MITSUBISHI ELECTRIC

700 series

INVERTER
Plug-in option
FR-A7NC
INSTRUCTION MANUAL

CC-Link *communication function*

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Thank you for choosing this Mitsubishi Inverter plug-in option. This instruction manual gives handling information and precautions for use of this equipment. Incorrect handling might cause an unexpected fault. Before using the equipment, please read this manual carefully to use the equipment to its optimum. Please forward this manual to the end user.

This section is specifically about safety matters

Do not attempt to install, operate, maintain or inspect this product until you have read through this instruction manual and appended documents carefully and can use the equipment correctly. Do not use this product until you have a full knowledge of the equipment, safety information and instructions.

In this instruction manual, the safety instruction levels are classified into "WARNING" and "CAUTION".

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

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

SAFETY INSTRUCTIONS

1. Electric Shock Prevention

⚠**WARNING**

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

2. Injury Prevention

⚠ CAUTION

- **The voltage applied to each terminal must be the ones specified in the Instruction Manual. Otherwise burst, damage, etc. may occur.**
- **The cables must be connected to the correct terminals. Otherwise burst, damage, etc. may occur.**
- **Polarity must be correct. Otherwise burst, damage, etc. may occur.**
- **While power is ON or for some time after power-OFF, do not touch the inverter as they will be extremely hot. Doing so can cause burns.**

3. Additional Instructions

Also the following points must be noted to prevent an accidental failure, injury, electric shock, etc.

1) Transportation and mounting

⚠ CAUTION

- **Do not install or operate the plug-in option if it is damaged or has parts missing.**
- **Do not stand or rest heavy objects on the product.**
- **The mounting orientation must be correct.**
- **Foreign conductive objects must be prevented from entering the inverter. That includes screws and metal fragments or other flammable substances such as oil.**

2) Trial run

⚠ CAUTION

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

3) Usage

⚠ WARNING

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

⚠ CAUTION

- **When parameter clear or all parameter clear is performed, the required parameters must be set again before starting operations because all parameters return to the initial value.**
- **For prevention of damage due to static electricity, nearby metal must be touched before touching this product to eliminate static electricity from your body.**

4) Maintenance, inspection and parts replacement

⚠ CAUTION

- **Do not test the equipment with a megger (measure insulation resistance).**

5) Disposal

⚠ CAUTION

- **This inverter plug-in option must be treated as industrial waste.**

6) General instruction

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

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IV

1 PRE-OPERATION INSTRUCTIONS

1.1 Inverter model

The inverter model, 55K and 75K stated in this Instruction Manual differs according to each -NA, -EC, -CH(T) versions. Refer to the following correspondence table for each inverter model. *(Refer to the instruction manual of each inverter for the inverter type.)*

For example, "for the 75K or more" indicates "for the FR-A740-01440-NA or more" in the case of FR-A740 of NA version.

		NA	EC	CH
F700	FR-F720-55K	FR-F720-02330-NA	─	─
	FR-F720-75K	FR-F720-03160-NA	─	─
	FR-F740-55K	FR-F740-01160-NA	FR-F740-01160-EC	FR-F740-55K-CH(T)
	FR-F740-75K	FR-F740-01800-NA	FR-F740-01800-EC	FR-F740-S75K-CH(T)
A700	FR-A720-55K	FR-A720-02150-NA	─	─
	FR-A720-75K	FR-A720-02880-NA	─	─
	FR-A740-55K	FR-A740-01100-NA	FR-A740-01800-EC	FR-A740-55K-CHT
	FR-A740-75K	FR-A740-01440-NA	FR-A740-02160-EC	FR-A740-75K-CHT

1.2   Unpacking and product confirmation

Take the plug-in option out of the package, check the product name, and confirm that the product is as you ordered and intact.

This product is a plug-in option for the FR-A700/F700(P) series, and the FR-FP700 series manufactured in May 2008 or later.

● **SERIAL number check**

   Refer to the inverter manual for the location of the rating plate.

   Rating plate example

   $$\underbrace{\square}_{\text{Symbol}} \quad \underbrace{8}_{\text{Year}} \quad \underbrace{5}_{\text{Month}} \quad \underbrace{\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc\bigcirc}_{\text{Control number}} \left.\right] \text{SERIAL (Serial No.)}$$

   TC○○○A○○○G○○   ]TC number
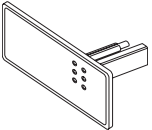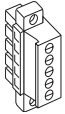
The SERIAL consists of 1 version symbol, 2 numeric characters or 1 numeric character and 1 alphabet letter indicating year and month, and 6 numeric characters indicating control number.
The last digit of the production year is indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), or Z (December.)

1.2.1 Product confirmation

Check the enclosed items.

Plug-in option 1	Mounting screw (M3 × 6mm) .... 2 *(Refer to page 10.)*	Hex-head screw for option mounting (5.5mm) .... 1 *(Refer to page 10.)*
		5.5mm
Communication option LED display cover .... 1 *(Refer to page 9.)*	Terminal block .... 1 *(Refer to page 18.)*	

1.2.2 Parts

Connector for communication
Mount the accessory terminal block to connect to the network. *(Refer to page 16.)*

Mounting hole

Terminating resistor selection switch
Select the resistor value of the terminating resistor. *(Refer to page 13.)*

Front view

Mounting hole

Rear view

SD L.RUN
RD L.ERR
RUN

SW2
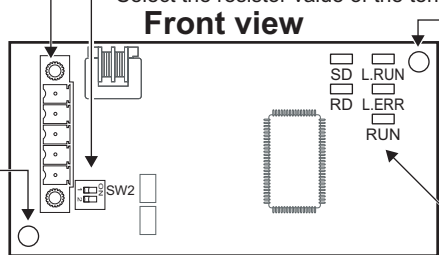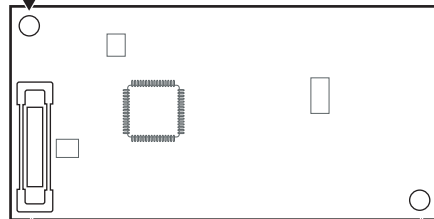
Mounting hole

Connector
Connect to the inverter option connector.

Terminal layout

DA
DB
DG
SLD
FG

SW2
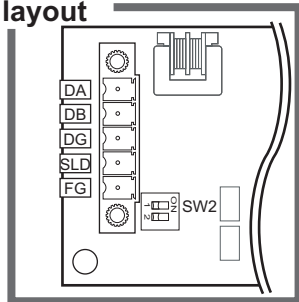
Operation status indication LED
Lit/flicker of the LED indicate operation status. *(Refer to page 5.)*

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●Operation status indication LED

L.RUN	Lit when refresh data is properly received. Turns off when a data transmission is stopped for a certain period of time.
L.ERR	• Lit when a communication error occurs in the own station and flickers when settings of switch, etc. are changed while power is on. • Flickers when the *Pr. 542* or *Pr. 543* setting is changed. Turn the power on again or turn the RES signal on. *(Refer to page 39, 40.)*
RUN	Lit during normal operation (5V is supplied in the board) (Lit even in the non-communication status.) Flickers when the master station is CC-Link Ver.1 and the FR-A7NC is CC-Link Ver.2 compatible. *(Refer to page 7.)*
SD	Turns off when no data is transmitted.
RD	Lit when the received data carrier is detected.

1

REMARKS

· Set the station number using *Pr. 542 Communication station number (CC-Link). (Refer to page 39.)*
· Set transmission baud rate using *Pr.543 Baud rate (CC-Link). (Refer to page 40.)*

1.3 Inverter option specifications

Type	Inverter plug-in option type, terminal block connectable
Power supply	5VDC supplied from the inverter
Number of units connected	42 units max. (Refer to *page 45* for the number of stations occupied), May be used with other equipment.
Cable size	0.3mm^2 to 0.75mm^2
Station type	Remote device station
Number of stations occupied	Ver.1: occupies one station, Ver.2: occupies one station (selectable from among double, quadruple and octuple)
Communication cable	CC-Link dedicated cable, CC-Link Ver. 1.10 compatible CC-Link dedicated cable

1.4 CC-Link version

1.4.1 CC-Link Ver. 1.10

The conventional CC-Link products, whose inter-station cable lengths have equally been changed to 20cm or more to improve the inter-station cable length restriction, are defined as CC-Link Ver. 1.10. In comparison, the conventional products are defined as CC-Link Ver. 1.00.

Refer to the CC-Link Master Module Manual for the maximum overall cable lengths and inter-station cable lengths of CC-Link Ver. 1.00 and Ver. 1.10.

CC-Link Ver. 1.10 compatibility conditions

1) All modules that comprise a CC-Link system should be compatible with CC-Link Ver. 1.10.
2) All data link cables should be CC-Link Ver. 1.10 compatible, CC-Link dedicated cables.
   (CC-Link Ver. 1.10 compatible cables have a CC_{-Link} logo or Ver. 1.10 indication.)

——— **CAUTION** ———

In a system that uses the CC-Link Ver. 1.00 and Ver. 1.10 modules and cables together, the maximum overall cable length and inter-station cable length are as specified for CC-Link Ver. 1.00.

1.4.2 CC-Link Ver. 2

The FR-A7NC is compatible with CC-Link Ver.2.

When using the CC-Link Ver.2 setting with the FR-A7NC, the master station needs to be compatible with the CC-Link Ver.2.

For CC-Link Ver.2, double, quadruple and octuple settings can be used to increase the remote register (RWr/w) points.

Master station (Ver.1)

Ver.1 setting	Ver.2 setting
Communication enabled	**Communication disabled** ("RUN" LED flickers)

Master station (Ver.2)

Ver.1 setting	Ver.2 setting
Communication enabled	**Communication enabled**
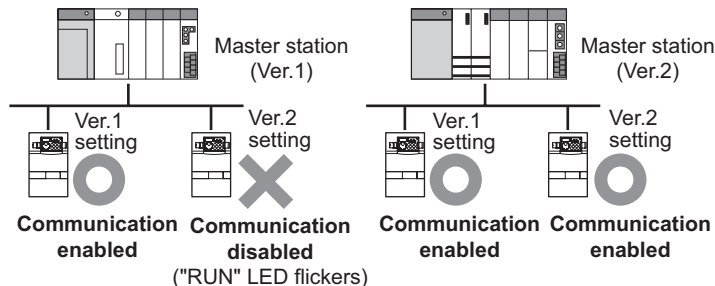
2 INSTALLATION

2.1 Pre-installation instructions

Make sure that the input power of the inverter is OFF.

⚠**CAUTION**

⚠ **With input power ON, do not install or remove the plug-in option. Otherwise, the inverter and plug-in option may be damaged.**

⚠ **For prevention of damage due to static electricity, touch nearby metal before touching this product to eliminate static electricity from your body.**

2.2   Installation of the communication option LED display cover

Mount the cover for displaying the operation status indication LED for the communication option on the inverter front cover.

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

Cut off with a nipper, etc.

Cut off with a nipper, etc.
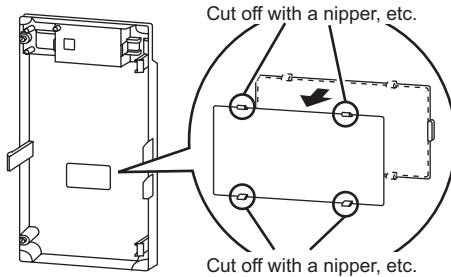
2) Fit the communication option LED display cover to the front of the inverter front cover and push it into until fixed with hooks.

Fit it so that the position of lenses is in the upper-right of the LED display cover.

When attached
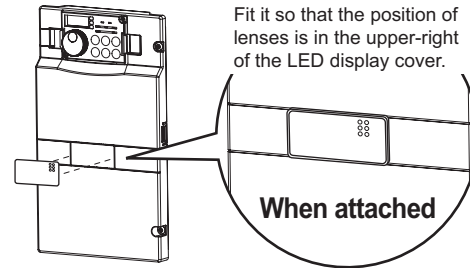
⚠ **CAUTION**

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

2.3   Installation procedure
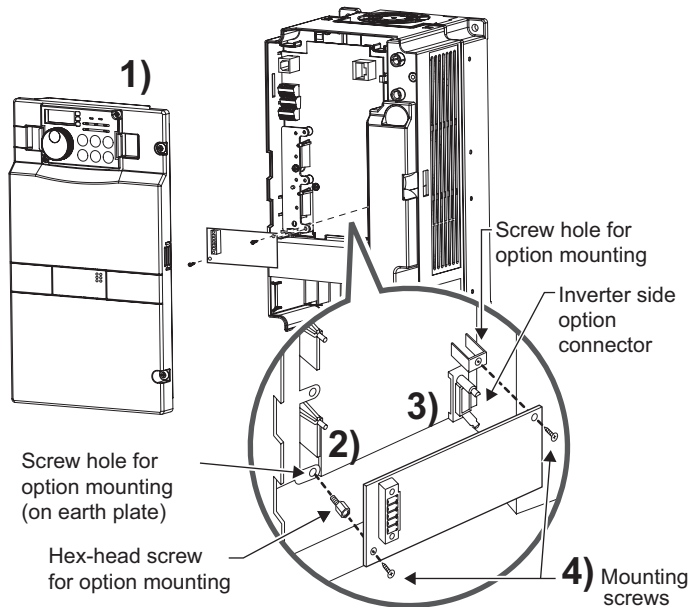
1) Remove the inverter front cover.

2) Mount the hex-head screw for option mounting into the inverter screw hole (on earth plate). (size 5.5mm, tightening torque 0.56N·m to 0.75N·m)

3) Securely fit the connector of the plug-in option to the inverter connector along the guides.

4) Securely fix the both right and left sides of the plug-in option to the inverter with the accessory mounting screws. (Tightening torque 0.45N·m to 0.55N·m)
If the screw holes do not line-up, the connector may not have been plugged securely. Check for loose plugging.

REMARKS

• Remove a plug-in option after removing two screws on both left and right sides.
(The plug-in option is easily removed if the control circuit terminal block is removed before.)

═══ **CAUTION** ═══

- **When using this option unit with the FR-A700 series inverter, mount it in the "option connector 3 (lowermost connector)" of the inverter.**

  If it is fitted in option connector 1 or 2, " $E.\ \ I$ " or " $E.\ \ 2$ " (option fault) is displayed and the inverter will not function. In addition, when the inverter can not recognize that the option is mounted due to improper installation, etc.,

  " $E.\ \ 3$ " (option fault) is displayed even if the option is fitted in the option connector 3.

Mounting Position	Fault Display
Connector 1	$E.\ \ I$
Connector 2	$E.\ \ 2$
Connector 3	$E.\ \ 3$

- **The FR-F700(P)/FP700 series has one connection connector for the plug-in option. When the inverter can not recognize that the option unit is mounted due to improper installation, etc., " $E.\ \ I$ " (option fault) is displayed.**
- **Take caution not to drop a hex-head screw for option mounting or mounting screw during mounting and removal.**
- **Pull out the option straight to remove. Otherwise, the connector may be damaged.**

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3 WIRING

3.1 System configuration example

(1) Programmable controller side
Load the "QJ61BT11N", "QJ61BT11", "AJ61QBT11", "A1SJ61QBT11", "AJ61BT11" or "A1SJ61BT11" "Control & Communication Link system master/local module" on the main or extension base unit having the programmable controller CPU used as the master station.

(2) Inverter side
Mount the option (FR-A7NC) on the inverter.

(3) Connect the programmable controller CC-Link module master station and the terminal block supplied with the FR-A7NC with the CC-Link dedicated cable. After connecting the terminal block to the FR-A7NC, fit the front cover.

Manual of the CC-Link master station
· QJ61BT11N type
CC-Link System Master/Local Module
User's Manual ...SH-080394E
· QJ61BT11 type
CC-Link System Master/Local Module
User's Manual ...SH-080016
· AJ61QBT11/A1SJ61QBT11 type Control & Communication Link System Master/Local Module
User's Manual ...IB-66722
· AJ61BT11/A1SJ61BT11 type Control & Communication Link System Master/Local Module
User's Manual ...IB-66721
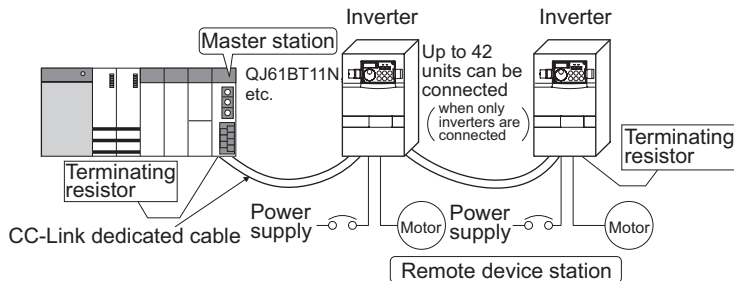
REMARKS

· When the CPU has automatic refresh function (example: QnA series CPU)
Through communication with the corresponding devices using sequence ladder logic, data is automatically transferred to the refresh buffer of the master station at the execution of the END instruction to perform communication with the remote devices.

· When the CPU does not have automatic refresh function (example: AnA series CPU)
Data is transferred to the refresh buffer of the master station directly by sequence ladder logic to perform communication with the remote devices.

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3.2 Connection of several inverters

Factory automation can be applied to several inverters which share a link system as CC-Link remote device stations and are controlled and monitored by programmable controller user programs.

For the shield cable of the CC-Link dedicated cable, connect it to "SLD" of each unit and always earth (ground) it via "FG".

Terminals SLD and FG are connected inside the unit.
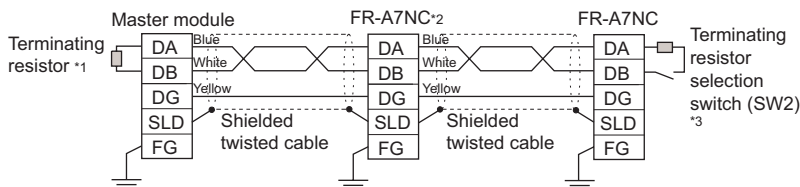
*1 Use the terminating resistors supplied with the programmable controller.
*2 For the unit in the middle, set 1 and 2 of SW2 to OFF (without terminating resistor).
*3 Perform setting of the terminating resistor selection switch (SW1).
   (Refer to page 3 for the position of the switch.)
   When connecting a terminating resistor separately, do not use a built-in terminating resistor. (SW2 1-OFF, 2-OFF)

	1	2	Description
	OFF	OFF	Without terminating resistor
	ON	OFF	Do not use.
	OFF	ON	130Ω
	ON	ON	110Ω

130Ω is a resistance value for the CC-Link Ver.1.00 dedicated high performance cable.

