MITSUBISHI ELECTRIC

INVERTER

700 series

FR-E700

FR-E700-NE ETHERNET FUNCTION MANUAL

Ethernet communication function

This manual explains the Ethernet communication specifications. For the functions not found in this manual, refer to the Instruction Manual (Applied) of the FR-E700 inverter.
In addition to this manual, please read the Instruction Manual (Applied) of the FR-E700 inverter carefully. Do not use this product until you have a full knowledge of the equipment, safety information and instructions.
Please forward this manual to the end user.

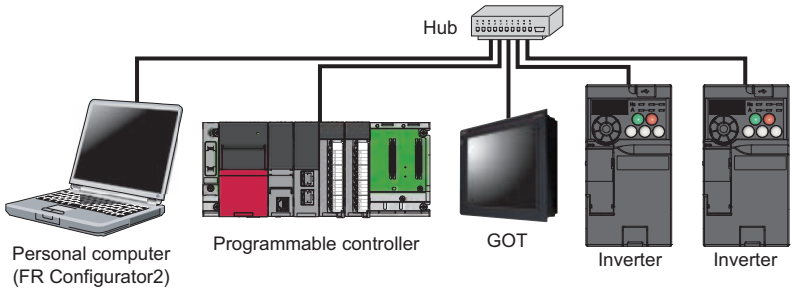
E700

CONTENTS

1 INTRODUCTION

1.1 Ethernet communication overview

The FR-E700-NE inverter is equipped with an Ethernet board. Communication with network devices can be made via Ethernet by connecting an Ethernet cable to the Ethernet connector on the Ethernet board.



◆Precautions for Ethernet communication

- In order to protect the inverter and the system against unauthorized access by external systems via network, take security measures including firewall settings.
- Depending on the network environment, the inverter may not operate as intended due to delays or disconnection in communication. Carefully consider the conditions and safety for the inverter on site.

◆Abbreviations

Abbreviation / generic name	Description
PU	Operation panel and parameter unit (FR-PU04, FR-PU07)
Inverter	FR-E700 series inverter with Ethernet communication function
Ethernet board	Ethernet communication board (FR-E7NE)
Pr.	Parameter number (Number assigned to function)
iQSS	iQ Sensor Solution*1
TCP/IP	Transmission Control Protocol / Internet Protocol
UDP/IP	User Datagram Protocol / Internet Protocol

*1 The solution enables seamless sensor control using a programmable controller, GOT, and other devices. The iQSS contributes to the reduction in the total cost from development to maintenance of production equipment.

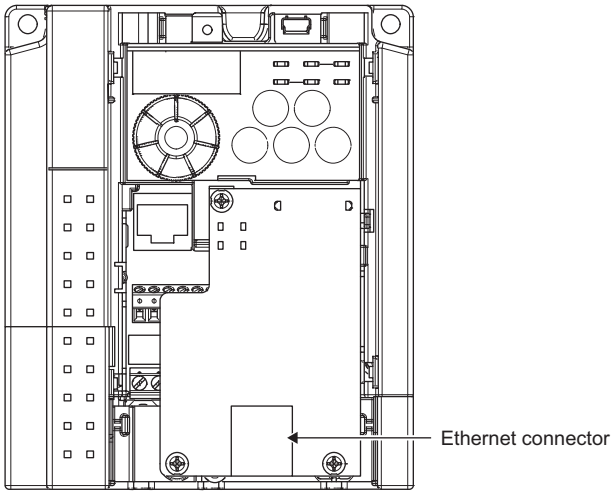
◆Trademarks

- Ethernet is a registered trademark of Fuji Xerox Corporation.
- MODBUS is a registered trademark of SCHNEIDER ELECTRIC USA, INC.

1.2 Ethernet connector

◆Ethernet communication specifications

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)
Interface	RJ-45
Number of interfaces available	1
IP version	IPv4



◆Connection cable

Use Ethernet cables compliant with the following standards.

Communication speed	Cable	Connector	Standard
100 Mbps	Category 5 or higher, (shielded / STP) straight cable	RJ-45 connector	100BASE-TX
10 Mbps	Category 3 or higher, (shielded / STP) straight cable		10BASE-T
	Category 3 or higher, (UTP) straight cable		

◆Hub

Use a hub that supports transmission speed of the Ethernet.

1.3 Ethernet cable 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. Handling the conductors with oily hands or dust/dirt adhesion to the conductors may cause transmission losses and impair normal data link operation.
- Check the Ethernet cable for the following points before use.
  - The cable is not broken.
  - The cable does not have a short circuit.
  - The connector is properly installed.
- Do not use an Ethernet cable with a broken latch. Doing so may cause the cable to come off or malfunction.
- Do not connect the Ethernet cable to the PU connector. The product could be damaged due to differences in electrical specifications.
- The maximum distance between stations is specified as 100 m. However, the maximum distance may be shorter depending on the environment. For details of the cable, contact your cable manufacturer.

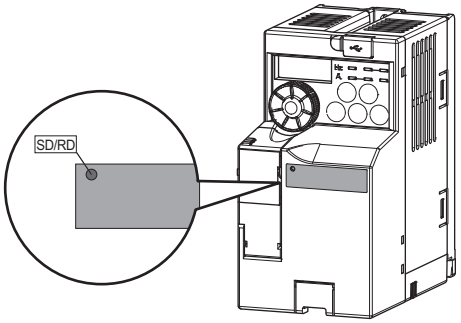
◆Connecting and disconnecting of the Ethernet cable

Hold the cable connector 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.

1.4 LED indicator for communication status

Check the LED indicator for communication status to confirm the Ethernet communication status.

LED indicator for communication status



LED indicator	Description
SD/RD (LED indicator for communication status)	ON (green): Transmitting/receiving data via Ethernet

2 PARAMETER

2.1 Parameter list

The following parameters are dedicated to Ethernet communication. Set the parameters according to application. For other parameters, refer to the Instruction Manual (Applied) of the FR-E700 inverter.

Pr.	Name	Setting range	Minimum setting increments	Initial value	Refer to page	Customer setting
313	DO0 output selection	0, 1, 3, 4, 7, 8, 11 to 16, 20, 25, 26, 46, 47, 64, 90, 91, 93, 95, 96, 98, 99, 100, 101, 103, 104, 107, 108, 111 to 116, 120, 125, 126, 146, 147, 164, 190, 191, 193, 195, 196, 198, 199, 9999	1	9999	12	
314	DO1 output selection		1	9999	12	
315	DO2 output selection		1	9999	12	
342	Communication EEPROM write selection	0, 1	1	0	13	
349	Communication reset selection	0, 1	1	0	13	
442	Default gateway address 1	0 to 255	1	0	17	
443	Default gateway address 2	0 to 255	1	0	17	
444	Default gateway address 3	0 to 255	1	0	17	
445	Default gateway address 4	0 to 255	1	0	17	
501	Communication error occurrence count display	0	1	0	13	
502	Stop mode selection at communication error	0 to 3	1	0	13	
541	Frequency command sign selection	0, 1	1	0	36	
544	CC-Link extended setting	0, 1, 12, 14, 18	1	0	36	
550	NET mode operation command source selection	0, 2	1	0	8	
551	PU mode operation command source selection	2 to 4, 9999	1	9999	8	
805	Ethernet IP address 1	0 to 255	1	192	17	
806	Ethernet IP address 2	0 to 255	1	168	17	
807	Ethernet IP address 3	0 to 255	1	50	17	
808	Ethernet IP address 4	0 to 255	1	1	17	
809	Subnet mask 1	0 to 255	1	255	17	
810	Subnet mask 2	0 to 255	1	255	17	
811	Subnet mask 3	0 to 255	1	255	17	
812	Subnet mask 4	0 to 255	1	0	17	
830	Ethernet communication network number	1 to 239	1	1	17	
831	Ethernet communication station number	1 to 120	1	1	17	
832	Link speed and duplex mode selection	0 to 4	1	0	17	
833	Ethernet function selection 1	0, 10, 20, 30, 31, 36, 38, 9999	1	31	17	
834	Ethernet function selection 2		1	20	17	
835	Ethernet function selection 3		1	9999	17	
837	Ethernet IP filter address 1	0 to 255	1	0	17	
838	Ethernet IP filter address 2	0 to 255	1	0	17	
839	Ethernet IP filter address 3	0 to 255	1	0	17	
840	Ethernet IP filter address 4	0 to 255	1	0	17	
841	Ethernet IP filter address 2 range specification	0 to 255, 9999	1	9999	17	
842	Ethernet IP filter address 3 range specification	0 to 255, 9999	1	9999	17	
843	Ethernet IP filter address 4 range specification	0 to 255, 9999	1	9999	17	
844	Ethernet command source selection IP address 1	0 to 255	1	0	17	
845	Ethernet command source selection IP address 2	0 to 255	1	0	17	
846	Ethernet command source selection IP address 3	0 to 255	1	0	17	
847	Ethernet command source selection IP address 4	0 to 255	1	0	17	
848	Ethernet command source selection IP address 3 range specification	0 to 255, 9999	1	9999	17	
849	Ethernet command source selection IP address 4 range specification	0 to 255, 9999	1	9999	17	
850	Ethernet TCP disconnection time coefficient	1 to 7200	1	3600	17	
851	Ethernet signal loss detection function selection	0, 2, 3	1	3	17	
852	Ethernet communication check time interval	0 to 999.8 s, 9999	0.1 s	1.5 s	17	

2.2 Parameters (functions) and instruction codes under different control methods

The following table shows the Ethernet communication parameters, the corresponding instruction codes, and the availability of the parameters by control method. For information on the instruction codes and availability of other parameters by control method, refer to the Instruction Manual (Applied) of the FR-E700 inverter.

Pr.	Name	Instruction code*1			Control method*2			Parameter		
		Read	Write	Extended	V/F	AD MFVC	GP MFVC	Copy*3	Clear*3	All clear*3
313	DO0 output selection	0D	8D	3	○	○	○	○	×	○
314	DO1 output selection	0E	8E	3	○	○	○	○	×	○
315	DO2 output selection	0F	8F	3	○	○	○	○	×	○
442	Default gateway address 1	2A	AA	4	○	○	○	○	○*4	○*4
443	Default gateway address 2	2B	AB	4	○	○	○	○	○*4	○*4
444	Default gateway address 3	2C	AC	4	○	○	○	○	○*4	○*4
445	Default gateway address 4	2D	AD	4	○	○	○	○	○*4	○*4
805	Ethernet IP address 1	05	85	8	○	○	○	×	○*4	○*4
806	Ethernet IP address 2	06	86	8	○	○	○	×	○*4	○*4
807	Ethernet IP address 3	07	87	8	○	○	○	×	○*4	○*4
808	Ethernet IP address 4	08	88	8	○	○	○	×	○*4	○*4
809	Subnet mask 1	09	89	8	○	○	○	○	○*4	○*4
810	Subnet mask 2	0A	8A	8	○	○	○	○	○*4	○*4
811	Subnet mask 3	0B	8B	8	○	○	○	○	○*4	○*4
812	Subnet mask 4	0C	8C	8	○	○	○	○	○*4	○*4
830	Ethernet communication network number	1E	9E	8	○	○	○	○	○*4	○*4
831	Ethernet communication station number	1F	9F	8	○	○	○	○	○*4	○*4
832	Link speed and duplex mode selection	20	A0	8	○	○	○	○	○*4	○*4
833	Ethernet function selection 1	21	A1	8	○	○	○	○	○*4	○*4
834	Ethernet function selection 2	22	A2	8	○	○	○	○	○*4	○*4
835	Ethernet function selection 3	23	A3	8	○	○	○	○	○*4	○*4
837	Ethernet IP filter address 1	25	A5	8	○	○	○	○	○*4	○*4
838	Ethernet IP filter address 2	26	A6	8	○	○	○	○	○*4	○*4
839	Ethernet IP filter address 3	27	A7	8	○	○	○	○	○*4	○*4
840	Ethernet IP filter address 4	28	A8	8	○	○	○	○	○*4	○*4
841	Ethernet IP filter address 2 range specification	29	A9	8	○	○	○	○	○*4	○*4
842	Ethernet IP filter address 3 range specification	2A	AA	8	○	○	○	○	○*4	○*4
843	Ethernet IP filter address 4 range specification	2B	AB	8	○	○	○	○	○*4	○*4
844	Ethernet command source selection IP address 1	2C	AC	8	○	○	○	○	○*4	○*4
845	Ethernet command source selection IP address 2	2D	AD	8	○	○	○	○	○*4	○*4
846	Ethernet command source selection IP address 3	2E	AE	8	○	○	○	○	○*4	○*4
847	Ethernet command source selection IP address 4	2F	AF	8	○	○	○	○	○*4	○*4
848	Ethernet command source selection IP address 3 range specification	30	B0	8	○	○	○	○	○*4	○*4
849	Ethernet command source selection IP address 4 range specification	31	B1	8	○	○	○	○	○*4	○*4
850	Ethernet TCP disconnection time coefficient	32	B2	8	○	○	○	○	○*4	○*4
851	Ethernet signal loss detection function selection	33	B3	8	○	○	○	○	○*4	○*4
852	Ethernet communication check time interval	34	B4	8	○	○	○	○	○*4	○*4

*1 Instruction codes are used to read or write parameters through the Ethernet network (CC-Link IE Field Network Basic). (Refer to page 36.)

*2 Function availability under each control method is as follows:
○: Available
× : Not available

*3 For "parameter copy", "parameter clear", and "all parameter clear", "○" indicates the function is available, and "×" indicates the function is not available.

*4 Communication parameters that are not cleared by Parameter clear (All parameter clear) through the Ethernet network (MODBUS/TCP or CC-Link IE Field Network Basic). (Refer to page 24 for the details of the MODBUS/TCP, and page 36 for the details of the CC-Link IE Field Network Basic.)

2.3 Selection of operation mode and operation location

Purpose	Parameter to set		Refer to page
To select the command source during communication operation	Selection of the command source during communication operation	Pr.550, Pr.551	8

2.3.1 Selection of the command source during communication operation

When the Ethernet connector is used, the command source in the network (NET) / PU operation mode can be selected.

Pr.	Name	Initial value	Setting range	Description
550	NET mode operation command source selection	0	0	The Ethernet connector is the command source when in the NET operation mode.
			2	The PU connector is the command source when in the NET operation mode.
551	PU mode operation command source selection	9999	2	The PU connector is the command source when in the PU operation mode.
			3	The USB connector is the command source when in the PU operation mode.
			4	The operation panel is the command source when in the PU operation mode.
			9999	USB automatic recognition Normally, operation panel is the command source. When the parameter unit is connected to the PU connector, PU is the command source. When USB is connected, USB connector is the command source.

◆Selection of command source in the network (NET) operation mode (Pr.550)

- Either the Ethernet connector or the PU connector can be specified for the command source in the NET operation mode.
- For example, set **Pr.550** = "0 (initial value)" to write parameters or input the start and frequency commands via the Ethernet connector in the NET operation mode.

◆Selection of the command source of the PU operation mode (Pr.551)

- Any of the operation panel, PU connector, or USB connector can be specified as the command source in the PU operation mode.
- In the PU operation mode, set **Pr.551** to "2" when executing parameter write, start command or frequency command during the RS-485 communication with PU communication.

NOTE

- When performing the RS-485 communication with the PU connector when **Pr.551** = "9999", PU mode command source does not automatically change to the PU connector. Change to the Network operation mode to change the command source.
- When "2" (NET mode PU connector) is set in **Pr.550** and "2" (PU mode PU connector) is set in **Pr.551**, PU operation mode has priority.
- Changed setting value is valid when powering ON or resetting the inverter.
- The MODBUS RTU protocol cannot be used in the PU operation mode. Select Network operation mode (NET mode command source).

Pr.550 setting	Pr.551 setting	Command source					Remarks
		Operation panel	USB connector	PU connector		Ethernet connector	
				Parameter unit	RS-485 communication		
0 (initial value)	2	×	×	PU operation mode	PU operation mode*1	NET operation mode	
	3	×	PU operation mode	×	×	NET operation mode	
	4	PU operation mode	×	×	×	NET operation mode	
	9999 (initial value)	PU operation mode*2	PU operation mode*2	PU operation mode*2	×	NET operation mode	
2	2	×	×	PU operation mode	PU operation mode*1	×	Switching to NET operation mode disabled
	3	×	PU operation mode	×	NET operation mode	×	
	4	PU operation mode	×	×	NET operation mode	×	
	9999 (initial value)	PU operation mode*2	PU operation mode*2	PU operation mode*2	NET operation mode	×	

*1 The MODBUS RTU protocol cannot be used in the PU operation mode. To use the MODBUS RTU protocol, set **Pr.550** = "2".

