MITSUBISHI ELECTRIC

INVERTER

FR-D800
Instruction Manual (Communication)
(Standard model / Ethernet model)

Compact & easy-to-use inverter

CONTENTS

1 Introduction

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

◆ Abbreviations

Item	Description
Operation panel	Inverter's operation panel, LCD operation panel (FR-LU08), and enclosure surface operation panel (FR-PA07)
Parameter unit	Parameter unit (FR-PU07)
PU	Operation panel and parameter unit
Inverter	Mitsubishi Electric FR-D800 series inverter
D800	Standard model (RS-485 communication)
D800-E	Ethernet model (Ethernet communication)
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 PM motor	EM-A

◆ Digital characters and their corresponding printed equivalents

0	1	2	3	4	5	6	7	8	9	A	B	C
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
d	E	F	G	H	I	J	K	L	n	n	o	P
Q	R	S	T	U	V	W	X	Y	Z	-	_	
q	r	S	T	U	v	W	X	y	Z	-	_	

◆ Trademarks

- MODBUS is a registered trademark of SCHNEIDER ELECTRIC USA, INC.
- EtherNet/IP is a registered trademark of ODVA (Open DeviceNet Vendor Association, INC).
- PROFINET is a trademark or registered trademark 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 either trademarks or 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 Instruction Manual (Connection) for the switching of the control logic of the inverter.)

◆ Precautions

- To change the protocol group used for the FR-D800-EPA or FR-D800-EPB, the firmware of the FR-D800-EPA can be changed from PA to PB, and the firmware of the FR-D800-EPB can be changed from PB to PA. When changing the firmware from the initial status, be sure not to modify the indication on the rating plate including the inverter model name, such as revising it with a pen and replacing the plate. If the rating plate is modified, the product will not comply with the standards.
- Some of the communication protocols cannot be used together as shown in the following table. For the application and protocol settings, refer to page 173.

	CC-Link IE TSN	CC-Link IE Field Network Basic	EtherNet/IP	PROFINET
CC-Link IE TSN	—	×	×	×
CC-Link IE Field Network Basic	×	—		
EtherNet/IP	×		—	×
PROFINET	×		×	—

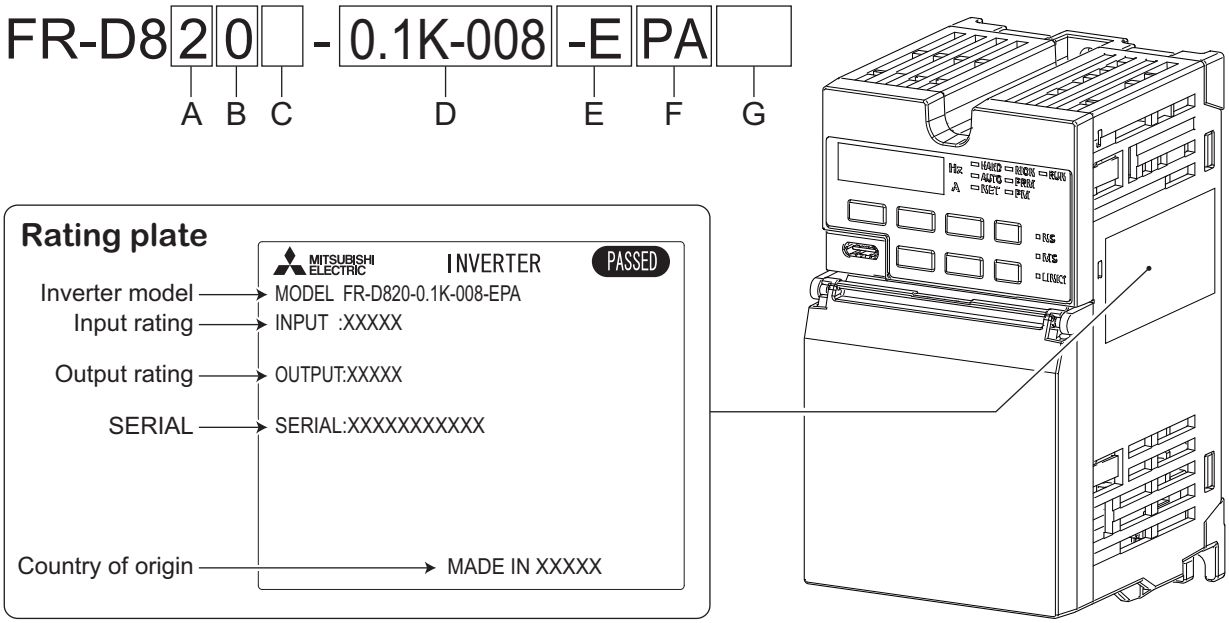
×: Not available

NOTE

- FR Configurator2 can be used for any communication protocol.

1.1 Product checking

◆ Inverter model



- A: The voltage class is shown.

Symbol	Voltage class
1	100 V class
2	200 V class
4	400 V class

- B: The protective structure is shown.

Symbol	Protective structure
0	Open type (IP20)

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

Symbol	Description
None	Three-phase input
S	Single-phase input
W	Single-phase input (double voltage output)

- D: The applicable motor capacity and the inverter rated current are shown.

Symbol	Description
Example) 200 V class 0.1K-008 to 7.5K-318	Applicable motor capacity (ND) (kW) - Inverter rated current (ND) (A)

- E: The communication type is shown.

Symbol	Communication
None	RS-485 communication
-E	Ethernet communication

- F: The communication protocol is shown.

Symbol	Protocol specification
None	Mitsubishi inverter protocol, MODBUS RTU
PA*1*2	Protocol group A (CC-Link IE TSN, CC-Link IE Field Network Basic, MODBUS/TCP, and EtherNet/IP)
PB*1*2	Protocol group B (CC-Link IE TSN, CC-Link IE Field Network Basic, MODBUS/TCP, and PROFINET)

*1 To change the protocol group, the firmware of the FR-D800-EPA can be changed from PA to PB, and the firmware of the FR-D800-EPB can be changed from PB to PA. After the firmware change, the protocol group before the change cannot be used. Download the firmware from the Mitsubishi Electric FA Global Website. For details on firmware change, refer to "Firmware update" in the FR Configurator2 Instruction Manual.

*2 When changing the firmware from the initial status, be sure not to modify the indication on the rating plate including the inverter model name, such as revising it with a pen and replacing the plate. If the rating plate is modified, the product will not comply with the standards.

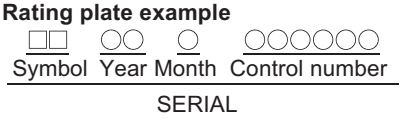
- G: Availability of circuit board coating is shown.

Symbol	Circuit board coating*1
None	Without coating
-60	With coating

*1 Conforming to IEC 60721-3-3:1994 3C2/3S2

◆ 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).

◆ Specification differences by the country of origin

The rated frequency (initial setting) and the control logic (initial status) of the input signal differ depending on the country of origin.

For the country of origin, refer to the rating plate (page 5).

Country of origin	Rated frequency (initial setting)	Control logic	
		Input signal (initial status)	Safety stop signal
MADE IN JAPAN	60 Hz	Sink logic	Source logic (fixed)
MADE IN CHINA	50 Hz	Source logic	

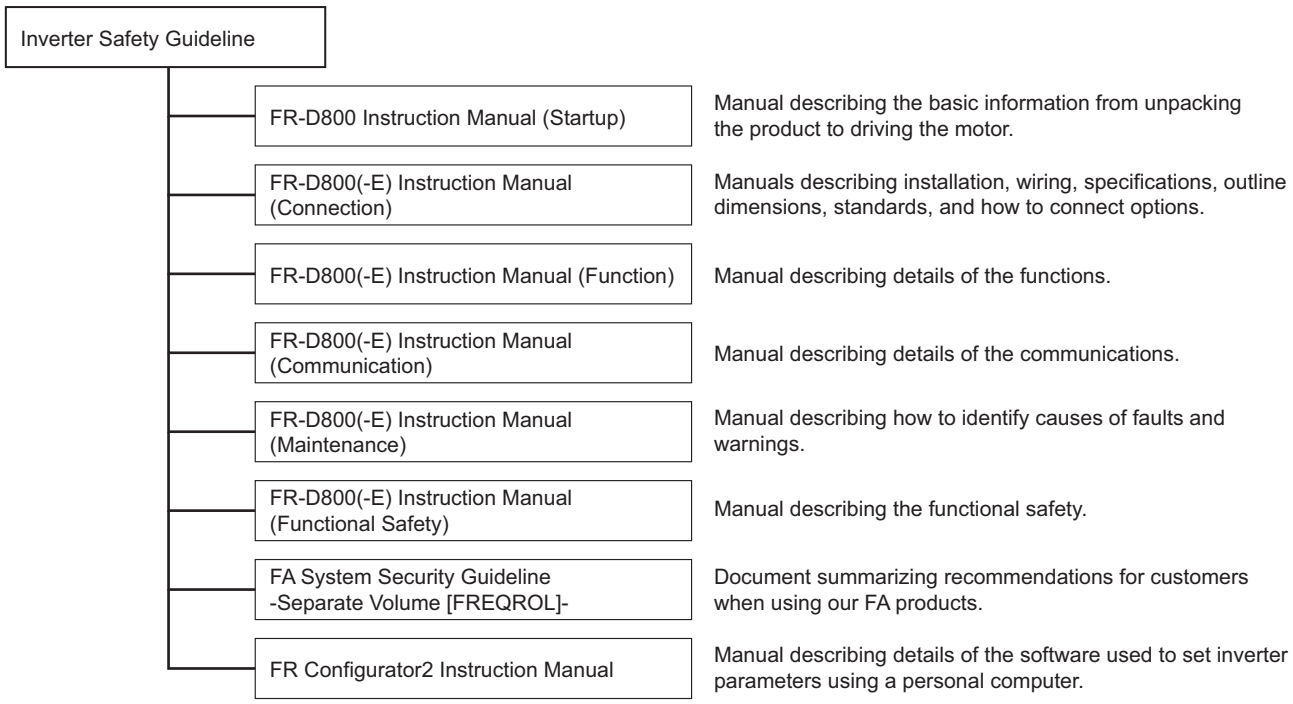
1.2 Related manuals

When using this inverter for the first time, prepare the following manuals as required and use the inverter safely. The latest version of e-Manual Viewer and the latest PDF manuals can be downloaded from the Mitsubishi Electric FA Global Website.
https://www.MitsubishiElectric.com/app/fa/download/search.do?kisyu=/inv&mode=manual

Point

- e-Manual refers to the Mitsubishi FA electronic book manuals that can be browsed using a dedicated tool.
- e-Manual has the following features:
  Required information can be cross-searched in multiple manuals.
  Pages that users often browse can be bookmarked.

Manuals related to the FR-D800 inverter are shown in the following table.



Name	Manual number
FR-D800 Inverter Safety Guideline	IB-0601019
FR-D800-E Inverter Safety Guideline	IB-0601022
FR-D800 Instruction Manual (Startup)	IB-0601026ENG
FR-D800(-E) Instruction Manual (Connection)	IB-0601031ENG
FR-D800(-E) Instruction Manual (Function)	IB-0601036ENG
FR-D800(-E) Instruction Manual (Maintenance)	IB-0601046ENG
FR-D800(-E) Instruction Manual (Functional Safety)	BCN-A23498-003(E)
FA System Security Guideline -Separate Volume [FREQROL]-	BCN-C22005-1054
FR Configurator2 Instruction Manual	IB-0600516ENG

2 Ethernet Communication

2.1 Outline

Ethernet communication is available for the Ethernet model.

◆ 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. (Refer to the FA System Security Guideline -Separate Volume [FREQROL]-.)
- 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	Star
Interface	RJ-45
Number of interfaces available	1
IP version	IPv4

◆ Operation status LEDs

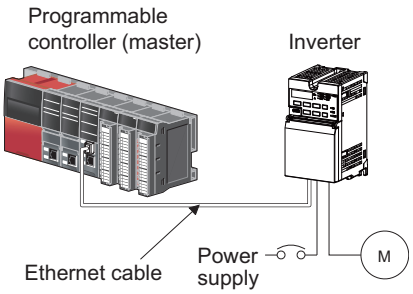
LED name	Description	LED status	Remarks
NS	Communication status	OFF	Duplicate IP address not detected
		Red	Duplicate IP address detected
MS	Inverter status	OFF	Power-OFF / during inverter reset
		Green	Operating properly
		Red	Fault detected
LINK1	Communication connector status	OFF	Power-OFF/link-down
		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. Prepare the equipment required for wiring. (Refer to page 10.)
2. Turn OFF the power of the programmable controller and the inverter.
3. Connect the programmable controller (master) and the inverters with Ethernet cables. (Refer to page 11.)



2.2.2 Network configuration

◆ Network topology

The network can be wired into star topology. Units are configured into a star using a switching hub and Ethernet cables. Except for the master, units can be easily added in a star topology. Data link continues with the stations that are operating normally.

◆ Station number and connection position

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

◆ Replacing CC-Link IE TSN devices

Units (except for the master) 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	Standard
Category 5 or higher straight cable (double shielded / STP)	RJ-45 connector	The cables compliant with the following standards: • IEEE 802.3 (100BASE-TX) • ANSI/TIA/EIA-568-B (Category 5)

- Recommended product (as of April 2023)

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

*1 SC-E5EW cable is for in-enclosure use and indoor use for fixed parts, SC-E5EW-MV cable for indoor use for moving parts, and SC-E5EW-L cable 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.

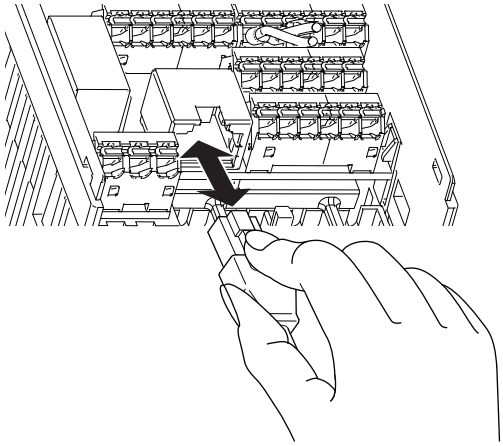
- Compliance with the IEEE 802.3 (100BASE-TX)
- Support of the auto MDI/MDI-X function
- Support of the auto-negotiation function
- Switching hub (layer 2 switch)*1

*1 A repeater hub is not available.

2.3 Ethernet cable connection

This section explains Ethernet cable connection and the relevant precautions. For details on the network configuration and the cables and hubs used for wiring, refer to page 9 onwards.

2.3.1 Wiring method



◆ Connection

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.

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.

2.4 Initial setting for Ethernet communication

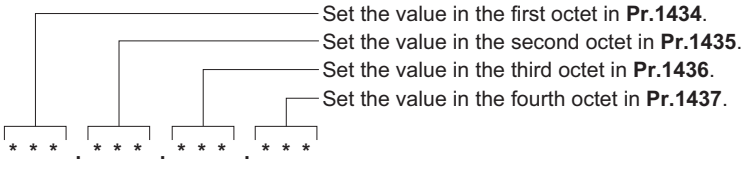
Use the following parameters to perform required settings for Ethernet communication between the inverter and other devices. To make communication between other devices and the inverter, perform the initial settings of the inverter parameters to match the communication specifications of the devices. Data communication cannot be made if the initial settings are not configured 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 is available for the FR-D800-EPA and FR-D800-EPB.

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
Communication speed		100 Mbps (10 Mbps is not supported.)
Authentication class		A (Compatible with protocol version 2.0)
Communication mode		Unicast
Cycle time*1		5000 to 6400000 µs
Communication method		Time-managed polling method
Maximum number of connected units		121 units (sum of master and remote stations)
Maximum number of branches		No upper limit on the same Ethernet network
Connection cable		Ethernet cable (IEEE 802.3 100BASE-TX compliant cable and ANSI/TIA/EIA-568-B (Category 5) compliant shielded 4-pair branched cable)
Node type		Remote station
Maximum cyclic size (of one node)	RX	32 bits
	RY	32 bits
	RWr	32 words
	RWw	32 words

*1 Consider the scaling factor in the multiple period setting to change the basic period setting on the engineering software (GX Works3).

◆ 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	Communication connector status	OFF	Power-OFF/link-down
		Blinking green	Link-up (Data reception in progress)
		Solid green	Link-up

◆ Combination with the master station

■ When all remote stations are authentication class A products

Master station	Master station communication speed	Network configuration
• MELSEC iQ-R series master/local module RJ71GN11-T2, RJ71GN11-EIP • MELSEC iQ-F series master/local module FX5-CCLGN-MS • Master station that supports both 1 Gbps and 100 Mbps communication speeds	1 Gbps	• Star topology • Connection sequence: Master station → Remote station (communication speed: 1 Gbps) → General-purpose switching hub[*1] → Remote station (communication speed: 100 Mbps)
	100 Mbps	• Star topology • Remote station (communication speed: 100 Mbps)
• MELSEC iQ-R series Motion module RD78G[]/GH[] • MELSEC iQ-F series Motion module FX5-[]SSC-G	1 Gbps	• Star topology • Connection sequence: Master station → Remote station (communication speed: 1 Gbps) → General-purpose switching hub[*1] → Remote station (communication speed: 100 Mbps)
	100 Mbps	• Star topology • Remote station (communication speed: 100 Mbps)

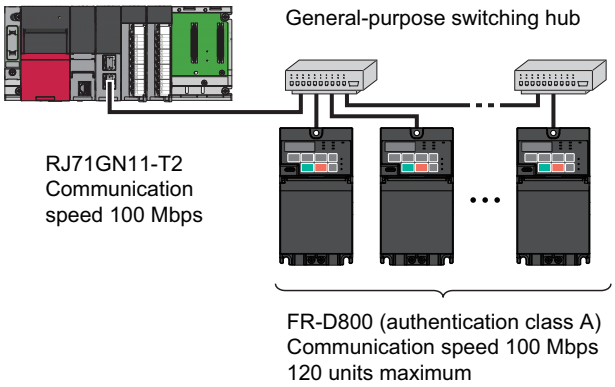
■ When both authentication class B and class A products are used as remote stations

Master station	Master station communication speed	Network configuration
• MELSEC iQ-R series master/local module RJ71GN11-T2, RJ71GN11-EIP • MELSEC iQ-F series master/local module FX5-CCLGN-MS • Master station that supports both 1 Gbps and 100 Mbps communication speeds	1 Gbps	• Star topology • Connection sequence: Master station → Remote station (authentication class B, communication speed: 1 Gbps) → General-purpose switching hub[*1] → Remote station (authentication class A, communication speed: 100 Mbps)
	100 Mbps	• Star topology • Connection sequence: Master station → Remote station (authentication class B) → Remote station (authentication class A)
• MELSEC iQ-R series Motion module RD78G[]/GH[] • MELSEC iQ-F series Motion module FX5-[]SSC-G	1 Gbps	• Star topology • Connection sequence: Master station → Remote station (authentication class B, communication speed: 1 Gbps) → General-purpose switching hub[*1] → Remote station (authentication class A, communication speed: 100 Mbps)
	100 Mbps	• Star topology • Connection sequence: Master station → Remote station (authentication class B) → Remote station (authentication class A)

*1 Use the product that supports 1 Gbps / 100 Mbps.

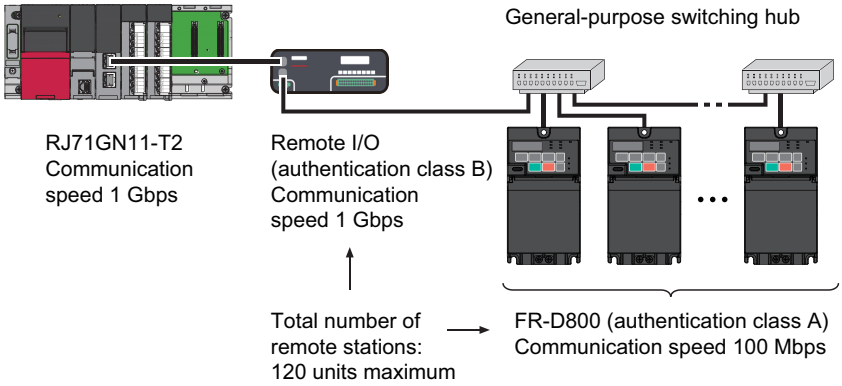
■ Network configuration example

- When all remote stations are authentication class A products

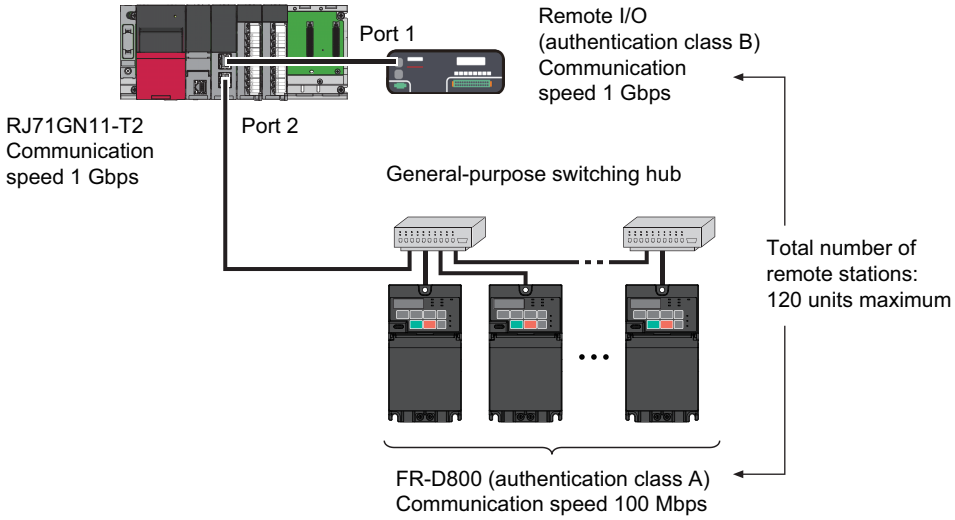


- When both authentication class B and class A products are used as remote stations

Class A units should be connected starting from the remotest class B unit.



When the master station has more than one port, use separate ports for both authentication classes.



■ Compatible firmware version of the master station

Model	Compatible with protocol version 2.0
RJ71GN11-T2	15 or later
RJ71GN11-EIP	01 or later
FX5-CCLGN-MS	1.010 or later
RD78G[]/GH[]	20 or later
FX5-[]SSC-G	1.002 or later

■ Compatible version of the engineering software

Name	Compatible with protocol version 2.0
GX Works3	1.080J or later

■ Related manuals

For details of network configurations, refer to the Master Module User's Manual.

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

◆ CSP+ file

A CSP+ file is available for download.

Mitsubishi Electric FA Global Website
https://www.MitsubishiElectric.com/fa/products/drv/inv/support/d800/d800e.html
The download is free at the website above. For details, contact your sales representative.

NOTE

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

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 11.)
2. Enter the IP address (**Pr.1434 to Pr.1437**). (Refer to page 13.)
3. Set "45238" (CC-Link IE TSN) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. (Refer to page 24.)
   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.

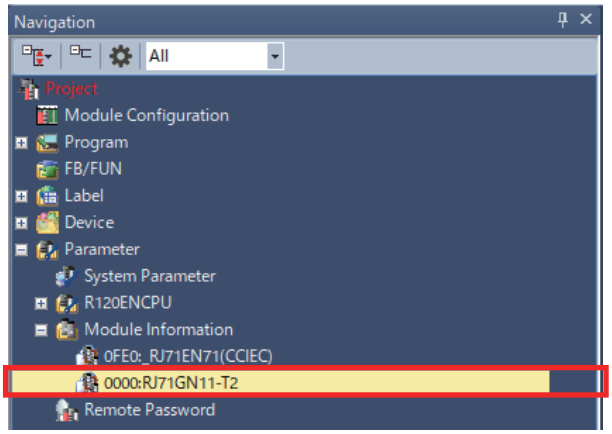
■ Creating a project file

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

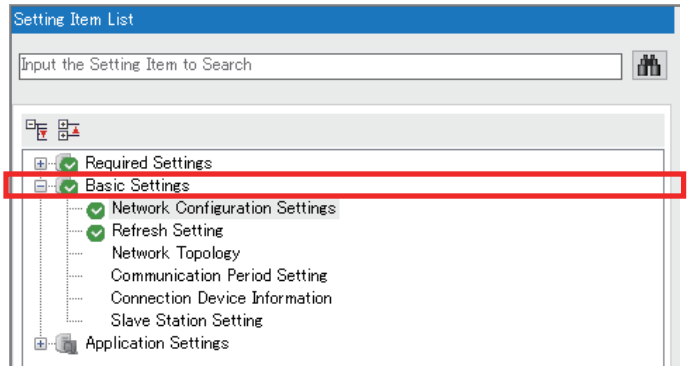
■ Detecting an inverter

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.

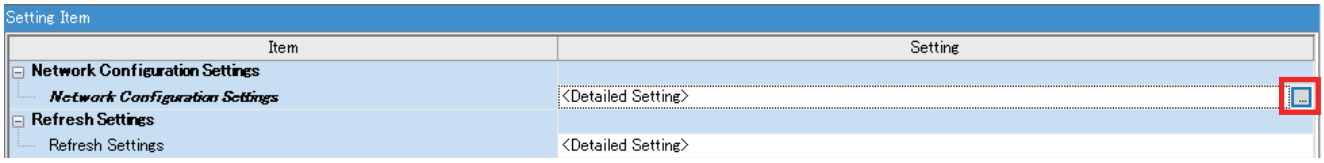
1. In the "Navigation" window, select [Parameter] > [Module Information] then select the module name.



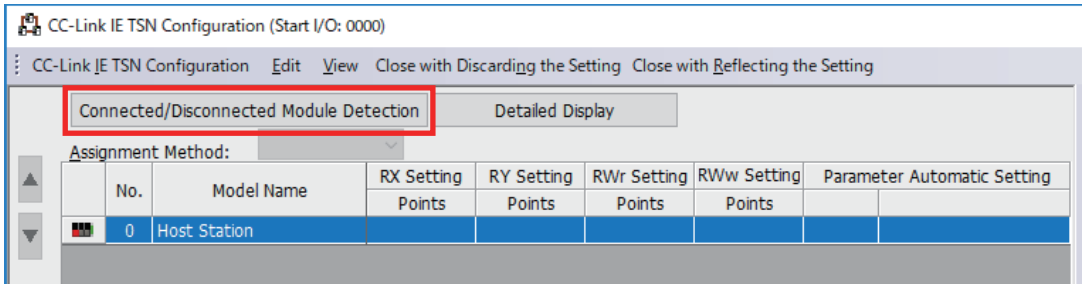
2. Select [Basic Settings] in the "Setting Item List" window.



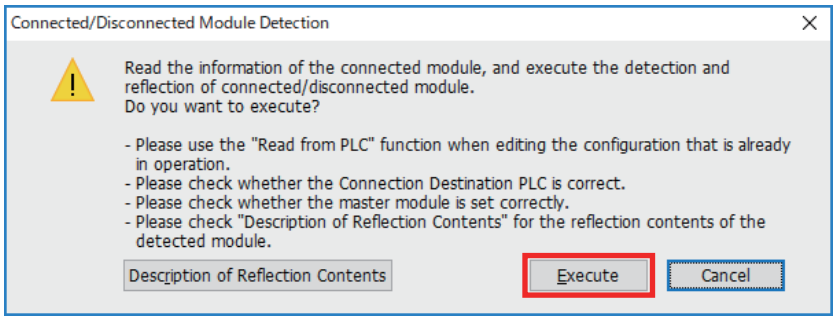
3. In the "Setting Item" window, go to [Network Configuration Settings] then click [...] next to the [Detailed Setting] field.



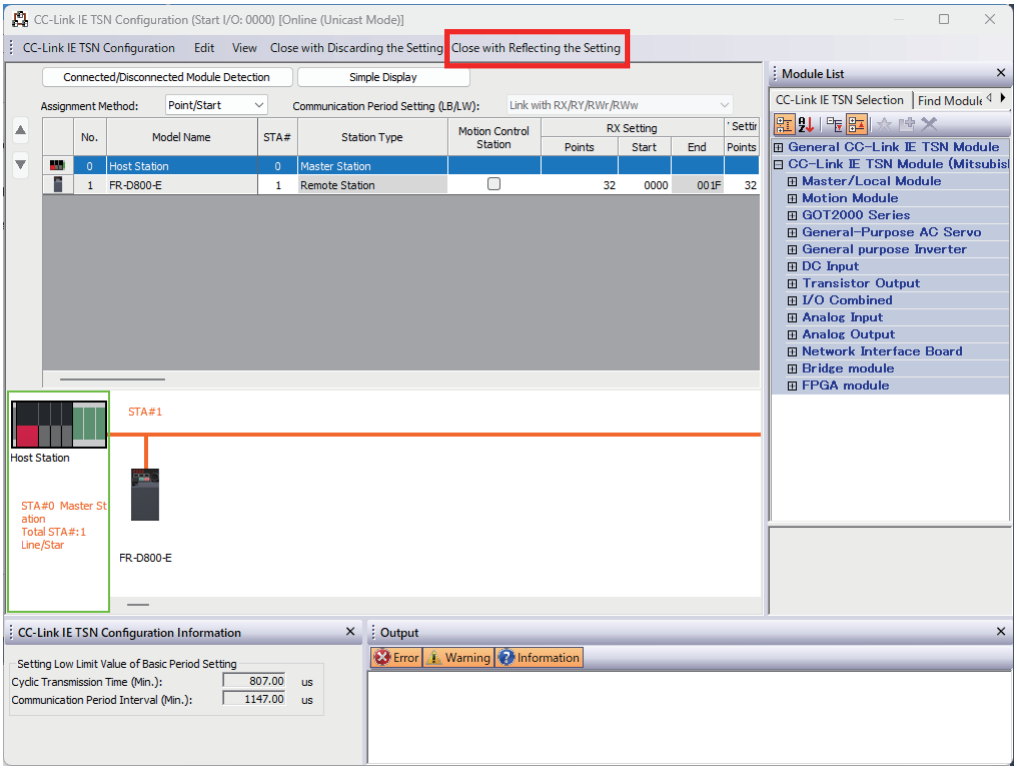
4. Click [Connected/Disconnected Module Detection] in the "CC-Link IE TSN configuration" window.



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

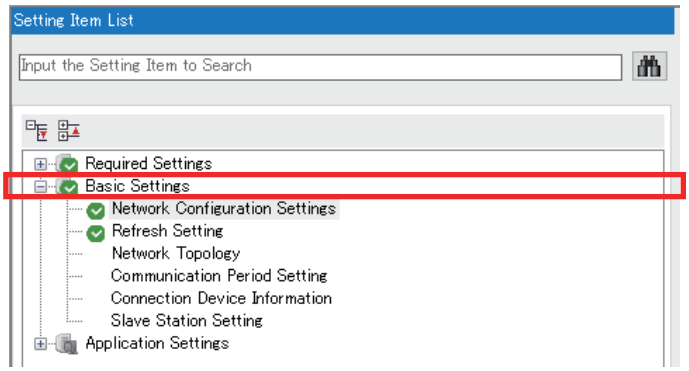


6. The inverter model will appear on the screen when it is detected. Click [Close with Reflecting the Setting] to close the window.

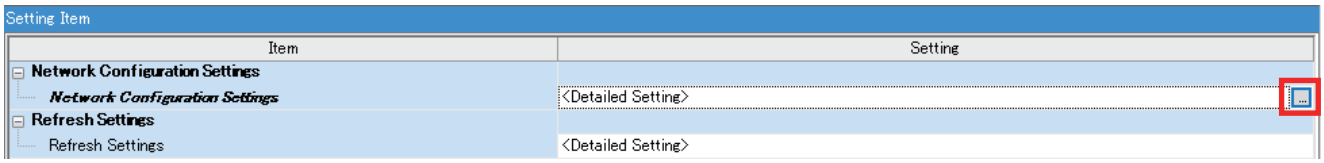


■ System setting window (communication speed setting of the master: 1 Gbps)

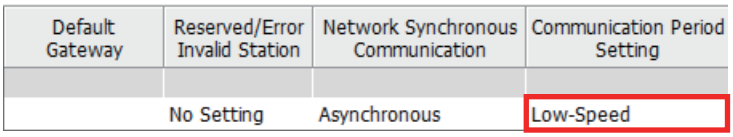
1. Select [Basic Settings] in the "Setting Item List" window.



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 "1000.00 µs" (initial value) for [Communication Period Interval Setting (Do not Set it in Units of 1us)].

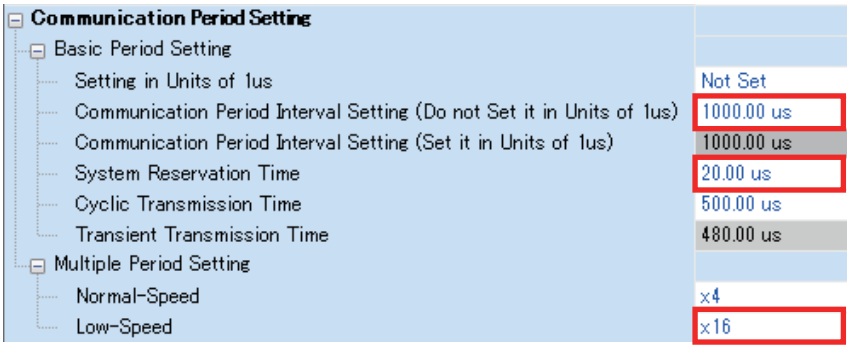
- When RJ71GN11-T2 is the master

Set "20.00 µs" (initial value) for [System Reservation Time].

Consider the scaling factor in [Multiple Period Setting] - [Low-Speed] to change the settings for [Basic Period Setting]. Refer to the following examples.

[Communication Period Interval Setting] = "5000.00 µs" / "16 (initial value)" (minimum value)

[System Reservation Time] = "200.00 µs" / "16 (initial value)" (minimum value)

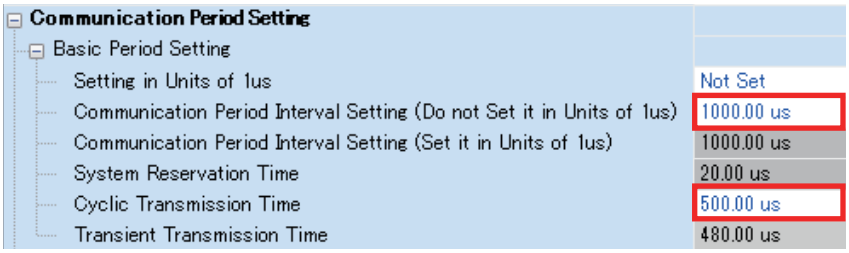


- When FX5-CCLGN-MS is the master

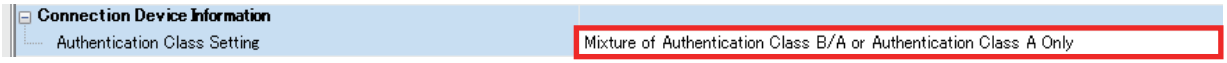
Set "500.00 µs" (initial value) for [Cyclic Transmission Time].

Consider the scaling factor in [Multiple Period Setting] - [Low-Speed] to change the settings for [Basic Period Setting]. Refer to the following examples.

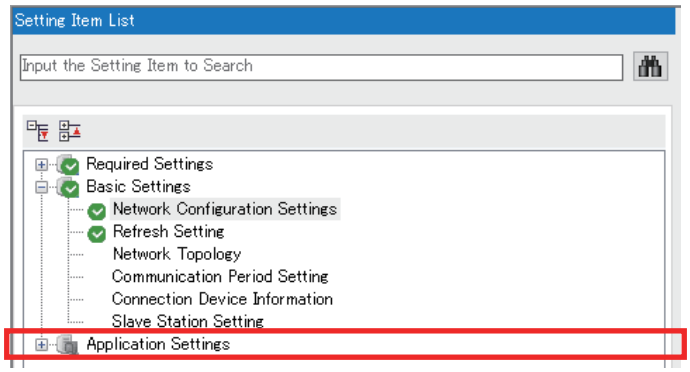
[Communication Period Interval Setting] = "5000.00 µs" / "16 (fixed)" (minimum value)



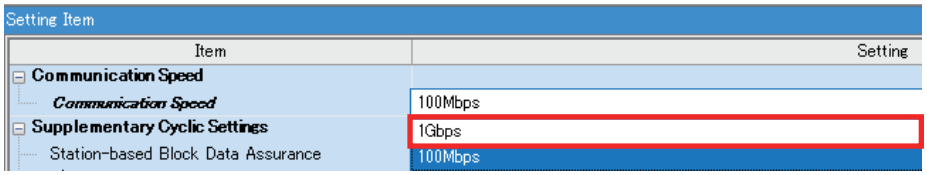
5. Set "Mixture of Authentication Class B/A or Authentication Class A Only" for [Authentication Class Setting].



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

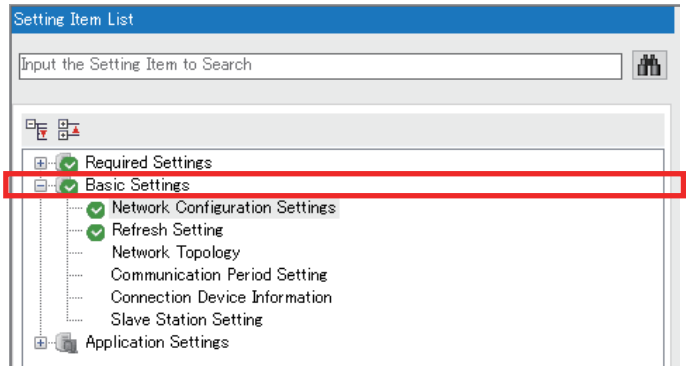


7. Set "1 Gbps" for [Communication Speed].

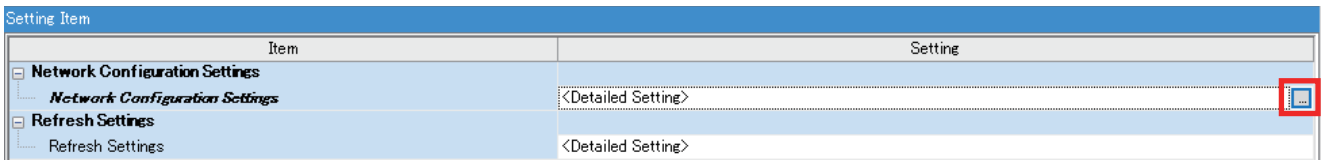


■ System setting window (communication speed setting of the master: 100 Mbps)

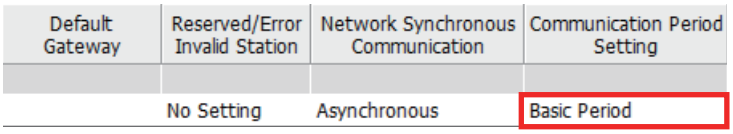
1. Select [Basic Settings] in the "Setting Item List" window.



2. 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 "Basic Period" for [Communication Period Setting].
When [Multiple Period Setting] is used, set "Normal-Speed" or "Low-Speed".

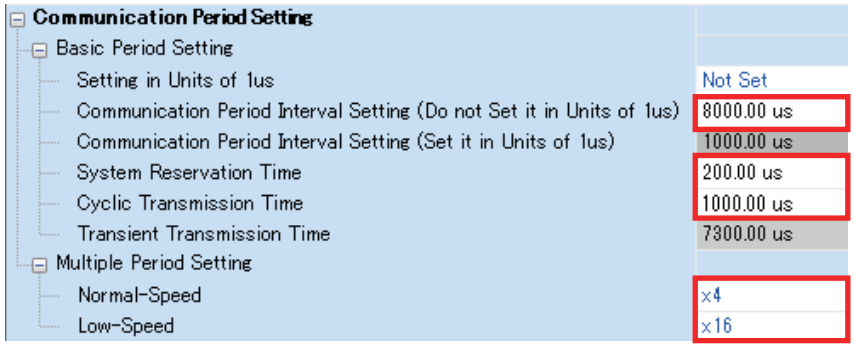


4. Set "5000.00 µs" or larger value for [Communication Period Interval Setting (Do not Set it in Units of 1us)]. Set "200.00 µs" for [System Reservation Time]. Set "1000.00 µs" for [Cyclic Transmission Time].

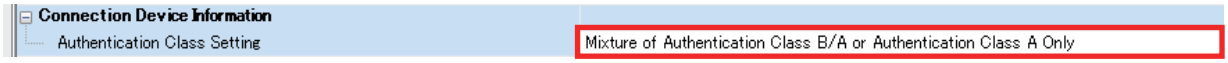
Consider the scaling factor in [Multiple Period Setting] - [Normal-Speed] or [Low-Speed] to change the settings for [Basic Period Setting]. Refer to the following examples.

[Communication Period Interval Setting] = "5000.00 µs" / "16 (initial value for [Low-Speed])" (minimum value)

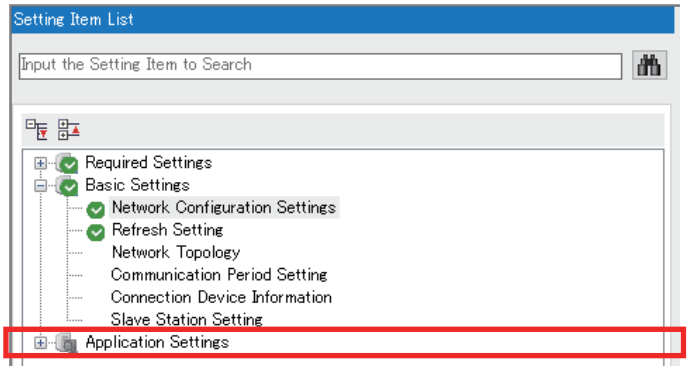
[System Reservation Time] = "200.00 µs" / "16 (initial value for [Low-Speed])" (minimum value)



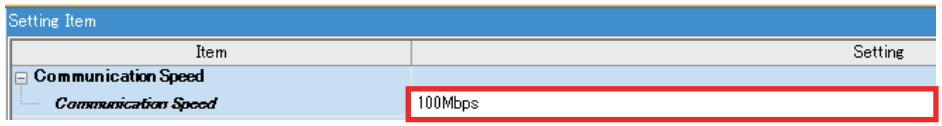
5. Set "Mixture of Authentication Class B/A or Authentication Class A Only" for [Authentication Class Setting].



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



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



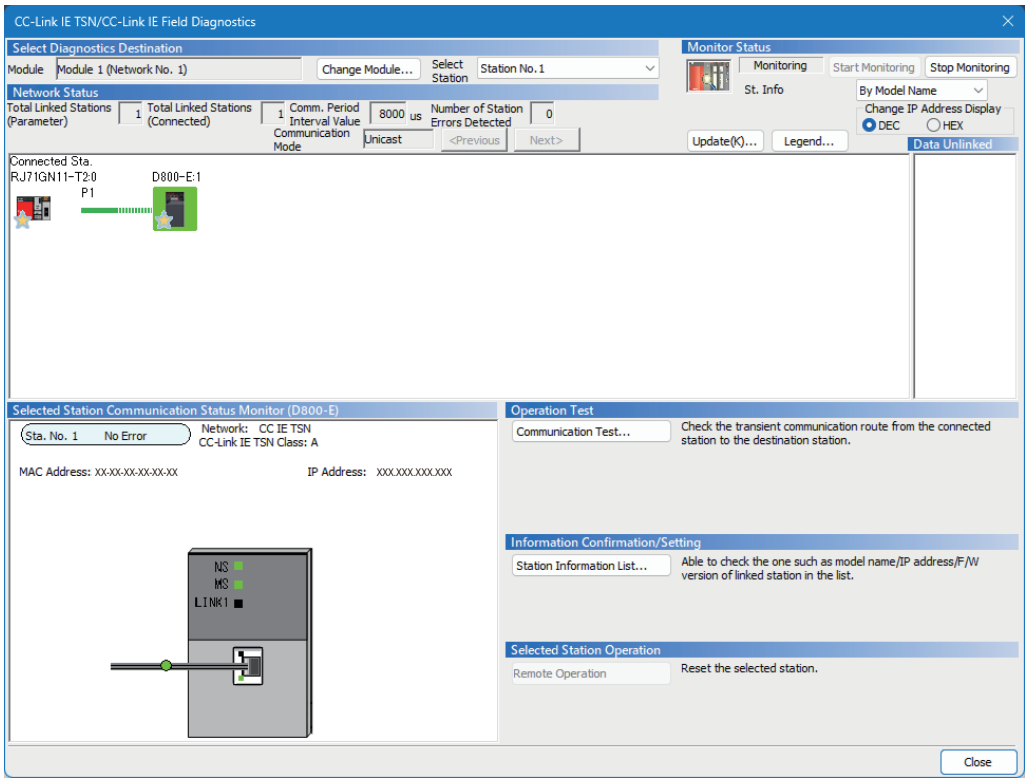
■ Checking communication

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

NS	MS	LINK1
Solid green	Solid green	Blinking green

NOTE

- If the inverter 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.



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 configured 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, 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 for the FR-D800-EPA.
*3 The setting is available for the FR-D800-EPB.

◆ 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 4 and page 173.)

