[n] Unsigned16	The inverter parameter number + 12288 (3000h) is the PNU number.
Monitor data	P16384 to P20479	Monitor Data	R	Unsigned16	The monitor number + 16384 (4000h) is the PNU number.
Inverter control parameter	P20480 to P24575	Inverter Control Parameters	R/W	Unsigned16	Inverter control parameter
PROFINET parameter	P61000	Name of station	R	Octetstring 240	Station name of device
	P61001	IP address	R	Octetstring 4	Current IP address
	P61002	MAC address	R	Octetstring 6	MAC address
	P61003	Gateway	R	Octetstring 4	Current gateway address
	P61004	Subnet mask	R	Octetstring 4	Current subnet mask

- Selection switch Setpoint telegram, Selection switch Actual value telegram (P915/P916)

PNU	Sub	Access	Name	Data Type	Description	Default
915	0 to n	R	Selection switch Setpoint telegram	Array[n] Unsigned16	Setpoint data assigned to the cyclic data is sent back.	—
916	0 to n	R	Selection switch Actual value telegram	Array[n] Unsigned16	Actual value data assigned to the cyclic data is sent back.	—

Details of the read values are as follows.

Value	Description	Remarks
1	STW1	
2	ZSW1	
5	NSOLL_A	
6	NIST_A	
100	Target torque	device-specific
101	Actual torque	device-specific

- Telegram Selection (P922)

PNU	Sub	Access	Name	Data Type	Description	Default
922	0	R	Telegram selection	Unsigned16	The selected telegram is sent back.	1

Details of the read values are as follows.

Value	Description
1	Standard telegram 1
100	Telegram 100

- Fault message counter (P944)

PNU	Sub	Access	Name	Data Type	Description	Default
944	0	R	Fault message counter	Unsigned16	The value of Fault message counter is sent back. This value is incremented when an inverter fault occurs.	0

- Fault numbers (P947)

PNU	Sub	Access	Name	Data Type	Description	Default
947	0 to 7	R	Fault numbers	Array[8] Unsigned16	Displays up to eight inverter fault codes for the faults which occurred after the power is turned ON. While no fault occurs, "0" is read for P947.0 to 7.	0

- Drive Unit identification (P964)

The FR-E800-(SC)E identification information is sent back.

PNU	Sub	Access	Name	Data Type	Description	Default
964	0	R	Drive Unit identification	Array[5] Unsigned16	Manufacturer ID: Manufacturer ID of Mitsubishi Electric	540
	1				Device type	0
	2				Firmware version: FR-E800-(SC)E firmware version	

- Profile identification number (P965)

PNU	Sub	Access	Name	Data Type	Description	Default
965	0	R	Profile identification number	OctetString 2	Profile Number 3	03h
	1				Profile Version Number 42	2Ah

- STW1, ZSW1 (P967/P968)

Refer to details on the control word 1 (STW1) (page 136) and the status word 1 (ZSW1) (page 137).

- DO identification (P975)

The drive object identification information is sent back.

PNU	Sub	Access	Name	Data Type	Description	Default
975	0	R	DO identification	Array[8] Unsigned16	Manufacturer ID: Manufacturer ID of Mitsubishi Electric	540
	1				Drive Object type	0
	2				Firmware version: FR-E800-(SC)E firmware version	
	5				PROFIdrive DO type class 1: Axis	1
	6				PROFIdrive DO sub class 1 1: Application Class 1 supported	1
	7				Drive Object ID (DO-ID) Number of Drive Objects(DO)	1

- Parameter Database Handling and Identification (P980)

PNU	Sub	Access	Name	Data Type	Description	Default
980	0 to n	R	Parameter Database Handling and Identification	Array[n] Unsigned16	All supported PNU numbers are listed in the following order: PROFIdrive parameters, PROFINET parameters, inverter parameters, monitor data, and inverter control parameters. Among the PNU numbers specified in the subindices, up to 117 numbers are shown. (Number of elements (234 max.) / Unsigned16 (2 bytes))	—

- Inverter Parameters (P12288 to P16383)

PNU	Sub	Access	Name	Data Type	Description	Default
12288 to 16383	0, 1	R/W	Inverter Parameters	Array[n] Unsigned16	The inverter parameter number + 12288 (3000h) is the PNU number. Set "1" for the subindex when calibration parameters are accessed. Example) **C3 (Pr.902)**: PNU = 902 + 3000h, sub = 1	—

For the inverter parameter numbers, refer to the parameter list of the Instruction Manual (Function).

NOTE

- Values "8888" and "9999" displayed on the parameter unit indicate 65520 (0xFFF0) and 65535 (0xFFFF) respectively.

- Monitor Data (P16384 to P20479)

PNU	Sub	Access	Name	Data Type	Description	Default
16384 to 20479	0	R	Monitor Data	Unsigned16	The monitor number + 16384 (4000h) is the PNU number.	—

For details of the monitor numbers and the monitor items, refer to the description of **Pr.52** in the FR-E800 Instruction Manual (Function).

- Inverter Control Parameters (P20480 to P24575)

PNU	Sub	Access	Name	Data Type	Description	Default
20480 to 24575	0	R/W	Inverter Control Parameters	Unsigned16	Inverter control parameters	—

PNU	Definition	Read/write	Remarks
20488 (5008h)	Inverter status / control input command (extended)*1	Read/write	Refer to the following.
20489 (5009h)	Inverter status / control input command*1	Read/write	Refer to the following.
20981 (51F5h)	Fault record 1	Read/write	Being 2 bytes in length, the data is stored as H00○○. Refer to the lowest 1 byte for the error code. (For details on error codes, refer to the list of fault displays in the Instruction Manual (Maintenance).) The fault history is batch-cleared by writing to 20981 (51F5h). Set any value as data.
20982 (51F6h)	Fault record 2	Read	
20983 (51F7h)	Fault record 3	Read	
20984 (51F8h)	Fault record 4	Read	
20985 (51F9h)	Fault record 5	Read	
20986 (51FAh)	Fault record 6	Read	
20987 (51FBh)	Fault record 7	Read	
20988 (51FCh)	Fault record 8	Read	
20989 (51FDh)	Fault record 9	Read	
20990 (51FEh)	Fault record 10	Read	

*1 The data is written as a control input command for writing.
The data is read as the inverter status for reading.

Inverter status / control input command, and inverter status / control input command (extended)

Bit	Definition	
	Control input command	Inverter status
0	—	RUN (Inverter running)*2
1	—	During forward rotation
2	—	During reverse rotation
3	RH (High-speed operation command)*1	Up to frequency
4	RM (Middle-speed operation command)*1	Overload alarm
5	RL (Low-speed operation command)*1	0
6	JOG operation selection 2	FU (Output frequency detection)*2
7	Second function selection	ABC (Fault)*2
8	Terminal 4 input selection	0
9	—	Safety monitor output 2
10	MRS (Output stop)*1	0
11	—	0
12	RES (—)*1	0
13	—	0
14	—	0
15	—	Fault occurrence

Bit	Definition	
	Control input command	Inverter status
0	NET X1 (—)*1	NET Y1 (0)*2
1	NET X2 (—)*1	NET Y2 (0)*2
2	NET X3 (—)*1	NET Y3 (0)*2
3	NET X4 (—)*1	NET Y4 (0)*2
4	NET X5 (—)*1	0
5	—	0
6	—	0
7	—	0
8	—	0
9	—	0
10	—	0
11	—	0
12	—	0
13	—	0
14	—	0
15	—	0

*1 The signal within parentheses ( ) is assigned in the initial status. The function changes depending on the setting of **Pr.180 to Pr.189 (Input terminal function selection)**.
For details, refer to the description of **Pr.180 to Pr.189 (Input terminal function selection)** in the Instruction Manual (Function).
The signals assigned to the input terminals may be valid or invalid in the NET operation mode. (Refer to the Instruction Manual (Function).)

*2 The signal within parentheses ( ) is assigned in the initial status. The function changes depending on the setting of **Pr.190 to Pr.196 (Output terminal function selection)**.
For details, refer to the description of **Pr.190 to Pr.196 (Output terminal function selection)** in the Instruction Manual (Function).

- Name of station (P61000)

PNU	Sub	Access	Name	Data Type	Description	Default
61000	0 to 239	R	Name of station	Octetstring 240	Device name	FR-E800-(SC)E

- IP address (P61001)

PNU	Sub	Access	Name	Data Type	Description	Default
61001	0	R	IP address	Octetstring 4	IP address first octet	—
	1				IP address second octet	—
	2				IP address third octet	—
	3				IP address fourth octet	—

- MAC address (P61002)

PNU	Sub	Access	Name	Data Type	Description	Default
61002	0	R	MAC address	Octetstring 6	MAC address (upper)	—
	1				MAC address	—
	2				MAC address	—
	3				MAC address	—
	4				MAC address	—
	5				MAC address (lower)	—

- Gateway (P61003)

PNU	Sub	Access	Name	Data Type	Description	Default
61003	0	R	Gateway	Octetstring 4	Gateway address first octet	—
	1				Gateway address second octet	—
	2				Gateway address third octet	—
	3				Gateway address fourth octet	—

- Subnet mask (P61004)

PNU	Sub	Access	Name	Data Type	Description	Default
61004	0	R	Subnet mask	Octetstring 4	Subnet mask first octet	255
	1				Subnet mask second octet	255
	2				Subnet mask third octet	255
	3				Subnet mask fourth octet	0

■ PROFIdrive parameter request format (master to slave)

	Byte No.	Field	Parameter read	Parameter change
Header	0	Request reference	○	○
	1	Request ID	○	○
	2	DO-ID	○	○
	3	Number of parameters	○	○
Parameter address	4	Attribute	○	○
	5	Number of elements (n)	○	○
	6	PNU number	○	○
	7		○	○
	8	Sub-index	○	○
	9		○	○
Parameter value	10	Format	×	○
	11	Number of data	×	○
	12	Parameter value	×	○
	13		×	○
	14 to 237		×	○*1
	238		×	○*1
	239		×	○*1

*1 Availability depends on the format or data size.

■ PROFIdrive parameter response format (slave to master)

	Byte No.	Field	Parameter read		Parameter change	
			Positive	Negative	Positive	Negative
Header	0	Request reference	○	○	○	○
	1	Request ID	○	○	○	○
	2	DO-ID	○	○	○	○
	3	Number of parameters	○	○	○	○
Parameter value	4	Format	○	○	×	○
	5	Number of data	○	○	×	○
	6	Parameter value / error number	○	○	×	○
	7		○	○	×	○
	8		○*1	×	×	×
	9		○*1	×	×	×
	10 to 237		○*1	×	×	×
	238		○*1	×	×	×
	239		○*1	×	×	×

*1 Availability depends on the format or data size.

◆ Programming examples

The following explains the programming examples for controlling the inverter with sequence programs.

■ Programming example for forward rotation operation at 60 Hz

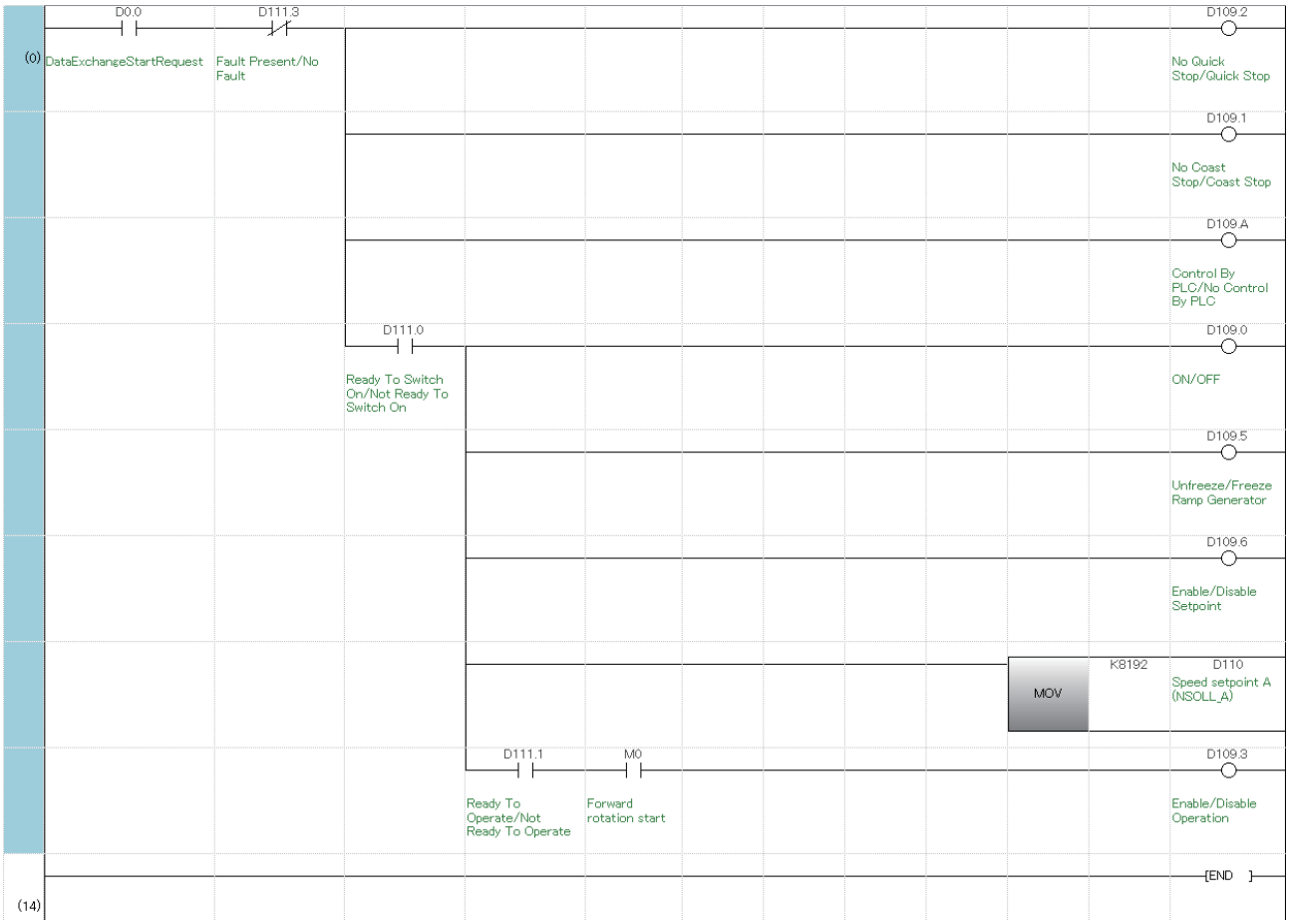
- Network setting and device examples

Device name	Description
M0	Inverter forward rotation
D0.0	DataExchangeStartRequest
D109	Control word 1 (STW1)
D109.0	ON/OFF
D109.1	No Coast Stop/Coast Stop
D109.2	No Quick Stop/Quick Stop
D109.3	Enable/Disable Operation
D109.4	—
D109.5	Unfreeze/Freeze Ramp Generator
D109.6	Enable/Disable Setpoint
D109.7	Fault Acknowledge
D109.8	—
D109.9	—
D109.A	Control By PLC/No Control By PLC
D109.B	Target torque enabled
D109.C	Start command direction selection
D109.D to D109.F	—
D110	Speed setpoint A (NSOLL_A)
D111	Status word 1 (ZSW1)
D111.0	Ready To Switch On/Not Ready To Switch On
D111.1	Ready To Operate/Not Ready To Operate
D111.2	Operation Enabled (drive follows setpoint)/Operation Disabled
D111.3	Fault Present/No Fault
D111.4	Coast Stop Not Activated/Coast Stop Activated
D111.5	Quick Stop Not Activated/Quick Stop Activated
D111.6	Switching On Inhibited/Switching On Not Inhibited
D111.7	Warning Present/No Warning
D111.8	—
D111.9	Control Requested/No Control Requested
D111.A to D111.F	—
D112	Speed actual value A (NIST_A)

Programming example for state transition from S1 (Switching On Inhibited) to S3 (Switched On) (For the state transition diagram, refer to page 138.)

- Set frequency: Speed setpoint A (NSOLL_A)
  NSOLL_A = (6000 (60 Hz) × 16384 (0x4000)) / 12000 (**Pr.1** = 120 Hz) = 8192 (0x2000)

Turning ON M0 starts operation at 60 Hz.
Turning OFF M0 stops operation.



2.13 Inverter-to-inverter link function

The inverter-to-inverter link function enables communication between multiple inverters connected by Ethernet in a small-scale system by using the I/O devices and special registers of the PLC function.
The inverter-to-inverter link function is enabled by simply setting **Pr.1124 Station number in inverter-to-inverter link** and **Pr.1125 Number of inverters in inverter-to-inverter link system**.

Pr.	Name	Initial value	Setting range	Description
1124 **N681**[*1]	**Station number in inverter-to-inverter link**	9999	0 to 5	Set the station number for the inverter-to-inverter link function.
			9999	Inverter-to-inverter link function disabled
1125 **N682**[*1]	**Number of inverters in inverter-to-inverter link system**	2	2 to 6	Set the total number of inverters used for the inverter-to-inverter link function.

*1 The setting is applied after an inverter reset or next power-ON.

◆Communication specifications

The communication specification varies depending on the specification of the master.

Item		Description
Transmission speed		100 Mbps
Number of connectable units		Master: 1 Slave: up to 5
Topology		Line, star, or a combination of line and star
Maximum number of links per station	Output device	16 (2 bytes)
	Special register	8 (16 bytes)

◆Setting procedure

1. Set a value other than "0" in **Pr.414 PLC function operation selection** to enable the PLC function.
2. To set the inverter as the master, set "0" in **Pr.1124 Station number in inverter-to-inverter link**, and to set the inverter as a slave, select a station number from 1 to 5 and set the number in **Pr.1124**.
3. Set the total number of inverters used for the inverter-to-inverter link function in **Pr.1125 Number of inverters in inverter-to-inverter link system**. For example, set "3" in **Pr.1125** when two slave inverters and the master inverter are used.
4. Use FR Configurator2 to write sequence programs to the master inverter.