*2 When **Pr.551** = "9999", the priorities of the PU command source is USB connector > parameter unit (FR-PU04/FR-PU07) > operation panel.

◆Controllability through communication

- Controllability through communication in each operation mode is shown below.
- Monitoring and parameter read can be performed from any operation regardless of operation mode.

Command source	Condition (Pr.551 setting)	Item	Controllability in each operation mode					
			PU operation	External operation	EXT/PU combined operation mode 1 (Pr.79 = 3)	EXT/PU combined operation mode 2 (Pr.79 = 4)	NET Operation (when the PU connector is used)*6	NET operation (when the Ethernet connector is used)*7
Control by RS-485 communication from PU connector	2 (PU connector)	Run command (start)	○	×	×	○	×	
		Run command (stop)	○	Δ*3	Δ*3	○	Δ*3	
		Running frequency setting	○	×	○	×	×	
		Parameter write	○*4	×*5	○*4	○*4	×*5	
		Inverter reset	○	○	○	○	○	
	Other than the above	Run command (start)	×	×	×	×	○*1	×
		Run command (stop)	×	×	×	×	○*1	×
		Running frequency setting	×	×	×	×	○*1	×
		Parameter write	×*5	×*5	×*5	×*5	○*4	×*5
		Inverter reset	×	×	×	×	○*2	×
Control via USB connector	3 (USB connector) 9999 (automatic recognition)	Run command (start, stop)	○	×	×	○	×	
		Running frequency setting	○	×	○	×	×	
		Parameter write	○*4	×*5	×*5	×*5	×*5	
		Inverter reset	○	○	○	○	○	
	Other than the above	Run command (start, stop)	×	×	×	×	×	
		Running frequency setting	×	×	×	×	×	
		Parameter write	×*5	×*5	×*5	×*5	×*5	
		Inverter reset	○	○	○	○	○	
Control by communication via Ethernet connector	—	Run command (start, stop)	×	×	×	×	×	○*1
		Running frequency setting	×	×	×	×	×	○*1
		Parameter write	×*5	×*5	×*5	×*5	×*5	○*4
		Inverter reset	×	×	×	×	×	○*2
Control circuit external terminals	—	Inverter reset	○	○	○	○	○	
		Run command (start, stop)	×	○	○	×	× *1	
		Frequency setting	×	○	×	○	× *1	

○: Enabled, ×: Disabled, Δ: Partially valid

*1 As set in **Pr.338 Communication operation command source** and **Pr.339 Communication speed command source**. (Refer to the Instruction Manual (Applied) of the FR-E700 inverter.)

*2 At occurrence of RS-485 communication error, the inverter cannot be reset from the computer.

*3 Enabled only when stopped by the PU. At a PU stop, PS is displayed on the operation panel. As set in **Pr.75 Reset selection/disconnected PU detection/PU stop selection**. (Refer to the Instruction Manual (Applied) of the FR-E700 inverter.)

*4 Some parameters may be write-disabled according to the **Pr.77 Parameter write selection** setting and operating status. (Refer to the Instruction Manual (Applied) of the FR-E700 inverter.)

*5 Some parameters are write-enabled independently of the operation mode and command source presence/absence. When **Pr.77** = 2, write is enabled. (Refer to the Instruction Manual (Applied) of the FR-E700 inverter.) Parameter clear is disabled.

*6 When **Pr.550 NET mode operation command source selection** = "2" (PU connector valid)

*7 When **Pr.550 NET mode operation command source selection** = "0" (Ethernet connector valid)

◆Operation at fault

Fault record	Condition (Pr.551 setting)	Operation in each operation mode at error occurrences					
		PU operation	External operation	EXT/PU combined operation mode 1 (Pr.79 = 3)	EXT/PU combined operation mode 2 (Pr.79 = 4)	NET operation (when the PU connector is used)*5	NET operation (when the Ethernet connector is used)*6
Inverter fault	—	Stop					
PU connector disconnection of the PU	2 (PU connector) 9999 (automatic recognition)	Stop/continued *1, *4					
	Other than the above	Stop/continued*1					
RS-485 communication error of the PU connector	2 (PU connector)	Stop/ continued*2	Continued		Stop/continued*2	—	Continued
	Other than the above	Continued				Stop/continued *2	Continued
Communication error of USB connector	3 (USB connector) 9999 (automatic recognition)	Stop/ continued*2	Continued		Stop/continued*2	Continued	
	Other than the above	Continued					
Communication error at Ethernet connector	—	Continued					Stop/continued*3

*1 Selectable with **Pr.75 Reset selection/disconnected PU detection/PU stop selection**.

*2 Selectable with **Pr.122 PU communication check time interval**, **Pr.336 RS-485 communication check time interval**, **Pr.548 USB communication check time interval**.

*3 Selectable with **Pr.502 Stop mode selection at communication error** or **Pr.851 Ethernet signal loss detection function selection**.

*4 In the PU JOG operation mode, operation is always stopped when the PU is disconnected. Whether fault (E.PUE) occurrence is allowed or not is as set in **Pr.75 Reset selection/disconnected PU detection/PU stop selection**.

*5 When **Pr.550 NET mode operation command source selection** = "2" (PU connector valid)

*6 When **Pr.550 NET mode operation command source selection** = "0" (Ethernet connector valid)

2.4 Function assignment of external terminal and control

Purpose	Parameter to set		Refer to page
To assign functions to the output terminals	Output terminal function assignment	Pr.313 to Pr.315	12

2.4.1 Output terminal function selection

Use the following parameters to change the functions of the output virtual terminals of CC-Link IE Field Network Basic.

Pr.	Name	Initial value	Initial set signal	Setting range
313	DO0 output selection	9999	No function	0, 1, 3, 4, 7, 8, 11 to 16, 20, 25, 26, 46, 47, 64, 90, 91, 93, 95, 96, 98, 99, 100, 101, 103, 104, 107, 108, 111 to 116, 120, 125, 126, 146, 147, 164, 190, 191, 193, 195, 196, 198, 199, 9999*1
314	DO1 output selection	9999	No function	
315	DO2 output selection	9999	No function	

*1 The settings of **Pr.313 to Pr.315** are the same as those of **Pr.190 to Pr.192 (Output terminal function selection)**. For the details of **Pr.190 to Pr.192**, refer to the Instruction Manual (Applied) of the FR-E700 inverter.

2.5 Operation via communication and its settings

Purpose	Parameter to set		Refer to page
To start operation via communication	Initial setting of operation via communication	Pr.342, Pr.349, Pr.501, Pr.502	13
To communicate via Ethernet connector	Initial setting of Ethernet communication	Pr.442 to Pr.445, Pr.805 to Pr.812, Pr.830 to Pr.835, Pr.837 to Pr.852	17
	CC-Link IE Field Network Basic	Pr.541, Pr.544	36

2.5.1 Initial setting of operation via communication

Set the action at fault occurrence or at writing of parameters when the inverter is performing operation via communication.

Pr.	Name	Initial value	Setting range	Description
342	Communication EEPROM write selection	0	0	Parameter values are written to the EEPROM and RAM by communication.
			1	Parameter values are written to the RAM only by communication.
349	Communication reset selection	0	0	Enables the error reset function in any operation mode.
			1	Enables the error reset function only in the Network operation mode.
501	Communication error occurrence count display	0	0	Displays the communication error occurrence count. Writing "0" in this parameter clears the cumulative count.
502	Stop mode selection at communication error	0	0 to 3	Selects the inverter operation after occurrence of a fault in the Ethernet communication line or an Ethernet board fault.

◆Communication EEPROM write selection (Pr.342)

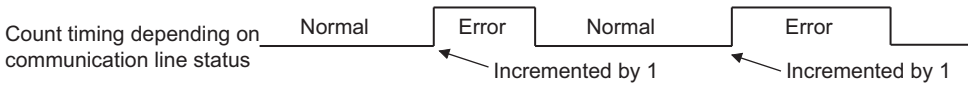
- When parameter write is performed via the inverter PU connector, USB communication, or the Ethernet connector, the parameters storage device setting can be switched to RAM only from both EEPROM and RAM. Use this function if parameter settings are changed frequently.
- When changing the parameter values frequently, set "1" in **Pr.342 Communication EEPROM write selection** to write them to the RAM only. The life of the EEPROM will be shorter if parameter write is performed frequently with the setting unchanged from "0 (initial value)" (EEPROM write).

REMARKS

- Turning OFF the inverter's power supply clears the modified parameter settings when **Pr.342** = "1" (write to RAM only). Therefore, the parameter values at next power-ON are the values last stored in EEPROM.
- The parameter setting written in RAM cannot be checked on the operation panel. (The values displayed on the operation panel are the ones stored in EEPROM.)

◆Displaying and clearing the communication error count (Pr.501)

- The cumulative count of communication error occurrences can be displayed.
  Write "0" to clear this cumulative count.
- At the point of communication line error occurrence, **Pr.501 Communication error occurrence count display** is incremented by 1.
- The cumulative count of communication error occurrences is counted from 0 to 65535. When the count exceeds 65535, the displayed value is cleared and the counting starts over from 0 again.



NOTE

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

◆Inverter operation at a communication error occurrence (Pr.502)

- The inverter operation after occurrence of a fault in the Ethernet communication line or an Ethernet board fault can be selected.
- The operation at a communication error can be selected with **Pr.502** when **Pr.851 Ethernet signal loss detection function selection** = "3 (initial value)" or **Pr.852 Ethernet communication check time interval** ≠ "9999" during Ethernet communication.
- When an Ethernet communication error is detected while **Pr.851 Ethernet signal loss detection function selection** = "2 or 3 (initial value)", the alarm (LF) signal is output via an output terminal of the inverter. For the LF signal, set "98 (positive logic) or 198 (negative logic)" in any of **Pr.190 to Pr.192 (Output terminal function selection)** to assign the function to the output terminal.
- About setting
  - Operation at an error occurrence

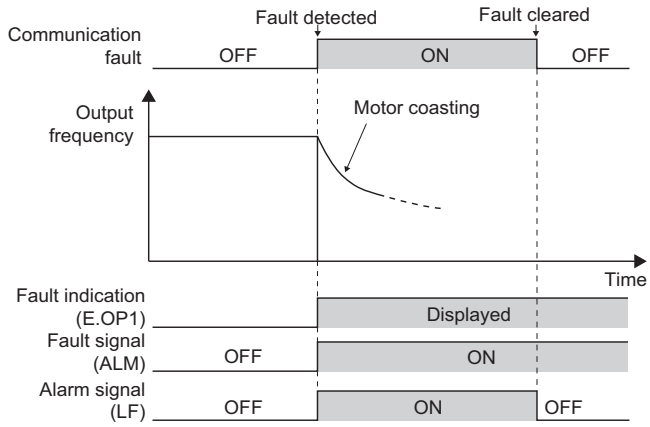
Error definition	Pr.502 setting	Operation	Indication	Fault output
Ethernet communication line	0 (initial value)	Output shutoff	"E.OP1"	Provided
	1	Decelerated to stop	"E.OP1" after stop	Provided after stop
	2			Not provided
	3	Continued	Normal indication	
Ethernet board	0 (initial value), 3	Output shutoff	"E. 1"	Provided
	1, 2	Decelerated to stop	"E. 1" after stop	Provided after stop

  - Operation at error removal

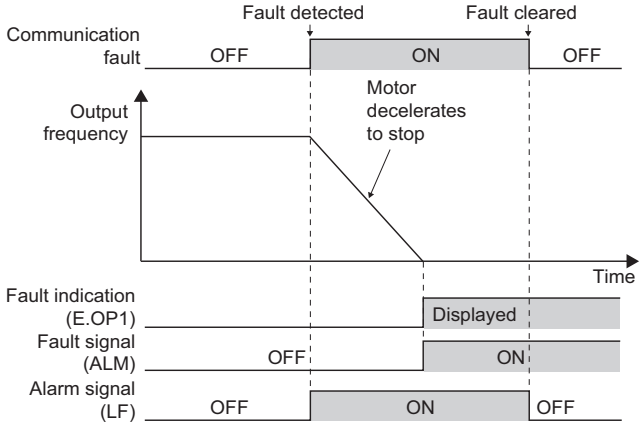
Error definition	Pr.502 setting	Operation	Indication	Fault output
Ethernet communication line	0 (initial value)	Output stop status continued	"E.OP1" continued	Kept provided
	1			
	2	Restart	Normal indication	Not provided
	3	Continued		
Ethernet board	0 (initial value), 3	Output stop status continued	"E. 1" continued	Kept provided
	1, 2			

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

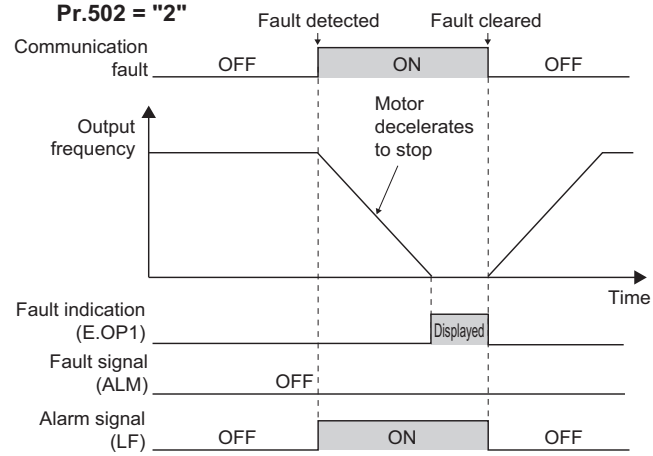
Pr.502 = "0 (initial value)"



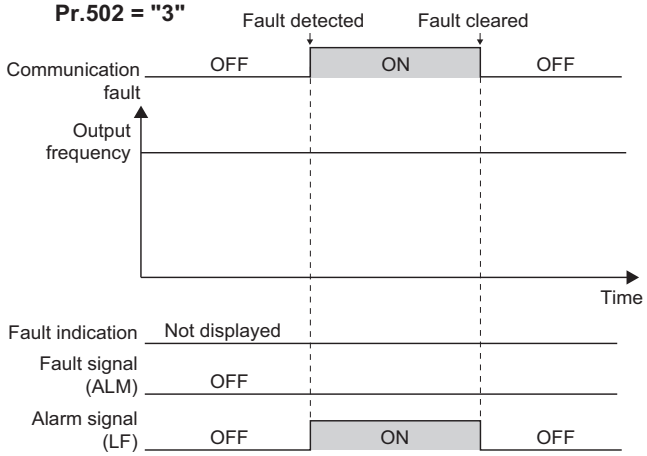
Pr.502 = "1"



Pr.502 = "2"



Pr.502 = "3"

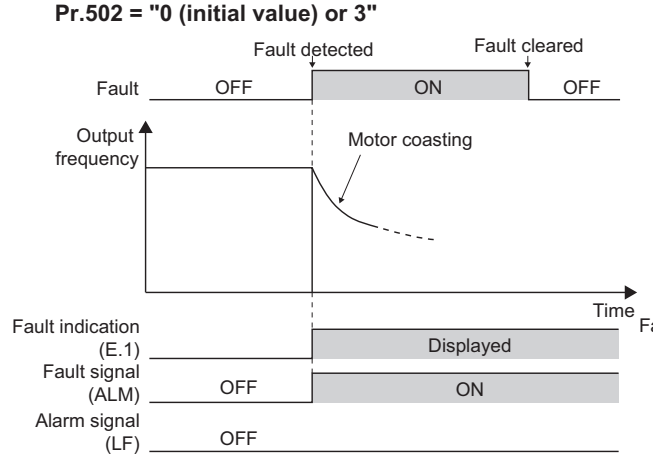


NOTE

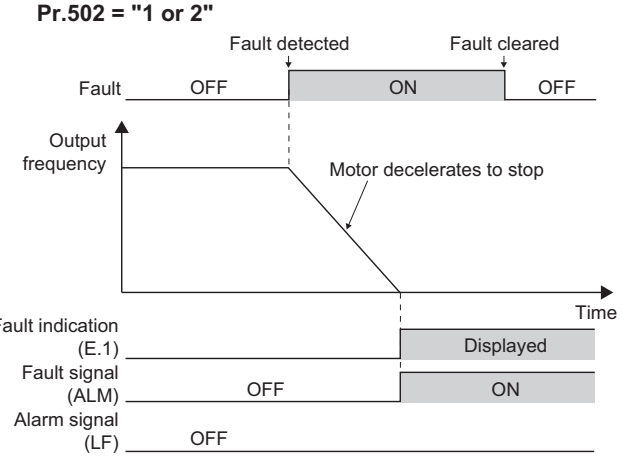
- When the **Pr.851** setting is changed to a value other than "3 (initial value)" after the operation defined by the **Pr.502** setting starts, the operation will be changed according to the **Pr.851** setting.
- The LF signal is output when Ethernet communication is interrupted by physical factors.

