MITSUBISHI ELECTRIC

INVERTER

A800-GN
CC-LINK IE TSN FUNCTION MANUAL

*CC-Link**IE TSN** Class B

CC-Link IE TSN communication function

This manual explains the CC-Link IE TSN communication specifications. For the functions not found in this manual, refer to the Instruction Manual (Detailed) of the FR-A800 inverter.
In addition to this manual, please read the Instruction Manual (Detailed) of the FR-A800 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.

A800-GN

CONTENTS

1 INTRODUCTION

1.1 CC-Link IE TSN communication overview

This product is equipped with a CC-Link IE TSN communication circuit board. Connecting network devices to port 1 or 2 on the circuit board using an Ethernet cable allows for communication via CC-Link IE TSN.

Hub

Personal computer (FR Configurator2) Programmable controller GOT Inverter Inverter
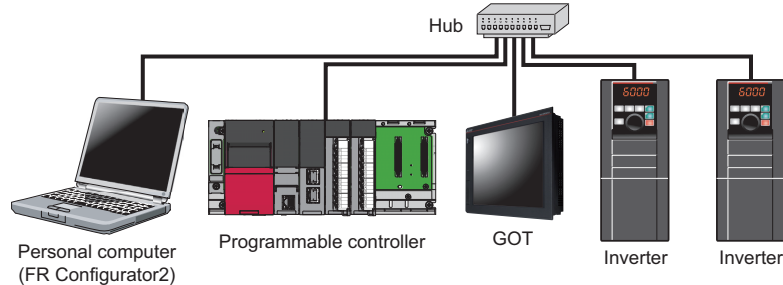
NOTE
• Ethernet is a registered trademark of Fuji Xerox Corporation in Japan.

◆Precautions for CC-Link IE TSN communication

• To maintain the security (confidentiality, integrity, and availability) of the inverter and the system against unauthorized access, DoS[1] attacks, computer viruses, and other cyberattacks from external devices via network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions. We shall have no responsibility or liability for any problems involving inverter trouble and system trouble by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

• Depending on the network environment, the inverter may not operate as intended due to delays or disconnection in communication. Carefully consider the conditions and safety for the inverter on site.

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

◆Operation status LEDs
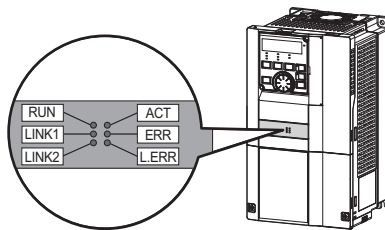
LED name	Description	ON	Blinking	OFF
RUN	Operation status	Normal operation (normal 5 V internal voltage)[1]	-	Hardware failure
LINK1	Connector for communication (PORT1) status	Link-up	Data transmission in progress	Link-down
LINK2	Connector for communication (PORT2) status	Link-up	Data transmission in progress	Link-down
ACT	SLMP command request message reception status	-	Inverter identification in progress[2]	Inverter identification paused
ERR	Node failure status[3]	Node failure	-	Normal operation
L.ERR	Link error	Received data error	IP address error[4]	Received data normal

  [1] Also lit in no-communication state.
  [2] This LED blinks when the MAC address and IP address of the inverter match the MAC address and IP address specified by using engineering software such as FR Configurator2.
  [3] This LED indicates an interruption in communication between the master station and the inverter (due to cables disconnecting/breaking or the master station powering OFF / resetting).
  [4] " d! P " (duplicate IP address) or " ! P " (IP address error) will appear on the operation panel.
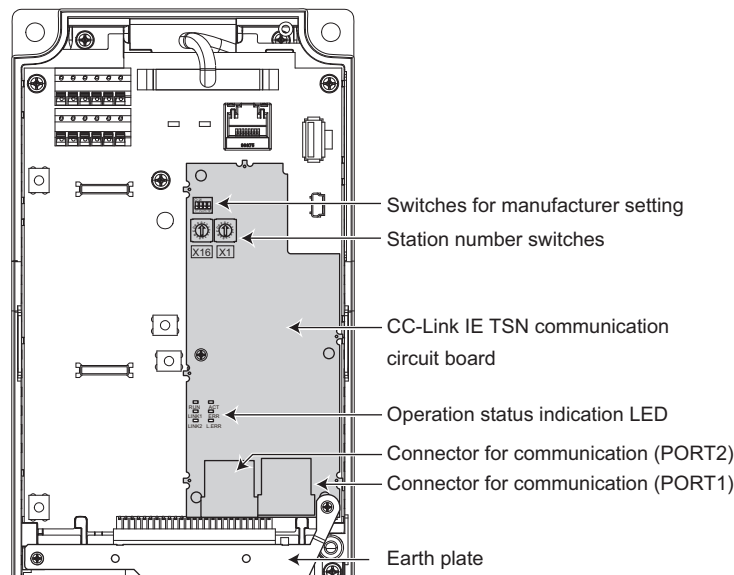
1.2 Wiring

◆CC-Link IE TSN communication specifications

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

Item		Description
Transmission speed		1 Gbps/100 Mbps
Minimum synchronization cycle		125.00 µs
CC-Link IE TSN authentication class		B
Communication method		Time sharing method
Synchronization function		Compliant with IEEE 802.1AS and IEEE 1588v2
Maximum number of connected units		121 units (sum of master and slave stations)
Maximum distance between nodes		100 m
Maximum number of branches		No upper limit within the same Ethernet system
Topology		Line, star, ring, or a combination of line and star
Connection cable		Ethernet cable (IEEE 802.3 1000BASE-T compliant cable or ANSI/TIA/EIA-568-B (Category 5e) compliant shielded 4-pair branched cable)
Connector		Shielded RJ-45
Node type		Slave station
Maximum cyclic size (of one node)	RX	64 bits
	RY	64 bits
	RWr	128 words
	RWw	128 words

◆Parts

- Switches for manufacturer setting
- Station number switches
- CC-Link IE TSN communication circuit board
- Operation status indication LED
- Connector for communication (PORT2)
- Connector for communication (PORT1)
- Earth plate

• • • ▶ NOTE ◀ • • •
• Do not remove the CC-Link IE TSN communication circuit board or the earth plate.

◆Combination with the master station

CC-Link IE TSN authentication classes of slave stations

A: FR-E800

B: FR-A800 and FR-F800 (with FR-A8NCG installed), FR-A800-GN, and AC servo

• When the communication speed of the master is set to 1 Gbps and no AC servo is connected

Master station	Slave station	
	Class B devices only	Mixture of class B and class A devices
MELSEC iQ-R series master/local module RJ71GN11-T2 or a master station that supports both 1 Gbps and 100 Mbps communication speeds	Line topology / star topology / ring topology*1*2 / combination of line topology and star topology For star topology, use a TSN switching hub.	Star topology / combination of line topology and star topology (Line topology only is not supported.) Connection sequence: Master station → Slave station (authentication class B, communication speed: 1 Gbps) → General-purpose switching hub → Slave station (authentication class A)
MELSEC iQ-F series master/local module FX5-CCLGN-MS or a master station that supports 1 Gbps communication speed only	Line topology / star topology / combination of line topology and star topology For star topology, use a TSN switching hub.	

*1 Not available for the RJ71GN11-T2 whose firmware version is earlier than 10.
*2 Not available for the FR-A8NCG and FR-A800-GN manufactured in August 2020 or earlier.

• When the communication speed of the master is set to 100 Mbps and no AC servo is connected

Master station	Slave station	
	Class B devices only	Mixture of class B and class A devices
MELSEC iQ-R series master/local module RJ71GN11-T2 or a master station that supports both 1 Gbps and 100 Mbps communication speeds	Line topology / star topology / ring topology*1*2 / combination of line topology and star topology For star topology, use a TSN switching hub.	Line topology / star topology / combination of line topology and star topology For star topology, use a general-purpose switching hub. Slave station (authentication class: B, communication speed: 100 Mbps*2)

*1 Not available for the RJ71GN11-T2 whose firmware version is earlier than 10.
*2 Not available for the FR-A8NCG and FR-A800-GN manufactured in August 2020 or earlier.

• When AC servos are connected

Master station	Slave station	
	Class B devices only	Mixture of class B and class A devices
MELSEC iQ-R series Motion module RD78G[]/GH[]	Line topology only (Star topology is not supported.)	Combination of line topology and star topology (Line topology only or star topology only is not supported.) Connection sequence: Master station → Slave station (authentication class B) → General-purpose switching hub → Slave station (authentication class A)

> ⚡ NOTE
> • The data size must not exceed 2k bytes for cyclic transmission of all slave stations in the authentication class A region of the connection. For details, refer to the Master Module User's Manual.

• Related manuals

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

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◆Connection cable

For wiring, use the 1000BASE-T compliant Ethernet cables.

Ethernet cable	Connector	Type
Category 5e or higher (Double shielded/STP) Straight cable	RJ-45 connector	The following conditioning cables: • IEEE 802.3 (1000BASE-T) • ANSI/TIA/EIA-568-B (Category 5e)

• Recommended products (as of April 2019)

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

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

> **NOTE**
> • For CC-Link IE TSN wiring, use the recommended wiring components by CC-Link Partner Association.
> • Depending on the cable connector shape, the cable may not be able to be connected to the communication connector.

◆Hubs

To connect only the authentication class B devices in star topology when the communication speed of the master station is 1 Gbps, use a CC-Link IE TSN compatible switching hub (TSN switching hub).

• Industrial switching hub

Name	Description
TSN switching hub	Authentication class B CC-Link IE TSN compatible switching hub certified by the CC-Link Partner Association.

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.

◆Network configuration

Check the network configuration before wiring, and perform correct wiring.

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1.4 CC-Link IE TSN configuration

◆Procedure

◆Before communication

1 Connect each unit with an Ethernet cable. (Refer to **page 4**.)

2 Set the station number using the rotary switches on the CC-Link IE TSN communication circuit board. (Refer to **page 20**.)

Example: 1 (H01)

X16 X1
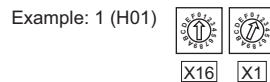
3 Clear all parameters, then turn the inverter power OFF and ON again.

◆Registering a profile

1 Start GX Works3.

2 On the menu bar, select [Tool] → [Profile Management] → [Register...].

3 Select a CSP+ file to be registered on the "Register Profile" screen, and click the [Register] button.

⌐•●NOTE⌐
• A profile is a compressed file (such as *.zip, *.ipar, and *.cspp). Register a profile without decompressing the file.

◆Creating a project file

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

◆Detecting an Inverter

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

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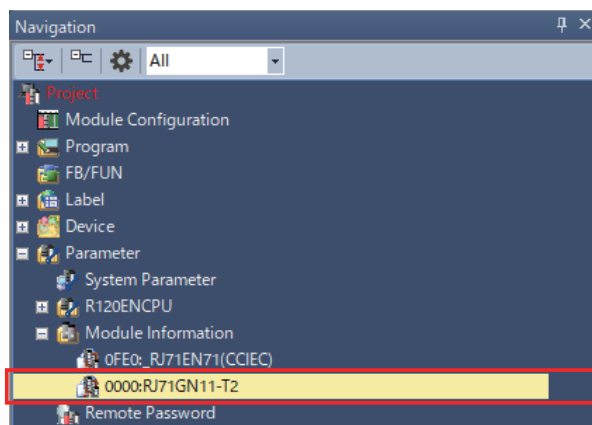
2 Select [Basic Settings] in the "Setting Item List" window.
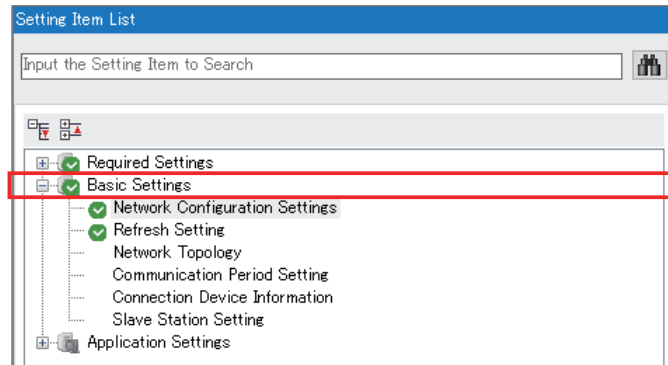
3 In the "Setting Item" window, go to [Network Configuration Settings] then click "⬜" next to the [Detailed Setting] field.
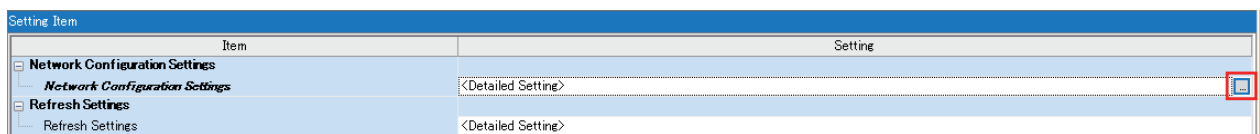
4 Click [Connected/Disconnected Module Detection] in the "CC-Link IE TSN Configuration" window.
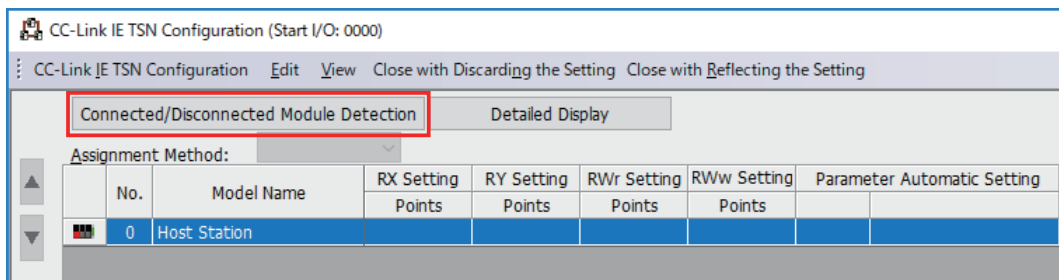
5 Read the cautions in the "Connected/Disconnected Module Detection" window and click [Execute].
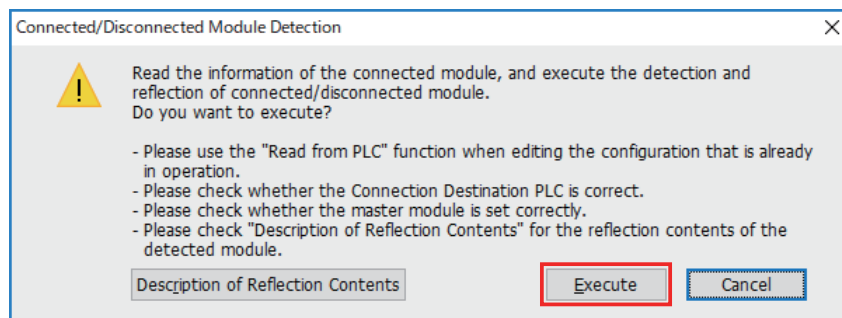
1

6 **The FR-A800-GN will appear on the screen once it is detected. Click [Close with Reflecting the Setting] to close the window.**
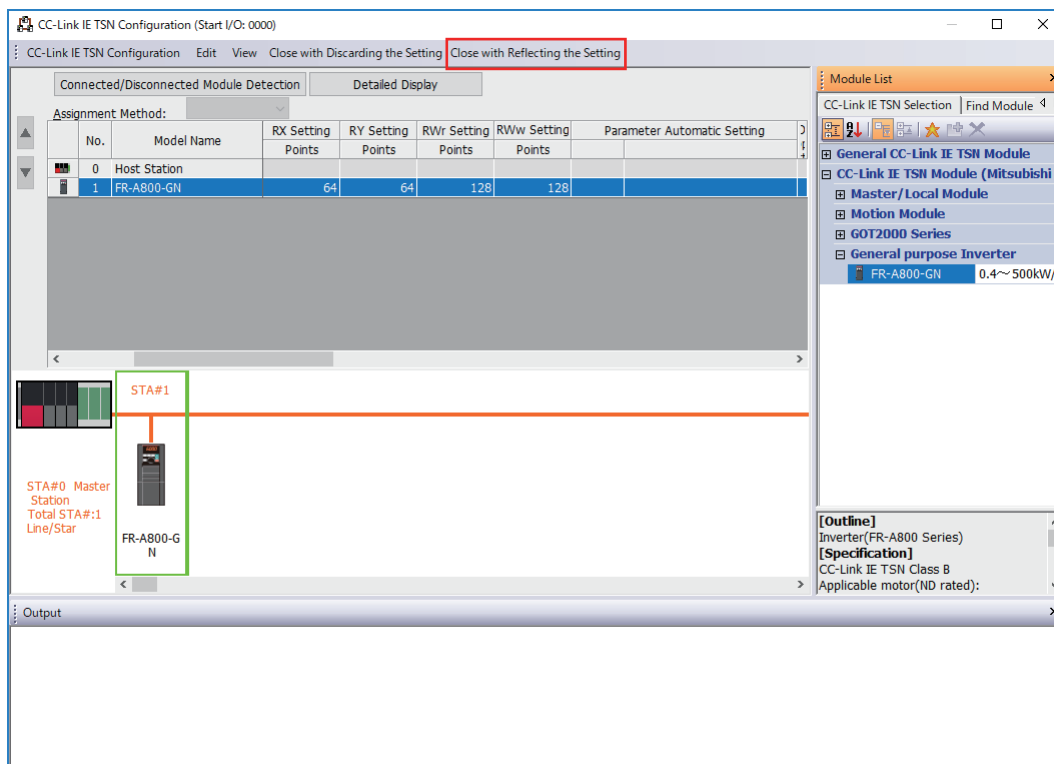
◆ **Checking communication**

The following table shows the status of the LEDs when communication is established between the programmable controller and the inverter.