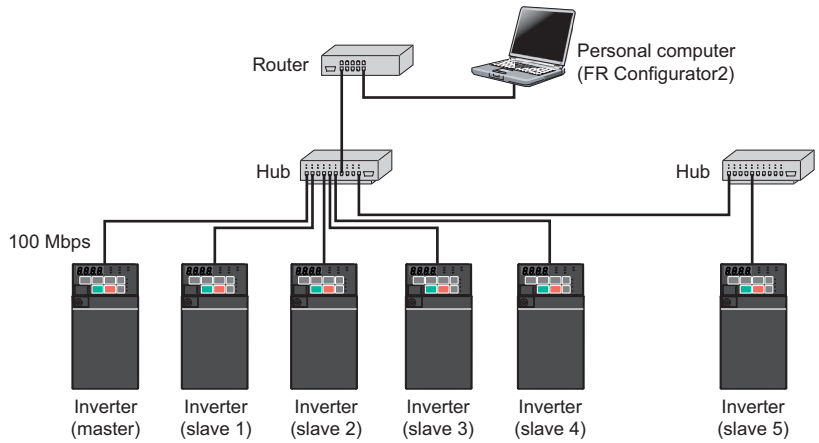
NOTE

- Use different station numbers for different devices. (If different devices have the same station number, the communication cannot be performed properly.)
- Set consecutive numbers for the station numbers. (Do not skip any numbers like 1, 2, then 4.)
- When **Pr.1124** is set to a value equal to or greater than the value set in **Pr.1125**, normal communication is not available.
- Use the Inverter-to-inverter linkup (LNK) signal to check that the master-slave communication is established. (For details of the LNK signal, refer to the FR-E800 Instruction Manual (Function).)
- To detect the interruption of the inverter-to-inverter link communication and activate the protective function, set **Pr.997 Fault initiation** in advance, and create and execute a sequence program to activate the protective function by the input of the signal loss detection signal from the external sensor.
- For the details of the PLC function, refer to the PLC Function Programming Manual and the Instruction Manual of FR Configurator2. For the details of FR Configurator2, refer to the Instruction Manual of FR Configurator2.

◆System configuration

The following shows the system configuration for using the inverter-to-inverter link function. The master inverter can communicate with the slave inverters through one or two hubs (refer to the description of **Pr.1124** for the master/slave setting).

(Communication using the inverter-to-inverter function is not available for the inverters directly connected to the router.)



◆Device map

The following shows the I/O devices and special registers used for the inverter-to-inverter link function. (For the details of the other I/O devices and special registers, refer to the PLC Function Programming Manual.)

■I/O device map (master)

Device No.	Name
X40 to X4F	Inverter-to-inverter link input (from slave 1 to master)
X50 to X5F	Inverter-to-inverter link input (from slave 2 to master)
X60 to X6F	Inverter-to-inverter link input (from slave 3 to master)
X70 to X7F	Inverter-to-inverter link input (from slave 4 to master)
X80 to X8F	Inverter-to-inverter link input (from slave 5 to master)

Device No.	Name
Y40 to Y4F	Inverter-to-inverter link output (from master to slave 1)
Y50 to Y5F	Inverter-to-inverter link output (from master to slave 2)
Y60 to Y6F	Inverter-to-inverter link output (from master to slave 3)
Y70 to Y7F	Inverter-to-inverter link output (from master to slave 4)
Y80 to Y8F	Inverter-to-inverter link output (from master to slave 5)

■I/O device map (slave)

Device No.	Name
X40 to X4F	Inverter-to-inverter link input (from master to slave)

Device No.	Name
Y40 to Y4F	Inverter-to-inverter link output (from slave to master)

◆Special register (common)

Device No.	Name	Description
SD1460	Station number in inverter-to-inverter link	The station number in the inverter-to-inverter link is stored. b15 b8 b7 b0 Reserved (H00) | Station No. • H00: Master • H01: Slave 1 • H02: Slave 2 • H03: Slave 3 • H04: Slave 4 • H05: Slave 5 • HFF: Function disabled
SD1461	Communication status of inverter-to-inverter link	The communication status of the slaves (0: Link not established, 1: Link established) in the inverter-to-inverter link is stored. (In the slave inverter, only its own communication status is indicated.) b15 b5 b4 b0 • Bit 0: Slave 1 • Bit 1: Slave 2 • Bit 2: Slave 3 • Bit 3: Slave 4 • Bit 4: Slave 5

■Special register (master)

Device No.	Name	Description
SD1470 to SD1477	Inverter-to-inverter link receive data 1 to 8 (slave 1)	Data 1 to 8 received from slave 1
SD1478 to SD1485	Inverter-to-inverter link send data 1 to 8 (slave 1)	Data 1 to 8 sent to slave 1
SD1486 to SD1493	Inverter-to-inverter link receive data 1 to 8 (slave 2)	Data 2 to 8 received from slave 1
SD1494 to SD1501	Inverter-to-inverter link send data 1 to 8 (slave 2)	Data 2 to 8 sent to slave 1
SD1502 to SD1509	Inverter-to-inverter link receive data 1 to 8 (slave 3)	Data 3 to 8 received from slave 1

Device No.	Name	Description
SD1510 to SD1517	Inverter-to-inverter link send data 1 to 8 (slave 3)	Data 3 to 8 sent to slave 1
SD1518 to SD1525	Inverter-to-inverter link receive data 1 to 8 (slave 4)	Data 4 to 8 received from slave 1
SD1526 to SD1533	Inverter-to-inverter link send data 1 to 8 (slave 4)	Data 4 to 8 sent to slave 1
SD1534 to SD1541	Inverter-to-inverter link receive data 1 to 8 (slave 5)	Data 5 to 8 received from slave 1
SD1542 to SD1549	Inverter-to-inverter link send data 1 to 8 (slave 5)	Data 5 to 8 sent to slave 1

■ Special register (slave)

Device No.	Name	Description
SD1470 to SD1477	Inverter-to-inverter link receive data 1 to 8 (master)	Data 1 to 8 received from master
SD1478 to SD1485	Inverter-to-inverter link send data 1 to 8 (master)	Data 1 to 8 sent to master
SD1486 to SD1549	For manufacturer setting. Do not set.	

◆ Troubleshooting

Condition	Possible cause	Countermeasure
Communication is not established.	The same station number is assigned to multiple inverters.	Set **Pr.1124** correctly.
	The station numbers are not consecutive.	Set **Pr.1124** so that the station numbers are consecutive.
	The specified number of inverters in the system is not correct. (**Pr.1124** is set to a value equal to or greater than the value set in **Pr.1125**.	Set **Pr.1125** correctly.
	The connection is half-duplex.	Use full-duplex connection. (When **Pr.1426 Link speed and duplex mode selection** = "0 (initial value)", check that the hub and the Ethernet cable are compatible with full-duplex connection.)
	The inverter is not reset after **Pr.1124** and **Pr.1125** are set.	Reset the inverter.
A command sent by the master is not applied to a slave.	The PLC function is disabled.	Set a value other than "0" in **Pr.414** to enable the PLC function.

2.14 Ethernet communication parameters

The following table shows parameters used in common for Ethernet communication protocols. Set the parameters as required.

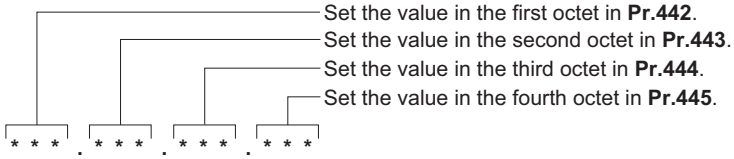
Pr.	Name	Initial value	Setting range	Description	
442 **N620**[*1]	**Default gateway address 1**	0	0 to 255	Enter the default gateway address.	
443 **N621**[*1]	**Default gateway address 2**	0			
444 **N622**[*1]	**Default gateway address 3**	0			
445 **N623**[*1]	**Default gateway address 4**	0			
1399 **N649**	**Inverter identification enable/disable selection**	1	0	Inverter identification disabled	
			1	Inverter identification enabled	
1427 **N630**[*1]	**Ethernet function selection 1**	5001	502, 5000 to 5002, 5006 to 5008, 5010 to 5013, 9999 to 34962[*3], 44818[*2], 45237, 45238, 47808[*2], 61450	Set the application, protocol, etc.	
1428 **N631**[*1]	**Ethernet function selection 2**	45237			
1429 **N632**[*1]	**Ethernet function selection 3**	45238			
1430 **N633**[*1]	**Ethernet function selection 4**	9999			
1431 **N643**[*4]	**Ethernet signal loss detection function selection**	3	0	Signal loss detection disabled	Set the availability of the signal loss detection and select the action when Ethernet communication is interrupted by physical factors.
			1	A warning (EHR) is output for a signal loss.	
			2	A warning (EHR) and the Alarm (LF) signal are output for a signal loss.	
			3	A warning (EHR) and the Alarm (LF) signal are output for a signal loss.	
				A protective function is activated for a signal loss.[*5*6]	
1438 **N610**[*1]	**Subnet mask 1**	255	0 to 255	Enter the subnet mask of the network to which the inverter belongs.	
1439 **N611**[*1]	**Subnet mask 2**	255			
1440 **N612**[*1]	**Subnet mask 3**	255			
1441 **N613**[*1]	**Subnet mask 4**	0			
1455 **N642**	**Keepalive time**	60 s	1 to 7200 s	When no response is returned for an alive check message (Keep Alive ACK) for the time (s) set in **Pr.1455** multiplied by 8 elapsed, the connection will be forced to be closed.	
1456 **N647**[*7]	**Network diagnosis selection**	9999	0	Disabled	
			1	SNMP enabled	
			2	Duplicate IP address detection is enabled when link-up events occur.	
			9999	SNMP enabled Duplicate IP address detection is enabled when link-up events occur.	

Pr.	Name	Initial value	Setting range	Description	
1457 **N648**[*4]	**Extended setting for Ethernet signal loss detection function selection**	9999	0	Signal loss detection disabled	The setting of **Pr.1431** will be applied to the operation when signal loss is detected at PORT1, and the setting of **Pr.1457** will be applied when signal loss is detected at PORT2.
			1	A warning (EHR) is output for a signal loss.	
			2	A warning (EHR) and the Alarm (LF) signal are output for a signal loss	
			3	A warning (EHR) and the Alarm (LF) signal are output for a signal loss.	
				A protective function is activated for a signal loss.[*5*6]	
			8888	When a signal loss is detected for both PORT1 and PORT2, the **Pr.1431** setting is applied.	
			9999	When a signal loss is detected for either PORT1 or PORT2, the **Pr.1431** setting is applied.	

*1 The setting is applied after an inverter reset or next power-ON.
*2 The setting is available only for the FR-E800-EPA and the FR-E800-SCEPA.
*3 The setting is available only for the FR-E800-EPB and the FR-E800-SCEPB.
*4 For CC-Link IE TSN communication, a protective function (E.EHR) is activated regardless of the **Pr.1431 and Pr.1457** settings when a signal loss is detected during cyclic communication.
*5 The protective function is not activated while the inverter stops.
*6 The operation follows the **Pr.502 Stop mode selection at communication error** setting. (Refer to page 190.)
*7 When "34962" is set in any of **Pr.1427 to Pr.1430**, SNMP is disabled regardless of the **Pr.1456** setting.

◆ Default gateway address (Pr.442 to Pr.445)

Set the default gateway address in **Pr.442 to Pr.445** to establish a communication with the devices on a different network.



◆ Ethernet function selection (Pr.1427 to Pr.1430)

Refer to the Instruction Manual of the device connected via Ethernet, and set **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4** according to the application and protocol.

Pr.1427 to Pr.1430 setting[*1]	Application	Protocol	Number of connectable clients
502	MODBUS/TCP	TCP/IP	3
5000	MELSOFT / FA product connection (Connection with a computer (FR Configurator2), GOT, or a relay station (programmable controller))	UDP	No limit
5001 (**Pr.1427** initial value)[*2]			
5002[*2]		TCP/IP	2[*3]
5006		UDP	No limit
5007		TCP/IP	2[*3]
5008		UDP	No limit
5010	SLMP	UDP	No limit
5011			
5012		TCP/IP	2[*3]
5013			
34962[*5]	PROFINET	—	No limit
44818[*4]	EtherNet/IP	UDP	No limit
		TCP/IP	2
45237 (**Pr.1428** initial value)	iQSS (supported by FR Configurator2)	UDP	No limit
45238 (**Pr.1429** initial value)	CC-Link IE TSN	—	No limit
47808[*4]	BACnet/IP	UDP	No limit
61450	CC-Link IE Field Network Basic	UDP	No limit
9999 (**Pr.1430** initial value)	Unselected		

*1 If both application and protocol settings are identical in **Pr.1427 to Pr.1430**, the priority of the setting is defined as follows: **Pr.1427**> **Pr.1428**> **Pr.1429**> **Pr.1430**.
(Example) When **Pr.1427** = "5001", **Pr.1428** = "5006", **Pr.1429** = "5010", and **Pr.1430** = "5012", "5001", "5010" and "5012" are valid.

*2 To connect the inverter and FR Configurator2 via the MELSOFT / FA product for Ethernet communication, set "5001 (initial value)" or "5002" according to the protocol type (UDP or TCP/IP) in any of **Pr.1427 to Pr.1430**.

*3 When the inverter is connected with other equipment via a hub, and if the communication between the other equipment and the hub is interrupted and resumed, the communication between the inverter and the other equipment may not be established depending on the specifications of the hub. To re-establish communication with the other equipment, reset the inverter to forcefully close the connection. (Setting a shorter time in **Pr.1455 Keepalive time** is also effective as a preventive measure (refer to page 153).)

*4 The setting is available only for the FR-E800-EPA and the FR-E800-SCEPA.

*5 The setting is available only for the FR-E800-EPB and the FR-E800-SCEPB.

NOTE

- For details of communication protocols that cannot be used together, refer to page 5.

◆ Ethernet signal loss detection (Pr.1431, Pr.1457)

Use **Pr.1431** and **Pr.1457** to set the operation when Ethernet communication is interrupted by physical factors including disconnection of the Ethernet cable or damages on the Ethernet cable.

Pr.1431 setting	Description	Applicable port			Operation panel indication	LF signal output
		Pr.1457 = "0 to 3"	Pr.1457 = "8888"	Pr.1457 = "9999"		
0	Detection disabled	PORT1	PORT1 or PORT2	PORT1 or PORT2	—	Not available
1	Warning output				EHR	Not available
2	Warning and alarm output				EHR	Available
3 (initial value)	Warning and alarm output				EHR	Available
	Protective function activation*1				*2	*2

Pr.1457 setting	Description	Applicable port	Operation panel indication	LF signal output
0	Detection disabled	PORT2	—	Not available
1	Warning output		EHR	Not available
2	Warning and alarm output		EHR	Available
3	Warning and alarm output		EHR	Available
	Protective function activation*1		*2	*2
8888	When a signal loss is detected for both PORT1 and PORT2, the **Pr.1431** setting is applied.	PORT1 or PORT2	—	—
9999 (initial value)	When a signal loss is detected for either PORT1 or PORT2, the **Pr.1431** setting is applied.	PORT1 or PORT2		

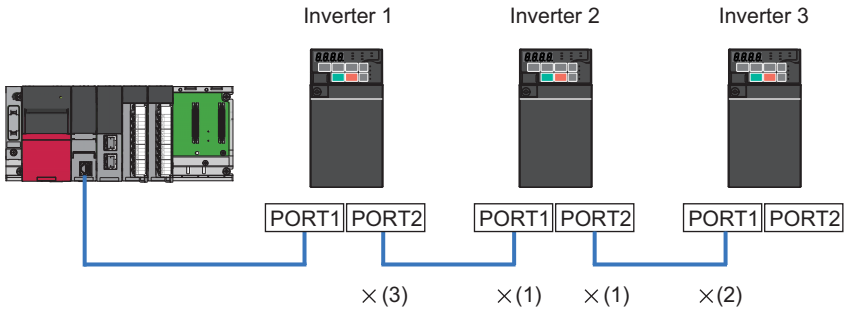
*1 The protective function is not activated while the inverter stops.

*2 The operation follows the **Pr.502 Stop mode selection at communication error** setting. (Refer to page 190.)

- Precautions for connection in line topology

For connection in line topology, set **Pr.502** or configure a setting for signal loss detection for each port.

Example: Link-down of inverter 2 due to power-OFF or other reason (**Pr.1431** = "3 (initial value)", **Pr.1457** = "3")



(1) Link-down of inverter 2 due to power-OFF or other reason

(2) "E.EHR" is displayed as the connection between PORT1 of inverter 3 and inverter 2 is interrupted.

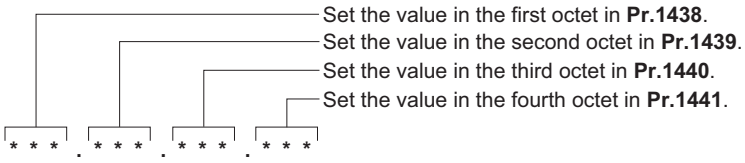
(3) "E.EHR" is displayed as the connection between PORT2 of inverter 1 and inverter 2 is interrupted.

NOTE

- For CC-Link IE TSN communication, a protective function (E.EHR) is activated regardless of the **Pr.1431 and Pr.1457** settings when a signal loss is detected during cyclic communication.

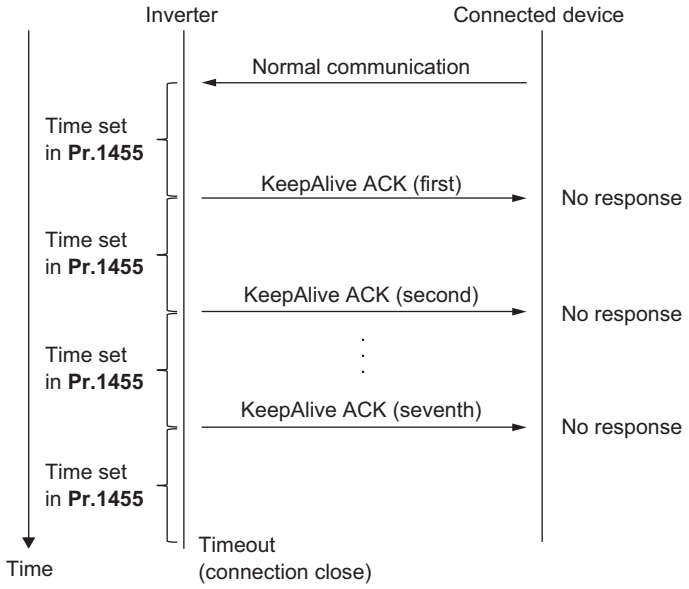
◆ Subnet mask (Pr.1438 to Pr.1441)

The subnet mask of the network to which the inverter belongs can be set in **Pr.1438 to Pr.1441**.