3

REMARKS

When performing online exchange

The built-in terminating resistor can not be exchanged online since the terminating resistor is on the FR-A7NC board and disconnected when the terminal block is removed from the FR-A7NC connector for communication. When changing the FR-A7NC online, connect a terminating resistor supplied with a programmable controller master module to the FR-A7NC after modifying it and do not use the internal terminating resistor (SW2 1-OFF, 2-OFF).

● Connection with the terminating resistor
Connect the terminating resistor between terminals DA-DB of the FR-A7NC at the end.
Modify the terminating resistors supplied with the programmable controller to use.
When a resistor is not supplied with the master module, use a resistor with 110Ω 1/2W available on the market.

Tube
Cut — Cut the tube
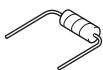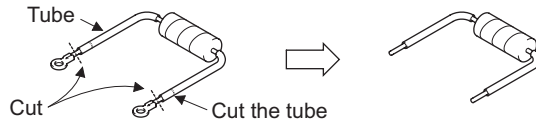
(1) Maximum number of units connected to one master station (CC-Link Ver.1.10)
42 units (when connections are inverters only)

If any other units are included, the number of stations occupied depends on the unit and therefore the following conditions must be satisfied:

$\{(1 \times a) + (2 \times b) + (3 \times c) + (4 \times d)\} \leq 64$

a: Number of units occupying 1 station   c: Number of units occupying 3 stations
b: Number of units occupying 2 stations   d: Number of units occupying 4 stations

$\{(16 \times A) + (54 \times B) + (88 \times C)\} \leq 2304$

A: Number of remote I/O ≤ 64
B: Number of remote device stations ≤ 42
C: Number of local, standby master and intelligent device stations ≤ 26

(2) Maximum number of units connected to one master station (CC-Link Ver.2.00)
42 units (when connections are inverter only)

If any other units are included, the number of stations occupied depends on the unit and therefore the following conditions must be satisfied:

· $\{(a + a2 + a4 + a8) + (b + b2 + b4 + b8) \times 2 + (c + c2 + c4 + c8) \times 3 + (d + d2 + d4 + d8) \times 4\} \leq 64$
· $\{(a \times 32 + a2 \times 32 + a4 \times 64 + a8 \times 128) + (b \times 64 + b2 \times 96 + b4 \times 192 + b8 \times 384) + (c \times 96 + c2 \times 160 + c4 \times 320 + c8 \times 640) + (d \times 128 + d2 \times 224 + d4 \times 448 + d8 \times 896)\} \leq 8192$
· $\{(a \times 4 + a2 \times 8 + a4 \times 16 + a8 \times 32) + (b \times 8 + b2 \times 16 + b4 \times 32 + b8 \times 64) + (c \times 12 + c2 \times 24 + c4 \times 48 + c8 \times 96) + (d \times 16 + d2 \times 32 + d4 \times 64 + d8 \times 128)\} \leq 2048$

a: Number of single setting devices occupying one station
b: Number of single setting devices occupying two stations
c: Number of single setting devices occupying three stations
d: Number of single setting devices occupying four stations
a2: Number of double setting devices occupying one station
b2: Number of double setting devices occupying two stations
c2: Number of double setting devices occupying three stations
d2: Number of double setting devices occupying four stations
a4: Number of quadruple setting devices occupying one station
b4: Number of quadruple setting devices occupying two stations
c4: Number of quadruple setting devices occupying three stations
d4: Number of quadruple setting devices occupying four stations
a8: Number of octuple setting devices occupying one station
b8: Number of octuple setting devices occupying two stations
c8: Number of octuple setting devices occupying three stations
d8: Number of octuple setting devices occupying four stations

· $16 \times A + 54 \times B + 88 \times C \leq 2304$
A: Numbers of remote I/O ≤ 64
B: Number of remote device stations ≤ 42
C: Number of local and intelligent device stations ≤ 26

3

3.3 Connection cable

In the CC-Link system, use CC-Link dedicated cables.
If the cable used is other than the CC-Link dedicated cable, the performance of the CC-Link system is not guaranteed.
For the specifications of the CC-Link dedicated cable, refer to the website of the CC-Link Partner Association.

· Website of the CC-Link Partner Association http://www.cc-link.org/

3.4 Wiring

(1) Strip off the sheath of the CC-Link dedicated cable and twist wires to use. If the length of the sheath pealed is too long, a short circuit may occur among neighboring wires. If the length is too short, wires might come off.
Use recommended cables. *(Refer to page 16.)* Recommended tightening torque : 0.22N·m to 0.25N·m
Wire the stripped cable after twisting it to prevent it from becoming loose. (Do not solder it.)

Cable stripping length

6.5mm
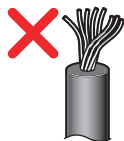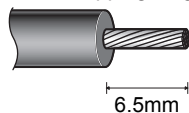
Use a blade type terminal as required.

Recommended blade terminal

For wiring of the CC-link communication signal, two CC-Link dedicated cables need to be twisted to wire to one terminal block.

It is recommended to use the following blade terminal and tool.

Recommended products (as of March 2008):

Phoenix Contact Co.,Ltd.

·Blade terminal model: AI-TWIN2 × 0,5-8WH

·Blade terminal crimping tool:
  CRIMPFOX UD6, ZA3

Note the crimping method.

Hold the long side in a longitudinal direction and insert it into the terminal block.
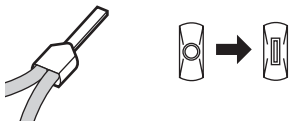
Connection of the shielded cable of the CC-Link dedicated cable

Twist the shielded cable and wire to the terminal SLD. Use a compression tube and junction terminal block.

Shielded cable

Use of a compression tube

CC-Link dedicated cable

Prevent looseness with a compression tube
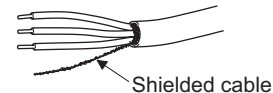
Shielded cable
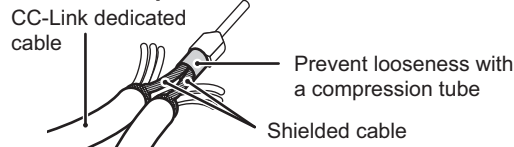
Use of a junction terminal block

FR-A7NC SLD

FR-A7NC SLD

Junction terminal block   Junction terminal block
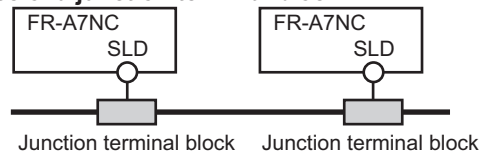
3

(2) Loosen the terminal screw and insert the cable into the terminal.

Screw Size	Tightening Torque	Cable Size	Screwdriver
M2	0.22N·m to 0.25N·m	0.3mm^2 to 0.75mm^2	Small ⊖ flat-blade screwdriver (Tip thickness: 0.4mm /tip width: 2.5mm)

CAUTION

Undertightening can cause cable disconnection or malfunction. Overtightening can cause a short circuit or malfunction due to damage to the screw or unit.

(3) Connect the terminal block to the connector for communication of the communication option.
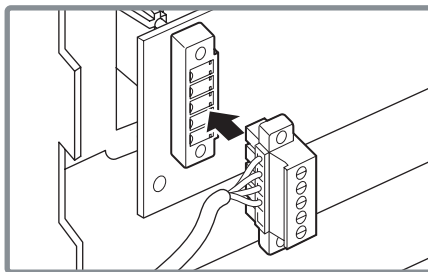
(4) For wiring of the inverter which has one front cover, route wires between the control circuit terminal block and front cover. If cables can not be routed between the control circuit terminal block and front cover (approx 7mm), remove a hook of the front cover, and use the space became available.
For wiring of the inverter which has front cover 1 and 2, use the space on the left side of the control circuit terminal block.

Cut off with a nipper, etc.

Cut off a hook on the inverter front cover side surface.
(Cut off so that no portion is left.)

Front cover
CC-Link dedicated cable

Inverter which has one front cover

CC-Link dedicated cable

Front cover 1
Front cover 2

Control circuit terminal block
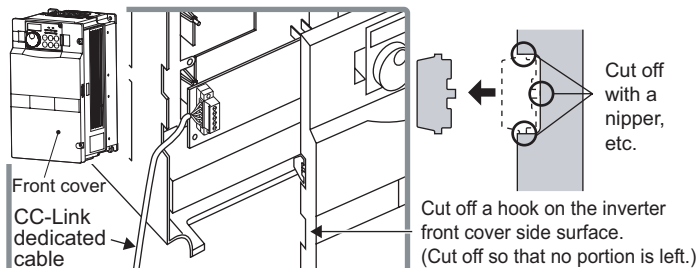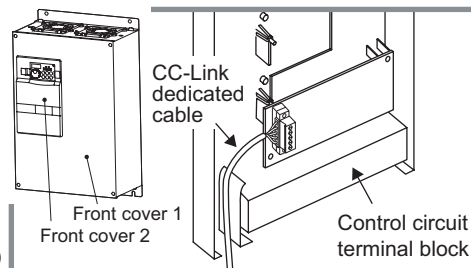
Inverter which has front cover 1 and 2

3

REMARKS

· When the hook of the inverter front cover is cut off for wiring, the protective structure (JEM1030) changes to open type (IP00).
· If the terminal block of the FR-A7NC is removed, built-in terminating resistor can not be used. *(Refer to page 13.)*

⚠ **CAUTION**

⚠ **When performing wiring using the space between the inverter front cover and control circuit terminal block, take care not to subject the cable to stress.**

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

4 INVERTER SETTING

4.1 Parameter list

The following parameters are used for the plug-in option (FR-A7NC).
Set the values according to need.

Parameter Number	Name	Setting Range	Minimum Setting Increments	Initial Value	Refer to Page
79	Operation mode selection	0 to 4, 6, 7	1	0	22
313 *1	DO0 output selection	0 to 8, 10 to 20, 25 to 28, 30 to 36, 39, 41 to 47, 64, 70 to 78, 84 to 99, 100 to 108, 110 to 116, 120, 125 to 128, 130 to 136, 139, 141 to 147, 164, 170, 184 to 199, 9999 *4	1	9999	58
314 *1	DO1 output selection				
315 *1	DO2 output selection				
338	Communication operation command source	0, 1	1	0	26
339	Communication speed command source	0, 1, 2	1	0	26
340	Communication startup mode selection	0, 1, 2, 10, 12	1	0	22
342	Communication EEPROM write selection	0, 1	1	0	30
349 *1	Communication reset selection	0, 1	1	0	38
500 *1	Communication error recognition waiting time	0 to 999.8s	0.1s	0	31
501 *1	Communication error occurrence count display	0	1	0	32
502 *1	Communication error time stop mode selection	0 to 3	1	0	33
541 *1, *5	Frequency command sign selection (CC-Link)	0, 1	1	0	41
542 *1, *2, *3	Communication station number (CC-Link)	1 to 64	1	1	*39*
543 *1, *2, *3	Baud rate selection (CC-Link)	0 to 4	1	0	*40*
544 *1, *2	CC-Link extended setting	0, 1, 12, 14, 18, 100, 112, 114, 118 *6	1	0	45
550 *2	NET mode operation command source selection	0, 1, 9999	1	9999	25
804 *5	Torque command source selection	0, 1, 3, 4, 5, 6	1	0	79

*1 Parameters which can be displayed when the plug-in option (FR-A7NC) is mounted.
*2 The setting is reflected after inverter reset or at the next power-on.
*3 "L.ERR" LED flickers if the setting is changed. If the inverter is reset, the setting is reflected and the LED turns off.
*4 The setting range differs according to the inverter. For details, refer to *page 60*.
*5 These parameters can be set for the FR-A700 series only.
*6 *Pr.544 CC-Link extended setting* = "100, 112, 114, 118" are available with the FR-A700 series-NA/EC version inverter only.

4.2 Operation mode setting

The inverter mounted with a communication option has three operation modes.

(1) PU operation [PU]............. Controls the inverter from the key of the operation panel (FR-DU07) mounted on the inverter.

(2) External operation [EXT] ... Controls the inverter by switching on/off external signals connected to the control circuit terminals of the inverter.
(The inverter is factory-set to this mode.)

(3) Network operation [NET] ... Controls the inverter with instructions from the network via the communication option.
(The operation signal and running frequency can be entered from the control circuit terminals depending on the *Pr. 338 Communication operation command source* and *Pr. 339 Communication speed command source* settings. *Refer to page 26.*)

4.2.1 Operation mode indication

FR-DU07
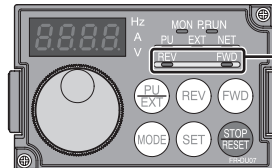
Operation mode indication
(The inverter operates according to the LED lit mode.)
PU: PU operation mode
EXT: External operation mode
NET: Network operation mode

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

(1) Operation mode switching conditions

Before switching the operation mode, check that:

1) The inverter is at a stop;

2) Both the STF and STR signals are off; and

3) The *Pr. 79 Operation mode selection* setting is correct.

(Set with the operation panel of the inverter.)

Refer to *the Inverter Manual* for details of *Pr. 79*.

(2) Operation mode selection at power on and at restoration from instantaneous power failure

The operation mode at power on and at restoration from instantaneous power failure can be selected.

Set a value other than "0" in *Pr. 340* to select the network operation mode.

After started in network operation mode, parameter write from the network is enabled. (Refer to *page 89* for a program example for parameter write.)

REMARKS

1. Change of the *Pr. 340* setting is valid when powering on or resetting the inverter.
2. *Pr. 340* can be changed with the operation panel independently of the operation mode.

Pr. 340 Setting	*Pr. 79* Setting	Operation Mode at Power on or Power Restoration	Operation Mode Switchover
0 (initial value)	0 (initial value)	External operation mode	Switching among the External, PU, and NET operation mode is enabled *1
	1	PU operation mode	PU operation mode fixed
	2	External operation mode	Switching between the External and Net operation mode is enabled Switching to the PU operation mode is disallowed
	3, 4	External/PU combined operation mode	Operation mode switching is disallowed
	6	External operation mode	Switching among the External, PU, and NET operation mode is enabled while running.
	7	X12 (MRS) signal ON ..... external operation mode	Switching among the External, PU, and NET operation mode is enabled *1
		X12 (MRS) signal OFF ... external operation mode	External operation mode fixed (Forcibly switched to External operation mode.)
1, 2 *2	0	NET operation mode	Same as when *Pr. 340* = "0"
	1	PU operation mode	
	2	NET operation mode	
	3, 4	External/PU combined operation mode	
	6	NET operation mode	
	7	X12 (MRS) signal ON .... NET operation mode	
		X12 (MRS) signal OFF ... external operation mode	
10, 12 *2	0	NET operation mode	Switching between the PU and NET operation mode is enabled *3
	1	PU operation mode	Same as when *Pr. 340* = "0"
	2	NET operation mode	NET operation mode fixed
	3, 4	External/PU combined operation mode	Same as when *Pr. 340* = "0"
	6	NET operation mode	Switching between the PU and NET operation mode is enabled while running *3
	7	External operation mode	Same as when *Pr. 340* = "0"

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

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

*3 Operation mode can be changed between the PU operation mode and Network operation mode with $\left(\frac{PU}{EXT}\right)$ of the operation panel (FR-DU07) and X65 signal.

4

(3) Operation mode switching method

When "0, 1, or 2" is set in Pr. 340

Switching from the network

Switch to the External operation mode from the network.

Switch to the Network operation mode from the network.

Switching from the PU

Press $\left(\frac{PU}{EXT}\right)$ of the PU to light $\overset{PU}{\underset{\ominus}{}}$.

Press $\left(\frac{PU}{EXT}\right)$ of the PU to light $\overset{EXT}{\underset{\ominus}{}}$.
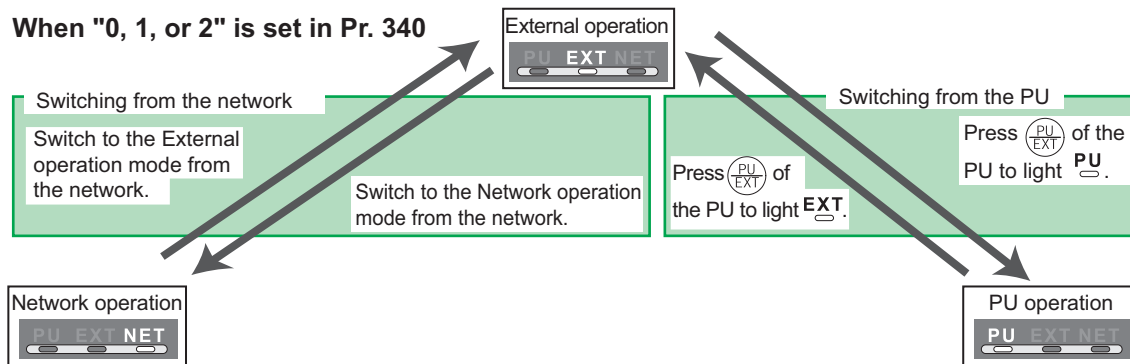
When "10 or 12" is set in Pr. 340

Press $\left(\frac{PU}{EXT}\right)$ of the PU to light $\overset{PU}{\underset{\ominus}{}}$.

Press $\left(\frac{PU}{EXT}\right)$ of the PU to light $\overset{NET}{\underset{\ominus}{}}$.
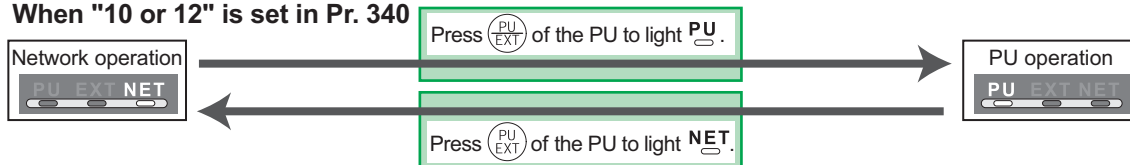
For the switching method from the external terminal, refer to *the Inverter Manual*.
Refer to *page 71* for a switching method from the network.

── **CAUTION** ──

· When starting the inverter in the Network operation mode at powering on or an inverter reset, set a value other than 0 in *Pr. 340*. *(Refer to page 22)*
· When setting a value other than 0 in *Pr. 340*, make sure that the initial settings of the inverter are correct.

4.3   Operation and speed command source (Pr. 338, Pr. 339, Pr. 550)

(1) Select command source for the Network operation mode *(Pr. 550)*

A control location for the Network operation mode can be selected from either the inverter RS-485 terminals or a communication option.

When using a communication option, set "0 or 9999 (initial value)" in *Pr. 550*.