RUN	LINK1	LINK2
ON	Blinking*1	

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

> **NOTE**
>
> - If the FR-A800-GN cannot be detected, on the menu bar select [Diagnostics (D)] → [CC Link IE TSN / CC Link IE Field Diagnostics]. The "CC Link IE TSN / CC Link IE Field Diagnostics" window will be displayed. Broken or disconnected wires can be detected.
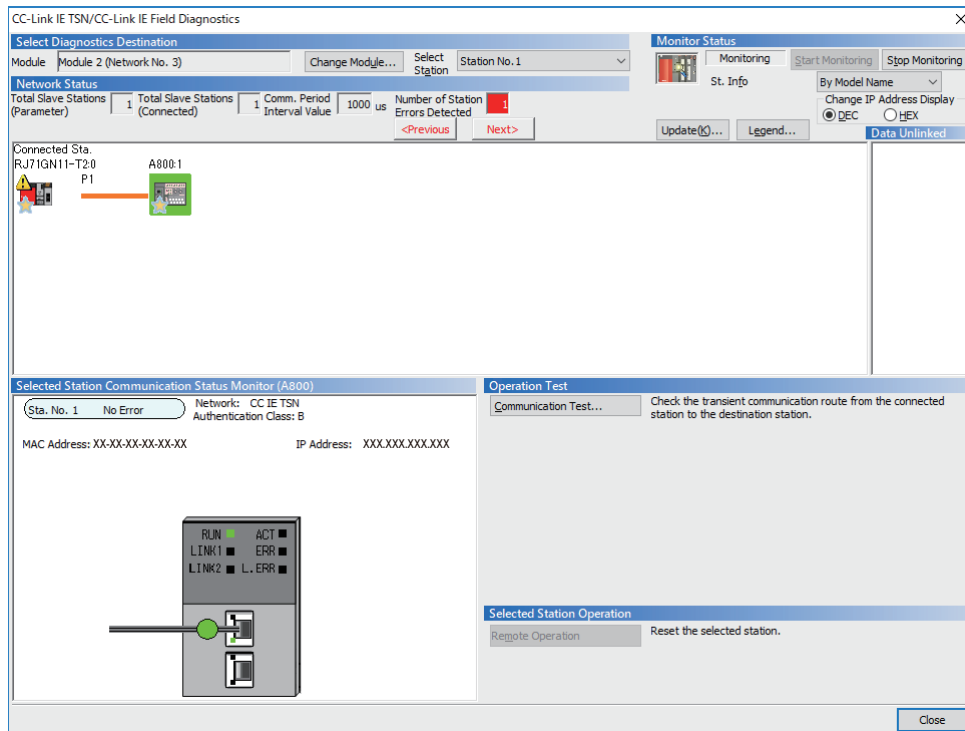
- If the "L.ERR" LED blinks and "◻⌐ ⌐" (duplicate IP address) or "⌐ ⌐" (IP address error) appears on the operation panel, check the rotary switch setting. (Refer to **page 45**.)

2 PARAMETER

2.1 Parameter list (by parameter number)

The following parameters are dedicated to CC-Link IE TSN communication. Set the parameters according to application. For other parameters, refer to the Instruction Manual (Detailed) of the FR-A800 inverter.

Pr.	Pr. group	Name	Setting range	Minimum setting increments	Initial value	Refer to page	Customer setting
79	D000	Operation mode selection	0 to 4, 6, 7	1	0	**19**	
340	D001	Communication startup mode selection	0 to 2, 10, 12	1	0	**19**	
342	N001	Communication EEPROM write selection	0, 1	1	0	**14**	
349	—	Communication reset selection/Ready bit status selection/Reset selection when inverter errors cleared	0, 1, 100, 101, 1000, 1001, 1100, 1101	1	0	**14**	
	N010	Communication reset selection	0, 1	1	0	**14**	
	N240	Ready bit status selection	0, 1	1	0	**14**	
	N241	Reset selection when inverter errors cleared	0, 1	1	0	**14**	
434	N700	IP address 1	0 to 255	1	0 (192∗1)	**20**	
435	N701	IP address 2	0 to 255	1	0 (168∗1)	**20**	
436	N702	IP address 3	0 to 255	1	0 (50∗1)	**20**	
437	N703	IP address 4	0 to 255	1	0 (2∗1)	**20**	
438	N710	Subnet mask 1	0 to 255	1	0 (255∗1)	**20**	
439	N711	Subnet mask 2	0 to 255	1	0 (255∗1)	**20**	
440	N712	Subnet mask 3	0 to 255	1	0 (255∗1)	**20**	
441	N713	Subnet mask 4	0 to 255	1	0 (255∗1)	**20**	
502	N013	Stop mode selection at communication error	0 to 4, 11, 12	1	0	**14**	
541	N100	Frequency command sign selection	0, 1	1	0	**24**	
779	N014	Operation frequency during communication error	0 to 590 Hz, 9999	0.01 Hz	9999	**14**	
804	D400	Torque command source selection	0 to 6	1	0	**24**	
810	H700	Torque limit input method selection	0 to 2	1	0	**24**	
1130	N741	Link speed selection	0, 1	1	0	**20**	
1442	N760	IP filter address 1 (Ethernet)	0 to 255	1	0	**20**	
1443	N761	IP filter address 2 (Ethernet)	0 to 255	1	0	**20**	
1444	N762	IP filter address 3 (Ethernet)	0 to 255	1	0	**20**	
1445	N763	IP filter address 4 (Ethernet)	0 to 255	1	0	**20**	
1446	N764	IP filter address 2 range specification (Ethernet)	0 to 255, 9999	1	9999	**20**	
1447	N765	IP filter address 3 range specification (Ethernet)	0 to 255, 9999	1	9999	**20**	
1448	N766	IP filter address 4 range specification (Ethernet)	0 to 255, 9999	1	9999	**20**	
1459	N746	Clock source selection	0 to 2	1	0	**24**	

∗1   The initial value after all parameters have been cleared.

2.2 Parameter list (by function group)

◆D: Operation command and frequency command

Parameters that specify the inverter's command source, and parameters that set the motor driving frequency and torque.

Pr. group	Pr.	Name	Refer to page
D000	79	Operation mode selection	19
D001	340	Communication startup mode selection	19
D400	804	Torque command source selection	24

◆H: Protective function parameter

Parameters to protect the motor and the inverter.

Pr. group	Pr.	Name	Refer to page
H700	810	Torque limit input method selection	24

◆N: Operation via communication and its settings

Parameters for communication operation. These parameters set the communication specifications and operation.

Pr. group	Pr.	Name	Refer to page
N001	342	Communication EEPROM write selection	14
N010	349	Communication reset selection/ Ready bit status selection/Reset selection when inverter errors cleared	14
N013	502	Stop mode selection at communication error	14
N014	779	Operation frequency during communication error	14
N100	541	Frequency command sign selection	24
N240	349	Ready bit status selection	14
N241	349	Reset selection when inverter errors cleared	14
N700	434	IP address 1	20
N701	435	IP address 2	20
N702	436	IP address 3	20
N703	437	IP address 4	20
N710	438	Subnet mask 1	20
N711	439	Subnet mask 2	20
N712	440	Subnet mask 3	20
N713	441	Subnet mask 4	20
N741	1130	Link speed selection	20
N746	1459	Clock source selection	24
N760	1442	IP filter address 1 (Ethernet)	20
N761	1443	IP filter address 2 (Ethernet)	20
N762	1444	IP filter address 3 (Ethernet)	20
N763	1445	IP filter address 4 (Ethernet)	20
N764	1446	IP filter address 2 range specification (Ethernet)	20

Pr. group	Pr.	Name	Refer to page
N765	1447	IP filter address 3 range specification (Ethernet)	20
N766	1448	IP filter address 4 range specification (Ethernet)	20

2

PARAMETER | **13**

2.3 (N) Operation via communication and its settings

Purpose	Parameter to set			Refer to page
To start operation via communication	Initial setting of operation via communication	P.N001, P.N010, P.N013, P.N014, P.N240, P.N241	Pr.342, Pr.349, Pr.502, Pr.779	14
To start operation via CC-Link IE TSN	Initial setting of CC-Link IE TSN communication	P.N700 to P.N703, P.N710 to P.N713, P.N741, P.N760 to P.N766	Pr.434 to Pr.441, Pr.1130, Pr.1442 to Pr.1448	20
	CC-Link IE TSN communication function	P.N100, P.D400, P.H700, P.N746	Pr.541, Pr.804, Pr.810, Pr.1459	24

2.3.1 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 N001	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/Ready bit status selection/Reset selection when inverter errors cleared	0	0	Enables the error reset function in any operation mode.
			1	Enables the error reset function only in the Network operation mode.
			100, 101[1][2]	The status of Ready bit in communication data can be selected.
			1000, 1001, 1100, 1101[2]	When the communication option is specified for the command source in Network operation mode, it is possible to select whether the inverter is reset after the "Fault reset" command is executed.
N010	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.
N240	Ready bit status selection	0	0	The status of Ready bit in communication data can be selected.
			1[1][2]	
N241	Reset selection when inverter errors cleared	0	0	When the communication option is specified for the command source in Network operation mode, it is possible to select whether the inverter is reset after the "Fault reset" command is executed.
			1[2]	

Pr.	Name	Initial value	Setting range	Description		
					Inverter operation when a communication error occurs	**Inverter operation after a communication error is cleared**
502 N013	Stop mode selection at communication error	0	0		Output shutoff "E.OP1" indication ALM signal output	Output stop status continues. ("E.OP1" indication)
			1		Output to decelerate and stop the motor "E.OP1" indication after stop ALM signal output after stop	Output stop status continues. ("E.OP1" indication)
			2		Output to decelerate and stop the motor "E.OP1" indication after stop	Restart
			3		Operation continues at the frequency set in **Pr.779**.	Normal
			4		Operation continues at the frequency set in **Pr.779**. "CF" warning indication	Normal
			11		Deceleration stop according to the setting of **Pr.111**. "E.OP1" indication after stop ALM signal output after stop	Output stop status continues. ("E.OP1" indication)
			12		Deceleration stop according to the setting of **Pr.111**. "E.OP1" indication after stop	Restart
779 N014	Operation frequency during communication error	9999	0 to 590 Hz	Set the frequency for the operation when a communication error occurs.		
			9999	Operation continues at the same frequency before the communication error.		

∗1   Available when the FR-A8ND or FR-A8NF is installed. Not available during operation via CC-Link IE TSN.

∗2   Available when the HMS network option is installed. Not available during operation via CC-Link IE TSN.

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GROUP
N

PARAMETER 15

◆Communication EEPROM write selection (Pr.342)

- When parameter write is performed via the inverter PU connector, RS-485 terminal, USB communication, or a communication option, the parameters storage device can be changed to RAM only from both EEPROM and RAM. Use this function if parameter settings are changed frequently.
- When changing the parameter values frequently, set "1" in **Pr.342 Communication EEPROM write selection** to write them to the RAM only. The life of the EEPROM will be shorter if parameter write is performed frequently with the setting unchanged from "0 (initial value)" (EEPROM write).

> **NOTE**
> - Turning OFF the inverter's power supply clears the modified parameter settings when **Pr.342** = "1" (write 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.)

◆Operation selection at a communication error (Pr.502, Pr.779)

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

Fault description	Pr.502 setting	Operation	Indication	Fault output
Communication line	0	Continued∗1	Normal∗1	Not output∗1
	1, 11			
	2, 12			
	3			
	4			
Communication option itself	0, 3	Output shutoff	"E. 1"	Provided
	1, 2, 11, 12	Output to decelerate and stop the motor	"E. 1" after stop	Provided after stop
	4	Continued	"CF" warning	Not output

∗1 When the communication returns to normal within the time period set in **Pr.500**, the protective function (E.OP1) is not activated.

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

Fault description	Pr.502 setting	Operation	Indication	Fault output
Communication line	0	Output shutoff	"E.OP1"	Provided
	1, 11	Output to decelerate and stop the motor	"E.OP1" after stop	Provided after stop
	2, 12			Not output
	3	Continues operation with the **Pr.779** setting.∗3	Normal	
	4		"CF" warning	
Communication option itself	0, 3	Output stop status continues.∗2	"E.1" kept∗2	Kept provided∗2
	1, 2, 11, 12			
	4	Continues operation with the **Pr.779** setting.∗3	"CF" warning	Not output

∗2 When an error occurs, the inverter outputs a command to decelerate the motor or shuts off the output, and outputs the fault, independently of the **Pr.500** setting.
∗3 Under position control, the operation is continued to the target position.

- Operation at error removal

Fault description	Pr.502 setting	Operation	Indication	Fault output
Communication line	0	Output stop status continues.	"E.OP1" kept	Kept provided
	1, 11			
	2, 12	Restart∗4	Normal	Not output
	3	Normal		
	4			
Communication option itself	0, 3	Output stop status continues.	"E. 1" kept	Kept provided
	1, 2, 11, 12			
	4	Continues operation with the **Pr.779** setting.	"CF" warning	Not output

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

- The motor is decelerated to a stop according to the setting of **Pr.111 Third deceleration time** when an error occurs while **Pr.502** = "11 or 12".

