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MITSUBISHI
INVERTER
Instruction Manual

COMPUTER LINK UNIT
TYPE FR-EPB

- PLG Feedback Control
- Computer Link

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Warning symbols For your own safety please pay special attention to instructions containing these symbols:



This warning symbol indicates the presence of dangerous voltage. It informs you of high voltage conditions, situations and locations that may cause death or serious injury if you do not follow precautions.



This symbol indicates a general warning.



This warning symbol indicates an electrostatic discharge hazard.

NOTES inform you of situations or conditions which will damage machinery or cause additional motor-operation downtime if you do not take suggested steps to correct or address such situations or conditions.

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Thank you for choosing the option unit for the Mitsubishi FREQROL transistorized frequency inverters.
Please read this manual carefully to make optimum use of this option unit.

Computer Link Unit (FR-EPB)

This option unit is a multi-function unit including a function to communicate with various personal computers and designed to configure a Factory Automation-compatible drive system. Its functions are as follows:

- PLG feedback control
- Computer link

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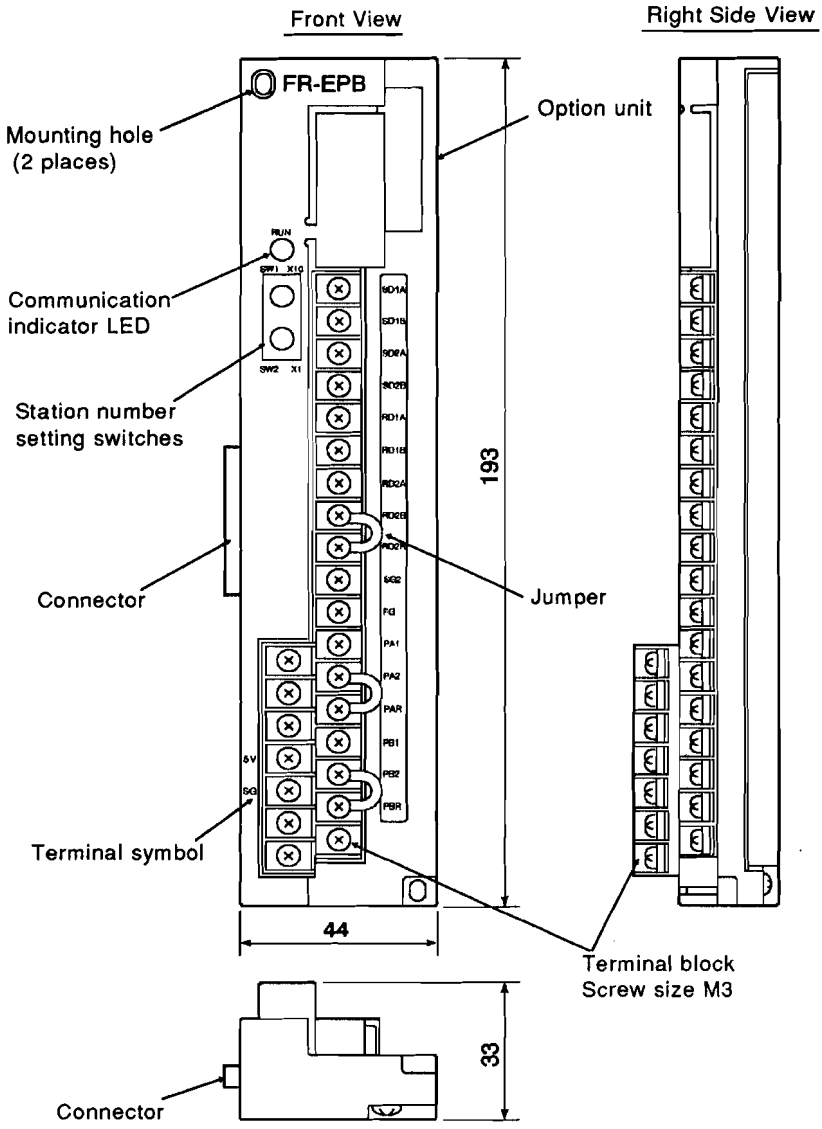
4. COMPUTER LINK FUNCTION 11

CAUTION Since this option unit has multiple functions, the initial settings of its functions are as listed in the following table. To make the required function valid, set the corresponding parameter in accordance with the relevant page.

Function	Initial Setting	Remarks
PLG feedback control	Invalid	The factory setting of Pr. 105 is "9999". (See page 7.)
Computer link	Invalid. Note that monitored values and parameter settings can be read.	The factory setting of Pr. 122 is "0". (See page 23.)

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1. STRUCTURE



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2. INSTALLATION

Remove the inverter cover and install the option unit with the following procedure:

2.1 Pre-Installation Checks

(1) Check the inverter type. This option unit may only be used with the FREQROL-A200E series inverters and must not be used with any other series (e.g.A200, A100 Z and F series). If you connect forcibly, the inverter may be damaged.

(2) Make sure that the inverter input power is off. The inverter may become faulty if the option unit is installed with the input power on.
(The inverter or option unit may be damaged and the inverter may display the alarm "E. CPU".)

(3) To carry out PLG feedback control, this option unit requires an encoder (or motor with encoder) and an external power supply. For more information, see page 9.

(4) Check that the following accessories are supplied with the option unit:
- 1 - Instruction manual
- 2 - Mounting screws M3 x 14
- 3 - Jumpers (installed to the terminal block)

2.2 Installation Procedure

(1) Insert the connector of the option unit into the connector of the inverter.

(2) Securely fix the option unit to the inverter at the top and bottom with the accessory mounting screws.
If the screw holes in the option unit do not match those in the inverter, check that the connectors have fitted correctly.

(3) For the installation diagram, see page 3.

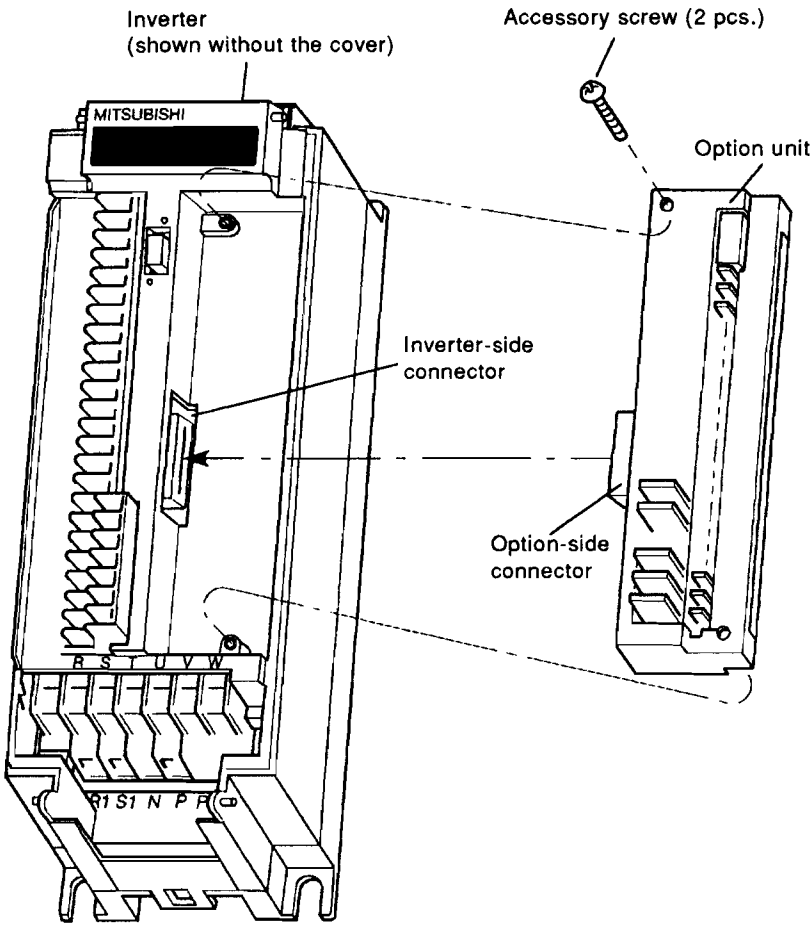
* The empty terminals, which are used inside the option, must not be used as relay terminals. Otherwise, the option may be damaged.

Note: Route the cables neatly in the wiring space so that when the front cover is reinstalled, the cables to the inverter control circuit terminals and option terminals are not caught between the inverter and cover.



Warning! Hazardous voltage present.
Always isolate the power from the inverter, and wait 5 minutes to ensure the charge lamp has gone out before inserting or removing this option unit, or touching the terminals.

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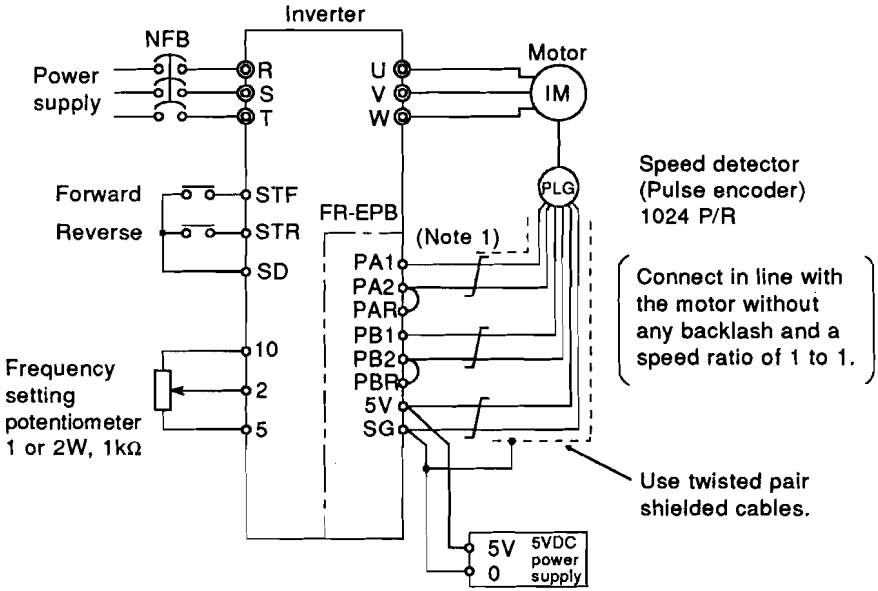


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3. PLG FEEDBACK CONTROL

This function is used with a speed detector (pulse encoder, PLG) to allow the motor speed to be detected by the speed detector and fed back to the inverter so that the output frequency of the inverter is controlled to keep the motor speed constant during load variations.

