MITSUBISHI ELECTRIC

800 series

INVERTER
RS-485 interface board
FR-A8ERS
INSTRUCTION MANUAL

RS-485 communication terminals

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Thank you for choosing this RS-485 interface board for Mitsubishi inverter.
This Instruction Manual provides handling information and precautions for use of this product. Incorrect handling might cause an unexpected fault. Before using this product, always read this Instruction Manual carefully to use this product correctly.
Please forward this Instruction Manual to the end user.

Safety instructions

Do not attempt to install, operate, maintain or inspect the product until you have read through this Instruction Manual and appended documents carefully and can use the equipment correctly. Do not use this product until you have a full knowledge of the equipment, safety information and instructions. In this Instruction Manual, the safety instruction levels are classified into "Warning" and "Caution".

⚠ Warning — Incorrect handling may cause hazardous conditions, resulting in death or severe injury.

⚠ Caution — Incorrect handling may cause hazardous conditions, resulting in medium or slight injury, or may cause only material damage.

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

◆ **Electric Shock Prevention**

⚠ Warning

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

◆ **Injury Prevention**

⚠ Caution

- The voltage applied to each terminal must be the ones specified in the Instruction Manual. Otherwise a burst, damage, etc. may occur.
- The cables must be connected to the correct terminals. Otherwise a burst, damage, etc. may occur.
- The polarity (+ and -) must be correct. Otherwise a burst or damage may occur.
- While power is ON or for some time after power OFF, do not touch the inverter as it will be extremely hot. Touching these devices may cause a burn.

◆ **Additional Instructions**

The following instructions must be also followed. If the product is handled incorrectly, it may cause unexpected fault, an injury, or an electric shock.

⚠ Caution

Transportation and mounting
- Do not install or operate the product if it is damaged or has parts missing.
- Do not stand or rest heavy objects on the product.
- The mounting orientation must be correct.
- Foreign conductive objects must be prevented from entering the inverter. That includes screws and metal fragments or other flammable substance such as oil.
- If halogen-based materials (fluorine, chlorine, bromine, iodine, etc.) infiltrate into a Mitsubishi product, the product will be damaged. Halogen-based materials are often included in fumigant, which is used to sterilize or disinfest wooden packages. When packaging, prevent residual fumigant components from being infiltrated into Mitsubishi products, or use an alternative sterilization or disinfection method (heat disinfection, etc.) for packaging. Sterilization of disinfection of wooden package should also be performed before packaging the product.

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

⚠ Warning

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

⚠ Caution

Usage
- When parameter clear or all parameter clear is performed, the required parameters must be set again before starting operations. Because all parameters return to their initial values.
- Static electricity in your body must be discharged before you touch the product.

Maintenance, inspection and parts replacement
- Do not carry out a megger (insulation resistance) test.

Disposal
- The product must be treated as industrial waste.

General instruction

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

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1 PRE-OPERATION INSTRUCTIONS

1.1 Unpacking and product confirmation

Take the product out of the package, check the product name, and confirm that the product is as you ordered and intact.
The product is an RS-485 interface board for the FR-A800-E (with a built-in Ethernet board) series inverter.

1.1.1 Product confirmation

Check the enclosed items.

FR-A8ERS...1	Spacer...2	Mounting screw...2

1.1.2 Component names
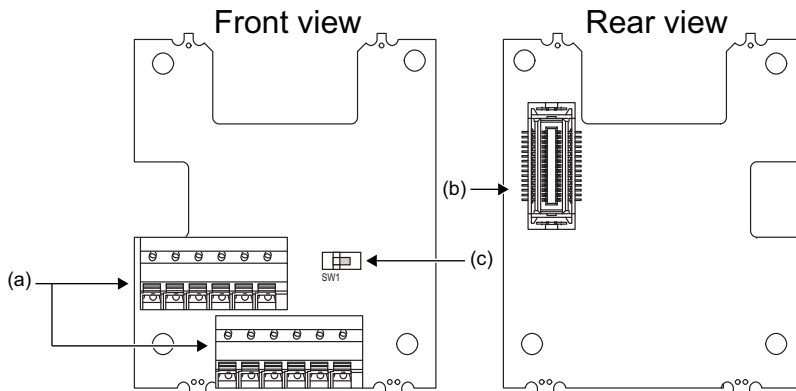
Symbol	Name	Description	Refer to page
a	Terminal block	Connect signal cables.	**12**
b	Connector	Connects to the interface board connector of the inverter.	**10**
c	Terminating resistor selection switch (SW1)	Switches ON or OFF the internal terminating resistor.	**8**

1.1.3   Terminal layout

Terminating resistor switch
Initially-set to "OPEN".
Set only the terminating resistor
switch of the remotest inverter to
the "100Ω" position.

P5S   SG   SDA1   SDB1   RDA1   RDB1
(VCC)   (GND)   (TXD1+)   (TXD1-)   (RXD1+)   (RXD1-)

OPEN   100Ω

VCC   GND   + TXD -   + RXD -

VCC   GND   + TXD -   + RXD -

P5S   SG   SDA2   SDB2   RDA2   RDB2
(VCC)   (GND)   (TXD2+)   (TXD2-)   (RXD2+)   (RXD2-)
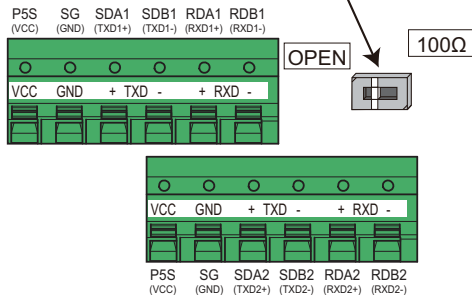
Name	Description
RDA1 (RXD1+)	Inverter receive +
RDB1 (RXD1-)	Inverter receive -
RDA2 (RXD2+)	Inverter receive + (for branch)
RDB2 (RXD2-)	Inverter receive - (for branch)
SDA1 (TXD1+)	Inverter send +
SDB1 (TXD1-)	Inverter send -
SDA2 (TXD2+)	Inverter send + (for branch)
SDB2 (TXD2-)	Inverter send - (for branch)
P5S (VCC)	5V Permissible load current 100 mA
SG (GND)	Earthing (grounding) (connected to terminal SD)

1.1.4 Terminal connection diagrams
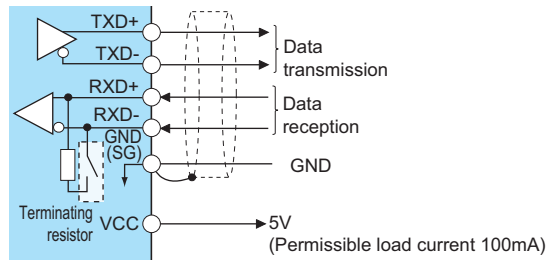
1.1.5 Terminal specifications

Terminal Symbol	Terminal name	Terminal function description
TXD+	Inverter transmission terminal	The RS-485 terminals enables the communication by RS-485. Conforming standard: EIA-485 (RS-485) Transmission format: Multidrop link Communication speed: 300 to 115200 bps Overall length: 500 m
TXD-		
RXD+	Inverter reception terminal	
RXD-		
GND (SG)	Earthing (grounding)	

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2 INSTALLATION

2.1 Pre-installation instructions

Check that the inverter's input power and the control circuit power are both OFF.

⚠ **Caution**
● **With input power ON, do not install or remove the product. Otherwise, the inverter and the product may be damaged.**
● **To avoid damage due to static electricity, static electricity in your body must be discharged before you touch the product.**

2.2 Installation procedure

(1) Remove the Ethernet board from the inverter. (Refer to the Instruction Manual of the inverter.)
(2) For the two mounting holes that will not be tightened with mounting screws, insert spacers.
(3) Fit the connector of the product to the guide of the connector on the inverter unit side, and insert the product as far as it goes. (Install the product to the connector used for the Ethernet board.)
(4) Fit the two locations on the left and right of the product securely to the inverter by screwing in the mounting screws supplied with the product. (tightening torque 0.33 N·m to 0.40 N·m) If the screw holes do not line up, the connector may not be inserted deep enough. Check the connector.

Spacer

Inverter side connector

Spacer
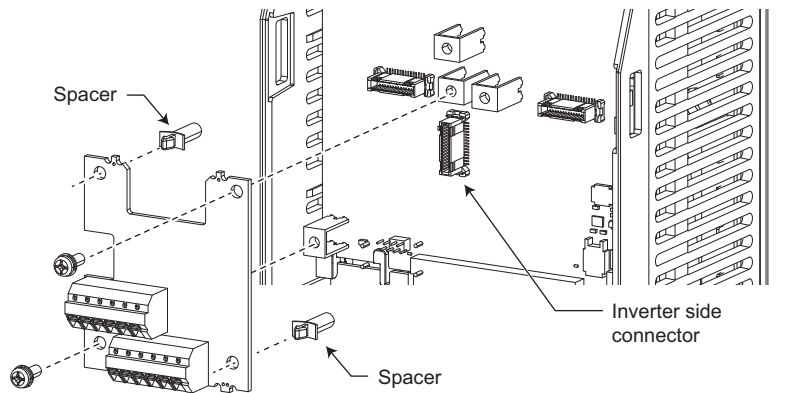
NOTE

- The Ethernet board earth plate is not required for installing the product.
- Do not install the product to a plug-in option connector.

3 WIRING AND CONFIGURATION

3.1 Connection of RS-485 terminals and wires

• The terminal size of the product is the same as that of the control circuit terminal block of the inverter. Refer to the Instruction Manual (Detailed) of the inverter for the wiring method.

3.2 System configuration of RS-485 terminals

• Computer and inverter connection (1:1)
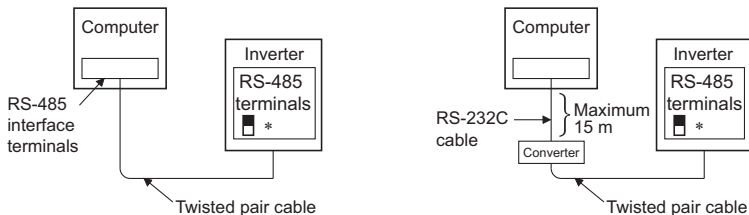
∗Set the terminating resistor switch to the "100 Ω" position.

• Combination of computer and multiple inverters (1:n)

∗Set only the terminating resistor switch of the remotest inverter to the "100 Ω" position.

∗Set only the terminating resistor switch of the remotest inverter to the "100 Ω" position.
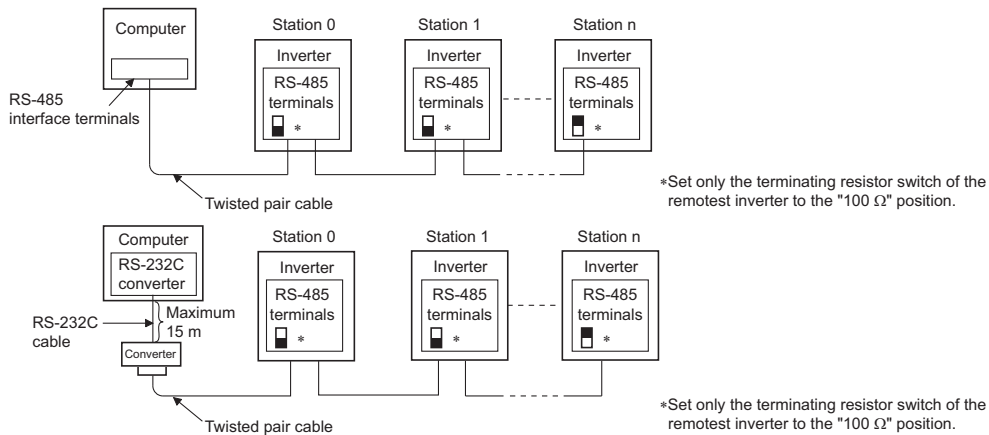
3.3 How to wire RS-485 terminals

• 1 inverter and 1 computer with RS-485 terminals

Computer
RDA
RDB
SDA
SDB
RSA
RSB
CSA
CSB
SG
FG

*1

SDB1 SDA1 RDB1 RDA1
*2
SG
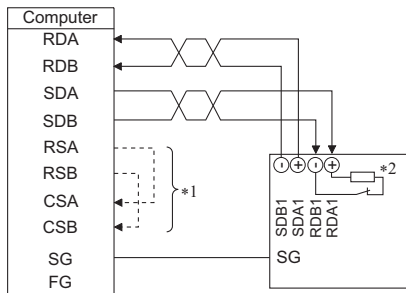
• Multiple inverters and 1 computer with RS-485 terminals

Computer
RDA
RDB
SDA
SDB
RSA
RSB
CSA
CSB
SG
FG

*1

SDB1 SDA1 SDB2 SDA2 RDB1 RDA1 RDB2 RDA2
SG   SG
Station 0

SDB1 SDA1 SDB2 SDA2 RDB1 RDA1 RDB2 RDA2
SG   SG
Station 1

SDB1 SDA1 RDB1 RDA1
*2
SG
Station n
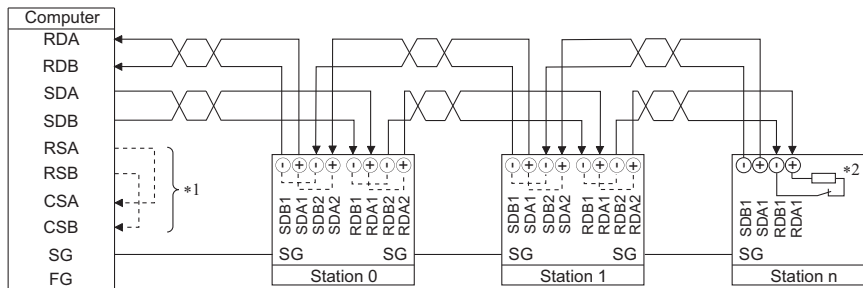
*1 Make connection in accordance with the Instruction Manual of the computer to be used with.
    Fully check the terminal numbers of the computer since they vary with the model.
*2 For the inverter farthest from the computer, set the terminating resistor switch to ON (100 Ω side).