◆ Keepalive time (Pr.1455)

An alive check message (KeepAlive ACK) is sent to a device if the device does not return any response within the time set in **Pr.1455 Keepalive time** while a TCP connection is established. When no response is returned after the seventh transmission, the connection will be forced to be closed.



◆ Network diagnosis selection (Pr.1456)

Pr.1456 setting	Description	Remarks
0	Disabled	
1	SNMP enabled	The network diagnosis function using SNMP is enabled.
2	Duplicate IP address detection is enabled when link-up events occur.	A protective function (DIP) is activated when an IP address overlapping with that of any other device on the network is detected.
9999	SNMP enabled Duplicate IP address detection is enabled when link-up events occur.	

NOTE

- When "34962" is set in any of **Pr.1427 to Pr.1430**, SNMP is disabled regardless of the **Pr.1456** setting.

MEMO

CHAPTER 3 RS-485 Communication

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3.4 Mitsubishi inverter protocol (computer link communication) 160
3.5 MODBUS RTU 172

3 RS-485 Communication

3.1 Outline

Use the following parameters to perform required settings for RS-485 communication between the inverter and a personal computer.

- Use the PU connector on the inverter as communication interface.
- Parameter setting, monitoring, etc. can be performed using Mitsubishi inverter protocol or MODBUS RTU communication protocol.
- To make communication between the personal computer and inverter, setting of the communication specifications must be made to the inverter in advance. Data communication cannot be made if the initial settings are not made or if there is any setting error.

3.2 Wiring

3.2.1 Wiring procedure

1. Prepare the equipment required for wiring according to the connection method.
2. Turn OFF the power of the programmable controller and the inverters.
3. Perform wiring between communication devices.
4. Connect a terminating resistor.

3.2.2 Connected device

◆ Computer-inverter connection cable

Refer to the following for the connection cable (USB to RS-485 converter) between the computer and an inverter.
Commercially available products (as of December 2019)

Product name	Model	Manufacturer
Interface embedded cable dedicated for inverter*1	DINV-U4	Diatrend Corp.

*1 The conversion cable cannot connect multiple inverters. (The computer and inverter are connected in a 1:1 pair.) This is a USB-to-RS485 converter-embedded conversion cable. No additional cable or connector is required. For the product details, contact the manufacturer.

◆ Connection cable

Use Ethernet cables compliant with the following standards.

Ethernet cable	Connector	Type
Category 5e or higher straight cable (double shielded/STP)	RJ-45 connector	The following conditioning cables: • IEEE 802.3 (1000BASE-T) • ANSI/TIA/EIA-568-B (Category 5e)

◆ Distributor

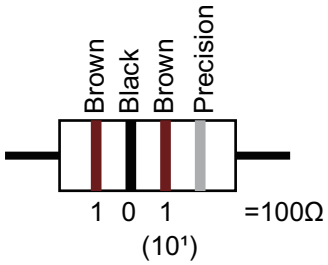
Use a distributor to connect a terminating resistor to the inverter.

Commercially available products (as of December 2019)

Product name	Model	Manufacturer
RS-485 distributor	BMJ-8-28N (Pins No. 2 and No. 8 are not connected internally.) (A plug with a terminating resistor is not used.)	HACHIKO ELECTRIC CO., LTD.
	DMDH-3PN DMDH-10PN	Diatrend Corp.

◆ Terminating resistor

Prepare a 100 Ω 1/2 W terminating resistor such as the following.

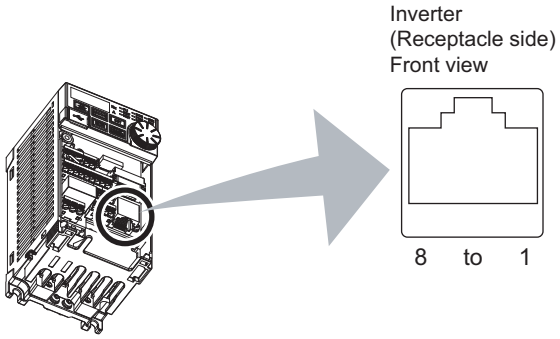


- Connect the terminating resistor between pin No. 3 (RDA) and pin No. 6 (RDB).
- Connect the terminating resistor to only the inverter remotest from the programmable controller.

3.3 Wiring of PU connector

Using the PU connector as a computer network port enables communication operation from a personal computer, etc. When the PU connector is connected with a personal, FA, or other computer by a communication cable, a user program can run and monitor the inverter or read and write to parameters.

◆PU connector pin-outs



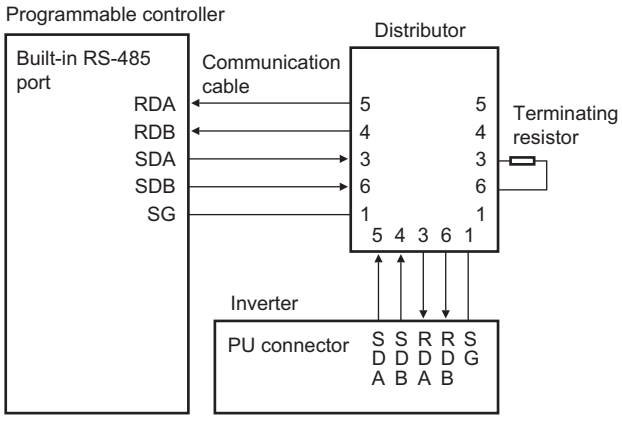
Pin number	Name	Description
1	SG	Earth (ground) (connected to terminal 5)
2	—	Operation panel power supply
3	RDA	Inverter receive+
4	SDB	Inverter send-
5	SDA	Inverter send+
6	RDB	Inverter receive-
7	SG	Earth (ground) (connected to terminal 5)
8	—	Operation panel power supply

NOTE

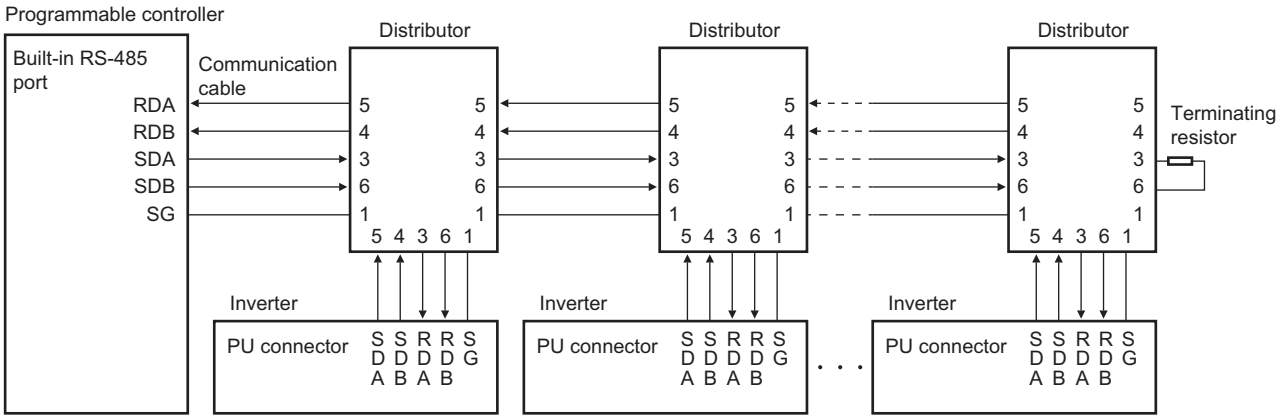
- Pins No. 2 and 8 provide power to the operation panel or parameter unit. Do not use these pins for RS-485 communication.
- Do not connect the PU connector to the computer's LAN board, FAX modem socket, or telephone modular connector. The product could be damaged due to differences in electrical specifications.

◆Wiring method

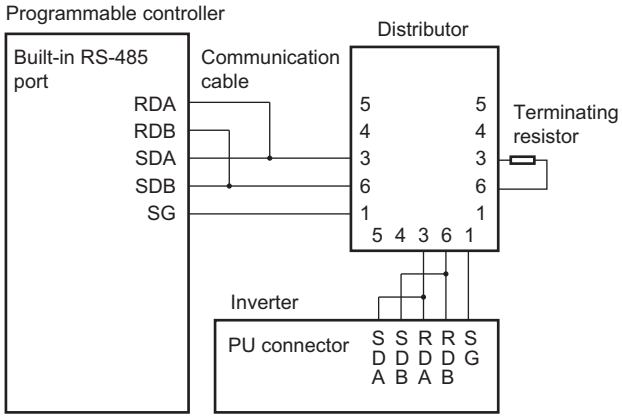
- Connecting one inverter (four-wire type)



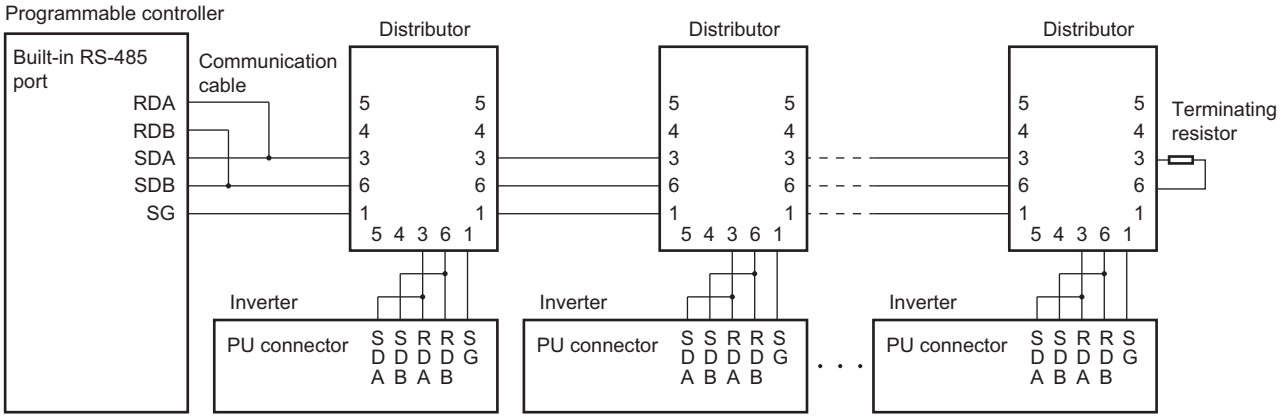
- Connecting multiple inverters (four-wire type)



- Connecting one inverter (two-wire type)



- Connecting multiple inverters (two-wire type)



3.4 Mitsubishi inverter protocol (computer link communication)

Parameter setting and monitoring, etc. are possible by using the Mitsubishi inverter protocol (computer link communication) via the PU connector on the inverter.

Pr.	Name	Initial value	Setting range	Description	
117 **N020**	**PU communication station number**	0	0 to 31*1	Specify the inverter station number. Enter the inverter station numbers when two or more inverters are connected to one personal computer.	
118 **N021**	**PU communication speed**	192	48, 96, 192, 384, 576, 768, 1152	Select the communication speed. The setting value × 100 equals the communication speed. For example, enter 192 to set the communication speed of 19200 bps.	
N022	**PU communication data length**	0	0	Data length 8 bits	
			1	Data length 7 bits	
N023	**PU communication stop bit length**	1	0	Stop bit length 1 bit	
			1	Stop bit length 2 bits	
119	**PU communication stop bit length / data length**	1	0	Stop bit length 1 bit	Data length 8 bits
			1	Stop bit length 2 bits	
			10	Stop bit length 1 bit	Data length 7 bits
			11	Stop bit length 2 bits	
120 **N024**	**PU communication parity check**	2	0	Parity check disabled.	
			1	Parity check (odd parity) enabled.	
			2	Parity check (even parity) enabled.	
121 **N025**	**PU communication retry count**	1	0 to 10	Set the permissible number of retries for unsuccessful data reception. If the number of consecutive errors exceeds the permissible value, the inverter output will be stopped.	
			9999	The inverter output will not be shut off even when a communication error occurs.	
122 **N026**	**PU communication check time interval**	0	0	PU connector communication is disabled.	
			0.1 to 999.8 s	Set the interval of the communication check (signal loss detection) time If a no-communication state persists for longer than the permissible time, the inverter output will be shut off.	
			9999	No communication check (signal loss detection)	
123 **N027**	**PU communication waiting time setting**	9999	0 to 150 ms	Set the time delay between data transmission to the converter and the response.	
			9999	The time delay is not set in this parameter but in communication data. Delay time: Number set in the data × 10 ms	
124 **N028**	**PU communication CR/LF selection**	1	0	Without CR/LF	
			1	With CR	
			2	With CR/LF	

*1 When a value outside the setting range is set, the inverter operates at the initial value.

NOTE

- Always reset the inverter after making the initial settings of the parameters. After changing the communication-related parameters, communication cannot be made until the inverter is reset.

◆ Communication specifications

- The communication specifications are shown in the following table.

Item	Description	Related parameter
Communication protocol	Mitsubishi inverter protocol (computer link communication)	**Pr.549**
Conforming standard	EIA-485 (RS-485)	—
Number of connectable units	1: N (maximum 32 units), the setting range of station number is 0 to 31.	**Pr.117**
Communication speed	Selected among 4800/9600/19200/38400/57600/76800/115200 bps.	**Pr.118**
Control procedure	Asynchronous method	—
Communication method	Half-duplex system	—

Item		Description	Related parameter
Communication specifications	Character system	ASCII (7 bits or 8 bits can be selected.)	**Pr.119**
	Start bit	1 bit	—
	Stop bit length	1 bit or 2 bits can be selected.	**Pr.119**
	Parity check	Check (at even or odd numbers) or no check can be selected.	**Pr.120**
	Error check	Sum code check	—
	Terminator	CR/LF (whether or not to use it can be selected)	**Pr.124**
Time delay setting		Availability of the setting is selectable.	**Pr.123**

◆ Communication procedure

- Data communication between the computer and inverter is made in the following procedure.

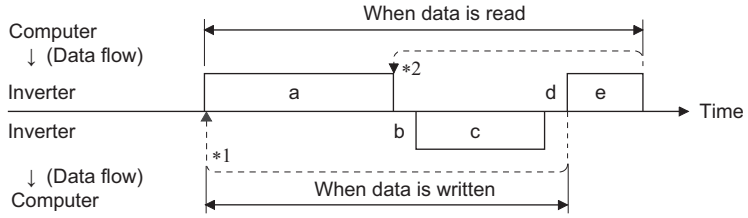
(a) Request data is sent from the computer to the inverter. (The inverter will not send data unless requested.)

(b) Communication waiting time

(c) The inverter sends reply data to the computer in response to the computer request.

(d) Inverter data processing time

(e) An answer from the computer in response to reply data (c) of the inverter is transmitted. (Even if (e) is not sent, subsequent communication is made properly.)



*1 If a data error is detected and a retry must be made, perform retry operation with the user program. The inverter output is shut off if the number of consecutive retries exceeds the parameter setting.

*2 On receipt of a data error occurrence, the inverter returns reply data (c) to the computer again. The inverter output is shut off if the number of consecutive data errors reaches or exceeds the parameter setting.

◆ Communication operation presence/absence and data format types

- Data communication between the computer and inverter is made in ASCII code (hexadecimal code).
- Communication operation presence/absence and data format types are as follows.

Symbol	Operation		Operation command	Running frequency	Multi command	Parameter write	Inverter reset	Monitor	Parameter read
a	Communication request is sent to the inverter in accordance with the user program in the computer.		A, A1	A (A2)*1	A2	A (A2)*2	A	B	B
b	Inverter data processing time		With	With	With	With	Without	With	With
c	Reply data from the inverter (Data (a) is checked for an error.)	No error*3 (Request accepted)	C	C	C1*5	C	C*4	E, E1, E2, E3*1	E (E2)*2
		With error (Request rejected)	D	D	D	D	D*4	D	D
d	Computer processing delay time		10 ms or more						
e	Reply from computer in response to reply data c (Data c is checked for error.)	No error*3 (No inverter processing)	Without	Without	Without	Without	Without	Without (C)	Without (C)
		With error (Inverter outputs c again.)	Without	Without	Without	Without	Without	F	F

*1 When **Pr.53** = "4" and the data code HFF = 1, the data format is A2 or E2. (Refer to page 167.)

*2 The data writing format is A2 and the data reading format is E2 for **Pr.37**. (Refer to page 167.)

*3 In the communication request data from the computer to the inverter, the time of 10 ms or more is also required after an acknowledgment (ACK) signal showing "No data error detected" is sent. (Refer to page 165.)

*4 Reply from the inverter to the inverter reset request can be selected. (Refer to page 167.)

*5 At mode error, and data range error, C1 data contains an error code. (Refer to page 171.) Except for those errors, the error is returned with data format D.

- Data writing format

  a. Communication request data from the computer to the inverter

Format	Number of characters																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
A	ENQ *1	Inverter station number *2		Instruction code		*3	Data				Sum check		*4						
A1	ENQ *1	Inverter station number *2		Instruction code		*3	Data			Sum check	*4								
A2	ENQ *1	Inverter station number *2		Instruction code		*3	Send data type	Receive data type	Data 1				Data 2				Sum check		*4

  c. Reply data from the inverter to the computer (No data error detected)

Format	Number of characters																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
C	ACK *1	Inverter station number *2		*4															
C1	STX *1	Inverter station number *2		Send data type	Receive data type	Error code 1	Error code 2	Data 1				Data 2				ETX *1	Sum check		*4

  c. Reply data from the inverter to the computer (Data error detected)

Format	Number of characters				
	1	2	3	4	5
D	NAK *1	Inverter station number *2		Error code	*4

*1 Indicates a control code.

*2 The inverter station number is specified in hexadecimal in the range of H00 to H1F (stations No. 0 to 31).

*3 Set the delay time. When **Pr.123 PU communication waiting time setting** is set to other than "9999", create the communication request data without "delay time" in the data format. (The number of characters decreases by 1.)

*4 CR+LF code: When a computer transmits data to the inverter, some computers automatically provide either one or both of the codes CR (carriage return) and LF (line feed) at the end of a data group. In this case, the same setting is required for data sent from the inverter to the computer. Use **Pr.124 PU communication CR/LF selection** for the CR+LF code setting.