Parameter Number	Name	Initial Value	Setting Range	Description
550	NET mode operation command source selection	9999	0	Command source is at a communication option (Command source is not at inverter RS-485 terminals)
			1	Command source is at inverter RS-485 terminals (Command source is not at a communication option)
			9999	Automatic recognition of the communication option Normally, command source is at RS-485 terminals. When a communication option is mounted, the command source is at a communication option.

Refer to the Inverter Manual for details.

4

(2) Selection of command source for the Network operation mode (*Pr. 338*, *Pr. 339*)

- There are two command types: the start command, which controls the signals related to the inverter start command and function selection, and the speed command, which controls signals related to frequency setting.
- In Network operation mode, commands from the external terminals and communication are as listed below.

Control Location Selection			*Pr. 338 Communication operation command source*	0:NET			1:External			Remarks
			Pr. 339 Communication speed command source	0:NET	1: External	2: External	0:NET	1: External	2: External	
Fixed functions (Functions equivalent to terminals)			**Running frequency from communication**	NET	—	NET	NET	—	NET	
			Terminal 2	—	External	—	—	External	—	
			Terminal 4	—	External		—	External		
			Terminal 1	Compensation						
Selective functions	*Pr. 178 to Pr. 189 settings*	0	RL **Low-speed operation command/ remote setting clear**	NET	External		NET	External		*Pr. 59* = "0" (multi-speed) *Pr. 59* = "1, 2" (remote)
		1	RM **Middle-speed operation command/ remote setting deceleration**	NET	External		NET	External		
		2	RH **High-speed operation command/ remote setting acceleration**	NET	External		NET	External		
		3	RT **Second function selection**	NET			External			
		4	AU **Terminal 4 input selection**	—	Combined		—	Combined		
		5	JOG **Jog operation selection**	—			External			
		6	CS **Automatic restart after instantaneous power failure selection**	External						
		7	OH **External thermal relay input**	External						
		8	REX **15-speed selection**	NET	External		NET	External		*Pr. 59* = "0" (multi-speed)
		9	X9 **Third function *1**	NET			External			
		10	X10 **Inverter run enable signal**	External						

Control Location Selection				*Pr. 338 Communication operation command source*	0:NET			1:External			Remarks
				Pr. 339 Communication speed command source	0:NET	1: External	2: External	0:NET	1: External	2: External	
Selective functions	*Pr. 178 to Pr. 189 settings*	11	X11	**FR-HC connection, instantaneous power failure detection**	External						
		12	X12	**PU operation external interlock**	External						
		13	X13	**External DC injection brake operation is started** *3	NET			External			
		14	X14	**PID control valid terminal**	NET	External		NET	External		
		15	BRI	**Brake opening completion signal** *1	NET			External			
		16	X16	**PU-External operation switchover**	External						
		17	X17	**Load pattern selection forward rotation reverse rotation boost** *1	NET			External			
		18	X18	**V/F switchover** *1	NET			External			
		19	X19	**Load torque high speed frequency** *1	NET			External			
		20	X20	**S-pattern acceleration/deceleration C switching terminal** *1	NET			External			
		22	X22	**Orientation command** *1, *2	NET			External			
		23	LX	**Pre-excitation** *1	NET			External			
		24	MRS	**Output stop**	Combined			External			*Pr. 79* ≠ "7"
				PU operation interlock	External						*Pr. 79* = "7" When the X12 signal is not assigned
		25	STOP	**Start self-holding selection**	—			External			
		26	MC	**Control mode switchover** *1	NET			External			
		27	TL	**Torque limit selection** *1	NET			External			
		28	X28	**Start time tuning** *1	NET			External			
		37	X37	**Traverse function selection** *4	NET			External			
		42	X42	**Torque bias selection 1** *1, *2	NET			External			
		43	X43	**Torque bias selection 2** *1, *2	NET			External			
		44	X44	**P/PI control switchover** *1	NET			External			

4

Control Location Selection				Pr. 338 Communication operation command source	0:NET			1:External			Remarks
				Pr. 339 Communication speed command source	0:NET	1: External	2: External	0:NET	1: External	2: External	
Selective functions	Pr. 178 to Pr. 189 settings	50	SQ	Sequence start *5	External and NET*			External			* The signal is valid when there are inputs from external terminals and NET.
		60	STF	Forward rotation command	NET			External			
		61	STR	Reverse rotation command	NET			External			
		62	RES	Reset	External						
		63	PTC	PTC thermistor selection	External						
		64	X64	PID forward rotation action switchover	NET	External		NET	External		
		65	X65	PU/NET operation switchover	External						
		66	X66	External/NET operation switchover	External						
		67	X67	Command source switchover	External						
		68	NP	Conditional position pulse train sign *1, *2	External						
		69	CLR	Conditional position droop pulse clear *1, *2	External						
		70	X70	DC feeding operation permission *1	NET			External			
		71	X71	DC feeding cancel *1	NET			External			
		74	X74	Magnetic flux decay output shutoff signal	NET			External			

*1　Setting can be made only for the FR-A700 series.
*2　Available only when used with the FR-A7AP.
*3　For the FR-F700 series, setting can be made only for the EC and NA versions.
*4　Setting can be made only for the EC and CH versions.
*5　Setting can be made only for the FR-A700 series NA and EC versions.
*6　When using a programmable controller function, terminals whose settings are set to "9999" with *Pr.178 to Pr.189* can be used as general-purpose input terminal. (FR-A700 series NA and EC version only)

[Explanation of table]
External   :Control by signal from external terminal is only valid.
NET   :Control from network is only valid
Combined   :Operation from either external terminal or communication is valid.
—   :Operation from either external terminal or computer is invalid.
Compensation   :Control by signal from external terminal is only valid if *Pr. 28 Multi-speed input compensation* setting is "1".

REMARKS

The *Pr. 338* and *Pr. 339* settings can be changed while the inverter is running when *Pr. 77* = 2. Note that the setting change is reflected after the inverter has stopped. Until the inverter has stopped, communication operation command source and communication speed command source before the setting change are valid.

4

4.3.1 Communication EEPROM write selection (Pr. 342)

When parameter write is performed from the communication option, write to RAM is enabled. Set when frequent parameter changes are necessary.

Parameter Number	Name	Initial Value	Setting Range	Description
342	Communication EEPROM write selection	0	0	Parameter values written by communication are written to the EEPROM and RAM.
			1	Parameter values written by communication are written to the RAM.

· When changing the parameter values frequently, set "1" in *Pr. 342* to write them to the RAM.
  Performing frequent parameter write with "0 (initial value)" (EEPROM write) set will shorten the life of the EEPROM.

REMARKS

When "1" (write to RAM only) is set in *Pr. 342*, powering off the inverter will erase the changed parameter values. Therefore, the parameter values available when power is switched on again are the values stored in EEPROM previously.

4.4   Operation at communication error occurrence

4.4.1   Operation selection at communication error occurrence (Pr. 500 to Pr. 502)

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

(1) Waiting time for the communication line error output after a communication error

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

Parameter Number	Name	Setting Range	Minimum Setting Increments	Initial Value
500	Communication error execution waiting time	0 to 999.8s	0.1s	0
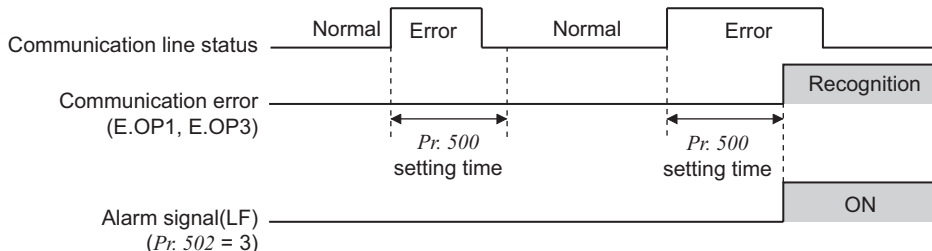
When a communication line error occurs and lasts longer than the time set in *Pr. 500*, it is recognized as a communication error.

If the communication returns to normal within the time, it is not recognized as a communication error, and the operation continues.

(2) Displaying and clearing the communication error count

The cumulative count of communication error occurrences can be displayed.

Write "0" to clear this cumulative count.

Parameter Number	Name	Setting Range	Minimum Setting Increments	Initial Value
501	Communication error occurrence count display	0	1	0

Count timing depending on communication line status

Normal	Error	Normal	Error	

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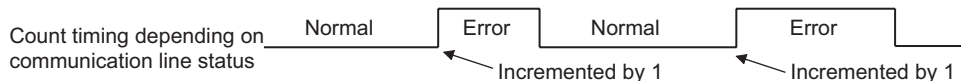
At the point of communication line error occurrence, *Pr. 501 Communication error occurrence count display* is incremented by 1.

=== CAUTION ===

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

(3) Inverter operation at a communication error occurrence

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

Parameter Number	Name	Setting Range	Minimum Setting Increments	Initial Value
502	Stop mode selection at communication error	0, 1, 2, 3	1	0

About setting

●**Operation at an error occurrence**

Error Definition	*Pr. 502* Setting	Operation	Indication	Fault Output
Communication line	0	Continued *	Normal indication *	Not provided *
	1			
	2			
	3			
Communication option itself	0, 3	Coast to stop	E. 1 or E. 3 lit	Provided
	1, 2	Decelerated to stop	E. 1 or E. 3 lit after stop	Provided after stop

* When the communication returns to normal within the time period set in *Pr. 500*, the communication option error (E.OP1 or E.OP3) does not occur.

●**Operation at error recognition after elapse of *Pr. 500* time**

Error Definition	*Pr. 502* Setting	Operation	Indication	Fault Output
Communication line	0	Coast to stop	E.OP1 or E.OP3 lit	Provided
	1	Decelerated to stop	E.OP1 or E.OP3 lit after stop	Provided after stop
	2			Not provided
	3	Continued	Normal indication	
Communication option itself	0, 3	Coast to stop	E. 1 or E.3 lit	Provided
	1, 2	Decelerated to stop	E. 1 or E.3 lit after stop	Provided after stop

4

●**Operation at error removal**

Error Definition	*Pr. 502* Setting	Operation	Indication	Fault Output
Communication line	0	Kept stopped	E.OP1 or E.OP3 kept lit	Kept provided
	1			
	2	Restart	Normal indication	Not provided
	3	Continued		
Communication option itself	0, 3	Kept stopped	E. 1 or E.3 kept lit	Kept provided
	1, 2			

═══ **CAUTION** ═══

1. **Communication line error [E.OP1 (fault data: HA1) or E.OP3 (fault data: HA3)] is an error that occurs on the communication line. Communication option error [E. 1 (fault data: HF1) or E. 3 (fault data: HF3)] is an error that occurs in the communication circuit inside the option.**
2. **Fault output indicates the fault output signal (ALM signal) and fault bit output.**
3. **When the fault output setting is active, fault records are stored in the faults history.**
   When the fault output setting is not active, fault record is overwritten to the faults history temporarily but not stored.
   After the error is removed, the fault indication is reset, changing the display back to normal, and the last fault is displayed in the faults history.
4. **When the *Pr. 502* setting is "1" or "2", the deceleration time is the ordinary deceleration time setting (e.g. *Pr. 8, Pr. 44, Pr. 45*).**
5. **The acceleration time at a restart is the ordinary acceleration time setting (e.g. *Pr. 7, Pr. 44*).**
6. **When the *Pr. 502* setting is "2", the operation/speed command at a restart is the one given before the error occurrence.**
7. **When a communication line error occurs at the *Pr. 502* setting of "2", removing the error during deceleration causes acceleration to restart at that point. (Acceleration is not restarted if the error is that of the option unit itself.)**

4.4.2   Fault and measures

(1)   The inverter operates as follows at fault occurrences.

Fault Location	Status		Operation Mode		
			Network Operation	External Operation	PU Operation
Inverter	Inverter operation		**Inverter trip**	Inverter trip	Inverter trip
	Data communication		**Continued**	Continued	Continued
Communication line	Inverter operation		**Inverter trip (depends on the *Pr. 502* setting)**	Continued	Continued
	Data communication		**Stop**	Stop	Stop
Communication option	Communication option connection error	Inverter operation	**Inverter trip (depends on the *Pr. 502* setting)**	Inverter trip (depends on the *Pr. 502* setting)	Inverter trip (depends on the *Pr. 502* setting)
		Data communication	**Continued**	Continued	Continued
	Error of communication option itself	Inverter operation	**Inverter trip (depends on the *Pr. 502* setting)**	Continued	Continued
		Data communication	**Stop**	Stop	Stop

4

(2) Measures at error occurrences

Fault Indication	Error Definition	Measures
E.OP1, E.OP3	Communication line error	Check the LED status of the option unit and remove the cause of the alarm. (Refer to *page 96* for LED indication status) Inspect the master.
E.1, E.2, E.3	Option fault	Check the connection between the inverter and option unit for poor contact, etc. and remove the cause of the error. For the FR-A700 series, fit the communication option in the option connector 3.

When faults other than the above are displayed, refer to the inverter manual and remove the cause of the error.

4.5   Inverter reset

(Refer to *page 93* for an inverter reset program example.)

(1) Operation conditions of inverter reset

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

Resetting Method			Operation Mode		
			Network Operation	**External Operation**	**PU Operation**
Reset from the network	Inverter reset *(Refer to page 73)* *1		Allowed	Disallowed	Disallowed
	Error reset (RY1A)at inverter fault *(Refer to page 57)* *2	*Pr.349* = 0	Allowed	Allowed	Allowed
		Pr.349 = 1		Disallowed	Disallowed
Turn on the inverter RES signal (terminal RES)			Enabled	Enabled	Enabled
Switch off inverter power			Enabled	Enabled	Enabled
Reset from the PU/DU	Inverter reset		Enabled	Enabled	Enabled
	Reset at inverter fault		Enabled	Enabled	Enabled

*1   Inverter reset can be made any time.

*2   Reset can be made only when the protective function of the inverter is activated.

=== **CAUTION** ===

1. **When a communication line error has occurred, reset cannot be made from the network.**
2. **The inverter is set to the External operation mode if it has been reset in Network operation mode in the initial status.**
   To resume the network operation, the inverter must be switched to the Network operation mode again.
   Set a value other than "0" in *Pr. 340* **to start in the Network operation mode.** *(Refer to page 22.)*
3. **Communication continues during inverter reset. (The inverter can not be controlled for about 1s after release of a reset command .)**

4

(2) Error reset operation selection at inverter fault

When used with the communication option (FR-A7NC), an error reset command* from network can be invalid in the External operation mode or PU operation mode.

Parameter Number	Name	Initial Value	Setting Range	Function
349	Communication reset selection	0	0	Error reset* is enabled independently of operation mode
			1	Error reset* is enabled only in the network operation mode

* RY1A *(Refer to page 57)*

4.6 CC-Link function setting

4.6.1 Station number setting (Pr. 542)

Use *Pr. 542 Communication station number (CC-Link)* to set station number of the inverter. Set this parameter within the range of 1 to 64.

Parameter Number	Name	Initial Value	Setting Range
542	Communication station number (CC-Link)	1	1 to 64

=== **CAUTION** ===

Use different station numbers for different devices. (If different devices have the same station number, the communication cannot be performed properly.)

Connection example

CC-Link master module	Programmable controller remote I/O station (occupies one station)	Inverter No.1 (FR-A7NC) Remote device station	Inverter No.2 (FR-A7NC) Remote device station	Inverter No.3 (FR-A7NC) Remote device station
Station 00	Station 01	Station 02	Station 03	Station 04

Number of stations connected is 4

4
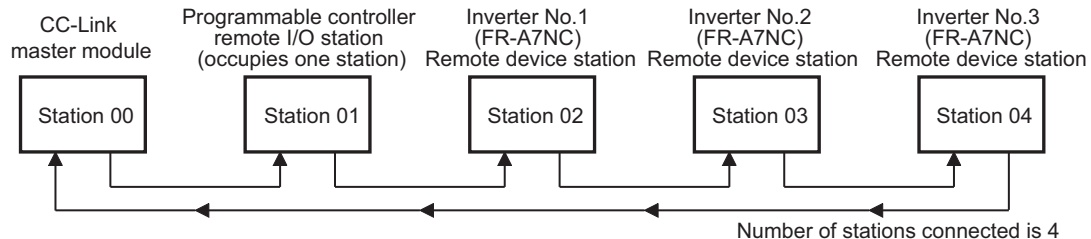
REMARKS

· Set consecutive numbers for the station numbers. (Do not skip a number in sequence like "station number 1 - station number 2- station number 4".)
  The station number does not have to match with the physical connection sequence. (There is no problem with having the physical connection sequence like "station number 1 - station number 3 - station number 4 - station number 2".)
· One inverter occupies one station. (One remote device station)
· "L.ERR" LED flickers if the setting is changed. When power is switched on again or the RES signal is turned on, the setting value is reflected and the LED turns off.

4.6.2   Baud rate setting (Pr. 543)

Set the transmission speed. (Refer to the manual for the CC-Link master module for details of transmission speed.)

Parameter Number	Name	Initial Value	Setting Range	Transmission Speed
543	Baud rate selection	0	0	156kbps
			1	625kbps
			2	2.5Mbps
			3	5Mbps
			4	10Mbps

REMARKS

"L.ERR" LED flickers if the setting is changed. When power is switched on again or the RES signal is turned on, the setting value is reflected and the LED turns off.

4.6.3 Frequency command with sign (FR-A700 series only)

By frequency command with sign, start command (forward rotation/reverse rotation) can be inversed to operate.
Make selection of sign for the frequency command from RWw1.

Parameter Numbers	Name	Initial Value	Setting Range
541	Frequency command sign selection (CC-Link)	0	0, 1

Speed setting using *Pr.37* and *Pr.144*	*Pr.541* Setting	Sign	Setting Range	Actual Frequency Command
Not used	0	Not used	0 to 40000	0 to 400.00Hz
	1	With	-32768 to 32767 (two's complement)	-327.68 to 327.67Hz
With	0	Not used	0 to 65535	It depends on *Pr.37, Pr.144, Pr.811*.
	1	With	-32768 to 32767 (two's complement)	(in 1 or 0.1 increments)

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

Start command	Sign of the Frequency Command	Actual Run Command
Forward rotation	+	Forward rotation
	-	Reverse rotation
Reverse rotation	+	Reverse rotation
	-	Forward rotation

REMARKS

When *Pr.541* = 1(with sign)
- When EEPROM write is specified with the RYE, write mode error (error code H01) will occur.
- When concurrent execution of both RYD and RYE is enabled (when a value other than 0 is set in *Pr.544*) and both RYD and RYE are turned on, RYD has precedence.
- When power is turned on (inverter reset), the initial setting status of the sign bit is "positive" and the set frequency is "0Hz". (EEPROM value is not reflected.)
  Note that the operation mode when power is turned on (inverter reset) is PU or External combined operation (*Pr.79* = 1, 3), the set frequency is EEPROM value.
- 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 to 0.1 r/min for vector control.