- For branching, connect the wires as shown below.

GND TXD RXD   GND TXD RXD

To computer ground

To computer receive

To computer send

To receiving terminal
of the next inverter

To sending terminal
of the next inverter

To next inverter
To earth (ground)
terminal
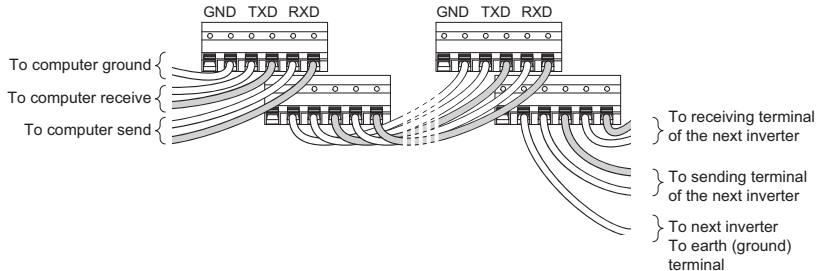
3.4 Two-wire type connection

- 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.

Computer

Inverter

Transmission
enable

Reception
enable

TXD+

TXD-

RXD+

RXD-

Pass a wire

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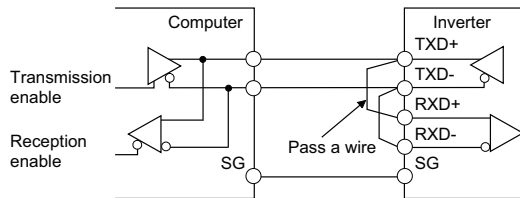
- A program should be created so that transmission is disabled (receiving state) when the computer is not sending and reception is disabled (sending state) during sending to prevent the computer from receiving its own data.

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4 PARAMETER

4.1   Operation mode setting

To enable RS-485 communication operation via the RS-485 terminals on the product, select the Network operation mode for the inverter.

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

◆ Operation mode switching conditions

Operation mode switching conditions
- The inverter is at a stop;
- Both the STF and STR signals are off; and
- The **Pr.79 Operation mode selection** setting is correct.
  (Set with the operation panel of the inverter.)

◆ Operation mode selection at power ON and at restoration from instantaneous power failure

The operation mode at power ON and at restoration from instantaneous power failure can be selected.
Set a value other than "0" in **Pr.340 Communication startup mode selection** to select the network operation mode.
After started in network operation mode, parameter write from the network is enabled.

> **NOTE**
> - Change of the **Pr.340** setting is valid when powering on or resetting the inverter.
> - **Pr.340** can be changed with the operation panel independently of the operation mode.
> - When setting a value other than "0" in **Pr.340**, make sure that the initial settings of the inverter are correct.
> - Refer to the Instruction Manual (Detailed) of the inverter for details of **Pr.79**, **Pr.340**.

Pr.340 setting	Pr.79 setting	Operation mode at power-ON, at power restoration, or after a reset	Operation mode switching
0 (initial value)	0 (initial value)	External operation mode	Switching among the External, PU, and NET operation modes is enabled.*2
	1	PU operation mode	PU operation mode fixed
	2	External operation mode	Switching between the External and NET operation modes is enabled. Switching to PU operation mode is disabled
	3, 4	External/PU combined operation mode	Operation mode switching is disabled
	6	External operation mode	Switching among the External, PU, and NET operation mode is enabled while running.
	7	X12 (MRS) signal ON External operation mode	Switching among the External, PU, and NET operation modes is enabled.*2
		X12 (MRS) signal OFF External operation mode	External operation mode fixed. (Forcibly switched to External operation mode.)
1, 2*1	0	NET operation mode	Same as **Pr.340**="0" setting
	1	PU operation mode	
	2	NET operation mode	
	3, 4	External/PU combined operation mode	
	6	NET operation mode	
	7	X12 (MRS) signal ON NET operation mode	
		X12 (MRS) signal OFF External operation mode	
10, 12 *1	0	NET operation mode	Switching between the PU and NET operation mode is enabled*3
	1	PU operation mode	Same as **Pr.340**="0" setting
	2	NET operation mode	NET operation mode fixed
	3, 4	External/PU combined operation mode	Same as **Pr.340**="0" setting
	6	NET operation mode	Switching between the PU and NET operation mode is enabled while running.*3
	7	External operation mode	Same as **Pr.340**="0" setting

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∗1 The setting value "2 or 12" of **Pr.340** is used primarily during communication operation of the inverter via the RS-485 terminals of the product.
Even if an instantaneous power failure occurs while **Pr.57 Restart coasting time** ≠ "9999" (with automatic restart after instantaneous power failure), inverter continues operation at the condition before the instantaneous failure.
When **Pr.340** = "1 or 10", if a power failure occurs while the start signal is being input through communication, the start signal is OFF at power restoration.

∗2 The operation mode cannot be directly changed between the PU operation mode and Network operation mode.

∗3 Switching between the PU and NET operation modes is available with the $\boxed{\dfrac{\text{PU}}{\text{EXT}}}$ key on the operation panel and the X65 signal.

4.2 Start command source and frequency command source during communication operation

The start and frequency commands from an external device are enabled during communication via the RS-485 terminals of the product or the communication option.
The command source in the PU operation mode can also be selected.

Pr.	Pr. group	Name	Initial value	Setting range	Description
338	D010	Communication operation command source	0	0	Start command source is communication.
				1	Start command source is external.
339	D011	Communication speed command source	0	0	Frequency command source is communication.
				1	Frequency command source is external.
				2	Frequency command source is external. (When there is no external input, the frequency command via communication is valid, and the frequency command from terminal 2 is invalid.)
550	D012	NET mode operation command source selection	9999	0	The communication option is the command source when in the NET operation mode.
				1	The RS-485 terminals are the command source when in the NET operation mode.
				5	The command source is specified as communication via the Ethernet connector in the NET operation mode. Do not select this setting while the product is installed.
				9999	Communication option is recognized automatically. Normally, the RS-485 terminals are the command source. When the communication option is mounted, the communication option is the command source.

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Pr.	Pr. group	Name	Initial value	Setting range	Description
551	D013	PU mode operation command source selection	9999	1	The RS-485 terminals are the command source when in the PU operation mode.
				2	The PU connector is the command source when in the PU operation mode.
				3	The USB connector is the command source when in the PU operation mode.
				5	The command source is specified as communication via Ethernet connector in the PU operation mode. Do not select this setting while the product is installed.
				9999	USB automatic recognition Normally, the PU connector is the command source. When the USB is connected, the USB connector is the command source.

4.2.1 Selection of command source in Network operation mode (Pr.550)

- Either of the RS-485 terminals or the communication option can be specified for the command source in the Network operation mode.
- For example, whether or not the communication option is mounted, set **Pr.550** ="1" to write parameters from or input the start and frequency commands via RS-485 terminals in the Network operation mode.

NOTE

- In the initial setting, "9999" (communication option automatic recognition) is set for **Pr.550**. Thus, if the communication option is mounted, parameters cannot be written or the start and frequency commands cannot be sent by communications that use the RS-485 terminals. (Monitoring or parameter reading can be performed.)

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

- Any of the PU connector, RS-485 terminals, or USB connector can be specified as the command source in the PU operation mode.
- Set **Pr.551** ="1" to use communication connected to the RS-485 terminals to write parameters or execute start and frequency commands in the PU operation mode.

NOTE

- When **Pr.550** ="1" (NET mode RS-485 terminals) and **Pr.551** ="1" (PU mode RS-485 terminals), the PU operation mode has a precedence. For this reason, if the communication option is not mounted, switching to the Network operation mode is not longer possible.

• Changed setting values are enabled at power-ON or inverter reset.

Pr.550 setting	Pr.551 setting	Command source				Remarks
		PU connector	**USB connector**	**RS-485 terminals**	**Communication option**	
0	1	×	×	PU operation mode*1	NET operation mode*2	
	2	PU operation mode	×	×	NET operation mode*2	
	3	×	PU operation mode	×	NET operation mode*2	
	9999 (initial value)	PU operation mode*3	PU operation mode*3	×	NET operation mode*2	
1	1	×	×	PU operation mode*1	×	Switching to NET operation mode disabled
	2	PU operation mode	×	NET operation mode	×	
	3	×	PU operation mode	NET operation mode	×	
	9999 (initial value)	PU operation mode*3	PU operation mode*3	NET operation mode	×	

Pr.550 setting	Pr.551 setting	Command source				Remarks
		PU connector	**USB connector**	**RS-485 terminals**	**Communication option**	
9999 (initial value)	1	×	×	PU operation mode*1	NET operation mode*2	
	2	PU operation mode	×	×	NET operation mode*2	With communication option
				NET operation mode	×	Without communication option
	3	×	PU operation mode	×	NET operation mode*2	With communication option
				NET operation mode	×	Without communication option
	9999 (initial value)	PU operation mode*3	PU operation mode*3	×	NET operation mode*2	With communication option
				NET operation mode	×	Without communication option

*1 The MODBUS RTU protocol cannot be used in the PU operation mode. To use the MODBUS RTU protocol, set **Pr.551**="2".
*2 If the communication option is not mounted, switching to the Network operation mode is not longer possible.
*3 When **Pr.551**= "9999", the priority of the PU command source is USB connector > PU connector.

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4.2.3 Controllability through communication via the RS-485 terminals

Condition (Pr.551 setting)	Item	Controllability in each operation mode					
		PU operation	External operation	External/PU combined operation mode 1 (Pr.79 =3)	External/PU combined operation mode 2 (Pr.79 =4)	NET operation (when RS-485 terminals are used) *6	NET operation (when communication option is used) *7
1 (RS-485 terminals)	Operation command (start, stop)	○	×	×	○	×	
	Running frequency	○	×	○	×	×	
	Monitor	○	○	○	○	○	
	Parameter writing	○*4	×*5	○*4	○*4	×*5	
	Parameter read	○	○	○	○	○	
	Inverter reset	○	○	○	○	○	
Other than the above	Operation command (start, stop)	×	×	×	×	○*1	×
	Running frequency	×	×	×	×	○*1	×
	Monitor	○	○	○	○	○	○
	Parameter writing	×*5	×*5	×*5	×*5	○*4	×*5
	Parameter read	○	○	○	○	○	○
	Inverter reset	×	×	×	×	○*2	×

○: Valid ×: Invalid Δ: Partially valid

∗1 Follows the **Pr.338 Communication operation command source** and **Pr.339 Communication speed command source** settings. (Refer to the Instruction Manual (Detailed) of the inverter.)

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

∗3 PU stop is only enabled. PS is displayed on the operation panel during PU stop. Follows the **Pr.75 Reset selection/disconnected PU detection/PU stop selection** setting. (Refer to the Instruction Manual (Detailed) of the inverter.)

∗4 Writing of some parameters may be disabled by the **Pr.77 Parameter write selection** setting and the operating condition. (Refer to the Instruction Manual (Detailed) of the inverter.)

