MITSUBISHI ELECTRIC

INVERTER

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

Compact & easy-to-use inverter

CONTENTS

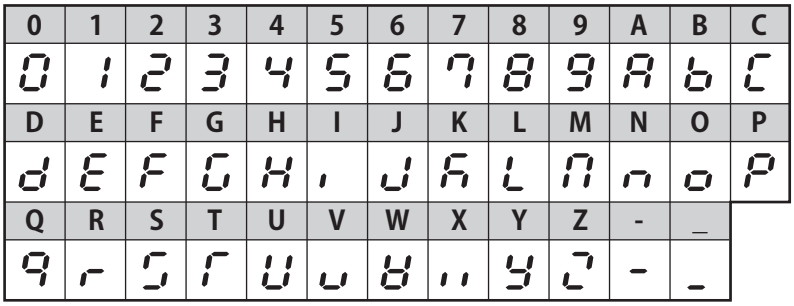
1 Introduction

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

◆ Abbreviations

Item	Description
Operation panel	Inverter's operation panel, LCD operation panel (FR-LU08), and enclosure surface operation panel (FR-PA07)
Parameter unit	Parameter unit (FR-PU07)
PU	Operation panel and parameter unit
Inverter	Mitsubishi Electric FR-D800 series inverter
D800	Standard model (RS-485 communication)
Pr.	Parameter number (Number assigned to function)
PU operation	Operation using the PU (operation panel / parameter unit)
External operation	Operation using the control circuit signals
Combined operation	Combined operation using the PU (operation panel / parameter unit) and External operation
Mitsubishi Electric standard efficiency motor	SF-JR
Mitsubishi Electric constant-torque motor	SF-HRCA
Mitsubishi Electric high-performance energy-saving motor	SF-PR
Mitsubishi Electric PM motor	EM-A

◆ Digital characters and their corresponding printed equivalents



◆ Trademarks

- MODBUS is a registered trademark of SCHNEIDER ELECTRIC USA, INC.
- Other company and product names herein are either trademarks or registered trademarks of their respective owners.

◆ Notes on descriptions in this Instruction Manual

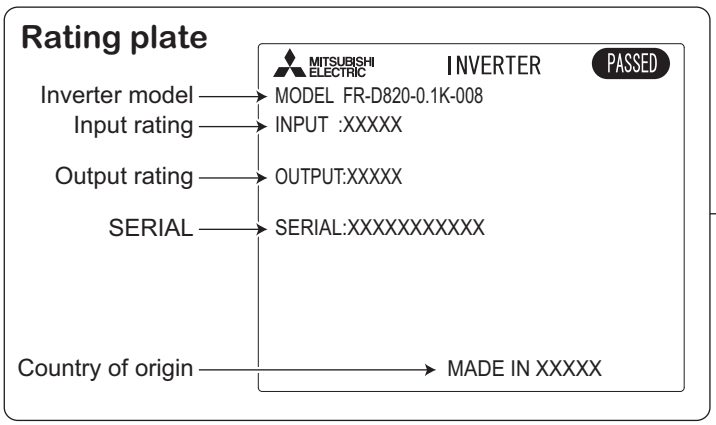
- Connection diagrams in this Instruction Manual appear with the control logic of the input terminals as sink logic, unless otherwise specified. (Refer to the Instruction Manual (Connection) for the switching of the control logic of the inverter.)

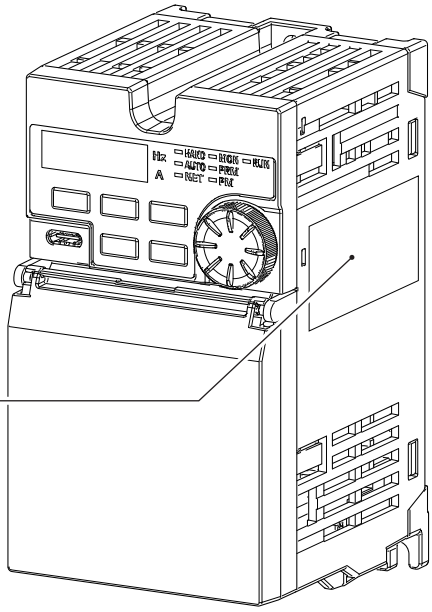
1.1 Product checking

◆ Inverter model

FR-D8 [2] [0] [ ] - [0.1K-008] [ ]

A B C D E





- A: The voltage class is shown.

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

- B: The protective structure is shown.

Symbol	Protective structure
0	Open type (IP20)

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

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

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

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

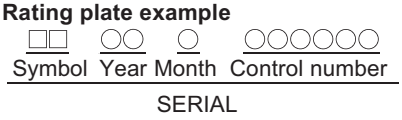
- E: Availability of circuit board coating is shown.

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

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

◆ How to read the SERIAL number

Rating plate example



The SERIAL consists of two symbols, three characters indicating the production year and month, and six characters indicating the control number.
The last two digits of the production year are indicated as the Year, and the Month is indicated by 1 to 9, X (October), Y (November), or Z (December).

◆ Specification differences by the country of origin

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

For the country of origin, refer to the rating plate (page 3).

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

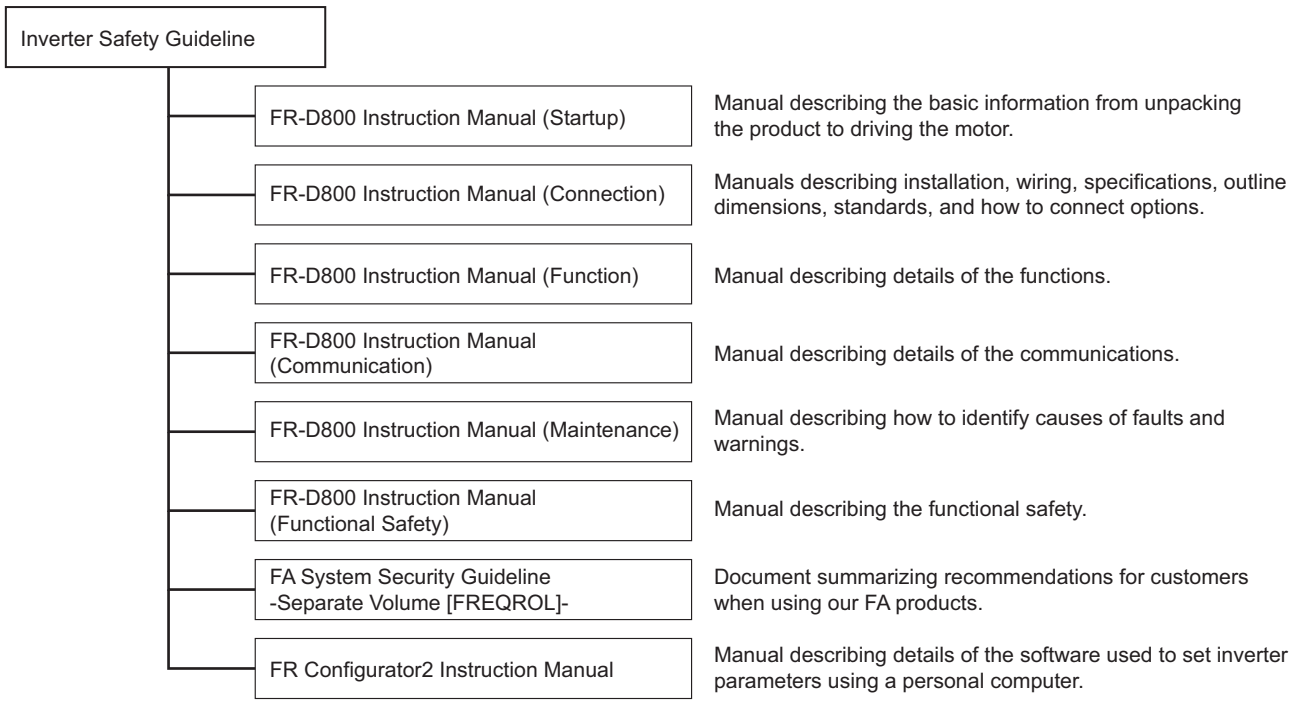
1.2 Related manuals

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

Point

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

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



Name	Manual number
FR-D800 Inverter Safety Guideline	IB-0601019
FR-D800 Instruction Manual (Startup)	IB-0601026ENG
FR-D800 Instruction Manual (Connection)	IB-0601029ENG
FR-D800 Instruction Manual (Function)	IB-0601034ENG
FR-D800 Instruction Manual (Maintenance)	IB-0601044ENG
FR-D800 Instruction Manual (Functional Safety)	BCN-A23498-007(E)
FA System Security Guideline -Separate Volume [FREQROL]-	BCN-C22005-1054
FR Configurator2 Instruction Manual	IB-0600516ENG

2 RS-485 Communication

2.1 Outline

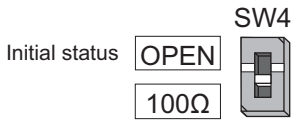
RS-485 communication is available for the standard model.

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

2.2 Wiring

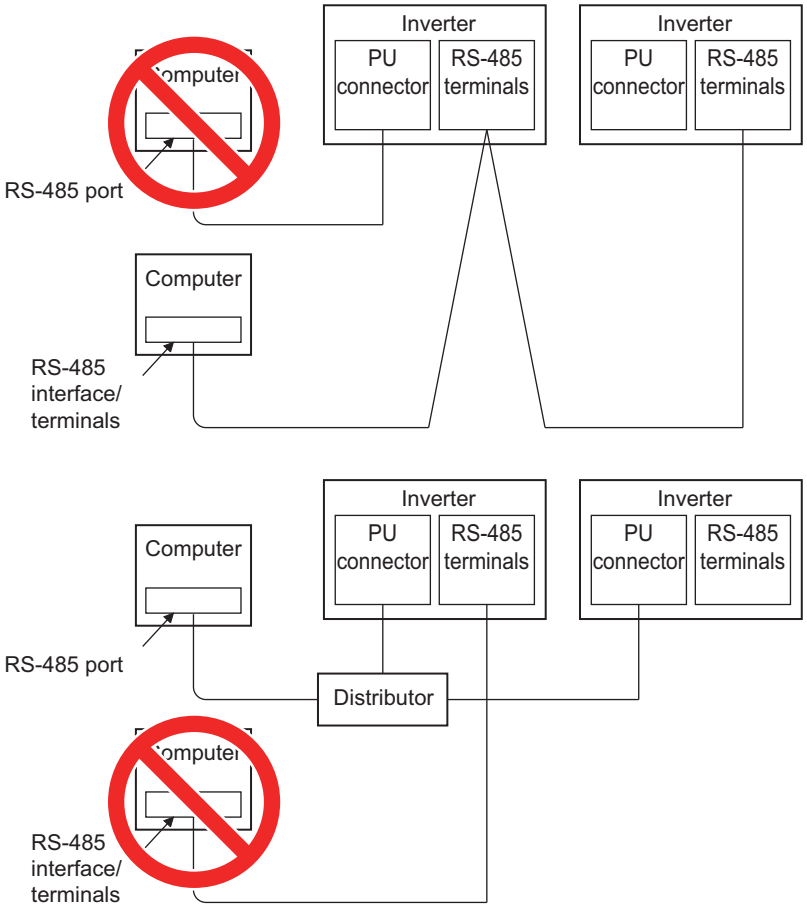
2.2.1 Wiring procedure

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



2.2.2 Precautions

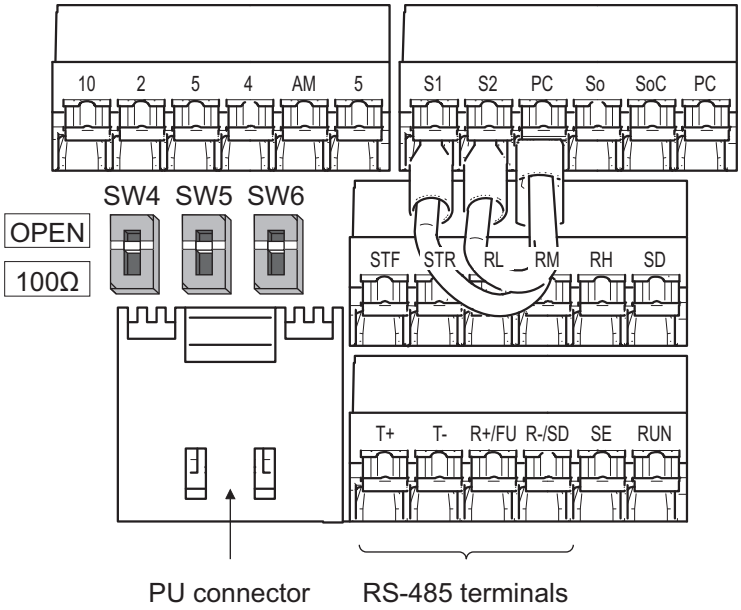
- The PU connector and the RS-485 terminals cannot be used simultaneously. Use either the connector or the terminals, and do not wire the other.
- RS-485 communication via the PU connector is enabled initially. (Refer to page 8.)
- When using the RS-485 terminals, switch the R+/FU switch (SW5) and the R-/SD switch (SW6). (Refer to page 12.)



2.3 Wiring of PU connector

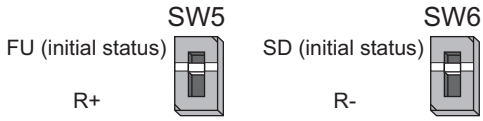
Using the PU connector enables communication operation from a personal computer, etc.

◆ Before communication

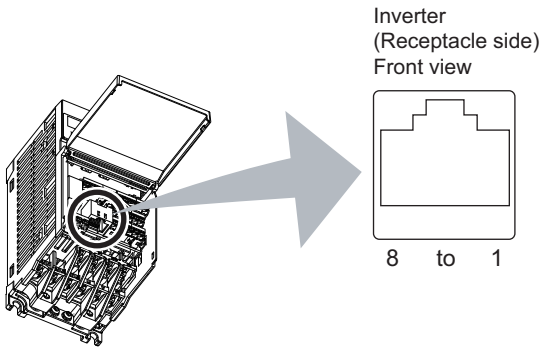


1. If any cable is connected to the RS-485 terminals, remove the wiring.
When terminals R+/FU or R-/SD are used as terminals FU or SD, the wiring does not need to be removed.

