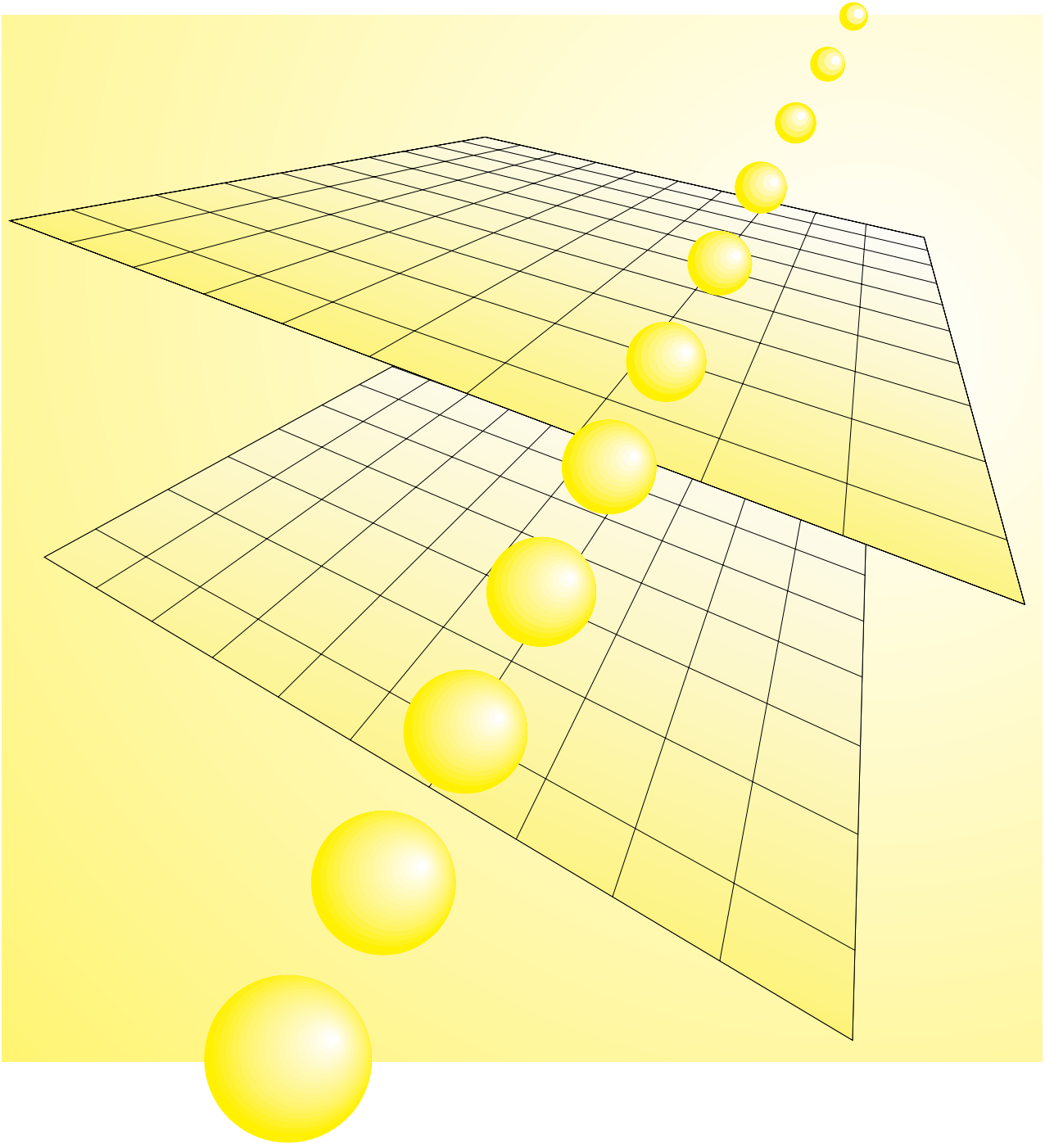
MITSUBISHI

TRANSISTORIZED INVERTER

FR-A500
F500
E500

FR-A500/F500/E500 series

COMMUNICATION OPTION REFERENCE MANUAL



INTRODUCTION

Along with strong wiring-saving needs on the market, there are increasing needs for remote operation and monitoring by linking a personal computer, PLCs and inverters.
We have been responding to market needs with the MELSECNET/MINI-S3-compatible option units which are the lower-level link of our PLCs.
However, various field networks (lower-level link) have been made open mainly in Europe and U.S.A., and recent trends toward open field networks are rapidly making a deep penetration in the Factory Automation field.
In response to such trends toward open field networks, inverters are also being made open in various ways in the corresponding areas. To meet such trends, options or special-purpose products developed for compatibility with the major networks in the world are available for our inverters.
This manual explains the settings, programming methods and other general information of these network-compatible inverters and options.

Network Comparison Table

Item	RS-485	CC-Link	DeviceNet™	Profibus DP	Modbus Plus
Developed by	EIA Standard	Mitsubishi Electric	Allen Bradley	Siemens, etc.	Modicon
Released	April, 1983	October, 1996	March, 1994	1994	
User group	—	None	ODVA (Open DeviceNet Vendor Association)	PNO (Profibus Netzer Organization)	None
Number of partners	—	122	250	575	—
Main supporters	—	SMC, CKD, Idec Izumi, Sunx, Rika Kogyo, Yamatake-Honeywell, Sumitomo Heavy Industries, M System Giken, NEC, Yokogawa Electric	ABB, Omron, Hitachi, AEG Modicon, Cutler Hammer, Square D, SST, NAMCO	Rockwell, ABB, Omron, Fesco, GE Fanuc, Allen Bradley, Fuji, AEG Modicon, Klockner Mueller	Groupe Schneider
Position	General	Device bus	Device bus	Device bus	Device bus
Industry application	General	General	Automobile	Automobile	General
Major area	General	Asia	North America	Europe	North America, Europe
Communication speed	19.2Kbps maximum	156K to 10Mbps	125K to 500Kbps	9.6K to 12Mbps	38.4Kbps maximum
Overall distance	500m	1200m (156Kbps) 600m (625Kbps) 200m (2.5Mbps) 100m (10Mbps)	500m (125Kbps) 250m (250Kbps) 100m (500Kbps)	1200m (9.6Kbps) 200m (1.5Mbps) 100m (12Mbps)	450m (1Mbps) 450m extendible per installation of one repeater, max. 1800m
Communication system	Master/slave	Master/slave	Master/slave, N: N	Master/slave	Master/slave
Maximum message size	14 bytes	M→D: 150 bytes D→M: 34 bytes	8 bytes	32 bytes	No limit
Connection cable	Twisted pair	Twisted pair	4-wire (single pair + power pair)	Twisted pair, fiber-optic (option)	Twisted pair
Max. number of nodes	32	64	64 (including master)	32 (126 using repeaters)	61
Max. number of link points	—	2048 I/O 512 words	2048 I/O	512 I/O (I/O 256 each)	No limit (master memory range)
Real scan time	Response time approximately 25ms (9600bps)	4ms (2048 I/O 10Mbps) 7ms (2048 I/O + 512 registers 10Mbps)	7ms (63 devices)	2ms (512 I/O 12Mbps)	
Remarks	Global communication standard widely used throughout the world. The values given in the table are for inverters.	Setting of the standby master station enables data link to be continued if a fault occurs in the master station. The temporary error disable station function allows the unit to be changed with the data retained online.	Omron and Hitachi are actively publicizing in Japan. Unsuitable for communication of large volumes of transmission data because the data that may be transmitted in one package is a maximum 8 bytes.	As of April, 1997, about 80% of Profibus nodes shipped are DP. The maximum communication speed of original 1.5Mbps was increased to 12Mbps in 1995. PNO has set up offices in 15 countries, and Profibus International was established in 1995 to integrate global management.	Modicon's private network
Applicable inverters	(PU connector used for compatibility) FR-A500 FR-F500 FR-E500 (Plug-in option used for compatibility) FR-A500 + FR-A5NR FR-F500 + FR-A5NR	(Plug-in option used for compatibility) FR-A500 + FR-A5NC FR-F500 + FR-A5NC FR-E540 + FR-E5NC (Dedicated inverter used for compatibility) FR-E520-〇〇KN	(Plug-in option used for compatibility) FR-A500 + FR-A5ND FR-F500 + FR-A5ND	(Plug-in option used for compatibility) FR-A500 + FR-A5NP FR-F500 + FR-A5NP	(Plug-in option used for compatibility) FR-A500 + FR-A5NM FR-F500 + FR-A5NM

CONTENTS

1 COMPUTER LINK (RS-485)

1.1 Overview

Computer link allows inverters connected with a computer, such as a personal computer, by communication cables to be operated and monitored and their parameters to be changed, saved etc. by user programs.

(1) Features of computer link-compatible inverters

1) Communication function is standard.
   You can remove the operation panel (or cover etc.) and use RS-485 to perform communication operation via the PU connector.
   Note: A commercially available converter is required when using a computer (personal computer) which only has RS-232C communication.
2) Plug-in option is also available.
   The computer link plug-in option available for the FR-A500 and FR-F500 series inverters and enables RS-485 communication operation to be performed with the Parameter unit (operation panel) connected.
3) Setup Software
   The Setup Software which offers an easy-to-use inverter environment is available to support you from inverter startup to maintenance.

(2) Types of computer link-compatible inverters

Inverter Series	Method for Compatibility with Computer Link	
	PU connector	Plug-in option
FR-A500	Connected to PU connector	Connect FR-A5NR plug-in option.
FR-F500	Connected to PU connector	Connect FR-A5NR plug-in option.
FR-E500	Connected to PU connector	Incompatible

1.2 Specifications

(1) Power supply
- Control power: Supplied by the inverter
- Communication power: 5VDC, maximum 60mA

(2) Conforming standard
- [EIA Standard] Shared between RS-422 and RS-485

(3) Transmission form
- Multidrop link system

(4) Communication cable
- Twisted pair cable

(5) Transmission distance
- Maximum 500m overall

(6) Number of inverters connected
- Up to 10 inverters for RS-422 computer interface
- Up to 32 inverters for RS-485 computer interface

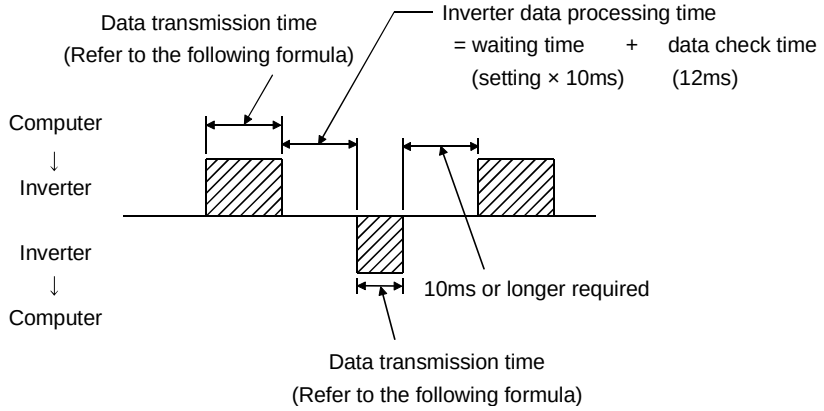
(7) Applicable computer
- Computer with RS-422 or RS-485 interface function

  By using a converter, a computer with RS-232C interface function is also applicable.

(8) Communication specifications

			Connection with PU Connector	Connection of FR-A5NR
Conforming standard			RS-485 Standard	
Number of inverters connected			1: N (maximum 32 inverters)	
Communication speed			Selectable between 19200, 9600 and 4800bps	Selectable between 19200, 9600, 4800, 2400, 1200, 600 and 300bps
Control procedure			Asynchronous system	
Communication method			Half duplex system	
Communication specifications	Station number setting		0 to 31	
	Character system		ASCII (7 bits/8 bits) selectable	
	Stop bit length		1 bit/2 bits selectable	
	Terminator		CR/LF (yes/no selectable)	
	Check system	Parity check	Yes (even/odd)/no selectable	
		Sum check	Yes	
	Waiting time setting		Yes/no selectable	

(9) Response time



[Data transmission time formula]

$$\frac{1}{\text{Communication speed (Baudrate)}} \times \text{Number of data characters (Refer to inverter manual)} \times \text{Communication specifications* (Total number of bits)} = \text{data transmission time (s)}$$

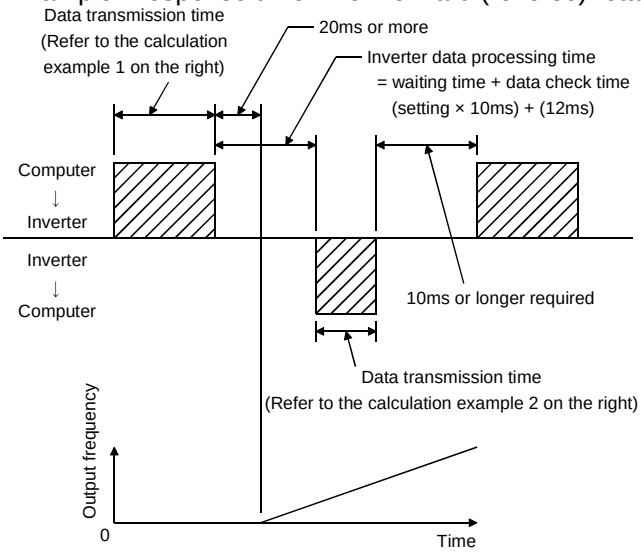
*Communication specifications (Refer to the following table)

Name	Number of Bits
Stop bit length	1 bit
	2 bits
Data length	7 bits
	8 bits

Name		Number of Bits
Parity check	Yes	1 bit
	No	0
Start bit		1 bit

Note: 1 bit is always required for the start bit.
Minimum total number of bits: 9 bits, maximum total number of bits: 12 bits

• Example: Response time when forward (reverse) rotation command is given by communication

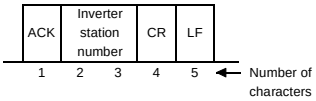


<Example 1>

Format A'

<Example 2>

Format G



<Calculation example 1>

1) Baudrate = 9600 baud, number of data characters = 12, stop bit length = 2 bits, data length = 8 bits, parity check = yes (presence), CR, LF instructions = yes (presence)

$\frac{1}{9600} \times 12 \times 12 = 0.015s(15.0ms)$

2) Same conditions as above with the exception of baudrate = 19200 baud

$\frac{1}{19200} \times 12 \times 12 = 0.0075s(7.5ms)$

3) Same conditions as above with the exception of baudrate = 300 baud

$\frac{1}{300} \times 12 \times 12 = 0.48s(480ms)$

<Calculation example 2>

1) Baudrate = 9600 baud, number of data characters = 5, stop bit length = 2 bits, data length = 8 bits, parity check = yes (presence), CR, LF instructions = yes (presence)

$\frac{1}{9600} \times 5 \times 12 = 0.00625s(6.25ms)$

2) Same conditions as above with the exception of baudrate = 19200 baud

$\frac{1}{19200} \times 5 \times 12 = 0.003125s(3.125ms)$

3) Same conditions as above with the exception of baudrate = 300 baud

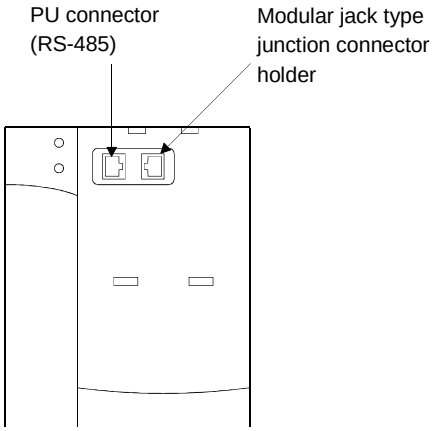
$\frac{1}{300} \times 5 \times 12 = 0.2s(200ms)$

"At-A-Glance" Guide to Response Time

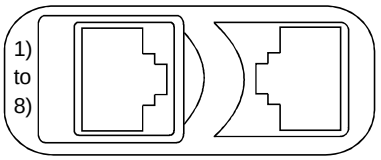
Number of Data Characters	Communication Specifications (Total number of bits)	Communication Speed (bps)						
		300	600	1200	2400	4800	9600	19200
5	10	166.7ms	83.3ms	41.7ms	20.8ms	10.4ms	5.2ms	2.6ms
5	12	200.0ms	100.0ms	50.0ms	25.0ms	12.5ms	6.3ms	3.1ms
10	10	333.3ms	166.7ms	83.3ms	41.7ms	20.8ms	10.4ms	5.2ms
10	12	400.0ms	200.0ms	100.0ms	50.0ms	25.0ms	12.5ms	6.3ms
12	10	400.0ms	200.0ms	100.0ms	50.0ms	25.0ms	12.5ms	6.3ms
12	12	480.0ms	240.0ms	120.0ms	60.0ms	30.0ms	15.0ms	7.5ms
14	10	466.7ms	233.3ms	116.7ms	58.3ms	29.2ms	14.6ms	7.3ms
14	12	560.0ms	280.0ms	140.0ms	70.0ms	35.0ms	17.5ms	8.8ms

1.3.1 Connection with PU connector (FR-A500, F500)

(1) Appearance



(2) PU connector pin-outs



1) SG	5) SDA
2) P5S	6) RDB
3) RDA	7) SG
4) SDB	8) P5S

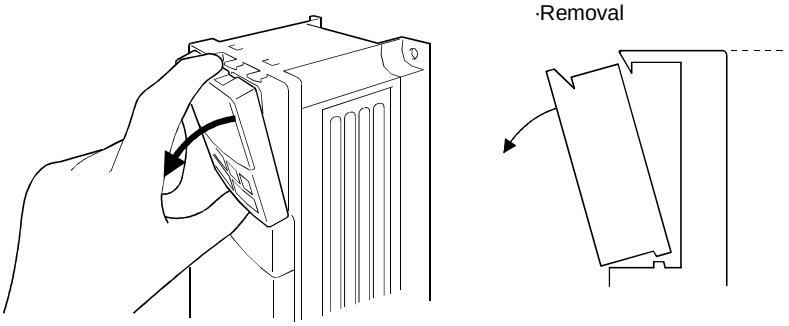
Note 1. Do not make connection to the computer LAN board, FAX modem socket or telephone modular connector. Doing so may damage the product due to differences in electrical specifications.

Note 2. Pins 2 and 8 (P5S) are power supplies for the operation panel or parameter unit. Do not use them when performing RS-485 communication.

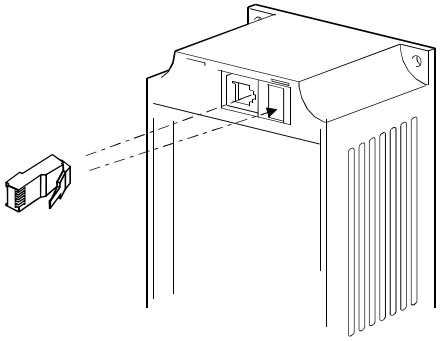
Note 3. Use a commercially available RS-485/RS-232C converter when the personal computer's communication board has the RS-232C specifications.

(3) Mounting method

1) Hold down the top button of the operation panel and pull the operation panel toward you to remove.



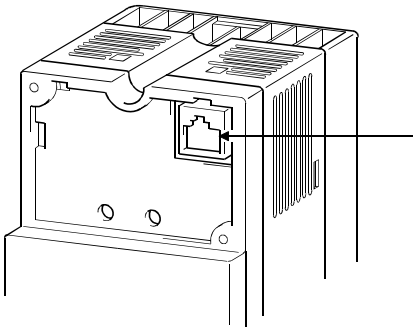
2) Unplug the modular jack type junction connector. (Place the removed modular jack type junction connector into the modular jack type junction connector holder.)



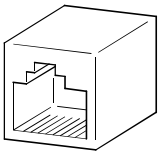
3) Securely plug one end of the connection cable into the PU connector of the inverter and the other end into the personal computer (or converter etc.).

1.3.2 Connection with PU connector (FR-E500)

(1) Appearance



(2) PU connector pin-outs



1) SG 5) SDA
2) P5S 6) RDB
3) RDA 7) SG
4) SDB 8) P5S

8) to 1)

Note 1. Do not make connection to the computer LAN board, FAX modem socket or telephone modular connector. Doing so may damage the product due to differences in electrical specifications.

Note 2. Pins 2 and 8 (P5S) are power supplies for the operation panel or parameter unit. Do not use them when performing RS-485 communication.

Note 3. Use a commercially available RS-485/RS-232C converter when the personal computer's communication board has the RS-232C specifications.

(3) Mounting method

1) Remove the operation panel. Hold down the portion indicated by arrow A in Fig. A and remove the operation panel as shown in Fig. B. (If you remove it in any other way, force applied to the internal connector may damage the product.)

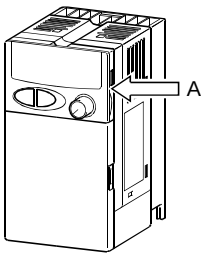


Fig. A

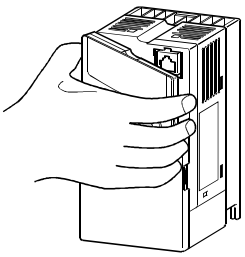


Fig. B

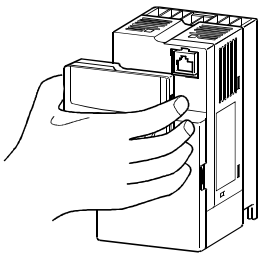
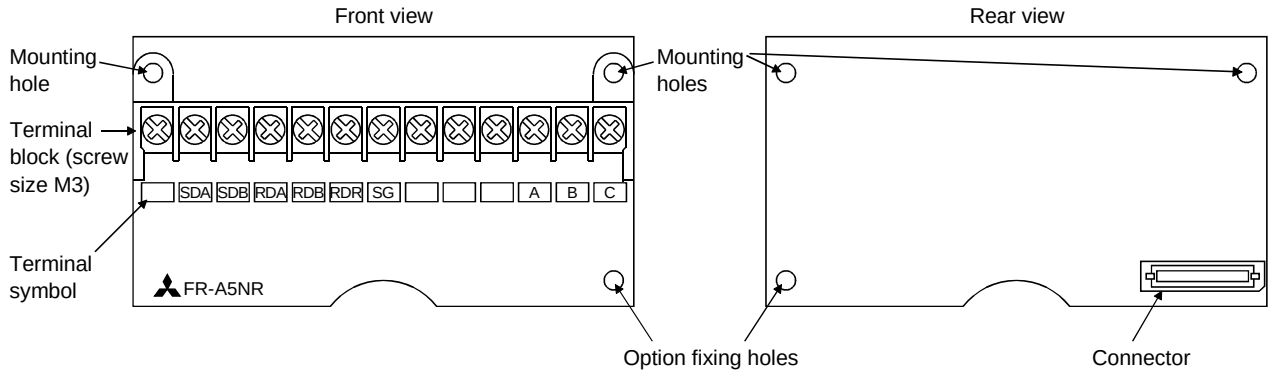


Fig. C

2) Securely plug one end of the connection cable into the PU connector of the inverter and the other end into the personal computer (or converter etc.).

1.3.3 Connection of FR-A5NR

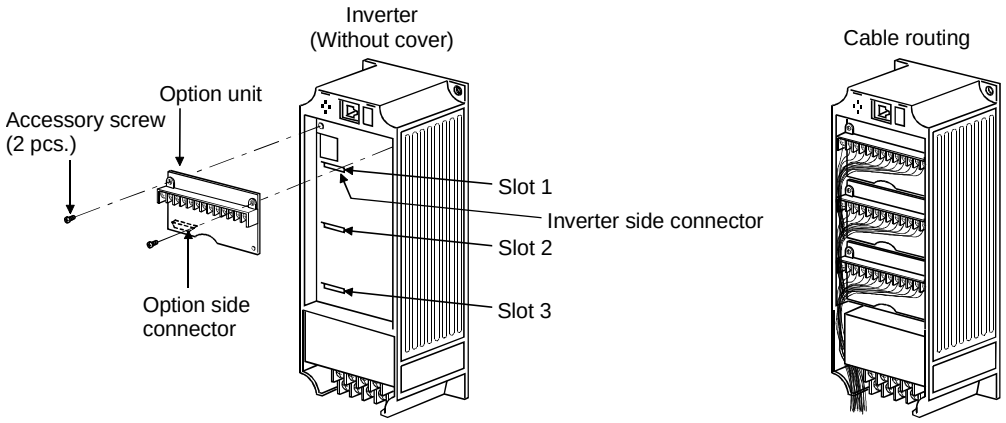
(1) Appearance



Note: Never use the unused terminals as junction terminals since they are used in the option. Doing so may damage the option unit.

(2) Installation procedure

1) Securely insert the connector of the option unit far into the connector of the inverter. At this time, also fit the option fixing holes correctly. For the slot positions, refer to the figure below.
2) Securely fix the option unit to the inverter on both sides with the accessory mounting screws. If the screw holes do not match, the connector may not have been plugged correctly. Check for loose connection.
3) Route the cables so that they do not take up a large space in the control circuit terminal block wiring area of the option unit.
   During wiring, do not leave wire off-cuts in the inverter. They can cause a fault, failure or malfunction.
   Use the left-hand side space for routing the cables.



Note 1. Only one option of the same model may be used. When two or more options are mounted, priority is in order of slots 1, 2 and 3, and the options having lower priority are inoperative. (Only one communication option may be used.)

Note 2. When the inverter cannot recognize that the option is mounted, it displays "E.OPT".

Note 3. When one FR-A5NR is used with the other communication option than the FR-A5NR, no error is displayed and the relay output of the FR-A5NR and the communication function of the other communication option are made valid.

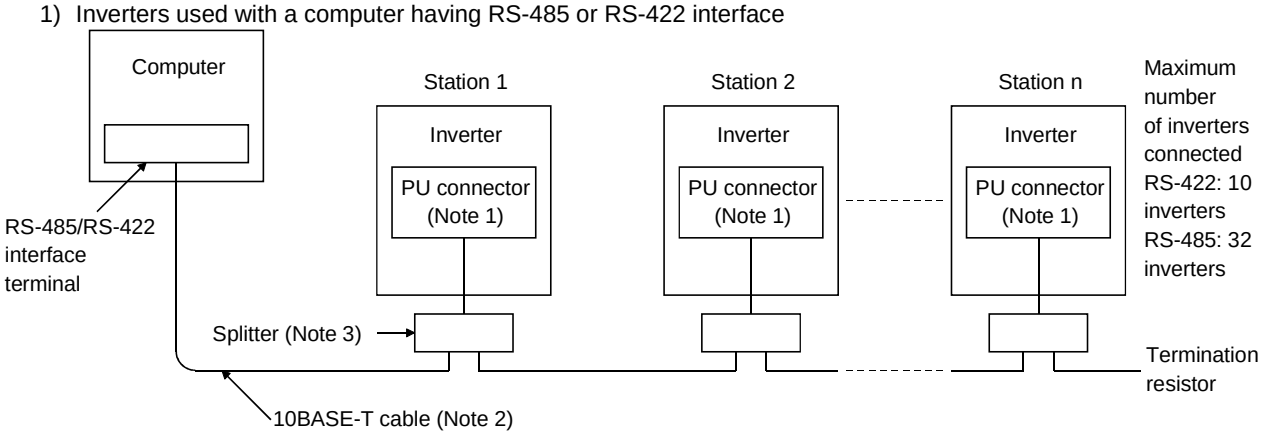
Mounting Position	Error Display
Slot 1	E.OP1
Slot 2	E.OP2
Slot 3	E.OP3

Note 4. When installing the inverter front cover, the cables to the inverter's control circuit terminals and option terminals should be routed properly in the wiring space to prevent them from being caught between the inverter and its cover.

1.4.1 Connection with PU connector

(1) System configuration examples

1) Inverters used with a computer having RS-485 or RS-422 interface



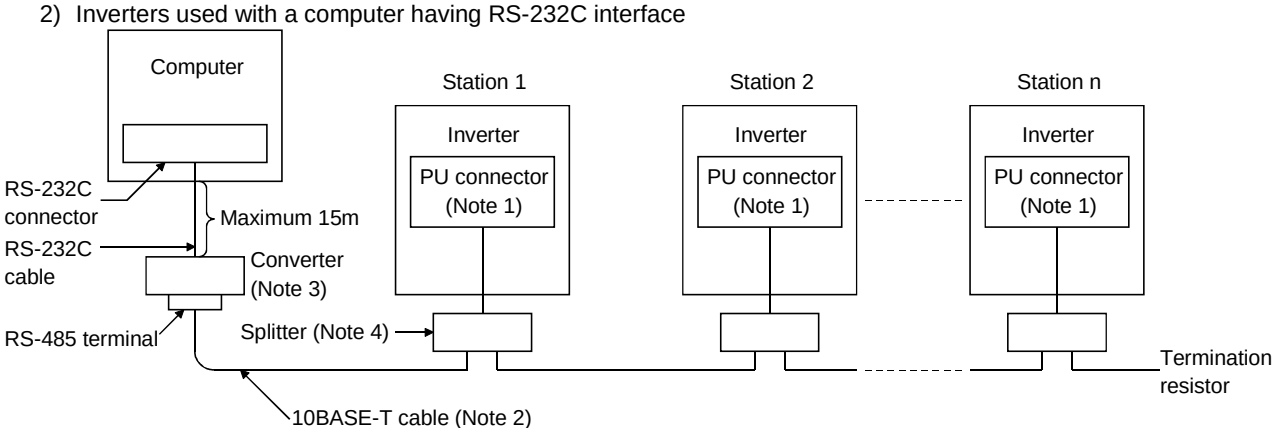
Use the connectors and cables available on the market.

Note 1. Connector: RJ45 connector
Example: 5-554720-3, Japan AMP Co., Ltd.

Note 2. Cable: Cable conforming to EIA568 (e.g. 10BASE-T cable)
Example: SGLPEV 0.5mm × 4P, Mitsubishi Cable Industries, Ltd.

Note 3. Splitter
Example: BMJ-8 modular rosette, Hakko Electrical Mfg. Co., Ltd.....03-3806-9171

2) Inverters used with a computer having RS-232C interface



Use the connectors and cables available on the market.

Note 1. Connector: RJ45 connector
Example: 5-554720-3, Japan AMP Co., Ltd.

Note 2. Cable: Cable conforming to EIA568 (e.g. 10BASE-T cable)
Example: SGLPEV 0.5mm × 4P, Mitsubishi Cable Industries, Ltd.

Note 3. Commercially available converter examples:

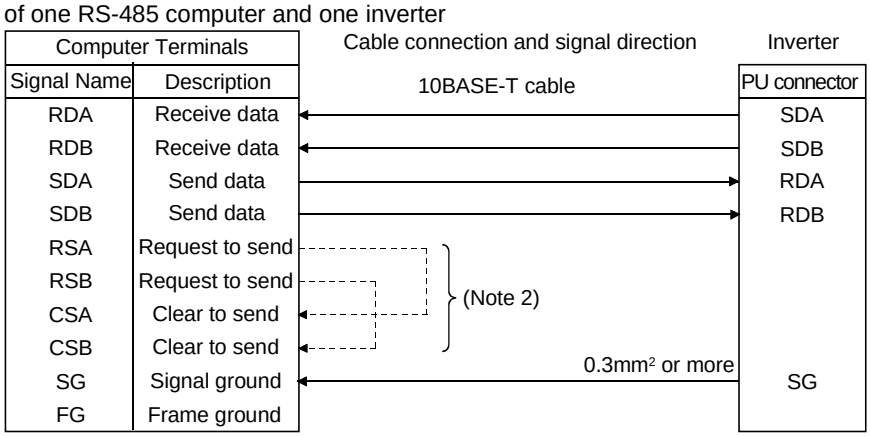
1) Model: FA-T-RS40
Converter
Nagoya Sales Office, Mitsubishi Electric Engineering Co., Ltd.....052-565-3435

2) Model: DAFXI-CABL series cable with built-in interface
+
DINV-485CAB connector conversion cable
Diatrend Co., Ltd 06-6460-2100

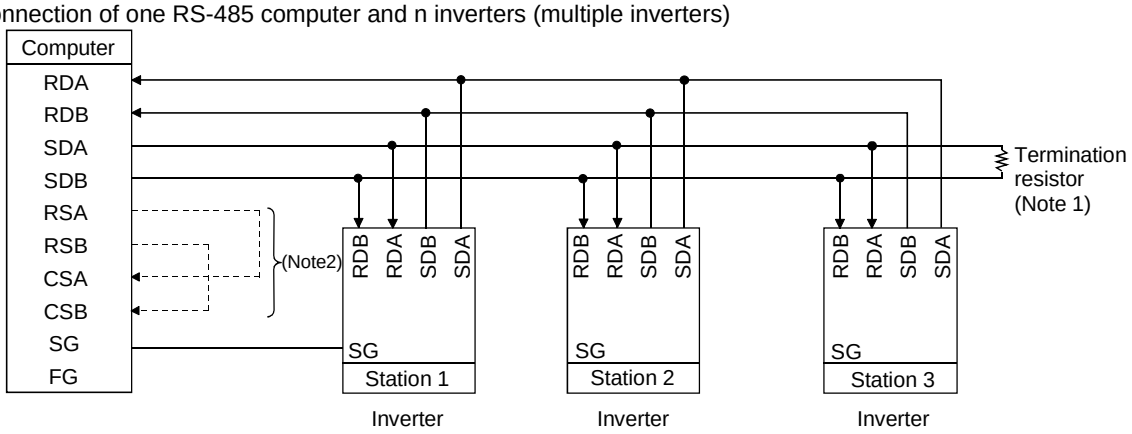
Note 4. Splitter
Example: BMJ-8 modular rosette, Hakko Electrical Mfg. Co., Ltd. 03-3806-9171

(2) Wiring method

1) Connection of one RS-485 computer and one inverter



2) Connection of one RS-485 computer and n inverters (multiple inverters)



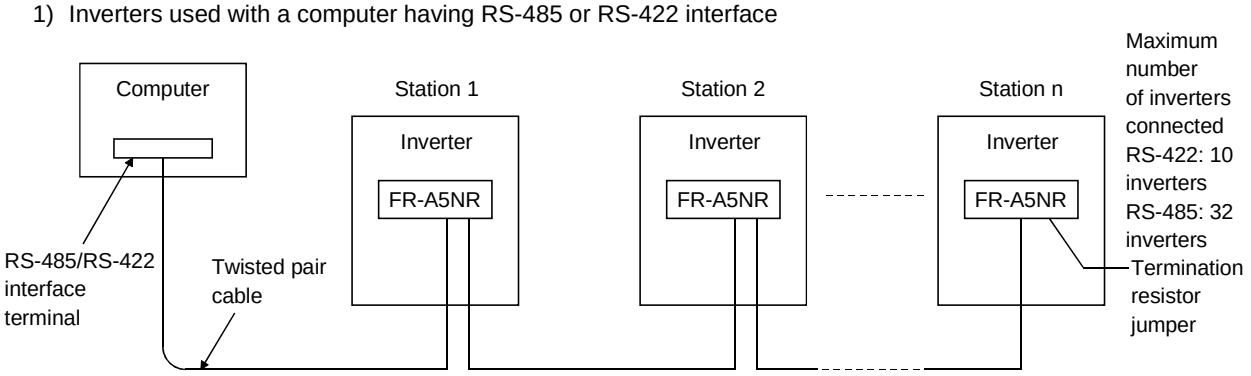
Note 1. Depending on the transmission speed and/or transmission distance, the inverters may be affected by reflection. If so, provide a termination resistor. For connection using the PU connector, use a splitter because a termination connector cannot be fitted. The termination resistor should be connected to only the remotest inverter from the computer. (Termination resistor: 100 Ω)

Note 2. Connect in accordance with the manual of the computer used. Note that the computer terminal numbers depend on the model used.

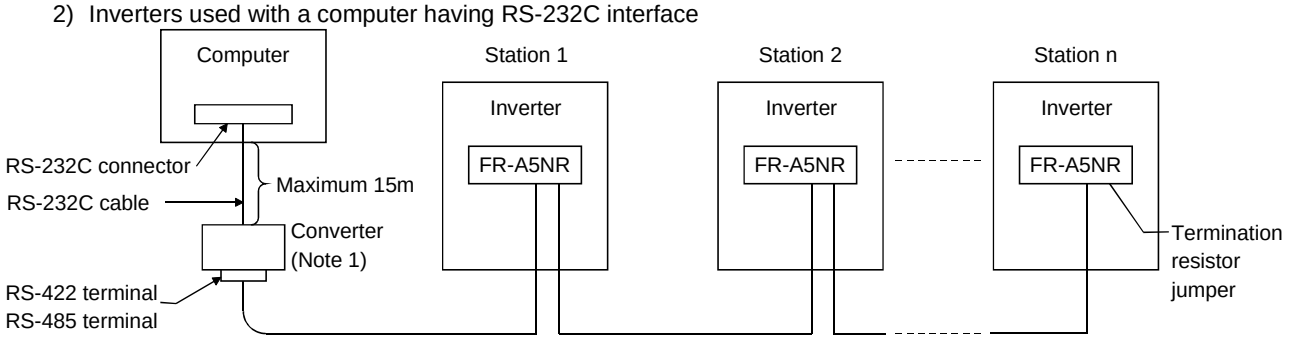
1.4.2 Connection of FR-A5NR

(1) System configuration examples

1) Inverters used with a computer having RS-485 or RS-422 interface



2) Inverters used with a computer having RS-232C interface



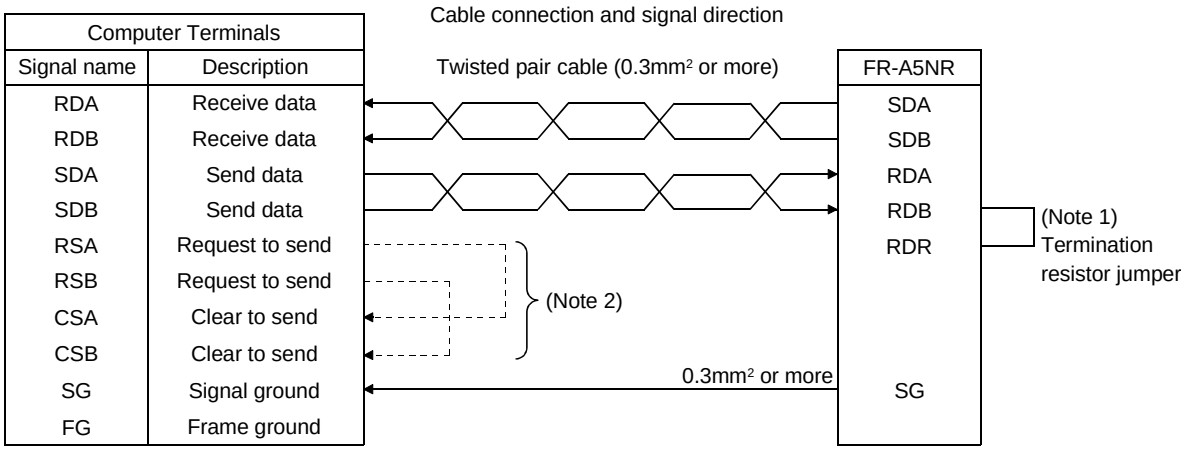
Note 1. Commercially available converter examples:

1) Model: FA-T-RS40
   Converter
   Nagoya Sales Office, Mitsubishi Electric Engineering Co., Ltd. 052-565-3435

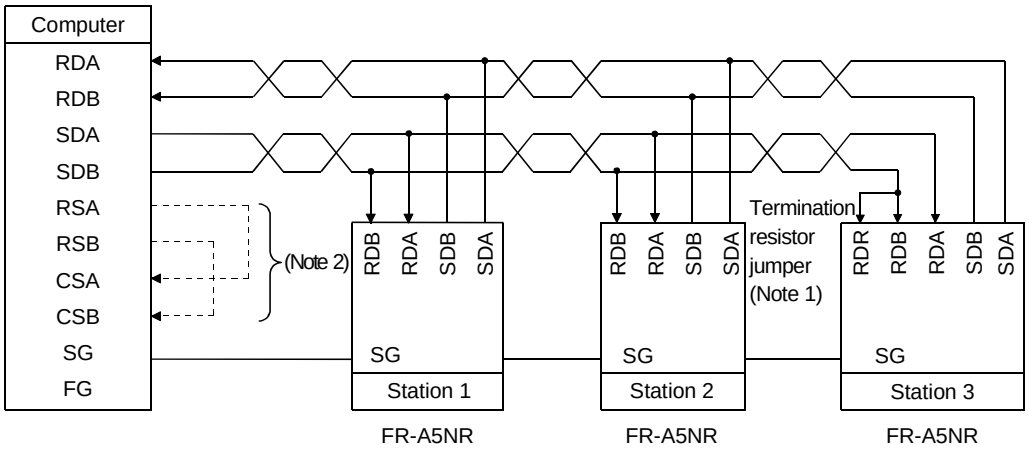
2) Model: DAFXI-CABL series cable with built-in interface
   +
   DINV-485CAB connector conversion cable
   Diatrend Co., Ltd. 06-6460-2100

(2) Wiring method

1) Connection of one computer and one inverter



2) Connection of one computer and n inverters (multiple inverters)



Note 1. The termination resistor jumper should be connected to only the remotest FR-A5NR from the computer. (Termination resistor: 100 Ω)

Note 2. Connect in accordance with the manual of the computer used. Note that the computer terminal numbers depend on the model used.

1.5 Inverter Setting

(1) Parameters

<Connection with PU connector>

Parameter Number	Name	Setting Range	Setting Increments	Factory Setting
117	Station number	0 to 31	1	0
118	Communication speed	48, 96, 192	1	192
119	Stop bit length/data length	0, 1 (data length 8) 10, 11 (data length 7)	1	1
120	Parity check presence/absence	0, 1, 2	1	2
121	Number of communication retries	0 to 10, 9999	1	1
122	Communication check time interval	0 to 999.8 sec., 9999	0.1	0 (Note)
123	Waiting time setting	0 to 150ms, 9999	1ms	9999
124	CR, LF presence/absence selection	0, 1, 2	1	1

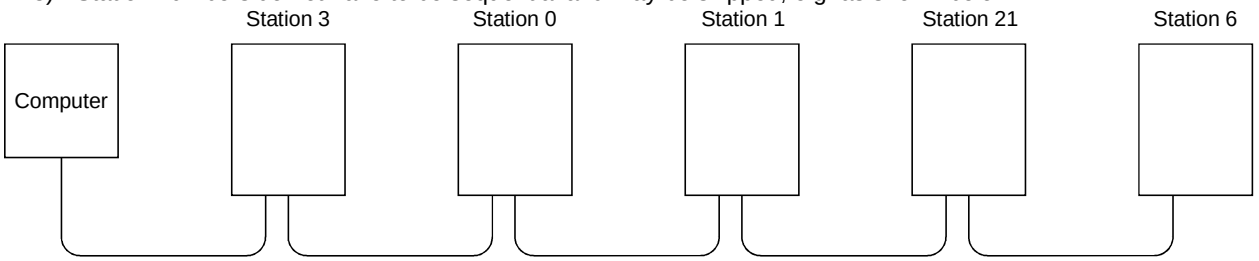
Note: The factory setting of Pr. 122 for the NA, EC and CH version inverters is "9999".

<Connection of FR-A5NR>

Parameter Number	Name	Setting Range	Setting Increments	Factory Setting
331	Inverter station number	0 to 31	1	0
332	Communication speed	3, 6, 12, 24, 48, 96, 192	1	96
333	Stop bit length/data length	0, 1 (data length 8) 10, 11 (data length 7)	1	1
334	Parity check presence/absence	0, 1, 2	1	2
335	Number of communication retries	0 to 10, 9999	1	1
336	Communication check time interval	0 to 999.8 sec., 9999	0.1	0
337	Waiting time setting	0 to 150ms, 9999	1ms	9999
338	Operation command write	0, 1	1	0
339	Speed command write	0, 1	1	0
340	Link start mode selection	0, 1, 2	1	0
341	CR, LF presence/absence selection	0, 1, 2	1	1
342	E^2ROM write yes/no	0, 1	1	0

(2) Station number setting (Pr. 117, Pr. 331 "inverter station number")

1) The station number may be set between 0 and 31.
   When the RS-422 interface is used, the station number may be set between 0 and 31 but the number of inverters connected must be within 10.
2) Note that the same station number cannot be set for different inverters. (If such setting has been made, proper communication cannot be performed.)
3) Station numbers do not have to be sequential and may be skipped, e.g. as shown below:



Station number setting example

(3) Communication specifications

Refer to the following table and set the parameters:

Parameter Number	Description	Data Setting	Data Definition
118, 332	Communication speed	3, 6, 12, 24, 48, 96, 192 (Note 1)	3: 300 baud. 6: 600 baud. 12: 1200 baud. 24: 2400 baud. 48: 4800 baud. 96: 9600 baud. 192: 19200 baud (Note 1)
119, 333	Stop bit length/data length	0, 1, 10, 11	0, 10: Stop bit length = 1 bit 1. 11: Stop bit length = 2 bits. 0, 1: Data length = 8 bits. 10, 11: Data length = 7 bits
120, 334	Parity check presence/absence	0, 1, 2	0: No parity check 1: Odd parity 2: Even parity
124, 341	CR, LF instruction presence/absence	0, 1, 2	0: Without CR and LF 1: With CR only 2: With CR and LF

Note 1. The setting range of Pr. 118 is 48, 96 and 192.

Note 2. The inverter will not be faulty if the Pr. 333 "stop bit length/data length" setting differs from the actual data value.

(4) Number of data communication error retries

Set the permissible number of retries at occurrence of data receive error. If the number of consecutive errors exceeds the permissible value, the inverter will come to an alarm stop.

Parameter Number	Name	Data Setting	Data Definition
121, 335	Number of communication retries	0 to 10	Permissible number of retries at error occurrence 〔If the number of retries exceeds the preset value, the inverter will come to an alarm stop. (Factory-set to one)〕
		9999 (65535) (Note 1)	If a communication error occurs, the inverter will not come to an alarm stop. At this time, the inverter can be coasted to a stop by MRS or RESET input. During an error, the minor fault signal (LF) is given to the open collector output. Allocate the used terminal with any of Pr. 190 to Pr. 195 (output terminal function selection) for A500 series inverters. Allocate the used terminal with any of Pr. 190 to Pr. 192 for E500 series inverters.

Note: The data to be entered from the parameter unit is 9999 and that from the computer is 65535 ($FFFF_H$).

(5) Permissible communication time interval

Set the permissible communication time interval between the computer and inverter.

(If no-communication with the computer persists for more than the permissible time, the inverter will come to an alarm stop due to time-out error.)

Parameter Number	Name	Data Setting	Data Definition
122, 336	Communication check time interval	0	Computer link operation disallowed
		0.1 to 999.8	Permissible communication time interval (0.1 second increments)
		9999(65535) (Note 1)	Communication check stop

Note 1. The data to be entered from the parameter unit is 9999 and that from the computer is 65535 ($FFFF_H$).

Note 2. At power-on (or reset), communication time interval check begins when the first communication is started.

Note 3. If the parameter setting is changed, check begins when the change is made.

Note 4. If communication is broken due to signal cable breakage, computer fault etc., the inverter does not detect such a fault. This should be fully noted.

(6) E^2ROM write yes/no (connection of FR-A5NR)

When the FR-A5NR is connected, choose whether the parameters will be written to E^2ROM or not.

Parameter Number	Name	Data Setting	Data Definition
342	E^2ROM write yes/no	0	Written to both E^2ROM and RAM.
		1	Written to RAM only.

1.6 Operation Modes

1.6.1 Connection with PU connector

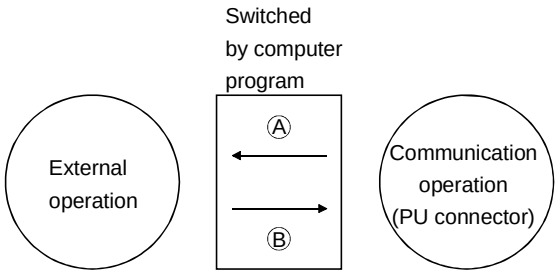
(1) Operation Modes

1) External operation ..... Controls the inverter by switching on/off external signals connected to the control circuit terminals of the inverter.

2) Communication operation (PU connector).... Controls the inverter in accordance with the computer program via the PU connector.
Since the PU connector is used for operation, the PU operation mode is the communication operation (PU connector) mode.

(2) Operation mode switching method

Change the operation mode as described below:



Symbol	Switching Type	Switching Method
A	Communication operation (PU connector) → external operation	By the user program of the computer (Note 1)
B	External operation → communication operation (PU connector)	By the user program of the computer (Note 1)

Note 1. Set "0" in Pr. 79 "operation mode selection" to carry out the above switching.
When "1" is set in Pr. 79 "operation mode selection", the operation mode available is the communication operation (PU connector) only.
When "2" is set in Pr. 79 "operation mode selection", the operation mode available is the external operation only.

1.6.2 Connection of FR-A5NR

(1) Operation modes

1) PU operation ..... Controls the inverter from the keyboard of the operation panel/parameter unit (FR-DU04/FR-PU04) (referred to as the "PU") installed to the inverter.

2) External operation ..... 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) Computer link operation ..... Controls the inverter in accordance with the computer program via the computer link unit (FR-A5NR).
By setting parameters Pr. 338 "operation command write" and Pr. 339 "speed command write" as appropriate, the operation signal and running frequency can be entered from the control circuit terminals.

(2) Operation mode switching

1) Operation mode switching conditions

Before switching the operation mode, check that:

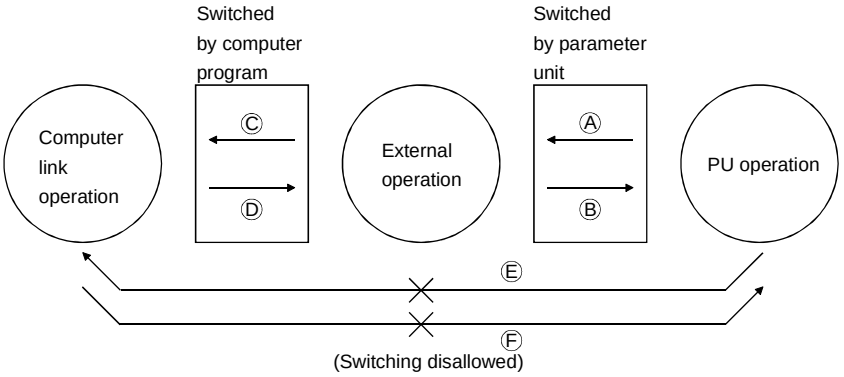
- The inverter is at a stop.
- Both the forward and reverse rotation signals are off; and
- The Pr. 79 "operation mode selection" setting is correct.

(Use the operation panel/parameter unit (FR-DU04/FR-PU04) of the inverter for setting.)

Setting	Operation Mode Selection	Switching to Computer Link Operation Mode
0	PU or external operation	Disallowed when the PU mode is selected. Allowed when the external mode is selected.
1	PU operation only	Disallowed
2	External operation only	Allowed
3	External/PU combined operation	Disallowed
4	External/PU combined operation	Disallowed
5	Programmed operation	Disallowed (Parameter values write-enabled in the external operation mode may be changed)
6	Switch-over	Allowed
7	External operation (PU interlock signal)	Allowed only in the external operation mode when the PU interlock signal (X12) is on.
8	PU or external (signal switching)	Allowed only in the external operation mode (X16 on).

2) Operation mode switching method

Change the operation mode as described below:



Symbol	Switching Type	Switching Method
A	PU operation → external operation	Operate the external operation key sheet on the PU.
B	External operation → PU operation	Operate the PU operation key sheet on the PU.
C	External operation → computer link operation	By the user program of the computer.
D	Computer link operation → external operation	By the user program of the computer.
E	PU operation → computer link operation	Switching disallowed/allowed if external operation is selected in A and computer link operation is then selected in C. (Note 2)
F	Computer link operation → PU operation	Switching disallowed/allowed if external operation is selected in D and PU operation is then selected in B. (Note 2)

When "1 or 2" is set in Pr. 340 "link start mode selection", the operation mode is computer link operation at power on or inverter reset.

Note 1. When setting "1 or 2" in Pr. 340, the initial settings (station number setting, etc.) of the inverter must be made without fail.

Note 2. In the switch-over mode, switching in E and F is also allowed.

3) Operation mode display

The operation mode is displayed on the PU as indicated below:

- PU operation ..... PU
- External operation ..... EXT
- Computer link operation ... NET

4) Operation mode at power on and instantaneous power failure

By setting the Pr. 340 "link start mode selection" value as appropriate, the operation mode at power on and at restoration from instantaneous power failure can be selected.

Pr. 340 Setting	Pr.79	Operation Mode Name	Mode at Power On or at Restoration from Instantaneous Power Failure
0	0	PU or external operation	Inverter goes into the external operation mode.
	1	PU operation only	Inverter goes into the PU operation mode.
	2	External operation only	Inverter goes into the external operation mode.
	3	External/PU combined operation mode	Running frequency is set in the PU operation mode and the start signal is set in the external operation mode.
	4	External/PU combined operation mode	Running frequency is set in the external operation mode and the start signal is set in the PU operation mode.
	5	Programmed operation mode	Inverter is operated by the program.
	6	Switch-over mode	Operation mode is switched while running.
	7	External operation mode	Shift to the PU operation mode is controlled by ON/OFF of the X12 signal.
	8	External/PU combined operation mode	Operation mode is switched by ON/OFF of the X16 signal.
1	Computer link operation		Inverter goes into the computer link operation mode. (Program need not be used for switching)
2	Computer link operation automatic restart after instantaneous power failure		When the computer link unit (FR-A5NR) is fitted and Pr. 57 setting is other than 9999 (setting of automatic restart after instantaneous power failure), automatic restart is made in the status prior to the occurrence of instantaneous power failure to continue computer link operation, if no communication signal is given from the computer. (Program need not be used for switching)

Note 1. If an instantaneous power failure occurs during computer link operation, the programming of the computer stops and remains stopped if power is restored.
If an instantaneous power failure occurs with "2" set in Pr. 340 "link start mode selection", the inverter continues operation in the status prior to the instantaneous power failure. (When Pr. 57 ≠ 9999)
- The Pr. 340 value may be changed in any operation mode.
- To start computer link operation at power-on, set "1 or 2" in Pr. 340.

(3) Control location selection

In the computer link operation mode, operation can be performed by signals from external terminals in accordance with the settings of Pr. 338 "operation command write" and Pr. 339 "speed command write".