∗5 Some parameters are write-enabled independently of the operation mode and command source presence/absence. Writing is also enabled when **Pr.77**="2". (Refer to the Instruction Manual (Detailed) of the inverter.) Parameter clear is disabled.

∗6 When **Pr.550 NET mode operation command source selection**="1" (RS-485 terminals enabled), or **Pr.550 NET mode operation command source selection**="9999" with no communication option connected.

∗7 When **Pr.550 NET mode operation command source selection**="0" (communication option enabled), or **Pr.550 NET mode operation command source selection**="9999" with communication option connected.

4.2.4   Operation at fault

Fault record	Conditions (Pr.551 setting)	Operation in each operation mode at error occurrences					
		PU operation	External operation	External/PU combined operation mode 1 (Pr.79 =3)	External/PU combined operation mode 2 (Pr.79 =4)	NET operation (when RS-485 terminals are used) ∗2	NET operation (when communication option is used) ∗3
Communication error at RS-485 terminals	1 (RS-485 terminals)	Stop/ continued ∗1	Continued		Stop/ continued ∗1	Continued	
	Other than 1	Continued				Stop/continued ∗1	Continued

∗1　Selectable with **Pr.122 PU communication check time interval**, **Pr.336 RS-485 communication check time interval**, and **Pr.548 USB communication check time interval**

∗2　When **Pr.550 NET mode operation command source selection**= "1" (RS-485 terminals enabled), or **Pr.550 NET mode operation command source selection**="9999" with no communication option connected.

∗3　When **Pr.550 NET mode operation command source selection**="0" (communication option enabled), or **Pr.550 NET mode operation command source selection**="9999" with communication option connected.

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4.3 Initial setting of operation via communication

Set the action when the inverter is performing operation via communication.
- Set the RS-485 communication protocol. (Mitsubishi inverter protocol/MODBUS RTU protocol)
- Set the action at fault occurrence or at writing of parameters

Pr.	Pr. group	Name	Initial value	Setting range	Description	
549	N000	Protocol selection	0	0	Mitsubishi inverter protocol (computer link)	
				1	MODBUS RTU protocol	
342	N001	Communication EEPROM write selection	0	0	Parameter values are written to the EEPROM and RAM by communication.	
				1	Parameter values are written to the RAM only by communication .	
502	N013	Stop mode selection at communication error	0		**At fault occurrence**	**At fault removal**
				0	Output shutoff "E.SER" indication ALM signal output	Output stop status continues. ("E.SER" indication)
				1	Output to decelerate and stop the motor "E.SER" indication after stop ALM signal output after stop	Output stop status continues. ("E.SER" indication)
				2	Output to decelerate and stop the motor "E.SER" indication after stop	Restart
				3	Operation continues at the frequency set in **Pr.779**.	Normal
				4	Operation continues at the frequency set in **Pr.779**. "CF" indication	
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.	

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4.3.1　Setting the communication protocol (Pr.549)

• Select the RS-485 communication protocol.
• The MODBUS-RTU protocol is used for communication via the RS-485 terminals on the product.

Pr.549 setting	Communication protocol
0 (initial value)	Mitsubishi inverter protocol (computer link)
1	MODBUS RTU protocol

4.3.2　Communication EEPROM write selection (Pr.342)

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

NOTE

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

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

- During communication via the RS-485 terminals, the inverter operation at a communication error can be selected. The operation is active under the Network operation mode.
- Select the stop operation at the retry count excess (**Pr.335**, only with Mitsubishi inverter protocol) or at a signal loss detection (**Pr.336**, **Pr.539**).
- When a communication error is detected during communication via the RS-485 terminals, the Alarm (LF) signal is output via an output terminal of the inverter. For the LF signal, set "98 (positive logic) or 198 (negative logic)" in any of **Pr.190 to Pr.196 (output terminal function selection)** to assign the function to the output terminal. (If communication is not performed for the time set in **Pr.336** or longer, the LF signal is output when "3 or 4" is set in **Pr.502**.)

Pr.502 setting	At fault occurrence			At fault removal		
	Operation	**Indication**	**Fault (ALM) signal**	**Operation**	**Indication**	**Fault (ALM) signal**
0 (initial value)	Output shutoff	"E. SER"	ON	Output stop status continues.	"E. SER"	ON
1	Output to decelerate and stop the motor	"E. SER" after stop	ON after stop			
2			OFF	Restart∗2	Normal	OFF
3	Operation continues at the set frequency of **Pr.779**.∗1	Normal	OFF	Normal	Normal	OFF
4		"CF"	OFF			

　∗1　Under position control, the operation is continued to the target position.
　∗2　When the communication error is removed during deceleration, the motor re-accelerates.
　　　Under position control, the motor does not re-accelerates even when the communication error is removed during deceleration.

4

• The following charts show the inverter operations when a communication line error occurs.

Pr.502 = "0" (initial value)

	Fault detected	Fault cleared
Communication fault	OFF	ON	OFF

Output frequency — Motor coasting

Fault indication (E.SER)		Display
Fault output (ALM)	OFF	ON
Alarm output (LF)	OFF	ON	OFF

Pr.502 = "1"

	Fault detected	Fault cleared
Communication fault	OFF	ON	OFF

Output frequency — Motor coasting

Fault indication (E.SER)		Display
Fault output (ALM)	OFF	ON
Alarm output (LF)	OFF	ON	OFF

Pr.502 = "2"

	Fault detected	Fault cleared
Communication fault	OFF	ON	OFF

Output frequency — Decelerates to stop

Fault indication (E.SER)		Display
Fault output (ALM)	OFF	
Alarm output (LF)	OFF	ON	OFF

Pr.502 = "3"

	Fault detected	Fault cleared
Communication fault	OFF	ON	OFF

Output frequency — **Pr.779**="9999"

Pr.779

Pr.779≠"9999"
(Operation continues at the frequency setting of **Pr.779**)

Fault indication	Not displayed
Fault output (ALM)	OFF
Alarm output (LF)	OFF	ON	OFF

Pr.502 = "4"

	Fault detected	Fault cleared
Communication fault	OFF	ON	OFF

Output frequency — **Pr.779**="9999"

Pr.779

Pr.779≠"9999"
(Operation continues at the frequency setting of **Pr.779**)

Warning indication (CF)		Display
Fault output (ALM)	OFF
Alarm output (LF)	OFF	ON	OFF

- Fault output indicates the Fault signal (ALM) and an alarm bit output.
- When the fault output is set enabled, fault records are stored in the faults history. (A fault record is written to the faults history at a fault output.)
- When the fault output is not set enabled, fault record is overwritten to the faults history of the faults history temporarily but not stored.
- After the fault is removed, the fault indication goes back to normal indication on the monitor, and the faults history goes back to the previous status.
- When **Pr.502** ≠ "0", the normal deceleration time setting (setting in **Pr.8**, **Pr.44**, **Pr.45**, or the like) is applied as the deceleration time. Normal acceleration time setting (settings like **Pr.7** and **Pr.44**) is applied as the acceleration time for restart.
- When **Pr.502** = "2, 3 or 4", the inverter operates with the start command and the speed command, which were used before the fault.
- If a communication line error occurs, then the error is removed during deceleration while **Pr.502** = "2", the motor re-accelerates from that point.
- These parameters are valid under the Network operation mode. When performing communication through RS-485 terminals, set **Pr.551 PU mode operation command source selection** ≠ "1".
- **Pr.502** is valid for the device that has the command source under the Network operation mode. If a communication option is installed while **Pr.550** = "9999 (initial value)", a communication error in RS-485 terminals occurs and **Pr.502** becomes invalid.
- If the communication error setting is disabled with **Pr.502** = "3 or 4", **Pr.335** = "9999", and **Pr.539** = "9999", the inverter does not continue its operation with the frequency set by **Pr.779** at a communication error.
- If a communication error occurs while continuous operation at **Pr.779** is selected with **Pr.502** = "3 or 4", the inverter operates at the frequency set in **Pr.779** even though the speed command source is at the external terminals. Example) If a communication error occurs while **Pr.339** = "2" and the external terminal RL is ON, the operation is continued at the frequency set in **Pr.779**.
- During position control, a fault is output without deceleration even if **Pr.502** = "2".

⚠️**Caution**

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

4

4.4 Communication specifications of the Mitsubishi inverter protocol (computer link communication)

- Parameter setting, monitoring, etc. can be performed using Mitsubishi inverter protocol.
- To make communication between the personal computer and inverter, setting of the communication specifications must be made to the inverter in advance.
  Data communication cannot be made if the initial settings are not made or if there is any setting error.

Pr.	Pr. group	Name	Initial value	Setting range	Description	
331	N030	RS-485 communication station number	0	0 to 31*1	Specify the inverter station number. Set the inverter station numbers when two or more inverters are connected to one personal computer.	
332	N031	RS-485 communication speed	96	3, 6, 12, 24, 48, 96, 192, 384, 576, 768, 1152	Set the communication speed. The setting value × 100 equals the communication speed. For example, if 192 is set, the communication speed is 19200 bps.	
—	N032	RS-485 communication data length	0	0	Data length 8 bits	
				1	Data length 7 bits	
—	N033	RS-485 communication stop bit length	1	0	Stop bit length 1 bit	
				1	Stop bit length 2 bits	
333	—	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	

Pr.	Pr. group	Name	Initial value	Setting range	Description
334	N034	RS-485 communication parity check selection	2	0	Without parity check
				1	With parity check at odd numbers
				2	With parity check at even numbers
335	N035	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 will trip.
				9999	If a communication error occurs, the inverter will not trip.
336	N036	RS-485 communication check time interval	0	0	RS-485 communication is available, but the inverter trips in the NET operation mode.
				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 will trip.
				9999	No communication check (signal loss detection)
337	N037	RS-485 communication waiting time setting	9999	0 to 150 ms	Set the waiting time between data transmission to the inverter and the response.
				9999	Set with communication data.
341	N038	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.

4

> **NOTE**

- The monitored items and parameter settings can be read during communication with the **Pr.336 RS-485 communication check time interval** = "0 (initial value)" setting, but such operation will become faulty once the operation mode is changed to the NET operation mode. When the NET operation mode is selected as the start-up operation mode, communication is performed once, then a Communication fault (inverter) (E.SER) occurs. To perform operation or parameter writing via communication, set "9999" or a large setting value in **Pr.336**. (The setting value is determined by the computer program.) (Refer to **page 45**.)
- 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.

4.4.1   Communication specifications

Item		Description	Related Parameter
Communication protocol		Mitsubishi protocol (computer link)	**Pr.551**
Conforming standard		EIA-485 (RS-485)	—
Connectable units		1:N (maximum 32 units), setting is 0 to 31 stations	**Pr.117** **Pr.331**
Communication Speed		Selected among 300/600/1200/2400/4800/9600/19200/38400/57600/76800/115200 bps	**Pr.332**
Control procedure		Asynchronous system	—
Communication method		Half-duplex system	—
Communication specifications	Character system	ASCII (7 bits or 8 bits can be selected.)	**Pr.333**
	Start bit	1 bit	—
	Stop bit length	1 bit or 2 bits can be selected.	**Pr.333**
	Parity check	Check (at even or odd numbers) or no check can be selected.	**Pr.334**
	Error check	Sum code check	—
	Terminator	CR/LF (presence/absence selectable)	**Pr.341**
Waiting time setting		Selectable between presence and absence	**Pr.337**

4.4.2　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)   After waiting for the waiting time,
    (c)   The inverter sends reply data to the computer in response to the computer request.
    (d)   After waiting for the 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.)
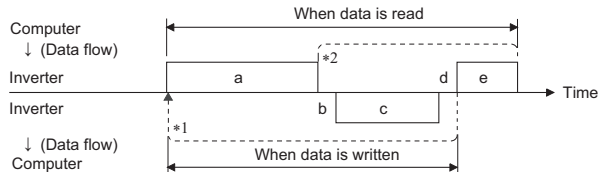
   ∗1   If a data error is detected and a retry must be made, perform retry operation with the user program. The inverter trips if the number of consecutive retries exceeds the parameter setting.
   ∗2   On receipt of a data error occurrence, the inverter returns reply data (c) to the computer again. The inverter trips if the number of consecutive data errors reaches or exceeds the parameter setting.