Pr.502 setting	Operation to a stop at a communication error occurrence
0	Output shutoff
1 to 4	Deceleration stop according to the selected deceleration time (selectable using the RT or X9 signal)
11, 12	Deceleration stop according to the setting of **Pr.111**

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

Pr.502 = "0 (initial value)"

Pr.502 = "1, 11"

Pr.502 = "2, 12"

Pr.502 = "3"

Pr.502 = "4"
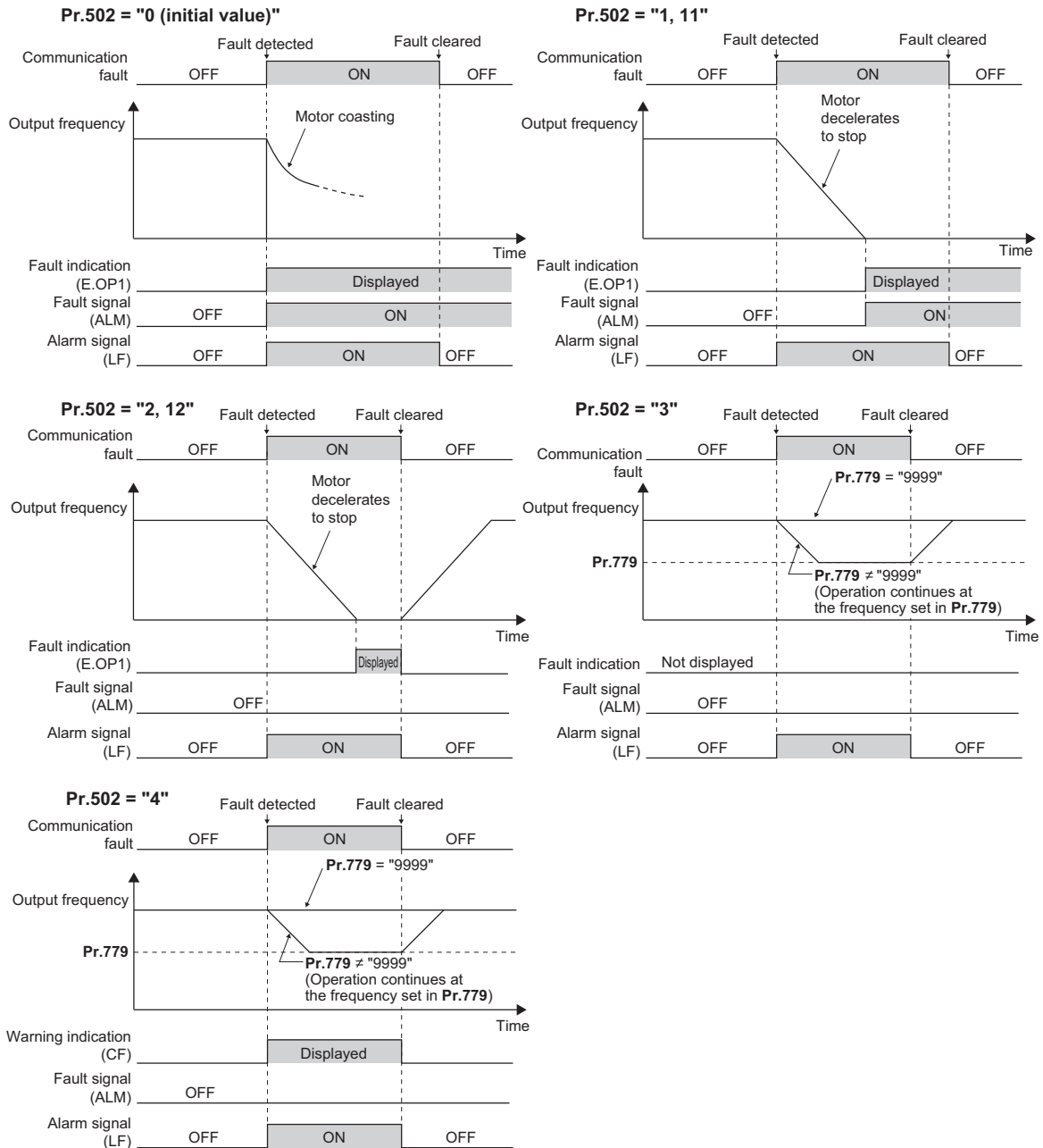
(N) Operation via communication and its settings

- The following charts show operations when a communication option is used and a fault occurs.

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

Pr.502 = "1, 2, 11 or 12"

Pr.502 = "4"
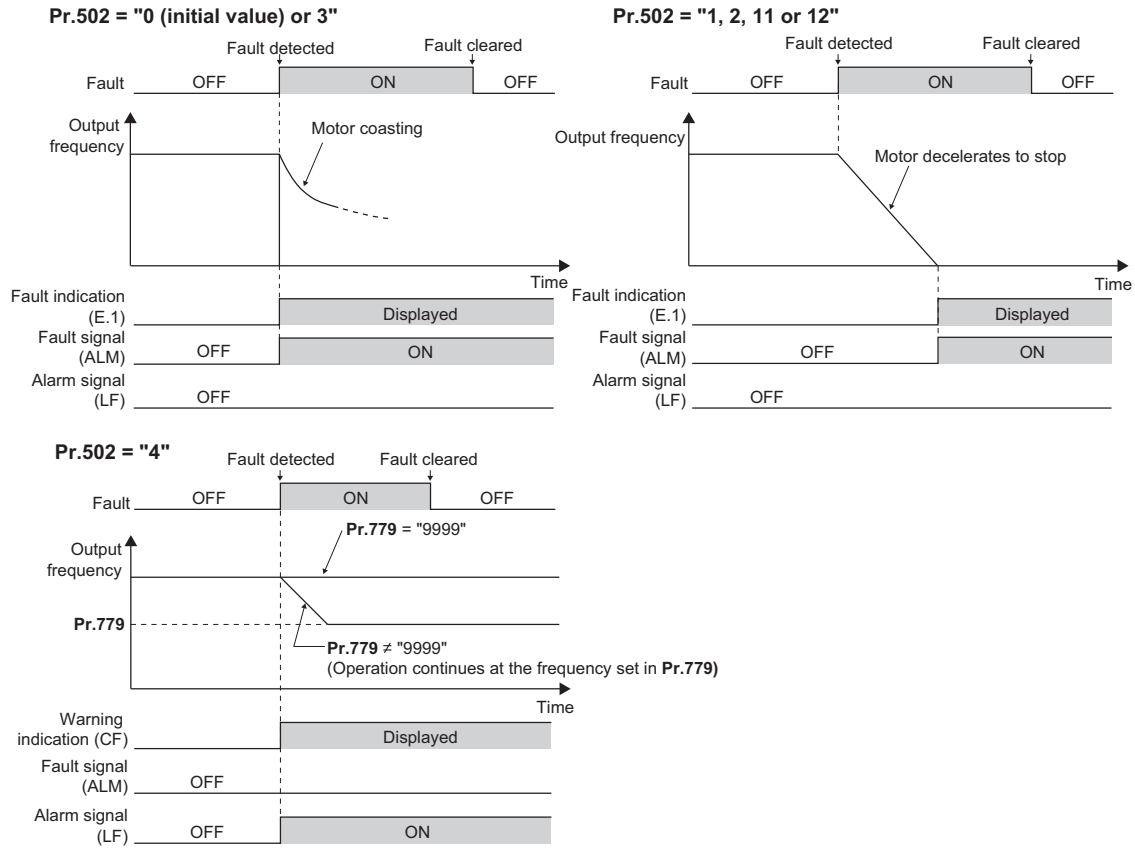
NOTE

- The protective function [E.OP1 (fault data: HA1)] is activated at error occurrences on the communication line. The protective function [E.1 (fault data: HF1)] is activated at error occurrences in the communication circuit inside the option.
- Fault output indicates the fault (ALM) signal and fault bit output.
- When the fault output setting is active, fault records are stored in the fault history. (A fault record is written to the fault history at a fault output.)
- When the fault output setting is not active, fault record is overwritten to the fault 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 fault history.
- When **Pr.502** is set to "1 to 4", the normal deceleration time setting (such as **Pr.8**/**Pr.44**/**Pr.45** setting) is applied.
- When a communication line error occurs while **Pr.502** = "2 or 12", the motor re-accelerates if the error is removed during deceleration. The operation command and the speed command before the fault occurred will be applied for restarting. The normal acceleration time setting (such as **Pr.7**/**Pr.44** setting) is applied for restart. (Acceleration is not restarted if the error is that of the option unit itself.)

⚠ **CAUTION**

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

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

- An error reset command from communication option can be invalid in the External operation mode or PU operation mode. Use RY3A for an error reset command from network. (Refer to **page 30**.)

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
100, 101∗1	The status of Ready bit in communication data can be selected. (Refer to the Instruction Manual (Detailed).)
1000, 1001, 1100, 1101∗1	When the communication option is specified for the command source in Network operation mode, it is possible to select whether the inverter is reset after the "Fault reset" command is executed. (Refer to the Instruction Manual (Detailed).)

∗1　Not available during operation via CC-Link IE TSN.

◆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. (Refer to **page 41** for a program example for parameter write.)

```
NOTE
```
- The changed value in **Pr.340** is applied after the next power-ON or inverter reset.
- The **Pr.340** setting can be changed on the operation panel in any operation mode.
- When setting a value other than "0" in **Pr.340**, make sure that the communication settings of the inverter are correct.

◀◀▌ **Parameters referred to** ▐▶▶

Pr.7 Acceleration time, Pr.8 Deceleration time, Pr.111 Third deceleration time ☞ **Instruction Manual (Detailed) of the FR-A800 inverter**
Pr.79 Operation mode selection ☞ **Instruction Manual (Detailed) of the FR-A800 inverter**
Pr.340 Communication startup mode selection ☞ **Instruction Manual (Detailed) of the FR-A800 inverter**

2.3.2 Initial settings for CC-Link IE TSN communication

Use the following parameters to perform required settings for CC-Link IE TSN 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
434 N700*1	IP address 1	0 (192*2)	0 to 255	Enter the IP address of the inverter to be connected to CC-Link IE TSN.
435 N701*1	IP address 2	0 (168*2)		
436 N702*1	IP address 3	0 (50*2)		
437 N703*1	IP address 4	0 (2*2)		
438 N710*1	Subnet mask 1	0 (255*2)	0 to 255	Enter the subnet mask of the network to which the inverter belongs.
439 N711*1	Subnet mask 2	0 (255*2)		
440 N712*1	Subnet mask 3	0 (255*2)		
441 N713*1	Subnet mask 4	0		
1130 N741*1	Link speed selection	0	0, 1	Set the communication speed.
1442 N760*1	IP filter address 1 (Ethernet)	0	0 to 255	Set the range of connectable IP addresses for the network devices. (When **Pr.1442 to Pr.1445** = "0 (initial value)", the function is invalid.)
1443 N761*1	IP filter address 2 (Ethernet)	0		
1444 N762*1	IP filter address 3 (Ethernet)	0		
1445 N763*1	IP filter address 4 (Ethernet)	0		
1446 N764*1	IP filter address 2 range specification (Ethernet)	9999	0 to 255, 9999	
1447 N765*1	IP filter address 3 range specification (Ethernet)	9999		
1448 N766*1	IP filter address 4 range specification (Ethernet)	9999		

*1 The setting is applied after an inverter reset or power-ON.
*2 The initial value after all parameters have been cleared.

◆IP address setting

For CC-Link IE TSN communication, the IP address of the inverter is set using the rotary switches on the CC-Link IE TSN communication circuit board or inverter parameters. Note that the rotary switch setting has a higher priority than the parameter setting (when the rotary switch settings are "1 to 254").

For CC-Link IE TSN communication, the third octet of the inverter's IP address is used as the network No. and the fourth octet is used as the station number. (Enter the IP address assigned by the network administrator.)
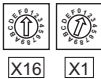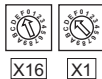
◆ Setting the IP address with the rotary switches

Set a value other than "0 (H00)" or "255 (HFF)" to specify a station number using the rotary switches. The setting range is from "1 (H01)" to "254 (HFE)". The setting is applied after an inverter reset or at the next power-ON.

IP address	Description
First octet	The settings of the master station are used. (The settings from **Pr.434 to Pr.436** are invalid.)
Second octet	
Third octet	
Fourth octet	The rotary switch setting is enabled regardless of the setting in **Pr.437**.

Set the arrow (⇧) of each switch to the number or letter (0-9, A-F) corresponding to the desired station number.

• Setting example

Setting for station number 1 (H01): Set the arrow (⇧) of X16 to "0" and the arrow (⇧) of X1 to "1". X16 X1	Setting for station number 254 (HFE): Set the arrow (⇧) of X16 to "F" and the arrow (⇧) of X1 to "E". X16 X1

NOTE

- Set the rotary switches before turning ON the inverter. Do not change the setting while the power is ON. Doing so may cause an electric shock.
- Set the rotary switch exactly onto one of the numbers. Otherwise normal data communication cannot be established.
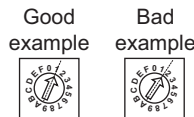
Good example   Bad example

- Set a unique station number. (If different devices have the same station number, communication cannot be performed properly. If an error occurs due to a duplicated number, assign the station number correctly, then reset the master or the inverter power.)
- Station numbers do not have to be consecutive numbers.
- The rotary switch setting can be displayed on the operation panel when "45" is set in **Pr.52 Operation panel main monitor selection**.

◆ Setting the IP address with parameters (Pr.434 to Pr.437)

Set the rotary switches to "0 (H00) or 255 (HFF)" to specify the IP address of the inverter using **Pr.434 to Pr.437**.
The setting is applied after an inverter reset or at the next power-ON.

IP address	Description
First octet	**Pr.434**
Second octet	**Pr.435**
Third octet	**Pr.436**
Fourth octet	**Pr.437**

- Enter the inverter network number in **Pr.436 IP address 3**.
- The setting range of **Pr.436** is "0 to 255", but its active range is "1 to 254". The values out of the active range are invalid because such values cannot be transmitted to the master station.
- Use **Pr.437 IP address 4** to enter the station number of the inverter.
- The setting range of **Pr.437** is "0 to 255", but its active range is "1 to 254". The values out of the active range are invalid because such values cannot be transmitted to the master station.

NOTE

- Set a unique station number. (If different devices have the same station number, communication cannot be performed properly. If an error occurs due to a duplicated number, assign the station number correctly, then reset the master or the inverter power.)
- Station numbers do not have to be consecutive numbers.

◆Subnet mask setting (Pr.438 to Pr.441)

When the inverter station number is specified using the rotary switches on the CC-Link IE TSN communication circuit board, the setting in the master is used for the subnet mask setting. (The settings from **Pr.438 to Pr.441** are invalid.) When the rotary switches are set to "0 (H00) or 255 (HFF)", enter the subnet mask of the network to which the inverter belongs in **Pr.438 to Pr.441**.

Set the value in the first octet in **Pr.438**.
Set the value in the second octet in **Pr.439**.
Set the value in the third octet in **Pr.440**.
Set the value in the fourth octet in **Pr.441**.

* * * . * * * . * * * . * * *
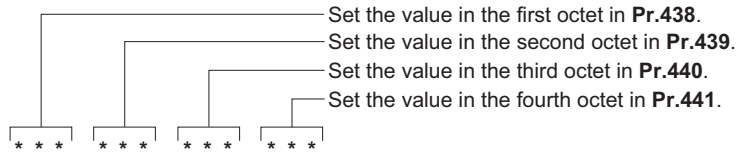
◆Selecting the communication speed (Pr.1130)

Set the communication speed using **Pr.1130 Link speed selection**.

Pr.1130 setting	Communication speed
0 (initial value)	1 Gbps
1	100 Mbps

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

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

[Setting example 1]

	Pr.1442	Pr.1443	Pr.1444	Pr.1445
IP filter address (Ethernet)	192	168	1	100

The range is between the values set in both parameters.

The range is between the values set in both parameters.

	Pr.1446	Pr.1447	Pr.1448
IP filter address range specification (Ethernet)	—	9999	3	150

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]

	Pr.1442	Pr.1443	Pr.1444	Pr.1445
IP filter address (Ethernet)	192	168	2	100

The range is between the values set in both parameters.

	Pr.1446	Pr.1447	Pr.1448
IP filter address range specification (Ethernet)	—	9999	9999	50

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

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

⚠️ **CAUTION**

● **The IP filtering function (Ethernet) (Pr.1442 to Pr.1448) 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 this product and the system against unauthorized access from external sources, take security measures in addition to this function. Mitsubishi Electric Corporation will not take any responsibility for any problems with 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.)

2.3.3 CC-Link IE TSN communication function

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

Pr.	Name	Initial value	Setting range	Description
541 N100	Frequency command sign selection	0	0	Frequency command without sign
			1	Frequency command with sign
804 D400	Torque command source selection	0	0 to 6	In the torque control mode, the torque command source can be selected.
810 H700	Torque limit input method selection	0	0 to 2	The torque limit input method can be selected.
1459 N746∗1	Clock source selection	0	0 to 2	The internal clocks of connected devices on the network can be synchronized.