- The following charts show operations when an Ethernet board fault occurs.

Pr.502 = "0 (initial value) or 3"



Pr.502 = "1 or 2"



REMARKS

- Ethernet communication fault "E.OP1 (fault data: HA1)" appears at error occurrences on the Ethernet communication line. Ethernet board fault "E.1 (fault data: HF1)" appears at error occurrences in the communication circuit inside the Ethernet board.
- Fault output indicates the fault output signal (ALM signal) and fault bit output.
- When the fault output setting is active, fault records are stored in the faults history. (A fault record is written to the faults history at fault output.)
  When the fault output setting is not active, fault record is overwritten to the faults history temporarily but not stored.
  After the error is removed, the fault indication is reset, changing the display back to normal, and the last fault is displayed in the faults history.
- The LF signal turns OFF when the fault is removed.
- When the **Pr.502** setting is "1" or "2", the deceleration time is the normal deceleration time setting (e.g. **Pr.8**, **Pr.44**, **Pr.45**).
- The acceleration time at a restart is the normal acceleration time setting (e.g. **Pr.7**, **Pr.44**).
- When the **Pr.502** setting is "2", the operation/speed command at a restart is the one given before the error occurrence.
- When a communication line error occurs at the **Pr.502** setting of "2", removing the error during deceleration causes acceleration to restart at that point. (Acceleration does not restart at an Ethernet communication line error of the inverter.)

⚠ CAUTION

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

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

- In the External operation mode or the PU operation mode, use this parameter to disable an error reset command sent through the Ethernet network.

Pr.349 setting	Description
0 (initial value)	Error reset is enabled independently of operation mode
1	Error reset is enabled only 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.)
- The operation mode at power ON and at restoration from instantaneous power failure can be selected. Set a value other than "0" in **Pr.340 Communication startup mode selection** to select the Network operation mode.
- After the inverter starts up in the Network operation mode, parameter write can be commanded via the network.

REMARKS

- 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.

Parameters referred to

Pr.79 Operation mode selection ☞ **Instruction Manual (Applied) of the FR-E700 inverter**
Pr.340 Communication startup mode selection ☞ **Instruction Manual (Applied) of the FR-E700 inverter**

2.5.2 Initial settings and specifications of Ethernet communication

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

Pr.	Name	Initial value	Setting range	Description
442＊1	**Default gateway address 1**	0	0 to 255	Enter the IP address of the default gateway, which is a device connecting the different networks, to establish a communication between the inverter and the devices outside the inverter network.
443＊1	**Default gateway address 2**	0	0 to 255	
444＊1	**Default gateway address 3**	0	0 to 255	
445＊1	**Default gateway address 4**	0	0 to 255	
805＊1	**Ethernet IP address 1**	192	0 to 255	Enter the IP address of the inverter to be connected to Ethernet.
806＊1	**Ethernet IP address 2**	168	0 to 255	
807＊1	**Ethernet IP address 3**	50	0 to 255	
808＊1	**Ethernet IP address 4**	1	0 to 255	
809＊1	**Subnet mask 1**	255	0 to 255	Enter the subnet mask of the network to which the inverter belongs.
810＊1	**Subnet mask 2**	255	0 to 255	
811＊1	**Subnet mask 3**	255	0 to 255	
812＊1	**Subnet mask 4**	0	0 to 255	
830＊1	**Ethernet communication network number**	1	1 to 239	Enter the network number.
831＊1	**Ethernet communication station number**	1	1 to 120	Enter the station number.
832＊1	**Link speed and duplex mode selection**	0	0 to 4	Set the communication speed and the communication mode (full-duplex/half-duplex).
833＊1	**Ethernet function selection 1**	31	0, 10, 20, 30, 31, 36, 38, 9999	Set the application, protocol, etc.
834＊1	**Ethernet function selection 2**	20		
835＊1	**Ethernet function selection 3**	9999		
837＊1	**Ethernet IP filter address 1**	0	0 to 255	Set the range of connectable IP addresses for the network devices. (When **Pr.837 to Pr.840** = "0 (initial value)", the function is invalid.)
838＊1	**Ethernet IP filter address 2**	0	0 to 255	
839＊1	**Ethernet IP filter address 3**	0	0 to 255	
840＊1	**Ethernet IP filter address 4**	0	0 to 255	
841＊1	**Ethernet IP filter address 2 range specification**	9999	0 to 255, 9999	
842＊1	**Ethernet IP filter address 3 range specification**	9999	0 to 255, 9999	
843＊1	**Ethernet IP filter address 4 range specification**	9999	0 to 255, 9999	
844＊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 (MODBUS/TCP or CC-Link IE Field Network Basic), set the range of IP addresses of the devices. When **Pr.844 to Pr.847** = "0 (initial value)", no IP address is specified for sending commands through the Ethernet network. In this case, operation through the Ethernet network (MODBUS/TCP or CC-Link IE Field Network Basic) is not available. When four or more clients attempt a connection to the inverter during MODBUS/TCP communication, the connection attempted from outside of the IP address range set for Ethernet command source selection may be forcibly closed.
845＊1	**Ethernet command source selection IP address 2**	0	0 to 255	
846＊1	**Ethernet command source selection IP address 3**	0	0 to 255	
847＊1	**Ethernet command source selection IP address 4**	0	0 to 255	
848＊1	**Ethernet command source selection IP address 3 range specification**	9999	0 to 255, 9999	
849＊1	**Ethernet command source selection IP address 4 range specification**	9999	0 to 255, 9999	

Pr.	Name	Initial value	Setting range	Description	
850	**Ethernet TCP disconnection time coefficient**	3600	1 to 7200	When the inverter does not receive a packet within the time calculated by multiplying the **Pr.850** setting by 8 in seconds from the devices with the TCP connection established, the connection will be forcibly closed.	
851	**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.
			2	The alarm (LF) signal is output for a signal loss.	
			3	A protective function (E.OP1) is activated for a signal loss.	
852	**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.844 to Pr.849**). If a no-communication state persists for the permissible time or longer, the inverter output is shut off.	
			9999	No communication check (signal loss detection)	

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

NOTE

- The monitored items and parameter settings can be read during communication with the **Pr.852 Ethernet communication check time interval** = "0" setting, but an inverter fault occurs instantly when the operation mode is switched to the NET operation mode. When the NET operation mode is selected as the start-up operation mode, communication is performed once, then the Ethernet communication fault (E.OP1) is activated.
  To perform operation or parameter writing via communication, set **Pr.852** to "9999" or a value larger than the communication cycle or retry time setting. (Refer to **page 22**.)

◆Ethernet function selection (Pr.833 to Pr.835)

Refer to the Instruction Manual of the device connected via Ethernet, and set **Pr.833 to Pr.835 Ethernet function selection 1 to 3** according to the application and protocol.
A communication socket is provided only for the selected application.

Pr.833 to Pr.835 setting	Port number	Application∗1	Protocol∗1	Number of connectable clients	Refer to page
0	502	MODBUS/TCP	TCP/IP	3	**24**
10	61450	CC-Link IE Field Network Basic	UDP/IP	No limit	**36**
20 (**Pr.834** initial value)∗2	45237	iQSS (supported by FR Configurator2)	UDP/IP	No limit	—
30	5000	MELSOFT / FA product connection	UDP/IP	No limit	**23**
31 (**Pr.833** initial value)∗2	5001		UDP/IP	No limit	
36	5006		UDP/IP	No limit	
38	5008		UDP/IP	No limit	
9999 (**Pr.835** initial value)	Unselected				—

∗1 If both application and protocol settings are identical in **Pr.833 to Pr.835**, the priority of the setting is defined as follows: **Pr.833** > **Pr.834** > **Pr.835**.
(Example) When **Pr.833** = "31", **Pr.834** = "36", **Pr.835** = "20", "20" and "31" are valid.

∗2 To establish the Ethernet communication between the inverter and FR Configurator2, set "20" and "31" in any two of **Pr.833 to Pr.835**.

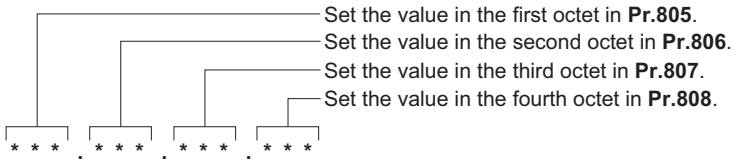
◆Communication speed and full-duplex/half-duplex selection (Pr.832)

Set the communication speed and the communication mode (full-duplex/half-duplex) in **Pr.832 Link speed and duplex mode selection**. If the operation is not performed properly in the initial setting (**Pr.832** = "0"), set **Pr.832** according to the specifications of the connected hub.

Pr.832 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.
1	100 Mbps	Full-duplex	—
2	100 Mbps	Half-duplex	—
3	10 Mbps	Full-duplex	—
4	10 Mbps	Half-duplex	—

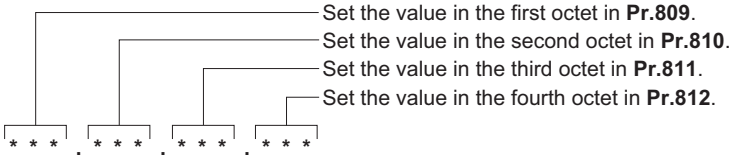
◆IP address (Pr.805 to Pr.808)

Enter the IP address of the inverter to be connected to Ethernet in **Pr.805 to Pr.808**.
(Enter the IP address assigned by the network administrator.)



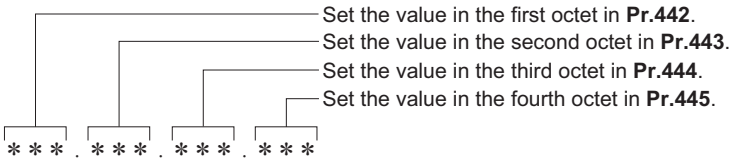
◆Subnet mask (Pr.809 to Pr.812)

Enter the subnet mask of the network to which the inverter belongs in **Pr.809 to Pr.812**.



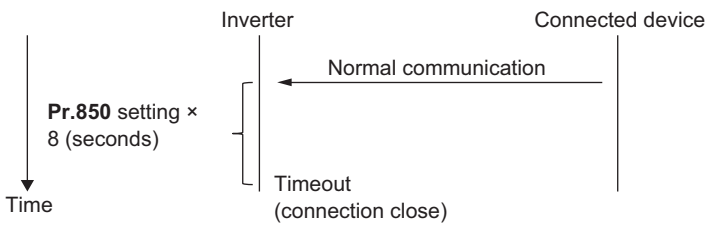
◆Default gateway address (Pr.442 to Pr.445)

Set the IP address of the default gateway, which is a device connecting the networks, in **Pr.442 to Pr.445** to establish a communication between the inverter and the devices outside the inverter network.



◆Ethernet TCP disconnection time coefficient (Pr.850)

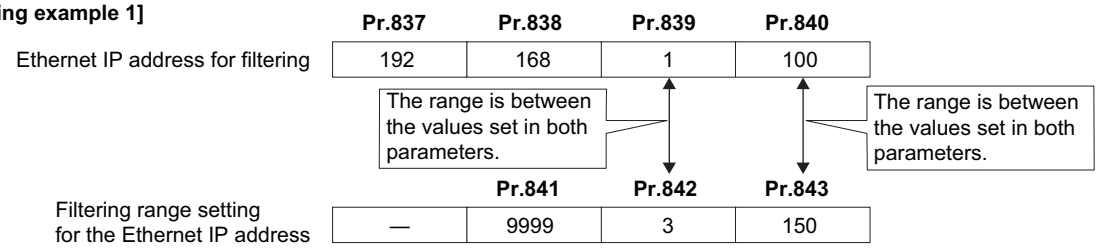
When the inverter does not receive a packet within the time calculated by multiplying the **Pr.850** setting by 8 in seconds from the devices with the TCP connection established, the connection will be forcibly closed.



◆Ethernet IP filtering function (Pr.837 to Pr.843)

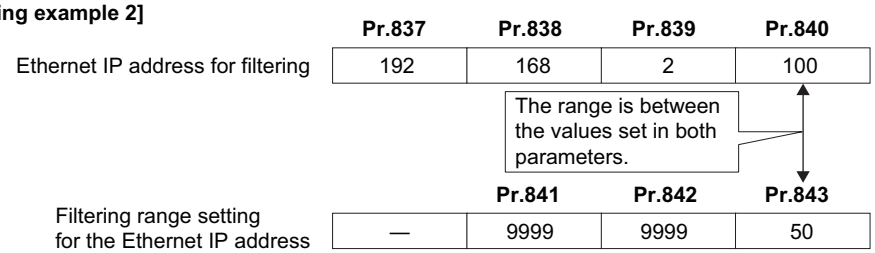
- Set the IP address range for connectable network devices (**Pr.837 to Pr.843**) to limit the connectable devices. The IP address setting range depends on the settings in **Pr.838** and **Pr.841**, **Pr.839** and **Pr.842**, and **Pr.840** and **Pr.843**. (Either of the settings can be larger than the other in **Pr.838** and **Pr.841**, **Pr.839** and **Pr.842**, and **Pr.840** and **Pr.843**.)

[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.837** to **Pr.840** = "0 (initial value)", the function is invalid.
- When **Pr.841** to **Pr.843** = "9999 (initial value)", the range is invalid.

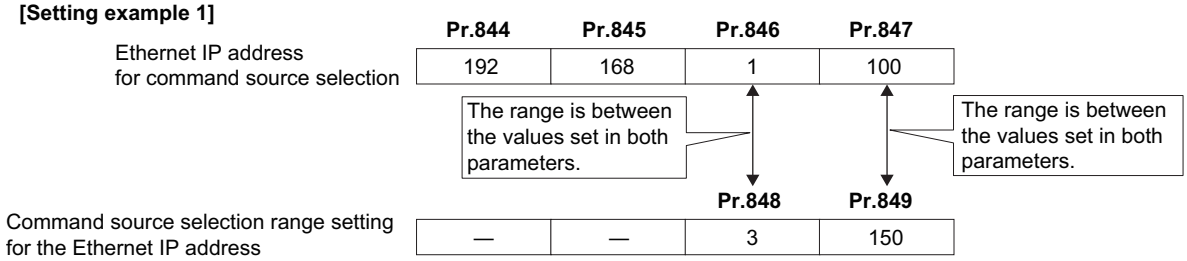
⚠ CAUTION

- **The Ethernet IP filtering function (Pr.837 to Pr.843) is provided as a means to prevent unauthorized access (with intentions such as to corrupt programs or data) by external systems, but the function does not prevent it completely. In order to protect the inverter and the system against unauthorized access by external systems, take additional security measures. Mitsubishi Electric Corporation will not take any responsibility for any problems in the inverter and the system incurred by unauthorized access.**
  The following are examples of measures to prevent unauthorized access.
  - Install a firewall.
  - Install a personal computer as a relay station, and control the relaying of transmission data using an application program.
  - Install an external device as a relay station to control access rights. (For the details of external devices used to control access rights, contact the distributors of the external devices.)