4

4.4.3 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	Operation 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	A	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 *1 (Request accepted)	C	C	C1*3	C	C*2	E, E1, E2, E3	E
		With error (Request rejected)	D	D	D	D	D*2	D	D
d	Computer processing delay time		10 ms or more						
e	Answer from computer in response to reply data c (Data c is checked for error)	No error *1 (No inverter processing)	Without	Without	Without (C)	Without	Without	Without (C)	Without (C)
		With error (Inverter outputs c again.)	Without	Without	F	Without	Without	F	F

∗1 In the communication request data from the computer to the inverter, 10 ms or more is also required after "no data error (ACK)". (Refer to **page 43**.)

∗2 Reply from the inverter to the inverter reset request can be selected. (Refer to **page 47**.)

∗3 At mode error, and data range error, C1 data contains an error code. (Refer to **page 57**.) 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	16	17	18	19
A	ENQ *1	Inverter station No. *2		Instruction code		*3	Data				Sum check		*4						
A1	ENQ *1	Inverter station No. *2		Instruction code		*3	Data		Sum check		*4								
A2	ENQ *1	Inverter station No. *2		Instruction code		*3	Send data type	Receive data type	Data1				Data2				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	14	15	16	17	18	19
C	ACK *1	Inverter station No. *2		*4															
C1	STX *1	Inverter station No *2		Send data type	Receive data type	Error code1	Error code2	Data1					Data2				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 No *2		Error code	*4

*1   Indicates a control code.

*2   Specifies the inverter station numbers in the range of H00 to H1F (stations 0 to 31) in hexadecimal.

*3   When **Pr.337 (Waiting time setting)** ≠ 9999, create a communication request data without "waiting time" in the data format. (The number of characters decreases by 1.)

*4   CR, LF code: When data is transmitted from the computer to the inverter, codes CR (carriage return) and LF (line feed) are automatically set at the end of a data group on some computers. In this case, setting must be also made on the inverter according to the computer. Whether the CR and LF codes will be present or absent can be selected using **Pr.341 (CR/LF selection)**.

- 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 No.*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 No.*2		Read data					ETX *1	Sum check		*4	
E1	STX *1	Inverter station No.*2		Read data			ETX *1	Sum check		*4		
E2	STX *1	Inverter station No.*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 No.*2		Read data (Inverter 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 No.*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 No.∗2		∗4
F (Data error detected)	NAK ∗1	Inverter station No.∗2		∗4

∗1　Indicates a control code.
∗2　Specifies the inverter station numbers in the range of H00 to H1F (stations 0 to 31) in hexadecimal.
∗3　When **Pr.337 (Waiting time setting)** ≠ 9999, create a communication request data without "waiting time" in the data format. (The number of characters decreases by 1.)
∗4　CR, LF code: When data is transmitted from the computer to the inverter, codes CR (carriage return) and LF (line feed) are automatically set at the end of a data group on some computers. In this case, setting must be also made on the inverter according to the computer. Whether the CR and LF codes will be present or absent can be selected using **Pr.341 (CR/LF selection)**.

4.4.4 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. Hence, the inverter can be run and monitored in various ways by specifying the instruction code appropriately. (Refer to **page 47**.)
• 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 47**.)
• Waiting time
  Specify the waiting time between the receipt of data at the inverter from the computer and the transmission of reply data. Set the waiting time in accordance with the response time of the computer in the range of 0 to 150 ms in 10 ms increments. (For example; 1=10 ms, 2= 20 ms)

Computer
↓
Inverter

Inverter
↓
Computer

Inverter data processing time
= Waiting time + data check time
  (setting × 10ms)   (About 10 to 30 ms, which depends on the instruction code)
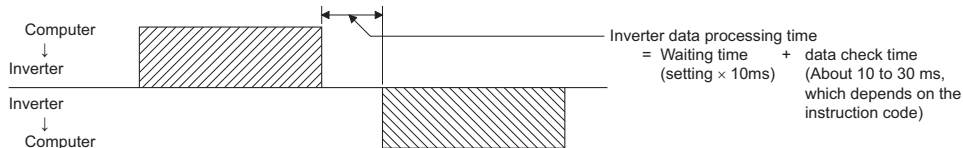
> **NOTE**
>
> - When **Pr.337 (Waiting time setting)** ≠ "9999", create a communication request data without "waiting time" in the data format. (The number of characters decreases by 1.)
> - The data check time varies depending on the instruction code. (Refer to **page 43**.)

- Sum check code

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

(Example 1) Computer → Inverter	ENQ	Station number		Instruction code		*Waiting time	Data				Sum check code		← Binary code
		0	1	E	1	1	0	7	A	D	F	4	
ASCII Code →	H05	H30	H31	H45	H31	H31	H30	H37	H41	H44	H46	H34	

H30+H31+H45+H31+H31+H30+H37+H41+H44

= H1F4

Sum
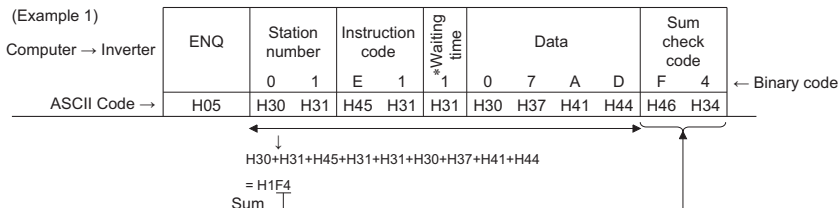
∗When the **Pr.337 (Waiting time setting)** ≠ "9999", create the communication request data without "waiting time" in the data format. (The number of characters decreases by 1.)

(Example 2) Inverter → Computer	STX	Station number		Data read				ETX	Sum check code		← Binary code
		0	1	1	7	7	0		3	0	
ASCII Code →	H02	H30	H31	H31	H37	H37	H30	H03	H33	H30	

H30+H31+H31+H37+H37+H30

= H130

Sum

4
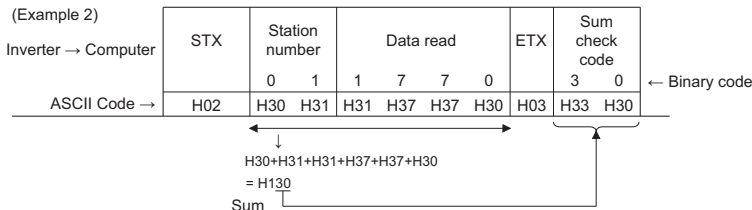
- Error code
  If any error is found in the data received by the inverter, its error definition is sent back to the computer together with the NAK code.

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.	Trips (E.SER) if error occurs continuously more than the permissible number of retries.
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. CR or LF is not as set in 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).	Does not accept the received data, burt the inverter does not trip.
H8	—	—	—
H9	—	—	—
HA	Mode error	Parameter write was attempted in other than the computer link operation mode, when operation command source is not selected or during inverter operation.	Does not accept the received data, but the inverter does not trip.
HB	Instruction code error	The specified instruction code does not exist.	
HC	Data range error	Invalid data has been specified for parameter writing, running frequency setting, etc.	
HD	—	—	—
HE	—	—	—
HF	Normal (no error)	—	—

4.4.5   Response time

Data sending time (refer to the following formula)

Inverter data processing time = Waiting time + Data check time
(setting × 10 ms) (depends on the instruction code (see the following table))

Computer
⇩
Inverter

Inverter
⇩
Computer

Time

10 ms or more necessary

Data sending time (refer to the following formula)
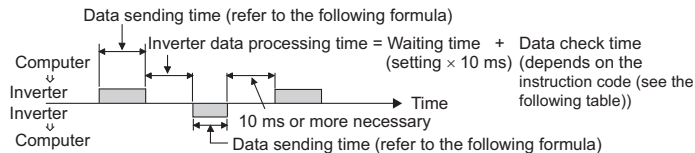
[Formula for data transmission time]

$$\frac{1}{\text{Communication speed (bps)}} \times \frac{\text{Number of data characters}}{\text{(Refer to page 36.)}} \times \text{(Total number of bits)} = \text{data transmission time (s)}$$

Communication specifications (Refer to the following.)

● Communication specifications

Name		Number of bits
Stop bit length		1 bit 2 bits
Data Length		7 bits 8 bits
Parity check	With	1 bits
	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

● Data check time

Item	Check time
Various monitors, operation command, Frequency setting (RAM)	<12 ms
Parameter read/write, Frequency setting (EEPROM)	<30 ms
Parameter clear / all clear	<5 s
Reset command	No answer

4.4.6 Retry count setting (Pr.335)

- Set the permissible number of retries at data receive error occurrence. (Refer to **page 42** 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.SER) occurs and the inverter trips.
- When a data transmission error occurs while "9999" is set, the inverter does not trip 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.335** = "1" (initial value)
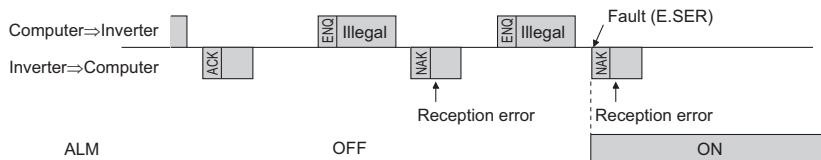
Example: **Pr.335** = "9999"
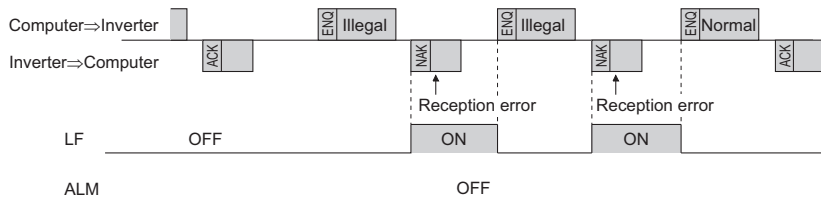
• The operation at a communication error occurrence depends on the **Pr.502 Stop mode selection at communication error** setting. (Refer to **page 27**)

4.4.7 Signal loss detection (Pr.336 RS-485 communication check time interval)

• If a signal loss (communication stop) is detected between the inverter and computer as a result of a signal loss detection, a communication fault (E.SER) occurs and the inverter trips.
• When the setting is "9999", communication check (signal loss detection) is not made.
• When the setting is "0", reading, etc. of monitors and parameters is possible, though a communication error (E.SER) occurs instantly when the Network operation mode is switched to.
• A signal loss detection is made when the setting is any of "0.1 s to 999.8 s". To make a signal loss detection, it is necessary to send data (for details on control codes, refer to **page 40**) 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 master).
• Communication check is started at the first communication in the operation mode having the operation source (Network operation mode in the initial setting).

Example: **Pr.336** = "0.1 to 999.8 s"
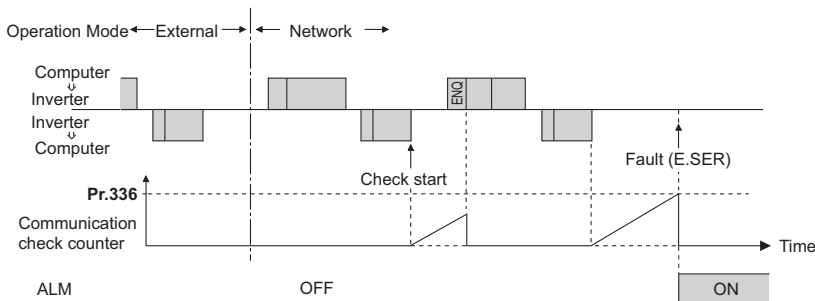
4.4.8 Instructions for the program

- 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, for example, run 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.
- For the program example, refer to the description on the RS-485 communication via the PU connector in the Instruction Manual (Detailed) of the inverter.