- Data reading format

  a. Communication request data from the computer to the inverter

Format	Number of characters								
	1	2	3	4	5	6	7	8	9
B	ENQ *1	Inverter station number *2		Instruction code		*3	Sum check		*4

  c. Reply data from the inverter to the computer (No data error detected)

Format	Number of characters												
	1	2	3	4	5	6	7	8	9	10	11	12	13
E	STX *1	Inverter station number *2		Read data				ETX *1	Sum check		*4		
E1	STX *1	Inverter station number *2		Read data		ETX *1	Sum check		*4				
E2	STX *1	Inverter station number *2		Read data						ETX *1	Sum check		*4

Format	Number of characters						
	1	2	3	4 to 23	24	25	26	27
E3	STX *1	Inverter station number *2		Read data (Inverter model information)	ETX *1	Sum check		*4

c. Reply data from the inverter to the computer (Data error detected)

Format	Number of characters				
	1	2	3	4	5
D	NAK*1	Inverter station number*2		Error code	*4

e. Transmission data from the computer to the inverter when reading data

Format	Number of characters			
	1	2	3	4
C (No data error detected)	ACK*1	Inverter station number*2		*4
F (Data error detected)	NAK*1	Inverter station number*2		*4

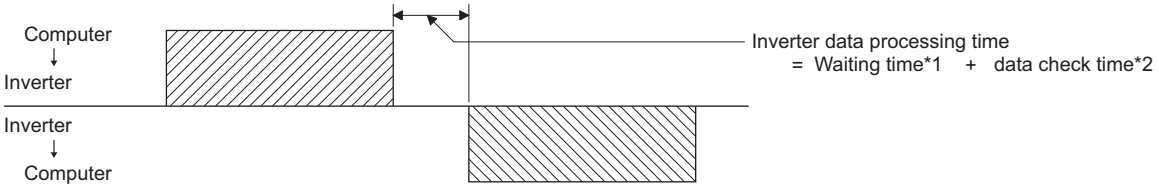
*1 Indicates a control code.
*2 The inverter station number is specified in hexadecimal in the range of H00 to H1F (stations No. 0 to 31).
*3 Set the delay time. When **Pr.123 PU communication waiting time setting** is set to other than "9999", create the communication request data without "delay time" in the data format. (The number of characters decreases by 1.)
*4 CR+LF code: When a computer transmits data to the inverter, some computers automatically provide either one or both of the codes CR (carriage return) and LF (line feed) at the end of a data group. In this case, the same setting is required for data sent from the inverter to the computer. Use **Pr.124 PU communication CR/LF selection** for the CR+LF code setting.

◆ Data definitions

- Control code

Signal name	ASCII code	Description
STX	H02	Start Of Text (Start of data)
ETX	H03	End Of Text (End of data)
ENQ	H05	Enquiry (Communication request)
ACK	H06	Acknowledge (No data error detected)
LF	H0A	Line Feed
CR	H0D	Carriage Return
NAK	H15	Negative Acknowledge (Data error detected)

- Inverter station number
  Specify the station number of the inverter which communicates with the computer.
- Instruction code
  Specify the processing request, for example, operation or monitoring, given by the computer to the inverter. Therefore, the operation or monitoring an item is enabled by specifying the corresponding instruction code. (Refer to page 167.)
- Data
  Indicates the data such as frequency and parameters transferred to and from the inverter. The definitions and ranges of set data are determined in accordance with the instruction codes. (Refer to page 167.)
- Time delay
  Specify the delay time (time period between the time when the inverter receives data from the computer and the time when the inverter starts transmission of reply data). Set the delay time in accordance with the response time of the computer in the range of 0 to 150 ms in 10 ms increments. (For example, "1" for 10 ms or "2" for 20 ms.)
  When **Pr.123 PU communication waiting time setting** is set to other than "9999", create the communication request data without "delay time" in the data format. (The number of characters decreases by 1.)



*1 When **Pr.123** = "9999", the waiting time is the data setting value × 10 ms. When **Pr.123** ≠ "9999", the waiting time is the value set in **Pr.123**.
*2 About 10 to 30 ms. It varies depending on the instruction code.

NOTE

- The data check time varies depending on the instruction code. (Refer to page 165.)

- Sum check code

  The sum check code is a 2-digit ASCII (hexadecimal) representing the lower 1 byte (8 bits) of the sum derived from the checked ASCII data.

(Example 1)

Computer→ Inverter

	ENQ	Station number		Instruction code		*Waiting time	Data				Sum check code		
		0	1	E	1	1	0	7	A	D	F	4	←Binary code
ASCII Code →	H05	H30	H31	H45	H31	H31	H30	H37	H41	H44	H46	H34	

H30+H31+H45+H31+H31+H30+H37+H41+H44

= H1F4

Sum

*When the **Pr.123 PU communication waiting time setting** ≠"9999", create the communication request data without "waiting time" in the data format. (The number of characters decreases by 1.)

(Example 2)

Inverter → Computer

	STX	Station number		Data read				ETX	Sum check code		
		0	1	1	7	7	0		3	0	←Binary code
ASCII Code →	H02	H30	H31	H31	H37	H37	H30	H03	H33	H30	

H30+H31+H31+H37+H37+H30

= H130

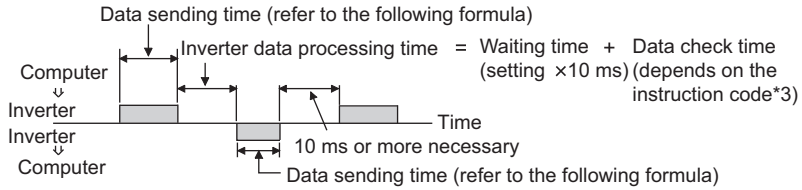
Sum

- Error code

  If any error is found in the data received by the inverter, its error definition is sent back to the computer together with the NAK code.

Error code	Error item	Error description	Inverter operation
H0	Computer NAK error	The number of errors consecutively detected in communication request data from the computer is greater than the permissible number of retries.	The inverter output is shut off (E.PUE) if error occurs continuously more than the permissible number of retries. The LF signal is output.
H1	Parity error	The parity check result does not match the specified parity.	
H2	Sum check error	The sum check code in the computer does not match that of the data received by the inverter.	
H3	Protocol error	The data received by the inverter has a grammatical mistake. Or, data receive is not completed within the predetermined time. The CR or LF code specification is not the same as the setting of the parameter.	
H4	Framing error	The stop bit length differs from the initial setting.	
H5	Overrun error	New data has been sent by the computer before the inverter completes receiving the preceding data.	
H6	—	—	—
H7	Character error	The character received is invalid (other than 0 to 9, A to F, control code).	The inverter does not accept the received data. However, the inverter output is not shut off.
H8	—	—	—
H9	—	—	—
HA	Mode error	Parameter write was attempted when the inverter does not perform computer link communication, when the operation commands are not given through communication, or during inverter operation.	The inverter does not accept the received data. However, the inverter output is not shut off.
HB	Instruction code error	The specified instruction code does not exist.	
HC	Data range error	Invalid data has been specified for parameter writing, set frequency setting, etc.	
HD	—	—	—
HE	—	—	—
HF	Normal (no error)	—	—

◆ Response time



[Formula for data transmission time]

$$\frac{1}{\text{Communication speed (bps)}} \times \text{Number of data characters *1} \times \text{Communication specifications (Total number of bits) *2} = \text{data transmission time (s)}$$

*1 Refer to page 161.

*2 Communication specifications

Name		Number of bits
Stop bit length		1 bit 2 bits
Data length		7 bits 8 bits
Parity check	With	1 bit
	Without	0

In addition to the above, 1 start bit is necessary.

Minimum number of total bits: 9 bits

Maximum number of total bits: 12 bits

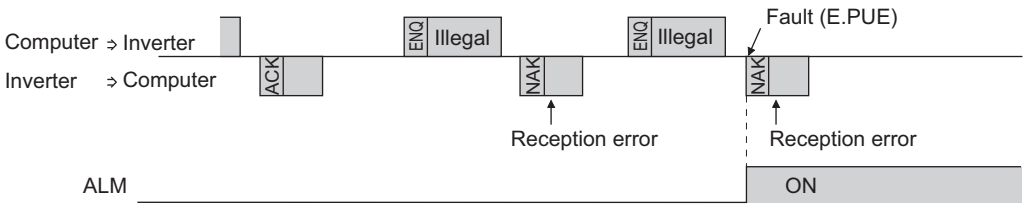
*3 Data check time

Item	Check time
Monitoring, operation command, frequency setting (RAM)	Less than 12 ms
Parameter read/write, frequency setting (EEPROM)	Less than 30 ms
Parameter clear / All parameter clear	Less than 5 s
Reset command	No reply

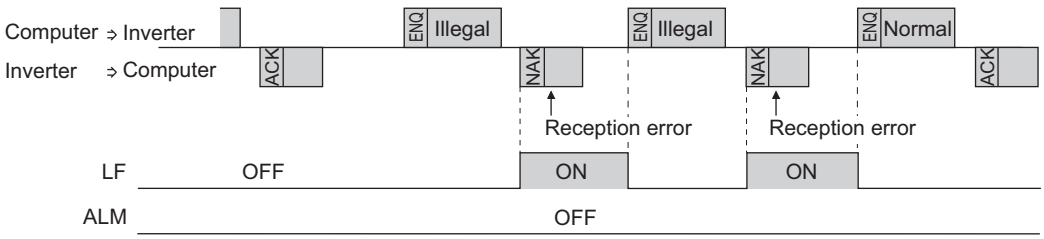
◆ Retry count setting (Pr.121)

- Set the permissible number of retries at data receive error occurrence. (Refer to page 164 for data receive error for retry.)
- When the data receive errors occur consecutively and the number of retries exceeds the permissible number setting, a communication fault (E.PUE) occurs and the inverter output is shut off.
- When a data transmission error occurs while "9999" is set, the inverter does not shut off its output but outputs the Alarm (LF) signal. To use the LF signal, set "98 (positive logic) or 198 (negative logic)" in any of **Pr.190 to Pr.196 (Output terminal function selection)** to assign the function to an output terminal.

Example: PU connector communication, **Pr. 121** = "1" (initial value)



Example: PU connector communication, **Pr. 121** = "9999"



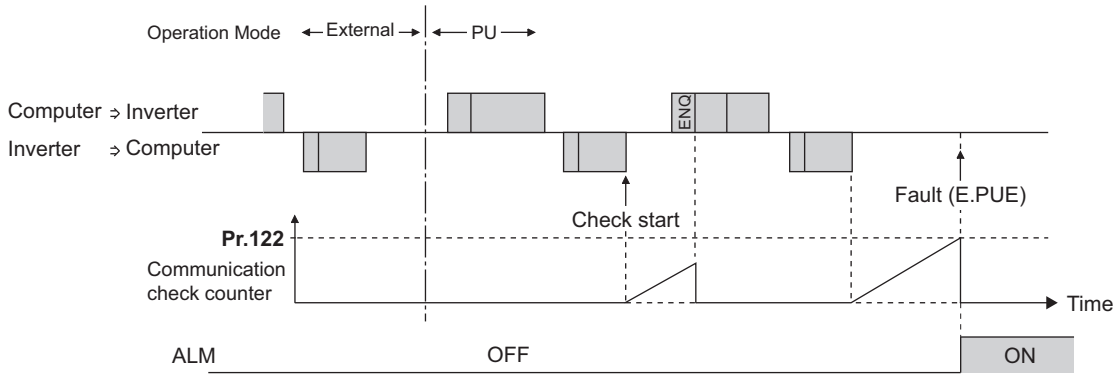
NOTE

- The operation at a communication error occurrence depends on the setting of **Pr.502 Stop mode selection at communication error**. (Refer to page 190.)

◆ Signal loss detection (Pr.122)

- If a signal loss (communication stop) is detected between the inverter and computer as a result of a signal loss detection, a communication error (E.PUE) occurs and the inverter output will be shut off.
- When a signal loss is detected, the LF signal is output.
- When the setting is "9999", communication check (signal loss detection) is not made.
- When the setting is "0", communication through the PU connector is not possible.
- A signal loss detection is made when the setting is any of "0.1 s to 999.8 s". To make a signal loss detection, it is necessary to send data (for details on control codes, refer to page 163) from the computer within the communication check time interval. (The inverter makes a communication check (clearing of communication check counter) regardless of the station number setting of the data sent from the master). Communication check is started at the initial communication in the operation mode for the selected command interface (PU operation mode for PU connector communication in the initial setting).

Example: PU connector communication, **Pr. 122** = "0.1 to 999.8s"



◆ Programming instructions

- When data from the computer has any error, the inverter does not accept that data. Hence, in the user program, always insert a retry program for data error.
- All data communication, for example, run command or monitoring, are started when the computer gives a communication request. The inverter does not return any data without the computer's request. Hence, design the program so that the computer gives a data read request for monitoring, etc. as required.

⚠ CAUTION

- Always set the communication check time interval before starting operation to prevent hazardous conditions.
- Data communication is not started automatically but is made only once when the computer provides a communication request. If communication is disabled during operation due to signal cable breakage etc., the inverter cannot be stopped. When the communication check time interval has elapsed, the inverter output will be shut off (E.PUE). Turn the RES signal of the inverter ON or shut off the power supply to coast the motor to a stop.
- If communication is broken due to signal cable breakage, computer fault etc., the inverter does not detect such a fault. This should be fully noted.

◆ Setting items and set data

- After completion of parameter settings, set the instruction codes and data, then start communication from the computer to allow various types of operation control and monitoring.

Item		Read/ write	Instruction code	Data description	Number of data digits (format)*1
Operation mode		Read	H7B	H0000: Network operation H0001: External operation, External operation (JOG operation) H0002: PU operation, External/PU combined operation, PUJOG operation	4 digits (B and E/D)
		Write	HFB	H0000: Network operation H0001: External operation H0002: PU operation (Setting is available via communication through the PU connector.)	4 digits (A and C/D)
Monitor	Output frequency / rotations per minute (machine speed)	Read	H6F	H0000 to HFFFF: Output frequency in 0.01 Hz increments (The display can be changed to the rotations per minute (machine speed) using **Pr.37** and **Pr.53**. Refer to the FR-E800 Instruction Manual (Function).)	4 digits (B and E (E2) / D)
	Output current	Read	H70	H0000 to HFFFF: Output current (hexadecimal) in 0.01 A increments	4 digits (B and E/D)
	Output voltage	Read	H71	H0000 to HFFFF: Output voltage (hexadecimal) in 0.1 V increments	4 digits (B and E/D)
	Special monitor	Read	H72	H0000 to HFFFF: Data of the monitor item selected with the instruction code HF3.	4 digits (B and E (E2) / D)
	Special monitor selection No.	Read	H73	Monitor selection data (Refer to the FR-E800 Instruction Manual (Function) for details on selection No.)	2 digits (B and E1/D)
		Write	HF3		2 digits (A1 and C/D)
	Fault record	Read	H74 to H78	H0000 to HFFFF: Two fault records per code. (For details on fault record read data, refer to the FR-E800 Instruction Manual (Maintenance).) b15 b8b7 b0 H74 First latest fault / Latest fault H75 Third latest fault / Second latest fault H76 Fifth latest fault / Fourth latest fault H77 Seventh latest fault / Sixth latest fault H78 Ninth latest fault / Eighth latest fault Fault record display example (instruction code H74) With the read data H30A0 (First latest fault : THT) (Latest fault : OPT) b15 b8 b7 b0 0 0 1 1 0 0 0 0 1 0 1 0 0 0 0 0 First latest fault (H30) Latest fault (HA0)	4 digits (B and E/D)
Operation command (extended)		Write	HF9	Control input commands such as the Forward rotation command (STF) signal and the Reverse rotation command (STR) signal can be set. (For the details, refer to page 169.)	4 digits (A and C/D)
Operation command		Write	HFA		2 digits (A1 and C/D)
Operation command (extended 2)		Write	HFE		4 digits (A and C/D)
Inverter status monitor (extended)		Read	H79	The states of the output signals such as the Forward rotation output, Reverse rotation output, and Inverter running (RUN) signals can be monitored. (For the details, refer to page 170.)	4 digits (B and E/D)
Inverter status monitor		Read	H7A		2 digits (B and E1/D)
Inverter status monitor (extended 2)		Read	H7E		4 digits (B and E/D)

Item		Read/ write	Instruction code	Data description	Number of data digits (format)*1
Set frequency (RAM)		Read	H6D	Read the set frequency or rotations per minute (machine speed) from the RAM or EEPROM. H0000 to HFFFF: Set frequency in 0.01 Hz increments (The display can be changed to the rotations per minute (machine speed) using **Pr.37** and **Pr.53**. Refer to the FR-E800 Instruction Manual (Function).)	4 digits (B and E (E2) / D)
Set frequency (EEPROM)			H6E		
Set frequency (RAM)		Write	HED	Write the set frequency or rotations per minute (machine speed) into the RAM or EEPROM. H0000 to HE678 (0 to 590.00 Hz): Frequency in 0.01 Hz increments. (The display can be changed to the rotations per minute (machine speed) using **Pr.37** and **Pr.53**. Refer to the FR-E800 Instruction Manual (Function).) To change the set frequency consecutively, write data to the RAM of the inverter. (Instruction code: HED)	4 digits (A (A2) and C/D)
Set frequency (RAM, EEPROM)			HEE		
Inverter reset		Write	HFD	H9696: Inverter reset As the inverter is reset at the start of communication by the computer, the inverter cannot send reply data back to the computer.	4 digits (A and C/D)
				H9966: Inverter reset After the computer correctly starts communication and send data to the inverter, the inverter returns the ACK signal to the computer before being reset.	4 digits (A and D)
Fault history clear		Write	HF4	H9696: Fault history is cleared.	4 digits (A and C/D)
Parameter clear / All parameter clear		Write	HFC	All parameters return to initial values. Whether to clear communication parameters or not can be selected according to the data. • Parameter clear H9696: Parameters including communication parameters are cleared. H5A5A: Parameters other than communication parameters are cleared.*2 • All parameter clear H9966: Parameters including communication parameters are cleared. H55AA: Parameters other than communication parameters are cleared.*2 For the details of whether or not to clear parameters, refer to the FR-E800 Instruction Manual (Function). When a clear is performed with H9696 or H9966, communication related parameter settings also return to the initial values. When resuming the operation, set the parameters again. Performing a clear will clear the instruction code HEC, HF3, and HFF settings. Only H9966 and H55AA (All parameter clear) are valid when a password is set (refer to the FR-E800 Instruction Manual (Function)).	4 digits (A and C/D)
Parameter		Read	H00 to H6B	Refer to the FR-E800 Instruction Manual (Function) for the instruction codes, and write and/or read parameter values as required. When setting **Pr.100** and later, set the link parameter extended setting.	4 digits (B and E/D)
		Write	H80 to HEB		4 digits (A and C/D)
Link parameter extended setting		Read	H7F	Parameter settings are changed (extended) according to the settings. For details of the settings, refer to instruction code list in the FR-E800 Instruction Manual (Function).	2 digits (B and E1/D)
		Write	HFF		2 digits (A1 and C/D)
Second parameter changing (instruction code HFF = 1, 9)		Read	H6C	When setting the calibration parameters*3 H00: Frequency*4 H01: Parameter-set analog value H02: Analog value input from terminal	2 digits (B and E1/D)
		Write	HEC		2 digits (A1 and C/D)
Multi command		Read/ write	HF0	Available for writing 2 commands, and monitoring 2 items for reading data. (Refer to page 171 for details.)	10 digits (A2 and C1/ D)
Product profile	Model	Read	H7C	The inverter model can be read in ASCII code. "H20" (blank code) is set for blank area. Example) FR-E820-1: H46,H52,H2D,H45,H38,H32,H30,H2D,H31,H20,H20...H20	20 digits (B and E3/ D)
	Capacity	Read	H7D	The capacity in the inverter model can be read in ASCII code. Data is read in increments of 0.1 kW, and rounds down to 0.01 kW increments. "H20" (blank code) is set for blank area. Example) 0.75K: " 7" (H20, H20, H20, H20, H20, H37)	6 digits (B and E2/D)

*1 Refer to page 161 for data formats (A, A1, A2, B, C, C1, D, E, E1, E2, E3, F).