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, 38	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		
1320 to 1329 N810 to N819[*1]	**User Defined Cyclic Communication Input 1 to 10 Mapping**	9999	5[*2], 100[*2], 12288 to 13787, 20488, 20489, 24672, 24703, 24707, 24708	Set the index number for inverter parameters, inverter control parameters, and CiA402 drive profile. Functions can be assigned to remote registers RWwn+4 to RWwn+17 when **Pr.544** = "38".
			9999	Function disabled

Pr.	Name	Initial value	Setting range	Description
1330 to 1343 N850 to N863[*1]	**User Defined Cyclic Communication Output 1 to 14 Mapping**	9999	6[*2], 101[*2], 12288 to 13787, 16384 to 16483, 20488, 20489, 20981 to 20990, 20992, 24639, 24643, 24644, 24673, 24692, 24695, 25858	Set the index number for inverter parameters, monitor data, inverter control parameters, and CiA402 drive profile. Functions can be assigned to remote registers RWrn+4 to RWrn+1F when **Pr.544** = "38".
			9999	Function disabled
1389[*1]	**User Defined Cyclic Communication Input Sub 1 and 2 Mapping**	0	0, 1, 256, 257	**Pr.1389** (lower 8 bits): Subindex to which the index number is specified using **Pr.1320** **Pr.1389** (upper 8 bits): Subindex to which the index number is specified using **Pr.1321**
1390[*1]	**User Defined Cyclic Communication Input Sub 3 and 4 Mapping**	0	0, 1, 256, 257	**Pr.1390** (lower 8 bits): Subindex to which the index number is specified using **Pr.1322** **Pr.1390** (upper 8 bits): Subindex to which the index number is specified using **Pr.1323**
1391[*1]	**User Defined Cyclic Communication Input Sub 5 and 6 Mapping**	0	0, 1, 256, 257	**Pr.1391** (lower 8 bits): Subindex to which the index number is specified using **Pr.1324** **Pr.1391** (upper 8 bits): Subindex to which the index number is specified using **Pr.1325**
1392[*1]	**User Defined Cyclic Communication Input Sub 7 and 8 Mapping**	0	0, 1, 256, 257	**Pr.1392** (lower 8 bits): Subindex to which the index number is specified using **Pr.1326** **Pr.1392** (upper 8 bits): Subindex to which the index number is specified using **Pr.1327**
1393[*1]	**User Defined Cyclic Communication Input Sub 9 and 10 Mapping**	0	0, 1, 256, 257	**Pr.1393** (lower 8 bits): Subindex to which the index number is specified using **Pr.1328** **Pr.1393** (upper 8 bits): Subindex to which the index number is specified using **Pr.1329**
N830 to N839[*1]	**User Defined Cyclic Communication Input Sub 1 to 10 Mapping**	0	0, 1	Subindices to which the index numbers are specified using **Pr.1320 to Pr.1329**
1394[*1]	**User Defined Cyclic Communication Output Sub 1 and 2 Mapping**	0	0, 1, 256, 257	**Pr.1394** (lower 8 bits): Subindex to which the index number is specified using **Pr.1330** **Pr.1394** (upper 8 bits): Subindex to which the index number is specified using **Pr.1331**
1395[*1]	**User Defined Cyclic Communication Output Sub 3 and 4 Mapping**	0	0, 1, 256, 257	**Pr.1395** (lower 8 bits): Subindex to which the index number is specified using **Pr.1332** **Pr.1395** (upper 8 bits): Subindex to which the index number is specified using **Pr.1333**
1396[*1]	**User Defined Cyclic Communication Output Sub 5 and 6 Mapping**	0	0, 1, 256, 257	**Pr.1396** (lower 8 bits): Subindex to which the index number is specified using **Pr.1334** **Pr.1396** (upper 8 bits): Subindex to which the index number is specified using **Pr.1335**
1397[*1]	**User Defined Cyclic Communication Output Sub 7 and 8 Mapping**	0	0, 1, 256, 257	**Pr.1397** (lower 8 bits): Subindex to which the index number is specified using **Pr.1336** **Pr.1397** (upper 8 bits): Subindex to which the index number is specified using **Pr.1337**
1398[*1]	**User Defined Cyclic Communication Output Sub 9 and 10 Mapping**	0	0, 1, 256, 257	**Pr.1398** (lower 8 bits): Subindex to which the index number is specified using **Pr.1338** **Pr.1398** (upper 8 bits): Subindex to which the index number is specified using **Pr.1339**
N870 to N879[*1]	**User Defined Cyclic Communication Output Sub 1 to 10 Mapping**	0	0, 1	Subindices to which the index numbers are specified using **Pr.1330 to Pr.1339**
804 D400	**Torque limit command source selection**	1	1, 3, 5, 6	The torque limit setting method can be selected.
810 H700	**Torque limit input method selection**	0	0, 2	The torque limit input method can be selected.

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

*2 The setting is available for the FR-D800-EPB, but the function is disabled.

◆ Precautions for CC-Link IE TSN communication

- 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
38	Compatible with the octuple setting of CC-Link Ver.2, user defined cyclic communication data selected

◆ 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 33.)

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

■ When Pr.544 = "0, 1, 12, 14, or 18"

- Remote I/O signals

Device No.*7	Signal name	Refer to page
RYn0	Forward rotation command*2	31
RYn1	Reverse rotation command*2	31
RYn2	High-speed operation command (terminal RH function)*1	31
RYn3	Middle-speed operation command (terminal RM function)*1	31
RYn4	Low-speed operation command (terminal RL function)*1	31

Device No.*7	Signal name	Refer to page
RXn0	Forward running	32
RXn1	Reverse running	32
RXn2	Running (terminal RUN function)*3	32
RXn3	Up to frequency*2	32
RXn4	Overload warning*2	32

Device No.[*7]	Signal name	Refer to page
RYn5	JOG operation selection 2[*2]	31
RYn6	Second function selection[*2]	31
RYn7	Current input selection[*2]	31
RYn8	**Pr.185** assignment function (NET X1)[*5]	31
RYn9	Output stop[*2]	31
RYnA	**Pr.186** assignment function (NET X2)[*5]	31
RYnB	Reserved	—
RYnC	Monitor command	31
RYnD	Frequency setting command (RAM)	31
RYnE	Frequency setting command (RAM, EEPROM)	31
RYnF	Instruction code execution request	31
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	31
RY(n+1)B	**Pr.187** assignment function (NET X3)[*5]	31
RY(n+1)C	**Pr.188** assignment function (NET X4)[*5]	31
RY(n+1)D	**Pr.189** assignment function (NET X5)[*5]	31
RY(n+1)E	Reserved	—
RY(n+1)F		

Device No.[*7]	Signal name	Refer to page
RXn5	**Pr.193** assignment function (NET Y1)[*6]	32
RXn6	Frequency detection (terminal FU function)[*3]	32
RXn7	Fault (terminal ABC function)[*3]	32
RXn8	**Pr.194** assignment function (NET Y2)[*6]	32
RXn9	**Pr.313** assignment function (DO0)[*4]	32
RXnA	**Pr.314** assignment function (DO1)[*4]	32
RXnB	**Pr.315** assignment function (DO2)[*4]	32
RXnC	Monitoring	32
RXnD	Frequency setting completion (RAM)	32
RXnE	Frequency setting completion (RAM, EEPROM)	32
RXnF	Instruction code execution completed	32
RX(n+1)0 to RX(n+1)5	Reserved	—
RX(n+1)6	**Pr.195** assignment function (NET Y3)[*6]	32
RX(n+1)7	**Pr.196** assignment function (NET Y4)[*6]	32
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	32
RX(n+1)B	Remote station ready	32
RX(n+1)C to RX(n+1)F	Reserved	—

*1 These signals are set in the initial setting. Using **Pr.180 to Pr.182**, input signals assigned to the device numbers can be changed. For details of **Pr.180 to Pr.182**, refer to the 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 Instruction Manual (Function).

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

*5 Input signals can be assigned using **Pr.185 to Pr.189**. For details, refer to the description of **Pr.185 to Pr.189 (Input terminal function selection)** in the 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 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	33
RWwn+1	Set frequency (0.01 Hz increments)[*2]		33
RWwn+2	Link parameter extended setting	Instruction code	33
RWwn+3	Data to be written		33
RWwn+4	Monitor code 3		33
RWwn+5	Monitor code 4		33
RWwn+6	Monitor code 5		33
RWwn+7	Monitor code 6		33
RWwn+8	Fault record No.	H00	33
RWwn+9	PID set point (0.01% increments)[*1]		33
RWwn+A	PID measured value (0.01% increments)[*1]		33

Address[*5]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value[*3]		34
RWrn+1	Second monitor value[*3]		34
RWrn+2	Reply code 2	Reply code 1	34
RWrn+3	Data to be read		34
RWrn+4	Third monitor value[*3]		34
RWrn+5	Fourth monitor value[*3]		34
RWrn+6	Fifth monitor value[*3]		34
RWrn+7	Sixth monitor value[*3]		34
RWrn+8	Fault record No.	Fault record (fault data)	34
RWrn+9	Fault record (output frequency)[*4]		34
RWrn+A	Fault record (output current)		34

Address[*5]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn+B	PID deviation (0.01% increments)[*1]		33
RWwn+C	Torque limit		33, 43
RWwn+D	H00 (Free)		—
RWwn+E			
RWwn+F			
RWwn+10	Link parameter extended setting	Instruction code	33
RWwn+11	Data to be written		33
RWwn+12	Link parameter extended setting	Instruction code	33
RWwn+13	Data to be written		33
RWwn+14	Link parameter extended setting	Instruction code	33
RWwn+15	Data to be written		33
RWwn+16	Link parameter extended setting	Instruction code	33
RWwn+17	Data to be written		33
RWwn+18	Link parameter extended setting	Instruction code	33
RWwn+19	Data to be written		33
RWwn+1A	H00 (Free)		—
RWwn+1B			
RWwn+1C			
RWwn+1D			
RWwn+1E			
RWwn+1F			

Address[*5]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn+B	Fault record (output voltage)		34
RWrn+C	Fault record (energization time)		35
RWrn+D	H00 (Free)		—
RWrn+E			
RWrn+F			
RWrn+10	Reply code		35
RWrn+11	Data to be read		35
RWrn+12	Reply code		35
RWrn+13	Data to be read		35
RWrn+14	Reply code		35
RWrn+15	Data to be read		35
RWrn+16	Reply code		35
RWrn+17	Data to be read		35
RWrn+18	Reply code		35
RWrn+19	Data to be read		35
RWrn+1A	H00 (Free)		—
RWrn+1B			
RWrn+1C			
RWrn+1D			
RWrn+1E			
RWrn+1F			

*1 Validity depends on the **Pr.128, Pr.609, and Pr.610** settings. For details, refer to the Instruction Manual (Function). If the data outside the range is set, the previous setting is retained.
*2 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**.
*3 When the item displayed in frequency is selected, the **Pr.37 and Pr.53** settings are invalid.
*4 The frequency is always displayed regardless of the settings in **Pr.37 and Pr.53**.
*5 "n" indicates a value determined by the station number.

■ When Pr.544 = "38" (user defined cyclic communication data selection)

- Remote I/O signals

Device No.[*7]	Signal name	Refer to page
RYn0	Forward rotation command[*2]	31
RYn1	Reverse rotation command[*2]	31
RYn2	High-speed operation command (terminal RH function)[*1]	31
RYn3	Middle-speed operation command (terminal RM function)[*1]	31
RYn4	Low-speed operation command (terminal RL function)[*1]	31
RYn5	JOG operation selection 2[*2]	31
RYn6	Second function selection[*2]	31
RYn7	Current input selection[*2]	31
RYn8	**Pr.185** assignment function (NET X1)[*5]	31
RYn9	Output stop[*2]	31
RYnA	**Pr.186** assignment function (NET X2)[*5]	31
RYnB	Reserved	—
RYnC	Monitor command	31
RYnD	Frequency setting command (RAM)	31
RYnE	Frequency setting command (RAM, EEPROM)	31
RYnF	Instruction code execution request	31

Device No.[*7]	Signal name	Refer to page
RXn0	Forward running	32
RXn1	Reverse running	32
RXn2	Running (terminal RUN function)[*3]	32
RXn3	Up to frequency[*2]	32
RXn4	Overload warning[*2]	32
RXn5	**Pr.193** assignment function (NET Y1)[*6]	32
RXn6	Frequency detection (terminal FU function)[*3]	32
RXn7	Fault (terminal ABC function)[*3]	32
RXn8	**Pr.194** assignment function (NET Y2)[*6]	32
RXn9	**Pr.313** assignment function (DO0)[*4]	32
RXnA	**Pr.314** assignment function (DO1)[*4]	32
RXnB	**Pr.315** assignment function (DO2)[*4]	32
RXnC	Monitoring	32
RXnD	Frequency setting completion (RAM)	32
RXnE	Frequency setting completion (RAM, EEPROM)	32
RXnF	Instruction code execution completed	32

Device No.[*7]	Signal name	Refer to page
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	31
RY(n+1)B	**Pr.187** assignment function (NET X3)[*5]	31
RY(n+1)C	**Pr.188** assignment function (NET X4)[*5]	31
RY(n+1)D	**Pr.189** assignment function (NET X5)[*5]	31
RY(n+1)E	User defined cyclic communication input writing request	31
RY(n+1)F	Reserved	—

Device No.[*7]	Signal name	Refer to page
RX(n+1)0 to RX(n+1)5	Reserved	—
RX(n+1)6	**Pr.195** assignment function (NET Y3)[*6]	32
RX(n+1)7	**Pr.196** assignment function (NET Y4)[*6]	32
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	32
RX(n+1)B	Remote station ready	32
RX(n+1)C to RX(n+1)F	Reserved	—

*1 These signals are set in the initial setting. Using **Pr.180 to Pr.182**, input signals assigned to the device numbers can be changed. For details of **Pr.180 to Pr.182**, refer to the 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 Instruction Manual (Function).

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

*5 Input signals can be assigned using **Pr.185 to Pr.189**. For details, refer to the description of **Pr.185 to Pr.189 (Input terminal function selection)** in the 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 Instruction Manual (Function).

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

- Remote registers

Address[*3]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	34
RWwn+1	Set frequency (0.01 Hz increments)[*1]		34
RWwn+2	Link parameter extended setting	Instruction code	34
RWwn+3	Data to be written		34
RWwn+4	User Defined Cyclic Communication Input 1 Mapping (**Pr.1320**), lower 16 bits		34
RWwn+5	User Defined Cyclic Communication Input 1 Mapping (**Pr.1320**), upper 16 bits		34
RWwn+6	User Defined Cyclic Communication Input 2 Mapping (**Pr.1321**), lower 16 bits		34
RWwn+7	User Defined Cyclic Communication Input 2 Mapping (**Pr.1321**), upper 16 bits		34
RWwn+8	User Defined Cyclic Communication Input 3 Mapping (**Pr.1322**), lower 16 bits		34
RWwn+9	User Defined Cyclic Communication Input 3 Mapping (**Pr.1322**), upper 16 bits		34
RWwn+A	User Defined Cyclic Communication Input 4 Mapping (**Pr.1323**), lower 16 bits		34
RWwn+B	User Defined Cyclic Communication Input 4 Mapping (**Pr.1323**), upper 16 bits		34

Address[*3]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value[*2]		35
RWrn+1	Second monitor value[*2]		35
RWrn+2	Reply code 2	Reply code 1	35
RWrn+3	Data to be read		35
RWrn+4	User Defined Cyclic Communication Output 1 Mapping (**Pr.1330**), lower 16 bits		35
RWrn+5	User Defined Cyclic Communication Output 1 Mapping (**Pr.1330**), upper 16 bits		35
RWrn+6	User Defined Cyclic Communication Output 2 Mapping (**Pr.1331**), lower 16 bits		35
RWrn+7	User Defined Cyclic Communication Output 2 Mapping (**Pr.1331**), upper 16 bits		35
RWrn+8	User Defined Cyclic Communication Output 3 Mapping (**Pr.1332**), lower 16 bits		35
RWrn+9	User Defined Cyclic Communication Output 3 Mapping (**Pr.1332**), upper 16 bits		35
RWrn+A	User Defined Cyclic Communication Output 4 Mapping (**Pr.1333**), lower 16 bits		35
RWrn+B	User Defined Cyclic Communication Output 4 Mapping (**Pr.1333**), upper 16 bits		35

Address[*3]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn+C	User Defined Cyclic Communication Input 5 Mapping (**Pr.1324**), lower 16 bits		34
RWwn+D	User Defined Cyclic Communication Input 5 Mapping (**Pr.1324**), upper 16 bits		34
RWwn+E	User Defined Cyclic Communication Input 6 Mapping (**Pr.1325**), lower 16 bits		34
RWwn+F	User Defined Cyclic Communication Input 6 Mapping (**Pr.1325**), upper 16 bits		34
RWwn+10	User Defined Cyclic Communication Input 7 Mapping (**Pr.1326**), lower 16 bits		34
RWwn+11	User Defined Cyclic Communication Input 7 Mapping (**Pr.1326**), upper 16 bits		34
RWwn+12	User Defined Cyclic Communication Input 8 Mapping (**Pr.1327**), lower 16 bits		34
RWwn+13	User Defined Cyclic Communication Input 8 Mapping (**Pr.1327**), upper 16 bits		34
RWwn+14	User Defined Cyclic Communication Input 9 Mapping (**Pr.1328**), lower 16 bits		34
RWwn+15	User Defined Cyclic Communication Input 9 Mapping (**Pr.1328**), upper 16 bits		34
RWwn+16	User Defined Cyclic Communication Input 10 Mapping (**Pr.1329**), lower 16 bits		34
RWwn+17	User Defined Cyclic Communication Input 10 Mapping (**Pr.1329**), upper 16 bits		34
RWwn+18	H00 (Free)		—
RWwn+19			
RWwn+1A			
RWwn+1B			
RWwn+1C			
RWwn+1D			
RWwn+1E			
RWwn+1F			

Address[*3]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn+C	User Defined Cyclic Communication Output 5 Mapping (**Pr.1334**), lower 16 bits		35
RWrn+D	User Defined Cyclic Communication Output 5 Mapping (**Pr.1334**), upper 16 bits		35
RWrn+E	User Defined Cyclic Communication Output 6 Mapping (**Pr.1335**), lower 16 bits		35
RWrn+F	User Defined Cyclic Communication Output 6 Mapping (**Pr.1335**), upper 16 bits		35
RWrn+10	User Defined Cyclic Communication Output 7 Mapping (**Pr.1336**), lower 16 bits		35
RWrn+11	User Defined Cyclic Communication Output 7 Mapping (**Pr.1336**), upper 16 bits		35
RWrn+12	User Defined Cyclic Communication Output 8 Mapping (**Pr.1337**), lower 16 bits		35
RWrn+13	User Defined Cyclic Communication Output 8 Mapping (**Pr.1337**), upper 16 bits		35
RWrn+14	User Defined Cyclic Communication Output 9 Mapping (**Pr.1338**), lower 16 bits		35
RWrn+15	User Defined Cyclic Communication Output 9 Mapping (**Pr.1338**), upper 16 bits		35
RWrn+16	User Defined Cyclic Communication Output 10 Mapping (**Pr.1339**), lower 16 bits		35
RWrn+17	User Defined Cyclic Communication Output 10 Mapping (**Pr.1339**), upper 16 bits		35
RWrn+18	User Defined Cyclic Communication Output 11 Mapping (**Pr.1340**), lower 16 bits		35
RWrn+19	User Defined Cyclic Communication Output 11 Mapping (**Pr.1340**), upper 16 bits		35
RWrn+1A	User Defined Cyclic Communication Output 12 Mapping (**Pr.1341**), lower 16 bits		35
RWrn+1B	User Defined Cyclic Communication Output 12 Mapping (**Pr.1341**), upper 16 bits		35
RWrn+1C	User Defined Cyclic Communication Output 13 Mapping (**Pr.1342**), lower 16 bits		35
RWrn+1D	User Defined Cyclic Communication Output 13 Mapping (**Pr.1342**), upper 16 bits		35
RWrn+1E	User Defined Cyclic Communication Output 14 Mapping (**Pr.1343**), lower 16 bits		35
RWrn+1F	User Defined Cyclic Communication Output 14 Mapping (**Pr.1343**), upper 16 bits		35

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

*2 When the item displayed in frequency is selected, the **Pr.37 and Pr.53** settings are invalid.

*3 "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 name	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[*2]	MRS signal	
RYA	— (terminal NET X2 function)[*3]	The function assigned to **Pr.186** 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 (RAM)	When "1" is set in RYD, the set frequency (RWw1) is written to the RAM of the inverter.[*4] After the writing completes, "1" is set in the frequency setting completion (RXD). Under PM sensorless vector control, the torque limit value is also written to the RAM at the same time.	
RYE	Frequency setting command (RAM, EEPROM)	When "1" is set in RYE, the set frequency (RWw1) is written to the RAM and EEPROM of the inverter. After the writing completes, "1" is set in the frequency setting completion (RXE). Under PM sensorless vector control, the torque limit value is also written to the RAM and EEPROM at the same time. To change the frequency consecutively, be sure to write data to the RAM of the inverter.	
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]		
RY1E	User defined cyclic communication input writing request	When "1" is set in RY1E, data set in RWw4 to RWw17 are written to the corresponding parameters that have the index numbers specified using **Pr.1320 to Pr.1329**. While "1" is set in RY1E, the data is always updated. The response time to write data is 100 ms at the most.	

*1 These signals are set in the initial setting. Using **Pr.180 to Pr.182**, 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.182, Pr.338, and Pr.339**, refer to the 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.185 to Pr.189** to assign signals to RY8, RYA, RYB, and RY1B to RY1D.
For details, refer to the description of **Pr.185 to Pr.189 (Input terminal function selection)** in the 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 220 for operation conditions of inverter reset.

■ 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 name	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 completion (RAM)	After "1" is set in the frequency setting command (RYD) and the frequency setting is written to the RAM of the inverter, "1" is set for this signal. When "0" is set in the frequency setting command (RYD), "0" is set for this signal.
RXE	Frequency setting completion (RAM, EEPROM)	After "1" is set in the frequency setting command (RYE) and the frequency setting 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 (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 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.313 to Pr.315 (Output terminal function selection)** in the 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 Instruction Manual (Function).

◆ Details of the remote register

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

- Remote register description (when **Pr.544** = "0, 1, 12, 14, or 18")

Device No.	Signal name	Description	
RWw0	Monitor code 1, 2	Set the monitor code to be monitored (refer to page 38). When "1" is set in RYC, data of the specified monitor item will be stored in RWr0 and 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 37) 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 record No.	Set the individual fault number of the fault history that you want to read. Fault records can be read back to the tenth latest fault. (The value in the lower 8 bits is fixed to H00.) Upper 8 bits: H00 (latest fault) to H09 (tenth latest fault) When H0A to HFF is set to the lower 8 bits, "0" is returned.	
RWw9	PID set point*3	Set the PID 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 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 limit value	When **Pr.804** = "3 or 5" and **Pr.810 Torque limit input method selection** = "2" under PM sensorless vector control, torque limit 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 (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 37) 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 the details, refer to the 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 to 327.67 Hz (-32768 to 32767), 0.01 Hz increments.
For the details, refer to page 26.

*3 Validity depends on the **Pr.128, Pr.609, and Pr.610** settings. For the details, refer to the Instruction Manual (Function). If the data outside the range is set, the previous setting is retained.

- Remote register description (when **Pr.544** = "38")

Device No.	Signal name	Description
RWw0	Monitor code 1, 2	Set the monitor code to be monitored (refer to page 38). When "1" is set in RYC, data of the specified monitor item will be stored in RWr0 and 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 37) 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 to RWw17	User defined cyclic communication input data selection	Data set in RWw4 to RWw17 are written to the corresponding parameters that have the index numbers specified using **Pr.1320 to Pr.1329**. When "20488 or 20489" is set in any of **Pr.1320 to Pr.1329**, the input value set in the corresponding register is invalid. While "1" is set in RY1E, the data is always updated. If the same index number is specified in two or more of **Pr.1320 to Pr.1329**, the number set in the parameter with the smallest parameter number is valid. The same number set in the other parameters is regarded as "9999". When a nonexistent index number or "9999" is set in **Pr.1320 to Pr.1329**, the data will be ignored. When the referenced index number is set for 16-bit data, the upper 16-bit data will be ignored.

*1 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**. For the details, refer to the 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 to 327.67 Hz (-32768 to 32767), 0.01 Hz increments.
For the details, refer to page 26.

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

- Remote register description (when **Pr.544** = "0, 1, 12, 14, or 18")

Device No.	Signal name	Description
RWr0	First monitor value*1	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)	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 limit) is set. (Refer to page 36.)
	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 36.)
RWr3	Data to be read	In a normal reply, a replay code for the instruction code is set.
RWr4	Third monitor value*1	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	
RWr6	Fifth monitor value*1	
RWr7	Sixth monitor value*1	
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)*2	The output frequency at the fault is stored for the fault record No. specified in RWw8.
RWrA	Fault record (output current)	The output current at the fault is always stored for the fault record No. specified in RWw8.
RWrB	Fault record (output voltage)	The output voltage at the fault is always stored for the fault record No. specified in RWw8.

Device No.	Signal name	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 36.)
	Data to be read	In a normal reply, a replay code for the instruction code is set.

*1 When the item displayed in frequency is selected, the **Pr.37 and Pr.53** settings are invalid.

*2 The frequency is always displayed regardless of the settings in **Pr.37 and Pr.53**.

- Remote register description (when **Pr.544** = "38")

Device No.	Signal name	Description
RWr0	First monitor value*1	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)	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 limit) is set. (Refer to page 36.)
	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 36.)
RWr3	Data to be read	In a normal reply, a replay code for the instruction code is set.
RWr4 to RWr1F	User defined cyclic communication output data selection	Data to which the index numbers are specified using **Pr.1330 to Pr.1343** are always stored in the corresponding registers. When a nonexistent index number or "9999" is set in **Pr.1330 to Pr.1343**, "0" is always stored. When the referenced index number is set for 16-bit data, "0" is always stored in the upper 16-bit data.

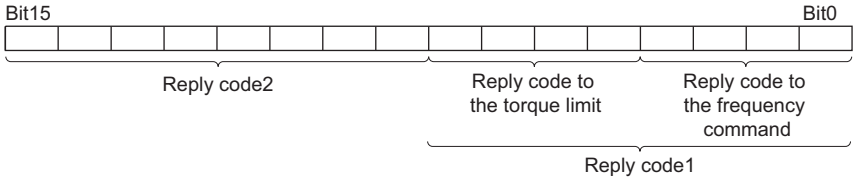
*1 When the item displayed in frequency is selected, the **Pr.37 and Pr.53** settings are invalid.

- Reply code description

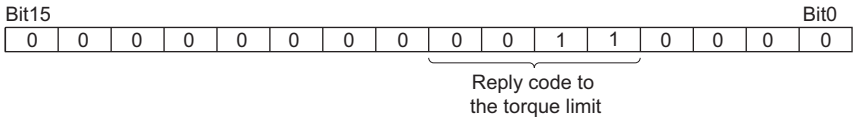
  The reply to the instruction execution command is set in RWr2, 10, 12, 14, 16, and 18. After the frequency setting (RYD or RYE) or execution of instruction code (RYF), check the reply code (RWr2) in the remote register.

Item	Data	Item	Fault 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 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 the torque is limited. The upper 4 bits of the reply code 1 are used as the reply code to the torque limit, and the lower 4 bits are used as the reply code to the frequency command.



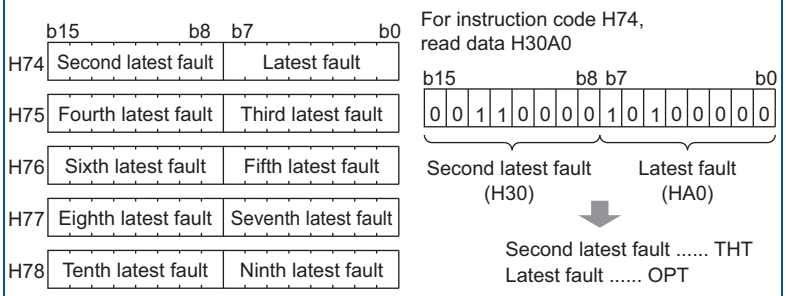
Example) When the torque limit is out of the setting range, the data is H0030.



■ Instruction code

Set instruction codes using the remote register (RWw). (Refer to page 33.)

The data read by the instruction code is stored in the remote register (RWr). (Refer to page 34.)

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")
Monitor	Output frequency / rotations per minute (machine speed)*1	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 Instruction Manual (Function).)
	Output current	Read	H70	H0000 to HFFFF Output current (hexadecimal) in 0.01 A increments
	Output voltage	Read	H71	H0000 to HFFFF Output voltage (hexadecimal) in 0.1 V increments
	Special monitor	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 38.
		Write	HF3*2	
	Fault record	Read	H74 to H78	H0000 to HFFFF: Two fault records per code. For the data codes or details of fault records, refer to the Instruction Manual (Maintenance). 
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 Instruction Manual (Function).)
Set frequency (EEPROM)			H6E	
Set frequency (RAM)*3		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 Instruction Manual (Function).) To change the set frequency consecutively, write data to the inverter RAM. (Instruction code: HED)
Set frequency (RAM and EEPROM)*3			HEE	
Parameter		Read	H00 to H63	• Refer to the instruction code list in the Instruction Manual (Function) to read/ write parameters 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 217.)
		Write	H80 to HE3	
Fault history clear		Write	HF4	H9696: Fault history is cleared.

Item	Read/ write	Instruction code	Data description
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[*4]: Communication parameters are not cleared. • All parameter clear H9966: Communication parameters are cleared. H55AA[*4]: Communication parameters are not cleared. For details on whether or not to clear parameters, refer to the 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.
Second parameter changing[*5]	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[*6] 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 Write data is in hexadecimal, and only the last two digits are valid. (The upper two digits are ignored.)

*3 Setting from the remote register (RWw1) is also available.

*4 Turning OFF the power supply while clearing parameters with H5A5A or H55AA returns the communication parameter settings to the initial settings.

*5 Reading or writing is available when the link parameter extended setting = "1 or 9".

*6 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 on the monitor codes or monitor items, refer to the monitor display section in the Instruction Manual (Function).
- When the item displayed in frequency is selected in the remote registers, RWw0 and RWw4 to RWw7, the **Pr.37 and Pr.53** settings are invalid.

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

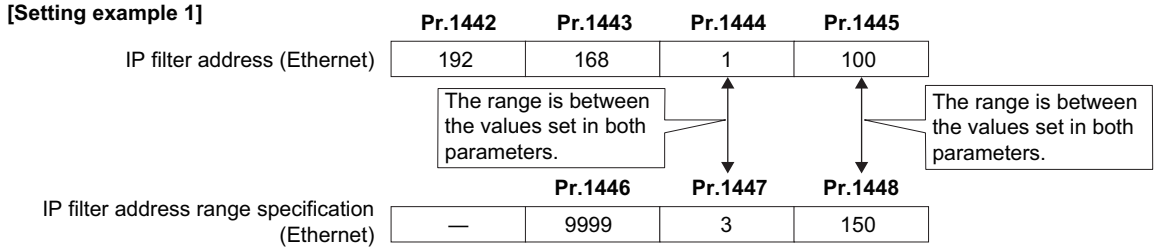
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

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)

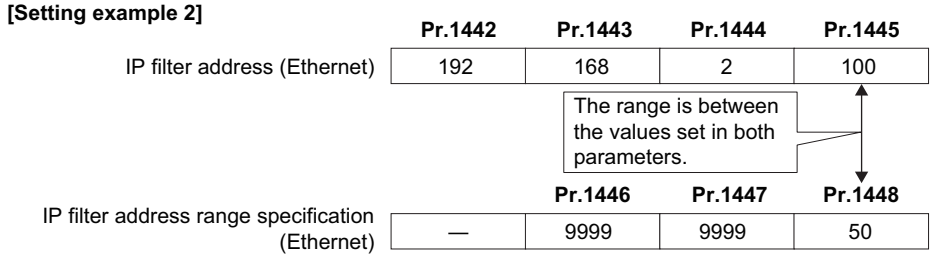
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either 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 details on external devices used to control access rights, contact the distributors of the external devices.)

◆ User defined cyclic communication data selection (Pr.1320 to Pr.1343, Pr.1389 to Pr.1398)

- To enable the user defined cyclic communication data selection, set **Pr.544** = "38".
- Users can select communication data using **Pr.1320 to Pr.1329 User Defined Cyclic Communication Input 1 to 10 Mapping and Pr.1330 to Pr.1343 User Defined Cyclic Communication Output 1 to 14 Mapping**.
- In **Pr.1389 to Pr.1398**, specify the subindices to which the index numbers are specified using **Pr.1320 to Pr.1339**.

Data No.	Input data selection (from the master module to the inverter)		Output data selection (from the inverter to the master module)	
	Index specification	Sub index specification	Index specification	Sub index specification
1	**Pr.1320**	**Pr.1389 (lower 8 bits)**	**Pr.1330**	**Pr.1394 (lower 8 bits)**
2	**Pr.1321**	**Pr.1389 (upper 8 bits)**	**Pr.1331**	**Pr.1394 (upper 8 bits)**
3	**Pr.1322**	**Pr.1390 (lower 8 bits)**	**Pr.1332**	**Pr.1395 (lower 8 bits)**
4	**Pr.1323**	**Pr.1390 (upper 8 bits)**	**Pr.1333**	**Pr.1395 (upper 8 bits)**
5	**Pr.1324**	**Pr.1391 (lower 8 bits)**	**Pr.1334**	**Pr.1396 (lower 8 bits)**
6	**Pr.1325**	**Pr.1391 (upper 8 bits)**	**Pr.1335**	**Pr.1396 (upper 8 bits)**
7	**Pr.1326**	**Pr.1392 (lower 8 bits)**	**Pr.1336**	**Pr.1397 (lower 8 bits)**
8	**Pr.1327**	**Pr.1392 (upper 8 bits)**	**Pr.1337**	**Pr.1397 (upper 8 bits)**
9	**Pr.1328**	**Pr.1393 (lower 8 bits)**	**Pr.1338**	**Pr.1398 (lower 8 bits)**
10	**Pr.1329**	**Pr.1393 (upper 8 bits)**	**Pr.1339**	**Pr.1398 (upper 8 bits)**
11	—	—	**Pr.1340**	Fixed to 0
12	—	—	**Pr.1341**	
13	—	—	**Pr.1342**	
14	—	—	**Pr.1343**	

- The following tables describe the index numbers of inverter parameters (read/write), monitor data (read), inverter control parameters (read), and CiA402 drive profile (read/write).
- Inverter parameters

Index	Sub index	Read/write	Remarks
12288 to 13787 (H3000 to H35DB)	0, 1	Read/write	The inverter parameter number + 12288 (H3000) is the index number.

- Calibration parameters

Index	Sub index	Name	Description
13189 (H3385)	0	Data	**C1 (Pr.901)**
	1	Sub Data	—
13190 (H3386)	0	Data	**C2 (Pr.902)**
	1	Sub Data	**C3 (Pr.902)**
13191 (H3387)	0	Data	**125 (Pr.903)**
	1	Sub Data	**C4 (Pr.903)**
13192 (H3388)	0	Data	**C5 (Pr.904)**
	1	Sub Data	**C6 (Pr.904)**
13193 (H3389)	0	Data	**126 (Pr.905)**
	1	Sub Data	**C7 (Pr.905)**
13222 (H33A6)	0	Data	**C42 (Pr.934)**
	1	Sub Data	**C43 (Pr.934)**
13223 (H33A7)	0	Data	**C44 (Pr.935)**
	1	Sub Data	**C45 (Pr.935)**

For the numbers and names of inverter parameters, refer to the parameter list of the Instruction Manual (Function).

NOTE

- Set 65520 (HFFF0) as a parameter value "8888" and 65535 (HFFFF) as "9999".
- When parameter write is performed, data are written to RAM.

- Monitor data

Index	Sub index	Read/write	Remarks
16384 to 16483 (H4000 to H4063)	0	Read	The monitor code + 16384 (H4000) is the index number.

For details of the monitor codes and monitor items, refer to the description of **Pr.52** in the Instruction Manual (Function).

NOTE

- The display can be changed from the frequency to rotations per minute (machine speed) using **Pr.53**. When the machine speed is displayed, the value is incremented by one.

- Inverter control parameter

Index	Sub index	Name	Read/write	Remarks
20488 (H5008)	0	Inverter status (extended)*1	Read	Refer to page 41.
20489 (H5009)	0	Inverter status*1	Read	Refer to page 41.
20981 (H51F5)	0	Fault record 1	Read	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).)
20982 (H51F6)	0	Fault record 2	Read	
20983 (H51F7)	0	Fault record 3	Read	
20984 (H51F8)	0	Fault record 4	Read	
20985 (H51F9)	0	Fault record 5	Read	
20986 (H51FA)	0	Fault record 6	Read	
20987 (H51FB)	0	Fault record 7	Read	
20988 (H51FC)	0	Fault record 8	Read	
20989 (H51FD)	0	Fault record 9	Read	
20990 (H51FE)	0	Fault record 10	Read	
20992 (H5200)	0	Safety input status	Read	Refer to page 42.

*1 When "20488 or 20489" is set in any of **Pr.1320 to Pr.1329**, the input value set in the corresponding register is invalid.

- Inverter status, inverter status (extended)

Bit	Definition
	Inverter status
0	RUN (Inverter running)*1
1	During forward rotation
2	During reverse rotation
3	Up to frequency
4	Overload warning
5	0
6	FU (Output frequency detection)*1
7	ABC (Fault)*1
8	0
9	Safety monitor output 2
10	0
11	0
12	0
13	0
14	0
15	Fault occurrence

Bit	Definition
	Inverter status (extended)
0	NET Y1 (0)*1
1	NET Y2 (0)*1
2	NET Y3 (0)*1
3	NET Y4 (0)*1
4	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.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).

- Safety input status

Bit	Definition
0	0: Terminal S1 ON 1: Terminal S1 OFF (output shutoff)
1	0: Terminal S2 ON 1: Terminal S2 OFF (output shutoff)
2 to 15	0

- CiA402 drive profile

Index	Sub index	Name	Description	Read/write	Data type
24639 (H603F)	0	Error code	Error number The error code of the latest fault that occurred after power-ON or an inverter reset is returned. When no fault occurs, no error is returned. When the fault history is cleared during occurrence of a fault, no error is returned. The upper eight bits are fixed to FF, and the lower eight bits represent the error code. (HFFXX: "XX" represents the error code.) (For details on error codes, refer to the list of fault displays in the Instruction Manual (Maintenance).)	Read	Unsigned16
24643 (H6043)	0	vl velocity demand	Output frequency (r/min)*1 The output frequency is read in r/min. Monitoring range: -32768 (H8000) to 32767 (H7FFF) When **Pr.81** = "9999", the number of motor poles is regarded as 4.	Read	Integer16
24644 (H6044)	0	vl velocity actual value	Operation speed (r/min)*1 The operation speed is read in r/min. Monitoring range: -32768 (H8000) to 32767 (H7FFF) When **Pr.81** = "9999", the number of motor poles is regarded as 4.	Read	Integer16
24672 (H6060)	0	Modes of operation	Control mode: -1 (vendor specific operation mode) (fixed)	Read/write	Integer8
24673 (H6061)	0	Modes of operation display	Current control mode: -1 (vendor specific operation mode) (fixed)	Read	Integer8
24692 (H6074)	0	Torque demand	Torque demand value (%) The torque command is read.	Read	Integer16
24695 (H6077)	0	Torque actual value	Torque actual value (%) The motor torque is read.	Read	Integer16
24703 (H607F)	0	Max profile velocity	Maximum profile speed (r/min) Set **Pr.18 High speed maximum frequency** in r/min. Setting range: 0 to 590 Hz	Read/write	Unsigned32
24707 (H6083)	0	Profile acceleration	Acceleration time constant (ms) Set **Pr.7 Acceleration time** in ms. Setting range: 0 to 3600 s The last two digits are rounded off when **Pr.21 Acceleration/ deceleration time increments** = "0", and the last digit is rounded off when **Pr.21** = "1".	Read/write	Unsigned32
24708 (H6084)	0	Profile deceleration	Deceleration time constant (ms) Set **Pr.8 Deceleration time** in ms. Setting range: 0 to 3600 s The last two digits are rounded off when **Pr.21 Acceleration/ deceleration time increments** = "0", and the last digit is rounded off when **Pr.21** = "1".	Read/write	Unsigned32
25858 (H6502)	0	Supported drive modes	Supported control mode: H00010000 (vendor specific operation mode)	Read	Unsigned32

*1 The value is displayed and set in r/min regardless of the settings in **Pr.53**.
The frequency is converted to the rotation speed for reading, and the setting value is converted to the frequency for writing.

■ Setting example

- The following table shows example settings when user defined cyclic communication data are selected (when **Pr.544** = "38"). When "1" is set in RY(n+1)E (writing request for user defined cyclic communication input data), data in RWwn+4 and RWwn+6 are written to the specified inverter parameters in the RAM. (The response time to write the data is 100 ms at the most.)

Pr.	Name	Setting example	Description	Applicable device No.
1320	**User Defined Cyclic Communication Input 1 Mapping**	12295 (H3007)	**Pr.7 Acceleration time** 7 (H0007) + 12288 (H3000)	RWwn+4
1321	**User Defined Cyclic Communication Input 2 Mapping**	12296 (H3008)	**Pr.8 Deceleration time** 8 (H0008) + 12288 (H3000)	RWwn+6
1330	**User Defined Cyclic Communication Output 1 Mapping**	12295 (H3007)	**Pr.7 Acceleration time** 7 (H0007) + 12288 (H3000)	RWrn+4
1331	**User Defined Cyclic Communication Output 2 Mapping**	12296 (H3008)	**Pr.8 Deceleration time** 8 (H0008) + 12288 (H3000)	RWrn+6
1332	**User Defined Cyclic Communication Output 3 Mapping**	16386 (H4002)	Output current monitor 2 (H0002) + +16384 (H4000)	RWrn+8
1333	**User Defined Cyclic Communication Output 4 Mapping**	12543 (H30FF)	**Pr.255 Life alarm status display** 255 (H00FF) + 12288 (H3000)	RWrn+A
1334	**User Defined Cyclic Communication Output 5 Mapping**	20981 (H51F5)	Fault record 1	RWrn+C

◆ Torque limit by CC-Link IE TSN

The torque can be limited by CC-Link IE TSN communication under PM sensorless vector control. To limit the torque, set **Pr.810 Torque limit input method selection** = "2". The torque limit setting method can be selected using **Pr.804 Torque limit command source selection**.

Pr.	Name	Initial value	Setting range	Description
804	**Torque limit command source selection**	1	1	Torque limit by CC-Link IE TSN • Torque limit (-400% to 400%) by the parameter setting (**Pr.805** or **Pr.806**)*1*2
			3	Torque limit by CC-Link IE TSN • Torque limit (-400% to 400%) by the parameter setting (**Pr.805** or **Pr.806**)*1*2 • Setting is available using the remote register RWwC (-400% to 400%).*2
			5	Torque limit by CC-Link IE TSN • 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 RWwC (-327.68% to 327.67%).*2
			6	Torque limit by CC-Link IE TSN • 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)
			2	Internal torque limit 2 (torque limited by CC-Link IE TSN)

*1 The value can also be set using the operation panel.
*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	PM sensorless vector control
RYD	Frequency setting command (RAM)	Frequency setting / torque limit command (RAM)
RYE	Frequency setting command (RAM, EEPROM)	Frequency setting / torque limit command (RAM, EEPROM)
RXD	Frequency setting completion (RAM)	Frequency setting / torque limit completion (RAM)
RXE	Frequency setting completion (RAM, EEPROM)	Frequency setting / torque limit completion (RAM, EEPROM)
RWwC	—	Torque limit*1

*1 Set **Pr.804** = "3 or 5" and **Pr.810** = "2".

■ 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 limit (when setting is made from CC-Link IE TSN communication)

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

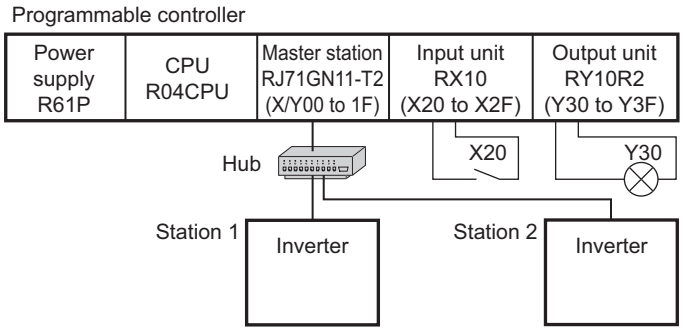
*1 The torque limit setting is defined as an absolute value.

◆ 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	47
Setting the operation mode	Selecting the Network operation mode	47
Setting the operation commands	Commanding the forward rotation and middle speed signals	48
Setting the monitoring function	Monitoring the output frequency	48
Reading a parameter value	Read the value of **Pr.7 Acceleration time**.	49
Writing a parameter value	Setting 3.0 seconds in **Pr.7 Acceleration time**.	49
Frequency setting (speed setting)	Setting to 50.00 Hz	50
Reading the fault records	Reading the inverter faults	51
Inverter reset	Resetting the inverter when an inverter error occurs	51

- 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)

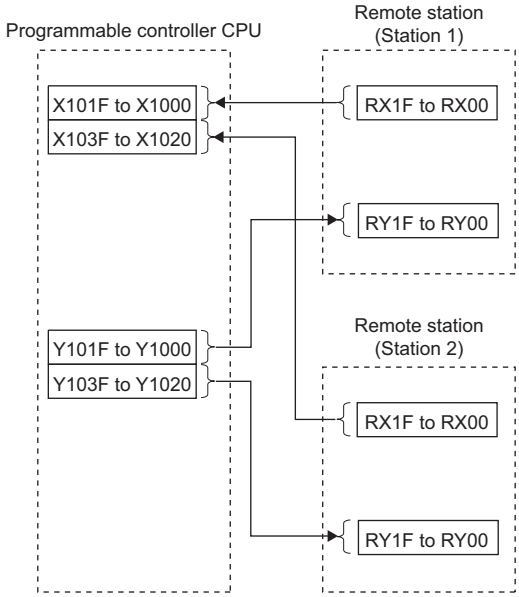
Item		Setting condition	
		Module 1	Module 2
Station number		1	2
Station type		Remote station	Remote station
RX/RY setting	Start	0000	0020
	End	001F	003F
RWw/RWr setting	Start	0000	0020
	End	001F	003F
Reserved station / error invalid station		No setting	No setting

- Refresh settings (assignment method: start/end)

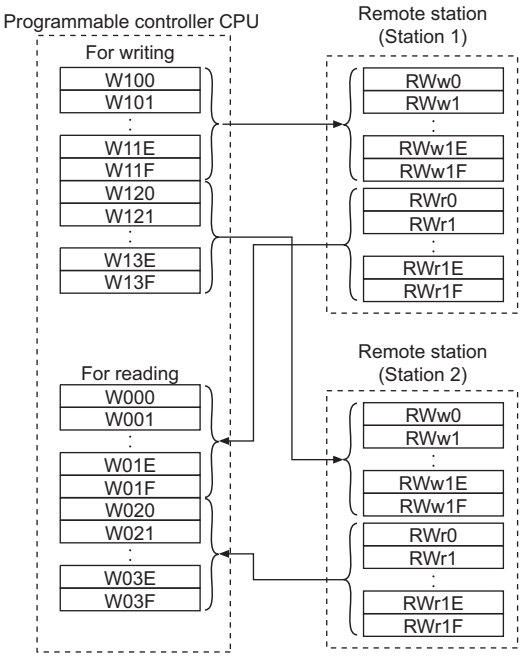
Link side			Master side		
Device name	Start	End	Device name	Start	End
SB	0000	013F	SB	0000	013F
SW	0000	013F	SW	0000	013F
RX	0000	003F	X	1000	103F
RY	0000	003F	Y	1000	103F
RWr	0000	003F	W	000000	00003F
RWw	0000	003F	W	000100	00013F

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

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

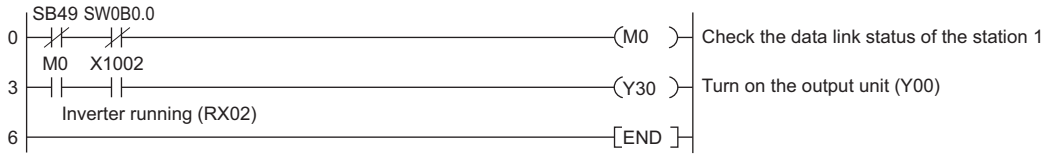


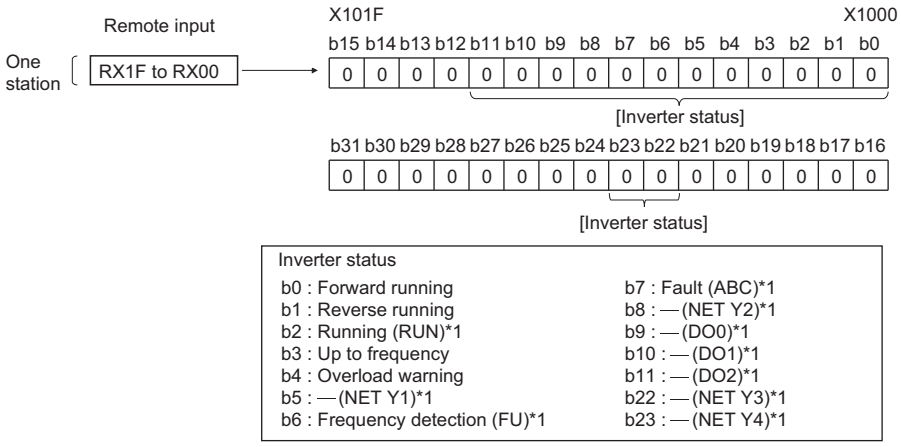
- Remote register areas (RWw and RWr) transmitted between the programmable controller CPU and the remote stations



■ 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.