General flowchart

```
┌─────────────────────────────┐
│          Port open          │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│    Communication setting    │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│      Time out setting       │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│    Send data processing     │
│     ○Data setting           │
│     ○Sum code calculation   │
│     ○Data transmission      │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│     Receive data waiting    │
└─────────────────────────────┘
              │
┌─────────────────────────────┐
│   Receive data processing   │
│     ○Data retrieval         │
│     ○Screen display         │
└─────────────────────────────┘
```
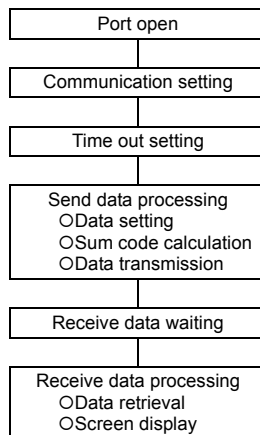
⚠ Caution

- **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 etc., the inverter cannot be stopped. When the communication check time interval has elapsed, the inverter will trip (E.SER).**
  The inverter can be coasted to a stop by switching ON the RES signals or by switching the power OFF.
- **If communication is broken due to signal cable breakage, computer fault etc., the inverter does not detect such a fault. This should be fully noted.**
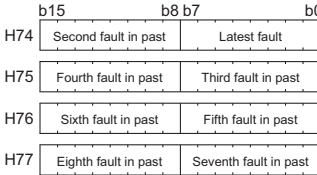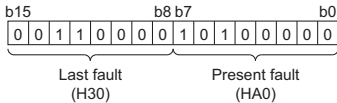
4.4.9   Setting items and set data

- After completion of parameter settings, set the instruction codes and data, 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 H0002: PU operation, External/PU combined operation, PUJOG operation	4 digits (B.E/D)
	Write	HFB	H0000: Network operation H0001: External operation H0002: PU operation (RS-485 communication operation via PU connector)	4 digits (A,C/D)

	Item	Read/write	Instruction code	Data description	Number of data digits (Format)•1
Monitor	Output frequency/speed	Read	H6F	H0000 to HFFFF: Output frequency in 0.01 Hz increments (The display can be changed to the rotations per minute using **Pr.37**, **Pr.144** and **Pr.811**. (Refer to the Instruction Manual (Detailed) of the inverter.))	4 digits (B.E/D)
	Output current	Read	H70	H0000 to HFFFF: Output current (hexadecimal) Increment 0.01 A (FR-A820-03160(55K) or lower, FR-A840-01800(55K) or lower) Increment 0.1 A (FR-A820-03800(75K) or higher, FR-A840-02160(75K) or higher)	4 digits (B.E/D)
	Output voltage	Read	H71	H0000 to HFFFF: Output voltage (hexadecimal) in 0.1 V increments	4 digits (B.E/D)
	Special monitor	Read	H72	H0000 to HFFFF: Monitor data selected in the instruction code HF3	4 digits (B.E/D)
	Special monitor selection No.	Read	H73	Monitor selection data: Refer to the monitor description list in the Instruction Manual (Detailed) of the inverter, and set the RS-485 communication dedicated monitor code.	2 digits (B.E1/D)
		Write	HF3		2 digits (A1,C/D)

Item		Read/write	Instruction code	Data description	Number of data digits (Format)•1
Monitor	Fault record	Read	H74 to H77	H0000 to HFFFF: Two latest fault records b15　　　　　　b8 b7　　　　　b0 H74 │ Second fault in past │ Latest fault │ H75 │ Fourth fault in past │ Third fault in past │ H76 │ Sixth fault in past │ Fifth fault in past │ H77 │ Eighth fault in past │ Seventh fault in past │ Fault record display example (instruction code H74) With the read data H30A0 (Last fault : THT) (Present fault : OPT) b15　　　　　　b8 b7　　　　　b0 0 0 1 1 0 0 0 0 1 0 1 0 0 0 0 0 Last fault (H30)　　　Present fault (HA0) (For details on fault record read data, refer to the data code in the list of fault displays in the Instruction Manual (Detailed) of the inverter.)	4 digits (B.E/D)
Operation command (extended)		Write	HF9	Control input commands such as forward rotation signal (STF) and reverse rotation signal (STR) can be set. (For the details, refer to **page 55**.)	4 digits (A,C/D)
Operation command		Write	HFA		2 digits (A1,C/D)
Inverter status monitor (extended)		Read	H79	The states of the output signals such as forward rotation, reverse rotation and inverter running (RUN) can be monitored. (For the details, refer to **page 56**.)	4 digits (B.E/D)
Inverter status monitor		Read	H7A		2 digits (B.E1/D)

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Item	Read/ write	Instruction code	Data description	Number of data digits (Format)•1
Set frequency (RAM)	Read	H6D	Read the set frequency/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 using **Pr.37**, **Pr.144** and **Pr.811**. (Refer to the Instruction Manual (Detailed) of the inverter.))	4 digits (B.E/D)
Set frequency (EEPROM)		H6E		
Set frequency (RAM)	Write	HED	Write the set frequency/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 using **Pr.37**, **Pr.144** and **Pr.811**. (Refer to the Instruction Manual (Detailed) of the inverter.)) To change the set frequency consecutively, write data to the inverter RAM. (Instruction code: HED)	4 digits (A,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,C/D)
			H9966: Inverter reset When data is sent normally, ACK is returned to the computer, and then the inverter is reset.	4 digits (A,D)
Faults history batch clear	Write	HF4	H9696: Faults history batch clear	4 digits (A,C/D)

Item	Read/ write	Instruction code	Data description	Number of data digits (Format)∗1
Parameter clear All 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: Communication parameters are cleared. H5A5A: Communication parameters are not cleared.∗2 All parameter clear H9966: Communication parameters are cleared. H55AA: Communication parameters are not cleared.∗2 For the details of whether or not to clear parameters, refer to the Instruction Manual (Detailed) of the inverter. 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 during the password lock (refer to the Instruction Manual (Detailed) of the inverter).	4 digits (A,C/D)
Parameter	Read	H00 to H63	Refer to the instruction code (the Instruction Manual (Detailed) of the inverter) and write and/or read parameter values as required. When setting **Pr.100** and later, the link parameter extended setting must be set.	4 digits (B.E/D)
	Write	H80 to HE3		4 digits (A,C/D)
Link parameter Extended setting	Read	H7F	Parameter settings are switched according to the H00 to H0D settings. For details of the settings, refer to the instruction code (the Instruction Manual (Detailed) of the inverter).	2 digits (B.E1/D)
	Write	HFF		2 digits (A1,C/D)

Item		Read/ write	Instruction code	Data description	Number of data digits (Format)*1
Second parameter changing (instruction code HFF = 1, 9)		Read	H6C	When setting the calibration parameters *3 H00: Frequency*4 H01: Parameter-set analog value H02: Analog value input from terminal	2 digits (B.E1/D)
		Write	HEC		2 digits (A1,C/D)
Multi command		Write/ Read	HF0	Available for writing 2 commands, and monitoring 2 items for reading data (Refer to **page 57**.)	10 digits (A2,C1/D)
Inverter model monitor	Inverter model	Read	H7C	Reading inverter model in ASCII code. "H20" (blank code) is set for blank area Example of "FR-A840-E1 (FM type)" H46, H52, H2D, H41, H38, H34, H30, H2D, H45, H31, H20, H20......H20	20 digits (B,E3/D)
	Capacity	Read	H7D	Reading inverter ND rated capacity 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,E2/D)

*1 Refer to **page 36** for data formats (A, A1, A2, B, C, C1, D, E, E1, E2, E3, F)
*2 Turning OFF the power supply while clearing parameters with H5A5A or H55AA returns the communication parameter settings to the initial settings.
*3 Refer to the following calibration parameters list for details on the calibration parameters.
*4 The gain frequency can be also written using **Pr.125** (instruction code: H99) or **Pr.126** (instruction code: H9A).

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	Set "H01" in the extended link parameter.
b	ENQ 00 EC 0 01 79	ACK 00	Set "H01" in 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.

4.4.10　List of calibration parameters

Pr.	Name	Instruction code			Pr.	Name	Instruction code		
		Read	Write	Extended			Read	Write	Extended
C2 (902)	Terminal 2 frequency setting bias frequency	5E	DE	1	C18 (920)	Terminal 1 gain command (torque)	14	94	9
C3 (902)	Terminal 2 frequency setting bias	5E	DE	1	C19 (920)	Terminal 1 gain (torque)	14	94	9
125 (903)	Terminal 2 frequency setting gain frequency	5F	DF	1	C8 (930)	Current output bias signal	1E	9E	9
C4 (903)	Terminal 2 frequency setting gain	5F	DF	1	C9 (930)	Current output bias current	1E	9E	9
C5 (904)	Terminal 4 frequency setting bias frequency	60	E0	1	C10 (931)	Current output gain signal	1F	9F	9
C6 (904)	Terminal 4 frequency setting bias	60	E0	1	C11 (931)	Current output gain current	1F	9F	9
126 (905)	Terminal 4 frequency setting gain frequency	61	E1	1	C38 (932)	Terminal 4 bias command (torque)	20	A0	9
C7 (905)	Terminal 4 frequency setting gain	61	E1	1	C39 (932)	Terminal 4 bias (torque)	20	A0	9
C12 (917)	Terminal 1 bias frequency (speed)	11	91	9	C40 (933)	Terminal 4 gain command (torque)	21	A1	9
C13 (917)	Terminal 1 bias (speed)	11	91	9	C41 (933)	Terminal 4 gain (torque)	21	A1	9
C14 (918)	Terminal 1 gain frequency (speed)	12	92	9	C42 (934)	PID display bias coefficient	22	A2	9
C15 (918)	Terminal 1 gain (speed)	12	92	9	C43 (934)	PID display bias analog value	22	A2	9
C16 (919)	Terminal 1 bias command (torque)	13	93	9	C44 (935)	PID display gain coefficient	23	A3	9
C17 (919)	Terminal 1 bias (torque)	13	93	9	C45 (935)	PID display gain analog value	23	A3	9

4.4.11 Operation command

Item	Instruction code	Bit length	Description∗1	Example
Operation command	HFA	8 bits	b0: AU (Terminal 4 input selection) b1: Forward rotation command b2: Reverse rotation command b3: RL (Low-speed operation command) b4: RM (Middle-speed operation command) b5: RH (High-speed operation command) b6: RT (Second function selection) b7: MRS (Output stop) ∗2	[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: AU (Terminal 4 input selection) b1: Forward rotation command b2: Reverse rotation command b3: RL (Low-speed operation command) b4: RM (Middle-speed operation command) b5: RH (High-speed operation command) b6: RT (Second function selection) b7: MRS (Output stop) ∗2 b8: JOG (Jog operation selection)∗3 b9: CS (Selection of automatic restart after instantaneous power failure, flying start) ∗3 b10: STP (STOP) (Start self-holding selection)∗3 b11: RES (Inverter reset) ∗3 b12 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] H0800 low speed operation (When **Pr.189 RES terminal function selection** is set to "0") b15 .... b0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

∗1 The signal within parentheses ( ) is the initial status. The description changes depending on the setting of **Pr.180 to Pr.189 (Input terminal function selection)**.

∗2 The inverter run enable signal is in the initial status for the separated converter type.

∗3 JOG operation/automatic restart after instantaneous power failure/start self-holding selection/reset cannot be controlled over a network, so in the initial status bit8 to bit11 are invalid. To use bit8 to bit11, change the signal by **Pr.185**, **Pr.186**, **Pr.188**, **or Pr.189 (Input terminal function selection)**. (A reset can be executed by the instruction code HFD.)

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4.4.12 Inverter status monitor

Item	Instruction code	Bit length	Description∗1	Example
Inverter status monitor	H7A	8 bits	b0: RUN (Inverter running) b1: During forward rotation b2: During reverse rotation b3: SU (Up to frequency) b4: OL (Overload warning) b5: IPF (Instantaneous power failure/undervoltage)∗2 b6: FU (Output frequency detection) b7: ABC1 (Fault)	[Example 1] H02 ··· During forward rotation b7　　　　　　　　　　b0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | [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) b1: During forward rotation b2: During reverse rotation b3: SU (Up to frequency) b4: OL (Overload warning) b5: IPF (Instantaneous power failure/undervoltage)∗2 b6: FU (Output frequency detection) b7: ABC1 (Fault) b8: ABC2 (—) b9: Safety monitor output b10 to b14: - b15: Fault occurrence	[Example 1] H0002 ··· During forward rotation b15　　　　　　　　　　　　　　　　　b0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | [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 |

∗1　The signal within parentheses ( ) is the initial status. The description changes depending on the setting of **Pr.190 to Pr.196 (output terminal function selection)**.

∗2　No function is assigned in the initial status for the separated converter type.