◆Ethernet IP address for command source selection (Pr.844 to Pr.849)

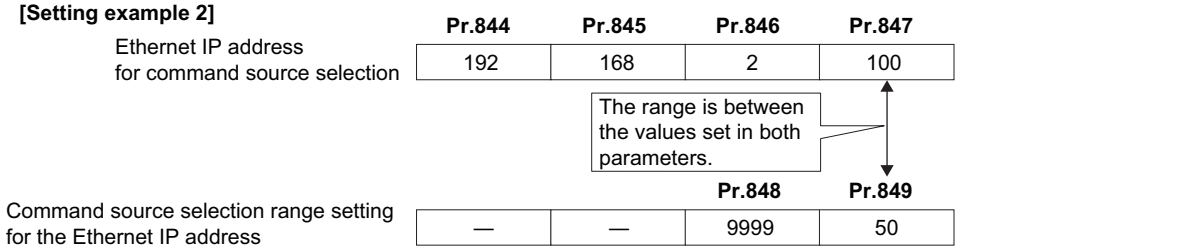
- To limit the network devices that send the operation or speed command through the Ethernet network (MODBUS/TCP or CC-Link IE Field Network Basic), set the range of IP addresses of the devices.
- When **Pr.844 to Pr.847** = "0 (initial value)", no IP address is specified for sending commands through the Ethernet network. In this case, operation through the Ethernet network (MODBUS/TCP or CC-Link IE Field Network Basic) is not available.
- When four or more clients attempt a connection to the inverter during MODBUS/TCP communication, the connection attempted from outside of the IP address range set for Ethernet command source selection may be forced to be closed.
- The setting range for command source selection depends on the settings in **Pr.846** and **Pr.848**, and **Pr.847** and **Pr.849**. (Either of the settings can be larger than the other in **Pr.846** and **Pr.848**, and **Pr.847** and **Pr.849**.)

[Setting example 1]



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

[Setting example 2]



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

- When "9999 (initial value)" is set in **Pr.848** and **Pr.849**, the range is invalid.

◆Ethernet signal loss detection function selection (Pr.851)

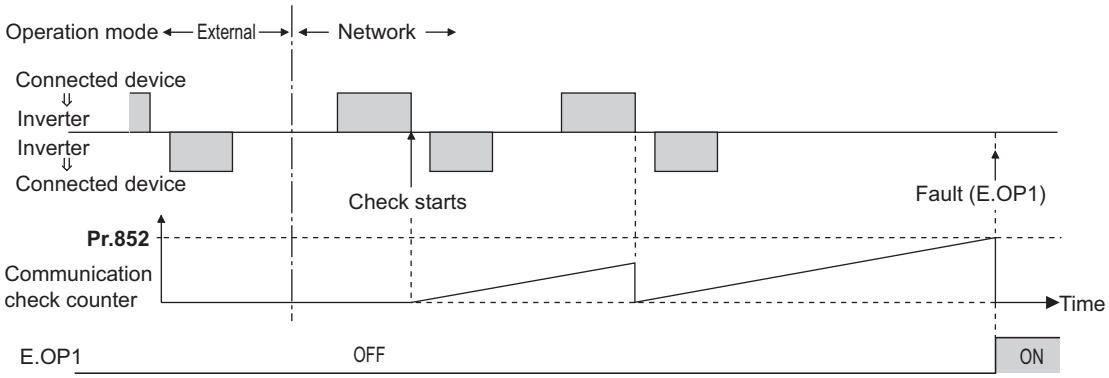
- Use **Pr.851** to set the operation when the Ethernet communication is interrupted by physical factors including disconnection of the Ethernet cable or damages on the Ethernet cable.
- When an Ethernet communication error is detected while **Pr.851** = "2 or 3 (initial value)", the alarm (LF) signal is output via an output terminal of the inverter. For the LF signal, set "98 (positive logic) or 198 (negative logic)" in any of **Pr.190 to Pr.192 (Output terminal function selection)** to assign the function to the output terminal.

Pr.851 setting	Description	Operation panel display/indicator	LF signal output
0	Detection disabled	—	No
2	Alarm output	—	Yes
3 (initial value)	Protective function (E.OP1)	E.OP1	Yes

◆Ethernet communication check time interval (Pr.852)

- Set the communication check (signal loss detection) interval in **Pr.852** (initial value: 1.5 seconds) for the inverter and all other devices with IP addresses in the range specified for Ethernet command source selection (**Pr.844 to Pr.849**). If a no-communication state persists for the permissible time or longer, the Ethernet communication fault (E.OP1) is activated and the inverter output is shut off.
- When "9999" is set in **Pr.852**, the communication check (signal loss detection) will not be performed.
- The monitored items and parameter settings can be read via Ethernet when "0" is set in **Pr.852**, but the Ethernet communication fault (E.OP1) is activated instantly when the operation mode is switched to the Network operation.
- A signal loss detection is made when any of 0.1 s to 999.8 s is set in **Pr.852**. 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.852** = 0.1 to 999.8 s



◆Ethernet communication network number (Pr.830), Ethernet communication station number (Pr.831)

- When the MELSOFT / FA product connection or iQSS is selected for Ethernet communication, enter the Ethernet communication network number in **Pr.830** and the Ethernet communication station number in **Pr.831**.

2.5.3 MELSOFT / FA product connection

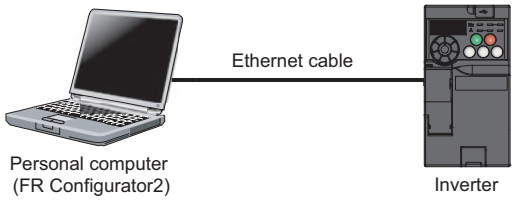
FR Configurator2 can be connected via Ethernet.

◆Initial setting

- Set any value from "30, 31, 36, 38" in any of **Pr.833 to Pr.835 Ethernet function selection 1 to 3** to select the MELSOFT / FA product connection for the application. (For how to set the application value, refer to the Instruction Manual of the device connected via Ethernet.) (Refer to page 18.)
- Enter the Ethernet communication network number in **Pr.830** and the Ethernet communication station number in **Pr.831**. (Refer to page 22.)

◆System configuration

- Direct connection with FR Configrator2



2.5.4 MODBUS/TCP

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

◆Communication specifications

- The communication specifications are given below.

Item		Description
Communication protocol		MODBUS/TCP protocol
Conforming standard		Open MODBUS/TCP specification
Waiting time setting		Not used
Maximum number of connections		3
Slave function (server)	Number of simultaneously acceptable request messages	1

◆Initial setting

- To select MODBUS/TCP for the application, set "0" in any of **Pr.833 to Pr.835 Ethernet function selection 1 to 3**. (Refer to **page 18**.)
- To limit the network devices that send the operation or speed command through the Ethernet network (MODBUS/TCP), set the range of IP addresses (**Pr.844 to Pr.849**). (Refer to **page 21**.)
- Set the interval of the communication check (signal loss detection) time in **Pr.852 Ethernet communication check time interval** for all devices with IP addresses in the range specified for Ethernet command source selection (**Pr.844 to Pr.849**). (Refer to **page 22**.)

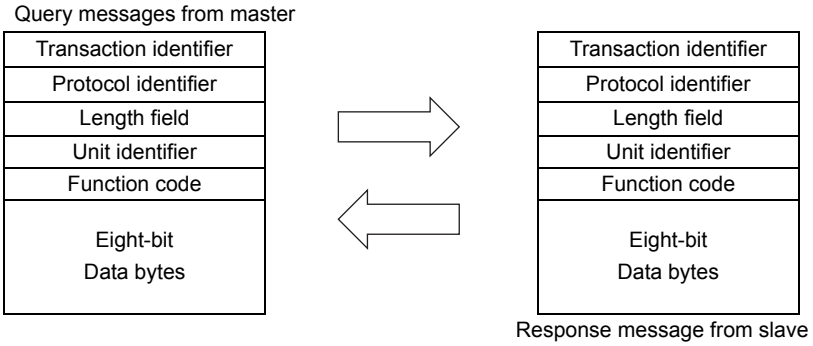
◆Message format

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

◆Message frame (protocol)

- Communication method

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



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

- Details of protocol

  The following table explains the six message fields.

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

Message field	Description
Transaction identifier	The master adds the data for the purpose of transaction control. The same data is returned in the response from the slave.
Protocol identifier	Fixed to 0. (When the slave receives data other than 0, it does not send the response message.) 0 is returned in the response from the slave.
Length field	The data length from the unit identifier to the data is stored in byte.
Unit identifier	Fixed to 255
Function code	1 to 255 can be set in single byte length (8 bits) for the function code. The master sets the function to be sent to the slave as the request, and the slave performs the requested operation. "Function code list" summarizes the supported function codes. An error response is generated when a function code other than "Function code list" is set. At a response from the slave, the function code set by the master is returned in the case of a normal response. At an error response, H80 and the function code are returned.
Data	The format changes according the function code. (Refer to page 27.) 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 Refer to page
Read holding register	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 33**.) Real time monitor (Refer to **page 34**.) Faults history (Refer to **page 35**.) Inverter parameters (Refer to **page 34**.)	**page 27**
Preset 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 33**.) Inverter parameters (Refer to **page 34**.)	**page 28**
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 29**
Preset 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 33**.) Inverter parameters (Refer to **page 34**.)	**page 30**
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 and H10 are supported. The number and start address of holding registers successfully accessed by the previous communication are returned. "0" is returned for both the number and start address for queries other than function code H03 and H10. When the connection is closed, the data in the log is cleared.	**page 31**

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

• Query message

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

• Query message setting

Message		Description
a	Transaction identifier	The master adds the data for the purpose of transaction control. The same data is returned in the response from the slave.
b	Protocol Identifier	Fixed to 0. (When the slave receives data other than 0, it does not send the response message.) 0 is returned in the response from the slave.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	Fixed to 255
e	Function	Set H03.
f	Starting address	Set the holding register address from which to start reading the data. Starting address = start register address (decimal) - 40001 For example, when start register address 0001 is set, the data of holding register address 40002 is read.
g	No. of points	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	Data	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	Starting address		No. of points	
*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	Byte count	Data					
*2	*2	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)

*2 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)

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

- The content of the system environmental variables and inverter parameters (refer to MODBUS register on page 33) 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	f. Register address		g. Preset data	
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	f. Register address		g. Preset data	
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H06 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)

- Query message setting

Message		Description
a	Transaction identifier	The master adds the data for the purpose of transaction control. The same data is returned in the response from the slave.
b	Protocol identifier	Fixed to 0. (When the slave receives data other than 0, it does not send the response message.) 0 is returned in the response from the slave.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	Fixed to 255
e	Function	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	Preset data	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	Register address		Preset data	
*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	f. Subfunction		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	f. Subfunction		g. Data	
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H08 (8 bits)	H00 (8 bits)	H00 (8 bits)	H (8 bits)	L (8 bits)

- Query message setting

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

◆Preset 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	f. Starting address		g. No. of Points		h. Byte count	i. Data		
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H10 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H (8 bits)	L (8 bits)	... (n × 2 × 8 bits)

- Normal response (Response message)

a. Transaction identifier		b. Protocol identifier		c. Length field		d. Unit identifier	e. Function	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)	H10 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)

- Query message setting

Message		Description
a	Transaction identifier	The master adds the data for the purpose of transaction control. The same data is returned in the response from the slave.
b	Protocol identifier	Fixed to 0. (When the slave receives data other than 0, it does not send the response message.) 0 is returned in the response from the slave.
c	Length field	The data length from the unit identifier to the data is stored in byte.
d	Unit identifier	Fixed to 255
e	Function	Set H10.
f	Starting address	Set the holding register address from which to start writing the data. Starting address = start register address (decimal) - 40001 For example, when start register address 0001 is set, the data of holding register address 40002 is read.
g	No. of Points	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	Data	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	Starting address		No. of points		Byte count	Data			
*1	*1	H00 (8 bits)	H00 (8 bits)	H00 (8 bits)	H0B (8 bits)	HFF (8 bits)	H10 (8 bits)	H03 (8 bits)	HEE (8 bits)	H00 (8 bits)	H02 (8 bits)	H04 (8 bits)	H00 (8 bits)	H05 (8 bits)	H00 (8 bits)	H0A (8 bits)

*1 A given value is set.

Normal response (Response message)

Transaction identifier		Protocol identifier		Length field		Unit identifier	Function	Starting address		No. of points	
*2	*2	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)

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

◆Read holding register access log (H46 or 70)

- Queries by function codes H03 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
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	f. Starting address		g. No. of points	
H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H46 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)

- Query message setting

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

- Content of normal response

Message		Description
f	Starting address	The start address of the holding register that was successfully accessed is returned. Starting address = start register address (decimal) - 40001 For example, when start 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
*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	Starting address		No. of points	
*2	*2	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)

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

Two successful reads of start address 41007 **(Pr.7)** are returned.

◆Error response

- An error response is returned if the query message received from the master contains an illegal function, address or data. No response is returned for parity, overrun, framing, and busy errors.
- Error response (Response message)

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

- Error code list

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

*1 An error response is not returned in the following cases:
・Function code H03 (reading data of holding registers)
When the number of registers is specified as one or more and there are one or more holding registers from which data can be read
・Function code H10 (writing data to multiple holding registers)
When the number of registers is specified as one or more and there are one or more holding registers to which data can be written
In other words, when function code H03 or H10 is used and multiple holding registers are accessed, an error response is not returned even if a nonexistent holding register or holding register that cannot be read or written from/to is accessed.

NOTE

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

◆MODBUS register

- The following shows the MODBUS registers for system environment variables (read/write), real time monitor items (read), parameters (read/write), faults 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.
40009	Inverter status / control input command*2	Read/write	Refer to the following.
40010	Operation mode / inverter setting*3	Read/write	Refer to the following.
40014	Running frequency (RAM value)	Read/write	The frequency indication can be changed to the machine speed indication using **Pr.37**. (Refer to the Instruction Manual (Applied) of the FR-E700 inverter.)
40015	Running frequency (EEPROM value)	Write	

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

[Inverter status / control input command]

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

*4 The signal within parentheses ( ) is the initial status. The input signal function can be changed using **Pr.180 to Pr.184 (Input terminal function selection)**.
For details of **Pr.180 to Pr.184**, refer to the Instruction Manual (Applied) of the FR-E700 inverter.
*5 The signal within parentheses ( ) is the initial status. The output signal function can be changed using **Pr.190 to Pr.192 (Output terminal function selection)**.
For details of **Pr.190 to Pr.192**, refer to the Instruction Manual (Applied) of the FR-E700 inverter.

[Operation mode / inverter setting]

Mode	Read value	Write value
EXT	H0000	H0010*6
PU	H0001	H0011*6
EXT JOG	H0002	—
PU JOG	H0003	—
NET	H0004	H0014
PU + EXT	H0005	—

*6 Writing is available depending on the **Pr.79 and Pr.340** settings. For details, refer to the Instruction Manual (Applied) of the FR-E700 inverter.
The restrictions depending on the operation mode changes according to the computer link specifications.

• Real time monitor

For the details of the monitor items, refer to the Instruction Manual (Applied) of the FR-E700 inverter.

Register	Monitor item	Increment
40201	Output frequency / machine speed *1*4	0.01Hz/1
40202	Output current *4	0.01A
40203	Output voltage *4	0.1V
40205	Frequency setting value / machine speed setting value *1	0.01Hz/1
40207	Motor torque	0.1%
40208	Converter output voltage	0.1V
40209	Regenerative brake duty	0.1%
40210	Electronic thermal relay function load factor	0.1%
40211	Output current peak value	0.01A
40212	Converter output voltage peak value	0.1V
40214	Output power	0.01kW
40215	Input terminal status *2	—
40216	Output terminal status *3	—

Register	Monitor item	Increment
40220	Cumulative energization time	1h
40223	Actual operation time	1h
40224	Motor load factor	0.1%
40225	Cumulative power	1kWh
40252	PID set point	0.1%
40253	PID measured value	0.1%
40254	PID deviation	0.1%
40258 to 40260	For manufacturer check. Do not set.	
40261	Motor thermal load factor	0.1%
40262	Inverter thermal load factor	0.1%
40263	Cumulative power 2	0.01kWh

*1 When **Pr.37** is not equal to "0", this will be machine speed display (1 increments).