4

5 FUNCTION OVERVIEW

5.1 Function block diagram

Using function blocks, this section explains I/O data transfer to/from an inverter in CC-Link:

• Link refresh is continuously executed between the master station and inverter in the CC-Link system at intervals of 1.1ms to 141ms (per station).
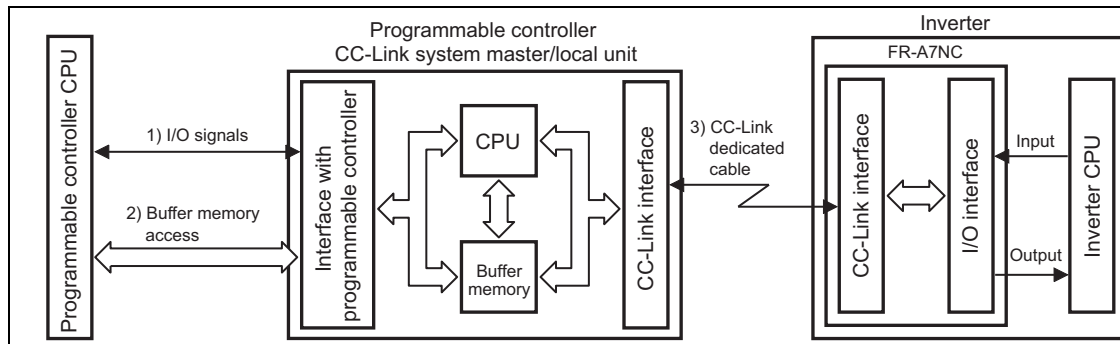
1) These are I/O signals assigned to the CC-Link system master/local unit. These signals are used for communication between the programmable controller CPU and CC-Link system master/local unit. Refer to *page 56* for details of the signal.

2) Allows input data to be read, output data to be written, and a CC-Link faulty station to be read, etc. Buffer memory is accessed by the FROM and TO instructions in the sequence program. (The FROM/TO instruction is not needed when the automatic refresh function is used.) For full information on the buffer memory, refer to the CC-Link system master/local unit manual.

3) CC-Link communication start command is given from the sequence program. After the CC-Link communication starts, link refresh is always performed asynchronously (or synchronously) with execution of sequence program.
For details, refer to the CC-Link system master/local unit manual.

5.2 Output from the inverter to the network

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

Item	Description	Refer to Page
Inverter status monitor	The output terminal status of the inverter can be monitored.	58
Output frequency monitor	The output frequency can be monitored.	67, 71
Output current monitor	The output current can be monitored.	71
Output voltage monitor	The output voltage can be monitored.	71
Special monitor	The monitor data selected can be checked.	71
Faults history	Fault records can be checked.	68, 72
Data at alarm occurrence	The inverter status at alarm occurrence can be checked.	68
Operation Mode	The current operation mode can be checked.	71
Parameter read	Parameter settings can be read.	73
Read of set frequency (torque command)	The current set frequency (torque command) can be read.	72

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REMARKS

Refer to the inverter manual for functions controllable from the network in each operation mode.

5.3 Input to the inverter from the network

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

Item	Description	Refer to Page
Forward rotation command	Give the forward rotation command.	56
Reverse rotation command	Give the reverse rotation command.	56
Input terminal function command	Execute functions assigned to the inverter input terminals.	56
Inverter output stop command	Stop the inverter output.	56
Error reset	Reset the inverter only when an inverter alarm occurs.	57
Frequency setting (torque command)	Set the frequency (torque command).	63, 72
Monitor command	Specify the description monitored.	63, 71
Operation mode specification	Set the operation mode.	71
Faults history clear	Erase past eight fault records.	73
All parameter clear	Return the parameter descriptions to the initial value.	73
Inverter reset	Reset the inverter.	73
Parameter write	Write parameter settings.	73
PID control	PID set point, PID measured value and PID deviation can be input from the network.	65

REMARKS

Refer to the inverter manual for functions controllable from the network in each operation mode.

6 I/O SIGNAL LIST

6.1 CC-Link extended setting (Pr. 544)

Remote register function can be extended.

Parameter Number	Name	Initial Value	Setting Range	CC-Link Ver.	Description	Refer to page
544	CC-Link extended setting	0	0	1	Occupies one station (FR-A5NC compatible) *1	46
			1		Occupies one station	49
			12 *2	2	Occupies one station double	50
			14 *2		Occupies one station quadruple	51
			18 *2		Occupies one station octuple	52
			100 *3	1	Occupies one station (Programmable controller function)	54
			112 *2, *3	2	Occupies one station double (Programmable controller function)	54
			114 *2, *3		Occupies one station quadruple (Programmable controller function)	55
			118 *2, *3		Occupies one station octuple (Programmable controller function)	55

*1 The program used for conventional series inverter (FR-A5NC) can be used.
     When RYD, RYE, and RYF turn on simultaneously, only one of them is executed.
     The upper 8 bits of RWw2 are link parameter extended setting.
*2 When using double, quadruple and octuple settings of the CC-Link Ver.2, station data of the master station must be set to double, quadruple and octuple also.
     (If the master station is CC-Link Ver.1 compatible station, the above setting can not be made.)
*3 *Pr.544 CC-Link extended setting* = "100, 112, 114, 118" are available with the FR-A700 series-NA/EC version inverter only.

REMARKS
The setting change is reflected after an inverter reset. (Refer to *page 37* for inverter reset.)

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6.2 I/O signal list

6.2.1 I/O signal when CC-Link Ver.1 one station (FR-A5NC compatible) is occupied (Pr. 544 = 0)

(1) Remote I/O (32 points)

Device No.	Signal	Refer to Page	Device No.	Signal	Refer to Page
RYn0	Forward rotation command	56	RXn0	Forward running	58
RYn1	Reverse rotation command	56	RXn1	Reverse running	58
RYn2	High-speed operation command (terminal RH function) *1	56	RXn2	Running (terminal RUN function) *2	58
RYn3	Middle-speed operation command (terminal RM function) *1	56	RXn3	Up to frequency (terminal SU function) *2	58
RYn4	Low-speed operation command (terminal RL function) *1	56	RXn4	Overload alarm (terminal OL function) *2	58
RYn5	Jog operation command (terminal Jog function) *1	56	RXn5	Instantaneous power failure (terminal IPF function) *2	58
RYn6	Second function selection (terminal RT function) *1	56	RXn6	Frequency detection (terminal FU function) *2	58
RYn7	Current input selection (terminal AU function) *1	56	RXn7	Error (terminal ABC1 function) *2	58
RYn8	Selection of automatic restart after instantaneous power failure (terminal CS function) *1	56	RXn8	⎯ (terminal ABC2 function) *2	58
RYn9	Output stop	56	RXn9	*Pr. 313* assignment function (DO0) *3	58
RYnA	Start self-holding selection (terminal STOP function) *1	56	RXnA	*Pr. 314* assignment function (DO1) *3	58
RYnB	Reset (terminal RES function) *1	56	RXnB	*Pr. 315* assignment function (DO2) *3	58
RYnC	Monitor command	57	RXnC	Monitoring	58
RYnD	Frequency setting command (RAM)	57	RXnD	Frequency setting completion (RAM)	59
RYnE	Frequency setting command (RAM, EEPROM)	57	RXnE	Frequency setting completion (RAM, EEPROM)	59

Device No.	Signal	Refer to Page	Device No.	Signal	Refer to Page
RYnF	Instruction code execution request	57	RXnF	Instruction code execution completion	59
RY(n+1)0 to RY(n+1)7	Reserved	—	RX(n+1)0 to RX(n+1)7	Reserved	—
RY(n+1)8	Not used (initial data process completion flag)	—	RX(n+1)8	Not used (initial data process request flag)	—
RY(n+1)9	Not used (initial data process request flag)	—	RX(n+1)9	Not used (initial data process completion flag)	—
RY(n+1)A	Error reset request flag	57	RX(n+1)A	Error status flag	59
RY(n+1)B to RY(n+1)F	Reserved	—	RX(n+1)B	Remote station ready	59
			RX(n+1)C to RX(n+1)F	Reserved	—

("n" indicates a value determined according to the station number setting.)

*1 These signals are set in the initial status. Using *Pr. 180* to *Pr. 186, Pr. 188,* and *Pr .189*, you can change input signal functions.
Signals of the RYn0, RYn1, and RYn9 can not be changed. Even when changed using *Pr. 178, Pr. 179,* and *Pr. 187*, the settings are invalid.
Refer to the inverter manual for details of *Pr. 178* to *Pr. 189*.

*2 These signals are set in the initial status. Using *Pr. 190* to *Pr .196*, you can change output signal functions.
Refer to *page 60* for signals which can be assigned.

*3 Output signal can be assigned using *Pr. 313 to Pr. 315*.
Refer to *page 60* for signals which can be assigned.

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(2) Remote register

Address	Description		Refer to Page	Address	Description	Refer to Page
	Upper 8 Bits	**Lower 8 Bits**				
RWwn	Monitor code 2	Monitor code 1	63	RWrn	First monitor value	67
RWwn+1	Set frequency (0.01Hz increments) / torque command *2		63	RWrn+1	Second monitor value	67
RWwn+2	H00 (arbitrary) *1	Instruction code	64	RWrn+2	Reply code	67
RWwn+3	Write data		64	RWrn+3	Read data	67

("n" indicates a value determined according to the station number setting.)

*1 The above 8 bit is always H00 even if a value other than H00 is set.
*2 For the FR-A700 series, setting "3" or "5" in *Pr.804* during torque control under Real sensorless vector control or vector control sets torque command in RWwn + 1.

6.2.2 I/O signal when CC-Link Ver.1 one station is occupied (Pr. 544 = 1)

(1) Remote I/O (32 points)

Same as when *Pr. 544* = 0 *(☞ Refer to page 46)*

(2) Remote register

Address	Description		Refer to Page	Address	Description		Refer to Page
	Upper 8 Bits	**Lower 8 Bits**			**Upper 8 Bits**	**Lower 8 Bits**	
RWwn	Monitor code 2	Monitor code 1	63	RWrn	First monitor value		67
RWwn+1	Set frequency (0.01Hz increments) / torque command *		63	RWrn+1	Second monitor value		67
RWwn+2	Link parameter extended setting	Instruction code	64	RWrn+2	Reply code 2	Reply code 1	67
RWwn+3	Write data		64	RWrn+3	Read data		67

("n" indicates a value determined according to the station number setting.)

*	For the FR-A700 series, setting "3" or "5" in *Pr.804* during torque control under Real sensorless vector control or vector control sets torque command in RWwn + 1.

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6.2.3 I/O signal when CC-Link Ver.2 double setting is selected (Pr. 544 = 12)

(1) Remote I/O (32 points)

Same as when *Pr. 544* = 0 (☞*Refer to page 46)*

(2) Remote register

Address	Description		Refer to Page	Address	Description		Refer to Page
	Upper 8 Bits	**Lower 8 Bits**			**Upper 8 Bits**	**Lower 8 Bits**	
RWwn	Monitor code 2	Monitor code 1	63	RWrn	First monitor value		67
RWwn+1	Set frequency (0.01Hz increments) / torque command *		63	RWrn+1	Second monitor value		67
RWwn+2	Link parameter extended setting	Instruction code	64	RWrn+2	Reply code 2	Reply code 1	67
RWwn+3	Write data		64	RWrn+3	Read data		67
RWwn+4	Monitor code 3		64	RWrn+4	Third monitor value		68
RWwn+5	Monitor code 4		64	RWrn+5	Fourth monitor value		68
RWwn+6	Monitor code 5		64	RWrn+6	Fifth monitor value		68
RWwn+7	Monitor code 6		64	RWrn+7	Sixth monitor value		68

("n" indicates a value determined according to the station number setting.)

*   For the FR-A700 series, setting "3" or "5" in *Pr.804* during torque control under Real sensorless vector control or vector control sets torque command in RWwn + 1.

6.2.4 I/O signal when CC-Link Ver.2 quadruple setting is selected (Pr. 544 = 14)

(1) Remote I/O (32 points)

Same as when *Pr. 544* = 0 *(☞ Refer to page 46)*

(2) Remote register

Address	Description		Refer to Page	Address	Description		Refer to Page
	Upper 8 Bits	**Lower 8 Bits**			**Upper 8 Bits**	**Lower 8 Bits**	
RWwn	Monitor code 2	Monitor code 1	63	RWrn	First monitor value		67
RWwn+1	Set frequency (0.01Hz increments)		63	RWrn+1	Second monitor value		67
RWwn+2	Link parameter extended setting	Instruction code	64	RWrn+2	Reply code 2	Reply code 1	67
RWwn+3	Write data		64	RWrn+3	Read data		67
RWwn+4	Monitor code 3		64	RWrn+4	Third monitor value		68
RWwn+5	Monitor code 4		64	RWrn+5	Fourth monitor value		68
RWwn+6	Monitor code 5		64	RWrn+6	Fifth monitor value		68
RWwn+7	Monitor code 6		64	RWrn+7	Sixth monitor value		68
RWwn+8	Faults history No.	H00	64	RWrn+8	Faults history No.	Fault data	68
RWwn+9	PID set point (0.01% increments) *1		65	RWrn+9	Fault record (output frequency)		68
RWwn+A	PID measured value (0.01% increments) *1		65	RWrn+A	Fault record (output current)		68
RWwn+B	PID deviation (0.01% increments) *1		65	RWrn+B	Fault record (output voltage)		68
RWwn+C	Torque command *2		79	RWrn+C	Fault record (energization time)		68
RWwn+D	H00 (Free)		—	RWrn+D	H00 (Free)		—
RWwn+E				RWrn+E			
RWwn+F				RWrn+F			

("n" indicates a value determined according to the station number setting.)

*1 When *Pr. 128* = "50, 51, 60, 61", they are valid.
*2 Setting "3" or "5" in *Pr.804* during torque control under Real sensorless vector control or vector control makes torque command valid. (FR-A700 series only)

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6.2.5 I/O signal when CC-Link Ver.2 octuple setting is selected (Pr. 544 = 18)

(1) Remote I/O (32 points)

Same as when *Pr. 544* = 0 *(☞ Refer to page 46)*

(2) Remote register

Address	Description		Refer to Page	Address	Description		Refer to Page
	Upper 8 Bits	**Lower 8 Bits**			**Upper 8 Bits**	**Lower 8 Bits**	
RWwn	Monitor code 2	Monitor code 1	63	RWrn	First monitor value		67
RWwn+1	Set frequency (0.01Hz increments)		63	RWrn+1	Second monitor value		67
RWwn+2	Link parameter extended setting	Instruction code	64	RWrn+2	Reply code 2	Reply code 1	67
RWwn+3	Write data		64	RWrn+3	Read data		67
RWwn+4	Monitor code 3		64	RWrn+4	Third monitor value		68
RWwn+5	Monitor code 4		64	RWrn+5	Fourth monitor value		68
RWwn+6	Monitor code 5		64	RWrn+6	Fifth monitor value		68
RWwn+7	Monitor code 6		64	RWrn+7	Sixth monitor value		68
RWwn+8	Faults history No.	H00	64	RWrn+8	Faults history No.	Faults history data	68
RWwn+9	PID set point (0.01% increments) *1		65	RWrn+9	Fault record (output frequency)		68
RWwn+A	PID measured value (0.01% increments) *1		65	RWrn+A	Fault record (output current)		68
RWwn+B	PID deviation (0.01% increments) *1		65	RWrn+B	Fault record (output voltage)		68
RWwn+C	Torque command *2		79	RWrn+C	Fault record (energization time)		68
RWwn+D	H00 (Free)		—	RWrn+D	H00 (Free)		—
RWwn+E				RWrn+E			
RWwn+F				RWrn+F			

*1 When *Pr. 128* = "50, 51, 60, 61", they are valid.
*2 Setting "3" or "5" in *Pr.804* during torque control under Real sensorless vector control or vector control makes torque command valid. (FR-A700 series only)

Address	Description		Refer to Page	Address	Description		Refer to Page
	Upper 8 Bits	**Lower 8 Bits**			**Upper 8 Bits**	**Lower 8 Bits**	
RWwn+10	Link parameter extended setting	Instruction code	66	RWrn+10	Reply code		68
RWwn+11	Write data		66	RWrn+11	Read data		68
RWwn+12	Link parameter extended setting	Instruction code	66	RWrn+12	Reply code		68
RWwn+13	Write data		66	RWrn+13	Read data		68
RWwn+14	Link parameter extended setting	Instruction code	66	RWrn+14	Reply code		68
RWwn+15	Write data		66	RWrn+15	Read data		68
RWwn+16	Link parameter extended setting	Instruction code	66	RWrn+16	Reply code		68
RWwn+17	Write data		66	RWrn+17	Read data		68
RWwn+18	Link parameter extended setting	Instruction code	66	RWrn+18	Reply code		68
RWwn+19	Write data		66	RWrn+19	Read data		68
RWwn+1A	H00 (Free)		—	RWrn+1A	H00 (Free)		—
RWwn+1B				RWrn+1B			
RWwn+1C				RWrn+1C			
RWwn+1D				RWrn+1D			
RWwn+1E				RWrn+1E			
RWwn+1F				RWrn+1F			

("n" indicates a value determined according to the station number setting.)

6

6.2.6 I/O signal when CC-Link Ver.1 one station is occupied (Pr. 544 = 100) (FR-A700 series NA/EC version only)

The device points usable in CC-Link communication are 32 input (RX) points, 32 output (RY) points, 4 remote register (RWr) points and 4 remote register (RWw) points.

For details of remote I/O and remote register, refer to the FR-A700 programmable controller function programming manual.

6.2.7 I/O signal when CC-Link Ver.2 double setting is selected (Pr. 544 = 112) (FR-A700 series NA/EC version only)

The device points usable in CC-Link communication are 32 input (RX) points, 32 output (RY) points, 4 remote register (RWr) points and 4 remote register (RWw) points.

For details of remote I/O and remote register, refer to the FR-A700 programmable controller function programming manual.

6.2.8 I/O signal when CC-Link Ver.2 quadruple setting is selected (Pr. 544 = 114) (FR-A700 series NA/EC version only)

The device points usable in CC-Link communication are 32 input (RX) points, 32 output (RY) points, 8 remote register (RWr) points and 8 remote register (RWw) points.

For details of remote I/O and remote register, refer to the FR-A700 programmable controller function programming manual.