4.4.13 Multi command (HF0)

Sending data format from computer to inverter

Format	Number of characters																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
A2	ENQ	Inverter station No.		Instruction Code (HF0)		Waiting time	Send data type *1	Receive data type *2	Data1 *3				Data2 *3				Sum check		CR/ LF

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

Format	Number of characters																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
C1	STX	Inverter station No.		Send data type *1	Receive data type *2	Error code 1 *5	Error code 2 *5	Data1 *4				Data2 *4				ETX	Sum check		CR/ LF

*1 Specify the data type of sending data (from computer to inverter).
*2 Specify the data type of reply data (from inverter to computer).
*3 Combination of data 1 and data 2 for sending

Data type	Data 1	Data 2	Remarks
0	Operation command (extended)	Set frequency (RAM)	Run command (extended) is same as instruction code HF9
1	Operation command (extended)	Set frequency (RAM, EEPROM)	(Refer to **page 55**)

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∗4　Combination of data 1 and data 2 for reply

Data type	Data 1	Data 2	Remarks
0	Inverter status monitor (extended)	Output frequency (speed)	Inverter status monitor (extended) is same as instruction code H79 (Refer to **page 56**) Replys the monitor item specified in instruction code HF3 for special monitor. (Refer to the Instruction Manual (Detailed) of the inverter.)
1	Inverter status monitor (extended)	Special monitor	

∗5　Error code for sending data 1 is set in error code 1, and error code for sending data 2 is set in error code 2.
　　 Mode error (HA), instruction code error (HB), data range error (HC) or no error (HF) is replied. (Refer to the Instruction Manual (Detailed) of the inverter for the details of the error codes.)

4.5 MODBUS RTU communication specification

- Parameter setting, monitoring, etc. can be performed using MODBUS RTU communication protocol.
- To make communication between the personal computer and inverter, setting of the communication specifications must be made to the inverter in advance.
  Data communication cannot be made if the initial settings are not made or if there is any setting error.

Pr.	Pr. group	Name	Initial value	Setting range	Description
331	N030	RS-485 communication station number	0	0	Broadcast communication
				1 to 247	Inverter station number specification Set the inverter station numbers when two or more inverters are connected to one personal computer.
332	N031	RS-485 communication speed	96	3, 6, 12, 24, 48, 96, 192, 384, 576, 768, 1152	Set the communication speed. The setting value × 100 equals the communication speed. For example, if 96 is set, the communication speed is 9600 bps.
—	N033	RS-485 communication stop bit length	1	0	Stop bit length 1 bit
				1	Stop bit length 2 bits	Valid when **Pr.N034 (Pr.334)** = "0"
333	—	RS-485 communication stop bit length / data length	1	0	Stop bit length 1 bit
				1	Stop bit length 2 bits
				10	Stop bit length 1 bit
				11	Stop bit length 2 bits
334	N034	RS-485 communication parity check selection	2	0	Without parity check The stop bit length is selectable between 1 bit and 2 bits (according to **Pr.333**).
				1	With parity check at odd numbers Stop bit length 1 bit
				2	With parity check at even numbers Stop bit length 1 bit

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Pr.	Pr. group	Name	Initial value	Setting range	Description
343	N080	Communication error count	0	—	Displays the communication error count during MODBUS RTU communication. Read-only.
539	N002	MODBUS RTU communication check time interval	999	0	MODBUS RTU communication, but the inverter trips in the NET operation mode.
				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 will trip.
				9999	No communication check (signal loss detection)
549	N000	Protocol selection	0	0	Mitsubishi inverter protocol (computer link)
				1	MODBUS RTU protocol

> **NOTE**
> - To use the MODBUS RTU protocol, set "1" to **Pr.549 Protocol selection**.
> - If MODBUS RTU communication is performed from the master to the address 0 (station number 0), the data is broadcasted, and the inverter does not send any reply to the master. To obtain replies from the inverter, set **Pr.331 RS-485 communication station number** ≠ "0 (initial value)".
>   Some functions are disabled in broadcast communication. (Refer to **page 65**.)
> - If a communication option is mounted with **Pr.550 NET mode operation command source selection** = "9999 (initial value)", commands (operation commands) transmitted via RS-485 terminals become invalid. (Refer to the Instruction Manual (Detailed) of the inverter.)

4.5.1　Communication specifications

· The communication specifications are given below.

| Item		Description	Related parameter
Communication protocol		MODBUS RTU protocol	**Pr.549**
Conforming standard		EIA-485 (RS-485)	—
Connectable units		1:N (maximum 32 units), setting is 0 to 247 stations	**Pr.331**
Communication Speed		Selected among 300/600/1200/2400/4800/9600/19200/38400/57600/76800/115200 bps	**Pr.332**
Control procedure		Asynchronous system	—
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 selectable between 1 bit and 2 bits	**Pr.333** **Pr.334**
	Parity check	Odd parity check, stop bit length 1 bit Even parity check, stop bit length 1 bit	
	Error check	CRC code check	—
	Terminator	Not used	—
Waiting time setting		Not used	—

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4.5.2　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 master and slaves. 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 master can communicate with inverters (for instance,. slaves) 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.

4.5.3　Message format
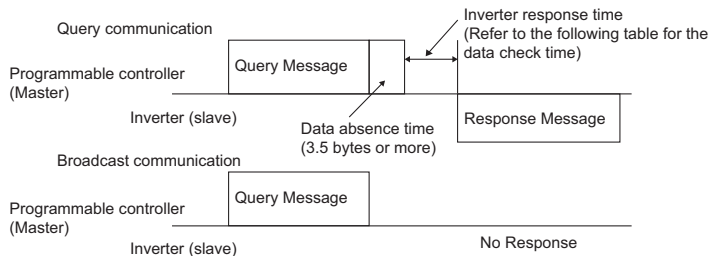
- Data check time

Item	Check time
Various monitors, operation command, Frequency setting (RAM)	<12 ms
Parameter read/write, frequency setting (EEPROM)	<30 ms
Parameter clear / all clear	<5 s
Reset command	No answer

- Query
  A message is sent to the slave (for instance, the inverter) having the address specified by the master.

- Normal Response
  After the query from the master is received, the slave executes the request function, and returns the corresponding normal response to the master.

- Error Response
  When an invalid function code, address or data is received by the slave, the error response is returned to the master.
  This response is appended with an error code that indicates the reason why the request from the master could not be executed.
  This response cannot be returned for errors, detected by the hardware, frame error and CRC check error.

- Broadcast
  The master can broadcast messages to all slaves by specifying address 0. All slaves that receive a message from the master execute the requested function. With this type of communication, slaves do not return a response to the master.

NOTE

- During broadcast communication, functions are executed regarded of the set inverter station number (**Pr.331**).
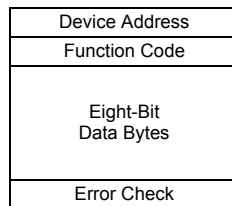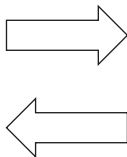
4.5.4　Message frame (protocol)

• Communication method

Basically, the master sends a Query message (question), and slaves return the 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), bit7 (= 80 h) of the Function Code is turned ON, and the error code is set at Data Bytes.

Query message from Master

| Device Address |
| Function Code |
| Eight-Bit
Data Bytes |
| Error Check |

| Device Address |
| Function Code |
| Eight-Bit
Data Bytes |
| Error Check |
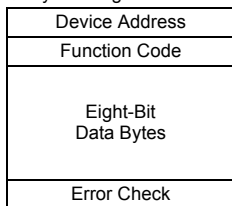
Response message from slave

Message frames comprise of the four message fields shown in the figures above.

A slave recognizes message data as a message by the message data being prefixed and appended with a no data time of 3.5 characters (T1: start/end).

• 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 single byte lengths (8 bits). Set "0" when sending broadcast messages (instructions to all addresses), and "1 to 247" to send messages to individual slaves. The address set by the master is also returned when the response from the slave is. The value set to **Pr.331 RS-485 communication station number** is the slave address.
Function field	1 to 255 can be set in single byte lengths (8 bits) for the function code. The master sets the function to be sent to the slave as the request, and the slave performs the requested operation. "Function code list" summarizes the supported function codes. An error response is generated when a function code other than "Function code list" is set. At a response from the slave, the function code set by the master is returned in the case of a normal response. At an error response, H80 + the function code is returned.
Data field	The format changes according to the function code. (Refer to **page 66**.) 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 message is appended with data 2 bytes long. When the message is appended with the CRC, the lower bytes are appended first, followed by the upper bytes. The CRC value is calculated by the sender that appends the message with the CRC. 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.

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4.5.5　Function code list

Function name	Read/ write	Code	Outline	Broadcast communication	Message format reference page
Read Holding Register	Read	H03	The data of the holding registers is read. The various data of the inverter can be read from MODBUS registers. System environmental variable (Refer to **page 78**.) Real time monitor (Refer to the Instruction Manual (Detailed) of the inverter.) Faults history (Refer to **page 83**.) Model information monitor (Refer to **page 84**.) Inverter parameters (Refer to **page 80**.)	Not available	**67**
Preset Single Register	Write	H06	Data is written to holding registers. Data can be written to MODBUS registers to output instructions to the inverter or set parameters. System environmental variable (Refer to **page 78**.) Inverter parameters (Refer to **page 80**.)	Available	**70**
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	**71**
Preset Multiple Registers	Write	H10	Data is written to consecutive multiple 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 78**.) Inverter parameters (Refer to **page 80**.)	Available	**72**

Function name	Read/write	Code	Outline	Broadcast communication	Message format reference page
Read holding register access log	Read	H46	The number of registers that were successfully accessed by the previous communication is read. Queries by function codes H03 and H10 are supported. The number and start address of holding registers successfully accessed by the previous communication are returned. "0" is returned for both the number and start address for queries other than function code H03 and H10.	Not available	**74**

4.5.6 Read Holding Register (reading of data of holding registers) (H03 or 03)

• Query message

a. Slave Address	b. Function	c. Starting Address		d. No. of Points		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. Slave Address	b. Function	e. Byte Count	f. Data			CRC Check	
(8 bits)	H03 (8 bits)	(8 bits)	H (8 bits)	L (8 bits)	... (n × 16 bits)	L (8 bits)	H (8 bits)

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• Query message setting

	Message	Description
a	Slave Address	Set the address to send messages to. Broadcast communication is not possible. (Invalid when "0" is set.)
b	Function	Set H03.
c	Starting Address	Set the address from which to start reading of data from the holding register. Start address = start register address (decimal) - 40001 For example, when start register address 0001 is set, the data of holding register address 40002 is read.
d	No. of Points	Set the number of holding registers to read. 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	Data	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.

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

Query message

Slave Address	Function	Starting Address		No. of Points		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)

Slave Address	Function	Byte Count	Data						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)

4

4.5.7 Preset Single Register (writing of data to holding registers) (H06 or 06)

- The content of the "system environmental variables" and "inverter parameters" assigned to the holding register area (refer to the register list (**page 78**)) can be written.
- Query message

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

- Content of normal response
  With a normal response, the content is the same as **a to d** (including the CRC check) query messages.
  In the case of broadcast communication, no response is returned.

Example) Write 60 Hz (H1770) to 40014 (running frequency) of slave address 5 (H05).

Query message

Slave Address	Function	Register Address		Preset Data		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)
Same data as 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.

4.5.8   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. Slave Address	b. Function	c. Subfunction		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. Slave Address	b. Function	c. Subfunction		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)

4

• Query message setting

	Message	Description
a	Slave Address	Set the address to send messages to. Broadcast communication is not possible. (Invalid when "0" is set.)
b	Function	Set H08.
c	Subfunction	Set H0000.
d	Data	Any data 2 bytes long can be set. Setting range is H0000 to HFFFF.

• Content of normal response
With a normal response, the content is the same as a to d (including the CRC check) 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.

4.5.9 Preset Multiple Registers (writing of data to multiple holding registers) (H10 or 16)

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

a. Slave Address	b. Function	c. Starting Address		d. No. of Registers		e. ByteCount	f. Data			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. Slave Address	b. Function	c. Starting Address		d. No. 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	Slave Address	Set the address to send messages to. Setting "0" enables broadcast communication.
b	Function	Set H10.
c	Starting Address	Set the address from which to start writing of data to the holding register. Start address = start register address (decimal) - 40001 For example, when start register address 0001 is set, the data of holding register address 40002 is read.
d	No. of Points	Set the number of holding registers to write to. 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	Data	Set the amount of data specified by d. Set write data Hi bytes first followed by Lo bytes, and arrange it as follows: data of start address, data of start address+1, data of start address+2, and so forth.

• Content of normal response
  With a normal response, the content is the same as a to d (including the CRC check) query messages.

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

Query message

Slave Address	Function	Starting Address		No. of Points		Byte Count	Data				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)

Slave Address	Function	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)

4

4.5.10　Read Holding Register access Log (H46 or 70)

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

• Query message

a. Slave Address	b. Function	CRC Check	
(8 bits)	H46 (8 bits)	L (8 bits)	H (8 bits)

• Normal response (Response message)

a. Slave Address	b. Function	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	Slave Address	Set the address to send messages to. Broadcast communication is not possible. (Invalid when "0" is set.)
b	Function	Set H46.