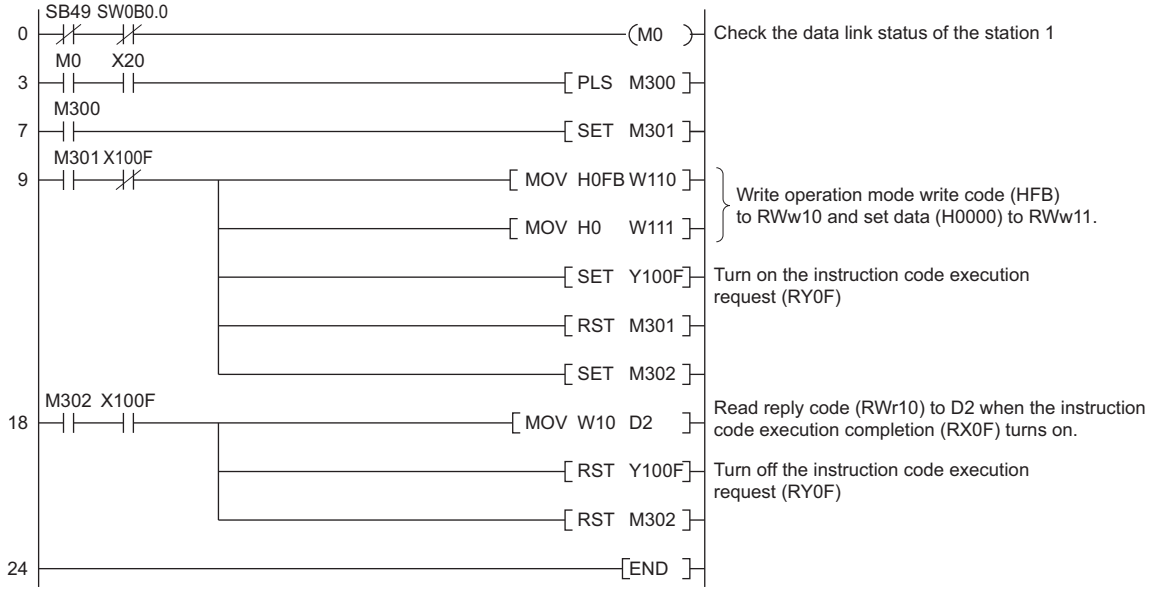
*1 These signals are assigned in the initial status. Use **Pr.190 to Pr.196 and Pr.313 to Pr.315 (Output terminal function selection)** to change the output signals.

■ Programming example for setting the operation mode

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

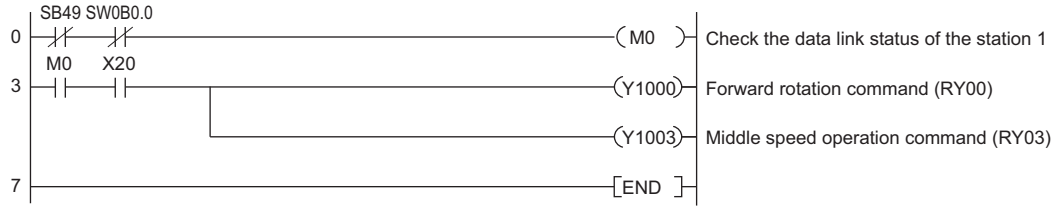
The following program changes the operation mode of the station 1 inverter to network operation.

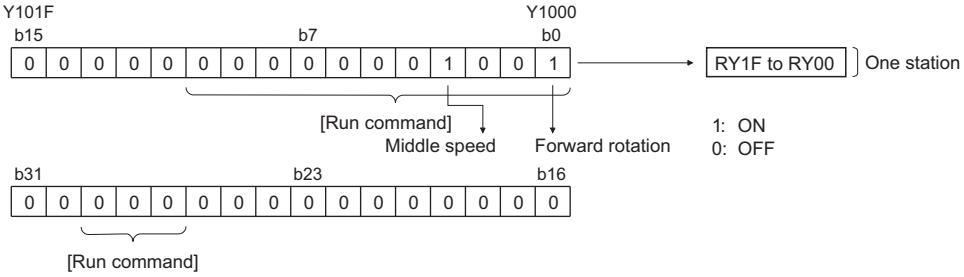
- Operation mode write code: HFB (hexadecimal)
- Network operation set data: H0000 (hexadecimal) (Refer to page 37.)
- The reply code to the instruction code execution is set in D2. (Refer to page 36 for the reply code (RWr10).)



■ 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
b2 : High-speed operation command (RH)*1	b10 : — (NET X2)*1
b3 : Middle-speed operation command (RM)*1	b27 : — (NET X3)*1
b4 : Low-speed operation command (RL)*1	b28 : — (NET X4)*1
b5 : JOG operation selection 2	b29 : — (NET X5)*1
b6 : Second function selection	
b7 : Current input selection	

*1 These signals are assigned in the initial status. Use **Pr.180 to Pr.182 and Pr.185 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

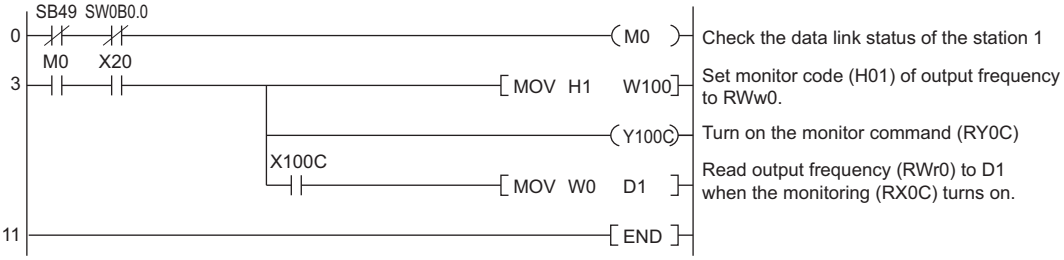
The following explains a program to read monitor functions of the inverter.

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 38.

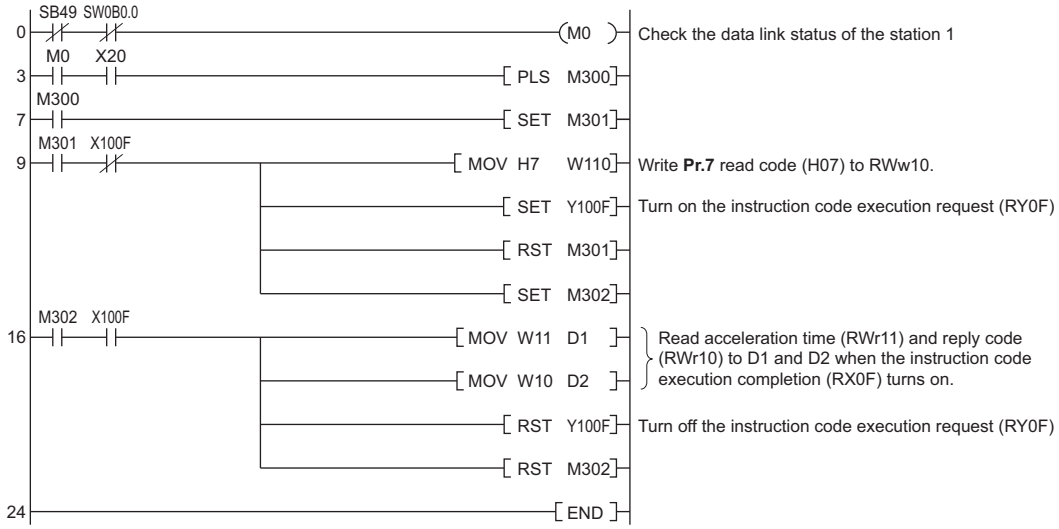
(Example) The output frequency of 60 Hz is indicated as "H1770 (6000)".



■ 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 36 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 instruction code list of the Instruction Manual (Function).

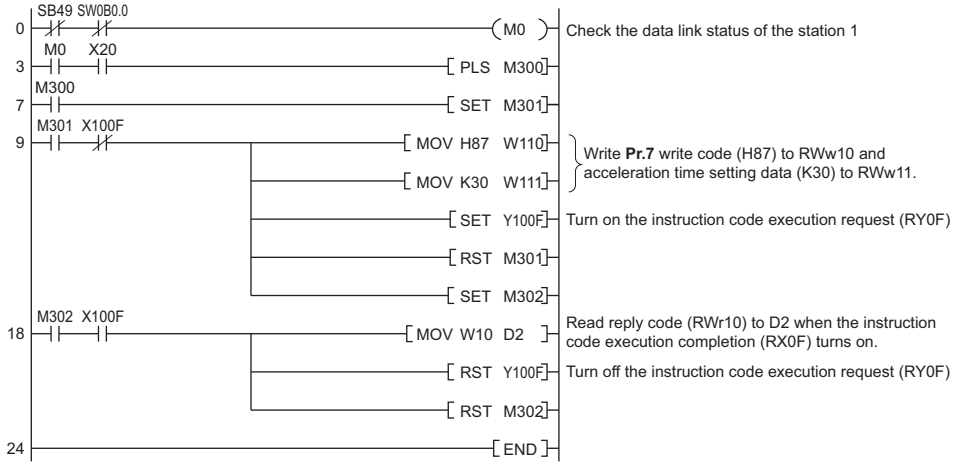
■ Programming example for the parameter writing

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 36 for the reply code (RWr10).)



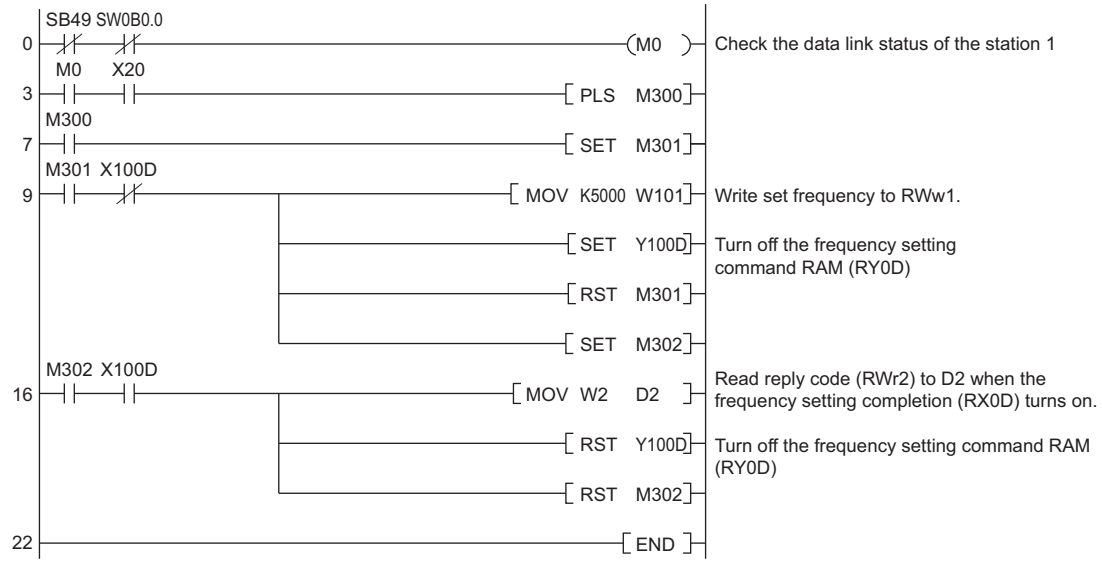
NOTE

- 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 instruction code list of the Instruction Manual (Function).
- For other functions, refer to the instruction codes (refer to page 37).

■ Programming example for frequency setting

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

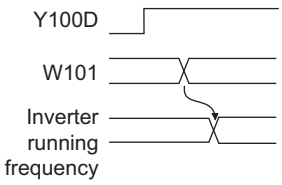
- Set frequency: K5000 (decimal)
- The reply code to the instruction code execution is set in D2. (Refer to page 36 for the reply code (RWr2).)



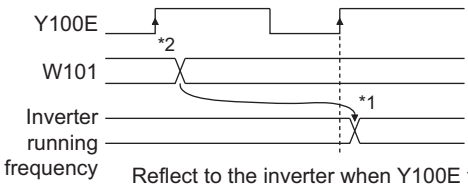
NOTE

- 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.

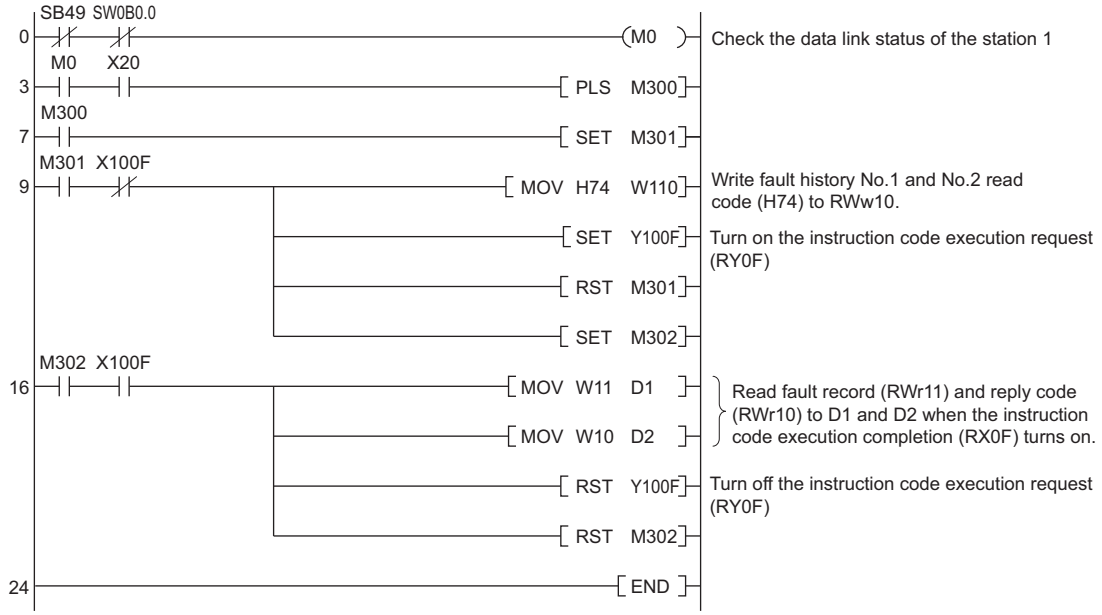
■ Programming example for the fault record reading

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)

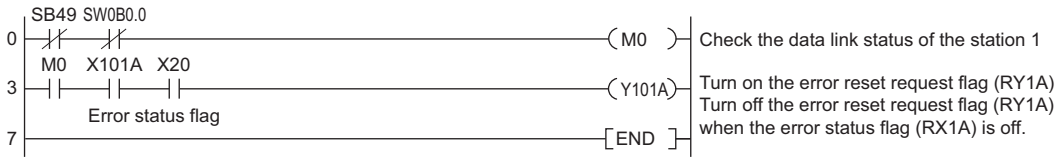
For the error codes, refer to the Instruction Manual (Maintenance).

The reply code to the instruction code execution is set in D2. (Refer to page 36 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.



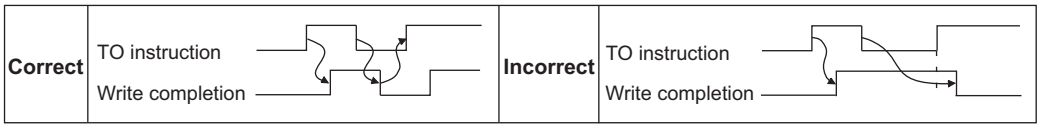
NOTE

- 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 47.)
- Refer to page 220 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. Operation commands input from external devices are 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 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

CC-Link IE Field Network Basic is available for the FR-D800-EPA and FR-D800-EPB.

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
Communication speed		100 Mbps (10 Mbps is not supported.)
Communication method		UDP
Number of connectable units		Master: 1 Remote: up to 64 stations (16 stations × 4 groups)
Connection cable		Ethernet cable (IEEE 802.3 100BASE-TX compliant cable and ANSI/TIA/EIA-568-B (Category 5) compliant shielded 4-pair branched cable)
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.

◆ CSP+ file

A CSP+ file is available for download.

Mitsubishi Electric FA Global Website

https://www.MitsubishiElectric.com/fa/products/drv/inv/support/d800/d800e.html

The download is free at the website above. For details, contact your sales representative.

NOTE

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

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 11.)
2. Enter the IP address (**Pr.1434 to Pr.1437**). (Refer to page 13.)
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 57.)
   (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 any of **Pr.1427 to Pr.1430**, the priority is given to CC-Link IE TSN, disabling CC-Link IE Field Network Basic.
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.
- To use GX Works2, refer to "6.1.4 Setting the station information in the CC-Link IEF Basic configuration window" in GX Works2 Version 1 Operating Manual (Common) (SH-080779ENG).

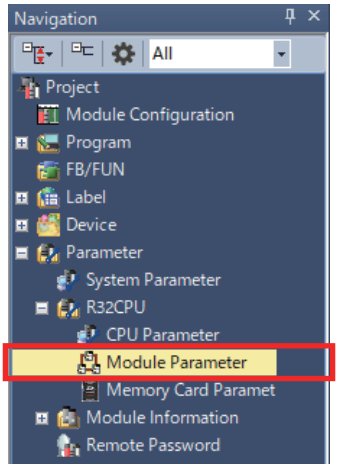
■ Creating a project file

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

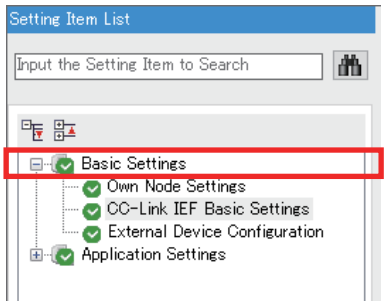
■ Detecting an inverter

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].

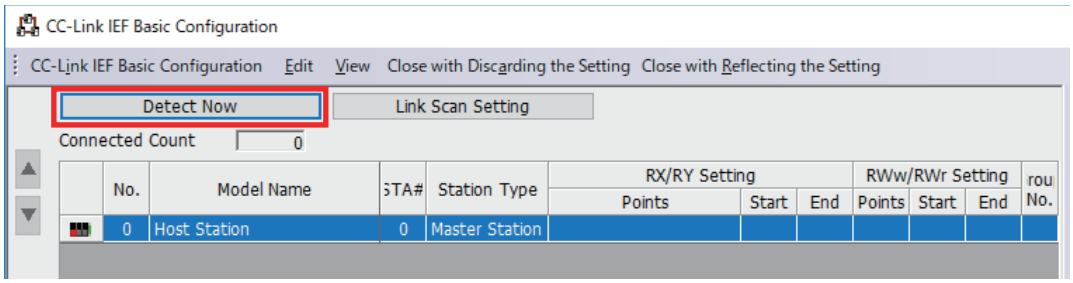


2. Select [Basic Settings] in the "Setting Item List" window.

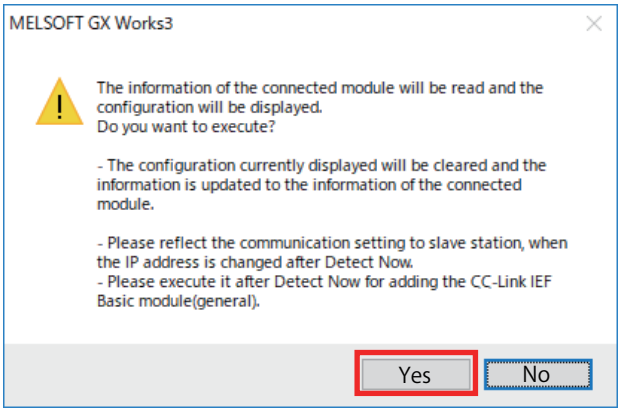


3. In the "CC-Link IEF Basic Configuration" window, go to [Network Configuration Settings] then click [...] next to the [Detailed Setting] field.

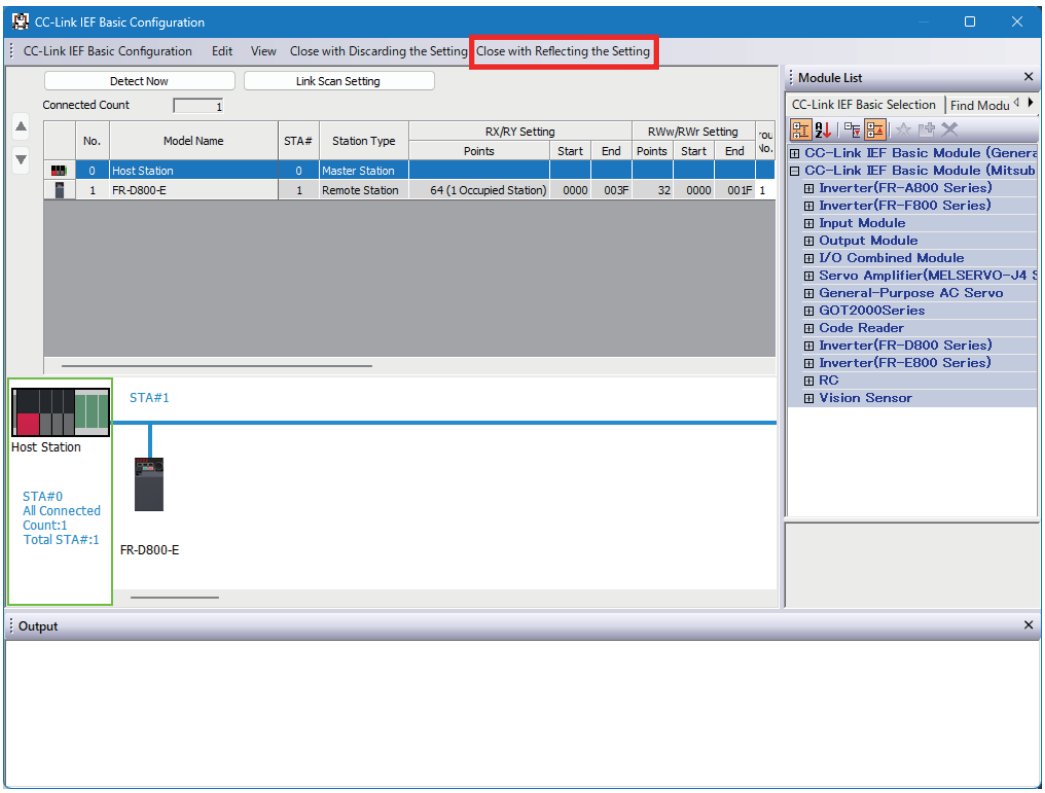
4. In the "CC-Link IEF Basic Configuration" window, click [Detect Now].



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



6. The inverter model will appear on the screen when it is detected. Click [Close with Reflecting the Setting] to close the window.



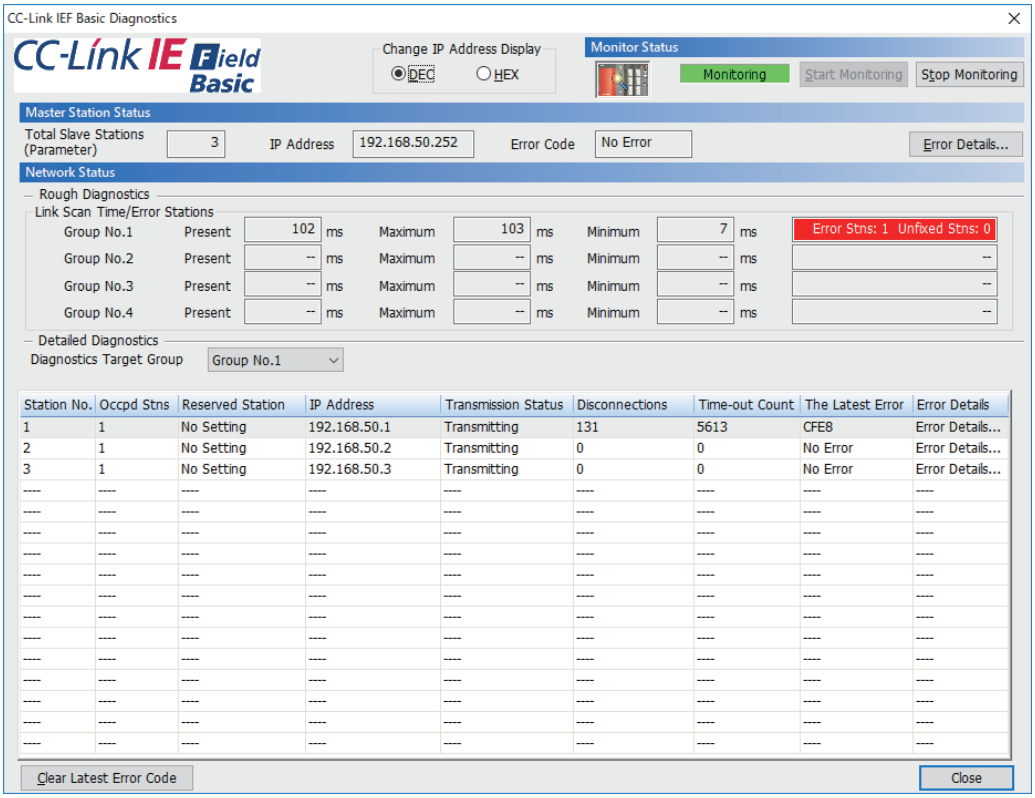
■ Checking communication

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

NS	MS	LINK1
OFF	Solid green	Blinking green

NOTE

- If the inverter 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 configured 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, 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		

Pr.	Name	Initial value	Setting range	Description
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 for the FR-D800-EPA.
*3 The setting is available for the FR-D800-EPB.

NOTE

- The monitor items and parameter settings can be read during communication with the **Pr.1432 Ethernet communication check time interval** = "0" 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 60.)
- 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 details on 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 any of **Pr.1427 to Pr.1430**, the priority is given to CC-Link IE TSN, disabling CC-Link IE Field Network Basic.

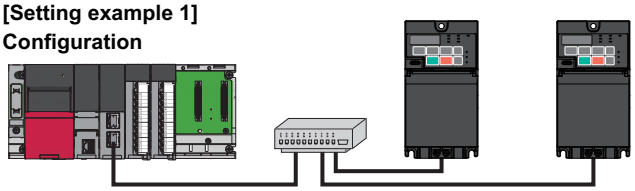
NOTE

- Change the setting if selected communication protocols cannot be used together. (Refer to page 4 and page 173.)

◆ 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]
Configuration



Master station	Remote station 1	Remote station 2
iQ-R R08CPU	FR-D800	FR-D800
192.168.50.100	192.168.50.1	192.168.50.2

To allow the master station to control the remote stations, set the parameters in remote stations 1 and 2 as follows to specify the IP address range for Ethernet command source selection.
Set the IP address of the master station in the engineering software (GX Works3) within the range from 192.168.50.100 to 192.168.50.110.

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	50	100

The range is between the values set in both parameters.

	Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	—	—	9999	110

In this case, the IP address range in which Ethernet communication is permitted is "192.168.50.xxx (100 to 110)".

[Setting example 2]

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	1	100

The range is between the values set in both parameters.

The range is between the values set in both parameters.

	Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	—	—	3	150

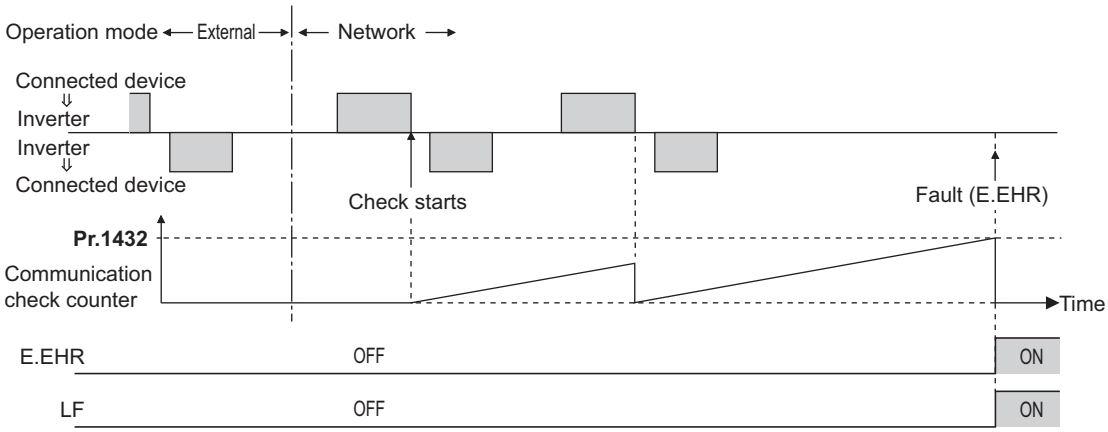
In this case, the IP address range for command source selection via Ethernet communication is "192.168.x (1 to 3).xxx (100 to 150)".

- 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 is lost (communication stops) 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 enabled when any of 0.1 to 999.8 seconds 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, 38	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 limit command source selection**	1	1, 3, 5, 6	The torque limit setting method can be selected.

Pr.	Name	Initial value	Setting range	Description
810 H700	**Torque limit input method selection**	0	0, 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	62
1	Compatible with CC-Link Ver.1	63
12	Compatible with the double setting of CC-Link Ver.2	63
14	Compatible with the quadruple setting of CC-Link Ver.2	63
18, 38	Compatible with the octuple setting of CC-Link Ver.2	64

◆ 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 67.)

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 name	Refer to page
RYn0	Forward rotation command[*2]	65
RYn1	Reverse rotation command[*2]	65
RYn2	High-speed operation command (terminal RH function)[*1]	65
RYn3	Middle-speed operation command (terminal RM function)[*1]	65
RYn4	Low-speed operation command (terminal RL function)[*1]	65
RYn5	JOG operation selection 2[*2]	65
RYn6	Second function selection[*2]	65
RYn7	Current input selection[*2]	65
RYn8	**Pr.185** assignment function (NET X1)[*5]	65
RYn9	Output stop[*2]	65
RYnA	**Pr.186** assignment function (NET X2)[*5]	65
RYnB	Reserved	—
RYnC	Monitor command	65
RYnD	Frequency setting command (RAM)	65
RYnE	Frequency setting command (RAM, EEPROM)	65
RYnF	Instruction code execution request	66
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	66
RY(n+1)B	**Pr.187** assignment function (NET X3)[*5]	66
RY(n+1)C	**Pr.188** assignment function (NET X4)[*5]	66
RY(n+1)D	**Pr.189** assignment function (NET X5)[*5]	66
RY(n+1)E	Reserved	—
RY(n+1)F		

Device No.[*7]	Signal name	Refer to page
RXn0	Forward running	66
RXn1	Reverse running	66
RXn2	Running (terminal RUN function)[*3]	66
RXn3	Up to frequency[*2]	66
RXn4	Overload warning[*2]	66
RXn5	**Pr.193** assignment function (NET Y1)[*6]	66
RXn6	Frequency detection (terminal FU function)[*3]	66
RXn7	Fault (terminal ABC function)[*3]	66
RXn8	**Pr.194** assignment function (NET Y2)[*6]	66
RXn9	**Pr.313** assignment function (DO0)[*4]	66
RXnA	**Pr.314** assignment function (DO1)[*4]	66
RXnB	**Pr.315** assignment function (DO2)[*4]	66
RXnC	Monitoring	66
RXnD	Frequency setting completion (RAM)	66
RXnE	Frequency setting completion (RAM, EEPROM)	66
RXnF	Instruction code execution completed	66
RX(n+1)0 to RX(n+1)5	Reserved	—
RX(n+1)6	**Pr.195** assignment function (NET Y3)[*6]	66
RX(n+1)7	**Pr.196** assignment function (NET Y4)[*6]	66
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	66
RX(n+1)B	Remote station ready	66
RX(n+1)C to RX(n+1)F	Reserved	—

*1 These signals are set in the initial setting. Using **Pr.180 to Pr.182**, input signals assigned to the device numbers can be changed. For details of **Pr.180 to Pr.182**, refer to the 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 Instruction Manual (Function).

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

*5 Input signals can be assigned using **Pr.185 to Pr.189**. For details, refer to the description of **Pr.185 to Pr.189 (Input terminal function selection)** in the 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 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	67
RWwn+1	Set frequency (0.01 Hz increments)[*2]		67
RWwn+2	H00 (arbitrary)[*1]	Instruction code	67
RWwn+3	Data to be written		67

Address[*4]	Description	Refer to page
RWrn	First monitor value[*3]	68
RWrn+1	Second monitor value[*3]	68
RWrn+2	Reply code	68
RWrn+3	Data to be read	68

*1 The upper 8 bits always contains H00 even a different value is set.
*2 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**.
*3 When the item displayed in frequency is selected, the **Pr.37 and Pr.53** settings are invalid.
*4 "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 62.)

- Remote registers

Address[*3]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	67
RWwn+1	Set frequency (0.01 Hz increments)[*1]		67
RWwn+2	Link parameter extended setting	Instruction code	67
RWwn+3	Data to be written		67

Address[*3]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value[*2]		68
RWrn+1	Second monitor value[*2]		68
RWrn+2	Reply code 2	Reply code 1	68
RWrn+3	Data to be read		68

*1 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**.
*2 When the item displayed in frequency is selected, the **Pr.37 and Pr.53** settings are invalid.
*3 "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 62.)

- Remote registers

Address[*3]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	67
RWwn+1	Set frequency (0.01 Hz increments)[*1]		67
RWwn+2	Link parameter extended setting	Instruction code	67
RWwn+3	Data to be written		67
RWwn+4	Monitor code 3		67
RWwn+5	Monitor code 4		67
RWwn+6	Monitor code 5		67
RWwn+7	Monitor code 6		67

Address[*3]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value[*2]		68
RWrn+1	Second monitor value[*2]		68
RWrn+2	Reply code 2	Reply code 1	68
RWrn+3	Data to be read		68
RWrn+4	Third monitor value[*2]		68
RWrn+5	Fourth monitor value[*2]		68
RWrn+6	Fifth monitor value[*2]		68
RWrn+7	Sixth monitor value[*2]		68

*1 The display can be changed to rotations per minute (machine speed) using **Pr.37 and Pr.53**.
*2 When the item displayed in frequency is selected, the **Pr.37 and Pr.53** settings are invalid.
*3 "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 62.)

- Remote registers

Address[*5]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	67
RWwn+1	Set frequency (0.01 Hz increments)[*2]		67
RWwn+2	Link parameter extended setting	Instruction code	67

Address[*5]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value[*3]		68
RWrn+1	Second monitor value[*3]		68
RWrn+2	Reply code 2	Reply code 1	68

Address[*5]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn+3	Data to be written		67
RWwn+4	Monitor code 3		67
RWwn+5	Monitor code 4		67
RWwn+6	Monitor code 5		67
RWwn+7	Monitor code 6		67
RWwn+8	Fault record No.	H00	67
RWwn+9	PID set point (0.01% increments)[*1]		67
RWwn+A	PID measured value (0.01% increments)[*1]		67
RWwn+B	PID deviation (0.01% increments)[*1]		67
RWwn+C	Torque limit		67, 74
RWwn+D	H00 (Free)		—
RWwn+E			
RWwn+F			

Address[*5]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn+3	Data to be read		68
RWrn+4	Third monitor value[*3]		68
RWrn+5	Fourth monitor value[*3]		68
RWrn+6	Fifth monitor value[*3]		68
RWrn+7	Sixth monitor value[*3]		68
RWrn+8	Fault record No.	Fault record (fault data)	68
RWrn+9	Fault record (output frequency)[*4]		68
RWrn+A	Fault record (output current)		68
RWrn+B	Fault record (output voltage)		68
RWrn+C	Fault record (energization time)		68
RWrn+D	H00 (Free)		—
RWrn+E			
RWrn+F			

*1 Validity depends on the **Pr.128, Pr.609, and Pr.610** settings. For details, refer to the Instruction Manual (Function). If the data outside the range is set, the previous setting is retained.

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

*3 When the item displayed in frequency is selected, the **Pr.37 and Pr.53** settings are invalid.

*4 The frequency is always displayed regardless of the settings in **Pr.37 and Pr.53**.

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

■ When Pr.544 = "18 or 38" (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 62.)

- Remote registers

Address[*5]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	67
RWwn+1	Set frequency (0.01 Hz increments)[*2]		67
RWwn+2	Link parameter extended setting	Instruction code	67
RWwn+3	Data to be written		67
RWwn+4	Monitor code 3		67
RWwn+5	Monitor code 4		67
RWwn+6	Monitor code 5		67
RWwn+7	Monitor code 6		67
RWwn+8	Fault record No.	H00	67
RWwn+9	PID set point (0.01% increments)[*1]		67
RWwn+A	PID measured value (0.01% increments)[*1]		67
RWwn+B	PID deviation (0.01% increments)[*1]		67
RWwn+C	Torque limit		67, 74
RWwn+D	H00 (Free)		—
RWwn+E	H00 (Free)		
RWwn+F	H00 (Free)		
RWwn+10	Link parameter extended setting	Instruction code	67
RWwn+11	Data to be written		67
RWwn+12	Link parameter extended setting	Instruction code	67
RWwn+13	Data to be written		67
RWwn+14	Link parameter extended setting	Instruction code	67
RWwn+15	Data to be written		67

Address[*5]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value[*3]		68
RWrn+1	Second monitor value[*3]		68
RWrn+2	Reply code 2	Reply code 1	68
RWrn+3	Data to be read		68
RWrn+4	Third monitor value[*3]		68
RWrn+5	Fourth monitor value[*3]		68
RWrn+6	Fifth monitor value[*3]		68
RWrn+7	Sixth monitor value[*3]		68
RWrn+8	Fault record No.	Fault record (fault data)	68
RWrn+9	Fault record (output frequency)[*4]		68
RWrn+A	Fault record (output current)		68
RWrn+B	Fault record (output voltage)		68
RWrn+C	Fault record (energization time)		68
RWrn+D	H00 (Free)		—
RWrn+E			
RWrn+F			
RWrn+10	Reply code		68
RWrn+11	Data to be read		68
RWrn+12	Reply code		68
RWrn+13	Data to be read		68
RWrn+14	Reply code		68
RWrn+15	Data to be read		68

Address[*5]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn+16	Link parameter extended setting	Instruction code	67
RWwn+17	Data to be written		67
RWwn+18	Link parameter extended setting	Instruction code	67
RWwn+19	Data to be written		67
RWwn+1A	H00 (Free)		—
RWwn+1B			
RWwn+1C			
RWwn+1D			
RWwn+1E			
RWwn+1F			

Address[*5]	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn+16	Reply code		68
RWrn+17	Data to be read		68
RWrn+18	Reply code		68
RWrn+19	Data to be read		68
RWrn+1A	H00 (Free)		—
RWrn+1B			
RWrn+1C			
RWrn+1D			
RWrn+1E			
RWrn+1F			

*1 Validity depends on the **Pr.128, Pr.609, and Pr.610** settings. For details, refer to the Instruction Manual (Function). If the data outside the range is set, the previous setting is retained.

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

*3 When the item displayed in frequency is selected, the **Pr.37 and Pr.53** settings are invalid.

*4 The frequency is always displayed regardless of the settings in **Pr.37 and Pr.53**.

*5 "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 name	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[*2]	MRS signal	
RYA	— (terminal NET X2 function)[*3]	The function assigned to **Pr.186** 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 (RAM)	When "1" is set in RYD, the set frequency (RWw1) is written to the RAM of the inverter.[*4] After the writing completes, "1" is set in the frequency setting completion (RXD). Under PM sensorless vector control, the torque limit value is also written to the RAM at the same time.	
RYE[*5]	Frequency setting command (RAM, EEPROM)	When "1" is set in RYE, the set frequency (RWw1) is written to the RAM and EEPROM of the inverter. After the writing completes, "1" is set in the frequency setting completion (RXE). Under PM sensorless vector control, the torque limit value is also written to the RAM and EEPROM at the same time. To change the frequency consecutively, be sure to write data to the RAM of the inverter.	

Device No.	Signal name	Description
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.182**, 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.182, Pr.338, and Pr.339**, refer to the 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.185 to Pr.189** to assign signals to RY8, RYA, RYB, and RY1B to RY1D. For details, refer to the description of **Pr.185 to Pr.189 (Input terminal function selection)** in the 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 220 for operation conditions of inverter reset.

■ 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 name	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 completion (RAM)	After "1" is set in the frequency setting command (RYD) and the frequency setting is written to the RAM of the inverter, "1" is set for this signal. When "0" is set in the frequency setting command (RYD), "0" is set for this signal.
RXE	Frequency setting completion (RAM, EEPROM)	After "1" is set in the frequency setting command (RYE) and the frequency setting 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 (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 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.313 to Pr.315 (Output terminal function selection)** in the 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 Instruction Manual (Function).

◆ Details of the remote register

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

- Remote register description

Device No.	Signal name	Description	
RWw0	Monitor code 1, 2	Set the monitor code to be monitored (refer to page 72). When "1" is set in RYC, data of the specified monitor item will be stored in RWr0 and 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 70) 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 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 record No.	Set the individual fault number of the fault history that you want to read. Fault records can be read back to the tenth latest fault. (The value in the lower 8 bits is fixed to H00.) Upper 8 bits: H00 (latest fault) to H09 (tenth latest fault) When H0A to HFF is set to the lower 8 bits, "0" is returned.	
RWw9	PID set point*3	Set the PID 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 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 limit value	When **Pr.544** = "14, 18, or 38", **Pr.804** = "3 or 5", and **Pr.810 Torque limit input method selection** = "2" under PM sensorless vector control, torque limit 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 (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 70) 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 the details, refer to the 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 to 327.67 Hz (-32768 to 32767), 0.01 Hz increments.
For the details, refer to page 61.
*3 Validity depends on the **Pr.128, Pr.609, and Pr.610** settings. For details, refer to the Instruction Manual (Function). If the data outside the range is set, the previous setting is retained.

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

- Remote register description

Device No.	Signal name	Description
RWr0	First monitor value*1	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)	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 69.)
	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 limit) is set. (Refer to page 69.)
	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 69.)
RWr3	Data to be read	In a normal reply, a replay code for the instruction code is set.
RWr4	Third monitor value*1	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	
RWr6	Fifth monitor value*1	
RWr7	Sixth monitor value*1	
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)*2	The output frequency at the fault is stored for the fault record No. specified in RWw8.
RWrA	Fault record (output current)	The output current at the fault is always stored for the fault record No. specified in RWw8.
RWrB	Fault record (output voltage)	The output voltage at the fault is always stored for the fault record No. specified in RWw8.
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 69.)
	Data to be read	In a normal reply, a replay code for the instruction code is set.

*1 When the item displayed in frequency is selected, the **Pr.37 and Pr.53** settings are invalid.

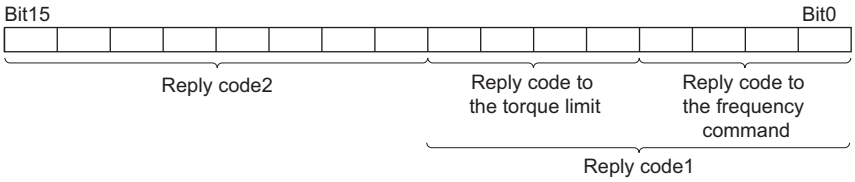
*2 The frequency is always displayed regardless of the settings in **Pr.37 and Pr.53**.

- Reply code description

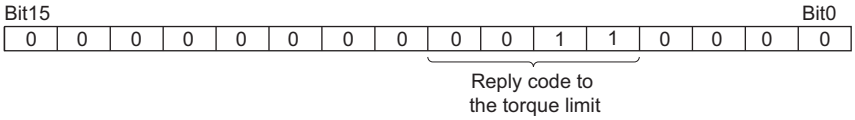
  The reply to the instruction execution command is set in RWr2, 10, 12, 14, 16, and 18. After the frequency setting (RYD or RYE) or execution of instruction code (RYF), check the reply code (RWr2) in the remote register.

Item	Data	Item	Fault description	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 or 38".
	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 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 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 the torque is limited (when **Pr.544** = "14, 18, or 38").
The upper 4 bits of the reply code 1 are used as the reply code to the torque limit, and the lower 4 bits are used as the reply code to the frequency command.



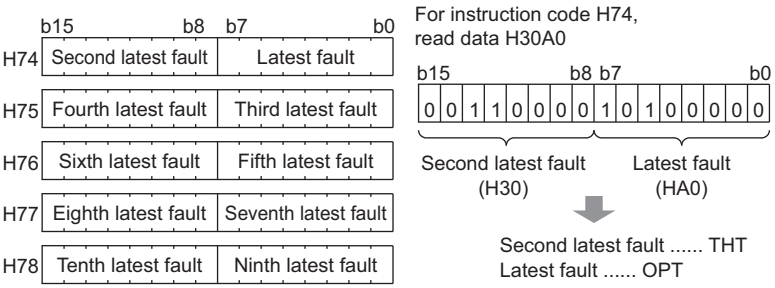
Example) When the torque limit is out of the setting range, the data is H0030.



■ Instruction code

Set instruction codes using the remote register (RWw). (Refer to page 67.)

The data read by the instruction code is stored in the remote register (RWr). (Refer to page 68.)

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")
Monitor	Output frequency / rotations per minute (machine speed)*1	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 Instruction Manual (Function).)
	Output current	Read	H70	H0000 to HFFFF Output current (hexadecimal) in 0.01 A increments
	Output voltage	Read	H71	H0000 to HFFFF Output voltage (hexadecimal) in 0.1 V increments
	Special monitor	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 72.
		Write	HF3*2	
	Fault record	Read	H74 to H78	H0000 to HFFFF: Two fault records per code. For the data codes or details of fault records, refer to the Instruction Manual (Maintenance). 
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 Instruction Manual (Function).)
Set frequency (EEPROM)			H6E	
Set frequency (RAM)*3		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 Instruction Manual (Function).) • To change the set frequency consecutively, write data to the inverter RAM. (Instruction code: HED)
Set frequency (RAM and EEPROM)*3			HEE	
Parameter		Read	H00 to H6B	• Refer to the instruction code list in the Instruction Manual (Function) to read/ write parameters 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 217.)
		Write	H80 to HEB	
Fault history clear		Write	HF4	H9696: Fault history is cleared.