3.1 Wiring Example



Note 1: The 5V power supply should be user-prepared.
(The power supply specifications are given on page 9.)

Note 1: The built-in terminal resistors are connected by the jumpers. When this option unit shares the same pulse encoder with another unit (e.g. NC) which is fitted with terminal resistors, remove the jumpers since the built-in terminal resistors are not required. (Terminal resistor: 100Ω)

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3.2 Terminals

Symbol	Terminal	Rating	Description
PA1	Encoder phase A signal input terminal	For information on pulse signals, see page 9.	Phase A and B signals are input from the encoder.
PA2	Encoder phase A inverse signal input terminal		
PB1	Encoder phase B signal input terminal		
PB2	Encoder phase B inverse signal input terminal		
PAR	Phase A terminal resistor terminal		Connected with PA2 by the jumper before shipment from the factory. Remove the jumper when the terminal resistor is not required.
PBR	Phase B terminal resistor terminal		Connected with PB2 by the jumper before shipment from the factory. Remove the jumper when the terminal resistor is not required.
5V	DC power (positive) input terminal	4.75 to 6VDC (Current consumption 50mA)	Connect DC power to power terminals of encoder. Connect the positive cable to the 5V terminal and the ground (0V) cable to the SG terminal. Also connect the shield of the shielded cable to SG.
SG	DC power ground terminal		

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3.3 Wiring Instructions

- Connection with the position detector (pulse encoder)
  Use twisted pair shielded cables (0.2mm2 or larger) to connect the unit (FR-EPB) and position detector. Cables to terminals 5V and SG must be connected in parallel or be larger in size according to the cable length as indicated below: The cables connected between the FR-EPB and encoder must be kept away (at least 10cm) from any source of noise, e.g. the main circuit.

(1) Cable length within 30m

Cable Length	Number of Parallel Cables of 0.2mm^2	Larger-Size Cables
Within 10m	2 or more cables	0.4mm^2 or larger
Within 20m	4 or more cables	0.75mm^2 or larger
Within 30m	6 or more cables	1.25mm^2 or larger

(2) Cable length of more than 30m
Use a power supply slightly higher than 5V in addition to 6 or more parallel cables of 0.2mm^2 or cables of 1.25mm^2 or more. This allows the cable length to be increased up to 100m.

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3.4 Adjustments

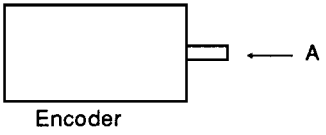
(1) Parameters

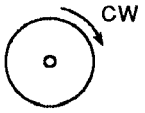
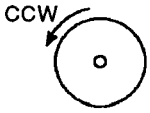
Before starting inverter operation, set the following parameters:

Parameter List

Function Number	Function	Setting Range	Minimum Increment	Initial Setting	Remarks
117	Encoder rotation direction	0,1	Integer	1	
37	Number of motor poles	2 to 8 *	Integer	4	See page 8.
105	Speed feedback range	0 to 400Hz 9999	0.01Hz	9999	Set 0 or 9999 to disable speed feedback control.
106	Feedback gain	0 to 100	0.1	1	See page 8.

(2) Setting the encoder rotation direction (Pr. 117)



Pr. 117 = 0	Pr. 117 = 1
 Forward rotation is clockwise when seen from A	 Forward rotation is counterclockwise when seen from A

By installing this option unit, the encoder rotation direction is displayed on the rotation direction monitor screen of the parameter unit.
Set the rotation direction in Pr. 117 so that FWD is displayed for the STF command and REV is displayed for the STR command.

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(3) Setting the number of motor poles (Pr. 37)

Set the number of poles of the motor driven.

* If the inverter is operated after any of 10 and 11 to 9998 has been set in Pr. 37, alarm E.OPT (option error) is displayed and the inverter comes to a stop.

Resetting method: After setting the correct number of motor poles, reset the inverter. (Refer to inverter manual)

(4) Setting the speed feedback range (Pr. 105)

Set the feedback control range.

Define the upper and lower limits in reference to the set value (frequency at which the motor is rotated at stable speed). Normally set the frequency converted from the rated motor speed (rated load) slip (rpm).

Example: Rated speed of the 4P motor is 1740rpm/60Hz

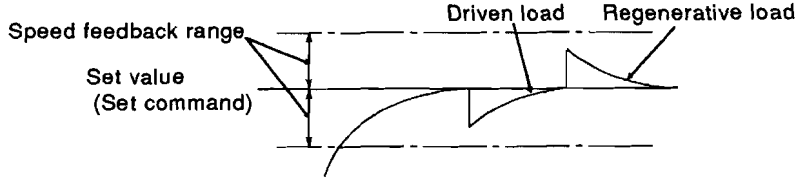
Slip Nsp = (synchronous speed) – (rated speed)

= 1800 – 1740 = 60 (rpm)

Frequency equivalent to slip fsp

$$fsp = \frac{Nsp \times (\text{number of poles})}{120} = \frac{60 \times 4}{120} = 2\,(Hz)$$

Response slows if the feedback range value is too large.



* The speed feedback range is factory-set to 9999 (speed feedback is not carried out). Before operation, an appropriate value must be set in Pr. 105.

(5) Setting the feedback gain (Pr. 106)

Set if rotation is unstable or response is slow.

When the set value is greater than 1, response is faster but overcurrent or rotational instability is more liable to occur.

When the set value is less than 1, response is slower but rotation is more stable.

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3.5 Instructions for Use of PLG Feedback Control

(1) The number of motor poles used must be checked before starting operation. The number of poles set must be correct to ensure proper control of the motor.

(2) The pulse encoder must be coupled in line with the motor shaft without any mechanical looseness and a speed ratio of 1 to 1.

(3) Check that the pulse encoder has been set to the correct rotation direction on the rotation direction display of the parameter unit. If the rotation direction is not correct, speed feedback control cannot be carried out (the inverter can be operated).

(4) During acceleration or deceleration, speed feedback control is not performed to prevent instability such as hunting.
Speed feedback control is started after the output frequency has once reached the set speed ± (speed feedback range).

(5) If any of the following states occur during speed feedback control operation, the inverter is run at the output frequency of (set speed) ± (speed feedback range) without coming to an alarm stop and does keep the motor speed constant:

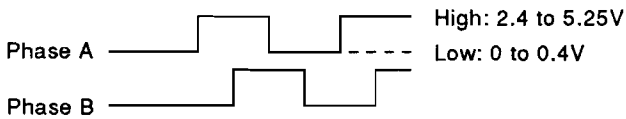
- The pulse signal from the pulse encoder is switched off due to an open cable, etc.;
- An accurate pulse signal cannot be detected due to induction noise, etc.; or
- The motor is forced to accelerate (regenerative operation) or decelerate (e.g. motor lock) by large external force.

(6) Use the RUN (running) signal to release the brake of a motor with brake. (When the FU (output frequency detection) signal is used, the brake may not be released.)

3.6 Specifications

(1) Motor driven 2-, 4-, 6- or 8-pole standard motor
2-, 4-, 6- or 8-pole constant-torque motor

(2) Speed detector (Pulse encoder)
1024 pulses/revolution (P/R) line driver LED pulse encoder



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Example of Encoder Output Signal Pin Numbers

Pin Number	Signal
A	Phase A signal
N	Phase A inverse signal
C	Phase B signal
R	Phase B inverse signal
H	+ 5V power input
K	Power common
E	Case ground

(3) Speed variation ratio — Within ± 0.1% of the maximum speed (3600 rpm) (load variation 0 to 100%*...6Hz or more)
*: Load variation 100% indicates the maximum continuous operation torque value of the motor output characteristic (see the catalogue and technical information) to the running frequency.

(4) Speed control range — Equivalent to the inverter.

(5) Functions
- Speed feedback range setting
- Feedback gain setting
- Encoder rotation direction setting

(6) DC power supply — A 5VDC power supply is required for the position detector (pulse encoder) and option unit.
This power supply should be user-prepared.
Power supply: 5VDC Current capacity 400mA or more (approx. 350mA for pulse encoder and 50mA for option unit)

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4. COMPUTER LINK FUNCTION

This function allows inverters connected to a computer (such as a personal computer or a factory automation computer) by communication cables to be operated and monitored and their parameters to be transerred by user programs.