6.2.9 I/O signal when CC-Link Ver.2 octuple setting is selected (Pr. 544 = 118) (FR-A700 series NA/EC version only)

The device points usable in CC-Link communication are 32 input (RX) points, 32 output (RY) points, 16 remote register (RWr) points and 16 remote register (RWw) points.

For details of remote I/O and remote register, refer to the FR-A700 programmable controller function programming manual.

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7 DETAILS OF INPUT AND OUTPUT SIGNALS

The following device No. are those for station 1.

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

7.1 Details of remote input and output signals

7.1.1 Output signals (master module to inverter (FR-A7NC))

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

Device No.	Signal	Description	
RY0	Forward rotation command *2	0 : Stop command 1 : Forward rotation start	When "1" is set, a start command is input to the inverter.
RY1	Reverse rotation command *2	0 : Stop command 1 : Reverse rotation start	When "1" is set in RY0 and RY1, a stop command is input.
RY2	High-speed operation command (terminal RH function) *1	Functions assigned to terminals RH, RM, RL, JOG, RT, AU, and CS are activated.	
RY3	Middle-speed operation command (terminal RM function) *1		
RY4	Low-speed operation command (terminal RL function) *1		
RY5	Jog operation command (terminal Jog function) *1		
RY6	Second function selection (terminal RT function) *1		
RY7	Current input selection (terminal AU function) *1		
RY8	Selection of automatic restart after instantaneous power failure (terminal CS function) *1		
RY9	Output stop *2	Turn on the MRS signal to stop the inverter output.	
RYA	Start self-holding selection (terminal STOP function) *1	Functions assigned to terminal STOP and RES are activated.	
RYB	Reset (RES terminal function) *1		

*1 Signal names are initial values. Using *Pr. 180* to *Pr. 186, Pr. 188,* and *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. *(Refer to page 26.)*

*2 Signals of the RY0, RY1, and RY9 can not be changed. Even when changed using *Pr. 178, Pr. 179*, and *Pr. 187*, the settings are invalid.
Refer to *the inverter manual* for details of *Pr. 178* to *Pr.189*.

Device No.	Signal	Description
RYC *7	Monitor command	When "1" is set in the monitor command (RYC), the monitored value is set in the remote register RWr0, 1, 4 to 7, and "1" is set in the monitoring (RXC). While "1" is set in the monitor command (RYC), the monitored data is always updated.
RYD *4, *7	Frequency setting command / torque command *5 (RAM)	When "1" is set in the frequency setting command/torque command (RYD), the set frequency/torque command (RWw1) is written to RAM of the inverter. *3 After the writing completes, "1" is set in the frequency setting (torque command) completion (RXD). Torque command is written to the inverter RAM at the same time during torque control under Real sensorless vector control or vector control.
RYE *4, *7	Frequency setting command / torque command *5 (RAM, EEPROM)	When "1" is set in the frequency setting command/torque command (RYE), the set frequency/torque command (RWw1) is written to RAM and EEPROM of the inverter. After the writing completes, "1" is set in the frequency setting (torque command) completion (RXE). Torque command is written to RAM and EEPROM of the inverter at the same time during torque control under Real sensorless vector control or vector control. To change the frequency consecutively, be sure to write data to the inverter RAM.
RYF *4, *7	Instruction code execution request	When "1" is set in the instruction code execution request (RYF), processes corresponding to the instruction codes set to RWw2, 10, 12, 14, 16 and18 are executed. "1" is set in the instruction code execution request (RXF) after completion of instruction codes. When an instruction code execution error occurs, a value other than "0" is set in the reply code (RWr2, 10, 12, 14, 16, 18).
RY1A	Error reset request flag	When "1" is set in the error reset request flag (RY1A) at an inverter fault, the inverter is reset, then "0" is set in the error status flag (RX1A). *6

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

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

*5 Torque command can be set for the FR-A700 series only.

*6 Refer to *page 37* for operation conditions of inverter reset.

*7 When *Pr.544* = "100", RYC to RYF are remotely input available with the programmable controller function. (FR-A700 series NA/EC version only) For details, refer to the FR-A700 Programmable controller function programming manual.

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7.1.2 Input signals (inverter (FR-A7NC) 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) *1	Functions assigned to terminals RUN, SU, OL, IPF, FU, ABC1 and ABC2 activate. Refer to *page 60* for signals which can be assigned.
RX3	Up to frequency (terminal SU function) *1	
RX4	Overload alarm (terminal OL function) *1	
RX5	Instantaneous power failure (terminal IPF function) *1	
RX6	Frequency detection (terminal FU function) *1	
RX7	Fault (terminal ABC1 function) *1	
RX8	— (terminal ABC2 function) *1	
RX9	— (DO0 function) *2	Functions assigned to *Pr. 313* to *Pr. 315* are activated. Refer to *page 60* for signals which can be assigned.
RXA	— (DO1 function) *2	
RXB	— (DO2 function) *2	
RXC *4	Monitoring	After "1" is set in the monitor command (RYC), and the monitored value is set in the remote register Rwr0, 1, 4 to 7, "1" is set in this signal. When "0" is set in the monitor command (RYC), "0" is set in this signal.

*1 Signal names are initial values. Using *Pr. 190* to *Pr .196*, you can change output signal functions.
   Refer to *the inverter manual* for details of *Pr. 190* to *Pr.196*.
*2 Signals are not assigned in the initial setting.
   Refer to *Pr. 190* to *Pr. 196* of *the inverter manual* for details of signals.

Device No.	Signal	Description
RXD *4	Frequency setting completion/torque command setting completion *3 (RAM)	After "1" is set in the frequency setting command/torque command (RYD) and the frequency setting command/torque command is written to the inverter RAM, "1" is set in this signal. When "0" is set in the frequency setting command/torque command (RYD), "0" is set in this signal.
RXE *4	Frequency setting completion/torque command setting completion *3 (RAM, EEPROM)	After "1" is set in the frequency setting command/torque command (RYE) and the frequency setting command/torque command is written to the inverter RAM and EEPROM, "1" is set in this signal. When "0" is set in the frequency setting command/torque command (RYE), "0" is set in this signal.
RXF *4	Instruction code execution completion	After "1" is set in the instruction code execution request (RYF) and the processes corresponding to the instruction codes (RWw2, 10, 12, 14, 16 and 18) are executed, "1" is set in this signal. When "0" is set in the instruction code execution request (RYF), "0" is set in this signal.
RX1A	Error status flag	When an inverter error occurs (protective function is activated), "1" is set in this signal.
RX1B	Remote station ready	When the inverter goes into the ready status upon completion of initial setting after power-on or hardware reset, "1" is set in this signal. When an inverter error occurs (protective function is activated), "0" is set in this signal. The signal is used as an interlock signal during the write to/read from the master module.

*3 Torque command can be set for the FR-A700 series only.
*4 When *Pr.544* = "100", RXC to RXF are remotely input available with the programmable controller function. (FR-A700 series NA/EC version only)
For details, refer to the FR-A700 programmable controller function programming manual.

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<Output Signal List>

The following signals can be assigned to RX2 to RX8 and RX9 to RXB using *Pr.190 to Pr.196* and *Pr.313 to Pr.315* respectively. For details of signal definitions, refer to *Pr. 190 to Pr. 196 Output terminal function selection of the inverter manual*.

Setting		Signal Name	Function	Applicable model		
Positive Logic	Negative Logic			A700	F700(P)	FP700
0	100	RUN	Inverter running	○	○	○
1	101	SU	Up to frequency	○	○	○
2	102	IPF	Instantaneous power failure/undervoltage	○	○	○
3	103	OL	Overload alarm	○	○	○
4	104	FU	Output frequency detection	○	○	○
5	105	FU2	Second output frequency detection	○	○	○
6	106	FU3	Third output frequency detection	○	—	—
7	107	RBP	Regenerative brake pre-alarm	○	○*1	○*1
8	108	THP	Electronic thermal O/L relay pre-alarm	○	○	○
10	110	PU	PU operation mode	○	○	○
11	111	RY	Inverter operation ready	○	○	○
12	112	Y12	Output current detection	○	○	○
13	113	Y13	Zero current detection	○	○	○
14	114	FDN	PID lower limit	○	○	○
15	115	FUP	PID upper limit	○	○	○
16	116	RL	PID forward/reverse rotation output	○	○	○
17	—	MC1	Electronic bypass MC1	○	○	—
18	—	MC2	Electronic bypass MC2	○	○	—
19	—	MC3	Electronic bypass MC3	○	○	—
20	120	BOF	Brake opening request	○	—	—
25	125	FAN	Fan fault output	○	○	○
26	126	FIN	Heatsink overheat pre-alarm	○	○	○
27	127	ORA	Orientation complete	○	—	—

Setting		Signal Name	Function	Applicable model		
Positive Logic	Negative Logic			A700	F700(P)	FP700
28	128	ORM	Orientation fault	O	—	—
30	130	Y30	Forward rotation output	O	—	—
31	131	Y31	Reverse rotation output	O	—	—
32	132	Y32	Regenerative status output	O	—	—
33	133	RY2	Operation ready 2	O	—	—
34	134	LS	Low speed output	O	—	—
35	135	TU	Torque detection	O	—	—
36	136	Y36	In-position	O	—	—
39	139	Y39	Start time tuning completion	O	—	—
41	141	FB	Speed detection	O	—	—
42	142	FB2	Second speed detection	O	—	—
43	143	FB3	Third speed detection	O	—	—
44	144	RUN2	Inverter running 2	O	—	—
45	145	RUN3	Inverter running and start command is on	O	O	O
46	146	Y46	During deceleration at occurrence of power failure	O	O	O
47	147	PID	During PID control activated	O	O	O
48	148	Y48	PID deviation limit	×	O	×
57	157	IPM	$$IPM motor control	—	O*2	—
64	164	Y64	During retry	O	O	O
67	167	Y67	During power failure	—	O*2	—
70	170	SLEEP	PID output interruption	O	O	O
71	—	RO1	Commercial-power supply side motor 1 connection RO1	×	O*3	×
72	—	RO2	Commercial-power supply side motor 2 connection RO2	×	O*3	×
73	—	RO3	Commercial-power supply side motor 3 connection RO3	×	O*3	×
74	—	RO4	Commercial-power supply side motor 4 connection RO4	×	O*3	×
75	—	RIO1	Inverter side motor 1 connection RIO1	×	O*3	×
76	—	RIO2	Inverter side motor 2 connection RIO2	×	O*3	×
77	—	RIO3	Inverter side motor 3 connection RIO3	×	O*3	×

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Setting		Signal Name	Function	Applicable model		
Positive Logic	Negative Logic			A700	F700(P)	FP700
78	—	RIO4	Inverter side motor 4 connection RIO4	×	○*3	×
79	179	Y79	Pulse train output of output power	×	○	○
84	184	RDY	Position control preparation ready	○	—	—
85	185	Y85	DC feeding	○	○	—
86	186	Y86	Control circuit capacitor life *4	○	○	○
87	187	Y87	Main circuit capacitor life *4	○	○	○
88	188	Y88	Cooling fan life *4	○	○	○
89	189	Y89	Inrush current limit circuit life *4	○	○	○
90	190	Y90	Life alarm	○	○	○
91	191	Y91	Fault output 3 (power-off signal)	○	○	○
92	192	Y92	Energy saving average value updated timing	○	○	○
93	193	Y93	Current average value monitor signal	○	○	○
94	194	ALM2	Fault output 2	○	○	○
95	195	Y95	Maintenance timer signal	○	○	○
96	196	REM	Remote output	○	○	○
97	197	ER	Alarm output 2	○	—	—
98	198	LF	Alarm output	○	○	○
99	199	ALM	Fault output	○	○	○
9999		—	No function	○	○	○

*1   The setting is available for the models with 75K (FR-F720-03610, FR-F740-01800) or higher capacity.
*2   The setting is only available for the FR-F700P series.
*3   Setting can be made only for NA, EC and CH version.
*4   These signals can not be assigned with *Pr.190 to Pr.196*.

REMARKS

When an option error ($E. \ \ 1$ to $E. \ \ 3$) occurs, all outputs are tuned off.

7.2 Details of remote register

7.2.1 Remote register (master module to inverter (FR-A7NC))

●**Remote register definition**

Device No.	Signal	Description
RWw0	Monitor code1/ Monitor code2	Set the monitor code to be referenced *(Refer to page 76)*. When "1" is set in RYC, data of specified monitored items will be stored in RWr0/RWr1.
RWw1	Set frequency *1, *2	· Specify the set frequency. At this time, whether to write to RAM or EEPROM is decided with the RYD and RYE settings. After setting the set frequency in this register, set "1" in RYD or RYE to write the frequency. After writing of frequency is completed, "1" is set in RXD or RXE in response to the input command. · The setting range is 0 to 400.00Hz (0.01Hz increments *3). Write "40000" when setting 400.00Hz.
	Torque command value (FR-A700 series only)	When performing torque control under Real sensorless vector control or vector control with *Pr.544 CC-Link extended setting* = 0, 1, 12, (112, 114) and *Pr.804 Torque command source selection* = 3, 5, specify torque command value. The value is written to the inverter either by RYD or RYE. *Pr.805 Torque command value (RAM)* and *Pr.806 Torque command value (RAM,EEPROM)* are updated as well. The setting range and setting increments depend on the *Pr.804* setting.

*1 When speed display is set using *Pr. 37* and *Pr. 144*, the monitor is 1r/min increments.

*2 When *Pr.541 Frequency command sign selection (CC-Link)* = 1, the setting value has either + or -. When the setting value is negative, the command is inversed from starting command.
Setting range: -327.68Hz to 327.67Hz (-327.68 to 327.67) 0.01Hz increments (FR-A700 series only)
For details refer to *page 41*.

*3 Setting "1 or 11" in *Pr.811 Set resolution switchover* changes the increments to 0.1 r/min for vector control. (FR-A700 series only)

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Device No.	Signal	Description
RWw2	Link parameter extended setting/ Instruction code	Set the instruction code for execution of operation mode rewrite, Pr. read/write, error reference, error clear, etc. *(Refer to page 71)* Set "1" in RYF to execute the corresponding instruction after completing the register setting. "1" is set in RXF after completing the execution of the instruction. When a value other than "0 (100)" is set in *Pr. 544 CC-Link expansion setting*, upper eight bits are link parameter extended setting. Example) When reading *Pr. 160*, instruction code is H0200.
RWw3	Write data	Set the data specified by the RWw2 instruction code. (When required) Set "1" in RYF after setting RWw2 and this register. Set zero when the write code is not required.
RWw4	Monitor code 3	Set the monitor code to be monitored. By setting "1" in RYC after setting, the specified monitored data is stored in RWr□. (□ indicates a register number. (RWr4 to 7))
RWw5	Monitor code 4	
RWw6	Monitor code 5	
RWw7	Monitor code 6	
RWw8	Faults history No.	Set how many fault records in past to be read. Back to eight fault records in past can be read. (lower 8bits is H00) Upper: H00 (latest fault) to H07 (eight faults in past)/lower: H00 When H08 to HFF are set, fault record becomes an unfixed value.

Device No.	Signal	Description	
RWw9	PID set point *4	Set the PID set point Setting range : "0 to 100.00%"	· Input a value 100 times greater than the value to be set
RWwA	PID measured value *4	Set the PID measured value Setting range : "0 to 100.00%"	For example, input "10000" when setting 100.00%.
RWwB	PID deviation *4	Set the PID deviation. Setting range : "-100.00% to 100.00%"	· Refer to *the inverter manual* for details of PID control.
RWwC	Torque command value (FR-A700 series only)	When performing torque control under Real sensorless vector control or vector control with *Pr.544 CC-Link extended setting* = "14, 18, (118)" and *Pr.804 Torque command source selection* = "3, 5", specify torque command value. The value is written to the inverter either by RYD or RYE. *Pr.805 Torque command value (RAM)* and *Pr.806 Torque command value (RAM,EEPROM)* are updated as well. The setting range and setting increments depend on the *Pr.804* setting.	

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

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Device No.	Signal	Description
RWw10, RWw12, RWw14, RWw16, RWw18	Link parameter extended setting/ Instruction code	Set the instruction code *(refer to page 71)* for execution of operation mode rewrite, Pr. read/write, error reference, error clear, etc. The instructions are executed in the following order by setting "1" in RYF after completing the register setting: RWw2, 10, 12, 14, 16, then 18. After completing the execution up to RWw18, "1" is set in RXF. Set HFFFF to disable an instruction by RWw10 to 18. (RWw2 is always executed.) The first 8bits are link parameter extended setting. Example) When reading *Pr. 160*, instruction code is H0200.
RWw11, RWw13, RWw15, RWw17, RWw19	Write data	Set the data specified by the instruction code of RWw10, 12, 14, 16, and 18. (when required) RWw10 and 11, 12 and 13, 14 and 15, 16 and 17, and 18 and 19 correspond each other. Set "1" in RYF after setting the instruction codes (RWw10, 12, 14, 16, and 18) and the corresponding register. Set zero when the write code is not required.

7.2.2 Remote register (inverter (FR-A7NC) to master module)

(1) Remote register definition

Device No.	Signal	Description
RWr0	First monitor value	When "1" is set in RYC, the specified monitored data is set to the lower 8 bits of the monitor code (RWw0).
RWr1	Second monitor value (Output frequency *1)	When "0" is set to the upper 8 bits of the monitor code (RWw0), the current output frequency is always set. When a value other than "0" is set to the upper 8 bits of the monitor code (RWw0) while "1" is set in RYC, the monitor data specified by the upper 8 bits of the monitor code (RWw0) is set. *1 When a value other than 9999 is set in *Pr.430* under position control (*Pr.800* = 3), pulse monitor is selected. (FR-A700 series)
RWr2	Reply code (when *Pr. 544* = 0)	When "1" is set in RYD or RYE, the reply code for the frequency setting command is set. When "1" is set in RYF, the reply code corresponding to the instruction code RWw2 is set. The value "0" is set for a normal reply and any digit other than "0" is set for data fault, mode error, etc. *(reply code ☞refer to page 69)*
	Reply code 1 (when *Pr. 544* ≠ 0, (100))	Lower 8bits of RWr2 When "1" is set in RYD or RYE, the reply code for the frequency setting command (torque command*2) is set. *(reply code 1 ☞refer to page 69)* *2 Torque command can be set for the FR-A700 series only.
	Reply code 2 (when *Pr. 544* ≠ 0, (100))	Upper 8bits of RWr2 When "1" is set in RYF, the reply code corresponding to the instruction code RWw2 is set. *(reply code 2 ☞refer to page 69)*
RWr3	Read data	For a normal reply, the reply data to the instruction specified by the instruction code is set.