Item	Read/ write	Instruction code	Data description
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[*4]: Communication parameters are not cleared. • All parameter clear H9966: Communication parameters are cleared. H55AA[*4]: Communication parameters are not cleared. For details on whether or not to clear parameters, refer to the 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.
Link parameter extended setting[*5]	Read	H7F	Parameter settings are changed according to the instruction code settings. For details of the settings, refer to the instruction code list in the Instruction Manual (Function).
	Write	HFF	
Second parameter changing[*6]	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[*7] 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 Write data is in hexadecimal, and only the last two digits are valid. (The upper two digits are ignored.)

*3 Setting from the remote register (RWw1) is also available.

*4 Turning OFF the power supply while clearing parameters with H5A5A or H55AA returns the communication parameter settings to the initial settings.

*5 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 67.)

*6 Reading or writing is available when the link parameter extended setting = "1 or 9".

*7 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, 18, or 38", 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 on the monitor codes or monitor items, refer to the monitor display section in the Instruction Manual (Function).
- When the item displayed in frequency is selected in the remote registers, RWw0 and RWw4 to RWw7, the **Pr.37 and Pr.53** settings are invalid.

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

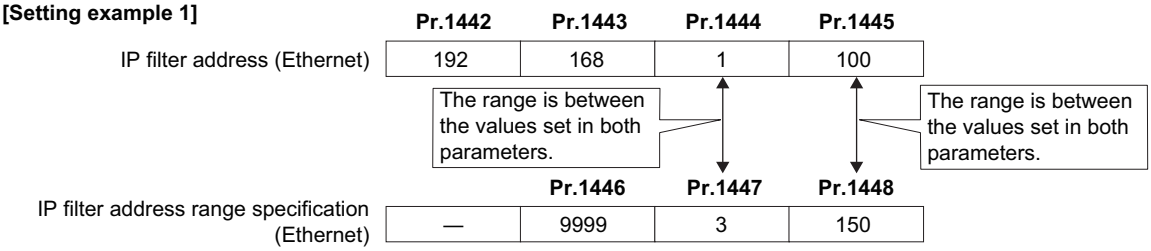
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

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)

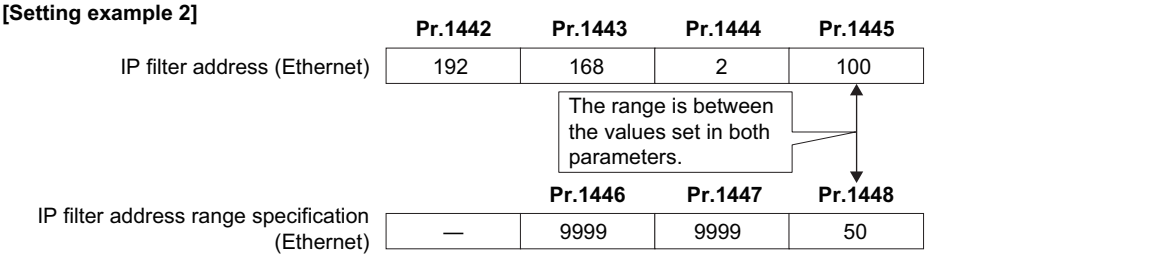
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either 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 details on external devices used to control access rights, contact the distributors of the external devices.)

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

The torque can be limited by CC-Link IE Field Network Basic communication under PM sensorless vector control. To limit the torque, set **Pr.810 Torque limit input method selection** = "2". The torque limit setting method can be selected using **Pr.804 Torque limit command source selection**.

Pr.	Name	Initial value	Setting range	Description
804	**Torque limit command source selection**	1	1	Torque limit using the CC-Link IE Field Network Basic • Torque limit (-400% to 400%) by the parameter setting (**Pr.805** or **Pr.806**)*1*2
			3	Torque limit using the CC-Link IE Field Network Basic • Torque limit (-400% to 400%) by the parameter setting (**Pr.805** or **Pr.806**)*1*2 • Setting is available using the remote register RWwC (-400% to 400%).*2
			5	Torque limit using the CC-Link IE Field Network Basic • 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 RWwC (-327.68% to 327.67%).*2
			6	Torque limit using the CC-Link IE Field Network Basic • 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)
			2	Internal torque limit 2 (torque limited by CC-Link IE Field Network Basic)

*1 The value can also be set using the operation panel.
*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	PM sensorless vector control
—	RYD	Frequency setting command (RAM)	Frequency setting / torque limit command (RAM)
—	RYE	Frequency setting command (RAM, EEPROM)	Frequency setting / torque limit command (RAM, EEPROM)
—	RXD	Frequency setting completion (RAM)	Frequency setting / torque limit completion (RAM)
—	RXE	Frequency setting completion (RAM, EEPROM)	Frequency setting / torque limit completion (RAM, EEPROM)
0, 1, 12	RWwC	—	—
14, 18, 38			Torque limit*1

*1 Set **Pr.804** = "3 or 5" and **Pr.810** = "2".

■ 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, 38	• 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, 38	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 limit (when setting is made from CC-Link IE Field Network Basic communication)

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

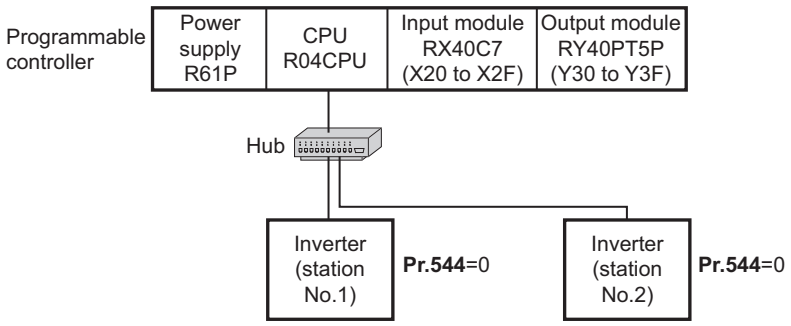
*1 The torque limit setting is defined as an absolute value.

◆ 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	77
Setting the operation mode	Selecting the Network operation mode	77
Setting the operation commands	Commanding the forward rotation and middle speed signals	78
Setting the monitoring function	Monitoring the output frequency	78
Reading a parameter value	Read the value of **Pr.7 Acceleration time**.	79
Writing a parameter value	Setting 3.0 seconds in **Pr.7 Acceleration time**.	80
Frequency setting (speed setting)	Setting to 50.00 Hz	81
Reading the fault records	Reading the inverter faults	82
Inverter reset	Resetting the inverter when an inverter error occurs	82

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



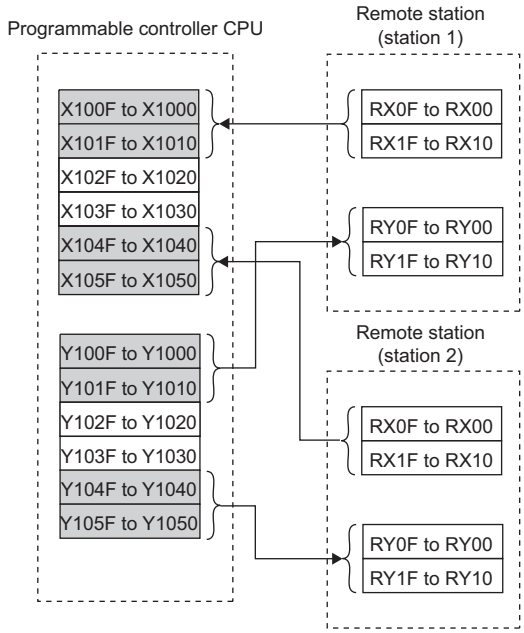
- Setting network parameters of the master station

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

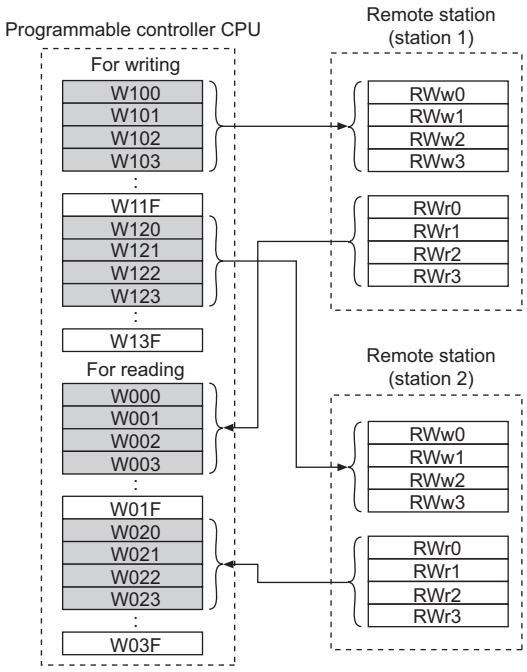
Item	Setting condition
Station type	CC-Link IE Field Network Basic (master station)
Start I/O	0000
Quantity	2
Remote input (RX)	X1000
Remote output (RY)	Y1000
Remote register (RWr)	W0
Remote register (RWw)	W100
Retry count	3

■ 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 stations. Shaded areas show the devices actually used.

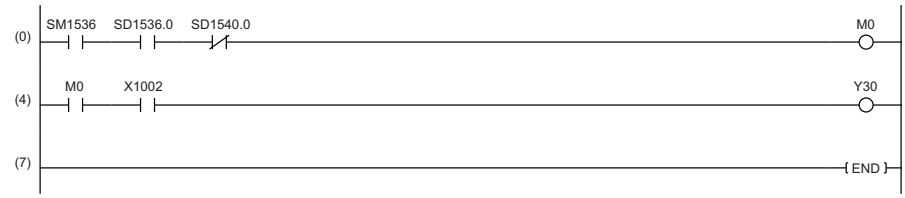


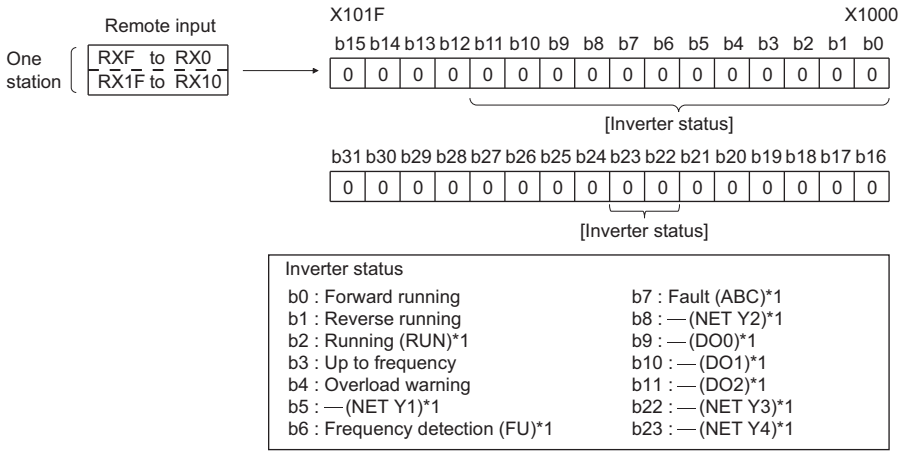
- The following diagram shows the remote register areas (RWw and RWr) transmitted between the programmable controller CPU and remote stations. Shaded areas show the devices actually used.



■ 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.





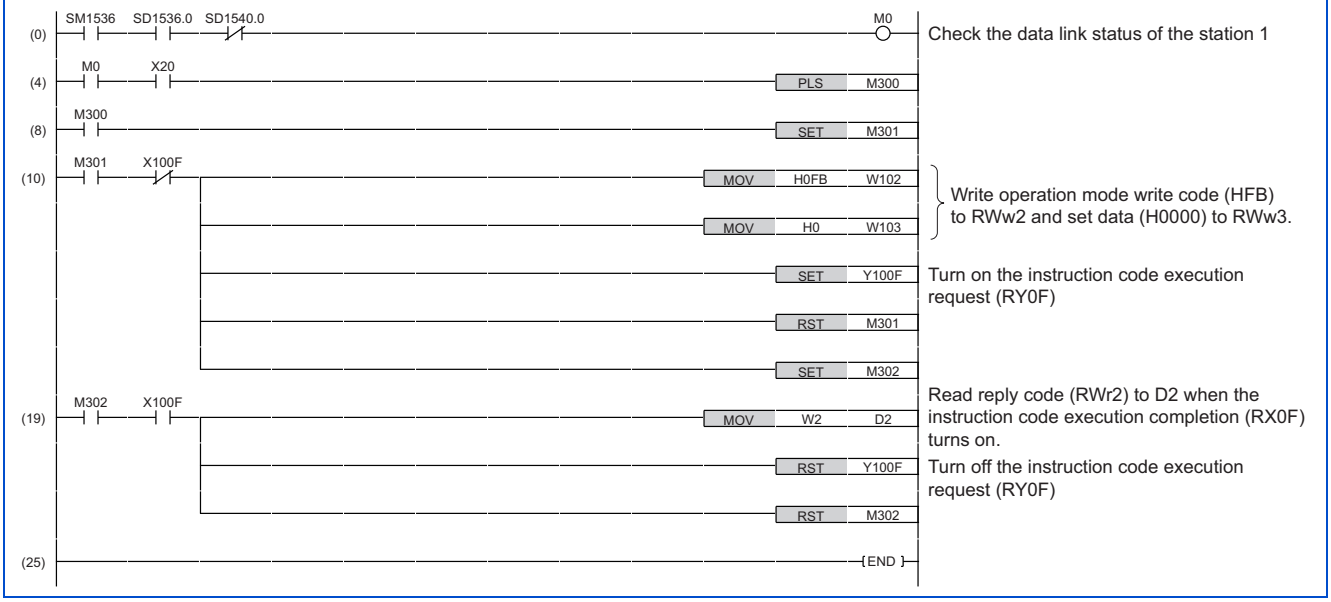
*1 These signals are assigned in the initial status. Use **Pr.190 to Pr.196 and Pr.313 to Pr.315 (Output terminal function selection)** to change the output signals.

■ Programming example for setting the operation mode

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

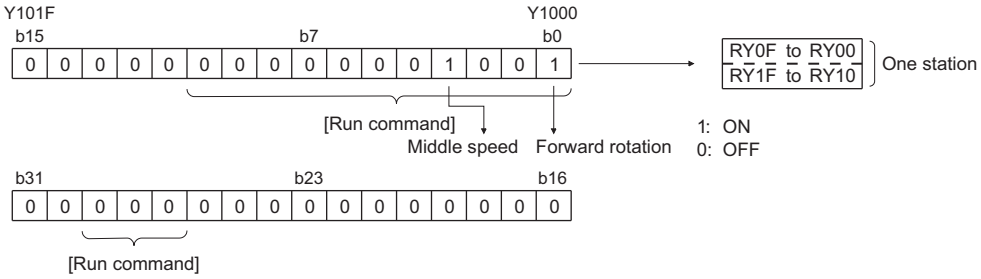
The following program changes the operation mode of the station 1 inverter to network operation.

- Operation mode write code: HFB (hexadecimal)
- Network operation set data: H0000 (hexadecimal) (Refer to page 70.)
- The reply code to the instruction code execution is set in D2. (Refer to page 69.)



■ 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
b2 : High-speed operation command (RH)*1	b10 : — (NET X2)*1
b3 : Middle-speed operation command (RM)*1	b27 : — (NET X3)*1
b4 : Low-speed operation command (RL)*1	b28 : — (NET X4)*1
b5 : JOG operation selection 2	b29 : — (NET X5)*1
b6 : Second function selection	
b7 : Current input selection	

*1 These signals are assigned in the initial status. Use **Pr.180 to Pr.182 and Pr.185 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

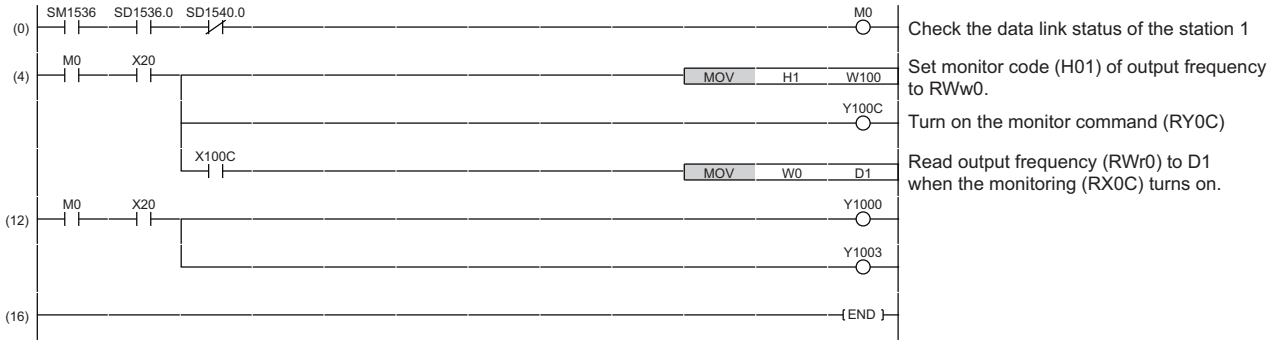
The following explains a program to read monitor functions of the inverter.

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 72.

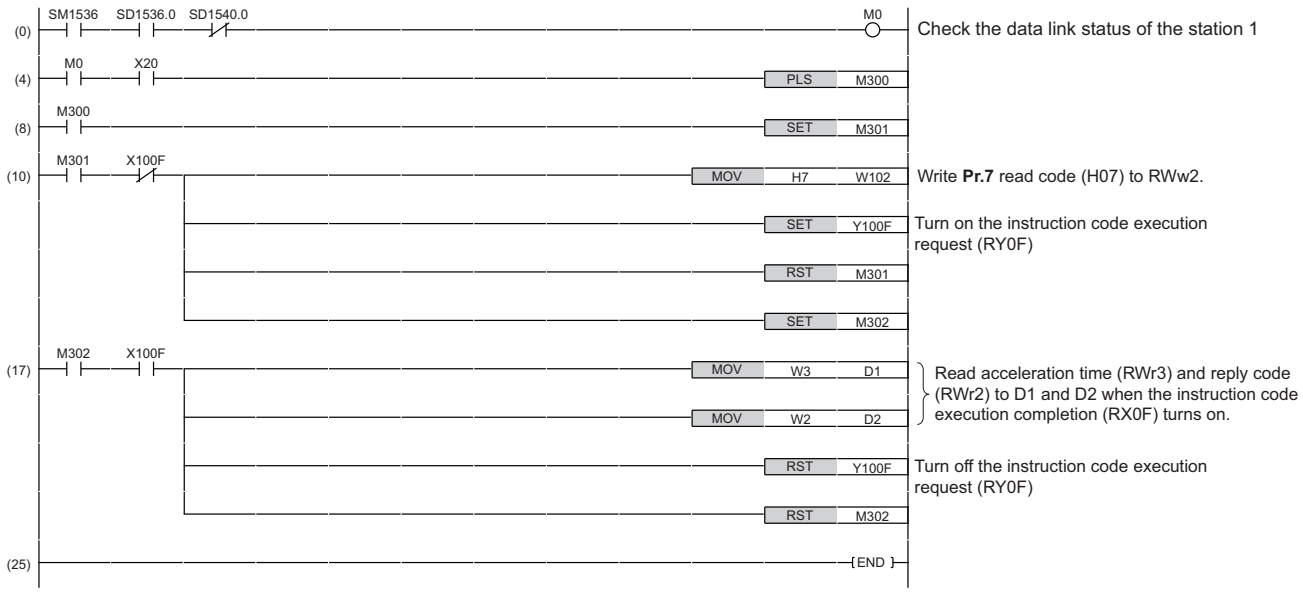
(Example) The output frequency of 60 Hz is indicated as "H1770 (6000)".



■ 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 69.)



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 instruction code list of the Instruction Manual (Function).

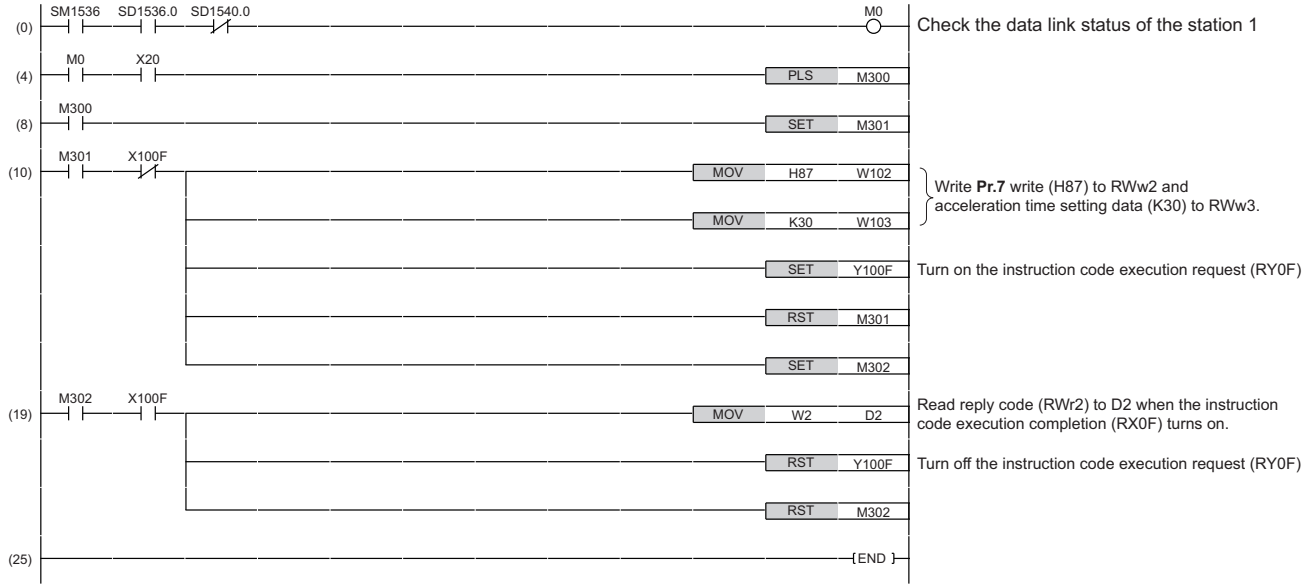
■ Programming example for the parameter writing

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 69.)



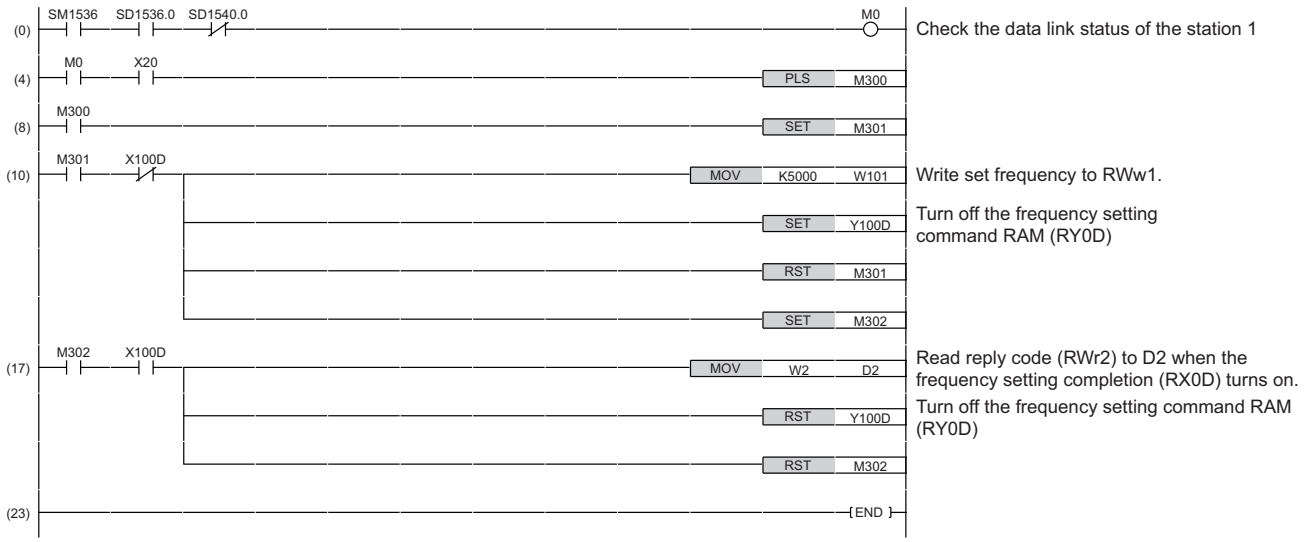
NOTE

- 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 instruction code list of the Instruction Manual (Function).
- For other functions, refer to the instruction codes (refer to page 70).

■ Programming example for frequency setting

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

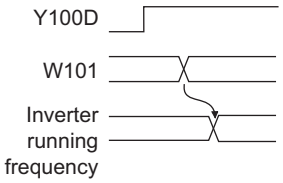
- Set frequency: K5000 (decimal)
- The reply code to the instruction code execution is set in D2. (Refer to page 69.)



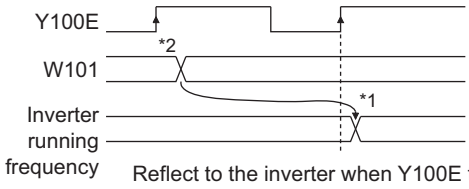
NOTE

- 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>



Reflect to the inverter when Y100E turns on

*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.

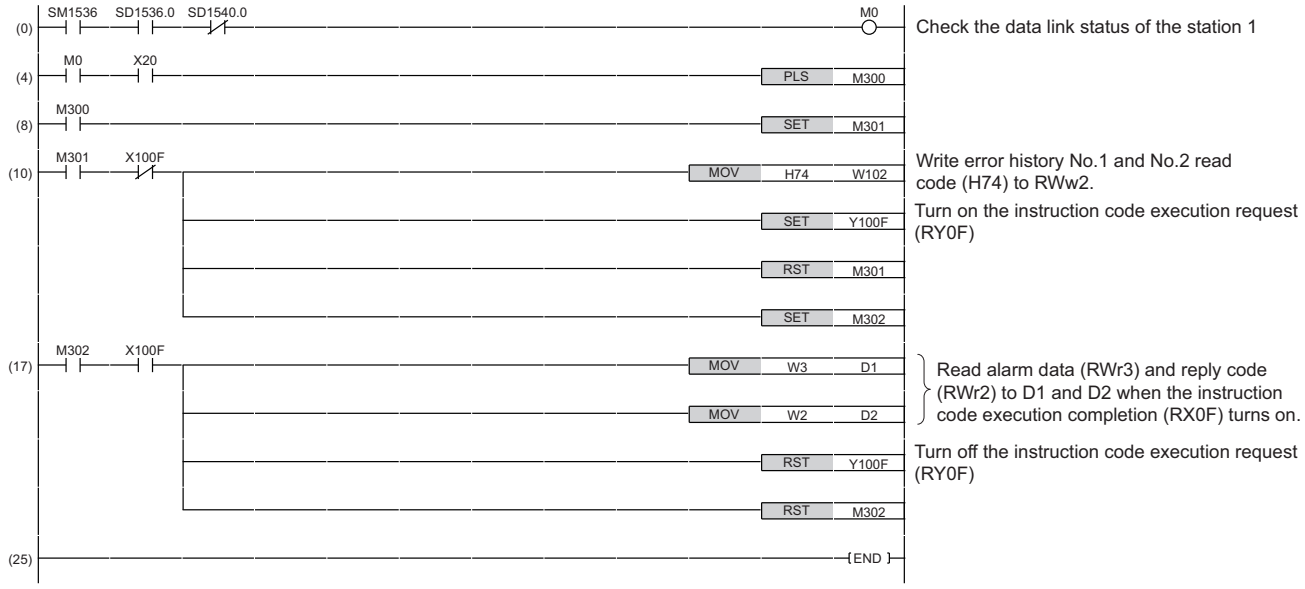
■ Programming example for the fault record reading

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)

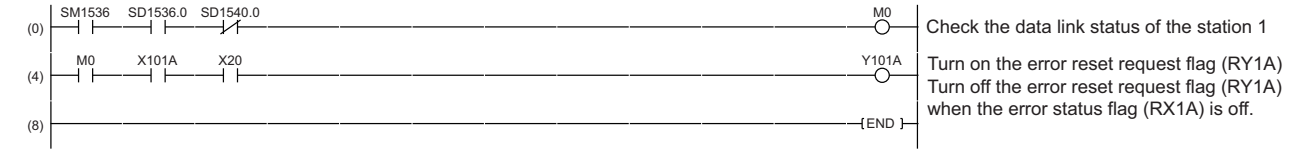
For the error codes, refer to the Instruction Manual (Maintenance).

The reply code to the instruction code execution is set in D2. (Refer to page 69.)



■ 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 77.)
- Refer to page 220 for operation conditions of inverter reset.

◆ Instructions

■ Operating and handling instructions

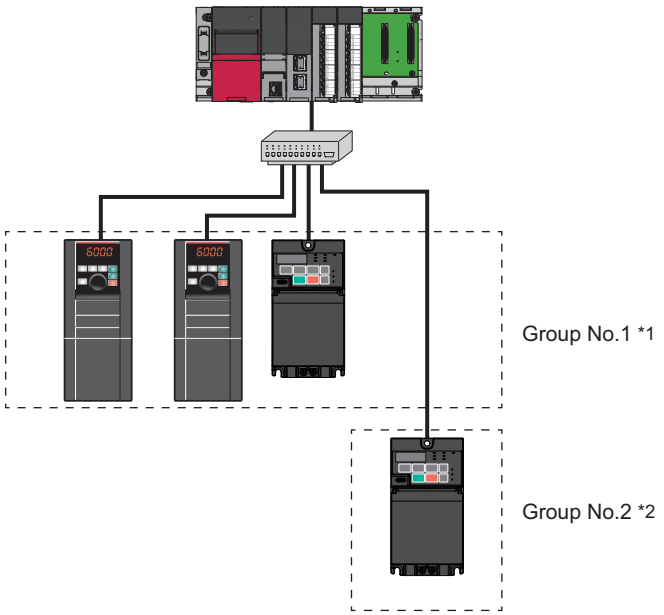
- The inverter only accepts the commands from the programmable controller during operation using the CC-Link IE Field Network Basic. Operation commands input from external devices are ignored.
- If multiple inverters have the same station number, the communication cannot be performed properly.
- The 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 or other factors 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 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 remote station to divide remote stations into groups and perform cyclic transmission by the group. By grouping the remote stations 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.)



*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

MODBUS/TCP is available for the FR-D800-EPA and FR-D800-EPB.

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*1		3
Server function	Number of simultaneously acceptable request messages	1 to 3

*1 This indicates the number of connections which can be simultaneously established by the inverter. The maximum number of connected units depends on the maximum number of connections of the client and the number of connections per inverter. For example, when the maximum number of connections of the client is 64 and one connection is used per inverter, up to 64 units can be connected. For details, refer to the User's Manual of the client.

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 configured 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, 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 for the FR-D800-EPA.
*3 The setting is available for the FR-D800-EPB.

NOTE

- The monitor items and parameter settings can be read during communication with the **Pr.1432 Ethernet communication check time interval** = "0" 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.)

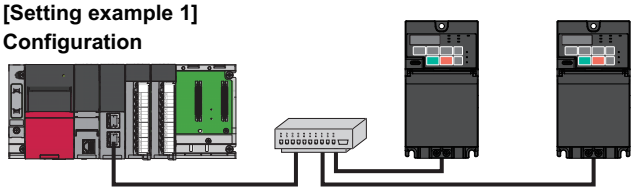
◆ Ethernet function selection (Pr.1427 to Pr.1430)

To select 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 173.)

◆ 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]
Configuration



Client	Server 1	Server 2
iQ-R R08CPU	FR-D800	FR-D800
192.168.50.100	192.168.50.1	192.168.50.2

To allow the client to control the servers, set the parameters in servers 1 and 2 as follows to specify the IP address range for Ethernet command source selection.
Set the IP address of the client in the engineering software (GX Works3) within the range from 192.168.50.100 to 192.168.50.110.

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	50	100
			The range is between the values set in both parameters.	
			Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	—	—	9999	110

In this case, the IP address range in which Ethernet communication is permitted is "192.168.50.xxx (100 to 110)".

[Setting example 2]

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	1	100
			The range is between the values set in both parameters.	The range is between the values set in both parameters.
			Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	—	—	3	150

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)".

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

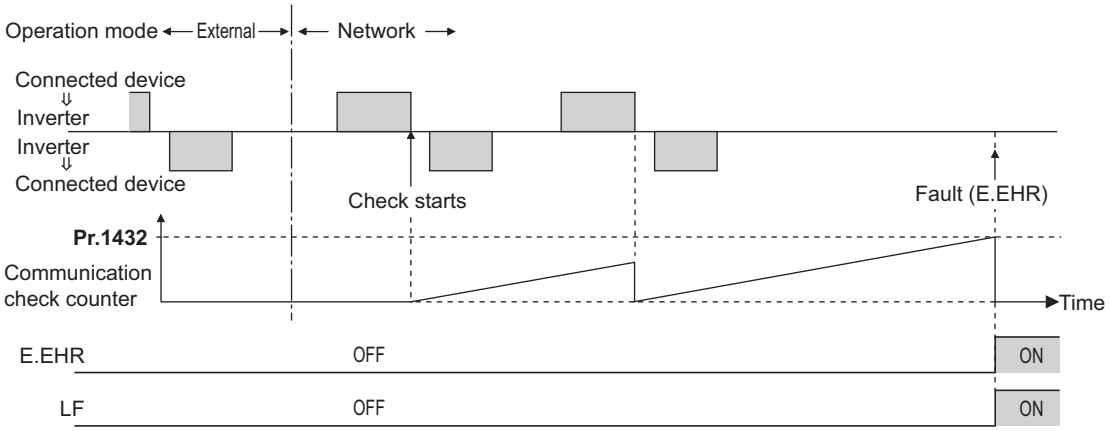
NOTE

- 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 is lost (communication stops) 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 enabled when any of 0.1 to 999.8 seconds 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 client.)
- 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)

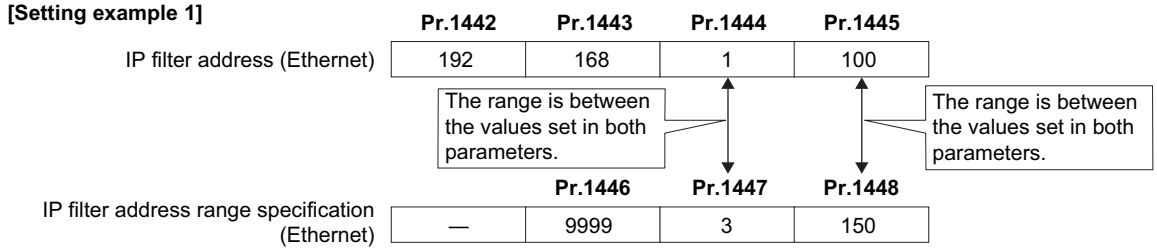
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

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 client.
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)

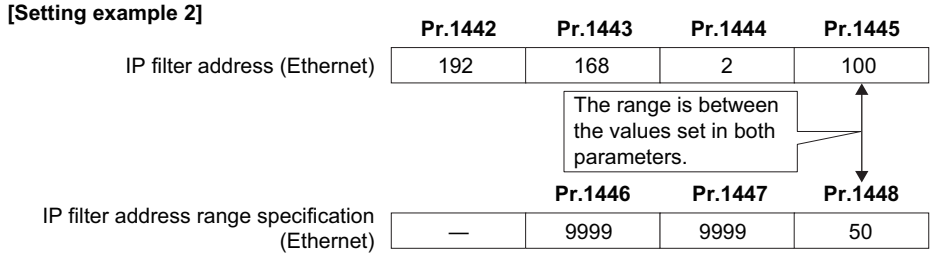
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either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



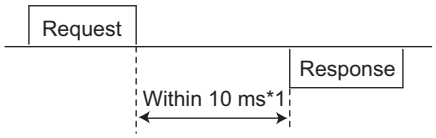
In this case, the IP address range in which Ethernet communication is permitted is "192.168.2.xxx (50 to 100)".

- 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 details on external devices used to control access rights, contact the distributors of the external devices.)

◆ Message format

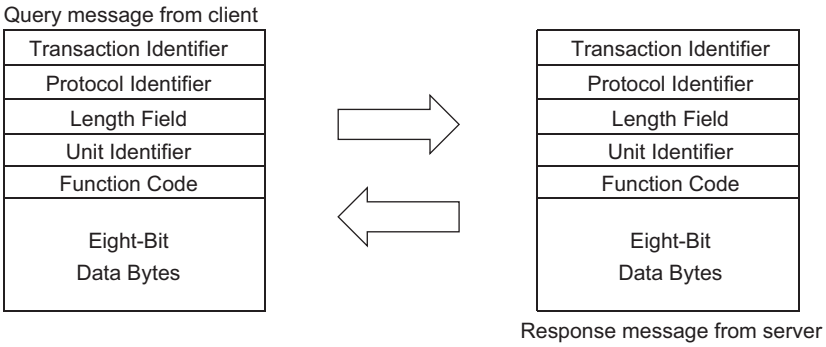


*1 The chart shows the performance when the inverter is connected to a client on a 1:1 basis. (It takes 10 ms or more for Parameter clear, All parameter clear, or accessing multiple registers.)

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

◆ Message frame (protocol)

- Communication method
  Basically, the client sends a query message (inquiry), and servers 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 code	Data
2 × 8 bits	2 × 8 bits	2 × 8 bits	8 bits	8 bits	n × 8 bits

Message field	Description
Transaction identifier	The client adds the data for the purpose of transaction control. The same data is returned in the response from the server.
Protocol identifier	Fixed to 0. (When the server receives data other than 0, it does not send the response message.) "0" is returned in the response from the server.
Length field	The data length from the unit identifier to the data is stored in byte.
Unit identifier	0, 255
Function code	"1 to 255" can be set as the function code in the single-byte (8-bit) length filed. The client sets the function to be sent to the server as the request, and the server 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 server contains the function code set by the client. The error response contains H80 and the function code.
Data	The format changes according to the function code. (Refer to page 90.) 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 97.) Monitor code (Refer to the Instruction Manual (Function).) Fault history (Refer to page 99.) Model information monitor (Refer to page 99.) Inverter parameters (Refer to page 98.) CiA402 drive profile (Refer to page 99.)	page 90
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 97.) Inverter parameters (Refer to page 98.)	page 91
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 92
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 97.) Inverter parameters (Refer to page 98.) CiA402 drive profile (Refer to page 99.)	page 92
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 codes H03, H06, and H10. When the connection is closed, the data in the log is cleared.	page 93

◆ 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 client adds the data for the purpose of transaction control. The same data is returned in the response from the server.
b	Protocol identifier	Fixed to 0. (When the server receives data other than 0, it does not send the response message.) "0" is returned in the response from the server.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	0, 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 (Except for the CiA402 drive profile) For example, when starting address 0001 is set, the data of holding register 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)	HB8 (8 bits)	H03 (8 bits)	HE8 (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 97) 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 client adds the data for the purpose of transaction control. The same data is returned in the response from the server.
b	Protocol identifier	Fixed to 0. (When the server receives data other than 0, it does not send the response message.) "0" is returned in the response from the server.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	0, 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 client adds the data for the purpose of transaction control. The same data is returned in the response from the server.
b	Protocol identifier	Fixed to 0. (When the server receives data other than 0, it does not send the response message.) "0" is returned in the response from the server.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	0, 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
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)

i. Register value		
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 client adds the data for the purpose of transaction control. The same data is returned in the response from the server.
b	Protocol identifier	Fixed to 0. (When the server receives data other than 0, it does not send the response message.) "0" is returned in the response from the server.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	0, 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 (Except for the CiA402 drive profile) 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
*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)

Register value			
H00 (8 bits)	H05 (8 bits)	H00 (8 bits)	H0A (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 client adds the data for the purpose of transaction control. The same data is returned in the response from the server.
b	Protocol identifier	Fixed to 0. (When the server receives data other than 0, it does not send the response message.) "0" is returned in the response from the server.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	0, 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. Start 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)**.

◆ CiA402 drive profile

- Reading and writing according to the CiA402 drive profile are available.
- Use the function code H03 (page 90) for reading and the function code H10 (page 92) for writing.

■ Example) Read the register values of vl velocity acceleration (index 24648, sub index 0 to 2)

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)	H60 (8 bits)	H48 (8 bits)	H00 (8 bits)	H04 (8 bits)

*1 A given value is set.

Normal response (Response message)

Transaction identifier		Protocol identifier		Length field		Unit identifier	Function code	Byte count
*1	*1	H00 (8 bits)	H00 (8 bits)	H00 (8 bits)	H0A (8 bits)	HFF (8 bits)	H03 (8 bits)	H08 (8 bits)

Register value							
H00 (8 bits)	H02 (8 bits)	H07 (8 bits)	H08 (8 bits)	H00 (8 bits)	H00 (8 bits)	H00 (8 bits)	H05 (8 bits)

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

Read value

Sub index 0 (Highest sub-index supported): H0002 (2)

Sub index 1 (Delta speed): H07080000 (1800 r/min)

Sub index 2 (Delta time): H0005 (0.5 s)

■ Example) Write the register values to vl velocity acceleration (index 24648, sub index 0 to 2)

Query message

Transaction identifier		Protocol identifier		Length field		Unit identifier	Function code	Starting address		Quantity of registers		Byte count
*1	*1	H00 (8 bits)	H00 (8 bits)	H00 (8 bits)	H0F (8 bits)	HFF (8 bits)	H10 (8 bits)	H60 (8 bits)	H48 (8 bits)	H00 (8 bits)	H04 (8 bits)	H08 (8 bits)

Register value							
H00 (8 bits)	H02 (8 bits)	H07 (8 bits)	H08 (8 bits)	H00 (8 bits)	H00 (8 bits)	H00 (8 bits)	H05 (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)	H60 (8 bits)	H48 (8 bits)	H00 (8 bits)	H04 (8 bits)

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

◆ Error response

- An error response is returned if the query message received from the client 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	f. 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 client adds the data for the purpose of transaction control. The same data is returned in the response from the server.
b	Protocol identifier	Fixed to 0. (When the server receives data other than 0, it does not send the response message.) "0" is returned in the response from the server.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	0, 255
e	Function code	The function code requested by the client 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 client has a function code that cannot be handled by the server.
02	ILLEGAL DATA ADDRESS	• The query message from the client has a register address that cannot be handled by the server. (No parameter, parameter cannot be read, parameter cannot be written) (Except for the CiA402 drive profile)*1 • A nonexistent holding register is accessed using the CiA402 drive profile. More than one holding register with more than one subindex is accessed.*2*3
03	ILLEGAL DATA VALUE	The query message from the client has data that cannot be handled by the server. (Out of parameter write range, a mode is specified, or some other error)*1
06	SERVER DEVICE BUSY	The request message cannot be processed because the server 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.
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.

*2 An error response is returned in the following cases.

Example	Index	Sub index	Function code	
			H03	H10
Access is attempted to index 24644 to index 24646 (index 24645 does not exist).	24644 (H6044)	0	Error code H02	Error code H02
	24646 (H6046)	0		
Access is attempted to index 24648 and index 24649.	24648 (H6048)	0	Error code H02	Error code H02 The written data will be valid as far as subindex 2 of index 24648.
		1		
		2		
	24649 (H6049)	0		
		1		
		2		

*3 An error response is not returned in the following cases.
Function code H10 (writing data to multiple holding registers)
Access is attempted to a writing-disabled subindex of a holding register with multiple subindices and data writing is enabled for at least one of the subindices.

◆ 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), model information monitor items (read), and CiA402 drive profile data (read/write).
- 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	Control input command / inverter status (extended)*2	Read/write	Refer to page 97.
40009	Control input command / inverter status*2	Read/write	Refer to page 97.
40010	Operation mode / inverter setting*3	Read/write	Refer to page 98.
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 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.

- Control input command / inverter status, control input command / inverter status (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	Output stop	0
11	—	0
12	—	0
13	—	0
14	—	0
15	—	Fault occurrence

Bit	Definition	
	Control input command (extended)	Inverter status (extended)
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.182 and Pr.185 to Pr.189 (Input terminal function selection)**.
For details, refer to the description of **Pr.180 to Pr.182 and Pr.185 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).

- 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 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 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 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
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 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 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-D820-EPA H46, H52, H2D, H44, 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 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.
- The display can be changed from the frequency to rotations per minute (machine speed) using **Pr.53**. When the machine speed is displayed, the value is incremented by one.