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

◆Frequency command with sign (Pr.541)

- By adding a sign to the frequency command value, the start command (forward/reverse rotation) can be inverted to start operation.
- The **Pr.541 Frequency command sign selection** setting is applied to the frequency command from RWw0. (Refer to **page 32**.)

Speed setting using Pr.37 and Pr.144	Pr.541 setting	Sign	Setting range	Actual frequency command
Not used	0	Not used	0 to 59000	0 to 590.00 Hz
	1	With	-32768 to 32767 (two's complement)	-327.68 to 327.67 Hz
With	0	Not used	0 to 65535	It depends on **Pr.37, Pr.144, Pr.811** (in 1 or 0.1 increments)
	1	With	-32768 to 32767 (two's complement)	

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

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

⋯⋯ **NOTE** ⋯⋯

　　　　　　　　• When **Pr. 541** = 1 (with sign)
　　　　　　　　　- When EEPROM write is specified with the RY22, write mode error (error code H01) will occur.
　　　　　　　　　- When both RY21 and RY22 are turned ON, RY21 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.
　　　　　　　　• Setting "1 or 11" in **Pr.811 Set resolution switchover** changes the increments from 1 r/min to 0.1 r/min.

◆Time synchronization (Pr.1459)

The internal clocks of connected devices on the CC-Link IE TSN Network can be synchronized (real time clock function).

The clock source will change depending on the setting of **Pr.1459 Clock source selection** and whether the FR-LU08 is installed or not.

Pr.1459 setting	FR-LU08	Clock source
0 (initial value)	Installed	FR-LU08
	Not installed	Master
1	Installed	FR-LU08
	Not installed	No synchronization
2	Installed∗1	Master
	Not installed	

    ∗1   The clock of the FR-LU08 is not synchronized with the master.

⌁ NOTE

- To adjust the clock in the FR-LU08, set **Pr.1006 to Pr.1008** on the FR-LU08.

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

- The clock of the inverter is adjusted every minute according to the received clock data.

- The time of the master must be set when the master is used as the clock source.

    The setting values must be within the following range.

Date	Range
Year	2010 to 2099
Month	1 to 12
Day	1 to 31 (The maximum value differs depending on the month.)

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PARAMETER ┃ **25**

◆I/O signal list

• Remote I/O (64 points fixed)

Device No. *5	Signal	Refer to page	Device No. *5	Signal	Refer to page
RYn0	Forward rotation command *2	30	RXn0	Forward running	31
RYn1	Reverse rotation command *2	30	RXn1	Reverse running	31
RYn2	High-speed operation command (terminal RH function) *1	30	RXn2	Running (terminal RUN function) *3	31
RYn3	Middle-speed operation command (terminal RM function) *1	30	RXn3	Up to frequency (terminal SU function) *3	31
RYn4	Low-speed operation command (terminal RL function) *1	30	RXn4	Overload alarm (terminal OL function) *3	31
RYn5	Jog operation selection (terminal Jog function) *1	30	RXn5	Instantaneous power failure (terminal IPF function) *3	31
RYn6	Second function selection (terminal RT function) *1	30	RXn6	Frequency detection (terminal FU function) *3	31
RYn7	Current input selection (terminal AU function) *1	30	RXn7	Error (terminal ABC1 function) *3	31
RYn8	Selection of automatic restart after instantaneous power failure (terminal CS function) *1	30	RXn8	— (terminal ABC2 function) *3	31
RYn9	Output stop (terminal MRS function) *1	30	RXn9 to RXnF	Reserved	—
RYnA	Start self-holding selection (terminal STOP function) *1	30			
RYnB	Reset (terminal RES function) *1	30			
RYnC to RYnF	Reserved	—	RX(n+1)0	**Pr.313** assignment function (DO0) *4	31
			RX(n+1)1	**Pr.314** assignment function (DO1) *4	31
RY(n+1)0 to RY(n+1)F			RX(n+1)2	**Pr.315** assignment function (DO2) *4	31
			RX(n+1)3 to RX(n+1)F	Reserved	—
RY(n+2)0	Monitor command	30	RX(n+2)0	Monitoring	31
RY(n+2)1	Frequency setting command (RAM)	30	RX(n+2)1	Frequency setting completion (RAM)	31
RY(n+2)2	Frequency setting command (RAM, EEPROM)	30	RX(n+2)2	Frequency setting completion (RAM, EEPROM)	31
RY(n+2)3	Torque command / torque limit (RAM)	30	RX(n+2)3	Torque command / torque limit setting completion (RAM)	31
RY(n+2)4	Torque command / torque limit (RAM, EEPROM)	30	RX(n+2)4	Torque command / torque limit setting completion (RAM, EEPROM)	31
RY(n+2)5	Instruction code execution request	30	RX(n+2)5	Instruction code execution completion	31
RY(n+2)6 to RY(n+3)9	Reserved	—	RX(n+2)6 to RX(n+3)9	Reserved	—
RY(n+3)A	Error reset request flag	30	RX(n+3)A	Error status flag	31
RY(n+3)B to RY(n+3)F	Reserved	—	RX(n+3)B	Remote station ready	31
			RX(n+3)C to RX(n+3)F	Reserved	—

*1 These signals are set in the initial values. Using **Pr. 180 to Pr. 189**, you can change input signal functions.
Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr. 180 to Pr. 189**.

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

*3 These signals are set in the initial values. Using **Pr. 190 to Pr. 196**, you can change output signal functions.
Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr. 190 to Pr. 196**.

*4 Output signal can be assigned using **Pr. 313 to Pr. 315**.
The settings of **Pr.313 to Pr.315** are the same as those of **Pr.190 to Pr.196 (output terminal function selection)**.
Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr. 190 to Pr. 196**.

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

• Remote register (128 words fixed)

Address [3]	Description		Refer to page	Address [3]	Description		Refer to page
	Upper 8 bits	Lower 8 bits			Upper 8 bits	Lower 8 bits	
RWwn	Set frequency (0.01 Hz increments)		**32**	RWrn	Reply code		**33**
RWwn+1	Reserved		—	RWrn+1	Reserved		—
RWwn+2	Torque command / torque limit		**32**	RWrn+2	Reply code		**33**
RWwn+3	Reserved		—	RWrn+3	Reserved		—
RWwn+4	PID set point (0.01% increments) [1]		**32**	RWrn+4	Reply code		**33**
RWwn+5	PID measured value (0.01% increments) [1]		**32**	RWrn+5	Reply code		**33**
RWwn+6	PID deviation (0.01% increments) [1]		**32**	RWrn+6	Reply code		**33**
RWwn+7 to RWwn+F	Reserved		—	RWrn+7 to RWrn+F	Reserved		—
RWwn+10	Link parameter extended setting	Instruction code [2]	**32**	RWrn+10	Reply code		**33**
RWwn+11	Write data		**32**	RWrn+11	Read data [2]		**33**
RWwn+12	Link parameter extended setting	Instruction code [2]	**32**	RWrn+12	Reply code		**33**
RWwn+13	Write data		**32**	RWrn+13	Read data [2]		**33**
RWwn+14	Link parameter extended setting	Instruction code [2]	**32**	RWrn+14	Reply code		**33**
RWwn+15	Write data		**32**	RWrn+15	Read data [2]		**33**
RWwn+16	Link parameter extended setting	Instruction code [2]	**32**	RWrn+16	Reply code		**33**
RWwn+17	Write data		**32**	RWrn+17	Read data [2]		**33**
RWwn+18	Link parameter extended setting	Instruction code [2]	**32**	RWrn+18	Reply code		**33**
RWwn+19	Write data		**32**	RWrn+19	Read data [2]		**33**
RWwn+1A	Link parameter extended setting	Instruction code [2]	**32**	RWrn+1A	Reply code		**33**
RWwn+1B	Write data		**32**	RWrn+1B	Read data [2]		**33**
RWwn+1C to RWwn+1F	Reserved		—	RWrn+1C to RWrn+1F	Reserved		—
RWwn+20	Reserved		—	RWrn+20	Error status		**33**
RWwn+21	Fault history No.		**32**	RWrn+21	Fault history No.	Fault record (fault data)	**33**
RWwn+22 to RWwn+25	Reserved		—	RWrn+22	Fault record (output frequency)		**33**
				RWrn+23	Fault record (output current)		**33**
				RWrn+24	Fault record (output voltage)		**33**
				RWrn+25	Fault record (energization time)		**33**
RWwn+26	Monitor code 1		**32**	RWrn+26	First monitor value		**33**
RWwn+27	Monitor code 2		**32**	RWrn+27	Second monitor value		**33**
RWwn+28	Monitor code 3		**32**	RWrn+28	Third monitor value		**33**
RWwn+29	Monitor code 4		**32**	RWrn+29	Fourth monitor value		**33**
RWwn+2A	Monitor code 5		**32**	RWrn+2A	Fifth monitor value		**33**
RWwn+2B	Monitor code 6		**32**	RWrn+2B	Sixth monitor value		**33**
RWwn+2C	Monitor code 7		**32**	RWrn+2C	Seventh monitor value		**33**
RWwn+2D	Monitor code 8		**32**	RWrn+2D	Eighth monitor value		**33**
RWwn+2E	Monitor code 9		**32**	RWrn+2E	Ninth monitor value		**33**
RWwn+2F	Monitor code 10		**32**	RWrn+2F	Tenth monitor value		**33**

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(N) Operation via communication and its settings

Address *3	Description Upper 8 bits	Description Lower 8 bits	Refer to page	Address *3	Description Upper 8 bits	Description Lower 8 bits	Refer to page
RWwn+30 to RWwn+54	Reserved		—	RWrn+30	Output frequency		**33**
				RWrn+31	Reserved		—
				RWrn+32	output current		**33**
				RWrn+33	output voltage		**33**
				RWrn+34	Reserved		—
				RWrn+35	Frequency setting value		**33**
				RWrn+36	Running speed		**33**
				RWrn+37	Motor torque		**33**
				RWrn+38	Converter output voltage		**33**
				RWrn+39	Regenerative brake duty		**33**
				RWrn+3A	Electric thermal relay function load factor		**33**
				RWrn+3B	Output current peak value		**33**
				RWrn+3C	Converter output voltage peak value		**33**
				RWrn+3D	Input power		**33**
				RWrn+3E	Output power		**33**
				RWrn+3F	Input terminal status		**33**
				RWrn+40	Output terminal status		**33**
				RWrn+41	Load meter		**33**
				RWrn+42	Motor excitation current		**33**
				RWrn+43	Position pulse		**33**
				RWrn+44	Cumulative energization time		**33**
				RWrn+45	Reserved		—
				RWrn+46	Orientation status		**33**
				RWrn+47	Actual operation time		**33**
				RWrn+48	Motor load factor		**33**
				RWrn+49	Cumulative power		**33**
				RWrn+4A	Position command (lower digits)		**33**
				RWrn+4B	Position command (upper digits)		**33**
				RWrn+4C	Current position (lower digits)		**33**
				RWrn+4D	Current position (upper digits)		**33**
				RWrn+4E	Droop pulse (lower digits)		**33**
				RWrn+4F	Droop pulse (upper digits)		**33**
				RWrn+50	Torque command		**33**
				RWrn+51	Torque current command		**33**
				RWrn+52	Motor output		**33**
				RWrn+53	Feedback pulse		**33**
				RWrn+54	Reserved		—

Address [*3]	Description		Refer to page	Address [*3]	Description		Refer to page
	Upper 8 bits	**Lower 8 bits**			**Upper 8 bits**	**Lower 8 bits**	
				RWrn+55	Reserved		—
				RWrn+56	Trace status		**33**
				RWrn+57	Reserved		—
				RWrn+58	PLC function user monitor 1		**33**
				RWrn+59	PLC function user monitor 2		**33**
				RWrn+5A	PLC function user monitor 3		**33**
				RWrn+5B	Station number (RS-485 terminals)		**33**
				RWrn+5C	Station number (PU)		**33**
				RWrn+5D	Station number (CC-Link / CC-Link IE TSN)		**33**
				RWrn+5E to RWrn+61	Reserved		—
				RWrn+62	Power saving effect		**33**
				RWrn+63	Cumulative saving power		**33**
				RWrn+64	PID set point		**33**
RWwn+55 to RWwn+7F	Reserved		—	RWrn+65	PID measured value		**33**
				RWrn+66	PID deviation		**33**
				RWrn+67 to RWrn+69	Reserved		—
				RWrn+6A	Option input terminal status 1		**33**
				RWrn+6B	Option input terminal status 2		**33**
				RWrn+6C	Option output terminal status		**33**
				RWrn+6D	Motor thermal load factor		**33**
				RWrn+6E	Inverter thermal load factor		**33**
				RWrn+6F	Reserved		—
				RWrn+70	PTC thermistor value		**33**
				RWrn+71	Reserved		—
				RWrn+72			
				RWrn+73	PID measured value 2		**33**
				RWrn+74 to RWrn+76	Reserved		—
				RWrn+77	Cumulative pulse		**33**
				RWrn+78	Cumulative pulse carrying-over times		**33**
				RWrn+79	Cumulative pulse (control terminal option)		**33**
				RWrn+7A	Cumulative pulse carrying-over times (control terminal option)		**33**
				RWrn+7B to RWrn+7F	Reserved		—

*1   When **Pr. 128** = "50, 51, 60, 61", they are valid.

*2   Instructions will be processed in the order they are received. Thus, the read value of an instruction may differ at different timings if other writing requests are being made.

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

2

GROUP
N

PARAMETER **29**

◆Details of remote 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	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. • The signals are fixed. They cannot be changed using parameters.
RY1	Reverse rotation command	0: Stop command 1: Reverse rotation start	
RY2	High-speed operation command (terminal RH function)	• Functions assigned to terminals RH, RM, RL, JOG, RT, AU, CS, MRS, STOP and RES are activated. • Signal names are initial values. Using **Pr.180 to Pr.189**, 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, RYB reset (terminal RES function) cannot be controlled via network. Refer to the Instruction Manual (Detailed) of the inverter for the details of **Pr.180 to Pr.189, Pr.338, and Pr.339**.	
RY3	Middle-speed operation command (terminal RM function)		
RY4	Low-speed operation command (terminal RL function)		
RY5	Jog operation selection (terminal JOG function)		
RY6	Second function selection (terminal RT function)		
RY7	Current input selection (terminal AU function)		
RY8	Selection of automatic restart after instantaneous power failure (terminal CS function)		
RY9	Output stop (terminal MRS function)		
RYA	Start self-holding selection (terminal STOP function)		
RYB	Reset (RES terminal function)		
RY20	Monitor command	When "1" is set in the monitor command (RY20), the monitored value is set in the remote register RWr26 to RWr2F, and "1" is set in the monitoring (RX20). While "1" is set in the monitor command (RY20), the monitored data is always updated.	
RY21	Frequency setting command (RAM)	When "1" is set in the frequency setting command (RY21), the set frequency (RWw0) is written to RAM of the inverter. While "1" is set, the set frequency (RWw0) is always applied. After the writing completes, "1" is set in the frequency setting completion (RX21).	
RY22	Frequency setting command (RAM, EEPROM)	When "1" is set in the frequency setting command (RY22), the set frequency (RWw0) is written to RAM and EEPROM of the inverter. After the writing completes, "1" is set in the frequency setting completion (RX22). To change the frequency consecutively, be sure to write data only to the inverter RAM.	
RY23	Torque command / torque limit (RAM)	When "1" is set in the torque command / torque limit (RY23), the set torque command / torque limit (RWw2) is written to RAM of the inverter. After the writing completes, "1" is set in the torque command / torque limit setting completion (RX23). The following value is written to RAM. • During torque control *1: Torque command value • During speed control / position control: Torque limit value	
RY24	Torque command / torque limit (RAM, EEPROM)	When "1" is set in the torque command / torque limit (RY24), the set torque command / torque limit (RWw2) is written to RAM and EEPROM of the inverter. After the writing completes, "1" is set in the torque command / torque limit setting completion (RX24). The following value is written to RAM and EEPROM. • During torque control *1: Torque command value • During speed control / position control: Torque limit value To change the torque command or the torque limit consecutively, be sure to write data to the inverter RAM.	
RY25	Instruction code execution request	When "1" is set in the instruction code execution request (RY25), processes corresponding to the instruction codes set to RWw10, 12, 14, 16, 18 and 1A are executed. "1" is set in the instruction code execution request (RX25) after completion of instruction codes. When an instruction code execution error occurs, a value other than "0" is set in the reply code (RWr10, 12, 14, 16, 18 and 1A).	
RY3A	Error reset request flag	When "1" is set in the error reset request flag (RY3A) at an inverter fault, the inverter is reset, then "0" is set in the error status flag (RX3A). Refer to **page 19** for operation conditions of inverter reset.	