Control place selection			Operation command write (Pr. 338)	0: Computer	0: Computer	1: External	1: External	Remarks
			Speed command write (Pr. 339)	0: Computer	1: External	0: Computer	1: External	
Fixed functions (Functions equivalent to terminals)			Forward rotation command (STF)	Computer	Computer	External	External	
			Reverse rotation command (STR)	Computer	Computer	External	External	
			Start self-holding selection (STOP)	—	—	External	External	
			Output halt (MRS)	Both	Both	External	External	(Note 1)
			Reset (RES)	Both	Both	Both	Both	
			Computer link operation frequency	Computer	—	Computer	—	
			2	—	External	—	External	
			4	—	External	—	External	
			1	Compensation	External	Compensation	External	
Selective functions	Pr. 180 to Pr. 186 settings	0	Low-speed operation command (RL)	Computer	External	Computer	External	Pr. 59 = 0
		1	Middle-speed operation command (RM)	Computer	External	Computer	External	Pr. 59 = 0
		2	High-speed operation command (RH)	Computer	External	Computer	External	Pr. 59 = 0
		3	Second function selection (RT)	Computer	Computer	External	External	
		4	Current input selection (AU)	—	Both	—	Both	
		5	Jog operation selection (JOG)	—	—	External	External	
		6	Automatic restart after instantaneous power failure selection (CS)	External	External	External	External	
		7	External thermal relay input (OH)	External	External	External	External	
		8	15-speed selection (REX)	Computer	External	Computer	External	Pr. 59 = 0
		9	Third function (X9)	Computer	Computer	External	External	
		10	FR-HC connection, inverter operation enable (X10)	External	External	External	External	
		11	FR-HC connection, instantaneous power failure detection (X11)	External	External	External	External	
		12	PU external interlock (X12)	External	External	External	External	
		13	External DC dynamic braking start (X13)	Computer	Computer	External	External	
		14	PID control valid terminal (X14)	Computer	External	Computer	External	
		15	Brake opening completion signal (BRI)	Computer	Computer	External	External	
		16	PU operation-external operation switching (X16)	External	External	External	External	
		17	Load pattern selection-forward/reverse rotation boost switching (X17)	Computer	Computer	External	External	
		18	Magnetic flux-V/F switching (X18)	Computer	Computer	External	External	
		19	Load torque high-speed frequency (X19)	Computer	Computer	External	External	
		20	S-pattern acceleration/deceleration C switch-over terminal	Computer	Computer	External	External	
		22	Orientation command	Computer	Computer	External	External	(Note 2)
		23	Pre-excitation	Computer	Computer	External	External	
RH, RM, RL, RT selection functions			Remote setting (RH, RM, RH)	Computer	External	Computer	External	Pr. 59 = 1, 2
			Programmed operation group selection (RH, RM, RL)	—	—	—	—	Pr. 79 = 5 Computer link operation disallowed
			Stop-on-contact selection 0 (RL)	Computer	External	Computer	External	Pr. 270 = 1, 3
			Stop-on-contact selection 1 (RT)	Computer	Computer	External	External	

[Explanation of table]

External : Control by signal from external terminal only is valid.
Computer : Control from sequence program only is valid.
Both : Control from both external terminal and computer is valid.
— : Control from both external terminal and computer is invalid.
Compensation : Control by signal from external terminal is only valid if Pr. 28 (multi-speed input compensation) setting is 1.

Note 1. If the FR-HC is connected, inverter operation enable signal (X10) is not assigned when the FR-HC is used (Pr. 30 = 2) or if the PU operation interlock signal (X12) is not assigned when the PU operation interlock function is set (Pr. 79 = 7). This function is also used by the MRS signal and therefore the MRS signal is only valid for the external terminals, independently of the Pr. 338 and Pr. 339 settings.

Note 2. The orientation command needs the FR-A5AP and FR-A5AX options.

1.7 Operational Functions

(1) Operation mode-based functions

Control location	Item	Operation Mode		
		PU operation	External operation	Computer link operation (when FR-A5NR is used)
Computer user program from PU connector	Operation command (start)	Allowed	Disallowed	Disallowed
	Running frequency setting	Allowed	Allowed (combined mode)	Disallowed
	Monitoring	Allowed	Allowed	Allowed
	Parameter write	Allowed (Note 4)	Allowed (Note 4)	Allowed (Note 4)
	Parameter read	Allowed	Allowed	Allowed
	Inverter reset	Allowed	Allowed	Allowed
	Stop command (Note 3)	Allowed	Allowed	Allowed
Computer user program from FR-A5NR	Operation command	Disallowed	Disallowed	Allowed (Note 1)
	Running frequency setting	Disallowed	Disallowed	Allowed (Note 1)
	Monitoring	Allowed	Allowed	Allowed
	Parameter write	Disallowed (Note 4)	Disallowed (Note 4)	Disallowed (Note 4)
	Parameter read	Allowed	Allowed	Allowed
	Inverter reset	Disallowed	Disallowed	Allowed
	Stop command (Note 3)	Disallowed	Disallowed	Allowed
Control circuit terminal	Inverter reset	Allowed	Allowed	Allowed
	Operation command	Disallowed	Allowed	Allowed (Note 1)
	Frequency setting	Disallowed	Allowed	Allowed (Note 1)

Note 1. Depends on the Pr. 338 "operation command write" and Pr. 399 "speed command write" settings.

Note 2. Cannot be reset from the computer when an RS-485 communication error occurs.

Note 3. Depends on the Pr. 75 "reset selection" setting.

Note 4. Depends on the Pr. 77 "parameter write inhibit selection" setting.

(2) Input from computer to inverter

1) Operation commands..... The following command can be given:

<Connection via PU connector>	<Connection via FR-A5NR>
Bit 0: —	Bit 0: Current input selection (AU)*
1: Forward rotation (STF)	1: Forward rotation (STF)
2: Reverse rotation (STR)	2: Reverse rotation (STR)
3: —	3: Low speed (RL)*
4: —	4: Middle speed (RM)*
5: —	5: High speed (RH)*
6: —	6: Second acceleration/deceleration (RT)*
7: —	7: Output halt (MRS)

The input signals marked * can be changed using Pr. 180 to Pr. 186 (input terminal function selection) for A500 and F500 series inverters.

2) Running frequency

The output frequency of the inverter can be set between 0 and 400Hz (16-bit binary in 0.01Hz increments)

3) Inverter reset

The inverter can be reset from the computer.

4) Parameter setting write

For the parameters indicated in Appendix "Data Code List", their settings can be written.

(3) Input from inverter to computer

1) Inverter status ..... The following operating status can be monitored.

Bit 0: Running (RUN)*

1: Forward running

2: Reverse running

3: Up to frequency (SU)*

4: Overload (OL)*

5: Instantaneous power failure (IPF)*

6: Frequency detection (FU)*

7: Alarm occurrence*

Note 1. For the FR-A500 and F500 series, the output signals marked * can be changed using Pr. 190 to Pr. 195 (output terminal function selection).

Note 2. The E500 series uses Pr. 190 to Pr. 192. Also, for the FR-E500 series, bit 5: Instantaneous power failure (IPF) is not available.

2) Inverter monitoring

- Output frequency ..... Binary in 0.01Hz increments
- Output current..... Binary in 0.01A increments
- Output voltage ..... Binary in 0.1V increments
- Alarm definition ..... Binary (up to eight alarms)

3) Parameter setting read

For the parameters indicated in Appendix "Data Code List", their settings can be read.

(4) Operation at alarm occurrence

Alarm Location	Description		Operation Mode		
			PU operation	External operation	Computer link operation (when FR-A5NR is used)
Inverter fault	Inverter operation		Stop	Stop	Stop
	Data communication	PU connector	Continued	Continued	Continued
		FR-A5NR	Continued	Continued	Continued
Communication error (communication from PU connector)	Inverter operation		Stop/continued (Note 1)	Continued	Continued
	Data communication	PU connector	Stop	Stop	Stop
		FR-A5NR	Continued	Continued	Continued
Communication error (plug-in option)	Inverter operation		Continued	Continued	Stop/continued (Note 2)
	Data communication	PU connector	Continued	Continued	Continued
		FR-A5NR	Stop	Stop	Stop

Note 1. Can be selected by parameter setting (factory-set to continued).

Note 2. Can be selected by parameter setting (factory-set to stop).

(5) Communication error

Error Location	Error Code
Communication error (communication from PU connector)	E.PUE
Communication error (FR-A5NR)	E.OP1 to E.OP3

(6) Inverter reset

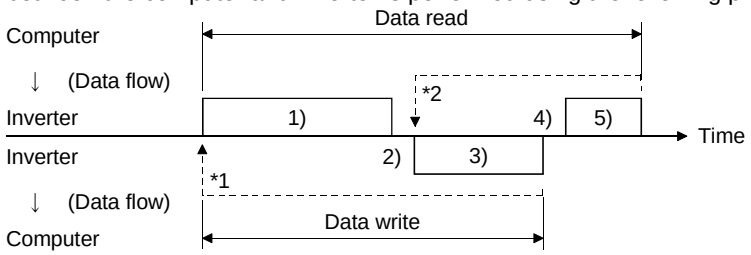
Resetting Method	Operation Mode		
	PU operation	External operation	Computer link operation (when FR-A5NR is used)
Computer user program	Disallowed	Disallowed	Allowed (Note)
Terminals RES-SD ON	Allowed	Allowed	Allowed
Inverter power OFF	Allowed	Allowed	Allowed

Note: When the inverter is reset in the computer link operation mode, it is put in the external operation mode. Accordingly, to resume computer link operation, switch the operation mode to computer link operation again.

1.8 Computer Programming

(1) Communication protocol

Data communication between the computer and inverter is performed using the following procedure:



*1. If a data error is detected and a retry must be made, execute retry operation with the user program. The inverter comes to an alarm stop if the number of consecutive retries exceeds the parameter setting.

*2. On receipt of a data error occurrence, the inverter returns retry data 3 to the computer again. The inverter comes to an alarm stop if the number of consecutive data errors reaches or exceeds the parameter setting.

(2) Communication operation presence/absence and data format types

Communication operation presence/absence and data format types are as follows:

No.	Operation		Operation command	Running Frequency	Parameter Write	Inverter Reset	Monitoring	Parameter Read
1)	Communication request is sent to the inverter in accordance with the user program.		A'	A (A") (Note)	A (A") (Note)	A	B	B
2)	Inverter data processing time		Present	Present	Present	Absent	Present	Present
3)	Reply data from the inverter (Data 1 is checked for error)	No error Request accepted	C	C	C	Absent	E,E' (E") (Note)	E
		With error Request rejected	D	D	D	Absent	F	F
4)	Computer processing delay time		Absent	Absent	Absent	Absent	Absent	Absent
5)	Answer from computer in response to reply data 3 (Data 3 is checked for error)	No error No processing	Absent	Absent	Absent	Absent	G	G
		With error 3 is output	Absent	Absent	Absent	Absent	H	H

Note: For the FR-E500 series, the data format is A" or E" when you set any of "0.01 to 9998" in Pr. 37 "output frequency setting" and "1" in the data code "HFF".

(3) Data format

Hexadecimal data is used.

Data is automatically transferred in ASCII between the computer and inverter.

• Data format types

1) Communication request data from computer to inverter

[Data write]

Format A

1	2	3	4	5	6	7	8	9	10	11	12	13
*3 ENQ	Inverter station number		Instruction code		Waiting time *5	Data				Sum check		*4

← Number of characters

Format A'

1	2	3	4	5	6	7	8	9	10	11
*3 ENQ	Inverter station number		Instruction code		Waiting time *5	Data		Sum check		*4

← Number of characters

Format A"

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
*3 ENQ	Inverter station number		Instruction code		Waiting time	Data						Sum check		*4

← Number of characters

[Data read]

Format B

1	2	3	4	5	6	7	8	9
*3 ENQ	Inverter station number		Instruction code		Waiting time *5	Sum check		*4

← Number of characters

Note 1. The inverter station numbers may be set between H00 and H1F (stations 0 and 31) in hexadecimal.

Note 2. *3 indicates the control code.

Note 3. *4 indicates the CR or LF code.

When data is transmitted from the computer to the inverter, code CR (carriage return) or LF (line feed) is automatically set at the end of a data group on some computers. In this case, setting must also be made from the inverter according to the computer.

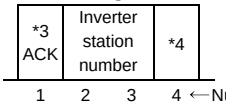
Also, the presence and absence of the CR and LF codes can be selected using Pr. 124 (Pr. 341).

Note 4. *5: When Pr. 123 (Pr. 337) "waiting time setting" ≠ 9999, create the communication request data with no "waiting time" in the data format. (The number of characters decreases by 1.)

2) Send data from computer to inverter during data write

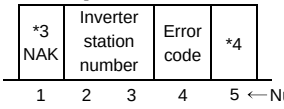
[No data error detected]

Format C



[Data error detected]

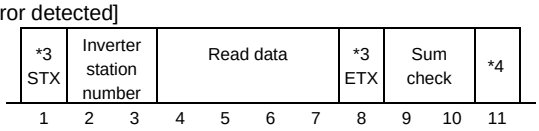
Format D



3) Reply data from inverter to computer during data read

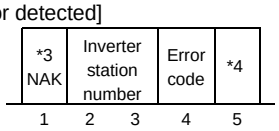
[No data error detected]

Format E

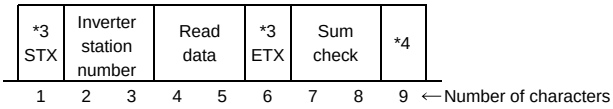


[Data error detected]

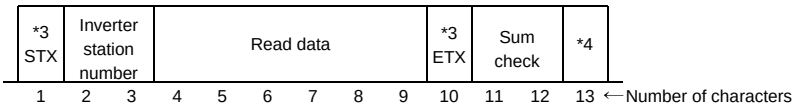
Format F



Format E'



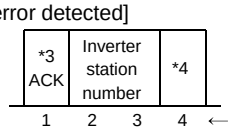
Format E"



4) Replay data from computer to inverter during data read

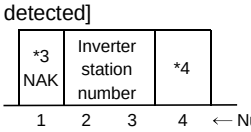
[No data error detected]

Format G



[Data error detected]

Format H



(4) Data definitions

1) Control codes

Signal Name	ASCII Code	Description
STX	H02	Start Of Text (Start of data)
ETX	H03	End Of Text (End of data)
ENQ	H05	Enquiry (Communication request)
ACK	H06	Acknowledge (No data error detected)
LF	H0A	Line Feed
CR	H0D	Carriage Return
NAK	H15	Negative Acknowledge (Data error detected)

2) Inverter station number

Specify the station number of the inverter which communicates with the computer.

3) Instruction code

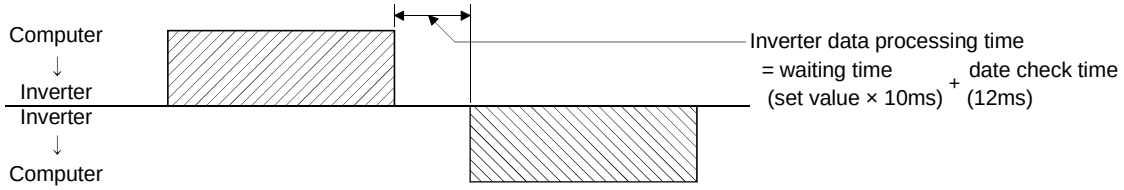
Specify the processing request (e.g. operation, monitoring) given by the computer to the inverter. Hence, the inverter can be run and monitored in various ways by specifying the instruction code as appropriate.

4) Data

Indicates the data such as frequency and parameters transferred to and from the inverter. The definitions and ranges of set data are determined in accordance with the instruction codes.

5) Waiting time

Specify the waiting time between the receipt of data at the inverter from the computer and the transmission of reply data. Set the waiting time in accordance with the response time of the computer between 0 and 150ms in 10ms increments (e.g. 1 = 10ms, 2 = 20ms).



6) Sum check code

The sum check code is 2-digit ASCII (hexadecimal) representing the lower 1 byte (8 bits) of the result (sum) derived from the checked ASCII data.

(Example 1)

Computer → inverter

	E N Q	Station number		Instruction code		* Waiting time	Data				Sum check code		
		0	1	E	1	1	0	7	A	D	F	4	← Binary code
ASCII code →	05H	30H	31H	45H	31H	31H	30H	37H	41H	44H	46H	34H	

H H H H H H H H H H
30+31+45+31+31+30+37+41+44
H
=1F4
Sum

*When Pr. 123 (Pr. 337) "waiting time setting" ≠ 9999, create the communication request data with no "waiting time" in the data format. (The number of characters decreases by 1.)

(Example 2)

Computer → inverter

	S T X	Station number		Read data				E T X	Sum check code		
		0	1	1	7	7	0		3	0	← Binary code
ASCII code →	02H	30H	31H	31H	37H	37H	30H	03H	33H	30H	

H H H H H H
30+31+31+37+37+30
H
=130
Sum

7) Error code

If any error is found in the data received by the inverter, its definition is sent back to the computer together with the NAK code.

Note 1. When the data from the computer has an error, the inverter will not accept that data.

Note 2. A request of any data communication, e.g. operation command, monitoring, is always given by the computer and the inverter will not return data to the computer. Hence, the program should be written to give a data read request as required from the computer at the time of monitoring, etc.

Note 3. Data for link parameter expansion setting differs as indicated below between access to Pr. 0-Pr. 99 values and access to Pr. 100 and later:

		Instruction Code	Data
Link parameter expansion setting	Read	7FH	00H: Pr. 0 to Pr. 99 values are accessible. 01H: Pr. 100 to Pr. 159, Pr. 200 to Pr. 231 and Pr. 900 to Pr. 905 values are accessible. 02H: Pr. 160 to Pr. 199 and Pr. 232 to Pr. 285 values are accessible. 03H: Pr. 300 to Pr. 399 values are accessible. 09H: Pr. 990 value is accessible (and other 900 parameters).
	Write	FFH	

(5) Programming instructions

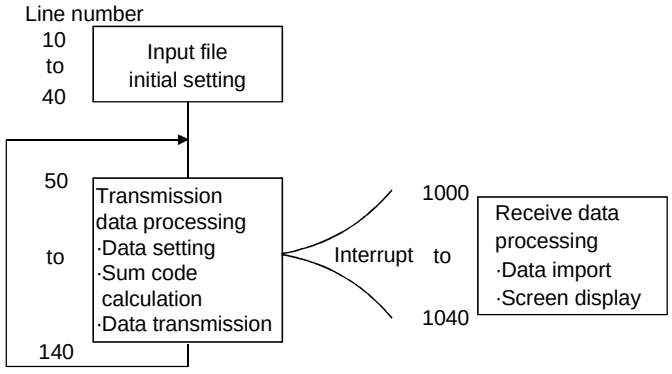
1) The inverter does not accept data from the computer if it has an error. For this reason, a retry program for data error must be included in the user program.
2) A request of any data communication, e.g. operation command, monitoring, is always given by the computer and the inverter will not return data to the computer. Hence, the program should be written to give a data read request as required from the computer at the time of monitoring, etc.

(6) Program example (BASIC)

When the operation mode is switched to communication operation

```
                                                  Initial setting of I/O file
10 OPEN “COM1:9600,E,8,2,HD” AS#1                 :Communication file opening
20 COMST1,1,1:COMST1,2,1                          :Circuit control signal (RS, ER) ON/OFF setting
30 ON COM(1)GOSUB*REC                             :Interrupt definition at data receive
40 COM(1)ON                                       :Interrupt enable
50 D$= “01FB10002”                                Transmission data setting
60 S=0
70 FOR I=1 TO LEN(D$)
80 A$=MID$(D$,I,1)
90 A=ASC(A$)                                      Sum code calculation
100 S=S+A
110 NEXT I
120 D$=CHR$(&H5)+D$+RIGHT$(HEX$(S),2)             :Addition of control and sum codes
130 PRINT#1,D$                                    Data transmission
140 GOTO 50
1000 *REC                                         Interrupt data receive
1010 IF LOC(1)=0 THEN RETURN                      :Interrupt occurrence at data receive
1020 PRINT “RECEIVE DATA”
1030 PRINT INPUT$(LOC(1),#1)
1040 RETURN
```

General flowchart



Note 1. When the inverter's communication check time interval is not set, interlocks are provided to disable operation to prevent hazards. Always set the communication check time interval before starting operation.

Note 2. Data communication is not started automatically but is made only once when the computer provides a communication request. If communication is disabled during operation due to signal cable breakage etc., the inverter cannot be stopped. When the communication check time interval has elapsed, the inverter will come to an alarm stop. The inverter can be coasted to a stop by switching on its RES signal or by switching power off.

Note 3. If communication is broken due to signal cable breakage, computer failure etc., the inverter does not detect such a fault. This should be fully noted.

1.9 Troubleshooting

(1) Data from computer unread by inverter

1) Computer conforming to RS-422 or RS-485 Standard?
2) Communication cables (and FR-A5NR) fitted properly? (Check for contact fault, open cable, wrong polarity, etc.)
3) Inverter initialization correct?
4) Station number setting (Pr. 117, Pr. 331) proper? (Check that setting and program matches and that the same station number is not used for different inverters.)
5) Communication check time interval (Pr. 112, Pr. 336) other than 0?
6) Proper communication request program executed in computer?

(2) Operation mode unswitched to computer link operation

1) When inverter is switched from external operation, are the signals to the external terminals STF or STR off?
2) Proper operation mode switching program executed?

(3) Inverter unstarted in computer link mode

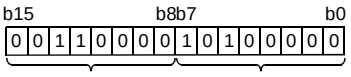
1) Inverter starting program executed properly?
2) Control location select conditions set properly when FR-A5NR is connected?
3) Inverter output provided?
4) Permissible communication time interval set properly?

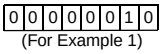
(4) Inverter brought to alarm stop during operation due to communication error

1) Communication cables (and FR-A5NR) fitted properly? (Check for contact fault, open cable, etc.)
2) Computer operating without fault?
3) Program written to give communication request from computer periodically?
4) Permissible communication time interval set properly?
5) Format of data transferred proper?
6) Termination resistor jumper connected?

1.10 Setting Items and Set Data

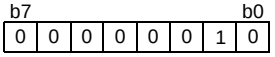
After completion of parameter setting, set the instruction codes and data as indicated below and start communication from the computer to allow various types of operation control and monitoring.

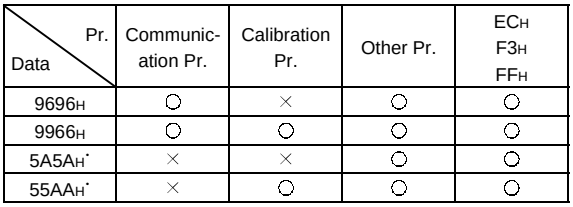
<table>
<tr><th>No.</th><th colspan="3">Item</th><th>Instruction Code</th><th>Description</th><th>Number of Data Digits</th></tr>
<tr><td>1</td><td colspan="2">Operation mode</td><td>Read</td><td>7BH</td><td>0000H: Communication option operation (connection of FR-A5NR)
0001H: External operation
0002H: Communication operation (PU connector), PU operation</td><td>4 digits</td></tr>
<tr><td></td><td colspan="2"></td><td>Write</td><td>FBH</td><td>0000H: Communication option operation (connection of FR-A5NR)
0001H: External operation
0002H: Communication operation (PU connector)</td><td></td></tr>
<tr><td rowspan="6">2</td><td rowspan="6">Monitoring</td><td>Output frequency [speed]</td><td colspan="2">6FH</td><td>0000H to FFFFH: Output frequency (hexadecimal) in 0.01Hz increments
[Speed (hexadecimal) in 1r/min increments if Pr. 37 = 1 to 9998 or Pr. 144 = 2 to 10, 102 to 110.]</td><td>4 digits</td></tr>
<tr><td>Output current</td><td colspan="2">70H</td><td>0000H to FFFFH: Output current (hexadecimal) in 0.01A increments</td><td>4 digits</td></tr>
<tr><td>Output voltage</td><td colspan="2">71H</td><td>0000H to FFFFH: Output voltage (hexadecimal) in 0.1V increments</td><td>4 digits</td></tr>
<tr><td>Special monitor (Note 1)</td><td colspan="2">72H</td><td>0000H to FFFFH: Monitored data selected by instruction code F3H</td><td>4 digits</td></tr>
<tr><td rowspan="2">Special monitor selection No. (Note 1)</td><td>Read</td><td>73H</td><td rowspan="2">01H to 0EH: Monitor selection data
<table><tr><th>Data</th><th>Description</th><th>Increments</th><th>Data</th><th>Description</th><th>Increments</th></tr><tr><td>01H</td><td>Output frequency</td><td>0.01Hz</td><td>09H</td><td>Regenerative brake</td><td>0.1%</td></tr><tr><td>02H</td><td>Output current</td><td>0.01A</td><td>0AH</td><td>Electronic overcurrent protection load factor</td><td>0.1%</td></tr><tr><td>03H</td><td>Output voltage</td><td>0.1V</td><td>0BH</td><td>Output current peak value</td><td>0.01A</td></tr><tr><td>05H</td><td>Frequency setting</td><td>0.01Hz</td><td>0CH</td><td>Converter output voltage peak value</td><td>0.1V</td></tr><tr><td>06H</td><td>Running speed</td><td>1r/min</td><td>0DH</td><td>Input power</td><td>0.01kW</td></tr><tr><td>07H</td><td>Motor torque</td><td>0.1%</td><td>0EH</td><td>Output power</td><td>0.01kW</td></tr></table></td><td rowspan="2">2 digits</td></tr>
<tr><td>Write</td><td>F3H</td></tr>
<tr><td>Alarm definition</td><td colspan="2">74H to 77H</td><td>0000H to FFFFH: Two most recent alarm definitions
Alarm definition display example (instruction code 74H)
Read data: [Example] 30A0H
(Previous alarm ..... THT) (Most recent alarm ..... OPT)
 

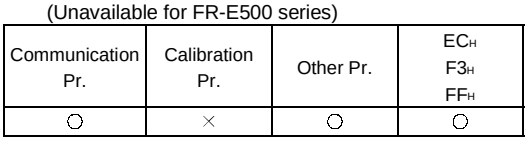
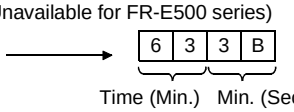
Alarm data
<table><tr><th>Data</th><th>Descri-ption</th><th>Data</th><th>Descri-ption</th><th>Data</th><th>Descri-ption</th></tr><tr><td>00H</td><td>No alarm</td><td>60H</td><td>OLT</td><td>C0H(*)</td><td>CPU</td></tr><tr><td>10H</td><td>OC1</td><td>70H</td><td>BE</td><td>C1H(*)</td><td>CTE</td></tr><tr><td>11H</td><td>OC2</td><td>80H(*)</td><td>GF</td><td>C2H(*)</td><td>P24</td></tr><tr><td>12H</td><td>OC3</td><td>81H(*)</td><td>LF</td><td>D5H(*)</td><td>MB1</td></tr><tr><td>20H</td><td>OV1</td><td>90H</td><td>OHT</td><td>D6H(*)</td><td>MB2</td></tr><tr><td>21H</td><td>OV2</td><td>A0H(*)</td><td>OPT</td><td>D7H(*)</td><td>MB3</td></tr><tr><td>22H</td><td>OV3</td><td>A1H(*)</td><td>OP1</td><td>D8H(*)</td><td>MB4</td></tr><tr><td>30H</td><td>THT</td><td>A2H(*)</td><td>OP2</td><td>D9H(*)</td><td>MB5</td></tr><tr><td>31H</td><td>THM</td><td>A3H(*)</td><td>OP3</td><td>DAH(*)</td><td>MB6</td></tr><tr><td>40H</td><td>FIN</td><td>BOH</td><td>PE</td><td>DBH(*)</td><td>MB7</td></tr><tr><td>50H(*)</td><td>IPF</td><td>B1H</td><td>PUE</td><td>F6H(*)</td><td>E6</td></tr><tr><td>51H(*)</td><td>UVT</td><td>B2H</td><td>RET</td><td>F7H(*)</td><td>E7</td></tr></table>*Alarm data unavailable for FR-E500 series.
C0H(CPU) is output only when FR-A5NR is used.</td><td>4 digits</td></tr>
<tr><td>3</td><td colspan="2">Operation command</td><td colspan="2">FAH</td><td>00H to FFH: Operation command
[Example 1] 02H ... Forward rotation
[Example 2] 00H ... Stop
 

(For Example 1)
<Connection with PU connector> <Connection of FR-A5NR>
b0: ——— b0: Current input selection (AU)*
b1: Forward rotation (STF) b1: Forward rotation (STF)
b2: Reverse rotation (STR) b2: Reverse rotation (STR)
b3: ——— b3: Low speed (RL)*
b4: ——— b4: Middle speed (RM)*
b5: ——— b5: High speed (RH)*
b6: ——— b6: Second acceleration/deceleration (RT)*
b7: ——— b7: Output halt (MRS)
The input signals marked * can be changed using input terminal assignment functions.</td><td>2 digits</td></tr>
</table>

Note 1. Special monitoring is not available for the FR-E500 series.

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Instruction Code</th><th>Description</th><th>Number of Data Digits</th></tr>
<tr><td>4</td><td colspan="2">Inverter status monitor</td><td>7AH</td><td>00H to FFH: Inverter status monitor
[Example 1] 02H ... Forward running
[Example 2] 80H ... Stop due to alarm occurrence
 

(For Example 1)
b0: Inverter running (RUN)*
b1: Forward running (STF)
b2: Reverse running (STR)
b3: Up to frequency (SU)*
b4: Overload (OL)*
b5: Instantaneous power failure (IPF)*
b6: Frequency detection (FU)*
b7: Alarm occurrence*
* For the FR-A500 and F500 series, outputs change with the settings of Pr. 190 to Pr. 195.
Instantaneous power failure (IPF) is not available for the FR-E500 series.</td><td>2 digits</td></tr>
<tr><td>5</td><td colspan="2">Running frequency write E2PROM</td><td>EEH</td><td>0000H to 9C40H: 0.01Hz increments (hexadecimal)
0 to 400.00Hz
To change the running frequency consecutively, write data to the inverter RAM. (Instruction code: EDH)</td><td>4 digits</td></tr>
<tr><td>6</td><td colspan="2">Alarm definition batch clear</td><td>F4H</td><td>9696H: Batch-clears the alarm history.</td><td>4 digits</td></tr>
<tr><td>7</td><td colspan="2">All parameter clear</td><td>FCH</td><td>All parameters return to the factory settings.
Any of four different clear operations is performed according to the data.
 

When all parameter clear is executed with 9696H or 9966H, communication-related parameter settings also return to the factory settings. When resuming operation, therefore, make parameter setting again.
* 5A5AH and 55AAH are not available when the FR-A5NR is connected.</td><td>4 digits</td></tr>
<tr><td>8</td><td colspan="2">User clear</td><td>FCH</td><td>9669H User clear is made.
(Unavailable for FR-E500 series)
 
</td><td>4 digits</td></tr>
<tr><td>9</td><td colspan="2">Inverter reset</td><td>FDH</td><td>9696H: Resets the inverter.
As the inverter is reset at start of communication by the computer, the inverter cannot send reply data back to the computer.</td><td>4 digits</td></tr>
<tr><td>10</td><td colspan="2">Parameter write</td><td>80H to E3H</td><td rowspan="2">Refer to Appendices and write and/or read parameter values as required.
Note that some parameters may be inaccessible.</td><td rowspan="2">4 digits</td></tr>
<tr><td>11</td><td colspan="2">Parameter read</td><td>00H to 63H</td></tr>
<tr><td rowspan="2">12</td><td rowspan="2">Link parameter expansion setting</td><td>Read</td><td>7FH</td><td rowspan="2">Parameter values of 00H to 6CH and 80H to ECH are changed.
00H: Pr. 0 to Pr. 99 values are accessible.
01H: Pr. 100 to Pr. 159 , Pr. 200 to Pr. 231 and Pr. 900 to Pr. 905 values are accessible.
02H: Pr. 160 to Pr. 199 and Pr. 232 to Pr. 285 values are accessible.
03H: Pr. 300 to Pr. 399 values are accessible.
09H: Pr. 992, Pr. 923, Pr. 990 and Pr. 991 values are accessible.</td><td rowspan="2">2 digits</td></tr>
<tr><td>Write</td><td>FFH</td></tr>
<tr><td rowspan="2">13</td><td rowspan="2">Second parameter changing (Instruction code FFH=1)</td><td>Read</td><td>6CH</td><td>When setting the programmed operation (data codes 3DH to 5AH, BDH to ADH) parameters (Unavailable for FR-E500 series)
00H: Running frequency
01H: Time
02H: Rotation direction
 
</td><td rowspan="2">2 digits</td></tr>
<tr><td>Write</td><td>ECH</td><td>When setting the bias/gain (data codes 5EH to 6AH, DEH to EDH) parameters
00H: Offset/gain
01H: Analog
02H: Analog value of terminal</td></tr>
</table>

1.11 Error Code List

The corresponding error code in the following list is displayed if an error is detected in any communication request data from the computer:

Error Code	Item	Definition	Inverter Operation
0_H	Computer NAK error	The number of errors consecutively detected in communication request data from the computer is greater than the permissible number of retries.	Brought to an alarm stop if error occurs continuously more than the permissible number of retries. (E.PUE, E.OP1 to OP3)
1_H	Parity error	The parity check result does not match the specified parity.	
2_H	Sum check error	Sum check code in the computer does not match that of the data received by the inverter.	
3_H	Protocol error	Data received by the inverter is in wrong syntax, data receive is not completed within given time, or CR and LF are not as set in the parameter.	
4_H	Framing error	The stop bit length differs from initial setting.	
5_H	Overrun error	New data has been sent by the computer before the inverter completes receiving the preceding data.	
6_H	—	—	—
7_H	Character error	The character received is invalid (other than 0 to 9, A to F, control code).	Does not accept receive data but is not brought to alarm stop.
8_H	—	—	—
9_H	—	—	—
A_H	Mode error	Parameter write was attempted in other than the computer link operation mode or during inverter operation.	Does not accept receive data but does not result in alarm.
B_H	Instruction code error	The specified command does not exist.	
C_H	Data range error	Invalid data has been specified for parameter, running frequency write, etc.	
D_H	—	—	—
E_H	—	—	—
F_H	—	—	—

2 CC-Link

2.1 Overview

"CC-Link" is the abbreviation of Control & Communication Link developed by Mitsubishi Electric Corporation as the next-generation Factory Automation field network.
A CC-Link system is designed to control from the PLC CPU the distributed I/O units, special function units (e.g. inverters) and other equipment connected by dedicated cables.
The CC-Link system has enabled wiring saving and fast data communication.

(1) Features of CC-Link-compatible inverters

1) High-speed communication
   Cyclic transmission of not only bit data but also word data can be made to enable high-speed communication.
   • Communication as fast as 10Mbps
   • The broadcast polling system is used to ensure 3.9ms to 6.7ms high speeds even at the maximum link scan.
2) Variable communication speed/distance system
   Selection of the appropriate speed and distance provides a wide range of applications such as a system demanding high speed and a system requiring a long distance.
3) Prevention of system fault (station separating function)
   Due to the bus connection system, the communications of normal remote and local stations are not affected by the occurrence of a faulty remote or local station due to power off, etc.
   Use of the removable terminal block allows the unit to be changed during data link.
4) Functionality for Factory Automation
   Factory Automation can be easily applied to the inverters that share the link system as CC-Link remote device stations and are controlled and monitored by PLC user programs.
   Various set values, such as motor speed and acceleration/deceleration time, can be changed and checked from the PLC.

(2) CC-Link stations

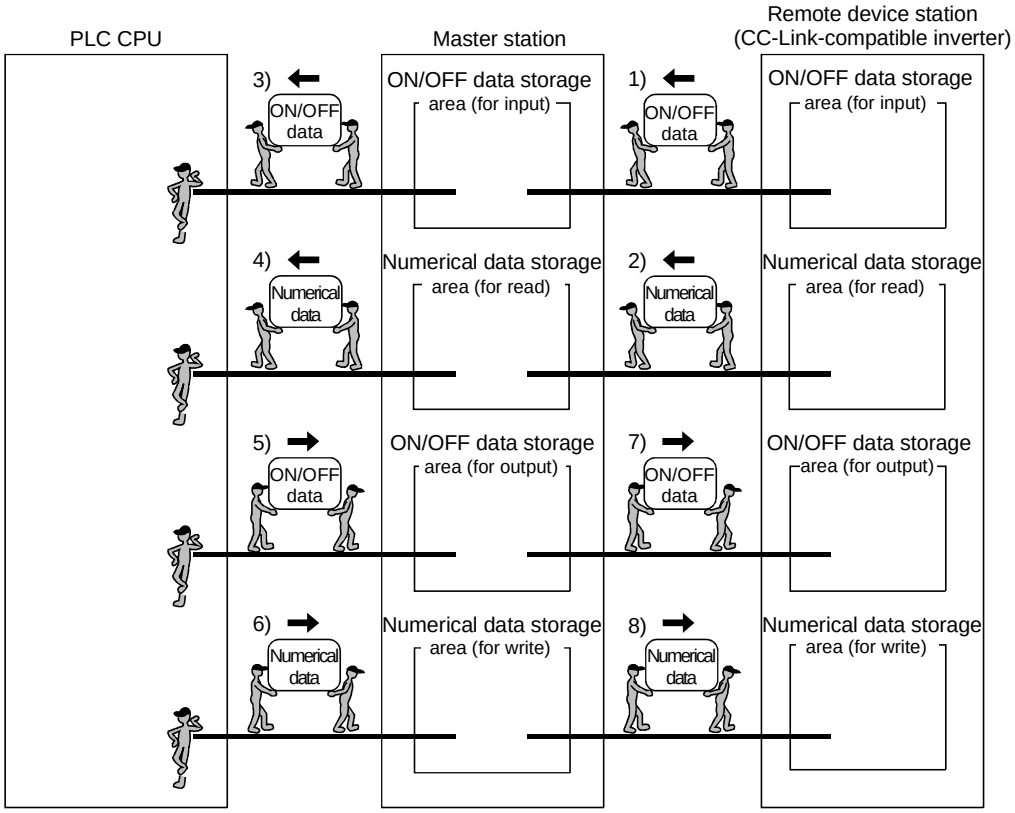
CC-Link consists of the following stations:

• Master station	: Controls the whole CC-Link system.
• Local station	: Loaded to the base unit and can communicate with the master and other local stations.
• Remote I/O station	: Controlled by the master station in the CC-Link system. Can transfer I/O signals from/to externally connected equipment.
• Remote device station (CC-Link-compatible inverter)	: Controlled by the master station in the CC-Link system. Can transfer externally connected equipment controlling I/O signals and digital-analog conversion, temperature detection and other values.
• Intelligent device station	: Controlled by the master station in the CC-Link system. Can transfer I/O signals and numerical and character data.

(3) How the master and remote device stations communicate

In the CC-Link system, the inverter is a remote device station.

How the master and remote device stations communicate will be described below:



1) The ON/OFF data of the remote device station (CC-Link-compatible inverter) is sent to the master station via the network and stored there.
2) The numerical data of the remote device station (CC-Link-compatible inverter) is sent to the master station via the network and stored there.
3) The PLC CPU reads the ON/OFF data stored in the master station.
4) The PLC CPU reads the numerical data stored in the master station.
5) The PLC CPU writes the ON/OFF data to the master station.
6) The PLC CPU writes the numerical data to the master station.
7) The ON/OFF data is sent from the master station to the remote device station (CC-Link-compatible inverter) via the network and stored there.
8) The numerical data is sent from the master station to the remote device station (CC-Link-compatible inverter) via the network and stored there.

The above sketch shows an image of general communication.

(4) Types of CC-Link-compatible inverters

Inverter Series		Method for Compatibility with CC-Link
FR-A500		Connect FR-A5NC plug-in option.
FR-F500		Connect FR-A5NC plug-in option.
FR-E500	3-phase 200V class	Made compatible by FR-E520-○○KN CC-Link-dedicated inverter.
	3-phase 400V class	Connect FR-E5NC plug-in option.
	Single-phase 200V class (FR-E520S-EC/CH)	Connect FR-E5NC plug-in option
	Other than above	Incompatible

2.2 Specifications

(1) Inverter side specifications

Item	Specifications
Station type	Remote device station
Number of units connected	42 inverters max. (1 station occupied by 1 inverter). May be used with other models.
Terminal block	Removable terminal block

(2) PLC side specifications

Item			Specifications							
Applicable CPU card			Q, QnA(H), QnAs(H), A1S, A1SH, AnUS(H), AnN, AnA, AnU(H)							
Communication speed			10M/5M/2.5M/625K/156Kbps							
Communication system			Broadcast polling system							
Synchronization system			Frame synchronization system							
Transmission path form			Bus form (conforms to EIA RS-485)							
Transmission format			Conforms to HDLC.							
Remote station number			Stations 1 to 64							
Max. transmission distance	Communication speed		156Kbps	625Kbps	2.5Mbps	5Mbps		10Mbps		
	Overall extension distance		1200m	600m	200m	150m	110m	100m	80m	50m
	Interstation distance	Between master/local station and preceding/succeeding station	2m or more							
		Between remote I/O station/remote device station and remote I/O station/remote device station	30cm or more	30cm or more	30cm or more	60cm or more	30 to 59cm	1m or more	60 to 99cm	30 to 59cm
Error control system			CRC							
Communication cable			Twisted pair cable (3-wire type)							

For further details, refer to the "CC-Link System Master/Local Module User's Manual".

(3) Twisted cable specifications

If the cables used are not the CC-Link-dedicated cables, we cannot guarantee the performance of the CC-Link system.

For the specifications and contact of the CC-Link-dedicated cables, refer to the CC-Link catalog L(NA)74108143.

(4) Data link processing time

1) Link scan time

The link scan time of CC-Link is found by the following expression:

<Link scan time (LS)>

LS= BT {29.4 + (NI × 4.8) + (NW × 9.6) + (N × 32.4) + (ni × 4.8) + (nw × 9.6)} + ST
+ { number of communication fault stations × 48 × BT × number of retries }* [µs]

BT : Constant (transmission speed)

Transmission Speed	156kbps	625kbps	2.5Mbps	5Mbps	10Mbps
BT	51.2	12.8	3.2	1.6	0.8

NI : Last station number among a, b and c (including occupied stations but not including reserved stations)
NW : Last station number among b and c (including occupied stations but not including reserved stations)
} Multiples of 8

Last Station Number	1 to 8	9 to 16	17 to 24	25 to 32	33 to 40	41 to 48	49 to 56	57 to 64
NI, NW	8	16	24	32	40	48	56	64

N : Number of connected stations (excluding reserved stations)

ni : a + b + c (excluding reserved stations)

nw : b + c (excluding reserved stations)

ST : Constant (The largest value among 1) to 3). Note that 2) should be ignored when b = 0, and 3) ignored when c = 0.)
1) 800 + (a × 15)
2) 900 + (b × 50)
3) When c ≦ 26: 1200 + (c × 100)
When c • 26: 3700 + {(c - 26) × 25}

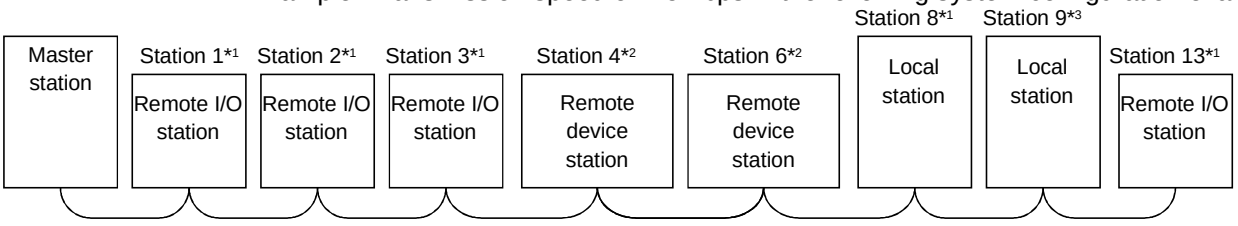
a : Total number of occupied remote I/O stations

b : Total number of occupied remote device stations (CC-Link-compatible inverters)

c : Total number of occupied intelligent device stations (including local stations)

* : Only when communication fault stations (including error invalid stations and temporary error invalid stations) exist

Example: Transmission speed of 2.5Mbps in the following system configuration example



*1: 1 station occupied *2: 2 stations occupied *3: 4 stations occupied

BT = 3.2 ST = 1700
NI = 13 ⇨ 16 1) 800 + (4 × 15) = 860
NW = 12 ⇨ 16 2) 900 + (4 × 50) = 1100
N = 8 3) 1200 + (5 × 100) = 1700
Ni = 13 a = 4 b = 4 c = 5
nw = 9
LS = 3.2 {29.4 + (16 × 4.8) + (16 × 9.6) + (8 × 32.4) + (13 × 4.8)
+ (9 × 9.6)} + 1700
= 3836.96 [µs]
= 3.84 [ms]

2) Transmission delay times

Transmission delay times (times until data is transmitted) are indicated below.

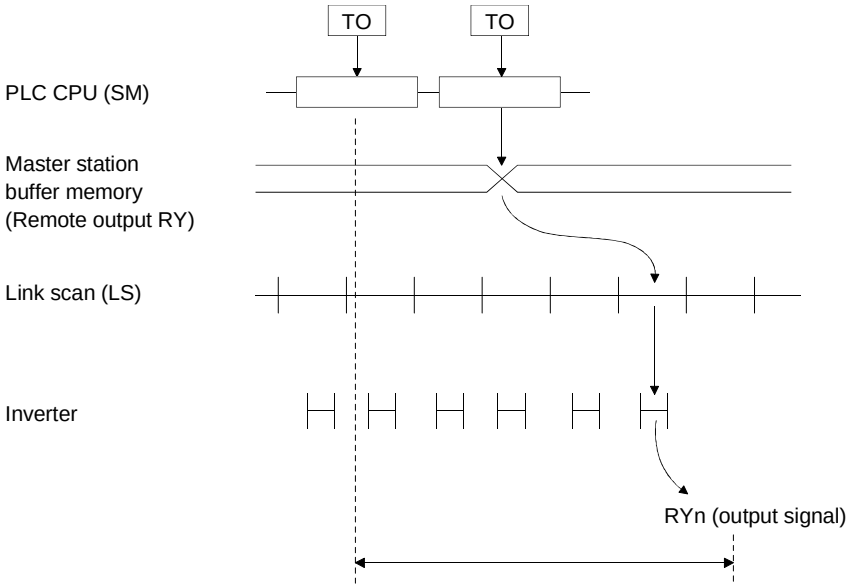
(a) Output signal (Master module to inverter)

<Expression>

SM + LS × 3 + inverter processing time [ms]

SM : Scan time of master station sequence program
LS : Link scan time (refer to Section 1))
Inverter processing time: 10 to 20ms

<Data flow>



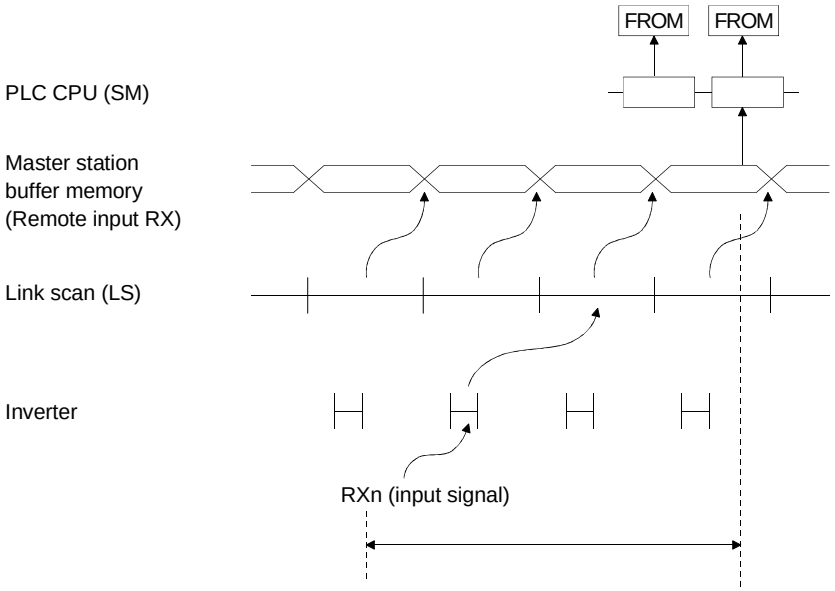
(b) Input signal (Inverter to master module)

<Expression>

SM + LS × 2 + inverter processing time [ms]

SM : Scan time of master station sequence program
LS : Link scan time (refer to Section 1))
Inverter processing time: 10 to 20ms

<Data flow>



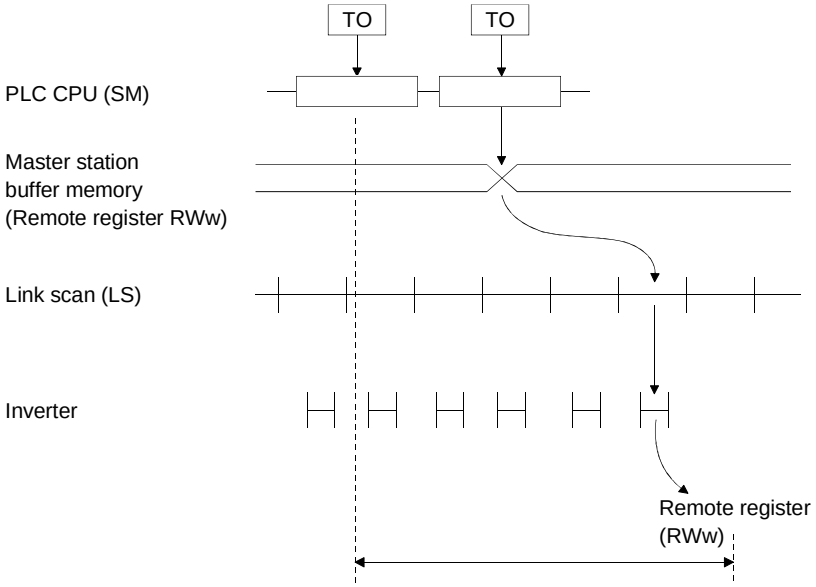
(c) Remote register (Master module to inverter)

<Expression>

SM + LS × 3 + inverter processing time [ms]

SM : Scan time of master station sequence program
LS : Link scan time (refer to Section 1))
Inverter processing time: 10 to 20ms

<Data flow>



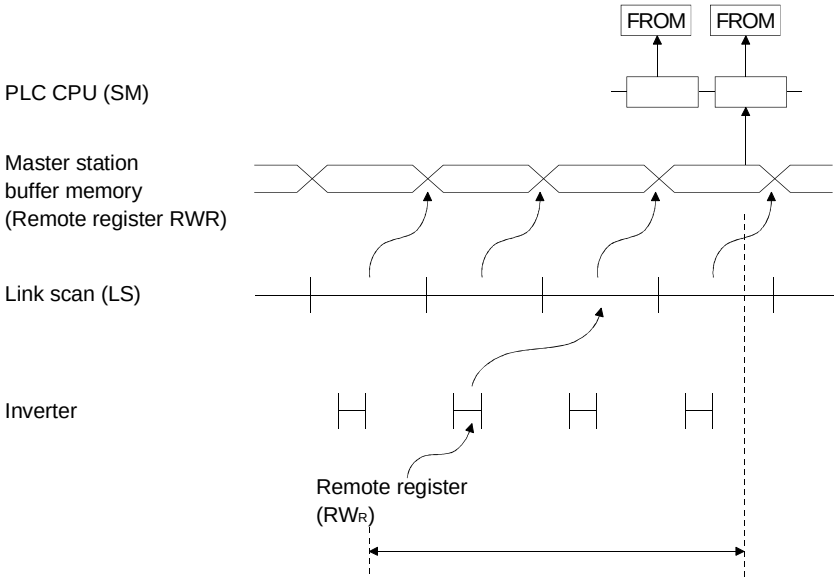
(d) Remote register (Inverter to master module)

<Expression>

SM + LS × 2 + inverter processing time [ms]

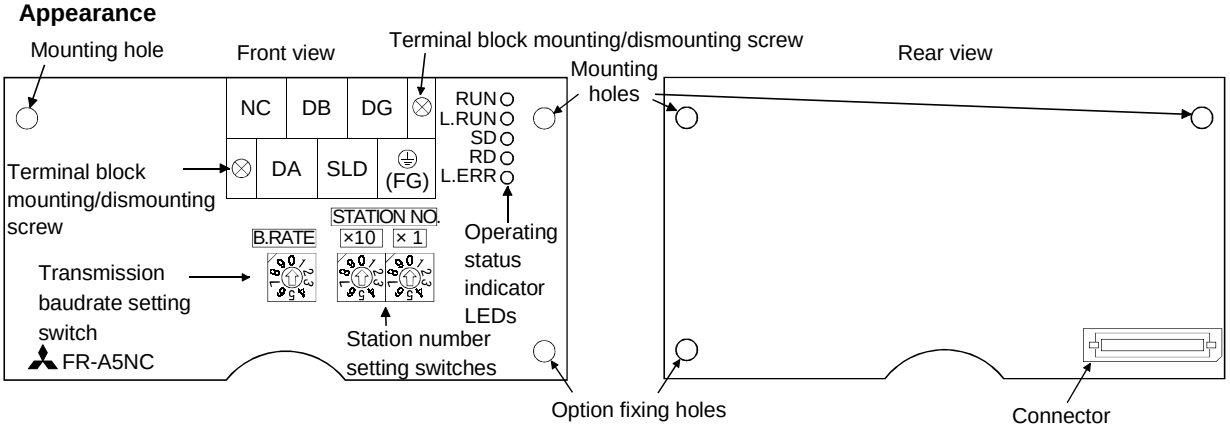
SM : Scan time of master station sequence program
LS : Link scan time (refer to Section 1))
Inverter processing time: 10 to 20ms

<Data flow>

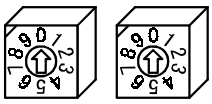


2.3.1 When FR-A5NC is connected

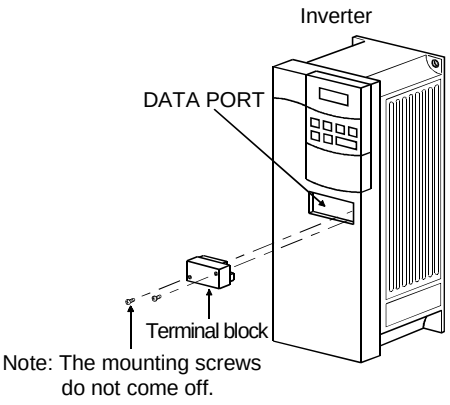
(1) Appearance



(2) Names and functions

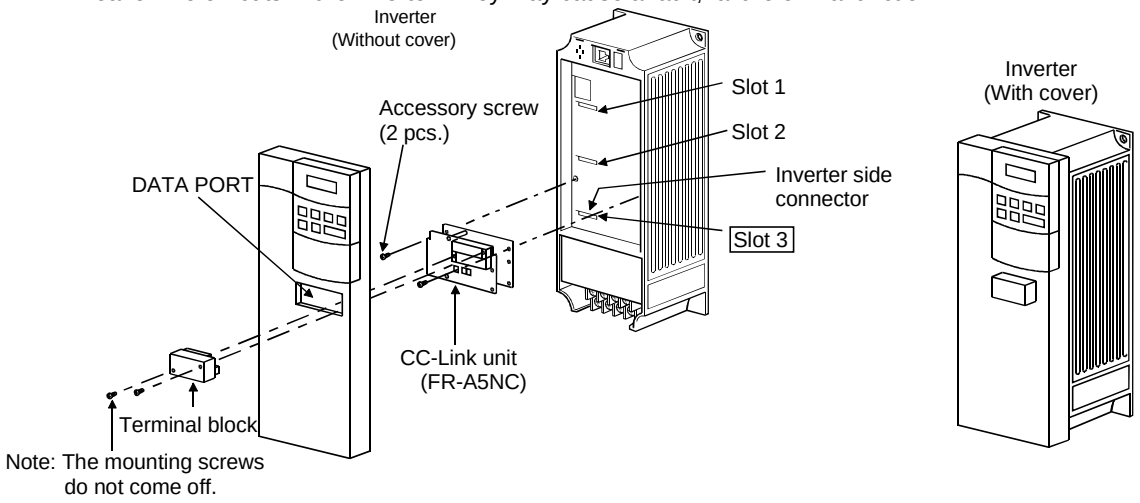
Name	Function
Station number setting switches	 × 10 × 1 — Used to set the inverter station number between 1 and 64. For details, refer to page 41.
Transmission baudrate setting switch	Used to set the transmission speed. Refer to page 41 for details.
Operating status indicator LEDs	RUN ..... Lit to indicate normal data communication with the master station. L.RUN ..... Lit to indicate normal receipt of refresh data. Extinguished to indicate a break for a given period. SD ..... Extinguished when send data is "0". RD ..... Lit on detection of receive data carrier L.ERR..... Lit to indicate communication error of host station.