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



◆ PU connector pin-outs



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

NOTE

- Pins No. 2 and 8 provide power to the operation panel or parameter unit. Do not use these pins for RS-485 communication.
- Do not connect the PU connector to the computer's LAN board, FAX modem socket, or telephone modular connector. The product could be damaged due to differences in electrical specifications.

◆ Connection cable

Use Ethernet cables compliant with the following standards.

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

NOTE

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

Commercially available products (as of April 2023)

Product name	Model	Manufacturer
Interface embedded cable dedicated for inverter*1	DINV-U4	Diatrend Corp.

*1 The conversion cable cannot connect multiple inverters. (The computer and inverter are connected in a 1:1 pair.) This is a USB-to-RS-485 converter-embedded conversion cable. No additional cable or connector is required. For the product details, contact the manufacturer.

◆ Distributor

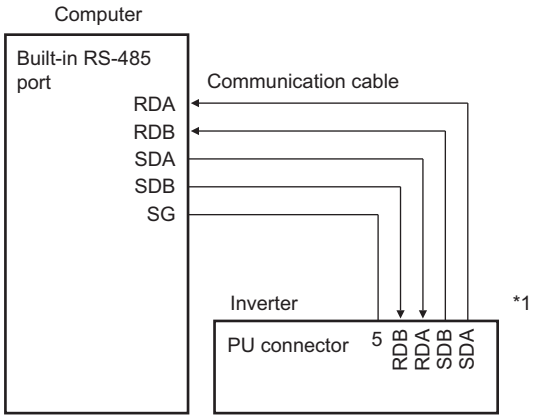
To connect multiple inverters, use distributors.

Commercially available products (as of April 2023)

Product name	Model	Manufacturer
RS-485 distributor	BMJ-8-28N (Pins No. 2 and No. 8 are not connected internally.) (A plug with a terminating resistor is not used.)	HACHIKO ELECTRIC CO., LTD.
	DMDH-3PN (Pins No. 2 and No. 8 are not connected internally.) DMDH-10PN (Pins No. 2 and No. 8 are not connected internally.)	Diatrend Corp.

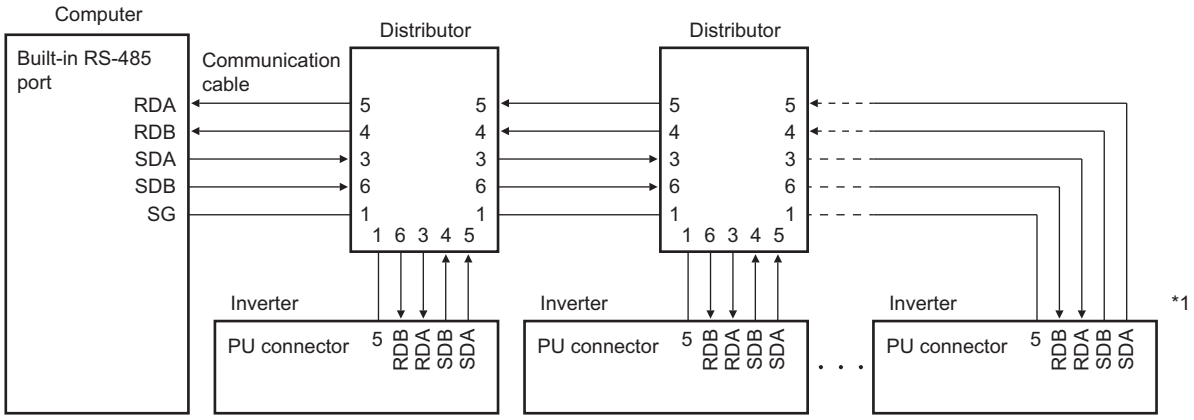
◆ PU connector wiring method

- Connecting one inverter (four-wire type)



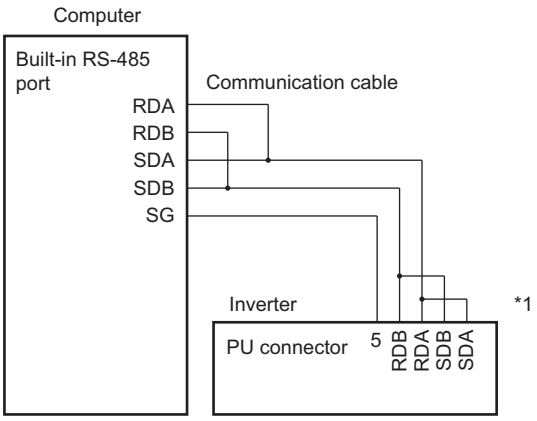
*1 Set the terminating resistor switch (SW4) to the 100 Ω side.

- Connecting multiple inverters (four-wire type)



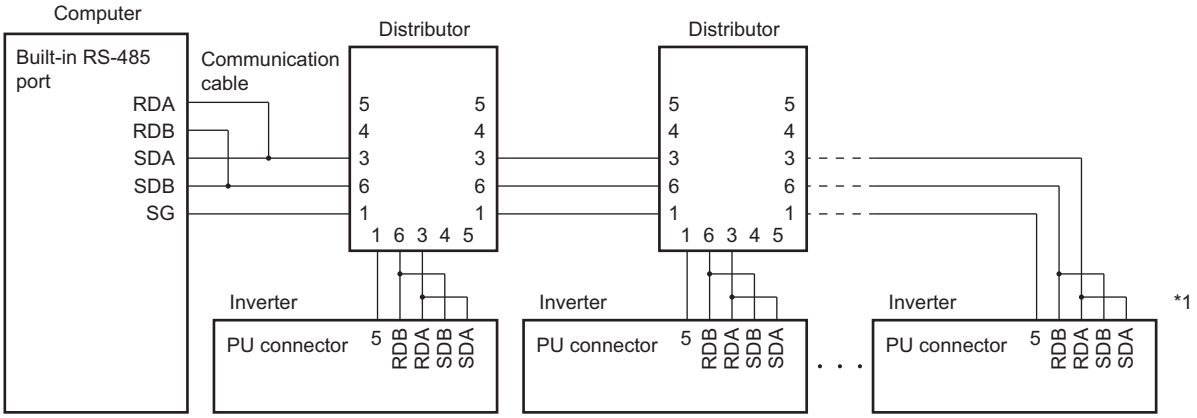
*1 On the inverter most remotely connected with the computer, set the terminating resistor switch (SW4) to the 100 Ω side.

- Connecting one inverter (two-wire type)



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

- Connecting multiple inverters (two-wire type)

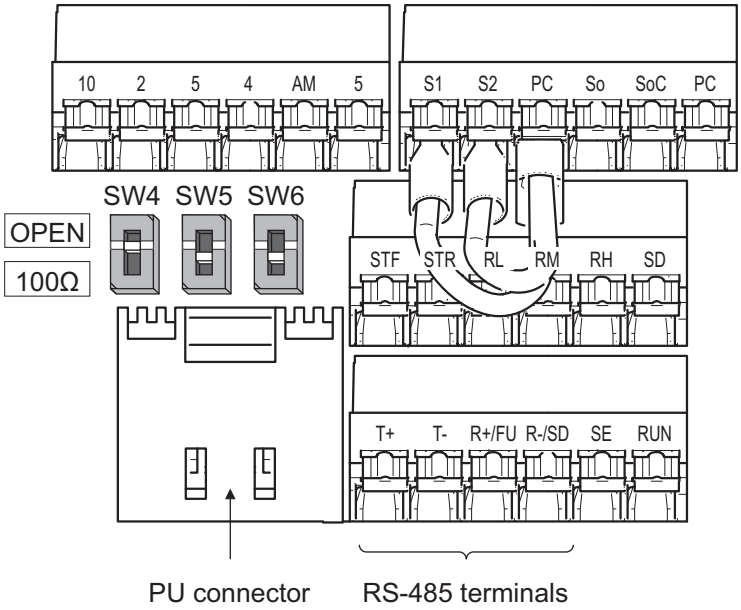


*1 On the inverter most remotely connected with the computer, set the terminating resistor switch (SW4) to the 100 Ω side.

2.4 Wiring of RS-485 terminals

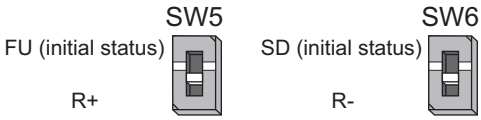
Using the RS-485 terminals enables communication operation from a personal computer, etc.

◆ Before communication

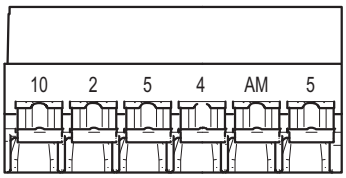


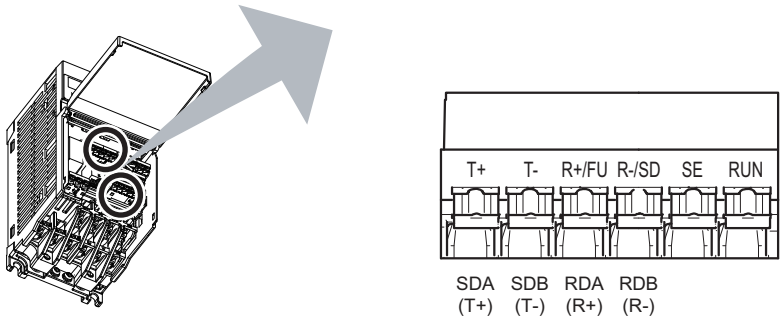
1. If any cable is connected to the PU connector, remove the wiring.

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



◆ RS-485 terminal layout





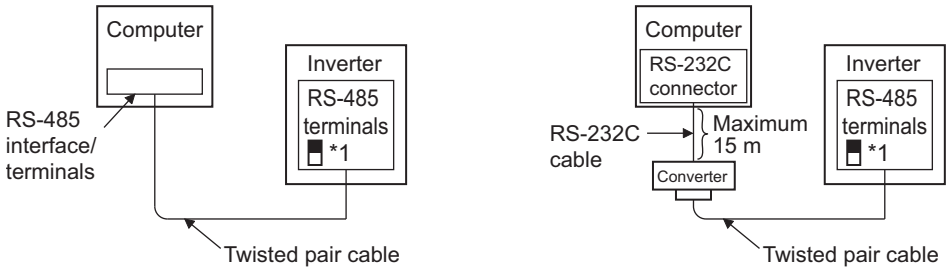
Name	Description
RDA (R+)	Inverter receive+
RDB (R-)	Inverter receive-
SDA (T+)	Inverter send+
SDB (T-)	Inverter send-
5	Earthing (grounding)

◆ Wiring the RS-485 terminals

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

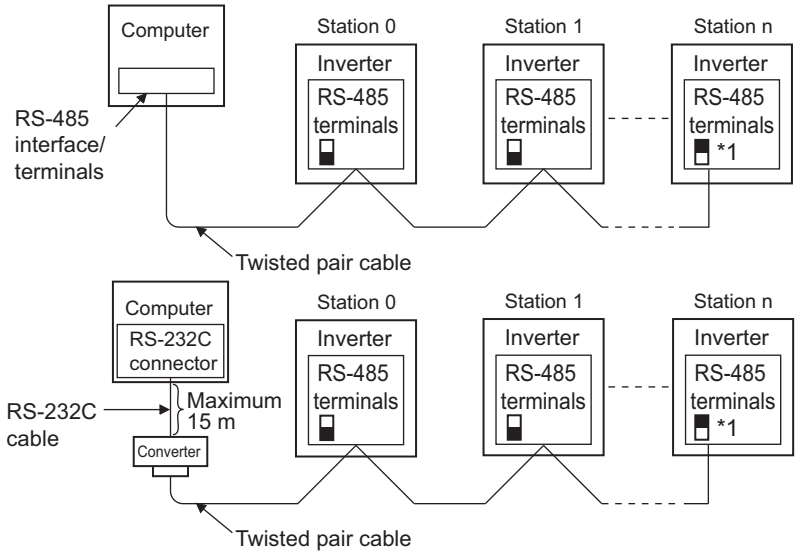
◆ System configuration of RS-485 terminals

- Computer and inverter connection (1:1)



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

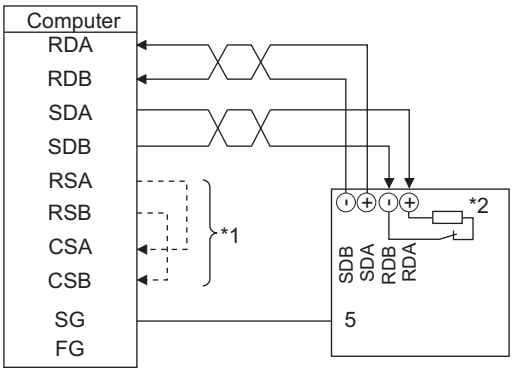
- Combination of a computer and multiple inverters (1:n)



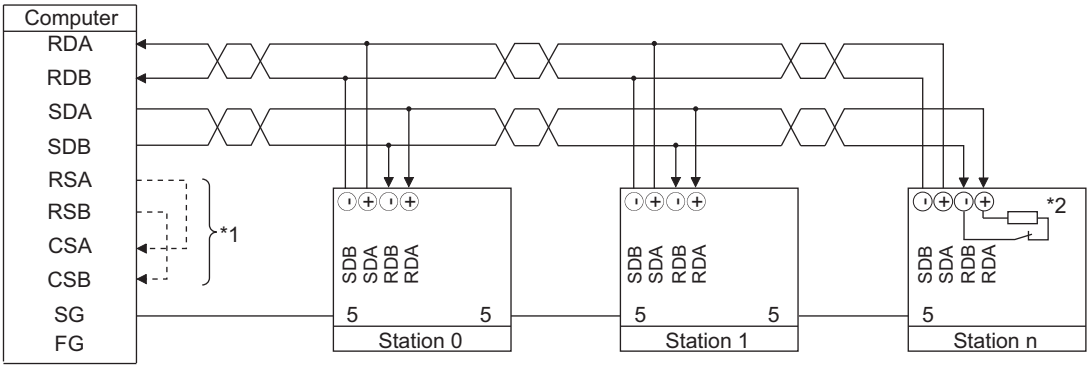
*1 On the inverter most remotely connected with the computer, set the terminating resistor switch (SW4) to the 100 Ω side.