4.1 Configuration

(1) Basic configuration

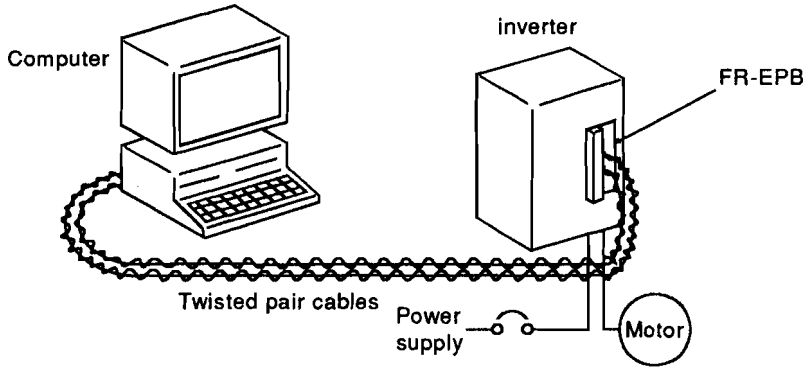


Fig. 4.1

(2) System configuration examples

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

Max. number of inverters connected
RS-422:10
RS-485:32

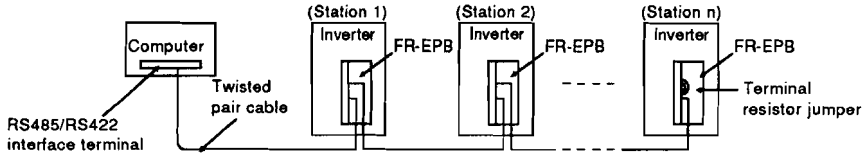


Fig. 4.2.1

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

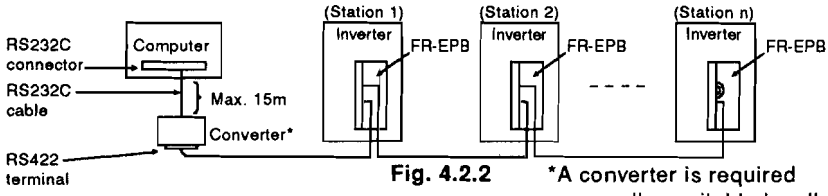


Fig. 4.2.2

*A converter is required generally available locally.

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4.2 Wiring Method

(1) Connection of one computer and one inverter

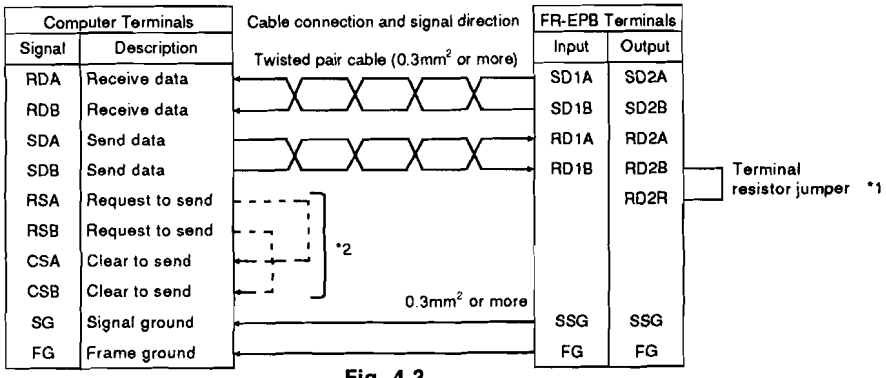


Fig. 4.3

(2) Connection of one computer and n inverters

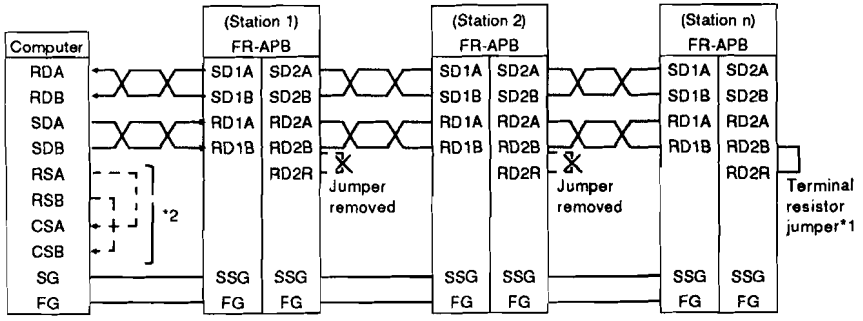


Fig. 4.4

*1. The terminal resistor jumper should only be connected to the remotest FR-EPB unit. (Terminal resistor: 100Ω)

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

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4.3 Operational Functions

(1) Operation modes

1) PU operation

Controls the inverter from the keyboard of the parameter unit (referred to as the "PU") installed on the inverter.

2) External operation

Controls the inverter by switching on/off external signals to the control circuit terminals of the inverter.

3) Computer link operation

Controls the inverter in accordance with the computer program via the FR-EPB computer link unit.

Setting parameters 123 and 124 as appropriate allows the operation signal and output frequency to be entered from the control circuit terminals. See Section 4.6 (4).

■ Operation mode switching

Table 4.1

Symbol	Mode Switching	Description
A	External operation ↔ PU operation	Press the corresponding key on the PU.
B	External operation ↔ computer link operation	By computer user program. See Section 4.5 (4).

- Switching conditions: The inverter is at a stop (output frequency = 0); and Both the forward and reverse commands are off.

* Set "1" in parameter 125 to cause the inverter to enter the computer link operation mode when it is powered up or reset. (See Section 4.7.)

Note: When "1" or "2" is set in parameter 125, the initial settings of the inverter must be made correctly.

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(2) Functions available in operation modes

Table 4.2

Place of Control	Item	Operation Mode		
		Computer Link mode	External mode	PU mode
User program from computer	Operation command	Yes *1	No	No
	Output frequency setting	Yes *1	No	No
	Monitor	Yes	Yes	Yes
	Parameter write	Yes (while at a stop) *3	No *3	No *3
	Parameter read	Yes	Yes	Yes
	Inverter reset	Yes *2	No	No
Control circuit terminal	Operation command	Yes *1	Yes	No
	Output frequency setting	Yes *1	Yes	No
	Inverter reset	Yes	Yes	Yes

Note: If different data are written from the PU and computer to the same parameter at the same time, they may not be written properly.

*1: Depends on the set values of Pr. 123 and Pr. 124. (See Section 4.6 (4).)

*2: The inverter cannot be reset if a computer link communication error has occurred.

*3: As set in Pr. 77.

(3) Input from computer to inverter

1) Operation commands

Bit 0: — (Note1)

1: Forward rotation (STF)
2: Reverse rotation (STR)
3: Low speed (RL)
4: Middle speed (RM)
5: High speed (RH)
6: Second acceleration/deceleration selection (RT)
7: Inverter output stop (MRS)

Note1: When the external terminal has been selected in Pr. 124 (speed command right), the command operation of this bit 0 is made valid as current input selection (AU).

2) Output frequency: Output range: 0 to 400Hz 16-bit binary in increments of 0.01Hz
The output frequency of the inverter can be set.

3) Inverter reset
The inverter can be reset from the computer.

4) Parameter set value write
For the parameters indicated in the data code list in Section 4.11, their set values can be written.

(4) Input from inverter to computer

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(4) Input from inverter to computer

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

Bit 0: Running (RUN)
1: Forward running
2: Reverse running
3: Up to frequency (SU)
4: Overload (OL)
5: Instantaneous power failure (IPF)
6: Frequency detection (FU)
7: Alarm

2) Inverter monitoring

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

3) Parameter set value read

For the parameters indicated in the data code list in Section 4.11, their set values can be read.

(5) Operation at alarm occurrence

Table 4.3

Place of Alarm Occurrence	Description	Operation Mode		
		Computer link operation	External operation	PU operation
Inverter fault	Inverter operation	Stop	Stop	Stop
	Data communication	Continued	Continued	Continued
Data communication fault	Inverter operation	Stop *	Continued	Continued
	Data communication	Stop	Stop	Stop

* Operation stops after given time (allowable communication time interval) has elapsed.

(6) Inverter reset (Note2)

Table 4.4

Resetting Method	Operation Mode		
	Computer link operation	External operation	PU operation
Computer program	Yes (Note3)	No	No
Connect terminals RES-SD	Yes	Yes	Yes
Switch off inverter power	Yes	Yes	Yes

Note2: Resetting the inverter in the computer link operation mode switches the inverter to the external operation mode. To resume the computer link operation, the operation mode must be switched to the computer link operation again.

Note3: If the computer or communication cable is faulty, the inverter cannot be reset from the computer.

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4.4 Operation

(1) General operation (See Fig. 4.5)

1) The computer CPU decodes and executes the user program.
2) Communication data in accordance with the user program is converted into serial signals in the computer and is then converted into the level conforming to the RS-422 or RS-485 standard and transmitted to the inverter by the driver.
3) The communication data is received by the receiver in the FR-EPB unit, converted into parallel signals by the communication LSI, and transmitted to the inverter CPU.
4) The inverter CPU checks the data for errors, processes the data in accordance with the check result, and creates reply data.
5) The reply data is converted into serial signals by the communication LSI in the FR-EPB unit, then converted into the interface level conforming to the RS-422 or RS-485 standard, and returned to the computer.
6) The reply data is received by the receiver in the computer and read and checked in accordance with the user program to execute the user sequence.

(2) Function block diagram

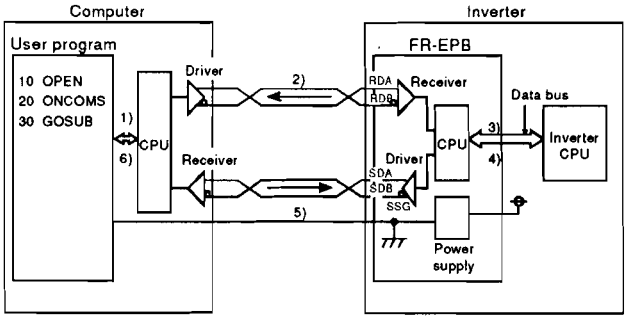


Fig. 4.5

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4.5 Programming

(1) Communication protocol

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

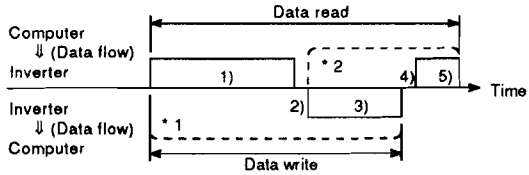


Fig. 4.6

*1. If a data error has occurred and a retry must be made, execute retry according to the user program. The inverter comes to an alarm stop (E. OPT) if the number of consecutive retries exceeds the permissible value.

*2. On receiving the occurrence of any data error, the inverter returns reply data 3 to the computer again. The inverter comes to an alarm stop (E. OPT) if the number of consecutive data error times exceeds the permissible value.

(2) Communication presence/absence and data format types

In this table, A to H indicate data format types. For details of the formats, see the next page.