*2 Turning OFF the power supply while clearing parameters with H5A5A or H55AA returns the communication parameter settings to the initial settings.

*3 Refer to the following calibration parameter list for details on the calibration parameters.

*4 The gain frequency can be also written using **Pr.125** (instruction code: H99) or **Pr.126** (instruction code: H9A).

NOTE

- Set 65520 (HFFF0) as a parameter value "8888" and 65535 (HFFFF) as "9999".
- For the instruction codes HFF, HEC, and HF3, their values once written are held, but cleared to zero when an inverter reset or all clear is performed.
- When a 32-bit parameter setting or monitor item is read and the value to be read exceeds HFFFF, HFFFF is returned.

Example) When reading the **C3 (Pr.902) and C6 (Pr.904)** settings from the inverter of station No. 0.

	Computer send data	Inverter send data	Description
a	ENQ 00 FF 0 01 7D	ACK 00	"H01" is set in the extended link parameter.
b	ENQ 00 EC 0 01 79	ACK 00	"H01" is set in the second parameter changing.
c	ENQ 00 5E 0 0A	STX 00 0000 ETX 20	**C3 (Pr.902)** is read. 0% is read.
d	ENQ 00 60 0 F6	STX 00 0000 ETX 20	**C6 (Pr.904)** is read. 0% is read.

To read/write **C3 (Pr.902)** or **C6 (Pr.904)** after inverter reset or parameter clear, execute from (a) again.

◆ List of calibration parameters

Pr.	Name	Instruction code		
		Read	Write	Extended
C2 (902)	Terminal 2 frequency setting bias frequency	5E	DE	1
C3 (902)	Terminal 2 frequency setting bias	5E	DE	1
125 (903)	Terminal 2 frequency setting gain frequency	5F	DF	1
C4 (903)	Terminal 2 frequency setting gain	5F	DF	1
C5 (904)	Terminal 4 frequency setting bias frequency	60	E0	1
C6 (904)	Terminal 4 frequency setting bias	60	E0	1
126 (905)	Terminal 4 frequency setting gain frequency	61	E1	1
C7 (905)	Terminal 4 frequency setting gain	61	E1	1
C38 (932)	Terminal 4 bias command (torque/magnetic flux)	20	A0	9
C39 (932)	Terminal 4 bias (torque/magnetic flux)	20	A0	9
C40 (933)	Terminal 4 gain command (torque/magnetic flux)	21	A1	9
C41 (933)	Terminal 4 gain (torque/magnetic flux)	21	A1	9
C42 (934)	PID display bias coefficient	22	A2	9
C43 (934)	PID display bias analog value	22	A2	9
C44 (935)	PID display gain coefficient	23	A3	9
C45 (935)	PID display gain analog value	23	A3	9

◆ Operation command

Item	Instruction code	Bit length	Description	Example
Operation command	HFA	8 bits	b0: Terminal 4 input selection b1: Forward rotation command b2: Reverse rotation command b3: RL (Low-speed operation command)*1 b4: RM (Middle-speed operation command)*1 b5: RH (High-speed operation command)*1 b6: Second function selection b7: MRS (Output stop)*1	[Example 1] H02 Forward rotation b7 b0 0 0 0 0 0 0 1 0 [Example 2] H00 Stop b7 b0 0 0 0 0 0 0 0 0

Item	Instruction code	Bit length	Description	Example
Operation command (extended)	HF9	16 bits	b0: Terminal 4 input selection b1: Forward rotation command b2: Reverse rotation command b3: RL (Low-speed operation command)*1 b4: RM (Middle-speed operation command)*1 b5: RH (High-speed operation command)*1 b6: Second function selection b7: MRS (Output stop)*1 b8: JOG operation selection 2 b9: — b10: — b11: RES (Inverter reset)*1*2 b12 to b15: –	[Example 1] H0002 Forward rotation b15 … b0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 [Example 2] H0804 Low-speed reverse operation (When **Pr.184 RES terminal function selection** is set to "0") b15 … b0 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0
Operation command (extended 2)	HFE	16 bits	b0: NET X1 (—)*1 b1: NET X2 (—)*1 b2: NET X3 (—)*1 b3: NET X4 (—)*1 b4: NET X5 (—)*1 b5 to b15: –	[Example] H0001 Low-speed operation (When **Pr.185 NET X1 terminal function selection** is set to "0") b15 … b0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1

*1 The signal within parentheses ( ) is the initial status. The description changes depending on the setting of **Pr.180 to Pr.189 (Input terminal function selection)**. For details, refer to the description of **Pr.180 to Pr.189 (Input terminal function selection)** in the FR-E800 Instruction Manual (Function).

*2 Resetting cannot be controlled over a network, so in the initial status bit 11 is invalid. To use bit 11, change the signal by **Pr.184 RES terminal function selection**. (A reset can be executed by the instruction code HFD.)
For details of **Pr.184**, refer to the FR-E800 Instruction Manual (Function).

◆Inverter status monitor

Item	Instruction code	Bit length	Description	Example
Inverter status monitor	H7A	8 bits	b0: RUN (Inverter running)*1 b1: Forward running b2: Reverse running b3: Up to frequency b4: Overload alarm b5: — b6: FU (Output frequency detection)*1 b7: ABC (Fault)*1	[Example 1] H03 ··· During forward rotation b7 … b0 0 0 0 0 0 0 1 1 [Example 2] H80 ··· Stop at fault occurrence b7 … b0 1 0 0 0 0 0 0 0
Inverter status monitor (extended)	H79	16 bits	b0: RUN (Inverter running)*1 b1: Forward running b2: Reverse running b3: Up to frequency b4: Overload alarm b5: — b6: FU (Output frequency detection)*1 b7: ABC (Fault)*1 b8: — b9: Safety monitor output 2 b10 to b14: – b15: Fault occurrence	[Example 1] H0003 ···During forward rotation b15 … b0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 [Example 2] H8080 ···Stop at fault occurrence b15 … b0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
Inverter status monitor (extended 2)	H7E	16 bits	b0: NET Y1 (—)*1 b1: NET Y2 (—)*1 b2: NET Y3 (—)*1 b3: NET Y4 (—)*1 b4 to b15: –	[Example] H0001 ··· Stop at fault occurrence (When "99 (positive logic)" or "199 (negative logic)" is set in **Pr.193 NET Y1 terminal function selection**) b15 … b0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1

*1 The signal within parentheses ( ) is the initial status. The description changes depending on the setting of **Pr.190 to Pr.196 (Output terminal function selection)**. For details, refer to the description of **Pr.190 to Pr.196 (Output terminal function selection)** in the FR-E800 Instruction Manual (Function).

◆ Multi command (HF0)

- Sending data format from computer to inverter

Format	Number of characters																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
A2	ENQ	Inverter station number		Instruction code (HF0)		Time delay	Send data type*1	Receive data type*2	Data 1*3				Data 2*3				Sum check		CR/ LF

- Reply data format from inverter to computer (No data error detected)

Format	Number of characters																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
C1	STX	Inverter station number		Send data type*1	Receive data type*2	Error code 1*5	Error code 2*5	Data 1*4				Data 2*4				ETX	Sum check		CR/ LF

*1 Specify the data type of sending data (from computer to inverter). To use the data type 4, specify "4" for both the send data type and the receive data type.

*2 Specify the data type of reply data (from inverter to computer). To use the data type 4, specify "4" for both the send data type and the receive data type.

*3 Combination of data 1 and data 2 for sending

Data type	Data 1	Data 2	Remarks
0	Operation command (extended)	Set frequency (RAM)	Operation command (extended) is the same as instruction code HF9. (Refer to page 169.)
1	Operation command (extended)	Set frequency (RAM, EEPROM)	
4	Monitor code 1	Monitor code 2	Set the special monitor selection No. in the monitor codes 1 and 2 (set "00" in the upper 2 digits).
5	Operation command (extended)	Operation command (extended 2)	Operation command (extended) is the same as instruction code HF9. (Refer to page 169.) Operation command (extended 2) is the same as instruction code HFE. (Refer to page 169.)
6	Operation command (extended 2)	Set frequency (RAM)	
7	Operation command (extended 2)	Set frequency (RAM, EEPROM)	

*4 Combination of data 1 and data 2 for reply

Data type	Data 1	Data 2	Remarks
0	Inverter status monitor (extended)	Output frequency / rotations per minute (machine speed)	The inverter status monitor (extended) data is the same as the data of instruction code H79. (Refer to page 170.) The monitor item specified in instruction code HF3 is returned for the special monitor. (Refer to page 170.)
1	Inverter status monitor (extended)	Special monitor	
4	Monitor 1	Monitor 2	Monitor items specified by the send data type 4 are returned for the monitor 1 and monitor 2. When the send data type is other than "4", the current monitor value is returned for the monitor 1 and the output frequency monitor value is returned for the monitor 2.
5	Inverter status monitor (extended)	Inverter status monitor (extended 2)	The inverter status monitor (extended) data is the same as the data of instruction code H79. (Refer to page 170.) The inverter status monitor (extended 2) data is the same as the data of instruction code H7E. (Refer to page 170.) The monitor item specified in instruction code HF3 is returned for the special monitor. (Refer to the FR-E800 Instruction Manual (Function).)
6	Inverter status monitor (extended 2)	Output frequency / rotations per minute (machine speed)	
7	Inverter status monitor (extended 2)	Special monitor	

*5 The error code for sending data 1 is set in error code 1, and the error code for sending data 2 is set in error code 2. The mode error (HA), instruction code error (HB), data range error (HC) or no error (HF) is returned. (Refer to the FR-E800 Instruction Manual (Maintenance) for the details of the error codes.)

3.5 MODBUS RTU

Operation or parameter setting via communication is possible using the MODBUS RTU communication protocol through the PU connector on the inverter.

Pr.	Name	Initial value	Setting range	Description	
117 **N020**	**PU communication station number**	0	0	Broadcast communication	
			1 to 247	Specify the inverter station number. Enter the inverter station numbers when two or more inverters are connected to one personal computer.	
118 **N021**	**PU communication speed**	192	48, 96, 192, 384, 576, 768, 1152	Select the communication speed. The setting value × 100 equals the communication speed. For example, enter 96 to set the communication speed of 9600 bps.	
N023	**PU communication stop bit length**	1	0	Stop bit length 1 bit	Valid when **Pr.N024 (Pr.120)** = "0"
			1	Stop bit length 2 bits	
119	**PU communication stop bit length / data length**	1	0	Stop bit length 1 bit	Valid when **Pr.120** = "0"
			1	Stop bit length 2 bits	
			10	Stop bit length 1 bit	
			11	Stop bit length 2 bits	
120 **N024**	**PU communication parity check**	2	0	Parity check disabled. Stop bit length selectable between 1 bit and 2 bits (depending on the setting of **Pr.119**).	
			1	Parity check (odd parity) enabled. Stop bit length: 1 bit.	
			2	Parity check (even parity) enabled. Stop bit length: 1 bit.	
122 **N026**	**PU communication check time interval**	0	0	PU connector communication is disabled.	
			0.1 to 999.8 s	Set the interval of the communication check (signal loss detection) time If a no-communication state persists for longer than the permissible time, the inverter output will be shut off.	
			9999	No communication check (signal loss detection)	
343 **N080**	**Communication error count**	0	—	Displays the communication error count during MODBUS RTU communication. Read-only.	
549 **N000**	**Protocol selection**	0	0	Mitsubishi inverter protocol (computer link)	
			1	MODBUS RTU protocol	

NOTE

- To use the MODBUS RTU protocol, set "1" in **Pr.549 Protocol selection**.
- If MODBUS RTU communication is performed from the master to the address 0 (station number 0), the data is broadcasted, and the inverter does not send any reply to the master. To obtain replies from the inverter, set **Pr.117 PU communication station number** ≠ "0 (initial value)".
- Some functions are disabled in broadcast communication. (Refer to page 174.)
- If a communication option is installed with **Pr.550 NET mode operation command source selection** = "9999 (initial value)", commands (operation commands) transmitted through the PU connector become invalid. (Refer to the FR-E800 Instruction Manual (Function).)
- Always reset the inverter after making the initial settings of the parameters. After changing the communication-related parameters, communication cannot be made until the inverter is reset.

◆ Communication specifications

- The communication specifications are shown in the following table.

Item	Description	Related parameter
Communication protocol	MODBUS RTU protocol	**Pr.549**
Conforming standard	EIA-485 (RS-485)	—
Number of connectable units	1: N (maximum 32 units), setting is 0 to 247 stations	**Pr.117**
Communication speed	Selected among 4800/9600/19200/38400/57600/76800/115200 bps.	**Pr.118**
Control procedure	Asynchronous method	—
Communication method	Half-duplex system	—

Item		Description	Related parameter
Communication specifications	Character system	Binary (fixed at 8 bits)	—
	Start bit	1 bit	—
	Stop bit length	Select from the following three types: No parity check, stop bit length 1 bit / 2 bits (depends on the setting of **Pr.119**) Odd parity check, stop bit length 1 bit Even parity check, stop bit length 1 bit	**Pr.119** **Pr.120**
	Parity check		
	Error check	CRC code check	—
	Terminator	Not available	—
Time delay setting		Not available	—

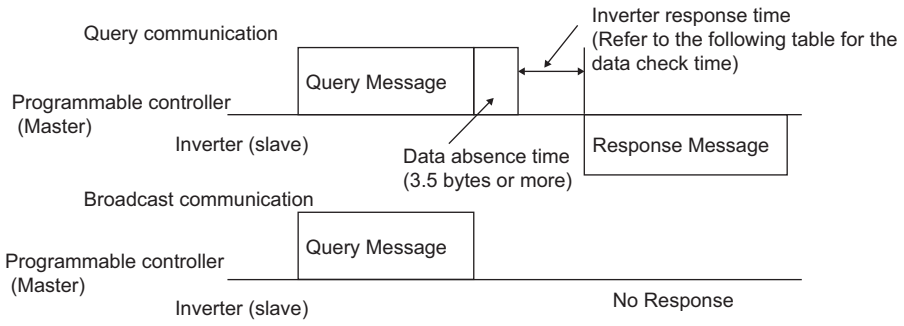
◆ Outline

- The MODBUS communication protocol was developed by Modicon for programmable controllers.
- The MODBUS protocol uses exclusive message frames to perform serial communication between a master and slaves. These exclusive message frames are provided with a feature called "functions" that allows data to be read or written. These functions can be used to read or write parameters from the inverter, write input commands to the inverter or check the inverter's operating status, for example. This product classifies the data of each inverter into holding register area (register address 40001 to 49999). The master can communicate with inverters (slaves) by accessing pre-assigned holding register addresses.

NOTE

- There are two serial transmission modes, the ASCII (American Standard Code for Information Interchange) mode and the RTU (Remote Terminal Unit) mode. However, this product supports only the RTU mode, which transfers 1 byte data (8 bits) as it is. Also, only communication protocol is defined by the MODBUS protocol. Physical layers are not stipulated.

◆ Message format



- Data check time

Item	Check time
Monitoring, operation command, frequency setting (RAM)	Less than 12 ms
Parameter read/write, frequency setting (EEPROM)	Less than 30 ms
Parameter clear / All parameter clear	Less than 5 s
Reset command	No reply

- Query
  A message is sent to the slave (the inverter) having the address specified by the master.
- Normal response
  After the query from the master is received, the slave executes the request function, and returns the corresponding normal response to the master.
- Error Response
  When an invalid function code, address or data is received by the slave, the error response is returned to the master.
  This response is appended with an error code that indicates the reason why the request from the master could not be executed.
  This response cannot be returned for errors, detected by the hardware, frame error and CRC check error.
- Broadcast
  The master can broadcast messages to all slaves by specifying address 0. All slaves that receive a message from the master execute the requested function. With this type of communication, slaves do not return a response to the master.

NOTE

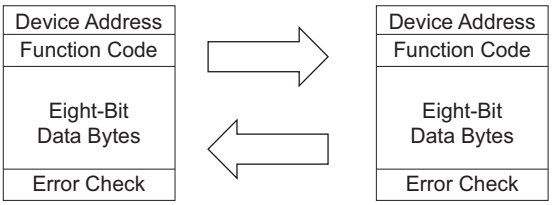
- During broadcast communication, functions are executed regarded of the set inverter station number (**Pr.117**).

◆ Message frame (protocol)

- Communication method

  Basically, the master sends a query message (inquiry), and slaves return a response message (response). At normal communication, the device address and function code are copied as they are, and at erroneous communication (illegal function code or data code), bit 7 (= H80) of the function code is turned ON, and the error code is set at data bytes.

Query message from Master



Response message from slave

Message frames comprise the four message fields shown in the figures above.

A slave recognizes message data as one message when a 3.5 character long no-data time (T1: start/end) is added before and after the data.

- Details of protocol

  The following table explains the four message fields.