◆ RS-485 terminals wiring method

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



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

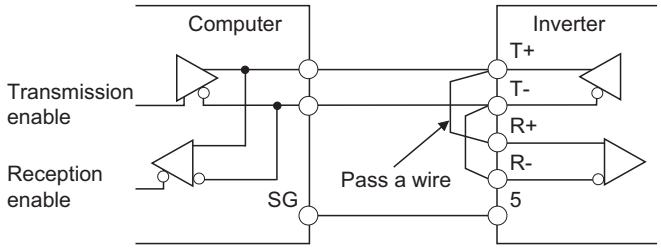


*1 Make connection in accordance with the Instruction Manual of the computer to be used with.
Fully check the terminal numbers of the computer since they vary with the model.

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

◆ Two-wire type connection

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



NOTE

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

2.5 Mitsubishi inverter protocol (computer link communication)

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

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

Pr.	Name	Initial value	Setting range	Description	
549 **N000**	**Protocol selection**	0	0	Mitsubishi inverter protocol (computer link)	
			1	MODBUS RTU protocol	
117 **N020**	**RS-485 communication station number**	0	0 to 31*1	Use this parameter to specify the inverter station number. Enter the inverter station numbers when two or more inverters are connected to one personal computer.	
118 **N021**	**RS-485 communication speed**	192	48, 96, 192, 384, 576, 768, 1152	Select the communication speed. The setting value × 100 equals the communication speed. For example, enter 192 to set the communication speed of 19200 bps.	
N022	**RS-485 communication data length**	0	0	Data length 8 bits	
			1	Data length 7 bits	
N023	**RS-485 communication stop bit length**	1	0	Stop bit length 1 bit	
			1	Stop bit length 2 bits	
119	**RS-485 communication stop bit length / data length**	1	0	Stop bit length 1 bit	Data length 8 bits
			1	Stop bit length 2 bits	
			10	Stop bit length 1 bit	Data length 7 bits
			11	Stop bit length 2 bits	
120 **N024**	**RS-485 communication parity check**	2	0	Parity check disabled.	
			1	Parity check (odd parity) enabled.	
			2	Parity check (even parity) enabled.	
121 **N025**	**RS-485 communication retry count**	1	0 to 10	Set the permissible number of retries for unsuccessful data reception. If the number of consecutive errors exceeds the permissible value, the inverter output is shut off.	
			9999	The inverter output will not be shut off even when a communication error occurs.	
122 **N026**	**RS-485 communication check time interval**	0	0	RS-485 communication is enabled. However, the inverter output is shut off if the operation mode is changed to the one for the selected command interface.	
			0.1 to 999.8 s	Set the interval of the communication check (signal loss detection) time. If a no-communication state persists for longer than the permissible time, the inverter output will be shut off.	
			9999	No communication check (signal loss detection)	
123 **N027**	**RS-485 communication waiting time setting**	9999	0 to 150 ms	Set the delay between data transmission to the inverter and response.	
			9999	The time delay is not set in this parameter but in communication data. Delay time: Number set in the data × 10 ms	
124 **N028**	**RS-485 communication CR/LF selection**	1	0	Without CR/LF	
			1	With CR	
			2	With CR/LF	

*1 When a value outside the setting range is set, the inverter operates at the initial value.

NOTE

- Always reset the inverter after making the initial settings of the parameters. After changing the communication-related parameters, communication cannot be made until the inverter is reset.

◆ Communication specifications

- The communication specifications are shown in the following table.

Item		Description	Related parameter
Communication protocol		Mitsubishi inverter protocol (computer link communication)	**Pr.549**
Conforming standard		EIA-485 (RS-485)	—
Number of connectable units		1: N (maximum 32 units), the setting range of station number is 0 to 31.	**Pr.117**
Communication speed		Selected among 4800/9600/19200/38400/57600/76800/115200 bps.	**Pr.118**
Control procedure		Asynchronous method	—
Communication method		Half-duplex system	—
Communication specifications	Character system	ASCII (7 bits or 8 bits can be selected.)	**Pr.119**
	Start bit	1 bit	—
	Stop bit length	1 bit or 2 bits can be selected.	**Pr.119**
	Parity check	Check (at even or odd numbers) or no check can be selected.	**Pr.120**
	Error check	Sum code check	—
	Terminator	CR/LF (whether or not to use it can be selected)	**Pr.124**
Time delay setting		Availability of the setting is selectable.	**Pr.123**

◆ Communication procedure

- Data communication between the computer and inverter is made in the following procedure.

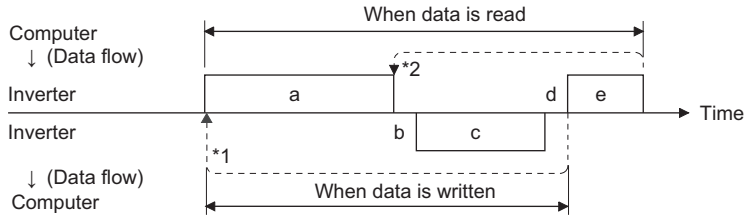
(a) Request data is sent from the computer to the inverter. (The inverter will not send data unless requested.)

(b) Communication waiting time

(c) The inverter sends reply data to the computer in response to the computer request.

(d) Inverter data processing time

(e) An answer from the computer in response to reply data (c) of the inverter is transmitted. (Even if (e) is not sent, subsequent communication is made properly.)



*1 If a data error is detected and a retry must be made, perform retry operation with the user program. The inverter output is shut off if the number of consecutive retries exceeds the parameter setting.

*2 On receipt of a data error occurrence, the inverter returns reply data (c) to the computer again. The inverter output is shut off if the number of consecutive data errors reaches or exceeds the parameter setting.

◆ Communication operation presence/absence and data format types

- Data communication between the computer and inverter is made in ASCII code (hexadecimal code).
- Communication operation presence/absence and data format types are as follows.

Symbol	Operation		Operation command	Running frequency	Multi command	Parameter write	Inverter reset	Monitor	Parameter read
a	Communication request is sent to the inverter in accordance with the user program in the computer.		A, A1	A (A2)*1	*3	A (A2)*2	A	B	B
b	Inverter data processing time		With	With	With	With	Without	With	With
c	Reply data from the inverter (Data a is checked for an error.)	No error*4 (Request accepted)	C	C	*3*6	C	C*5	E, E1, E2, E3*1	E (E2)*2
		With error (Request rejected)	D	D	D	D	D*5	D	D
d	Computer processing delay time		10 ms or more						
e	Reply from computer in response to reply data c (Data c is checked for error.)	No error*4 (No inverter processing)	Without	Without	Without	Without	Without	Without (C)	Without (C)
		With error (Inverter outputs c again.)	Without	Without	Without	Without	Without	F	F

*1 When **Pr.53** = "4" and the data code HFF = 1, the data format is A2 or E2. (Refer to page 25.)
*2 The data writing format is A2 and the data reading format is E2 for **Pr.37**. (Refer to page 25.)
*3 Refer to page 29 for multi command data formats.
*4 In the communication request data from the computer to the inverter, the time of 10 ms or more is also required after an acknowledgment (ACK) signal showing "No data error detected" is sent. (Refer to page 22.)
*5 Reply from the inverter to the inverter reset request can be selected. (Refer to page 25.)
*6 At mode error and data range error, data on page 29 contains an error code. Except for those errors, the error is returned with data format D.

- Data writing format

a. Communication request data from the computer to the inverter

Format	Number of characters														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	ENQ*1	Inverter station number*2		Instruction code		*3	Data				Sum check		*4		
A1	ENQ*1	Inverter station number*2		Instruction code		*3	Data		Sum check		*4				
A2	ENQ*1	Inverter station number*2		Instruction code		*3	Data						Sum check		*4

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

Format	Number of characters			
	1	2	3	4
C	ACK*1	Inverter station number*2		*4

c. Reply data from the inverter to the computer (Data error detected)

Format	Number of characters				
	1	2	3	4	5
D	NAK*1	Inverter station number*2		Error code	*4

*1 Indicates a control code.
*2 The inverter station number is specified in hexadecimal in the range of H00 to H1F (stations No. 0 to 31).
*3 Set the delay time. When **Pr.123 RS-485 communication waiting time setting** is set to other than "9999", create the communication request data without "delay time" in the data format. (The number of characters decreases by 1.)
*4 CR+LF code: When a computer transmits data to the inverter, some computers automatically provide either one or both of the codes CR (carriage return) and LF (line feed) at the end of a data group. In this case, the same setting is required for data sent from the inverter to the computer. Use **Pr.124 RS-485 communication CR/LF selection** for the CR+LF code setting.

- Data reading format

a. Communication request data from the computer to the inverter

Format	Number of characters								
	1	2	3	4	5	6	7	8	9
B	ENQ*1	Inverter station number*2		Instruction code		*3	Sum check		*4

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

Format	Number of characters												
	1	2	3	4	5	6	7	8	9	10	11	12	13
E	STX*1	Inverter station number*2		Read data				ETX*1	Sum check		*4		
E1	STX*1	Inverter station number*2		Read data		ETX*1	Sum check		*4				
E2	STX*1	Inverter station number*2		Read data						ETX*1	Sum check		*4

Format	Number of characters							
	1	2	3	4 to 23	24	25	26	27
E3	STX*1	Inverter station number*2		Read data (Model information)	ETX*1	Sum check		*4

c. Reply data from the inverter to the computer (Data error detected)

Format	Number of characters				
	1	2	3	4	5
D	NAK*1	Inverter station number*2		Error code	*4

e. Transmission data from the computer to the inverter when reading data

Format	Number of characters			
	1	2	3	4
C (No data error detected)	ACK*1	Inverter station number*2		*4
F (Data error detected)	NAK*1	Inverter station number*2		*4

*1 Indicates a control code.

*2 The inverter station number is specified in hexadecimal in the range of H00 to H1F (stations No. 0 to 31).

*3 Set the delay time. When **Pr.123 RS-485 communication waiting time setting** is set to other than "9999", create the communication request data without "delay time" in the data format. (The number of characters decreases by 1.)

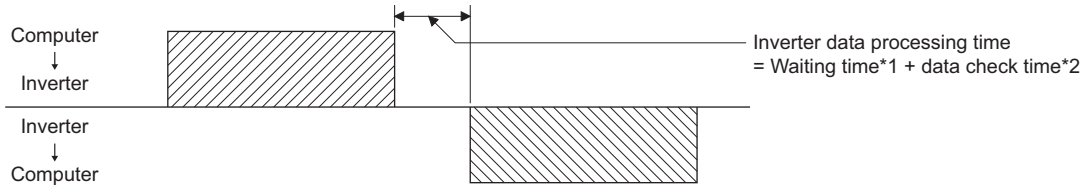
*4 CR+LF code: When a computer transmits data to the inverter, some computers automatically provide either one or both of the codes CR (carriage return) and LF (line feed) at the end of a data group. In this case, the same setting is required for data sent from the inverter to the computer. Use **Pr.124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

◆ Data definitions

- Control code

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

- Inverter station number
  Specify the station number of the inverter which communicates with the computer.
- Instruction code
  Specify the processing request, for example, operation or monitoring, given by the computer to the inverter. Therefore, the operation or monitoring an item is enabled by specifying the corresponding instruction code. (Refer to page 25.)
- Data
  Indicates the data such as frequency and parameters transferred to and from the inverter. The definitions and ranges of set data are determined in accordance with the instruction codes. (Refer to page 25.)
- Time delay
  Specify the waiting time between the receipt of data at the inverter from the computer and the transmission of reply data. Set the delay time in accordance with the response time of the computer in the range of 0 to 150 ms in 10 ms increments. (For example, "1" for 10 ms or "2" for 20 ms.)
  When **Pr.123 RS-485 communication waiting time setting** is set to other than "9999", create the communication request data without "delay time" in the data format. (The number of characters decreases by 1.)



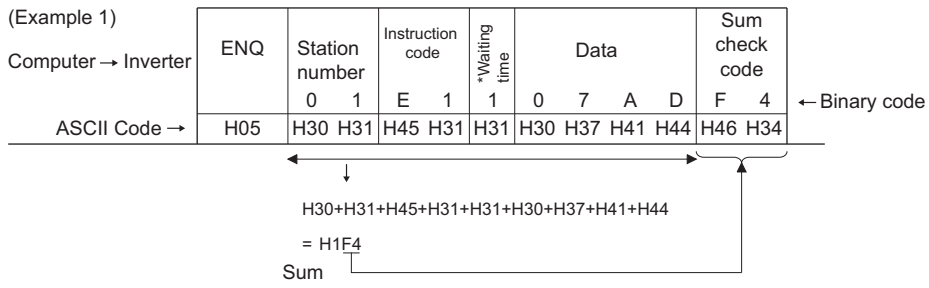
*1 When **Pr.123** = "9999", the waiting time is the data setting value × 10 ms. When **Pr.123** ≠ "9999", the waiting time is the value set in **Pr.123**.
*2 Approximately 5 to 50 ms. It varies depending on the instruction code.

NOTE

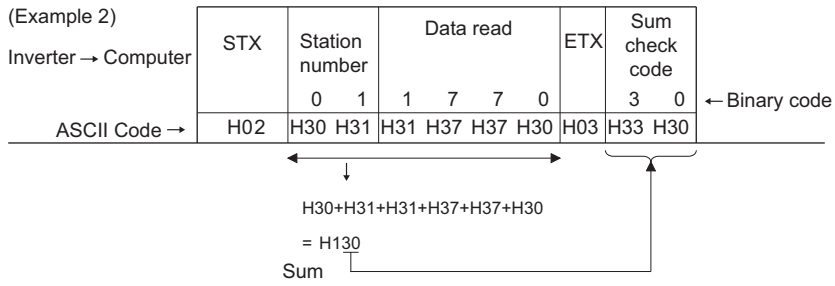
- The data check time varies depending on the instruction code. (Refer to page 22.)