Table 4.5

No.	Operation Control		Operation Command	Frequency Setting	Parameter Write	Inverter Reset	Monitor	Parameter Read
1	Communication request is sent to the inverter in accordance with the computer program.		A'	A	A	A	B	B
2	Inverter data processing time		Present	Present	Present	Absent	Present	Present
3	Reply data from the inverter Data 1 is checked for error.	Without error Request accepted	C	C	C	Absent	E E'	E
		With error Request rejected	D	D	D	Absent	F	F
4	Computer processing delay time		Absent	Absent	Absent	Absent	Present	Present
5	Answer from computer in response to reply data 3 Data 3 is checked for error.	Without error No processing	Absent	Absent	Absent	Absent	G	G
		With error 3 re-output	Absent	Absent	Absent	Absent	H	H

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(3) Data format

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

1) Data format types

(1) Communication request data from computer to inverter

[Data write]

Format A

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

13 ← Number of characters

*3. Control code (See Table 4.6.)

Format A'

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

← Number of characters

[Data read]

Format B

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

← Number of characters

Fig. 4.7.1

Note: Specify the inverter station number in hexadecimal between H100 and H1F (stations 0 and 31).

*4.CR, LF codes

When data is transmitted from the computer to the inverter, the CR (carriage return) and LF (line feed) codes are automatically set at the end of a data group depending on the computer used. In such a case, these codes must also be set when data is transmitted from the inverter to the computer.

Using Pr. 126, you can select the presence/absence of the CR and LF codes.

(2) Reply data from inverter to computer during data write

[No data error detected]

Format C

	*3 ACK	Inverter station number	*4
	1	2 3	4

← Number of characters

Fig. 4.7.2

[Data error detected]

Format D

	*3 NAK	Inverter station number	Error code	*4
	1	2 3	4	5

Fig. 4.7.3

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(3) Reply data from inverter to computer during data read

[No data error detected]

Format E

*3 STX	Inverter station number	Read data	*3 ETX	Sum check	*4
1	2 3	4 5 6 7	8	9 10	11

Format E'

*3 STX	Inverter station number	Read data	*3 ETX	Sum check	*4
1	2 3	4 5	6	7 8	9 ← Number of characters

Fig. 4.7.4

[Data error detected]

Format F

*3 NAK	Inverter station number	Error code	*4
1	2 3	4	5

Fig. 4.7.5

(4) Reply data from computer to inverter during data read

[No data error detected]

Format G

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

Fig. 4.7.6

[Data error detected]

Format H

*3 NAK	Inverter station number	*4
1	2 3	4

Fig. 4.7.7

2) Data

(1) Control codes

Table 4.6

Signal	ASCII Code	Description
NUL	H00	Null (No processing)
STX	H02	Start of Text (Start of data)
ETX	H03	End of Text (End of data)
ENQ	H05	Enquiry (Communication request)
ACK	H06	Acknowledge (No data error detected)
LF	H0A	Line Feed
CR	H0D	Carriage Return
NAK	H15	Negative Acknowledge (Data error detected)

(2) Inverter station number

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

Specify the station number in hexadecimal between H100 and H1F (stations 0 and 31).

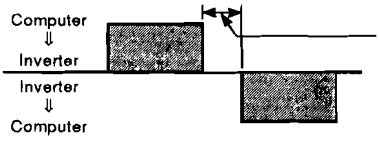
(3) Instruction code

Specify the processing request (e.g. operation, monitoring) given by the computer to the inverter. Hence, the inverter can be run and monitored in various ways by specifying the instruction code as appropriate. (For more information, see Section 4.10.)

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(4) Data
Indicates frequency, parameters, etc. transferred to and from the inverter. The definition and range of set data are determined in accordance with the instruction code in above (3). (For more details, see Section 4.10.)

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



Inverter data processing time
= waiting time + data check time
(set value × 10msec) (12msec)

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

(Example1)

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

H H H H H H H H H H
30 + 31 + 45 + 31 + 31 + 30 + 37 + 41 + 44
H
= 1 F 4
Sum

(Example2)

	STX	Station number		Read data				ETX	Sum check code		
		0	1	1	7	7	0		3	0	← Binary code
Inverter⇒Computer ASCII code→	H02	H30	H31	H31	H37	H37	H30	H03	H33	H30	

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

(7) Error code
If any error is found in the data received by the inverter, its definition is sent back to the computer together with the NAK code. For error definitions, see the error code list in Appendix 4.12.

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(4) Program Example

The following example switches the operation mode to computer link operation.

Program

Line number

```
 10 OPEN"COM1 :9600,E,8,2,HD"AS#1
 20 COMST1, 1, 1 :COMST1, 2, 1
 30 ON COM(1)GOSUB*REC
 40 COM(1)ON
 50 D$="01FB10000"
 60 S=0
 70 FOR I=1 TO LEN(D$)
 80 A$=MID$(D$, I, 1)
 90 A=ASC(A$)
100 S=S+A
110 NEXT I
120 D$=CHR$(&H5)+D$+RIGHT$(HEX$(S), 2)
130 PRINT#1, D$
140 GOTO 50
1000 *REC
1010 IF LOC(1)=0 THEN RETURN
1020 PRINT"RECEIVE DATA"
1030 PRINT INPUT$(LOC(1), #1)
1040 RETURN
```

I/O file initialization

Communication file open

Circuit control signal (RS, ER) ON/OFF setting

Interrupt definition at data receive

Interrupt enable

Transmission data setting

Sum code calculation

Addition of control code and sum code

Data transmission

Interrupt data receive

Interrupt occurrence at data receive

General flowchart

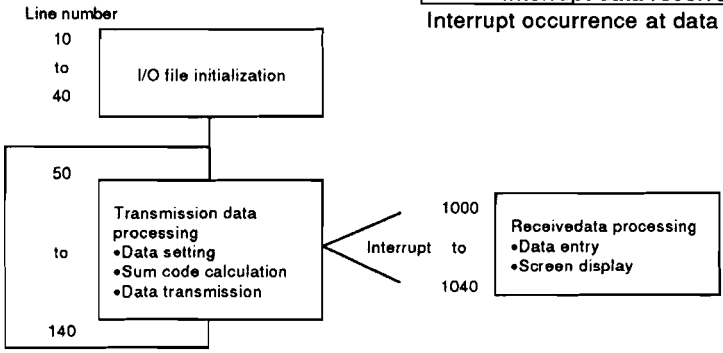


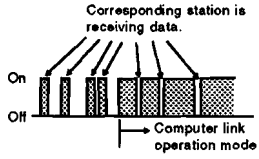
Fig. 4.8

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4.6 Adjustments and Settings

(1) Functions of parts

Table 4.7

Description	Explanation
Connector	To interface with the inverter printed circuit board. Correctly fit this connector to the inverter connector pins. (See Section 2.2.)
Terminal block (input) Terminal block (output)	For serial signal input/output. See Section 4.2 for the wiring method. (Terminal pitch: 7.62mm, terminal screw size: M3)
Terminal resistor jumper	To connect the terminal resistor contained in the FR-EPB unit. (See Section 4.2.) • The remotest inverter: Connect terminals RD2b and RD2R. • Inverters other than the remotest one: Remove the jumper.
Station number setting switches	To set the inverter station number between 0 and 31. (See Section 4.6 (2).)
Communication status indicator LED	In other than the computer link operation mode, on indicates that the corresponding station is receiving data. In the computer link operation mode, off indicates that the corresponding station is receiving data. 
Installation holes (2 places)	To fasten the FR-EPB unit to the inverter cover with the accessory mounting screws (See Section 2.2.)

(2) Setting the inverter station number

Using the switches (SW1, SW2) on the FR-EPB unit, set the inverter station number before powering up the inverter. Note that if any station number is changed during operation, data communication is disabled and the inverter cannot be stopped.

1) Setting method...See Fig. 4.9.

Set the arrow (⇑) of the corresponding switch to the required number.

Example:

- To set the station number to 1, set SW2 to 1. (Set SW1 to 0.)
- To set the station number to 26, set SW2 to 6 and SW1 to 2.
- To set the station number to 0, set both SW2 and SW1 to 0.

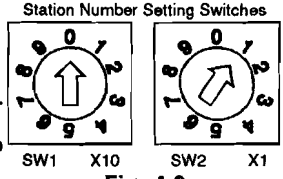


Fig. 4.9

2) The station number may be set between 0 and 31. (Any station number between 32 and 99 is ignored.) When the RS422 interface is used, the station number may be set between 0 and 31 but the number of inverters connected must be less than 10.

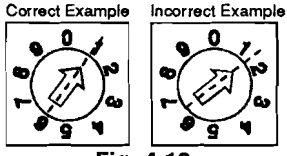


Fig. 4.10

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3) Note that the same station number cannot be set for different inverters. (If such setting has been made, communication cannot be performed properly.
4) Any station number setting switch must be in either the ON or OFF position. If it is set midway between ON and OFF, data communication cannot be done correctly.
5) Station numbers do not have to be sequential and may be skipped, e.g. as shown in Fig. 4.11.

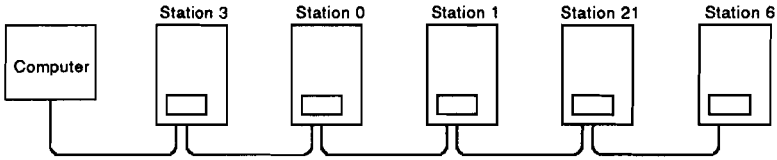


Fig. 4.11 Station Number Setting Example

(3) Parameter initialization

To perform communication between the computer and inverter, the inverter parameters must be initialized to communication specifications. Data communication cannot be made if the initialization has not been made or there is any wrong setting.

Note: After the parameters have been initialized, the inverter must be reset. Communication cannot be made if the inverter is not reset after the communication-related parameter values have been changed.

1) Allowable communication time interval

Set the allowable time interval of communication with the computer.