Start	Address	Function	Data	CRC check		End
T1	8 bits	8 bits	n × 8 bits	L 8 bits	H 8 bits	T1

Message field	Description
Address field	"0 to 247" can be set in the single-byte (8-bit) length field. Set "0" when sending broadcast messages (instructions to all addresses), and "1 to 247" to send messages to individual slaves. The response from the slave also contains the address set by the master. The value set in **Pr.117 PU communication station number** is the slave address.
Function field	"1 to 255" can be set as the function code in the single-byte (8-bit) length filed. The master sets the function to be sent to the slave as the request, and the slave performs the requested operation. Refer to the function code list for details of the supported function codes. An error response is generated when a function code other than those in the function code list is set. The normal response from the slave contains the function code set by the master. The error response contains H80 and the function code.
Data field	The format changes according the function code. (Refer to page 175.) The data, for example, includes the byte count, number of bytes, and accessing content of holding registers.
CRC check field	Errors in the received message frame are detected. Errors are detected in the CRC check, and the 2 bytes length data is appended to the message. When the CRC is appended to the message, the lower bytes of the CRC are appended first, followed by the upper bytes. The CRC value is calculated by the sender that appends the CRC to the message. The receiver recalculates the CRC while the message is being received, and compares the calculation result against the actual value that was received in the error check field. If the two values do not match, the result is treated as an error.

◆ Function code list

Function name	Read/ write	Code	Outline	Broadcast communication	Message format reference page
Read holding registers	Read	H03	The data of the holding registers is read. The various data of the inverter can be read from MODBUS registers. System environmental variable (Refer to page 180.) Monitor code (Refer to the FR-E800 Instruction Manual (Function).) Fault history (Refer to page 182.) Model information monitor (Refer to page 182.) Inverter parameters (Refer to page 181.)	Not available	page 175

Function name	Read/ write	Code	Outline	Broadcast communication	Message format reference page
Write single register	Write	H06	Data is written to a holding register. Data can be written to MODBUS registers to output instructions to the inverter or set parameters. System environmental variable (Refer to page 180.) Inverter parameters (Refer to page 181.)	Available	page 176
Diagnostics	Read	H08	Functions are diagnosed. (communication check only) A communication check can be made since the query message is sent and the query message is returned as it is as the return message (subfunction code H00 function). Subfunction code H00 (Return query data).	Not available	page 176
Write multiple registers	Write	H10	Data is written to multiple consecutive holding registers. Data can be written to consecutive multiple MODBUS registers to output instructions to the inverter or set parameters. System environmental variable (Refer to page 180.) Inverter parameters (Refer to page 181.)	Available	page 177
Read holding register access log	Read	H46	The number of registers that were successfully accessed by the previous communication is read. Queries by function codes H03, H06, and H10 are supported. The number and start address of holding registers successfully accessed by the previous communication are returned. "0" is returned for both the number and start address for queries other than function code H03, H06, and H10.	Not available	page 178

◆Read holding registers (reading data of holding registers) (H03 or 03)

- Query message

a. Slave address	b. Function code	c. Starting address		d. Quantity of registers		CRC check	
(8 bits)	H03 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Normal response (Response message)

a. Slave address	b. Function code	e. Byte count	f. Register value			CRC check	
(8 bits)	H03 (8 bits)	(8 bits)	H (8 bits)	L (8 bits)	... (n × 16 bits)	L (8 bits)	H (8 bits)

- Query message setting

Message		Description
a	Slave address	Set the address to send messages to. Broadcast communication is not possible. (Invalid when "0" is set.)
b	Function code	Set H03.
c	Starting address	Set the holding register address from which to start reading the data. Starting address = start register address (decimal) - 40001 For example, when starting register address 0001 is set, the data of holding register address 40002 is read.
d	Quantity of registers	Set the number of holding registers for reading data. Data can be read from up to 125 registers.

- Content of normal response

Message		Description
e	Byte count	The setting range is H02 to HFA (2 to 250). Twice the number of reads specified by (d) is set.
f	Register value	The amount of data specified by (d) is set. Read data is output Hi bytes first followed by Lo bytes, and is arranged as follows: data of start address, data of start address+1, data of start address+2, and so forth.

■Example) Read the register values of 41004 (Pr.4) to 41006 (Pr.6) from slave address 17 (H11).

Query message

Slave address	Function code	Starting address		Quantity of registers		CRC check	
H11 (8 bits)	H03 (8 bits)	H03 (8 bits)	HEB (8 bits)	H00 (8 bits)	H03 (8 bits)	H77 (8 bits)	H2B (8 bits)

Normal response (Response message)

Slave address	Function code	Byte count	Register value						CRC check	
H11 (8 bits)	H03 (8 bits)	H06 (8 bits)	H17 (8 bits)	H70 (8 bits)	H0B (8 bits)	HB8 (8 bits)	H03 (8 bits)	HE8 (8 bits)	H2C (8 bits)	HE6 (8 bits)

Read value

Register 41004 **(Pr.4)**: H1770 (60.00 Hz)

Register 41005 **(Pr.5)**: H0BB8 (30.00 Hz)

Register 41006 **(Pr.6)**: H03E8 (10.00 Hz)

◆Write single register (writing data to holding registers) (H06 or 06)

- The content of the system environmental variables and inverter parameters (refer to page 179) assigned to the holding register area can be written.
- Query message

a. Slave address	b. Function code	c. Register address		d. Register value		CRC check	
(8 bits)	H06 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Normal response (Response message)

a. Slave address	b. Function code	c. Register address		d. Register value		CRC check	
(8 bits)	H06 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Query message setting

Message		Description
a	Slave address	Set the address to send messages to. Setting "0" enables broadcast communication.
b	Function code	Set H06.
c	Register address	Set the holding register address to write data to. Register address = holding register address (decimal) - 40001 For example, when register address 0001 is set, data is written to holding register address 40002.
d	Register value	Set the data to write to the holding register. Write data is fixed at 2 bytes.

- Content of normal response

  The contents in the normal response (**a to d**, including the CRC check) are the same as those in the query messages.

  In the case of broadcast communication, no response is returned.

■Example) Write 60 Hz (H1770) to 40014 (set frequency RAM) of slave address 5 (H05).

Query message

Slave address	Function code	Register address		Register value		CRC check	
H05 (8 bits)	H06 (8 bits)	H00 (8 bits)	H0D (8 bits)	H17 (8 bits)	H70 (8 bits)	H17 (8 bits)	H99 (8 bits)

Normal response (Response message)

The same data as those in the query message

NOTE

- With broadcast communication, no response is generated even if a query is executed, so when the next query is made, it must be made after waiting for the inverter data processing time after the previous query is executed.

◆Diagnostics (diagnosis of functions) (H08 or 08)

- A communication check can be made since the query message is sent and the query message is returned as it is as the return message (subfunction code H00 function). Subfunction code H00 (Return query data)
- Query message

a. Slave address	b. Function code	c. Sub-function		d. Data		CRC check	
(8 bits)	H08 (8 bits)	H00 (8 bits)	H00 (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Normal response (Response message)

a. Slave address	b. Function code	c. Sub-function		d. Data		CRC check	
(8 bits)	H08 (8 bits)	H00 (8 bits)	H00 (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Query message setting

Message		Description
a	Slave address	Set the address to send messages to. Broadcast communication is not possible. (Invalid when "0" is set.)
b	Function code	Set H08.
c	Sub-function	Set H0000.
d	Data	Any 2-byte long data can be set. The setting range is H0000 to HFFFF.

- Content of normal response

  The contents in the normal response (**a to d**, including the CRC check) are the same as those in the query messages.

NOTE

- With broadcast communication, no response is generated even if a query is executed, so when the next query is made, it must be made after waiting for the inverter data processing time after the previous query is executed.

◆Write multiple registers (writing data to multiple holding registers) (H10 or 16)

- Data can be written to multiple holding registers.
- Query message

a. Slave address	b. Function code	c. Starting address		d. Quantity of registers		e. Byte count	f. Registers value			CRC check	
(8 bits)	H10 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H (8 bits)	L (8 bits)	... (n × 2 × 8 bits)	L (8 bits)	H (8 bits)

- Normal response (Response message)

a. Slave address	b. Function code	c. Starting address		d. Quantity of registers		CRC check	
(8 bits)	H10 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Query message setting

Message		Description
a	Slave address	Set the address to send messages to. Setting "0" enables broadcast communication.
b	Function code	Set H10.
c	Starting address	Set the holding register address from which to start writing the data. Starting address = start register address (decimal) - 40001 For example, when starting address 0001 is set, data is written to holding register 40002.
d	Quantity of registers	Set the number of holding registers for writing data. Data can be written to up to 125 registers.
e	Byte count	The setting range is H02 to HFA (2 to 250). Set twice the value specified by **d**.
f	Registers value	Set the amount of data specified by **d**. Write data is output Hi bytes first followed by Lo bytes, and is arranged as follows: data of start address, data of start address+1, data of start address+2, and so forth.

- Content of normal response

  The contents in the normal response (**a to d**, including the CRC check) are the same as those in the query messages.

■Example) Write 0.5 s (H05) to 41007 (Pr.7) and 1 s (H0A) to 41008 (Pr.8) of slave address 25 (H19).

Query message

Slave address	Function code	Starting address		Quantity of registers		Byte count	Register value				CRC check	
H19 (8 bits)	H10 (8 bits)	H03 (8 bits)	HEE (8 bits)	H00 (8 bits)	H02 (8 bits)	H04 (8 bits)	H00 (8 bits)	H05 (8 bits)	H00 (8 bits)	H0A (8 bits)	H86 (8 bits)	H3D (8 bits)

Normal response (Response message)

Slave address	Function code	Starting address		Quantity of registers		CRC check	
H19 (8 bits)	H10 (8 bits)	H03 (8 bits)	HEE (8 bits)	H00 (8 bits)	H02 (8 bits)	H22 (8 bits)	H61 (8 bits)

◆ Read holding register access log (H46 or 70)

- Queries by function codes H03, H06, and H10 are supported. The number and start address of holding registers successfully accessed by the previous communication are returned. "0" is returned for both the number and start address for queries other than the function codes above.
- Query message

a. Slave address	b. Function code	CRC check	
(8 bits)	H46 (8 bits)	L (8 bits)	H (8 bits)

- Normal response (Response message)

a. Slave address	b. Function code	c. Starting address		d. No. of points		CRC check	
(8 bits)	H46 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Query message setting

Message		Description
a	Slave address	Set the address to send messages to. Broadcast communication is not possible. (Invalid when "0" is set.)
b	Function code	Set H46.

- Content of normal response

Message		Description
c	Starting address	The start address of the holding register that was successfully accessed is returned. Starting address = start register address (decimal) - 40001 For example, when starting address 0001 is returned, the holding register address that was successfully accessed is 40002.
d	No. of points	The number of holding registers that were successfully accessed is returned.

■ Example) Read the successful register start address and number of successful accesses from slave address 25 (H19).

Query message

Slave address	Function code	CRC check	
H19 (8 bits)	H46 (8 bits)	H8B (8 bits)	HD2 (8 bits)

Normal response (Response message)

Slave address	Function code	Starting address		No. of points		CRC check	
H19 (8 bits)	H10 (8 bits)	H03 (8 bits)	HEE (8 bits)	H00 (8 bits)	H02 (8 bits)	H22 (8 bits)	H61 (8 bits)

The number of holding registers that were successfully accessed was returned as two with the start address 41007 **(Pr.7)**.

◆ Error response

- An error response is returned if the query message received from the master contains an illegal function, address or data. No response is returned for parity, CRC, overrun, framing, and busy errors.

NOTE

- No response is also returned in the case of broadcast communication.

- Error response (Response message)

a. Slave address	b. Function code	c. Exception code	CRC check	
(8 bits)	H80 + Function (8 bits)	(8 bits)	L (8 bits)	H (8 bits)

	Message	Description
a	Slave address	Set the address received from the master.
b	Function code	The function code requested by the master and H80 is set.
c	Exception code	The codes in the following table are set.

- Error code list

Code	Error item	Error description
01	ILLEGAL FUNCTION	The query message from the master has a function code that cannot be handled by the slave.
02	ILLEGAL DATA ADDRESS*1	The query message from the master has a register address that cannot be handled by the slave. (No parameter, parameter cannot be read, parameter cannot be written)
03	ILLEGAL DATA VALUE	The query message from the master has data that cannot be handled by the slave. (Out of parameter write range, a mode is specified, or other error)

*1 An error response is not returned in the following cases:

(a) Function code H03 (reading data of holding registers)

When the quantity of registers is specified as one or more and there are one or more holding registers from which data can be read.

(b) Function code H10 (writing data to multiple holding registers)

When the quantity of registers is specified as one or more and there are one or more holding registers to which data can be written.

In other words, when function code H03 or H10 is used and multiple holding registers are accessed, an error response is not returned even if a nonexistent holding register or holding register that cannot be read or written from/to is accessed.

NOTE

- An error response is returned if none of the accessed holding registers exist. When an accessed holding register does not exist, the read value is 0 and the written data is invalid.

- Error detection of message data

  The following errors are detected in message data from the master. The inverter output is not shut off even if an error is detected.

Error check items

Error item	Error description	Inverter operation
Parity error	The data received by the inverter is different from the specified parity (**Pr.120** setting).	When this error occurs, **Pr.343** is incremented by one. When this error occurs, the LF signal is output.
Framing error	The data received by the inverter is different from the stop bit length (**Pr.119**/**Pr.120**) setting.	
Overrun error	The next data has been sent by the master before the inverter completes receiving the preceding data.	
Message frame error	The data length of the message frame is checked, and an error is generated if the received data length is less than 4 bytes. When a receive buffer overflow occurs, an error is generated if a received message frame is addressed to the own station or broadcasted.	
CRC check error	An error is generated if the data in the message frame does not match the calculation result.	

NOTE

- The LF signal can be assigned to an output terminal by setting any of **Pr.190 to Pr.196 (Output terminal function selection)**. Changing the terminal assignment may affect other functions. Set parameters after confirming the function of each terminal.

◆ MODBUS register

- The following shows the MODBUS registers for system environment variables (read/write), monitor codes (read), parameters (read/write), fault history data (read/write), and model information monitor items (read).

- System environment variables

Register	Definition	Read/write	Remarks
40002	Inverter reset	Write	Any value
40003	Parameter clear	Write	Set H965A.
40004	All parameter clear	Write	Set H99AA.
40006	Parameter clear*1	Write	Set H5A96.
40007	All parameter clear*1	Write	Set HAA99.
40008	Inverter status / control input command (extended)*2	Read/write	Refer to the following.
40009	Inverter status / control input command*2	Read/write	Refer to the following.
40010	Operation mode / inverter setting*3	Read/write	Refer to the following.
40014	Set frequency (RAM value)	Read/write	(The display can be changed to the rotations per minute (machine speed) using **Pr.37 and Pr.53**. Refer to the FR-E800 Instruction Manual (Function).)
40015	Set frequency (EEPROM value)	Write	

*1 Settings in the communication parameters are not cleared.
*2 The data is written as a control input command for writing.
The data is read as the inverter status for reading.
*3 The data is written as an operation mode setting for writing.
The data is read as the operation mode status for reading.

- Inverter status / control input command, and inverter status / control input command (extended)

Bit	Definition	
	Control input command	Inverter status
0	Stop command	RUN (Inverter running)*2
1	Forward rotation command	Forward running
2	Reverse rotation command	Reverse running
3	RH (High-speed operation command)*1	Up to frequency
4	RM (Middle-speed operation command)*1	Overload alarm
5	RL (Low-speed operation command)*1	0
6	JOG operation selection 2	FU (Output frequency detection)*2
7	Second function selection	ABC (Fault)*2
8	Terminal 4 input selection	0
9	—	Safety monitor output 2
10	MRS (Output stop)*1	0
11	—	0
12	RES (Inverter reset)*1	0
13	—	0
14	—	0
15	—	Fault occurrence

Bit	Definition	
	Control input command	Inverter status
0	NET X1 (—)*1	NET Y1 (0)*2
1	NET X2 (—)*1	NET Y2 (0)*2
2	NET X3 (—)*1	NET Y3 (0)*2
3	NET X4 (—)*1	NET Y4 (0)*2
4	NET X5 (—)*1	0
5	—	0
6	—	0
7	—	0
8	—	0
9	—	0
10	—	0
11	—	0
12	—	0
13	—	0
14	—	0
15	—	0

*1 The signal within parentheses ( ) is the initial status. The description changes depending on the setting of **Pr.180 to Pr.189 (Input terminal function selection)**.
For details, refer to the description of **Pr.180 to Pr.189 (Input terminal function selection)** in the FR-E800 Instruction Manual (Function).
The signals assigned to the input terminals may be valid or invalid in the NET operation mode. (Refer to the FR-E800 Instruction Manual (Function).)
*2 The signal within parentheses ( ) is the initial status. The description changes depending on the setting of **Pr.190 to Pr.196 (Output terminal function selection)**.
For details, refer to the description of **Pr.190 to Pr.196 (Output terminal function selection)** in the FR-E800 Instruction Manual (Function).

- Operation mode / inverter setting

Mode	Read value	Write value
EXT	H0000	H0010*1
PU	H0001	H0011*1
EXT JOG	H0002	—

Mode	Read value	Write value
PU JOG	H0003	—
NET	H0004	H0014
PU + EXT	H0005	—

*1 Writing is available depending on the **Pr.79 and Pr.340** settings. For details, refer to the FR-E800 Instruction Manual (Function).
Restrictions in each operation mode conform with the computer link specification.

- Monitor code

  For details of the register numbers and the monitor items, refer to the description of **Pr.52** in the FR-E800 Instruction Manual (Function).