(3) Wiring of terminal block



(4) Installation procedure

1) Remove the front cover of the inverter and mount the option unit to slot 3.
2) Securely insert the connector of the option unit far into the connector of slot 3 in the inverter. At this time, also fit the option fixing hole snugly. For the position of slot 3, refer to the figure below.
3) Securely fix both sides of the option unit to the inverter with the accessory mounting screws. If the screw holes do not match, the connector may not have been plugged snugly. Check for loose plugging.
4) Remove the terminal block mounting/dismounting screws to dismount the terminal block.
5) Remove the DATA PORT from the inverter's front cover and reinstall the front cover. (To remove the DATA PORT cover, push it from the back of the front cover.)
6) Reinstall the terminal block securely.
7) Route the cables so that they do not take up a large space in the control circuit terminal block wiring area of the option unit. Before wiring, mount the CC-Link unit (FR-A5NC) and fit the inverter front cover. During wiring, do not leave wire off-cuts in the inverter. They may cause a fault, failure or malfunction.



Note 1. Only one option of the same model may be used. When two or more options are mounted, priority is in order of slots 1, 2 and 3, and the options having lower priority are inoperative. (Only one communication option may be used.)

Note 2. When the inverter cannot recognize that the option is mounted or when two or more communication option units are connected, E.OPT error is displayed.

The errors shown change with the mounting slots 1, 2, 3.

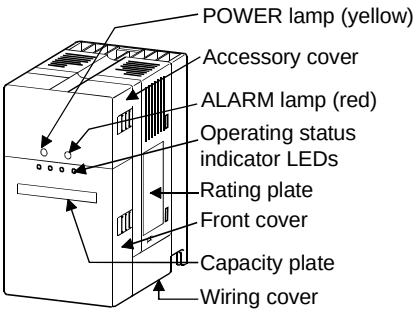
Mounting	Error Display
Slot 1	E.OP1
Slot 2	E.OP2
Slot 3	E.OP3

Note 3. If the inverter front cover is installed with the terminal block mounted, the front cover may not be installed securely.

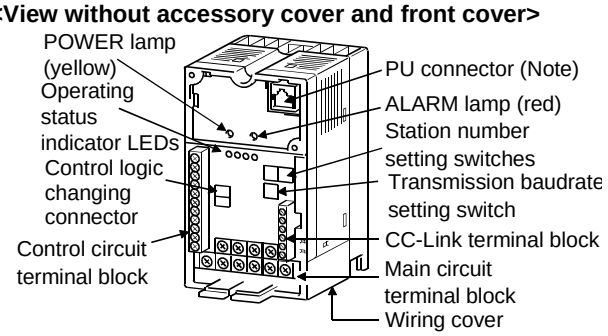
2.3.2 FR-E520-○○KN

(1) Appearance

<Front view>

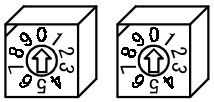


<View without accessory cover and front cover>



Note: Use the PU connector for the FR-PU04 (option) and RS-485 communication.

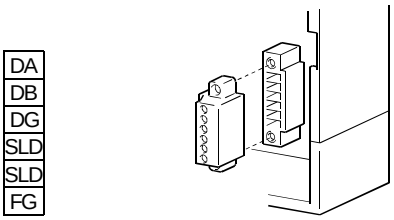
(2) Names and functions

Name	Function
Station number setting switches	 × 10 × 1 — Used to set the inverter station number between 1 and 64. For details, refer to page 41.
Transmission baudrate setting switch	Used to set the transmission speed. Refer to page 41 for details.
Operating status indicator LEDs	L.RUN ..... Lit to indicate normal receipt of refresh data. Extinguished to indicate a break for a given period. SD ..... Extinguished when send data is "0". RD ..... Lit on detection of receive data carrier L.ERR..... Lit to indicate communication error of host station. Flickers to indicate a change in setting of any switch or like while power is on.

(3) Wiring of terminal block

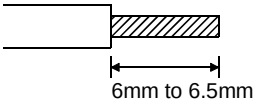
The layout of the inverter's CC-Link communication signal terminals are as shown below.

Terminal screw size: M2.5



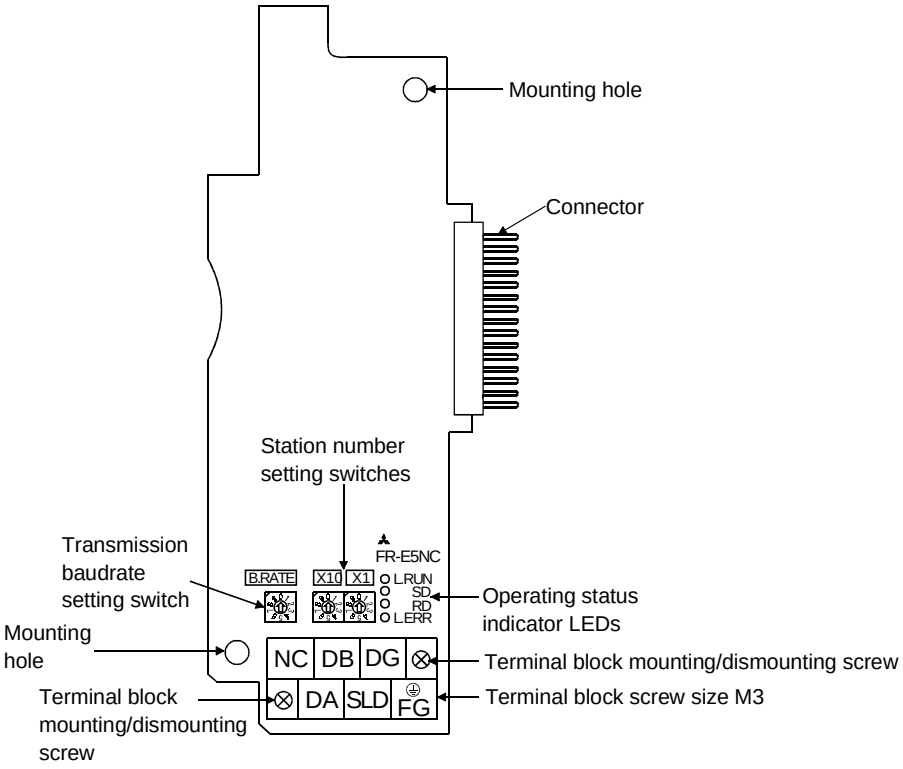
(4) Wiring method

Use a twisted cable after stripping its sheath and twisting the wires. Stripping too much may cause a short with the adjacent wires. Stripping too little may cause the wires to come off.

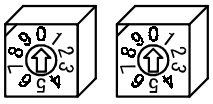


2.3.3 When FR-E5NC is connected

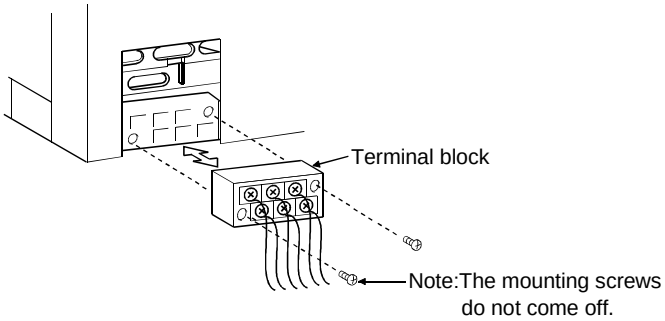
(1) Appearance



(2) Names and functions

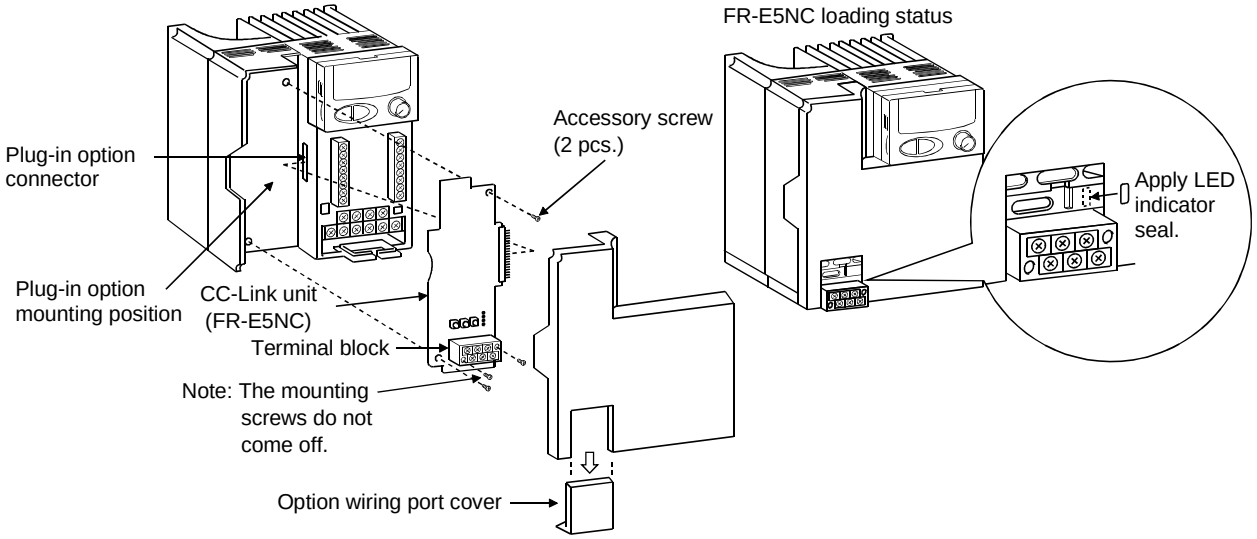
Name	Function
Station number setting switches	 × 10 × 1 Used to set the inverter station number between 1 and 64. For details, refer to page 41.
Transmission baudrate setting switch	Used to set the transmission speed. Refer to page 41 for details.
Operating status indicator LEDs	L.RUN ..... Lit to indicate normal receipt of refresh data. Extinguished to indicate a break for a given period. SD..... Extinguished when send data is "0". RD..... Lit on detection of receive data carrier L.ERR..... Lit to indicate communication error of host station. Flickers to indicate a change in setting of any switch or like while power is on.

(3) Wiring of terminal block



(4) Mounting method

1) Remove the front cover and option wiring port cover.
2) Remove the sponge in the connector of the plug-in option , and match and insert the option unit's connector into the plug-in option connector of the inverter securely far enough.
3) Using the accessory mounting screws, fix the two portions at top and bottom of the option unit to the inverter. If the screw holes do not match, the connector may not have been plugged snugly. Check for loose plugging.
4) Reinstall the front cover to the inverter.



Note 1. While the plug-in option is loaded, keep the option wiring port cover carefully.

Note 2. When this option is loaded, the protective structure of the inverter is the open type (IP00).

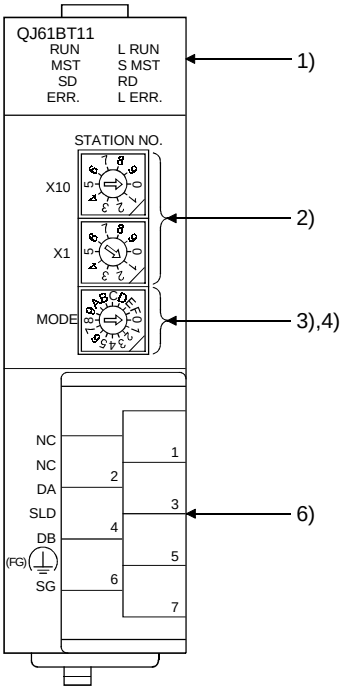
Note 3. If the inverter cannot recognize the loading of the option, it displays the E.OPT error.

2.3.4 Master and local modules

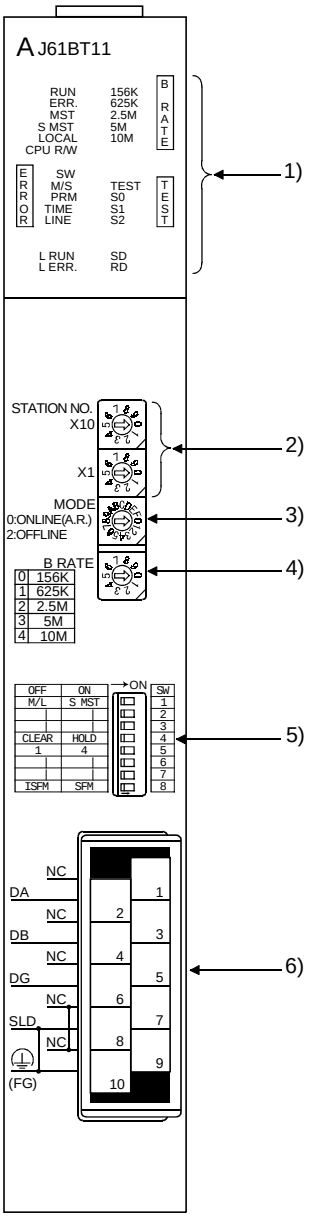
Five models of QJ61BT11, AJ61BT11, A1SJ61BT11, AJ61QBT11 and A1SJ61QBT11 are available as the master and local modules.

Master/Local Module Name	Applicable PLC Series
QJ61BT11	Q series
AJ61BT11	A series
A1SJ61BT11	AnS series
AJ61QBT11	QnA series
A1SJ61QBT11	Q2AS series

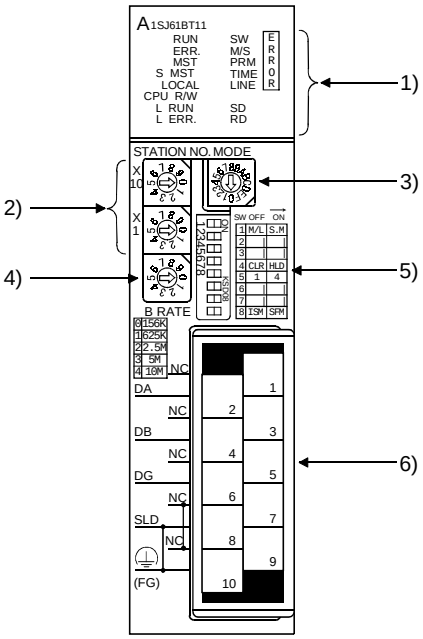
QJ61BT11



AJ61BT11

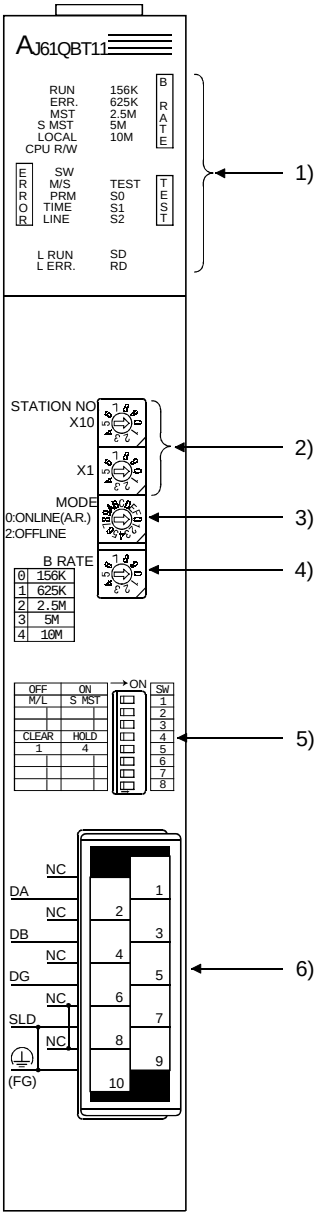


A1SJ61BT11

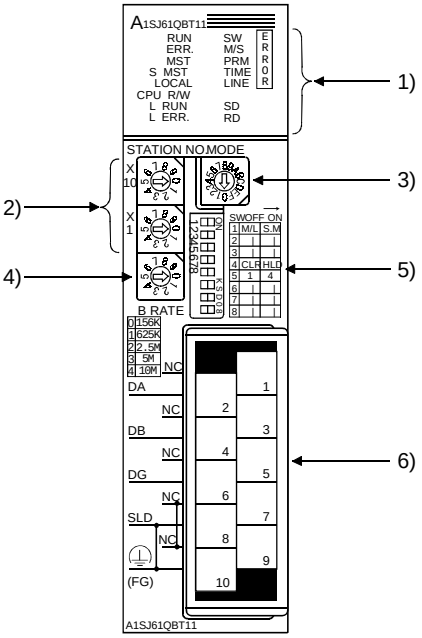


Number	Name
1)	LED indicators
2)	Station number setting switches
3)	Mode setting switch
4)	Transmission speed setting switch
5)	Condition setting switches
6)	Terminal block

AJ61QBT11

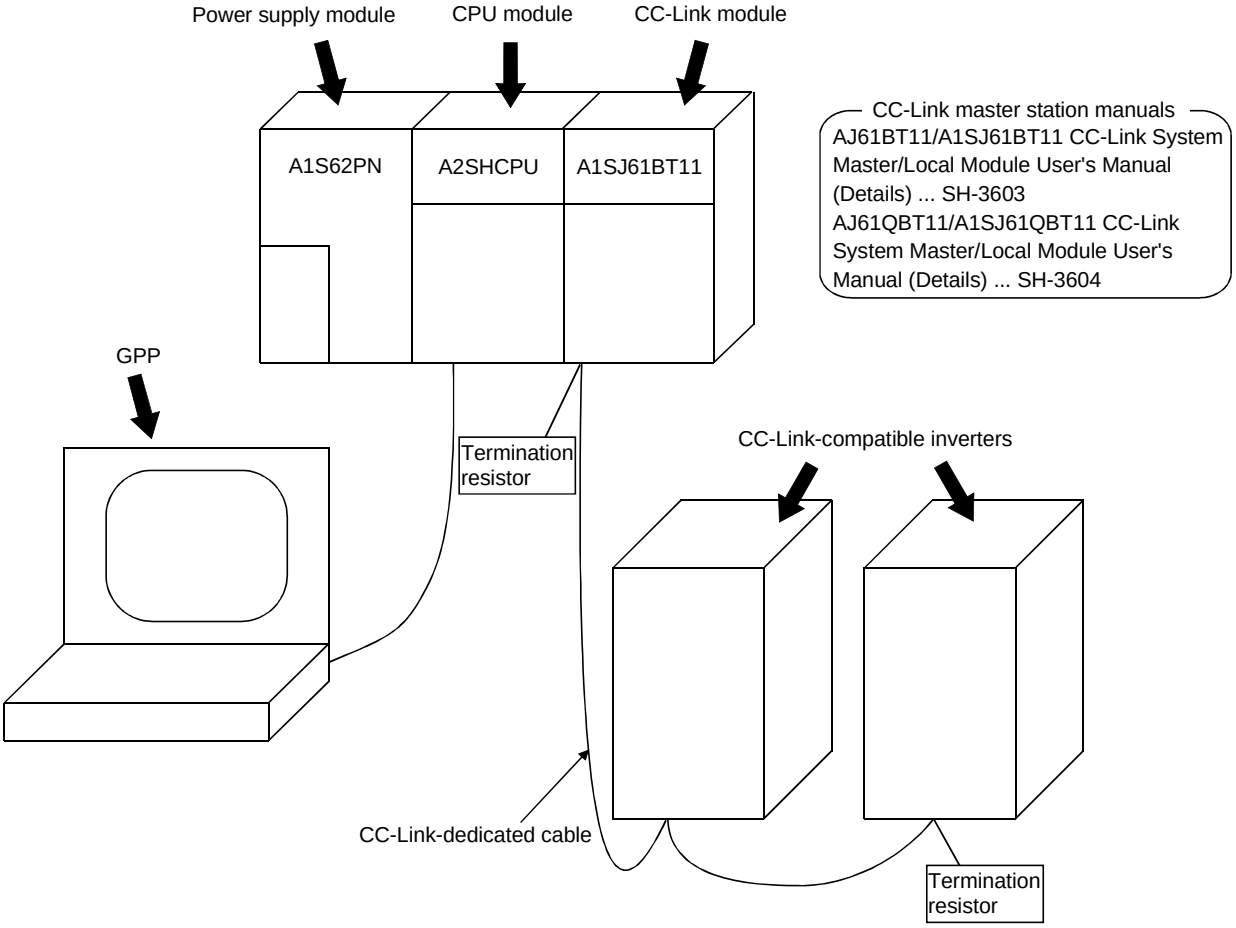


A1SJ61QBT11



Number	Name
1)	LED indicators
2)	Station number setting switches
3)	Mode setting switch
4)	Transmission speed setting switch
5)	Condition setting switches
6)	Terminal block

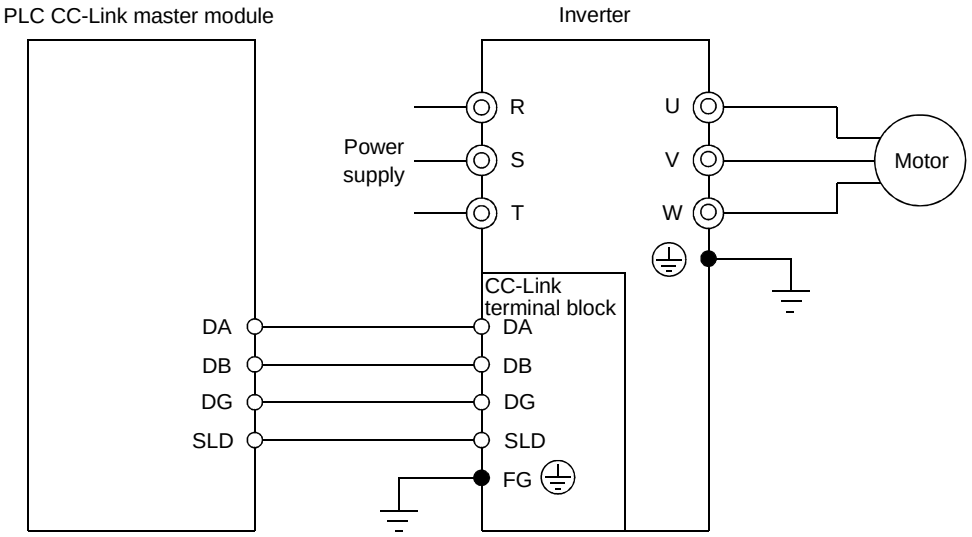
(1) System configuration example



1) PLC side
   Load the "QJ61BT11", "AJ61BT11", "A1SJ61BT11", "AJ61QBT11" or "A1SJ61QBT11" CC-Link system master/local module on the main or extension base unit of the PLC CPU used as the master station.
2) Inverter side
   Install the CC-Link-compatible inverters. Load the optional CC-Link unit if required.
3) Connect the PLC CC-Link module master station and CC-Link-compatible inverters with the CC-Link-dedicated cables.
4) When the CPU has automatic refresh function (example: QnA series CPU)
   Through communication with the corresponding devices using sequence ladders, 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 (CC-Link-compatible inverters).
5) 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 ladders to perform communication with the remote devices (CC-Link-compatible inverters).

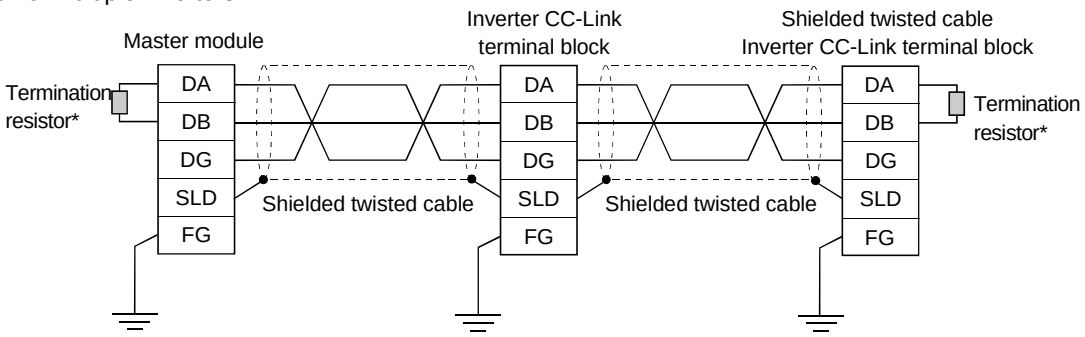
(2) Wiring method

1) Connection of one inverter



Note: During wiring, take care to prevent wire off-cuts from entering the inverter. They can cause a fault, failure or malfunction.

2) Connection of multiple inverters



*Use the termination resistors supplied for the PLC.

<Max. number of inverters connected to one master station>

42 units (when only inverters are connected)

When there are other modules, the number of stations occupied changes with the module and therefore the following conditions must be satisfied:

{(1×a)+(2×b)+(3×c)+(4×d)}≤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×A)+(54×B)+(88×C)}≤2304

A: Number of remote I/O stations ≤ 64
B: Number of remote device stations ≤ 42
C: Number of local stations ≤ 26

2.5 Inverter Setting

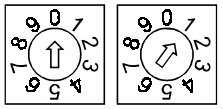
(1) Inverter station number setting

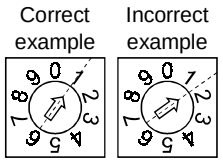
Set the station numbers of the inverters before powering on the inverters and do not change the settings while power is on. Set the station numbers noting the following:

1) Station numbers may be set between 1 and 64.
   Fully note that if you change any station number during operation, data communication cannot be made with the new station number.
2) Setting method
   - Place the arrows (⇧) of the corresponding switches to the positions of the station number you want to set.

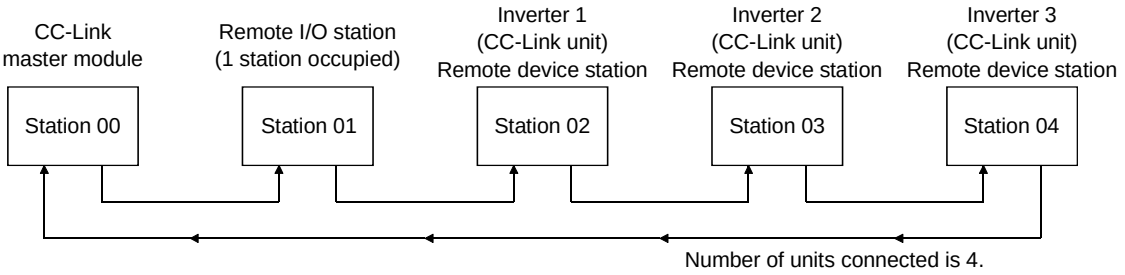
   Example
   - For station 1: Set (⇧) of ×10 to "0" and (⇧) of ×1 to "1".
   - For station 26: Set (⇧) of ×10 to "2" and (⇧) of ×1 to "6".
   - Set the station numbers sequentially in order of connection. (Station numbers may be specified independently of the connection sequence.)
   - Note that the same station number cannot be used more than once. (Doing so disables proper communications.)
   - Securely set the station number switch in the numeral position. Setting it between numerals disables proper data communications.

Station number setting switches





3) Connection example



Note: One inverter occupies one station. (One remote device station)

(2) Setting of transmission baudrate setting switch

Set the transmission speed.

(For details, refer to the CC-Link master module manual.)

Setting Switch	Transmission Speed
0	156kbps
1	625kbps
2	2.5Mbps
3	5Mbps
4	10Mbps
Positions 5 and later are not used. (If the switch is set to any of these positions, the L.ERR LED is lit to indicate a communication error.)	

2.6.1 When FR-A5NC is connected

(1) Operation modes

1) PU operation : Controls the inverter from the keyboard of the operation panel (FR-DU04) or parameter unit (FR-PU04) installed to the inverter.
2) External operation: Controls the inverter by switching on/off external signals connected to the control circuit terminals of the inverter.
3) PLC link operation: Controls the inverter in accordance with the PLC program via the CC-Link unit (FR-A5NC).

(2) Operation mode switching

1) Operation mode switching conditions

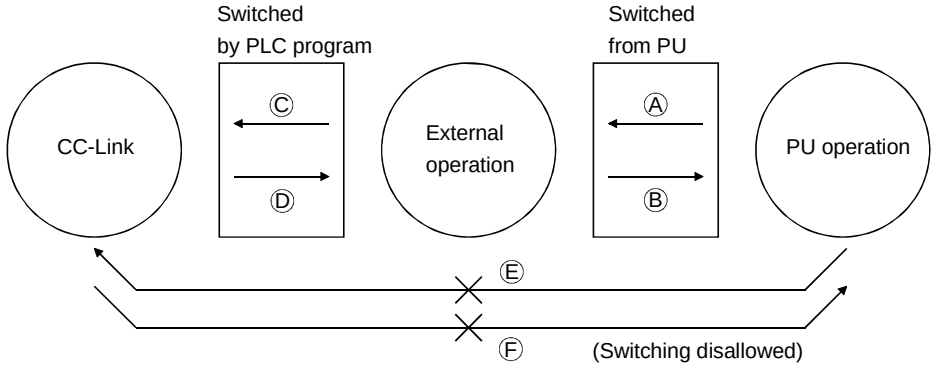
Before switching the operation mode, check that:

- The inverter is at a stop;
- Both the forward and reverse rotation signals are off; and
- The Pr. 79 "operation mode" setting is correct.

(Use the parameter unit of the inverter for setting.)

Pr. 79 Setting	Operation Mode Selection	Switching to CC-Link Operation Mode
0	PU or external operation	Disallowed when the PU mode is selected. Allowed when the external mode is selected.
1	PU operation mode	Disallowed
2	External operation mode	Allowed
3,4	External/PU combined operation mode	Disallowed
5	Programmed operation	Disallowed
6	Switch-over	Allowed
7	External operation (PU operation interlock)	Allowed only in the external operation mode when the PU interlock signal (X12) is on.
8	PU or external (signal switching)	Allowed only in the external operation mode (X16 on).

2) Operation mode switching method



Symbol	Switching Type	Switching Method
A	PU operation → external operation	Operate the external operation key on the PU.
B	External operation → PU operation	Operate the PU operation key on the PU.
C	External operation → CC-Link operation	By the user program of the PLC.
D	CC-Link operation → external operation	By the user program of the PLC.
E	PU operation → CC-Link operation	Switching disallowed. Allowed if external operation is selected in A and CC-Link operation is then selected in C. (Note 2)
F	CC-Link operation → PU operation	Switching disallowed. Allowed if external operation is selected in D and PU operation is then selected in B. (Note 2)

When "1 or 2" is set in Pr. 340 "link start mode selection", the operation mode is CC-Link operation at power on or inverter reset.

Note 1. When setting "1 or 2" in Pr. 340, the initial settings (station number setting, etc.) of the inverter must be made without fail.

Note 2. In the switch-over mode (Pr. 79 = 6), switching in E and F is also allowed.

3) Link start mode

By setting the Pr. 340 value as appropriate, the operation mode at power on and at restoration from instantaneous power failure can be selected.

Pr. 340 Setting	Operation Mode		Mode at Power On or at Restoration from Instantaneous Power Failure
	Pr.79		
0	0	PU or external operation	Inverter goes into the external operation mode.
	1	PU operation	Inverter goes into the PU operation mode.
	2	External operation	Inverter goes into the external operation mode.
	3	External/PU combined operation mode	Running frequency is set in the PU operation mode and the start signal is set in the external operation mode.
	4	External/PU combined operation mode	Running frequency is set in the external operation mode and the start signal is set in the PU operation mode.
	5	Programmed operation mode	Inverter is operated by the program.
	6	Switch-over mode	Operation mode is switched while running.
	7	External operation mode	Shift to the PU operation mode is controlled by ON/OFF of the X12 signal.
	8	External/PU combined operation mode	Operation mode is switched by ON/OFF of the X16 signal.
1	CC-Link operation		Inverter goes into the CC-Link operation mode. (Program need not be used for switching)
2	CC-Link operation		Inverter goes into the CC-Link operation mode. (Program need not be used for switching) For computer link operation.

- The Pr. 340 value may be changed in any operation mode.
- When Pr. 79 "operation mode selection" = "0, 2 or 6", "1 and 2" in Pr. 340 are made valid.
- When starting CC-Link operation at power-on, set "1 or 2" in Pr. 340.

(3) Control place selection

In the CC-Link operation mode, commands from the external terminals and sequence program are as listed below:

Control place selection		Pr. 338 "operation command right"	0: PLC	0: PLC	1: External	1: External	Remarks
		Pr. 339 "speed command right"	0: PLC	1: External	0: PLC	1: External	
Fixed functions (Functions equivalent to terminals)		Forward rotation command (STF)	PLC	PLC	External	External	
		Reverse rotation command (STR)	PLC	PLC	External	External	
		Start self-holding selection (STOP)	—	—	External	External	
		Output halt (MRS)	Both	Both	External	External	(Note 1)
		Reset (RES)	Both	Both	Both	Both	
		CC-Link operation frequency	PLC	—	PLC	—	
		2	—	External	—	External	
		4	—	External	—	External	
		1	Compensation	External	Compensation	External	
Selective functions	**Pr. 180 to Pr. 183 settings**	**0**	Low-speed operation command (RL)	PLC	External	PLC	External	Pr.59 = 0
		1	Middle-speed operation command (RM)	PLC	External	PLC	External	Pr.59 = 0
		2	High-speed operation command (RH)	PLC	External	PLC	External	Pr.59 = 0
		3	Second function selection (RT)	PLC	PLC	External	External	
		4	Current input selection (AU)	—	Both	—	Both	
		5	Jog operation selection (JOG)	—	—	External	External	
		6	Automatic restart after instantaneous power failure selection (CS)	External	External	External	External	
		7	External thermal relay input (OH)	External	External	External	External	
		8	15-speed selection (REX)	PLC	External	PLC	External	Pr.59 = 0
		9	Third function (X9)	PLC	PLC	External	External	
		10	FR-HC connection, inverter operation enable (X10)	External	External	External	External	
		11	FR-HC connection, instantaneous power failure detection (X11)	External	External	External	External	
		12	PU external interlock (X12)	External	External	External	External	
		13	External DC dynamic braking start (X13)	PLC	PLC	External	External	
		14	PID control valid terminal (X14)	PLC	External	PLC	External	
		15	Brake opening completion signal (BRI)	PLC	PLC	External	External	
		16	PU operation-external operation switching (X16)	External	External	External	External	
		17	Load pattern selection-forward/reverse rotation boost switching (X17)	PLC	PLC	External	External	
		18	Magnetic flux-V/F switching (X18)	PLC	PLC	External	External	
		19	Load torque high-speed frequency (X19)	PLC	PLC	External	External	
		20	S-pattern acceleration/deceleration C switch-over terminal	Computer	Computer	External	External	
		22	Orientation command	PLC	PLC	External	External	(Note 2)
		23	Pre-excitation	Computer	Computer	External	External	
RH, RM, RL, RT selection functions		Remote setting (RH, RM, RH)	PLC	External	PLC	External	Pr. 59 = 1, 2
		Programmed operation group selection (RH, RM, RL)	—	—	—	—	Pr. 79 = 5 CC-Link operation disallowed
		Stop-on-contact selection 0 (RL)	PLC	External	PLC	External	Pr.270 = 1, 3
		Stop-on-contact selection 1 (RT)	PLC	PLC	External	External	

[Explanation of table]

External : Control by signal from external terminal is only valid.

PLC : Control from sequence program is only valid.

Both : Control from both external terminal and PLC is valid.

— : Control from both external terminal and PLC is invalid.

Compensation : Control by signal from external terminal is only valid if Pr. 28 "multi-speed input compensation" setting is "1".

Note 1. If the FR-HC connection, inverter operation enable signal (X10) is not assigned when the FR-HC is used (Pr. 30 = 2) or if the PU operation interlock signal (X12) is not assigned when the PU operation interlock function is set (Pr. 79 = 7), this function is also used by the MRS signal and therefore the MRS signal is only valid for the external terminals, independently of the Pr. 338 and 339 settings.

Note 2. The orientation command needs the FR-A5AP and FR-A5AX options.

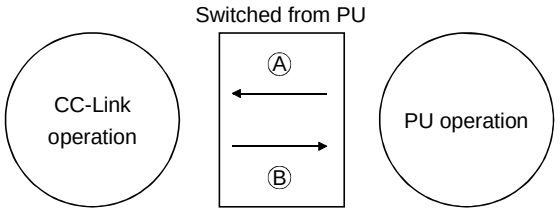
2.6.2 FR-E520-○○KN

(1) Operation modes

1) PU operation : Controls the inverter from the keyboard of the operation panel or parameter unit (FR-PU04) installed to the inverter.
2) CC-Link operation : Controls the inverter in accordance with the PLC program by CC-Link.

(2) Operation mode switching method

Change the operation mode as described below:



Symbol	Switching Type	Switching Method
A	PU operation → CC-Link operation	Can be switched from parameter unit (Note 1)
B	CC-Link operation → PU operation	Can be switched from parameter unit (Note 1)

Note 1. Set "0" in Pr. 79 "operation mode selection" to carry out the above switching.
When "1" is set in Pr. 79 "operation mode selection", the operation mode available is the PU operation only.
When "2" is set in Pr. 79 "operation mode selection", the operation mode available is the CC-Link operation only.
You cannot change the operation mode with the user program from the PLC.

(3) Control place selection

In the CC-Link operation mode, operation can be performed with the signals from the external terminals.

Operation Mode			CC-Link Operation Mode		Remarks
Fixed functions (Functions equivalent to terminals)			Reset (RES)	Both	
			CC-Link operation frequency	PLC	
Selective functions	Pr. 183 setting	0	Low-speed operation command (RL)	Both	
		1	Middle-speed operation command (RM)	Both	
		2	High-speed operation command (RH)	Both	
		3	Second function selection (RT)	Both	
		6	Output halt terminal (MRS)	Both	
		7	External thermal relay input (OH)	External	
		8	15-speed selection (REX)	Both	
		18	Magnetic flux-V/F switching (X18)	Both	

[Explanation of table]

External : Control by signal from external terminal is only valid.
PLC : Control from sequence program is only valid.
Both : Control from both external terminal and PLC is valid.

2.6.3 When FR-E5NC is connected

(1) Operation modes

1) PU operation : Controls the inverter from the keyboard of the operation panel or parameter unit (FR-PU04) installed to the inverter.
2) External operation : Controls the inverter by switching on/off external signals connected to the control circuit terminals of the inverter.
3) CC-Link operation : Controls the inverter in accordance with the PLC program via the CC-Link unit (FR-E5NC).

(2) Operation mode switching

1) Operation mode switching conditions

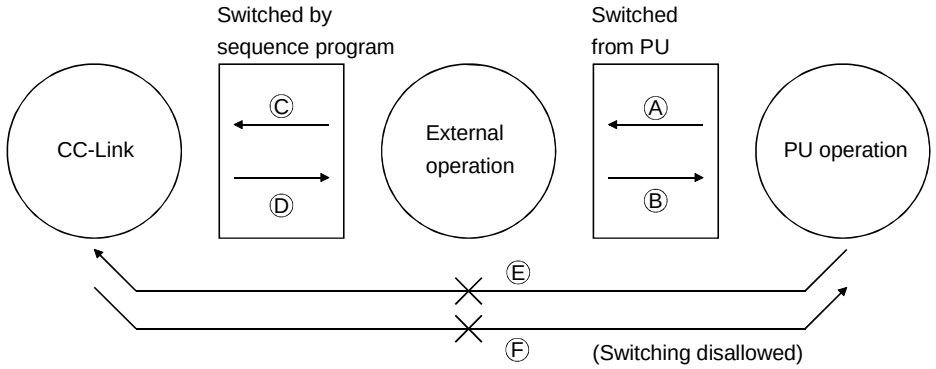
Before switching the operation mode, check that:

- The inverter is at a stop;
- Both the forward and reverse rotation signals are off; and
- The Pr. 79 "operation mode" setting is correct.

(Use the operation panel of the inverter or the optional parameter unit for setting.)

Pr. 79 Setting	Operation Mode Selection	Switching to CC-Link Operation Mode
0	PU or external operation	Disallowed when the PU mode is selected. Allowed when the external mode is selected.
1	PU operation mode	Disallowed
2	External operation mode	Allowed
3, 4	External/PU combined operation mode	Disallowed
6	Switch-over	Allowed
7	External operation (PU operation interlock)	Allowed only in the external operation mode when the output halt signal (MRS) is on.
8	PU or external (signal switching)	Allowed only in the external operation mode (X16 on).

2) Operation mode switching method



Symbol	Switching Type	Switching Method
A	PU operation → external operation	Operate the external operation key on the PU.
B	External operation → PU operation	Operate the PU operation key on the PU.
C	External operation → CC-Link operation	By the user program of the PLC.
D	CC-Link operation → external operation	By the user program of the PLC.
E	PU operation → CC-Link operation	Switching disallowed. Allowed if external operation is selected in A and CC-Link operation is then selected in C. (Note 2)
F	CC-Link operation → PU operation	Switching disallowed. Allowed if external operation is selected in D and PU operation is then selected in B. (Note 2)

When "1 or 2" is set in Pr. 340 "link start mode selection", the operation mode is CC-Link operation at power on or inverter reset.

Note 1. When setting "1 or 2" in Pr. 340, the initial settings (station number setting, etc.) of the inverter must be made without fail.

Note 2. In the switch-over mode (Pr. 79 = 6), switching in E and F is also allowed.

(3) Link start mode

You can choose the operation mode at power-on or at power restoration after instantaneous power failure.
Set "1" in Pr. 340 value to choose the CC-Link operation mode.
After a link start, the program can be used to write parameters.

Note: Pr. 79 "operation mode" changes in function according to the inverter. For details, refer to the inverter instruction manual.

Pr. 340 Setting	Operation Mode		Mode at Power On or at Restoration from Instantaneous Power Failure
	Pr.79		
0 (Factory setting)	0	PU or external operation	Inverter goes into the external operation mode.
	1	PU operation	Inverter goes into the PU operation mode.
	2	External operation	Inverter goes into the external operation mode.
	3	External/PU combined operation mode	Running frequency is set in the PU operation mode and the start signal is set in the external operation mode.
	4	External/PU combined operation mode	Running frequency is set in the external operation mode and the start signal is set in the PU operation mode.
	6	Switch-over mode	Operation mode is switched while running.
	7	External operation mode	MRS signal ON .....Can be shifted to the PU operation mode. (Output stop during external operation) MRS signal OFF.....Cannot be shifted to the PU operation mode.
	8	External/PU combined operation mode	X16 signal ON.....Shifted to the external operation mode. X16 signal OFF .....Shifted to the PU operation mode.
1	CC-Link operation		Inverter goes into the CC-Link operation mode. (Program need not be used for switching)

- The Pr. 340 value may be changed from the PU in any operation mode.
- When Pr. 79 "operation mode selection" = "0, 2 or 6", "1" in Pr. 340 is made valid.
- When starting CC-Link operation at power-on, set "1" in Pr. 340.

(3) Control place selection

In the CC-Link operation mode, commands from the external terminals and sequence program are as listed below. (Pr. 180 to Pr. 183 (input terminal function selection) change in functions according to the inverter. For details, refer to the inverter instruction manual.)

Control place selection			Pr. 338 "operation command right"	0: PLC	0: PLC	1: External	1: External	Remarks
			Pr. 339 "speed command right"	0: PLC	1: External	0: PLC	1: External	
Fixed functions (Functions equivalent to terminals)			Forward rotation command (STF)	PLC	PLC	External	External	
			Reverse rotation command (STR)	PLC	PLC	External	External	
			Reset (RES)	Both	Both	Both	Both	
			CC-Link operation frequency	PLC	—	PLC	—	
			2	—	External	—	External	
			4	—	External	—	External	
Selective functions	Pr. 180 to Pr. 183 settings	0	Low-speed operation command (RL)	PLC	External	PLC	External	Pr. 59 = 0
		1	Middle-speed operation command (RM)	PLC	External	PLC	External	Pr. 59 = 0
		2	High-speed operation command (RH)	PLC	External	PLC	External	Pr. 59 = 0
		3	Second function selection (RT)	PLC	PLC	External	External	
		4	Current input selection (AU)	—	Both	—	Both	
		5	Start self-holding selection (STOP)	—	—	External	External	
		6	Output halt terminal (MRS)	Both	Both	External	External	(Note)
		7	External thermal relay input (OH)	External	External	External	External	
		8	15-speed selection (REX)	PLC	External	PLC	External	Pr. 59 = 0
		16	PU operation-external operation switching (X16)	External	External	External	External	
		18	Magnetic flux-V/F switching (X18)	PLC	PLC	External	External	
RH, RM, RL, RT selection functions			Remote setting (RH, RM, RH)	PLC	External	PLC	External	Pr. 59 = 1, 2

[Explanation of table]

External : Control by signal from external terminal is only valid.
PLC : Control from sequence program is only valid.
Both : Control from both external terminal and PLC is valid.
— : Control from both external terminal and PLC is invalid.

Note: When "7" (PU operation interlock function) is set in Pr. 79 "operation mode selection", this function is also used by the MRS signal and therefore the MRS signal is only valid for the external terminals, independently of the Pr. 338 and 339 settings.

2.7.1 When FR-A5NC is connected

(1) Operation mode-based functions

Control Location	Item	Operation Mode		
		PU operation	External operation	CC-Link operation
User program	Operation command	Disallowed	Disallowed	Allowed
	Running frequency setting	Disallowed	Disallowed	Allowed
	Monitoring	Allowed	Allowed	Allowed
	Parameter write	Disallowed (Note 3)	Disallowed (Note 3)	Allowed (Note 3)
	Parameter read	Allowed	Allowed	Allowed
	Inverter reset	Disallowed	Disallowed	Allowed (Note 1)
	Error reset at inverter alarm (RY1A)	Allowed (Note 1)	Allowed (Note 1)	Allowed (Note 1)
	Stop command (Note 2)	Disallowed	Disallowed	Allowed
Control circuit terminal	Inverter reset terminal	Allowed	Allowed	Allowed
	Operation command	Disallowed	Allowed	Allowed (Note 4)
	Frequency setting	Disallowed	Allowed	Allowed (Note 4)

Note 1. At occurrence of a communication error, the inverter cannot be reset from the PLC.

Note 2. As set in Pr. 75.

Note 3. As set in Pr. 77.
Values can be written to Pr. 4 to 6, 22, 24 to 27, 52 to 56, 232 to 239 and 271 to 274 during operation.

Note 4. As set in Pr. 338 and Pr. 339.

Note 5. The inverter goes into the external operation mode if it is reset from the PLC in the CC-Link operation mode.

Note 6. In the programmed operation mode, parameters write-enabled in the external operation mode are write-enabled in CC-Link.

(2) Monitoring

The following items can be monitored by the PLC:

1) Output frequency..... Binary in 0.01Hz increments
2) Output current ..... Binary in 0.01A increments
3) Output voltage..... Binary in 0.1V increments
4) Alarm definition
5) Special monitoring..... Monitored data selected by instruction code HF3
6) Inverter status
   - Forward running
   - Reverse running
   - Running (RUN)*
   - Up to frequency (SU)*
   - Overload (OL)*
   - Instantaneous power failure (IPF)*
   - Frequency detection (FU)*
   - Alarm*

   The output signals marked * can be changed using Pr. 190 to Pr. 195 (output terminal function selection).

Note: Items 1) to 4) are read from the buffer memory by setting the corresponding code numbers when needed. Item 6) can be read from the buffer memory any time.

(3) Operation commands

Any of the following commands can be output from the PLC to the inverter as an operation command any time:

- Forward rotation (STF)
- Reverse rotation (STR)
- Low speed (RL)*
- Middle speed (RM)*
- High speed (RH)*
- Second acceleration/deceleration (RT)*
- Inverter output halt (MRS)
- AU terminal*
- JOG terminal*
- CS terminal*

The input signals marked *1 can be changed using Pr. 180 to Pr. 186 (input terminal function selection).

(4) Running frequency

The running frequency is written from the PLC to the inverter when it is changed ..... Binary in 0.01Hz increments

The running frequency may be written to either E^2PROM or RAM.

When changing the frequency continuously, always write the data to the inverter RAM.

(5) Parameter write

Functions can be written from the PLC. Note that write during inverter operation will result in a write mode error.

(6) Parameter read

Functions can be read to the PLC.

(7) Operation at alarm occurrence

Alarm Location	Description		Operation Mode		
			PU operation	External operation	CC-Link operation
Inverter alarm	Inverter operation		Stop (Inverter trip)	Stop (Inverter trip)	Stop (Inverter trip)
	Data communication	FR-A5NC	Continued	Continued	Continued
Communication alarm (FR-A5NC)	Inverter operation		Continued	Continued	Stop (Inverter trip)
	Data communication	FR-A5NC	Stop	Stop	Stop

1) Inverter side alarm
   Refer to the inverter manual and remove the cause of the alarm.
2) Communication alarm
   Check the LED states of the FR-A5NC and remove the cause.
   Check the CC-Link master station.
3) Communication error in CC-Link operation
   When a communication error occurs, the error message "E.OP3" appears.
4) Inverter reset

Resetting Method		Operation Mode		
		PU operation	External operation	CC-Link operation
PLC program	Inverter reset (Note 1) (Instruction code)	Disallowed	Disallowed	Allowed
	Error reset at inverter fault (RY1A) (Note 2)	Allowed	Allowed	Allowed
Connect terminals RES-SD		Allowed	Allowed	Allowed
Switch off inverter power		Allowed	Allowed	Allowed

Note 1. The inverter may be reset any time.
Note 2. The inverter may be reset only when its protective function is activated.
Note 3. Reset cannot be made from the PLC when a communication error has occurred.
Note 4. The inverter is set to the external operation mode if it has been reset in the CC-Link operation mode. To resume the CC-Link operation, therefore, the inverter must be switched to the CC-Link operation again. (Switching is not needed when "1" or "2" is set in Pr. 340 "link start mode selection".)

2.7.2 FR-E520-○○KN

(1) Operation mode-based functions

The following table lists the functions that may be performed from the PLC by the CC-Link system:

Control Location	Item	Operation Mode	
		PU operation	CC-Link operation
User program	Operation command	Disallowed	Allowed
	Running frequency setting	Disallowed	Allowed
	Monitoring	Allowed	Allowed
	Parameter write	Disallowed (Note 3)	Allowed (Note 3)
	Parameter read	Allowed	Allowed
	Inverter reset	Disallowed	Allowed (Note 1)
	Error reset at inverter alarm (RY1A)	Allowed (Note 1)	Allowed (Note 1)
	Stop command (Note 2)	Disallowed	Allowed
Control circuit terminal	Inverter reset terminal	Allowed	Allowed

Note 1. At occurrence of a communication error, the inverter cannot be reset from the PLC.

Note 2. As set in Pr. 75.

Note 3. As set in Pr. 77.
Values can be written to Pr. 4 to 6, 22, 24 to 27, 52, 72 and 232 to 239 during operation.

(2) Monitoring

The following items can be monitored by the PLC:

1) Output frequency..... Binary in 0.01Hz increments
2) Output current ..... Binary in 0.01A increments
3) Output voltage ..... Binary in 0.1V increments
4) Alarm definition
5) Special monitoring..... Monitored data selected by instruction code HF3
6) Inverter status
   - Forward running
   - Reverse running
   - Running (RUN)*
   - Up to frequency (SU)
   - Overload (OL)
   - Frequency detection (FU)*
   - Alarm*

   The output signals marked * can be changed using Pr. 190 to Pr. 192 (output terminal (remote input) function selection).

Note: Items 1) to 4) are read from the buffer memory by setting the corresponding code numbers when needed. Item 6) can be read from the buffer memory any time.

(3) Operation commands

Any of the following commands can be output from the PLC to the inverter as an operation command any time:

- Forward rotation (STF)
- Reverse rotation (STR)
- Low speed (RL)*
- Middle speed (RM)*
- High speed (RH)*
- Inverter output halt (MRS)

The input signals marked *1 can be changed using Pr. 180 to Pr. 183 (input terminal function selection). Note that some signals do not accept the command from the PLC according to the setting.

(4) Running frequency

The running frequency is written from the PLC to the inverter when it is changed ..... Binary in 0.01Hz increments

The running frequency may be written to either E^2PROM or RAM.

When changing the frequency continuously, always write the data to the inverter RAM.

(5) Parameter write

Functions can be written from the PLC. Note that write during inverter operation will result in a write mode error.

(6) Parameter read

Functions can be read to the PLC.

(7) Operation at alarm occurrence

Alarm Location	Description		Operation Mode	
			PU operation	CC-Link operation
Inverter alarm	Inverter operation		Stop (Inverter trip)	Stop (Inverter trip)
	Data communication	CC-Link	Continued	Continued
Communication alarm (CC-Link)	Inverter operation		Continued	Stop (Inverter trip)
	Data communication	CC-Link	Stop	Stop

1) Inverter side alarm
   Refer to the inverter manual and remove the cause of the alarm.
2) Communication alarm
   Check the LED states of CC-Link operation and remove the cause.
   Check the CC-Link master station.
3) Communication error in CC-Link operation
   When a communication error occurs, the error message "E.OPT" appears.
4) Inverter reset

Resetting Method		Operation Mode	
		PU operation	CC-Link operation
PLC program	Inverter reset (Note 1) (Instruction code)	Disallowed	Allowed
	Error reset at inverter fault (RY1A) (Note 2)	Allowed	Allowed
Connect terminals RES-SD		Allowed	Allowed
Switch off inverter power		Allowed	Allowed

Note 1. The inverter may be reset any time.

Note 2. The inverter may be reset only when its protective function is activated.

Note 3. Reset cannot be made from the PLC when a communication error has occurred.

2.7.3 When FR-E5NC is connected

(1) Operation mode-based functions

The following table lists the functions that may be performed from the PLC by the CC-Link system:

Control Location	Item	Operation Mode		
		PU operation	External operation	CC-Link operation
User program	Operation command	Disallowed	Disallowed	Allowed
	Running frequency setting	Disallowed	Disallowed	Allowed
	Monitoring	Allowed	Allowed	Allowed
	Parameter write	Disallowed (Note 3)	Disallowed (Note 3)	Allowed (Note 3)
	Parameter read	Allowed	Allowed	Allowed
	Inverter reset	Disallowed	Disallowed	Allowed (Note 1)
	Error reset at inverter alarm (RY1A)	Allowed (Note 1)	Allowed (Note 1)	Allowed (Note 1)
	Stop command (Note 2)	Disallowed	Disallowed	Allowed
Control circuit terminal	Inverter reset terminal	Allowed	Allowed	Allowed
	Operation command	Disallowed	Allowed	Allowed (Note 4)
	Frequency setting	Disallowed	Allowed	Allowed (Note 4)

Note 1. At occurrence of a communication error, the inverter cannot be reset from the PLC.

Note 2. As set in Pr. 75.

Note 3. As set in Pr. 77.
Values can be written to Pr. 4 to 6, 22, 24 to 27, 52, 72 and 232 to 239 during operation.

Note 4. As set in Pr. 338 and Pr. 339.

Note 5. The inverter goes into the external operation mode if it is reset from the PLC in the CC-Link operation mode.
The inverter goes into the CC-Link operation mode when "1" is set in Pr. 340.

(2) Monitoring functions

The following items can be monitored by the PLC:

1) Output frequency..... Binary in 0.01Hz increments
2) Output current ..... Binary in 0.01A increments
3) Output voltage..... Binary in 0.1V increments
4) Alarm definition
5) Special monitoring..... Monitored data selected by instruction code HF3
6) Inverter status
   - Forward running
   - Reverse running
   - Running (RUN)*
   - Up to frequency (SU)*
   - Overload (OL)
   - Frequency detection (FU)*
   - Alarm*

The output signals marked * can be changed using Pr. 190 to Pr. 195 (output terminal function selection).

Note: Items 1) to 4) are read from the buffer memory by setting the corresponding code numbers when needed. Item 6) can be read from the buffer memory any time.