*2 Input terminal monitor details ("1" denotes terminal ON, "0" denotes terminal OFF, and "—" denotes undetermined value.)

b15															b0
—	—	—	—	—	RES	—	0	—	RH	RM	RL	—	—	STR	STF

*3 Output terminal monitor details ("1" denotes terminal ON, "0" denotes terminal OFF, and "—" denotes undetermined value.)

b15															b0
—	—	—	—	—	—	—	—	—	—	ABC	FU	—	—	—	RUN

*4 The monitored values are retained even if an inverter fault occurs. Resetting will clear the retained values.

• Parameters

Pr.	Register	Parameter name	Read/write	Remarks
0 to 999	41000 to 41999	Refer to the Instruction Manual (Applied) of the FR-E700 inverter for parameter names.	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 to **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 to **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 to **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 to **C7 (905)**
	43905	Terminal 4 frequency setting gain (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4

• Faults history

Register	Definition	Read/write	Remarks
40501	Faults history 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 following table for the error codes.) Performing write using the register 40501 batch-clears the faults history. Set any value as data.
40502	Faults history 2	Read	
40503	Faults history 3	Read	
40504	Faults history 4	Read	
40505	Faults history 5	Read	
40506	Faults history 6	Read	
40507	Faults history 7	Read	
40508	Faults history 8	Read	

Error code list *1

Data	Definition
H00	No fault present
H10	E.OC1
H11	E.OC2
H12	E.OC3
H20	E.OV1
H21	E.OV2
H22	E.OV3
H30	E.THT
H31	E.THM

Data	Definition
H40	E.FIN
H52	E.ILF
H60	E.OLT
H70	E.BE
H80	E.GF
H81	E.LF
H90	E.OHT
HA0	E.OPT
HA1	E.OP1
HB0	E.PE

Data	Definition
HB1	E.PUE
HB2	E.RET
HB3	E.PE2
HC0	E.CPU
HC5	E.IOH
HC7	E.AIE
HC8	E.USB
HC9	E.SAF
HD8	E.MB4
HD9	E.MB5

Data	Definition
HDA	E.MB6
HDB	E.MB7
HF1	E.1
HF5	E.5
HF6	E.6
HF7	E.7
HFD	E.13

*1 For the details of the faults, refer to the Instruction Manual (Applied) of the FR-E700 inverter.

NOTE

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

2.5.5 CC-Link IE Field Network Basic

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.).

Pr.	Name	Initial value	Setting range	Description
541	**Frequency command sign selection**	0	0	Frequency command without sign
			1	Frequency command with sign
544∗1	**CC-Link extended setting**	0	0, 1, 12, 14, 18	The function of the remote registers can be extended when the CC-Link IE Field Network Basic is used.

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

◆Communication specifications

Item		Description
Transmission speed		100 Mbps
Communication method		UDP/IP
Connectable units		Master: 1 Slave: up to 64
Topology		Star
Number of occupied stations		Occupies one station
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 communication time from when the inverter receives a command from the master until the inverter returns the response to the master.

◆Initial setting

- To select the CC-Link IE Field Network Basic for the application, set "10" in any of **Pr.833 to Pr.835 Ethernet function selection 1 to 3**. (Refer to page 18.)
- To limit the network devices that send the command through the Ethernet network (CC-Link IE Field Network Basic), set the range of IP addresses (**Pr.844 to Pr.849**). (Refer to page 21.)
- Use **Pr.852 Ethernet communication check time interval** to set the interval of the check time (for signal loss detection) for all devices with IP addresses in the range specified for Ethernet command source selection (**Pr.844 to Pr.849**). (Refer to page 22.)

NOTE

- When **Pr.852 Ethernet communication check time interval** ≠ 9999 and the CC-Link IE Field Network Basic is used, the Ethernet communication fault (E.OP1) is activated in the following cases: the data addressed to the own station is not received for the predetermined timeout period or longer, or the status bit of the cyclic transmission addressed to the own station turns OFF (when the master inverter gives a command to stop the cyclic transmission). (For the details of the timeout period, status bit of the cyclic transmission, and command to stop the cyclic transmission, refer to the Instruction Manual of the master controller which supports the CC-Link IE Field Network Basic.)

◆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 setting)	Compatible with CC-Link Ver.1	38
1	Compatible with CC-Link Ver.1	39
12	Compatible with the double setting of CC-Link Ver.2	39
14	Compatible with the quadruple setting of CC-Link Ver.2	39
18	Compatible with the octuple setting of CC-Link Ver.2	40

*1 Refer to the PLC function programming manual.

◆Frequency command with sign (Pr.541)

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

• The **Pr.541 Frequency command sign selection** setting is applied to the frequency command from RWw1. (Refer to page 43.)

Pr.541 setting	Sign	Setting range	Actual frequency command
0	Not used	0 to 40000	0 to 400.00 Hz
1	With	-32768 to 32767 (two's complement)	-327.68 to 327.67 Hz

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

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

REMARKS

• When **Pr.541** = 1 (with sign)
  • When EEPROM write is specified with the RYE, write mode error (error code H01) will occur.
  • When concurrent execution of both RYD and RYE is enabled (when a value other than 0 is set in **Pr.544**) and 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 and 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 (32 points)

Device No.*5	Signal	Refer to page
RYn0	Forward rotation command*2	41
RYn1	Reverse rotation command*2	41
RYn2	High-speed operation command (terminal RH function)*1	41
RYn3	Middle-speed operation command (terminal RM function)*1	41
RYn4	Low-speed operation command (terminal RL function)*1	41
RYn5	Not used	—
RYn6	Second function selection (RT signal)*2	41
RYn7	Terminal 4 input selection (AU signal)*2	41
RYn8	Not used	—
RYn9	Output stop (terminal MRS function)*1	41
RYnA	Not used	—
RYnB	Reset (terminal RES function)*1	41
RYnC	Monitor command	41
RYnD	Frequency setting command (RAM)	41
RYnE	Frequency setting command (RAM, EEPROM)	41
RYnF	Instruction code execution request	41
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	41
RY(n+1)B to RY(n+1)F	Reserved	—

Device No.*5	Signal	Refer to page
RXn0	Forward running	42
RXn1	Reverse running	42
RXn2	Inverter running (terminal RUN function)*3	42
RXn3	Up to frequency (SU signal)*2	42
RXn4	Overload alarm (OL signal)*2	42
RXn5	Not used	—
RXn6	Frequency detection (terminal FU function)*3	42
RXn7	Fault (terminal ABC function)*3	42
RXn8	Not used	—
RXn9	**Pr.313** assignment function (DO0)*4	42
RXnA	**Pr.314** assignment function (DO1)*4	42
RXnB	**Pr.315** assignment function (DO2)*4	42
RXnC	Monitoring	42
RXnD	Frequency setting completion (RAM)	42
RXnE	Frequency setting completion (RAM, EEPROM)	42
RXnF	Instruction code execution completion	42
RX(n+1)0 to RX(n+1)7	Reserved	—
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	42
RX(n+1)B	Remote station ready	42
RX(n+1)C to RX(n+1)F	Reserved	—

*1 These signals are set in the initial status. Using **Pr.180 to Pr.184**, you can change input signal functions. For the details of **Pr.180 to Pr.184**, refer to the Instruction Manual (Applied) of the FR-E700 inverter.

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

*3 These signals are set in the initial status. Using **Pr.190 to Pr.192**, you can change output signal functions. Refer to the Instruction Manual (Applied) of the FR-E700 inverter for details of **Pr.190 to Pr.192**.

*4 Functions assigned to **Pr.313 to Pr.315** are activated. For the assignable functions, refer to the description of **Pr.190 to Pr.192** in the Instruction Manual (Applied) of the FR-E700 inverter.

*5 "n" indicates a value determined according to the station number setting.

• Remote register

Address*8	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	43
RWwn+1	Set frequency (0.01 Hz increments)*7		43
RWwn+2	H00 (arbitrary)*6	Instruction code	43
RWwn+3	Write data		43

Address*8	Description	Refer to page
RWrn	First monitor value	44
RWrn+1	Second monitor value	44
RWrn+2	Reply code	44
RWrn+3	Read data	44

*6 The above 8 bit is always H00 even if a value other than H00 is set.

*7 When **Pr.37** is not equal to "0", this will be machine speed display (1 increments).

*8 "n" indicates a value determined according to the station number setting.

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

- Remote I/O (32 points)

  Same as when **Pr.544** = 0 (Refer to page 38.)

- Remote register

Address*2	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	43
RWwn+1	Set frequency (0.01 Hz increments)*1		43
RWwn+2	Link parameter extended setting	Instruction code	43
RWwn+3	Write data		43

Address*2	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value		44
RWrn+1	Second monitor value		44
RWrn+2	Reply code 2	Reply code 1	44
RWrn+3	Read data		44

*1 When **Pr.37** is not equal to "0", this will be machine speed display (1 increments).

*2 "n" indicates a value determined according to the station number setting.

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

- Remote I/O (32 points)

  Same as when **Pr.544** = 0 (Refer to page 38.)

- Remote register

Address*2	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	43
RWwn+1	Set frequency (0.01 Hz increments)*1		43
RWwn+2	Link parameter extended setting	Instruction code	43
RWwn+3	Write data		43
RWwn+4	Monitor code 3		43
RWwn+5	Monitor code 4		43
RWwn+6	Monitor code 5		43
RWwn+7	Monitor code 6		43

Address*2	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value		44
RWrn+1	Second monitor value		44
RWrn+2	Reply code 2	Reply code 1	44
RWrn+3	Read data		44
RWrn+4	Third monitor value		44
RWrn+5	Fourth monitor value		44
RWrn+6	Fifth monitor value		44
RWrn+7	Sixth monitor value		44

*1 When **Pr.37** is not equal to "0", this will be machine speed display (1 increments).

*2 "n" indicates a value determined according to the station number setting.

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

- Remote I/O (32 points (64 points occupied))

  Same as when **Pr.544** = 0 (Refer to page 38.)

- Remote register

Address*3	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	43
RWwn+1	Set frequency (0.01 Hz increments)*2		43
RWwn+2	Link parameter extended setting	Instruction code	43
RWwn+3	Write data		43
RWwn+4	Monitor code 3		43
RWwn+5	Monitor code 4		43
RWwn+6	Monitor code 5		43
RWwn+7	Monitor code 6		43
RWwn+8	Faults history No.	H00	43
RWwn+9	PID set point (0.01% increments)*1		43
RWwn+A	PID measured value (0.01% increments)*1		43
RWwn+B	PID deviation (0.01% increments)*1		43
RWwn+C	H00 (Free)		—
RWwn+D			
RWwn+E			
RWwn+F			

Address*3	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value		44
RWrn+1	Second monitor value		44
RWrn+2	Reply code 2	Reply code 1	44
RWrn+3	Read data		44
RWrn+4	Third monitor value		44
RWrn+5	Fourth monitor value		44
RWrn+6	Fifth monitor value		44
RWrn+7	Sixth monitor value		44
RWrn+8	Faults history No.	Fault data	44
RWrn+9	Fault record (output frequency)		44
RWrn+A	Fault record (output current)		44
RWrn+B	Fault record (output voltage)		44
RWrn+C	Fault record (energization time)		44
RWrn+D	H00 (Free)		—
RWrn+E			
RWrn+F			

*1 Valid when **Pr.128**="50, 51, 60, or 61".

*2 When **Pr.37** is not equal to "0", this will be machine speed display (1 increments).

*3 "n" indicates a value determined according to the station number setting.

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

- Remote I/O (32 points (128 points occupied))
  Same as when **Pr.544** = 0 (Refer to page 38.)
- Remote register

Address*3	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWwn	Monitor code 2	Monitor code 1	43
RWwn+1	Set frequency (0.01 Hz increments)*2		43
RWwn+2	Link parameter extended setting	Instruction code	43
RWwn+3	Write data		43
RWwn+4	Monitor code 3		43
RWwn+5	Monitor code 4		43
RWwn+6	Monitor code 5		43
RWwn+7	Monitor code 6		43
RWwn+8	Faults history No.	H00	43
RWwn+9	PID set point (0.01% increments)*1		43
RWwn+A	PID measured value (0.01% increments)*1		43
RWwn+B	PID deviation (0.01% increments)*1		43
RWwn+C	H00 (Free)		—
RWwn+D			
RWwn+E			
RWwn+F			
RWwn+10	Link parameter extended setting	Instruction code	43
RWwn+11	Write data		43
RWwn+12	Link parameter extended setting	Instruction code	43
RWwn+13	Write data		43
RWwn+14	Link parameter extended setting	Instruction code	43
RWwn+15	Write data		43
RWwn+16	Link parameter extended setting	Instruction code	43
RWwn+17	Write data		43
RWwn+18	Link parameter extended setting	Instruction code	43
RWwn+19	Write data		43
RWwn+1A	H00 (Free)		—
RWwn+1B			
RWwn+1C			
RWwn+1D			
RWwn+1E			
RWwn+1F			

Address*3	Description		Refer to page
	Upper 8 bits	Lower 8 bits	
RWrn	First monitor value		44
RWrn+1	Second monitor value		44
RWrn+2	Reply code 2	Reply code 1	44
RWrn+3	Read data		44
RWrn+4	Third monitor value		44
RWrn+5	Fourth monitor value		44
RWrn+6	Fifth monitor value		44
RWrn+7	Sixth monitor value		44
RWrn+8	Faults history No.	Fault data	44
RWrn+9	Fault record (output frequency)		44
RWrn+A	Fault record (output current)		44
RWrn+B	Fault record (output voltage)		44
RWrn+C	Fault record (energization time)		44
RWrn+D	H00 (Free)		—
RWrn+E			
RWrn+F			
RWrn+10	Reply code		44
RWrn+11	Read data		44
RWrn+12	Reply code		44
RWrn+13	Read data		44
RWrn+14	Reply code		44
RWrn+15	Read data		44
RWrn+16	Reply code		44
RWrn+17	Read data		44
RWrn+18	Reply code		44
RWrn+19	Read data		44
RWrn+1A	H00 (Free)		—
RWrn+1B			
RWrn+1C			
RWrn+1D			
RWrn+1E			
RWrn+1F			

*1 Valid when **Pr.128**="50, 51, 60, or 61".
*2 When **Pr.37** is not equal to "0", this will be machine speed display (1 increments).
*3 "n" indicates a value determined according to the station number setting.

◆Details of input and output signals

The following device No. are those for station 1. For stations 2 and later, the device No. are different. (Refer to the master module manual for correspondence between the device No. and station number)

◆Output signals (master module to inverter)

The output signals from the master module are indicated. (Input signals to inverter)

Device No.	Signal	Description	
RY0	Forward rotation command*2	0: Stop command 1: Forward rotation start	When "1" is set, a start command is input to the inverter. When "1" is set in RY0 and RY1, a stop command is input.
RY1	Reverse rotation command*2	0: Stop command 1: Reverse rotation start	
RY2	High-speed operation command (terminal RH function)*1	Functions assigned to terminals RH, RM and RL are activated.	
RY3	Middle-speed operation command (terminal RM function)*1		
RY4	Low-speed operation command (terminal RL function)*1		
RY6	Second function selection (RT signal)*2	1 : Second function is selected	
RY7	Terminal 4 input selection (AU signal)*2	1 : Terminal 4 input is the main speed setting	
RY9	Output stop (terminal MRS function)*1	Function assigned to terminal MRS is activated.	
RYB	Reset (terminal RES function)*1	Function assigned to terminal RES is activated.	
RYC	Monitor command	When "1" is set in the monitor command (RYC), the monitored value is set in the remote register RWr0, 1, 4 to 7, and "1" is set in the monitoring (RXC). While "1" is set in the monitor command (RYC), the monitored data is always updated.	
RYD*4	Frequency setting command (RAM)	When "1" is set in the frequency setting command (RYD), the set frequency (RWw1) is written to RAM of the inverter.*3 After the writing completes, "1" is set in the frequency setting completion (RXD).	
RYE*4	Frequency setting command (RAM, EEPROM)	When "1" is set in the frequency setting command (RYE), the set frequency (RWw1) is written to RAM and EEPROM of the inverter. After the writing completes, "1" is set in the frequency setting completion (RXE).*6 To change the frequency consecutively, be sure to write data to the inverter RAM.	
RYF*4	Instruction code execution request	When "1" is set in the instruction code execution request (RYF), processes corresponding to the instruction codes set to RWw2, 10, 12, 14, 16 and 18 are executed. "1" is set in the instruction code execution request (RXF) after completion of instruction codes.*6 When an instruction code execution error occurs, a value other than "0" is set in the reply code (RWr2, 10, 12, 14, 16, 18).	
RY1A	Error reset request flag	When "1" is set in the error reset request flag (RY1A) at an inverter fault, the inverter is reset, then "0" is set in the error status flag (RX1A).*5	

*1 Signal names are initial values. Using **Pr.180 to Pr.184**, you can change input signal functions. Note that some of signals do not accept a command from the network according to the **Pr.338** and **Pr.339** settings. For example, the RES signal (the function assigned to terminal RES) in RYB cannot be controlled via network. (Refer to the Instruction Manual (Applied) of the FR-E700 inverter.)
Refer to the Instruction Manual (Applied) of the FR-E700 inverter for details of **Pr.180 to Pr.184**.