[If the inverter does not communicate with the computer for more than the allowable time, it comes to an alarm stop due to a time-out error.]

Pr. Number	Instruction Code	Data Setting	Description
122	H16: Read H96: Write (HFF = 1)	0.1 to 999.8	Allowable value (0.1 seconds increments)
		(9999) 65535 *	Communication check halt
		0 (factory setting)	Computer link operation disallowed

* The data entered from the parameter unit is 9999 and that from the computer is 65535 (HFFFF).

Note: 1. Note that communication break errors, such as an open signal cable and a computer failure, are not detected by the inverter.
2. At power on (or reset), communication time interval check is started as soon as the first communication is made.
3. When a parameter value is changed, check is started as soon as the value is changed.

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2) Number of retries at data communication error

Set the allowable number of retries at occurrence of a data communication error. If the number of errors that occurred consecutively exceeds the allowable value, the inverter comes to an alarm stop.

Pr. Number	Instruction Code	Data Setting	Description
121	H15: Read H95: Write (HFF = 1)	0 to 10	Allowed number of retries at error occurrence [If the number of retries made is more than the setting, the inverter comes to an alarm stop. (Factory setting is 1.)]

3) Communication specifications

Refer to the following table and set the parameters. (* : Factory setting)

Pr. Number	Function	Instruction Code	Data Setting	Description
118	Communication speed	H12: Read H92: Write (HFF = 1)	3, 6, 12, 24, 48, 96*, 192	3: 300 baud, 6: 600 baud, 12: 1200 baud, 24: 2400 baud, 48: 4800 baud, 96: 9600 baud, 192: 19200 baud
119	Stop bit length	H13: Read H93: Write (HFF = 1)	0, 1*, 10, 11	0, 10: stop bit length = 1 bit 1, 11: stop bit length = 2 bits 0, 1: data length = 8 bits 10, 11: data length = 7 bits
120	Parity check presence/absence	H14: Read H94: Write (HFF = 1)	0, 1, 2*	0: no parity check 1: odd parity 2: even parity
126	CR, LF instruction presence/absence	H1A: Read H9A: Write (HFF = 1)	0, 1*, 2	0: Both CR and LF absent. 1: CR only present. 2: Both CR and LF present.

Note: If the setting of Pr. 119 (stop bit length) differs from the actual value, the inverter does not become faulty.

4) Operation mode at start-up

Pr. Number	Function	Instruction Code	Data Setting	Description
125	Link start-up mode selection	H19: Read H99: Write (HFF = 1)	0*, 1, 2	0: normal (as in Pr. 79) (factory setting) 1: computer link operation mode 2: computer link operation mode (with restart)

Note: In the link mode, the setting of Pr. 125 can be changed from the parameter unit.

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(4) Control place selection

In the computer link operation mode, operation can be performed by signals from external terminals in accordance with the conditions set in parameter 123 (operation command control place selection) and parameter 124 (speed command control place selection).

Table 4.9 Control Place Selection

Control Place Selection		Functions Equivalent to External Terminals													
Pr. 123 (operation command)	Pr. 124 (speed command)	STF	STR	STOP	JOG	RT	2	4	1	RH, RM, RL	AU	RES	MRS	0H	CS
0: Computer	0: Computer	COM	COM	–	–	COM	COM	–	AUX	COM	–	BO	BO	EX	EX
0: Computer	1: External terminal	COM	COM	–	–	COM	EX	EX	EX	EX	BO	BO	BO	EX	EX
1: External terminal	0: Computer	EX	EX	EX	EX	EX	COM	–	AUX	COM	–	BO	EX	EX	EX
1: External terminal	1: External terminal	EX	EX	EX	EX	EX	EX	EX	EX	EX	BO	BO	EX	EX	EX

Note EX: Control by signal from external terminal is valid only.
COM: Control from computer user program is valid only.
BO: Control from both external terminal and computer is valid.
– : Control from both external terminal and computer is invalid.
AUX: Control by signal from external terminal is only valid if Pr. 28 (multi-speed input compensation) is 1.

(5) Inverter station number setting

- Using the station number setting switches on the FR-EPB board, select the station number between 0 and 31. (See Section 4.6(2).)
- Communication is started with the station number which was recognized when the inverter was powered up (or reset).

Note: Note that if the station number is changed during operation, data communication cannot be made with the new station number.

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4.7 Operation Mode at Power On and Instantaneous Power Failure

Set parameter 125 (start-up operation mode) as appropriate to select the operation mode at power on and restoration from instantaneous power failure.

Table 4.10

Parameter Set Value	Operation Mode		Mode at Power On and Restoration from Instantaneous Power Failure
	Pr. 79		
0	0	PU or external operation	External operation mode
	1	PU operation	PU operation mode
	2	External operation	External operation mode
*1	Computer link operation		Computer link operation mode. (Need not be switched by program.)
*2	Automatic computer link restart after instantaneous power failure		When the inverter is fitted with the FR-EPB unit, restart is made automatically without the communication signal from the computer to resume the computer link operation in the state as before the occurrence of instantaneous power failure.

Note: If instantaneous power failure occurs during computer link operation, the computer program is stopped and remains stopped after the power is restored.

* Set 1 or 2 in Pr. 125 after initializing the parameters of the inverter.

4.8 Instructions

(1) Programming instructions

1) The inverter does not accept data from the computer if it has an error. For this reason, a retry program for data error must be included in the user program.
2) A request of any data communication (e.g. operation command, monitor) is given by the computer and the inverter does not voluntarily return data to the computer. Hence, the program should be written to give a data read request as required from the computer at the time of monitoring, etc.
3) Depending on whether the values set in Pr. 0 to Pr. 99 or those set in Pr. 100 to Pr. 915 are transferred, the data of link parameter expansion setting differs as indicated below:

		Instruction Code	Description
Link parameter expansion setting	Read	H7F	H0000: Values in Pr. 0 to Pr. 99 can be transferred. H0001: Values in Pr. 100 to Pr. 915 can be transferred.
	Write	HFF	

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(2) Operating instructions

1) To prevent hazard, the inverter is designed to be inoperative when the allowable communication time interval is not set in Pr. 122 (set value = 0). Before starting operation, therefore, an appropriate value must be set in Pr. 122.

2) Data communication is not made automatically but is executed only once when a communication request is given by the computer. The inverter therefore cannot be stopped if communication is disabled during operation due to an open cable, etc. After the allowable communication time interval has elapsed, the inverter is brought to an alarm stop (E. OPT).
The inverter can be coasted to a stop by connecting inverter terminals RES-SD or shutting the power off.

4.9 Troubleshooting

(1) Data from computer is unread by inverter

1) Computer conforming to RS-422, RS-485 standard?
2) FR-EPB unit and communication cables fitted properly? (Check for contact fault, broken cable, wrong polarity, etc.)
3) Inverter initialization correct?
4) Inverter station number setting correct? (Check that setting and program match and that the same station number is not used for different inverters.)
5) Proper communication request program executed in computer?

(2) Operation mode unswitched to computer link operation

1) Inverter in external operation mode? Signal to external terminal STF or STR off?
2) Operation mode switching program executed?

(3) Inverter does not start in computer link mode

1) Inverter starting program executed properly?
2) Control place select conditions in Section 4.6 (4) set properly?
3) Inverter output provided?
4) Allowable communication time interval set properly?

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

1) FR-EPB unit and communication cables fitted properly? (Check for contact fault, broken cable, etc.)
2) Computer operating without fault?
3) Program written to give communication request from computer periodically?
4) Allowable communication time interval set properly?
5) Format of data transferred correct?

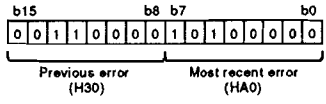
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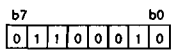
4.10 Set Items and Set Data

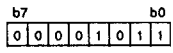
After initialization is complete, set the instruction codes and data as required and start communication from the computer to allow operation control and monitoring as appropriate.

<table>
<tr><th>No.</th><th colspan="2">Item</th><th colspan="2">Instruction Code</th><th>Description</th><th>Number of Data Digits</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Operation mode</td><td>Read</td><td colspan="2">H7B</td><td>H0000: Computer link operation
H0001: External operation
H0002: PU operation</td><td rowspan="2">4 digits</td></tr>
<tr><td>Write</td><td colspan="2">HFB</td><td>H0000: Computer link operation
H0001: External operation</td></tr>
<tr><td rowspan="6">2</td><td rowspan="6">Monitor</td><td>Output frequency (speed)</td><td colspan="2">H6F</td><td>H0000 to HFFFF: Output frequency (hexadecimal) in 0.01Hz increments
(Speed (hexadecimal) in 1rpm increments if parameter 37 setting is between 11 and 9998.)</td><td rowspan="4">4 digits</td></tr>
<tr><td>Output current</td><td colspan="2">H70</td><td>H0000 to HFFFF: Output current (hexadecimal) in 0.1A increments</td></tr>
<tr><td>Output voltage</td><td colspan="2">H71</td><td>H0000 to HFFFF: Output voltage (hexadecimal) in 0.1V increments</td></tr>
<tr><td>Special monitoring</td><td colspan="2">H72</td><td>H0000 to HFFFF: Monitored data selected by instruction code HF3</td></tr>
<tr><td rowspan="2">Special monitoring selection number</td><td>Read</td><td>H73</td><td rowspan="2">H01 to H0E: Data selected for monitoring
<table>
<tr><th>Data</th><th>Description</th><th>Increment</th><th>Data</th><th>Description</th><th>Increment</th></tr>
<tr><td>H01</td><td>Output frequency</td><td>0.01Hz</td><td>H09</td><td>Regenerative brake duty</td><td>0.1%</td></tr>
<tr><td>H02</td><td>Output current</td><td>0.01A</td><td>H0A</td><td>Electronic overcurrent protection load factor</td><td>0.1%</td></tr>
<tr><td>H03</td><td>Output voltage</td><td>0.1V</td><td>H0B</td><td>Output current peak value</td><td>0.01A</td></tr>
<tr><td>H05</td><td>Frequency setting</td><td>0.01Hz</td><td>H0C</td><td>Converter output voltage peak value</td><td>0.1V</td></tr>
<tr><td>H06</td><td>Running speed</td><td>1r/min</td><td></td><td></td><td></td></tr>
<tr><td>H07</td><td>Motor torque</td><td>1%</td><td>H0D</td><td>Input power</td><td>0.1kW</td></tr>
<tr><td>H08</td><td>Converter output voltage</td><td>0.1V</td><td>H0E</td><td>Output power</td><td>0.1kW</td></tr>
</table></td><td rowspan="2">2 digits</td></tr>
<tr><td>Write</td><td>HF3</td></tr>
</table>