- CiA402 drive profile

Register		Name	Description	Read/write	Data type
Index	Sub index				
24639 (H603F)	0	Error code	Error number The error code of the latest fault that occurred after power-ON or an inverter reset is returned. When no fault occurs, no error is returned. When the fault history is cleared during occurrence of a fault, no error is returned. The upper eight bits are fixed to FF, and the lower eight bits represent the error code. (HFFXX: "XX" represents the error code.) (For details on error codes, refer to the list of fault displays in the Instruction Manual (Maintenance).)	Read	Unsigned16
24642 (H6042)	0	vl target velocity	Set speed (r/min)*1*3 Set the set frequency in r/min. Monitoring range: -32768 (H8000) to 32767 (H7FFF) When **Pr.81** = "9999", the number of motor poles is regarded as 4. Do not change the settings of this index and index 24831 (H60FF) at the same time.	Read/write	Integer16
24643 (H6043)	0	vl velocity demand	Output frequency (r/min)*1 The output frequency is read in r/min. Monitoring range: -32768 (H8000) to 32767 (H7FFF) When **Pr.81** = "9999", the number of motor poles is regarded as 4.	Read	Integer16

Register		Name	Description	Read/write	Data type
Index	Sub index				
24644 (H6044)	0	vl velocity actual value	Operation speed (r/min)[*1] The operation speed is read in r/min. Monitoring range: -32768 (H8000) to 32767 (H7FFF) When **Pr.81** = "9999", the number of motor poles is regarded as 4.	Read	Integer16
24646 (H6046)	—	vl velocity min max amount	Minimum/maximum speed (r/min)	—	—
	0	Highest sub-index supported	Maximum value of subindex: H02 (fixed)	Read	Unsigned8
	1	vl velocity min amount	Minimum speed (r/min)[*1*2] Set **Pr.2 Minimum frequency** in r/min. Setting range: 0 to 120 Hz	Read/write	Unsigned32
	2	vl velocity max amount	Maximum speed (r/min)[*1*2] Set **Pr.18 High speed maximum frequency** in r/min. Setting range: 0 to 590 Hz Do not change the settings of this index and index 24703 (H607F) at the same time.	Read/write	Unsigned32
24648 (H6048)	—	vl velocity acceleration	Acceleration vl velocity acceleration = Delta speed/Delta time	—	—
	0	Highest sub-index supported	Maximum value of subindex: H02 (fixed)	Read	Unsigned8
	1	Delta speed	Reference speed (r/min)[*1*2] Set **Pr.20 Acceleration/deceleration reference frequency** in r/min. Setting range: 1 to 590 Hz	Read/write	Unsigned32
	2	Delta time	Acceleration time (s)[*2] Set **Pr.7 Acceleration time**. Setting range: 0 to 3600 s (Example: To accelerate to 1500 r/min for 3.7 seconds, set sub index 1 to 15000 r/min and set sub index 2 to 37 seconds.) Do not change the settings of this index and index 24707 (H6083) at the same time.	Read/write	Unsigned16
24649 (H6049)	—	vl velocity deceleration	Deceleration vl velocity deceleration = Delta speed/Delta time	—	—
	0	Highest sub-index supported	Maximum value of subindex: H02 (fixed)	Read	Unsigned8
	1	Delta speed	Reference speed (r/min)[*1*2] Set **Pr.20 Acceleration/deceleration reference frequency** in r/min. Setting range: 1 to 590 Hz	Read/write	Unsigned32
	2	Delta time	Deceleration time (s)[*2] Set **Pr.8 Deceleration time**. Setting range: 0 to 3600 s (Example: To decelerate from 1500 r/min for 3.7 seconds, set sub index 1 to 15000 r/min and set sub index 2 to 37 seconds.) Do not change the settings of this index and index 24708 (H6084) at the same time.	Read/write	Unsigned16
24672 (H6060)	0	Modes of operation	Control mode: -1 (vendor specific operation mode) (fixed)	Read/write	Integer8
24673 (H6061)	0	Modes of operation display	Current control mode: -1 (vendor specific operation mode) (fixed)	Read	Integer8
24692 (H6074)	0	Torque demand	Torque demand value (%) The torque command is read.	Read	Integer16
24695 (H6077)	0	Torque actual value	Torque actual value (%) The motor torque is read.	Read	Integer16
24703 (H607F)	0	Max profile velocity	Maximum profile speed (r/min)[*1*2] Set **Pr.18 High speed maximum frequency** in r/min. Setting range: 0 to 590 Hz Do not change the settings of this index and index 24646 (H6046), sub index 2 at the same time.	Read/write	Unsigned32

Register		Name	Description	Read/write	Data type
Index	Sub index				
24707 (H6083)	0	Profile acceleration	Acceleration time constant (ms) Set **Pr.7 Acceleration time** in ms. Setting range: 0 to 3600 s The last two digits are rounded off when **Pr.21 Acceleration/ deceleration time increments** = "0", and the last digit is rounded off when **Pr.21** = "1". Do not change the settings of this index and index 24648 (H6048), sub index 2 at the same time.	Read/write	Unsigned32
24708 (H6084)	0	Profile deceleration	Deceleration time constant (ms) Set **Pr.8 Deceleration time** in ms. Setting range: 0 to 3600 s The last two digits are rounded off when **Pr.21 Acceleration/ deceleration time increments** = "0", and the last digit is rounded off when **Pr.21** = "1". Do not change the settings of this index and index 24649 (H6049), sub index 2 at the same time.	Read/write	Unsigned32
24831 (H60FF)	0	Target velocity	Set speed (r/min)*1*3 Set the set frequency in r/min. Monitoring range: -32768 (H8000) to 32767 (H7FFF) When **Pr.81** = "9999", the number of motor poles is regarded as 4. For writing the value after the unit switchover using **Pr.53**, the lower 24 bits of the data are valid and the upper 8 bits are ignored. Do not change the settings of this index and index 24642 (H6042) at the same time.	Read/write	Integer32
25858 (H6502)	0	Supported drive modes	Supported control mode: H00010000 (vendor specific operation mode)	Read	Unsigned32
26623 (H67FF)	0	Single device type	Device type Bit 0 to 15 Device Profile Number: H0192 (402: Drive Profile) Bit 16 to 23 Additional Information (Type): H01 (Frequency Converter: Inverter) Bit 24 to 31 Additional Information (mode bits): H00	Read	Unsigned32

*1 The value is displayed and set in r/min regardless of the settings in **Pr.53**.
The frequency is converted to the rotation speed for reading, and the setting value is converted to the frequency for writing.
*2 Writing to EEPROM or RAM is selected according to the setting in **Pr.342 Communication EEPROM write selection**.
*3 Writing is not restricted by the **Pr.18 and Pr.2** settings.

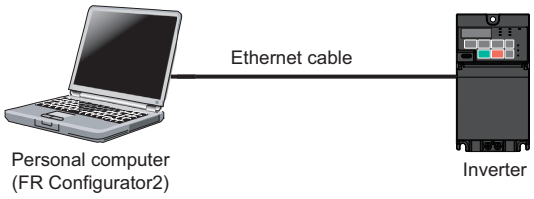
2.8 MELSOFT / FA product connection

2.8.1 Outline

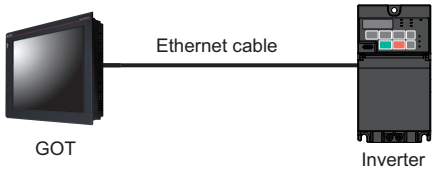
A computer (FR Configurator2), GOT, or a relay station (programmable controller) can be connected via Ethernet.

◆ System configuration

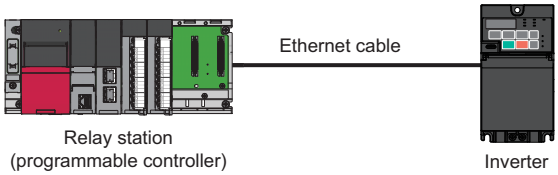
- Direct connection with a computer (FR Configurator2)



- Direct connection with GOT



- Connection using a relay station (programmable controller)



2.8.2 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 configured 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, 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.

Pr.	Name	Initial value	Setting range	Description
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	Set the IP address range of the device for which the communication check (signal loss detection) is performed using **Pr.1432**.
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 for the FR-D800-EPA.
*3 The setting is available for the FR-D800-EPB.

NOTE

- The monitor items and parameter settings can be read during communication with the **Pr.1432 Ethernet communication check time interval** = "0" 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 105.)

◆ 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 173.)

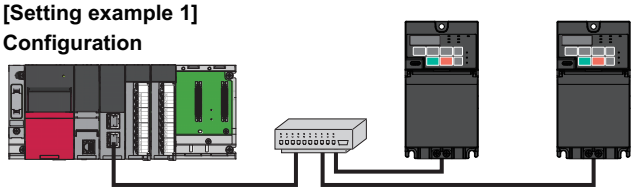
◆ Ethernet communication network number (Pr.1424), Ethernet communication station number (Pr.1425)

- 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**.

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

- Set the IP address range of the device for which the communication check (signal loss detection) is performed using **Pr.1432 Ethernet communication check time interval**.
- The IP address range of the device for which the signal loss detection is performed 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]
Configuration



Master	Inverter 1	Inverter 2
iQ-R R08CPU	FR-D800	FR-D800
192.168.50.100	192.168.50.1	192.168.50.2

To enable signal loss detection for connection with the master, set the parameters in inverters 1 and 2 as follows to specify the IP address range for Ethernet command source selection.
Set the IP address of the master station in the engineering software (GX Works3) within the range from 192.168.50.100 to 192.168.50.110.

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	50	100

The range is between the values set in both parameters.

	Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	9999	110

In this case, the IP address range of the device to perform the signal loss detection is "192.168.50.xxx (100 to 110)".

[Setting example 2]

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	1	100

The range is between the values set in both parameters.

The range is between the values set in both parameters.

	Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	3	150

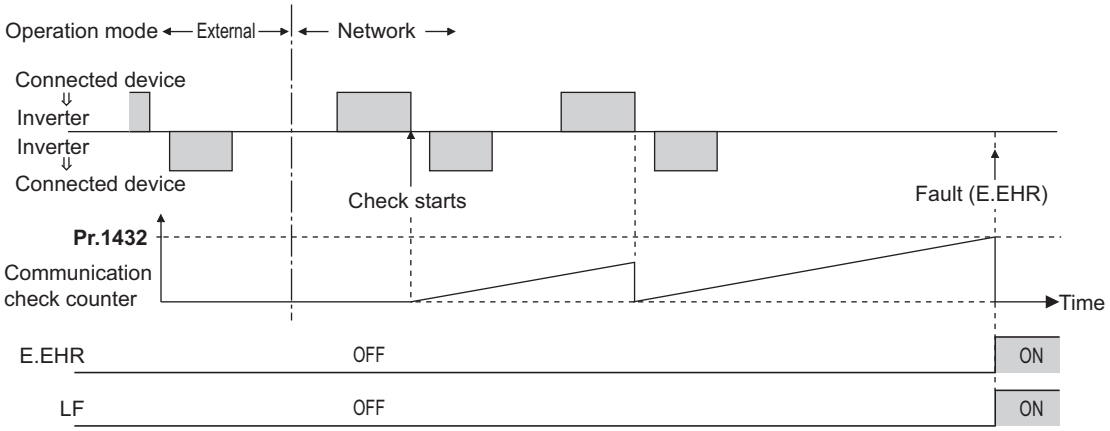
In this case, the IP address range of the device to perform the signal loss detection is "192.168.x (1 to 3).xxx (100 to 150)".

- 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 is lost (communication stops) 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 enabled when any of 0.1 to 999.8 seconds 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 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)

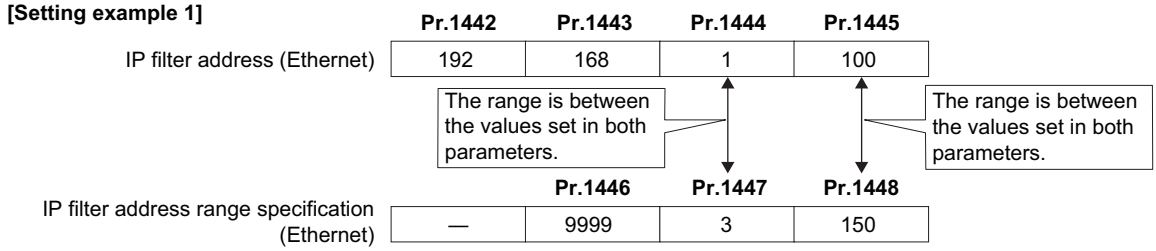
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

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)

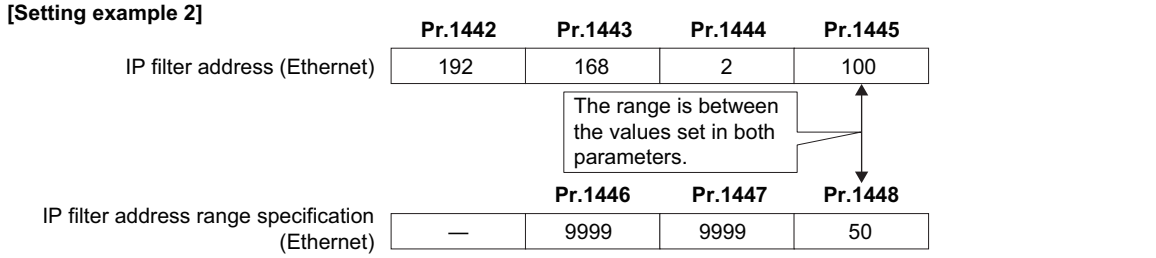
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either 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 details on external devices used to control access rights, contact the distributors of the external devices.)

2.9 SLMP

2.9.1 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 details on the SLMP compatibility of external devices, refer to the Instruction Manual of external devices.)

2.9.2 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 configured 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, 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.
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	Set the IP address range of the device for which the communication check (signal loss detection) is performed using **Pr.1432**.
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 for the FR-D800-EPA.
*3 The setting is available for the FR-D800-EPB.

NOTE

- Only binary code is supported. (ASCII code is not supported.)
- The monitor items and parameter settings can be read during communication with the **Pr.1432 Ethernet communication check time interval** = "0" 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 110.)

◆ 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 173.)

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

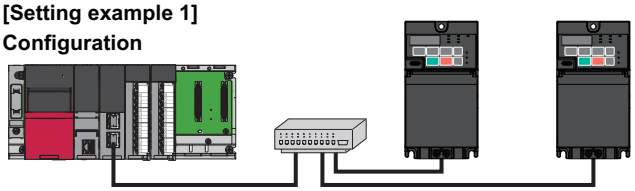
- When the MELSOFT / FA product connection, SLMP, or iQSS is selected for Ethernet communication, enter the Ethernet communication network number in **Pr.1424** and the Ethernet communication station number in **Pr.1425**.

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

- Set the IP address range of the device for which the communication check (signal loss detection) is performed using **Pr.1432 Ethernet communication check time interval**.
- The IP address range of the device for which the signal loss detection is performed 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]

Configuration



Master	Inverter 1	Inverter 2
iQ-R R08CPU	FR-D800	FR-D800
192.168.50.100	192.168.50.1	192.168.50.2

To enable signal loss detection for connection with the master, set the parameters in inverters 1 and 2 as follows to specify the IP address range for Ethernet command source selection.
Set the IP address of the master station in the engineering software (GX Works3) within the range from 192.168.50.100 to 192.168.50.110.

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	50	100

The range is between the values set in both parameters.

	Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	9999	110

In this case, the IP address range of the device to perform the signal loss detection is "192.168.50.xxx (100 to 110)".

[Setting example 2]

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	1	100

The range is between the values set in both parameters.

The range is between the values set in both parameters.

	Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	3	150

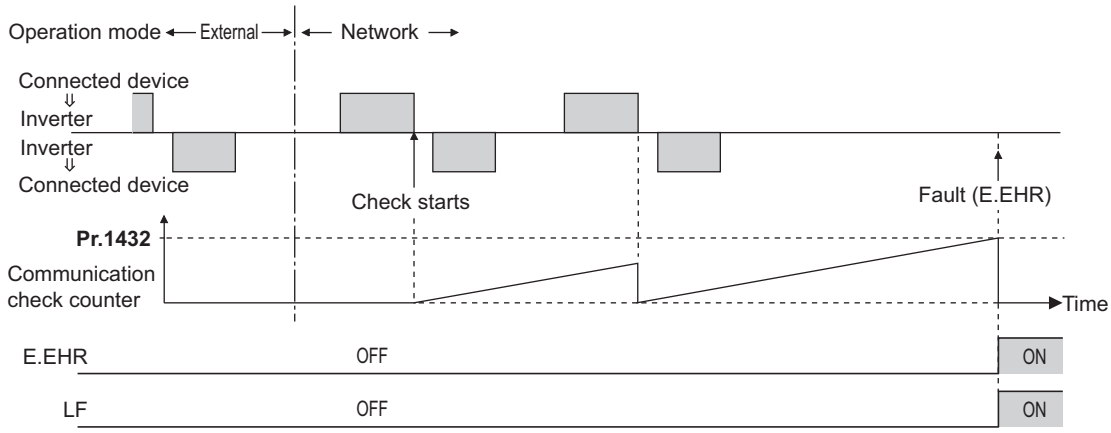
In this case, the IP address range of the device to perform the signal loss detection is "192.168.x (1 to 3).xxx (100 to 150)".

- 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 is lost (communication stops) 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 enabled when any of 0.1 to 999.8 seconds 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



2.9.3 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).
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)

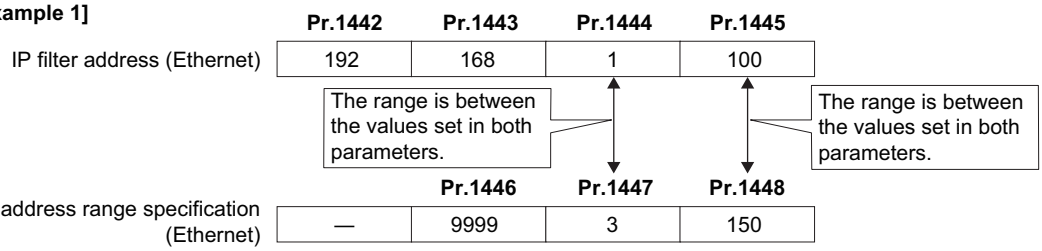
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

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)

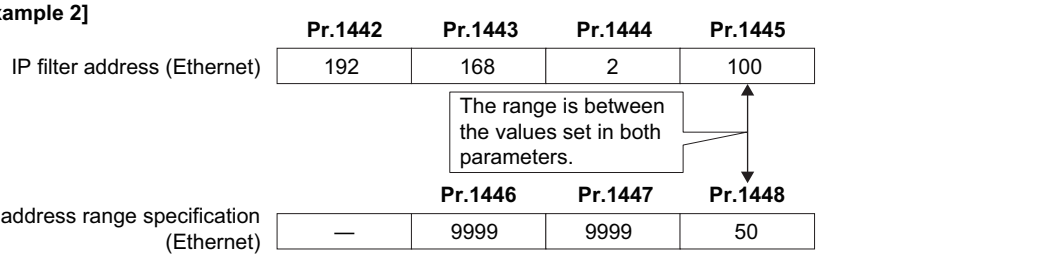
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either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

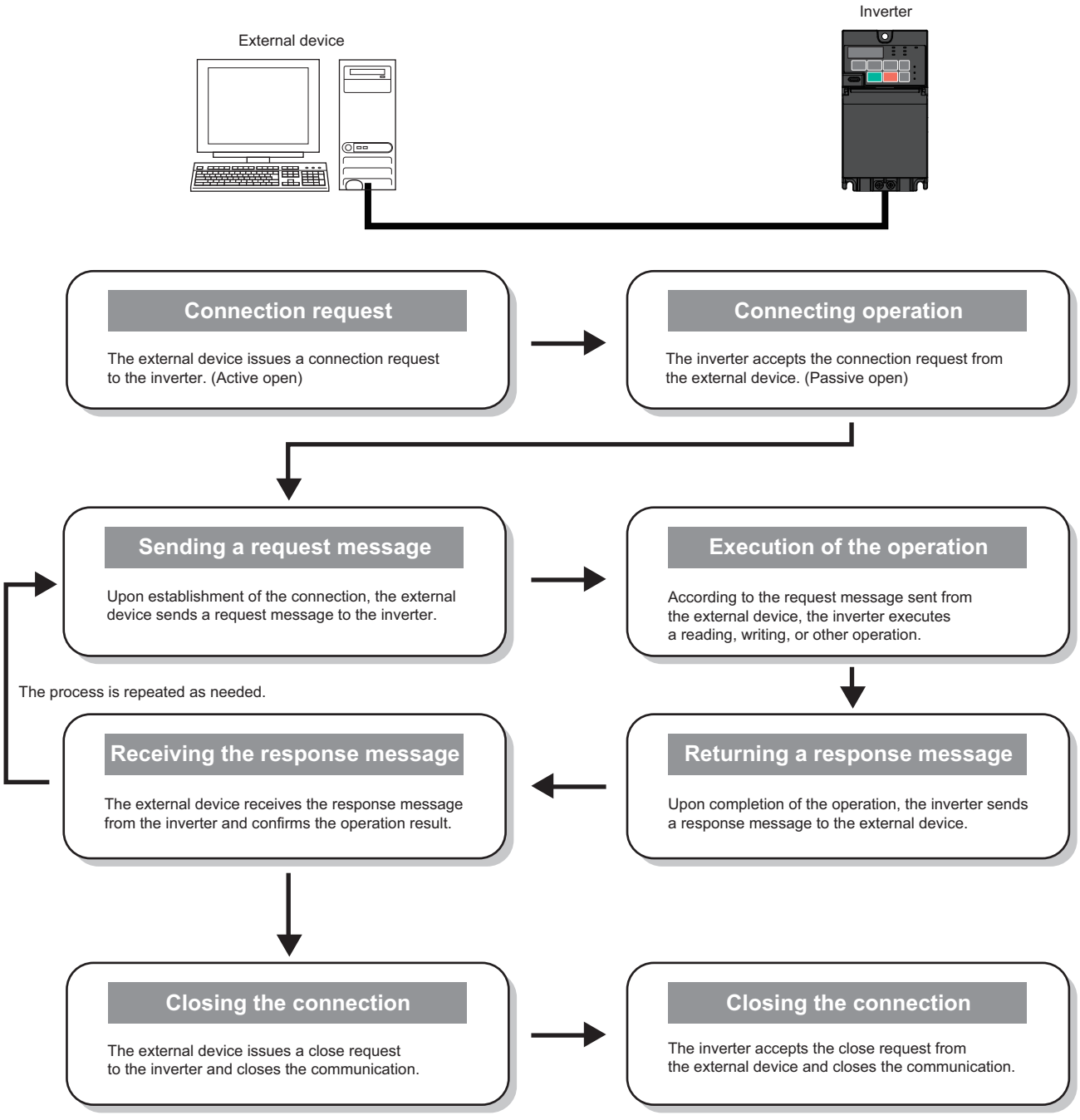
- The IP filtering function (Ethernet) (**Pr.1442 to Pr.1448**) is provided as a means to prevent unauthorized access, DoS attacks, computer viruses, or other cyberattacks from external devices, but the function does not prevent such access completely. In order to protect the inverter and the system 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 details on 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.

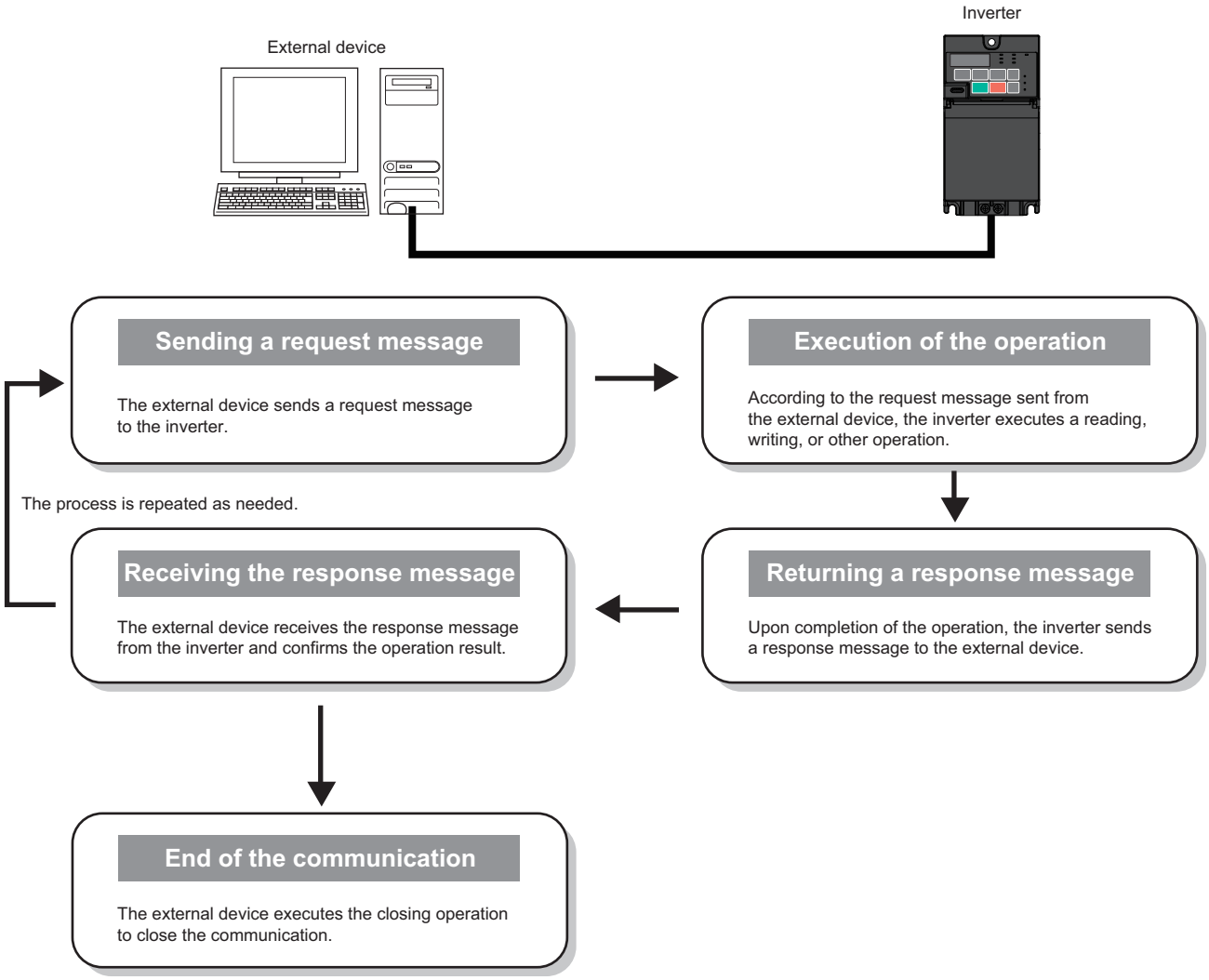
  With TCP/IP, connections are established when communication is executed, and whether data is received normally or not is checked to ensure reliability of data. However, the line load is higher as compared to UDP.



- 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

Header	Subheader	Destination network No.	Destination station No.	Destination unit I/O No.	Destination multidrop station No.	Response data length	End code	Response data	Footer

• Failed completion

Header	Subheader	Destination network No.	Destination station No.	Destination unit I/O No.	Destination multidrop station No.	Response data length	End code	Network No. (responding station)	Station No. (responding station)	Destination unit I/O No.	Destination multidrop station No.	Command	Subcommand	Footer

Error information

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)	

Item	Size	Endian	Description
Request data	Variable	Little	Specify the command, subcommand, and data that indicate the requested operation. (Refer to page 115.)
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 121) 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 word units	H0401	H0000	The inverter reads the value in word devices (with consecutive device numbers) in 1-word units.	119
	Write	In word units	H1401	H0000	The inverter writes the value to word devices (with consecutive device numbers) in 1-word units.	120
	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 units.	120
	Write Random	In word units	H1402	H0000	The inverter writes the value to the word devices with the specified device numbers (each word has a device number). The devices with non-consecutive numbers can be specified.	121

◆ Device

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

Device	Category	Device code	Range*1
Link register (W)	Word	HB4	8192

*1 If write/read is requested from/to any devices outside the range, the error code H4031 is returned. (Refer to page 121.)

◆ Link register

The following shows the link registers for parameters (read/write), inverter status monitor items (read), fault history (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 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	

Pr.	Register	Name	Read/write	Remarks
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
C42 (934)	W934	PID display bias coefficient	Read/write	
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
C44 (935)	W935	PID display gain coefficient	Read/write	
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
1000 to 1499	W1000 to W1499	For details on parameter names, refer to the parameter list in the 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
W5013	Input power	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

Register	Monitor item	Read/ write
W5033	Torque current command	Read
W5037	Heat sink temperature	Read
W5038	Trace status	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
W5061	Motor thermal load factor	Read
W5062	Inverter thermal load factor	Read
W5064	PTC thermistor resistance	Read
W5067	PID measured value 2	Read
W5068	Emergency drive status	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
W5091	PID manipulated amount	Read
W5097	Dancer main speed setting	Read
W5098	Control circuit temperature	Read
W5807	Inverter status 1	Read
W5808	Inverter status 2	Read

- Inverter status 1, inverter status 2

Bit	Definition	
	Inverter status 1	Inverter status 2
0	Inverter running	DO0 (0)*2
1	During forward rotation	DO1 (0)*2
2	During reverse rotation	DO2 (0)*2
3	Up to frequency	0
4	Overload warning	0
5	0	0
6	Output frequency detection	0
7	Fault	0
8	Alarm	0
9	NET Y1 (0)*1	0
10	NET Y2 (0)*1	0
11	NET Y3 (0)*1	0
12	NET Y4 (0)*1	0
13	0	0
14	0	0
15	SO	0

*1 The signal within parentheses ( ) is assigned in the initial status. The function changes depending on the setting of **Pr.193 to Pr.196 (Output terminal function selection)**.
For details, refer to the description of **Pr.193 to Pr.196 (Output terminal function selection)** in the Instruction Manual (Function).

*2 The signal within parentheses ( ) is assigned in the initial status. The function changes depending on the setting of **Pr.313 to Pr.315 (Output terminal function selection)**.
For details, refer to the description of **Pr.313 to Pr.315 (Output terminal function selection)** in the Instruction Manual (Function).

- Fault history

Register	Definition	Read/write	Remarks
W5900 to W5906	Fault record 1	Read	Example) For fault record 1 W5900: Error code W5901: Output frequency at error occurrence W5902: Output current at error occurrence W5903: Output voltage at error occurrence W5904: Energization time at error occurrence W5905: Year and month of occurrence (Bit 0 to 3: Month, Bit 4 to 15: Year) W5906: Date and time of occurrence (Bit 0 to 5: Minute, Bit 6 to 10: Hour, Bit 11 to 15: Day)
W5907 to W5913	Fault record 2	Read	
W5914 to W5920	Fault record 3	Read	
W5921 to W5927	Fault record 4	Read	
W5928 to W5934	Fault record 5	Read	
W5935 to W5941	Fault record 6	Read	
W5942 to W5948	Fault record 7	Read	
W5949 to W5955	Fault record 8	Read	
W5956 to W5962	Fault record 9	Read	
W5963 to W5969	Fault record 10	Read	

- Preventive maintenance data

Register	Definition	Read/write	Remarks
W6000	Control method	Read	H02: V/F control H04: Advanced magnetic flux vector control H18: 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-D820-EPA: H46, H52, H2D, H44, 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	

Register	Definition	Read/write	Remarks
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.

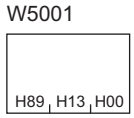
■ Device No. (first device No.) specification

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) Link register W5001



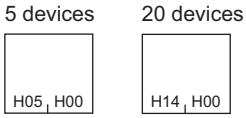
The link register W5001 is regarded as H001389 and sent in the order 89, 13, and 00.

■ 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



■ 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.

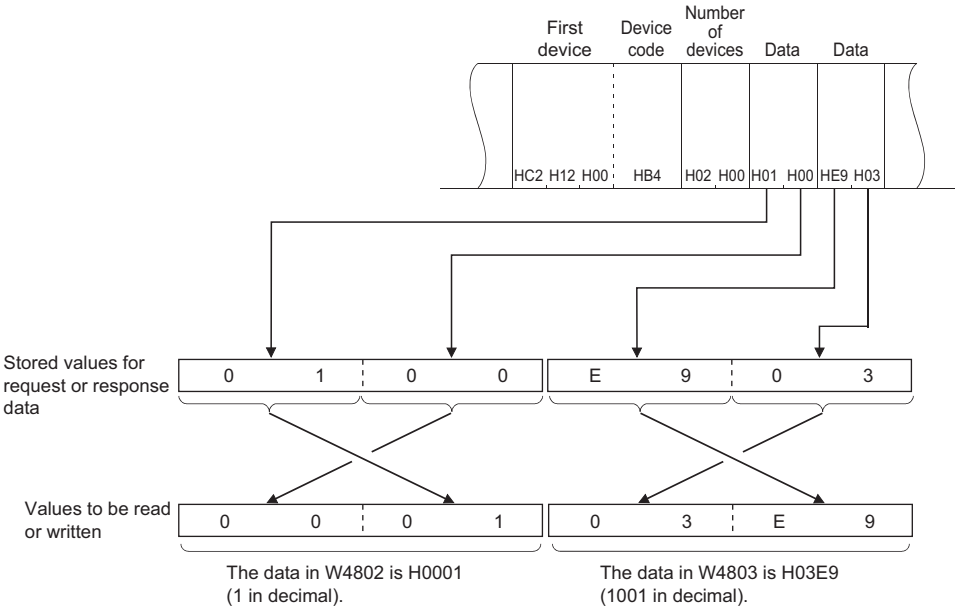
- In word units (subcommand: H0000)

When word devices are used, one word is specified in 16 bits. 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 W4802 and W4803



◆ 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 (word) for reading.
First device No.	Specify the number of the first device. (Refer to page 118.)
Device code	Specify the type of target devices. (Refer to page 115.)
Number of devices	Specify the number of target devices.

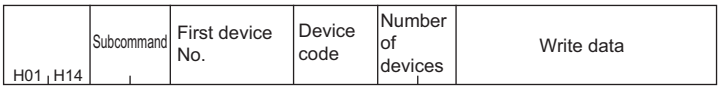
- Response data

The value read from the device is stored in hexadecimal.

■ Write

The inverter writes the value to the specified devices.

- Request data



Item	Description
Subcommand	Specify the unit (word) for writing.
First device No.	Specify the number of the first device. (Refer to page 118.)
Device code	Specify the type of the target devices. (Refer to page 115.)
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.

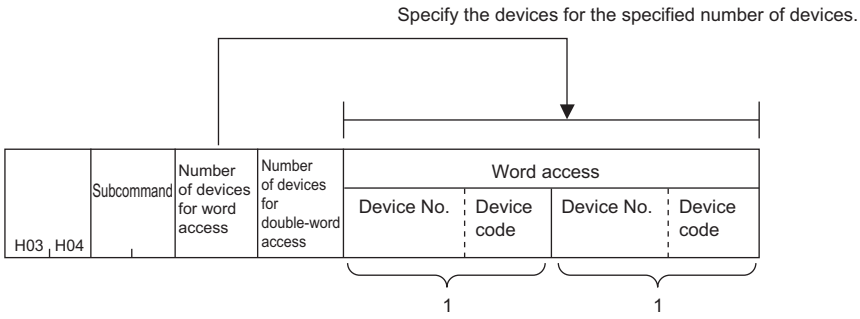
- Response data

None

■ Read Random

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

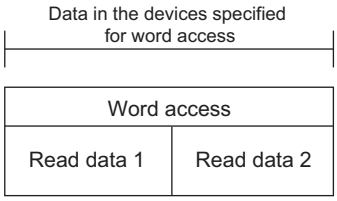
- Request data



Item	Description
Subcommand	Specify the unit (word) for reading.
Number of devices for word access	Specify the number of devices for one-word access. (word device: one word)
Number of devices for double-word access	"0" is always specified.
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.
Device No.	Specify the device number of target devices. (Refer to page 118.)
Device code	Specify the type of target devices. (Refer to page 115.)

- Response data

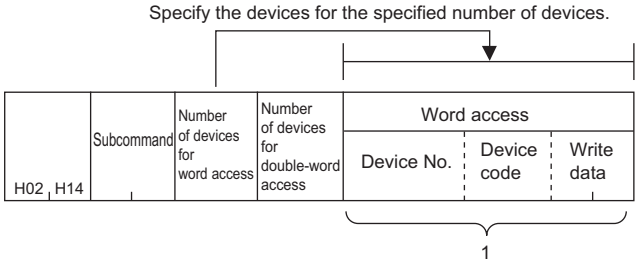
The value read from the device is stored in hexadecimal.



■ 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 (word) for writing.
Number of devices for word access	Specify the number of devices for one-word access. (word device: one word)
Number of devices for double-word access	"0" is always specified.
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.
Device No.	Specify the device number of target devices. (Refer to page 118.)
Device code	Specify the type of the target devices. (Refer to page 115.)

- Response data

None

◆ 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	Error description
H4031	The device outside of the range is specified.
H4035	The request cannot be executed because a protection range is set to prevent writing from external devices.
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.
HC061	The request data length is inconsistent with the number of data.

2.10 EtherNet/IP

2.10.1 Outline

EtherNet/IP is available for the FR-D800-EPA.

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 inverters. 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 and ANSI/TIA/EIA-568-B (Category 5e) compliant shielded 4-pair branched cable)
Class 1 communication (I/O Message communication)	Communication method	Cyclic communication
	Number of connections	4
	Communication data size	For details, refer to description of Assembly Object (page 131).
	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		CT20
LLDP (supported TLVs)		Chassis ID (TLV Type = 1) Port ID (TLV Type = 2) Time to Live (TLV Type = 3) System Capabilities (TLV Type = 7) Management Address (TLV Type = 8) CIP Identification (TLV Type = 127, subtype = 09)

◆ 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	Communication connector 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
https://www.MitsubishiElectric.com/fa/products/drv/inv/support/d800/d800e.html
The download is free at the website above. For details, contact your sales representative.
Use an appropriate EDS file for the inverter as specified in the following table. Errors may occur due to engineering software operation.

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.

2.10.2 EtherNet/IP 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 11.)
2. Set "44818" (EtherNet/IP) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. (Refer to page 124.)
   (Example: **Pr.1429** = "45238" (CC-Link IE TSN) (initial value) → "44818" (EtherNet/IP))
   When **Pr.1429** = "45238 (initial value)" (CC-Link IE TSN), change the value to "44818" (EtherNet/IP). When "45238" is set in any of **Pr.1427 to Pr.1430**, the priority is given to CC-Link IE TSN, disabling EtherNet/IP.
3. Reset the inverter, or turn OFF and then ON the power.

■ Network configuration

1. Add the downloaded EDS 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.
   Set the device name for each inverter when two or more inverters are connected.

■ 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
Solid green	Solid green	Blinking green

2.10.3 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 configured 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, 44818, 45237, 45238, 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.

NOTE

- The monitor items and parameter settings can be read during communication with the **Pr.1432 Ethernet communication check time interval** = "0" 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 126.)

◆ 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 any of **Pr.1427 to Pr.1430**, the priority is given to CC-Link IE TSN, disabling EtherNet/IP.

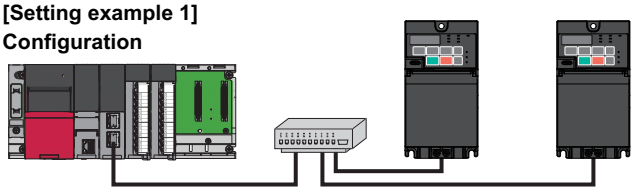
NOTE

- Change the setting if selected communication protocols cannot be used together. (Refer to page 4 and page 173.)

◆ 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]
Configuration



Master	Inverter 1	Inverter 2
iQ-R R08CPU	FR-D800	FR-D800
192.168.50.100	192.168.50.1	192.168.50.2

To allow the master to control the inverters, set the parameters in inverters 1 and 2 as follows to specify the IP address range for Ethernet command source selection.
Set the IP address of the master in the engineering software (GX Works3) within the range from 192.168.50.100 to 192.168.50.110.

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	50	100

The range is between the values set in both parameters.

	Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	9999	110

In this case, the IP address range in which Ethernet communication is permitted is "192.168.50.xxx (100 to 110)".

[Setting example 2]

	Pr.1449	Pr.1450	Pr.1451	Pr.1452
Ethernet IP address for command source selection	192	168	1	100

The range is between the values set in both parameters.

The range is between the values set in both parameters.

	Pr.1453	Pr.1454
Command source selection range setting for the Ethernet IP address	3	150

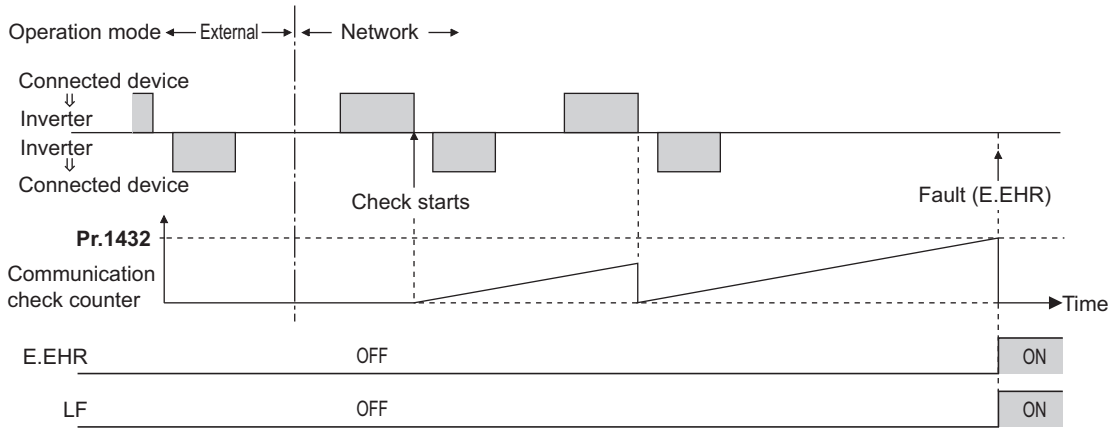
In this case, the IP address range for command source selection via Ethernet communication is "192.168.x (1 to 3).xxx (100 to 150)".

- 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 is lost (communication stops) 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 enabled when any of 0.1 to 999.8 seconds 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



2.10.4 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
541 **N100**	**Frequency command sign selection**	0	0	Signed frequency command value
			1	Unsigned frequency command value
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		
1318 **N800**[*1]	**User Defined Cyclic Communication Input fixing format selection**	9999	20 to 23	Set the output assembly instance number of Assembly Object (04h). Users can assign a function to the configurable output instance.
			9999	Function disabled

Pr.	Name	Initial value	Setting range	Description
1319 N801[*1]	**User Defined Cyclic Communication Output fixing format selection**	9999	70 to 73	Set the input assembly instance number of Assembly Object (04h). Users can assign a function to the configurable input instance.
			9999	Function disabled
1320 to 1329 N810 to N819[*1]	**User Defined Cyclic Communication Input 1 to 10 Mapping**	9999	12288 to 13787, 20488, 20489, 24672, 24703, 24707, 24708	Set the instance number of Inverter Configuration Object (64h) or the index number of CiA402 drive profile. Users can assign a function to the configurable output instance.
			9999	Function disabled
1330 to 1343 N850 to N863[*1]	**User Defined Cyclic Communication Output 1 to 14 Mapping**	9999	12288 to 13787, 16384 to 16483, 20488, 20489, 20981 to 20990, 20992, 24639, 24643, 24644, 24673, 24692, 24695, 25858	Set the instance number of Inverter Configuration Object (64h) or the index number of CiA402 drive profile. Users can assign a function to the configurable input instance.
			9999	Function disabled
1389[*1]	**User Defined Cyclic Communication Input Sub 1 and 2 Mapping**	0	0, 1, 256, 257	**Pr.1389** (lower 8 bits): Subindex to which the instance/index number is specified using **Pr.1320** **Pr.1389** (upper 8 bits): Subindex to which the instance/index number is specified using **Pr.1321**
1390[*1]	**User Defined Cyclic Communication Input Sub 3 and 4 Mapping**	0	0, 1, 256, 257	**Pr.1390** (lower 8 bits): Subindex to which the instance/index number is specified using **Pr.1322** **Pr.1390** (upper 8 bits): Subindex to which the instance/index number is specified using **Pr.1323**
1391[*1]	**User Defined Cyclic Communication Input Sub 5 and 6 Mapping**	0	0, 1, 256, 257	**Pr.1391** (lower 8 bits): Subindex to which the instance/index number is specified using **Pr.1324** **Pr.1391** (upper 8 bits): Subindex to which the instance/index number is specified using **Pr.1325**
1392[*1]	**User Defined Cyclic Communication Input Sub 7 and 8 Mapping**	0	0, 1, 256, 257	**Pr.1392** (lower 8 bits): Subindex to which the instance/index number is specified using **Pr.1326** **Pr.1392** (upper 8 bits): Subindex to which the instance/index number is specified using **Pr.1327**
1393[*1]	**User Defined Cyclic Communication Input Sub 9 and 10 Mapping**	0	0, 1, 256, 257	**Pr.1393** (lower 8 bits): Subindex to which the instance/index number is specified using **Pr.1328** **Pr.1393** (upper 8 bits): Subindex to which the instance/index number is specified using **Pr.1329**
N830 to N839[*1]	**User Defined Cyclic Communication Input Sub 1 to 10 Mapping**	0	0, 1	Subindices to which the instance/index numbers are specified using **Pr.1320 to Pr.1329**
1394[*1]	**User Defined Cyclic Communication Output Sub 1 and 2 Mapping**	0	0, 1, 256, 257	**Pr.1394** (lower 8 bits): Subindex to which the instance/index number is specified using **Pr.1330** **Pr.1394** (upper 8 bits): Subindex to which the instance/index number is specified using **Pr.1331**
1395[*1]	**User Defined Cyclic Communication Output Sub 3 and 4 Mapping**	0	0, 1, 256, 257	**Pr.1395** (lower 8 bits): Subindex to which the instance/index number is specified using **Pr.1332** **Pr.1395** (upper 8 bits): Subindex to which the instance/index number is specified using **Pr.1333**
1396[*1]	**User Defined Cyclic Communication Output Sub 5 and 6 Mapping**	0	0, 1, 256, 257	**Pr.1396** (lower 8 bits): Subindex to which the instance/index number is specified using **Pr.1334** **Pr.1396** (upper 8 bits): Subindex to which the instance/index number is specified using **Pr.1335**
1397[*1]	**User Defined Cyclic Communication Output Sub 7 and 8 Mapping**	0	0, 1, 256, 257	**Pr.1397** (lower 8 bits): Subindex to which the instance/index number is specified using **Pr.1336** **Pr.1397** (upper 8 bits): Subindex to which the instance/index number is specified using **Pr.1337**
1398[*1]	**User Defined Cyclic Communication Output Sub 9 and 10 Mapping**	0	0, 1, 256, 257	**Pr.1398** (lower 8 bits): Subindex to which the instance/index number is specified using **Pr.1338** **Pr.1398** (upper 8 bits): Subindex to which the instance/index number is specified using **Pr.1339**
N870 to N879[*1]	**User Defined Cyclic Communication Output Sub 1 to 10 Mapping**	0	0, 1	Subindices to which the instance/index numbers are specified using **Pr.1330 to Pr.1339**

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

◆ 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 EtherNet/IP.
- The **Pr.541 Frequency command sign selection** setting is applied to SpeedRef (attribute 8) of AC/DC Drive Object (2Ah). (Refer to page 137.)

Pr.541 setting	Sign
0	Without
1	With

- 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

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

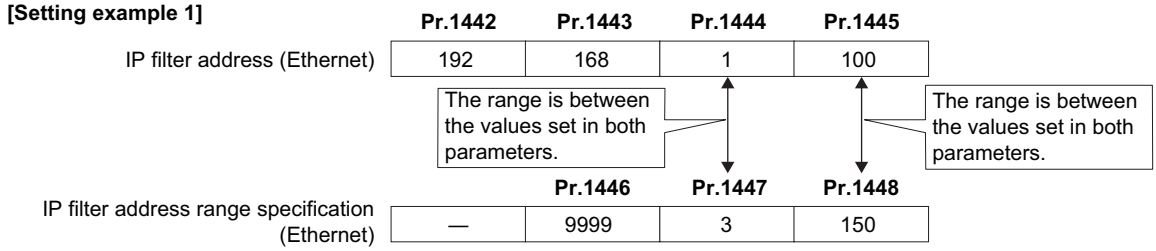
Use **Pr.1426 Link speed and duplex mode selection** to set the communication speed and the full-duplex or half-duplex system. If the operation is not performed properly in the initial setting (**Pr.1426** = "0"), set **Pr.1426** according to the specifications of the connected device.

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)

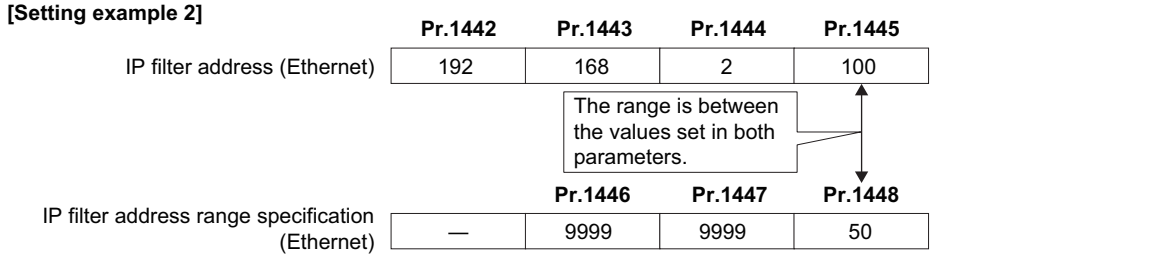
- Set the IP address range for connectable network devices (**Pr.1442 to Pr.1448**) to limit the connectable devices. The setting range for IP address of connectable network devices depends on the settings in **Pr.1443** and **Pr.1446**, **Pr.1444** and **Pr.1447**, and **Pr.1445** and **Pr.1448**. (Either 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 details on external devices used to control access rights, contact the distributors of the external devices.)