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

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

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

*5 Refer to **page 16** for operation conditions of inverter reset.

*6 When "1" is set in the RYE or RYF, a communication cannot be established through the applications other than the CC-Link IE Field Network Basic. When it is found that "1" is set in RXE or RXF, change the setting "1" of RYE or RYF to "0".

◆Input signals (inverter to master module)

The input signals to the master module are indicated. (Output signals from inverter)

Device No.	Signal	Description
RX0	Forward running	0: Other than forward running (during stop or reverse rotation) 1: Forward running
RX1	Reverse running	0: Other than reverse running (during stop or forward rotation) 1: Reverse running
RX2	Inverter running (terminal RUN function)*1	A function assigned to terminal RUN is activated.
RX3	Up to frequency (SU signal)*2	1: Output frequency has reached the set frequency
RX4	Overload alarm (OL signal)*2	1: Overload alarm occurrence
RX6	Frequency detection (terminal FU function)*1	Functions assigned to terminals FU and ABC activate.
RX7	Fault (terminal ABC function)*1	
RX9	**Pr.313** assignment function (DO0 function)	Functions assigned to **Pr.313** to **Pr.315** are activated. For the assignable functions, refer to the description of **Pr.190 to Pr.192** in the Instruction Manual (Applied) of the FR-E700 inverter.
RXA	**Pr.314** assignment function (DO1 function)	
RXB	**Pr.315** assignment function (DO2 function)	
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 in this signal. When "0" is set in the monitor command (RYC), "0" is set in this signal.
RXD	Frequency setting completion (RAM)	After "1" is set in the frequency setting command (RYD) and the frequency setting command is written to the inverter RAM, "1" is set in this signal. When "0" is set in the frequency setting command (RYD), "0" is set in this signal.
RXE	Frequency setting completion (RAM, EEPROM)	After "1" is set in the frequency setting command (RYE) and the frequency setting command is written to the inverter RAM and EEPROM, "1" is set in this signal. When "0" is set in the frequency setting command (RYE), "0" is set in this signal.
RXF	Instruction code execution completion	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 in this signal. When "0" is set in the instruction code execution request (RYF), "0" is set in this signal.
RX1A	Error status flag	When an inverter error occurs (protective function is activated), "1" is set in this signal.
RX1B	Remote station ready	When the inverter goes into the ready status upon completion of initial setting after power-ON or hardware reset, "1" is set in this signal. When an inverter error occurs (protective function is activated), "0" is set in this signal. The signal is used as an interlock signal during the write to/read from the master module.

*1 Signal names are initial values. Using **Pr.190 to Pr.192**, you can change output signal functions. Refer to the Instruction Manual (Applied) of the FR-E700 inverter for details of **Pr.190 to Pr.192**.

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

◆Details of remote register

◆Remote register (master module to inverter)

• Remote register definition

Device No.	Signal	Description	
RWw0	Monitor code1/ Monitor code2*3	Set the monitor code to be monitored. (Refer to **page 46**.) By setting "1" in RYC after setting, the specified monitored data is stored in RWr0/RWr1.	
RWw1	Set frequency*1*2	• Specify the set frequency or machine speed. At this time, whether to write to 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 400.00Hz (0.01Hz increments). Write "40000" when setting 400.00Hz.	
RWw2	Link parameter extended setting/Instruction code	Set the instruction code for execution of operation mode rewrite, parameter read/write, error reference, error clear, etc. (Refer to **page 45**.) 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 in **Pr.544 CC-Link extended setting**, upper eight bits are link parameter extended setting. Example) When reading **Pr.160**, instruction code is H0200.	
RWw3	Write data	Set the data specified by the RWw2 instruction code. (When required) Set "1" in RYF after setting RWw2 and this register. Set zero when the write code is not required.	
RWw4	Monitor code 3*3	Set the monitor code to be monitored. By setting "1" in RYC after setting, the specified monitored data is stored in RWr☐. (☐ indicates a register number. (RWr4 to 7)) Refer to **page 46** for monitor code details.	
RWw5	Monitor code 4*3		
RWw6	Monitor code 5*3		
RWw7	Monitor code 6*3		
RWw8	Faults history No.	Set the individual fault number of the faults history that you want to read. Up to the 8th previous fault can be read. Upper digits: H00 (the latest fault) to H07 (8th oldest fault) / lower digits: H00 When any of H08 to HFF is set to the upper digits, the fault record becomes an undetermined value.	
RWw9	PID set point*4	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, input "10000" when setting 100.00%. • Refer to the FR-E700 instruction manual (Applied) of the inverter for details of PID control.
RWwA	PID measured value*4	Set the PID measured value Setting range : "0 to 100.00%"	
RWwB	PID deviation*4	Set the PID deviation. Setting range : "-100.00% to 100.00%"	
RWw10, RWw12, RWw14, RWw16, RWw18	Link parameter extended setting/Instruction code	Set the instruction code (refer to **page 45**) for execution of operation mode rewrite, parameter read/write, error reference, error clear, etc. 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. (RWw2 is always executed.) The first 8 bits are link parameter extended setting. Example) When reading **Pr.160**, instruction code is H0200.	
RWw11, RWw13, RWw15, RWw17, RWw19	Write data	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 code is not required.	

*1 When **Pr.37** is not equal to "0", this will be machine speed display (1 increments).

*2 When **Pr.541 Frequency command sign selection (CC-Link)** = "1", the setting value has either + or -. When the setting value is negative, the command is inversed from starting command.
Setting range: -327.68 Hz to 327.67 Hz (-327.68 to 327.67) 0.01 Hz increments.
For details, refer to **page 37**.

*3 Write data is hexadecimal and only lower two digits are valid. (Upper 2 digits are ignored.)

*4 When **Pr.128** = "50, 51, 60, 61", they are valid. If the data outside the range is set, the previous setting is retained. Refer to the FR-E700 instruction manual (Applied) of the inverter for details of **Pr.128**.

◆Remote register (inverter to master module)

• Remote register definition

Device No.	Signal	Description
RWr0	First monitor value	When "1" is set in RYC, the specified monitored data is set to the lower 8 bits of the monitor code (RWw0). When **Pr.37 Speed display** ≠ 0 and output frequency or set frequency monitor is set for monitor code (RWw0), machine speed setting (1 unit) is monitored.
RWr1	Second monitor value (Output frequency)	When "0" is set to the upper 8 bits of the monitor code (RWw0), the current output frequency is always set. When a value other than "0" is set to the upper 8 bits of the monitor code (RWw0) while "1" is set in RYC, the monitor data specified by the upper 8 bits of the monitor code (RWw0) is set. When **Pr.37 Speed display** ≠ 0 and output frequency or set frequency monitor is set for monitor code (RWw0), machine speed setting (1 unit) is monitored.
RWr2	Reply code (when **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 any digit other than "0" is set for data fault, mode error, etc. (Refer to page 44.)
	Reply code 1 (when **Pr.544** ≠ 0)	Lower 8 bits of RWr2 When "1" is set in RYD or RYE, the reply code for the frequency setting command is set. (Refer to page 44.)
	Reply code 2 (when **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 44.)
RWr3	Read data	For a normal reply, the reply data to the instruction specified by the instruction code is set.
RWr4	Third monitor value	When "1" is set in RYC, the monitored data specified by the monitor code (RWw☐) is saved. (☐ indicates a register number (RWw4 to 7) When **Pr.37 Speed display** ≠ 0 and output frequency or set frequency monitor is set for monitor code (RWw0), machine speed setting (1 unit) is monitored.
RWr5	Fourth monitor value	
RWr6	Fifth monitor value	
RWr7	Sixth monitor value	
RWr8	Fault record (fault data)	The fault data of faults history No. specified by RWw8 is stored in the lower 8 bits. Upper 8 bits of RWw8 will be reverted back to the upper 8 bits.
RWr9	Fault record (output frequency)	Output frequency of the faults history No. specified in RWw8 is stored.
RWrA	Fault record (output current)	Output current of the faults history No. specified in RWw8 is stored.
RWrB	Fault record (output voltage)	Output voltage of the faults history No. specified in RWw8 is stored.
RWrC	Fault record (energization time)	Energization time of the faults history No. specified in RWw8 is stored.
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 other than "0" is set for data fault, mode error, etc. (Refer to page 44.)
	Read data	For a normal reply, the reply data to the instruction specified by the instruction code is set.

• Reply code definition

The reply to the instruction execution is set to RWr2, 10, 12, 14, 16, 18.

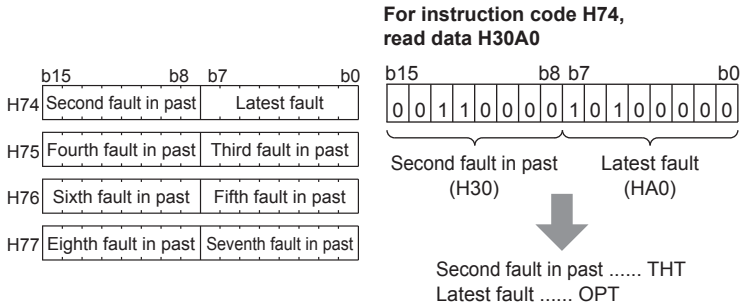
When executing the frequency setting (RYD, RYE) or instruction code execution (RYF), check the reply code (RWr2) in the remote register after execution.

	Data	Item	Alarm definition	Remarks
Reply code	H0000	Normal	No error (normal completion of instruction code execution)	• Reply code to RWr2 when **Pr.544** = 0 • Reply code to RWw10, 12, 14, 16, and 18 when **Pr.544** = 18
	H0001	Write mode error	Parameter write was attempted during operation other than a stop in the network operation mode.	
	H0002	Parameter selection error	Unregistered code number was set.	
	H0003	Setting range error	Set data is outside the permissible data range.	
Reply code 1	H00	Normal	No error (normal completion of instruction code execution)	Reply code to RWr2 when **Pr.544** ≠ 0
	H01	Write mode error	Parameter write was attempted during operation other than a stop in the network operation mode.	
	H03	Frequency command setting range error	The value outside the range is set.	
Reply code 2	H00	Normal	No error (normal completion of instruction code execution)	
	H01	Write mode error	Parameter write was attempted during operation other than a stop in the network operation mode.	
	H02	Parameter selection error	Unregistered code number was set.	
	H03	Setting range error	Set data is outside the permissible data range.	

◆Instruction codes

Set the instruction code using a remote register (RWw) (Refer to page 43.)

The definition read by the instruction code is stored in the remote register (RWr). (Refer to page 44.)

Item		Read/ write	Instruction code	Description
Operation mode		Read	H7B	H0000: Network operation mode H0001: External operation mode, External JOG operation mode H0002: PU operation mode, External/PU combined operation mode 1 and 2, PUJOG operation mode
		Write	HFB	H0000: Network operation mode H0001: External operation mode H0002: PU operation mode (**Pr.79** = "6")
Monitor	Output frequency/ speed*1	Read	H6F	H0000 to HFFFF Output frequency: Increments 0.01 Hz Machine speed: Increments 1 (When **Pr.37** ≠ "0")
	Output current	Read	H70	H0000 to HFFFF Output current (hexadecimal): Increments 0.01 A
	Output voltage	Read	H71	H0000 to HFFFF Output voltage (hexadecimal): Increments 0.1 V
	Special monitor	Read	H72	H0000 to HFFFF: Check the data of the monitor selected by the instruction code HF3.
	Special monitor selection No.	Read	H73	H01 to HFF: Monitor selection data Refer to monitor code. (Refer to page 46.)
		Write	HF3*2	
Monitor	Faults history	Read	H74 to H77	H0000 to HFFFF: Last two fault records  For the data codes or details of fault records, refer to the Instruction Manual (Applied) of the FR-E700 inverter.
Set frequency (RAM)		Read	H6D	Read the set frequency/machine speed from the RAM or EEPROM. • H0000 to HFFFF: Set frequency: 0.01Hz increments Machine speed: 1 increments (When **Pr.37** ≠ "0")
Set frequency (EEPROM)			H6E	
Set frequency (RAM)*3		Write	HED	Write the set frequency/machine speed into the RAM or EEPROM. • H0000 to H9C40 (0 to 400.00Hz) : Frequency: 0.01Hz increments • H0000 to H270E (0 to 9998) : Machine speed: 1 increments (When **Pr.37** ≠ "0") • To change the set frequency consecutively, write data to the inverter RAM. (Instruction code: HED)
Set frequency (RAM and EEPROM)*3		Write	HEE	
Parameter		Read	H00 to H63	• Refer to the instruction code in the Instruction Manual (Applied) of the FR-E700 inverter to read and write as required. Write to **Pr.77** and **Pr.79** is disabled. When setting **Pr.100** and later, set 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. (Refer to page 13.)
		Write	H80 to HE3	
Faults history batch clear		Write	HF4	H9696: Clears the faults history as a batch.

<table>
<tr><th>Item</th><th>Read/ write</th><th>Instruction code</th><th>Description</th></tr>
<tr><td>All parameter clear</td><td>Write</td><td>HFC</td><td>All parameters return to the initial values.
Whether to clear communication parameters or not can be selected according to data. (○: Clear, ×: Not clear)
Refer to the Instruction Manual (Applied) of the FR-E700 inverter for parameter clear, all clear, and communication parameters.
<table>
<tr><th>Clear type</th><th>Data</th><th>Communication Pr.</th></tr>
<tr><td rowspan="2">Parameter clear</td><td>H9696</td><td>○</td></tr>
<tr><td>H5A5A</td><td>×*4</td></tr>
<tr><td rowspan="2">All parameter clear</td><td>H9966</td><td>○</td></tr>
<tr><td>H55AA</td><td>×*4</td></tr>
</table>
When clear is executed for H9696 or H9966, communication-related parameter settings also return to the initial values. When resuming operation, set the parameters again. Executing clear will clear the instruction code HEC, HF3, and HFF settings.</td></tr>
<tr><td>Inverter reset</td><td>Write</td><td>HFD</td><td>H9696: Resets the inverter.</td></tr>
<tr><td rowspan="2">Link parameter extended setting*5</td><td>Read</td><td>H7F</td><td rowspan="2">H00 to H0D: Parameter description is changed according to the instruction code (extended) setting. Refer to the Instruction Manual (Applied) of the FR-E700 inverter for instruction code (extended) settings.</td></tr>
<tr><td>Write</td><td>HFF</td></tr>
<tr><td rowspan="2">Second parameter changing*6</td><td>Read</td><td>H6C</td><td rowspan="2">Read or write of bias and gain parameters (instruction codes H5E to H61 and HDE to HE1 with the link parameter extended setting = "1", H11 to H23 and H91 to HA3 with the link parameter extended setting = "9").
H00: Frequency*7
H01: Analog value set in parameters
H02: Analog value input from the terminal</td></tr>
<tr><td>Write</td><td>HEC</td></tr>
</table>

*1 When "100" is set in **Pr.52 Operation panel main monitor selection**, frequency setting is monitored during a stop and output frequency is monitored during running.

*2 Write data is in hexadecimal, and only 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 sets back the communication parameter settings to the initial settings.

*5 Setting is valid only when **Pr.544** = "0". When **Pr.544** ≠ "0", set using RWw2 or RWw10, 12, 14, 16, or 18. (Refer to **page 43**.)

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

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

REMARKS

- When the 32-bit parameter setting or monitor description are read and the read value exceeds HFFFF, the reply data will be HFFFF.