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<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Instruction Code</th><th>Description</th><th>Number of Data Digits</th></tr>
<tr><td>2</td><td>Monitor</td><td>Alarm definition</td><td>H74 to H77</td><td>H0000 to HFFFF:
Alarm definition display example (instruction code H74)
Read data = H30A0
[Previous error..... THT
Most recent error ..... OPT]


Alarm data ..... For more information, see the inverter manual.
<table><tr><th>Data</th><th>Description</th><th>Data</th><th>Description</th></tr><tr><td>H00</td><td>No alarm</td><td>H50</td><td>IPF</td></tr><tr><td>H10</td><td>OC1</td><td>H51</td><td>UVT</td></tr><tr><td>H11</td><td>OC2</td><td>H60</td><td>OLT</td></tr><tr><td>H12</td><td>OC3</td><td>H70</td><td>BE</td></tr><tr><td>H20</td><td>OV1</td><td>H80</td><td>GF</td></tr><tr><td>H21</td><td>OV2</td><td>H90</td><td>OHT</td></tr><tr><td>H22</td><td>OV3</td><td>HA0</td><td>OPT</td></tr><tr><td>H30</td><td>THT</td><td>HB0</td><td>PE</td></tr><tr><td>H31</td><td>THM</td><td>HB1</td><td>PUE</td></tr><tr><td>H40</td><td>—</td><td>HB2</td><td>RET</td></tr><tr><td>H41</td><td>—</td><td>HC0</td><td>CPU</td></tr></table></td><td>4 digits</td></tr>
<tr><td>3</td><td colspan="2">Operation command</td><td>HFA</td><td>H00 to HFF: Operation command


(Data of example 1)
b0: — (Note)
b1: Forward rotation (STF)
b2: Reverse rotation (STR)
b3: Low speed (RL)
b4: Middle speed (RM)
b5: High speed (RH)
b6: Second acceleration/ deceleration selection (RT)
b7: Inverter output halt (MRS)
Example 1: H62 .....
Second acceleration/deceleration selected for high-speed forward rotation.
Example 2: H00 ..... Stop
Note: When the external terminal has been selected in Pr. 124 (speed command right), the command operation of this bit 0 is made valid as current input selection (AU).</td><td>2 digits</td></tr>
<tr><td>4</td><td colspan="2">Inverter status monitor</td><td>H7A</td><td>H00 to HFF: Inverter operating status


(Data of example 1)
b0: Inverter running (RUN)
b1: Forward running
b2: Reverse running
b3: Up to frequency (SU)
b4: Overload (OL)
b5: Instantaneous power failure (IPF)
b6: Frequency detection (FU)
b7: Alarm
Example 1 H0B: Frequency reached during forward running.
Example 2 H80: Stop due to error occurrence.</td><td>2 digits</td></tr>
</table>

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<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Instruction Code</th><th>Description</th><th>Number of Data Digits</th></tr>
<tr><td>5</td><td colspan="2">Output frequency write (E^2ROM)</td><td>HEE</td><td>H0000 to H9C40: In 0.01Hz increments (hexadecimal) (0 to 400.00Hz)
To change the output frequency consecutively, write data to the inverter RAM.
(Instruction code: HED)</td><td></td></tr>
<tr><td>6</td><td colspan="2">Inverter reset</td><td>HFD</td><td>H9696: Inverter is reset.
Since the inverter is reset on start of communication by the computer, the inverter cannot send reply data back to the computer.</td><td></td></tr>
<tr><td>7</td><td colspan="2">Parameter all clear</td><td>HFC</td><td>All parameters are returned to the factory settings. Four different all clear operations are available according to data.
<table>
<tr><th>Pr
Data</th><th>Commu-nication Pr.</th><th>Calibra-tion</th><th>Other Pr.</th><th>HEC
HF3
HFF</th></tr>
<tr><td>9696H</td><td>O</td><td>X</td><td>O</td><td>O</td></tr>
<tr><td>9966H</td><td>O</td><td>O</td><td>O</td><td>O</td></tr>
<tr><td>5A5AH</td><td>X</td><td>X</td><td>O</td><td>O</td></tr>
<tr><td>55AAH</td><td>X</td><td>O</td><td>O</td><td>O</td></tr>
</table>
When H9696 or H9966 is used to execute parameter all clear, the initialized items set in Section 4.6 (3) also return to the factory settings. Hence, initialization should be made again to resume operation.</td><td></td></tr>
<tr><td>8</td><td colspan="2">Parameter write</td><td>H80 to HEC</td><td rowspan="2">Write and/or read parameters as required in accordance with the instruction code and data list in Section 4.11.
Note that some parameters cannot be written or read.</td><td rowspan="2">4 digits</td></tr>
<tr><td>9</td><td colspan="2">Parameter read</td><td>H00 to H7F</td></tr>
<tr><td rowspan="2">10</td><td rowspan="2">Link parameter expansion setting</td><td>Read</td><td>H7C</td><td rowspan="2">Used to change the parameter values of H00 to H6C and H80 to HEC.
H0000: Values in Pr. 0 to Pr. 99 can be transferred.
H0001: Values in Pr. 100 to Pr. 915 can be transferred.</td><td rowspan="2">2 digits</td></tr>
<tr><td>Write</td><td>HFF</td></tr>
<tr><td rowspan="2">11</td><td rowspan="2">Second parameter switching (Code FF=1)</td><td>Read</td><td>H6C</td><td rowspan="2">In H3D to H5A and HBD to HDA (code FF=1),
H0000: running frequency
H0001: time
H0002: rotation direction
In H5E to H6A and HDE to HEA (code FF=1),
H0000: offset/gain
H0001: analog
H0002: analog value of terminal</td><td rowspan="2">4 digits</td></tr>
<tr><td>Write</td><td>HEC</td></tr>
</table>

Note: HFF (HFF=0, 1), HEC (HFF=1) and HF3 (HFF=0, 1) are "0 at power on", "held after write", and "0 at all clear".

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4.11 Data Code List

(1) Standard parameters [Link parameter expansion setting (data code 7F) = 0]

Parameter No.	Function	Data Code		Setting Range	Minimum Increment	Initial Setting
		Read	Write			
0	Torque boost (manual)	00	80	0 to 30%	0.1%	6/3%
1	Max. frequency limit	01	81	0 to 120Hz	0.01Hz	120Hz
2	Min. frequency limit	02	82	0 to 120Hz	0.01Hz	0Hz
3	Base frequency	03	83	0 to 400Hz	0.01Hz	60Hz
4	Multi-speed setting (high speed)	04	84	0 to 400Hz	0.01Hz	60Hz
5	Multi-speed setting (middle speed)	05	85	0 to 400Hz	0.01Hz	30Hz
6	Multi-speed setting (low speed)	06	86	0 to 400Hz	0.01Hz	10Hz
7	Acceleration time	07	87	0 to 3600 seconds/ 0 to 360 seconds	0.1/0.01 seconds	5/15 seconds
8	Deceleration time	08	88	0 to 3600 seconds/ 0 to 360 seconds	0.1/0.01 seconds	5/15 seconds
9	Electronic thermal relay	09	89	0 to 500A	0.01A	Rated value
10	DC dynamic brake frequency	0A	8A	0 to 120Hz, 9999	0.01Hz	3Hz
11	DC dynamic brake time	0B	8B	0 to 10 seconds , 8888	0.1 seconds	0.5 seconds
12	DC dynamic brake voltage	0C	8C	0 to 30%	0.1%	6/3%
13	Starting frequency	0D	8D	0 to 60Hz	0.01Hz	0.5Hz
14	Load pattern selection	0E	8E	0, 1, 2, 3, 4, 5	1	0
15	Jog frequency	0F	8F	0 to 400Hz	0.01Hz	5Hz
16	Jog acceleration/deceleration time	10	90	0 to 3600 seconds/ 0 to 360 seconds	0.1/0.01 seconds	0.5 seconds
17	External thermal relay signal input	11	91	0, 1, 2, 3	1	0
18	High-speed maximum frequency limit	12	92	120 to 400Hz	0.01Hz	120Hz
19	Base frequency voltage	13	93	0 to 1000V, 9999, 8888	0.1V	9999
20	Acceleration/deceleration reference frequency	14	94	1 to 400Hz	0.01Hz	60Hz
21	Acceleration/deceleration time unit	15	95	0, 1	1	0
22	Stall prevention level	16	96	0 to 200%, 9999	0.1%	150%
23	Stall prevention level compensation factor for double speed	17	97	0 to 200%, 9999	0.1%	9999
24	Multi-speed setting (4th)	18	98	0 to 400Hz, 9999	0.01Hz	9999
25	Multi-speed setting (5th)	19	99	0 to 400Hz, 9999	0.01Hz	9999
26	Multi-speed setting (6th)	1A	9A	0 to 400Hz, 9999	0.01Hz	9999
27	Multi-speed setting (7th)	1B	9B	0 to 400Hz, 9999	0.01Hz	9999
28	Multi-speed input correction	1C	9C	0, 1	1	0
29	Acceleration/deceleration pattern	1D	9D	0, 1, 2, 3	1	0

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[Link parameter expansion setting (data code 7F) = 0]