(3) Operation commands

Any of the following commands can be output from the PLC to the inverter as an operation command any time:

- Forward rotation (STF)
- Reverse rotation (STR)
- Low speed (RL)*
- Middle speed (RM)*
- High speed (RH)*
- Inverter output halt (MRS)

The input signals marked * can be changed using Pr. 180 to Pr. 183 (input terminal function selection). Note that some signals do not accept the command from the PLC according to the setting.

(4) Running frequency

The running frequency is written from the PLC to the inverter when it is changed ..... Binary in 0.01Hz increments
The running frequency may be written to either E^2PROM or RAM.
When changing the frequency continuously, always write the data to the inverter RAM.

(5) Parameter write

Functions can be written from the PLC. Note that write during inverter operation will result in a write mode error.

(6) Parameter read

Functions can be read to the PLC.

(7) Operation at alarm occurrence

Alarm Location	Description		Operation Mode		
			PU operation	External operation	CC-Link operation
Inverter alarm	Inverter operation		Stop (Inverter trip)	Stop (Inverter trip)	Stop (Inverter trip)
	Data communication	FR-E5NC	Continued	Continued	Continued
Communication alarm (FR-E5NC)	Inverter operation		Continued	Continued	Stop (Inverter trip)
	Data communication	FR-E5NC	Stop	Stop	Stop

1) Inverter side alarm
   Refer to the inverter manual and remove the cause of the alarm.
2) Communication alarm
   Check the LED states of the FR-E5NC and remove the cause.
   Check the CC-Link master station.
3) Communication error in CC-Link operation
   When a communication error occurs, the error message "E.OPT" appears.
4) Inverter reset

Resetting Method		Operation Mode		
		PU operation	External operation	CC-Link operation
PLC program	Inverter reset (Note 1) (Instruction code)	Disallowed	Disallowed	Allowed
	Error reset at inverter fault (RY1A) (Note 2)	Allowed	Allowed	Allowed
Connect terminals RES-SD		Allowed	Allowed	Allowed
Switch off inverter power		Allowed	Allowed	Allowed

Note 1. The inverter may be reset any time.
Note 2. The inverter may be reset only when its protective function is activated.
Note 3. Reset cannot be made from the PLC when a communication error has occurred.
Note 4. The inverter is set to the external operation mode if it has been reset in the CC-Link operation mode. To resume the CC-Link operation, therefore, the inverter must be switched to the CC-Link operation again. (Switching is not needed when "1" is set in Pr. 340 "link start mode selection".)

(1) I/O signal lists

The following device numbers are those of station 1.

Different device numbers are used for station 2 and later. (Refer to page 60 for the device number correspondence table.)

1) Output signals (Master module to inverter)

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

Device No.	Signal Name		Description	Remarks
	FR-A5NC	FR-E520○○KN FR-E5NC		
RY0	Forward rotation command		OFF: Stop command ON: Forward rotation start	Switching RY0 and RY1 on at the same time gives a stop command.
RY1	Reserve rotation command		OFF: Stop command ON: Reserve rotation start	
RY2	RH terminal function (high speed)		Functions assigned to RH/RM/RL are selected. In the factory setting, multi-speed selection can be made by the combination of RH, RM and RL.	The input signal functions can be changed. (Note 1)
RY3	RM terminal function (middle speed)			
RY4	RL terminal function (low speed)			
RY5	JOG terminal function	Unused (Note 2)	Function assigned to the JOG terminal is selected.	
RY6	RT terminal function		Function assigned to the RT terminal is selected.	
RY7	AU terminal function		Function assigned to the AU terminal is selected.	
RY8	CS terminal function		Function assigned to the CS terminal is selected.	
RY9	Output halt (MRS)		When the MRS signal switches on, the inverter output stops.	
RYA	Unused (Note 2)		Reserved for the system.	
RYB				
RYC	Monitor command		When the monitor command (RYC) is switched on, the monitored value is set to remote register RWR0 and monitoring (RXC) switches on. While the monitor command (RYC) is on, the monitored value is always updated.	
RYD	Frequency setting command (RAM)		When the frequency setting command (RYD) is switched on, the set frequency (RWW1) is written to the inverter. (Note 3) On completion of write, frequency setting completion (RXD) switches on.	Do not switch on RYD, RYE and RYF at the same time. If they are switched on simultaneously, only one of them is executed. Hence, switch on RYD, RYE and RYF one by one.
RYE	Frequency setting command (E^2PROM)		When the frequency setting command (RYE) is switched on, the set frequency (RW_{W1}) is written to the inverter. On completion of write, frequency setting completion (RXE) switches on.	
RYF	Instruction code execution request		When the instruction code execution request (RYC) is switched on, processing corresponding to the instruction code set to RW_{W2} is executed. After completion of instruction code execution, instruction code execution completion (RXC) switches on. When an instruction code execution error occurs, a value other than 0 is set to the reply code (RW_{R2}).	
RY10	Unused (Note 2)		Reserved for the system.	
RY11				
RY12				
RY13				
RY14				
RY15				
RY16				
RY17				
RY18				
RY19				
RY1A	Error reset request flag		When the error reset request flag (RY1A) is switched on at the occurrence of an inverter fault, the inverter is reset and the error status flag (RX1A) switches off.	
RY1B	Unused (Note 2)		Reserved for the system.	
RY1C				
RY1D				
RY1E				
RY1F				

Note 1. The assignable device numbers change with the inverter model.
When the FR-A5NC (FR-A500, F500 series) is used, RY2 to RY8 can be changed with Pr. 180 to Pr. 186.
When the FR-E520-○○KN or FR-E5NC is used, RY2 to RY4 and RY9 can be changed with Pr. 180 to Pr. 183.

Note 2. Turn off the unused input signals. (Enter 0)

Note 3. While the set frequency command (RYD) is on, the set frequency (RW_{W1}) value is always reflected.

2) Input signals (Inverter to master module)

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

Device No.	Signal Name		Description	Remarks
	FR-A5NC	FR-E520-○○KN FR-E5NC		
RX0	Forward running		OFF: Other than forward running (during stop or reverse rotation) ON: Forward running	
RX1	Reverse running		OFF: Other than reverse running (during stop or forward rotation) ON: Reverse running	
RX2	Running (RUN)		On while the inverter is running.	Outputs can be changed. (Note 1)
RX3	Up to frequency (SU)		Switched on when the output frequency reaches the set frequency ± Pr. 41.	
RX4	Overload (OL)		Switched on when stall prevention operation is performed, switched off when stall prevention is canceled.	
RX5	Instantaneous power failure (IPF)	Unused	Switched on when instantaneous power failure or undervoltage occurs.	
RX6	Frequency detection (FU)		Switched on when the output frequency reaches any set frequency.	
RX7	Alarm (ABC)		Switched on when the inverter's protective function is activated to stop the output.	
RX8	Unused		Reserved for the system.	
RX9				
RXA				
RXB				
RXC	Monitoring		Switched on when the monitored value is set by the monitor command (RYC) switched on. Switched off when the monitor command (RYC) is switched off.	
RXD	Frequency setting completion (RAM)		Switched on when the set frequency is written to the inverter by the frequency setting command (RYD) switched on. Switched off when the frequency setting command (RYD) is switched off.	
RXE	Frequency setting completion (E^2PROM)		Switched on when the set frequency is written to the inverter by the frequency setting command (RYE) switched on. Switched off when the frequency setting command (RYE) is switched off.	
RXF	Instruction code execution completion		Switched on on completion of the processing corresponding to the instruction code (RW_{W2}) which is executed when the instruction code execution request (RYF) switches on. Switched off when the instruction code execution completion (RXF) is switched off.	
RX10	Unused		Reserved for the system.	
RX11				
RX12				
RX13				
RX14				
RX15				
RX16				
RX17				
RX18				
RX19				
RX1A	Error status flag		Switched on when an inverter error occurs (protective function is activated).	
RX1B	Remote station ready		Switched on when the inverter goes into the ready status on completion of initial setting after power-on or hardware reset. (Used as an interlock for read/write from/to the master station.) Switched off at inverter error occurrence (when protective function is activated).	
RX1C	Unused		Reserved for the system.	
RX1D				
RX1E				
RX1F				

Note 1. The assignable device numbers change with the inverter model.
When the FR-A5NC (FR-A500, F500 series) is used, RX2 to RX7 can be changed with Pr. 190 to Pr. 195.
When the FR-E520-○○KN or FR-E5NC is used, RX2, RX6 and RY7 can be changed with Pr. 190 to Pr. 192.

Note 2. When you set to ON the "data link fault station's input data status (SW4)" condition setting switch of the master module, the input data from the data link fault station is retained in the status at the time of alarm occurrence. Hence, note that if an inverter error occurs, the remote station ready and other signals remain ON.

3) Remote registers (Master module to inverter)

Device No.	Signal Name	Description	Remarks
RW_{W0}	Monitor code	Set the monitor code (refer to page 57) to be referred to. By switching on the RYC signal after setting, the specified monitored data is set to RW_{R0}.	
RW_{W1}	Set frequency	Specify the set frequency. At this time, whether it is written to RAM or E^2PROM is differentiated by the RYD and RYE signals. After setting the frequency to this register, switch on the above RYD or RYE to write the frequency. On completion of frequency write, RXD or RXE switches on in response to the input command.	
RW_{W2}	Instruction code	Set the instruction code (refer to page 59) for execution of operation mode rewrite, Pr. read/write, error reference, error clear, etc. The corresponding instruction is executed by switching on RYF after completion of register setting. RXF switches on completion of instruction execution.	
RW_{W3}	Write data	Set the data specified by the above instruction code. (When required) Switch RYF on after setting the above instruction code and this register. Set zero when the write code is not required.	

4) Remote registers (Inverter to master module)

Device No.	Signal Name	Description	Remarks
RW_{R0}	Monitored value	The monitored value specified by RW_{W0} (monitor code) is set.	
RW_{R1}	Output frequency	The present output frequency is always set.	
RW_{R2}	Reply code	The reply code (refer to page 59) corresponding to RW_{W2} (instruction code) is set. 0 is set for a normal reply and a value other than 0 is set for a data error.	
RW_{R3}	Read data	For a normal reply, the reply data to the instruction specified by the instruction code is set.	

(2) Code list

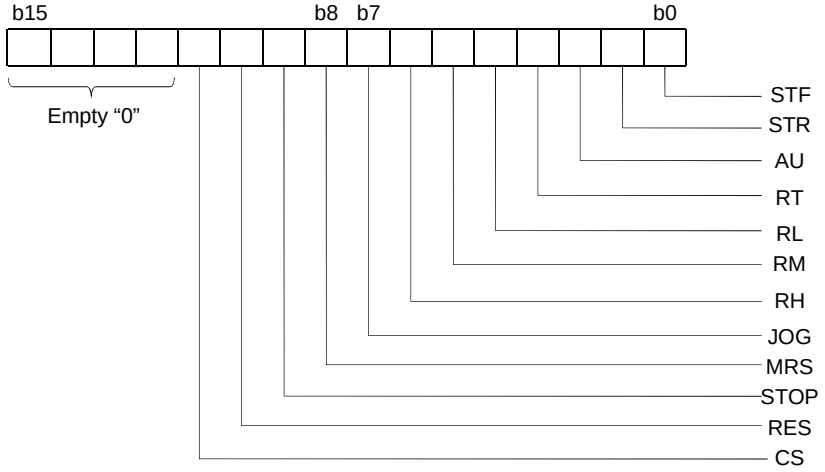
1) Monitor codes

<When FR-A5NC is connected>

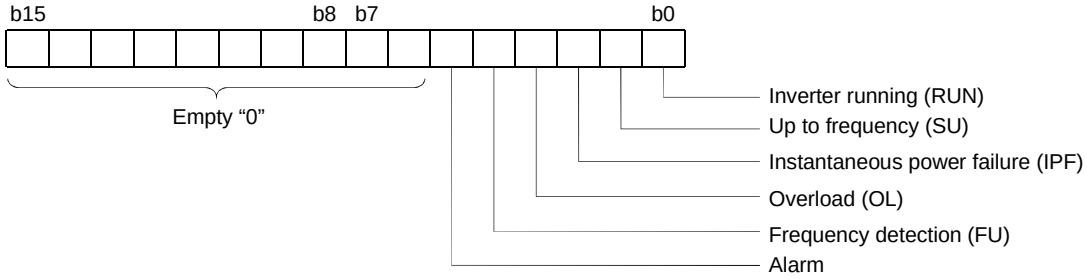
Code Number	Description	Increments
0000_H	No monitoring (monitored value fixed to 0)	——
0001_H	Output frequency	0.01Hz
0002_H	Output current	0.01A
0003_H	Output voltage	0.1V
0004_H	No monitoring (monitored value fixed to 0)	——
0005_H	Frequency setting	0.01Hz
0006_H	Running speed	1r/min
0007_H	Motor torque	0.1%
0008_H	Converter output voltage	0.1V
0009_H	Regenerative brake duty factor	0.1%
$000A_H$	Electronic overcurrent protection load factor	0.1%
$000B_H$	Output current peak value	0.01A
$000C_H$	Converter output voltage peak value	0.1V
$000D_H$	Input power	0.01kW
$000E_H$	Output power	0.01kW
$000F_H$	Input terminal status	——
0010_H	Output terminal status	——
0011_H	Load meter	0.1%
0012_H	Motor exciting current	0.01A
0013_H	Position pulse (Note 1)	1 pulse
0014_H	Cumulative energization time	1hr
0015_H	No monitoring (monitored value fixed to 0)	——
0016_H	Orientation status (Note 1)	——
0017_H	Actual operation time	1hr
0018_H	Motor load factor	0.1%
0019_H	Cumulative power	1kWh

Note 1. Valid only when the FR-A5AP and FR-A5AX options are mounted.

• Input terminal status monitoring details



• Output terminal status monitoring details



In the input and output terminal statuses, 0 indicates OFF and 1 ON.

<For FR-E520-○○KN or when FR-E5NC is connected>

Code Number	Description	Increments
0000H	No monitoring (monitored value fixed to 0)	•
0001H	Output frequency (Note 1)	0.01Hz
0002H	Output current	0.01A
0003H	Output voltage	0.1V

Note 1. The increments are 1 (integer data) when other than 0 is set in Pr. 37 "speed display" to choose the speed display.

2) Instruction codes

Item		Code Number	Description	Remarks
Operation mode read		007BH	0000H: CC-Link operation 0001H: External operation (Note 1) 0002H: PU operation	
Operation mode write		00FBH	0000H: CC-Link operation 0001H: External operation (Note 1)	
Error history No. 1, No. 2 read		0074H	Reads the most recent No. 1 and 2 errors.	
Error history No. 3, No. 4 read		0075H	Reads the most recent No. 3 and 4 errors.	
Error history No. 5, No. 6 read		0076H	Reads the most recent No. 5 and 6 errors.	
Error history No. 7, No. 8 read		0077H	Reads the most recent No. 7 and 8 errors.	
Set frequency (RAM) read		006DH	Reads the set frequency (RAM).	Setting can be made from the remote register.
Set frequency (E^2PROM) read		006EH	Reads the set frequency (E^2PROM).	
Set frequency (RAM) write		00EDH	Writes the set frequency to RAM.	
Set frequency (E^2PROM) write		00EEH	Writes the set frequency to E^2PROM.	
Parameter read		0000H to 006CH	Used with link parameter expansion setting to access Pr. 0 to Pr. 999. Refer to Appendices for the code numbers. Note that some parameters are inaccessible.	
Parameter write		0080H to 00ECH		
Batch alarm definition clear		00F4H	9696H: Batch-clears the alarm history.	
All parameter clear		00FCH	9696H: Parameter clear (reset to factory settings with the exception of calibration values) 9966H: All parameter clear 9669H: Parameter user clear (FR-A5NC only)	
Inverter reset		00FDH	9696H: Resets the inverter.	
Link parameter expansion setting	Read	007FH	Changes the 0000H to 006CH and 0080H to 00ECH parameter values. 0000H: Pr.0 to Pr.99 0001H: Pr.100 to 159, Pr.200 to 231, Pr.900 to 905 0002H: Pr.160 to 199, Pr.232 to Pr.285 0003H: Pr.300 to 399 0009H: Pr.922, Pr.923, Pr.990, Pr.991	
	Write	00FFH		
Second parameter changing	Read	006CH	Pr.201 to 230 0000H: Running frequency 0001H: Time 0002H: Rotation direction	
	Write	00ECH	Pr.902 to 905 0000H: Offset/gain 0001H: Analog 0002H: Analog value of terminal	

Note 1. Not available for the FR-E520-○○KN.

3) Reply codes

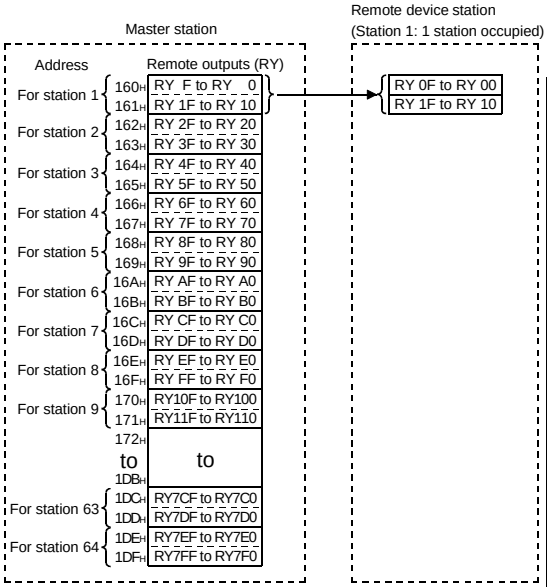
After performing frequency setting (RYD, RYE) or instruction code execution (RYF), check the reply code (RWR2) of the remote register.

Data	Item	Alarm Definition
0000H	Normal	Normal completion of instruction code execution
0001H	Write mode error	An attempt was made to write parameters other than during stop in the CC-Link operation mode.
0002H	Parameter selection error	Code number not registered was set.
0003H	Setting range error	Set data is outside the permissible data range.

(3) Buffer memory

1) Output signals (Master module to inverter)

- Output states to remote device stations are stored.
- Outputs for 2 words are used per station.

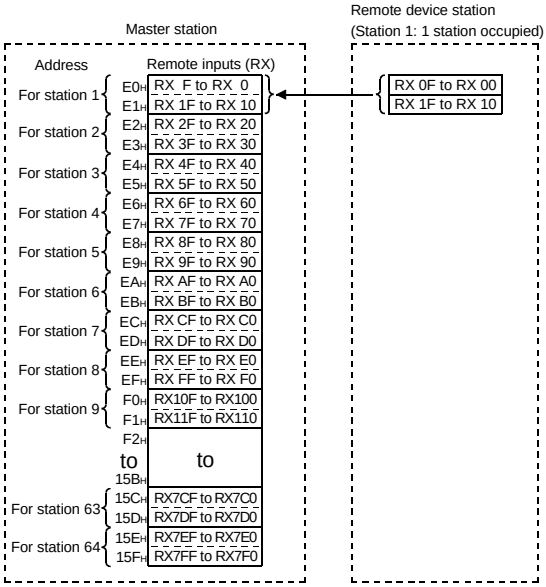


List for Correspondence between Master Station Buffer Memory Addresses and Station Numbers

Station Number	Buffer Memory Address	Station Number	Buffer Memory Address	Station Number	Buffer Memory Address	Station Number	Buffer Memory Address
1	160H to 161H	17	180H to 181H	33	1A0H to 1A1H	49	1C0H to 1C1H
2	162H to 163H	18	182H to 183H	34	1A2H to 1A3H	50	1C2H to 1C3H
3	164H to 165H	19	184H to 185H	35	1A4H to 1A5H	51	1C4H to 1C5H
4	166H to 167H	20	186H to 187H	36	1A6H to 1A7H	52	1C6H to 1C7H
5	168H to 169H	21	188H to 189H	37	1A8H to 1A9H	53	1C8H to 1C9H
6	16AH to 16BH	22	18AH to 18BH	38	1AAH to 1ABH	54	1CAH to 1CBH
7	16CH to 16DH	23	18CH to 18DH	39	1ACH to 1ADH	55	1CCH to 1CDH
8	16EH to 16FH	24	18EH to 18FH	40	1AEH to 1AFH	56	1CEH to 1CFH
9	170H to 171H	25	190H to 191H	41	1B0H to 1B1H	57	1D0H to 1D1H
10	172H to 173H	26	192H to 193H	42	1B2H to 1B3H	58	1D2H to 1D3H
11	174H to 175H	27	194H to 195H	43	1B4H to 1B5H	59	1D4H to 1D5H
12	176H to 177H	28	196H to 197H	44	1B6H to 1B7H	60	1D6H to 1D7H
13	178H to 179H	29	198H to 199H	45	1B8H to 1B9H	61	1D8H to 1D9H
14	17AH to 17BH	30	19AH to 19BH	46	1BAH to 1BBH	62	1DAH to 1DBH
15	17CH to 17DH	31	19CH to 19DH	47	1BCH to 1BDH	63	1DCH to 1DDH
16	17EH to 17FH	32	19EH to 19FH	48	1BEH to 1BFH	64	1DEH to 1DFH

2) Input signals (Inverter to master module)

- Input states from remote device stations are stored.
- Inputs for 2 words are used per station.

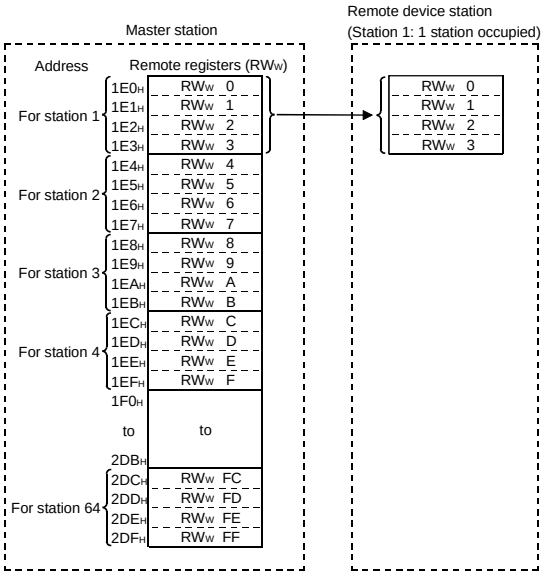


List for Correspondence between Master Station Buffer Memory Addresses and Station Numbers

Station Number	Buffer Memory Address	Station Number	Buffer Memory Address	Station Number	Buffer Memory Address	Station Number	Buffer Memory Address
1	E0H to E1H	17	100H to 101H	33	120H to 121H	49	140H to 141H
2	E2H to E3H	18	102H to 103H	34	122H to 123H	50	142H to 143H
3	E4H to E5H	19	104H to 105H	35	124H to 125H	51	144H to 145H
4	E6H to E7H	20	106H to 107H	36	126H to 127H	52	146H to 147H
5	E8H to E9H	21	108H to 109H	37	128H to 129H	53	148H to 149H
6	EAH to EBH	22	10AH to 10BH	38	12AH to 12BH	54	14AH to 14BH
7	ECH to EDH	23	10CH to 10DH	39	12CH to 12DH	55	14CH to 14DH
8	EEH to EFH	24	10EH to 10FH	40	12EH to 12FH	56	14EH to 14FH
9	F0H to F1H	25	110H to 111H	41	130H to 131H	57	150H to 151H
10	F2H to F3H	26	112H to 113H	42	132H to 133H	58	152H to 153H
11	F4H to F5H	27	114H to 115H	43	134H to 135H	59	154H to 155H
12	F6H to F7H	28	116H to 117H	44	136H to 137H	60	156H to 157H
13	F8H to F9H	29	118H to 119H	45	138H to 139H	61	158H to 159H
14	FAH to FBH	30	11AH to 11BH	46	13AH to 13BH	62	15AH to 15BH
15	FCH to FDH	31	11CH to 11DH	47	13CH to 13DH	63	15CH to 15DH
16	FEH to FFH	32	11EH to 11FH	48	13EH to 13FH	64	15EH to 15FH

3) Remote registers (Master module to inverter)

- Data sent to remote registers (RW_W) of remote device stations are stored.
- Outputs for 4 words are used per station.

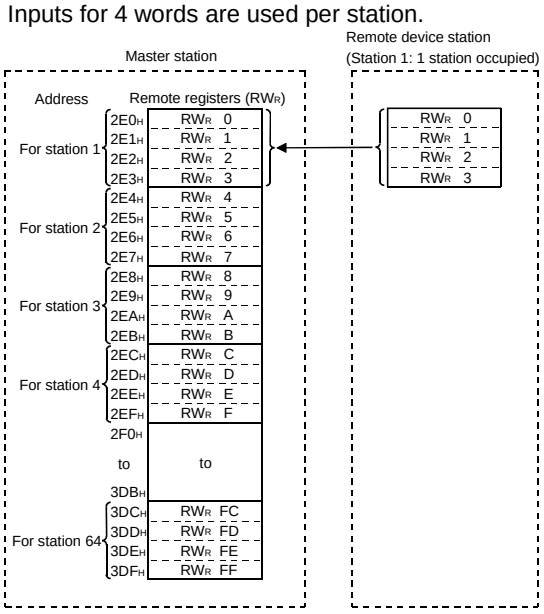


List for Correspondence between Master Station Buffer Memory Addresses and Station Numbers

Station Number	Buffer Memory Address	Station Number	Buffer Memory Address	Station Number	Buffer Memory Address	Station Number	Buffer Memory Address
1	1E0H to 1E3H	17	220H to 223H	33	260H to 263H	49	2A0H to 2A3H
2	1E4H to 1E7H	18	224H to 227H	34	264H to 267H	50	2A4H to 2A7H
3	1E8H to 1EBH	19	228H to 22BH	35	268H to 26BH	51	2A8H to 2ABH
4	1ECH to 1EFH	20	22CH to 22FH	36	26CH to 26FH	52	2ACH to 2AFH
5	1F0H to 1F3H	21	230H to 233H	37	270H to 273H	53	2B0H to 2B3H
6	1F4H to 1F7H	22	234H to 237H	38	274H to 277H	54	2B4H to 2B7H
7	1F8H to 1FBH	23	238H to 23BH	39	278H to 27BH	55	2B8H to 2BBH
8	1FCH to 1FFH	24	23CH to 23FH	40	27CH to 27FH	56	2BCH to 2BFH
9	200H to 203H	25	240H to 243H	41	280H to 283H	57	2C0H to 2C3H
10	204H to 207H	26	244H to 247H	42	284H to 287H	58	2C4H to 2C7H
11	208H to 20BH	27	248H to 24BH	43	288H to 28BH	59	2C8H to 2CBH
12	20CH to 20FH	28	24CH to 24FH	44	28CH to 28FH	60	2CCH to 2CFH
13	210H to 213H	29	250H to 253H	45	290H to 293H	61	2D0H to 2D3H
14	214H to 217H	30	254H to 257H	46	294H to 297H	62	2D4H to 2D7H
15	218H to 21BH	31	258H to 25BH	47	298H to 29BH	63	2D8H to 2DBH
16	21CH to 21FH	32	25CH to 25FH	48	29CH to 29FH	64	2DCH to 2DFH

4) Remote registers (Inverter to master module)

- Data sent from remote registers (RW_R) of remote device stations are stored.
- Inputs for 4 words are used per station.



List for Correspondence between Master Station Buffer Memory Addresses and Station Numbers

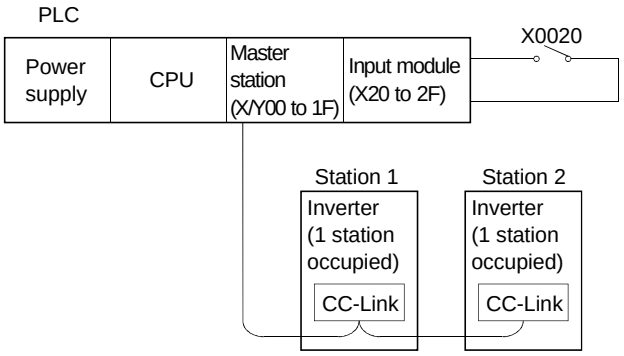
Station Number	Buffer Memory Address	Station Number	Buffer Memory Address	Station Number	Buffer Memory Address	Station Number	Buffer Memory Address
1	2E0H to 2E3H	17	320H to 323H	33	360H to 363H	49	3A0H to 3A3H
2	2E4H to 2E7H	18	324H to 327H	34	364H to 367H	50	3A4H to 3A7H
3	2E8H to 2EBH	19	328H to 32BH	35	368H to 36BH	51	3A8H to 3ABH
4	2ECH to 2EFH	20	32CH to 32FH	36	36CH to 36FH	52	3ACH to 3AFH
5	2F0H to 2F3H	21	330H to 333H	37	370H to 373H	53	3B0H to 3B3H
6	2F4H to 2F7H	22	334H to 337H	38	374H to 377H	54	3B4H to 3B7H
7	2F8H to 2FBH	23	338H to 33BH	39	378H to 37BH	55	3B8H to 3BBH
8	2FCH to 2FFH	24	33CH to 33FH	40	37CH to 37FH	56	3BCH to 3BFH
9	300H to 303H	25	340H to 343H	41	380H to 383H	57	3C0H to 3C3H
10	304H to 307H	26	344H to 347H	42	384H to 387H	58	3C4H to 3C7H
11	308H to 30BH	27	348H to 34BH	43	388H to 38BH	59	3C8H to 3CBH
12	30CH to 30FH	28	34CH to 34FH	44	38CH to 38FH	60	3CCH to 3CFH
13	310H to 313H	29	350H to 353H	45	390H to 393H	61	3D0H to 3D3H
14	314H to 317H	30	354H to 357H	46	394H to 397H	62	3D4H to 3D7H
15	318H to 31BH	31	358H to 35BH	47	398H to 39BH	63	3D8H to 3DBH
16	31CH to 31FH	32	35CH to 35FH	48	39CH to 39FH	64	3DCH to 3DFH

(4) Programming examples

This section gives the program examples used to control the inverter with the sequence programs.

	Item	Program Example	Refer To
1)	Inverter status read	Reads the inverter status from the master station buffer memory.	63
2)	Operation mode setting	Sets the CC-Link operation mode.	63
3)	Operation command setting	Commands the forward rotation and mid-speed signals.	64
4)	Monitor function setting	Monitors the output frequency.	64
5)	Parameter read	Reads Pr. 7 "acceleration time".	65
6)	Parameter write	Sets "3.0 seconds" in Pr. 7 "acceleration time".	65
7)	Running frequency setting	Sets to 50.00Hz.	66
8)	Alarm definition read	Reads the inverter alarm.	67
9)	Inverter reset	Make an inverter reset.	68

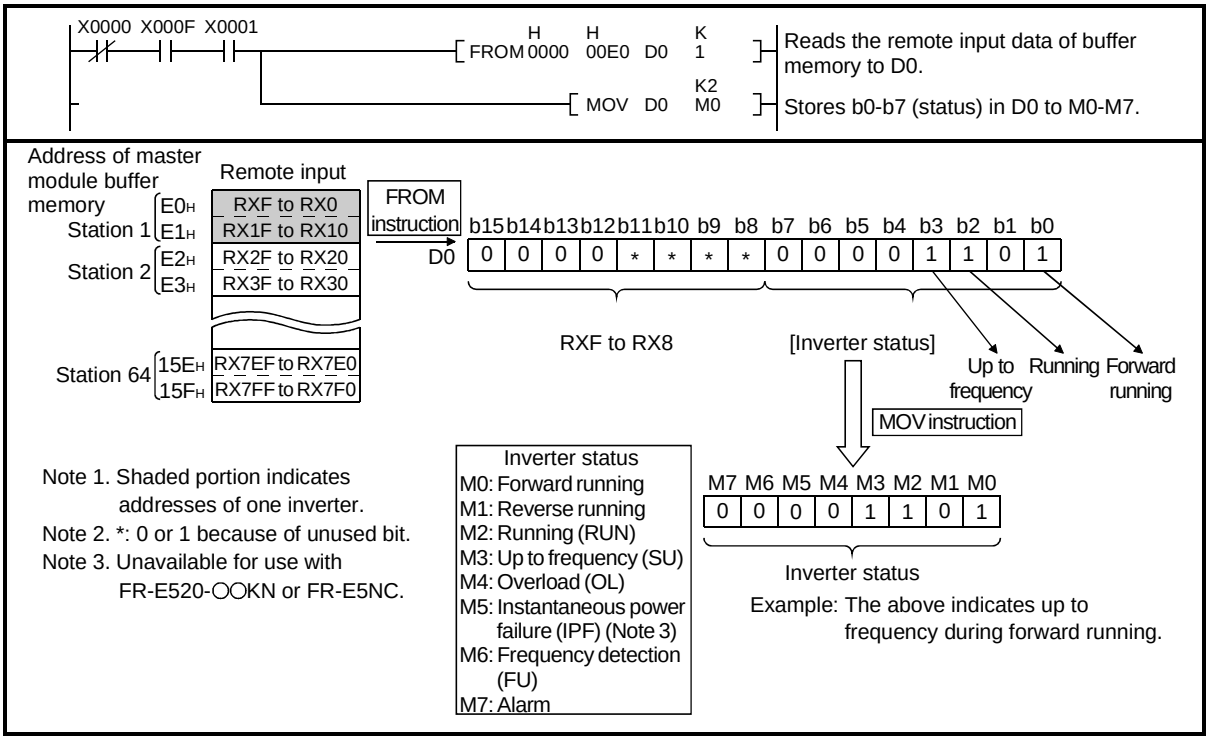
System configuration of programming examples



1) Inverter status reading program example

Write a program as explained below to read the inverter status from the master station buffer memory.

The following program reads the inverter status of station 1 to M0-M7:



2) Operation mode setting program example

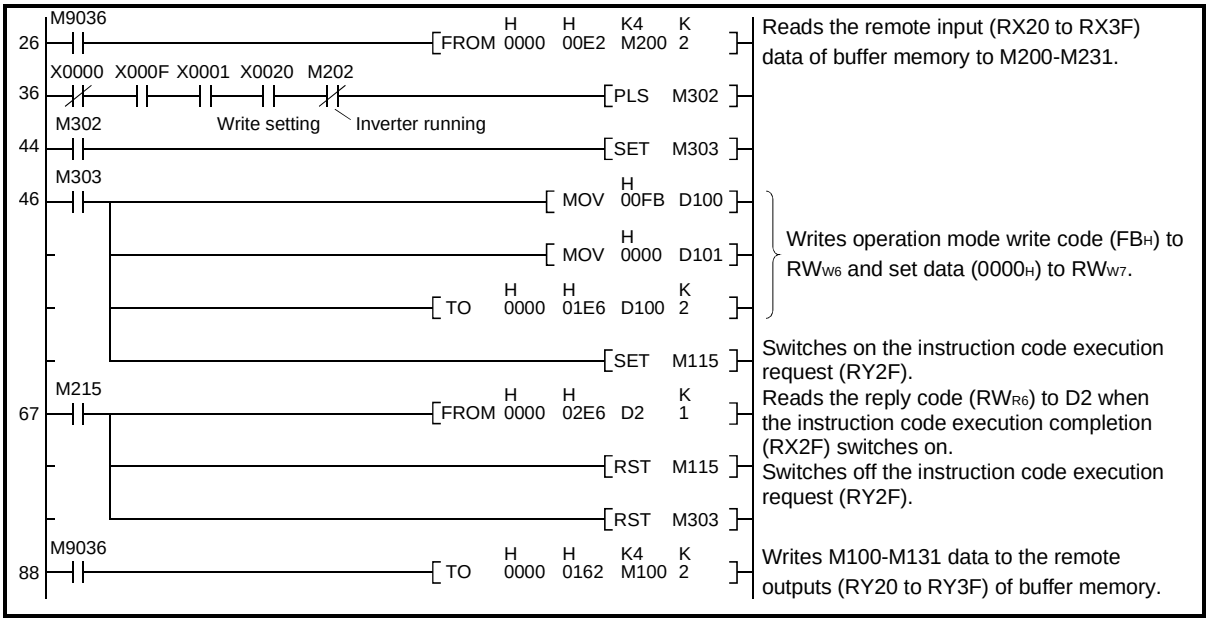
Write a program as explained below to write various data to the inverters.

The following program changes the operation mode of station 2 inverter to CC-Link operation.

Operation mode writing code number: 00FB$_H$ (hexadecimal) (Refer to page 59)

CC-Link operation set data: 0000$_H$ (hexadecimal) (Refer to page 59)

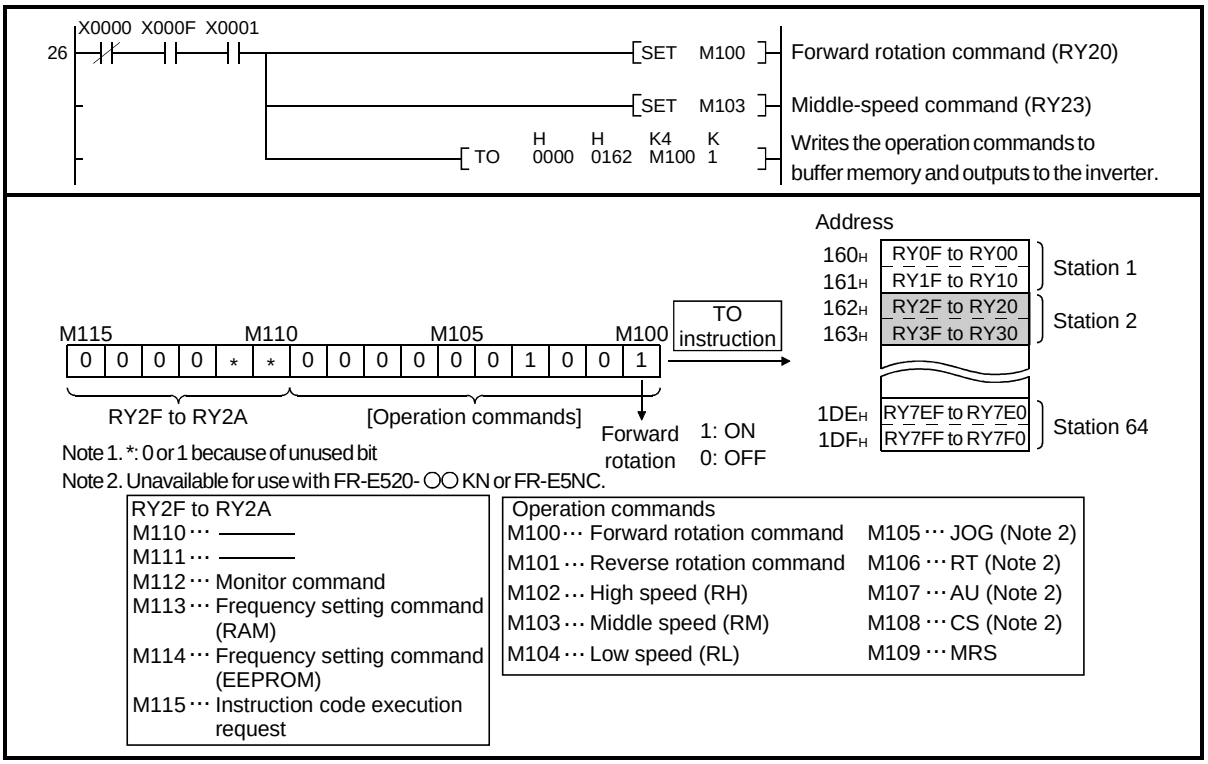
The reply code at the time of instruction code execution is set to D2. (Refer to page 59)



3) Operation command setting program example

Write a program as explained below to write the inverter operation commands to the master station buffer memory. The inverter is operated in accordance with the operation commands written to the remote outputs (addresses 160H to 1DFH).

The following program gives the commands of forward rotation and middle speed signals to the inverter of station 2:



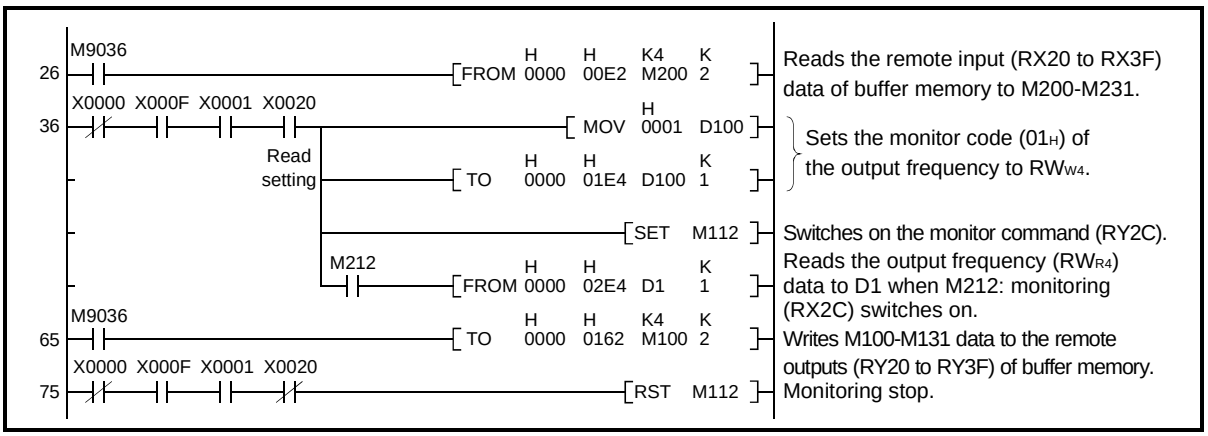
4) Output frequency monitoring program example

Write a program as explained below to read the monitor function of the inverter.

The following program reads the output frequency of station 2 inverter to D1.

Output frequency reading code number: 0001H (hexadecimal)

Example: The data indicated is 1770H (600) at the output frequency of 60Hz.



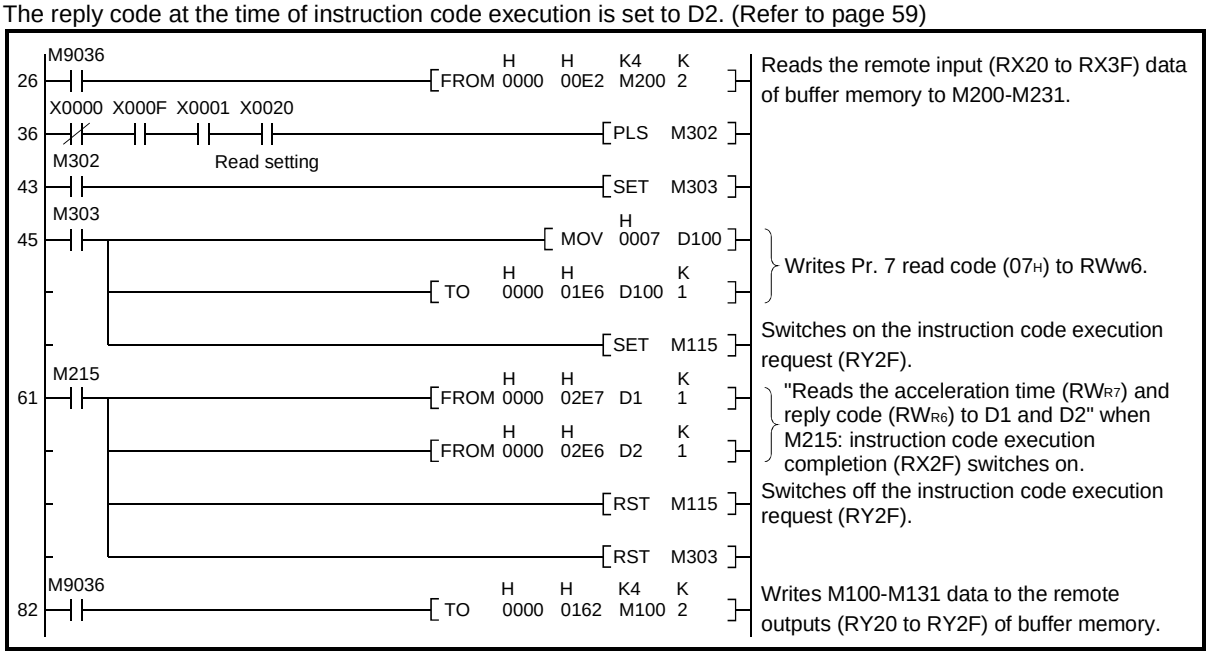
5) Parameter reading program example

The following program reads the Pr. 7 "acceleration time" setting of station 2 inverter to D1.

Pr. 7 "acceleration time" reading code number: 07H (hexadecimal)

For the parameter code numbers, refer to Appendices.

The reply code at the time of instruction code execution is set to D2. (Refer to page 59)



Note: For the parameters of number 100 and later, change the link parameter expansion setting (to other than 0000H).

6) Parameter writing program example

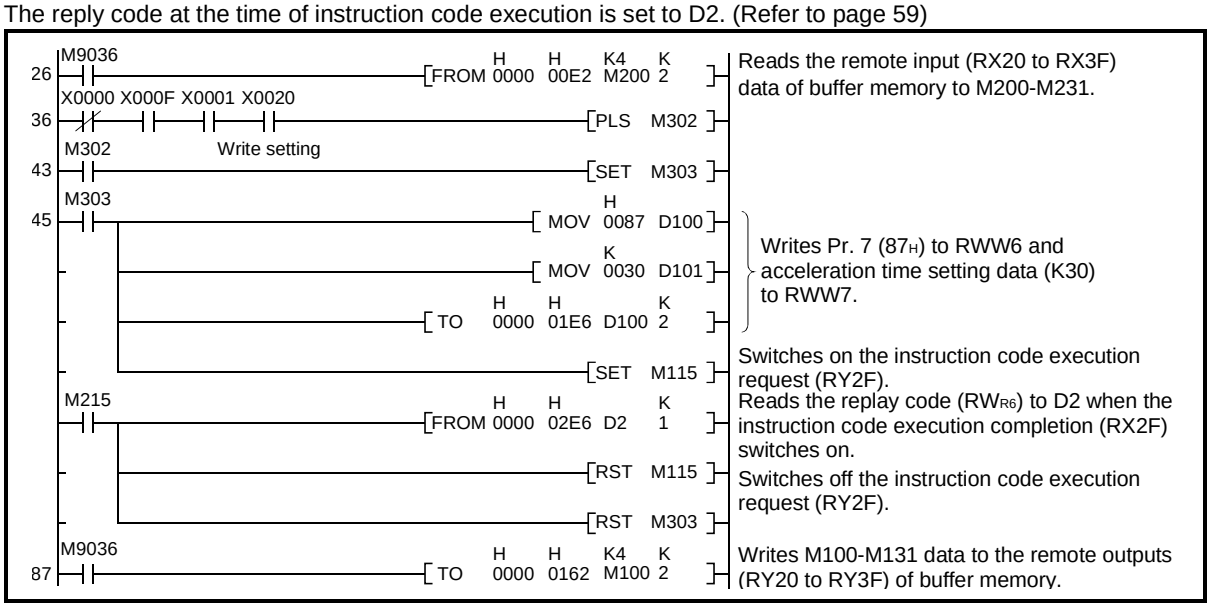
The following program changes the Pr. 7 acceleration time setting of station 2 inverter to 3.0 seconds.

Acceleration time writing code number: 87H (hexadecimal)

Acceleration time set data: K30 (decimal)

For the parameter code numbers, refer to Appendix.

The reply code at the time of instruction code execution is set to D2. (Refer to page 59)



Note 1. For the parameters of number 100 and later, change the link parameter expansion setting (to other than 0000H).

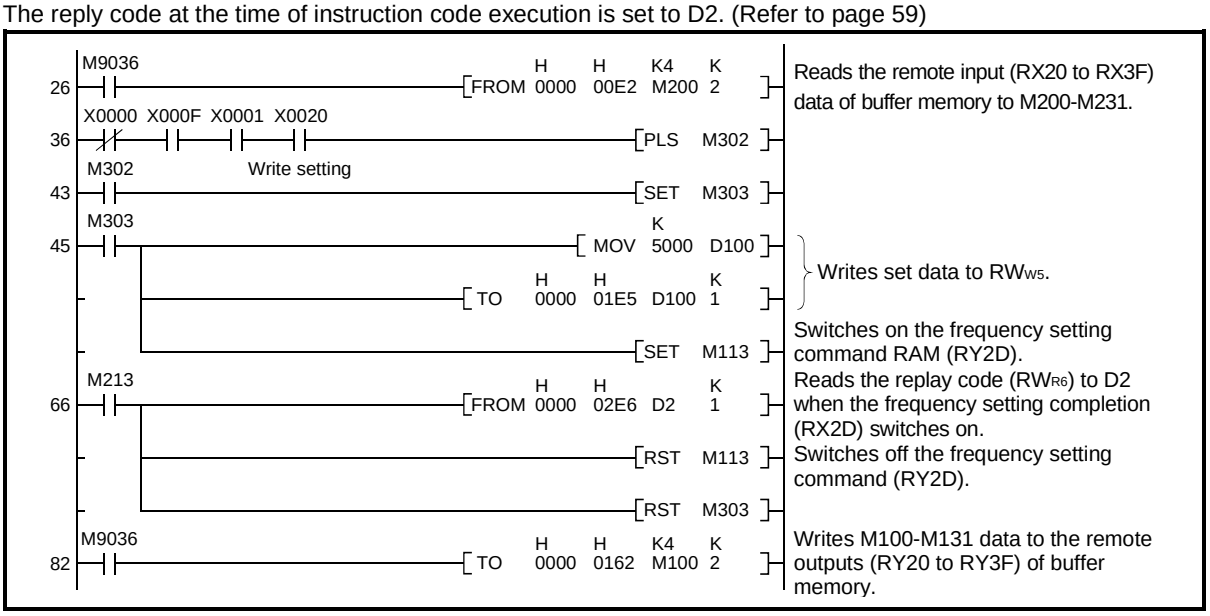
Note 2. For other functions, refer to the instruction codes (page 59).

7) Running frequency setting program example

The following program changes the running frequency of station 2 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 59)



• To continuously change the running frequency from PLC

When the frequency setting completion (example: RX2D) switches on, make sure that the reply code in the remote register is 0000H and change the set data (example: RWW5) continuously.

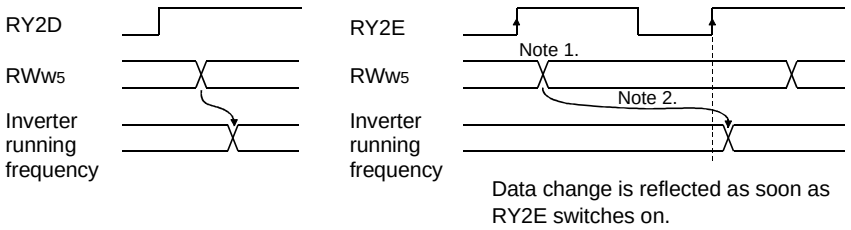
• Program example for writing data to E^2PROM

Modify the above program as follows:

Frequency setting command RX2D → RX2E.

Frequency setting completion RX2D → RX2E.

<Timing chart for write to RAM> <Timing chart for write to E^2PROM>



Note 1. For E^2PROM, write is made only once when RY2E is switched on.

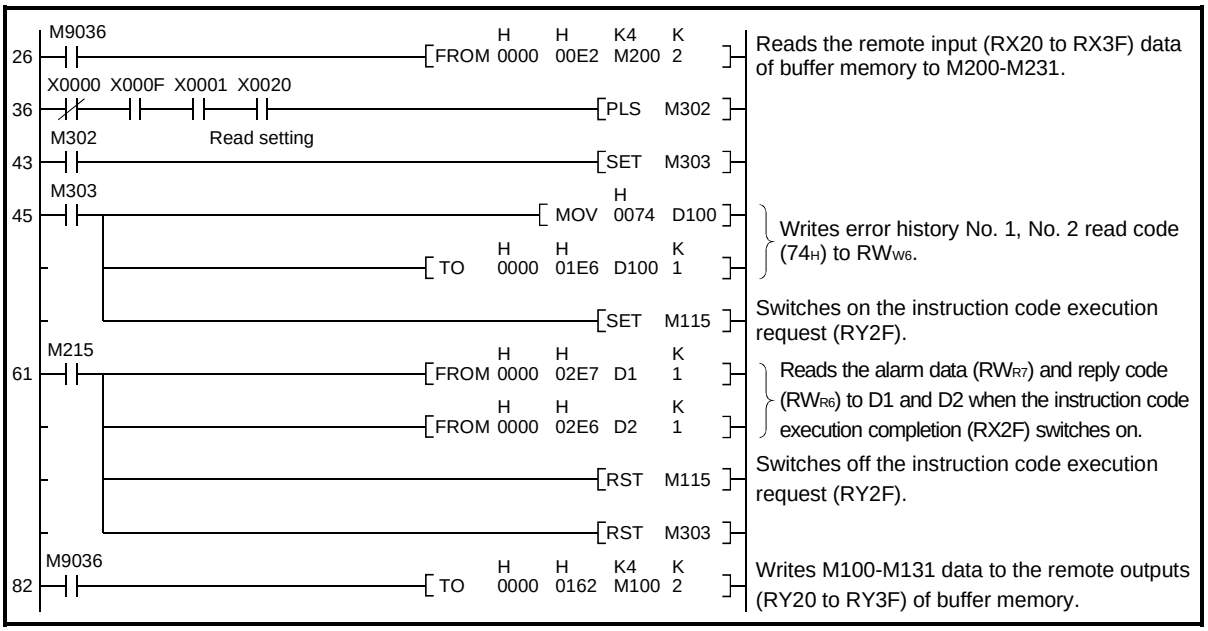
Note 2. If the set data is changed with RY2E on, it is not reflected on the inverter.

8) Alarm definition reading program example

The following program reads the alarm definition of station 2 inverter to D1.

Alarm definition reading code number: 74H (hexadecimal)

The reply code at the time of instruction code execution is set to D2. (Refer to page 59)

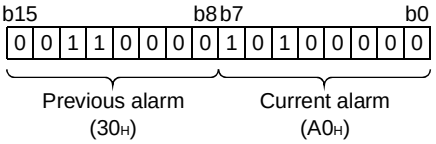


• Alarm definition display example

Example: Read data is 30A0H

Previous alarm..... THT

Current alarm..... OPT



• Alarm data

For full information on alarm definitions, refer to the inverter manual.

The alarm definitions change with the inverter. For details, refer to the inverter manual.

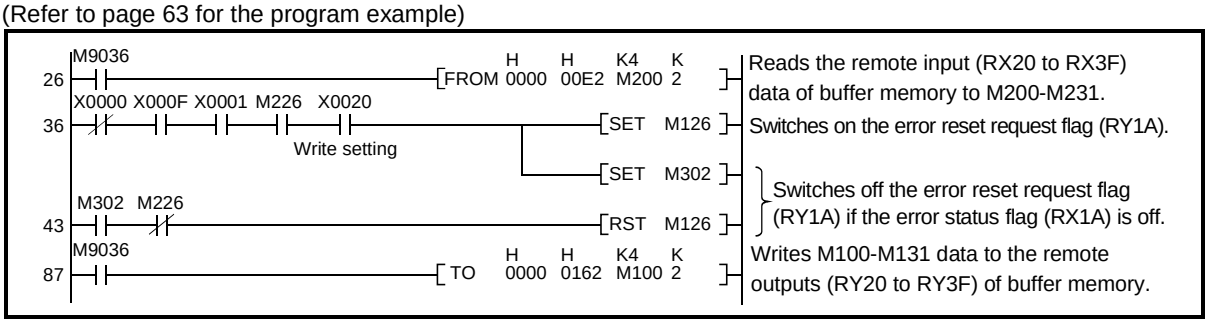
Data	Definition	Data	Definition	Data	Definition
00H	No alarm	60H	OLT	C0H	CPU
10H	OC1	70H	BE	C1H	CTE
11H	OC2	80H	GF	C2H	P24
12H	OC3	81H	LF	D5H	MB1
20H	OV1	90H	OHT	D6H	MB2
21H	OV2	A0H	OPT	D7H	MB3
22H	OV3	A1H	OP1	D8H	MB4
30H	THT	A2H	OP2	D9H	MB5
31H	THM	A3H	OP3	DAH	MB6
40H	FIN	B0H	PE	DBH	MB7
50H	IPF	B1H	PUE	F6H	E6
51H	UVT	B2H	RET	F7H	E7

9) Inverter error-time inverter resetting program example

The following program resets the inverter of station 2.