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Device No.	Signal	Description
RWr4	Third monitor value	When "1" is set in RYC, the monitored data specified by the monitor code (RWw□) is saved. (□ indicates a register number (RWw4 to 7)
RWr5	Fourth monitor value	
RWr6	Fifth monitor value	
RWr7	Sixth monitor value	
RWr8	Fault record (fault data)	The fault data of faults history No. specified by RWw8 is stored in the lower 8bits. Faults history No. specified is echo backed to the upper 8bits.
RWr9	Fault record (output frequency)	Output frequency of the faults history No. specified in RWw8 is stored.
RWrA	Fault record (output current)	Output current of the faults history No. specified in RWw8 is stored.
RWrB	Fault record (output voltage)	Output voltage of the faults history No. specified in RWw8 is stored.
RWrC	Fault record (energization time)	Energization time of the faults history No. specified in RWw8 is stored.
RWr10 to RWr19	Reply code	When "1" is set in RYF, the reply codes corresponding to the instruction code RWw10, 12, 14, 16, and 18 are set. The value "0" is set for a normal reply and other than "0" is set for data fault, mode error, etc. *(reply code ☞ refer to page 69)*
	Read data	For a normal reply, the reply data to the instruction specified by the instruction code is set.

(2) Reply code definition

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

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

	Data	Item	Alarm Definition	Remarks
Reply code	H0000	Normal	No error (normal completion of instruction code execution)	· Reply code to Rwr2 when *Pr. 544* = 0 · Reply code to RWwr10, 12, 14, 16, and 18 when *Pr. 544* = 18
	H0001	Write mode error	Parameter write was attempted during operation other than a stop in the network operation mode.	
	H0002	Parameter selection error	Unregistered code number was set.	
	H0003	Setting range error	Set data is outside the permissible data range.	
Reply code 1 *	H00	Normal	No error (normal completion of instruction code execution)	Reply code to RWwr2 when *Pr. 544* ≠ 0, (100)
	H01	Write mode error	Parameter write was attempted during operation other than a stop in the network operation mode.	
	H03	Frequency command (torque command) setting range error	Frequency (torque command) outside the range is set	
Reply code 2	H00	Normal	No error (normal completion of instruction code execution)	
	H01	Write mode error	Parameter write was attempted during operation other than a stop in the network operation mode.	
	H02	Parameter selection error	Unregistered code number was set.	
	H03	Setting range error	Set data is outside the permissible data range.	

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* When torque command (FR-A700 series only) is given, values of reply code 1 below are changed.
(when values other than 14, 18, (118) are set in *Pr.544*)

When *Pr.544* = 14, 18, (118), the above 4 bit of the reply code 1 is reply code to the torque command and the lower 4 bit is to the frequency command.

Bit15   Bit0

Reply code2   Reply code corresponds to the torque command   Reply code corresponds to the frequency command

Reply code1
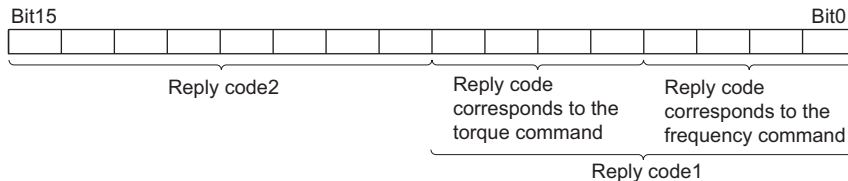
Example) The error code is H0030 when the torque command value is outside the setting range.

Bit15   Bit0

0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0

Reply code corresponds to
the torque command
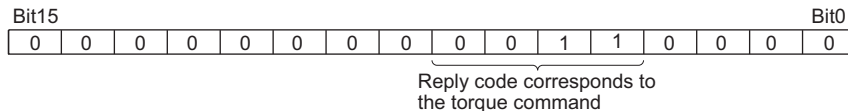
7.2.3 Instruction codes

(1) Instruction code definition

Set the instruction code using a remote register (RWw) *(Refer to page 63.)*
The definition read by the instruction code is stored in the remote register (RWr). *(Refer to page 67.)*

Item		Read/Write	Code Number	Description
Operation mode		Read	H007B	H0000: Network operation H0001: External operation H0002: PU operation
		Write	H00FB	H0000: Network operation H0001: External operation H0002: PU operation (*Pr. 79* = "6")
Monitor	Output frequency *1, *2	Read	H006F	H0000 to HFFFF: Running frequency .....Increments 0.01Hz Speed ....Increments 1r/min (when *Pr.37* = 1 to 9998 or *Pr.144* = 2 to 10, 102 to 110)
	Output current	Read	H0070	H0000 to HFFFF: Output current (hexadecimal) Increments 0.01A (55K or less) / 0.1A (75K or more) *3
	Output voltage	Read	H0071	H0000 to HFFFF: Output voltage (hexadecimal) Increments 0.1V
	Special monitor	Read	H0072	H0000 to HFFFF: Check the data of the monitor selected by the instruction code H00F3.
	Special monitor selection No.	Read	H0073	H01 to H4A: Monitor selection data
		Write	H00F3	Refer to monitor code. *(Refer to page 76.)*

*1   When "100" is set in *Pr. 52 DU/PU main display data selection*, frequency setting is monitored during a stop and output frequency is monitored during running.

*2   When a value other than 9999 is set in *Pr.430* under position control (*Pr.800* = 3), pulse monitor is selected. (FR-A700 series)

*3   The inverter type, 55K and 75K differ according to -NA and -EC versions. *(Refer to page 1.)*

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Item		Read/ Write	Code Number	Description
Monitor	Faults history	Read	H0074 to H0077	H0000 to HFFFF: Last two fault records b15　　　　　b8 b7　　　　　b0 H74 | Second fault in past | Latest fault H75 | Fourth fault in past | Third fault in past H76 | Sixth fault in past | Fifth fault in past H77 | Eighth fault in past | Seventh fault in past Refer to the fault data table *(page 75)*
Set frequency (RAM) *4		Read	H006D	Read set frequency/speed from RAM or EEPROM. · H0000 to HFFFF: 　Set frequency...0.01Hz increments 　Speed ....Unit r/min (when *Pr.37* = 1 to 9998 or *Pr.144* = 2 to 10, 102 to 110)
Set frequency (EEPROM) *4			H006E	· When performing torque control under Real sensorless vector control or vector control with *Pr.544* = "0, 1, 12, (100, 112, 114)" and *Pr.804* = "3 or 5", read torque command value. The setting range depends on *Pr.804*. (FR-A700 series)
Set frequency (RAM) *4		Write	H00ED	Write set frequency/speed to RAM or EEPROM. · H0000 to H9C40 (0 to 400.00Hz) : 　Frequency........0.01Hz increments · H0000 to H270E (0 to 9998) : 　Speed ....Unit r/min (when *Pr.37* = 1 to 9998 or *Pr.144* = 2 to 10, 102 to 110)
Set frequency (RAM and EEPROM) *4		Write	H00EE	· To change the set frequency consecutively, write data to the inverter RAM. (Instruction code: HED) · When performing torque control under Real sensorless vector control or vector control (torque control) with *Pr.544* = "0, 1, 12, (100, 112, 114)" and *Pr.804* = "3 or 5", torque command is set. The setting range depends on *Pr.804*. (FR-A700 series)

*4　Setting from remote registers can be made.

Item	Read/ Write	Code Number	Description
Parameter	Read	H0000 to H0063	· Refer to the instruction code in the parameter list in the inverter manual 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	H0080 to H00E3	· 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 30.)*
Faults history batch clear	Write	H00F4	H9696: Clears the faults history as a batch.
All parameter clear	Write	H00FC	All parameters return to the initial values. Whether to clear communication parameters or not can be selected according to data. (○: Clear, ×: Not clear) *Refer to the inverter manual* for parameter clear, all clear, and communication parameters.

All parameter clear table (within the H00FC cell):

Clear Type	Data	Communication Pr.
Parameter clear	H9696	○
	H5A5A	×
All parameter clear	H9966	○
	H55AA	×

When clear is executed for H9696 or H9966, communication-related parameter settings also return to the initial values. When resuming operation, set the parameters again.
Executing clear will clear the instruction code HEC, HF3, and HFF settings.

Item	Read/ Write	Code Number	Description
Inverter reset	Write	H00FD	H9696: Resets the inverter.

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Item	Read/ Write	Code Number	Description
Link parameter extended setting *5	Read	H007F	H0000 to H0009: Parameter description is changed according to the instruction code (extended) setting. Refer to *the inverter manual* for instruction code (extended) settings.
	Write	H00FF	
Second parameter changing *6	Read	H006C	When setting the bias/gain (instruction codes H5E to H61, HDE to HE1) parameters H00: Frequency *7 H01: Analog value set in parameters H02: Analog value input from the terminal
	Write	H00EC	

*5   Setting is valid only when *Pr. 544* = "0, (100)". When *Pr. 544* ≠ "0, (100)", set using RWw2 or RWw10, 12, 14, 16, or 18. *(Refer to page 64)*
*6   Setting can be made when the link parameter extended setting = "1, 9".
*7   Gain frequencies can be written using *Pr. 125* (instruction code H99) and *Pr. 126* (instruction code H9A) also.

(2) Fault data

Refer to the inverter manual for details of fault definitions.

Data	Definition
H00	No alarm
H10	OC1
H11	OC2
H12	OC3
H20	OV1
H21	OV2
H22	OV3
H30	THT
H31	THM
H40	FIN
H50	IPF
H51	UVT
H52	ILF
H60	OLT
H61	SOT*3, *4
H70	BE
H80	GF
H81	LF
H90	OHT

Data	Definition
H91	PTC
HA0	OPT
HA1	OP1 *2, *3
HA3	OP3 *1
HB0	PE
HB1	PUE
HB2	RET
HB3	PE2
HC0	CPU
HC1	CTE
HC2	P24
HC4	CDO
HC5	IOH
HC6	SER
HC7	AIE
HC8	USB *1
HD0	OS *1
HD1	OSD *1
HD2	ECT *1

Data	Definition
HD3	OD *1
HD5	MB1 *1
HD6	MB2 *1
HD7	MB3 *1
HD8	MB4 *1
HD9	MB5 *1
HDA	MB6 *1
HDB	MB7 *1
HDC	EP *1
HE6	PID *2
HF1	E1
HF2	E2 *1
HF3	E3 *1
HF5	E5
HF6	E6
HF7	E7
HFB	E11 *1
HFD	E13

Fault record display example
(instruction code H74)

For read data H30A1

b15								b8	b7							b0
0	0	1	1	0	0	0	0	1	0	1	0	0	0	0	1
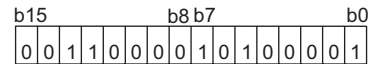
Last fault   Current fault
(H30)   (HA1)

⬇

Last fault ...... THT
Current fault OP1

*1   Displayed on the FR-A700 series.
*2   Displayed on the FR-F700(P) series.
*3   Displayed on the FR-FP700 series.
*4   Displayed on the FR-F700P series.

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7.2.4 Monitor codes

Monitor items selected with RWw0, RWw4 to 7 are explained below.
Divide the monitor code (RWw0) into half to select the first monitor description (RWr0) from the lower 8 bits and the second monitor description (RWr1) from the upper 8 bits.

REMARKS

When *Pr. 544* = 12, 14, 18, (114, 118) descriptions of monitor code 3 (RWw4) to 6 (RWw7) can be selected.

(Example) When output current is selected for the first monitor and running speed is selected for the second monitor → monitor code is H0602

Code Number	Second Monitor Description (the first 8 bits)	First, Third to Sixth Monitor Description (the last 8 bits)	Increments	Applicable model		
				A700	F700	FP700
H00	Output frequency *1, *10	No monitoring (monitor value is 0)	0.01Hz	○	○	○
H01	Output frequency *1, *10		0.01Hz *1	○	○	○
H02	Output current		0.01A / 0.1A *2	○	○	○
H03	Output voltage		0.1V	○	○	○
H05	Frequency setting value *1		0.01Hz *1	○	○	○
H06	Running speed *1		r/min *1	○	○	○
H07	Motor torque		0.1%	○	—	—
H08	Converter output voltage		0.1V	○	○	○
H09	Regenerative brake duty		0.1%	○	○ *3	—
H0A	Electronic thermal relay function load factor		0.1%	○	○	○
H0B	Output current peak value		0.01A / 0.1A *2	○	○	○
H0C	Converter output voltage peak value		0.1V	○	○	○
H0D	Input power		0.01kW / 0.1kW *2	○	○	○
H0E	Output power		0.01kW / 0.1kW *2	○	○	○
H0F	Input terminal status *5		—	○	○	○
H10	Output terminal status *6		—	○	○	○

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Code Number	Second Monitor Description (the first 8 bits)	First, Third to Sixth Monitor Description (the last 8 bits)	Increments	Applicable model		
				A700	F700	FP700
H11	Load meter		0.1%	○	○	○
H12	Motor excitation current		0.01A / 0.1A *2	○	—	—
H13	Position pulse *4		—	○	—	—
H14	Cumulative energization time		1h	○	○	○
H16	Orientation status *4		1	○	—	—
H17	Actual operation time		1h	○	○	○
H18	Motor load factor		0.1%	○	○	○
H19	Cumulative power		1kWh	○	○	○
H20	Torque command		0.1%	○	—	—
H21	Torque current command		0.1%	○	—	—
H22	Motor output		0.01kW / 0.1kW *2	○	—	—
H23	Feedback pulse *4		—	○	—	—
H32	Power saving effect		Variable according to parameters	○	○	○
H33	Cumulative saving power		Variable according to parameters	○	○	○
H34	PID set point		0.1%	○	○	○
H35	PID measured value		0.1%	○	○	○
H36	PID deviation		0.1%	○	○	○
H3A	Option input terminal state1 *7		—	○	—	—
H3B	Option input terminal state2 *8		—	○	—	—
H3C	Option output terminal status *9		—	○	—	—
H41	Output power (with regenerative display)		0.1kW	○ *11	—	—
H42	Cumulative regenerative power		1kWh	○ *11	—	—
H47	32-bit cumulative power (lower 16 bits)		1kWh	—	○ *12	—
H48	32-bit cumulative power (upper 16 bits)		1kWh	—	○ *12	—
H49	32-bit cumulative power (lower 16 bits)		0.01kWh/0.1kWh *2	—	○ *12	—
H4A	32-bit cumulative power (upper 16 bits)		0.01kWh/0.1kWh *2	—	○ *12	—

7

*1   Displayed increments differ by the combination of *Pr.37* and *Pr.144*. Refer to the Instruction Manual of the inverter for the details.

When frequency is selected ....0.01Hz increment

When rotation speed is selected ....1r/min increment (Note that the increment is always 0.1r/min if *Pr.811* is set to "1 or 11" while using FR-A700.)

When machine speed is selected..............1

*2   The setting depends on the inverter capacity. (55K or less/75K or more)

The inverter type, 55K and 75K differ according to -NA and -EC versions. *(Refer to page 1.)*

*3   The setting is available for the models with 75K (FR-F720-03610, FR-F740-01800) or higher capacity.

*4   Available only when the FR-A7AP/FR-A7AL is mounted.

*5   Input terminal monitor details

b15   b0

—	—	—	—	CS	RES	STOP	MRS	JOG	RH	RM	RL	RT	AU	STR	STF

*6   Output terminal monitor details

b15   b0

—	—	—	—	—	—	—	—	—	ABC2	ABC1	FU	OL	IPF	SU	RUN

*7   Details of option input terminal monitor 1 (input terminal status of FR-A7AX)

—all terminals are off when an option is not fitted.

b15   b0

X15	X14	X13	X12	X11	X10	X9	X8	X7	X6	X5	X4	X3	X2	X1	X0

*8   Details of option input terminal monitor 2 (input terminal status of FR-A7AX)

—all terminals are off when an option is not fitted.

b15   b0

—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	DY

*9   Details of option output terminal monitor (output terminal status of FR-A7AY/A7AR)

—all terminals are off when an option is not fitted.

b15   b0

—	—	—	—	—	—	RA3	RA2	RA1	Y6	Y5	Y4	Y3	Y2	Y1	Y0

*10 When a value other than 9999 is set in *Pr.430* under position control (*Pr.800* = 3), pulse monitor is selected. (FR-A700 series)

*11 $$This can be monitored only for the FR-A701 series.

*12 $$This can be monitored only for the FR-F700P series.

7.3 Torque command by CC-Link communication (FR-A700 series only)

Digital torque command can be given during torque control under Real sensorless vector control and vector control using the FR-A7NC.

Parameter No.	Name	Initial Value	Setting Range	Definition
804	Torque command source selection	0	0	Torque command by terminal1 analog input
			1	Torque command by parameter setting Setting value of *Pr.805* or *Pr.806* (-400% to 400%)
			3	Torque command by CC-Link communication (FR-A7NC) Torque setting is enabled with a remote register. (-400% to 400%)
			4	16 bit digital input (FR-A7AX)
			5	Torque command by CC-Link communication (FR-A7NC) Torque setting is enabled with a remote register. (-327.68% to 327.67%)
			6	Torque command by CC-Link communication (FR-A7NC) (-327.68% to 327.67%)

(1) When torque command is given, functions of I/O devices below are changed.

I/O Device	Controls other than Torque Control	Torque Control	
RYD	Frequency setting command (RAM)	Torque setting command (RAM)	
RYE	Frequency setting command (EEPROM)	Torque setting command (EEPROM)	
RXD	Frequency setting completion (RAM)	Torque setting completion (RAM)	
RXE	Frequency setting completion (EEPROM)	Torque setting completion (EEPROM)	
RWw1	Set frequency	*Pr.544* setting	
		0, 1, 12, (112, 114)	Torque command
		14, 18, (118)	Set frequency
RWwC	—	0, 1, 12, (112, 114)	—
		14, 18, (118)	Torque command

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(2) Torque command setting method

Pr.804 Setting	*Pr.544* Setting	Torque command setting method (Any method below can be chosen)
3, 5	0, 1, 12, (112, 114)	1) Set the torque command in RWwn+1 and turn on either RYD or RYE. 2) Set the instruction code HED and HEE in RWwn+2, the torque command value in RWwn+3, and "1" in RYF. (Torque command value can be read by the instruction code H6D and H6E.) 3) Set H08 in the link parameter extended setting (HFF), the instruction code H85 and H86 in RWwn+2, the torque command value in RWwn+3, and "1" in RYF. (write to *Pr.805 and Pr.806*)
	14, 18, (118)	1) Set the torque command value in RWwn+C, and "1" in RYD or RYE. 2) Set H08 in the link parameter extended setting (HFF), the instruction code H85 and H86 in RWwn+2, the torque command value in RWwn+3, and "1" in RYF. (write to *Pr.805 and Pr.806*)
1, 6	0, 1, 12, 14, 18, (100, 112, 114, 118)	1) Set H08 in the link parameter extended setting (HFF), the instruction code H85 and H86 in RWwn+2, the torque command value in RWwn+3, and "1" in RYF. (write to *Pr.805 and Pr.806*)
0, 4	—	Torque command from CC-Link communication is disabled.