Parameter No.	Function	Data Code		Setting Range	Minimum Increment	Initial Setting
		Read	Write			
30	Regenerative brake duty change selection	1E	9E	0, 1	1	0
31	Frequency jump 1A	1F	9F	0 to 400Hz, 9999	0.01Hz	9999
32	Frequency jump 1B	20	A0	0 to 400Hz, 9999	0.01Hz	9999
33	Frequency jump 2A	21	A1	0 to 400Hz, 9999	0.01Hz	9999
34	Frequency jump 2B	22	A2	0 to 400Hz, 9999	0.01Hz	9999
35	Frequency jump 3A	23	A3	0 to 400Hz, 9999	0.01Hz	9999
36	Frequency jump 3B	24	A4	0 to 400Hz, 9999	0.01Hz	9999
37	Speed display	25	A5	2 to 10, 11 to 9998	1	4
38	Automatic torque boost	26	A6	0 to 200%	0.1%	0
39	Automatic torque boost starting current	27	A7	0 to 500A	0.01A	0
40	Output terminal assignment	28	A8	0 to 9999	1	1234
41	Up to frequency sensitivity	29	A9	0 to 100%	0.1%	10%
42	Output frequency detection	2A	AA	0 to 400Hz	0.01Hz	6Hz
43	Output frequency detection during reverse operation	2B	AB	0 to 400Hz, 9999	0.01Hz	9999
44	Second acceleration/deceleration time	2C	AC	0 to 3600 seconds/ 0 to 360 seconds	0.1/0.01 seconds	5 seconds
45	Second deceleration time	2D	AD	0 to 3600 seconds/ 0 to 360 seconds, 9999	0.1/0.01 seconds	9999
46	Second torque boost	2E	AE	0 to 30%, 9999	0.1%	9999
47	Second V/F (base frequency)	2F	AF	0 to 400Hz, 9999	0.01Hz	9999
48	Second stall prevention current	30	B0	0 to 200%	0.1%	150%
49	Second stall prevention frequency	31	B1	0 to 400Hz	0.01Hz	0
50	Second output frequency detection	32	B2	0 to 400Hz	0.01Hz	30Hz
51	Inverter LED display data selection	33	B3	1 to 14, 17, 18	1	1
52	PU main display data selection	34	B4	0, 17 to 20, 23, 24	1	1
53	PU level display data selection	35	B5	0 to 3, 5 to 14, 17, 18	1	1
54	FM terminal function selection	36	B6	1 to 3,6 to 14, 17,18,21,101 to 103,112 to 114, 117,118,121	1	1
55	Frequency monitoring reference	37	B7	0 to 400Hz	0.01Hz	60Hz
56	Current monitoring reference	38	B8	0 to 500A	0.01A	Rated value

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[Link parameter expansion setting (data code 7F) = 0]

Parameter No.	Function	Data Code		Setting Range	Minimum Increment	Initial Setting
		Read	Write			
57	Coasting time for automatic restart	39	B9	0 to 5 seconds, 9999	0.1 seconds	9999
58	Automatic restart time	3A	BA	0 to 5 seconds	0.1 seconds	1.0 seconds
59	Remote setting function selection	3B	BB	0, 1, 2	1	0
60	Intelligent mode selection	3C	BC	0 to 6	1	0
61	Reference current	3D	BD	0 to 500A, 9999	0.01A	9999
62	Current reference value for acceleration	3E	BE	0 to 200%, 9999	0.1%	9999
63	Current reference value for deceleration	3F	BF	0 to 200%, 9999	0.1%	9999
64	Starting frequency for elevator mode	40	C0	0 to 10Hz, 9999	0.01Hz	9999
65	Retry selection	41	C1	0 to 5	1	0
66	Stall prevention reduction starting frequency	42	C2	0 to 400Hz	0.01Hz	60Hz
67	Number of retries at alarm occurrence	43	C3	0 to 10	1	0
68	Retry waiting time	44	C4	0 to 10 seconds	0.1 seconds	1 seconds
69	Retry count display erase	45	C5	0	–	0
70	Special regenerative brake duty	46	C6	0 to 15%/ 0 to 30%/0%	0.1%	0
71	Motor driven	47	C7	0 to 6, 13 to 16, 20	1	0
72	PWM frequency selection	48	C8	0.7to 14.5KHz	0.1KHz	14.5KHz
73	0-5V, 0-10V selection	49	C9	0 to 5, 10 to 15	1	1
74	Input filter constant	4A	CA	0 to 8	1	1
75	Reset selection/PU disconnection selection	4B	CB	0, 1, 2, 3	1	0
76	Alarm code output selection	4C	CC	0, 1, 2, 3	1	0
77	Parameter write prohibition	–	–	0, 1, 2	1	0. Must not be set.
78	Reverse prevention	4E	CE	0, 1, 2	1	0
79	Operation mode selection	–	–	0 to 5, 7, 8	1	0. Must not be set.
80	Motor capacity	50	D0	0.4 to 55kW, 9999	0.01kW	9999
81	Number of motor poles	51	D1	2, 4, 6, 12, 14, 16, 9999	1	9999
83	Rated motor voltage	53	D3	0 to 1000V	0.1V	200V
84	Rated motor frequency	54	D4	50 to 120Hz	0.01Hz	60Hz
86	Exciting current low-speed magnification	56	D6	0 to 1000%	0.1%	100%
88	q axis control gain	58	D8	0 to 1000%	0.1%	100%
89	Speed control gain	59	D9	0 to 1000%	0.1%	100%
90	Motor constant R1	5A	DA	0 to , 9999	–	9999
91	Motor constant R2	5B	DB	0 to , 9999	–	9999

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[Link parameter expansion setting (data code 7F) = 0]

Parameter No.	Function		Data Code Read	Data Code Write	Setting Range	Minimum Increment	Initial Setting
92	Motor constant L1		5C	DC	0 to , 9999	–	9999
93	Motor constant L2		5D	DD	0 to , 9999	–	9999
94	Motor constant X		5E	DE	0 to , 9999	–	9999
96	Auto tuning setting/state		60	E0	0, 1, 101	1	0
–	Second parameter switching		6C	EC	00, 01, 02		00
–	Frequency setting	Output frequency setting (RAM)	6D	ED	0 to 400Hz	0.01Hz	0Hz
–	Frequency setting	Output frequency setting (E^2PROM)	6E	EE	0 to 400Hz	0.01Hz	0Hz
–	MONITOR	Frequency monitor	6F	-	0 to 400Hz	0.01Hz	
–	MONITOR	Output current monitor	70	-	0 to 500A	0.01A	
–	MONITOR	Output voltage monitor	71	–	0 to 1000V	0.1V	
–	MONITOR	Special monitor	72	–			
–	MONITOR	Special monitor selection No.	73	F3	1 to 14	1	1
–	Alarm display	Most recent No. 1, No. 2/alarm display clear	74	F4	9696H		
–	Alarm display	Most recent No. 3, No. 4	75	–			
–	Alarm display	Most recent No. 5, No. 6	76	–			
–	Alarm display	Most recent No. 7, No. 8	77	–			
–	Inverter status monitor/operation command		7A	FA	00 to FF		
–	Operation mode acquisition		7B	FB	0, 1, 2 (2 must not be set.)		
–	Parameter all clear		–	FC	9696H, 9966H, 5A5AH, 55AAH		
–	Inverter reset		–	FD	9696H		
–	Link parameter expansion setting		7F	FF	0: Pr. 0 to 99, 1: Pr. 100 to 915	1	0

Note: 1. Set 65535 (HFFFF) for the set value 9999 and set 65520 (HFFF0) for 8888.
2. Pr. 86 to 94 may only be displayed and set when "801" is set in Pr. 77 from the PU.
3. The factory setting of the FR-A240E (400V) series is 400V.

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(2) Special parameters [Link parameter expansion setting (data code 7F) = 1]

Parameter No.	Function	Data Code		Setting Range	Minimum Increment	Initial Setting
		Read	Write			
105	Speed feedback range	05	85	0 to 400Hz, 9999	0.01Hz	9999
106	Feedback gain	06	86	1 to 100	0.1	1.0
117	Encoder rotation direction	11	91	0, 1	1	1
118	Communication speed	–	-	3 to 192	1	96
119	Stop bit length	–	-	0, 1, 10, 11	1	1
120	Parity check	–	-	0, 1, 2	1	2
121	Number of communication retries	15	95	0 to 10	1	1
122	Communication check time interval	16	96	0 to 999.8 seconds, 9999	0.1 seconds	0
123	Operation command right	17	97	0, 1	1	0
124	Speed command right	18	98	0, 1	1	0
125	Link start-up mode selection	–	-	0, 1, 2	1	0
126	CR, LF code selection	–	-	0, 1, 2	1	1
127	Setting of E^2PROM write by PC link/computer link	1B	9B	0, 1	1	0
145	Parameter unit language switching	2D	AD	0 to 3	1	0
155	RT activated condition	37	B7	0, 10	1	0
156	Stall prevention selection	38	B8	0 to 31, 100	1	0
157	OL signal waiting time	39	B9	0 to 25 seconds, 9999	0.1 seconds	0
158	AM terminal function selection	3A	BA	1 to 3, 5 to 14, 17, 18, 21, 9999	1	9999
159	Carrier decrease selection at low speed	3B	BB	0, 1, 2, 3	1	0
200	Program minute/second selection	3C	BC	0, 1	1	0
201	Program setting 1	3D	BD	0 to 2 for rotation direction 0 to 400.0Hz, 9999 for frequency 0 to 99.59 for time	1 0.1Hz 0.01	0 9999 0
202	Program setting 2	3E	BE			
203	Program setting 3	3F	BF			
204	Program setting 4	40	C0			
205	Program setting 5	41	C1			
206	Program setting 6	42	C2			
207	Program setting 7	43	C3			
208	Program setting 8	44	C4			
209	Program setting 9	45	C5			
210	Program setting 10	46	C6			
211	Program setting 11	47	C7			
212	Program setting 12	48	C8			
213	Program setting 13	49	C9			
214	Program setting 14	4A	CA			
215	Program setting 15	4B	CB			
216	Program setting 16	4C	CC			
217	Program setting 17	4D	CD			
218	Program setting 18	4E	CE			
219	Program setting 19	4F	CF			
220	Program setting 20	50	D0			