- Sum check code

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



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

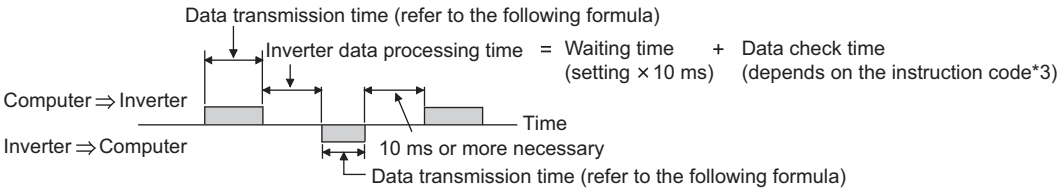


- Error code

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

Error code	Error item	Error description	Inverter operation
H0	Computer NAK error	The number of errors consecutively detected in communication request data from the computer is greater than the permissible number of retries.	The output is shut off (E.PUE) if errors occur consecutively more than the permissible number of retries. The LF signal is output.
H1	Parity error	The parity check result does not match the specified parity.	
H2	Sum check error	The sum check code in the computer does not match that of the data received by the inverter.	
H3	Protocol error	The data received by the inverter has a grammatical mistake. Or, data receive is not completed within the predetermined time. The CR or LF code specification is not the same as the setting of the parameter.	
H4	Framing error	The stop bit length differs from the initial setting.	
H5	Overrun error	New data has been sent by the computer before the inverter completes receiving the preceding data.	
H6	—	—	—
H7	Character error	The character received is invalid (other than 0 to 9, A to F, control code).	The inverter does not accept the received data. However, the inverter output is not shut off.
H8	—	—	—
H9	—	—	—
HA	Mode error	Parameter write was attempted when the inverter does not perform computer link communication, when the operation commands are not given through communication, or during inverter operation.	The inverter does not accept the received data. However, the inverter output is not shut off.
HB	Instruction code error	The specified instruction code does not exist.	
HC	Data range error	Invalid data has been specified for parameter writing, frequency setting, etc.	
HD	—	—	—
HE	—	—	—
HF	Normal (no error)	—	—

◆ Response time



[Formula for data transmission time]

$$\frac{1}{\text{Communication speed (bps)}} \times \text{Number of data characters *1} \times \text{Communication specifications (Total number of bits) *2} = \text{Data transmission time (s)}$$

*1 Refer to page 18.

*2 Communication specifications

Name		Number of bits
Stop bit length		1 bit 2 bits
Data length		7 bits 8 bits
Parity check	With	1 bit
	Without	0

In addition to the above, 1 start bit is necessary.

Minimum number of total bits: 9 bits

Maximum number of total bits: 12 bits

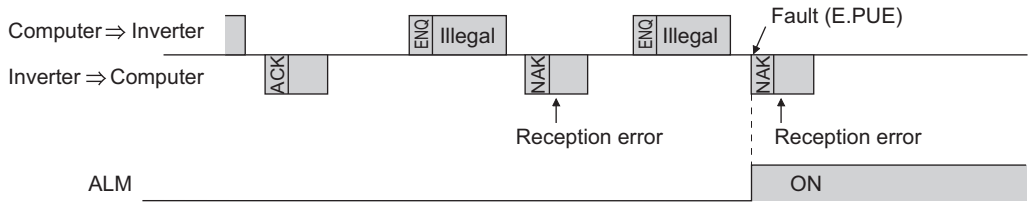
*3 Data check time

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

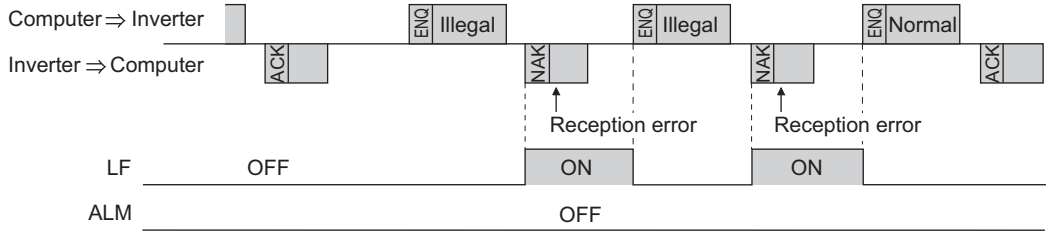
◆ Retry count setting (Pr.121)

- Set the permissible number of retries at data receive error occurrence. (Refer to page 21 for data receive error for retry.)
- When the data receive errors occur consecutively and the number of retries exceeds the permissible number setting, a communication fault (E.PUE) occurs and the inverter output is shut off.
- When a data transmission error occurs while "9999" is set, the inverter does not shut off its output but outputs the Alarm (LF) signal. To use the LF signal, set "98 (positive logic) or 198 (negative logic)" in any of **Pr.190 to Pr.196 (Output terminal function selection)** to assign the function to an output terminal.

Example: **Pr.121** = "1" (initial value)



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

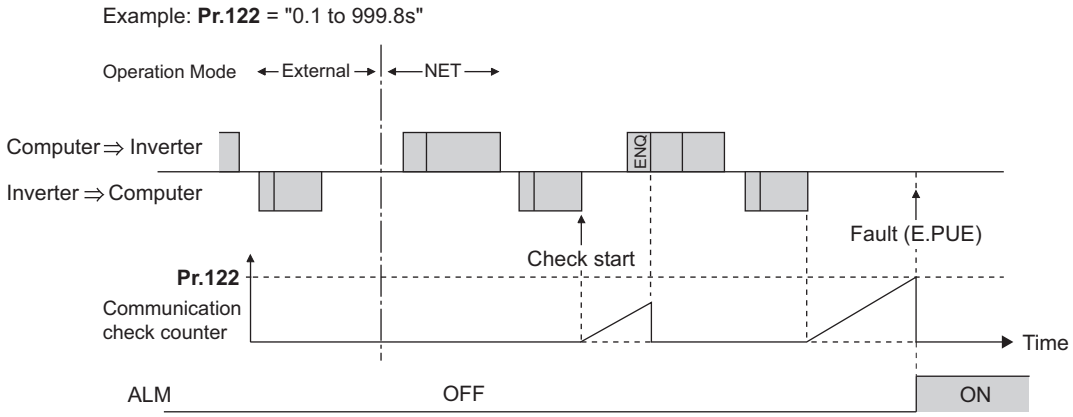


NOTE

- The operation at a communication error occurrence depends on the setting of **Pr.502 Stop mode selection at communication error**. (Refer to page 47.)

◆ Signal loss detection (Pr.122)

- If a signal is lost (communication stops) between the computer and the inverter as a result of a signal loss detection, the communication error (E.PUE) occurs and the inverter output will be shut off.
- When a signal loss is detected, the LF signal is output.
- When "9999" is set, the communication check (signal loss detection) will not be performed.
- The monitor items and parameter settings can be read via RS-485 communication when "0" is set, but a communication error (E.PUE) occurs instantly when the operation mode is switched to the one for the selected command interface (Network operation mode in the initial setting).
- Setting any value from 0.1 to 999.8 seconds will enable signal loss detection. To detect signal loss, data must be sent from the computer within the communication check time interval (for further information on control codes, refer to page 20). (The inverter makes a communication check (clearing of communication check counter) regardless of the station number setting of the data sent from the master.)
- Communication check is started at the initial communication in the operation mode for the selected command interface (Network operation mode in the initial setting).



◆ Programming instructions

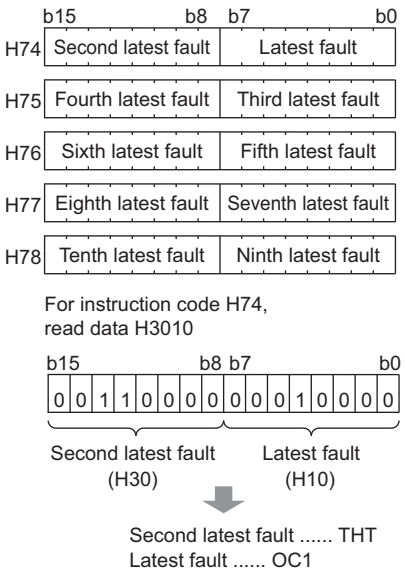
- When data from the computer has any error, the inverter does not accept that data. Hence, in the user program, always insert a retry program for data error.
- All data communication such as the operation command or monitoring are started when the computer gives a communication request. The inverter does not return any data without the computer's request. Hence, design the program so that the computer gives a data read request for monitoring, etc. as required.

⚠CAUTION

- Always set the communication check time interval before starting operation to prevent hazardous conditions.
- Data communication is not started automatically but is made only once when the computer provides a communication request. If communication is disabled during operation due to signal cable breakage or other factors, the inverter cannot be stopped. When the communication check time interval has elapsed, the inverter output will be shut off (E.PUE). Turn the RES signal of the inverter ON or shut off the power supply to coast the motor to a stop.
- If communication is broken due to signal cable breakage, computer fault, or other factors, the inverter does not detect such a fault. This should be fully noted.

◆ Setting items and set data

- After completion of parameter settings, set the instruction codes and data as shown in the following table, then start communication from the computer to allow various types of operation control and monitoring.

Item		Read/ write	Instruction code	Data description	Number of data digits (format)*1
Operation mode		Read	H7B	H0000: Network operation H0001: External operation, External operation (JOG operation) H0002: PU operation, External/PU combined operation, PUJOG operation	4 digits (B and E/ D)
		Write	HFB	H0000: Network operation H0001: External operation H0002: PU operation	4 digits (A and C/ D)
Monitor	Output frequency / rotations per minute (machine speed)	Read	H6F	H0000 to HFFFF: Output frequency in 0.01 Hz increments (The display can be changed to the rotations per minute (machine speed) using **Pr.37 and Pr.53**. Refer to the Instruction Manual (Function).)	4 digits (B and E (E2) / D)
	Output current	Read	H70	H0000 to HFFFF: Output current (hexadecimal) in 0.01 A increments	4 digits (B and E/ D)
	Output voltage	Read	H71	H0000 to HFFFF: Output voltage (hexadecimal) in 0.1 V increments	4 digits (B and E/ D)
	Special monitor	Read	H72	H0000 to HFFFF: Data of the monitor item selected with the instruction code HF3.	4 digits (B and E (E2) / D)
	Special monitor selection No.	Read	H73	Monitor selection data (Refer to the Instruction Manual (Function) for details on selection No.)	2 digits (B and E1/D)
		Write	HF3		2 digits (A1 and C/D)
	Fault record	Read	H74 to H78	H0000 to HFFFF: Two fault records per code. For the data codes or details of fault records, refer to the Instruction Manual (Maintenance).  For instruction code H74, read data H3010 	4 digits (B and E/ D)
Operation command (extended)		Write	HF9	Control input commands such as the Forward rotation command (STF) signal and the Reverse rotation command (STR) signal can be set. (For the details, refer to page 28.)	4 digits (A and C/ D)
Operation command		Write	HFA		2 digits (A1 and C/D)
Operation command (extended 2)		Write	HFE		4 digits (A and C/ D)
Inverter status monitor (extended)		Read	H79	The states of the output signals such as the Forward rotation output, Reverse rotation output, and Inverter running (RUN) signals can be monitored. (For the details, refer to page 28.)	4 digits (B and E/ D)
Inverter status monitor		Read	H7A		2 digits (B and E1/D)
Inverter status monitor (extended 2)		Read	H7E		4 digits (B and E/ D)

Item	Read/ write	Instruction code	Data description	Number of data digits (format)[*1]
Set frequency (RAM)	Read	H6D	Read the set frequency or rotations per minute (machine speed) from the RAM or EEPROM. H0000 to HFFFF: Set frequency in 0.01 Hz increments (The display can be changed to the rotations per minute (machine speed) using **Pr.37 and Pr.53**. Refer to the Instruction Manual (Function).)	4 digits (B and E (E2) / D)
Set frequency (EEPROM)		H6E		
Set frequency (RAM)	Write	HED	Write the set frequency or rotations per minute (machine speed) into the RAM or EEPROM. H0000 to HE678 (0 to 590.00 Hz): Frequency in 0.01 Hz increments (The display can be changed to the rotations per minute (machine speed) using **Pr.37 and Pr.53**. Refer to the Instruction Manual (Function).) To change the set frequency consecutively, write data to the inverter RAM. (Instruction code: HED)	4 digits (A (A2) and C/D)
Set frequency (RAM, EEPROM)		HEE		
Inverter reset	Write	HFD	H9696: Inverter reset As the inverter is reset at the start of communication by the computer, the inverter cannot send reply data back to the computer.	4 digits (A and C/ D)
			H9966: Inverter reset After the computer correctly starts communication and send data to the inverter, the inverter returns the ACK signal to the computer before being reset.	4 digits (A and D)
Fault history clear	Write	HF4	H9696: Fault history is cleared.	4 digits (A and C/ D)
Parameter clear / All parameter clear	Write	HFC	All parameters return to initial values. Whether to clear communication parameters or not can be selected according to the data. • Parameter clear H9696: Parameters including communication parameters are cleared. H5A5A: Parameters other than communication parameters are cleared.[*3] • All parameter clear H9966: Parameters including communication parameters are cleared. H55AA: Parameters other than communication parameters are cleared.[*3] For details on whether or not to clear parameters, refer to the Instruction Manual (Function). When a clear is performed with H9696 or H9966, communication related parameter settings also return to the initial values. When resuming the operation, set the parameters again. Performing a clear will clear the instruction code HEC, HF3, and HFF settings. Only H9966 and H55AA (All parameter clear) are valid when a password is set (**Pr.296, Pr.297**) (refer to the Instruction Manual (Function)).	4 digits (A and C/ D)
Parameter	Read	H00 to H6B	Refer to the instruction code list in the Instruction Manual (Function) to write/read parameters as required. When setting **Pr.100** and later, set the link parameter extended setting.	4 digits (B and E/ D)
	Write	H80 to HEB		4 digits (A and C/ D)
Link parameter extended setting	Read	H7F	Parameter settings are changed according to the instruction code settings. For details of the settings, refer to the instruction code list in the Instruction Manual (Function).	2 digits (B and E1/D)
	Write	HFF		2 digits (A1 and C/D)
Second parameter changing (instruction code HFF = 1, 9)	Read	H6C	When setting the calibration parameters[*4] H00: Frequency[*5] H01: Parameter-set analog value H02: Analog value input from terminal	2 digits (B and E1/D)
	Write	HEC		2 digits (A1 and C/D)
Multi command	Read/ write	HF0	Available for writing 2 commands, and monitoring 2 items for reading data. (Refer to page 29 for details.)	10 digits ([*2]/D)

Item		Read/ write	Instruction code	Data description	Number of data digits (format)*1
Product profile	Model	Read	H7C	The inverter model can be read in ASCII code. "H20" (blank code) is set for blank area. Example) FR-D820: H46, H52, H2D, H44, H38, H32, H30, H20...H20	20 digits (B and E3/D)
	Capacity	Read	H7D	The capacity in the inverter model can be read in ASCII code. Data is read in increments of 0.1 kW, and rounds down to 0.01 kW increments. "H20" (blank code) is set for blank area. Example) 0.75K: " 7" (H20, H20, H20, H20, H20, H37)	6 digits (B and E2/D)

*1 Refer to page 18 for data formats (A, A1, A2, B, C, D, E, E1, E2, E3, F).