The reply code at the time of instruction code execution is set to D2. (Refer to page 59)

(Refer to page 63 for the program example)



Note 1. The above inverter reset using RY1A may be made only when an inverter error has occurred. The inverter may be reset in any operation mode.

Note 2. When using the instruction code execution request (RYF) with the instruction code (FD_H) and data (9696_H) to reset the inverter, make a reset and then change the operation mode to the CC-Link operation mode. (Refer to page 63 for the program example)

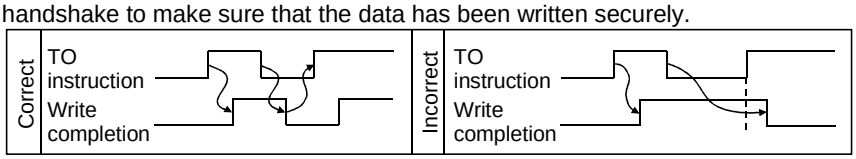
(5) Programming instructions

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 securely.

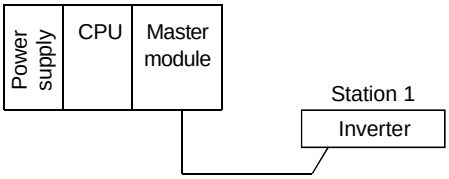
When transferring data between the inverter and sequence program via the buffer memory, perform the handshake to make sure that the data has been written securely.



2.9 How to Check for Error with the LED Lamps

(1) When one inverter is connected

The following example indicates the causes and corrective actions for faults which may be judged from the LED states of the CC-Link unit on the inverter under the condition that the SW, M/S and PRM LEDs of the master module are off (the master module setting is proper) in the system configuration where one inverter is connected:

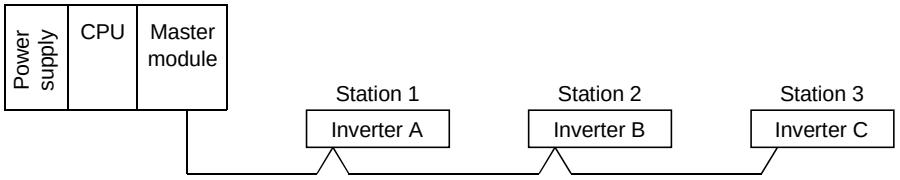


LED States				Cause
L.RUN	SD	RD	L.ERR	
●	◎	◎	◎	Normal communication is made but CRC error has occurred due to noise.
●	◎	◎	○	Normal communication
●	◎	○	◎	Hardware fault
●	◎	○	○	Hardware fault
●	○	◎	◎	Cannot answer due to CRC error of receive data.
●	○	◎	○	Data to be sent to the host station does not reach destination.
●	○	○	◎	Hardware fault
●	○	○	○	Hardware fault
○	◎	◎	◎	Polling response is made but refresh receive is in CRC error.
○	◎	◎	○	Hardware fault
○	◎	○	◎	Hardware fault
○	◎	○	○	Hardware fault
○	○	◎	◎	Data to be sent to the host station is in CRC error.
○	○	◎	○	There is no data to be sent to the host station, or data to be sent to the host station cannot be received due to noise.
○	○	○	◎	Hardware fault
○	○	○	○	Cannot receive data due to open cable, etc.
○	○	◎○	●	Invalid baud rate or station number setting
●	◎	◎	◎	Baud rate or station number changed during operation.
○	○	○	●	WDT error occurrence (hardware fault), power off, power supply failure

●: On ○: Off ◎: Flicker

(2) When multiple inverters are connected

The following example indicates the causes and corrective actions for faults which may be judged from the LED states of the CC-Link units of the inverters under the condition that the SW, M/S and PRM LEDs of the master unit are off (the master module setting is proper) in the system configuration shown below:



LED States				Cause	Corrective Action
Master module	Inverter (CC-Link)				
	Station 1	Station 2	Station 3		
TIME ○ LINE ○ or TIME ● LINE ○	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ● SD ● RD ● L.ERR ○	Normal	——
	L.RUN ○ SD ○ RD ○ L.ERR ○	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ● SD ● RD ● L.ERR ○	Contact fault of inverter and CC-Link option unit	Fit the CC-Link option unit correctly. Check the connector.
	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ○ SD ∗ RD ∗ L.ERR ○	L.RUN ○ SD ∗ RD ∗ L.ERR ○	Since the L.RUN LEDs of 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.
	L.RUN ○ SD ∗ RD ∗ L.ERR ○	L.RUN ○ SD ∗ RD ∗ L.ERR ○	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.
	L.RUN ○ SD ∗ RD ∗ L.ERR ∗	L.RUN ○ SD ∗ RD ∗ L.ERR ∗	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 and off

(3) When communication stops during operation

- Check that the CC-Link units and twisted pair cables are fitted properly. (Check for contact fault, open cable, etc.)
- Check that the PLC program is executed reliably and that the PLC CPU is running.
- Check that data communication is not stopped due to an instantaneous power failure, etc.

LED States				Cause	Corrective Action
Master module	Inverter (CC-Link)				
	Station 1	Station 2	Station 3		
	L.RUN ○ SD ＊ RD ● L.ERR ○	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ○ SD ＊ RD ● L.ERR ○	Since the L.RUN LEDs of stations 1 and 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, switch power on again.
	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ○ SD ○ RD ● L.ERR ○	L.RUN ● SD ● RD ● L.ERR ○	Since the L.RUN and SD LEDs of station 2 are off, the transmission speed setting of station 2 is wrong within the setting range (0 to 4).	After correcting the transmission speed setting, power on the inverter again.
	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ● SD ● RD ● L.ERR ◎	Since the L.ERR LED of station 3 flickers, the setting switch of station 3 was moved during normal operation.	Return the setting switch of the inverter (CC-Link) to the original position and power on the inverter again.
TIME ○ LINE ○ or TIME ● LINE ○	L.RUN ○ SD ○ RD ● L.ERR ●	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ● SD ● RD ● L.ERR ○	Since the L.RUN and SD LEDs of station 1 are off and its L.ERR LED is on, the setting switch setting of station 1 is outside the range (transmission speed: 5 to 9, station number: 65 or more).	After correcting the setting switch position of the inverter (CC-Link), switch power on again.
	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ● SD ● RD ● L.ERR ●	L.RUN ● SD ● RD ● L.ERR ○	Since the L.ERR LED of station 2 is on, station 2 itself is affected by noise. (L.RUN may go off.)	Securely connect FG of each inverter and master module to ground.
	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ● SD ● RD ● L.ERR ●	L.RUN ● SD ● RD ● L.ERR ●	Since the L.ERR LEDs of 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 line. (100mm or more)
	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ● SD ● RD ● L.ERR ○	L.RUN ● SD ● RD ● L.ERR ●	Termination resistors are left unconnected. (L.RUN may go off.)•	Check that the termination resistors are connected.

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

2.10 Troubleshooting

(1) Operation mode unswitched to CC-Link

- Check that the twisted pair cables (and FR-A5NC or FR-E5NC) are fitted properly. (Check for contact fault, open cable, etc.)
- Check that the 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 run.
- Check that the operation mode switching program has been written correctly.

(2) Inverter unstarted in CC-Link operation mode

- Check that the operation mode is set to the CC-Link operation mode.
- Check that the inverter starting program has been written correctly.
- Check that the inverter starting program is run.
- Check that the inverter is providing output.

(3) Operating and handling instructions

- During CC-Link operation, the inverter only accepts commands from the PLC and ignores any external operation command and any operation command from the parameter unit.
- If the same station number is set to different inverters, wrong data will be transferred and normal communication cannot be made.
- The inverter is brought to an alarm stop "E.OPT" or " E.OP3" if data communication stops, even instantaneously, due to a PLC fault, an open twisted pair cable or the like during CC-Link operation.
- If the PLC (master station) is reset or powered off during CC-Link operation, data communication stops and the inverter is brought to an alarm stop "E.OPT" or " E.OP3".
  To reset the PLC (master station), switch the operation mode to the external operation once, then reset the PLC.
- When the FR-A5NC or FR-E5NC is used, any inverter whose main power is restored is reset to return to the external operation mode. To resume the CC-Link operation, therefore, set the operation mode to the CC-Link operation using the sequence program.
  Note that setting "1" in Pr. 340 (link start mode) selects the CC-Link operation mode.

3 Device Net TM

3.1 Overview

Device NetTM was developed and released by Allen-Bradley Company, Inc. in 1994. ODVA (Open DeviceNet Vendor Association, Inc.) is now operating the business since it became independent from Allen-Bradley in 1995. As an open field network, Device NetTM can connect versatile devices of third parties and is compatible with not only inverters but also various field-level applications.
Use of the configuration software enables nodes (devices to communicate with) to be assigned on a network to establish the communication configuration of specific devices.

(1) Features

Connection with the master module (personal computer/PLC) by communication cables allows inverters to be run and monitored and their parameter values to be read/written from a user program or configurator.

(2) Types of Device NetTM-compatible inverters

Inverter Series	Method for Compatibility with Device NetTM
FR-A500	Connect the FR-A5ND plug-in option.
FR-F500	Connect the FR-A5ND plug-in option.

(3) Instructions

0x given in the text indicates that the numeral that follows is a hexadecimal number.

3.2 Specifications

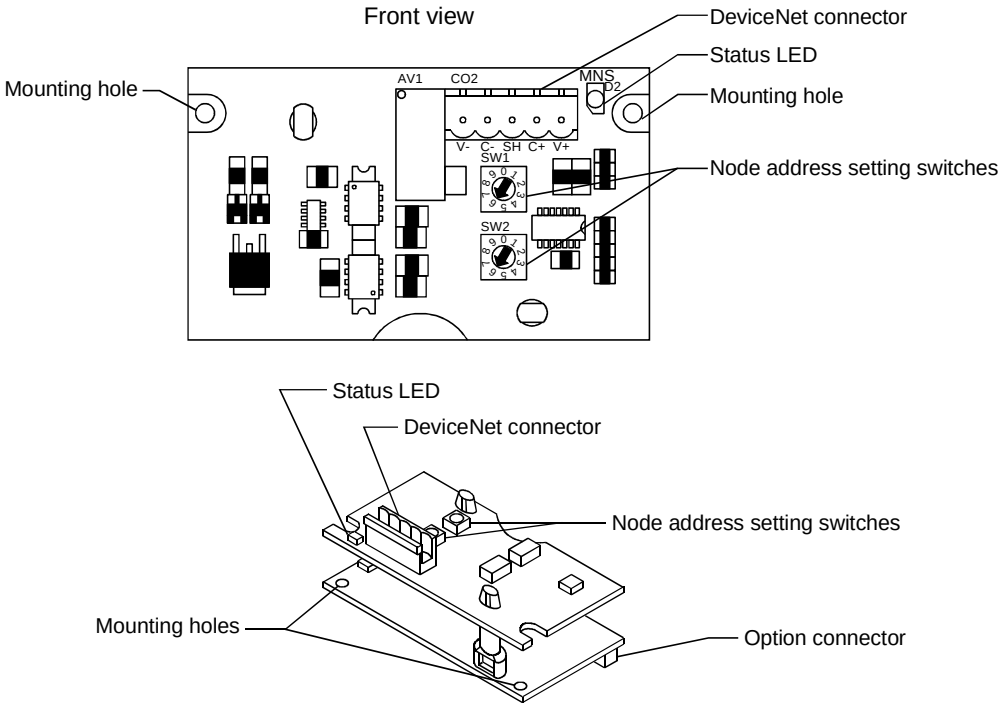
Device Net™

Item		Specifications
Power supply	Control power	Supplied by the inverter.
	External power input	Input voltage: 11 to 28V Current consumption: Maximum 90mA
Standard		Conforms to ODVA DeviceNet Specification Release 2.0. (independently tested by University of Michigan test lab, February, 1998) Supports UCMM.
Network topology		DeviceNet (linear bus with drop lines)
Communication cable		DeviceNet standard thick or thin cable (Use a "thin" cable as the drop cable.)
Maximum cable length		500m(125kbps) 250m(250kbps) 100m(500kbps)
Communication speed		125kbps, 250kbps, 500kbps
Number of inverters connectable		64 inverters (including master) (Note)
Response time		Read request response time = 1ms Write request response time = 30ms Parameter clear, all parameter clear response time = 5 seconds

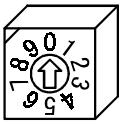
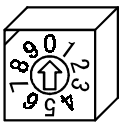
Note: When there is one master, the maximum number of inverters connected is 63 (64-1).

3.3 Structure

(1) Appearance

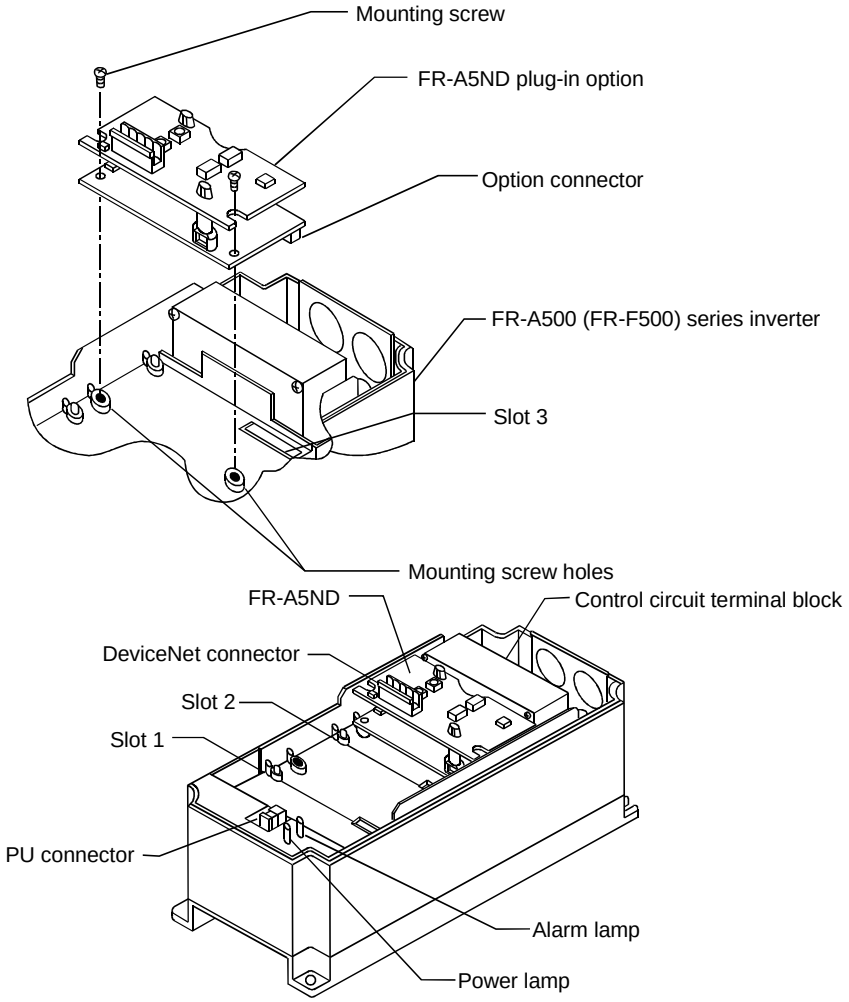


(2) Part names

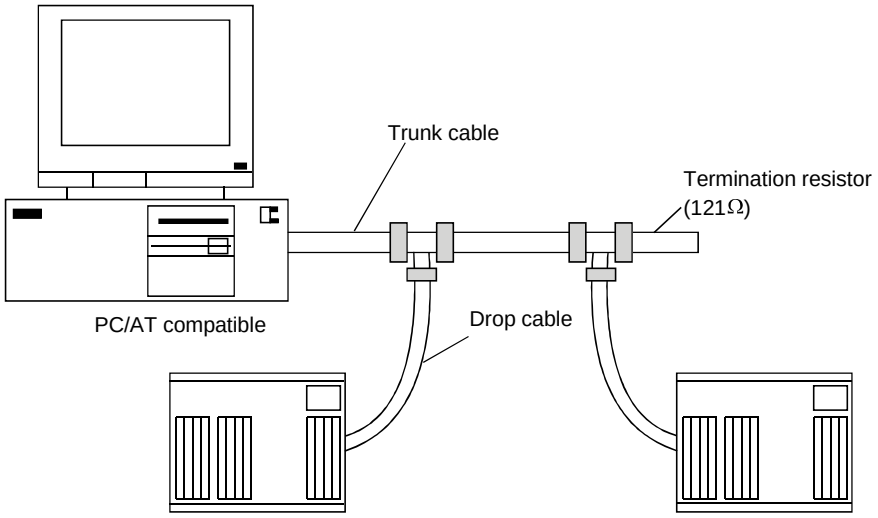
Name	Function
Node address setting switches	SW1  SW2  Used to set the node address of the inverter within the station range 0 to 63. Set the tens digit of the node address to SW1 and the units digit to SW2. Any setting other than 0 to 63 is regarded as 63.The node address setting switches are valid when ADDR of Pr. 345 is 63. When ADDR of Pr. 345 is not 63, the node address setting switches are invalid and the ADDR value of Pr. 345 is the node address.
Status LED	The operating states are indicated by the two colors (red and green) of the LED. For details, refer to page 79, where the system states and corresponding LED states are explained in detail.

(3) Installation procedure

1) Remove the front cover of the inverter and insert this option unit into slot 3 of the inverter.
2) Securely insert the option unit connector into the inverter connector. At this time, also fit the option fixing hole snugly.
3) Then, securely fix the option unit to the inverter with the mounting screws (2 places). If the mounting holes of the option unit do not match the inverter mounting holes, recheck whether the connector is secured properly.
4) Remove the DATA PORT from the inverter front cover and reinstall the front cover.
   (To remove the DATA PORT cover, push it from the back of the front cover.)



(1) System configuration example



Connection with DeviceNet network

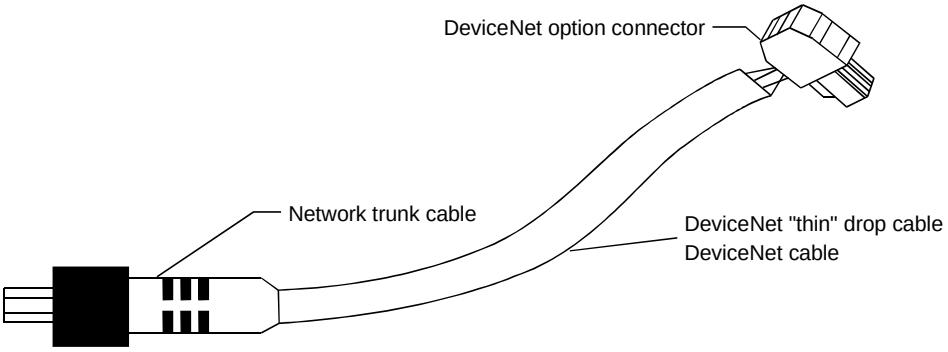
(2) Fabrication of DeviceNet drop cable

Use a DeviceNet drop cable to connect the inverter to the DeviceNet network. The drop cable consists of an ODVA approved "thin" cable and an ODVA approved 5-pin connector plugged to the connector of the inverter. To match the drop cable with the DeviceNet connector of the network trunk cable, use the one specified by the user/installer. The recommended parts are as follows:

DeviceNet "thin" drop cable: Belden make part number 3084A or equivalent

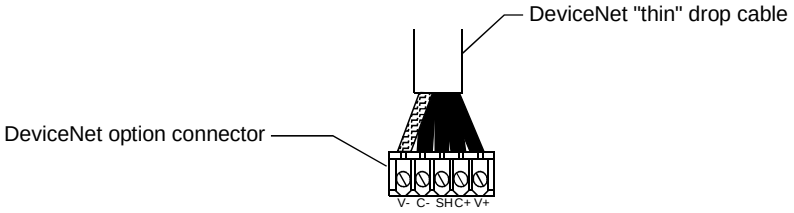
5-pin connector: Phoenix Contact make part number MSTB 2.5/5-ST-5.08-AU

Note: The maximum length of the drop cable should be 6.1m (20 feet).



DeviceNet cable

The DeviceNet connector pin-out connections are shown below. The function of each pin is listed below.



Connector pin-out connection diagram

Pin-Outs/Functions		
Pin number	**Signal**	**Color**
1	V-	Black
2	CAN-	Blue
3	Shield wire	Silver
4	CAN+	White
5	V+	Red

1) Strip the insulation sheath about 40mm (1.5 inches) from the end of the drop cable to expose the four color signal wires and silver shield wire.
2) Strip the insulations of the signal wires to approximately 6mm (1/4 inches). Plate each lead wire with solder.
3) Tin the end of the shield wire to prevent it from fraying.
4) Plug the connector to the DeviceNet cable as described below:
   (a) Insert a flat-blade screwdriver (maximum width 3.75mm) into the top hole of the connector plug to open the clamp in the lower hole to insert the wire.
   (b) Connect the signal wires to the plug of Phoenix Contact make. Confirm that the wire colors match the pins as indicated above.
   (c) After all signal wires are inserted properly, turn the tightening screws clockwise to fasten the signal wires securely. When tightened properly, the signal wires cannot be pulled off.

(3) Wiring procedure

1) Power off the inverter and make sure that the working environment is safe. After ensuring safety, remove the inverter cover.
2) Set the node address of the inverter within the station range 0 to 63.
   Set the tens digit of the node address to SW1 and the units digit to SW2. Any setting other than 0 to 63 is regarded as 63.
   The node address setting switches are valid when ADDR of Pr. 345 is 63.
   When ADDR of Pr. 345 is not 63, the node address setting switches are invalid and the ADDR value of Pr. 345 is the node address.
3) When the inverters have been installed properly and the node addresses set correctly, reinstall the inverter covers.
   Make sure that the DeviceNet trunk cable is wired properly and the termination resistor is fitted to each termination of the trunk cable. These termination resistors should satisfy the following requirements:
   1. R=121Ω
   2. 1% metal coating
   3. 0.25W
   Connect the drop cables to the network. (These are cables from the inverters to the DeviceNet network.)
   If the trunk connector is a DeviceNet plug or shield connector which meets the standard, connection to the network can be made independently of whether the inverter is on or off. Completion of connection is recognized automatically by the inverter.
   When free wires are used to make connection with the network, two or more signal wires may be shorted. As safety measures, also power off the network.
4) Make sure that connection is all completed and the cables irrelevant to DeviceNet are all connected to the inverter units as specified.

(4) Changing the node address

The node address status is checked only when the inverter is powered on. Therefore, changing the node address after power-on is invalid. The node address read at power-on is retained.

Change the node address setting switch positions in the following procedure (when ADDR of Pr. 345 is 63):

1) Power off the inverter.
2) Disconnect the drop cable from the option unit.
3) Remove the inverter cover.
4) Change the node address (node address setting switch positions).
5) Reinstall the inverter cover.
6) Reconnect the drop cable to the inverter unit.
7) Power on the inverter.

(5) LED status indications

The LED status indications represent the inverter's operating states listed below. Indications include five states: off, green lamp flickering, green, red lamp flickering and red.

Check the LED status after connecting the drop cable to the truck cable on the active network. The status LED of the option unit provides an indication according to the module/network status specified in the DeviceNet communication standard.

LED status indications

LED Indication	System Status	Remarks
Off	Inverter power off, network power on	Powering on the inverter causes the inverter to check for identical node addresses on the network.
Green lamp flickering	Host unconnected status	The inverter has been powered on and a check that there are no identical node addresses is completed. However, the host has not yet established a communication link.
Green	Network and inverter power on, host connection completed	The inverter has been powered on and the master station on the network recognizes this inverter unit. The LED holds this indication during communication.
Red lamp flickering	Connection time-out	The master station recognizes this inverter unit during communication (the LED is green). However, no response is made within the time limit (Note) preset to the expected packet rate. Check to see if the host station is disconnected from the network.
Red	Critical link error	Communication device fault • Overlapping node address setting • Network power off • Network cable connection fault or no-connection • Network failure Power reset must be made to recover from the link error.

Note: Time limit = 4 × EPR (Expected Packet Rate)

Note that this EPR is set in the DeviceNet master. This does not apply to the EPR bit setting using Pr. 347.

3.5 Inverter Setting

This section is intended to facilitate inverter setting. This section assumes that the factory settings are used. If you want to change these values, change the settings in accordance with the data in 3.9 Object Map.
This section also assumes that the network cabling is complete and DevicveNet communication has been established. Make sure that the LED status of the inverter is the flickering green lamp as described in Section 3.4(5).

(1) Overview

The inverter is regarded as a slave device in the DeviceNet communication standard. This means that the inverter cannot initiate messages on the network. The master device must establish communication with the inverter unit and send commands, requests for information, etc.
The inverter supports Group 3 Messaging as defined in the DeviceNet standard. This feature of the inverter means that it is possible for one master to control the inverter while the other master reads data from the same inverter. (This also means that the DeviceNet master must support the UCMM protocol for proper operation.)
It is strongly recommended to configure the DeviceNet network using the software tool designed specifically for that purpose. The use of such a tool greatly simplifies the configuration, reduces confusion, and enhances reliability.
One of such tools is DeviceNet Manager™ supplied by Rockwell Automation. Tools are available from many other suppliers but the description contained in this section is based on use of DeviceNet Manager™.
To use the DeviceNet Manager™ software, you need to acquire the DeviceNet Electronic Data Sheet (EDS) file. The EDS file is a standard DeviceNet file which defines the configurable parameters of a field device. Refer to the configuration software tool manual for more information on the installation and use of the EDS file.

(2) Baud rate setting

The baud rate must be consistent throughout the network in order to establish communication and enable equipment communication via the network.
Therefore, this step is important for the inverter setting.

- At power-on, the inverter defaults to the communication speed of 125kbps.
- You can set the baud rate using "Node Address", Attribute 1 of DeviceNet Class 0x03, Instance 1. Refer to Section 3.9.2 (1) for further information.
- You can also set the node address manually by changing the Pr. 346 value from the parameter unit. Refer to page 81 for more information.

(3) Node address setting

The node address assigned to the inverter is determined when the inverter is powered on. When an address conflict is found in network configuration, you can set the baud rate using "Baud Rate", Attribute 2 of DeviceNet Class 0x03, instance. Refer to Section 3.9.2 (1) for details.
You can also set the baud rate manually by changing the Pr. 345 value from the parameter unit. Refer to page 81 for more information.

(4) DeviceNet I/O assembly

Communication between the master device and a slave device on the network requires that the DeviceNet Class 0x04- "Assembly Object" in both devices be the same.

1) Default I/O assembly

When power is switched on, the inverter defaults to Class 0x04- Output Instance 21 and Class 0x04- Input Instance 71. Refer to Section 3.8 (2) for more information on DeviceNet Class 0x04 and I/O Instance.

2) Polling rate

Determination of the proper polling rate of the DeviceNet master device depends on the characteristics of the entire network. To minimize potential conflicts and maximize system reliability, a polling rate interval of 30ms or longer is suggested. The user may adjust this rate within the network performance range.

3) Loss of communications

In the default polled communication mode, the inverter responds to loss of communication in accordance with the WDA bit setting of Pr. 345 defined on page 81. These bits default to 0. Such loss of communication may occur due to disconnection of network cabling, network power off, failure within the master etc.

When the WDA bits of Pr. 345 are set to 0, the inverter keeps executing the last command received until the communication time limit is exceeded. This time limit is four times the Expected Packet Rate (EPR) configured by the user (note that this EPR is set by the DeviceNet master. This differs from the EPR bit setting of Pr. 345).

When the time limit of the inverter is exceeded and the WDA is activated, the E.OP3 error occurs in the inverter, coasting it to a stop.

When the WDA bits of Pr. 345 are set to 2, the inverter does not generate an error and keeps executing the last command received until the next instruction is given. The inverter automatically resets the connection when communication is restored.

(5) Parameters

Parameter Number	Function	Setting Range	Minimum Setting Increments	Factory Setting
338 (Note 1)	Operation command write	0, 1	1	0
339 (Note 1)	Speed command write	0, 1	1	0
340 (Note 1)	Link start mode selection	0, 1, 2	1	0
345 (Note 2)	DeviceNet address start data	0 to 65535	1	41023(0xA03F)
346 (Note 2)	DeviceNet baud rate start data	0 to 65535	1	20612(0x5084)

Note 1. Refer to Section 3.6 Operation Modes (page 84) for details of Pr. 338 to 340.

Note 2. You cannot write the Pr. 345 and Pr. 346 values (Class 0x67 Instance 1 Attribute 45 and 46) from the network. They may only be read. In addition, these parameters may be set from the FR-PU04 only. Note that you cannot set them from the FR-DU04.

Pr. 345 is a bit map parameter and is defined as follows:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Address key				WDA			DN failure mode (Note)			Device node address					

Pr. 346 is a bit map parameter and is defined as follows:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Baud rate key				Input assembly					Output assembly					Baud rate	

Note: The DN failure mode is not supported. The inverter always recognizes it as 0.

<Definition of each registration>

Item	Description	Definition	Factory Setting
Watch dog time-out operation (WDA)	Specifies the inverter operation when communication stops for a given period (4×EPR). Note: You may also set this function using DeviceNet Connection Object Class 0x05, Instance 2, Attribute 12. However, since it is not written to EEPROM in the inverter, resetting the inverter returns to the previous value set from the parameter unit. When the value is changed from the parameter unit, the EEPROM value is also changed.	(1) Setting of 0, 4 (shift to time-out status) Inverter: E.OP3 occurs. LED indication: Red flickering Network: Connection continued. (2) Setting of 1, 5 (auto delete) Inverter: E.OP3 occurs. LED indication: Green lit Network: Polled I/O connection cut off. (3) Setting of 2, 6 (auto reset: time-out operation ignored) Inverter: No error LED indication: Green lit Network: Connection continued. (4) Setting of 3, 7 (WDA invalid) Inverter: No error LED indication: Green lit Network: Connection continued.	0
Input assembly (INP) (Note 1)	Choose the input instance of Assembly Object Class 0x04 used. (You can set this function using Control Management Class 0x29, Instance 1, Attribute 40.)	0 = Input Instance 70 1 = Input Instance 71 6 = Input Instance 76	1
Output assembly (OUTP) (Note 1)	Choose the output instance of Assembly Object Class 0x04 used. (You can set this function using Control Management Class 0x29, Instance 1, Attribute 41.)	0 = Output Instance 20 1 = Output Instance 21 6 = Output Instance 26	1
Baud rate (BR)	Set the baud rate. (You can set this function using DeviceNet Object Class 0x03, Instance 1, Attribute 2.)	0, 3 = 125 kbps 1 = 250 kbps 2 = 500 kbps	0
Device node address (ADDR) (Note 2)	Set the node address (MAC ID) of the device. (You can set this function using DeviceNet Object Class 0x03, Instance 1, Attribute 1.)	0 to 63	63
Address key (ADDRKEY) (Note 3)	Internal setting	Fixed to 10 (1010 in binary)	10
Baud rate key (BRKEY) (Note 3)	Internal setting	Fixed to 5 (0101 in binary)	5

Note 1. The input assembly and output assembly must match. (For example, if the input assembly is 0, the output assembly must also be 0.) Any other value than 0, 1 and 6 set to the input and output assemblies is regarded as 6.

Note 2. The node address may also be set with the node address setting switches, which are made valid only when ADDR of Pr. 345 is 63. (When ADDR of Pr. 345 is not 63, the node address setting switch value is ignored and the ADDR value of Pr. 345 is valid.)

Note 3. If the setting is other than the fixed value, the FR-A5ND recognizes it as a wrong value, and if the other parameter (WDA, INP, OUTP, BR, ADDR) values are different from the factory settings, it uses the factory settings as the values of these parameters.

<Parameter setting method>

The Pr. 345 value is the sum of the values in all items which have been multiplied by the corresponding factors in the following table.

Pr. 345 setting method

Item	Setting Range	Factor	Example 1 (Setting × Factor)	Example 2 (Setting × Factor)	Example 3 (Setting × Factor)
Address key	10	4096	10 × 4096	10 × 4096	10 × 4096
WDA	0 to 3	512	0 × 512	1 × 512	2 × 512
DN failure mode	0	64	0 × 64	0 × 64	0 × 64
Device node address	0 to 63	1	63 × 1	4 × 1	10 ×1
Total (Pr. 345)	—	—	41023	41476	41994

If you do not have the DevceNet configuration tool, enter the total value to the inverter using the FR-PU04. The values in Example 1 in the above table are the same as the factory settings.

- Example 1
  Address key = 10 only
  Watch dog time-out operation WDA = 0
  DN failure mode = 0 only
  Device node address = 63
  Total = (10 × 4096) + (0 × 512) + (0 × 64) + (63 × 1) = 41023

The Pr. 346 value is the sum of the values in all items which have been multiplied by the corresponding factors in the following table.

Pr. 346 setting method

Item	Setting Range	Factor	Example 1 (Setting × Factor)	Example 2 (Setting × Factor)	Example 3 (Setting × Factor)
Baud rate key	5	4096	5 × 4096	5 × 4096	5 × 4096
Input assembly	0 to 6	128	1 × 128	0 × 128	6 × 128
Output assembly	0 to 6	4	1 × 4	0 × 4	6 × 4
Baud rate	0 to 2	1	0 × 1	1 × 1	2 × 1
Total (Pr. 346)	—	—	20612	20481	21274

If you do not have the DevceNet configuration tool, enter the total value to the inverter using the FR-PU04. The values in Example 1 in the above table are the same as the factory settings.

- Example 1
  Baud rate key = 5 only
  Input assembly = 1 (Input Instance 71)
  Output assembly = 1 (Output Instance 21)
  Baud rate = 0 (125kbps)
  Total = (5 × 4096) + (1 × 128) + (1 × 4) + (0 × 1) = 20612

3.6 Operation Modes

(1) Operation modes

1) PU operation : Controls the inverter from the keyboard of the operation panel (FR-DU04) or parameter unit (FR-PU04) installed to the inverter.

2) External operation : Controls the inverter by switching on/off external signals connected to the control circuit terminals of the inverter.

3) DeviceNet operation : Controls the inverter in accordance with the personal computer, PLC or other program via the DeviceNet unit (FR-A5ND).

(2) Operation mode switching

1) Operation mode switching conditions

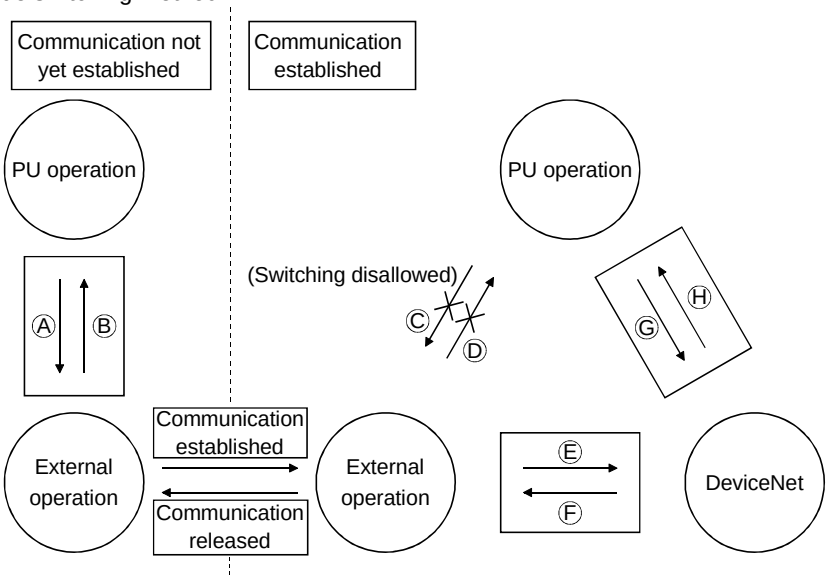
Before switching the operation mode, check that:

- The inverter is at a stop;
- Both the STF and STR signals are off; and
- The Pr. 79 "operation mode" setting is correct.

(Use the parameter unit of the inverter for setting.)

Pr. 79 Setting	Operation Mode Selection	Switching to DeviceNet Operation Mode
0	PU or external operation	Disallowed when the PU mode is selected. Allowed when the external mode is selected.
1	PU operation mode	Disallowed
2	External operation mode	Allowed
3, 4	External/PU combined operation mode	Disallowed
5	Programmed operation	Disallowed
6	Switch-over	Allowed
7	External operation (PU operation interlock)	Allowed only in the external operation mode when the PU interlock signal (X12) is on.
8	PU or external (signal switching)	Allowed only in the external operation mode (X16 on).

2) Operation mode switching method



Symbol	Switching Type	Switching Method
A	PU operation → external operation	Operate the external operation key on the PU.
B	External operation → PU operation	Operate the PU operation key on the PU.
C	PU operation → external operation	Switching disallowed.
D	External operation → PU operation	Switching disallowed.
E	External operation → DeviceNet operation	By user program.
F	DeviceNet operation → external operation	By user program.
G	PU operation → DeviceNet operation	Switching allowed by user program only when Pr. 79 = 6.
H	DeviceNet operation → PU operation	Switching allowed by user program only when Pr. 79 = 6.

When "1 or 2" is set in Pr. 340 "link start mode selection", the DeviceNet operation mode is selected at power-on or inverter reset.

Note 1. When setting "1 or 2" in Pr. 340, the initial settings (station number setting, etc.) of the inverter must be made without fail.

3) Link start mode

By setting the Pr. 340 value as appropriate, you can select the operation mode at power on or at restoration from instantaneous power failure.

Pr. 340 Setting	Operation Mode		Mode at Power On or at Restoration from Instantaneous Power Failure
	Pr.79		
0	0	PU or external operation	Inverter goes into the external operation mode.
	1	PU operation	Inverter goes into the PU operation mode.
	2	External operation	Inverter goes into the external operation mode.
	3	External/PU combined operation mode	Running frequency is set in the PU operation mode and the start signal is set in the external operation mode.
	4	External/PU combined operation mode	Running frequency is set in the external operation mode and the start signal is set in the PU operation mode.
	5	Programmed operation mode	Inverter is operated by the program.
	6	Switch-over mode	Operation mode is switched while running.
	7	External operation mode	Shift to the PU operation mode is controlled by ON/OFF of the X12 signal.
	8	External/PU combined operation mode	Operation mode is switched by ON/OFF of the X16 signal.
1	DeviceNet operation		Inverter goes into the DeviceNet operation mode. (Program need not be used for switching)
2	DeviceNet automatic restart after instantaneous power failure		Inverter goes into the DeviceNet operation mode. When Pr. 57 setting is other than 9999 (automatic restart after instantaneous power failure), automatic restart is made in the status prior to occurrence of an instantaneous power failure to continue DeviceNet operation, if a communication signal is not given. (Program need not be used for switching)

- The Pr. 340 value may be changed in any operation mode.
- When Pr. 79 "operation mode selection" = "0, 2 or 6", "1 and 2" in Pr. 340 are made valid.
- When starting DeviceNet operation at power-on, set "1 or 2" in Pr. 340.

(3) Control place selection

In the DeviceNet operation mode, commands from the external terminals and program are as listed below:

Control place selection								Remarks
			Pr. 338 "operation command write"	0: DN	0: DN	1: External	1: External	
			Pr. 339 "speed command write"	0: DN	1: External	0: DN	1: External	
Fixed functions (Functions equivalent to terminals)			Forward rotation command (STF)	DN	DN	External	External	
			Reverse rotation command (STR)	DN	DN	External	External	
			Start self-holding selection (STOP)	DN	DN	External	External	
			Output halt (MRS)	External	External	External	External	(Note 1)
			Reset (RES)	Both	Both	Both	External	
			DeviceNet operation frequency	DN	—	DN	—	
			2	—	External	—	External	
			4	—	External	—	External	
			1	Compensation	External	Compensation	External	
Selective functions	Pr. 180 to Pr. 186 settings	0	Low-speed operation command (RL)	DN	External	DN	External	Pr. 59 = 0
		1	Middle-speed operation command (RM)	DN	External	DN	External	Pr. 59 = 0
		2	High-speed operation command (RH)	DN	External	DN	External	Pr. 59 = 0
		3	Second function selection (RT)	DN	DN	External	External	
		4	Current input selection (AU)	—	External	—	External	
		5	Jog operation selection (JOG)	—	—	External	External	
		6	Automatic restart after instantaneous power failure selection (CS)	External	External	External	External	
		7	External thermal relay input (OH)	External	External	External	External	
		8	15-speed selection (REX)	DN	External	DN	External	Pr. 59 = 0
		9	Third function (X9)	DN	DN	External	External	
		10	FR-HC connection, inverter operation enable (X10)	External	External	External	External	
		11	FR-HC connection, instantaneous power failure detection (X11)	External	External	External	External	
		12	PU external interlock (X12)	External	External	External	External	
		13	External DC dynamic braking start (X13)	DN	DN	External	External	
		14	PID control valid terminal (X14)	DN	External	DN	External	
		15	Brake opening completion signal (BRI)	DN	DN	External	External	
		16	PU operation-external operation switching (X16)	External	External	External	External	
		17	Load pattern selection-forward/reverse rotation boost switching (X17)	DN	DN	External	External	
		18	Magnetic flux-V/F switching (X18)	DN	DN	External	External	
		19	Load torque high-speed frequency (X19)	DN	DN	External	External	
		22	Orientation command	DN	DN	External	External	(Note 2)
RH, RM, RL, RT selection functions			Remote setting (RH, RM, RH)	DN	External	DN	External	Pr. 59 = 1, 2
			Programmed operation group selection (RH, RM, RL)	—	—	—	—	Pr. 79 = 5 DeviceNet operation disallowed
			Stop-on-contact selection 0 (RL)	DN	External	DN	External	Pr. 270 = 1, 3
			Stop-on-contact selection 1 (RT)	DN	DN	External	External	

[Explanation of table]

External :Control by signal from external terminal is only valid.

DN :Control from DeviceNet sequence program is only valid.

Both :Control from both external terminal and PLC is valid.

— :Control from both external terminal and PLC is invalid.

Compensation :Control by signal from external terminal is only valid if Pr. 28 (multi-speed input compensation) setting is 1.

Note 1. If the FR-HC connection, inverter operation enable signal (X10) is not assigned when the FR-HC is used (Pr. 30 = 2) or if the PU operation interlock signal (X12) is not assigned when the PU operation interlock function is set (Pr. 79 = 7), this function is also used by the MRS signal and therefore the MRS signal is only valid for the external terminals, independently of the Pr. 338 and Pr. 339 settings.

Note 2. The orientation command needs the FR-A5AP and FR-A5AX options.

3.7 Operational Functions

(1) Operation mode-based functions

Control Method	Item	Operation Mode		
		Net mode	External mode	PU mode
DeviceNet	Operation command	Allowed (Note 1)	Disallowed	Disallowed
	Output frequency setting	Allowed (Note 1)	Disallowed	Disallowed
	Monitoring	Allowed	Allowed	Allowed
	Parameter write	Allowed (Note 3)	Disallowed (Note 3)	Disallowed (Note 3)
	Parameter read	Allowed	Allowed	Allowed
	Inverter reset	Allowed (Note 2)	Disallowed	Disallowed
Control circuit terminal	Operation command	Allowed (Note 1)	Allowed	Disallowed
	Output frequency setting	Allowed (Note 1)	Allowed	Disallowed
	Inverter reset	Allowed	Allowed	Allowed

Note 1. As set in Pr. 338 and Pr. 339.

Note 2. The inverter cannot be reset at occurrence of a network error.

Note 3. As set in Pr. 77.

Note 4. The inverter goes into the external operation mode if it is reset from DeviceNet in the net operation mode.

(2) Monitoring

The following items can be monitored by Class 0x2A Attribute 141 to 193:

1) Output frequency ..... Binary in 0.01Hz increments
2) Output current ..... Binary in 0.01A increments
3) Output voltage ..... Binary in 0.1V increments
4) Frequency setting ..... Binary in 0.01Hz increments
5) Running speed ..... Binary in 1r/min increments
6) Motor torque ..... Binary in 0.1% increments
7) Converter output voltage ..... Binary in 0.1V increments
8) Regenerative brake duty ..... Binary in 0.1% increments
9) Electronic overcurrent protection load factor ..... Binary in 0.1% increments
10) Output current peak value ..... Binary in 0.01A increments
11) Input power ..... Binary in 0.01kW increments
12) Output power ..... Binary in 0.01kW increments
13) Input terminal states

15-12	11	10	9	8	7	6	5	4	3	2	1	0
0	CS	RES	STOP	MRS	JOG	RH	RM	RL	RT	AU	STR	STF

14) Output terminal states

15-6	5	4	3	2	1	0
0	ABC	FU	OL	IPF	SU	RUN

15) Load meter ..... Binary in 0.1% increments
16) Motor exciting current ..... Binary in 0.01A increments
17) Position pulse (*) ..... Binary in 1 pulse increments
18) Cumulative energization time ..... Binary in 1 hr increments
19) Orientation status (*)
20) Actual operation time ..... Binary in 1 hr increments
21) Motor load factor ..... Binary in 0.1% increments
22) Cumulative power ..... Binary in 1kwh increments
23) Alarm definition

*Valid only when FR-A5AP is fitted

24) Inverter status

You can monitor the inverter status using Class 0x2A, Attribute 114, A500 Inverter Status. This is defined in the following bit map:

bit	Definition
0	Running (RUN)
1	Forward run (forward rotation)
2	Reverse run (reverse rotation)
3	Up to frequency (SU)
4	Overload alarm (OL)
5	Instantaneous power failure (IPF)
6	Frequency detection (FU)
7	Alarm output (ABC)

(3) Operation commands

To send the control input instruction, check Attribute 114 of Class 0x2A AC Drive Object supplied with the instruction data you want. For example, setting of numerical value 0x0002 means that the inverter is run in forward rotation at the frequency setting in RAM.

Follow the bit map table below:

15-11	10	9	8	7	6	5	4	3	2	1	0
0	MRS	CS(*)	AU(*)	RT(*)	JOG(*)	RL(*)	RM(*)	RH(*)	STR	STF	0

The input signals marked * can be changed using Pr. 180 to Pr. 186 (input terminal function selection).

(4) Running frequency

The running frequency can be set to a minimum of 0.01Hz within the range 0 to 400Hz.

The frequency setting in RAM can be made using Attribute 112 and 113 of Class 0x2A AC Drive Object.

(5) Parameter write

Functions can be written using DeviceNet. Note that write during inverter operation will result in a write mode error.

(6) Parameter read

Functions can be read using DeviceNet.

(7) Operation at alarm occurrence

Alarm Location	Description	Operation Mode		
		DeviceNet mode	External mode	PU mode
Inverter alarm	Inverter operation	Stop	Stop	Stop
	Data communication	Continued	Continued	Continued
DeviceNet alarm	Inverter operation	Stop (Note 1)	Continued	Continued
	Data communication	Continued (Note 2)	Continued (Note 2)	Continued (Note 2)

Note 1. The motor coasts to a stop if the inverter outputs an error due to the FR-A5ND's connection object failure or watch dog time-out.

Note 2. Depends on the communication error type.

3.8 DeviceNet Programming

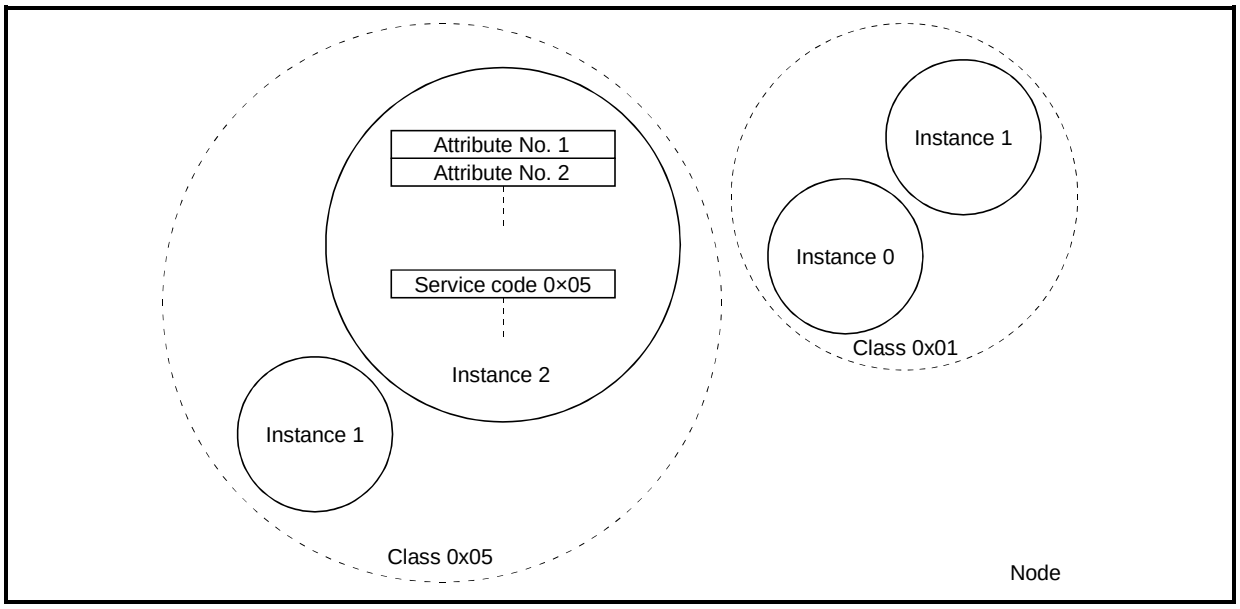
DeviceNet programs change with the master module. For programming details, refer to the master module instruction manual.

(1) Object model

In DeviceNet, each node (device to communicate with) is modeled as a cluster of objects (abstracted specific product functions). In other words, each node allows the map of an object model to be drawn on the basis of the characteristics of each function. This is an object map.

The following four items are used to represent an object:

Item	Description
Class	Cluster of all objects having the same type of function Generalized object
Instance	Specific representation of object
Attribute	Representation of object characteristic
Service	Function supported by object or class



Object model image diagram

Object model example

Class	Instance	Attribute	Attribute Value
Human	John	Sex	Male
		Age	20
	Mary	Sex	Female
		Age	42

In DeviceNet communication, changing this attribute value enables the inverter setting to be changed and reading the attribute value enables the inverter data (output current value, etc.) to be monitored.

Such reading and changing of the attribute value, sending of operation commands to the inverter, and others can be performed using the I/O instances. The I/O data examples given below use the I/O instances to run the inverter and change the parameter values.

Refer to Section 3.9 Object Map for information on each class, instance, attribute and service.

(2) I/O specifications (Polled I/O connection)

1) Output signals (Master module to inverter)

The output signals from the master module can be provided using any of the following output instances:

• Class 0x04 - Output instance 20

	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Output instance 20 (0x14)	0						Fault Reset		Forward Rotation
	1	—							
	2	Speed setting (lower byte)							
	3	Speed setting (upper byte)							

• Class 0x04 - Output instance 21

	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Output instance 21 (0x15)	0		NetRef	NetCtrl			Fault Reset	Reverse Rotation	Forward Rotation
	1	—							
	2	Speed setting (lower byte)							
	3	Speed setting (upper byte)							

• Class 0x04 - Output instance 26

	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Output instance 26 (0x1A)	0	Write Param	NetRef	NetCtrl			Fault Reset	Reverse Rotation	Forward Rotation
	1	00							
	2	Speed setting or parameter write data (lower byte)							
	3	Speed setting or parameter write data (upper byte)							
	4	Parameter class							
	5	Parameter attribute number							

Output instance 26 (0x1A) is used to set write/read the parameter access control, parameter class, parameter attribute number and parameter write data.

Output instance 26 must be used with input instance 76 in the command which requires parameter access. Output instance 26 uses 6-byte data.

<Definition of BYTE data>

Output instances 20, 21, 26 are executed under the following rules. (Some bits and data are not in output instances 20, 21. Refer to the above data table.)

BYTE 0: Bit 7 - If Write Param = 1, the parameter write data in BYTE 2 and BYTE 3 is written to the parameter indicated in BYTE 4 and BYTE 5 and the functions of the other bits are ignored.
If Write Param = 0, the RPM speed setting (same value as in BYTE 2 and BYTE 3 of output instance 21) is set and the functions of the other bits are executed.

Bit 6 - If NetRef = 1, the speed setting is adopted from BYTE 2 and BYTE 3. (Note 2)

Bit 5 - If NetCtrl = 1, Bits 2, 1, 0 are made valid.
If NetCtrl = 0, the operation command entered from the external terminal (STF, STR terminal) is made valid. (Note 3)

Bit 4 - Unused

Bit 3 - Unused

Bit 2 - If Fault Reset is changed from 0 to 1, the inverter is reset.

Bit 1 - If Reverse Rotation = 1 and Forward Rotation = 0, reverse rotation is performed.

Bit 0 - If Forward Rotation = 1 and Reverse Rotation = 0, forward rotation is performed.

Note 1. To make Bits 2, 1, 0 valid, NetCtrl must be 1.

Note 2. The speed command write (Pr. 339) changes.

Note 3. The operation command write (Pr. 338) changes.

BYTE 1: Must be 00.

BYTE 2: Lower byte of speed setting (1r/min increments) or parameter write data

BYTE 3: Upper byte of speed setting (1r/min increments) or parameter write data

BYTE 4: Parameter class, e.g. 0x2A, 0x66, 0x67

BYTE 5: Parameter attribute No. (instance 1), e.g. 0x0A, 0x65

2) Input signals (Inverter to master module)

The input signals to the master module can be provided using any of the following input instances:

• Class 0x04 - Input instance 70

	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Input instance 70 (0x46)	0						Forward Rotation		Faulted
	1	—							
	2	Actual speed (lower byte)							
	3	Actual speed (upper byte)							

• Class 0x04 - Input instance 71 (factory setting)

	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Input instance 71 (0x47)	0	At Ref Speed	Ref From Net	Ctrl From Net	Ready	Reverse Rotation	Forward Rotation		Faulted
	1	—							
	2	Actual speed (lower byte)							
	3	Actual speed (upper byte)							

• Class 0x04 - Input instance 76

	Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Input instance 76 (0x4C)	0	At Ref Speed	Ref From Net	Ctrl From Net	Ready	Reverse Rotation	Forward Rotation		Faulted
	1	00							
	2	Actual speed (lower byte)							
	3	Actual speed (upper byte)							
	4	Parameter read (lower byte)							
	5	Parameter read (upper byte)							

Input instance 76 (0x4C) offers 16-bit parameter data.

Input instance 76 must be used with output instance 26 in the command which requires parameter access. Input instance 76 uses 6-byte data.

<Definition of BYTE data>

Input instances 70, 71, 76 are executed under the following rules. (Some bits and data are not in input instances 70, 71. Refer to the above data table.)

BYTE 0: Bit 7 - When At Ref Speed = 1, operation is being performed at the speed setting.
Bit 6 - When Ref From Net = 1, the speed setting from the DeviceNet master is used.
Bit 5 - When Ctrl From Net = 1, error reset, forward rotation or reverse rotation is given from the DeviceNet master.
Bit 4 - Ready
Bit 3 - Reverse rotation
Bit 2 - Forward rotation
Bit 1 - Unused
Bit 0 - When Faulted = 1, the inverter is in error.

BYTE 1: Must be 00.
BYTE 2: Lower byte of actual speed (1r/min increments) (Note 1)
BYTE 3: Upper byte of actual speed (1r/min increments) (Note 1)
BYTE 4: Parameter read data (lower byte) set in output instance 26 (Bytes 4, 5) (Note 2)
BYTE 5: Parameter read data (upper byte) set in output instance 26 (Bytes 4, 5) (Note 2)

Note 1. Not the actual speed of the motor.