• Content of normal response

	Message	Description
c	Starting Address	The start address of the holding register that was successfully accessed is returned. Starting address = [Start address (decimal) of the holding registers successfully accessed] - 40001 For example, when starting address 0001 is returned, the start address of the holding registers 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 access from slave address 25 (H19).

Query message

Slave Address	Function	CRC Check	
H19 (8 bits)	H46 (8 bits)	H8B (8 bits)	HD2 (8 bits)

Normal response (Response message)

Slave Address	Function	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)

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

4.5.11 Error response

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

NOTE

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

• Error response (Response message)

a. Slave Address	b. Function	c. Exception Code	CRC Check	
(8 bits)	H80 + Function (8 bits)	(8 bits)	L (8 bits)	H (8 bits)

	Message	Description
a	Slave Address	Set the address received from the master.
b	Function	The function code requested by the master + 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 master is set with a function code that cannot be handled by the slave.
02	IILLEGAL DATA ADDRESS *1	The query message from the master is set with a register address that cannot be handled by the inverter. (No parameter, parameter cannot be read, parameter cannot be written)
03	ILLEGAL DATA VALUE	The query message from the master is set with data that cannot be handled by the inverter. (Out of parameter write range, a mode is specified, other error)

*1 An error does not occur in the following cases:
- Function code H03 (read data of holding register)
  When there are 1 or more number of reads (No. of Points) and there is 1 or more holding register from where data can be read
- Function code H10 (write data to multiple holding registers)
  When there are 1 or more number of writes (No. of Points) and there is 1 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 will not occur even if a non-existent holding register or holding register that cannot be read or written is accessed.

NOTE

- An error will occur if all accesses holding registers do not exist. The data read value of non-existent holding registers is 0, and data is invalid when written to non-existent holding registers.

- Error detection of message data
  The following errors are detected in message data from the master. The inverter is not tripped 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.334** 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.334**) setting.	
Overrun error	The next data has been sent by the master 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.	
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 **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.

4.5.12   MODBUS register

- System environmental variables

Register	Definition	Read/write	Remarks
40002	Inverter reset	Write	Any value can be written
40003	Parameter clear	Write	Set H965A for the write value.
40004	All parameter clear	Write	Set H99AA for the write value.
40006	Parameter clear *1	Write	Set H5A96 for the write value.
40007	All parameter clear *1	Write	Set HAA99 for the write value.
40009	Inverter status/control input command *2	Read/write	Refer to the following.
40010	Operation mode/inverter setting *3	Read/write	Refer to the following.
40014	Running frequency (RAM value)	Read/write	The display can be changed to the rotations per minute using **Pr.37**, **Pr.144** and **Pr.811**. (Refer to the Instruction Manual (Detailed) of the inverter.)
40015	Running frequency (EEPROM value)	Write	

    *1   Communication parameter settings are not cleared.
    *2   At a write, the data is set as the control input command.
           At a read, the data is read as the inverter running status.
    *3   At a write, the data is set as the operation mode setting.
           At a read, the data is read as the operation mode setting.

<Inverter status/control input command>

Bit	Definition	
	Control input command	**Inverter status**
0	Stop command	RUN (Inverter running)∗6
1	Forward rotation command	During forward rotation
2	Reverse rotation command	During reverse rotation
3	RH (High-speed operation command)∗4	SU (Up to frequency)∗6
4	RM (Middle-speed operation command)∗4	OL (Overload warning)∗6
5	RL (Low-speed operation command)∗4	IPF (Instantaneous power failure/undervoltage)∗6∗7
6	JOG (Jog operation selection)∗4	FU (Output frequency detection)∗6
7	RT (Second function selection)∗4	ABC1 (Fault)∗6
8	AU (Terminal 4 input selection)∗4	ABC2 (-)∗6
9	CS (Selection of automatic restart after instantaneous power failure, flying start)∗4	Safety monitor output
10	MRS (Output stop)∗4∗5	0
11	STP (STOP) (Start self-holding selection)∗4	0
12	RES (Inverter reset)∗4	0
13	0	0
14	0	0
15	0	Fault occurrence

∗4 The signal within parentheses ( ) is the initial status. The description changes depending on the setting of **Pr.180 to Pr.189 (input terminal function selection)** (Refer to the Instruction Manual (Detailed) of the inverter).
 For each of the assigned signals, some signals are enabled by NET and some are disabled. (Refer to the Instruction Manual (Detailed) of the inverter.)

∗5 The inverter run enable signal is in the initial status for the separated converter type.

∗6 The signal within parentheses ( ) is the initial status. The description changes depending on the setting of **Pr.190 to Pr.196 (output terminal function selection)** (Refer to the Instruction Manual (Detailed) of the inverter).

∗7 No function is assigned in the initial status for the separated converter type.

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<Operation mode/inverter setting>

Mode	Read value	Write value
EXT	H0000	H0010 *8
PU	H0001	H0011 *8
EXT JOG	H0002	—
PU JOG	H0003	—
NET	H0004	H0014
PU+EXT	H0005	—

∗8 Enable/disable parameter writing by **Pr.79** and **Pr.340** settings. For the details, refer to the Instruction Manual (Detailed) of the inverter. Restrictions in each operation mode conform with the computer link specification.

- Real-time monitor
  Refer to the Instruction Manual (Detailed) of the inverter for the register numbers and monitored items of the real time monitor.

- Parameters

Pr.	Register	Name	Read/write	Remarks
0 to 999	41000 to 41999	For details on parameter names, refer to the parameter list (the Instruction Manual (Detailed) of the inverter).	Read/Write	The parameter number + 41000 is the register number.
C2 (902)	41902	Terminal 2 frequency setting bias frequency	Read/Write	
C3 (902)	42092	Terminal 2 frequency setting bias (analog value)	Read/Write	Analog value (%) set to **C3 (902)**
	43902	Terminal 2 frequency setting bias (terminal analog value)	Read	Analog value (%) of voltage (current) applied to terminal 2
125 (903)	41903	Terminal 2 frequency setting gain frequency (frequency)	Read/Write	

Pr.	Register	Name	Read/write	Remarks
C4 (903)	42093	Terminal 2 frequency setting gain (analog value)	Read/Write	Analog value (%) set to **C4 (903)**
	43903	Terminal 2 frequency setting gain (terminal analog value)	Read	Analog value (%) of voltage (current) applied to terminal 2
C5 (904)	41904	Terminal 4 frequency setting bias frequency (frequency)	Read/Write	
C6 (904)	42094	Terminal 4 frequency setting bias (analog value)	Read/Write	Analog value (%) set to **C6 (904)**
	43904	Terminal 4 frequency setting bias (terminal analog value)	Read	Analog value (%) of current (voltage) applied to terminal 4
126 (905)	41905	Terminal 4 frequency setting gain frequency (frequency)	Read/Write	
C7 (905)	42095	Terminal 4 frequency setting gain (analog value)	Read/Write	Analog value (%) set to **C7 (905)**
	43905	Terminal 4 frequency setting gain (terminal analog value)	Read	Analog value (%) of current (voltage) applied to terminal 4
C12 (917)	41917	Terminal 1 bias frequency (speed)	Read/Write	
C13 (917)	42107	Terminal 1 bias (speed)	Read/Write	Analog value (%) set to **C13 (917)**
	43917	Terminal 1 bias (speed) (terminal analog value)	Read	Analog value (%) of voltage applied to terminal 1
C14 (918)	41918	Terminal 1 gain frequency (speed)	Read/Write	
C15 (918)	42108	Terminal 1 gain (speed)	Read/Write	Analog value (%) set to **C15 (918)**
	43918	Terminal 1 gain (speed) (terminal analog value)	Read	Analog value (%) of voltage applied to terminal 1
C16 (919)	41919	Terminal 1 bias command (torque/magnetic flux)	Read/Write	
C17 (919)	42109	Terminal 1 bias (torque/magnetic flux)	Read/Write	Analog value (%) set to **C17 (919)**
	43919	Terminal 1 bias (torque/magnetic flux) (terminal analog value)	Read	Analog value (%) of voltage applied to terminal 1
C18 (920)	41920	Terminal 1 gain command (torque/magnetic flux)	Read/Write	

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Pr.	Register	Name	Read/write	Remarks
C19 (920)	42110	Terminal 1 gain (torque/magnetic flux)	Read/Write	Analog value (%) set to **C19 (920)**
	43920	Terminal 1 gain (torque/magnetic flux) (terminal analog value)	Read	Analog value (%) of voltage applied to terminal 1
C29 (925)	42115	Motor temperature detection calibration (analog input)	Read/Write	
	43925	Motor temperature detection calibration (analog input) (terminal analog value)	Read	Analog value (%) between terminals TH1 and TH2 of the FR-A8AZ
C30 (926)	41926	Terminal 6 bias frequency (speed)	Read/Write	
C31 (926)	42116	Terminal 6 bias (speed)	Read/Write	Analog value (%) set to **C31 (926)**
	43926	Terminal 6 bias (speed) (terminal analog value)	Read	Analog value (%) of voltage applied to terminal 6 of the FR-A8AZ
C32 (927)	41927	Terminal 6 gain frequency (speed)	Read/Write	
C33 (927)	42117	Terminal 6 gain (speed)	Read/Write	Analog value (%) set to **C33 (927)**
	43927	Terminal 6 gain (speed) (terminal analog value)	Read	Analog value (%) of voltage applied to terminal 6 of the FR-A8AZ
C34 (928)	41928	Terminal 6 bias command (torque)	Read/Write	
C35 (928)	42118	Terminal 6 bias (torque)	Read/Write	Analog value (%) set to **C35 (928)**
	43928	Terminal 6 bias (torque) (terminal analog value)	Read	Analog value (%) of voltage applied to terminal 6 of the FR-A8AZ
C36 (929)	41929	Terminal 6 gain command (torque)	Read/Write	
C37 (929)	42119	Terminal 6 gain (torque)	Read/Write	Analog value (%) set to **C37 (929)**
	43929	Terminal 6 gain (torque) (terminal analog value)	Read	Analog value (%) of voltage applied to terminal 6 of the FR-A8AZ
C8 (930)	41930	Current output bias signal	Read/Write	
C9 (930)	42120	Current output bias current	Read/Write	Analog value (%) set to **C9 (930)**
C10 (931)	41931	Current output gain signal	Read/Write	
C11 (931)	42121	Current output gain current	Read/Write	Analog value (%) set to **C11 (931)**
C38 (932)	41932	Terminal 4 bias command (torque/magnetic flux)	Read/Write	

Pr.	Register	Name	Read/write	Remarks
C39 (932)	42122	Terminal 4 bias (torque/magnetic flux)	Read/Write	Analog value (%) set to **C39 (932)**
	43932	Terminal 4 bias (torque/magnetic flux) (terminal analog value)	Read	Analog value (%) of current (voltage) applied to terminal 4
C40 (933)	41933	Terminal 4 gain command (torque/magnetic flux)	Read/Write	
C41 (933)	42123	Terminal 4 gain (torque/magnetic flux)	Read/Write	Analog value (%) set to **C41 (933)**
	43933	Terminal 4 gain (torque/magnetic flux) (terminal analog value)	Read	Analog value (%) of 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 to **C43 (934)**
	43934	PID display bias analog value (terminal analog value)	Read	Analog value (%) of 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 to **C45 (935)**
	43935	PID display gain analog value (terminal analog value)	Read	Analog value (%) of current (voltage) applied to terminal 4
1000 to 1999	45000 to 45359	For details on parameter names, refer to the parameter list (the Instruction Manual (Detailed) of the inverter).	Read/Write	The parameter number + 44000 is the register number.

• Faults history

Register	Definition	Read/write	Remarks
40501	Faults history 1	Read/Write	Data is 2 bytes and so is stored in "H00○○". The lowest 1 byte can be referred to for the error code. (For details on error codes, refer to the Instruction Manual (Detailed) of the inverter.) The faults history is batch-cleared by writing to register 40501. Set any value for the data.
40502	Faults history 2	Read	
40503	Faults history 3	Read	
40504	Faults history 4	Read	
40505	Faults history 5	Read	
40506	Faults history 6	Read	
40507	Faults history 7	Read	
40508	Faults history 8	Read	

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- Model information monitor

Register	Definition	Read/Write	Remarks
44001	Model (First and second characters)	Read	Reading inverter type in ASCII code. "H20" (blank code) is set for blank area. Example of FR-A840-E1 (FM type) H46, H52, H2D, H41, H38, H34, H30, H2D, H45, H31, H20......H20
44002	Model (Third and fourth characters)	Read	
44003	Model (Fifth and sixth characters)	Read	
44004	Model (Seventh and eighth characters)	Read	
44005	Model (Ninth and tenth characters)	Read	
44006	Model (Eleventh and twelfth characters)	Read	
44007	Model (Thirteenth and fourteenth characters)	Read	
44008	Model (Fifteenth and sixteenth characters)	Read	
44009	Model (Seventeenth and eighteenth characters)	Read	
44010	Model (Nineteenth and twentieth characters)	Read	
44011	Capacity (First and second characters)	Read	Reading inverter capacity 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 (Third and fourth characters)	Read	
44013	Capacity (Fifth and sixth characters)	Read	

NOTE

- When a 32-bit parameter setting or monitored value is read and the read value exceeds HFFFF, the reply data will be HFFFF.