- Parameters

Pr.	Register	Name	Read/write	Remarks
0 to 999	41000 to 41999	For details on parameter names, refer to the parameter list in the FR-E800 Instruction Manual (Function).	Read/write	The parameter number + +41000 is the register number.
C2 (902)	41902	Terminal 2 frequency setting bias (frequency)	Read/write	
C3 (902)	42092	Terminal 2 frequency setting bias (analog value)	Read/write	Analog value (%) set in **C3 (902)**
	43902	Terminal 2 frequency setting bias (terminal analog value)	Read	Analog value (%) of the voltage (current) applied to terminal 2
125 (903)	41903	Terminal 2 frequency setting gain (frequency)	Read/write	
C4 (903)	42093	Terminal 2 frequency setting gain (analog value)	Read/write	Analog value (%) set in **C4 (903)**
	43903	Terminal 2 frequency setting gain (terminal analog value)	Read	Analog value (%) of the voltage (current) applied to terminal 2
C5 (904)	41904	Terminal 4 frequency setting bias (frequency)	Read/write	
C6 (904)	42094	Terminal 4 frequency setting bias (analog value)	Read/write	Analog value (%) set in **C6 (904)**
	43904	Terminal 4 frequency setting bias (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
126 (905)	41905	Terminal 4 frequency setting gain (frequency)	Read/write	
C7 (905)	42095	Terminal 4 frequency setting gain (analog value)	Read/write	Analog value (%) set in **C7 (905)**
	43905	Terminal 4 frequency setting gain (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C38 (932)	41932	Terminal 4 bias command (torque/ magnetic flux)	Read/write	
C39 (932)	42122	Terminal 4 bias (torque/magnetic flux)	Read/write	Analog value (%) set in **C39 (932)**
	43932	Terminal 4 bias (torque/magnetic flux) (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C40 (933)	41933	Terminal 4 gain command (torque/ magnetic flux)	Read/write	
C41 (933)	42123	Terminal 4 gain (torque/magnetic flux)	Read/write	Analog value (%) set in **C41 (933)**
	43933	Terminal 4 gain (torque/magnetic flux) (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C42 (934)	41934	PID display bias coefficient	Read/write	
C43 (934)	42124	PID display bias analog value	Read/write	Analog value (%) set in **C43 (934)**
	43934	PID display bias analog value (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C44 (935)	41935	PID display gain coefficient	Read/write	
C45 (935)	42125	PID display gain analog value	Read/write	Analog value (%) set in **C45 (935)**
	43935	PID display gain analog value (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
1000 to 1999	45000 to 45999	For details on parameter names, refer to the parameter list in the FR-E800 Instruction Manual (Function).	Read/write	The parameter number + 44000 is the register number.

- Fault history

Register	Definition	Read/write	Remarks
40501	Fault record 1	Read/write	Being 2 bytes in length, the data is stored as H00○○. Refer to the lowest 1 byte for the error code. (For details on error codes, refer to the FR-E800 Instruction Manual (Maintenance).) The fault history is batch-cleared by writing to register 40501. Set any value as data.
40502	Fault record 2	Read	
40503	Fault record 3	Read	
40504	Fault record 4	Read	
40505	Fault record 5	Read	
40506	Fault record 6	Read	
40507	Fault record 7	Read	
40508	Fault record 8	Read	
40509	Fault record 9	Read	
40510	Fault record 10	Read	

- Product profile

Register	Definition	Read/write	Remarks
44001	Model (1st and 2nd characters)	Read	The inverter model can be read in ASCII code. "H20" (blank code) is set for blank area. Example) FR-E820-1: H46, H52, H2D, H45, H38, H32, H30, H2D, H31, H20.....H20
44002	Model (3rd and 4th characters)	Read	
44003	Model (5th and 6th characters)	Read	
44004	Model (7th and 8th characters)	Read	
44005	Model (9th and 10th characters)	Read	
44006	Model (11th and 12th characters)	Read	
44007	Model (13th and 14th characters)	Read	
44008	Model (15th and 16th characters)	Read	
44009	Model (17th and 18th characters)	Read	
44010	Model (19th and 20th characters)	Read	
44011	Capacity (1st and 2nd characters)	Read	The capacity in the inverter model can be read in ASCII code. Data is read in increments of 0.1 kW, and rounds down to 0.01 kW increments. "H20" (blank code) is set for blank area. Example) 0.75K: " 7" (H20, H20, H20, H20, H20, H37)
44012	Capacity (3rd and 4th characters)	Read	
44013	Capacity (5th and 6th characters)	Read	

NOTE

- When a 32-bit parameter setting or monitor item is read and the value to be read exceeds HFFFF, HFFFF is returned.

◆ Pr.343 Communication error count

- The communication error occurrence count can be checked.

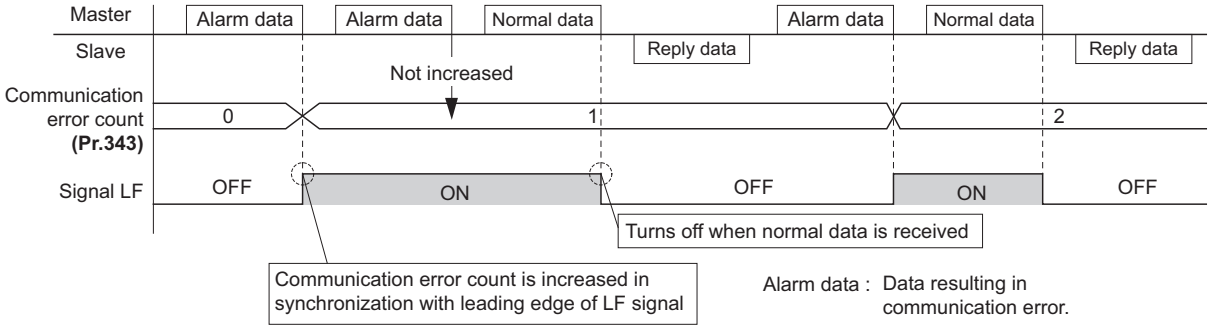
Parameter	Setting range	Minimum setting range	Initial value
343	(Read-only)	1	0

NOTE

- The communication error count is temporarily stored in the RAM memory. The value is not stored in the EEPROM, and so is cleared to 0 when power is reset and the inverter is reset.

◆ Alarm (LF) signal output (communication error warning)

- During a communication error, the Alarm (LF) signal is output by open collector output. Assign the terminal to be used using any of **Pr.190 to Pr.196 (Output terminal function selection)**.



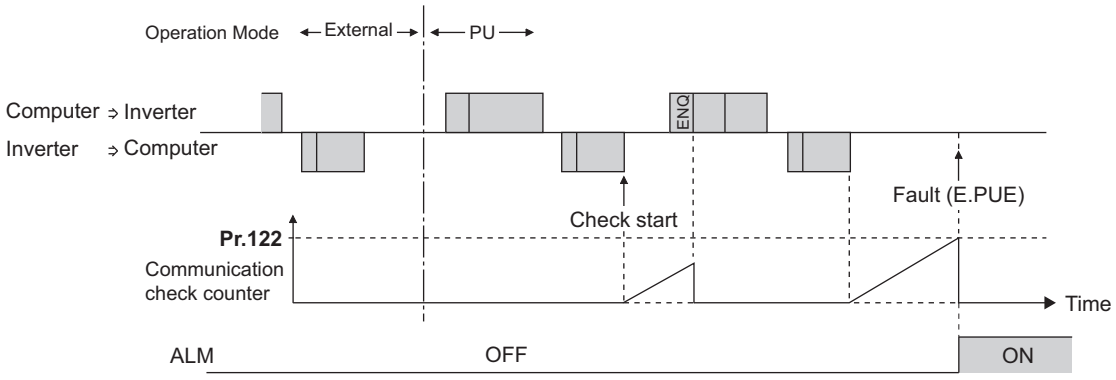
NOTE

- The LF signal can be assigned to an output terminal by setting **Pr.190 to Pr.196**. Changing the terminal assignment may affect other functions. Set parameters after confirming the function of each terminal.

◆ Signal loss detection (Pr.122)

- If a signal loss (communication stop) is detected between the inverter and computer as a result of a signal loss detection, a communication error (E.PUE) occurs and the inverter output will be shut off.
- When a signal loss is detected, the LF signal is output.
- When the setting is "9999", communication check (signal loss detection) is not made.
- When the setting is "0", communication through the PU connector is not possible.
- A signal loss detection is made when the setting is any of "0.1 s to 999.8 s". To make a signal loss detection, it is necessary to send data from the computer within the communication check time interval. (The inverter makes a communication check (clearing of communication check counter) regardless of the station number setting of the data sent from the master).
- Communication check is started at the initial communication in the operation mode for the selected command interface (PU operation mode for PU connector communication in the initial setting).

Example: PU connector communication, **Pr. 122** = "0.1 to 999.8s"



NOTE

- The operation at a communication error occurrence depends on the setting of **Pr.502 Stop mode selection at communication error**. (Refer to page 190.)

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CHAPTER 4 Other Communication Options

4.1 USB device communication 186
4.2 Automatic connection with GOT 187

4 Other Communication Options

4.1 USB device communication

A personal computer and an inverter can be connected with a USB cable. Setup of the inverter can be easily performed with FR Configurator2.

The inverter can be connected easily to a personal computer by a USB cable.

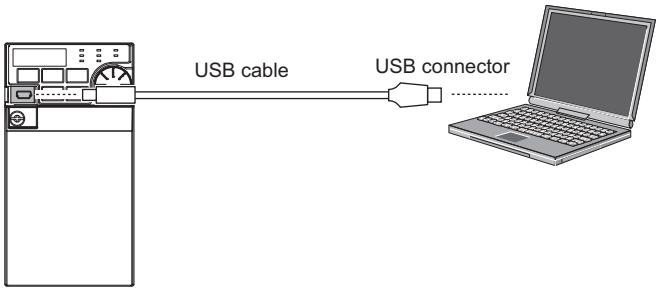
Pr.	Name	Initial value	Setting range	Description
547 **N040**[*1]	**USB communication station number**	0	0 to 31	Specify the inverter station number.
548 **N041**[*1]	**USB communication check time interval**	9999	0	USB communication is possible, however the inverter output is shut off (E.USB) when the mode changes to the PU operation mode.
			0.1 to 999.8 s	Set the communication check time interval. If a no-communication state persists for longer than the permissible time, the inverter output is shut off (E.USB).
			9999	No communication check

*1 The changed value is applied after the next power-ON or inverter reset.

◆USB communication specifications

Interface	Conforms to USB1.1 (USB2.0 full speed)
Transmission speed	12 Mbps
Wiring length	Maximum 5 m
Connector	USB mini B connector (receptacle)
Power supply	Self-powered[*1]
Recommended USB cable	MR-J3USBCBL3M (cable length 3 m)

*1 USB bus power connection is available. The maximum SCCR is 500 mA. A PU connector cannot be used during USB bus power connection.



- At the initial setting (**Pr.551 PU mode operation command source selection** = "9999"), communication with FR Configurator2 can be made in the PU operation mode simply by connecting a USB cable. To fix the command source to the USB connector in the PU operation mode, set "3" in **Pr.551**.
- Parameter setting and monitoring can be performed by using FR Configurator2. For details, refer to the Instruction Manual of FR Configurator2.

NOTE

- Operation is not guaranteed when multiple inverters are connected using a USB hub.

4.2 Automatic connection with GOT

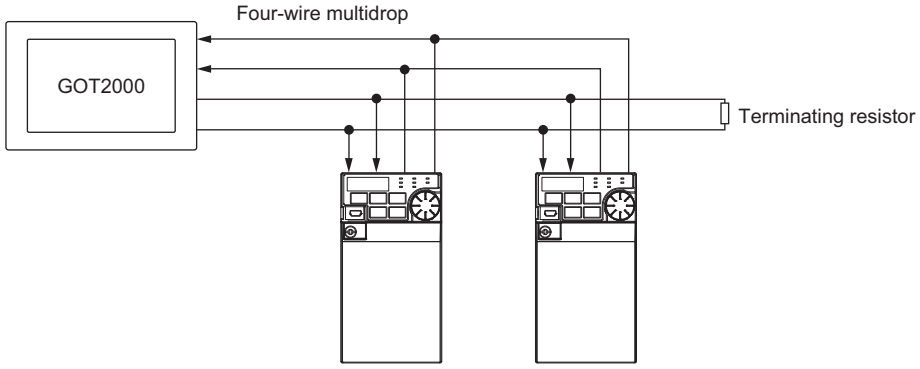
When the automatic connection is enabled in the GOT2000 series, the inverter can communicate with the GOT2000 series with only setting the station number and connecting the GOT. This eliminates the need for setting each communication parameter separately.

Pr.	Name	Initial value	Setting range	Description
117 **N020**	**PU communication station number**	0	0 to 31 (0 to 247)*1*2	Specify the inverter station number. The inverter station number setting is required when multiple inverters are connected to one GOT (PU connector communication).

*1 When **Pr.549 Protocol selection** = "1" (MODBUS RTU protocol), the setting range is as shown in the parentheses.

*2 When a value outside the setting range is set, the inverter operates at the initial value.

◆Automatic connection system configuration



◆GOT2000 series automatic recognition

- Set the station number (**Pr.117**) of the inverter before the automatic recognition is performed.
- When the GOT2000 series is connected, the parameters required for the GOT connection are automatically changed by setting the automatic recognition on the GOT2000 series side.
- Connect all the stations of inverters with GOT before the automatic recognition is performed. The inverter newly added after automatic recognition will not be recognized automatically. (When an inverter is added, perform the initial setting in **Pr.999 Automatic parameter setting** or set the automatic recognition on the GOT side again.)

Automatic change item	Automatic change parameter	Setting value after change
Communication speed	**Pr.118**	Depending on the setting of the connected device on the GOT side.
Data length / stop bit	**Pr.119**	
Parity	**Pr.120**	
Time delay setting	**Pr.123**	
CR/LF selection	**Pr.124**	
Number of communication retries	**Pr.121**	9999 (fixed)
Communication check time interval	**Pr.122**	9999 (fixed)
Protocol selection	**Pr.549**	0 (fixed to Mitsubishi inverter protocol)

NOTE

- If the automatic recognition cannot be performed, initial setting in **Pr.999** is required.
- For connection to a device other than the GOT2000 series, initial setting in **Pr.999** is required.
- For details, refer to the GOT2000 Series Connection Manual (Mitsubishi Product).

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CHAPTER 5 Common Settings

5 Common Settings

Set the action when the inverter is performing operation via communication.
Set the action at fault occurrence or at writing of parameters.

Pr.	Name	Initial value	Setting range	Description
342 **N001**	**Communication EEPROM write selection**	0	0	Parameter values written by communication are written to the EEPROM and RAM.
			1	Parameter values written by communication are written to the RAM.
349 **N010**[*1]	**Communication reset selection**	0	0	Enables the error reset function in any operation mode.
			1	Error reset is enabled in the Network operation mode.
500 **N011**[*1]	**Communication error execution waiting time**	0	0 to 999.8 s	Set the time from when the communication line error occurs until the inverter starts the operation for the communication error (when a communication option is used).
501 **N012**[*1]	**Communication error occurrence count display**	0	0	Displays the communication error occurrence count (when a communication option is used).
502 **N013**	**Stop mode selection at communication error**	0	0 to 2, 6	Select the operation at a communication error occurrence.
779 **N014**	**Operation frequency during communication error**	9999	0 to 590 Hz	Set the frequency for the operation when a communication error occurs.
			9999	Operation continues at the same frequency before the communication error.

*1 The setting is available only when a communication option is installed.

◆ Communication EEPROM write selection (Pr.342)

- When parameter write is performed via the inverter PU connector, Ethernet connector, USB communication, or a communication option, the parameters storage device can be changed to RAM only from both EEPROM and RAM. Use this function if parameter settings are changed frequently.
- When changing the parameter values frequently, set "1" in **Pr.342 Communication EEPROM write selection** to write them to the RAM only. The life of the EEPROM will be shorter if parameter write is performed frequently with the setting unchanged from "0 (initial value)" (EEPROM write).

NOTE

- Turning OFF the inverter's power supply clears the modified parameter settings when **Pr.342** = "1 (write only to RAM)". Therefore, the parameter values at next power-ON are the values last stored in the EEPROM.
- The parameter setting written in the RAM cannot be checked on the operation panel. (The values displayed on the operation panel are the ones stored in the EEPROM.)

◆ Operation selection at a communication error (Pr.502, Pr.779)

- For communication via the PU connector, Ethernet connector, or a communication option, operation at a communication error can be selected. The operation is active under the Network operation mode.
- Select the stop operation at the retry count excess (**Pr.121**, enabled only when the Mitsubishi inverter protocol is selected) or at a signal loss detection (**Pr.122**) during the RS-485 communication.
- The operation at a communication error can be selected with **Pr.502** when **Pr.1431 Ethernet signal loss detection function selection** = "3" or **Pr.1432 Ethernet communication check time interval** ≠ "9999" during Ethernet communication.

Fault type	Pr.502 setting	At fault occurrence			At fault removal		
		Operation	Display	Fault (ALM) signal	Operation	Display	Fault (ALM) signal
PU disconnection, Ethernet communication fault, communication option fault	0 (initial value)	Output shutoff	"E.PUE", "E.EHR", "E.OP1"	ON	Output stop status continues.	"E.PUE", "E.EHR", "E.OP1"	ON
	1	Output to decelerate and stop the motor.	"E.PUE", "E.EHR", "E.OP1" after stop	ON after stop			
	2			OFF	Restart*1	Normal	OFF
	6	Operation continues at the frequency set in **Pr.779**.*2*3	"CF" warning	OFF	Normal	Normal	OFF
Option fault (when a communication option is used)	0	Output shutoff	"E. 1"	ON	Output stop status continues.	"E. 1"	ON
	1, 2	Output to decelerate and stop the motor.	"E. 1" after stop	ON after stop			
	6	Operation continues at the frequency set in **Pr.779**.*2*3	"CF" warning	OFF	Operation continues at the frequency set in **Pr.779**.	"CF" warning	OFF

*1 When the communication error is removed during deceleration, the motor re-accelerates.

*2 When the frequency command interface is switched to the one other than NET during operation, the frequency command given from an external device can be made valid.

*3 During torque control, the **Pr.779** setting becomes invalid when **Pr.807 Speed limit selection** = "1". In this case, operation continues at the frequency set in **Pr.808 Speed limit** or **Pr.809 Reverse-side speed limit**.

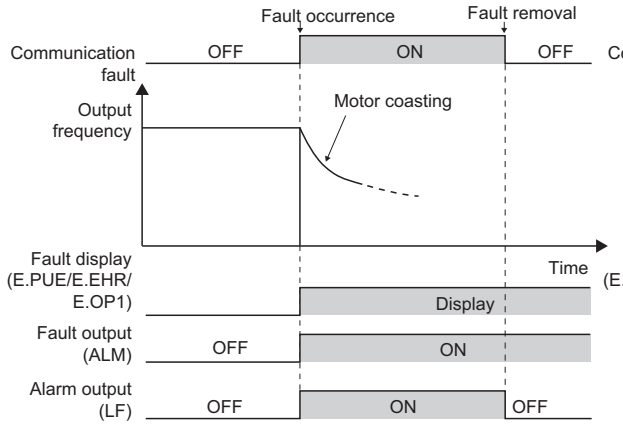
- When a communication error is detected during communication through the PU connector, USB connector, or a communication option, the Alarm (LF) signal is output to an output terminal of the inverter. (When an option fault occurs, the LF signal is output only when "6" is set in **Pr.502**.)
- When a communication error is detected during communication via the Ethernet connector while **Pr.1431 Ethernet signal loss detection function selection** = "2 or 3", the Alarm (LF) signal is output to an output terminal of the inverter.