*2 Refer to page 29 for multi command data formats.

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

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

*5 The gain frequency can be also written using **Pr.125** (instruction code: H99) or **Pr.126** (instruction code: H9A).

NOTE

- Set 65520 (HFFF0) as a parameter value "8888" and 65535 (HFFFF) as "9999".
- For the instruction codes HFF, HEC, and HF3, their values once written are held, but cleared to zero when an inverter reset or all clear is performed.
- When a 32-bit parameter setting or monitor item is read and the value to be read exceeds HFFFF, HFFFF is returned.

Example) When reading the **C3 (Pr.902) and C6 (Pr.904)** settings from the inverter of station No. 0.

	Computer send data	Inverter send data	Description
a	ENQ 00 FF 0 01 7D	ACK 00	"H01" is set in the extended link parameter.
b	ENQ 00 EC 0 01 79	ACK 00	"H01" is set in the second parameter changing.
c	ENQ 00 5E 0 0A	STX 00 0000 ETX 20	**C3 (Pr.902)** is read. "0%" is read.
d	ENQ 00 60 0 F6	STX 00 0000 ETX 20	**C6 (Pr.904)** is read. "0%" is read.

To read/write **C3 (Pr.902)** or **C6 (Pr.904)** after inverter reset or parameter clear, execute from (a) again.

◆ List of calibration parameters

Pr.	Name	Instruction code		
		Read	Write	Extended
C2 (902)	Terminal 2 frequency setting bias frequency	5E	DE	1
C3 (902)	Terminal 2 frequency setting bias	5E	DE	1
125 (903)	Terminal 2 frequency setting gain frequency	5F	DF	1
C4 (903)	Terminal 2 frequency setting gain	5F	DF	1
C5 (904)	Terminal 4 frequency setting bias frequency	60	E0	1
C6 (904)	Terminal 4 frequency setting bias	60	E0	1
126 (905)	Terminal 4 frequency setting gain frequency	61	E1	1
C7 (905)	Terminal 4 frequency setting gain	61	E1	1
C42 (934)	PID display bias coefficient	22	A2	9
C43 (934)	PID display bias analog value	22	A2	9
C44 (935)	PID display gain coefficient	23	A3	9
C45 (935)	PID display gain analog value	23	A3	9

◆ Operation command

Item	Instruction code	Bit length	Description	Example
Operation command	HFA	8 bits	b0: Terminal 4 input selection b1: Forward rotation command b2: Reverse rotation command b3: RL (Low-speed operation command)*1 b4: RM (Middle-speed operation command)*1 b5: RH (High-speed operation command)*1 b6: Second function selection b7: Output stop	[Example 1] H02 Forward rotation b7 b0 0 0 0 0 0 0 1 0 [Example 2] H00 Stop b7 b0 0 0 0 0 0 0 0 0
Operation command (extended)	HF9	16 bits	b0: Terminal 4 input selection b1: Forward rotation command b2: Reverse rotation command b3: RL (Low-speed operation command)*1 b4: RM (Middle-speed operation command)*1 b5: RH (High-speed operation command)*1 b6: Second function selection b7: Output stop b8: JOG operation selection 2 b9 to b15: –	[Example 1] H0002 Forward rotation b15 b0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 [Example 2] H000C Low-speed reverse operation (When **Pr.180 RL terminal function selection** is set to "0") b15 b0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0
Operation command (extended 2)	HFE	16 bits	b0: NET X1 (—)*1 b1: NET X2 (—)*1 b2: NET X3 (—)*1 b3: NET X4 (—)*1 b4: NET X5 (—)*1 b5 to b15: –	[Example] H0001 Low-speed operation (When **Pr.185 NET X1 terminal function selection** is set to "0") b15 b0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1

*1 The signal within parentheses ( ) is assigned in the initial status. The function changes depending on the setting of **Pr.180 to Pr.182 and Pr.185 to Pr.189 (Input terminal function selection)**. For details, refer to the description of **Pr.180 to Pr.182 and Pr.185 to Pr.189 (Input terminal function selection)** in the Instruction Manual (Function).

◆ Inverter status monitor

Item	Instruction code	Bit length	Description	Example
Inverter status monitor	H7A	8 bits	b0: RUN (Inverter running)*1 b1: Forward running b2: Reverse running b3: Up to frequency b4: Overload alarm b5: — b6: FU (Output frequency detection)*1 b7: ABC (Fault)*1	[Example 1] H03 ··· During forward rotation b7 b0 0 0 0 0 0 0 1 1 [Example 2] H80 ··· Stop at fault occurrence b7 b0 1 0 0 0 0 0 0 0
Inverter status monitor (extended)	H79	16 bits	b0: RUN (Inverter running)*1 b1: Forward running b2: Reverse running b3: Up to frequency b4: Overload alarm b5: — b6: FU (Output frequency detection)*1 b7: ABC (Fault)*1 b8: — b9: Safety monitor output 2 b10 to b14: – b15: Fault occurrence	[Example 1] H0003 ···During forward rotation b15 b0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 [Example 2] H8080 ···Stop at fault occurrence b15 b0 1 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0

Item	Instruction code	Bit length	Description	Example
Inverter status monitor (extended 2)	H7E	16 bits	b0: NET Y1 (—)*1 b1: NET Y2 (—)*1 b2: NET Y3 (—)*1 b3: NET Y4 (—)*1 b4 to b15: –	[Example] H0001⋯Stop at fault occurrence (When "99 (positive logic)" or "199 (negative logic)" is set in **Pr.193 NET Y1 terminal function selection**) b15 b0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1

*1 The signal within parentheses ( ) is assigned in the initial status. The function changes depending on the setting of **Pr.190 to Pr.196 (Output terminal function selection)**. For details, refer to the description of **Pr.190 to Pr.196 (Output terminal function selection)** in the Instruction Manual (Function).

◆ Multi command (HF0)

- Sending data format from computer to inverter

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

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

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

*1 Set the delay time. When **Pr.123 RS-485 communication waiting time setting** is set to other than "9999", create the communication request data without "delay time" in the data format. (The number of characters decreases by 1.)

*2 Specify the data type of sending data (from computer to inverter). To use the data type 4, specify "4" for both the send data type and the receive data type.

*3 Specify the data type of reply data (from inverter to computer). To use the data type 4, specify "4" for both the send data type and the receive data type.

*4 Combination of data 1 and data 2 for sending

Data type	Data 1	Data 2	Remarks
0	Operation command (extended)	Set frequency (RAM)	Operation command (extended) is the same as instruction code HF9. (Refer to page 28.)
1	Operation command (extended)	Set frequency (RAM, EEPROM)	
4	Monitor code 1	Monitor code 2	Set the special monitor selection No. in the monitor codes 1 and 2 (set "00" in the upper 2 digits).
5	Operation command (extended)	Operation command (extended 2)	Operation command (extended) is the same as instruction code HF9. (Refer to page 28.) Operation command (extended 2) is the same as instruction code HFE. (Refer to page 28.)
6	Operation command (extended 2)	Set frequency (RAM)	
7	Operation command (extended 2)	Set frequency (RAM, EEPROM)	

*5 Combination of data 1 and data 2 for reply

Data type	Data 1	Data 2	Remarks
0	Inverter status monitor (extended)	Output frequency / rotations per minute (machine speed)	The inverter status monitor (extended) data is the same as the data of instruction code H79 (Refer to page 28.) The monitor item specified in instruction code HF3 is returned for the special monitor. (Refer to page 28.)
1	Inverter status monitor (extended)	Special monitor	
4	Monitor 1	Monitor 2	Monitor items specified by the send data type 4 are returned for the monitor 1 and monitor 2. When the send data type is other than "4", the current monitor value is returned for the monitor 1 and the output frequency monitor value is returned for the monitor 2.
5	Inverter status monitor (extended)	Inverter status monitor (extended 2)	The inverter status monitor (extended) data is the same as the data of instruction code H79 (Refer to page 28.) The inverter status monitor (extended 2) data is the same as the data of instruction code H7E (Refer to page 28.) The monitor item specified in instruction code HF3 is returned for the special monitor. (Refer to the Instruction Manual (Function).)
6	Inverter status monitor (extended 2)	Output frequency / rotations per minute (machine speed)	
7	Inverter status monitor (extended 2)	Special monitor	

*6 The error code for sending data 1 is set in error code 1, and the error code for sending data 2 is set in error code 2. The mode error (HA), instruction code error (HB), data range error (HC) or no error (HF) is returned. (Refer to the Instruction Manual (Maintenance) for the details of the error codes.)

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

2.6 MODBUS RTU

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

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

Pr.	Name	Initial value	Setting range	Description	
549 N000	**Protocol selection**	0	0	Mitsubishi inverter protocol (computer link)	
			1[*1]	MODBUS RTU protocol	
117 N020	**RS-485 communication station number**	0	0	Broadcast communication	
			1 to 247	Specify the inverter station number. Enter the inverter station numbers when two or more inverters are connected to one personal computer.	
118 N021	**RS-485 communication speed**	192	48, 96, 192, 384[*1], 576, 768, 1152	Select the communication speed. The setting value × 100 equals the communication speed. For example, enter 96 to set the communication speed of 9600 bps.	
N023	**RS-485 communication stop bit length**	1	0	Stop bit length 1 bit	Valid when **Pr.N024 (Pr.120)** = "0"
			1	Stop bit length 2 bits	
119	**RS-485 communication stop bit length / data length**	1	0	Stop bit length 1 bit	Valid when **Pr.120** = "0"
			1	Stop bit length 2 bits	
			10	Stop bit length 1 bit	
			11	Stop bit length 2 bits	
120 N024	**RS-485 communication parity check**	2	0	Parity check disabled. Stop bit length selectable between 1 bit and 2 bits (depending on the setting of **Pr.119**).	
			1	Parity check (odd parity) enabled. Stop bit length: 1 bit.	
			2	Parity check (even parity) enabled. Stop bit length: 1 bit.	
122 N026	**RS-485 communication check time interval**	0	0	RS-485 communication is enabled. However, the inverter output is shut off if the operation mode is changed to the one for the selected command interface.	
			0.1 to 999.8 s	Set the interval of the communication check (signal loss detection) time. If a no-communication state persists for longer than the permissible time, the inverter output will be shut off.	
			9999	No communication check (signal loss detection)	
343 N080	**Communication error count**	0	(0 to 999)	Displays the communication error count during MODBUS RTU communication. Read-only.	

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

NOTE

- If MODBUS RTU communication is performed from the client to the address 0 (station number 0), the data is broadcasted, and the inverter does not send any reply to the client. To obtain replies from the inverter, set **Pr.117 RS-485 communication station number** ≠ "0 (initial value)".
- Some functions are disabled in broadcast communication. (Refer to page 33.)
- Always reset the inverter after making the initial settings of the parameters. After changing the communication-related parameters, communication cannot be made until the inverter is reset.

◆ Communication specifications

- The communication specifications are shown in the following table.

Item		Description	Related parameter
Communication protocol		MODBUS RTU protocol	**Pr.549**
Conforming standard		EIA-485 (RS-485)	—
Number of connectable units		1: N (maximum 32 units), setting is 0 to 247 stations	**Pr.117**
Communication speed		Selected among 4800/9600/19200/38400/57600/76800/115200 bps.	**Pr.118**
Control procedure		Asynchronous method	—
Communication method		Half-duplex system	—
Communication specifications	Character system	Binary (fixed at 8 bits)	—
	Start bit	1 bit	—
	Stop bit length	Select from the following three types: No parity check, stop bit length 1 bit / 2 bits (depends on the setting of **Pr.119**) Odd parity check, stop bit length 1 bit Even parity check, stop bit length 1 bit	**Pr.119** **Pr.120**
	Parity check		
	Error check	CRC code check	—
	Terminator	Not available	—
Time delay setting		Not available	—

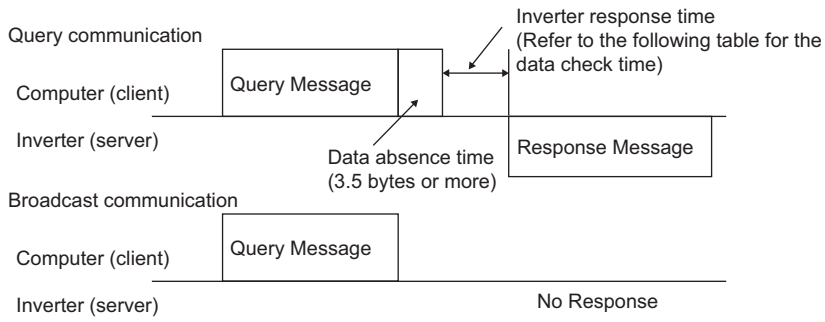
◆ Outline

- The MODBUS communication protocol was developed by Modicon for programmable controllers.
- The MODBUS protocol uses exclusive message frames to perform serial communication between a client and servers. These exclusive message frames are provided with a feature called "functions" that allows data to be read or written. These functions can be used to read or write parameters from the inverter, write input commands to the inverter or check the inverter's operating status, for example. This product classifies the data of each inverter into holding register area (register address 40001 to 49999). The client can communicate with inverters (servers) by accessing pre-assigned holding register addresses.

NOTE

- There are two serial transmission modes, the ASCII (American Standard Code for Information Interchange) mode and the RTU (Remote Terminal Unit) mode. However, this product supports only the RTU mode, which transfers 1 byte data (8 bits) as it is. Also, only communication protocol is defined by the MODBUS protocol. Physical layers are not stipulated.