(3) Relationship between *Pr.804* and the setting range and actual torque command
(when setting is made from CC-Link communication)

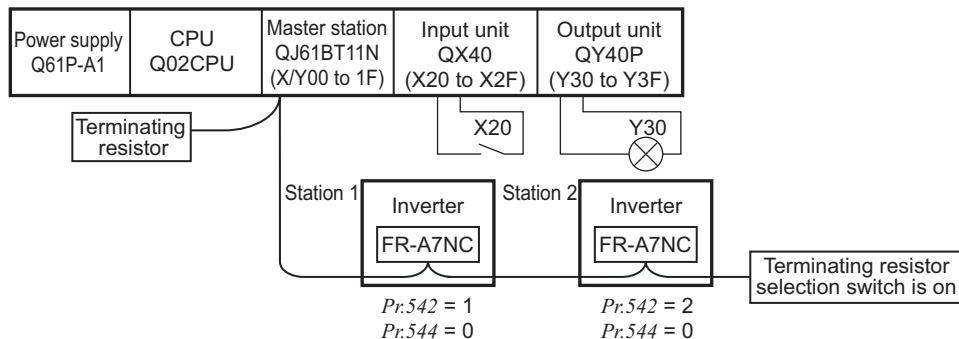| *Pr.804* Setting	Setting Range	Actual Torque Command
1, 3	600 to 1400 (1% increments)	-400 to 400%
5, 6	-32768 to 32767 (two's complement)	-327.68 to 327.67%

8 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	84
Setting the operation mode	Selecting the network operation mode	85
Setting the operation commands	Commanding the forward rotation and middle speed signals	86
Setting the monitoring function	Monitoring the output frequency	87
Reading a parameter value	Reading the value of *Pr. 7 Acceleration time*	88
Writing a parameter value	Setting "3.0 s" in *Pr. 7 Acceleration time*	89
Setting the running frequency (running speed)	Setting to 50.00Hz	90
Reading the fault records	Reading the inverter faults	92
Inverter reset	Perform inverter reset at an inverter alarm occurrence.	93

(1) System configuration for programming example

PLC

| Power supply Q61P-A1 | CPU Q02CPU | Master station QJ61BT11N (X/Y00 to 1F) | Input unit QX40 (X20 to X2F) | Output unit QY40P (Y30 to Y3F) |

Terminating resistor

X20   Y30

Station 1 Inverter FR-A7NC   Station 2 Inverter FR-A7NC   Terminating resistor selection switch is on

Pr.542 = 1
Pr.544 = 0

Pr.542 = 2
Pr.544 = 0

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(2) Network parameter setting of the master station
Network parameters are set as below.

Item		Setting Conditions
Start I/O No.		0000
Operation settings	Data link alarm station setting	Input clear
	Setting at CPU stop	Refresh
Type		Master
Mode		Remote net Ver.1 mode
All connect count		2
Remote input (RX)		X1000
Remote output (RY)		Y1000
Remote register (RWr)		W0

Item		Setting Conditions
Remote register (RWw)		W100
Special relay (SB)		SB0
Special resister (SW)		SW0
Retry count		3
Automatic reconnection station count		1
CPU down select		Stop
Scan mode settings		Asynchronous
Station information	Station type	Remote device station

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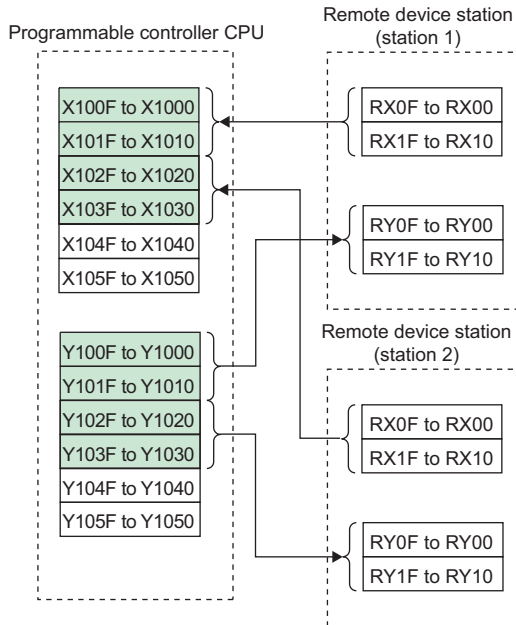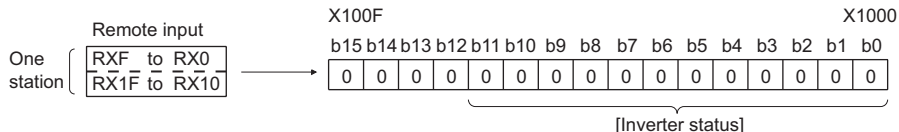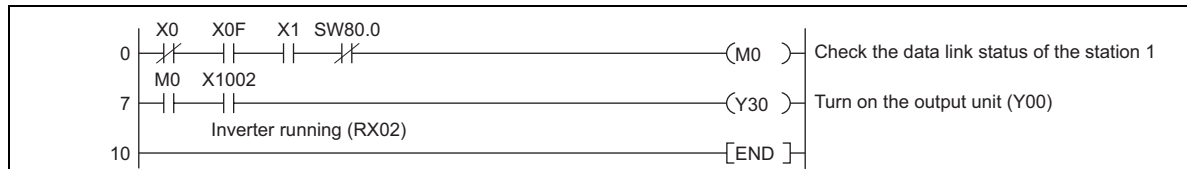

(4) The relation between the device of the programmable controller CPU and remote register (RWw, RWr) of the remote device station is as follows: The devices used actually are indicated in shaded regions.

8

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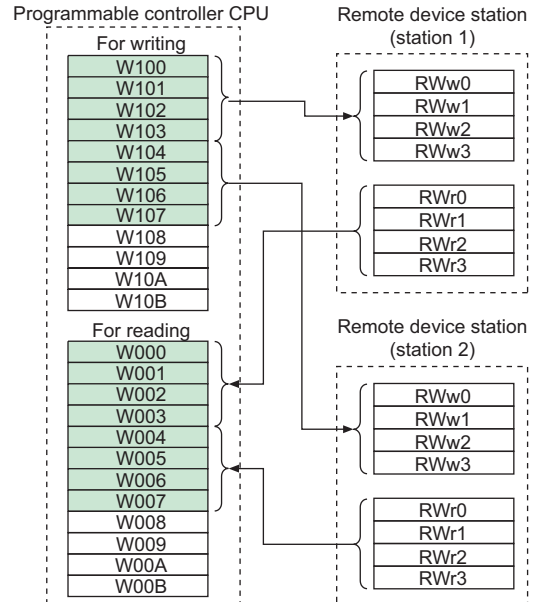
8.1 Program example for reading the inverter status

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

8.2 Program example for setting the operation mode

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

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

· Operation mode writing code number: HFB (hexadecimal)
· Network operation set data: H0000 (hexadecimal) *(Refer to page 71)*
· The reply code at the time of instruction code execution is set to D2. *(Refer to page 69)*

8

85
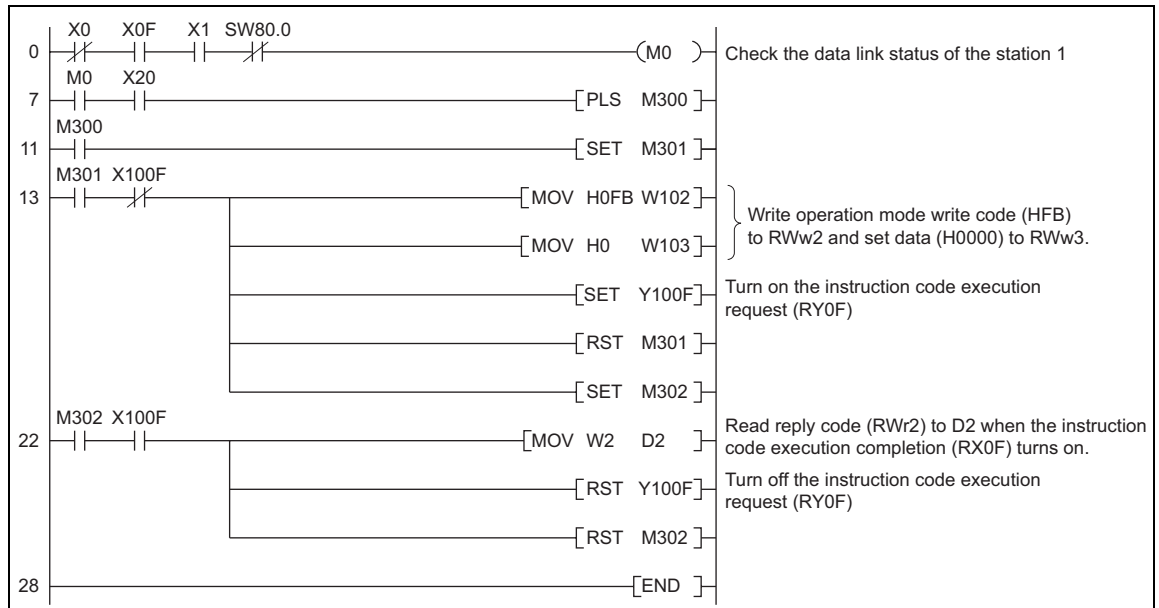
8.3 Program example for setting the operation commands

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


```
        X0   X0F  X1  SW80.0
0      ─┤↑├──┤↑├──┤├──┤↓├──────────────────(M0  )─   Check the data link status of the station 1
        M0   X20
7      ─┤├───┤├───┬────────────────────────(Y1000)─  Forward rotation command (RY00)
                  │
                  └─────────────────────────(Y1003)─  Middle speed operation command (RY03)

11     ─────────────────────────────────────[END ]─
```

Y100F															Y1000
b15							b7								b0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1

$\overline{RY0F}$ to $\overline{RY00}$
$\overline{RY1F}$ to $\overline{RY10}$ } One station

[Run command]

Middle speed   Forward rotation

1 : ON
0 : OFF

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

*1 These signals are initial values. You can change input signals using *Pr. 180* to *Pr.186, Pr.188*, and *Pr.189 (input terminal function selection)*.
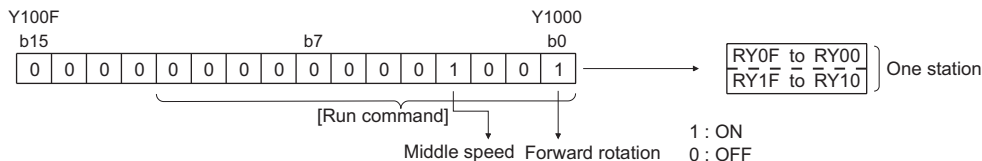Note that some of the signals do not receive a command from the programmable controller depending on the setting. *(Refer to page 26.)*

## 8.4 Program example for monitoring the output frequency

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

The following program reads the output frequency of station 1 inverter to D1.
Output frequency reading code number: H0001 (hexadecimal)
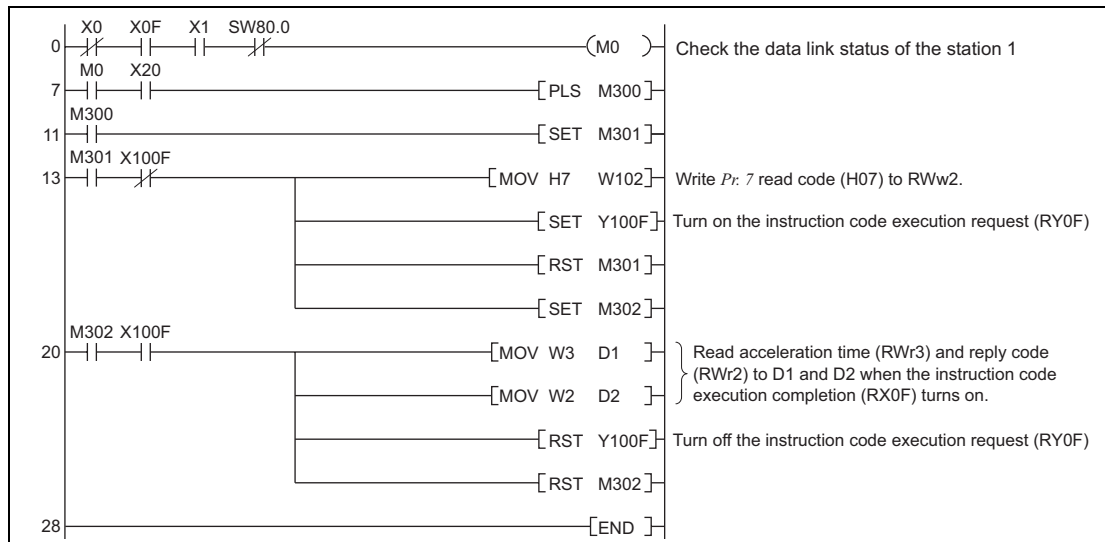Refer to *page 76* for the monitor code numbers.
(Example) The output frequency of 60Hz is indicated as H1770 (6000).
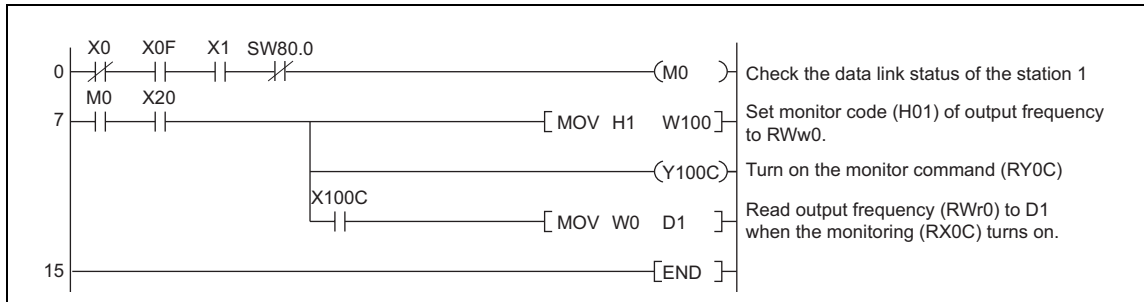
8.5 Program example for parameter reading

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

· *Pr. 7 Acceleration time* reading code number: H07 (hexadecimal)
· Refer to the inverter manual for details of the parameter codes .
· The reply code at the time of instruction code execution is set to D2. *(Refer to page 69)*

```
      X0   X0F  X1   SW80.0
 0   ─┤↓├──┤↑├──┤├───┤↓├──────────────────────────(M0  )─   Check the data link status of the station 1
      M0   X20
 7   ─┤├───┤├────────────────────────────────────[PLS  M300]
      M300
11   ─┤├──────────────────────────────────────────[SET  M301]
      M301 X100F
13   ─┤├───┤↓├──────────────────────[MOV  H7   W102]   Write *Pr. 7* read code (H07) to RWw2.

                                     ─[SET  Y100F]   Turn on the instruction code execution request (RY0F)

                                     ─[RST  M301]

                                     ─[SET  M302]

      M302 X100F
20   ─┤├───┤├─────────────────────────[MOV  W3   D1  ]   ⎫ Read acceleration time (RWr3) and reply code
                                                          ⎬ (RWr2) to D1 and D2 when the instruction code
                                       ─[MOV  W2   D2  ]   ⎭ execution completion (RX0F) turns on.

                                     ─[RST  Y100F]   Turn off the instruction code execution request (RY0F)

                                     ─[RST  M302]

28   ─────────────────────────────────────────────[END ]
```

REMARKS

For parameters having numbers 100 and later, change their link parameter extended settings (set them to other than H0000). Refer to *the inverter manual* for details.

8.6 Program example for parameter writing

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

· Acceleration time writing code number: H87 (hexadecimal)

· Acceleration time set data: K30 (decimal)

For the parameter code numbers, refer to the inverter manual.

The reply code at the time of instruction code execution is set to D2. *(Refer to page 69)*
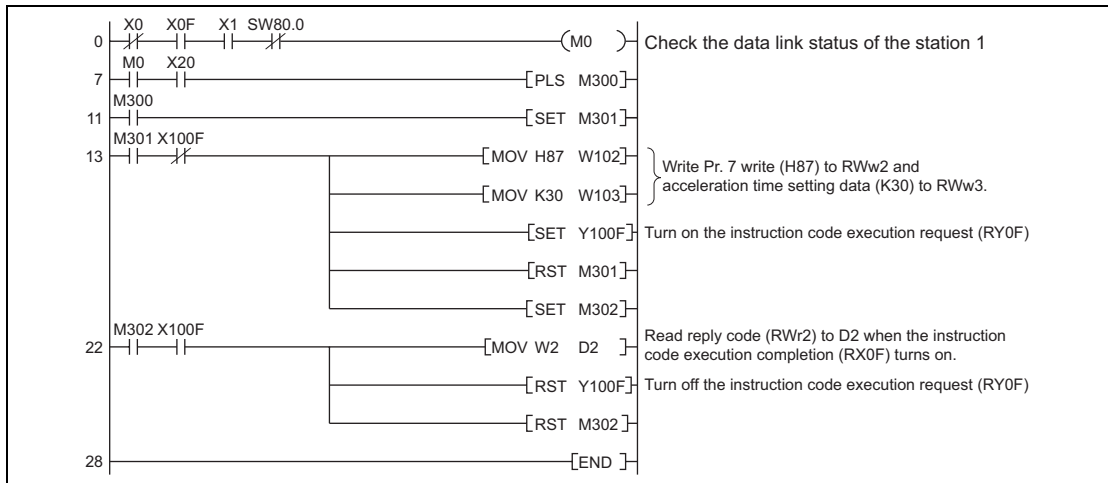

REMARKS

1. For parameters having numbers 100 and later, change their link parameter extended settings (set them to other than H0000). Refer to the parameter list of *the inverter manual* for settings.
2. For other functions, refer to the instruction codes *(page 71)*.