NOTE

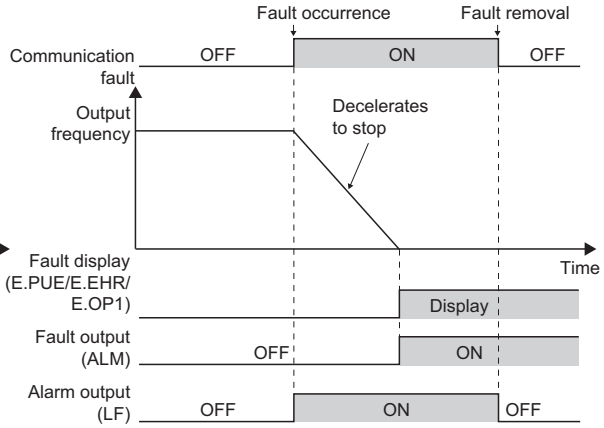
- To use the LF signal, set "98 (positive logic) or 198 (negative logic)" in any of **Pr.190 to Pr.196 (Output terminal function selection)** to assign the function to the output terminal.

- The following charts show operations when a communication line error occurs.

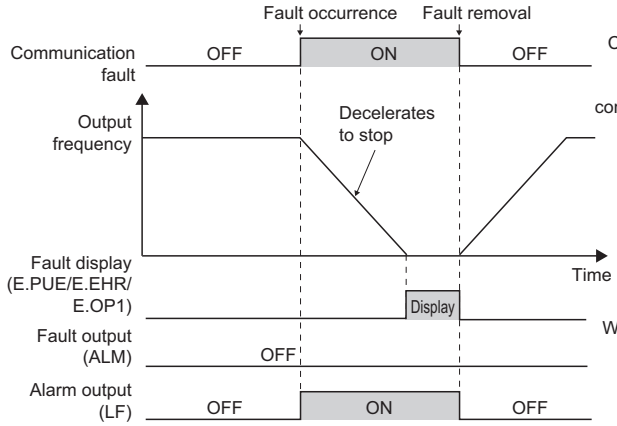
Pr.502 = "0" (initial value)



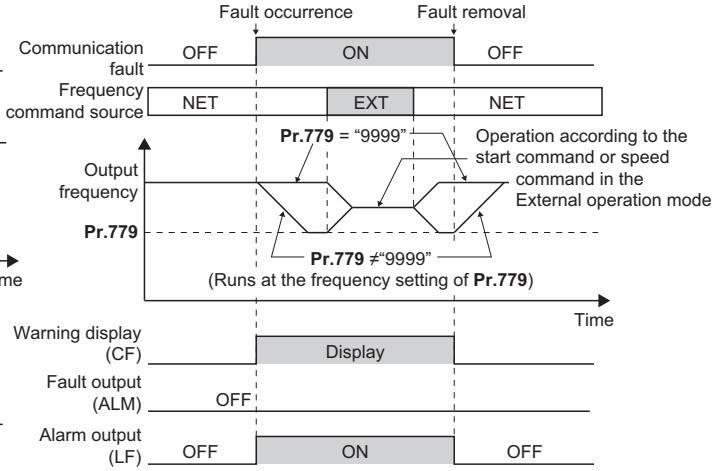
Pr.502 = "1"



Pr.502 = "2"



Pr.502 = "6"

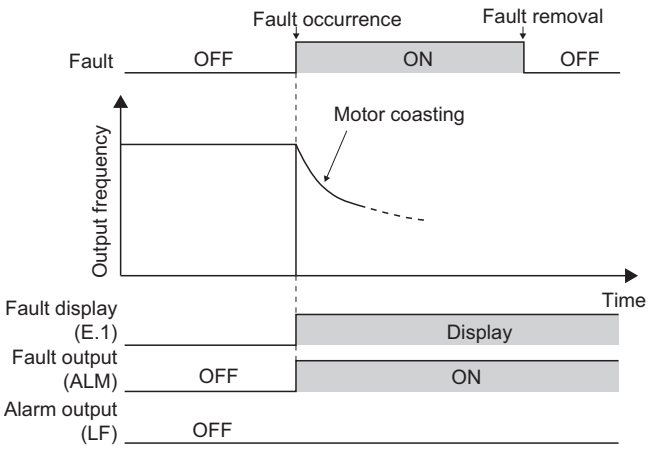


NOTE

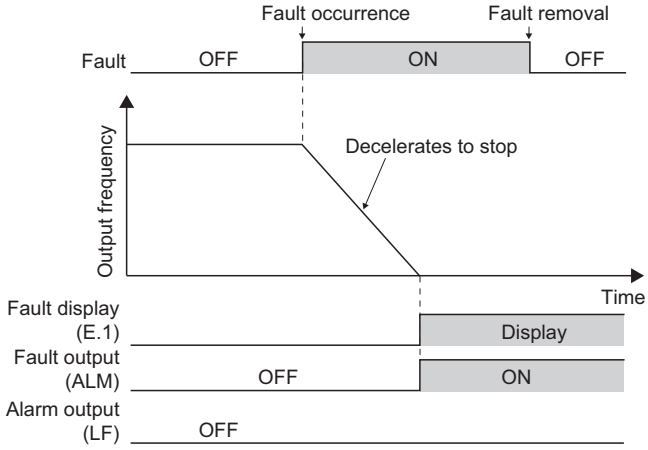
- When the **Pr.1431** setting is changed to a value other than "3" and the **Pr.1457** setting is changed to a value other than "9999" after the operation defined by the **Pr.502** setting starts during Ethernet communication, the operation will be changed according to the settings of **Pr.1431** and **Pr.1457**.
- When the switchover mode (**Pr.79 Operation mode selection** = "6") is set, the operation can be switched between NET and External during operation using the External/NET operation switchover (X66) signal. (Refer to the FR-E800 Instruction Manual (Function).)

- The following charts show operations when a communication option fault occurs.

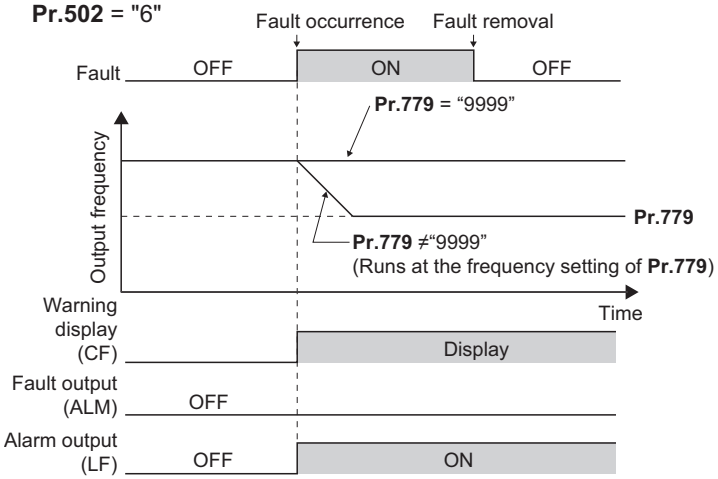
Pr.502 = "0 (initial value)"



Pr.502 = "1 or 2"



Pr.502 = "6"



NOTE

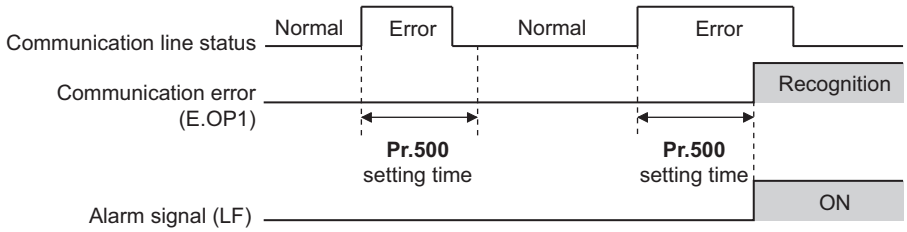
- When a communication option is used, the protective function [E.OP1 (fault data: HA1)] is activated at error occurrences on the communication line. The protective function [E.1 (fault data: HF1)] is activated at error occurrences in the communication circuit inside the option.
- Fault output indicates the Fault (ALM) signal and an alarm bit output.
- When the fault output is set enabled, fault records are stored in the fault history. (A fault record is written to the fault history at a fault output.)
- When the fault output is not enabled, a fault record is overwritten to the fault history temporarily but not stored.
- After the fault is removed, the fault indication goes back to normal indication on the monitor, and the fault history goes back to the previous status.
- When **Pr.502** = "1 or 2", the normal deceleration time setting (settings like **Pr.8, Pr.44, and Pr.45**) is applied as the deceleration time.
- If a communication line error occurs, then the error is removed during deceleration while **Pr.502** = "2", the motor re-accelerates from that point. The operation command and the speed command before the fault occurred will be applied for restarting. The normal acceleration time setting (such as **Pr.7/Pr.44** setting) is applied for restart. (Acceleration does not restart when a communication option fault occurs.)
- The **Pr.502** and **Pr.779** settings are valid when communication is performed via the PU connector, Ethernet connector, or a communication option.
- These parameters are valid under the Network operation mode. When performing communication through the PU connector, set **Pr.551 PU mode operation command source selection** ≠ "2".
- **Pr.502** is valid for the device that has the command source under the Network operation mode. When an error occurs for communication through the PU connector or the Ethernet connector while **Pr.550** = "9999 (initial value)" and a communication option is installed, **Pr.502** becomes invalid.
- If the communication error setting is disabled with **Pr.121** = "9999" or **Pr.122** = "9999" while **Pr.502** = "6", the inverter does not operate with the frequency set in **Pr.779** when a communication error occurs.

⚠CAUTION

- When **Pr.502** = "6" and a communication line error (PU disconnection, Ethernet communication fault, communication option fault) occurs, or a communication option fault occurs, the operation continues. When setting "6" 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.

◆Waiting time setting from the communication line error occurrence to the communication error activation (Pr.500)

- When a communication option is used, use **Pr.500 Communication error execution waiting time** to set the time from when the communication line error occurs until the inverter starts the operation for the communication error.
- 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.



- Operation from the error occurrence until the **Pr.500** setting time elapses

Fault type	Pr.502 setting	Operation	Display	Fault (ALM) signal
PU disconnection, Ethernet communication fault, communication option fault	0	Operation continues.*1	Normal*1	OFF*1
	1			
	2			
	6			
Option fault (when a communication option is used)	0	Output shutoff	"E. 1"	ON
	1, 2	Output to decelerate and stop the motor	"E. 1" after stop	ON after stop
	6	Operation continues at the frequency set in **Pr.779**.*2*3	"CF" warning	OFF

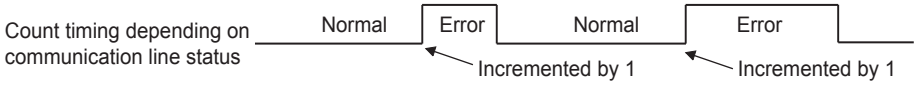
*1 When the communication returns to normal within the time period set in **Pr.500**, the protective function (E.OP1) is not activated.

*2 When the frequency command interface is switched to the one other than NET during operation, the frequency command given from an external device can be made valid.

*3 During torque control, the **Pr.779** setting becomes invalid when **Pr.807 Speed limit selection** = "1". In this case, operation continues at the frequency set in **Pr.808 Speed limit** or **Pr.809 Reverse-side speed limit**.

◆Displaying and clearing the communication error count (Pr.501)

- When a communication option is used, the cumulative count of communication error occurrences can be displayed. Write "0" to clear this cumulative count.
- When a communication line error occurs, the setting of **Pr.501 Communication error occurrence count display** increases by one.
- 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 the EEPROM only once per hour. If power reset or inverter reset is performed, **Pr.501** setting will be the one that is last stored to the EEPROM depending on the reset timing.

◆ Error reset operation selection at inverter fault (Pr.349)

- An error reset command from a communication option can be invalidated in the External operation mode or the PU operation mode.

Pr.349 setting	Description
0 (initial value)	Error reset is enabled independently of operation mode.
1	Error reset is enabled in the Network operation mode.

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

- Check the following before switching the operation mode.
  The inverter is at a stop.
  Both the STF and STR signals are off.
  The **Pr.79 Operation mode selection** setting is correct. (Check the setting on the operation panel of the inverter.) (Refer to the FR-E800 Instruction Manual (Function).)
- 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. (Refer to the FR-E800 Instruction Manual (Function).)
- After the inverter starts up in the Network operation mode, parameter write can be commanded via the network.

NOTE

- The changed value in **Pr.340** is applied after the next power-ON or inverter reset.
- The **Pr.340** setting can be changed on the operation panel in any operation mode.
- When setting a value other than "0" in **Pr.340**, make sure that the communication settings of the inverter are correct.

MEMO

CHAPTER 6 Appendix

6.1 How to check the specification change.....198

6 Appendix

Appendix provides the reference information for use of this product.
Refer to the information as required.

6.1 How to check the specification change

Check the SERIAL number indicated on the inverter rating plate or packaging. For how to read the SERIAL number, refer to page 7.

6.1.1 Specification change

◆Number of connectable units on the CC-Link IE Field Network Basic

Number of connectable units	SERIAL (serial number)
Master: 1 Slave: up to 16 stations (16 stations × 1 group)	□□ 204 ○○○○○○ or earlier
Master: 1 Slave: up to 16 stations (16 stations × 4 groups)	□□ 205 ○○○○○○ or later

◆Functions available for the inverters manufactured in May 2020 or later

Item	Details
Mitsubishi Electric geared motor	GM-[]
Plug-in option	FR-A8ND E kit, FR-A8NP E-kit
Stand-alone option	Parameter unit (FR-PU07), LCD operation panel (FR-LU08)
Added parameters	**Pr.1499, P.E107, (Pr.75)**
Changed parameter setting range	• Setting value "13" added for **Pr.52, Pr.54, Pr.158, Pr.774 to Pr.776, Pr.992, Pr.1027 to Pr.1034** • Setting values "1800 and 1803" added for **Pr.71 and Pr.450** (for 200/400 V class only) • Setting values "10000 to 10003, and 10014 to 10017" added for **Pr.75** (for the safety communication model only)

◆Functions available for the inverters manufactured in August 2020 or later

Item	Details
Mitsubishi Electric vector control dedicated motor (SF-V5RU (1500 r/min series))	The SF-V5RU 1.5 to 5.5 kW motors can be driven by the FR-E820-0110(2.2K) to 0330(7.5K) inverters. The SF-V5RUH 1.5 to 5.5 kW motors can be driven by the FR-E840-0060(2.2K) to 0170(7.5K) inverters.
Mitsubishi Electric high-performance energy-saving motor with encoder	SF-PR-SC
Mitsubishi Electric inverter-driven geared motor for encoder feedback control	GM-DZ, GM-DP
Plug-in option	FR-A8AP E kit
Added parameters	**Pr.284, Pr.359, Pr.367, Pr.368, Pr.369, Pr.376, Pr.422, Pr.552, Pr.600 to Pr.604, Pr.607, Pr.608, Pr.690, Pr.692 to Pr.696, Pr.802, Pr.823, Pr.828, Pr.833, Pr.840 to Pr.848, Pr.854, Pr.873, Pr.877 to Pr.881, P.A107 (Pr.285)**
Changed parameter setting range	• Setting value "8888" added for **Pr.11** • Setting values "19 and 35" added for **Pr.52, Pr.774 to Pr.776, Pr.992, and Pr.1027 to Pr.1034** • Setting values "30 and 33" added for **Pr.71 and Pr.450** • Setting values "13, 23, 42, 43, and 74" added for **Pr.178 to Pr.189** • Setting values "30 to 33, and 130 to 133" added for **Pr.190 to Pr.196** • Setting values "30 to 33" added for **Pr.320 to Pr.322** • Setting values "0 to 2, and 9" added for **Pr.800** • Setting value "2" added for **Pr.850** • Setting value "6" added for **Pr.858**
Added fault signals	• Signal loss detection (E.ECT) • Brake sequence fault (E.MB1 to E.MB3)

Warranty

When using this product, make sure to understand the warranty described below.

1. **Warranty period and coverage**

   We will repair any failure or defect (hereinafter referred to as "failure") in our FA equipment (hereinafter referred to as the "Product") arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

   [Term]

   The term of warranty for Product is twelve months after your purchase or delivery of the Product to a place designated by you or eighteen months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

   [Limitations]

   (1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule. It can also be carried out by us or our service company upon your request and the actual cost will be charged.
   However, it will not be charged if we are responsible for the cause of the failure.

   (2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

   (3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
   - a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
   - a failure caused by any alteration, etc. to the Product made on your side without our approval
   - a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
   - a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
   - any replacement of consumable parts (condenser, cooling fan, etc.)
   - a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
   - a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
   - any other failures which we are not responsible for or which you acknowledge we are not responsible for

2. **Term of warranty after the stop of production**

   (1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.

   (2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

3. **Service in overseas**

   Our regional FA Center in overseas countries will accept the repair work of the Product; however, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

4. **Exclusion of loss in opportunity and secondary loss from warranty liability**

   Regardless of the gratis warranty term, Mitsubishi Electric shall not be liable for compensation to:

   (1) Damages caused by any cause found not to be the responsibility of Mitsubishi Electric.

   (2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi Electric products.

   (3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi Electric products.

   (4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. **Change of Product specifications**

   Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. **Application and use of the Product**

   (1) For the use of our product, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in product, and a backup or fail-safe function should operate on an external system to product when any failure or malfunction occurs.

   (2) Our product is designed and manufactured as a general purpose product for use at general industries.
   Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used.
   In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used.
   We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

Revisions

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

Revision date	*Manual number	Revision
Dec. 2019	IB(NA)-0600871ENG-A	First edition
Apr. 2020	IB(NA)-0600871ENG-B	Added • FR-E820S-0008(0.1K) to 0110(2.2K)(E/SCE) • FR-E800-SCE (safety communication model)
Jun. 2020	IB(NA)-0600871ENG-C	Added • How to check the specification change
Jun. 2020	IB(NA)-0600871ENG-D	Added • Vector control • Parameter unit (FR-PU07) • EtherNet/IP: Inverter Configuration Object (64h) • PROFINET: Inverter parameters, monitor data, and inverter control parameters

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