∗1   Torque control cannot be performed with a PM motor.

◆ **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	Running (terminal RUN function)	• Functions assigned to terminals RUN, SU, OL, IPF, FU, ABC1 and ABC2 activate. • Signal names are initial values. Using **Pr.190 to Pr.196**, you can change output signal functions. Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.190 to Pr.196**.
RX3	Up to frequency (terminal SU function)	
RX4	Overload alarm (terminal OL function)	
RX5	Instantaneous power failure (terminal IPF function)	
RX6	Frequency detection (terminal FU function)	
RX7	Fault (terminal ABC1 function)	
RX8	— (terminal ABC2 function)	
RX10	— (DO0 function)	• Functions assigned to **Pr.313 to Pr.315** are activated. • No signal is assigned in the initial setting. Use **Pr.313 to Pr.315** to assign signals to the devices RX10 to RX12. The settings of **Pr.313 to Pr.315** are the same as those of **Pr.190 to Pr.196 (output terminal function selection)**. Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.190 to Pr.196**.
RX11	— (DO1 function)	
RX12	— (DO2 function)	
RX20	Monitoring	After "1" is set in the monitor command (RY20), and the monitored value is set in the remote register RWr26 to RWr2F, "1" is set in this signal. When "0" is set in the monitor command (RY20), "0" is set in this signal.
RX21	Frequency setting completion (RAM)	After "1" is set in the frequency setting command (RY21) and the set frequency is written to the inverter RAM, "1" is set in this signal. When "0" is set in the frequency setting command (RY21), "0" is set in this signal.
RX22	Frequency setting completion (RAM, EEPROM)	After "1" is set in the frequency setting command (RY22) and the set frequency is written to the inverter RAM and EEPROM, "1" is set in this signal. When "0" is set in the frequency setting command (RY22), "0" is set in this signal.
RX23	Torque command / torque limit setting completion (RAM)	After "1" is set in the torque command / torque limit (RY23) and the torque command / torque limit value is written to the inverter RAM, "1" is set in this signal. When "0" is set in the torque command / torque limit (RY23), "0" is set in this signal.
RX24	Torque command / torque limit setting completion (RAM, EEPROM)	After "1" is set in the torque command / torque limit (RY24) and the torque command / torque limit value is written to the inverter RAM and EEPROM, "1" is set in this signal. When "0" is set in the torque command / torque limit (RY24), "0" is set in this signal.
RX25	Instruction code execution completion	After "1" is set in the instruction code execution request (RY25) and the processes corresponding to the instruction codes (RWw10, 12, 14, 16, 18 and 1A) are executed, "1" is set in this signal. When "0" is set in the instruction code execution request (RY25), "0" is set in this signal.
RX3A	Error status flag	When an inverter error occurs (protective function is activated), "1" is set in this signal.
RX3B	Remote station ready	When the inverter is ready for communication upon completion of initial setting after power-ON or a hardware reset, "1" is set in this signal. When an inverter error occurs (protective function is activated), "0" is set in this signal.

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◆Details of remote register

❖Remote register (master module to inverter)

• Remote register definition

Device No.	Signal	Description		
RWw0	Set frequency *1, *2	• Specify the set frequency or rotations per minute (machine speed). At this time, whether to write to RAM or EEPROM is decided with the RY21 and RY22 settings. After setting the set frequency in this register, set "1" in RY21 or RY22 to write the frequency. After writing of frequency is completed, "1" is set in RX21 or RX22 in response to the input command. • The setting range is 0 to 590.00 Hz (0.01 Hz increments). Write "59000" when setting 590.00 Hz.		
RWw2 *5	Torque command value	Specify the torque command value / torque limit value. Set **Pr.804 Torque command source selection** = "1, 3, 5, or 6" to activate this signal under Real sensorless vector control, vector control, and PM sensorless vector control. The value is written to the inverter either by RY23 or RY24. **Pr.805 Torque command value (RAM)** and **Pr.806 Torque command value (RAM, EEPROM)** are updated as well. The setting range and setting increments depend on the **Pr.804** setting. (Refer to **page 36**.)		
	Torque limit value			
RWw4	PID set point *3	Set the PID set point Setting range: 0 to 100.00%	• Input a value 100 times greater than the value to be set. For example, input "10000" when setting 100.00%. • Refer to the Instruction Manual (Detailed) of the inverter for details of PID control.	
RWw5	PID measured value *3	Set the PID measured value Setting range: 0 to 100.00%		
RWw6	PID deviation *3	Set the PID deviation. Setting range: -100.00% to 100.00%		
RWw10, RWw12, RWw14, RWw16, RWw18, RWw1A	Link parameter extended setting/ Instruction code	Set an instruction code (refer to **page 34**) for an operation such as operation mode switching, parameter read/write, alarm reference, and alarm clear in the lower eight bits. The instructions are executed in the following order by setting "1" in RY25 after completing the register setting: RWw10, 12, 14, 16, 18, then 1A. After completing the execution up to RWw1A, "1" is set in RX25. Set HFFFF to disable an instruction by RWw10 to 1A. Set the link parameter extended setting in the upper eight bits. Example) When reading **Pr.160**, instruction code is H0200.		
RWw11, RWw13, RWw15, RWw17, RWw19, RWw1B	Write data	Set the data specified by the instruction code of RWw10, 12, 14, 16, 18 and 1A (when required). RWw10, 12, 14, 16, 18, and 1A correspond to RWw11 13, 15, 17, 19, and 1B, respectively. Set "1" in RY25 after setting the instruction codes (RWw10, 12, 14, 16, 18, and 1A) and the corresponding register. Set "0" when the write code is not required.		
RWw21	Fault history No. *4	Set the number of previous faults you want to be able to read in the fault history. Up to 7 previous faults can be read. Last two digits: H00 (most recent fault) to H07 (7th most recent fault) Set H08 to HFF to make the fault history No. to "0."		
RWw26	Monitor code 1 *4	Set the monitor code to be monitored (refer to **page 35**). By setting "1" in RY20 after setting, the specified monitored data is stored in RWr26 to RWr2F. If a monitor code out of the setting range is set, no item is monitored (the monitor value is fixed to 0).		
RWw27	Monitor code 2 *4			
RWw28	Monitor code 3 *4			
RWw29	Monitor code 4 *4			
RWw2A	Monitor code 5 *4			
RWw2B	Monitor code 6 *4			
RWw2C	Monitor code 7 *4			
RWw2D	Monitor code 8 *4			
RWw2E	Monitor code 9 *4			
RWw2F	Monitor code 10 *4			

*1   Setting increment differs according to the combination of **Pr.37, Pr.144, and Pr.811**.
     Refer to the Instruction Manual (Detailed) of the inverter for the details.
*2   When **Pr.541 Frequency command sign selection** = "1", the setting value has either + or -. When the setting value is negative, the command is the inverse from the command.
     Setting range: -327.68 Hz to 327.67 Hz (-327.68 to 327.67) 0.01 Hz increments.
     For details refer to **page 24**.
*3   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 Instruction Manual (Detailed) of the inverter for details of **Pr.128**.
*4   Write data is in hexadecimal, and only two digits are valid. (The upper two digits are ignored.)
*5   The value in RWw2 is used as the torque limit value during speed control or position control, and as the torque command value during torque control. (Torque control cannot be performed with a PM motor.) To use the value as the torque limit value, set **Pr.810** = "2".

◆ **Remote register (inverter to master module)**

• Remote register definition

Device No.	Signal	Description
RWr0	Reply code	When "1" is set in RY21 or RY22, the following reply codes are set for the frequency setting command. The setting value "0" is set normally, and a value other than "0" is set at an error. | Value	Description
---	---
H0000	Normal
H0001	Write mode fault
H0003	Setting range fault	
RWr2	Reply code	When "1" is set in RY23 or RY24, the following reply codes are set for the torque command / torque limit. The setting value "0" is set normally, and a value other than "0" is set at an error. | Value	Description
---	---
H0000	Normal
H0003	Setting range fault	
RWr4, RWr5, RWr6	Reply code	When the PID command (RWw4 to RWw6) is set, the following reply code is set for the PID command. The setting value "0" is set normally, and a value other than "0" is set at an error. | Value	Description
---	---
H0000	Normal
H0003	Setting range fault	
RWr10, RWr12, RWr14, RWr16, RWr18, RWr1A	Reply code	When "1" is set in RY25, the following reply codes corresponding to the instruction code RWw10, 12, 14, 16, 18, and 1A are set. The setting value "0" is set normally, and a value other than "0" is set at an error. | Value	Description
---	---
H0000	Normal
H0001	Write mode fault
H0002	Parameter selection fault
H0003	Setting range fault	
RWr11, RWr13, RWr15, RWr17, RWr19, RWr1B	Read data	For a normal reply, the reply data to the instruction specified by the instruction code is set.
RWr20	Error status	The setting value "0" is set during normal inverter operation, and the data code of the corresponding error is set at an error. (For the data codes or details of fault records, refer to the Instruction Manual (Detailed) of the inverter.)
RWr21	Fault record (fault data)	The data code of fault history No. specified by RWw21 is stored in the lower 8bits. Lower 8 bits of RWw21 will be reverted back to the upper 8 bits.
RWr22	Fault record (output frequency)	Output frequency of the fault history No. specified in RWw21 is stored.
RWr23	Fault record (output current)	Output current of the fault history No. specified in RWw21 is stored.
RWr24	Fault record (output voltage)	Output voltage of the fault history No. specified in RWw21 is stored.
RWr25	Fault record (energization time)	Energization time of the fault history No. specified in RWw21 is stored.
RWr26	First monitor value	When "1" is set in RY20, the monitored data specified by the monitor code RWw26 to RWw2F is saved. Output frequency, output current, and output voltage monitors are held at an inverter failure.
RWr27	Second monitor value	
RWr28	Third monitor value	
RWr29	Fourth monitor value	
RWr2A	Fifth monitor value	
RWr2B	Sixth monitor value	
RWr2C	Seventh monitor value	
RWr2D	Eighth monitor value	
RWr2E	Ninth monitor value	
RWr2F	Tenth monitor value	
RWr30 to RWr7F	Monitor value	Fixed monitored data are saved regardless of the RY20 setting. Output frequency, output current, and output voltage monitors are held at an inverter failure.

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◆Instruction codes

Set the instruction code using a remote register (RWw) (refer to **page 32**).

The definition read by the instruction code is stored in the remote register (RWr) (refer to **page 33**).

Item		Read/ write	Code number	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 modes 1 and 2, PUJOG operation mode
		Write	HFB	H0000: Network operation mode H0001: External operation mode H0002: PU operation mode (**Pr.79** = "6", **Pr.340** = "10 or 12")
Monitor	Output frequency *1, *2	Read	H6F	H0000 to HFFFF: Running frequency: 0.01 Hz increments Speed (machine speed): 1 increments *3
	Output current	Read	H70	H0000 to HFFFF: Output current (hexadecimal): Increments 0.01 A/0.1 A *5
	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: Selection of the monitored item (monitor code) (Refer to **page 35**.)
		Write	HF3 *4	If a monitor code out of the range is set, a range error occurs.
	Fault 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 (Detailed) of the inverter.
Set frequency (RAM)		Read	H6D	Read set frequency/speed (machine speed) from RAM or EEPROM. H0000 to HE678: Set frequency: 0.01 Hz increments Speed (machine speed): 1 increments *3
Set frequency (EEPROM)			H6E	
Set frequency (RAM) *6		Write	HED	Write set frequency/speed (machine speed) to RAM or EEPROM. • H0000 to HE678 (0 to 590.00 Hz): Frequency: 0.01 Hz increments • H0000 to H270E (0 to 9998): Speed (machine speed): 1 increments *3 • To change the set frequency consecutively, write data to the inverter RAM. (Instruction code: HED)
Set frequency (RAM and EEPROM) *6		Write	HEE	
Parameter		Read	H00 to H63	• Refer to the instruction code in the Instruction Manual (Detailed) of the inverter to read and write as required. Write to **Pr.77 and Pr.79** is disabled. When setting **Pr.100** and later, set link parameter extended setting.
		Write	H80 to HE3	• 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 14**.)
Fault history batch clear		Write	HF4	H9696: Clears the fault history as a batch.

Fault history diagram (for code H74 to H77):

```
      b15      b8  b7      b0      For instruction code H74,
H74 | Second latest fault | Latest fault |    read data H30A0
H75 | Fourth latest fault | Third latest fault |   b15       b8 b7       b0
H76 | Sixth latest fault  | Fifth latest fault |  0 0 1 1 0 0 0 0 1 0 1 0 0 0 0 0
H77 | Eighth latest fault | Seventh latest fault |
                                               Second latest fault    Latest fault
                                                    (H30)               (HA0)

                                               Second latest fault ...... THT
                                               Latest fault ...... OPT
```

Item	Read/write	Code number	Description
Parameter clear All parameter clear	Write	HFC	All parameters return to the initial values. Whether communication parameters are also cleared or not depends on the data. (O: Cleared, ×: Not cleared) Refer to the Instruction Manual (Detailed) of the inverter for Parameter clear, All parameter clear, and communication parameters. Table: | Clear command	Data	Communication Pr.
Parameter clear	H9696	O
	H5A5A	× *7
All parameter clear	H9966	O
	H55AA	× *7	 When clear is executed with H9696 or H9966, communication parameters 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.
Inverter reset	Write	HFD	H9696: Resets the inverter.
Second parameter changing *8	Read	H6C	Read or write of bias and gain parameters (instruction codes H5E to H61 and HDE to HE1 with the link parameter extended setting = "1", H11 to H23 and H91 to HA3 with the link parameter extended setting = "9").
	Write	HEC	H00: Frequency *9 H01: Analog value set in parameters H02: Analog value input from the terminal

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

*2 When position control is selected, the number of pulses is monitored when **Pr.430** ≠ "9999".

*3 Displayed increments differ according to the combination of **Pr.37, Pr.144, and Pr.811**. For the details, refer to the Instruction Manual (Detailed) of the inverter.

*4 Write data is in hexadecimal, and only two digits are valid. (The upper two digits are ignored.)

*5 Differs according to capacities.

*6 Setting from remote registers (RWw0) can be made.

*7 Turning OFF the power supply while clearing parameters with H5A5A or H55AA sets back the communication parameter settings back to the initial values.

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

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

NOTE

- 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, RWw26 to 2F.

NOTE

- The monitor codes (monitor items) are the same as those of the RS-485 communication dedicated monitor.
  For the details of the monitor code and monitor description, refer to the section of the monitor display in the Instruction Manual (Detailed) of the inverter.
- When the remote registers RWw26 to 2F are used for monitoring, H01 (output frequency) and H05 (set frequency) always indicate the frequency regardless of the settings of **Pr.37, Pr.144, and Pr.811**.