Note 2. When a value is written to a certain parameter and the same parameter value is then read right after that, it may remain unchanged since it will be read before the data is reflected on Bytes 4 and 5 because of processing time. Read the same parameter value more than 1 second after writing it.

(3) Programming examples (Data examples for Polled I/O connection)

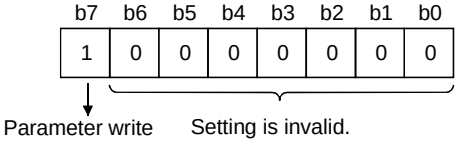
Programming changes with the device used as the master station. Refer to the master station programming manual. Data examples for programming are given below.

	Item	Data Example	Refer To Page
1)	Operation mode setting	Set to the DeviceNet operation mode.	92
2)	Inverter speed reading	Read the inverter data.	92
3)	Running speed setting	Set the running speed to 900r/min.	93
4)	Operation command designation	Command the forward rotation and mid-speed signals.	93
5)	Inverter status reading	Read the inverter status.	94
6)	Parameter reading	Read Pr. 0 "torque boost".	95
7)	Parameter writing	Set "2.0%" in Pr. 0 "torque boost".	96

1) Operation mode setting data example

When sending the DeviceNet operation mode command to the inverter, use Class 0x2A, Attribute No. 120 to write the following data to output instance 26:

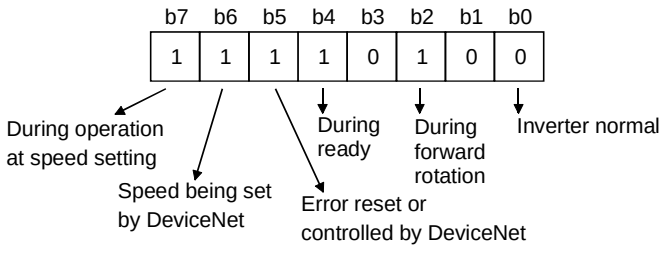
<Write data example: DeviceNet operation mode>

Output Instance 26		Description
BYTE 0	0x80	
BYTE 1	0x00	—
BYTE 2	0x14	(Lower-byte data) (Upper-byte data) → Data 0x0014 (DeviceNet operation mode) of parameter class 0x2A, parameter attribute No. 120 (0x78)
BYTE 3	0x00	
BYTE 4	0x2A	Parameter class
BYTE 5	0x78	Parameter attribute No. (Instance 1)

2) Inverter speed reading data example

To know the inverter speed, read the value of input instance 71.

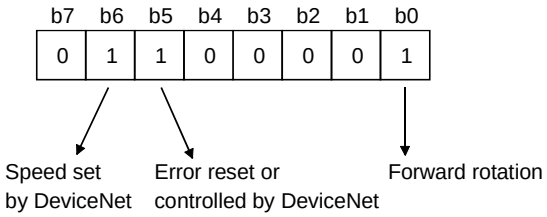
<Read data example: 60Hz forward running>

Input Instance 71		Description
BYTE 0	0xF4	
BYTE 1	0x00	—
BYTE 2	0x08	(Lower-byte data) (Upper-byte data) → Actual speed 0x0708 ⇒ 1800(r/min)
BYTE 3	0x07	

3) Running speed setting data example

When running the inverter at 900r/min (30Hz) in forward rotation, write the following data to output instance 21:

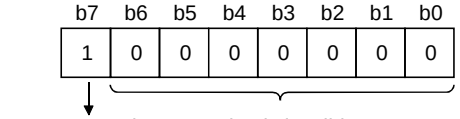
<Write data example: 30Hz forward rotation operation>

Output Instance 21		Description
BYTE 0	0x61	
BYTE 1	0x00	—
BYTE 2	0x84	(Lower-byte data) (Upper-byte data) Speed setting 0x0384⇒900(r/min)
BYTE 3	0x03	

4) Operation command setting data example

When sending the forward rotation and mid-speed commands to the inverter, use Class 0x2A, Attribute No. 114 to write the following data to output instance 26:

<Write data example: Forward rotation, mid-speed operation>

Output Instance 26		Description
BYTE 0	0x80	
BYTE 1	0x00	—
BYTE 2	0x12	(Lower-byte data) (Upper-byte data) Data of Class 0x2A, Attribute No. 114 (0x72) b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 RM STF
BYTE 3	0x00	
BYTE 4	0x2A	Parameter class
BYTE 5	0x72	Parameter attribute No. (Instance 1)

5) Inverter status reading data example

When reading the inverter status, use Class 0x2A, Attribute No. 114 to read data.

<Write data example: Perform write to request the Class 0x2A, Attribute No. 114 data>

Output Instance 26		Description
BYTE 0	0x61	b7 b6 b5 b4 b3 b2 b1 b0 = 0 1 1 0 0 0 0 1 Speed set by DeviceNet Error reset or controlled by DeviceNet Forward rotation
BYTE 1	0x00	—
BYTE 2	0x84	(Lower-byte data) (Upper-byte data) → Speed setting 0x0384 ⇒ 900(r/min)
BYTE 3	0x03	
BYTE 4	0x2A	Parameter class
BYTE 5	0x72	Parameter attribute No. (Instance 1)

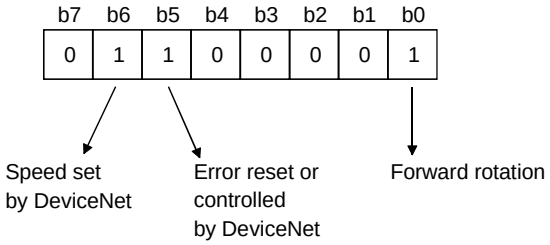
<Read data example: Read the Class 0x2A, Attribute No. 114 data>

Input Instance 76		Description
BYTE 0	0xF4	b7 b6 b5 b4 b3 b2 b1 b0 = 1 1 1 1 0 1 0 0 During operation at speed setting Speed being set by DeviceNet Error reset or controlled by DeviceNet During ready During forward rotation Inverter normal
BYTE 1	0x00	—
BYTE 2	0x84	(Lower-byte data) (Upper-byte data) → Actual speed 0x0384 ⇒ 900(r/min)
BYTE 3	0x03	
BYTE 4	0x4B	(Lower-byte data) Data of parameter class 0x2A, parameter attribute No. 114 (0x72) b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0 = 0 0 0 0 0 0 0 0 0 1 0 0 1 0 1 1 FU, SU, During forward rotation, RUN
BYTE 5	0x00	(Upper-byte data)

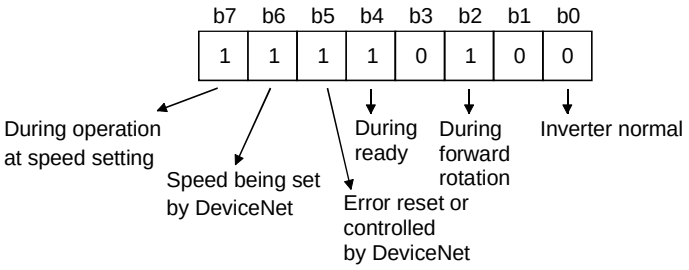
6) Parameter reading data example

When reading the setting of inverter's Pr. 0 "torque boost", use Class 0x66, Attribute No. 10 to read data.

<Write data example: Perform write to request the Class 0x66, Attribute No. 10 data>

Output Instance 26		Description
BYTE 0	0x61	
BYTE 1	0x00	—
BYTE 2	0x84	(Lower-byte data) (Upper-byte data) → Speed setting 0x0384 ⇒ 900(r/min)
BYTE 3	0x03	
BYTE 4	0x66	Parameter class
BYTE 5	0x0A	Parameter attribute No. (Instance 1)

<Read data example: Read the Class 0x66, Attribute No. 10 data>

Input Instance 76		Description
BYTE 0	0xF4	
BYTE 1	0x00	—
BYTE 2	0x84	(Lower-byte data) (Upper-byte data) → Actual speed 0x0384 ⇒ 900(r/min)
BYTE 3	0x03	
BYTE 4	0x1E	(Lower-byte data) (Upper-byte data) → Data of parameter class 0x66, parameter attribute No. 10 (0x0A) 0X001E ⇨ 30 (Represents 3.0% because of 0.1% increments)
BYTE 5	0x00	

7) Parameter writing data example

When setting 2.0% in Pr. 0 "torque boost" of the inverter, use Class 0x66, Attribute No. 10 to write the following data to output instance 26:

<Write data example: Pr. 0 = 2.0%>

Output Instance 26		Description
BYTE 0	0x80	b7 b6 b5 b4 b3 b2 b1 b0 1 0 0 0 0 0 0 0 Parameter write: Setting is invalid. (Ignored)
BYTE 1	0x00	—
BYTE 2	0x14	(Lower-byte data) → Data of parameter class 0x66, parameter attribute No. 10 (0x0A) 0X0014⇨20 (Represents 2.0% because of 0.1% increments)
BYTE 3	0x00	(Upper-byte data)
BYTE 4	0x66	Parameter class
BYTE 5	0x0A	Parameter attribute No. (Instance 1)

(3) Programming instructions

1) When designing software, use either of the following techniques:
   - Use of handshake technique
     After sending a request to the FR-A5ND option unit, wait for a reply from the option unit, and after receiving the reply, send the next request.
   - Considering the response time (refer to page 74) of the FR-A5ND, set the waiting time for the next request. For example, send the next request more than 30ms after sending a write request.

2) When the master station connected is of OMRON (Model C200HW-DRM21-V1, Model CVM1-DRM21-V1), use it after making either of the following master station settings:
   - Use it in the scan list disable mode.
   - When using it in the scan list enable mode, increase the master station's communication intervals more than 200ms.
     (Use OMRON's configurator to set the master station's communication intervals.)

3.9 Object Map

This section describes the object definitions for use of FR-A5ND DeviceNet. For details of the definitions, refer to ODVA's DeviceNet documentation.

Class	Object Name
0x01	Identity object
0x03	DeviceNet object
0x04	Assembly object
0x05	DeviceNet connection object
0x28	Motor data object
0x29	Control management object
0x2A	AC drive object
0x66	A500 expansion object I
0x67	A500 expansion object II

In the following tables, Get means read from the inverter and Set means write to the inverter.

3.9.1 Class 0x01 Identity object

(1) Class 0x01 Instance 0 attributes

Attribute No.	Access	Description	Type	Value
1	Get	Version of Class 0x01 object	Word	1
2	Get	Maximum instance count of Class 0x01	Word	1
6	Get	Maximum attribute count of Class 0x01	Word	7
7	Get	Maximum instance attribute count of Class 0x01	Word	7

(2) Class 0x01 Instance 0 service

Service Code	Service
0x0E	Read the attribute value.

(3) Class 0x01 Instance 1 attributes

Attribute No.	Access	Description	Type	Value
1	Get	Vendor ID (Mitsubishi Electric)	Word	82
2	Get	Product type (AC drive)	Word	02
3	Get	Product code	Word	500
4	Get	Version	Word	1.YYY (Note 1)
5	Get	Status	Word	0000
6	Get	Serial number	Word	XXXXXXXX (Note 2)
7	Get	Product name (FR-A500)	Word	A500 (Note 3)

Note 1. The upper byte of the read hexadecimal word data indicates the integer part and its lower byte indicates the fraction part. For example, the read data of 0x010A means version 1.010.

Note 2. The value changes with the product.

Note 3. The actual data stored are 0x04, 0x41, 0x35, 0x30 and 0x30. The first 0x04 indicates the 4-byte data and the others indicate "A500" in ASCII.

(4) Class 0x01 Instance 1 services

Service Code	Service	Definition
0x05	Reset or all parameter clear	0: Reset 1: All parameter clear
0x0E	Read the attribute value.	—

3.9.2 Class 0x03 DeviceNet object

(1) Class 0x03 Instance 1 attributes

Attribute No.	Access	Description	Range	Value
1	Get/Set	Node address setting (Note 1)	0 to 63	0
2	Get/Set	Baud rate setting (Note 1) 0: 125kbps 1: 250kbps 2: 500kbps	0, 1, 2	0
3	Get/Set	Bus off interrupt 0: On detection of bus off, the CAN chip is held in the reset status. 1: On detection of bus off, the CAN chip is reset and communication is continued.	0, 1	0
4	Get/Set	Bus off counter (Counts the number of times when the CAN chip is set to bus-off.)	0 to 255	0
5	Get	Allocation information	0 to 0xFFFF	0x0103
8	Get	Actual value of node address	0 to 63	0
9	Get	Actual value of baud rate	0, 1, 2	0

Note 1. May also be read using Class 0x67 Instance 1 Attributes 45 and 46.

Note 2. For detailed definitions, refer to the DeviceNet specifications Vol. I 5-5.

(2) Class 0x03 Instance 1 services

Service Code	Service
0x4B	Allocate
0x4C	Release
0x0E	Read the attribute value.
0x10	Write the attribute value.

3.9.3 Class 0x04 Assembly object

(1) Class 0x04 Output instance 20

Byte	Description							
0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	—	—	—	—	—	Fault Reset	—	Forward Rotation
1	—							
2	Speed setting (lower byte)							
3	Speed setting (upper byte)							

(2) Class 0x04 Output instance 21

Byte	Description							
0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	—	NetRef	NetCtrl	—	—	Fault Reset	Reverse Rotation	Forward Rotation
1	—							
2	Speed setting (lower byte)							
3	Speed setting (upper byte)							

(3) Class 0x04 Output instance 26

Byte	Description							
0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Write Param	NetRef	NetCtrl	—	—	Fault Reset	Reverse Rotation	Forward Rotation
1	00							
2	Speed setting or parameter write data (lower byte)							
3	Speed setting or parameter write data (upper byte)							
4	Parameter class							
5	Parameter attribute number							

Note 1. Before directing the inverter via the network, always turn on the bits of "NetCtrl" and "NetRef". If they are off, the inverter will not accept the directives even in the network operation mode.

Note 2. When issuing a command, always hold the forward/reverse rotation flag in the present running status. Transmitting a wrong status will change the running status.
(Example: The inverter will stop the output if bit 0 is turned off during the inverter forward rotation command.)

Note 3. Always set "0" in Byte 1 of output instance 26. The inverter will not recognize any other value as normal data.

(4) Class 0x04 Input instance 70

Byte	Description							
0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	—	—	—	—	—	Forward Rotation	—	Faulted
1	—							
2	Actual speed (lower byte)							
3	Actual speed (upper byte)							

(5) Class 0x04 Input instance 71

Byte	Description							
0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	At Ref Speed	Ref From Net	Ctrl From Net	Ready	Reverse Rotation	Forward Rotation	—	Faulted
1	—							
2	Actual speed (lower byte)							
3	Actual speed (upper byte)							

(6) Class 0x04 Input instance 76

Byte	Description							
0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	At Ref Speed	Ref From Net	Ctrl From Net	Ready	Reverse Rotation	Forward Rotation	—	Faulted
1	00							
2	Actual speed (lower byte)							
3	Actual speed (upper byte)							
4	Parameter read (lower byte)							
5	Parameter read (upper byte)							

3.9.4 Class 0x05 DeviceNet connection object

The FR-A5ND supports only Polled I/O and Explicit Messaging. It does not support Bit-Strobed I/O. Also, Instances 4 to 6 are the instances of Explicit Messaging.

(1) Class 0x05 Instance 1 attributes (Explicit Messaging)

Attribute No.	Access	Description	Range	Value
1	Get	Connection status 0: Non-existent 1: Configuring 2: Waiting for connection ID 3: Established 4: Timed Out 5: Deferred Delete	0 to 5	—
2	Get	Connection instance type 0: Explicit Messaging connection 1: Polled I/O connection	0,1	0
3	Get	Transport Trigger Class 0x83: Server Transport Class 3	0 to 0xFF	0x83
4	Get	Produced Connection ID	0 to 0xFFFF	—
5	Get	Consumed Connection ID	0 to 0xFFFF	—
6	Get	Initial Communication Characteristics (Defines the sending and receiving message groups) 0x22: Group 2 message in both sending and receiving	0 to 0xFF	0x22
7	Get	Produced Connection Size (Maximum number of bytes of the message body that may be sent)	0 to 0xFFFF	7
8	Get	Consumed Connection Size (Max. number of bytes of the message body that may be received)	0 to 0xFFFF	7
9	Get/Set	Expected Packet Rate(EPR)	0 to 0xFFFF	—
12	Get	Watch dog operation 0: Transition to timed out 1: Auto Delete 2: Auto reset 3: Deferred Delete	0 to 3	1
13	Get	Produced Connection Path Length	0 to 0xFFFF	0
14	Get	Produced Connection Path	0 to 0xFF	0x04
			0 to 0xFF	0x03
15	Get	Consumed Connection Path Length	0	0
16	Get	Consumed Connection Path	0 to 0xFF	0

Note: For detailed definitions, refer to the DeviceNet specifications Vol. I 5-4.

(2) Class 0x05 Instance 2 attributes (Polled I/O)

Attribute No.	Access	Description	Range	Value
1	Get	Connection status 0: Non-existent 1: Configuring 2: Waiting for connection ID 3: Established 4: Timed Out 5: Deferred Delete	0 to 5	—
2	Get	Connection instance type 0: Explicit Messaging connection 1: Polled I/O connection	0,1	0
3	Get	Transport Trigger Class 0x82: Server Transport Class 2	0 to 0xFF	0x82
4	Get	Produced Connection ID	0 to 0xFFFF	—
5	Get	Consumed Connection ID	0 to 0xFFFF	—
6	Get	Initial Communication Characteristics (Defines the sending and receiving message groups) 0x01: Sending Group 1 message, Receiving Group 2 message	0 to 0xFF	0x01
7	Get	Produced Connection Size (Note 1) (Maximum amount of I/O data that may be sent)	0 to 0xFFFF	4
8	Get	Consumed Connection Size (Note 1) (Max. amount of I/O data that may be received)	0 to 0xFFFF	4
9	Get/Set	Expected Packet Rate(EPR)	0 to 0xFFFF	0
12	Get	Watch dog operation 0: Transition to timed out 1: Auto Delete 2: Auto reset 3: Deferred Delete	0 to 3	0
13	Get	Produced Connection Path Length	0 to 0xFFFF	3
14	Get	Produced Connection Path (Note 2)	0 to 0xFF	0x62
			0 to 0xFF	0x34
			0 to 0xFF	0x37
15	Get	Consumed Connection Path Length	0 to 0xFFFF	3
16	Get	Consumed Connection Path (Note 2)	0 to 0xFF	0x62
			0 to 0xFF	0x31
			0 to 0xFF	0x35

Note 1. Depends on the communication data used. 4 for use of output instances 20, 21 and input instances 70, 71 or 6 for use of output instance 26 and input instance 76.

Note 2. As the Produced Connection Path and Consumed Connection Path, specify the application objects of the data to be transferred. Their structures are as follows.

0x62 0xMM 0xNN

0x62 (=logical address)

0xMM 0xNN: Application object data. The I/O instance numbers (hexadecimal) represented in ASCII.

Example: When output instance 21 and input instance 71 are used as communication data

(a) Produced Connection Path (send data)

Input instance 71 = 0x47

ASCII code: 4 = 0x34, 7 = 0x37

Hence, Produced Connection Path = 0x62 0x34 0x37

(b) Consumed Connection Path (receive data)

Output instance 21 = 0x15

ASCII code: 1 = 0x31, 5 = 0x35

Hence, Consumed Connection Path = 0x62 0x31 0x35

Note 3. For detailed definitions, refer to the DeviceNet specifications Vol. I 5-4.

(3) Class 0x05 Instance 4 attributes (Explicit Messaging)

Attribute No.	Access	Description	Range	Value
1	Get	Connection status	0 to 5	—
2	Get	Connection instance type	0,1	0
3	Get	Transport Trigger Class	0 to 0xFF	0x83
4	Get	Produced Connection ID	0 to 0xFFFF	—
5	Get	Consumed Connection ID	0 to 0xFFFF	—
6	Get	Initial Communication Characteristics	0 to 0xFF	0x22
7	Get	Produced Connection Size	0 to 0xFFFF	7
8	Get	Consumed Connection Size	0 to 0xFFFF	7
9	Get/Set	Expected Packet Rate(EPR)	0 to 0xFFFF	0x09c4
12	Get	Watch dog operation	0 to 3	1
13	Get	Produced Connection Path Length	0 to 0xFFFF	0
14	Get	Produced Connection Path	0 to 0xFF	0
15	Get	Consumed Connection Path Length	0	0
16	Get	Consumed Connection Path	0 to 0xFF	0x33

(4) Class 0x05 Instance 5 attributes (Explicit Messaging)

Attribute No.	Access	Description	Range	Value
1	Get	Connection status	0 to 5	—
2	Get	Connection instance type	0,1	0
3	Get	Transport Trigger Class	0 to 0xFF	0x83
4	Get	Produced Connection ID	0 to 0xFFFF	—
5	Get	Consumed Connection ID	0 to 0xFFFF	—
6	Get	Initial Communication Characteristics	0 to 0xFF	0x22
7	Get	Produced Connection Size	0 to 0xFFFF	7
8	Get	Consumed Connection Size	0 to 0xFFFF	7
9	Get/Set	Expected Packet Rate(EPR)	0 to 0xFFFF	0x09c4
12	Get	Watch dog operation	0 to 3	1
13	Get	Produced Connection Path Length	0 to 0xFFFF	0
14	Get	Produced Connection Path	0 to 0xFF	0
15	Get	Consumed Connection Path Length	0	0
16	Get	Consumed Connection Path	0 to 0xFF	0

(5) Class 0x05 Instance 6 attributes (Explicit Messaging)

Attribute No.	Access	Description	Range	Value
1	Get	Connection status	0 to 5	—
2	Get	Connection instance type	0,1	0
3	Get	Transport Trigger Class	0 to 0xFF	0x83
4	Get	Produced Connection ID	0 to 0xFFFF	—
5	Get	Consumed Connection ID	0 to 0xFFFF	—
6	Get	Initial Communication Characteristics	0 to 0xFF	0x22
7	Get	Produced Connection Size	0 to 0xFFFF	7
8	Get	Consumed Connection Size	0 to 0xFFFF	7
9	Get/Set	Expected Packet Rate(EPR)	0 to 0xFFFF	0x09c4
12	Get	Watch dog operation	0 to 3	1
13	Get	Produced Connection Path Length	0 to 0xFFFF	0
14	Get	Produced Connection Path	0 to 0xFF	0
15	Get	Consumed Connection Path Length	0	0
16	Get	Consumed Connection Path	0 to 0xFF	0

(6) Class 0x05 Instance 1, 2, 4, 5, 6 services

Service Code	Service
0x0E	Read the attribute value.
0x10	Write the attribute value.

3.9.5 Class 0x28 Motor data object

(1) Class 0x28 Instance 1 attributes

Attribute No.	Access	Description	Range	Value
3	Get/Set	Motor type 7: Squirrel-cage induction motor	0 to 10	7 (fixed value)
6	Get/Set	Rated motor current (Pr. 9 "Electronic thermal O/L relay")	0 to 0xFFFF	0x00FF
7	Get/Set	Rated motor voltage (Pr. 83)	0 to 0xFFFF	0x07D0
8	Get/Set	Motor capacity (Pr. 80)	0 to 0xFFFF	0xFFFF
9	Get/Set	Rated motor frequency (Pr. 84)	0 to 0xFFFF	0x1770
12	Get/Set	Number of motor poles (Pr. 81)	0 to 0xFFFF	4
15	Get/Set	Base frequency (Pr. 3)	0 to 0xFFFF	0x0708

Note 1. Pr. 80 to Pr. 84 are not available for the FR-F500.

Note 2. For detailed definitions, refer to the DeviceNet specifications Vol. II 6-28.

(2) Class 0x28 Instance 1 services

Service Code	Service
0x0E	Read the attribute value.
0x10	Write the attribute value.

3.9.6 Class 0x29 Control management object

(1) Class 0x29 Instance 1 attributes

Attribute No.	Access	Description	Range	Value
3	Get/Set	Forward rotation 0: Stop 1: Forward rotation	0, 1	0
4	Get/Set	Reverse rotation 0: Stop 1: Reverse rotation	0, 1	0
5	Get/Set	Operation command write (Pr. 338) (Note 1) 0: Other than DeviceNet communication operation 1: DeviceNet communication operation (The actual operation command right status can be monitored using Attribute No. 15.)	0, 1	1
6	Get	Status 1: Start up 2: Not Ready 3: Ready 4: Enabled 5: Stopping 6: Fault-Stop 7: Faulted	1 to 7	3
7	Get	Forward rotation command 0: Without forward rotation command 1: With forward rotation command	0, 1	0
8	Get	Reverse rotation command 0: Without reverse rotation command 1: With reverse rotation command	0, 1	0
9	Get	Ready 0: Communication disabled 1: Communication enabled	0, 1	1
10	Get	Error 0: Without error 1: Error occurrence (latch)	0, 1	0
12	Get/Set	Error reset (Note 2) 0: Reset canceled 1: Reset executed	0, 1	0
15	Get	Operation command write monitor (Note 3) 0: Other than DeviceNet communication operation 1: DeviceNet communication operation	0, 1	1
16	Get/Set	DN failure mode (Operation performed when communication is broken) 0: Error occurrence and stop	0	0
40	Get/Set	Input assembly	70 to 76	0x47(71)
41	Get/Set	Output assembly	20 to 26	0x15(21)

Note 1. The logic is opposite to that of Pr. 338. (Attribute No. 5 = 1 is equivalent to Pr. 338 = 0.)

Note 2. After setting data to 1 and executing a reset, a reset cannot be executed again unless the data is set to 0 once to cancel a reset.

Note 3. This data is updated only after an inverter reset or operation cycle.

Note 4. For detailed definitions, refer to the DeviceNet specifications Vol. II 6-29.

(2) Class 0x29 Instance 1 services

Service Code	Service
0x0E	Read the attribute value.
0x10	Write the attribute value.

3.9.7 Class 0x2A AC drive object

(1) Class 0x2A Instance 1 attributes

AC Profile Compatibles

Attribute No.	Access	Description	Value
1	Get	Number of attributes supported	1
3	Get	Up to frequency 1: Speed reaches the speed command value.	0
4	Get/Set	Speed command write (Pr. 339) (Note 1) 0: Other than DeviceNet communication operation 1: DeviceNet communication operation (The actual speed command right status can be monitored using Attribute No. 29.)	1
6	Get/Set	Operation mode	0 (fixed value)
7	Get	Actual speed	0
8	Get/Set	Speed setting	0
9	Get	Actual current	0
15	Get	Actual power	0
17	Get	Output voltage	0
18	Get/Set	Acceleration time (Pr. 7)	0x0032
19	Get/Set	Deceleration time (Pr. 8)	0x0032
20	Get/Set	Minimum frequency (Pr. 2)	0
21	Get/Set	Maximum frequency (Pr. 1)	0xFFFF
29	Get	Speed command write monitor (Note 2) 0: Other than DeviceNet communication operation 1: DeviceNet communication operation	1

Note 1. The logic is opposite to that of Pr. 339. (Attribute No. 4 = 1 is equivalent to Pr. 339 = 0.)
Note 2. This data is updated only after an inverter reset or operation cycle.
Note 3. For detailed definitions, refer to the DeviceNet specifications Vol. II 6-30.

The following variables and parameters are specific to the FR-A500 series.

System Environment Variables

Attribute No.	Access	Description	Value
100	Set	User clear setting	0
101	Set	Inverter reset	0
102	Set	Parameter clear	0x965A
103	Set	All parameter clear	0x99AA
104	Set	Parameter user clear	0x5A55
105	Set	Parameter clear (external communication parameters)	0x5A96
106	Set	All parameter clear (external communication parameters)	0xAA99
107	Set	Parameter user clear (external communication parameters)	0x555A
112	Get/Set	Running frequency (RAM) (Note 1)	30.00Hz
113	Set	Running frequency (EEPROM) (Note 1)	30.00Hz
114	Get/Set	Inverter status/control input command (Note 2)	—
115	Get/Set	Jog operation frequency (setting)	5.00Hz
120	Get/Set	Operation mode read (Get) 0: External operation 1: PU operation 2: External jog 3: PU jog 4: DeviceNet communication operation 5: PU-external combined operation 6: Programmed operation Operation mode write (Set) 0x10: External operation 0x11: PU operation 0x14: DeviceNet communication operation (The operation mode may be changed to the PU operation mode from communication only when Pr. 79 = 6.)	—

Note 1. Data of No. 112 and 113 can be read from No. 112.

Note 2. Inverter status (Get)

b7	b6	b5	b4	b3	b2	b1	b0
ABC	FU	IPF	OL	SU	Reverse rotation	Forward rotation	RUN

Control input command (Set)

b15-b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
0	MRS	CS(*)	AU(*)	RT(*)	JOG(*)	RL(*)	RM(*)	RH(*)	STR	STF	0

The input signals marked * can be changed using Pr. 180 to Pr. 186 (input terminal function selection).

Monitor items

Attribute No.	Access	Description	Value
141	Get/Set	Alarm history 1 (Note 1)/all alarm history clear (Note 2)	0
142	Get	Alarm history 2 (Note 1)	—
143	Get	Alarm history 3 (Note 1)	—
144	Get	Alarm history 4 (Note 1)	—
145	Get	Alarm history 5 (Note 1)	—
146	Get	Alarm history 6 (Note 1)	—
147	Get	Alarm history 7 (Note 1)	—
148	Get	Alarm history 8 (Note 1)	—
170	Get	Output frequency (minimum setting increments 0.01Hz)	—
171	Get	Output current (minimum setting increments 0.1A)	—
172	Get	Output voltage (minimum setting increments 0.1V)	—
174	Get	Frequency setting (minimum setting increments 0.01Hz)	—
175	Get	Running speed (minimum setting increments 1r/min)	—
176	Get	Motor torque (minimum setting increments 0.1%)	—
177	Get	Converter voltage (minimum setting increments 0.1V)	—
178	Get	Brake duty (minimum setting increments 0.1%)	—
179	Get	Electronic overcurrent protection load factor (minimum setting increments 0.1%)	—
180	Get	Peak current (minimum setting increments 0.01A)	—
182	Get	Input power (minimum setting increments 0.01kW)	—
183	Get	Output power (minimum setting increments 0.01kW)	—
184	Get	Input terminal status (Note 3)	—
185	Get	Output terminal status (Note 3)	—
186	Get	Load meter (minimum setting increments 0.1%)	—
187	Get	Motor exciting current (minimum setting increments 0.01A)	—
188	Get	Position pulse (minimum setting increments 1 pulse) (Note 4)	—
189	Get	Cumulative energization time (minimum setting increments 1 hr)	—
191	Get	Orientation status (Note 4)	—
192	Get	Actual operation time (minimum setting increments 1 hr)	—
193	Get	Motor load factor (minimum setting increments 0.1%)	—
194	Get	Cumulative power (minimum setting increments 1kwh)	—

Note 1. For the alarm history, refer to the following alarm code-alarm definition correspondence table.

Note 2. Writing any value clears the alarm history.

Note 3. For the terminal monitor bit map, refer to Section 3.7 (2) Monitoring (page 87).

Note 4. Valid only when the FR-A5AP is plugged in.

Alarm code list

Code	Definition	Code	Definition	Code	Definition
0x10	OC1	0x70	BE	0xC1	CTE
0x11	OC2	0x80	GF	0xC2	P24
0x12	OC3	0x81	LF	0xD5	Mb1
0x20	OV1	0x90	OHT	0xD6	Mb2
0x21	OV2	0xA0	OPT	0xD7	Mb3
0x22	OV3	0xA1	OP1	0xD8	Mb4
0x30	THT	0xA2	OP2	0xD9	Mb5
0x31	THM	0xA3	OP3	0xDA	Mb6
0x40	FIN	0xB0	PE	0xDB	Mb7
0x50	IPF	0xB1	PUE	0xF6	E6
0x51	UVT	0xB2	RET	0xF7	E7
0x60	OLT	0xC0	CPU		

(2) Class 0x2A Instance 1 services

Service Code	Service
0x0E	Read the attribute value.
0x10	Write the attribute value.

3.9.8 Class 0x66 A500 expansion object I

(1) Class 0x66 Instance 1 attributes

Parameters

Attribute No.	Access	A500 Pr. Number	Description	Value
10	Get/Set	Pr. 0	Torque boost (manual)	6.0%
11	Get/Set	Pr. 1	Maximum frequency	120.00Hz
12	Get/Set	Pr. 2	Minimum frequency	0.00Hz
13	Get/Set	Pr. 3	Base frequency	60.00Hz
14	Get/Set	Pr. 4	Multi-speed setting (high speed)	60.00Hz
15	Get/Set	Pr. 5	Multi-speed setting (middle speed)	30.00Hz
16	Get/Set	Pr. 6	Multi-speed setting (low speed)	10.00Hz
17	Get/Set	Pr. 7	Acceleration time	5.0s
18	Get/Set	Pr. 8	Deceleration time	5.0s
19	Get/Set	Pr. 9	Electronic thermal O/L relay	Rated output current
20	Get/Set	Pr. 10	DC injection brake operation frequency	3.00Hz
21	Get/Set	Pr. 11	DC injection brake operation time	0.5s
22	Get/Set	Pr. 12	DC injection brake voltage	0
23	Get/Set	Pr. 13	Starting frequency	0.5Hz
24	Get/Set	Pr. 14	Load pattern selection	0
25	Get/Set	Pr. 15	Jog frequency	5.00Hz
26	Get/Set	Pr. 16	Jog acceleration/deceleration time	0.5s
27	Get/Set	Pr. 17	MRS input selection	0
28	Get/Set	Pr. 18	High-speed maximum frequency (Note 1)	120.00Hz
29	Get/Set	Pr. 19	Base frequency voltage	6553.5V
30	Get/Set	Pr. 20	Acceleration/deceleration reference frequency	60.00Hz
31	Get/Set	Pr. 21	Acceleration/deceleration time increments	0
32	Get/Set	Pr. 22	Stall prevention operation level	150.0%
33	Get/Set	Pr. 23	Stall prevention operation level at double speed	655.35Hz
34	Get/Set	Pr. 24	Multi-speed setting (speed 4)	655.35Hz
35	Get/Set	Pr. 25	Multi-speed setting (speed 5)	655.35Hz
36	Get/Set	Pr. 26	Multi-speed setting (speed 6)	655.35Hz
37	Get/Set	Pr. 27	Multi-speed setting (speed 7)	655.35Hz
38	Get/Set	Pr. 28	Multi-speed input compensation	0
39	Get/Set	Pr. 29	Acceleration/deceleration pattern	0
40	Get/Set	Pr. 30	Regenerative function selection	0
41	Get/Set	Pr. 31	Frequency jump 1A	655.35Hz
42	Get/Set	Pr. 32	Frequency jump 1B	655.35Hz
43	Get/Set	Pr. 33	Frequency jump 2A	655.35Hz
44	Get/Set	Pr. 34	Frequency jump 2B	655.35Hz
45	Get/Set	Pr. 35	Frequency jump 3A	655.35Hz
46	Get/Set	Pr. 36	Frequency jump 3B	655.35Hz
47	Get/Set	Pr. 37	Speed display	0
51	Get/Set	Pr. 41	Up-to-frequency sensitivity	10.0%
52	Get/Set	Pr. 42	Output frequency detection	6.00Hz
53	Get/Set	Pr. 43	Output frequency detection for reverse rotation	655.35Hz
54	Get/Set	Pr. 44	Second acceleration/deceleration time	5.0s
55	Get/Set	Pr. 45	Second deceleration time	6553.5s
56	Get/Set	Pr. 46	Second torque boost	6553.5%
57	Get/Set	Pr. 47	Second V/F (base frequency)	655.35Hz
58	Get/Set	Pr. 48	Second stall prevention operation current	150.0%
59	Get/Set	Pr. 49	Second stall prevention operation frequency	30.00Hz

Parameters

Attribute No.	Access	A500 Pr. Number	Description	Value
60	Get/Set	Pr. 50	Second output frequency detection	0.01Hz
61	Get/Set	Pr. 51	Inverter LED display data selection	1
62	Get/Set	Pr. 52	DU/PU main display data selection	0
63	Get/Set	Pr. 53	PU level display data selection	—
64	Get/Set	Pr. 54	FM terminal function selection	1
65	Get/Set	Pr. 55	Frequency monitoring reference	60.00Hz
66	Get/Set	Pr. 56	Current monitoring reference	Rated output current
67	Get/Set	Pr. 57	Restart coasting time	9999
68	Get/Set	Pr. 58	Restart cushion time	1.0s
69	Get/Set	Pr. 59	Remote setting function selection	0
70	Get/Set	Pr. 60	Intelligent mode selection	0
75	Get/Set	Pr. 65	Retry selection	0
76	Get/Set	Pr. 66	Stall prevention operation reduction starting frequency	60.00Hz
77	Get/Set	Pr. 67	Number of retries at alarm occurrence	0
78	Get/Set	Pr. 68	Retry waiting time	1.0s
79	Get/Set	Pr. 69	Retry count display erasure	0
80	Get/Set	Pr. 70	Special regenerative brake duty (Note 1)	0.0%
81	Get/Set	Pr. 71	Applied motor	0
82	Get/Set	Pr. 72	PWM frequency selection	2kHz
83	Get/Set	Pr. 73	0-5V/0-10V selection	1
84	Get/Set	Pr. 74	Filter time constant	1
85	Get/Set	Pr. 75	Reset selection/disconnected PU detection/PU stop selection	14
86	Get/Set	Pr. 76	Alarm code output selection	0
87	Get/Set	Pr. 77	Parameter write disable	0
88	Get/Set	Pr. 78	Reverse rotation prevention selection	0
89	Get/Set	Pr. 79	Operation mode selection	0
90	Get/Set	Pr. 80	Motor capacity (Note 1)	655.35kW
91	Get/Set	Pr. 81	Number of motor poles (Note 1)	65535
92	Get/Set	Pr. 82	Motor exciting current (Note 1)	655.35A
93	Get/Set	Pr. 83	Rated motor voltage (Note 1)	Rated voltage
94	Get/Set	Pr. 84	Rated motor frequency (Note 1)	60.00Hz
99	Get/Set	Pr. 89	Speed control gain (Note 1)	100.0%
100	Get/Set	Pr. 90	Motor constant R1 (Note 1)	65535
101	Get/Set	Pr. 91	Motor constant R2 (Note 1)	65535
102	Get/Set	Pr. 92	Motor constant L1 (Note 1)	65535
103	Get/Set	Pr. 93	Motor constant L2 (Note 1)	65535
104	Get/Set	Pr. 94	Motor constant X (Note 1)	65535
105	Get/Set	Pr. 95	Online auto tuning selection (Note 1)	0
106	Get/Set	Pr. 96	Auto tuning setting/status (Note 1)	0
110	Get/Set	Pr. 100	V/F1 (first frequency)	655.35Hz
111	Get/Set	Pr. 101	V/F1 (first frequency voltage)	0.0V
112	Get/Set	Pr. 102	V/F2 (second frequency)	655.35Hz
113	Get/Set	Pr. 103	V/F2 (second frequency voltage)	0.0V
114	Get/Set	Pr. 104	V/F3 (third frequency)	655.35Hz
115	Get/Set	Pr. 105	V/F3 (third frequency voltage)	0.0V
116	Get/Set	Pr. 106	V/F4 (fourth frequency)	655.35Hz
117	Get/Set	Pr. 107	V/F4 (fourth frequency voltage)	0.0V
118	Get/Set	Pr. 108	V/F5 (fifth frequency)	655.35Hz
119	Get/Set	Pr. 109	V/F5 (fifth frequency voltage)	0.0V
120	Get/Set	Pr. 110	Third acceleration/deceleration time (Note 1)	6553.5s

Parameters

Attribute No.	Access	A500 Pr. Number	Description	Value
121	Get/Set	Pr. 111	Third deceleration time (Note 1)	6553.5s
122	Get/Set	Pr. 112	Third torque boost (Note 1)	6553.5%
123	Get/Set	Pr. 113	Third V/F (base frequency) (Note 1)	655.35Hz
124	Get/Set	Pr. 114	Third stall prevention operation current (Note 1)	150.0%
125	Get/Set	Pr. 115	Third stall prevention operation frequency (Note 1)	0.00%
126	Get/Set	Pr. 116	Third output frequency detection	655.35Hz
127	Get/Set	Pr. 117	Station number	0
128	Get/Set	Pr. 118	Communication speed	192
129	Get/Set	Pr. 119	Stop bit length	1
130	Get/Set	Pr. 120	Parity check presence/absence	2
131	Get/Set	Pr. 121	Number of communication retries	1
132	Get/Set	Pr. 122	Communication check time interval	0.0s
133	Get/Set	Pr. 123	Waiting time setting	65535ms
134	Get/Set	Pr. 124	CR, LF presence/absence selection	1
138	Get/Set	Pr. 128	PID action selection	10
139	Get/Set	Pr. 129	PID proportional band	10.0%
140	Get/Set	Pr. 130	PID integral time	1.0s
141	Get/Set	Pr. 131	PID upper limit	6553.5%
142	Get/Set	Pr. 132	PID lower limit	6553.5%
143	Get/Set	Pr. 133	PID action set point for PU operation	0.00%
144	Get/Set	Pr. 134	PID differential time	6553.5s
145	Get/Set	Pr. 135	Commercial power supply-inverter switch-over sequence output terminal selection	0
146	Get/Set	Pr. 136	MC switch-over interlock time	1.0s
147	Get/Set	Pr. 137	Start waiting time	0.5s
148	Get/Set	Pr. 138	Commercial power supply-inverter switch-over selection at alarm occurrence	0
149	Get/Set	Pr. 139	Automatic inverter-commercial power supply switch-over frequency	9999
150	Get/Set	Pr. 140	Backlash acceleration stopping frequency	1.00Hz
151	Get/Set	Pr. 141	Backlash acceleration stopping time	0.5s
152	Get/Set	Pr. 142	Backlash deceleration stopping frequency	1.00Hz
153	Get/Set	Pr. 143	Backlash deceleration stopping time	0.5s
154	Get/Set	Pr. 144	Speed setting switch-over	4
158	Get/Set	Pr. 148	Stall prevention level at 0V input	0
159	Get/Set	Pr. 149	Stall prevention level at 10V input	0
160	Get/Set	Pr. 150	Output current detection level (Note 1)	150.0%
161	Get/Set	Pr. 151	Output current detection period (Note 1)	0.0s
162	Get/Set	Pr. 152	Zero current detection level	5.0%
163	Get/Set	Pr. 153	Zero current detection period	0.5s
164	Get/Set	Pr. 154	Voltage reduction selection during stall prevention operation	1
165	Get/Set	Pr. 155	RT activated condition	0
166	Get/Set	Pr. 156	Stall prevention operation selection	0
167	Get/Set	Pr. 157	OL signal waiting time	0.0
168	Get/Set	Pr. 158	AM terminal function selection	1
170	Get/Set	Pr. 160	User group read selection	1
172	Get/Set	Pr. 162	Automatic restart after instantaneous power failure selection	0
173	Get/Set	Pr. 163	First cushion time for restart	0.0s
174	Get/Set	Pr. 164	First cushion voltage for restart	0.0%
175	Get/Set	Pr. 165	Restart stall prevention operation level	150.0%
180	Get/Set	Pr. 170	Watt-hour meter clear	0
181	Get/Set	Pr. 171	Actual operation hour meter clear	0
183	Get/Set	Pr. 173	User group 1 registration	0

Parameters

Attribute No.	Access	A500 Pr. Number	Description	Value
184	Get/Set	Pr. 174	User group 1 deletion	0
185	Get/Set	Pr. 175	User group 2 registration	0
186	Get/Set	Pr. 176	User group 2 deletion	0
190	Get/Set	Pr. 180	RL terminal function selection	0
191	Get/Set	Pr. 181	RM terminal function selection	1
192	Get/Set	Pr. 182	RH terminal function selection	2
193	Get/Set	Pr. 183	RT terminal function selection	3
194	Get/Set	Pr. 184	AU terminal function selection	4
195	Get/Set	Pr. 185	JOG terminal function selection	5
196	Get/Set	Pr. 186	CS terminal function selection	6
200	Get/Set	Pr. 190	RUN terminal function selection	0
201	Get/Set	Pr. 191	SU terminal function selection	1
202	Get/Set	Pr. 192	IPF terminal function selection	2
203	Get/Set	Pr. 193	OL terminal function selection	3
204	Get/Set	Pr. 194	FU terminal function selection	4
205	Get/Set	Pr. 195	ABC terminal function selection	99
209	Get/Set	Pr. 199	User's initial value setting	0
212	Get/Set	Pr. 232	Multi-speed setting (speed 8) (Note 1)	655.35Hz
213	Get/Set	Pr. 233	Multi-speed setting (speed 9) (Note 1)	655.35Hz
214	Get/Set	Pr. 234	Multi-speed setting (speed 10) (Note 1)	655.35Hz
215	Get/Set	Pr. 235	Multi-speed setting (speed 11) (Note 1)	655.35Hz
216	Get/Set	Pr. 236	Multi-speed setting (speed 12) (Note 1)	655.35Hz
217	Get/Set	Pr. 237	Multi-speed setting (speed 13) (Note 1)	655.35Hz
218	Get/Set	Pr. 238	Multi-speed setting (speed 14) (Note 1)	655.35Hz
219	Get/Set	Pr. 239	Multi-speed setting (speed 15) (Note 1)	655.35Hz
241	Get/Set	Pr. 261	Power failure stop function (Note 1)	0
242	Get/Set	Pr. 262	Subtracted frequency at deceleration start (Note 1)	3.00Hz
243	Get/Set	Pr. 263	Subtraction starting frequency (Note 1)	60.00Hz
244	Get/Set	Pr. 264	Power-failure deceleration time 1 (Note 1)	5.0s
245	Get/Set	Pr. 265	Power-failure deceleration time 2 (Note 1)	6553.5s
246	Get/Set	Pr. 266	Power-failure deceleration time switch-over frequency (Note 1)	60.00Hz

Note 1. Parameters designed for the FR-A500 only. Not supported by the FR-F500.

Note 2. Values 65535, 6553.5 and 655.35 indicate that the functions are invalid and have the same meaning as 9999 displayed on the DU/PU.

Note 3. For details, refer to the FR-A500 or FR-F500 instruction manual.

Note 4. A change in the No. 31 value changes the setting increments of the inverter but is not reflected on DeviceNet.

(2) Class 0x66 Instance 1 services

Service Code	Service
0x0E	Read the attribute value.
0x10	Write the attribute value.

3.9.9 Class 0x67 A500 expansion object II

(1) Class 0x67 Instance 1 attributes

Parameters

Attribute No.	Access	A500 Pr. Number	Description	Value
10	Get/Set	Pr. 270	Stop-on-contact/load torque high-speed frequency control selection	0
11	Get/Set	Pr. 271	High-speed setting maximum current	50.0%
12	Get/Set	Pr. 272	Mid-speed setting minimum current	100.0%
13	Get/Set	Pr. 273	Current averaging range	655.35Hz
14	Get/Set	Pr. 274	Current averaging filter constant	16
15	Get/Set	Pr. 275	Stop-on-contact exciting current low-speed multiplying factor	6553.5%
16	Get/Set	Pr. 276	Stop-on-contact PWM carrier frequency	65535
18	Get/Set	Pr. 278	Brake opening frequency	3.00Hz
19	Get/Set	Pr. 279	Brake opening current	130.0%
20	Get/Set	Pr. 280	Brake opening current detection time	0.3s
21	Get/Set	Pr. 281	Brake operation time at start	0.3s
22	Get/Set	Pr. 282	Brake closing frequency	6.00Hz
23	Get/Set	Pr. 283	Brake operation time at stop	0.3s
24	Get/Set	Pr. 284	Deceleration detection function selection	0
25	Get/Set	Pr. 285	Overspeed detection frequency	655.35Hz
38	Get/Set	Pr. 338	Operation command right	0
39	Get/Set	Pr. 339	Speed command right	0
40	Get/Set	Pr. 340	Link start mode selection	0
42	Get/Set	Pr. 342	EEPROM write setting by PC link/computer link	0
45	Get	Pr. 345	DeviceNet address start data	41023
46	Get	Pr. 346	DeviceNet baud rate start data	20612
67	Get/Set	Pr. 367	Speed feedback range	0
68	Get/Set	Pr. 368	Feedback gain	0
100	Get/Set	Pr. 200	Programmed operation minute/second selection	0
101	Get/Set	Pr. 201	Program setting 1 time	0.00 time
102	Get/Set	Pr. 201	Program setting 1 direction	0
103	Get/Set	Pr. 201	Program setting 1 frequency	6553.5Hz
104	Get/Set	Pr. 202	Program setting 2 time	0.00 time
105	Get/Set	Pr. 202	Program setting 2 direction	0
106	Get/Set	Pr. 202	Program setting 2 frequency	6553.5Hz
107	Get/Set	Pr. 203	Program setting 3 time	0.00 time
108	Get/Set	Pr. 203	Program setting 3 direction	0
109	Get/Set	Pr. 203	Program setting 3 frequency	6553.5Hz
110	Get/Set	Pr. 204	Program setting 4 time	0.00 time
111	Get/Set	Pr. 204	Program setting 4 direction	0
112	Get/Set	Pr. 204	Program setting 4 frequency	6553.5Hz
113	Get/Set	Pr. 205	Program setting 5 time	0.00 time
114	Get/Set	Pr. 205	Program setting 5 direction	0
115	Get/Set	Pr. 205	Program setting 5 frequency	6553.5Hz
116	Get/Set	Pr. 206	Program setting 6 time	0.00 time
117	Get/Set	Pr. 206	Program setting 6 direction	0
118	Get/Set	Pr. 206	Program setting 6 frequency	6553.5Hz
119	Get/Set	Pr. 207	Program setting 7 time	0.00 time
120	Get/Set	Pr. 207	Program setting 7 direction	0
121	Get/Set	Pr. 207	Program setting 7 frequency	6553.5Hz
122	Get/Set	Pr. 208	Program setting 8 time	0.00 time
123	Get/Set	Pr. 208	Program setting 8 direction	0
124	Get/Set	Pr. 208	Program setting 8 frequency	6553.5Hz
125	Get/Set	Pr. 209	Program setting 9 time	0.00 time
126	Get/Set	Pr. 209	Program setting 9 direction	0

Parameters

Attribute No.	Access	A500 Pr. Number	Description	Value
127	Get/Set	Pr. 209	Program setting 9 frequency	6553.5Hz
128	Get/Set	Pr. 210	Program setting 10 time	0.00 time
129	Get/Set	Pr. 210	Program setting 10 direction	0
130	Get/Set	Pr. 210	Program setting 10 frequency	6553.5Hz
131	Get/Set	Pr. 211	Program setting 11 time	0.00 time
132	Get/Set	Pr. 211	Program setting 11 direction	0
133	Get/Set	Pr. 211	Program setting 11 frequency	6553.5Hz
134	Get/Set	Pr. 212	Program setting 12 time	0.00 time
135	Get/Set	Pr. 212	Program setting 12 direction	0
136	Get/Set	Pr. 212	Program setting 12 frequency	6553.5Hz
137	Get/Set	Pr. 213	Program setting 13 time	0.00 time
138	Get/Set	Pr. 213	Program setting 13 direction	0
139	Get/Set	Pr. 213	Program setting 13 frequency	6553.5Hz
140	Get/Set	Pr. 214	Program setting 14 time	0.00 time
141	Get/Set	Pr. 214	Program setting 14 direction	0
142	Get/Set	Pr. 214	Program setting 14 frequency	6553.5Hz
143	Get/Set	Pr. 215	Program setting 15 time	0.00 time
144	Get/Set	Pr. 215	Program setting 15 direction	0
145	Get/Set	Pr. 215	Program setting 15 frequency	6553.5Hz
146	Get/Set	Pr. 216	Program setting 16 time	0.00 time
147	Get/Set	Pr. 216	Program setting 16 direction	0
148	Get/Set	Pr. 216	Program setting 16 frequency	6553.5Hz
149	Get/Set	Pr. 217	Program setting 17 time	0.00 time
150	Get/Set	Pr. 217	Program setting 17 direction	0
151	Get/Set	Pr. 217	Program setting 17 frequency	6553.5Hz
152	Get/Set	Pr. 218	Program setting 18 time	0.00 time
153	Get/Set	Pr. 218	Program setting 18 direction	0
154	Get/Set	Pr. 218	Program setting 18 frequency	6553.5Hz
155	Get/Set	Pr. 219	Program setting 19 time	0.00 time
156	Get/Set	Pr. 219	Program setting 19 direction	0
157	Get/Set	Pr. 219	Program setting 19 frequency	6553.5Hz
158	Get/Set	Pr. 220	Program setting 20 time	0.00 time
159	Get/Set	Pr. 220	Program setting 20 direction	0
160	Get/Set	Pr. 220	Program setting 20 frequency	6553.5Hz
161	Get/Set	Pr. 221	Program setting 21 time	0.00 time
162	Get/Set	Pr. 221	Program setting 21 direction	0
163	Get/Set	Pr. 221	Program setting 21 frequency	6553.5Hz
164	Get/Set	Pr. 222	Program setting 22 time	0.00 time
165	Get/Set	Pr. 222	Program setting 22 direction	0
166	Get/Set	Pr. 222	Program setting 22 frequency	6553.5Hz
167	Get/Set	Pr. 223	Program setting 23 time	0.00 time
168	Get/Set	Pr. 223	Program setting 23 direction	0
169	Get/Set	Pr. 223	Program setting 23 frequency	6553.5Hz
170	Get/Set	Pr. 224	Program setting 24 time	0.00 time
171	Get/Set	Pr. 224	Program setting 24 direction	0
172	Get/Set	Pr. 224	Program setting 24 frequency	6553.5Hz
173	Get/Set	Pr. 225	Program setting 25 time	0.00 time
174	Get/Set	Pr. 225	Program setting 25 direction	0
175	Get/Set	Pr. 225	Program setting 25 frequency	6553.5Hz
176	Get/Set	Pr. 226	Program setting 26 time	0.00 time
177	Get/Set	Pr. 226	Program setting 26 direction	0

Parameters

Attribute No.	Access	A500 Pr. Number	Description	Value
178	Get/Set	Pr. 226	Program setting 26 frequency	6553.5Hz
179	Get/Set	Pr. 227	Program setting 27 time	0.00 time
180	Get/Set	Pr. 227	Program setting 27 direction	0
181	Get/Set	Pr. 227	Program setting 27 frequency	6553.5Hz
182	Get/Set	Pr. 228	Program setting 28 time	0.00 time
183	Get/Set	Pr. 228	Program setting 28 direction	0
184	Get/Set	Pr. 228	Program setting 28 frequency	6553.5Hz
185	Get/Set	Pr. 229	Program setting 29 time	0.00 time
186	Get/Set	Pr. 229	Program setting 29 direction	0
187	Get/Set	Pr. 229	Program setting 29 frequency	6553.5Hz
188	Get/Set	Pr. 230	Program setting 30 time	0.00 time
189	Get/Set	Pr. 230	Program setting 30 direction	0
190	Get/Set	Pr. 230	Program setting 30 frequency	6553.5Hz
191	Get/Set	Pr. 231	Timer setting	0

The relationships between PU reading and DeviceNet reading are as follows:

PU = hh: mm → DeviceNet = tt = 256 × mm + hh

DeviceNet = tt → PU = mm = Quotient of (tt/256)

hh = tt - 256 × mm

Example: 4 hours 45 minutes

PU = 4 : 45,Devicenet = tt = 256 × 45 + 4 = 11524

DeviceNet = tt = 11524,PU = mm = 11524/256 = 45

hh = 11524 - (256 × 45) = 4

Parameters

Attribute No.	Access	A500 Pr. Number	Description	Value
200	Get/Set	Pr. 900	FM terminal calibration	1359
201	Get/Set	Pr. 901	AM terminal calibration	3522
202	Get/Set	Pr. 902	Frequency setting voltage bias - frequency	0.00Hz
203	Get/Set	Pr. 902	Frequency setting voltage bias - percentage	0.0%
204	Get/Set	Pr. 903	Frequency setting voltage gain - frequency	60.00Hz
205	Get/Set	Pr. 903	Frequency setting voltage gain - percentage	97.0%
206	Get/Set	Pr. 904	Frequency setting current bias - frequency	0.00Hz
207	Get/Set	Pr. 904	Frequency setting current bias - percentage	18.8%
208	Get/Set	Pr. 905	Frequency setting current gain - frequency	60.00Hz
209	Get/Set	Pr. 905	Frequency setting current gain - percentage	92.7%

Note 1. No. 10 to 25, 67, 68 and 100 to 191 are designed for the FR-A500 only. Not supported by the FR-F500.