2.10.5 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.

2.10.6 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*1 (inverter reset)

*1 Writing is restricted by the settings of Ethernet IP address for command source selection (**Pr.1449 to Pr.1454**).

■ Class attribute

No.	Name	Access	Type	Description
1	Revision	Get	UINT	0002h (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	0070h (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 131.
6	Serial Number	Get	UDINT	Serial number of the inverter*2
7	Product Name	Get	SHORT_ STRING	FR-D800-E (product name)
11	Active language	Set/Get	Structure	Active language
			USINT	e, n, g (English)
			USINT	
			USINT	
30	Supported Language List 2	Get	Structure	List of languages supported by the host application
			UINT	0001h (number of languages in the list)
			Structure array	e, n, g (English)
			USINT	
			USINT	
			USINT	

*2 The number is created from the MAC address and used for EtherNet/IP communication. This is not the SERIAL number printed on the rating plate or on the package of the inverter.

- 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 (Exclusive Owner 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. Instance 20 to 23 and 70 to 73 are predefined for specific drive profile parameters. Users can select communication data using Instance 100 and 150.

■ 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/Get	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 133. Writing is restricted by the settings of Ethernet IP address for command source selection (**Pr.1449 to Pr.1454**).

- 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	00h							
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	00h							
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	00h							
2	Speed reference (Low byte)							
3	Speed reference (High byte)							
4	Torque reference (Low byte)*1							
5	Torque reference (High byte)*1							

*1 It can be used as a torque limit.

- 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	00h							
2	Speed reference (Low byte)							
3	Speed reference (High byte)							
4	Torque reference (Low byte)*1							
5	Torque reference (High byte)*1							

*1 It can be used as a torque limit.

- Instance 100 (64h): Configurable Output

  The data length depends on the settings in **Pr.1318, Pr.1320 to Pr.1329, and Pr.1389 to Pr.1393**. (For user defined cyclic communication input data, the data size ranges from 1 to 4 bytes depending on the data type specified in **Pr.1320 to Pr.1329 and Pr.1389 to Pr.1393**.) When "9999" is set in any of **Pr.1318 and Pr.1320 to Pr.1329**, the length of the corresponding data is treated as 0 bytes. (When "9999" is set in all of them, communication cannot be established.)

  If the same instance/index number is specified in two or more of **Pr.1320 to Pr.1329**, the number set in the parameter with the smallest parameter number is valid. The same number set in the other parameters is regarded as "9999". When a nonexistent instance/index number is set in **Pr.1320 to Pr.1329**, data is not written.

  The following format is an example when the data size is 2 bytes for all of the user defined cyclic communication input data.

Byte*1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 to (n-1)	User Defined Cyclic Communication Input fixing format selection (**Pr.1318**)							
n	User Defined Cyclic Communication Input 1 (lower bytes) (**Pr.1320**)							
n+1	User Defined Cyclic Communication Input 1 (upper bytes) (**Pr.1320**)							
n+2	User Defined Cyclic Communication Input 2 (lower bytes) (**Pr.1321**)							
n+3	User Defined Cyclic Communication Input 2 (upper bytes) (**Pr.1321**)							
n+4	User Defined Cyclic Communication Input 3 (lower bytes) (**Pr.1322**)							
n+5	User Defined Cyclic Communication Input 3 (upper bytes) (**Pr.1322**)							
n+6	User Defined Cyclic Communication Input 4 (lower bytes) (**Pr.1323**)							
n+7	User Defined Cyclic Communication Input 4 (upper bytes) (**Pr.1323**)							
n+8	User Defined Cyclic Communication Input 5 (lower bytes) (**Pr.1324**)							
n+9	User Defined Cyclic Communication Input 5 (upper bytes) (**Pr.1324**)							
n+10	User Defined Cyclic Communication Input 6 (lower bytes) (**Pr.1325**)							
n+11	User Defined Cyclic Communication Input 6 (upper bytes) (**Pr.1325**)							
n+12	User Defined Cyclic Communication Input 7 (lower bytes) (**Pr.1326**)							
n+13	User Defined Cyclic Communication Input 7 (upper bytes) (**Pr.1326**)							
n+14	User Defined Cyclic Communication Input 8 (lower bytes) (**Pr.1327**)							
n+15	User Defined Cyclic Communication Input 8 (upper bytes) (**Pr.1327**)							
n+16	User Defined Cyclic Communication Input 9 (lower bytes) (**Pr.1328**)							
n+17	User Defined Cyclic Communication Input 9 (upper bytes) (**Pr.1328**)							
n+18	User Defined Cyclic Communication Input 10 (lower bytes) (**Pr.1329**)							
n+19	User Defined Cyclic Communication Input 10 (upper bytes) (**Pr.1329**)							

*1 "n" indicates the data length of the instance specified in **Pr.1318** (4 or 6 bytes).

In **Pr.1389 to Pr.1393**, specify the subindices to which the instance/index numbers are specified using **Pr.1320 to Pr.1329**.

Data No.	Instance/index specification	Sub index specification
1	**Pr.1320**	**Pr.1389** (lower 8 bits)
2	**Pr.1321**	**Pr.1389** (upper 8 bits)
3	**Pr.1322**	**Pr.1390** (lower 8 bits)
4	**Pr.1323**	**Pr.1390** (upper 8 bits)
5	**Pr.1324**	**Pr.1391** (lower 8 bits)
6	**Pr.1325**	**Pr.1391** (upper 8 bits)
7	**Pr.1326**	**Pr.1392** (lower 8 bits)
8	**Pr.1327**	**Pr.1392** (upper 8 bits)
9	**Pr.1328**	**Pr.1393** (lower 8 bits)
10	**Pr.1329**	**Pr.1393** (upper 8 bits)

- 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 136, and AC/DC Drive Object (2Ah) on page 137.

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
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 135.

- 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	00h							
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 136.

- 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	00h							
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 136.

- Instance 150 (96h): Configurable Input

  The data length depends on the settings in **Pr.1319, Pr.1330 to Pr.1343, and Pr.1394 to Pr.1398**. (For user defined cyclic communication output data, the data size ranges from 1 to 4 bytes depending on the data type specified in **Pr.1330 to Pr.1343 and Pr.1394 to Pr.1398**.) When "9999" is set in any of **Pr.1319 and Pr.1330 to Pr.1343**, the length of the corresponding data is treated as 0 bytes.

  When a nonexistent instance/index number is set in **Pr.1330 to Pr.1343**, "0" is read.

  The following format is an example when the data size is 2 bytes for all of the user defined cyclic communication output data.

Byte*1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0 to (n-1)	User Defined Cyclic Communication Output fixing format selection (**Pr.1319**)							
n	User Defined Cyclic Communication Output 1 (lower bytes) (**Pr.1330**)							
n+1	User Defined Cyclic Communication Output 1 (upper bytes) (**Pr.1330**)							
n+2	User Defined Cyclic Communication Output 2 (lower bytes) (**Pr.1331**)							
n+3	User Defined Cyclic Communication Output 2 (upper bytes) (**Pr.1331**)							
n+4	User Defined Cyclic Communication Output 3 (lower bytes) (**Pr.1332**)							
n+5	User Defined Cyclic Communication Output 3 (upper bytes) (**Pr.1332**)							
n+6	User Defined Cyclic Communication Output 4 (lower bytes) (**Pr.1333**)							
n+7	User Defined Cyclic Communication Output 4 (upper bytes) (**Pr.1333**)							
n+8	User Defined Cyclic Communication Output 5 (lower bytes) (**Pr.1334**)							
n+9	User Defined Cyclic Communication Output 5 (upper bytes) (**Pr.1334**)							
n+10	User Defined Cyclic Communication Output 6 (lower bytes) (**Pr.1335**)							
n+11	User Defined Cyclic Communication Output 6 (upper bytes) (**Pr.1335**)							
n+12	User Defined Cyclic Communication Output 7 (lower bytes) (**Pr.1336**)							
n+13	User Defined Cyclic Communication Output 7 (upper bytes) (**Pr.1336**)							
n+14	User Defined Cyclic Communication Output 8 (lower bytes) (**Pr.1337**)							
n+15	User Defined Cyclic Communication Output 8 (upper bytes) (**Pr.1337**)							
n+16	User Defined Cyclic Communication Output 9 (lower bytes) (**Pr.1338**)							
n+17	User Defined Cyclic Communication Output 9 (upper bytes) (**Pr.1338**)							
n+18	User Defined Cyclic Communication Output 10 (lower bytes) (**Pr.1339**)							
n+19	User Defined Cyclic Communication Output 10 (upper bytes) (**Pr.1339**)							
n+20	User Defined Cyclic Communication Output 11 (lower bytes) (**Pr.1340**)							
n+21	User Defined Cyclic Communication Output 11 (upper bytes) (**Pr.1340**)							
n+22	User Defined Cyclic Communication Output 12 (lower bytes) (**Pr.1341**)							
n+23	User Defined Cyclic Communication Output 12 (upper bytes) (**Pr.1341**)							
n+24	User Defined Cyclic Communication Output 13 (lower bytes) (**Pr.1342**)							
n+25	User Defined Cyclic Communication Output 13 (upper bytes) (**Pr.1342**)							
n+26	User Defined Cyclic Communication Output 14 (lower bytes) (**Pr.1343**)							
n+27	User Defined Cyclic Communication Output 14 (upper bytes) (**Pr.1343**)							

*1 "n" indicates the data length of the instance specified in **Pr.1319** (4 or 6 bytes).

In **Pr.1394 to Pr.1398**, specify the subindices to which the instance/index numbers are specified using **Pr.1330 to Pr.1339**.

Data No.	Instance/index specification	Sub index specification
1	**Pr.1330**	**Pr.1394** (lower 8 bits)
2	**Pr.1331**	**Pr.1394** (upper 8 bits)
3	**Pr.1332**	**Pr.1395** (lower 8 bits)
4	**Pr.1333**	**Pr.1395** (upper 8 bits)
5	**Pr.1334**	**Pr.1396** (lower 8 bits)
6	**Pr.1335**	**Pr.1396** (upper 8 bits)
7	**Pr.1336**	**Pr.1397** (lower 8 bits)
8	**Pr.1337**	**Pr.1397** (upper 8 bits)
9	**Pr.1338**	**Pr.1398** (lower 8 bits)
10	**Pr.1339**	**Pr.1398** (upper 8 bits)
11	**Pr.1340**	Fixed to 0
12	**Pr.1341**	
13	**Pr.1342**	
14	**Pr.1343**	

- 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 136, and AC/DC Drive Object (2Ah) on page 137.

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
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 1 attributes

No.	Name	Access	Type	Description
3	MotorType	Set/Get*1	USINT	3: PM synchronous motor 7: Squirrel cage induction motor
6*2	Rated Current	Set/Get	UINT	Rated motor current (0.1 A increments) **Pr.9**
7*2	Rated Voltage	Set/Get	UINT	Rated motor voltage (V) **Pr.83**
9*2	RatedFreq	Set/Get	UINT	Rated motor frequency (Hz) **Pr.84**
12*2	PoleCount	Set/Get	UINT	Number of motor poles **Pr.81**
15*2	Rated Speed	Set/Get	UINT	Nominal speed (rpm) at rated frequency from nameplate*3 **Pr.84** × 120/**Pr.81**

*1 Writing is enabled only when the setting is the same as that of the inverter.

*2 When **Pr.77 Parameter write selection** ≠ "2", writing is restricted by the settings of Ethernet IP address for command source selection (**Pr.1449 to Pr.1454**).

*3 When **Pr.81** = "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*1 (Operation command clear, output shutoff, protective function reset)

*1 Disabled during emergency drive operation.
Writing is restricted by the settings of Ethernet IP address for command source selection (**Pr.1449 to Pr.1454**).
E.PE6, E.PE2, E.CPU, E.SAF, E.5 to E.7, and E.13 are not reset. In this case, take an appropriate corrective action first, and reset them by power reset or 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
3*1	Run1*2	Set/Get	BOOL	Forward rotation
4*1	Run2*2	Set/Get	BOOL	Reverse rotation
5*1	NetCtrl	Set/Get	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 RY signal-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 running 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

No.	Name	Access	Type	Description
10	Faulted	Get	BOOL	0: No fault 1: Fault
11	Warning	Get	BOOL	0: Without warnings 1: With warnings
12[*1]	FaultRst	Set/Get	BOOL	0: No reset 0→1: Protective function reset[*3]
15	CtrlFrom Net	Get	BOOL	Operation command source monitoring 0: Local control 1: Network control

*1 Writing is restricted by the settings of Ethernet IP address for command source selection (**Pr.1449 to Pr.1454**).

*2 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.

*3 E.PE6, E.PE2, E.CPU, E.SAF, E.5 to E.7, and E.13 are not reset. In this case, take an appropriate corrective action first, and reset them by power reset or inverter reset.

◆ AC/DC Drive Object (2Ah)

This object models the functions (speed control) specific to an AC or DC Drive.

■ 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	0: SU signal OFF 1: SU signal ON
4[*2]	NetRef	Set/Get	BOOL	Speed command source 0: **Pr.339** = "1" 1: **Pr.339** = "0 or 2" The actual status of the speed command source can be monitored with Attribute 29.
6	DriveMode	Set/Get[*1]	USINT	1: Speed control without encoder
7[*3]	Speed Actual	Get	INT	Actual drive speed Unit: rpm / $2^{SpeedScale}$
8[*2*3*4*5]	SpeedRef	Set/Get	INT	Speed setting value Unit: rpm / $2^{SpeedScale}$
9	Current Actual	Get	INT	Motor phase current Unit: 100 mA / $2^{CurrentScale}$
11	Torque Actual	Get	INT	Actual torque Unit: N·m / $2^{TorqueScale}$
12[*2*5]	TorqueRef	Set/Get	INT	Torque limit value (**Pr.805**) Unit: N·m / $2^{TorqueScale}$
15	Power Actual	Get	INT	Output power Unit: W
17	Output Voltage	Get	INT	Output voltage Unit: V
18[*2]	AccelTime	Set/Get	UINT	Acceleration time = **Pr.7** × **Pr.18**/**Pr.20** Time from 0 (stop) to HighSpdLimit (maximum speed limit) Unit: ms
19[*2]	DecelTime	Set/Get	UINT	Deceleration time = **Pr.8** × **Pr.18**/**Pr.20** Time from HighSpdLimit (maximum speed limit) to 0 (stop) Unit: ms
20[*2*3]	LowSpd Limit	Set/Get	UINT	Minimum speed limit (**Pr.2**) Unit: rpm / $2^{SpeedScale}$

No.	Name	Access	Type	Description
21[*2*3]	HighSpd Limit	Set/Get	UINT	Maximum speed limit (**Pr.18**) Unit: rpm / $2^{SpeedScale}$
22[*2*6]	SpeedScale	Set/Get	SINT	Speed scaling factor Applied to attributes 7, 8, 20, and 21.
23[*2*6]	Current Scale	Set/Get	SINT	Current scaling factor Applied to attribute 9.
24[*2*6]	Torque Scale	Set/Get	SINT	Torque scaling factor Applied to attributes 11 and 12.
29	RefFromNet	Get	BOOL	Speed 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.
*2 Writing is restricted by the settings of Ethernet IP address for command source selection (**Pr.1449 to Pr.1454**). However, the restriction is not applied to attributes 18, 19, 20, and 21 when **Pr.77 Parameter write selection** = "2".
*3 Use the speed scale of Inverter Configuration Object (64h) to set a scaling factor. (Refer to page 140.)
*4 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. (Refer to page 128.)
*5 If a value outside the range is set, the value is limited at the maximum/minimum value.
*6 At power-ON or inverter reset, executing the reset service of the Identity Object (01h) resets the value to "0" (initial value).

NOTE

- When the data in attributes of AC/DC Drive Object (2Ah) is larger than the size of data type, the data is limited to the size of data size.

◆ 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	Remarks
12288 to 16383 (3000h to 3FFFh)	Inverter Parameters[*1]	Set/Get	UINT	The inverter parameter number[*2] + 12288 (3000h) is the instance number.
16384 to 20479 (4000h to 4FFFh)	Monitor Data[*4]	Get	UINT	The monitor code[*3] + 16384 (4000h) is the instance number.
20480 to 24575 (5000h to 5FFFh)	Inverter Control Parameters	Set/Get	UINT	Inverter control parameter

*1 When parameter write is performed, data are written to RAM for I/O message communication. Writing to EEPROM or RAM is selected according to the setting in **Pr.342 Communication EEPROM write selection** for explicit message communication.
*2 For the numbers and names of inverter parameters, refer to the parameter list of the Instruction Manual (Function).
*3 For details of the monitor codes and monitor items, refer to the description of **Pr.52** in the Instruction Manual (Function).
*4 The display can be changed from the frequency to rotations per minute (machine speed) using **Pr.53**. When the machine speed is displayed, the value is incremented by one.

- Inverter control parameter

Instance No.	Name	Access	Remarks
20482 (5002h)[*1]	Inverter reset	Set/Get	Set 9966h for the written value. The read value is fixed to 0000h.
20483 (5003h)[*1]	Parameter clear	Set/Get	Set 965Ah for the written value. The read value is fixed to 0000h.
20484 (5004h)[*1]	All parameter clear	Set/Get	Set 99AAh for the written value. The read value is fixed to 0000h.
20486 (5006h)[*1]	Parameter clear[*2]	Set/Get	Set 5A96h for the written value. The read value is fixed to 0000h.
20487 (5007h)[*1]	All parameter clear[*2]	Set/Get	Set AA99h for the written value. The read value is fixed to 0000h.

Instance No.	Name	Access	Remarks
20488 (5008h)	Control input command / inverter status (extended)*3	Set/Get	Refer to page 139.
20489 (5009h)	Control input command / inverter status*3	Set/Get	Refer to page 139.
20981 (51F5h)	Fault record 1	Set/Get	Being 2 bytes in length, the data is stored as "00○○h". 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	Get	
20983 (51F7h)	Fault record 3	Get	
20984 (51F8h)	Fault record 4	Get	
20985 (51F9h)	Fault record 5	Get	
20986 (51FAh)	Fault record 6	Get	
20987 (51FBh)	Fault record 7	Get	
20988 (51FCh)	Fault record 8	Get	
20989 (51FDh)	Fault record 9	Get	
20990 (51FEh)	Fault record 10	Get	
20992 (5200h)	Safety input status	Get	Refer to page 140.
21216 (52E0h)*1	Speed scale (numerator)	Set/Get	Refer to page 140.
21217 (52E1h)*1	Speed scale (denominator)	Set/Get	Refer to page 140.

*1 Not available for I/O message communication.
*2 Settings in the communication parameters are not cleared.
*3 The data is written as a control input command for writing.
The data is read as the inverter status for reading.

- Control input command / inverter status, control input command / inverter status (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 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	Output stop	0
11	—	0
12	—	0
13	—	0
14	—	0
15	—	Fault occurrence

Bit	Definition	
	Control input command (extended)	Inverter status (extended)
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.182 and Pr.185 to Pr.189 (Input terminal function selection)**.
For details, refer to the description of **Pr.180 to Pr.182 and Pr.185 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).

- Safety input status

Bit	Definition
0	0: Terminal S1 ON 1: Terminal S1 OFF (output shutoff)
1	0: Terminal S2 ON 1: Terminal S2 OFF (output shutoff)
2 to 15	0

- Speed scale

A scaling factor can be set for attributes 7, 8, 20, and 21 of AC/DC Drive Object (2Ah). (Refer to page 137.)

Instance No.	Name	Access	Initial value	Setting range
21216 (52E0h)*1	Speed scale (numerator)	Set/Get	1	1 to 65535
21217 (52E1h)*1	Speed scale (denominator)	Set/Get	1	1 to 65535

*1 The setting value is applied immediately. At power-ON or inverter reset, executing the reset service of the Identity Object (01h) resets the value to the initial value.

Relationship between the set speeds of the master and the inverter

Set speed (inverter) = Set speed to be scaled (master) × (Speed scale (numerator) / Speed scale (denominator))

■ Instance attribute

No.	Name	Access	Type	Description
100*1	Data	Set/Get	UINT	Inverter parameters, monitor data, and inverter control parameters.
101*1	Sub Data	Set/Get	UINT	Analog value (%) set in **C3 (Pr.902), C4 (Pr.903), C6 (Pr.904), C7 (Pr.905), C43 (Pr.934), and C45 (Pr.935)** Example) **C3 (Pr.902)**: Instance = 902 + 12288 = 13190 (3386h), Attribute = 101

*1 When **Pr.77 Parameter write selection** ≠ "2", writing is restricted by the settings of Ethernet IP address for command source selection (**Pr.1449 to Pr.1454**).

- Calibration parameters

Instance No.	Attribute	Name	Description
13189 (3385h)	100	Data	**C1 (Pr.901)**
	101	Sub Data	—
13190 (3386h)	100	Data	**C2 (Pr.902)**
	101	Sub Data	**C3 (Pr.902)**
13191 (3387h)	100	Data	**125 (Pr.903)**
	101	Sub Data	**C4 (Pr.903)**
13192 (3388h)	100	Data	**C5 (Pr.904)**
	101	Sub Data	**C6 (Pr.904)**
13193 (3389h)	100	Data	**126 (Pr.905)**
	101	Sub Data	**C7 (Pr.905)**
13222 (33A6h)	100	Data	**C42 (Pr.934)**
	101	Sub Data	**C43 (Pr.934)**
13223 (33A7h)	100	Data	**C44 (Pr.935)**
	101	Sub Data	**C45 (Pr.935)**

NOTE

- Set 65520 (FFF0h) as a parameter value "8888" and 65535 (FFFFh) as "9999".
- To specify subindices in **Pr.1389 to Pr.1398**, set "0" in attribute 100 and set "1" in attribute 101.

◆ 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 141.
2	Configuration Capability	Get	DWORD	80 (0050h): Refer to "Configuration Capability (Attribute 2)" on page 141.
3	Configuration Control	Set/Get	DWORD	Refer to "Configuration Control (Attribute 3)" on page 142.
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 02h
5	Interface Configuration	Set/Get	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	IP filter address (**Pr.1442 to Pr.1445**)
	Name Server		UDINT	Fixed to 0
	Name Server 2		UDINT	Fixed to 0
	Domain Name		STRING	Fixed to 0
6	Host Name	Set/Get	STRING	Host name
13	Encapsulation Inactivity Timeout	Set/Get	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
5	Hardware Configurable	Attribute 5, hardware configuration condition 0: Setting not allowed 1: Setting allowed

Bit	Name	Description
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 143.
3*1	Physical Address	Get	Array of 6 USINT	(MAC ID): Assigned MAC address
6*1*2	Interface Control	Set/Get	Structure	Control Bits and Forced Interface Speed
	Control Bits		WORD	Refer to "Control Bits (Attribute 6)" on page 143.
	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 (Twisted pair cable) Instance 2: 1 (Embedded interface)
10	Interface Label	Get	SHORT_ STRING	Instance 1: Port 1 Instance 2: 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 143.
	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 and 2 are supported.

*2 When **Pr.77 Parameter write selection** ≠ "2", writing is restricted by the settings of Ethernet IP address for command source selection (**Pr.1449 to Pr.1454**).

- 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 2) 1: After reset (Instance 1)
1	Auto-negotiate	0: Not supported (Instance 2) 1: Supported (Instance 1)
2	Auto-MDIX	Fixed to 0 (not supported)
3	Manual Speed/Duplex	Fixed to 1 (supported)
4 to 31	—	Fixed to 0

◆ LLDP Management Object (109h)

This object shows the management information of the LLDP protocol.

■ 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
1	LLDP Enable	Set/Get	Structure	
	LLDP Enable Array Length		UINT	Number of bits defined in the LLDP Enable Array member of this structure
	LLDP Enable Array		ARRAY of: BYTE	The generation of LLDP frames is enabled globally and on a per-port basis to allow the processing of received LLDP frames globally. Refer to "LLDP Enable Array (Attribute 1)" on page 144.
2	msgTxInterval	Set/Get	UINT	Interval at which LLDP frames are sent from this device 1 to 3600 s
3	msgTxHold	Set/Get	USINT	Multiplier of msgTxInterval for calculating TTL TLV (Time to live) 1 to 100 TTL TLV = msgTxInterval × msgTxHold
4	LLDP Datastore	Get	WORD	The method supported by this device for searching the LLDP database is shown. Bit 0: LLDP Data Table Object
5	Last Change	Get	UDINT	sysUpTime when the entry in the local LLDP database was last changed. TTL TLV (Time to live) is not applicable.

- LLDP Enable Array (Attribute 1)

Bit	Name	Description
0	Global Enable	When Global Enable (Bit 0) = 0, transmission stops on all ports and the received LLDP frames are ignored. When Global Enable (Bit 0) is set from 1 to 0, all existing table entries are deleted. 0: LLDP Tx, LLDP Rx disabled 1: LLDP Tx, LLDP Rx enabled (initial value)
1	Port1 Tx Enable	0: LLDP Tx disabled 1: LLDP Tx enabled (initial value)
2	Port2 Tx Enable	0: LLDP Tx disabled (initial value)
3 or later	—	Fixed to 0

◆ LLDP Data Table Object (10Ah)

This object shows the records of adjacent devices that implement LLDP according to the receive state machine of the LLDP protocol.

When an LLDP event occurs, the instance is updated, created, or deleted.

LLDP event	Object operation
Receives LLDP frames from an unknown or new device.	Instance creation
Receives LLDP frames from a known device.	Instance update
Receives LLDP frames from a known device with TTL set to 0, or TTL timeout.	Instance deletion

■ Service

Class	Instance
Get_Attribute_Single Find_Next_Object_Instance	Get_Attribute_Single

■ Class attribute

No.	Name	Access	Type	Description
1	Revision	Get	UINT	0001h (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	Ethernet Link Instance Number	Get	UINT	Instance number of the Ethernet Link Object (F6h) received by the inverter via LLDP 0: Unknown 1 to 65535: Instance number
2	MAC Address	Get	ETH_MAC_ADDR	MAC address of the adjacent device received from CIP MAC Address, Chassis ID, or Port ID (TLV)
3	Interface Label	Get	SHORT_STRING	Interface Label of the adjacent device received from CIP Interface Label, Chassis ID, or Port ID (TLV)
4	Time to Live	Get	UINT	Duration for which the information about the adjacent device is considered valid (TLV Type = 3) 1 to 65535 s
5	System Capabilities TLV	Get	Structure	Main system functions of the adjacent device (TLV Type = 7)
	System Capabilities		WORD	Functions supported by the adjacent device based on the currently loaded firmware. Refer to "System Capabilities TLV (Attribute 5)" on page 146.
	Enabled Capabilities		WORD	Functions currently enabled on the adjacent device
6	IPv4 Management Addresses	Get	Structure	IPv4 management addresses of the adjacent device. List of IPv4-encoded management addresses defined by one or more received Management Address TLV (TLV Type = 8)
	Management Address Count		USINT	Number of management addresses to be implemented 0 to 255
	Management Address		ARRAY of UDINT	Management address
7	CIP Identification	Get	Structure	CIP Identification TLV of the adjacent device. 0 unless CIP Identification TLV (TLV Type = 127, subtype = 09) or CIP Identification TLV (TLV Type = 127, subtype = 01) exists.
	Vendor ID		UINT	Vendor identification number
	Device Type		UINT	—
	Product Code		UINT	Product code
	Major Revision		BYTE	Main revision number
	Minor Revision		USINT	Minor revision number
	CIP Serial Number		UDINT	Device serial number

No.	Name	Access	Type	Description
8	Additional Ethernet Capabilities	Get	Structure	Preemption Support TLV of the adjacent device. 0 unless Additional Ethernet Capabilities TLV (TLV Type = 127, subtype = 07) exists.
	Preemption Support		BOOL	Indicates whether Preemption Support is supported. 0: Not supported 1: Supported
	Preemption Status		BOOL	Indicates whether Preemption Status is active in the link. 0: Inactive 1: Active
	Preemption Active		BOOL	Indicates whether Preemption Status of this device is active. 0: Inactive 1: Active
	Additional Fragment Size		USINT	Number of octets of the frame of the additional fragment 0: 64 octets 1: 128 octets 2: 192 octets 3: 256 octets
9	Last Change	Get	UDINT	sysUpTime when any attribute of this instance was last changed.

- System Capabilities TLV (Attribute 5)

Bit	Name
0	Other
1	Repeater
2	Bridge
3	Access Point
4	Router
5	Telephone
6	DOCSIS Cable Device
7	End Station
8	C-VLAN component
9	S-VLAN component
10	Two-port MAC Relay Component
11 to 15	—

◆ CiA402 drive profile

Index	Sub index	Name	Description	Access	Type
24639 (603Fh)	00h	Error code	Error number The error code of the latest fault that occurred after power-ON or an inverter reset is returned. When no fault occurs, no error is returned. When the fault history is cleared during occurrence of a fault, no error is returned. The upper eight bits are fixed to FF, and the lower eight bits represent the error code. (FFXXh: "XX" represents the error code.) (For details on error codes, refer to the list of fault displays in the Instruction Manual (Maintenance).)	Get	Unsigned16
24643 (6043h)	00h	vl velocity demand	Output frequency (r/min)[*1] The output frequency is read in r/min. Monitoring range: -32768 (8000h) to 32767 (7FFFh) When **Pr.81** = "9999", the number of motor poles is regarded as 4.	Get	Integer16
24644 (6044h)	00h	vl velocity actual value	Operation speed (r/min)[*1] The operation speed is read in r/min. Monitoring range: -32768 (8000h) to 32767 (7FFFh) When **Pr.81** = "9999", the number of motor poles is regarded as 4.	Get	Integer16
24672 (6060h)	00h	Modes of operation	Control mode: -1 (vendor specific operation mode) (fixed)	Set/Get	Integer8
24673 (6061h)	00h	Modes of operation display	Current control mode: -1 (vendor specific operation mode) (fixed)	Get	Integer8
24692 (6074h)	00h	Torque demand	Torque demand value (%) The torque command is read.	Get	Integer16

Index	Sub index	Name	Description	Access	Type
24695 (6077h)	00h	Torque actual value	Torque actual value (%) The motor torque is read.	Get	Integer16
24703 (607Fh)	00h	Max profile velocity	Maximum profile speed (r/min) Set **Pr.18 High speed maximum frequency** in r/min. Setting range: 0 to 590 Hz	Set/Get	Unsigned32
24707 (6083h)	00h	Profile acceleration	Acceleration time constant (ms) Set **Pr.7 Acceleration time** in ms. Setting range: 0 to 3600 s The last two digits are rounded off when **Pr.21 Acceleration/ deceleration time increments** = "0", and the last digit is rounded off when **Pr.21** = "1".	Set/Get	Unsigned32
24708 (6084h)	00h	Profile deceleration	Deceleration time constant (ms) Set **Pr.8 Deceleration time** in ms. Setting range: 0 to 3600 s The last two digits are rounded off when **Pr.21 Acceleration/ deceleration time increments** = "0", and the last digit is rounded off when **Pr.21** = "1".	Set/Get	Unsigned32
25858 (6502h)	00h	Supported drive modes	Supported control mode: 00010000h (vendor specific operation mode)	Get	Unsigned32

*1 The value is displayed and set in r/min regardless of the settings in **Pr.53**.
The frequency is converted to the rotation speed for reading, and the setting value is converted to the frequency for writing.

◆ Data format

■ Explicit Message communication (request format)

	Byte No.	Field	Remarks
Common Industrial Protocol	0	Service	Service code
	1	Request Path Size	Data size of Request Path
	2 to n	Request Path	Application path
	n+1 to m	Data	Service specific data

■ Explicit Message communication (response format)

	Byte No.	Field	Remarks
Common Industrial Protocol	0	Reply Service	Request service code +80h
	1	Reserved	Fixed to 0
	2	General Status	General status code
	3	Size of Additional Status	Data size of Additional Status
	4	Additional Status	Not extended when the value is "0".
	5		
	6 to n	Response Data	

■ I/O Message communication (master to inverter)

	Byte No.	Field	Remarks
Common Industrial Protocol	0	CIP Sequence Count	Sequence No.
	1		
	2 to 5	32bit Header	Connection mode
	6 to n	Data	

■ I/O Message communication (inverter to master)

	Byte No.	Field	Remarks
Common Industrial Protocol	0	CIP Sequence Count	Sequence No.
	1		
	2 to n	Data	

◆ Error number

The error information for request command is stored in General Status of the response format for the Explicit Message communication.

Error No.	Name	Description
00h	Success	The service was successfully executed by the specified object.
05h	Path destination unknown	The path is unknown or references an object class, instance, or structure element not included in the processing node.
08h	Service not supported	The requested service is not supported, or is not defined in the object class or instance.
09h	Invalid attribute value	Invalid attribute data was detected.
0Eh	Attribute not settable	A change to an attribute that cannot be changed was requested.
10h	Device state conflict	The requested service cannot be executed in the current mode/state of the device.
13h	Not enough data	The data provided by the service is insufficient to perform the specified operation.
14h	Attribute not supported	The specified attribute is not supported.
15h	Too much data	The data provided by the service is more than expected.
20h	Invalid parameter	A parameter assigned to the request was invalid.

◆ Programming examples

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

Check that "44818" (EtherNet/IP) is set in any of **Pr.1427 to Pr.1430** (Ethernet function selection).

■ Programming example for forward rotation operation at 1500 r/min

- Connection settings in the engineering software

Select "Extended Speed Control" for the "Connections" setting of the inverter.

Names of setting items may differ depending of the engineering software used.

- Network setting and device examples

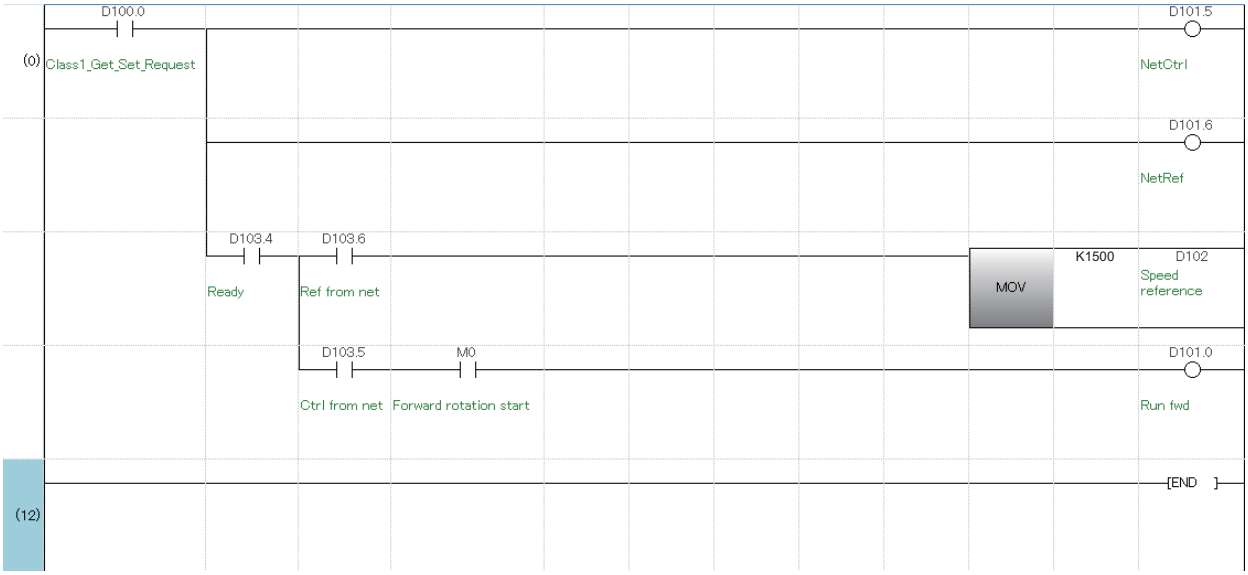
Data in D101 to D102 reflect the data for cyclic communication with inverters, either by data transmission to the buffer memory or using function blocks, according to the specification of the master module.

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 = 1500 r/min

Turning ON M0 (Forward rotation start) turns ON D101.0 (Run fwd) to start forward rotation operation at 1500 r/min. Turning OFF M0 stops operation.



◆ Setting example

- The following tables show example settings when user defined cyclic communication data are selected (Assembly Object (04h)). Data are written to the inverter when I/O communications are in run state and the data are updated by the master. (The response time to write the data is 100 ms at the most.)
- Instance 100 (64h): Configurable 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	00h							
2	Speed reference (Low byte)							
3	Speed reference (High byte)							
4	User Defined Cyclic Communication Input 1 (lower bytes) (**Pr.1320**)							
5	User Defined Cyclic Communication Input 1 (upper bytes) (**Pr.1320**)							
6	User Defined Cyclic Communication Input 2 (lower bytes) (**Pr.1321**)							
7	User Defined Cyclic Communication Input 2 (upper bytes) (**Pr.1321**)							

- Instance 150 (96h): Configurable 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	Drive state							
2	Speed actual (Low byte)							
3	Speed actual (High byte)							
4	User Defined Cyclic Communication Output 1 (lower bytes) (**Pr.1330**)							
5	User Defined Cyclic Communication Output 1 (upper bytes) (**Pr.1330**)							
6	User Defined Cyclic Communication Output 2 (lower bytes) (**Pr.1331**)							
7	User Defined Cyclic Communication Output 2 (upper bytes) (**Pr.1331**)							
8	User Defined Cyclic Communication Output 3 (lower bytes) (**Pr.1332**)							
9	User Defined Cyclic Communication Output 3 (upper bytes) (**Pr.1332**)							
10	User Defined Cyclic Communication Output 4 (lower bytes) (**Pr.1333**)							
11	User Defined Cyclic Communication Output 4 (upper bytes) (**Pr.1333**)							
12	User Defined Cyclic Communication Output 5 (lower bytes) (**Pr.1334**)							
13	User Defined Cyclic Communication Output 5 (upper bytes) (**Pr.1334**)							

- Parameters

Pr.	Name	Setting example	Remarks
1318	**User Defined Cyclic Communication Input fixing format selection**	21 (15h)	Extended Speed Control Output
1320	**User Defined Cyclic Communication Input 1 Mapping**	12295 (3007h)	**Pr.7 Acceleration time** 7 (0007h) + 12288 (3000h)
1321	**User Defined Cyclic Communication Input 2 Mapping**	12296 (3008h)	**Pr.8 Deceleration time** 8 (0008h) + 12288 (3000h)
1319	**User Defined Cyclic Communication Output fixing format selection**	71 (47h)	Extended Speed Control Input
1330	**User Defined Cyclic Communication Output 1 Mapping**	12295 (3007h)	**Pr.7 Acceleration time** 7 (0007h) + 12288 (3000h)
1331	**User Defined Cyclic Communication Output 2 Mapping**	12296 (3008h)	**Pr.8 Deceleration time** 8 (0008h) + 12288 (3000h)
1332	**User Defined Cyclic Communication Output 3 Mapping**	16386 (4002h)	Output current monitor 2 (0002h) + +16384 (4000h)
1333	**User Defined Cyclic Communication Output 4 Mapping**	12543 (30FFh)	**Pr.255 Life alarm status display** 255 (00FFh) + 12288 (3000h)
1334	**User Defined Cyclic Communication Output 5 Mapping**	20981 (51F5h)	Fault record 1

- Connection settings in the engineering software

Set "Configurable" for the "Connections" setting of the inverter. Change the setting according to the data length set in instance 100/150. (When the settings are inconsistent, communication is not established.)

Change the "Input Size" setting to "14bytes".

Change the "Output Size" setting to "8bytes".

Names of setting items may differ depending of the engineering software used.

2.11 PROFINET

2.11.1 Outline

PROFINET is available for the FR-D800-EPB.

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 inverters.

◆ Communication specifications

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

Item	Description
Category	100BASE-TX
Communication 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 and ANSI/TIA/EIA-568-B (Category 5e) compliant shielded 4-pair branched cable)
PROFINET communication specifications	PROFINET IO Device V2.44

◆ 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 / Connections established with the master (The master is in the stop state.)
		Solid green	Connections established with the master (The master is in the run state.)
MS	Inverter status	OFF	Power-OFF / during inverter reset
		Green	Operating properly
		Red	Fault detected
LINK1	Communication connector status	OFF	Power-OFF/link-down
		Blinking green	Link-up (Data reception in progress)
		Solid green	Link-up

NOTE

- Depending on packets sent to the inverter while the master is in the stop state, the NS LED may not turn blinking green. The run/stop state is determined by IOCS of the packet sent from the master to the inverter (Good (80h): run, Bad (60h): stop). When the following master is used, the above-mentioned operation is performed in the stop state.

Manufacturer	Model	Version
SIEMENS	SIMATIC S7-1500	CPU: 1511F-1 PN Product number: 6ES7511-1FK02-0AB0 Firmware version: V 02.05.02
Mitsubishi Electric	RJ71PN92	03 or later

◆ GSDML file

A GSDML file is available for download.

Mitsubishi Electric FA Global Website
https://www.MitsubishiElectric.com/fa/products/drv/inv/support/d800/d800e.html
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.

2.11.2 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 11.)
2. Set "34962" (PROFINET) in any of **Pr.1427 to Pr.1430 Ethernet function selection 1 to 4**. (Refer to page 153.)
   (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 any of **Pr.1427 to Pr.1430**, the priority is given to CC-Link IE TSN, disabling PROFINET.
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.
   Set the device name for each inverter when two or more inverters are connected.

■ 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
Solid green	Solid green	Blinking green

2.11.3 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 configured 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, 45237, 45238, 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.

NOTE

- For PROFINET, the IP filtering function (Ethernet) (**Pr.1442 to Pr.1448**) settings are invalid.

◆ Precautions for PROFINET communication

- 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**.
- When the device settings (IP address, subnet mask, and default gateway address settings) are inconsistent between the engineering tool and the connected inverter, "0" is set in **Pr.442 to Pr.445, Pr.1434 to Pr.1441** (EEPROM) using the DCP Temporary function of the master.

◆ 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 any of **Pr.1427 to Pr.1430**, the priority is given to CC-Link IE TSN, disabling PROFINET.

NOTE

- Change the setting if selected communication protocols cannot be used together. (Refer to page 4 and page 173.)

◆ 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	

2.11.4 Parameters related to PROFINET

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

Pr.	Name	Initial value	Setting range	Description
1320 to 1329 N810 to N819[*1]	**User Defined Cyclic Communication Input 1 to 10 Mapping**	9999	5, 100, 12288 to 13787, 20488, 20489, 24672, 24703, 24707, 24708	Users can assign a function to Setpoint Telegram (master to inverter) of Telegram 102.
			9999	Function disabled
1330 to 1343 N850 to N863[*1]	**User Defined Cyclic Communication Output 1 to 14 Mapping**	9999	6, 101, 12288 to 13787, 16384 to 16483, 20488, 20489, 20981 to 20990, 20992, 24639, 24643, 24644, 24673, 24692, 24695, 25858	Users can assign a function to Actual Value Telegram (inverter to master) of Telegram 102.
			9999	Function disabled
1389[*1]	**User Defined Cyclic Communication Input Sub 1 and 2 Mapping**	0	0, 1, 256, 257	**Pr.1389** (lower 8 bits): Subindex to which the signal number is specified using **Pr.1320** **Pr.1389** (upper 8 bits): Subindex to which the signal number is specified using **Pr.1321**
1390[*1]	**User Defined Cyclic Communication Input Sub 3 and 4 Mapping**	0	0, 1, 256, 257	**Pr.1390** (lower 8 bits): Subindex to which the signal number is specified using **Pr.1322** **Pr.1390** (upper 8 bits): Subindex to which the signal number is specified using **Pr.1323**
1391[*1]	**User Defined Cyclic Communication Input Sub 5 and 6 Mapping**	0	0, 1, 256, 257	**Pr.1391** (lower 8 bits): Subindex to which the signal number is specified using **Pr.1324** **Pr.1391** (upper 8 bits): Subindex to which the signal number is specified using **Pr.1325**
1392[*1]	**User Defined Cyclic Communication Input Sub 7 and 8 Mapping**	0	0, 1, 256, 257	**Pr.1392** (lower 8 bits): Subindex to which the signal number is specified using **Pr.1326** **Pr.1392** (upper 8 bits): Subindex to which the signal number is specified using **Pr.1327**
1393[*1]	**User Defined Cyclic Communication Input Sub 9 and 10 Mapping**	0	0, 1, 256, 257	**Pr.1393** (lower 8 bits): Subindex to which the signal number is specified using **Pr.1328** **Pr.1393** (upper 8 bits): Subindex to which the signal number is specified using **Pr.1329**
N830 to N839[*1]	**User Defined Cyclic Communication Input Sub 1 to 10 Mapping**	0	0, 1	Subindices to which the signal numbers are specified using **Pr.1320 to Pr.1329**
1394[*1]	**User Defined Cyclic Communication Output Sub 1 and 2 Mapping**	0	0, 1, 256, 257	**Pr.1394** (lower 8 bits): Subindex to which the signal number is specified using **Pr.1330** **Pr.1394** (upper 8 bits): Subindex to which the signal number is specified using **Pr.1331**
1395[*1]	**User Defined Cyclic Communication Output Sub 3 and 4 Mapping**	0	0, 1, 256, 257	**Pr.1395** (lower 8 bits): Subindex to which the signal number is specified using **Pr.1332** **Pr.1395** (upper 8 bits): Subindex to which the signal number is specified using **Pr.1333**
1396[*1]	**User Defined Cyclic Communication Output Sub 5 and 6 Mapping**	0	0, 1, 256, 257	**Pr.1396** (lower 8 bits): Subindex to which the signal number is specified using **Pr.1334** **Pr.1396** (upper 8 bits): Subindex to which the signal number is specified using **Pr.1335**
1397[*1]	**User Defined Cyclic Communication Output Sub 7 and 8 Mapping**	0	0, 1, 256, 257	**Pr.1397** (lower 8 bits): Subindex to which the signal number is specified using **Pr.1336** **Pr.1397** (upper 8 bits): Subindex to which the signal number is specified using **Pr.1337**
1398[*1]	**User Defined Cyclic Communication Output Sub 9 and 10 Mapping**	0	0, 1, 256, 257	**Pr.1398** (lower 8 bits): Subindex to which the signal number is specified using **Pr.1338** **Pr.1398** (upper 8 bits): Subindex to which the signal number is specified using **Pr.1339**
N870 to N879[*1]	**User Defined Cyclic Communication Output Sub 1 to 10 Mapping**	0	0, 1	Subindices to which the signal numbers are specified using **Pr.1330 to Pr.1339**

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

2.11.5 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. Users can select communication data using Telegram 102.