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GROUP
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◆Torque command / torque limit through CC-Link IE TSN communication

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

Pr.	Name	Initial value	Setting range	Description
804	Torque command source selection	0	0	Torque command by terminal1 analog input
			1	Torque command / torque limit through CC-Link IE TSN communication
			3	• Torque command / torque limit (-400% to 400%) by the parameter setting (**Pr.805** or **Pr.806**) [1], [2] • Torque command / torque limit (-400% to 400%) by the remote register RWw2 [2]
			4	Torque command by 16-bit digital input (FR-A8AX)
			5	Torque command / torque limit through CC-Link IE TSN communication
			6	• Torque command / torque limit (-327.68% to 327.67%) by the parameter setting (**Pr. 805** or **Pr. 806**) [1], [2] • Torque command / torque limit (-327.68% to 327.67%) by the remote register RWw2 [2]
810	Torque limit input method selection	0	0	Internal torque limit (torque limited by parameter settings)
			1	External torque limit (torque limited by terminals 1 and 4)
			2	Internal torque limit 2 (torque limited by CC-Link IE TSN)

[1] Can also be set from operation panel or parameter unit.
[2] When a negative value is set as the torque limit, the torque is limited by the absolute value.

◆ RWw2 function according to the parameter settings and the control mode

Set the torque command value or the torque limit value in RWw2. The RWw2 function is switched according to the **Pr.804** and **Pr.810** settings and the control mode.

Pr.804 setting	Pr.810 setting	RWw2 function	
		Speed control / position control	Torque control
1, 3, 5, 6	2	Torque limit	Torque command
	0, 1	RWw2 disabled	Torque command
0, 4	—	RWw2 disabled	RWw2 disabled

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

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

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

◆ Torque command / torque limit setting method

Setting method	Setting procedure
Writing in RWw2	1. Set the torque command / torque limit value in RWw2. 2. Set "1" in RY23 (or RY24).
Writing in **Pr.805** or **Pr.806**	1. Set link parameter extended setting = H08 for RWw10 (12, 14, 16, 18, 1A). 2. Set instruction codes H85 or H86 3. Set the torque command / torque limit value in RWw11 (13, 15, 17, 19, 1B). 4. Set "1" in RY25.

◆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	39
Setting the operation mode	Selecting the Network operation mode	39
Setting the operation commands	Commanding the forward rotation and middle speed signals	40
Setting the monitoring function	Monitoring the output frequency	40
Reading a parameter value	Reading the value of **Pr.7 Acceleration time**	41
Writing a parameter value	Setting "3.0 s" in **Pr.7 Acceleration time**	41
Setting the running frequency (running speed)	Setting to 50.00 Hz	42
Reading the fault records	Reading the inverter faults	43
Inverter reset	Perform inverter reset at an inverter alarm occurrence.	43

• System configuration for programming example
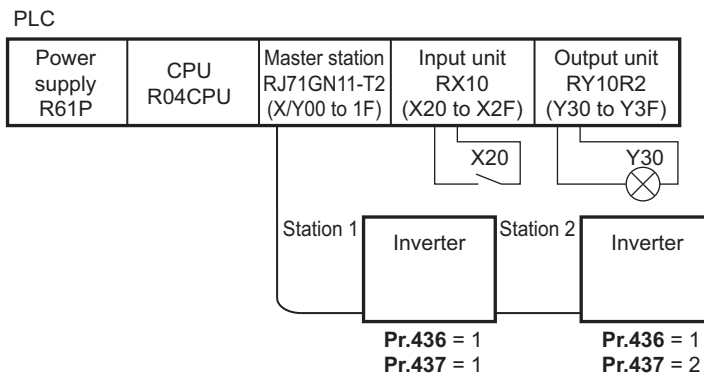
• Module parameter setting of the master station

In the programming example, module parameter are set as below.

Item	Setting condition
Station Type	CC-Link IE TSN (master station)
Start I/O	0000
Network No.	1
No.	2
Network Configuration Settings	Refer to **page 37**
Refresh Setting	Refer to **page 37**

• Network configuration (assignment method: start/end)

Item		Setting condition	
		Module 1	Module 2
Station number		1	2
Station type		Remote device station	Remote device station
RX/RY setting	Start	0000	0040
	End	003F	007F
RWw/RWr setting	Start	0000	0080
	End	007F	00FF
Reserved station/error invalid station		No setting	No setting

• Refresh Setting (assignment method: start/end)

Link side				Link side		
Device name	Start	End		Device name	Start	End
SB	0000	01FF	⇔	SB	0000	01FF
SW	0000	01FF	⇔	SW	0000	01FF
RX	0000	007F	⇔	X	1000	107F
RY	0000	007F	⇔	Y	1000	107F
RWr	0000	00FF	⇔	W	000000	0000FF
RWw	0000	00FF	⇔	W	000100	0001FF

◆ Schematic diagram of remote I/O and remote register

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

Programmable controller CPU   Remote device station (Station 1)

X103F to X1000	◄── RX3F to RX00
X107F to X1040	◄──
	RY3F to RY00
Y103F to Y1000	
Y107F to Y1040	──► RX3F to RX00
	──► RY3F to RY00

Remote device station (Station 2)
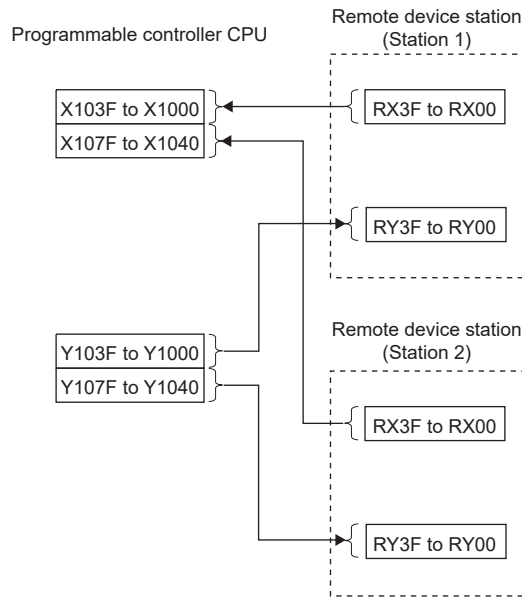
• Remote register areas (RWw and RWr) transmitted between the programmable controller CPU and the remote device stations

Programmable controller CPU   Remote device station (Station 1)

For writing

W100	RWw0
W101	RWw1
.	.
W17E	RWw7E
W17F	RWw7F
W180	RWr0
W181	RWr1
.	.
W1FE	RWr7E
W1FF	RWr7F

For reading   Remote device station (Station 2)

W000	RWw0
W001	RWw1
.	.
W07E	RWw7E
W07F	RWw7F
W080	RWr0
W081	RWr1
.	.
W0FE	RWr7E
W0FF	RWr7F
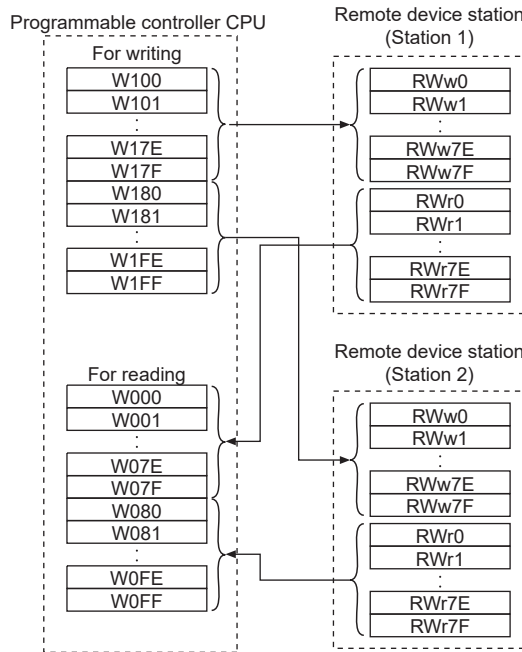
◆Programming example for reading the inverter status

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

```
        SB49  SW0B0.0
0       ─┤╱├──┤╱├─────────────────────────────(M0  )   Check the data link status of the station 1
        M0    X1002
3       ─┤ ├──┤ ├─────────────────────────────(Y30 )   Turn on the output unit (Y00)
              Inverter running (RX02)
6       ──────────────────────────────────────[END ]
```

```
                    Remote input      X101F                                        X1000
                                      b15 b14 b13 b12 b11 b10 b9  b8  b7  b6  b5  b4  b3  b2  b1  b0
        One      [ RX3F to RX00 ] ──▶  0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
        station                                                    └──────────────────────────────┘
                                                                              [Inverter status]

                                      b31 b30 b29 b28 b27 b26 b25 b24 b23 b22 b21 b20 b19 b18 b17 b16
                                       0   0   0   0   0   0   0   0   0   0   0   0   0   0   0   0
                                                                              └──────────┘
                                                                          [Inverter status]
```

Inverter status
b0 : Forward running
b1 : Reverse running
b2 : Running (RUN) *1
b3 : Up to frequency (SU) *1
b4 : Overload alarm (OL) *1
b5 : Instantaneous power failure (IPF) *1
b6 : Frequency detection (FU) *1
b7 : Fault (ABC1) *1
b8 : — (ABC2) *1
b16 : — (DO0) *1
b17 : — (DO1) *1
b18 : — (DO2) *1

*1   These signals are initial values. You can change output signals using **Pr.190 to Pr.196, Pr.313 to Pr.315 (output terminal function selection)**.

◆Programming 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 34**)
- The reply code at the time of instruction code execution is set to D2. (RWr10: Refer to **page 33**)
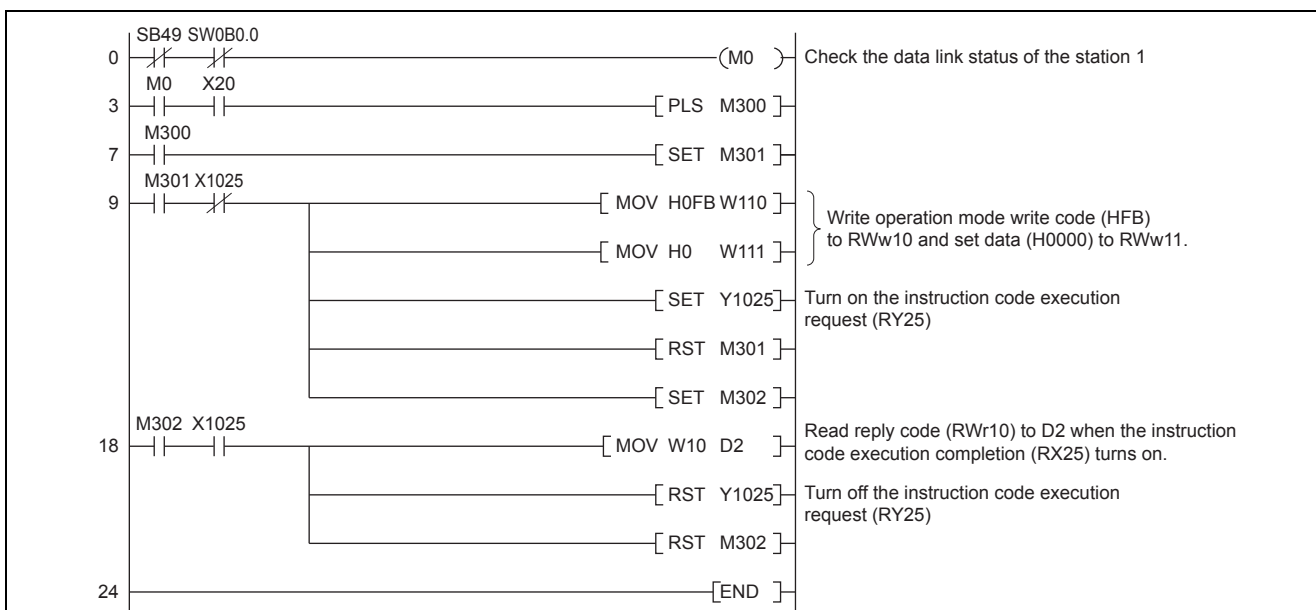
```
        SB49  SW0B0.0
0       ─┤╱├──┤╱├─────────────────────────────(M0  )         Check the data link status of the station 1
        M0    X20
3       ─┤ ├──┤ ├───────────────────────[ PLS  M300 ]
        M300
7       ─┤ ├────────────────────────────[ SET  M301 ]
        M301  X1025
9       ─┤ ├──┤╱├──────┬─────────────[ MOV  H0FB  W110 ]┐    Write operation mode write code (HFB)
                       ├─────────────[ MOV  H0    W111 ]┘    to RWw10 and set data (H0000) to RWw11.
                       ├─────────────[ SET  Y1025 ]         Turn on the instruction code execution
                       │                                    request (RY25)
                       ├─────────────[ RST  M301 ]
                       └─────────────[ SET  M302 ]
        M302  X1025
18      ─┤ ├──┤ ├──────┬─────────────[ MOV  W10   D2 ]      Read reply code (RWr10) to D2 when the instruction
                       │                                    code execution completion (RX25) turns on.
                       ├─────────────[ RST  Y1025 ]         Turn off the instruction code execution
                       │                                    request (RY25)
                       └─────────────[ RST  M302 ]
24      ──────────────────────────────────────[END ]
```

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PARAMETER | **39**

◆ **Programming example for setting the operation commands**

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

```
         SB49 SW0B0.0
    0 ───┤↑├──┤↑├─────────────────────────( M0 )──   Check the data link status of the station 1
         M0   X20
    3 ───┤├───┤├──────────────────────────(Y1000)──  Forward rotation command (RY00)

                      └─────────────────────(Y1003)──  Middle speed operation command (RY03)

    7 ────────────────────────────────────[ END ]──
```

```
  Y100F                                Y1000
  b15                     b7           b0
  ┌─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┬─┐
  │0│0│0│0│0│0│0│0│0│0│0│0│1│0│0│1│ ─────→  │ RY3F to RY00 │ One station
  └─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┴─┘
                       [Run command]              1: ON
                        Middle speed  Forward rotation   0: OFF
```

Run command	
b0 : Forward rotation command	b6 : Second function selection (RT)∗1
b1 : Reverse rotation command	b7 : Terminal 4 input selection (AU)∗1
b2 : High-speed operation command (RH)∗1	b8 : Selection of automatic restart after instantaneous power failure (CS)∗1
b3 : Middle-speed operation command (RM)∗1	b9 : Output stop (MRS)∗1
b4 : Low-speed operation command (RL)∗1	b10 : Start self-holding selection (STOP)∗1
b5 : Jog operation selection (JOG)∗1	b11 : Inverter reset (RES)∗1

∗1   These signals are initial values. You can change input signals using **Pr. 180 to Pr. 189 (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 (Detailed) of the inverter for the details.)