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[Link parameter expansion setting (data code 7F) = 1]

Parameter No.	Function		Data Code		Setting Range	Minimum Increment	Initial Setting
			Read	Write			
221	Program setting 21		51	D1			
222	Program setting 22		52	D2			
223	Program setting 23		53	D3			
224	Program setting 24		54	D4			
225	Program setting 25		55	D5			
226	Program setting 26		56	D6			
227	Program setting 27		57	D7			
228	Program setting 28		58	D8			
229	Program setting 29		59	D9			
230	Program setting 30		5A	DA			
231	Time of day setting		5B	DB	0 to 99.59	0.01	0
900	FM terminal calibration		5C	DC	0 to 4096	1	Not defined
901	AM terminal calibration		5D	DD	0 to 4096	1	255
902	Frequency setting voltage bias		5E	DE	0 to 60.00Hz (0 to 4096)	0.01Hz	0
903	Frequency setting voltage gain		5F	DF	1 to 400.00Hz (0 to 4096)	0.01Hz	60Hz
904	Frequency setting current bias		60	E0	0 to 60.00Hz (0 to 4096)	0.01Hz	0
905	Frequency setting current gain		61	E1	1 to 400.00Hz (0 to 4096)	0.01Hz	60Hz
–	Second parameter switching		6C	EC	00, 01, 02		00
–	Frequency setting	Output frequency (RAM)	6D	ED	0 to 400Hz	0.01Hz	0Hz
–	Frequency setting	Output frequency (E^2ROM)	6E	EE	0 to 400Hz	0.01Hz	0Hz
–	MONITOR	Frequency monitor	6F	-	0 to 400Hz	0.01Hz	
–	MONITOR	Output current monitor	70	-	0 to 500A	0.01A	
–	MONITOR	Output voltage monitor	71	–	0 to 1000V	0.1V	
–	MONITOR	Special monitor	72	–			
–	MONITOR	Special monitor selection No.	73	F3	1 to 14	1	1
–	Alarm display	Most recent No. 1, No. 2/alarm display clear	74	F4	9696H		
–	Alarm display	Most recent No. 3, No. 4	75	–			
–	Alarm display	Most recent No. 5, No. 6	76	–			
–	Alarm display	Most recent No. 7, No. 8	77	–			
–	Inverter status operation command		7A	FA	00 to FF		
–	Operation mode acquisition (write)		7B	FB	0, 1, 2 (2 must not be set)		0
–	Parameter all clear		–	FC	9696H, 9966H, 5A5AH, 55AAH		
–	Inverter reset		–	FD	9696H		
–	Link parameter expansion setting		7F	FF	0: Pr. 0 to 99, 1: Pr. 100 to 915	1	0

Note: Set 65535 (HFFFF) for the set value 9999 and set 65520 (HFFF0) for 8888.

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4.12 Error Code List

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

Error Code	Item	Definition	Inverter Operation
H0	Computer NAK error	The number of errors consecutively detected in communication request data from the computer is greater than the allowed number of retry times.	Brought to an alarm stop (E. OPT) if error occurs continuously more than the allowable number of retry times.
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	Data received by the inverter is in wrong protocol, data receive is not completed within given time, or CR and LF are not as set in the parameter.	
H4	Framing error	The stop bit length is not as specified by initialization.	
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 receive data but is not brought to alarm stop.
H8	–	—	–
H9	–	—	–
HA	Mode error	Parameter write was attempted in other than the computer link operation mode or during inverter operation.	Does not accept receive data but is not brought to alarm stop.
HB	Instruction code error	The specified command does not exist.	
HC	Data range error	Invalid data has been specified for parameter write, frequency setting, etc.	
HD	–	—	–
HE	–	—	–
HF	–	—	–

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4.13 ASCII Code List

ASCII codes

→ Upper 4 bits

: Indicates codes used often.

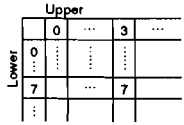
Lower 4 bits ↓

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL	TC1 (DLE)	(SP)	0	@	P	`	p								
1	TC1 (SOH)	DC1	!	1	A	Q	a	q								
2	TC2 (STX)	DC2	"	2	B	R	b	r								
3	TC3 (ETX)	DC3	#	3	C	S	c	s								
4	TC4 (EOT)	DC4	$	4	D	T	d	t								
5	TC5 (ENQ)	TC8 (NAK)	%	5	E	U	e	u								
6	TC6 (ACK)	TC9 (SYN)	&	6	F	V	f	v								
7	BEL	TC10 (ETB)	'	7	G	W	g	w								
8	FE0 (BS)	CAN	(	8	H	X	h	x								
9	FE1 (HT)	EM	)	9	I	Y	i	y								
A	FE2 (LF)	SUB	*	:	J	Z	j	z								
B	FE2 (VT)	ESC	+	;	K	[	k	{								
C	FE4 (FF)	IS4 (FS)	,	<	L	¥	l	|								
D	FE5 (CR)	IS3 (GS)	—	=	M	]	m	}								
E	SO	IS2 (RS)	.	>	N	^	n	—								
F	SI	IS1 (US)	/	?	O	_	o	DEL								

Example: The ASCII code H 3 7 is converted into 7.

Upper 4 bits

Lower 4 bits



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4.14 Specifications

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

(2) Conforming standard
- Shared between RS422 and RS485 (EIA standard)

(3) Transmission form
- Multidrop link system

(4) Communication cable
- Twisted pair cable

(5) Transmission distance
- Max. 500m overall

(6) Number of inverters connected
- Up to 10 inverters for RS422 computer interface
- Up to 32 inverters for RS485 computer interface

(7) Applicable computer
- Computer with RS422 or RS485 interface *1

(8) Applicable inverter
- All models of the FR-A200E series inverters

(9) Communication specifications

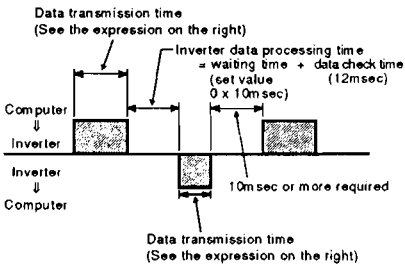
Item		Specifications
Communication speed		19200/9600*2/4800/2400/1200/600/300 baud rates selected.
Inverter response time		Time between the start of computer communication and the start of control (e.g. start, stop) by the inverter.

Communication speed (baud)	19200	9600	4800	2400	1200	600	300
Response time (msec)	Approx. 12	Approx. 17	Approx. 26	Approx. 45	Approx. 82	Approx. 157	Approx. 307

Inverter response time		Depends on communication speed.
Control procedure		Synchronous system
Communication system		Half duplex system
Character system		ASCII (7 bits/8 bits) selected.
Stop bit length		1/2*2 bits selected.
Check system	Parity check	Available (even*2/odd)/unavailable
	Sum check	Available

*1. A computer with RS232C interface is also applicable by using a converter.
*2. Factory setting

10)



[Expression for data transmission time calculation]

$$\frac{1}{\text{Communication speed (Baud rate)}} \times \text{number of data characters (See Section 4.5)} \times \text{communication specifications * (total number of bits)} = \text{Data transmission time (sec)}$$

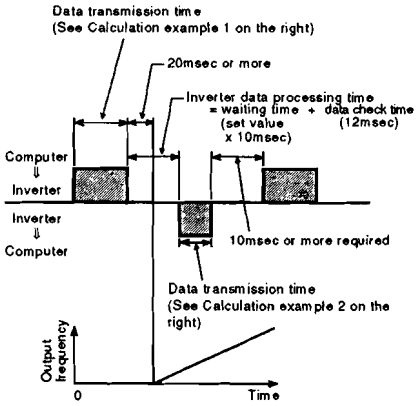
* Communication specifications (See the following table)

Name	Number of Bits	Name		Number of Bits
Stop bit length	1 bit	Parity check	Yes	1 bit
	2 bits		No	0
Data length	7 bits	CR, LF instructions	Yes	8 bits
	8 bits		No	0

Minimum total number of bits...8 bits, maximum total number of bits...16 bits

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- Example: Response time required when forward (reverse) rotation command is given through communication



<Calculation example 1>

1) Baud rate = 9600, number of data characters = 10, stop bit length = 2 bits, data length = 8 bits, parity check = yes, CR, LF instructions = yes

$$\frac{1}{9600} \times 10 \times 12 = 0.0125\text{sec (12.5msec)}$$

2) Conditions are the same as in the above with the exception that the baud rate is 19200

$$\frac{1}{19200} \times 10 \times 12 = 0.00625\text{sec (6.25msec)}$$

3) Conditions are the same as in the above with the exception that the baud rate is 300

$$\frac{1}{300} \times 10 \times 12 = 0.4\text{sec (400msec)}$$

<Calculation example 2>

1) Baud rate = 9600, number of data characters = 3, stop bit length = 2 bits, data length = 8 bits, parity check = yes, CR, LF instructions = yes

$$\frac{1}{9600} \times 3 \times 12 = 0.00375\text{sec (3.75msec)}$$

2) Conditions are the same as in the above with the exception that the baud rate is 19200

$$\frac{1}{19200} \times 3 \times 12 = 0.001875\text{sec (1.875msec)}$$

3) Conditions are the same as in the above with the exception that the baud rate is 300

$$\frac{1}{300} \times 3 \times 12 = 0.12\text{sec (120msec)}$$

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REVISIONS

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

Print Date	*Manual Number	Revision
Feb., 1995	IB (NA)66529-A	First edition

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IB (NA) 66529-A (9502) MEE Printed in Japan

Specifications subject to change without notice.

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