Telegram	Description	Size (words)
1	Standard Telegram 1 (Speed control)	2
102	Telegram 102 (Custom)	Setpoint Telegram: 21 Actual Value Telegram: 29

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 inverter)	1	Control word 1	STW1	16
	2	Speed setpoint A	NSOLL_A	16
Actual Value Telegram (inverter to master)	1	Status word 1	ZSW1	16
	2	Speed actual value A	NIST_A	16

- Telegram 102

Type	IO Data number	Name	Sub index specification	Data length (bit)	Remarks
Setpoint Telegram (master to inverter)	1	Control word 1 (STW1)	—	16	Fixed
	2	**Pr.1320**	**Pr.1389** (lower 8 bits)	32	The following signal numbers are selectable. 5: Speed setpoint A (NSOLL_A) (Refer to page 157.) 100: Target torque (Refer to page 158.) 12288 to 13787: Inverter Parameters (Refer to page 164.) 20488, 20489: Inverter Control Parameters (Refer to page 164.) 24672, 24703, 24707, 24708: CiA402 Drive Profile (Refer to page 166.) When the data length of the selected signal is 16 bits, only the setting value for the lower 16 bits is valid.
	3	**Pr.1321**	**Pr.1389** (upper 8 bits)	32	
	4	**Pr.1322**	**Pr.1390** (lower 8 bits)	32	
	5	**Pr.1323**	**Pr.1390** (upper 8 bits)	32	
	6	**Pr.1324**	**Pr.1391** (lower 8 bits)	32	
	7	**Pr.1325**	**Pr.1391** (upper 8 bits)	32	
	8	**Pr.1326**	**Pr.1392** (lower 8 bits)	32	
	9	**Pr.1327**	**Pr.1392** (upper 8 bits)	32	
	10	**Pr.1328**	**Pr.1393** (lower 8 bits)	32	
	11	**Pr.1329**	**Pr.1393** (upper 8 bits)	32	

Type	IO Data number	Name	Sub index specification	Data length (bit)	Remarks
Actual Value Telegram (inverter to master)	1	Status word 1 (ZSW1)	—	16	Fixed
	2	**Pr.1330**	**Pr.1394** (lower 8 bits)	32	The following signal numbers are selectable. 6: Speed actual value A (NIST_A) (Refer to page 157.) 101: Actual torque (Refer to page 158.) 12288 to 13787: Inverter Parameters (Refer to page 164.) 16384 to 16483: Monitor Data (Refer to page 164.) 20488, 20489, 20981 to 20990, 20992: Inverter Control Parameters (Refer to page 164.) 24639, 24643, 24644, 24673, 24692, 24695, 25858: CiA402 Drive Profile (Refer to page 166.)
	3	**Pr.1331**	**Pr.1394** (upper 8 bits)	32	
	4	**Pr.1332**	**Pr.1395** (lower 8 bits)	32	
	5	**Pr.1333**	**Pr.1395** (upper 8 bits)	32	
	6	**Pr.1334**	**Pr.1396** (lower 8 bits)	32	
	7	**Pr.1335**	**Pr.1396** (upper 8 bits)	32	
	8	**Pr.1336**	**Pr.1397** (lower 8 bits)	32	
	9	**Pr.1337**	**Pr.1397** (upper 8 bits)	32	
	10	**Pr.1338**	**Pr.1398** (lower 8 bits)	32	
	11	**Pr.1339**	**Pr.1398** (upper 8 bits)	32	
	12	**Pr.1340**	Fixed to 0	32	
	13	**Pr.1341**		32	
	14	**Pr.1342**		32	
	15	**Pr.1343**		32	

NOTE

- If the same signal number is specified in two or more of **Pr.1320 to Pr.1329**, the number set in the parameter with the smallest parameter number is valid. The same number set in the other parameters is regarded as "9999".
- When a nonexistent signal number or "9999" is set in **Pr.1320 to Pr.1329**, the data is not written.
- When a nonexistent signal number or "9999" is set in **Pr.1330 to Pr.1343**, "0" is read.

- 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 (enable operation)	0: Disabled 1: Enabled
4	—	Not used (fixed to 0)
5	Unfreeze/Freeze Ramp Generator (acceleration/deceleration interruption)	0: Acceleration/deceleration stopped 1: Acceleration/deceleration not stopped Invalid when the start command is OFF or during automatic restart after instantaneous power failure. Set frequency unaffected Enabled also during operation with speed commands not given by NSOLL_A
6	Enable/Disable Setpoint (enable set frequency)	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 (when the inverter is in a fault status, the protective function is reset).*1
8	—	Not used (fixed to 0)
9	—	Not used (fixed to 0)
10	Control By PLC/No Control By PLC (enable DOIO data from programmable controller)	0: STW1 disabled 1: STW1 enabled

Bit	Name	Inverter operation
11	Target torque enabled (Device-specific)	0: Target torque disabled (torque limit value = "0") 1: Target torque enabled (torque limit value = target torque)
12	Start command direction selection (Device-specific)	0: Forward when NSOLL_A > 0, reverse when NSOLL_A < 0 1: Reverse when NSOLL_A > 0, forward when NSOLL_A < 0
13 to 15	—	Not used (fixed to 0)

*1 E.PE6, E.PE2, E.CPU, E.SAF, E.5 to E.7, and E.13 are not reset. In this case, take an appropriate corrective action first, and reset them by power reset or inverter reset.

- 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: During output shutoff 1: Output shutoff release
5	Quick Stop Not Activated/Quick Stop Activated (No OFF3/OFF3) (during emergency stop)	0: 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)

  Setting the set frequency (speed limit value) and monitoring the output frequency 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 (speed limit value) (Hz) = (NSOLL_A / 4000h) × inverter maximum frequency (**Pr.1 or Pr.18**)

  Output frequency (Hz) = (NIST_A / 4000h) × inverter maximum frequency (**Pr.1 or Pr.18**)

Item	Description
Data type	N2
Range*1	-32768 (8000h) to 32767 (7FFFh) (-200% to 199.99%)
Reference	16384 (4000h) = inverter maximum frequency (**Pr.1 or Pr.18**)
Sign	Plus: forward rotation Minus: reverse rotation

*1 When the calculation result is larger than 590 Hz, the value is applied to the set frequency.

NOTE

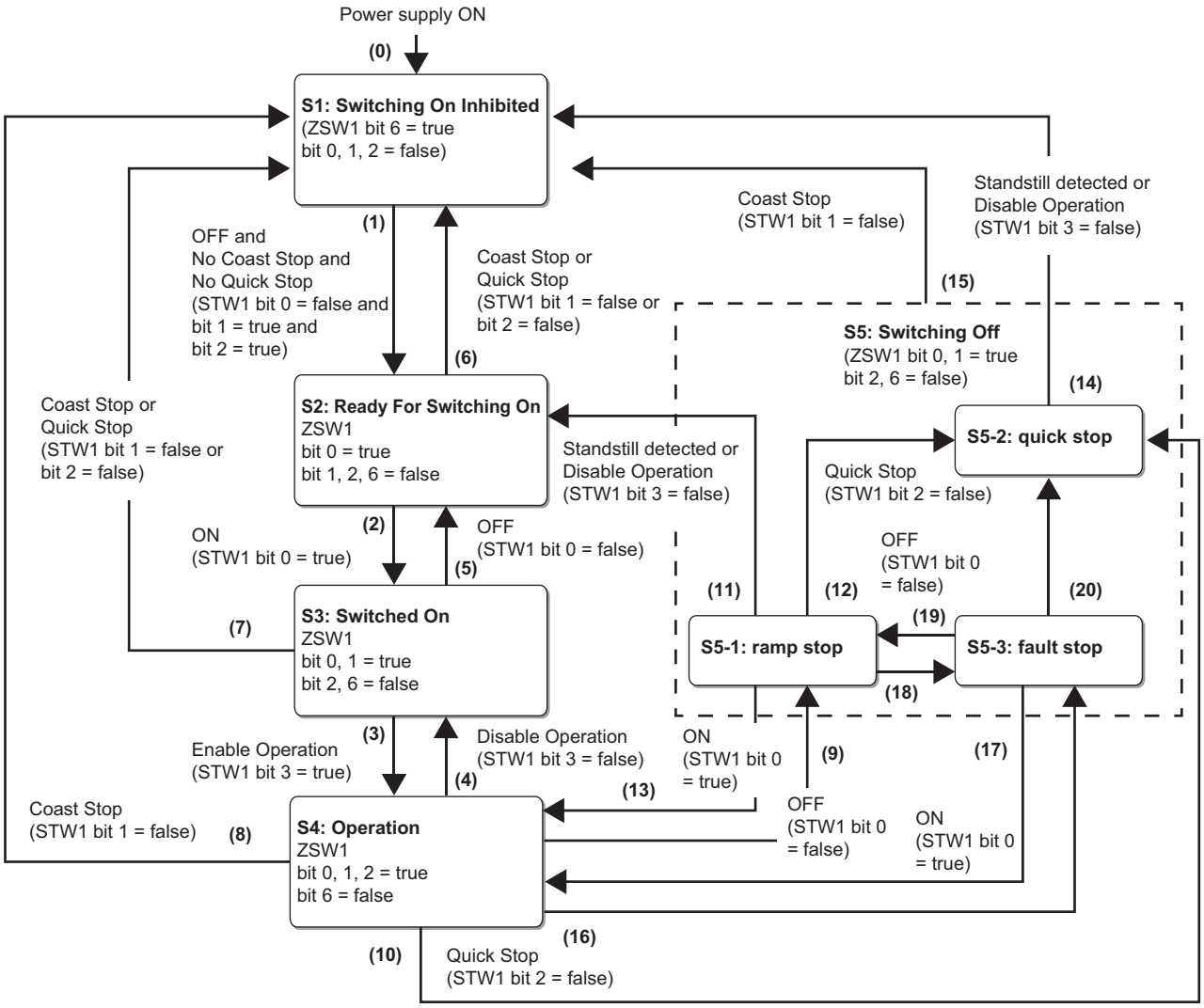
- When the target torque is assigned to Telegram 102, use bit 12 of STW1 to select the start command direction. The input to NSOLL_A is treated as an absolute value.
- When the HMS PROFINET network option A8NPRT is installed in the FR-A800 or FR-F800 inverter, **Pr.3 Base frequency** is used as reference. 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 is available in 1% increments and monitoring is available in 0.1% increments.
  Target torque is clamped at the upper and lower limits of the torque limit value. The value is set in **Pr.805** (1000% reference) (RAM).
  The motor torque (monitor code: 07h) is read for Actual torque.

NOTE

- To use the torque limit in Telegram 102, select 100 (Target torque) instead of 13093 (**Pr.805**).

■ State transition diagram of the inverter



- Definition

Symbol	Name	Description	Inverter operation
S1*1	Switching On Inhibited	During stop (initial status)	Output shutoff (RY signal OFF)
S2	Ready For Switching On	During stop (ready)	Output shutoff (RY signal OFF)
S3	Switched On	During stop (standby)	Output shutoff canceled (RY signal ON)*2
S4*3	Operation	During operation (enabled)	Start command ON (rotation direction depends on STW1 and NSOLL_A settings)
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")

*1 The inverter state is forcefully changed to S1 when any of the following conditions is met:
When an inverter fault occurs
Mode other than Network operation mode
During commercial power supply operation during emergency drive
Master is in the stop state while the inverter is running.

*2 When the output is shut off by the MRS signal or other signal, the RY signal remains OFF.

*3 The inverter state is forcefully changed to S4 during emergency drive operation.

- 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	Even when the RY signal turns OFF, status transition will occur. (The start command is turned OFF.)
(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	Status transition will occur even while the master is in the stop state.
(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.

NOTE

- Depending on packets sent to the inverter while the master is in the stop state, the inverter state may not be changed to S1. The run/stop state is determined by IOCS of the packet sent from the master to the inverter (Good (80h): run, Bad (60h): stop). When the following master is used, the above-mentioned operation is performed in the stop state.

Manufacturer	Model	Version
SIEMENS	SIMATIC S7-1500	CPU: 1511F-1 PN Product number: 6ES7511-1FK02-0AB0 Firmware version: V 02.05.02
Mitsubishi Electric	RJ71PN92	03 or later

- 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 inverter

STW1 = 1135 (046Fh)

b15															b0
0	0	0	0	0	1	0	0	0	1	1	0	1	1	1	1

NSOLL_A = (5000 (50 Hz) × 16384 (4000h)) / 12000 (**Pr.1** = 120 Hz) = 6827 (1AABh)

◆ 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, inverter control parameters, and CiA402 drive profile.

Item	Name	Setting value
API number	API_No	3A00h
Slot number	Slot_No	1h
Subslot number	SubSlot_No	1h
Index	Index	2Fh

■ 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	Unsigned16	Initial value: 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	Octetstring2	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.
	P972	Drive reset	R/W	Unsigned16	Writing "2" and then "1" resets 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	All the supported PNU numbers are saved in the subindices. Arrays are assigned in the following order: PROFIdrive parameters, PROFINET parameters, inverter parameters, monitor data, inverter control parameters, and CiA402 drive profile. The first parameter of the list of PNU numbers is marked by a subindex with the value "0".
Inverter parameters	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 code + 16384 (4000h) is the PNU number.
Inverter control parameter	P20480 to P24575	Inverter Control Parameters	R/W	Unsigned16	Inverter control parameter
CiA402 drive profile	P24576 to P28671	CiA402 Drive Profile	R/W	—	CiA402 drive profile

Group	PNU	Name	Access	Data Type	Description
PROFINET parameter	P61000	Name of station	R	Octetstring240	Station name of device
	P61001	IP address	R	Octetstring4	Current IP address
	P61002	MAC address	R	Octetstring6	MAC address
	P61003	Gateway	R	Octetstring4	Current gateway address
	P61004	Subnet mask	R	Octetstring4	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.

Signal number	Description
1	Control word 1 (STW1)
2	Status word 1 (ZSW1)
5	Speed setpoint A (NSOLL_A)
6	Speed actual value A (NIST_A)
100	Target torque
101	Actual torque
12288 to 16383	Inverter Parameters
16384 to 20479	Monitor Data
20480 to 24575	Inverter Control Parameters
24576 to 28671	CiA402 Drive Profile

- 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
102	Telegram 102

- 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 inverter 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: Inverter firmware version	—

- Profile identification number (P965)

PNU	Sub	Access	Name	Data Type	Description	Default
965	0	R	Profile identification number	Octetstring2	Profile Number 3	03h
	1				Profile Version Number 42	2Ah

- STW1, ZSW1 (P967/P968)

Refer to details on the control word 1 (STW1) (page 156) and the status word 1 (ZSW1) (page 157).

- Drive reset (P972)

PNU	Sub	Access	Name	Data Type	Description	Default
972	0	R/W	Drive reset	Unsigned16	0: Initial status (or status after a reset) 1: Power-on Reset (initiation) 2: Power-on Reset (preparation) The value "0" is read-only. Writing "2" and then "1" resets the inverter.	0

- 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: Inverter 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, inverter control parameters, and CiA402 drive profile.	—

Among the PNU numbers specified in the subindices, up to 117 numbers are shown. (Number of elements (234 max.) / Unsigned16 (2 bytes))

When "1" is set in the subindex and "3" is set for the number of elements, P916, P922, and P944 are displayed.

- 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.	—

Calibration parameters

PNU	Sub	Name	Description
13189 (3385h)	0	Data	**C1 (Pr.901)**
	1	Sub Data	—
13190 (3386h)	0	Data	**C2 (Pr.902)**
	1	Sub Data	**C3 (Pr.902)**
13191 (3387h)	0	Data	**125 (Pr.903)**
	1	Sub Data	**C4 (Pr.903)**
13192 (3388h)	0	Data	**C5 (Pr.904)**
	1	Sub Data	**C6 (Pr.904)**
13193 (3389h)	0	Data	**126 (Pr.905)**
	1	Sub Data	**C7 (Pr.905)**
13222 (33A6h)	0	Data	**C42 (Pr.934)**
	1	Sub Data	**C43 (Pr.934)**
13223 (33A7h)	0	Data	**C44 (Pr.935)**
	1	Sub Data	**C45 (Pr.935)**

For the numbers and names of inverter parameters, refer to the parameter list of the Instruction Manual (Function).

NOTE

- Set 65520 (FFF0h) as a parameter value "8888" and 65535 (FFFFh) as "9999".
- When parameter write is performed, data are written to RAM for Cyclic Data Exchange. Writing to EEPROM or RAM is selected according to the setting in **Pr.342 Communication EEPROM write selection** for Acyclic Data Exchange.

- Monitor Data (P16384 to P20479)

PNU	Sub	Access	Name	Data Type	Description	Default
16384 to 20479	0	R	Monitor Data	Unsigned16	The monitor code + 16384 (4000h) is the PNU number.	—

For details of the monitor codes and monitor items, refer to the description of **Pr.52** in the Instruction Manual (Function).

NOTE

- The display can be changed from the frequency to rotations per minute (machine speed) using **Pr.53**. When the machine speed is displayed, the value is incremented by one.

- 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 parameter	—

PNU	Name	Access	Description
20482 (5002h)*1	Inverter reset	R/W	Set 9966h for the written value. The read value is fixed to 0000h.
20483 (5003h)*1	Parameter clear	R/W	Set 965Ah for the written value. The read value is fixed to 0000h.
20484 (5004h)*1	All parameter clear	R/W	Set 99AAh for the written value. The read value is fixed to 0000h.
20486 (5006h)*1	Parameter clear*2	R/W	Set 5A96h for the written value. The read value is fixed to 0000h.
20487 (5007h)*1	All parameter clear*2	R/W	Set AA99h for the written value. The read value is fixed to 0000h.
20488 (5008h)	Control input command / inverter status (extended)*3	R/W	Refer to page 165.
20489 (5009h)	Control input command / inverter status*3	R/W	Refer to page 165.

PNU	Name	Access	Description
20981 (51F5h)	Fault record 1	R/W	Being 2 bytes in length, the data is stored as "00○○h". 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	R	
20983 (51F7h)	Fault record 3	R	
20984 (51F8h)	Fault record 4	R	
20985 (51F9h)	Fault record 5	R	
20986 (51FAh)	Fault record 6	R	
20987 (51FBh)	Fault record 7	R	
20988 (51FCh)	Fault record 8	R	
20989 (51FDh)	Fault record 9	R	
20990 (51FEh)	Fault record 10	R	
20992 (5200h)	Safety input status	R	Refer to page 165.

*1 Not available for Cyclic Data Exchange.
*2 Settings in the communication parameters are not cleared.
*3 The data is written as a control input command for writing.
The data is read as the inverter status for reading.

Control input command / inverter status, control input command / inverter status (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 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	Output stop	0
11	—	0
12	—	0
13	—	0
14	—	0
15	—	Fault occurrence

Bit	Definition	
	Control input command (extended)	Inverter status (extended)
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.182 and Pr.185 to Pr.189 (Input terminal function selection)**.
For details, refer to the description of **Pr.180 to Pr.182 and Pr.185 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).

Safety input status

Bit	Definition
0	0: Terminal S1 ON 1: Terminal S1 OFF (output shutoff)
1	0: Terminal S2 ON 1: Terminal S2 OFF (output shutoff)
2 to 15	0

- CiA402 Drive Profile (P24576 to P28671)

PNU	Sub	Name	Description	Access	Data type
24639 (603Fh)	0	Error code	Error number The error code of the latest fault that occurred after power-ON or an inverter reset is returned. When no fault occurs, no error is returned. When the fault history is cleared during occurrence of a fault, no error is returned. The upper eight bits are fixed to FF, and the lower eight bits represent the error code. (FFXXh: "XX" represents the error code.) (For details on error codes, refer to the list of fault displays in the Instruction Manual (Maintenance).)	R	Unsigned16
24643 (6043h)	0	vl velocity demand	Output frequency (r/min)*1 The output frequency is read in r/min. Monitoring range: -32768 (8000h) to 32767 (7FFFh) When **Pr.81** = "9999", the number of motor poles is regarded as 4.	R	Integer16
24644 (6044h)	0	vl velocity actual value	Operation speed (r/min)*1 The operation speed is read in r/min. Monitoring range: -32768 (8000h) to 32767 (7FFFh) When **Pr.81** = "9999", the number of motor poles is regarded as 4.	R	Integer16
24672 (6060h)	0	Modes of operation	Control mode: -1 (vendor specific operation mode) (fixed)	R/W	Integer8
24673 (6061h)	0	Modes of operation display	Current control mode: -1 (vendor specific operation mode) (fixed)	R	Integer8
24692 (6074h)	0	Torque demand	Torque demand value (%) The torque command is read.	R	Integer16
24695 (6077h)	0	Torque actual value	Torque actual value (%) The motor torque is read.	R	Integer16
24703 (607Fh)	0	Max profile velocity	Maximum profile speed (r/min) Set **Pr.18 High speed maximum frequency** in r/min. Setting range: 0 to 590 Hz	R/W	Unsigned32
24707 (6083h)	0	Profile acceleration	Acceleration time constant (ms) Set **Pr.7 Acceleration time** in ms. Setting range: 0 to 3600 s The last two digits are rounded off when **Pr.21 Acceleration/ deceleration time increments** = "0", and the last digit is rounded off when **Pr.21** = "1".	R/W	Unsigned32
24708 (6084h)	0	Profile deceleration	Deceleration time constant (ms) Set **Pr.8 Deceleration time** in ms. Setting range: 0 to 3600 s The last two digits are rounded off when **Pr.21 Acceleration/ deceleration time increments** = "0", and the last digit is rounded off when **Pr.21** = "1".	R/W	Unsigned32
25858 (6502h)	0	Supported drive modes	Supported control mode: 00010000h (vendor specific operation mode)	R	Unsigned32

*1 The value is displayed and set in r/min regardless of the settings in **Pr.53**.
The frequency is converted to the rotation speed for reading, and the setting value is converted to the frequency for writing.

- Name of station (P61000)

PNU	Sub	Access	Name	Data Type	Description	Default
61000	0 to 239	R	Name of station	Octetstring240	Device name	FR-D800-E

- IP address (P61001)

PNU	Sub	Access	Name	Data Type	Description	Default
61001	0	R	IP address	Octetstring4	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	Octetstring6	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	Octetstring4	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	Octetstring4	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 inverter)

	Byte No.	Field	Description	Parameter read	Parameter change
Header	0	Request reference	Determined by the setting in the master	○	○
	1	Request ID	Parameter read: 01h Parameter change: 02h	○	○
	2	DO-ID	01h	○	○
	3	Number of parameters	01h	○	○
Parameter address	4	Attribute	10h	○	○
	5	Number of elements (n)	Determined by the number of arrays (234 max.) 0 or 1 for data types other than array or octetstring	○	○
	6	PNU number	Refer to page 161.	○	○
	7			○	○
	8	Sub-index		○	○
	9			○	○
Parameter value	10	Format	Data Type Unsigned16: 06h Octetstring: 0Ah V2: 73h	×	○
	11	Number of data	Number of arrays	×	○
	12	Parameter value	Parameter writing value	×	○
	13			×	○
	14 to 237			×	○*1
	238			×	○*1
	239			×	○*1

*1 Availability depends on the format or data size.

■ PROFIdrive parameter response format (inverter to master)

	Byte No.	Field	Description	Parameter read		Parameter change	
				Positive	Negative	Positive	Negative
Header	0	Request reference	Determined by the setting in the master	○	○	○	○
	1	Request ID	Parameter read (positive): 01h Parameter change (positive): 02h Parameter read (negative): 81h Parameter change (negative): 82h Request ID fault: 80h	○	○	○	○
	2	DO-ID	01h	○	○	○	○
	3	Number of parameters	01h	○	○	○	○
Parameter value	4	Format	Data Type Unsigned16: 06h Octetstring: 0Ah V2: 73h 44h for error response	○	○	×	○
	5	Number of data	Number of arrays	○	○	×	○
	6	Parameter value / error number	Parameter reading value or error number	○	○	×	○
	7			○	○	×	○
	8			○*1	×	×	×
	9			○*1	×	×	×
	10 to 237			○*1	×	×	×
	238			○*1	×	×	×
	239			○*1	×	×	×

*1 Availability depends on the format or data size.

■ Error number

Error No.	Name	Description
00h	Impermissible parameter number	Access is attempted to a nonexistent PROFIdrive parameter.
01h	Parameter value cannot be changed	Writing is attempted to a writing-disabled PROFIdrive parameter.
02h	Low or high limit exceeded	Setting is out of range.
03h	Faulty subindex	Access is attempted to a nonexistent subindex.
04h	No array	Access is attempted to a PROFIdrive parameter which does not have a subindex.
05h	Incorrect data type	Data type does not match.
11h	Request cannot be executed because of operating state	Access is disabled temporarily due to the operating status.
16h	Parameter address impermissible	Value, number of elements, or PNU number is invalid for the subindex.
17h	Illegal format	PROFIdrive parameter data format is invalid.
19h	Axis/DO nonexistent	Access is attempted to a nonexistent shaft or object.
21h	Service not supported	Service is out of range. (Request ID is invalid.)
23h	Multi parameter access not supported	Access is attempted to multiple parameters at the same time.

◆ Programming examples

The following explains the programming examples for controlling the inverter with sequence programs when Standard Telegram 1 is selected.

Check that "34962" (PROFINET) is set in any of **Pr.1427 to Pr.1430** (Ethernet function selection).

■ Programming example for forward rotation operation at 50 Hz

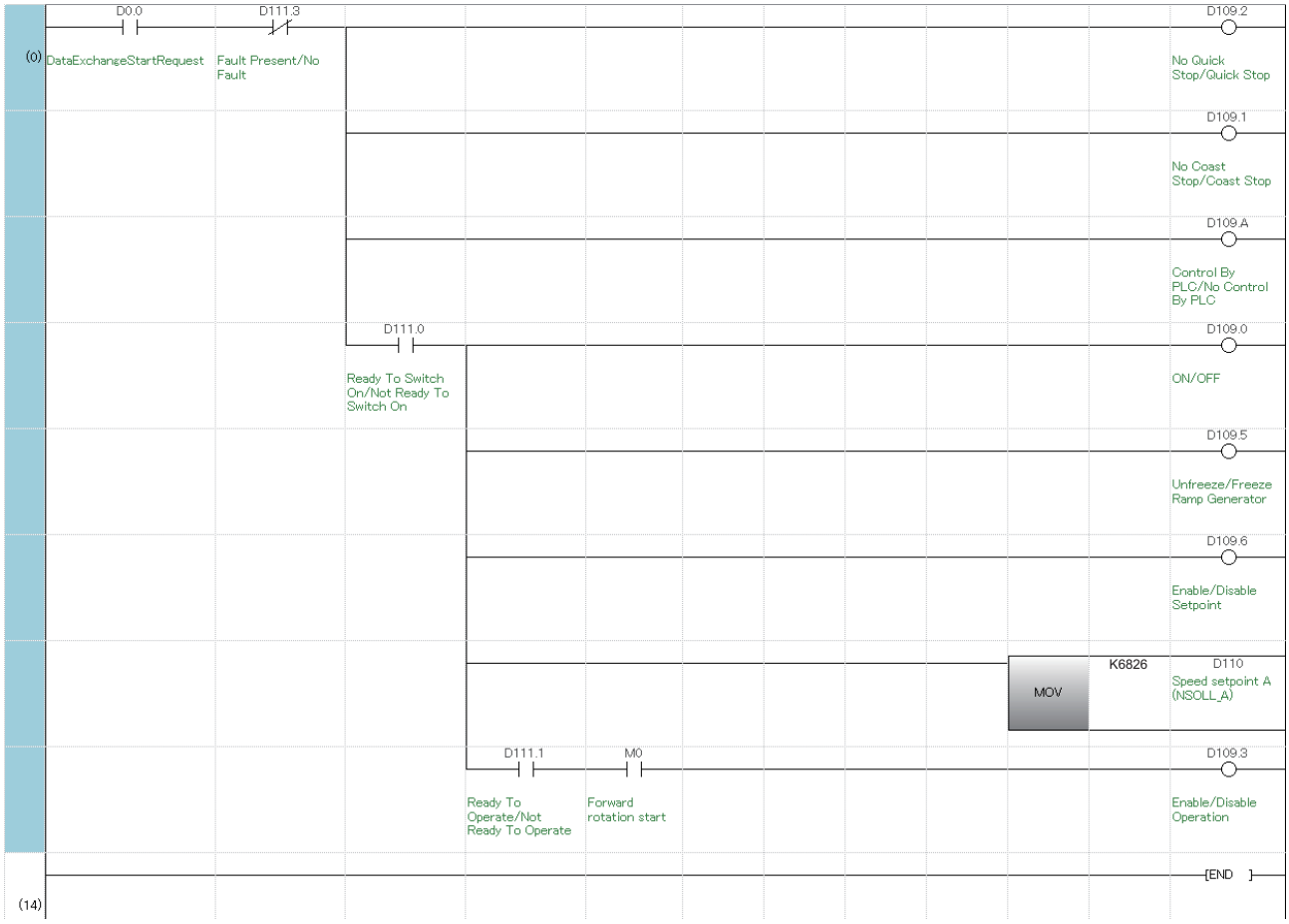
- Network setting and device examples

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 159.)

- Set frequency: Speed setpoint A (NSOLL_A)
  NSOLL_A = (5000 (50 Hz) × 16384 (4000h)) / 12000 (**Pr.1** = 120 Hz) = 6826 (1AAAh)

Turning ON M0 starts operation at 50 Hz.
Turning OFF M0 stops operation.



◆ Setting example

- The following tables show example settings when user defined cyclic communication data are selected (Telegram 102). When bit 10 of Control word 1 (STW1) is turned ON, data are written to the inverter. While bit 10 of Control word 1 (STW1) is ON, the data is always updated. (The response time to write the data is 100 ms at the most.)
- Telegram 102

Type	IO Data number	Name
Setpoint Telegram (master to inverter)	1	Control word 1 (STW1)
	2	**Pr.1320**
	3	**Pr.1321**
	4	**Pr.1322**
Actual Value Telegram (inverter to master)	1	Status word 1 (ZSW1)
	2	**Pr.1330**
	3	**Pr.1331**
	4	**Pr.1332**
	5	**Pr.1333**
	6	**Pr.1334**
	7	**Pr.1335**

- Parameter

Pr.	Name	Setting example	Remarks
1320	**User Defined Cyclic Communication Input 1 Mapping**	5 (5h)	Speed setpoint A (NSOLL_A)
1321	**User Defined Cyclic Communication Input 2 Mapping**	12295 (3007h)	**Pr.7 Acceleration time** 7 (0007h) + 12288 (3000h)
1322	**User Defined Cyclic Communication Input 3 Mapping**	12296 (3008h)	**Pr.8 Deceleration time** 8 (0008h) + 12288 (3000h)
1330	**User Defined Cyclic Communication Output 1 Mapping**	6 (6h)	Speed actual value A (NIST_A)
1331	**User Defined Cyclic Communication Output 2 Mapping**	12295 (3007h)	**Pr.7 Acceleration time** 7 (0007h) + 12288 (3000h)
1332	**User Defined Cyclic Communication Output 3 Mapping**	12296 (3008h)	**Pr.8 Deceleration time** 8 (0008h) + 12288 (3000h)
1333	**User Defined Cyclic Communication Output 4 Mapping**	16386 (4002h)	Output current monitor 2 (0002h) + +16384 (4000h)
1334	**User Defined Cyclic Communication Output 5 Mapping**	12543 (30FFh)	**Pr.255 Life alarm status display** 255 (00FFh) + 12288 (3000h)
1335	**User Defined Cyclic Communication Output 6 Mapping**	20981 (51F5h)	Fault record 1

- Connection settings in the engineering software

Set "Telegram 102" for the "Module Configuration" setting of the inverter.

Names of setting items may differ depending of the engineering software used.

2.12 Ethernet communication parameters

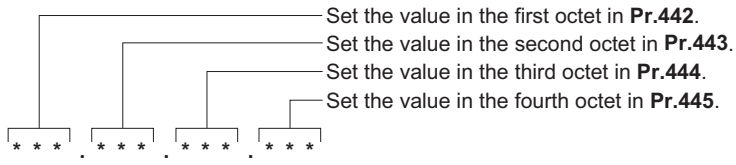
The following table shows parameters used in common for Ethernet communication protocols. Set the parameters as required.

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, 34962[*3], 44818[*2], 45237, 45238, 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 (KeepAlive ACK) for the time (s) set in **Pr.1455** multiplied by 8, 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.	

*1 The setting is applied after an inverter reset or next power-ON.
*2 The setting is available for the FR-D800-EPA.
*3 The setting is available for the FR-D800-EPB.
*4 For CC-Link IE TSN communication, a protective function (E.EHR) is activated regardless of the **Pr.1431** setting when a signal loss is detected during cyclic communication.
*5 The protective function is not activated while the inverter stops or during an inverter reset.
*6 The operation follows the **Pr.502 Stop mode selection at communication error** setting. (Refer to page 218.)
*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	1[*3]
5006		UDP	No limit
5007		TCP/IP	1[*3]
5008		UDP	No limit
5010	SLMP	UDP	No limit
5011			
5012		TCP/IP	1[*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
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 174).)

*4 The setting is available for the FR-D800-EPA.

*5 The setting is available for the FR-D800-EPB.

NOTE

- For details of communication protocols that cannot be used together, refer to page 4.

◆ Ethernet signal loss detection function selection (Pr.1431)

Use **Pr.1431** 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	Operation panel indication	LF signal output
0	Detection disabled	—	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

*1 The protective function is not activated while the inverter stops or during an inverter reset.

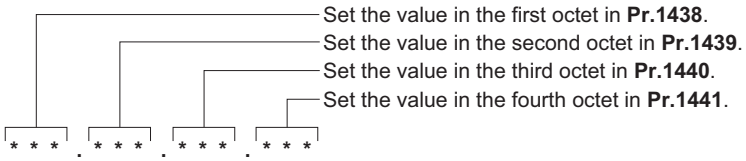
*2 The operation follows the **Pr.502 Stop mode selection at communication error** setting. (Refer to page 218.)

NOTE

- For CC-Link IE TSN communication, a protective function (E.EHR) is activated regardless of the **Pr.1431** setting when a signal loss is detected during cyclic communication.

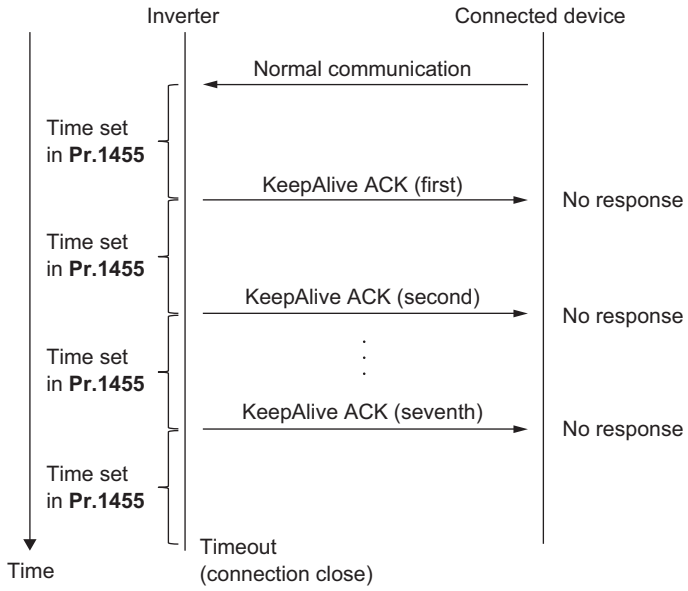
◆ Subnet mask (Pr.1438 to Pr.1441)

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.

3 RS-485 Communication

3.1 Outline

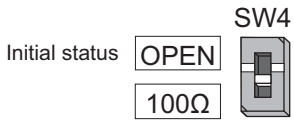
RS-485 communication is available for the standard model.

- Use the PU connector or the RS-485 terminals on the inverter as communication interface. When the inverter is connected to a computer, such as a personal computer or one within an FA device, via a communication cable, a user program can run to monitor the inverter operation or read and write parameters.
- Functions such as parameter settings and monitoring are available using the Mitsubishi inverter protocol or MODBUS RTU protocol.
- To make communication between the personal computer and inverter, setting of the communication specifications must be configured in the inverter in advance. Data communication cannot be made if the initial settings are not configured or if there is any setting error.

3.2 Wiring

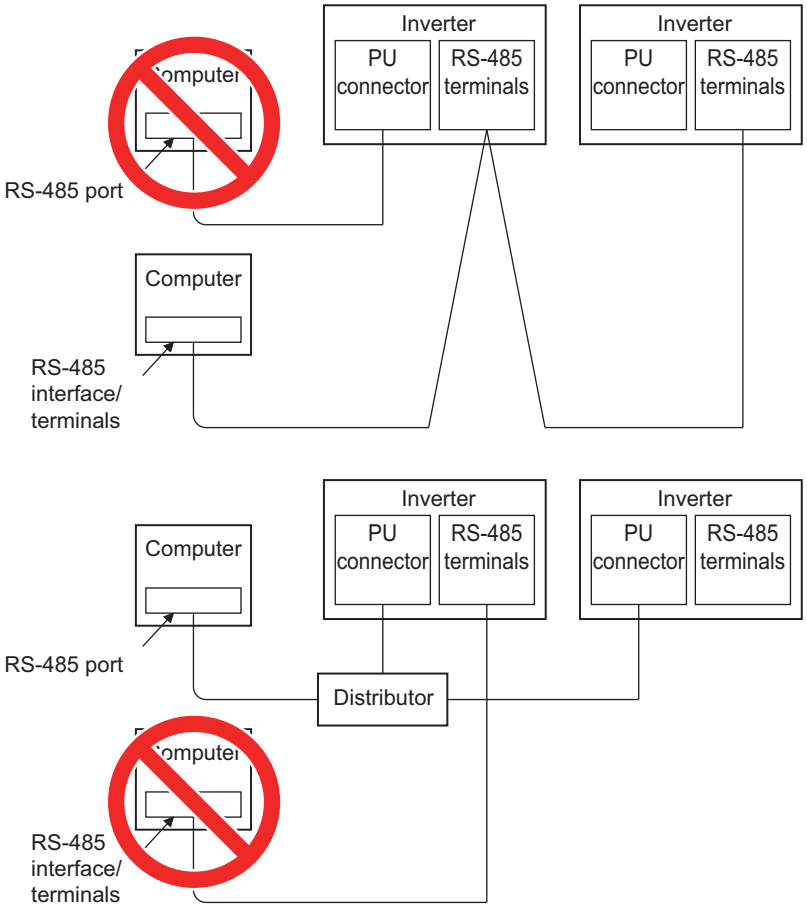
3.2.1 Wiring procedure

1. Prepare the equipment (connection cables / distributors) required for wiring according to the connection method (PU connector / RS-485 terminals).
2. Turn OFF the power of the computer and the inverter.
3. Connect the computer and the inverter.
4. Set the terminating resistor switch (SW4) of the inverter to the 100 Ω side. When connecting multiple inverters, set the terminating resistor switch (SW4) to the 100 Ω side on the inverter most remotely connected with the computer.



3.2.2 Precautions

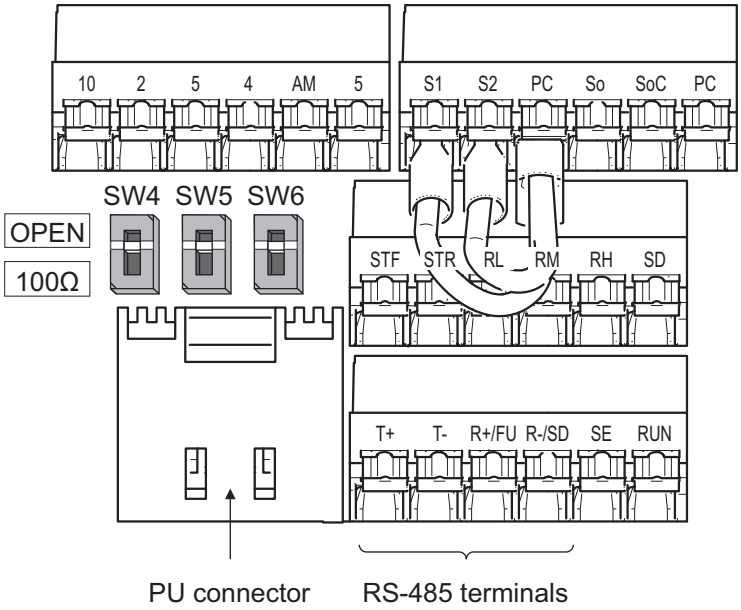
- The PU connector and the RS-485 terminals cannot be used simultaneously. Use either the connector or the terminals, and do not wire the other.
- RS-485 communication via the PU connector is enabled initially. (Refer to page 178.)
- When using the RS-485 terminals, switch the R+/FU switch (SW5) and the R-/SD switch (SW6). (Refer to page 182.)



3.3 Wiring of PU connector

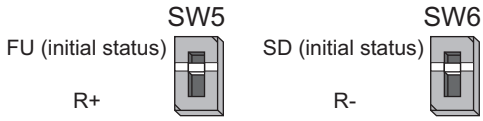
Using the PU connector enables communication operation from a personal computer, etc.

◆ Before communication

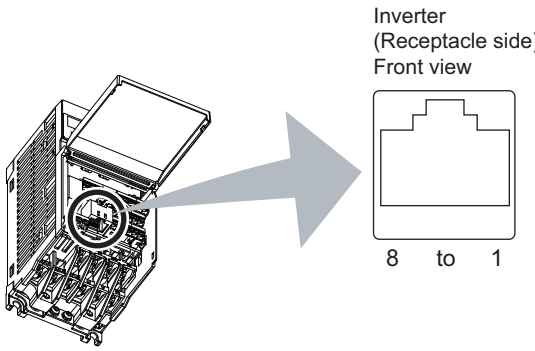


1. If any cable is connected to the RS-485 terminals, remove the wiring.
When terminals R+/FU or R-/SD are used as terminals FU or SD, the wiring does not need to be removed.

2. Set the R+/FU switch (SW5) to the upper position (FU) (initial status) and the R-/SD switch (SW6) to the upper position (SD) (initial status).



◆ PU connector pin-outs



Pin number	Name	Description
1	5 (GND)	Earthing (grounding)
2	—	Operation panel power supply
3	RDA	Inverter receive+
4	SDB	Inverter send-
5	SDA	Inverter send+
6	RDB	Inverter receive-
7	5 (GND)	Earthing (grounding)
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.

◆ Connection cable

Use Ethernet cables compliant with the following standards.

Ethernet cable	Connector	Standard
Category 5e or higher straight cable (double shielded/STP)	RJ-45 connector	The cables compliant with the following standards: • IEEE 802.3 (1000BASE-T) • ANSI/TIA/EIA-568-B (Category 5e)

NOTE

- Refer to the following for the cable (USB to RS-485 converter) to connect a computer with a USB Type-A port to an inverter.

Commercially available products (as of April 2023)

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-RS-485 converter-embedded conversion cable. No additional cable or connector is required. For the product details, contact the manufacturer.

◆ Distributor

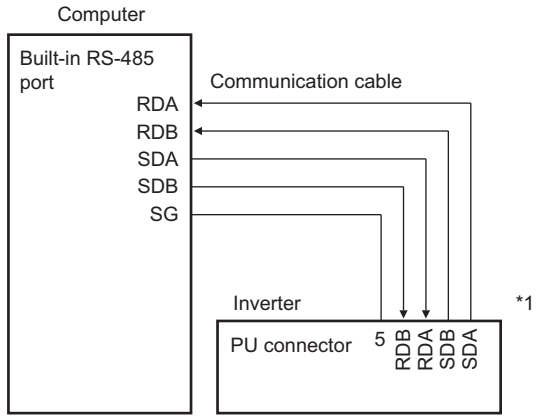
To connect multiple inverters, use distributors.

Commercially available products (as of April 2023)

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 (Pins No. 2 and No. 8 are not connected internally.) DMDH-10PN (Pins No. 2 and No. 8 are not connected internally.)	Diatrend Corp.

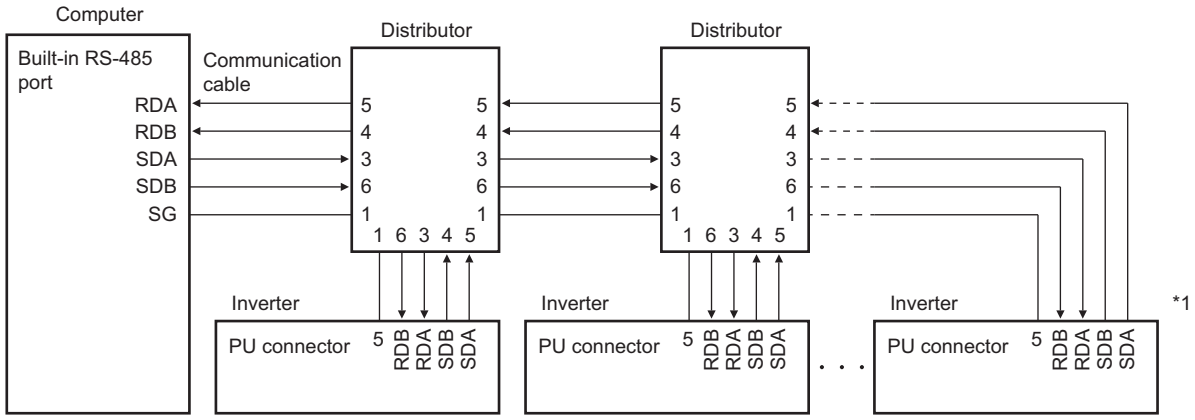
◆ PU connector wiring method

- Connecting one inverter (four-wire type)



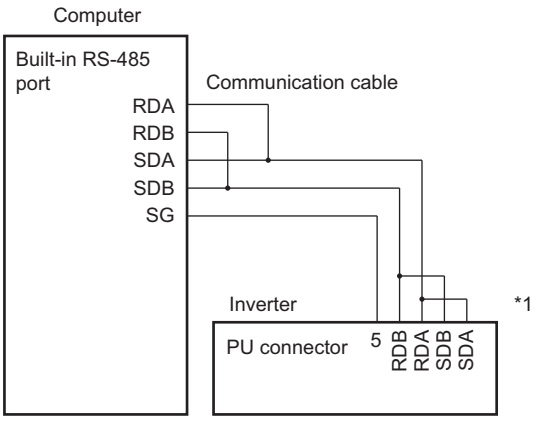
*1 Set the terminating resistor switch (SW4) to the 100 Ω side.

- Connecting multiple inverters (four-wire type)



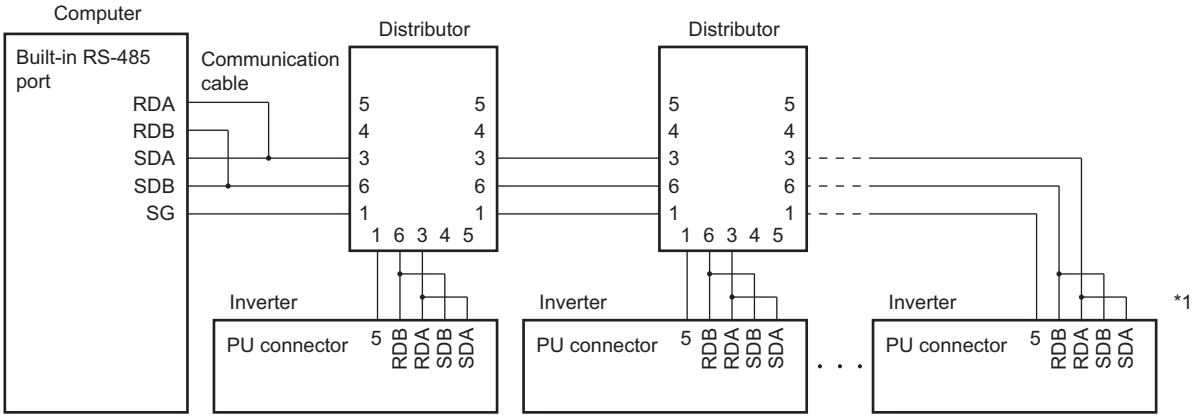
*1 On the inverter most remotely connected with the computer, set the terminating resistor switch (SW4) to the 100 Ω side.