◆ Message format



- Data check time

Item	Check time
Monitoring, operation command, frequency setting (RAM)	< 20 ms
Frequency setting (EEPROM)	< 50 ms
Reading/writing parameters	< Approximately 50 ms
Parameter clear / All parameter clear	Less than 5 s
Reset command	No reply

- Query

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

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

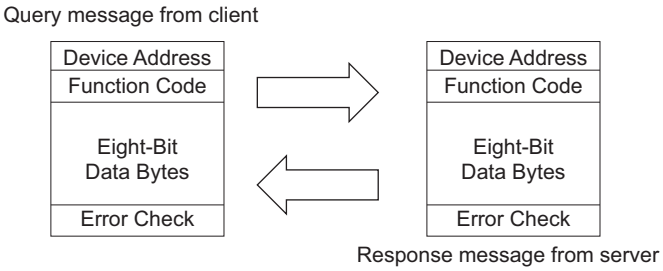
NOTE

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

◆ Message frame (protocol)

- Communication method

Basically, the client sends a query message (inquiry), and servers return a response message (response). At normal communication, the device address and function code are copied as they are, and at erroneous communication (illegal function code or data code), bit 7 (= H80) of the function code is turned ON, and the error code is set at data bytes.



Message frames comprise the four message fields shown in the figures above.
A server recognizes message data as one message when a 3.5 character long no-data time (T1: start/end) is added before and after the data.

- Details of protocol

The following table explains the four message fields.

Start	Address	Function	Data	CRC check		End
T1	8 bits	8 bits	n × 8 bits	L 8 bits	H 8 bits	T1

Message field	Description
Address field	"0 to 247" can be set in the single-byte (8-bit) length field. Set "0" when sending broadcast messages (instructions to all addresses), and "1 to 247" to send messages to individual servers. The response from the server also contains the address set by the client. The value set in **Pr.117 RS-485 communication station number** is the server address.
Function field	"1 to 255" can be set as the function code in the single-byte (8-bit) length filed. The client sets the function to be sent to the server as the request, and the server performs the requested operation. Refer to the function code list for details of the supported function codes. An error response is generated when a function code other than those in the function code list is set. The normal response from the server contains the function code set by the client. The error response contains H80 and the function code.
Data field	The format changes according to the function code. (Refer to page 34.) The data, for example, includes the byte count, number of bytes, and accessing content of holding registers.
CRC check field	Errors in the received message frame are detected. Errors are detected in the CRC check, and the 2 bytes length data is appended to the message. When the CRC is appended to the message, the lower bytes of the CRC are appended first, followed by the upper bytes. The CRC value is calculated by the sender that appends the CRC to the message. The receiver recalculates the CRC while the message is being received, and compares the calculation result against the actual value that was received in the error check field. If the two values do not match, the result is treated as an error.

◆ Function code list

Function name	Read/ write	Code	Outline	Broadcast communication	Message format reference page
Read holding registers	Read	H03	The data of the holding registers is read. The various data of the inverter can be read from MODBUS registers. System environmental variable (Refer to page 39.) Monitor code (Refer to the Instruction Manual (Function).) Fault history (Refer to page 41.) Model information monitor (Refer to page 42.) Inverter parameters (Refer to page 41.)	Not available	page 34
Write single register	Write	H06	Data is written to a holding register. Data can be written to MODBUS registers to output instructions to the inverter or set parameters. System environmental variable (Refer to page 39.) Inverter parameters (Refer to page 41.)	Available	page 35
Diagnostics	Read	H08	Functions are diagnosed. (Communication check only) A communication check can be made since the query message is sent and the query message is returned as it is as the return message (subfunction code H00 function). Subfunction code H00 (Return query data).	Not available	page 36
Write multiple registers	Write	H10	Data is written to multiple consecutive holding registers. Data can be written to consecutive multiple MODBUS registers to output instructions to the inverter or set parameters. System environmental variable (Refer to page 39.) Inverter parameters (Refer to page 41.)	Available	page 36
Read holding register access log	Read	H46	The number of registers that were successfully accessed by the previous communication is read. Queries by function codes H03, H06, and H10 are supported. The number and start address of holding registers successfully accessed by the previous communication are returned. "0" is returned for both the number and start address for queries other than function codes H03, H06, and H10.	Not available	page 37

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

- Query message

a. Server address	b. Function code	c. Starting address		d. Quantity of registers		CRC check	
(8 bits)	H03 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Normal response (Response message)

a. Server address	b. Function code	e. Byte count	f. Register value			CRC check	
(8 bits)	H03 (8 bits)	(8 bits)	H (8 bits)	L (8 bits)	… (n × 16 bits)	L (8 bits)	H (8 bits)

- Query message setting

Message		Description
a	Server address	Set the address to send messages to. Broadcast communication is not possible. (Invalid when "0" is set.)
b	Function code	Set H03.
c	Starting address	Set the holding register address from which to start reading the data. Start address = start register address (decimal) - 40001 For example, when starting address 0001 is set, the data of holding register 40002 is read.
d	Quantity of registers	Set the number of holding registers for reading data. Data can be read from up to 125 registers.

- Content of normal response

Message		Description
e	Byte count	The setting range is H02 to HFA (2 to 250). Twice the number of reads specified by (d) is set.
f	Register value	The amount of data specified by (d) is set. Read data is output Hi bytes first followed by Lo bytes, and is arranged as follows: data of start address, data of start address+1, data of start address+2, and so forth.

■ Example) Read the register values of 41004 (Pr.4) to 41006 (Pr.6) from server address 17 (H11).

Query message

Server address	Function code	Starting address		Quantity of registers		CRC check	
H11 (8 bits)	H03 (8 bits)	H03 (8 bits)	HEB (8 bits)	H00 (8 bits)	H03 (8 bits)	H77 (8 bits)	H2B (8 bits)

Normal response (Response message)

Server address	Function code	Byte count	Register value						CRC check	
H11 (8 bits)	H03 (8 bits)	H06 (8 bits)	H17 (8 bits)	H70 (8 bits)	H0B (8 bits)	HB8 (8 bits)	H03 (8 bits)	HE8 (8 bits)	H2C (8 bits)	HE6 (8 bits)

Read value

Register 41004 **(Pr.4)**: H1770 (60.00 Hz)

Register 41005 **(Pr.5)**: H0BB8 (30.00 Hz)

Register 41006 **(Pr.6)**: H03E8 (10.00 Hz)

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

- The content of the system environmental variables and inverter parameters (refer to page 39) assigned to the holding register area can be written.
- Query message

a. Server address	b. Function code	c. Register address		d. Register value		CRC check	
(8 bits)	H06 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Normal response (Response message)

a. Server address	b. Function code	c. Register address		d. Register value		CRC check	
(8 bits)	H06 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Query message setting

Message		Description
a	Server address	Set the address to send messages to. Setting "0" enables broadcast communication.
b	Function code	Set H06.
c	Register address	Set the holding register address to write data to. Register address = holding register address (decimal) - 40001 For example, when register address 0001 is set, data is written to holding register address 40002.
d	Register value	Set the data to write to the holding register. Write data is fixed at 2 bytes.

- Content of normal response

  The contents in the normal response (**a to d**, including the CRC check) are the same as those in the query messages.

  In the case of broadcast communication, no response is returned.

■ Example) Write 60 Hz (H1770) to 40014 (set frequency RAM) of server address 5 (H05).

Query message

Server address	Function code	Register address		Register value		CRC check	
H05 (8 bits)	H06 (8 bits)	H00 (8 bits)	H0D (8 bits)	H17 (8 bits)	H70 (8 bits)	H17 (8 bits)	H99 (8 bits)

Normal response (Response message)

The same data as those in the query message

NOTE

- With broadcast communication, no response is generated even if a query is executed, so when the next query is made, it must be made after waiting for the inverter data processing time after the previous query is executed.

◆ Diagnostics (diagnosis of functions) (H08 or 08)

- A communication check can be made since the query message is sent and the query message is returned as it is as the return message (subfunction code H00 function). Subfunction code H00 (Return query data)
- Query message

a. Server address	b. Function code	c. Sub-function		d. Data		CRC check	
(8 bits)	H08 (8 bits)	H00 (8 bits)	H00 (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Normal response (Response message)

a. Server address	b. Function code	c. Sub-function		d. Data		CRC check	
(8 bits)	H08 (8 bits)	H00 (8 bits)	H00 (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Query message setting

Message		Description
a	Server address	Set the address to send messages to. Broadcast communication is not possible. (Invalid when "0" is set.)
b	Function code	Set H08.
c	Sub-function	Set H0000.
d	Data	Any 2-byte long data can be set. The setting range is H0000 to HFFFF.

- Content of normal response

  The contents in the normal response (**a to d**, including the CRC check) are the same as those in the query messages.

NOTE

- With broadcast communication, no response is generated even if a query is executed, so when the next query is made, it must be made after waiting for the inverter data processing time after the previous query is executed.

◆ Write multiple registers (writing data to multiple holding registers) (H10 or 16)

- Data can be written to multiple holding registers.
- Query message

a. Server address	b. Function code	c. Starting address		d. Quantity of registers		e. Byte count	f. Registers value			CRC check	
(8 bits)	H10 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	(8 bits)	H (8 bits)	L (8 bits)	... (n × 2 × 8 bits)	L (8 bits)	H (8 bits)

- Normal response (Response message)

a. Server address	b. Function code	c. Starting address		d. Quantity of registers		CRC check	
(8 bits)	H10 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Query message setting

Message		Description
a	Server address	Set the address to send messages to. Setting "0" enables broadcast communication.
b	Function code	Set H10.
c	Starting address	Set the holding register address from which to start writing the data. Start address = start register address (decimal) - 40001 For example, when starting address 0001 is set, data is written to holding register 40002.
d	Quantity of registers	Set the number of holding registers for writing data. Data can be written to up to 125 registers.
e	Byte count	The setting range is H02 to HFA (2 to 250). Set twice the value specified by **d**.
f	Registers value	Set the amount of data specified by **d**. Write data is output Hi bytes first followed by Lo bytes, and is arranged as follows: data of start address, data of start address+1, data of start address+2, and so forth.

- Content of normal response

  The contents in the normal response (**a to d**, including the CRC check) are the same as those in the query messages.

■ Example) Write 0.5 s (H05) to 41007 (Pr.7) and 1 s (H0A) to 41008 (Pr.8) of server address 25 (H19).

Query message

Server address	Function code	Starting address		Quantity of registers		Byte count	Registers value				CRC check	
H19 (8 bits)	H10 (8 bits)	H03 (8 bits)	HEE (8 bits)	H00 (8 bits)	H02 (8 bits)	H04 (8 bits)	H00 (8 bits)	H05 (8 bits)	H00 (8 bits)	H0A (8 bits)	H86 (8 bits)	H3D (8 bits)

Normal response (Response message)

Server address	Function code	Starting address		Quantity of registers		CRC check	
H19 (8 bits)	H10 (8 bits)	H03 (8 bits)	HEE (8 bits)	H00 (8 bits)	H02 (8 bits)	H22 (8 bits)	H61 (8 bits)

◆ Read holding register access log (H46 or 70)

- Queries by function codes H03, H06, and H10 are supported. The number and start address of holding registers successfully accessed by the previous communication are returned. "0" is returned for both the number and start address for queries other than the function codes above.
- Query message

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

- Normal response (Response message)

a. Server address	b. Function code	c. Starting address		d. No. of points		CRC check	
(8 bits)	H46 (8 bits)	H (8 bits)	L (8 bits)	H (8 bits)	L (8 bits)	L (8 bits)	H (8 bits)

- Query message setting

Message		Description
a	Server address	Set the address to send messages to. Broadcast communication is not possible. (Invalid when "0" is set.)
b	Function code	Set H46.

- Content of normal response

Message		Description
c	Starting address	The start address of the holding register that was successfully accessed is returned. Start address = start register address (decimal) - 40001 For example, when starting address 0001 is returned, the holding register address that was successfully accessed is 40002.
d	No. of points	The number of holding registers that were successfully accessed is returned.

■ Example) Read the successful register start address and number of successful accesses from server address 25 (H19).

Query message

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

Normal response (Response message)

Server address	Function code	Starting address		No. of points		CRC check	
H19 (8 bits)	H10 (8 bits)	H03 (8 bits)	HEE (8 bits)	H00 (8 bits)	H02 (8 bits)	H22 (8 bits)	H61 (8 bits)

The number of holding registers that were successfully accessed was returned as two with the start address 41007 **(Pr.7)**.

◆ Error response

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

NOTE

- No response is also returned in the case of broadcast communication.

- Error response (Response message)

a. Server address	b. Function code	c. Exception code	CRC check	
(8 bits)	H80 + Function (8 bits)	(8 bits)	L (8 bits)	H (8 bits)

	Message	Description
a	Server address	Set the address received from the client.
b	Function code	The function code requested by the client and H80 is set.
c	Exception code	The codes in the following table are set.

- Error code list

Code	Error item	Error description
01	ILLEGAL FUNCTION	The query message from the client has a function code that cannot be handled by the server.
02	ILLEGAL DATA ADDRESS*1	The query message from the client has a register address that cannot be handled by the server. (No parameter, parameter cannot be read, parameter cannot be written)
03	ILLEGAL DATA VALUE	The query message from the client has data that cannot be handled by the server. (Out of parameter write range, a mode is specified, or other error)

*1 An error response is not returned in the following cases.

(a) Function code H03 (reading data of holding registers)

When the quantity of registers is specified as one or more and there are one or more holding registers from which data can be read.

(b) Function code H10 (writing data to multiple holding registers)

When the quantity of registers is specified as one or more and there are one or more holding registers to which data can be written.

In other words, when function code H03 or H10 is used and multiple holding registers are accessed, an error response is not returned even if a nonexistent holding register or holding register that cannot be read or written from/to is accessed.

NOTE

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

- Error detection of message data
  The following errors are detected in message data from the client. The inverter output is not shut off even if an error is detected.

Error check items

Error item	Error description	Inverter operation
Parity error	The data received by the inverter is different from the specified parity (**Pr.120** setting).	When this error occurs, **Pr.343** is incremented by one. When this error occurs, the LF signal is output.
Framing error	The data received by the inverter is different from the stop bit length (**Pr.119**/**Pr.120**) setting.	
Overrun error	The next data has been sent by the client before the inverter completes receiving the preceding data.	
Message frame error	The data length of the message frame is checked, and an error is generated if the received data length is less than 4 bytes. When a receive buffer overflow occurs, an error is generated if a received message frame is addressed to the own station or broadcasted.	
CRC check error	An error is generated if the data in the message frame does not match the calculation result.	