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8.7 Program example for setting the running frequency

1) The following program example changes the running frequency of ⎡station 1⎤ inverter to 50.00Hz
   Set frequency: K5000 decimal
   The reply code at the time of instruction code execution is set to D2. *(Refer to page 69)*
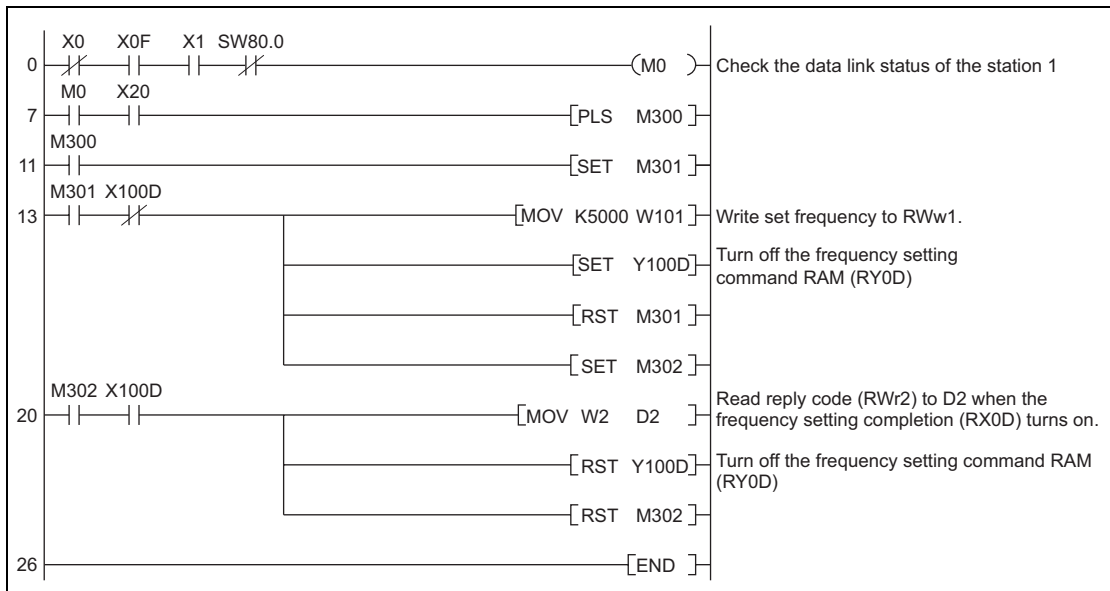
2) To continuously change the running frequency from the programmable controller
   When the frequency (speed) setting completion (example: X100D) switches on, make sure that the reply code in the remote register is 0000H and change the set data (example: W101) continuously.
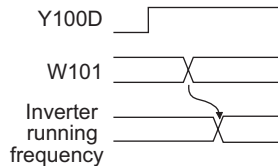
3) Program example for writing data to EEPROM
   Modify the above program as follows:
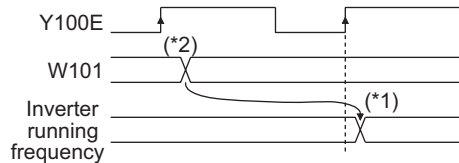   Frequency setting command Y100D → Y100E
   Frequency setting completion X100D → X100E

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

Reflect to the inverter when Y100E turns on

*1   For EEPROM, write is made only once when Y100E is switched on.
*2   If the set data is changed with Y100E on, it is not reflected on the inverter.
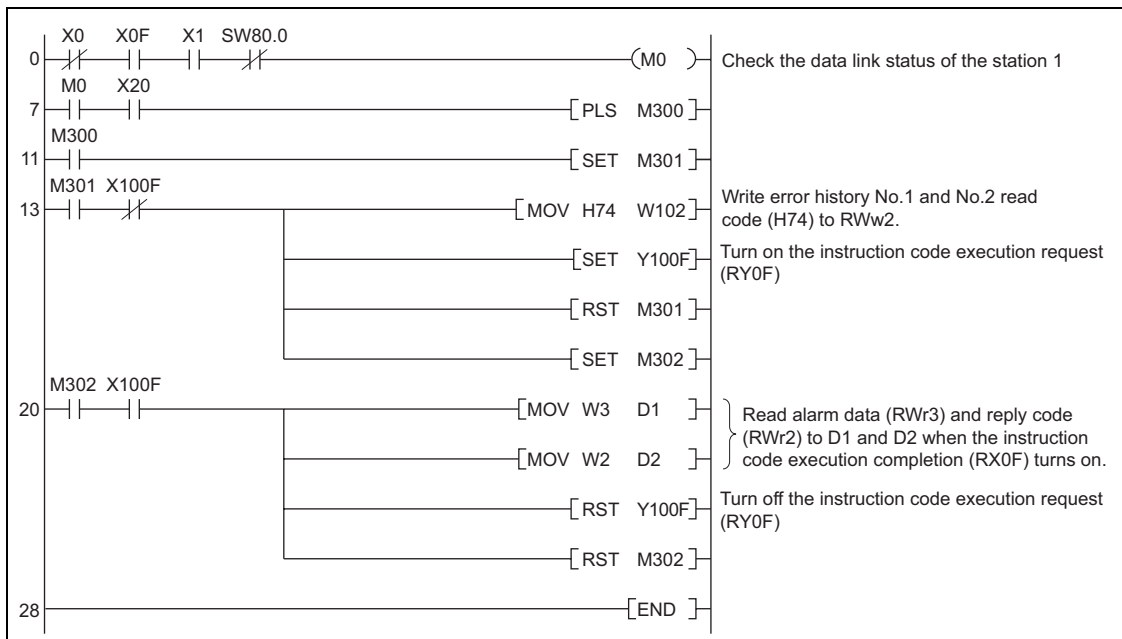
8

8.8 Program example for fault record reading

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

· Faults history No. 1, No. 2 reading code number: H74 (hexadecimal)
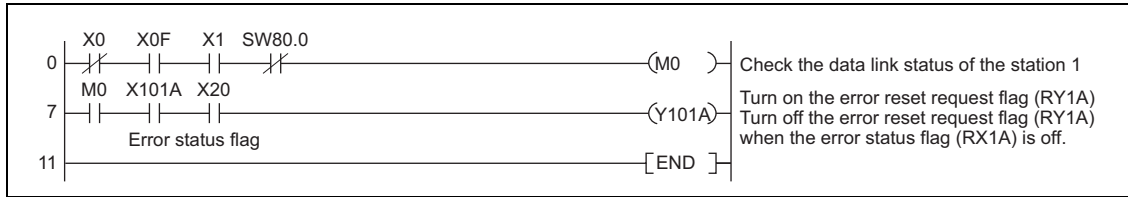
For the error code numbers, refer to *page 75.*

The reply code at the time of instruction code execution is set to D2. *(Refer to page 69)*

8.9 Program example for resetting the inverter at inverter error

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

```
     X0   X0F  X1  SW80.0
0   ─┨/┠──┨ ┠──┨ ┠──┨/┠──────────────────────(M0   )─  Check the data link status of the station 1
     M0  X101A X20
7   ─┨ ┠──┨ ┠──┨ ┠────────────────────────(Y101A)─  Turn on the error reset request flag (RY1A)
          Error status flag                              Turn off the error reset request flag (RY1A)
                                                         when the error status flag (RX1A) is off.
11  ──────────────────────────────────────────[END ]─
```

REMARKS

1. The above inverter reset using RY1A may be made only when an inverter error occurs.
   Also, inverter reset can be made independently of the operation mode.
2. When using the instruction code execution request (RYF) with the instruction code (HFD) and data (H9696) to reset the inverter, set a value other than "0" in *Pr. 340 Communication startup mode selection (refer to page 22)* or change the operation mode to the network operation mode. *(For the program example, refer to page 85)*
3. Refer to *page 37* for operation conditions of inverter reset.

8

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8.10 Instructions

(1) Programming instructions

   1) 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.

   2) 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.
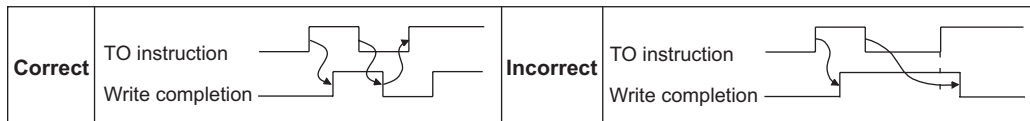
(2) Operating and handling instructions

   1) Command only from the programmable controller can be accepted during operation from CC-Link communication.

     The run command from external and parameter unit is ignored.

   2) If the station number set to different inverters is not the same, wrong data will be transferred and normal communication cannot be made.

   3) The inverter is brought to an alarm stop "E.OP1" or "E.OP3" if data communication stops for more than the time set in *Pr. 500 Communication error recognition waiting time* due to a programmable controller fault, an open CC-Link dedicated cable etc. during CC-Link operation.

4) If the programmable controller (master station) is reset during CC-Link operation or if the programmable controller is powered off, data communication stops and the inverter is brought to an alarm stop "E.OP1" or "E.OP3".

To reset the programmable controller (master station), switch the operation mode to the external operation once, then reset the programmable controller.

5) 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. *(Refer to page 22)*

(3) Troubleshooting

1)Operation mode does not switch to the network operation mode
- Check that the option unit (FR-A7NC) and CC-Link dedicated cables are fitted properly. (Check for contact fault, break in the cable, etc.)
- Check that *Pr. 542 CC-Link station number* setting switches are set to the correct positions. (Check that the station number matches the program, the station numbers are not repeated, and the station number is not outside 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.

2)Inverter does not start in the Network operation mode
- Check that the inverter starting program has been written correctly.
- Check that the inverter starting program is running.
- Check that *Pr.338 Communication operation command source* is not set to external.

8

9 HOW TO CHECK FOR ERROR USING THE LEDS

9.1 When one inverter is connected

The following diagram shows the system configuration with one inverter. The diagram indicates how the cause of the fault can be checked with the LED status of the inverter communication option (FR-A7NC). (In this example, assume SW, M/S, and PRM LEDs of the master module are OFF (master module is in normal operation).)
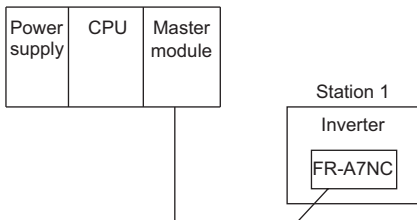
Operation status indication LED
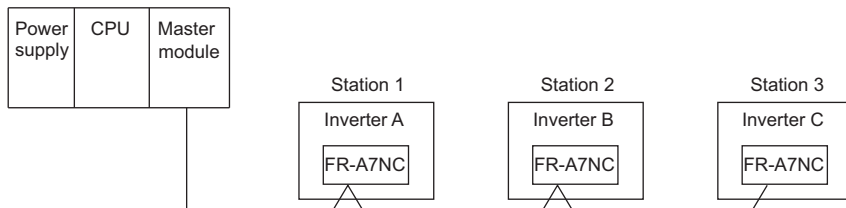
SD L.RUN
RD L.ERR
RUN

LED Status					Cause
RUN	L.RUN	SD	RD	L.ERR	
●	●	◎	◎	◎	Normal communication is made but CRC error has occurred due to noise.
●	●	◎	◎	○	Normal communication
●	●	◎	○	◎	Hardware fault
●	●	◎	○	○	Hardware fault
●	●	○	◎	◎	Cannot answer due to CRC error of receive data.
●	●	○	◎	○	Data sent to the host station does not reach destination.
●	●	○	○	◎	Hardware fault
●	●	○	○	○	Hardware fault
●	○	◎	◎	◎	Polling response is made but refresh receive is in CRC error.
●	○	◎	◎	○	Hardware fault
●	○	◎	○	◎	Hardware fault
●	○	◎	○	○	Hardware fault
●	○	○	◎	◎	Data sent to the host station is in CRC error.
●	○	○	◎	○	There is no data sent to the host station, or data sent to the host station cannot be received due to noise.
●	○	○	○	◎	Hardware fault
●	○	○	○	○	Cannot receive data due to break in the cable, etc.
●	○	○	◎○	●	Invalid baud rate or station number setting
●	●	◎	◎	◎	Baud rate or station number changed during operation.
○	○	○	○	○	Baud rate or station number changed during operation.
◎	-	-	-	-	Master station is connected to CC-Link ver. 1 and FR-A7NC is connected to CC-Link ver. 2.

●: On, ○: Off, ◎: Flicker

9.2 When two or more inverters are connected

The following system configuration shows how the cause of a fault can be checked with the LED status of the inverter communication option (FR-A7NC) and countermeasures for the fault.
(In this example, assume SW, M/S, and PRM LEDs of the master module are OFF (master module is in normal operation).)

LED Status				Cause	Corrective Action
Master Unit	**Inverters (FR-A7NC)**				
	Station 1	**Station 2**	**Station 3**		
TIME ○ LINE ○ or TIME ● LINE ○	RUN ● L.RUN ● SD ● RD ● L.ERR ○	RUN ● L.RUN ● SD ● RD ● L.ERR ○	RUN ● L.RUN ● SD ● RD ● L.ERR ○	Normal	—
TIME ● LINE ○	RUN ○ L.RUN ○ SD ○ RD ○ L.ERR ○	RUN ● L.RUN ● SD ● RD ● L.ERR ○	RUN ● L.RUN ● SD ● RD ● L.ERR ○	Poor contact of the FR-A7NC with the inverter	Plug the FR-A7NC securely. Check the connector.

●: On, ○: Off, ◉: Flicker, *: Any of on, flicker or off

LED Status				Cause	Corrective Action
Master Unit	**Inverters (FR-A7NC)**				
	Station 1	**Station 2**	**Station 3**		
	RUN ● L.RUN ● SD ● RD ● L.ERR ○	RUN ● L.RUN ○ SD * RD * L.ERR ○	RUN ● L.RUN ○ SD * RD * L.ERR ○	Since the L.RUN LEDs of the FR-A7NC on station 2 and later are off, the transmission cable between the remote I/O units A and B is open or disconnected from the terminal block.	Referring to the LED "on" condition, search for an open point and repair.
TIME ○ LINE ○ or TIME ● LINE ○	RUN ● L.RUN ○ SD * RD * L.ERR ○	RUN ● L.RUN ○ SD * RD * L.ERR ○	RUN ● L.RUN ○ SD * RD * L.ERR ○	The transmission cable is shorted.	Among the three wires of the transmission cable, search for the shorted wire and repair.
	RUN ● L.RUN ○ SD * RD * L.ERR *	RUN ● L.RUN ○ SD * RD * L.ERR *	RUN ● L.RUN ○ SD * RD * L.ERR *	The transmission cable is wired improperly.	Check the wiring on the inverter terminal block and correct the improper wiring point.

●: On, ○: Off, ◎: Flicker, *: Any of on, flicker or off

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9.3 Communication stops during operation

- Check that the option unit (FR-A7AC) and CC-Link dedicated cables are fitted properly.
  (Check for contact fault, break in the cable, etc.)
- Check that the programmable controller program is executed properly.
- Check that data communication has not stopped due to an instantaneous power failure, etc.

LED States				Cause	Corrective Action
Master Unit	Inverters (FR-A7NC)				
	Station 1	Station 2	Station 3		
TIME ○ LINE ○ or TIME ● LINE ○	RUN ● L.RUN ○ SD * RD ● L.ERR ○	RUN ● L.RUN ● SD ● RD ● L.ERR ○	RUN ● L.RUN ○ SD * RD ● L.ERR ○	Since the L.RUN LEDs of the FR-A7NC on station 1 and the FR-A7NC on station 3 are off, the station numbers of the inverters set as stations 1 and 3 are the same.	After correcting the repeated station numbers of the inverters using *Pr. 542 CC-Link station number*, switch power on again.
	RUN ● L.RUN ● SD ● RD ● L.ERR ○	RUN ● L.RUN ○ SD ○ RD ● L.ERR ○	RUN ● L.RUN ● SD ● RD ● L.ERR ○	Since the L.RUN and SD LEDs of the FR-A7NC on station 2 are off, the transmission speed setting of the FR-A7NC on station 2 is wrong within the setting range (0 to 4).	After correcting the transmission speed setting using *Pr. 543 CC-Link baud rate*, switch power on again.
	RUN ● L.RUN ● SD ● RD ● L.ERR ○	RUN ● L.RUN ● SD ● RD ● L.ERR ○	RUN ● L.RUN ● SD ● RD ● L.ERR ◎	Since the L.ERR LED of the FR-A7NC on station 3 flickers, the setting switch of the FR-A7NC on station 3 was moved during normal operation.	After returning the setting switch of the FR-A7NC to the original position using *Pr. 542 CC-Link station number* or *Pr. 543 CC-Link baud rate* power on the inverter again.

●: On, ○: Off, ◎: Flicker, *: Any of on, flicker or off

LED States				Cause	Corrective Action
Master Unit	**Inverters (FR-A7NC)**				
	Station 1	**Station 2**	**Station 3**		
	RUN ● L.RUN ● SD ● RD ● L.ERR ○	RUN ● L.RUN ● SD ● RD ● L.ERR ●	RUN ● L.RUN ● SD ● RD ● L.ERR ○	Since the L.ERR LED of the FR-A7NC on station 2 is on, the FR-A7NC itself on station 2 is affected by noise. (L.RUN may go off.)	Securely connect FG of each inverter and master module to ground.
TIME ● LINE ● or TIME ○ LINE ●	RUN ● L.RUN ● SD ● RD ● L.ERR ○	RUN ● L.RUN ● SD ● RD ● L.ERR ●	RUN ● L.RUN ● SD ● RD ● L.ERR ●	Since the L.ERR LEDs of the FR-A7NC on station 2 and later are on, the transmission cable between the inverters of stations 2 and 3 is affected by noise. (L.RUN may go off.)	Check that the transmission cable is connected to SLD. Also run it as far away as possible from the power lines. (100mm or more)
	RUN ● L.RUN ● SD ● RD ● L.ERR ○	RUN ● L.RUN ● SD ● RD ● L.ERR ○	RUN ● L.RUN ● SD ● RD ● L.ERR ●	Terminating resistor is not selected. (L.RUN may go off.)	Check that the setting of the terminating resistor selection switch is correct. *(refer to page 13)*

●: On, ○: Off, ◎: Flicker, *: Any of on, flicker or off

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REVISIONS

Print Date	*Manual Number	Revision
May 2004	IB(NA)-0600167ENG-A	First edition
Feb. 2006	IB(NA)-0600167ENG-B	Addition Compatible with the FR-A700 series

Sep. 2010	IB(NA)-0600167ENG-C	Addition
		• Compatible with the FR-FP700/FR-F700P series
		• Monitor
		  Output power (with regenerative display)
		  Cumulative regenerative power
		Modification
		
		Terminating resistor selection switch

INVERTER

MITSUBISHI ELECTRIC CORPORATION