◆Monitor codes

Information about the inverter can be monitored by setting the special monitor selection No. of the instruction code and monitor code using the remote registers, RWw0 and RWw4 to 7.

- For the monitor code (RWw0), select the first monitor description (RWr0) from the lower 8 bits and the second monitor description (RWr1) from the upper 8 bits.
  (Example) When output current is selected for the first monitor (RWr0) and output voltage is selected for the second monitor (RWr1) → monitor code (RWw0) is H0302
- When **Pr.544** = "12, 14, or 18", descriptions of monitor codes 3 (RWw4) to 6 (RWw7) can be selected.

Monitor code	Second monitor description (the first 8 bits)	First, third to sixth monitor description (the last 8 bits)	Increments
H00	Output frequency/machine speed*1	No monitoring (monitor value is 0)	0.01 Hz/1
H01	Output frequency/machine speed*1		0.01 Hz/1
H02	Output current		0.01 A
H03	Output voltage		0.1 V
H05	Frequency setting value/machine speed setting*1		0.01Hz/1
. . .	. . .		. . .

*1 When **Pr.37** is not equal to "0", this will be machine speed display (1 increments).

REMARKS

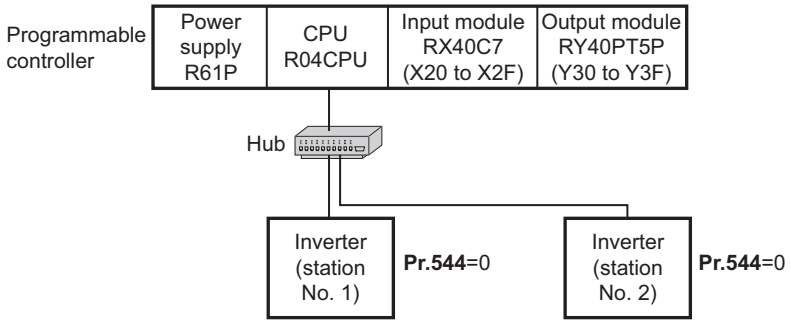
- The monitor codes from H01 and up and their contents are the same as those of the RS-485 communication dedicated monitor. For the details of the monitor codes or monitor items, refer to the RS-485 communication section in the Instruction Manual (Applied) of the FR-E700 inverter.

◆Programming examples

This chapter provides programming examples which control the inverter with sequence programs.

Item	Program example	Refer to page
Reading the inverter status	Reading the inverter status from the buffer memory of the master station	48
Setting the operation mode	Selecting the network operation mode	49
Setting the operation commands	Commanding the forward rotation and middle speed signals	49
Setting the monitoring function	Monitoring the output frequency	50
Reading a parameter value	Reading the value of **Pr.7 Acceleration time**	50
Writing a parameter value	Setting "3.0 s" in **Pr.7 Acceleration time**	51
Setting the running frequency (running speed)	Setting to 50.00 Hz	51
Reading the fault records	Reading the inverter faults	52
Inverter reset	Perform inverter reset at an inverter alarm occurrence.	52

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



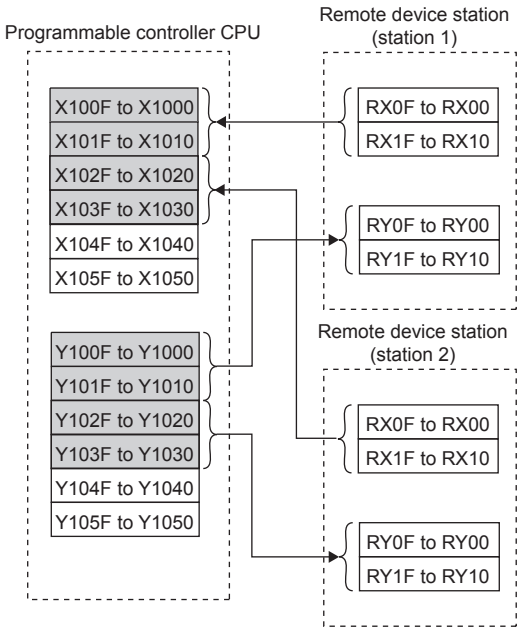
- Network parameter setting of the master station

  Network parameters are set as below.

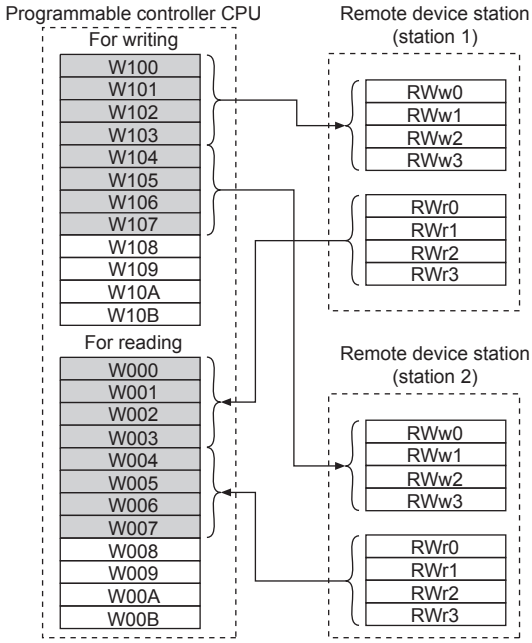
Item	Setting conditions
Start I/O No.	0000
Type	Master
All connect count	2
Remote input (RX)	X1000
Remote output (RY)	Y1000
Remote register (RWr)	W0

Item	Setting conditions
Remote register (RWw)	W100
Retry count	3

- The relation between the device of the programmable controller CPU and remote I/O (RX, RY) of the remote device station is as follows: The devices used actually are indicated in shaded regions.

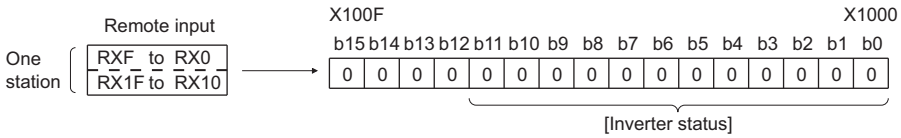


- The relation between the device of the programmable controller CPU and remote register (RWw, RWr) of the remote device station is as follows: The devices used actually are indicated in shaded regions.



◆Program example for reading the inverter status

The following program turns on Y00 of the output unit when station 1 inverter is running



Inverter status
- b0: During forward rotation
- b1: Reverse running
- b2: Inverter running (terminal RUN function)∗1
- b3: Up to frequency (SU signal)
- b4: Overload alarm (OL signal)
- b5: —
- b6: Frequency detection (terminal FU function)∗1
- b7: Fault (terminal ABC function)∗1
- b8: —
- b9: — (DO0 function)∗1
- b10: — (DO1 function)∗1
- b11: — (DO2 function)∗1

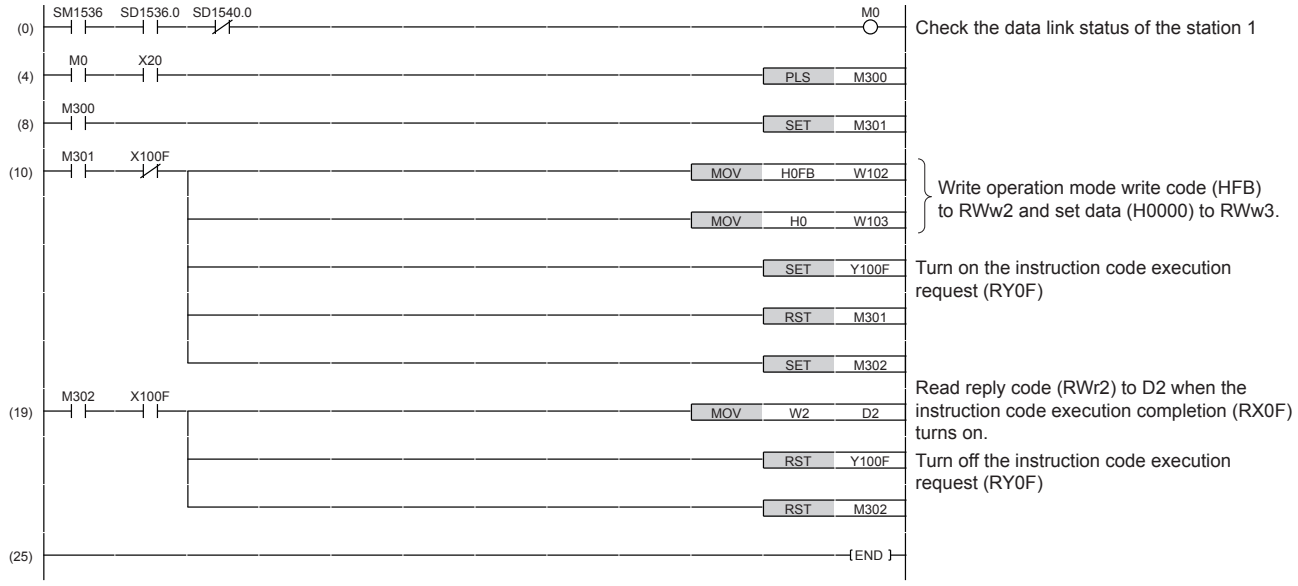
∗1 These signals are initial values. You can change output signals using **Pr.190 to Pr.192**, **Pr.313 to Pr.315 (Output terminal function selection)**.

◆Program example for setting the operation mode

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

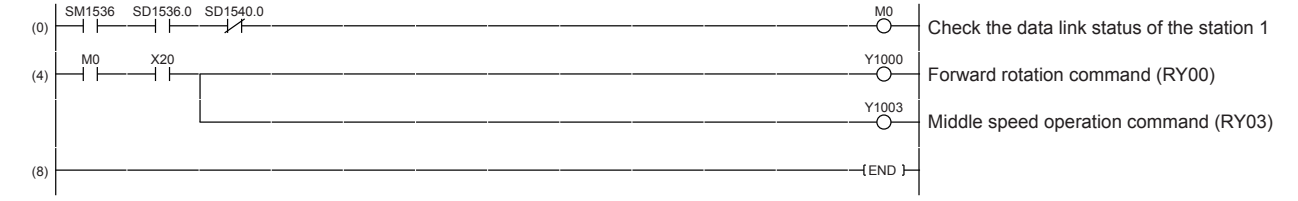
The following explains a program to change the operation mode of station 1 inverter to network operation.

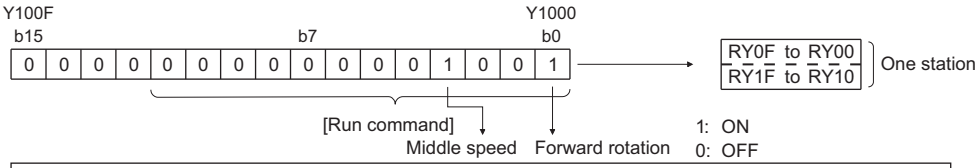
- Operation mode write code: HFB (hexadecimal)
- Network operation set data: H0000 (hexadecimal) (Refer to page 45.)
- The reply code at the time of instruction code execution is set to D2. (Refer to page 44.)



◆Program example for setting the operation commands

The following program gives a forward command and middle speed command to station 1 inverter





Run command	
b0 : Forward rotation command	b6 : Second function selection (RT signal)
b1 : Reverse rotation command	b7 : Terminal 4 input selection (AU signal)
b2 : High-speed operation command (terminal RH function)∗1	b8 : —
b3 : Middle-speed operation command (terminal RM function)∗1	b9 : Output stop (terminal MRS function)∗1
b4 : Low-speed operation command (terminal RL function)∗1	b10 : —
b5 : —	b11 : Inverter reset (terminal RES function)∗1

∗1 These signals are initial values. You can change input signals using **Pr.180 to Pr.184 (Input terminal function selection)**. Note that some of the signals do not receive a command from the programmable controller depending on the setting. (Refer to the Instruction Manual (Applied) of the FR-E700 inverter for details.)

◆Program example for monitoring the output frequency

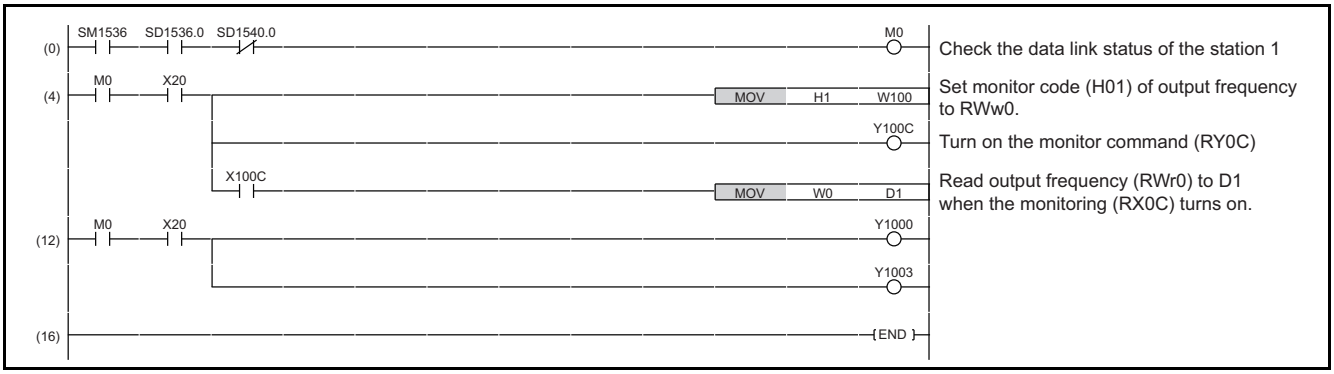
The following explains a program to read monitor functions of the inverter.

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

Output frequency read code: H0001 (hexadecimal)

Refer to page 46 for the monitor codes.

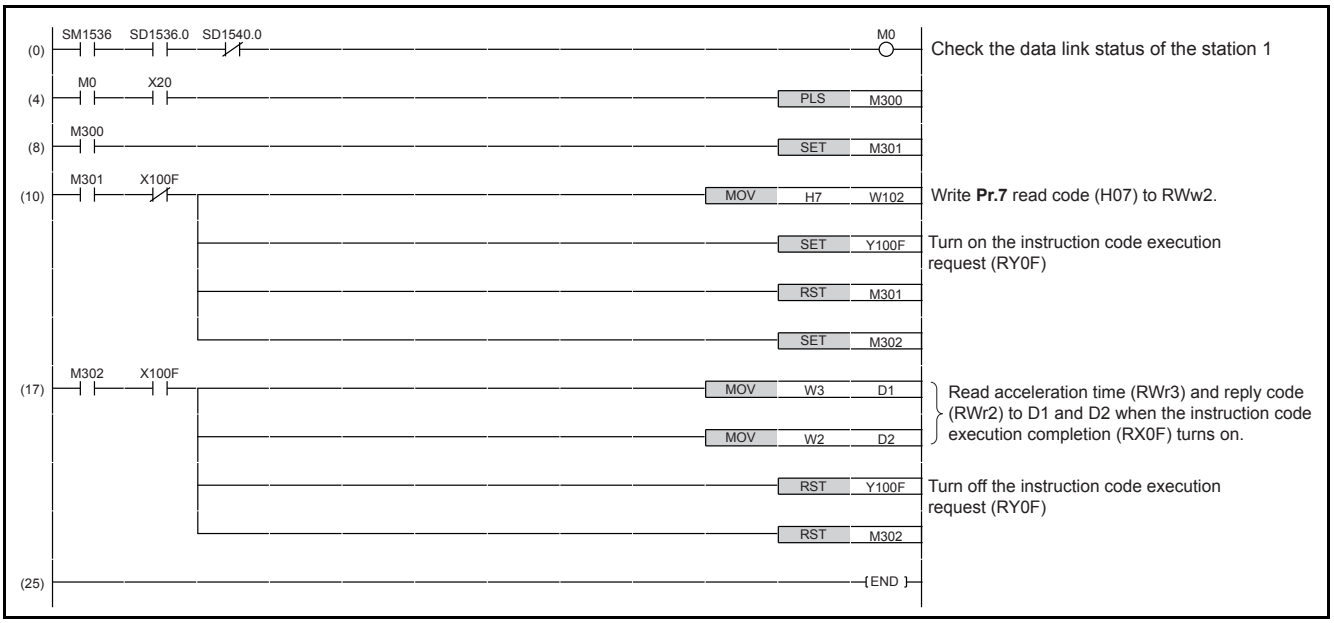
(Example) The output frequency of 60Hz is indicated as H1770 (6000).