NOTE

- The LF signal can be assigned to an output terminal by setting any of **Pr.190 to Pr.196 (Output terminal function selection)**. Changing the terminal assignment may affect other functions. Set parameters after confirming the function of each terminal.

◆ MODBUS register

- The following shows the MODBUS registers for system environment variables (read/write), monitor codes (read), parameters (read/write), fault history data (read/write), and model information monitor items (read).
- System environment variables

Register	Definition	Read/write	Remarks
40002	Inverter reset	Write	Any value
40003	Parameter clear	Write	Set H965A.
40004	All parameter clear	Write	Set H99AA.
40006	Parameter clear*1	Write	Set H5A96.
40007	All parameter clear*1	Write	Set HAA99.
40008	Control input command / inverter status (extended)*2	Read/write	Refer to page 40.
40009	Control input command / inverter status*2	Read/write	Refer to page 40.
40010	Operation mode / inverter setting*3	Read/write	Refer to page 40.
40014	Set frequency (RAM value)	Read/write	The display can be changed to the rotations per minute (machine speed) using **Pr.37 and Pr.53**. (Refer to the Instruction Manual (Function).)
40015	Set frequency (EEPROM value)	Write	

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

- Control input command / inverter status, control input command / inverter status (extended)

Bit	Definition	
	Control input command	Inverter status
0	Stop command	RUN (Inverter running)*2
1	Forward rotation command	Forward running
2	Reverse rotation command	Reverse running
3	RH (High-speed operation command)*1	Up to frequency
4	RM (Middle-speed operation command)*1	Overload warning
5	RL (Low-speed operation command)*1	0
6	JOG operation selection 2	FU (Output frequency detection)*2
7	Second function selection	ABC (Fault)*2
8	Terminal 4 input selection	0
9	—	Safety monitor output 2
10	Output stop	0
11	—	0
12	—	0
13	—	0
14	—	0
15	—	Fault occurrence

Bit	Definition	
	Control input command (extended)	Inverter status (extended)
0	NET X1 (-)*1	NET Y1 (0)*2
1	NET X2 (-)*1	NET Y2 (0)*2
2	NET X3 (-)*1	NET Y3 (0)*2
3	NET X4 (-)*1	NET Y4 (0)*2
4	NET X5 (-)*1	0
5	—	0
6	—	0
7	—	0
8	—	0
9	—	0
10	—	0
11	—	0
12	—	0
13	—	0
14	—	0
15	—	0

*1 The signal within parentheses ( ) is assigned in the initial status. The function changes depending on the setting of **Pr.180 to Pr.182 and Pr.185 to Pr.189 (Input terminal function selection)**.
For details, refer to the description of **Pr.180 to Pr.182 and Pr.185 to Pr.189 (Input terminal function selection)** in the Instruction Manual (Function).
The signals assigned to the input terminals may be valid or invalid in the NET operation mode. (Refer to the Instruction Manual (Function).)

*2 The signal within parentheses ( ) is assigned in the initial status. The function changes depending on the setting of **Pr.190 to Pr.196 (Output terminal function selection)**.
For details, refer to the description of **Pr.190 to Pr.196 (Output terminal function selection)** in the Instruction Manual (Function).

- Operation mode / inverter setting

Mode	Read value	Write value
EXT	H0000	H0010*1
PU	H0001	H0011*1
EXT JOG	H0002	—
PU JOG	H0003	—
NET	H0004	H0014
PU + EXT	H0005	—

*1 Writing is available depending on the **Pr.79 and Pr.340** settings. For details, refer to the Instruction Manual (Function).
Restrictions in each operation mode conform with the computer link specification.

- Monitor code
  For details of the register numbers and the monitor items, refer to the description of **Pr.52** in the Instruction Manual (Function).

- Parameters

Pr.	Register	Name	Read/write	Remarks
0 to 999	41000 to 41999	For details on parameter names, refer to the parameter list in the Instruction Manual (Function).	Read/write	The parameter number + 41000 is the register number.
C2 (902)	41902	Terminal 2 frequency setting bias frequency	Read/write	
C3 (902)	42092	Terminal 2 frequency setting bias (analog value)	Read/write	Analog value (%) set in **C3 (902)**
	43902	Terminal 2 frequency setting bias (terminal analog value)	Read	Analog value (%) of the voltage (current) applied to terminal 2
125 (903)	41903	Terminal 2 frequency setting gain frequency	Read/write	
C4 (903)	42093	Terminal 2 frequency setting gain (analog value)	Read/write	Analog value (%) set in **C4 (903)**
	43903	Terminal 2 frequency setting gain (terminal analog value)	Read	Analog value (%) of the voltage (current) applied to terminal 2
C5 (904)	41904	Terminal 4 frequency setting bias frequency	Read/write	
C6 (904)	42094	Terminal 4 frequency setting bias (analog value)	Read/write	Analog value (%) set in **C6 (904)**
	43904	Terminal 4 frequency setting bias (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
126 (905)	41905	Terminal 4 frequency setting gain frequency	Read/write	
C7 (905)	42095	Terminal 4 frequency setting gain (analog value)	Read/write	Analog value (%) set in **C7 (905)**
	43905	Terminal 4 frequency setting gain (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C42 (934)	41934	PID display bias coefficient	Read/write	
C43 (934)	42124	PID display bias analog value	Read/write	Analog value (%) set in **C43 (934)**
	43934	PID display bias analog value (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
C44 (935)	41935	PID display gain coefficient	Read/write	
C45 (935)	42125	PID display gain analog value	Read/write	Analog value (%) set in **C45 (935)**
	43935	PID display gain analog value (terminal analog value)	Read	Analog value (%) of the current (voltage) applied to terminal 4
1000 to 1999	45000 to 45999	For details on parameter names, refer to the parameter list in the Instruction Manual (Function).	Read/write	The parameter number + 44000 is the register number.

- Fault history

Register	Definition	Read/write	Remarks
40501	Fault record 1	Read/write	Being 2 bytes in length, the data is stored as H00○○. Refer to the lowest 1 byte for the error code. (Refer to the Instruction Manual (Maintenance) for the details of the error codes.) The fault history is batch-cleared by writing to register 40501. Set any value as data.
40502	Fault record 2	Read	
40503	Fault record 3	Read	
40504	Fault record 4	Read	
40505	Fault record 5	Read	
40506	Fault record 6	Read	
40507	Fault record 7	Read	
40508	Fault record 8	Read	
40509	Fault record 9	Read	
40510	Fault record 10	Read	

- Product profile

Register	Definition	Read/write	Remarks
44001	Model (1st and 2nd characters)	Read	The inverter model can be read in ASCII code. "H20" (blank code) is set for blank area. Example) FR-D820: H46, H52, H2D, H44, H38, H32, H30, H20...H20
44002	Model (3rd and 4th characters)	Read	
44003	Model (5th and 6th characters)	Read	
44004	Model (7th and 8th characters)	Read	
44005	Model (9th and 10th characters)	Read	
44006	Model (11th and 12th characters)	Read	
44007	Model (13th and 14th characters)	Read	
44008	Model (15th and 16th characters)	Read	
44009	Model (17th and 18th characters)	Read	
44010	Model (19th and 20th characters)	Read	
44011	Capacity (1st and 2nd characters)	Read	The capacity in the inverter model can be read in ASCII code. Data is read in increments of 0.1 kW, and rounds down to 0.01 kW increments. "H20" (blank code) is set for blank area. Example) 0.75K: " 7" (H20, H20, H20, H20, H20, H37)
44012	Capacity (3rd and 4th characters)	Read	
44013	Capacity (5th and 6th characters)	Read	

NOTE

- When a 32-bit parameter setting or monitor item is read and the value to be read exceeds HFFFF, HFFFF is returned.
- The display can be changed from the frequency to rotations per minute (machine speed) using **Pr.53**. When the machine speed is displayed, the value is incremented by one.

◆ Pr.343 Communication error count

- The communication error occurrence count can be checked.

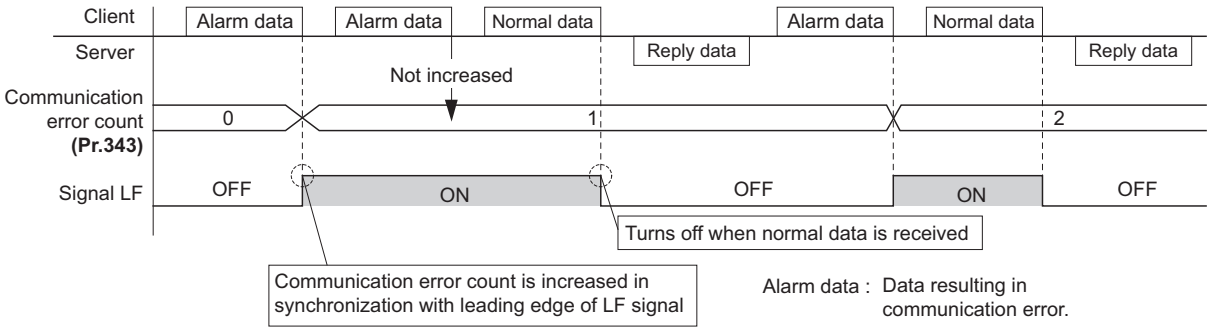
Parameter	Setting range	Minimum setting range	Initial value
343	(0 to 999) (Read-only)	1	0

NOTE

- The communication error count is temporarily stored in the RAM memory. The value is not stored in the EEPROM, and so is cleared to 0 when power is reset and the inverter is reset.

◆ Alarm (LF) signal output (communication error warning)

- During a communication error, the Alarm (LF) signal is output by open collector output. Assign the terminal to be used using any of **Pr.190 to Pr.196 (Output terminal function selection)**.



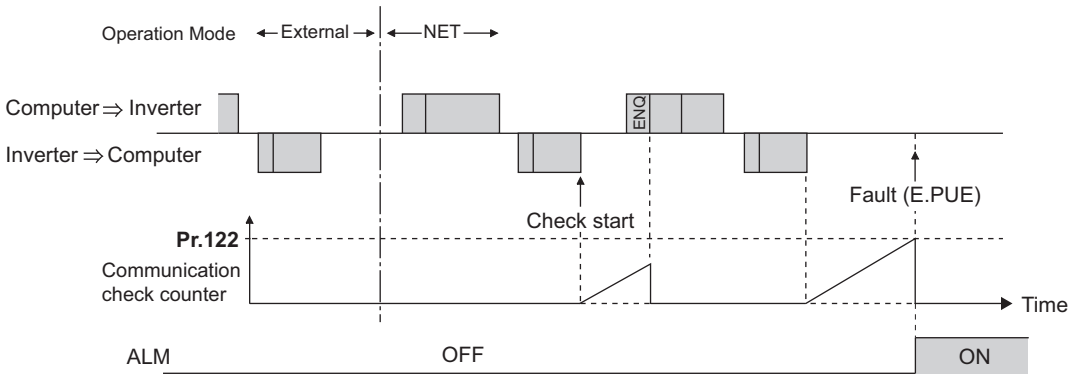
NOTE

- The LF signal can be assigned to an output terminal by setting **Pr.190 to Pr.196**. Changing the terminal assignment may affect other functions. Set parameters after confirming the function of each terminal.

◆ Signal loss detection (Pr.122)

- If a signal is lost (communication stops) between the computer and the inverter as a result of a signal loss detection, the communication error (E.PUE) occurs and the inverter output will be shut off.
- When a signal loss is detected, the LF signal is output.
- When "9999" is set, the communication check (signal loss detection) will not be performed.
- The monitor items and parameter settings can be read via RS-485 communication when "0" is set, but a communication error (E.PUE) occurs instantly when the operation mode is switched to the one for the selected command interface (Network operation mode in the initial setting).
- Setting any value from 0.1 to 999.8 seconds will enable signal loss detection. To make a signal loss detection, it is necessary to send data from the computer within the communication check time interval. (The inverter makes a communication check (clearing of communication check counter) regardless of the station number setting of the data sent from the client.)
- Communication check is started at the initial communication in the operation mode for the selected command interface (Network operation mode in the initial setting).

Example: **Pr.122** = "0.1 to 999.8s"



NOTE

- The operation at a communication error occurrence depends on the setting of **Pr.502 Stop mode selection at communication error**. (Refer to page 47.)

3 Other Communication Options

3.1 USB device communication

A personal computer and an inverter can be connected with a USB cable. Setup of the inverter can be easily performed with FR Configurator2.

The inverter can be connected easily to a personal computer by a USB cable.

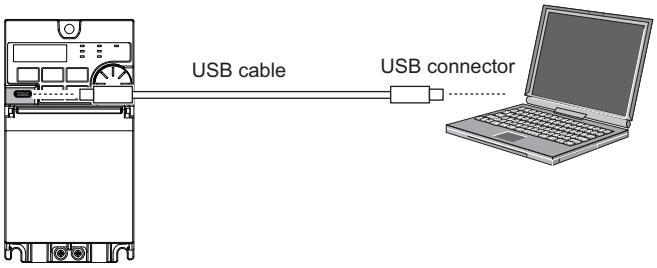
Pr.	Name	Initial value	Setting range	Description
547 **N040**[*1]	**USB communication station number**	0	0 to 31	Specify the inverter station number.
548 **N041**[*1]	**USB communication check time interval**	9999	0	USB communication is possible, however the inverter output is shut off (E.USB) when the mode changes to the PU operation mode.
			0.1 to 999.8 s	Set the communication check time interval. If a no-communication state persists for longer than the permissible time, the inverter output is shut off (E.USB).
			9999	No communication check

*1 The changed value is applied after the next power-ON or inverter reset.

◆ USB communication specifications

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

*1 USB bus power connection is available. The maximum SCCR is 500 mA. A PU connector cannot be used during USB bus power connection.