- Connecting one inverter (two-wire type)



*1 Set the terminating resistor switch (SW4) to the 100 Ω side.

- Connecting multiple inverters (two-wire type)

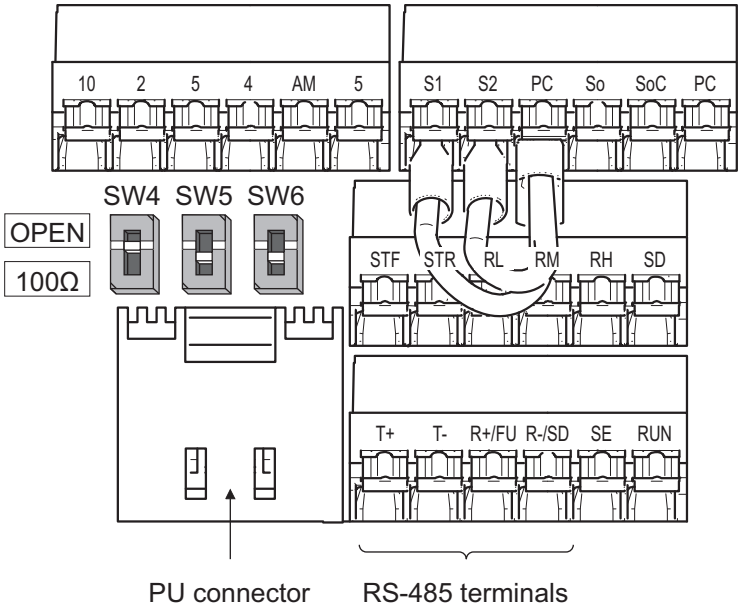


*1 On the inverter most remotely connected with the computer, set the terminating resistor switch (SW4) to the 100 Ω side.

3.4 Wiring of RS-485 terminals

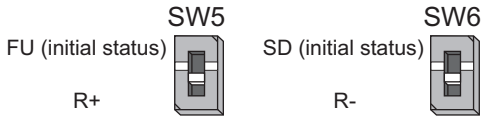
Using the RS-485 terminals enables communication operation from a personal computer, etc.

◆ Before communication

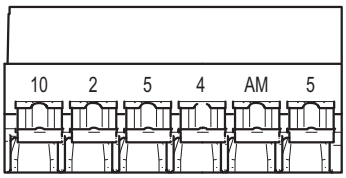


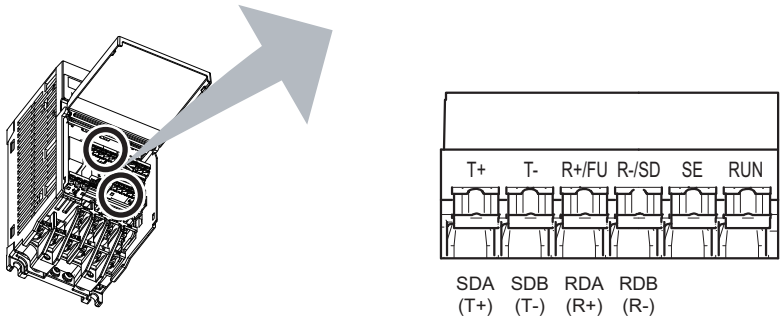
1. If any cable is connected to the PU connector, remove the wiring.

2. Set the R+/FU switch (SW5) to the lower position (R+) and the R-/SD switch (SW6) to the lower position (R-).



◆ RS-485 terminal layout





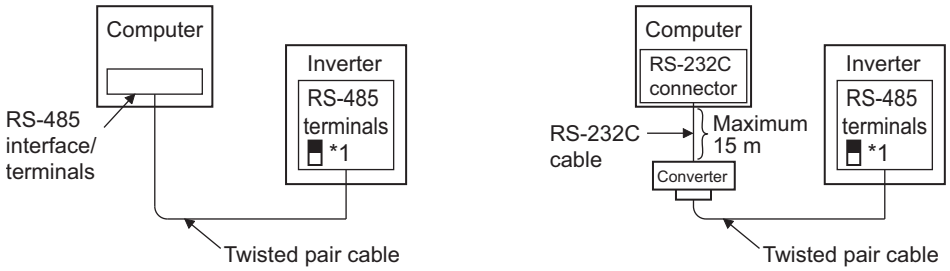
Name	Description
RDA (R+)	Inverter receive+
RDB (R-)	Inverter receive-
SDA (T+)	Inverter send+
SDB (T-)	Inverter send-
5	Earthing (grounding)

◆ Wiring the RS-485 terminals

- The size of RS-485 terminals is the same as that of other control circuit terminals. For details on the wiring, refer to the Instruction Manual (Connection).

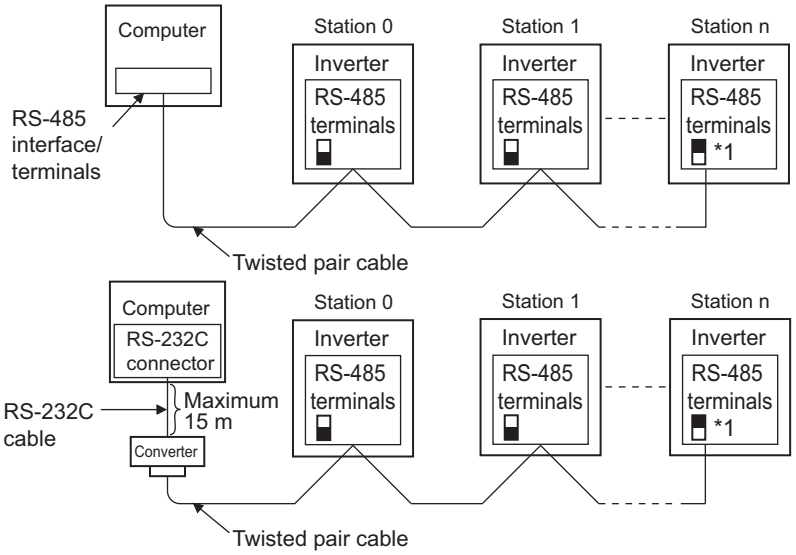
◆ System configuration of RS-485 terminals

- Computer and inverter connection (1:1)



*1 Set the terminating resistor switch (SW4) to the 100 Ω side.

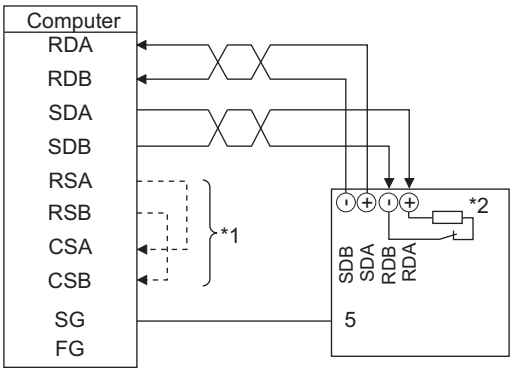
- Combination of a computer and multiple inverters (1:n)



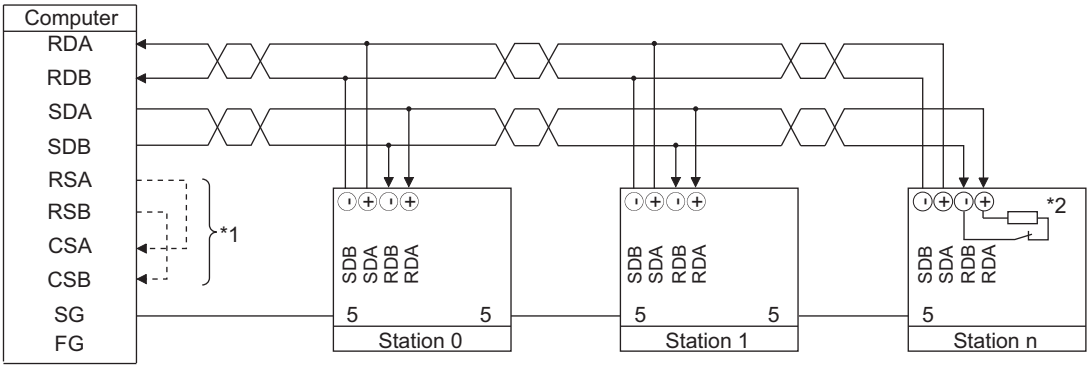
*1 On the inverter most remotely connected with the computer, set the terminating resistor switch (SW4) to the 100 Ω side.

◆ RS-485 terminals wiring method

- Wiring between a computer and an inverter for RS-485 communication



- Wiring between a computer and multiple inverters for RS-485 communication

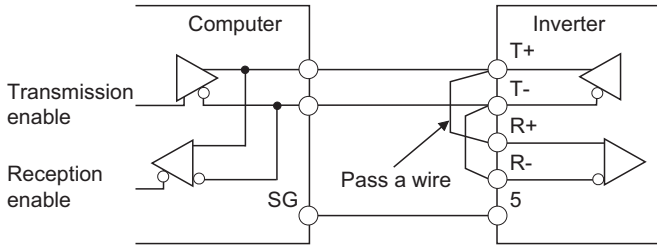


*1 Make connection in accordance with the Instruction Manual of the computer to be used with.
Fully check the terminal numbers of the computer since they vary with the model.

*2 On the inverter most remotely connected with the computer, set the terminating resistor switch (SW4) to the 100 Ω side.

◆ Two-wire type connection

- If the computer is 2-wire type, a connection from the inverter can be changed to 2-wire type by passing wires across reception terminals and transmission terminals of the RS-485 terminals.



NOTE

- A program should be created so that transmission is disabled (receiving state) when the computer is not sending and reception is disabled (sending state) during sending to prevent the computer from receiving its own data.

3.5 Mitsubishi inverter protocol (computer link communication)

The Mitsubishi inverter protocol (computer link communication) enables parameter setting, monitoring, and so on through communication via the PU connector or the RS-485 terminals on the inverter.

To use the Mitsubishi inverter protocol (computer link communication), set "0 (initial value)" in **Pr.549 Protocol selection**.

Pr.	Name	Initial value	Setting range	Description	
549 **N000**	**Protocol selection**	0	0	Mitsubishi inverter protocol (computer link)	
			1	MODBUS RTU protocol	
117 **N020**	**RS-485 communication station number**	0	0 to 31*1	Use this parameter to specify the inverter station number. Enter the inverter station numbers when two or more inverters are connected to one personal computer.	
118 **N021**	**RS-485 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	**RS-485 communication data length**	0	0	Data length 8 bits	
			1	Data length 7 bits	
N023	**RS-485 communication stop bit length**	1	0	Stop bit length 1 bit	
			1	Stop bit length 2 bits	
119	**RS-485 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**	**RS-485 communication parity check**	2	0	Parity check disabled.	
			1	Parity check (odd parity) enabled.	
			2	Parity check (even parity) enabled.	
121 **N025**	**RS-485 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 is shut off.	
			9999	The inverter output will not be shut off even when a communication error occurs.	
122 **N026**	**RS-485 communication check time interval**	0	0	RS-485 communication is enabled. However, the inverter output is shut off if the operation mode is changed to the one for the selected command interface.	
			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**	**RS-485 communication waiting time setting**	9999	0 to 150 ms	Set the delay between data transmission to the inverter and 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**	**RS-485 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	—
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.

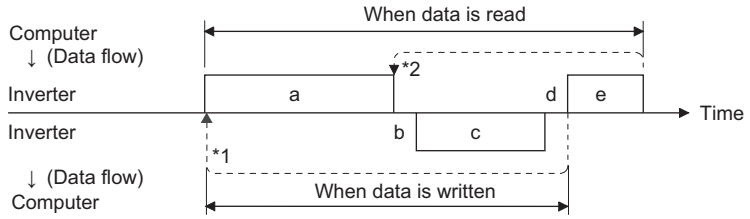
(a) Request data is sent from the computer to the inverter. (The inverter will not send data unless requested.)

(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	*3	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*4 (Request accepted)	C	C	*3*6	C	C*5	E, E1, E2, E3*1	E (E2)*2
		With error (Request rejected)	D	D	D	D	D*5	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*4 (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 195.)
*2 The data writing format is A2 and the data reading format is E2 for **Pr.37**. (Refer to page 195.)
*3 Refer to page 199 for multi command data formats.
*4 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 192.)
*5 Reply from the inverter to the inverter reset request can be selected. (Refer to page 195.)
*6 At mode error and data range error, data on page 199 contains an error code. 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
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	Data						Sum check		*4

c. Reply data from the inverter to the computer (No data error detected)

Format	Number of characters			
	1	2	3	4
C	ACK*1	Inverter station number*2		*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 RS-485 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 RS-485 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 (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 RS-485 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.)

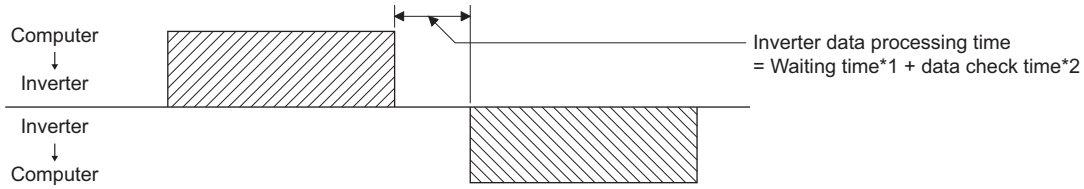
*4 CR+LF code: When a computer transmits data to the inverter, some computers automatically provide either one or both of the codes CR (carriage return) and LF (line feed) at the end of a data group. In this case, the same setting is required for data sent from the inverter to the computer. Use **Pr.124 RS-485 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 195.)
- 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 195.)
- Time delay
  Specify the waiting time between the receipt of data at the inverter from the computer and the 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 RS-485 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.)



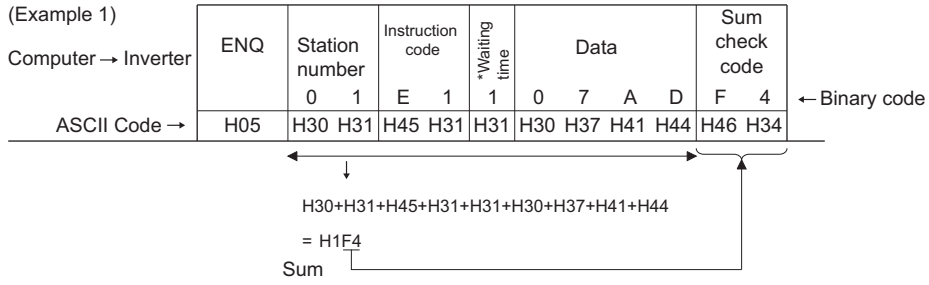
*1 When **Pr.123** = "9999", the waiting time is the data setting value × 10 ms. When **Pr.123** ≠ "9999", the waiting time is the value set in **Pr.123**.
*2 Approximately 5 to 50 ms. It varies depending on the instruction code.

NOTE

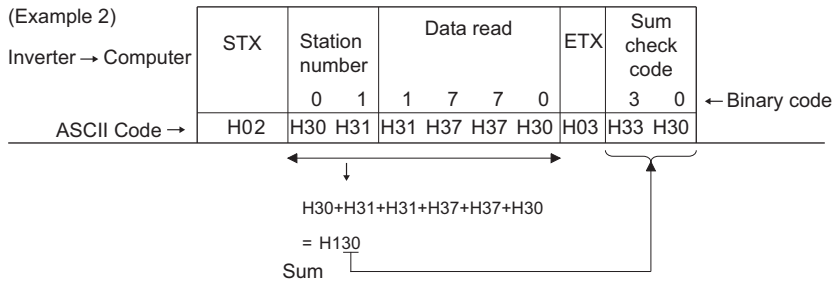
- The data check time varies depending on the instruction code. (Refer to page 192.)

- 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.



* When **Pr.123 RS-485 communication waiting time setting** ≠ "9999", create the communication request data without "waiting time" in the data format. (The number of characters decreases by 1.)

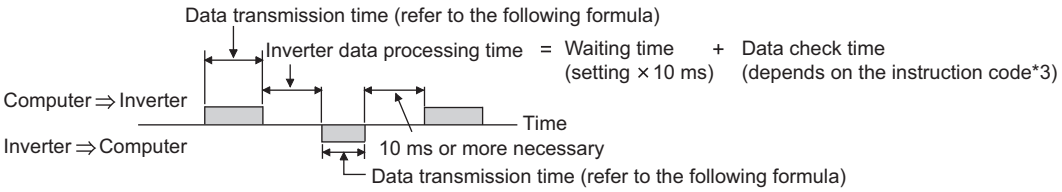


- Error code

  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 output is shut off (E.PUE) if errors occur consecutively 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, 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 188.

*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

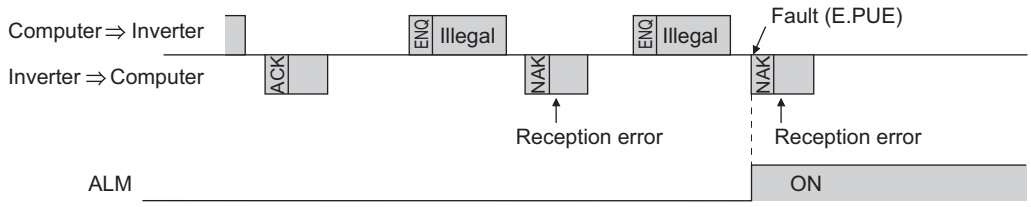
*3 Data check time

Item	Check time
Operation command, inverter status monitor, reading the monitor item, reading/writing the set frequency (RAM)	< 20 ms
Reading/writing the set frequency (EEPROM)	< 40 ms
Reading/writing parameters (RAM)	< Approximately 20 ms
Reading/writing parameters (EEPROM)	< Approximately 50 ms

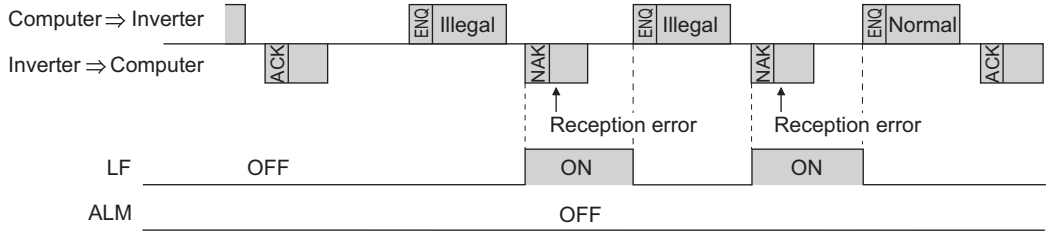
◆ Retry count setting (Pr.121)

- Set the permissible number of retries at data receive error occurrence. (Refer to page 191 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: **Pr.121** = "1" (initial value)



Example: **Pr.121** = "9999"

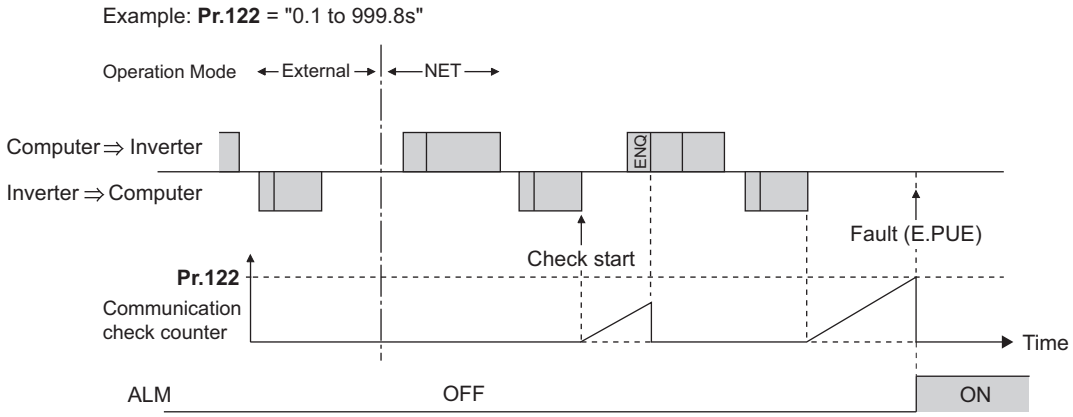


NOTE

- The operation at a communication error occurrence depends on the setting of **Pr.502 Stop mode selection at communication error**. (Refer to page 217.)

◆ Signal loss detection (Pr.122)

- If a signal is lost (communication stops) between the computer and the inverter as a result of a signal loss detection, the 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 "9999" is set, the communication check (signal loss detection) will not be performed.
- The monitor items and parameter settings can be read via RS-485 communication when "0" is set, but a communication error (E.PUE) occurs instantly when the operation mode is switched to the one for the selected command interface (Network operation mode in the initial setting).
- Setting any value from 0.1 to 999.8 seconds will enable signal loss detection. To detect signal loss, data must be sent from the computer within the communication check time interval (for further information on control codes, refer to page 190). (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 (Network operation mode in the initial setting).



◆ Programming instructions

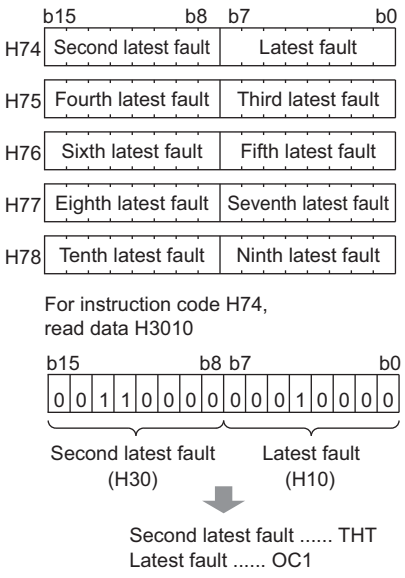
- When data from the computer has any error, the inverter does not accept that data. Hence, in the user program, always insert a retry program for data error.
- All data communication such as the operation command or monitoring are started when the computer gives a communication request. The inverter 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 or other factors, 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, or other factors, 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 as shown in the following table, 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	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 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 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 the data codes or details of fault records, refer to the Instruction Manual (Maintenance).  For instruction code H74, read data H3010 Second latest fault ..... THT Latest fault OC1	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 198.)	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 198.)	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 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 Instruction Manual (Function).) To change the set frequency consecutively, write data to the inverter RAM. (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.[*3] • All parameter clear H9966: Parameters including communication parameters are cleared. H55AA: Parameters other than communication parameters are cleared.[*3] For details on whether or not to clear parameters, refer to the 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 (**Pr.296, Pr.297**) (refer to the Instruction Manual (Function)).	4 digits (A and C/ D)
Parameter	Read	H00 to H6B	Refer to the instruction code list in the Instruction Manual (Function) to write/read parameters 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 according to the instruction code settings. For details of the settings, refer to the instruction code list in the 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[*4] H00: Frequency[*5] 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 199 for details.)	10 digits ([*2]/D)

Item		Read/ write	Instruction code	Data description	Number of data digits (format)*1
Product profile	Model	Read	H7C	The inverter model can be read in ASCII code. "H20" (blank code) is set for blank area. Example) FR-D820: H46, H52, H2D, H44, H38, H32, H30, 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 188 for data formats (A, A1, A2, B, C, D, E, E1, E2, E3, F).

*2 Refer to page 199 for multi command data formats.

*3 Turning OFF the power supply while clearing parameters with H5A5A or H55AA returns the communication parameter settings to the initial settings.

*4 Refer to the following calibration parameter list for details on the calibration parameters.

*5 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
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: Output stop	[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
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: Output stop b8: JOG operation selection 2 b9 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] H000C Low-speed reverse operation (When **Pr.180 RL terminal function selection** is set to "0") b15 b0 0 0 0 0 0 0 0 0 0 0 0 0 1 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 assigned in the initial status. The function changes depending on the setting of **Pr.180 to Pr.182 and Pr.185 to Pr.189 (Input terminal function selection)**. For details, refer to the description of **Pr.180 to Pr.182 and Pr.185 to Pr.189 (Input terminal function selection)** in the 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

Item	Instruction code	Bit length	Description	Example
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 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).

◆ Multi command (HF0)

- Sending data format from computer to inverter

Number of characters																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ENQ	Inverter station number		Instruction code (HF0)		Time delay*1	Send data type*2	Receive data type*3	Data 1*4				Data 2*4				Sum check		CR/ LF*7

- Reply data format from inverter to computer (No data error detected)

Number of characters																		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
STX	Inverter station number		Send data type*2	Receive data type*3	Error code 1*6	Error code 2*6	Data 1*5				Data 2*5				ETX	Sum check		CR/ LF*7

*1 Set the delay time. When **Pr.123 RS-485 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.)

*2 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.

*3 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.

*4 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 198.)
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 198.) Operation command (extended 2) is the same as instruction code HFE. (Refer to page 198.)
6	Operation command (extended 2)	Set frequency (RAM)	
7	Operation command (extended 2)	Set frequency (RAM, EEPROM)	

*5 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 198.) The monitor item specified in instruction code HF3 is returned for the special monitor. (Refer to page 198.)
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 198.) The inverter status monitor (extended 2) data is the same as the data of instruction code H7E (Refer to page 198.) The monitor item specified in instruction code HF3 is returned for the special monitor. (Refer to the Instruction Manual (Function).)
6	Inverter status monitor (extended 2)	Output frequency / rotations per minute (machine speed)	
7	Inverter status monitor (extended 2)	Special monitor	

*6 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 Instruction Manual (Maintenance) for the details of the error codes.)

*7 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 RS-485 communication CR/LF selection** for the CR+LF code setting.

3.6 MODBUS RTU

Operation or parameter setting through communication is possible using the MODBUS RTU communication protocol via the PU connector or the RS-485 terminals on the inverter.

To use MODBUS RTU, set "1" in **Pr.549 Protocol selection**.

Pr.	Name	Initial value	Setting range	Description	
549 N000	**Protocol selection**	0	0	Mitsubishi inverter protocol (computer link)	
			1*1	MODBUS RTU protocol	
117 N020	**RS-485 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	**RS-485 communication speed**	192	48, 96, 192, 384*1, 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	**RS-485 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	**RS-485 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	**RS-485 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	**RS-485 communication check time interval**	0	0	RS-485 communication is enabled. However, the inverter output is shut off if the operation mode is changed to the one for the selected command interface.	
			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	(0 to 999)	Displays the communication error count during MODBUS RTU communication. Read-only.	

*1 When **Pr.549** = "1 (MODBUS RTU)" and **Pr.118** = "384 (38400 bps)", the parameter unit is not available. To use the parameter unit, set a value other than "384" in **Pr.118** and perform an inverter reset.

NOTE

- If MODBUS RTU communication is performed from the client to the address 0 (station number 0), the data is broadcasted, and the inverter does not send any reply to the client. To obtain replies from the inverter, set **Pr.117 RS-485 communication station number** ≠ "0 (initial value)".
- Some functions are disabled in broadcast communication. (Refer to page 203.)
- 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	—
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	—

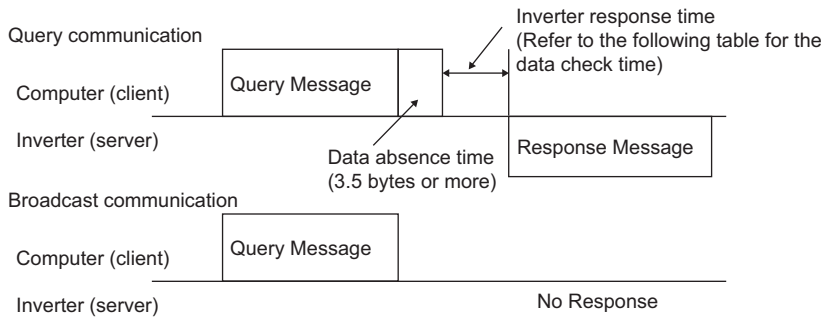
◆ Outline

- The MODBUS communication protocol was developed by Modicon for programmable controllers.
- The MODBUS protocol uses exclusive message frames to perform serial communication between a client and servers. 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 client can communicate with inverters (servers) 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)	< 20 ms
Frequency setting (EEPROM)	< 50 ms
Reading/writing parameters	< Approximately 50 ms
Parameter clear / All parameter clear	Less than 5 s
Reset command	No reply

- Query

  A message is sent to the server (the inverter) having the address specified by the client.

- Normal Response
  After the query from the client is received, the server executes the request function, and returns the corresponding normal response to the client.
- Error Response
  When an invalid function code, address or data is received by the server, the error response is returned to the client. This response is appended with an error code that indicates the reason why the request from the client could not be executed.
  This response cannot be returned for errors, detected by the hardware, frame error and CRC check error.
- Broadcast
  The client can broadcast messages to all servers by specifying address 0. All servers that receive a message from the client execute the requested function. With this type of communication, servers do not return a response to the client.

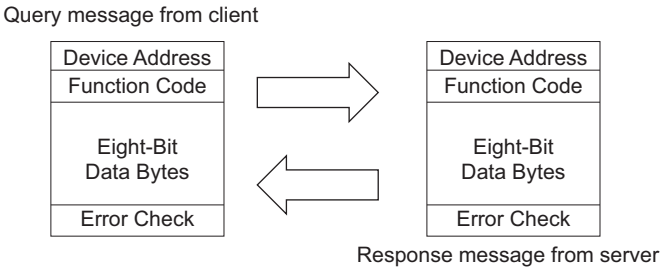
NOTE

- During broadcast communication, functions are executed regardless of the set inverter station number (**Pr.117**).

◆ Message frame (protocol)

- Communication method

Basically, the client sends a query message (inquiry), and servers 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.



Message frames comprise the four message fields shown in the figures above.
A server 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 servers. The response from the server also contains the address set by the client. The value set in **Pr.117 RS-485 communication station number** is the server address.
Function field	"1 to 255" can be set as the function code in the single-byte (8-bit) length filed. The client sets the function to be sent to the server as the request, and the server 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 server contains the function code set by the client. The error response contains H80 and the function code.
Data field	The format changes according to the function code. (Refer to page 204.) 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 209.) Monitor code (Refer to the Instruction Manual (Function).) Fault history (Refer to page 211.) Model information monitor (Refer to page 212.) Inverter parameters (Refer to page 211.)	Not available	page 204
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 209.) Inverter parameters (Refer to page 211.)	Available	page 205
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 206
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 209.) Inverter parameters (Refer to page 211.)	Available	page 206
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 codes H03, H06, and H10.	Not available	page 207

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

- Query message

a. Server 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. Server 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	Server 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. Start address = start register address (decimal) - 40001 For example, when starting address 0001 is set, the data of holding register 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 server address 17 (H11).

Query message

Server 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)

Server 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 209) assigned to the holding register area can be written.
- Query message

a. Server 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. Server 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	Server 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 server address 5 (H05).

Query message

Server 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. Server 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. Server 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	Server 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. Server 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. Server 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	Server 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. Start 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 server address 25 (H19).

Query message

Server address	Function code	Starting address		Quantity of registers		Byte count	Registers 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)

Server 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. Server address	b. Function code	CRC check	
(8 bits)	H46 (8 bits)	L (8 bits)	H (8 bits)

- Normal response (Response message)

a. Server 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	Server 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. Start 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 server address 25 (H19).

Query message

Server address	Function code	CRC check	
H19 (8 bits)	H46 (8 bits)	H8B (8 bits)	HD2 (8 bits)

Normal response (Response message)

Server 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 client 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. Server 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	Server address	Set the address received from the client.
b	Function code	The function code requested by the client 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 client has a function code that cannot be handled by the server.
02	ILLEGAL DATA ADDRESS*1	The query message from the client has a register address that cannot be handled by the server. (No parameter, parameter cannot be read, parameter cannot be written)
03	ILLEGAL DATA VALUE	The query message from the client has data that cannot be handled by the server. (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 client. 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 client 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	Control input command / inverter status (extended)*2	Read/write	Refer to page 210.
40009	Control input command / inverter status*2	Read/write	Refer to page 210.
40010	Operation mode / inverter setting*3	Read/write	Refer to page 210.
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 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.

- Control input command / inverter status, control input command / inverter status (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	Output stop	0
11	—	0
12	—	0
13	—	0
14	—	0
15	—	Fault occurrence

Bit	Definition	
	Control input command (extended)	Inverter status (extended)
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.182 and Pr.185 to Pr.189 (Input terminal function selection)**.
For details, refer to the description of **Pr.180 to Pr.182 and Pr.185 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).

- 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 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 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 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
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 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. (Refer to the Instruction Manual (Maintenance) for the details of the error codes.) 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-D820: H46, H52, H2D, H44, H38, H32, H30, 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.
- The display can be changed from the frequency to rotations per minute (machine speed) using **Pr.53**. When the machine speed is displayed, the value is incremented by one.

◆ Pr.343 Communication error count

- The communication error occurrence count can be checked.

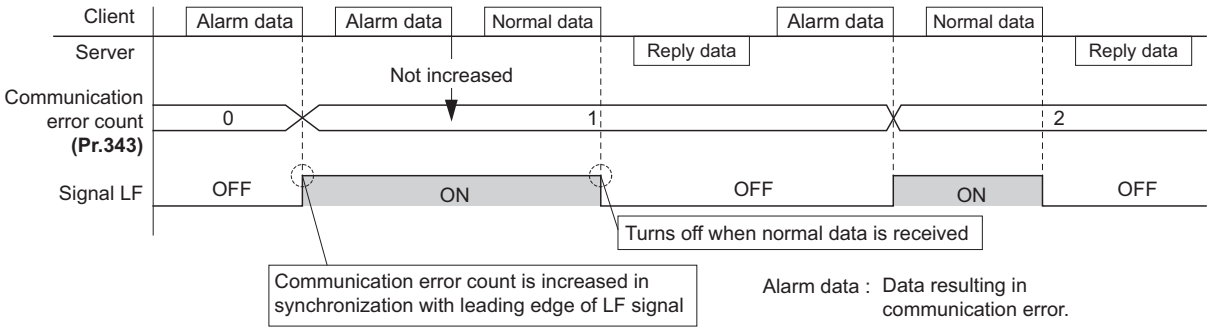
Parameter	Setting range	Minimum setting range	Initial value
343	(0 to 999) (Read-only)	1	0

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)**.



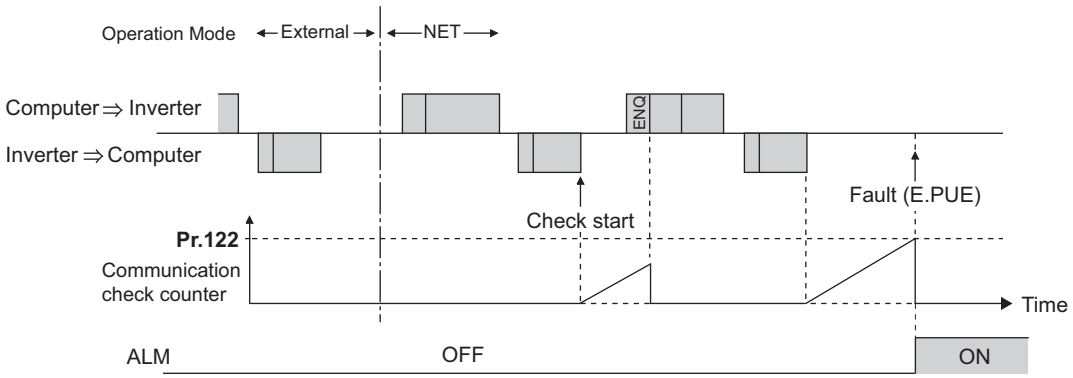
NOTE

- 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 is lost (communication stops) between the computer and the inverter as a result of a signal loss detection, the 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 "9999" is set, the communication check (signal loss detection) will not be performed.
- The monitor items and parameter settings can be read via RS-485 communication when "0" is set, but a communication error (E.PUE) occurs instantly when the operation mode is switched to the one for the selected command interface (Network operation mode in the initial setting).
- Setting any value from 0.1 to 999.8 seconds will enable signal loss detection. 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 client.)
- Communication check is started at the initial communication in the operation mode for the selected command interface (Network operation mode in the initial setting).

Example: **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 217.)

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.

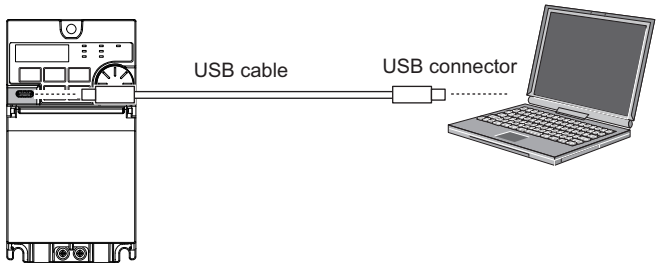
Pr.	Name	Initial value	Setting range	Description
547 **N040**[*1]	**USB communication station number**	0	0 to 31	Specify the inverter station number.
548 **N041**[*1]	**USB communication check time interval**	9999	0	USB communication is possible, however the inverter output is shut off (E.USB) when the 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

Item	Description
Interface	Conforms to USB 2.0.
Wiring length	Maximum 5 m
Connector	USB Type-C connector (receptacle)
Power supply	Self-powered[*1]

*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 the inverter and a personal computer with 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

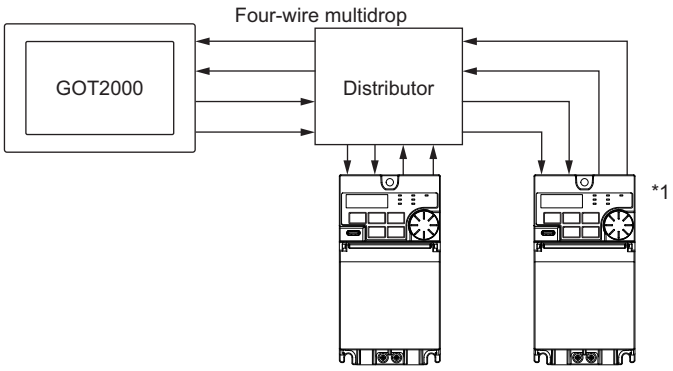
When the automatic connection is enabled in the GOT2000 series, the inverter can communicate with the GOT2000 series with only setting the station number and connecting the GOT. This eliminates the need for setting each communication parameter separately.

Pr.	Name	Initial value	Setting range	Description
117 **N020**	**RS-485 communication station number**	0	0 to 31*1	Specify the inverter station number. The inverter station number setting is required when multiple inverters are connected to one GOT (PU connector or RS-485 communication).

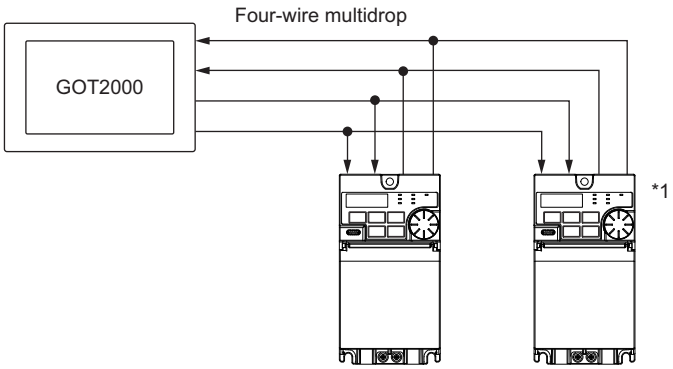
*1 Setting range when **Pr.549 Protocol selection** = "0" (Mitsubishi inverter protocol). The setting range is "0 to 247" when **Pr.549** = "1" (MODBUS RTU). When a value outside the setting range is set, the inverter operates at the initial value.

◆ Automatic connection system configuration

- When the PU connector is used



- When the RS-485 terminals are used



*1 On the inverter most remotely connected with the GOT, set the terminating resistor switch (SW4) to the 100 Ω side.

◆ 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).

5 Common Settings

Set the action when the inverter is performing operation via communication.
Set the action at fault occurrence or at reading/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. When the index of inverter parameter is read via Ethernet communication (acyclic communication), the EEPROM value is read.
			1	Parameter values written by communication are written to the RAM. When the index of inverter parameter is read via Ethernet communication (acyclic communication), the RAM value is read.
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.
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 Available for the Ethernet model only.

◆ Communication EEPROM write selection (Pr.342)

- When parameter write is performed via the inverter PU connector, RS-485 terminals, Ethernet connector, or USB connector, the parameters storage device can be changed to "RAM only" from "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. The life of the EEPROM will be shorter if parameter write is performed frequently with the setting unchanged from "0 (initial value)" (EEPROM write).
- When the index of inverter parameter is read via Ethernet communication (acyclic communication) while **Pr.342** = "0 (initial value)", the EEPROM value is read. When **Pr.342** = "1", the RAM value is read.

NOTE

- Turning OFF the inverter's power supply clears the modified parameter settings when **Pr.342** = "1 (write only to RAM)". Therefore, the parameter settings last stored to EEPROM applies at next power-ON.
- 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, RS-485 terminals, or Ethernet connector, operation at a communication error can be selected. The operation is active in 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	0 (initial value)	Output shutoff	"E.PUE", "E.EHR"	ON	Output stop status continues.	"E.PUE", "E.EHR"	ON
	1	Output to decelerate and stop the motor.	"E.PUE", "E.EHR" after stop	ON after stop			
	2			OFF	Restart*1	Normal	OFF
	6	Operation continues at the frequency set in **Pr.779**.*2	"CF" warning	OFF	Normal	Normal	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.

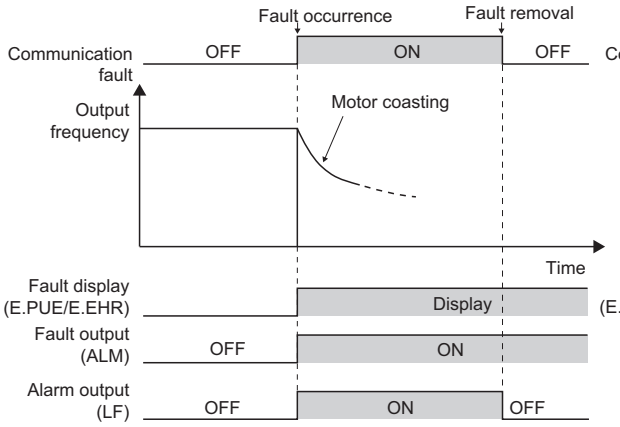
- When a communication error is detected during communication via the PU connector or the RS-485 terminals, the Alarm (LF) signal is output to an output terminal of the inverter.
- When a communication error is detected during communication via the Ethernet connector while **Pr.1431 Ethernet signal loss detection function selection** = "2 or 3", the Alarm (LF) signal is output to an output terminal of the inverter.

NOTE

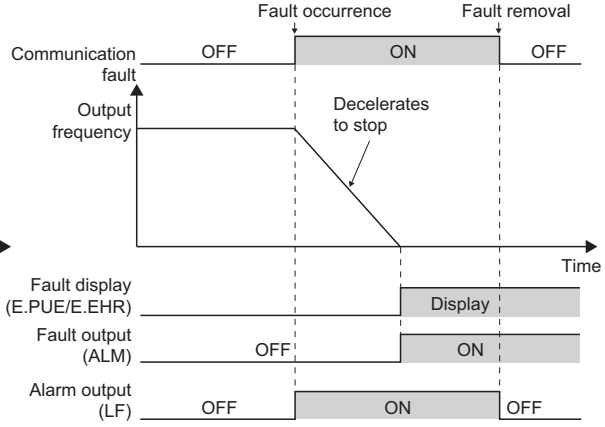
- To use the LF signal, set "98" (positive logic) or "198" (negative logic) in any of **Pr.190 to Pr.196 (Output terminal function selection)** to assign the function to an output terminal.

- The following charts show operations when a communication line error occurs.

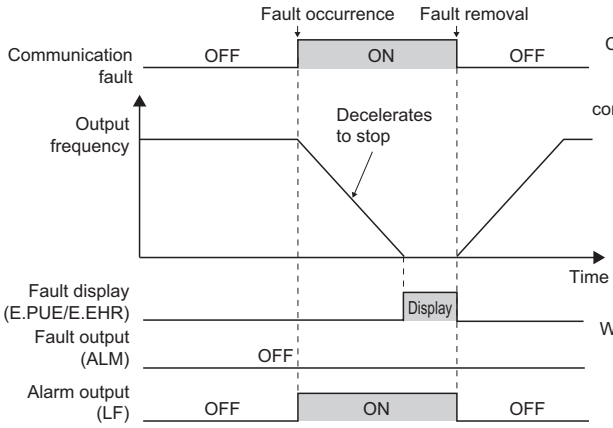
Pr.502 = "0" (initial value)



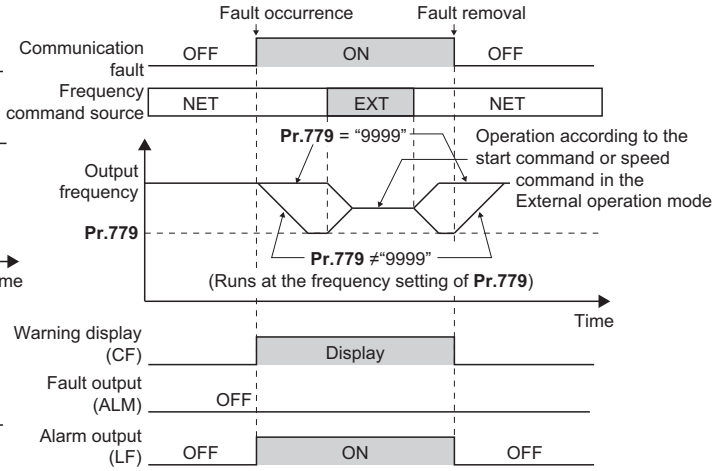
Pr.502 = "1"



Pr.502 = "2"



Pr.502 = "6"



NOTE

- When the **Pr.1431** setting is changed to a value other than "3" after the operation defined by the **Pr.502** setting starts during Ethernet communication, the operation will be changed according to the setting of **Pr.1431**.
- 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 Instruction Manual (Function).)
- 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.
- The **Pr.502** and **Pr.779** settings are valid when communication is performed via the PU connector, RS-485 terminals, or Ethernet connector.
- These parameters are valid in the Network operation mode. When performing communication via the PU connector or the RS-485 terminals, set **Pr.551 PU mode operation command source selection** ≠ "2".
- **Pr.502** is valid for the device that has the command source in the Network operation mode.

- 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) 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, etc.) or press the PU stop on the operation panel.

◆ Error reset operation selection at inverter fault (Pr.349)

- An error reset command can be disabled 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 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 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.

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 caused by using the emergency drive function
   - 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
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