◆ **Programming example for monitoring the output frequency**

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

The following program reads the output frequency of station 1 inverter to D1.
Output frequency read code: H0001 (hexadecimal)
For the monitor codes, refer to **page 35**.
(Example) The output frequency of 60 Hz is indicated as H1770 (6000).

```
         SB49 SW0B0.0
    0 ───┤↑├──┤↑├─────────────────────────( M0 )──     Check the data link status of the station 1
         M0   X20
    3 ───┤├───┤├──────────────[ MOV  H1    W126 ]──    Set monitor code (H01) of output frequency
                     │                                   to RWw26.
                     ├──────────────────────(Y1020)──   Turn on the monitor command (RY20)
         X1020
                     └┤├───────────────[ MOV  W26  D1 ]── Read output frequency (RWr26) to D1
                                                          when the monitoring (RX20) turns on.
   11 ────────────────────────────────────[ END ]──
```

◆ Programming 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 (Detailed) of the inverter for details of the parameter instruction code.
- The reply code at the time of instruction code execution is set to D2. (RWr10: Refer to **page 33**)
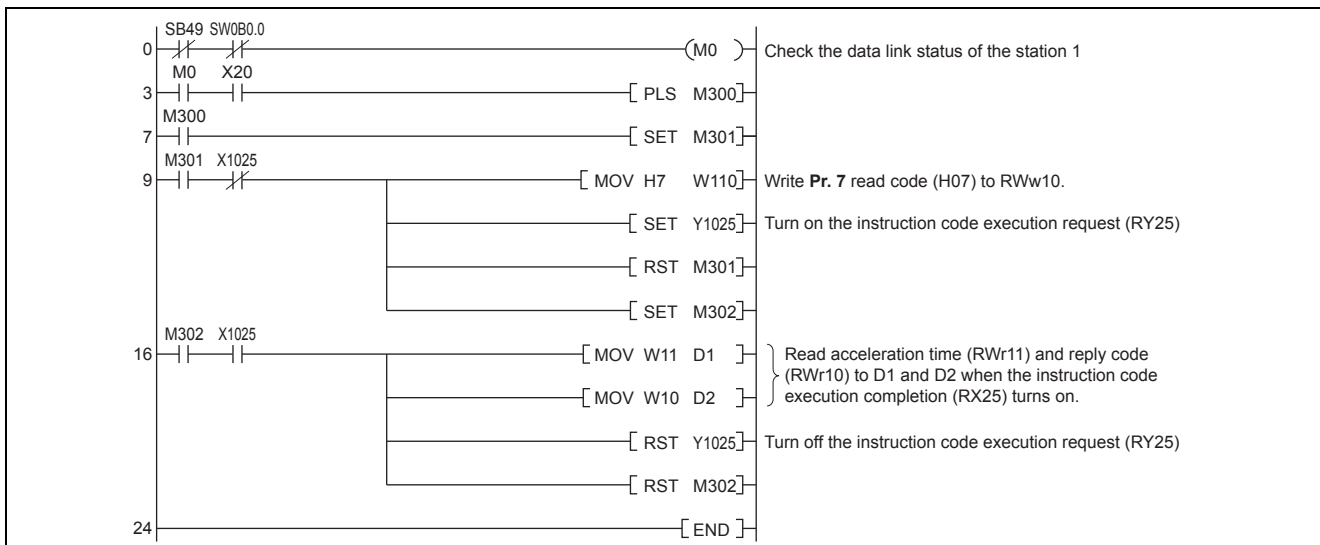
```
         SB49  SW0B0.0
    0  ──┤/├──┤/├───────────────────────────( M0 )─     Check the data link status of the station 1
         M0    X20
    3  ──┤ ├──┤ ├──────────────────────[ PLS  M300 ]─
         M300
    7  ──┤ ├────────────────────────────[ SET  M301 ]─
         M301  X1025
    9  ──┤ ├──┤/├─────────────────[ MOV  H7   W110 ]─    Write Pr. 7 read code (H07) to RWw10.
                                   [ SET  Y1025 ]─        Turn on the instruction code execution request (RY25)
                                   [ RST  M301 ]─
                                   [ SET  M302 ]─
         M302  X1025
   16  ──┤ ├──┤ ├──────────────────[ MOV  W11  D1 ]─     ⎫ Read acceleration time (RWr11) and reply code
                                                          ⎬ (RWr10) to D1 and D2 when the instruction code
                                   [ MOV  W10  D2 ]─      ⎭ execution completion (RX25) turns on.
                                   [ RST  Y1025 ]─        Turn off the instruction code execution request (RY25)
                                   [ RST  M302 ]─
   24  ─────────────────────────────────────[ END ]─
```

NOTE

- For parameters having numbers 100 and later, change their link parameter extended settings (set them to other than H00). Refer to the Instruction Manual (Detailed) of the inverter.
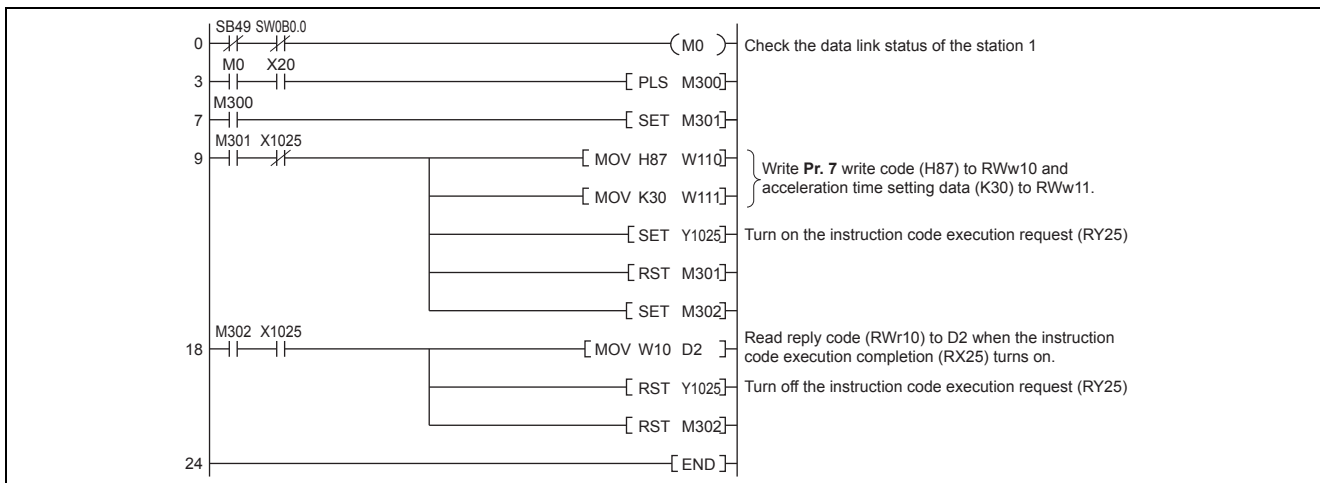
◆ Programming example for parameter writing

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

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

For the parameter instruction code, refer to the Instruction Manual (Detailed) of the inverter.

The reply code at the time of instruction code execution is set to D2. (RWr10: Refer to **page 33**)

```
         SB49  SW0B0.0
    0  ──┤/├──┤/├───────────────────────────( M0 )─     Check the data link status of the station 1
         M0    X20
    3  ──┤ ├──┤ ├──────────────────────[ PLS  M300 ]─
         M300
    7  ──┤ ├────────────────────────────[ SET  M301 ]─
         M301  X1025
    9  ──┤ ├──┤/├─────────────────[ MOV  H87  W110 ]─    ⎫ Write Pr. 7 write code (H87) to RWw10 and
                                   [ MOV  K30  W111 ]─    ⎭ acceleration time setting data (K30) to RWw11.
                                   [ SET  Y1025 ]─        Turn on the instruction code execution request (RY25)
                                   [ RST  M301 ]─
                                   [ SET  M302 ]─
         M302  X1025
   18  ──┤ ├──┤ ├──────────────────[ MOV  W10  D2 ]─     Read reply code (RWr10) to D2 when the instruction
                                                          code execution completion (RX25) turns on.
                                   [ RST  Y1025 ]─        Turn off the instruction code execution request (RY25)
                                   [ RST  M302 ]─
   24  ─────────────────────────────────────[ END ]─
```
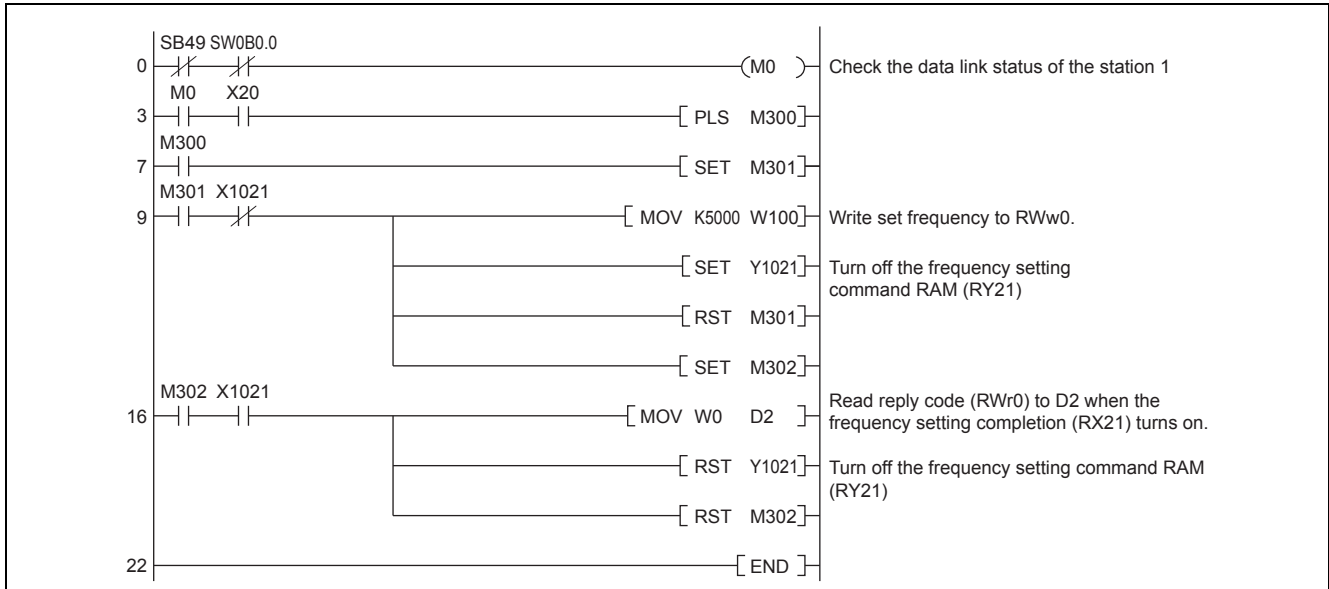
NOTE

- 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 (Detailed) of the inverter for settings.
- For other functions, refer to the instruction codes (Refer to **page 34**).

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PARAMETER **41**

◆**Programming 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. (RWr0: Refer to **page 33**)

```
     SB49 SW0B0.0
0    ─┤↑├──┤↑├──────────────────────────(M0   )   Check the data link status of the station 1
      M0    X20
3    ─┤ ├──┤ ├──────────────────────[ PLS  M300 ]
      M300
7    ─┤ ├────────────────────────────[ SET  M301 ]
      M301 X1021
9    ─┤ ├──┤↑├──────────────[ MOV  K5000 W100 ]   Write set frequency to RWw0.
                            [ SET  Y1021 ]   Turn off the frequency setting
                                             command RAM (RY21)
                            [ RST  M301 ]
                            [ SET  M302 ]
      M302 X1021
16   ─┤ ├──┤ ├──────────────[ MOV  W0  D2  ]   Read reply code (RWr0) to D2 when the
                                             frequency setting completion (RX21) turns on.
                            [ RST  Y1021 ]   Turn off the frequency setting command RAM
                                             (RY21)
                            [ RST  M302 ]
22   ─────────────────────────────────[ END ]
```

- To continuously change the running frequency from the programmable controller

  After the frequency setting complete (for example, X1021) turns ON, check that the reply code from the remote register is H0000, then change the setting data (for example, W100) continuously.

- Program example for writing data to EEPROM

  Modify the following commands of the programming example on **page 42**.

  Frequency setting command Y1021 → Y1022

  Frequency setting completion X1021 → X1022

<Timing chart when writing to RAM> <Timing chart when writing to EEPROM>

Reflect to the inverter when Y1022 turns on
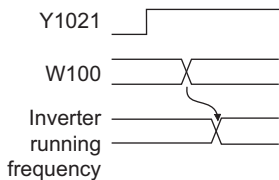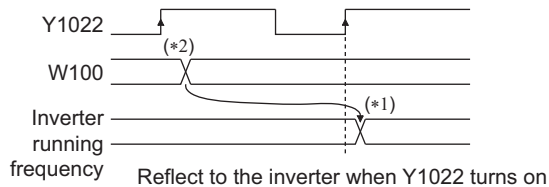
∗1 For EEPROM, write is made only once when Y1022 is switched on.

∗2 If the set data is changed with Y1022 on, it is not reflected on the inverter.
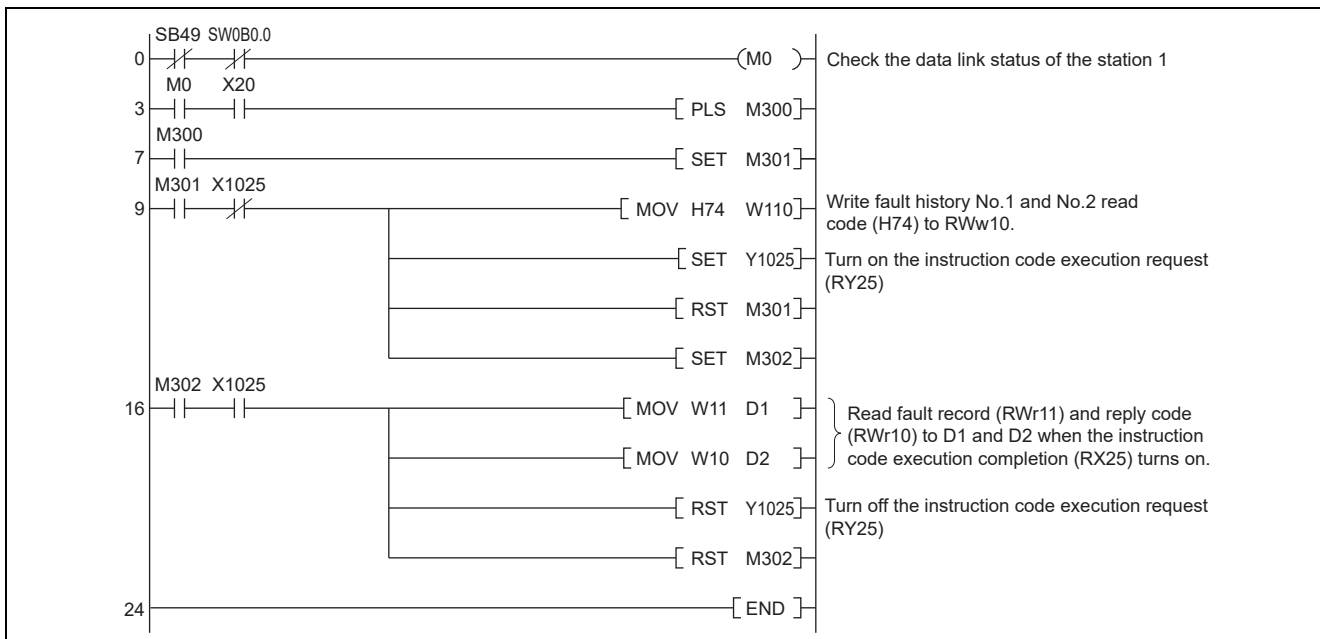
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◆ Programming example for fault record reading

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

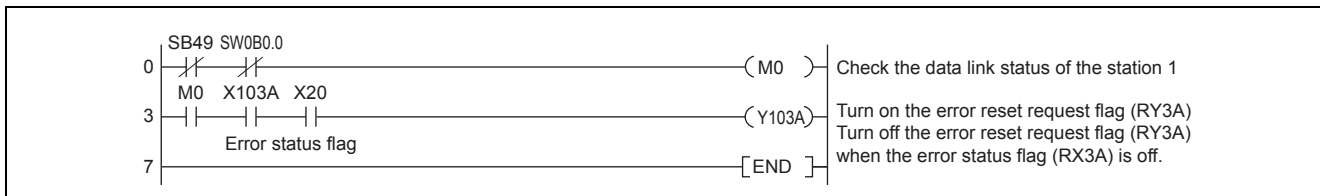• Fault history No. 1, No. 2 reading instruction code: H74 (hexadecimal)

For the error code, refer to the Instruction Manual (Detailed) of the inverter.