- At the initial setting (**Pr.551 PU mode operation command source selection** = "9999"), communication with FR Configurator2 can be made in the PU operation mode simply by connecting the inverter and a personal computer with a USB cable. To fix the command source to the USB connector in the PU operation mode, set "3" in **Pr.551**.
- Parameter setting and monitoring can be performed by using FR Configurator2. For details, refer to the Instruction Manual of FR Configurator2.

NOTE

- Operation is not guaranteed when multiple inverters are connected using a USB hub.

3.2 Automatic connection with GOT

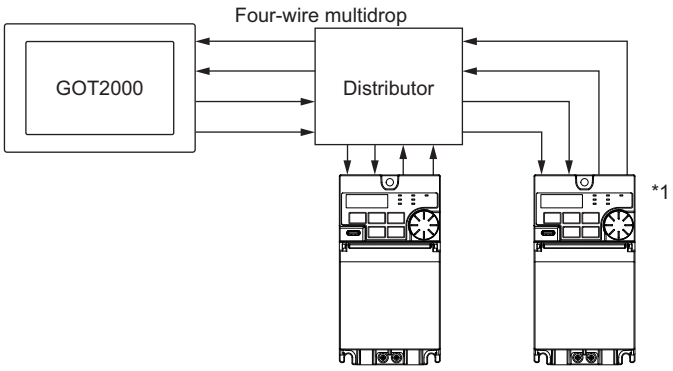
When the automatic connection is enabled in the GOT2000 series, the inverter can communicate with the GOT2000 series with only setting the station number and connecting the GOT. This eliminates the need for setting each communication parameter separately.

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

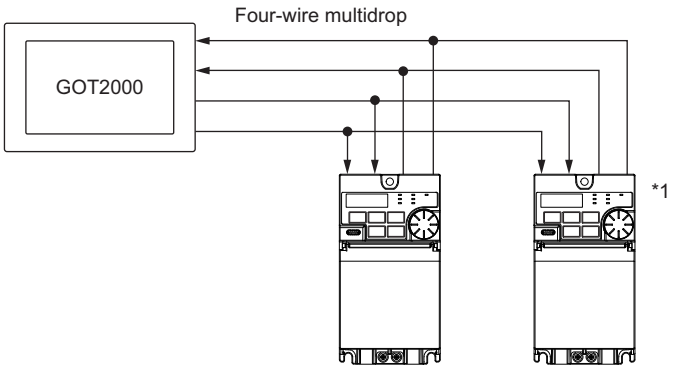
*1 Setting range when **Pr.549 Protocol selection** = "0" (Mitsubishi inverter protocol). The setting range is "0 to 247" when **Pr.549** = "1" (MODBUS RTU). When a value outside the setting range is set, the inverter operates at the initial value.

◆ Automatic connection system configuration

- When the PU connector is used



- When the RS-485 terminals are used



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

◆ GOT2000 series automatic recognition

- Set the station number (**Pr.117**) of the inverter before the automatic recognition is performed.
- When the GOT2000 series is connected, the parameters required for the GOT connection are automatically changed by setting the automatic recognition on the GOT2000 series side.
- Connect all the stations of inverters with GOT before the automatic recognition is performed. The inverter newly added after automatic recognition will not be recognized automatically. (When an inverter is added, perform the initial setting in **Pr.999 Automatic parameter setting** or set the automatic recognition on the GOT side again.)

Automatic change item	Automatic change parameter	Setting value after change
Communication speed	**Pr.118**	Depending on the setting of the connected device on the GOT side.
Data length / stop bit	**Pr.119**	
Parity	**Pr.120**	
Time delay setting	**Pr.123**	
CR/LF selection	**Pr.124**	
Number of communication retries	**Pr.121**	9999 (fixed)
Communication check time interval	**Pr.122**	9999 (fixed)
Protocol selection	**Pr.549**	0 (fixed to Mitsubishi inverter protocol)

NOTE

- If the automatic recognition cannot be performed, initial setting in **Pr.999** is required.
- For connection to a device other than the GOT2000 series, initial setting in **Pr.999** is required.
- For details, refer to the GOT2000 Series Connection Manual (Mitsubishi Product).

4 Common Settings

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

Pr.	Name	Initial value	Setting range	Description
342 **N001**	**Communication EEPROM write selection**	0	0	Parameter values written by communication are written to the EEPROM and RAM.
			1	Parameter values written by communication are written to the RAM.
502 **N013**	**Stop mode selection at communication error**	0	0 to 2, 6	Select the operation at a communication error occurrence.
779 **N014**	**Operation frequency during communication error**	9999	0 to 590 Hz	Set the frequency for the operation when a communication error occurs.
			9999	Operation continues at the same frequency before the communication error.

◆ Communication EEPROM write selection (Pr.342)

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

NOTE

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

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

- For communication via the PU connector or RS-485 terminals, operation at a communication error can be selected. The operation is active in the Network operation mode.
- Select the stop operation at the retry count excess (**Pr.121**, enabled only when the Mitsubishi inverter protocol is selected) or at a signal loss detection (**Pr.122**) during the RS-485 communication.

Fault type	Pr.502 setting	At fault occurrence			At fault removal		
		Operation	Display	Fault (ALM) signal	Operation	Display	Fault (ALM) signal
PU disconnection	0 (initial value)	Output shutoff	"E.PUE"	ON	Output stop status continues.	"E.PUE"	ON
	1	Output to decelerate and stop the motor.	"E.PUE" after stop	ON after stop			
	2			OFF	Restart*1	Normal	OFF
	6	Operation continues at the frequency set in **Pr.779**.*2	"CF" warning	OFF	Normal	Normal	OFF

*1 When the communication error is removed during deceleration, the motor re-accelerates.

*2 When the frequency command interface is switched to the one other than NET during operation, the frequency command given from an external device can be made valid.

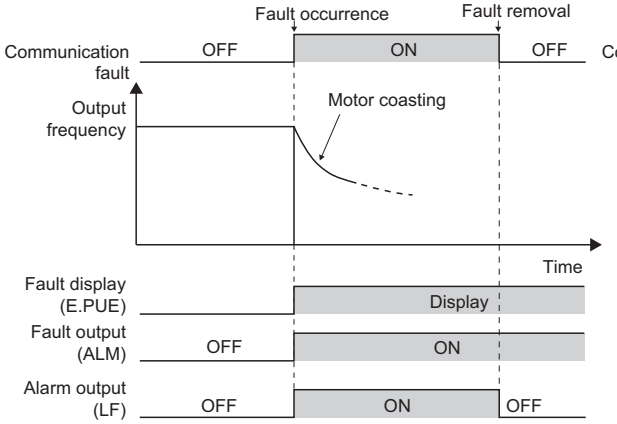
- When a communication error is detected during communication via the PU connector or the RS-485 terminals, the Alarm (LF) signal is output to an output terminal of the inverter.

NOTE

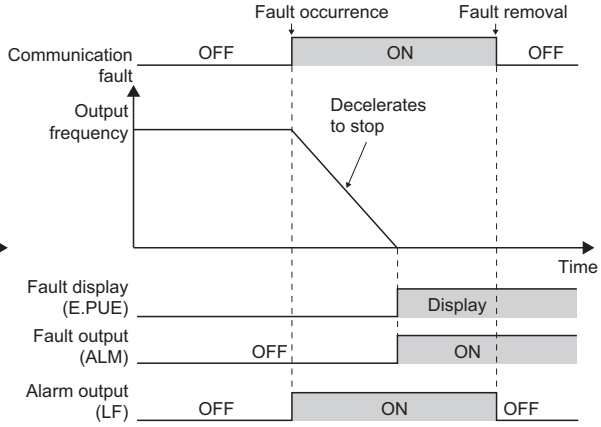
- To use the LF signal, set "98" (positive logic) or "198" (negative logic) in any of **Pr.190 to Pr.196 (Output terminal function selection)** to assign the function to an output terminal.

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

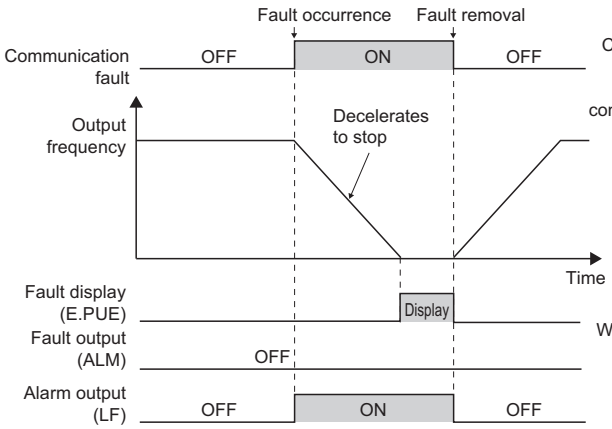
Pr.502 = "0" (initial value)



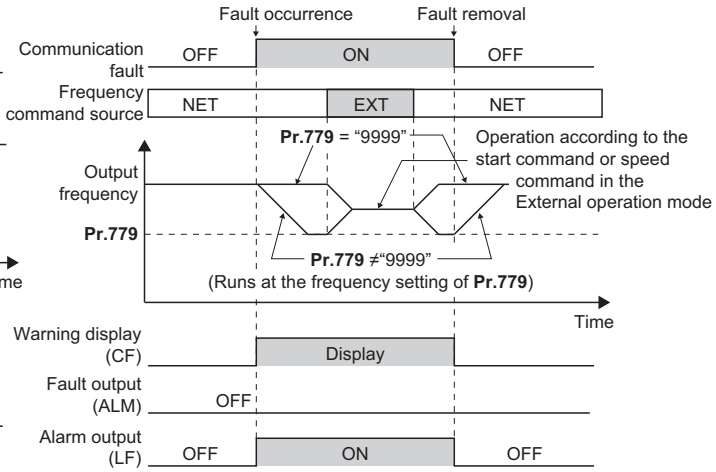
Pr.502 = "1"



Pr.502 = "2"



Pr.502 = "6"



NOTE

- When the switchover mode (**Pr.79 Operation mode selection** = "6") is set, the operation can be switched between NET and External during operation using the External/NET operation switchover (X66) signal. (Refer to the Instruction Manual (Function).)
- Fault output indicates the Fault (ALM) signal and an alarm bit output.
- When the fault output is set enabled, fault records are stored in the fault history. (A fault record is written to the fault history at a fault output.)
- When the fault output is not enabled, a fault record is overwritten to the fault history temporarily but not stored.
- After the fault is removed, the fault indication goes back to normal indication on the monitor, and the fault history goes back to the previous status.
- When **Pr.502** = "1 or 2", the normal deceleration time setting (settings like **Pr.8, Pr.44, and Pr.45**) is applied as the deceleration time.
- If a communication line error occurs, then the error is removed during deceleration while **Pr.502** = "2", the motor re-accelerates from that point. The operation command and the speed command before the fault occurred will be applied for restarting. The normal acceleration time setting (such as **Pr.7/Pr.44** setting) is applied for restart.
- The **Pr.502** and **Pr.779** settings are valid when communication is performed via the PU connector or RS-485 terminals.
- These parameters are valid in the Network operation mode. When performing communication via the PU connector or the RS-485 terminals, set **Pr.551 PU mode operation command source selection** ≠ "2".
- **Pr.502** is valid for the device that has the command source in the Network operation mode.
- If the communication error setting is disabled with **Pr.121** = "9999" or **Pr.122** = "9999" while **Pr.502** = "6", the inverter does not operate with the frequency set in **Pr.779** when a communication error occurs.

⚠CAUTION

• When **Pr.502** = "6" and a communication line error (PU disconnection) occurs, the operation continues. When setting "6" in **Pr.502**, provide a safety stop countermeasure other than via communication. For example, input a signal through an external terminal (RES, MRS, etc.) or press the PU stop on the operation panel.

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

- Check the following before switching the operation mode.
  The inverter is at a stop.
  Both the STF and STR signals are off.
  The **Pr.79 Operation mode selection** setting is correct. (Check the setting on the operation panel of the inverter.) (Refer to the Instruction Manual (Function).)
- The operation mode at power ON and at restoration from instantaneous power failure can be selected. Set a value other than "0" in **Pr.340 Communication startup mode selection** to select the Network operation mode. (Refer to the Instruction Manual (Function).)
- After the inverter starts up in the Network operation mode, parameter write can be commanded via the network.

NOTE

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

Warranty

When using this product, make sure to understand the warranty described below.

1. **Warranty period and coverage**

   We will repair any failure or defect (hereinafter referred to as "failure") in our FA equipment (hereinafter referred to as the "Product") arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit are repaired or replaced.

   [Term]

   The term of warranty for Product is twelve months after your purchase or delivery of the Product to a place designated by you or eighteen months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

   [Limitations]

   (1) You are requested to conduct an initial failure diagnosis by yourself, as a general rule. It can also be carried out by us or our service company upon your request and the actual cost will be charged.
   However, it will not be charged if we are responsible for the cause of the failure.

   (2) This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

   (3) Even during the term of warranty, the repair cost will be charged on you in the following cases;
   - a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
   - a failure caused by any alteration, etc. to the Product made on your side without our approval
   - a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
   - a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
   - any replacement of consumable parts (condenser, cooling fan, etc.)
   - a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
   - a failure caused by using the emergency drive function
   - a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
   - any other failures which we are not responsible for or which you acknowledge we are not responsible for

2. **Term of warranty after the stop of production**

   (1) We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales and Service, etc.

   (2) Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

3. **Service in overseas**

   Our regional FA Center in overseas countries will accept the repair work of the Product; however, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

4. **Exclusion of loss in opportunity and secondary loss from warranty liability**

   Regardless of the gratis warranty term, Mitsubishi Electric shall not be liable for compensation to:

   (1) Damages caused by any cause found not to be the responsibility of Mitsubishi Electric.

   (2) Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi Electric products.

   (3) Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi Electric products.

   (4) Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. **Change of Product specifications**

   Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. **Application and use of the Product**

   (1) For the use of our product, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in product, and a backup or fail-safe function should operate on an external system to product when any failure or malfunction occurs.

   (2) Our product is designed and manufactured as a general purpose product for use at general industries.
   Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used.
   In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used.
   We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

Revisions

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

Revision date	*Manual number	Revision
Dec. 2024	IB(NA)-0601039ENG-A	First edition

Model	FR-D800 TORISETSU TSUSHIN EIBUN
Model code	1AJ082

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BUILDING 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

IB(NA)-0601039ENG-A(2412)MEE Printed in Japan