Note 2. Values 65535, 6553.5 and 655.35 indicate that the functions are invalid and have the same meaning as 9999 displayed on the DU/PU.

Note 3. For details, refer to the FR-A500 or FR-F500 instruction manual.

(2) Class 0x67 Instance 1 services

Service Code	Service
0x0E	Read the attribute value.
0x10	Write the attribute value.

3.10 EDS File

(1) Outline of EDS file

When using the configuration software, the EDS file is required to connect the inverter and configurator.
The EDS file is designed to offer information on the settings (including the parameter object addresses) between configurator and inverter.

(2) Acquiring method

You can get the FR-A500 series EDS file in the following method:

- Download it from the Internet.
  It can be downloaded free on the Web site of Open DeviceNet Vendor Association:
  http://www.odva.org

(3) Using method

The A500.EDS file is created for the ODVA standard and assumes that the DeviceNet Manager™ product of Rockwell Automation is used.
For the appropriate installation method of the EDS file, refer to the DeviceNet configuration software manual.

Note 1. DeviceNet Manager™ is a registered trademark of Allen-Bradley Company, Inc.
Note 2. The above EDS file applies to the FR-A500 series only. Consult us separately when using the FR-F500 series.

4 Profibus-DP

4.1 Overview

Profibus-DP was released in 1994. PNO (Profibus Netzer Organization) set up offices in 15 countries, and Profibus International for integration of global management was established in 1995 for business operations. As an open field network, Profibus-DP allows a wide variety of devices of third parties to be connected, and is applicable to not only inverters but also various field-level applications.

(1) Features

Connection with the master module (personal computer/PLC) by communication cables allows inverters to be run and monitored and their parameter values to be read/written from a user program.

(2) Types of Profibus-DP-compatible inverters

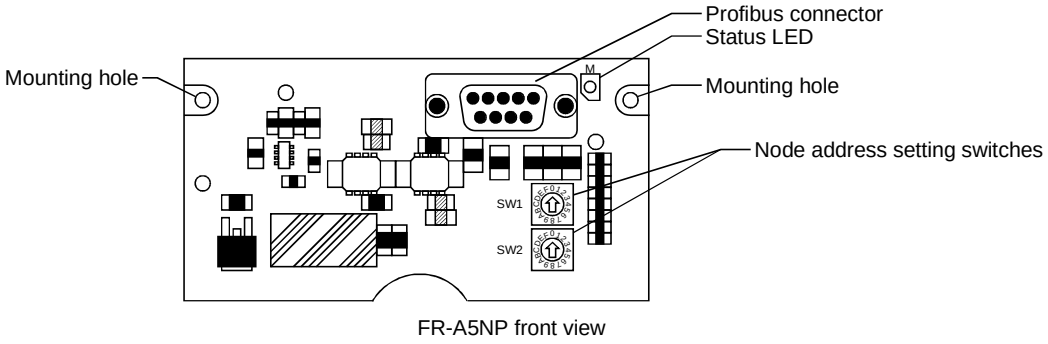
Inverter Series	Method for Compatibility with Profibus-DP
FR-A500	Connect the FR-A5NP plug-in option.
FR-F500	Connect the FR-A5NP plug-in option.

4.2 Specifications

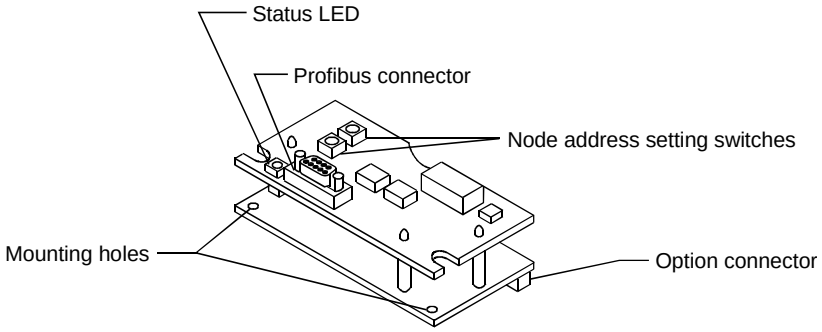
Item	Specifications
Current consumption	Supplied to Profibus network: 100mA (5VDC)
Dielectric withstand voltage	Minimum 500VDC
Communication rate	1200m or less: 9,600bps. 19,200bps. 93,750bps. 600m or less: 187,500bps. 200m or less: 500,000bps. 1,500,000bps. 100m or less: 3,000,000bps. 6,000,000bps. 12,000,000bps.
Operating temperature	-10 to 60 °C
Storage temperature	-20 to 65 °C
Ambient humidity	90% maximum at 60 °C

4.3 Structure

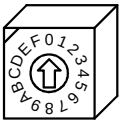
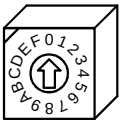
(1) Appearance



FR-A5NP front view

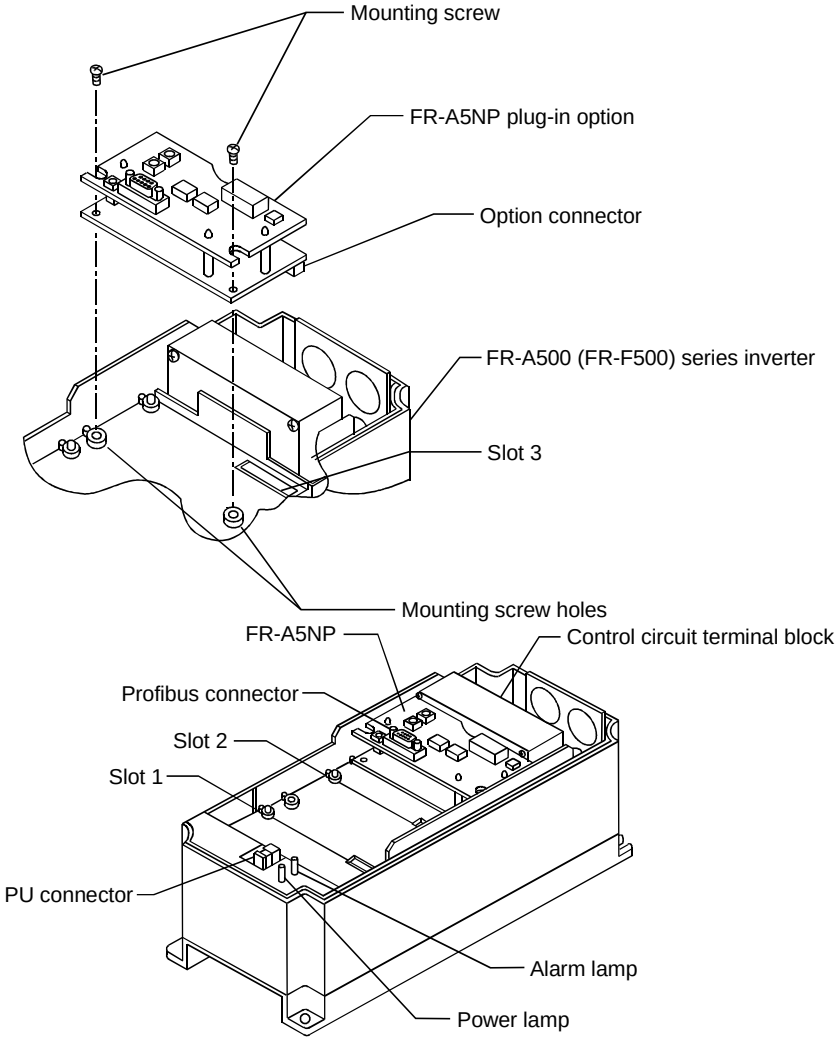


(2) Part names

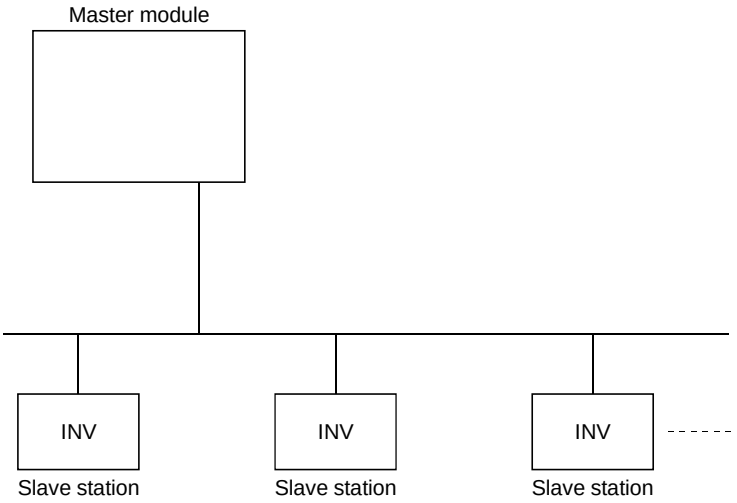
Name	Function
Node address setting switches	SW1  SW2  Used to set the node address of the inverter within the range 00 to 7EH. Do not set the node address to 7FH-FFH. If it is set to any of such addresses, the option unit will not operate properly. In addition, do not set the same node address to two or more options. SW1 is used to set the minimum digit. For example, when setting the node address to 7BH (123 in decimal system), set SW2 to 7 and SW1 to B.
Status LED	When the status is normal, the green LED is lit.

(3) Installation procedure

1) Remove the front cover of the inverter and insert this option unit into slot 3 of the inverter.
2) Securely insert the option unit connector into the inverter connector. At this time, also align the option fixing hole correctly.
3) Then, securely fix the option unit to the inverter with the mounting screws (2 places). If the mounting holes of the option unit do not match the inverter mounting holes, recheck whether the connector is secured properly.
4) Remove the DATA PORT from the inverter front cover and reinstall the front cover.
   (To remove the DATA PORT cover, push it from the back of the front cover.)



(1) System configuration example

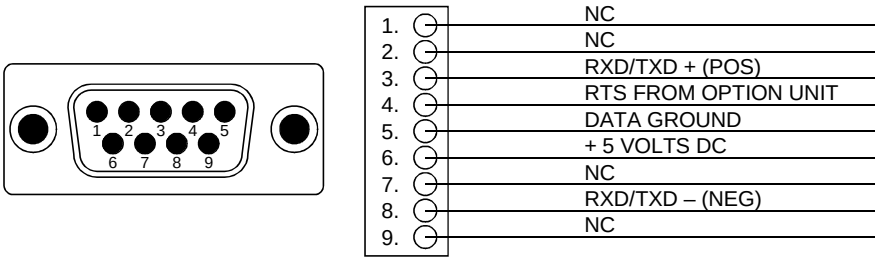


Connection with Profibus-DP network

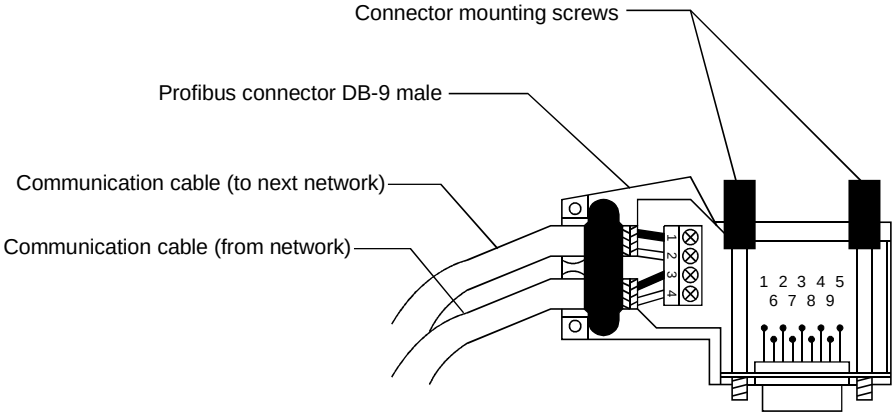
(2) Fabrication of cable

1) Plug one end of the cable to the connector linked to the network, and the other end to the DB9 type male connector. Make sure that the cable supports 12.0Mbps communication (specified in the EEIA-RS-485 Standard). For the connection of this cable, refer to the PROFIBUS connector terminal specifications given below.

   +5VDC (permissible current 100mA) is supplied from the option unit pin numbers 6 and 5. You can select whether pins 6 and 5 are used or not. Pin number 4 may not be required depending on the master used and this can also be selected. (For more information, refer to the ProfibusDP master manual.)



Profibus connector (DB-9 male) terminal specifications



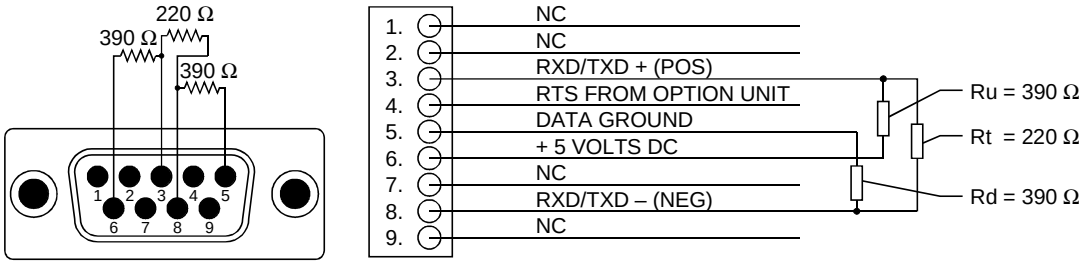
Perspective view of PROFIBUS standard junction connector

The DB9 connector pin layout is listed below. This layout is defined in Profibus Standard DIN-19-245, Part 1.

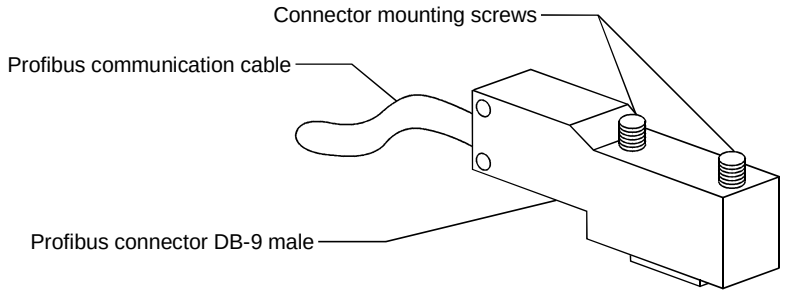
DB-9 Pin Number	FR-A5NP Signal Name	Profibus-DP Signal Name	Remarks
1	NC	NC	Not connected
2	NC	RP	Reserved for module power supply
3	RxD/TxD+	RxD/TxD+	Transferred data (+)
4	CNTR+	CNTR+	Control signal (request to send)
5	Isolated GND	DGND(V-)	Data ground
6	Isolated +5V output	V+	+5V voltage
7	NC	NC	Not connected
8	RxD/TxD-	RxD/TxD-	Transferred data (-)
9	NC	RP	Reserved for module power supply

NC: No connection

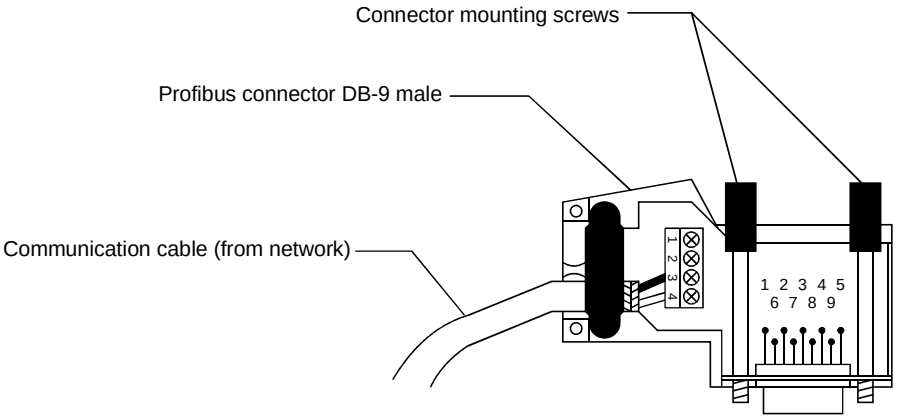
2) When the option unit is used to connect the network, connect the PROFIBUS connector which contains a termination resistor.



Profibus connector (DB-9 male) termination resistor connection specifications (all resistors 0.25W)



Appearance of PROFIBUS connector with built-in termination resistor



Perspective view of PROFIBUS connector with built-in termination resistor

(3) Wiring procedure

1) Power off the inverter and make sure that the working environment is safe.
   After ensuring safety, remove the inverter cover.
2) Set the node address using the two node address setting switches of the option unit. Valid addresses are 00_H to $7E_H$ (0 to 126 in decimal system). However, since addresses 00_H, 01_H, 02_H, $7C_H$, $7D_H$ and $7E_H$ (0, 1, 2, 124, 125, 126 in decimal system) may be used for the master station and repeater depending on the master used, it is recommended to use 03_H to $7B_H$ (3 to 123 in decimal system) which may be used for any master. Set the node address to the value at which communication will be established by the Profibus master. Communication will not be established unless the master recognizes the node address assigned to the FR-5ANP. Refer to the master manual for more information on the master.
   Do not set the node address to $7F_H$-FF_H. If it is set to any of such addresses, the option unit will not operate properly. In addition, do not set the same node address to two or more options.
   SW1 is used to set the minimum digit. For example, when setting the node address to $7B_H$ (123 in decimal system), set SW2 to 7 and SW1 to B.
3) When the inverters have been installed properly and the node addresses set correctly, reinstall the inverter covers. Then, insert the DB-9 male connector of the Profibus cable into the DB-9 female connector (Profibus connector) of the option unit to connect the Profibus cable.
4) Power on the inverters after making sure that connection is all completed and the inverters' external cables and Profibus network cable are run properly.

(4) LED status indications

After connecting the option unit to the active network, check the status of the operating status indicator LED. After power-on or reset, the LED indication is normally either of the following:

LED (Green)	System Status
Light off	The module is not powered on. The module is being subjected to a start test. The module is in the data exchange mode. Alternatively, network connection has timed out.
Light on	The module is operating properly. The data exchange mode is ready.

(1) Baud rate setting

Set the baud rate on the master module. The inverter recognizes the baud rate automatically and starts communication.

(2) Node address setting

The node address assigned to the inverter is determined when the inverter is powered on. Do not change the setting while power is on. Refer to Section 4.3 (2) for the way to set the node address.

(3) Parameters

Parameter Number	Function	Setting Range	Minimum Setting Increments	Factory Setting
338 (Note 1)	Operation command write	0, 1	1	0
339 (Note 1)	Speed command write	0, 1	1	0
340 (Note 1)	Link start mode selection	0, 1, 2	1	0

Note 1. Refer to Section 4.6 Operation Modes (page 122) for details of Pr. 338 to 340.

4.6 Operation Modes

(1) Operation modes

1) PU operation : Controls the inverter from the keyboard of the operation panel (FR-DU04) or parameter unit (FR-PU04) installed to the inverter.

2) External operation : Controls the inverter by switching on/off external signals connected to the control circuit terminals of the inverter.

3) Profibus operation : Controls the inverter in accordance with the program via the Profibus-DP unit (FR-A5NP).

(2) Operation mode switching

1) Operation mode switching conditions

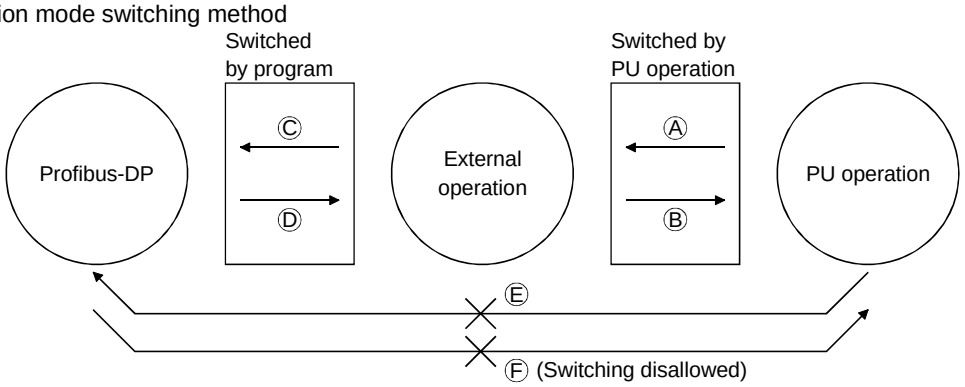
Before switching the operation mode, check that:

- The inverter is at a stop;
- Both the STF and STR signals are off; and
- The Pr. 79 "operation mode" setting is correct.

(Use the parameter unit of the inverter for setting.)

Pr. 79 Setting	Operation Mode Selection	Switching to Profibus Operation Mode
0	PU or external operation	Disallowed when the PU mode is selected. Allowed when the external mode is selected.
1	PU operation mode	Disallowed
2	External operation mode	Allowed
3, 4	External/PU combined operation mode	Disallowed
5	Programmed operation	Disallowed
6	Switch-over	Allowed
7	External operation (PU operation interlock)	Allowed only in the external operation mode when the PU interlock signal (X12) is on.
8	PU or external (signal switching)	Allowed only in the external operation mode (X16 on).

2) Operation mode switching method



Symbol	Switching Type	Switching Method
A	PU operation → external operation	Operate the external operation key on the PU.
B	External operation → PU operation	Operate the PU operation key on the PU.
C	External operation → Profibus operation	By user program. The master writes 0014H to PNU00BH (IND = 0100).
D	Profibus operation → external operation	By user program. The master writes 0010H to PNU00BH (IND = 0100).
E	PU operation → Profibus operation	Switching disallowed. Allowed if external operation is selected in A and Profibus operation is then selected in C. (Note 2)
F	Profibus operation → PU operation	Switching disallowed. Allowed if external operation is selected in D and PU operation is then selected in B. (Note 2)

When "1 or 2" is set in Pr. 340 "link start mode selection", the Profibus operation mode is selected at power-on or inverter reset.

Once the network operation mode has started, Profibus communication is made at least once during 5 seconds. If the option unit does not respond to Profibus communication for longer than 5 seconds, an option module alarm stop occurs. In that case, reset the inverter to clear the error.

Note 1. When setting "1 or 2" in Pr. 340, the initial settings (station number setting, etc.) of the inverter must be made without fail.

Note 2. In the switch-over operation mode (Pr. 79 = 6), switching in E and F is also allowed.

3) Link start mode

By setting the Pr. 340 value as appropriate, you can select the operation mode at power on or at restoration from instantaneous power failure.

Pr. 340 Setting	Operation Mode		Mode at Power On or at Restoration from Instantaneous Power Failure
	Pr.79		
0	0	PU or external operation	Inverter goes into the external operation mode.
	1	PU operation	Inverter goes into the PU operation mode.
	2	External operation	Inverter goes into the external operation mode.
	3	External/PU combined operation mode	Running frequency is set in the PU operation mode and the start signal is set in the external operation mode.
	4	External/PU combined operation mode	Running frequency is set in the external operation mode and the start signal is set in the PU operation mode.
	5	Programmed operation mode	Inverter is operated by the program.
	6	Switch-over mode	Operation mode is switched while running.
	7	External operation mode	Shift to the PU operation mode is controlled by ON/OFF of the X12 signal.
	8	External/PU combined operation mode	Operation mode is switched by ON/OFF of the X16 signal.
1	Profibus operation		Inverter goes into the Profibus operation mode. (Program need not be used for switching)
2	Profibus automatic restart after instantaneous power failure		Inverter goes into the Profibus operation mode. When Pr. 57 setting is other than 9999 (automatic restart after instantaneous power failure), automatic restart is made in the status prior to occurrence of an instantaneous power failure to continue Profibus operation, if a communication signal is not given. (Program need not be used for switching)

- The Pr. 340 value may be changed in any operation mode.
- When Pr. 79 "operation mode selection" = "0, 2 or 6", "1 and 2" in Pr. 340 are made valid.
- When starting Profibus operation at power-on, set "1 or 2" in Pr. 340.

(3) Control place selection

In the Profibus operation mode, commands from the external terminals and sequence program are as listed below:

Control place selection			Pr. 338 "operation command write"	0: Profibus	0: Profibus	1: External	1: External	Remarks
			Pr. 339 "speed command write"	0: Profibus	1: External	0: Profibus	1: External	
Fixed functions (Functions equivalent to terminals)			Forward rotation command (STF)	Profibus	Profibus	External	External	
			Reverse rotation command (STR)	Profibus	Profibus	External	External	
			Start self-holding selection (STOP)	Profibus	Profibus	External	External	
			Output halt (MRS)	External	External	External	External	(Note 1)
			Reset (RES)	Both	Both	Both	External	
			Profibus operation frequency	Profibus	—	Profibus	—	
			2	—	External	—	External	
			4	—	External	—	External	
			1	Compensation	External	Compensation	External	
Selective functions	Pr. 180 to Pr. 183 settings	0	Low-speed operation command (RL)	Profibus	External	Profibus	External	Pr. 59 = 0
		1	Middle-speed operation command (RM)	Profibus	External	Profibus	External	Pr. 59 = 0
		2	High-speed operation command (RH)	Profibus	External	Profibus	External	Pr. 59 = 0
		3	Second function selection (RT)	Profibus	Profibus	External	External	
		4	Current input selection (AU)	—	External	—	External	
		5	Jog operation selection (JOG)	—	—	External	External	
		6	Automatic restart after instantaneous power failure selection (CS)	External	External	External	External	
		7	External thermal relay input (OH)	External	External	External	External	
		8	15-speed selection (REX)	Profibus	External	Profibus	External	Pr. 59 = 0
		9	Third function (X9)	Profibus	Profibus	External	External	
		10	FR-HC connection, inverter operation enable (X10)	External	External	External	External	
		11	FR-HC connection, instantaneous power failure detection (X11)	External	External	External	External	
		12	PU external interlock (X12)	External	External	External	External	
		13	External DC dynamic braking start (X13)	Profibus	Profibus	External	External	
		14	PID control valid terminal (X14)	Profibus	External	Profibus	External	
		15	Brake opening completion signal (BRI)	Profibus	Profibus	External	External	
		16	PU operation-external operation switching (X16)	External	External	External	External	
		17	Load pattern selection-forward/reverse rotation boost switching (X17)	Profibus	Profibus	External	External	
		18	Magnetic flux-V/F switching (X18)	Profibus	Profibus	External	External	
		19	Load torque high-speed frequency (X19)	Profibus	Profibus	External	External	
		22	Orientation command	Profibus	Profibus	External	External	(Note 2)
RH, RM, RL, RT selection functions			Remote setting (RH, RM, RH)	Profibus	External	Profibus	External	Pr. 59 = 1, 2
			Programmed operation group selection (RH, RM, RL)	—	—	—	—	Pr. 79 = 5 Profibus operation disallowed
			Stop-on-contact selection 0 (RL)	Profibus	External	Profibus	External	Pr. 270 = 1, 3
			Stop-on-contact selection 1 (RT)	Profibus	Profibus	External	External	

[Explanation of table]

External : Control by signal from external terminal is only valid.

Profibus : Control from program is only valid.

Both : Control from both external terminal and Profibus is valid.

— : Control from both external terminal and Profibus is invalid.

Compensation : Control by signal from external terminal is only valid if Pr. 28 (multi-speed input compensation) setting is 1.

Note 1. If the FR-HC connection, inverter operation enable signal (X10) is not assigned when the FR-HC is used (Pr. 30 = 2) or if the PU operation interlock signal (X12) is not assigned when the PU operation interlock function is set (Pr. 79 = 7), this function is also used by the MRS signal and therefore the MRS signal is only valid for the external terminals, independently of the Pr. 338 and Pr. 339 settings.

Note 2. The orientation command needs the FR-A5AP and FR-A5AX options.

4.7 Operational Functions

(1) Operation mode-based functions

Control Method	Item	Operation Mode		
		Net mode	External mode	PU mode
Profibus	Operation command	Allowed (Note 1)	Disallowed	Disallowed
	Output frequency setting	Allowed (Note 1)	Disallowed	Disallowed
	Monitoring	Allowed	Allowed	Allowed
	Parameter write	Allowed (Note 3)	Disallowed (Note 3)	Disallowed (Note 3)
	Parameter read	Allowed	Allowed	Allowed
	Inverter reset	Allowed (Note 2)	Disallowed	Disallowed
Control circuit terminal	Operation command	Allowed (Note 1)	Allowed	Disallowed
	Output frequency setting	Allowed (Note 1)	Allowed	Disallowed
	Inverter reset	Allowed	Allowed	Allowed

Note 1. As set in Pr. 338 and Pr. 339.

Note 2. The inverter cannot be reset during occurrence of a network error.

Note 3. As set in Pr. 77.

Note 4. The inverter goes into the external operation mode if it is reset from Profibus during net mode operation.

(2) Monitoring

1) Output frequency.....0.01Hz minimum setting increments
2) Output current .....0.01A minimum setting increments
3) Output voltage .....0.1V minimum setting increments
4) Frequency setting.....0.01Hz minimum setting increments
5) Speed.....1r/min minimum setting increments
6) Motor torque .....0.1% minimum setting increments
7) Converter output voltage .....0.1V minimum setting increments
8) Regenerative brake duty .....0.1% minimum setting increments
9) Electronic overcurrent protection load factor ....0.1% minimum setting increments
10) Output current peak value .....0.01A minimum setting increments
11) Converter output voltage peak value.....0.1V minimum setting
12) Input power.....0.01kW minimum setting increments
13) utput power .....0.01kW minimum setting increments
14) Input terminal states

15-12	11	10	9	8	7	6	5	4	3	2	1	0
0	CS	RES	STOP	MRS	JOG	RH	RM	RL	RT	AU	STR	STF

15) Output terminal states

15-6	5	4	3	2	1	0
0	ABC	FU	OL	IPF	SU	RUN

Note: The bit format data here reflects Pr. 190 to Pr. 195. When the terminal layout is changed, this bit map is also changed.

16) Load meter.....0.1% minimum setting increments
17) Motor exciting current.....0.01A minimum setting increments
18) Position pulse
19) Cumulative energization time .....1 hr minimum setting increments
20) Orientation status
21) Actual operation time.....1 hr minimum setting increments
22) Motor load factor .....0.1% minimum setting increments
23) Cumulative power.....1kwh minimum setting increments
24) Alarm definition
25) Inverter status

(3) Operation commands

You can use PNU=00AH in the "SEV_I, Block I" area to give commands to the inverter.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	MRS	CS(*)	AU(*)	RT(*)	JOG(*)	RL(*)	RM(*)	RH(*)	STR	STF	0

The input signals marked * can be changed using Pr. 180 to Pr. 186 (input terminal function selection).

(4) Running frequency

The running frequency can be set to a minimum of 0.01Hz within the range 0 to 400Hz.

Use PNU=00DH, 00EH in the "SEV_I, Block I" area.

(5) Parameter write

Functions can be written using Profibus. Note that write during inverter operation will result in a write mode error.

(6) Parameter read

Functions can be read using Profibus.

(7) Operation at alarm occurrence

Alarm Location	Description	Operation Mode		
		Profibus mode	External mode	PU mode
Inverter alarm	Inverter operation	Stop	Stop	Stop
	Data communication	Continued	Continued	Continued
Profibus alarm	Inverter operation	Stop	Continued	Continued
	Data communication	Continued (*)	Continued (*)	Continued (*)

* Depends on the communication error type.

You can reset the inverter by writing 0000H to PNU=001H in the "SEV_I, Block I" area

4.8 Profibus Programming

Profibus-DP programs change with the master module used. For programming details, refer to the master module instruction manual.

This option unit operates as the slave of Profibus DP relative to the controller equivalent to Profibus DP master class 1 on the PLC or RS-485 network.

It means that the option unit:

- Receives a recognizable message; and
- Sends a message at the request of the network master.

The option unit also operates as the slave of Profibus DP relative to Profibus DP master class 2 which can read the inverter I/O.

The option unit itself cannot send a message and does not have the bus access right. In addition, the option unit cannot operate simultaneously as the slave of the network master and as the master relative to the inverter (slave).

(1) I/O specifications

To access the inverter operation data, this option unit uses special Profibus profile (data buffer). This profile consists of the following 6 words (12 bytes):

Word	Id	Definition	Communication Buffer Memory Map
1	PKE	Parameter number (PNU) and task or response Id (AK)	Bit No.: 15 to 12 | 11 | 10 to 0 AK | SPM | PNU SPM: Changed bit to process the parameter change report (Normally 0 since it is not supported)
2	IND	Parameter index (category)	Bit No.: 15 to 8 | 7 to 0 Index | Value
3	PWE1	Set to 0 as it is not used.	Bit No.: 15 to 0 0
4	PWE2	Parameter value	Bit No.: 15 to 0 Parameter value (PWE2)
5	ZSW1	Inverter status word Used for only the message given from the slave to the master. This word cannot be used for the message given from the mater to the slave. Set to 0.	Bit No.: 15 to 8 | 7 to 0 Command count | Status (ZSW1)
6	HIW	Set to 0 as it is not used.	Bit No.: 15 to 0 0

Note: The message from the master to the slave is called a command request.
The message from the slave to the master is called a command response.

Communication between the network master and slaves (option units) is defined by these 6 words through the Profibus DP protocol. Which data word in the inverter was accessed and what access it was are indicated through this definition.

1) Word 1 (PKE)

Bits	Id	Definition
0-10	PNU	Parameter number (PNU) PNU and IND (Profibus profile of Word #2) are used together to define which data word was accessed. Section 4.9 (see page 136) lists all accessible parameters.
11		Set to 0 as it is not used.
12-15	AK	Task or response Id value AK assumes the following value as the task signal (i.e. Cdm_Req) sent from the network master to the slave: 0_H = Without task 1_H = Parameter value is requested: Read 2_H = Parameter value (Word) is changed: Write 3_H to F_H = Not supported AK assumes the following value as the task signal (i.e. Cdm_Req) sent from the slave to the network master: 0_H = Without response 1_H = Parameter value (Word) is transferred 2_H to 6_H = Not supported 7_H = Task is not executed (error number stored in PWE which is Word #2 of Profibus Profile) 8_H = Without operation change right 9_H to F_H = Not supported

2) Word 2 (IND)

Bits	Id	Definition
0-7	PP	Page index Some special parameters require the page index. Set to 0 if it is not needed. If IND = 01, the following cases specify different blocks of sev's in system environment variables: 0_H = sev_i, block i 1_H = sev_ii, block ii, alarm history 2_H = sev_iii, block iii
8-15	IND	Parameter index Shows the area where the specific parameter number (PNU) is accessed (refer to Section 4.9 on page 136): 0_H = Real-time monitor area 1_H = System environment variable area (3 blocks) 2_H = Standard parameter area 4_H = Pr. 900 % calibration parameter area 6_H = Program setting (frequency) 7_H = Program setting (direction) 8_H = Program setting (time)

3) Word 3 (PWE1)

Bits	Id	Definition
0-15	PWE1	Reserved and should be set to 0.

4) Word 4 (PWE2)

Bits	Id	Definition
0-15	PWE	Parameter value The actual data is transferred to the signal. If a task could not be executed (AK response Id = 7), PWE indicates the type of the detected error: 0_H = Without error 1_H = Unsupported task 2_H = Invalid index (IND) 3_H = Invalid parameter number (PNU) 4_H = Dual-port read error 5_H = Dual-port write error 6_H = Invalid page 41_H = Mode error 42_H = Instruction code error 43_H = Data area error

5) Word 5 (ZSW1)

Messages from the slave to the master. Word #5 of Profibus Profile is used to pass the inverter status word.

Bits	Id	Definition
0	ZSW1	1 = Running (RUN)
1		1 = Forward rotation operation (FWD)
2		1 = Reverse rotation operation (REV)
3		1 = Up to frequency (SU)
4		1 = Overload (OL)
5		1 = Instantaneous power failure (IPF)
6		1 = Frequency detection (FU)
7		1 = Alarm (ABC)
8-14	Command count	The command count is an optional function defined by the Profibus master and has areas 00_H to $7F_H$. The option unit copies the command count from the received command to the same offset in the sent response. The master uses it to synchronize the commands and responses.
15		Reserved and should be set to 0.

For messages from the slave to the master, Bits 0-7 are not used and should therefore be set to 0.

The bit format data here do not reflect Pr. 190-195.

6) Word 6 (HIW)

Bits	Id	Definition
0-15	HIW	Reserved and should be set to 0.

(2) Data examples

	Item	Data Example	Refer To Page
1)	Operation mode setting	Set to the Profibus operation mode.	130
2)	Operation command setting, inverter status reading	Command the forward rotation and mid-speed signals and read the inverter status.	131
3)	Monitor function setting	Monitor the output frequency.	132
4)	Parameter reading	Read Pr. 7 "acceleration time".	133
5)	Parameter writing	Set "3.0 seconds" in Pr. 7 "acceleration time".	133
6)	Running frequency setting	Set to 50.00Hz.	134
7)	Alarm definition reading	Read the inverter alarm.	134
8)	Inverter resetting	Reset the inverter.	135

1) Operation mode setting

Change the operation mode to the Profibus operation mode. Specifically, write 0014H to the operation mode parameter (PNU=00BH) of the "SEV_I" area (IND=0100H).

<Write data example>

Data Example		Description
Word 1	200BH	AK = 2 (Parameter write) SPM = 0 PNU = 00BH (Operation mode parameter number)
Word 2	0100H	IND = 01H (System environment variable area) PP = 00H (SEV_I, block I)
Word 3	0000H	Unused
Word 4	0014H	PWE2 = 0014H (NET mode)
Word 5	0000H	Command count = 00H ZSW1 = 00H (00H because it is not used for write)
Word 6	0000H	Unused

2) Operation command setting, inverter status reading

Command the forward rotation and mid-speed signals, then read the inverter status.

Set the inverter's control input using the inverter control input parameter (PNU=00AH) of the "SEV_I" area (IND=0100H).

<Write data example>

Data Example		Description
Word 1	200AH	AK = 2 (Parameter write) SPM = 0 PNU = 00AH
Word 2	0100H	IND = 01H (System environment variable area) PP = 00H (SEV_I, block I)
Word 3	0000H	Unused
Word 4	0012H	b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 MRS CS AU RT JOG RL RM RH STR STF
Word 5	0000H	Command count = 00H ZSW1 = 00H (00H because it is not used for write)
Word 6	0000H	Unused

<Read data example>

Data Example		Description
Word 1	100AH	AK = 1 (Parameter value is transferred) 7 or 8 when error occurs. SPM = 0 PNU = 00AH
Word 2	0100H	IND = 01H (System environment variable area) PP = 00H (SEV_I, block I)
Word 3	0000H	Unused
Word 4	0000H	0 because of no error When error occurs, communication error code enters.
Word 5	004BH	Command count = 00H (Command count is the same data 00H because of the response data to the above write data) ZSW1 = 4BH b7 b6 b5 b4 b3 b2 b1 b0 0 1 0 0 1 0 1 1 ABC FU IPF OL SU Reverse rotation Forward rotation RUN
Word 6	0000H	Unused

3) Monitor function setting

Monitor the output frequency. For monitoring, use the output frequency parameter (PNU=000H) of the "real-time monitor" area (IND=0000H).

<Write data example>

Data Example		Description
Word 1	1000H	AK = 1 (Parameter read) SPM = 0 PNU = 000H (Output frequency)
Word 2	0000H	IND = 00H (Real-time monitor area) PP = 00H
Word 3	0000H	Unused
Word 4	0000H	PWE2 = 0000H (Unused)
Word 5	0100H	Command count = 01H ZSW1 = 00H (Unused)
Word 6	0000H	Unused

<Read data example>

Data Example		Description
Word 1	1000H	AK = 1 (Parameter value is transferred) SPM = 0 PNU = 000H (Output frequency)
Word 2	0000H	IND = 00H (Real-time monitor area) PP = 00H
Word 3	0000H	Unused
Word 4	0BB8H	PWE2 = 0BB8H → 3000 (Represents 30.00Hz because of 0.01Hz increments)
Word 5	014BH	Command count = 01H ZSW1 = 4BH b7 b6 b5 b4 b3 b2 b1 b0 0 1 0 0 1 0 1 1 ABC FU IPF OL SU Reverse rotation Forward rotation RUN
Word 6	0000H	Unused

4) Parameter reading

Read Pr. 7 "acceleration time". For parameter reading, use the acceleration time parameter (PNU=007H) of the "standard parameter" area (IND=200H).

<Write data example>

Data Example		Description
Word 1	1007H	AK = 1 (Parameter read) SPM = 0 PNU = 007H (Acceleration time)
Word 2	0200H	IND = 02H (Standard parameter area) PP = 00H
Word 3	0000H	Unused
Word 4	0000H	PWE2 = 0000H (Unused)
Word 5	0200H	Command count = 02H ZSW1 = 00H (Unused)
Word 6	0000H	Unused

<Read data example>

Data Example		Description
Word 1	1007H	AK = 1 (Parameter value is transferred) SPM = 0 PNU = 007H (Acceleration time)
Word 2	0200H	IND = 02H (Standard parameter area) PP = 00H
Word 3	0000H	Unused
Word 4	0032H	PWE2 = 0032H → 50 (Represents 5.0 seconds because of 0.1 second increments)
Word 5	0200H	Command count = 02H ZSW1 = 00H b7 b6 b5 b4 b3 b2 b1 b0 0 0 0 0 0 0 0 0 ABC FU IPF OL SU Reverse rotation Forward rotation RUN
Word 6	0000H	Unused

5) Parameter writing

Set "3.0 seconds" in Pr. 7 "acceleration time". For parameter writing, write 001EH to the acceleration time parameter (PNU=007H) of the "standard parameter" area (IND=200H).

<Write data example>

Data Example		Description
Word 1	2007H	AK = 2 (Parameter write) SPM = 0 PNU = 007H
Word 2	0200H	IND = 02H (Standard parameter area) PP = 00H
Word 3	0000H	Unused
Word 4	001EH	PWE2 = 001EH → 30 (Represents 3.0 seconds because of 0.1 second increments)
Word 5	0000H	Command count = 00H ZSW1 = 00H (Unused)
Word 6	0000H	Unused

6) Running frequency setting

Set the running frequency to "50.00Hz". To change the running frequency (RAM), write 1388H to the frequency setting (RAM) parameter (PNU=00DH) of the "SEV_I" area (IND=0100H).

<Write data example>

Data Example		Description
Word 1	200DH	AK = 2 (Parameter write) SPM = 0 PNU = 00DH (Frequency setting (RAM))
Word 2	0100H	IND = 01H (System environment variable area) PP = 00H (SEV_I, block I)
Word 3	0000H	Unused
Word 4	1388H	PWE2 = 1388H → 5000 (Represents 50.00Hz because of 0.01Hz increments)
Word 5	0000H	Command count = 00H ZSW1 = 00H (Unused)
Word 6	0000H	Unused

7) Alarm definition reading

Read the inverter alarm. For alarm history reading, use the alarm 1 (PNU=000H) of the "SEV_II" area (IND=0101H).

<Write data example>

Data Example		Description
Word 1	1000H	AK = 1 (Parameter read) SPM = 0 PNU = 000H (Alarm 1)
Word 2	0101H	IND = 01H (System environment variable area) PP = 01H (SEV_II, block II)
Word 3	0000H	Unused
Word 4	0000H	PWE2 = 0000H (Unused)
Word 5	0500H	Command count = 05H ZSW1 = 00H (Unused)
Word 6	0000H	Unused

<Read data example>

Data Example		Description
Word 1	1000H	AK = 1 (Parameter value is transferred) SPM = 0 PNU = 000H (Alarm 1)
Word 2	0101H	IND = 01H (System environment variable area) PP = 01H (SEV_II, block II)
Word 3	0000H	Unused
Word 4	00A3H	PWE2 = 00A3H → E.OP3 (from alarm code)
Word 5	0500H	Command count = 05H ZSW1 = 00H b7 b6 b5 b4 b3 b2 b1 b0 0 0 0 0 0 0 0 0 ABC FU IPF OL SU Reverse rotation Forward rotation RUN
Word 6	0000H	Unused

8) Inverter resetting

Reset the inverter. For inverter resetting, write 0 to the inverter reset (PNU=001H) of the "SEV_I" area (IND=0100H).

Data Example		Description
Word 1	2001H	AK = 2 (Parameter write) SPM = 0 PNU = 001H (Inverter reset)
Word 2	0100H	IND = 01H(System environment variable area) PP = 00H (SEV_I, block I)
Word 3	0000H	Unused
Word 4	0000H	PWE2 = 0000H
Word 5	0000H	Command count = 00H ZSW1 = 00H (Unused)
Word 6	0000H	Unused

4.9.1 IND=0000H Real-time monitor area

PNU (Decimal)	Definition
0	Output frequency (minimum setting increments 0.01Hz)
1	Output current (minimum setting increments 0.01A)
2	Output voltage (minimum setting increments 0.1V)
4	Frequency setting (minimum setting increments 0.01Hz)
5	Speed (minimum setting increments 1r/min)
6	Motor torque (minimum setting increments 0.1%)
7	Converter output voltage (minimum setting increments 0.1V)
8	Regenerative brake duty (minimum setting increments 0.1%)
9	Electronic overcurrent protection load factor (minimum setting increments 0.1%)
10	Peak current peak value (minimum setting increments 0.01A)
11	Converter output voltage peak value (minimum setting increments 0.1V)
12	Input power (minimum setting increments 0.01kW)
13	Output power (minimum setting increments 0.01kW)
14	Input terminal status
15	Output terminal status
16	Load meter (minimum setting increments 0.1%)
17	Motor exciting current (minimum setting increments 0.01A)
18	Position pulse
19	Cumulative energization time (minimum setting increments 1 hr)
21	Orientation status (Note 1)
22	Actual operation time (minimum setting increments 1 hr)
23	Motor load factor (minimum setting increments 0.1%)
24	Cumulative power (minimum setting increments 1kWh)

Note 1: When using FR-A5AP option.

Input terminal status monitor (PNU=14) bit map

15-12	11	10	9	8	7	6	5	4	3	2	1	0
0	CS	RES	STOP	MRS	JOG	RH	RM	RL	RT	AU	STR	STF

Output terminal status monitor (PNU=15) bit map

15-6	5	4	3	2	1	0
0	ABC	FU	OL	IPF	SU	RUN

Note: The bit format data here reflects Pr. 190 to Pr. 195. Changing the terminal assignment also changes this bit map.

4.9.2 IND=01pp$_H$ System environment variable area

(1) IND=0100 $_H$, pp=00, SEV_I, Block I

PNU (Decimal)	Definition	
0	User clear value setting	
1	WO: Inverter reset	Write value = 0000$_H$
2	WO: Parameter clear	Write value = 965A$_H$
3	WO: All parameter clear	Write value = 99AA$_H$
4	WO: Parameter user clear	Write value = 5A55$_H$
5	WO: Parameter clear (ExComPr)	Write value = 5A96$_H$
6	WO: All parameter clear (ExComPr)	Write value = AA99$_H$
7	WO: Parameter user clear (ExComPr)	Write value = 555A$_H$
10	Inverter status/control input command Inverter status word: See below. Bit 0: 1 = RUN Bit 1: 1 = FWD Bit 2: 1 = REV Bit 3: 1 = SU Bit 4: 1 = OL Bit 5: 1 = IPF Bit 6: 1 = FU Bit 7: 1 = ABC Bit 8-15: 0 to 7F$_H$ = command count Control input command word: See below. Bit 0: Reserved and should be set to 0. Bit 1: 1 = STF Bit 2: 1 = STR Bit 3: 1 = RH(Note 1) Bit 4: 1 = RM(Note 1) Bit 5: 1 = RL(Note 1) Bit 6: 1 = JOG(Note 1) Bit 7: 1 = RT(Note 1) Bit 8: 1 = AU(Note 1) Bit 9: 1 = CS(Note 1) Bit 10: 1 = MRS Bit 11-15: Not used and always set to 0.	Write value = XXXX$_H$
11	Operation mode 10$_H$: External mode 11$_H$: PU operation mode 14$_H$: Profibus communication operation mode	Write value = 1X$_H$
13	Frequency setting (RAM) (Note 2)	
14	WO: Frequency setting (EEPROM) (Note 2)	

WO : Write only, read disabled

Note 1. Bits 3, 4, 5, 6, 7, 8 and 9 correspond to Pr. 182, 181, 180, 185, 183, 184 and 186, respectively.

Note 2. The data written to PNU13 or PNU14 can be read from PNU13.

(2) IND=0101H, pp=01, SEV_II, Block II, alarm history

PNU (Decimal)	Definition
0	Alarm 1 (Note 1)
1	Alarm 2
2	Alarm 3
3	Alarm 4
4	Alarm 5
5	Alarm 6
6	Alarm 7
7	Alarm 8

Note 1. Writing a value 0000H to this parameter resets the alarm history buffer of all alarms. The other parameters are for read only.