◆Program example for parameter reading

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

- **Pr.7 Acceleration time** reading instruction code: H07 (hexadecimal)
- Refer to the Instruction Manual (Applied) of the FR-E700 inverter for details of the parameter instruction codes.
- The reply code at the time of instruction code execution is set to D2. (Refer to page 44.)



REMARKS

- For parameters having numbers 100 and later, change their link parameter extended settings (set them to other than H00). Refer to the Instruction Manual (Applied) of the FR-E700 inverter for details.

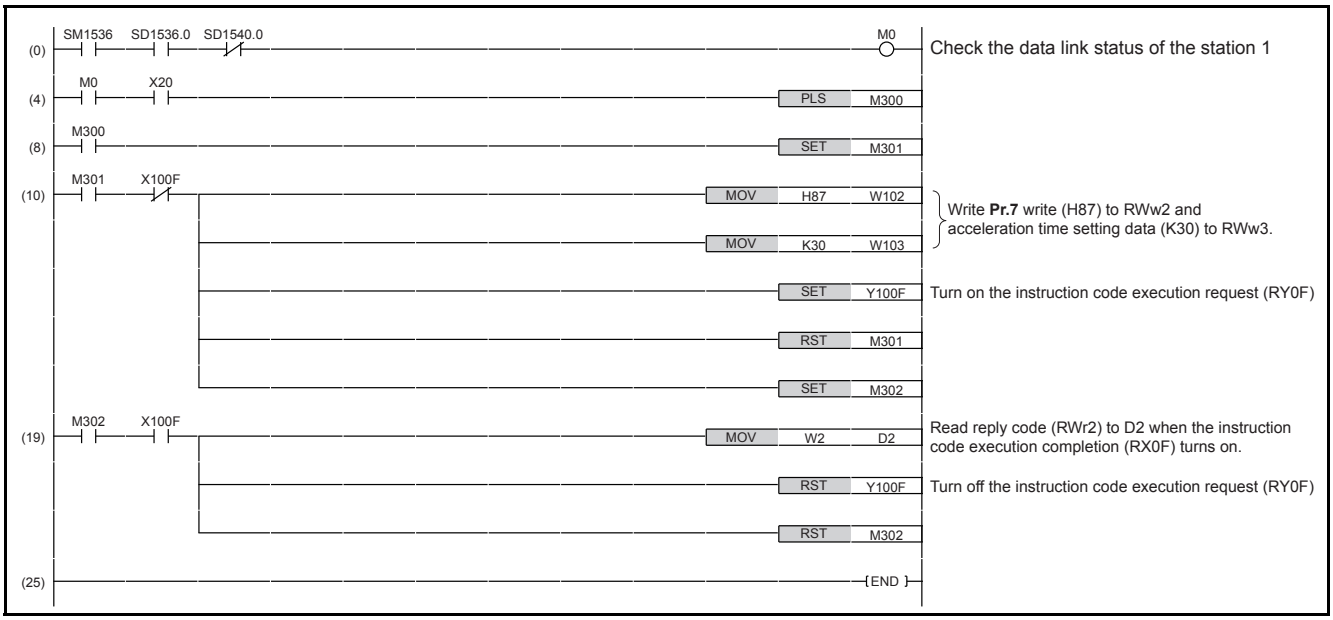
◆Program example for parameter writing

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

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

For the parameter instruction codes, refer to the Instruction Manual (Applied) of the FR-E700 inverter.

The reply code at the time of instruction code execution is set to D2. (Refer to **page 44**.)

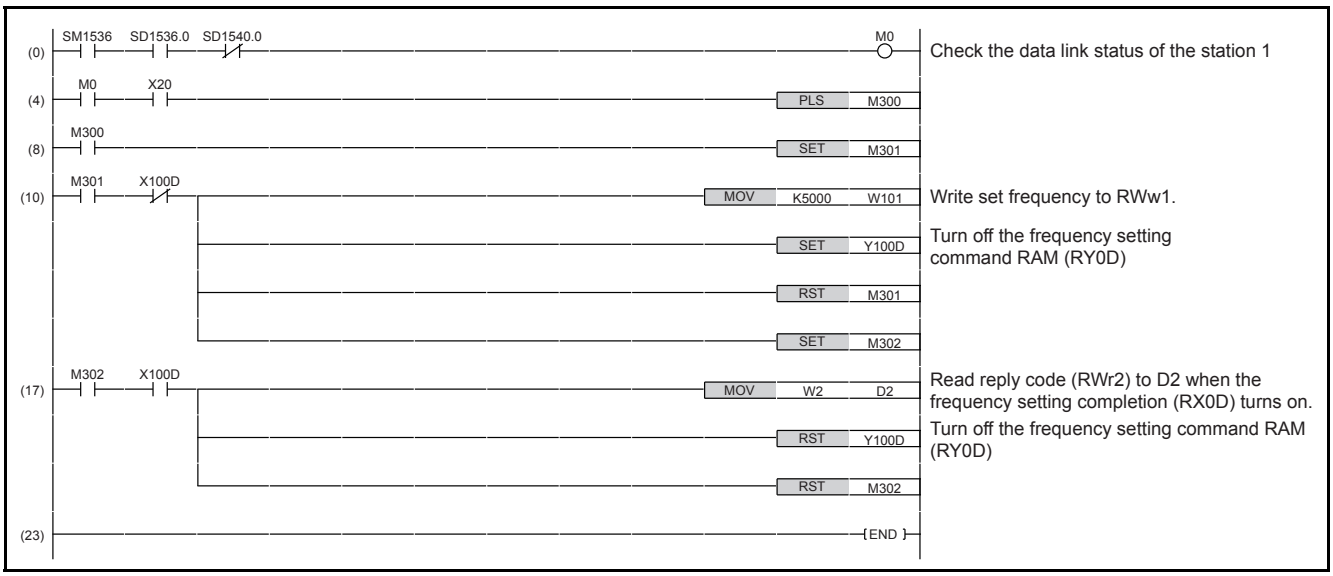


REMARKS

- For parameters having numbers 100 and later, change their link parameter extended settings (set them to other than H00). Refer to the parameter list of the Instruction Manual (Applied) of the FR-E700 inverter for settings.
- For other functions, refer to the instruction codes. (Refer to **page 45**.)

◆Program example for setting the running frequency

- The following program example changes the running frequency of station 1 inverter to 50.00 Hz
  Set frequency: K5000 decimal
  The reply code at the time of instruction code execution is set to D2. (Refer to **page 44**.)



- To continuously change the running frequency from the programmable controller
  When the frequency (speed) setting completion (example: X100D) switches on, make sure that the reply code in the remote register is 0000H and change the set data (example: W101) continuously.

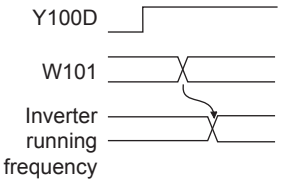
- Program example for writing data to EEPROM

  Modify the program on **page 51** as follows:

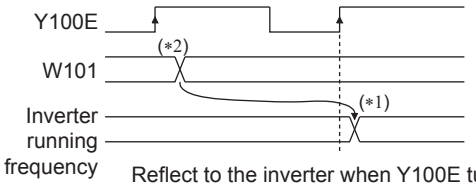
  Frequency setting command Y100D → Y100E

  Frequency setting completion X100D → X100E

<Timing chart when writing to RAM>



<Timing chart when writing to EEPROM>



Reflect to the inverter when Y100E turns on

*1 For EEPROM, write is made only once when Y100E is switched on.

*2 If the set data is changed with Y100E on, it is not reflected on the inverter.

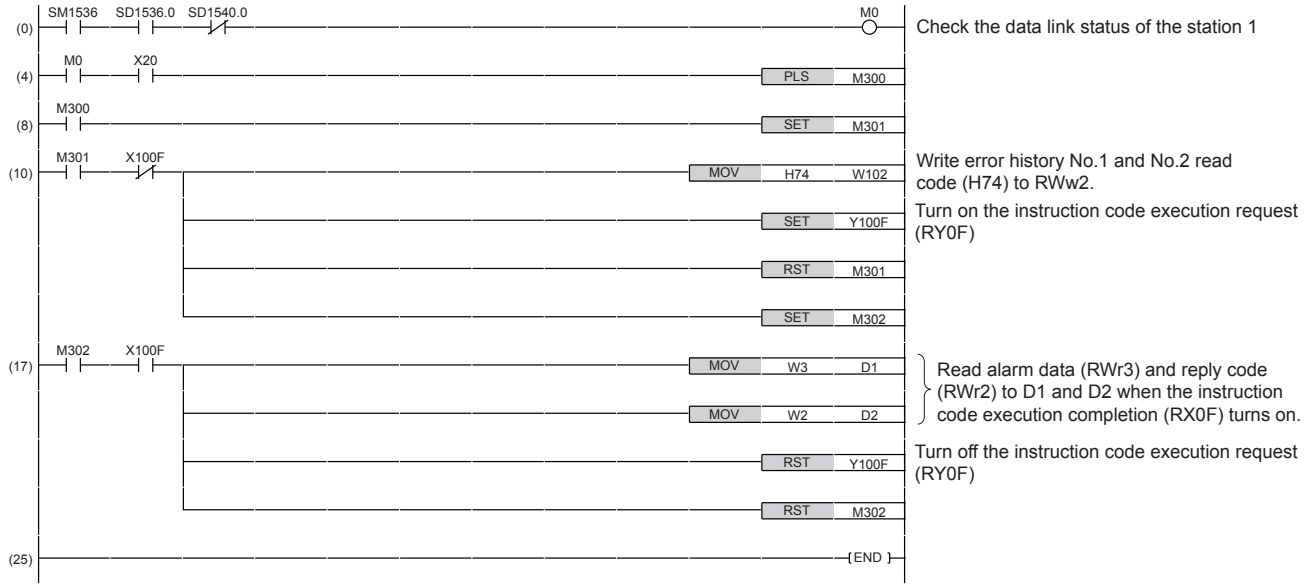
◆Program example for fault record reading

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

- Faults history No. 1, No. 2 reading instruction code: H74 (hexadecimal)

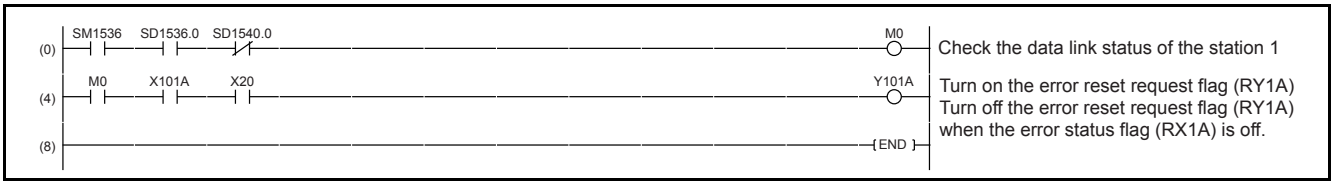
For the error codes, refer to the Instruction Manual (Applied) of the FR-E700 inverter.

The reply code at the time of instruction code execution is set to D2. (Refer to **page 44**.)



◆Program example for resetting the inverter at inverter error

The following is a program example for resetting station 1 inverter.



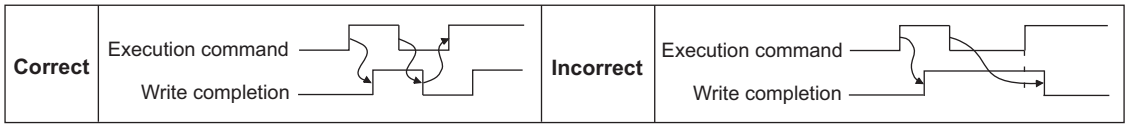
REMARKS

- The above inverter reset using RY1A may be made only when an inverter error occurs. When **Pr.349 Communication reset selection** = "0", inverter reset is available independently of the operation mode.
- When using the instruction code execution request (RYF) 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 49**.)
- Refer to **page 16** for operation conditions of inverter reset.

◆Instructions

◆Programming instructions

- Create a sequence program which always verifies that the data is written correctly after sending the execution command.



◆Operating and handling instructions

- The inverter only accepts the commands from the programmable controller during operation using the CC-Link IE Field Network Basic.
  The run command from external and parameter unit is ignored.
- If multiple inverters have the same station number, the communication cannot be performed properly.
- The inverter protective function (E.OP1) is activated if data communication stops for more than the time set in **Pr.852 Ethernet communication check time interval** due to a fault such as a programmable controller fault or a break in the Ethernet cable, during operation through the CC-Link IE Field Network Basic.
- 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.OP1) 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 (initial value)", 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 programmable controller program.
  Set a value other than "0" in **Pr.340** to start in the network operation mode after inverter reset. (For the details of **Pr.340**, refer to the Instruction Manual (Applied) of the FR-E700 inverter.)

◆Troubleshooting

Description	Check point
Operation mode does not switch to the network operation mode	Check that the Ethernet cable is installed correctly. (Check for a fault such as a contact fault or break in the cable.)
	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.

Parameters referred to

Pr.37 Speed display ☞ **Instruction Manual (Applied) of the FR-E700 inverter**

3 PROTECTIVE FUNCTIONS

3.1 Causes and corrective actions

◆Fault

When a protective function is activated, the inverter output is shut off and a Fault signal is output.

Operation panel indication	E.OP1	E.OP 1	FR-PU04 FR-PU07	Option slot alarm 1
Name	Ethernet communication fault			
Description	• Appears when Ethernet communication is interrupted by physical factors while **Pr.851 Ethernet signal loss detection function selection** = "3" (initial value). • The inverter output is shut off when Ethernet communication is cut off for the time set in **Pr.852 Ethernet communication check time interval** or longer between the inverter and all devices with the IP addresses in the range specified for the Ethernet command source selection (**Pr.844 to Pr.849**). • Stops the inverter output when excessive noise occurs around the inverter. • When the CC-Link IE Field Network Basic is used, the inverter output is shut off when the data addressed to the own station is not received for the predetermined timeout period or longer, or when the status bit of the cyclic transmission addressed to the own station turns OFF (when the master controller gives a command to stop the cyclic transmission). (For the details of the timeout period, status bit of the cyclic transmission, and command to stop the cyclic transmission, refer to the Instruction Manual of the master controller which supports the CC-Link IE Field Network Basic.)			
Check point	• Check for a break in the Ethernet cable. • Check that the **Pr.852** setting is not too short. • Check for excessive noise around the inverter. • When the CC-Link IE Field Network Basic is used, check that the timeout period set in the master is not shorter than the period during which the inverter does not receive the data addressed to the own station. • When the CC-Link IE Field Network Basic is used, check that the status bit of the cyclic transmission addressed to the own station is not OFF.			
Corrective action	• Check that the Ethernet cable is correctly connected to the Ethernet connector. Check that the Ethernet cable is not broken. • Set a larger value in **Pr.852**. • When excessive noise occurs around the inverter, change the communication setting of the master. (The noise may be reduced by setting a shorter timeout period or increasing the number of retries in the communication setting of the master.) • When the CC-Link IE Field Network Basic is used, set a timeout period longer than the period during which the inverter does not receive the data addressed to the own station. • When the CC-Link IE Field Network Basic is used, turn ON the status bit of the cyclic transmission addressed to the own station.			

Operation panel indication	E.1	E. 1	FR-PU04 FR-PU07	Fault 1
Name	Ethernet board fault			
Description	The inverter output is shut off when a contact fault occurs between the inverter and the Ethernet board. The indication also appears when the initial position of the manufacturer setting switch on the Ethernet board is changed.			
Check point	• Check that the Ethernet board is installed onto the connector securely. • Check for excessive noise around the inverter. • Check that the initial position of the manufacturer setting switch on the Ethernet board was not changed.			
Corrective action	• Connect the Ethernet board securely. • Take measures against noises if there are devices producing excessive electrical noises around the inverter. If the problem still persists after taking the above measure, contact your sales representative. • Set the manufacturer setting switch on the Ethernet board back to the initial position.			

REVISIONS

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

Print Date	*Manual Number	Revision
May 2017	IB(NA)-0600724ENG-A	First edition
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MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE: TOKYO BUILDING 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

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