The reply code at the time of instruction code execution is set to D2. (RWr10: Refer to **page 33**)

```
       SB49 SW0B0.0
  0     ─┤↑├─┤↑├──────────────────────────────────(M0  )  Check the data link status of the station 1
        M0   X20
  3     ─┤ ├─┤ ├──────────────────────────[ PLS  M300 ]
        M300
  7     ─┤ ├──────────────────────────────[ SET  M301 ]
        M301 X1025
  9     ─┤ ├─┤↑├──────────────────[ MOV  H74  W110 ]   Write fault history No.1 and No.2 read
                                                        code (H74) to RWw10.
                                   [ SET  Y1025 ]       Turn on the instruction code execution request
                                                        (RY25)
                                   [ RST  M301 ]
                                   [ SET  M302 ]
        M302 X1025
 16     ─┤ ├─┤ ├──────────────────[ MOV  W11  D1 ] ┐   Read fault record (RWr11) and reply code
                                                     │  (RWr10) to D1 and D2 when the instruction
                                   [ MOV  W10  D2 ] ─┤  code execution completion (RX25) turns on.
                                                     ┘
                                   [ RST  Y1025 ]       Turn off the instruction code execution request
                                                        (RY25)
                                   [ RST  M302 ]
 24     ─────────────────────────────────────[ END ]
```

◆ Programming example for resetting the inverter at inverter error

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

```
       SB49 SW0B0.0
  0     ─┤↑├─┤↑├──────────────────────────────────(M0  )  Check the data link status of the station 1
        M0   X103A  X20
  3     ─┤ ├─┤ ├──┤ ├─────────────────────────────(Y103A)  Turn on the error reset request flag (RY3A)
             Error status flag                             Turn off the error reset request flag (RY3A)
                                                           when the error status flag (RX3A) is off.
  7     ─────────────────────────────────────[ END ]
```

> **NOTE**
> • The above inverter reset using RY3A may be made only when an inverter error occurs.
>   When **Pr.349 Communication reset selection/Ready bit status selection/Reset selection when inverter errors cleared** is set to "0, 100, 1000, or 1100", inverter reset is available in any operation mode.
> • When using the instruction code execution request (RY25) 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 39**)

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PARAMETER **43**

◆Instructions

✦Programming instructions

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

Correct	TO instruction		Incorrect	TO instruction	
	Write completion			Write completion	
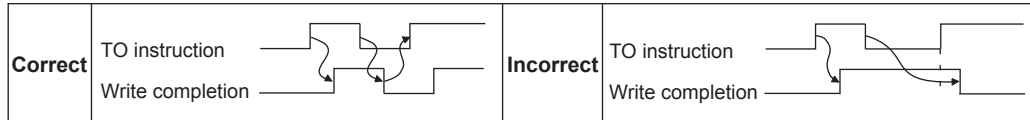
✦Operating and handling instructions

- Command only from the programmable controller can be accepted during CC-Link IE TSN communication.
  The run command from external and parameter unit is ignored.
- If different 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.500 Communication error execution waiting time** due to a programmable controller fault, an open Ethernet cable etc. during CC-Link IE TSN operation.
- If the programmable controller (master station) is reset during CC-Link IE TSN operation 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.

✦Troubleshooting

Description	Check point
Operation mode does not switch to the Network operation mode	Check that the Ethernet cable is installed correctly.(Check for contact fault, break in the cable, etc.)
	Check if **Pr.436 IP address 3** and **Pr.437 IP address 4** are correctly set. (Check that their settings match with the program, that the network number is set within the range, that no overlapping stations exist, and that the station number is set within the range.)
	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, Pr.144 Speed setting switchover ☞**Instruction Manual (Detailed) of the FR-A800 inverter**

Pr.811 Set resolution switchover ☞ **Instruction Manual (Detailed) of the FR-A800 inverter**

3   PROTECTIVE FUNCTIONS

3.1   Causes and corrective actions

◆Warning

Output is not shut off when a protective function is activated.

Operation panel indication	DIP	$dI\ P$
Name	Duplicate IP address	
Description	Appears when a duplicate IP address is detected.	
Check point	Check if the IP address is set to other devices on the network.	
Corrective action	Set a unique IP address. (Refer to **page 20**.)	

Operation panel indication	IP	$I\ P$
Name	IP address fault	
Description	Appears when the rotary switches are set to "0 or 255" and the value set for IP address or subnet mask is out of range.	
Check point	• Check if the same station number is set to other devices on the network. • Check if "0 or 255" is set for either the third octet or the fourth octet of the IP address. • Check that the subnet mask setting value is appropriate.	
Corrective action	• Set a unique station number. (Refer to **page 20**.) • Set two values from "1 to 254" for the third octet and the fourth octet of the IP address. (Refer to **page 20**.) • Set the subnet mask (**Pr.438 to Pr.441**) correctly. (Refer to **page 20**.)	

4 SPECIFICATIONS

4.1 Common specifications

◆FR-A800-GN

Control specifications	Control method		Soft-PWM control, high carrier frequency PWM control (selectable among V/F control, Advanced magnetic flux vector control, Real sensorless vector control), Optimum excitation control, vector control*1, and PM sensorless vector control
	Output frequency range		0.2 to 590 Hz (The upper-limit frequency is 400 Hz under Advanced magnetic flux vector control, Real sensorless vector control, vector control*1, and PM sensorless vector control.)
	Frequency setting resolution	Analog input	0.015 Hz/60 Hz (0 to 10 V/12 bits for terminals 2 and 4) 0.03 Hz/60 Hz (0 to 5 V/11 bits or 0 to 20 mA/approx. 11 bits for terminals 2 and 4, 0 to ±10 V/12 bits for terminal 1) 0.06 Hz/60 Hz (0 to ±5 V/11 bits for terminal 1)
		Digital input	0.01 Hz
	Frequency accuracy	Analog input	Within ±0.2% of the max. output frequency (25°C ± 10°C)
		Digital input	Within 0.01% of the set output frequency
	Voltage/frequency characteristics		Base frequency can be set from 0 to 590 Hz. Constant-torque/variable-torque pattern or adjustable 5 points V/F can be selected.
	Starting torque*2		SLD Rating: 120% 0.3 Hz, LD Rating: 150% 0.3 Hz, ND Rating: 200% 0.3 Hz*3, HD Rating: 250% 0.3 Hz*3 (Real sensorless vector control, vector control*1)
	Torque boost		Manual torque boost
	Acceleration/deceleration time setting		0 to 3600 s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration mode, backlash countermeasures acceleration/deceleration can be selected.
	DC injection brake (induction motor)		Operation frequency (0 to 120 Hz), operation time (0 to 10 s), operation voltage (0 to 30%) variable
	Stall prevention operation level		Activation range of stall prevention operation (SLD rating: 0 to 120%, LD rating: 0 to 150%, ND rating: 0 to 220%, HD rating: 0 to 280%). Whether to use the stall prevention or not can be selected. (V/F control, Advanced magnetic flux vector control)
	Torque limit level		Torque limit value can be set (0 to 400% variable). (Real sensorless vector control, vector control*1, PM sensorless vector control)
Operation specifications	Frequency setting signal	Analog input	Terminals 2 and 4: 0 to 10 V, 0 to 5 V, 4 to 20 mA (0 to 20 mA) are available. Terminal 1: -10 to +10 V, -5 to +5 V are available.
		Digital input	Input using the setting dial of the operation panel or parameter unit Four-digit BCD or 16-bit binary (when used with option FR-A8AX)
	Start signal		Forward and reverse rotation or start signal automatic self-holding input (3-wire input) can be selected.
	Input signals (twelve terminals)		Low-speed operation command, Middle-speed operation command, High-speed operation command, Second function selection, Terminal 4 input selection, Jog operation selection, Selection of automatic restart after instantaneous power failure, flying start, Output stop, Start self-holding selection, Forward rotation command, Reverse rotation command, Inverter reset The input signal can be changed using **Pr.178 to Pr.189 (Input terminal function selection)**.
		Pulse train input	100 k pulses/s
	Operational functions		Maximum and minimum frequency settings, multi-speed operation, acceleration/deceleration pattern, thermal protection, DC injection brake, starting frequency, JOG operation, output stop (MRS), stall prevention, regeneration avoidance, increased magnetic excitation deceleration, DC feeding*4, frequency jump, rotation display, automatic restart after instantaneous power failure, electronic bypass sequence, remote setting, automatic acceleration/deceleration, retry function, carrier frequency selection, fast-response current limit, forward/reverse rotation prevention, operation mode selection, slip compensation, droop control, load torque high-speed frequency control, speed smoothing control, traverse, auto tuning, applied motor selection, gain tuning, RS-485 communication, PID control, PID pre-charge function, easy dancer control, cooling fan operation selection, stop selection (deceleration stop/coasting), power-failure deceleration stop function, stop-on-contact control, PLC function, life diagnosis, maintenance timer, current average monitor, multiple rating, orientation control*1, speed control, torque control, position control, pre-excitation, torque limit, test run, 24 V power supply input for control circuit, safety stop function, anti-sway control
	Output signal	Open collector output (five terminals) Relay output (two terminals)	Inverter running, Up to frequency, Instantaneous power failure/undervoltage*4, Overload warning, Output frequency detection, Fault The output signal can be changed using **Pr.190 to Pr.196 (Output terminal function selection)**. Fault codes of the inverter can be output (4 bits) from the open collector.
		Pulse train output (FM type)	50 k pulses/s
Indication	For meter	Pulse train output (FM type)	Max. 2.4 kHz: one terminal (output frequency) The monitored item can be changed using **Pr.54 FM/CA terminal function selection.**
		Current output (CA type)	Max. 20 mADC: one terminal (output frequency) The monitored item can be changed using **Pr.54 FM/CA terminal function selection.**
		Voltage output	Max. 10 VDC: one terminal (output frequency) The monitored item can be changed using **Pr.158 AM terminal function selection.**
	Operation panel (FR-DU08)	Operating status	Output frequency, Output current, Output voltage, Frequency setting value The monitored item can be changed using **Pr.52 Operation panel main monitor selection**.
		Fault record	A fault record is displayed when a fault occurs. Past 8 fault records and the conditions immediately before the fault (output voltage/current/frequency/cumulative energization time/year/month/date/time) are saved.

Protective/ warning function	**Protective function**	Overcurrent trip during acceleration, Overcurrent trip during constant speed, Overcurrent trip during deceleration or stop, Regenerative overvoltage trip during acceleration, Regenerative overvoltage trip during constant speed, Regenerative overvoltage trip during deceleration or stop, Inverter overload trip, Motor overload trip, Heat sink overheat, Instantaneous power failure[4], Undervoltage[4], Input phase loss[4][5], Stall prevention stop, Loss of synchronism detection[5], Brake transistor alarm detection[4], Upper limit fault detection, Lower limit fault detection, Output side earth (ground) fault overcurrent, Output short circuit, Output phase loss, External thermal relay operation[5], PTC thermistor operation[5], Option fault, Communication option fault, Parameter storage device fault, PU disconnection, Retry count excess[5], CPU fault, Operation panel power supply short circuit/RS-485 terminals power supply short circuit, 24 VDC power fault, Abnormal output current detection[5], Inrush current limit circuit fault[4], Communication fault (inverter), Analog input fault, USB communication fault, Safety circuit fault, Overspeed occurrence[5], Speed deviation excess detection[1][5], Signal loss detection[1][5], Excessive position fault[1][5], Brake sequence fault[5], Encoder phase fault[1][5], 4 mA input fault[5], Pre-charge fault[5], PID signal fault[5], Option fault, Opposite rotation deceleration fault[5], Internal circuit fault, Magnetic pole position unknown[1], External fault during output operation[5]
	Warning function	Fan alarm, Stall prevention (overcurrent), Stall prevention (overvoltage), Regenerative brake pre-alarm[4][5], Electronic thermal relay function pre-alarm, PU stop, Speed limit indication[5], Parameter copy, Safety stop, Maintenance timer 1 to 3[5], USB host error, Home position return setting error[5], Home position return uncompleted[5], Home position return parameter setting error[5], Operation panel lock[5], Password locked[5], Parameter write error, Copy operation error, 24 V external power supply operation, Continuous operation during communication fault, Load fault warning, Duplicate IP address, IP address fault
Environment	**Surrounding air temperature**	-10°C to +50°C (non-freezing) (LD, ND, HD ratings) -10°C to +40°C (non-freezing) (SLD rating)
	Surrounding air humidity	95% RH or less (non-condensing) (With circuit board coating (conforming to IEC 60721-3-3 3C2/3S2)) 90% RH or less (non-condensing) (Without circuit board coating)
	Storage temperature[6]	-20°C to +65°C
	Atmosphere	Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt, etc.)
	Altitude/vibration	2500 m or lower[7], 5.9 m/s^2[8] or less at 10 to 55 Hz (directions of X, Y, Z axes)

∗1   Available only when a vector control compatible option is installed.

∗2   For PM sensorless vector control, refer to the Instruction Manual (Detailed) of the FR-A800 inverter.

∗3   In the initial setting of the FR-A820-00340(5.5K) or higher and the FR-A840-00170(5.5K) or higher, it is limited to 150% by the torque limit level.

∗4   Enabled only for standard models.

∗5   This protective function is not available in the initial status.

∗6   Temperature applicable for a short time, e.g. in transit.

∗7   For the installation at an altitude above 1000 m, consider a 3% reduction in the rated current per altitude increase of 500 m.

∗8   2.9 m/s^2 or less for the FR-A840-04320(160K) or higher.

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

The following table shows the CC-Link IE TSN 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 (Detailed) of the FR-A800 inverter.

Pr.	Name	Instruction code*1			Control method*2		Vector			Sensorless		PM		Parameter		
		Read	Write	Extended	V/F	Magnetic flux	Speed control	Torque control	Position control	Speed control	Torque control	Speed control	Position control*5	Copy*3	Clear*3	All clear*3
434	IP address 1	22	A2	4	○	○	○	○	○	○	○	○	○	○	○*4	○*4
435	IP address 2	23	A3	4	○	○	○	○	○	○	○	○	○	○	○*4	○*4
436	IP address 3	24	A4	4	○	○	○	○	○	○	○	○	○	○	○*4	○*4
437	IP address 4	25	A5	4	○	○	○	○	○	○	○	○	○	○	○*4	○*4
438	Subnet mask 1	26	A6	4	○	○	○	○	○	○	○	○	○	○	○*4	○*4
439	Subnet mask 2	27	A7	4	○	○	○	○	○	○	○	○	○	○	○*4	○*4
440	Subnet mask 3	28	A8	4	○	○	○	○	○	○	○	○	○	○	○*4	○*4
441	Subnet mask 4	29	A9	4	○	○	○	○	○	○	○	○	○	○	○*4	○*4
1130	Link speed selection	1E	9E	B	○	○	○	○	○	○	○	○	○	○	○*4	○*4
1442	IP filter address 1 (Ethernet)	2A	AA	E	○	○	○	○	○	○	○	○	○	○	○*4	○*4
1443	IP filter address 2 (Ethernet)	2B	AB	E	○	○	○	○	○	○	○	○	○	○	○*4	○*4
1444	IP filter address 3 (Ethernet)	2C	AC	E	○	○	○	○	○	○	○	○	○	○	○*4	○*4
1445	IP filter address 4 (Ethernet)	2D	AD	E	○	○	○	○	○	○	○	○	○	○	○*4	○*4
1446	IP filter address 2 range specification (Ethernet)	2E	AE	E	○	○	○	○	○	○	○	○	○	○	○*4	○*4
1447	IP filter address 3 range specification (Ethernet)	2F	AF	E	○	○	○	○	○	○	○	○	○	○	○*4	○*4
1448	IP filter address 4 range specification (Ethernet)	30	B0	E	○	○	○	○	○	○	○	○	○	○	○*4	○*4
1459	Clock source selection	3B	BB	E	○	○	○	○	○	○	○	○	○	○	○	○

*1 These instruction codes are used to write or read parameters through CC-Link IE TSN communication.

*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 or All parameter clear (H5A5A or H55AA) via CC-Link IE TSN communication.

*5 Position control is enabled when an MM-CF IPM motor is used with the low-speed range high-torque characteristic enabled (**Pr.788 Low speed range torque characteristic selection** = "9999" (initial value)).

MEMO

MEMO

REVISIONS

Revision date	*Manual number	Revision
Jun. 2019	IB(NA)-0600843ENG-A	First edition
Aug. 2020	IB(NA)-0600843ENG-B	Added • Ring topology • Transmission speed of 100 Mbps

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Specifications subject to change without notice.