Alarm code list

Code	Description	Code	Description	Code	Description
10H	OC1	70H	BE	C1H	CTE
11H	OC2	80H	GF	C2H	P24
12H	OC3	81H	LF	D5H	Mb1
20H	OV1	90H	OHT	D6H	Mb2
21H	OV2	A0H	OPT	D7H	Mb3
22H	OV3	A1H	OP1	D8H	Mb4
30H	THT	A2H	OP2	D9H	Mb5
31H	THM	A3H	OP3	DAH	Mb6
40H	FIN	B0H	PE	DBH	Mb7
50H	IPF	B1H	PUE	F6H	E6
51H	UVT	B2H	RET	F7H	E7
60H	OLT	C0H	CPU		

4.9.3 IND=0200H Standard parameter area

PNU (Decimal)	Definition	Setting Range	Hexadecimal	Minimum Setting Increments
0	Torque boost (manual)	0-30	0-12C	0.1%
1	Maximum frequency	0-120	0-2EE0	0.01Hz
2	Minimum frequency	0-120	0-2EE0	0.01Hz
3	Base frequency	0-400	0-9C40	0.01Hz
4	Multi-speed setting (high speed)	0-400	0-9C40	0.01Hz
5	Multi-speed setting (middle speed)	0-400	0-9C40	0.01Hz
6	Multi-speed setting (low speed)	0-400	0-9C40	0.01Hz
7	Acceleration time	0-3600	0-8CA0	0.1s
8	Deceleration time	0-3600/0-360	0-8CA0	0.1s/0.01s
9	Electronic thermal O/L relay	0-500	0-C350	0.01A
10	DC injection brake operation frequency	0-120	0-2EE0	0.01Hz
11	DC injection brake operation time	0-10	0-64	0.1s
12	DC injection brake voltage	0-30	0-12C	0.1%
13	Starting frequency	0-60	0-1770	0.01Hz
14	Load pattern selection	0-5	0-5	1
15	Jog frequency	0-400	0-9C40	0.01Hz
16	Jog acceleration/deceleration time	0-3600/0-360	0-8CA0	0.1s/0.01s
17	MRS input selection	0-3	0-3	1
18	High-speed maximum frequency	120-400	2EE0-9C40	0.01Hz

PNU (Decimal)	Definition	Setting Range	Hexadecimal	Minimum Setting Increments
19	Base frequency voltage	0-1000	0-2710	0.1V
20	Acceleration/deceleration reference frequency	0-400	0-9C40	0.01Hz
21	Acceleration/deceleration time increments	0-1	0-1	1
22	Stall prevention operation level	0-200	0-7D0	0.1%
23	Stall prevention operation level at double speed	0-200	0-7D0	0.1%
24	Multi-speed setting (speed 4)	0-400	0-9C40	0.01Hz
25	Multi-speed setting (speed 5)	0-400	0-9C40	0.01Hz
26	Multi-speed setting (speed 6)	0-400	0-9C40	0.01Hz
27	Multi-speed setting (speed 7)	0-400	0-9C40	0.01Hz
28	Multi-speed input compensation	0-1	0-1	1
29	Acceleration/deceleration pattern	0-3	0-3	1
30	Regenerative brake duty	0-1	0-1	1
31	Frequency jump 1A	0-400	0-9C40	0.01Hz
32	Frequency jump 1B	0-400	0-9C40	0.01Hz
33	Frequency jump 2A	0-400	0-9C40	0.01Hz
34	Frequency jump 2B	0-400	0-9C40	0.01Hz
35	Frequency jump 3A	0-400	0-9C40	0.01Hz
36	Frequency jump 3B	0-400	0-9C40	0.01Hz
37	Speed display	2-9998	2-270E	1
41	Up-to-frequency sensitivity	0-1000	0-3E8	0.1%
42	Output frequency detection	0-400	0-9C40	0.01Hz
43	Output frequency detection for reverse rotation	0-400	0-9C40	0.01Hz
44	Second acceleration/deceleration time	0-3600/0-360	0-8CA0	0.1s/0.01s
45	Second deceleration time	0-3600/0-360	0-8CA0	0.1s/0.01s
46	Second torque boost	0-30	0-12C	0.1%
47	Second V/F (base frequency)	0-400	0-9C40	0.01Hz
48	Second stall prevention operation current	0-200	0-7D0	0.1%
49	Second stall prevention operation frequency	0-400	0-9C40	0.01Hz
50	Second output frequency detection	0-400	0-9C40	0.01Hz
51	Inverter display data selection	0-18	0-12	1
52	PU main display data selection	0-20	0-18	1
53	PU level display data selection	0-18	0-12	1
54	FM terminal function selection	1-121	1-79	1
55	Frequency monitoring reference	0-400	0-9C40	0.01Hz
56	Current monitoring reference	0-500	0-C350	0.01Hz
57	Restart coasting time	0-5	0-32	0.1s
58	Restart cushion time	0-5	0-32	0.1s
59	Remote setting function selection	0-2	0-2	1
60	Intelligent mode selection	0-6	0-6	1
65	Retry selection	0-5	0-5	1
66	Stall prevention operation reduction starting frequency	0-400	0-9C40	0.01Hz
67	Number of retries at alarm occurrence	0-10	0-A	1
68	Retry waiting time	0-10	0-64	0.1s
69	Retry count display erasure	0	0	1
70	Special regenerative brake duty	0-30	0-12C	0.1%
71	Applied motor	0-20	0-14	1
72	PWM frequency selection	0-15	0-F	1
73	0-5V/0-10V selection	0-15	0-F	1
74	Filter time constant	0-8	0-8	1
75	Reset selection/disconnected PU detection/PU stop selection	0-3	0-3	1
76	Alarm code output selection	0-3	0-3	1
77	Parameter write disable selection	0-2	0-2	1

PNU (Decimal)	Definition	Setting Range	Hexadecimal	Minimum Setting Increments
78	Reverse rotation prevention selection	0-2	0-2	1
79	Operation mode selection	0-8	0-8	1
80	Motor capacity	0.4-55	28-157C	0.01kW
81	Number of motor poles	2-16	2-10	1
82	Motor exciting current	0-9999	0-270F	0.01A
83	Rated motor voltage	0-1000	0-2710	0.1V
84	Rated motor frequency	50-120	1388-2EE0	0.01Hz
89	Speed control gain	0-1000	0-2710	0.1%
90	Motor constant (R1)	0-9999	0-270F	0.01
91	Motor constant (R2)	0-9999	0-270F	0.01
92	Motor constant (L1)	0-9999	0-270F	0.01
93	Motor constant (L2)	0-9999	0-270F	0.01
94	Motor constant (X)	0-9999	0-270F	0.01
95	Online auto tuning selection	0-1	0-1	1
96	Auto tuning setting/status	0-101	0-65	1
100	V/F1 (first frequency)	0-400	0-9C40	0.01Hz
101	V/F1 (first frequency voltage)	0-1000	0-2710	0.1V
102	V/F2 (second frequency)	0-400	0-9C40	0.01Hz
103	V/F2 (second frequency voltage)	0-1000	0-2710	0.1V
104	V/F3 (third frequency)	0-400	0-9C40	0.01Hz
105	V/F3 (third frequency voltage)	0-1000	0-2710	0.1V
106	V/F4 (fourth frequency)	0-400	0-9C40	0.01Hz
107	V/F4 (fourth frequency voltage)	0-1000	0-2710	0.1V
108	V/F5 (fifth frequency)	0-400	0-9C40	0.01Hz
109	V/F5 (fifth frequency voltage)	0-1000	0-2710	0.1V
110	Third acceleration/deceleration time	0-3600	0-8CA0	0.1s
111	Third deceleration time	0-3600	0-8CA0	0.1s
112	Third torque boost	0-30	0-12C	0.1%
113	Third V/F (base frequency)	0-400	0-9C40	0.01Hz
114	Third stall prevention operation current	0-200	0-7D0	0.1%
115	Third stall prevention operation frequency	0-400	0-9C40	0.01Hz
116	Third output frequency detection	0-400	0-9C40	0.01Hz
117	Station number	0-31	0-1F	1
118	Communication speed	48-192	30-C0	1
119	Stop bit length	0-11	0-B	1
120	Parity check presence/absence	0-2	0-2	1
121	Number of communication retries	0-10	0-A	1
122	Communication check time interval	0-999.8	0-270E	0.1s
123	Waiting time setting	0-150	0-96	1ms
124	CR, LF presence/absence selection	0-2	0-2	1
128	PID action selection	10-21	A-15	1
129	PID proportional band	0-1000	0-2710	0.1%
130	PID integral time	0.1-3600	1-8CA0	0.1s
131	Upper limit	0-100	0-3E8	0.1%
132	Lower limit	0-100	0-3E8	0.1%
133	PID action set point for PU operation	0-100	0-3E8	0.1%
134	PID differential time	0.01-10	1-3E8	0.01s
135	Commercial power supply-inverter switch-over sequence output terminal selection	0-2	0-2	1
136	MC switch-over interlock time	0-100	0-3E8	0.1s
137	Start waiting time	0-100	0-3E8	0.1s
138	Commercial power supply-inverter switch-over selection at alarm occurrence	0-1	0-1	1
139	Automatic inverter-commercial power supply switch-over frequency	0-60	0-1770	0.01Hz
140	Backlash acceleration stopping frequency	0-400	0-9C40	0.01Hz

PNU (Decimal)	Definition	Setting Range	Hexadecimal	Minimum Setting Increments
141	Backlash acceleration stopping time	0-360	0-E10	0.1s
142	Backlash deceleration stopping frequency	0-400	0-9C40	0.01Hz
143	Backlash deceleration stopping time	0-360	0-E10	0.1s
144	Speed setting switch-over	0-110	0-6E	1
145	PU language switch-over	0-7	0-7	1
148	Stall prevention level at 0V input	0-200	0-7D0	0.1%
149	Stall prevention level at 10V input	0-200	0-7D0	0.1%
150	Output current detection level	0-200	0-7D0	0.1%
151	Output current detection period	0-10	0-64	0.1s
152	Zero current detection level	0-200	0-7D0	0.1%
153	Zero current detection period	0-1	0-64	0.01s
154	Voltage reduction selection during stall prevention operation	0-1	0-1	1
155	RT activated condition	0-10	0-A	1
156	Stall prevention operation selection	0-100	0-64	1
157	OL signal waiting time	0-25	0-FA	0.1s
158	AM terminal function selection	1-21	1-15	1
160	User group read selection	0-11	0-B	1
162	Automatic restart after instantaneous power failure selection	0-1	0-1	1
163	First cushion time for restart	0-20	0-C8	0.1s
164	First cushion voltage for restart	0-100	0-3E8	0.1s
165	Restart stall prevention operation level	0-200	0-7D0	0.1s
170	Watt-hour meter clear	0	0	1
171	Actual operation hour meter clear	0	0	1
173	User group 1 registration	0-999	0-3E7	1
174	User group 1 deletion	0-999	0-3E7	1
175	User group 2 registration	0-999	0-3E7	1
176	User group 2 deletion	0-999	0-3E7	1
180	RL terminal function selection	0-99	0-63	1
181	RM terminal function selection	0-99	0-63	1
182	RH terminal function selection	0-99	0-63	1
183	RT terminal function selection	0-99	0-63	1
184	AU terminal function selection	0-99	0-63	1
185	JOG terminal function selection	0-99	0-63	1
186	CS terminal function selection	0-99	0-63	1
190	RUN terminal function selection	0-199	0-C7	1
191	SU terminal function selection	0-199	0-C7	1
192	IPF terminal function selection	0-199	0-C7	1
193	OL terminal function selection	0-199	0-C7	1
194	FU terminal function selection	0-199	0-C7	1
195	ABC terminal function selection	0-199	0-C7	1
199	User's initial value setting	0-999	0-3E7	1
232	Multi-speed setting (speed 8)	0-400	0-9C40	0.01Hz
233	Multi-speed setting (speed 9)	0-400	0-9C40	0.01Hz
234	Multi-speed setting (speed 10)	0-400	0-9C40	0.01Hz
235	Multi-speed setting (speed 11)	0-400	0-9C40	0.01Hz
236	Multi-speed setting (speed 12)	0-400	0-9C40	0.01Hz
237	Multi-speed setting (speed 13)	0-400	0-9C40	0.01Hz
238	Multi-speed setting (speed 14)	0-400	0-9C40	0.01Hz
239	Multi-speed setting (speed 15)	0-400	0-9C40	0.01Hz
240	Soft-PWM setting	0-1	0-1	1
244	Cooling fan operation selection	0-1	0-1	1

PNU (Decimal)	Definition	Setting Range	Hexadecimal	Minimum Setting Increments
250	Stop selection	0-100	0-3E8	0.1s
261	Power failure stop function	0-1	0-1	1
262	Subtracted frequency at deceleration start	0-20	0-7D0	0.01Hz
263	Subtraction starting frequency	0-120	0-2EE0	0.01Hz
264	Power-failure deceleration time 1	0-3600	0-8CA0	0.1s
265	Power-failure deceleration time 2	0-3600	0-8CA0	0.1s
266	Power-failure deceleration time switch-over frequency	0-400	0-9C40	0.01Hz
270	Stop-on-contact/load torque high-speed frequency control selection	0-3	0-3	1
271	High-speed setting maximum current	0-200	0-7D0	0.1%
272	Mid-speed setting minimum current	0-200	0-7D0	0.1%
273	Current averaging range	0-400	0-9C40	0.01Hz
274	Current averaging filter constant	1-4000	1-FA0	1
275	Stop-on-contact exciting current low-speed multiplying factor	0-1000	0-3E8	1%
276	Stop-on-contact PWM carrier frequency	0-15	0-F	1
278	Brake opening frequency	0-30	0-BB8	0.01Hz
279	Brake opening current	0-200	0-7D0	0.1%
280	Brake opening current detection time	0-2	0-14	0.1s
281	Brake operation time at start	0-5	0-32	0.1s
282	Brake operation frequency	0-30	0-BB8	0.01Hz
283	Brake operation time at stop	0-5	0-32	0.1s
284	Deceleration detection function selection	0-1	0-1	1
285	Overspeed detection frequency	0-30	0-BB8	0.01Hz
286	Droop gain	0-100	0-2710	0.01%
287	Droop filter time constant	0-1	0-64	0.01s
294	Pr. 338 Operation command write	0-1	0-1	1
295	Pr. 339 Speed command write	0-1	0-1	1
296	Pr. 340 Link start mode selection	0-2	0-2	1
298	Pr. 342 EEPROM write setting by link operation	0-1	0-1	1
323	Pr. 367 Speed feedback region	0-400	0-9C40	0.01Hz
324	Pr. 368 Feedback gain	0-100	0-64	1

Note 1. Values 65535, 6553.5 and 655.35 simply indicate that the functions are invalid and have the same meaning as 9999 indicated on the PU and in the instruction manual.

Note 2. For details, refer to the FR-A500 instruction manual.

4.9.4 IND=0300H, Pr. 900 frequency calibration area

PNU (Decimal)	Definition	Setting Range	Hexadecimal	Minimum Setting Increments
327	Pr. 900 FM terminal calibration			
328	Pr. 901 AM terminal calibration			
329	Pr. 902 Frequency setting voltage bias (frequency)	0-60	0-1770	0.01Hz
330	Pr. 903 Frequency setting voltage gain (frequency)	1-400	64-9C40	0.01Hz
331	Pr. 904 Frequency setting current bias (frequency)	0-60	0-1770	0.01Hz
332	Pr. 905 Frequency setting current gain (frequency)	1-400	64-9C40	0.01Hz

4.9.5 IND=0400H, Pr. 900 % calibration area

PNU (Decimal)	Definition
2	Pr. 902 Frequency setting voltage bias (percent)
3	Pr. 903 Frequency setting voltage gain (percent)
4	Pr. 904 Frequency setting current bias (percent)
5	Pr. 905 Frequency setting current gain (percent)

4.9.6 IND=0800H Programmed operation time setting area

PNU (Decimal)	Definition	Setting Range	Hexadecimal	Minimum Setting Increments
200	Pr. 200 Program minute/second selection	0-3	0-3	1
201	Pr. 201 Program time setting 1	0-9959	0-26E7	1
202	Pr. 202 Program time setting 2	0-9959	0-26E7	1
203	Pr. 203 Program time setting 3	0-9959	0-26E7	1
204	Pr. 204 Program time setting 4	0-9959	0-26E7	1
205	Pr. 205 Program time setting 5	0-9959	0-26E7	1
206	Pr. 206 Program time setting 6	0-9959	0-26E7	1
207	Pr. 207 Program time setting 7	0-9959	0-26E7	1
208	Pr. 208 Program time setting 8	0-9959	0-26E7	1
209	Pr. 209 Program time setting 9	0-9959	0-26E7	1
210	Pr. 210 Program time setting 10	0-9959	0-26E7	1
211	Pr. 211 Program time setting 11	0-9959	0-26E7	1
212	Pr. 212 Program time setting 12	0-9959	0-26E7	1
213	Pr. 213 Program time setting 13	0-9959	0-26E7	1
214	Pr. 214 Program time setting 14	0-9959	0-26E7	1
215	Pr. 215 Program time setting 15	0-9959	0-26E7	1
216	Pr. 216 Program time setting 16	0-9959	0-26E7	1
217	Pr. 217 Program time setting 17	0-9959	0-26E7	1
218	Pr. 218 Program time setting 18	0-9959	0-26E7	1
219	Pr. 219 Program time setting 19	0-9959	0-26E7	1
220	Pr. 220 Program time setting 20	0-9959	0-26E7	1
221	Pr. 221 Program time setting 21	0-9959	0-26E7	1
222	Pr. 222 Program time setting 22	0-9959	0-26E7	1
223	Pr. 223 Program time setting 23	0-9959	0-26E7	1
224	Pr. 224 Program time setting 24	0-9959	0-26E7	1
225	Pr. 225 Program time setting 25	0-9959	0-26E7	1
226	Pr. 226 Program time setting 26	0-9959	0-26E7	1
227	Pr. 227 Program time setting 27	0-9959	0-26E7	1
228	Pr. 228 Program time setting 28	0-9959	0-26E7	1
229	Pr. 229 Program time setting 29	0-9959	0-26E7	1
230	Pr. 230 Program time setting 30	0-9959	0-26E7	1
231	Pr. 231 Timer setting	0-9959	0-26E7	1

Note: Use minutes:seconds (or hours:minutes) to set the time. To set 2 minutes 30 seconds, for example, set 0230 (decimal) = E6H.

4.9.7 IND=0700H Programmed operation rotation direction setting area

PNU (Decimal)	Definition	Setting Range	Hexadecimal	Minimum Setting Increments
0	Pr. 201 Program rotation direction setting 1	0-2	0-2	1
1	Pr. 202 Program rotation direction setting 2	0-2	0-2	1
2	Pr. 203 Program rotation direction setting 3	0-2	0-2	1
3	Pr. 204 Program rotation direction setting 4	0-2	0-2	1
4	Pr. 205 Program rotation direction setting 5	0-2	0-2	1
5	Pr. 206 Program rotation direction setting 6	0-2	0-2	1
6	Pr. 207 Program rotation direction setting 7	0-2	0-2	1
7	Pr. 208 Program rotation direction setting 8	0-2	0-2	1
8	Pr. 209 Program rotation direction setting 9	0-2	0-2	1
9	Pr. 210 Program rotation direction setting 10	0-2	0-2	1
10	Pr. 211 Program rotation direction setting 11	0-2	0-2	1
11	Pr. 212 Program rotation direction setting 12	0-2	0-2	1
12	Pr. 213 Program rotation direction setting 13	0-2	0-2	1
13	Pr. 214 Program rotation direction setting 14	0-2	0-2	1
14	Pr. 215 Program rotation direction setting 15	0-2	0-2	1
15	Pr. 216 Program rotation direction setting 16	0-2	0-2	1
16	Pr. 217 Program rotation direction setting 17	0-2	0-2	1
17	Pr. 218 Program rotation direction setting 18	0-2	0-2	1
18	Pr. 219 Program rotation direction setting 19	0-2	0-2	1
19	Pr. 220 Program rotation direction setting 20	0-2	0-2	1
20	Pr. 221 Program rotation direction setting 21	0-2	0-2	1
21	Pr. 222 Program rotation direction setting 22	0-2	0-2	1
22	Pr. 223 Program rotation direction setting 23	0-2	0-2	1
23	Pr. 224 Program rotation direction setting 24	0-2	0-2	1
24	Pr. 225 Program rotation direction setting 25	0-2	0-2	1
25	Pr. 226 Program rotation direction setting 26	0-2	0-2	1
26	Pr. 227 Program rotation direction setting 27	0-2	0-2	1
27	Pr. 228 Program rotation direction setting 28	0-2	0-2	1
28	Pr. 229 Program rotation direction setting 29	0-2	0-2	1
29	Pr. 230 Program rotation direction setting 30	0-2	0-2	1

Note: The setting of 0 indicates a stop, 1 forward rotation, and 2 reverse rotation.

4.9.8 IND=0600H Programmed operation frequency setting area

PNU (Decimal)	Definition	Setting Range	Hexadecimal	Minimum Setting Increments
0	Pr. 201 Program frequency setting 1	0-400, 9999	0-FA0, FFFF	0.1Hz
1	Pr. 202 Program frequency setting 2	0-400, 9999	0-FA0, FFFF	0.1Hz
2	Pr. 203 Program frequency setting 3	0-400, 9999	0-FA0, FFFF	0.1Hz
3	Pr. 204 Program frequency setting 4	0-400, 9999	0-FA0, FFFF	0.1Hz
4	Pr. 205 Program frequency setting 5	0-400, 9999	0-FA0, FFFF	0.1Hz
5	Pr. 206 Program frequency setting 6	0-400, 9999	0-FA0, FFFF	0.1Hz
6	Pr. 207 Program frequency setting 7	0-400, 9999	0-FA0, FFFF	0.1Hz
7	Pr. 208 Program frequency setting 8	0-400, 9999	0-FA0, FFFF	0.1Hz
8	Pr. 209 Program frequency setting 9	0-400, 9999	0-FA0, FFFF	0.1Hz
9	Pr. 210 Program frequency setting 10	0-400, 9999	0-FA0, FFFF	0.1Hz
10	Pr. 211 Program frequency setting 11	0-400, 9999	0-FA0, FFFF	0.1Hz
11	Pr. 212 Program frequency setting 12	0-400, 9999	0-FA0, FFFF	0.1Hz
12	Pr. 213 Program frequency setting 13	0-400, 9999	0-FA0, FFFF	0.1Hz
13	Pr. 214 Program frequency setting 14	0-400, 9999	0-FA0, FFFF	0.1Hz
14	Pr. 215 Program frequency setting 15	0-400, 9999	0-FA0, FFFF	0.1Hz
15	Pr. 216 Program frequency setting 16	0-400, 9999	0-FA0, FFFF	0.1Hz
16	Pr. 217 Program frequency setting 17	0-400, 9999	0-FA0, FFFF	0.1Hz
17	Pr. 218 Program frequency setting 18	0-400, 9999	0-FA0, FFFF	0.1Hz
18	Pr. 219 Program frequency setting 19	0-400, 9999	0-FA0, FFFF	0.1Hz
19	Pr. 220 Program frequency setting 20	0-400, 9999	0-FA0, FFFF	0.1Hz
20	Pr. 221 Program frequency setting 21	0-400, 9999	0-FA0, FFFF	0.1Hz
21	Pr. 222 Program frequency setting 22	0-400, 9999	0-FA0, FFFF	0.1Hz
22	Pr. 223 Program frequency setting 23	0-400, 9999	0-FA0, FFFF	0.1Hz
23	Pr. 224 Program frequency setting 24	0-400, 9999	0-FA0, FFFF	0.1Hz
24	Pr. 225 Program frequency setting 25	0-400, 9999	0-FA0, FFFF	0.1Hz
25	Pr. 226 Program frequency setting 26	0-400, 9999	0-FA0, FFFF	0.1Hz
26	Pr. 227 Program frequency setting 27	0-400, 9999	0-FA0, FFFF	0.1Hz
27	Pr. 228 Program frequency setting 28	0-400, 9999	0-FA0, FFFF	0.1Hz
28	Pr. 229 Program frequency setting 29	0-400, 9999	0-FA0, FFFF	0.1Hz
29	Pr. 230 Program frequency setting 30	0-400, 9999	0-FA0, FFFF	0.1Hz

4.10 Profibus Device Data (GSD File)

The configuration software of the network master uses the device data file to recognize the features and functions of the Profibus DP device. This file is an ASCII file and is available from the Internet (http://www.profibus.com) or Mitsubishi (name: MEAU0865.GSD) or can be created directly. Note that Remarks are not included in the ASCII file itself.

Parameter	Value	Remarks
#Profibus_DP		File header
Vendor_Name	"Mitsubishi Electric Automation,Inc."	(Note 1)
Model_Name	"FR-A5NP"	
Ident_Number	0865H	= 2149 (decimal system)
Revision	"Revision #.##"	
Protocol_Ident	0	Profibus DP
Station_Type	0	
FMS_Supp	0	
Hardware_Release	"Series **"	
Software_Release	"Revision #.##"	
9.6_supp	1	9600bps support
19.2_supp	1	19.2Kbps support
93.75_supp	1	93.75Kbps support
187.5_supp	1	187.5Kbps support
500_supp	1	500Kbps support
1.5M_supp	1	1.5Mbps support
3.0M_supp	1	3.0Mbps support
6.0M_supp	1	6.0Mbps support
12.0M_supp	1	12.0Mbps support
MaxTadr_9.6	60	60bit times
MaxTadr_19.2	60	60bit times
MaxTadr_93.75	60	60bit times
MaxTadr_187.5	60	60bit times
MaxTadr_500	100	100bit times
MaxTadr_1.5M	150	150bit times
MaxTadr_3.0M	300	300bit times
MaxTadr_6.0M	450	450bit times
MaxTadr_12.0M	800	800bit times
Redundancy	0	Without remainder
Repcater_Ctrl_Sig	2	Ctrl-P is TTL-level.
24V_Pins	0	Net24VDC cannot be connected.
Freeze_Mode_supp	1	Freeze support
Sync_Mode_supp	1	Sync mode support
Auto_Baud_supp	1	Auto Baud detection support
Set_Slave_Add_supp	0	Slave Address setting not made
User_Prm_Data_Len	0	Without user parameter data
Min_Slave_Interval	1	
Modular_Station	1	Without module unit (Note 2)
Max_Module	1	1ID Byte
Max_Input_Len	12	12 input bytes
Max_Output_Len	12	12 output bytes
Max_Data_Len	24	12+12 = 24
Module	"6 Word Input/6 Word Output" 75H	Code = 117 = 75H for 6W I/O's (Note 3)
EndModule		

Note 1. In some master devices, the Vendor_Name is up to 10 characters. In this case, use "Mitsubishi".

Note 2. In some PLCs, Modular_Station=1&/Min_Slave_Interval=20

Note 3. Since I/O's=6W, the 75H=117 code is automatically created by COMET200.

5 APPENDICES

5.1 Data Code Lists

The following data code lists are used to read and write the parameter values in the RS-485 operation mode or CC-Link operation mode.

5.1.1 FR-A500 series

Function	Parameter Number	Name	Data Codes		
			Read	Write	Link parameter extension setting (Data code 7F/FF)
Basic functions	0	Torque boost (manual)	00	80	0
	1	Maximum frequency	01	81	0
	2	Minimum frequency	02	82	0
	3	Base frequency	03	83	0
	4	Multi-speed setting (high speed)	04	84	0
	5	Multi-speed setting (middle speed)	05	85	0
	6	Multi-speed setting (low speed)	06	86	0
	7	Acceleration time	07	87	0
	8	Deceleration time	08	88	0
	9	Electronic thermal O/L relay	09	89	0
Standard operation functions	10	DC injection brake operation frequency	0A	8A	0
	11	DC injection brake operation time	0B	8B	0
	12	DC injection brake voltage	0C	8C	0
	13	Starting frequency	0D	8D	0
	14	Load pattern selection	0E	8E	0
	15	Jog frequency	0F	8F	0
	16	Jog acceleration/deceleration time	10	90	0
	17	MRS input selection	11	91	0
	18	High-speed maximum frequency	12	92	0
	19	Base frequency voltage	13	93	0
	20	Acceleration/deceleration reference frequency	14	94	0
	21	Acceleration/deceleration time increments	15	95	0
	22	Stall prevention operation level	16	96	0
	23	Stall prevention operation level at double speed	17	97	0
	24	Multi-speed setting (speed 4)	18	98	0
	25	Multi-speed setting (speed 5)	19	99	0
	26	Multi-speed setting (speed 6)	1A	9A	0
	27	Multi-speed setting (speed 7)	1B	9B	0
	28	Multi-speed input compensation	1C	9C	0
	29	Acceleration/deceleration pattern	1D	9D	0
	30	Regenerative function selection	1E	9E	0
	31	Frequency jump 1A	1F	9F	0
	32	Frequency jump 1B	20	A0	0
	33	Frequency jump 2A	21	A1	0
	34	Frequency jump 2B	22	A2	0
	35	Frequency jump 3A	23	A3	0
	36	Frequency jump 3B	24	A4	0
	37	Speed display	25	A5	0
Output terminal functions	41	Up-to-frequency sensitivity	29	A9	0
	42	Output frequency detection	2A	AA	0
	43	Output frequency detection for reverse rotation	2B	AB	0
Second functions	44	Second acceleration/deceleration time	2C	AC	0
	45	Second deceleration time	2D	AD	0
	46	Second torque boost	2E	AE	0
	47	Second V/F (base frequency)	2F	AF	0
	48	Second stall prevention operation current	30	B0	0
	49	Second stall prevention operation frequency	31	B1	0
	50	Second output frequency detection	32	B2	0
Display functions	52	DU/PU main display data selection	34	B4	0
	53	PU level display data selection	35	B5	0
	54	FM terminal function selection	36	B6	0
	55	Frequency monitoring reference	37	B7	0
	56	Current monitoring reference	38	B8	0
Automatic restart functions	57	Restart coasting time	39	B9	0
	58	Restart cushion time	3A	BA	0

Function	Parameter Number	Name	Data Codes		
			Read	Write	Link parameter extension setting (Data code 7F/FF)
Additional function	59	Remote setting function selection	3B	BB	0
Operation selection functions	60	Intelligent mode selection	3C	BC	0
	61	Reference current for intelligent mode	3D	BD	0
	62	Reference current for intelligent mode accel.	3E	BE	0
	63	Reference current for intelligent mode decel.	3F	BF	0
	64	Starting frequency for elevator mode	40	C0	0
	65	Retry selection	41	C1	0
	66	Stall prevention operation reduction starting frequency	42	C2	0
	67	Number of retries at alarm occurrence	43	C3	0
	68	Retry waiting time	44	C4	0
	69	Retry count display erasure	45	C5	0
	70	Special regenerative brake duty	46	C6	0
	71	Applied motor	47	C7	0
	72	PWM frequency selection	48	C8	0
	73	0-5V/0-10V selection	49	C9	0
	74	Filter time constant	4A	CA	0
	75	Reset selection/disconnected PU detection/PU stop selection	4B	CB	0
	76	Alarm code output selection	4C	CC	0
	77	Parameter write disable selection	4D	---	0
	78	Reverse rotation prevention selection	4E	CE	0
	79	Operation mode selection	4F	---	0
Motor constants	80	Motor capacity	50	D0	0
	81	Number of motor poles	51	D1	0
	82	Motor exciting current	52	D2	0
	83	Rated motor voltage	53	D3	0
	84	Rated motor frequency	54	D4	0
	89	Speed control gain	59	D9	0
	90	Motor constant (R1)	5A	DA	0
	91	Motor constant (R2)	5B	DB	0
	92	Motor constant (L1)	5C	DC	0
	93	Motor constant (L2)	5D	DD	0
	94	Motor constant (X)	5E	DE	0
	95	Online auto tuning selection	5F	DF	0
	96	Auto tuning setting/status	60	E0	0
5-point flexible V/F characteristics	100	V/F1 (first frequency)	00	80	1
	101	V/F1 (first frequency voltage)	01	81	1
	102	V/F2 (second frequency)	02	82	1
	103	V/F2 (second frequency voltage)	03	83	1
	104	V/F3 (third frequency)	04	84	1
	105	V/F3 (third frequency voltage)	05	85	1
	106	V/F4 (fourth frequency)	06	86	1
	107	V/F4 (fourth frequency voltage)	07	87	1
	108	V/F5 (fifth frequency)	08	88	1
	109	V/F5 (fifth frequency voltage)	09	89	1
Third functions	110	Third acceleration/deceleration time	0A	8A	1
	111	Third deceleration time	0B	8B	1
	112	Third torque boost	0C	8C	1
	113	Third V/F (base frequency)	0D	8D	1
	114	Third stall prevention operation current	0E	8E	1
	115	Third stall prevention operation frequency	0F	8F	1
	116	Third output frequency detection	10	90	1
Communication functions	117	Station number	11	91	1
	118	Communication speed	12	92	1
	119	Stop bit length/data length	13	93	1
	120	Parity check presence/absence	14	94	1
	121	Number of communication retries	15	95	1
	122	Communication check time interval	16	96	1
	123	Waiting time setting	17	97	1
	124	CR, LF presence/absence selection	18	98	1

Function	Parameter Number	Name	Data Codes		
			Read	Write	Link parameter extension setting (Data code 7F/FF)
PID control	128	PID action selection	1C	9C	1
	129	PID proportional band	1D	9D	1
	130	PID integral time	1E	9E	1
	131	Upper limit	1F	9F	1
	132	Lower limit	20	A0	1
	133	PID action set point for PU operation	21	A1	1
	134	PID differential time	22	A2	1
Commercial power supply-inverter switch-over	135	Commercial power supply-inverter switch-over sequence output terminal selection	23	A3	1
	136	MC switch-over interlock time	24	A4	1
	137	Start waiting time	25	A5	1
	138	Commercial power supply-inverter switch-over selection at alarm occurrence	26	A6	1
	139	Automatic inverter-commercial power supply switch-over frequency	27	A7	1
Backlash	140	Backlash acceleration stopping frequency	28	A8	1
	141	Backlash acceleration stopping time	29	A9	1
	142	Backlash deceleration stopping frequency	2A	AA	1
	143	Backlash deceleration stopping time	2B	AB	1
Display	144	Speed setting switch-over	2C	AC	1
	145	Parameter unit language switch-over			
Additional functions	148	Stall prevention level at 0V input	30	B0	1
	149	Stall prevention level at 10V input	31	B1	1
Current detection	150	Output current detection level	32	B2	1
	151	Output current detection period	33	B3	1
	152	Zero current detection level	34	B4	1
	153	Zero current detection period	35	B5	1
Sub functions	154	Voltage reduction selection during stall prevention operation	36	B6	1
	155	RT activated condition	37	B7	1
	156	Stall prevention operation selection	38	B8	1
	157	OL signal waiting time	39	B9	1
	158	AM terminal function selection	3A	BA	1
Additional function	160	User group read selection	00	80	2
Automatic restart after instantaneous power failure	162	Automatic restart after instantaneous power failure selection	02	82	2
	163	First cushion time for restart	03	83	2
	164	First cushion voltage for restart	04	84	2
	165	Restart stall prevention operation level	05	85	2
Initial monitor	170	Watt-hour meter clear	0A	8A	2
	171	Actual operation hour meter clear	0B	8B	2
User functions	173	User group 1 registration	0D	8D	2
	174	User group 1 deletion	0E	8E	2
	175	User group 2 registration	0F	8F	2
	176	User group 2 deletion	10	90	2
Terminal assignment functions	180	RL terminal function selection	14	94	2
	181	RM terminal function selection	15	95	2
	182	RH terminal function selection	16	96	2
	183	RT terminal function selection	17	97	2
	184	AU terminal function selection	18	98	2
	185	JOG terminal function selection	19	99	2
	186	CS terminal function selection	1A	9A	2
	190	RUN terminal function selection	1E	9E	2
	191	SU terminal function selection	1F	9F	2
	192	IPF terminal function selection	20	A0	2
	193	OL terminal function selection	21	A1	2
	194	FU terminal function selection	22	A2	2
	195	ABC terminal function selection	23	A3	2

Function	Parameter Number	Name	Data Codes		
			Read	Write	Link parameter extension setting (Data code 7F/FF)
Additional function	199	User's initial value setting	27	A7	2
Programmed operation	200	Programmed operation minute/second selection	3C	BC	1
	201	Program setting 1	3D	BD	1
	202	Program setting 2	3E	BE	1
	203	Program setting 3	3F	BF	1
	204	Program setting 4	40	C0	1
	205	Program setting 5	41	C1	1
	206	Program setting 6	42	C2	1
	207	Program setting 7	43	C3	1
	208	Program setting 8	44	C4	1
	209	Program setting 9	45	C5	1
	210	Program setting 10	46	C6	1
	211	Program setting 11	47	C7	1
	212	Program setting 12	48	C8	1
	213	Program setting 13	49	C9	1
	214	Program setting 14	4A	CA	1
	215	Program setting 15	4B	CB	1
	216	Program setting 16	4C	CC	1
	217	Program setting 17	4D	CD	1
	218	Program setting 18	4E	CE	1
	219	Program setting 19	4F	CF	1
	220	Program setting 20	50	D0	1
	221	Program setting 21	51	D1	1
	222	Program setting 22	52	D2	1
	223	Program setting 23	53	D3	1
	224	Program setting 24	54	D4	1
	225	Program setting 25	55	D5	1
	226	Program setting 26	56	D6	1
	227	Program setting 27	57	D7	1
	228	Program setting 28	58	D8	1
	229	Program setting 29	59	D9	1
	230	Program setting 30	5A	DA	1
	231	Timer setting	5B	DB	1
Multi-speed operation	232	Multi-speed setting (speed 8)	28	A8	2
	233	Multi-speed setting (speed 9)	29	A9	2
	234	Multi-speed setting (speed 10)	2A	AA	2
	235	Multi-speed setting (speed 11)	2B	AB	2
	236	Multi-speed setting (speed 12)	2C	AC	2
	237	Multi-speed setting (speed 13)	2D	AD	2
	238	Multi-speed setting (speed 14)	2E	AE	2
	239	Multi-speed setting (speed 15)	2F	AF	2
Sub functions	240	Soft-PWM setting	30	B0	2
	244	Cooling fan operation selection	34	B4	2
Stop selection function	250	Stop selection	3A	BA	2
Power failure stop functions	261	Power failure stop selection	45	C5	2
	262	Subtracted frequency at deceleration start	46	C6	2
	263	Subtraction starting frequency	47	C7	2
	264	Power-failure deceleration time 1	48	C8	2
	265	Power-failure deceleration time 2	49	C9	2
	266	Power-failure deceleration time switch-over frequency	4A	CA	2
Function selection	270	Stop-on-contact/load torque f selection	4E	CE	2
High-speed f control	271	High-speed setting maximum current	4F	CF	2
	272	Mid-speed setting minimum current	50	D0	2
	273	Current averaging range	51	D1	2
	274	Current averaging filter constant	52	D2	2
Stop on contact	275	Stop-on-contact exciting current low-speed multiplying factor	53	D3	2
	276	Stop-on-contact PWM carrier frequency	54	D4	2

Function	Parameter Number	Name	Data Codes		
			Read	Write	Link parameter extension setting (Data code 7F/FF)
Brake sequence functions	278	Brake opening frequency	56	D6	2
	279	Brake opening current	57	D7	2
	280	Brake opening current detection time	58	D8	2
	281	Brake operation time at start	59	D9	2
	282	Brake operation frequency	5A	DA	2
	283	Brake operation time at stop	5B	DB	2
	284	Deceleration detection function selection	5C	DC	2
	285	Overspeed detection frequency	5D	DD	2
Droop control functions	286	Droop gain	5E	DE	2
	287	Droop filter time constant	5F	DF	2
	332	Communication speed	20	A0	3
	333	Stop bit length	21	A1	3
	334	Parity check presence/absence	22	A2	3
	335	Number of communication retries	23	A3	3
	336	Communication check time interval	24	A4	3
	341	CR, LF presence/absence	25	A5	3
12-bit digital input	300	BCD code input bias	00	80	3
	301	BCD code input gain	01	81	3
	302	Binary code input bias	02	82	3
	303	Binary code input gain	03	83	3
	304	Digital input and analog compensation input enable/disable selection	04	84	3
	305	Data read timing signal operation selection	05	85	3
Analog output/digital output	306	Analog output signal selection	06	86	3
	307	Setting for zero analog output	07	87	3
	308	Setting for maximum analog output	08	88	3
	309	Analog output signal voltage/current changing	09	89	3
	310	Analog meter voltage output selection	0A	8A	3
	311	Setting for zero analog meter voltage output	0B	8B	3
	312	Setting for maximum analog meter voltage output	0C	8C	3
	313	Y0 output selection	0D	8D	3
	314	Y1 output selection	0E	8E	3
	315	Y2 output selection	0F	8F	3
	316	Y3 output selection	10	90	3
	317	Y4 output selection	11	91	3
	318	Y5 output selection	12	92	3
	319	Y6 output selection	13	93	3
Output relay	320	RA1 output selection	14	94	3
	321	RA2 output selection	15	95	3
	322	RA3 output selection	16	96	3
Computer link functions	330	RA output selection	1E	9E	3
	331	Inverter station number	1F	9F	3
	332	Communication speed	20	A0	3
	333	Stop bit length	21	A1	3
	334	Parity check presence/absence	22	A2	3
	335	Number of communication retries	23	A3	3
	336	Communication check time interval	24	A4	3
	337	Waiting time setting	25	A5	3
	338	Operation command write	26	A6	3
	339	Speed command write	27	A7	3
	340	Link start mode selection	28	A8	3
	341	CR, LF presence/absence selection	29	A9	3
	342	E^2PROM write presence/absence	2A	AA	3
Calibration functions	900	FM terminal calibration	5C	DC	1
	901	AM terminal calibration	5D	DD	1
	902	Frequency setting voltage bias	5E	DE	1
	903	Frequency setting voltage gain	5F	DF	1
	904	Frequency setting current bias	60	E0	1
	905	Frequency setting current gain	61	E1	1
	990	Buzzer control	5A	DA	9

Function	Parameter Number	Name		Data Codes		
				Read	Write	Link parameter extension setting (Data code 7F/FF)
	—	Second parameter switch-over		6C	EC	—
	—	Frequency setting	Running frequency (RAM)	6D	ED	—
	—		Running frequency (E^2PROM)	6E	EE	—
	—	Monitor	Frequency monitor	6F	—	—
	—		Output current monitor	70	—	—
	—		Output voltage monitor	71	—	—
	—		Special monitor	72	—	—
	—		Special monitor selection No.	73	F3	—
	—	Alarm display	Most recent No. 1, No. 2 /alarm display clear	74	F4	—
	—		Most recent No. 3, No. 4	75	—	—
	—		Most recent No. 5, No. 6	76	—	—
	—		Most recent No. 7, No. 8	77	—	—
	—	Inverter status monitor/operation command		7A	FA	—
	—	Operation mode acquisition		7B	FB	—
	—	All parameter clear		—	FC	—
	—	Inverter reset		—	FD	—
	—	Link parameter extension setting		7F	FF	—

5.1.2 FR-F500 series

Function	Parameter Number	Name	Data Codes		
			Read	Write	Link parameter extension setting (Data code 7F/FF)
Basic functions	0	Torque boost (manual)	00	80	0
	1	Maximum frequency	01	81	0
	2	Minimum frequency	02	82	0
	3	Base frequency	03	83	0
	4	Multi-speed setting (high speed)	04	84	0
	5	Multi-speed setting (middle speed)	05	85	0
	6	Multi-speed setting (low speed)	06	86	0
	7	Acceleration time	07	87	0
	8	Deceleration time	08	88	0
	9	Electronic thermal O/L relay	09	89	0
Standard operation functions	10	DC injection brake operation frequency	0A	8A	0
	11	DC injection brake operation time	0B	8B	0
	12	DC injection brake voltage	0C	8C	0
	13	Starting frequency	0D	8D	0
	14	Load pattern selection	0E	8E	0
	15	Jog frequency	0F	8F	0
	16	Jog acceleration/deceleration time	10	90	0
	17	MRS input selection	11	91	0
	19	Base frequency voltage	13	93	0
	20	Acceleration/deceleration reference frequency	14	94	0
	21	Acceleration/deceleration time increments	15	95	0
	22	Stall prevention operation level	16	96	0
	23	Stall prevention operation level at double speed	17	97	0
	24	Multi-speed setting (speed 4)	18	98	0
	25	Multi-speed setting (speed 5)	19	99	0
	26	Multi-speed setting (speed 6)	1A	9A	0
	27	Multi-speed setting (speed 7)	1B	9B	0
	28	Multi-speed input compensation	1C	9C	0
	29	Acceleration/deceleration pattern	1D	9D	0
	30	Regenerative function selection	1E	9E	0
	31	Frequency jump 1A	1F	9F	0
	32	Frequency jump 1B	20	A0	0
	33	Frequency jump 2A	21	A1	0
	34	Frequency jump 2B	22	A2	0
	35	Frequency jump 3A	23	A3	0
	36	Frequency jump 3B	24	A4	0
	37	Speed display	25	A5	0
	38	Automatic torque boost	26	A6	0
	39	Automatic torque boost operation starting current	27	A7	0
Output terminal functions	41	Up-to-frequency sensitivity	29	A9	0
	42	Output frequency detection	2A	AA	0
	43	Output frequency detection for reverse rotation	2B	AB	0
Second functions	44	Second acceleration/deceleration time	2C	AC	0
	45	Second deceleration time	2D	AD	0
	46	Second torque boost	2E	AE	0
	47	Second V/F (base frequency)	2F	AF	0
	48	Second stall prevention operation current	30	B0	0
	49	Second stall prevention operation frequency	31	B1	0
	50	Second output frequency detection	32	B2	0
Display functions	52	DU/PU main display data selection	34	B4	0
	53	PU level display data selection	35	B5	0
	54	FM terminal function selection	36	B6	0
	55	Frequency monitoring reference	37	B7	0
	56	Current monitoring reference	38	B8	0
Automatic restart functions	57	Restart coasting time	39	B9	0
	58	Restart cushion time	3A	BA	0

Function	Parameter Number	Name	Data Codes		
			Read	Write	Link parameter extension setting (Data code 7F/FF)
Additional function	59	Remote setting function selection	3B	BB	0
Operation selection functions	60	Intelligent mode selection	3C	BC	0
	61	Reference current for intelligent mode	3D	BD	0
	62	Reference current for intelligent mode accel.	3E	BE	0
	63	Reference current for intelligent mode decel.	3F	BF	0
	65	Retry selection	41	C1	0
	66	Stall prevention operation reduction starting frequency	42	C2	0
	67	Number of retries at alarm occurrence	43	C3	0
	68	Retry waiting time	44	C4	0
	69	Retry count display erasure	45	C5	0
	71	Applied motor	47	C7	0
	72	PWM frequency selection	48	C8	0
	73	0-5V/0-10V selection	49	C9	0
	74	Filter time constant	4A	CA	0
	75	Reset selection/disconnected PU detection/PU stop selection	4B	CB	0
	76	Alarm code output selection	4C	CC	0
	77	Parameter write disable selection	4D	---	0
	78	Reverse rotation prevention selection	4E	CE	0
	79	Operation mode selection	4F	---	0
5-point flexible V/F characteristics	100	V/F1 (first frequency)	00	80	1
	101	V/F1 (first frequency voltage)	01	81	1
	102	V/F2 (second frequency)	02	82	1
	103	V/F2 (second frequency voltage)	03	83	1
	104	V/F3 (third frequency)	04	84	1
	105	V/F3 (third frequency voltage)	05	85	1
	106	V/F4 (fourth frequency)	06	86	1
	107	V/F4 (fourth frequency voltage)	07	87	1
	108	V/F5 (fifth frequency)	08	88	1
	109	V/F5 (fifth frequency voltage)	09	89	1
Communication functions	117	Station number	11	91	1
	118	Communication speed	12	92	1
	119	Stop bit length/data length	13	93	1
	120	Parity check presence/absence	14	94	1
	121	Number of communication retries	15	95	1
	122	Communication check time interval	16	96	1
	123	Waiting time setting	17	97	1
	124	CR, LF presence/absence selection	18	98	1
PID control	128	PID action selection	1C	9C	1
	129	PID proportional band	1D	9D	1
	130	PID integral time	1E	9E	1
	131	Upper limit	1F	9F	1
	132	Lower limit	20	A0	1
	133	PID action set point for PU operation	21	A1	1
	134	PID differential time	22	A2	1
Commercial power supply-inverter switch-over	135	Commercial power supply-inverter switch-over sequence output terminal selection	23	A3	1
	136	MC switch-over interlock time	24	A4	1
	137	Start waiting time	25	A5	1
	138	Commercial power supply-inverter switch-over selection at alarm occurrence	26	A6	1
	139	Automatic inverter-commercial power supply switch-over frequency	27	A7	1
Backlash	140	Backlash acceleration stopping frequency	28	A8	1
	141	Backlash acceleration stopping time	29	A9	1
	142	Backlash deceleration stopping frequency	2A	AA	1
	143	Backlash deceleration stopping time	2B	AB	1
Display	144	Speed setting switch-over	2C	AC	1
	145	Parameter unit language switch-over	2D	AD	
Additional functions	148	Stall prevention level at 0V input	30	B0	1
	149	Stall prevention level at 10V input	31	B1	1
Current detection	152	Zero current detection level	34	B4	1
	153	Zero current detection period	35	B5	1

Function	Parameter Number	Name	Data Codes		
			Read	Write	Link parameter extension setting (Data code 7F/FF)
Sub functions	154	Voltage reduction selection during stall prevention operation	36	B6	1
	155	RT activated condition	37	B7	1
	156	Stall prevention operation selection	38	B8	1
	157	OL signal waiting time	39	B9	1
	158	AM terminal function selection	3A	BA	1
Additional function	160	User group read selection	00	80	2
Automatic restart after instantaneous power failure	162	Automatic restart after instantaneous power failure selection	02	82	2
	163	First cushion time for restart	03	83	2
	164	First cushion voltage for restart	04	84	2
	165	Restart stall prevention operation level	05	85	2
Initial monitor	170	Watt-hour meter clear	0A	8A	2
	171	Actual operation hour meter clear	0B	8B	2
User functions	173	User group 1 registration	0D	8D	2
	174	User group 1 deletion	0E	8E	2
	175	User group 2 registration	0F	8F	2
	176	User group 2 deletion	10	90	2
Terminal assignment functions	180	RL terminal function selection	14	94	2
	181	RM terminal function selection	15	95	2
	182	RH terminal function selection	16	96	2
	183	RT terminal function selection	17	97	2
	184	AU terminal function selection	18	98	2
	185	JOG terminal function selection	19	99	2
	186	CS terminal function selection	1A	9A	2
	190	RUN terminal function selection	1E	9E	2
	191	SU terminal function selection	1F	9F	2
	192	IPF terminal function selection	20	A0	2
	193	OL terminal function selection	21	A1	2
	194	FU terminal function selection	22	A2	2
	195	ABC terminal function selection	23	A3	2
Additional function	199	User's initial value setting	27	A7	2
Sub functions	240	Soft-PWM setting	30	B0	2
	244	Cooling fan operation selection	34	B4	2
Additional functions	251	Output phase failure protection function	3B	BB	2
	252	Override bias	3C	BC	2
	253	Override gain	3D	BD	2
12-bit digital input	300	BCD code input bias	00	80	3
	301	BCD code input gain	01	81	3
	302	Binary code input bias	02	82	3
	303	Binary code input gain	03	83	3
	304	Digital input and analog compensation input enable/disable selection	04	84	3
	305	Data read timing signal operation selection	05	85	3
Analog output/digital output	306	Analog output signal selection	06	86	3
	307	Setting for zero analog output	07	87	3
	308	Setting for maximum analog output	08	88	3
	309	Analog output signal voltage/current changing	09	89	3
	310	Analog meter voltage output selection	0A	8A	3
	311	Setting for zero analog meter voltage output	0B	8B	3
	312	Setting for maximum analog meter voltage output	0C	8C	3
	313	Y0 output selection	0D	8D	3
	314	Y1 output selection	0E	8E	3
	315	Y2 output selection	0F	8F	3
	316	Y3 output selection	10	90	3
	317	Y4 output selection	11	91	3
	318	Y5 output selection	12	92	3
	319	Y6 output selection	13	93	3

Function	Parameter Number	Name		Data Codes		
				Read	Write	Link parameter extension setting (Data code 7F/FF)
Output relay	320	RA1 output selection		14	94	3
	321	RA2 output selection		15	95	3
	322	RA3 output selection		16	96	3
Computer link functions	330	RA output selection		1E	9E	3
	331	Inverter station number		1F	9F	3
	332	Communication speed		20	A0	3
	333	Stop bit length		21	A1	3
	334	Parity check presence/absence		22	A2	3
	335	Number of communication retries		23	A3	3
	336	Communication check time interval		24	A4	3
	337	Waiting time setting		25	A5	3
	338	Operation command write		26	A6	3
	339	Speed command write		27	A7	3
	340	Link start mode selection		28	A8	3
	341	CR, LF presence/absence selection		29	A9	3
	342	E^2PROM write presence/absence		2A	AA	3
Calibration functions	900	FM terminal calibration		5C	DC	1
	901	AM terminal calibration		5D	DD	1
	902	Frequency setting voltage bias		5E	DE	1
	903	Frequency setting voltage gain		5F	DF	1
	904	Frequency setting current bias		60	E0	1
	905	Frequency setting current gain		61	E1	1
	990	Buzzer control		5A	DA	9
	991	LCD contrast		5B	DB	9
	-	Second parameter switch-over		6C	EC	-
	-	Frequency setting	Running frequency (RAM)	6D	ED	-
	-		Running frequency (E^2PROM)	6E	EE	-
	-	Monitor	Frequency monitor	6F	-	-
	-		Output current monitor	70	-	-
	-		Output voltage monitor	71	-	-
	-		Special monitor	72	-	-
	-		Special monitor selection No.	73	F3	-
	-	Alarm display	Most recent No. 1, No. 2 /alarm display clear	74	F4	-
	-		Most recent No. 3, No. 4	75	-	-
	-		Most recent No. 5, No. 6	76	-	-
	-		Most recent No. 7, No. 8	77	-	-
	-	Inverter status monitor/operation command		7A	FA	-
	-	Operation mode acquisition		7B	FB	-
	-	All parameter clear		-	FC	-
	-	Inverter reset		-	FD	-
	-	Link parameter extension setting		7F	FF	-

5.1.3 FR-E500 series

Function	Parameter Number	Name	Data Codes		
			Read	Write	Link parameter extension setting (Data code 7F/FF)
Basic functions	0	Torque boost (manual)	00	80	0
	1	Maximum frequency	01	81	0
	2	Minimum frequency	02	82	0
	3	Base frequency	03	83	0
	4	Multi-speed setting (high speed)	04	84	0
	5	Multi-speed setting (middle speed)	05	85	0
	6	Multi-speed setting (low speed)	06	86	0
	7	Acceleration time	07	87	0
	8	Deceleration time	08	88	0
	9	Electronic thermal O/L relay	09	89	0
Standard operation functions	10	DC injection brake operation frequency	0A	8A	0
	11	DC injection brake operation time	0B	8B	0
	12	DC injection brake voltage	0C	8C	0
	13	Starting frequency	0D	8D	0
	14	Load pattern selection	0E	8E	0
	15	Jog frequency	0F	8F	0
	16	Jog acceleration/deceleration time	10	90	0
	18	High-speed maximum frequency	12	92	0
	19	Base frequency voltage	13	93	0
	20	Acceleration/deceleration reference frequency	14	94	0
	21	Acceleration/deceleration time increments	15	95	0
	22	Stall prevention operation level	16	96	0
	23	Stall prevention operation level at double speed	17	97	0
	24	Multi-speed setting (speed 4)	18	98	0
	25	Multi-speed setting (speed 5)	19	99	0
	26	Multi-speed setting (speed 6)	1A	9A	0
	27	Multi-speed setting (speed 7)	1B	9B	0
	29	Acceleration/deceleration pattern	1D	9D	0
	30	Regenerative function selection	1E	9E	0
	31	Frequency jump 1A	1F	9F	0
	32	Frequency jump 1B	20	A0	0
	33	Frequency jump 2A	21	A1	0
	34	Frequency jump 2B	22	A2	0
	35	Frequency jump 3A	23	A3	0
	36	Frequency jump 3B	24	A4	0
	37	Speed display	25	A5	0
	38	Frequency at 5V (10V) input	26	A6	0
	39	Frequency at 20mA input	27	A7	0
Output terminal functions	41	Up-to-frequency sensitivity	29	A9	0
	42	Output frequency detection	2A	AA	0
	43	Output frequency detection for reverse rotation	2B	AB	0
Second functions	44	Second acceleration/deceleration time	2C	AC	0
	45	Second deceleration time	2D	AD	0
	46	Second torque boost	2E	AE	0
	47	Second V/F (base frequency)	2F	AF	0
	48	Second electronic overcurrent protection	30	B0	0
Display functions	52	Operation panel/PU main display data selection	34	B4	0
	54	FM terminal function selection	36	B6	0
	55	Frequency monitoring reference	37	B7	0
	56	Current monitoring reference	38	B8	0
Automatic restart functions	57	Restart coasting time	39	B9	0
	58	Restart cushion time	3A	BA	0
Additional function	59	Remote setting function selection	3B	BB	0

Function	Parameter Number	Name	Data Codes		
			Read	Write	Link parameter extension setting (Data code 7F/FF)
Operation selection functions	60	Shortest acceleration/deceleration mode	3C	BC	0
	61	Reference current for intelligent mode	3D	BD	0
	62	Reference current for intelligent mode accel.	3E	BE	0
	63	Reference current for intelligent mode decel.	3F	BF	0
	65	Retry selection	41	C1	0
	66	Stall prevention operation reduction starting frequency	42	C2	0
	67	Number of retries at alarm occurrence	43	C3	0
	68	Retry waiting time	44	C4	0
	69	Retry count display erasure	45	C5	0
	70	Special regenerative brake duty	46	C6	0
	71	Applied motor	47	C7	0
	72	PWM frequency selection	48	C8	0
	73	0-5V/0-10V selection	49	C9	0
	74	Filter time constant	4A	CA	0
	75	Reset selection/disconnected PU detection/PU stop selection	4B	CB	0
	77	Parameter write disable selection	4D	CD	0
	78	Reverse rotation prevention selection	4E	CE	0
	79	Operation mode selection	4F	CF	0
General-purpose magnetic flux vector control	80	Motor capacity	50	D0	0
	82	Motor exciting current	52	D2	0
	83	Rated motor voltage	53	D3	0
	84	Rated motor frequency	54	D4	0
	90	Motor constant (R1)	5A	DA	0
	96	Auto tuning setting/status	60	E0	0
Communication functions	117	Station number	11	91	1
	118	Communication speed	12	92	1
	119	Stop bit length	13	93	1
	120	Parity check presence/absence	14	94	1
	121	Number of communication retries	15	95	1
	122	Communication check time interval	16	96	1
	123	Waiting time setting	17	97	1
	124	CR, LF presence/absence selection	18	98	1
PID control	128	PID action selection	1C	9C	1
	129	PID proportional band	1D	9D	1
	130	PID integral time	1E	9E	1
	131	Upper limit	1F	9F	1
	132	Lower limit	20	A0	1
	133	PID action set point for PU operation	21	A1	1
	134	PID differential time	22	A2	1
Additional functions	145	Parameter unit language switch-over	2D	AD	1
	146	Frequency setting command selection	2E	AE	1
Current detection	150	Output current detection level	32	B2	1
	151	Output current detection period	33	B3	
	152	Zero current detection level	34	B4	1
	153	Zero current detection period	35	B5	1
Sub function	156	Stall prevention operation selection	38	B8	1
Additional function	160	User group read selection	00	80	2
Initial monitor	171	Actual operation hour meter clear	0B	8B	2
User functions	173	User group 1 registration	0D	8D	2
	174	User group 1 deletion	0E	8E	2
	175	User group 2 registration	0F	8F	2
	176	User group 2 deletion	10	90	2

Function	Parameter Number	Name	Data Codes		
			Read	Write	Link parameter extension setting (Data code 7F/FF)
Terminal assignment functions	180	RL terminal function selection	14	94	2
	181	RM terminal function selection	15	95	2
	182	RH terminal function selection	16	96	2
	183	MRS terminal function selection	17	97	2
	190	RUN terminal function selection	1E	9E	2
	191	FU terminal function selection	1F	9F	2
	192	A, B, C terminal function selection	20	A0	2
Multi-speed operation	232	Multi-speed setting (speed 8)	28	A8	2
	233	Multi-speed setting (speed 9)	29	A9	2
	234	Multi-speed setting (speed 10)	2A	AA	2
	235	Multi-speed setting (speed 11)	2B	AB	2
	236	Multi-speed setting (speed 12)	2C	AC	2
	237	Multi-speed setting (speed 13)	2D	AD	2
	238	Multi-speed setting (speed 14)	2E	AE	2
	239	Multi-speed setting (speed 15)	2F	AF	2
Sub functions	240	Soft-PWM setting	30	B0	2
	244	Cooling fan operation selection	34	B4	2
	245	Rated motor slip	35	B5	2
	246	Slip compensation response time	36	B6	2
	247	Constant output region slip compensation selection	37	B7	2
	249	Starting-time ground fault detection presence/absence	39	B9	2
Stop selection function	250	Stop selection	3A	BA	2
Computer link functions	338	Operation command write	26	A6	3
	339	Speed command write	27	A7	3
	340	Link start mode selection	28	A8	3
Calibration functions	900	FM terminal calibration	5C	DC	1
	902	Frequency setting voltage bias	5E	DE	1
	903	Frequency setting voltage gain	5F	DF	1
	904	Frequency setting current bias	60	E0	1
	905	Frequency setting current gain	61	E1	1
	922	Built-in frequency setting potentiometer bias	16	96	9
	923	Built-in frequency setting potentiometer gain	17	97	9
	990	Buzzer control	5A	DA	9
	991	LCD contrast	5B	DB	9