4.5.13 Pr.343 Communication error count

• The communication error occurrence count can be checked.

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

NOTE

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

4.5.14 Output signal LF "alarm output (communication error warning)"

• During a communication error, the alarm signal (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)**.
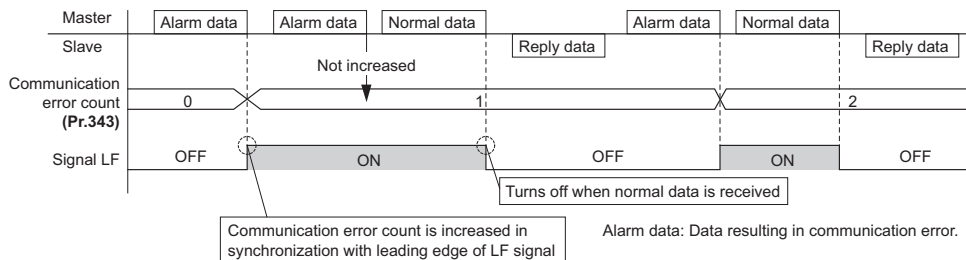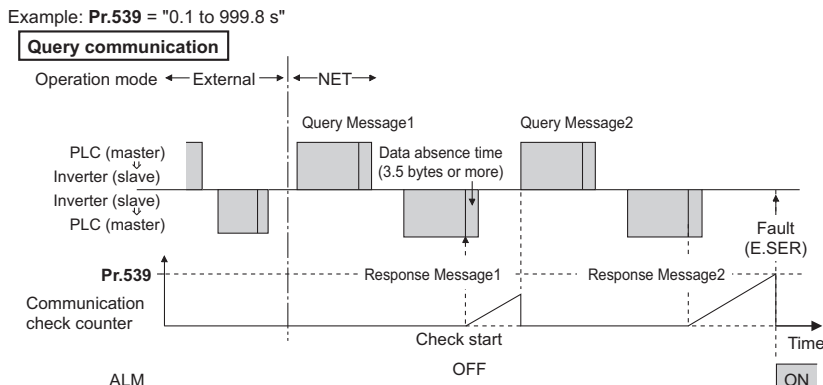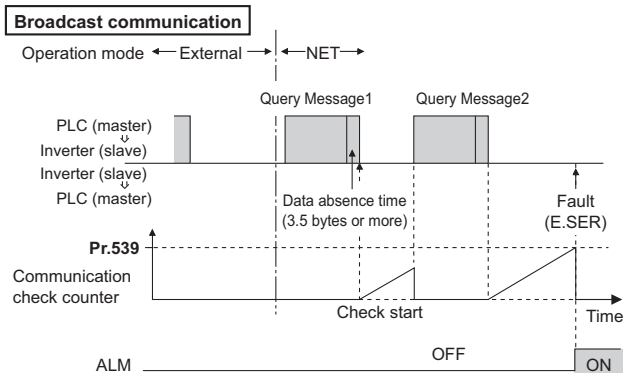

NOTE

> • 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.

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4.5.15 Signal loss detection (Pr.539 MODBUS RTU communication check time interval)

- If a signal loss (communication) is detected between the inverter and the master as a result of a signal loss detection, an inverter communication fault (E.SER) occurs and the inverter trips.
- When the setting is "9999", communication check (signal loss detection) is not made.
- When the setting is "0", reading, etc. of monitors and parameters is possible, though a Communication fault (inverter) (E.SER) occurs instantly when the Network operation mode is switched to.
- A signal loss detection is made when the setting is any of "0.1 s to 999.8 s". To make a signal loss detection, it is necessary to send data from the master 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 master).
- The communication check is made from the first communication in the Network operation mode (can be changed by **Pr.551 PU mode operation command source selection**).
- The communication check time by query communication includes a no data time (3.5 bytes).
  This no data time differs according to the communication speed, so take this time no data time into consideration when setting the communication check time.

Example: **Pr.539** = "0.1 to 999.8 s"

Broadcast communication

Operation mode ← External → | ← NET →

Query Message1   Query Message2

PLC (master)
↓
Inverter (slave)

Inverter (slave)
↓
PLC (master)

Data absence time
(3.5 bytes or more)

Fault
(E.SER)

Pr.539

Communication
check counter

Check start   Time

ALM   OFF   ON

> **NOTE**
>
> • The operation at a communication error occurrence depends on the **Pr.502 Stop mode selection at communication error** setting. (Refer to **page 27**)

4.6 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 the communication parameter setting.

Pr.	Pr. group	Name	Initial value	Setting range	Description
331	N030	RS-485 communication station number	0	0 to 31 (0 to 247)∗1∗2	Set the inverter station numbers. The inverter station number setting is required when multiple inverters are connected to one GOT (RS-485 terminal communication).

∗1   When **Pr.549 Protocol selection** = "1" (MODBUS RTU protocol), the setting range is as shown in the parentheses.
∗2   When the set value is outside of the setting range, the initial value is applied.

4.6.1 Automatic connection system configuration
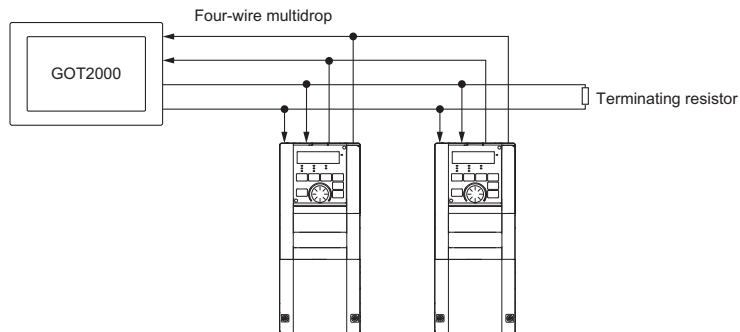
4.6.2 GOT2000 series automatic recognition

- 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.
- Set the station number (**Pr.331**) of the inverter before the automatic recognition is performed.
- 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.332**	Depending on the setting of the connected device on the GOT side.
Data length/stop bit	**Pr.333**	
Parity	**Pr.334**	
Waiting time setting	**Pr.337**	
CR/LF selection	**Pr.341**	
Number of communication retries	**Pr.335**	9999 (fixed)
Communication check time interval	**Pr.336**	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).

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4.7 Parameter reading/writing restriction when the password function is active

- When a password is registered, parameter reading/writing via the RS-485 terminals is restricted as follows according to the setting in **Pr.296 Password lock level**.

Pr.296 setting	NET operation mode operation command∗2	
	Read	**Write∗1**
9999	○	○
0, 100	×	×
1, 101	○	×
2, 102	○	○
3, 103	○	×
4, 104	×	×
5, 105	○	○
6, 106	×	×
99, 199	Only the parameters registered in the user group can be read/written.∗3 (For the parameters not registered in the user group, same restriction level as "4, 104" applies.)	

○: Enabled, ×: Disabled

∗1 If the parameter writing is restricted by the **Pr.77 Parameter write selection** setting, those parameters are unavailable for writing even when "○" is indicated.

∗2 This restricts parameter access from the command source that can write a parameter under the Network operation mode (initially the RS-485 terminals or a communication option). (For the NET operation mode command source selection, refer to **page 19**.)

∗3 Read/write is enabled only for the simple mode parameters registered in the user group when **Pr.160** ="9999". **Pr.296** and **Pr.297** are always read/write enabled whether registered to a user group or not.

NOTE

- When all parameter clear is performed during communication via the RS-485 terminals, the set password is cancelled. (The password is not cancelled by performing parameter clear.)
- For the details of the password function, refer to the Instruction Manual (Detailed) of the inverter.

4.8 Setting multiple parameters as a batch

Parameter settings are changed as a batch. Those include communication parameter settings for the Mitsubishi's human machine interface (GOT) connection and the parameter setting for the rated frequency settings of 50 Hz/60 Hz and acceleration/deceleration time.
Multiple parameters are changed automatically. Users do not have to consider each parameter number. (Automatic parameter setting mode)

Pr.	Pr. group	Name	Initial value	Setting range	Description	
999	E431	Automatic parameter setting	9999∗1	1	Standard PID display setting	
				2	Extended PID display setting	
				10	GOT initial setting (PU connector)	"Controller Type" in GOT: FREQROL 500/700/800, SENSORLESS SERVO
				11	GOT initial setting (RS485 terminals)	
				12	GOT initial setting (PU connector)	"Controller Type" in GOT: FREQROL 800 (Automatic Negotiation)
				13	GOT initial setting (RS-485 terminal)	
				20	50 Hz rated frequency	
				21	60 Hz rated frequency	
				9999	No action	

∗1   The read value is always "9999".

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- When "11 or 13" is set in **Pr.999**, the communication parameters for the GOT connection via RS-485 terminals are automatically set.

Pr.	Name	Initial value	Pr.999 ="11"	Pr.999 ="13"	Refer to page
79	Operation mode selection	0	0	0	**16**
332	RS-485 communication speed	96	192	1152	**32**
333	RS-485 communication stop bit length / data length	1	10	0	
334	RS-485 communication parity check selection	2	1	1	
335	RS-485 communication retry count	1	9999	9999	
336	RS-485 communication check time interval	0 s	9999	9999	
337	RS-485 communication waiting time setting	9999	0 ms	0 ms	
340	Communication startup mode selection	0	1	1	∗2
341	RS-485 communication CR/LF selection	1	1	1	**32**
414	PLC function operation selection	0	—	2∗1	∗2
549	Protocol selection	0	0	0	**59**

∗1 When **Pr.414** ="1", the setting value is not changed.
∗2 Refer to the Instruction Manual (Detailed) of the inverter.

- Initial setting with the GOT2000 series
  - When "FREQROL 500/700/800, SENSORLESS SERVO" is selected for "Controller Type" in the GOT setting, set **Pr.999** ="11" to configure the GOT initial setting.
  - When "FREQROL 800 (Automatic Negotiation)" is selected for "Controller Type" in the GOT setting, the GOT automatic connection can be used. When "FREQROL 800(Automatic Negotiation)" is selected for "Controller Type" in the GOT setting and the GOT automatic connection is not used, set **Pr.999** ="13" to configure the GOT initial setting. (Refer to **page 88**)
- Initial setting with the GOT1000 series
  - Set **Pr.999** ="11" to configure the GOT initial setting.

NOTE

- Always perform an inverter reset after the initial setting.
- For the details of connection with GOT, refer to the Instruction Manual of GOT.
- For the details of other **Pr.999** settings, refer to the Instruction Manual (Detailed) of the inverter.

5PROTECTIVE FUNCTIONS

Operation panel indication	E.CTE	*E. CTE*	FR-LU08	Circuit fault
Name	RS-485 terminals power supply short circuit			
Description	When the power supply for the RS-485 terminals are short circuited, this function shuts off the power output. At this time, communication from the RS-485 terminals cannot be made. To reset, use [STOP RESET] of the operation panel, enter the RES signal, or switch power OFF then ON again.			
Check point	Check that the RS-485 terminals are connected correctly.			
Corrective action	Check the connection of the RS-485 terminals.			

Operation panel indication	E.SER	*E. SER*	FR-LU08	VFD Comm error
Name	Communication fault (inverter)			
Description	The inverter trips when communication error occurs consecutively for the permissible number of retries or more when **Pr.335 RS-485 communication retry count** ≠ "9999" during RS-485 communication from the RS-485 terminals. The inverter also trips if communication is broken for the period of time set in **Pr.336 RS-485 communication check time interval**.			
Check point	Check the RS-485 terminal wiring.			
Corrective action	Perform wiring of the RS-485 terminals properly.			

REVISIONS

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

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INVERTER

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Specifications subject to change without notice.