

## TOSVERT VF-S9

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# Communications Function Instruction Manual

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### Notice

1. Make sure that this instruction manual is delivered to the end user of the inverter.
2. Read this manual before first using the communications function, and keep it handy as a reference for maintenance and inspections.

\* The contents of this manual are subject to change without notice.

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## Preface

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Thank you for purchasing a Tosvert VF-S9 series of inverter.

Every VF-S9 series of inverter has a communication port as standard equipment, so that data can be transmitted between it and a personal computer via an optional RS232C converter (RS2001Z) or RS485 converter (RS4001Z), cable with RS232C converter (RS20035-0).

To use the communications function of the VF-S9 correctly, please read this manual carefully before use and keep it in a safe place.

Also, make sure that this manual is stored close to the inverter so that it can be consulted anytime as a reference for maintenance and inspections.

Notice		
	<p>▼The EEPROM (Electrically Erasable Programmable Read-Only Memory) is good for 10,000 times of reprogramming.</p> <p>Unless it is absolutely necessary to store data into the EEPROM, use the P command to write data into the RAM. Do not rewrite data into the same parameter stored in the EEPROM more than 10,000 times, using the W command*.</p> <p>(*: Command allowing you to write data into both the RAM and the EEPROM).</p>	Reference 13, 14
	<p>▼Examples in this manual are based on the assumption that communications take place between one inverter and one computer.</p> <p>If connecting two or more inverters to the same network, you will need to assign a number to each of them. Failure to do so will cause a data crash and result in a communications error.</p>	7, 10

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## 1. General outlines of the communications function

The TOSVERT VF-S9 series of inverters can be connected to a computer or a controller (hereinafter referred to as the computer) for data communications via RS232C converter (RS2001Z) or RS485 converter (RS4001Z), cable with RS232C converter (RS20035-0). By writing computer programs, you can monitor the operating status of the inverter, control its operation in various ways from the computer, and change and store parameter settings on floppy disks.

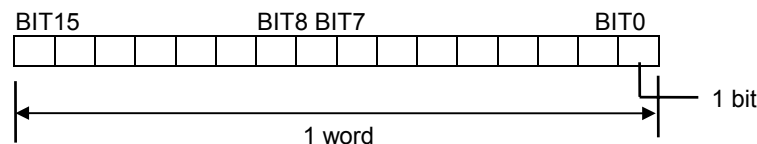
The communications function allows the transfer of the following information.

- Monitoring function (used to monitor the operating status of the inverter: Output frequency, current, voltage, etc.)
- Command function (used to issue run, stop and other commands to the inverter)
- Parameter function (used to set parameters and read their settings)
- Additional function (Timer function allowing the detection of breaks in cables)

As for data communications codes, the TOSVERT VF-S9 series of inverters support the binary (HEX) code, in addition to the JIS (ASCII) code. The communications function is designed on the assumption that the JIS (ASCII) code is used for communications between the inverter and the personal computer, and the binary (HEX) code for communications between the inverter and the microcomputer built into the controller. A communication number is used to access the desired data item.

Commands and frequency instructions from the computer have priority (over those from the operation panel or terminal board.) To take advantage of this feature, however, you need to enable the mode in which commands and frequency instructions from the computer are valid, regardless of the settings of the command mode selection parameter (*CMD*) or that of the frequency setting mode selection parameter (*FREQ*). For the way of enabling it, see 7, "Commands and monitoring from the computer."

★ The smallest unit of information that computers handle is called a "bit (binary digit)," which represents the two numbers in the binary system: 1 or 0. A group of 16 bits is referred to as a "word," which is the basic unit of information the VF-S9 series of inverters use for data communications. One word can handle data items of 0 to FFFFH in hexadecimal notation (or 0 to 65535 in decimal notation).



## 2. Data transmission specifications

Items	Specifications
Data transmission scheme	Half-duplex
Connection control scheme	Centralized control <sup>*1</sup>
Synchronization scheme	Start-stop synchronization
Communication baud rate	VF-S9: 9600 baud (Standard default setting) Selectable among 1200/2400/4800/9600/19200 baud (Operation panel/computer) <sup>*2</sup>
Data transmission code	ASCII mode: JIS-X-0201 (ASCII), fixed to 8 bits, even/odd/non parity <sup>*2</sup> and <sup>*3</sup> Binary mode: Binary (HEX) code, fixed to 8 bits, even/odd/non parity <sup>*2</sup> and <sup>*3</sup>
Error detecting scheme	Parity, checksum
Character transmission format	Receive: 11 bits <sup>*4</sup> , Send: 12 bits <sup>*4</sup>
Order of bit transmission	Low-order bits transmitted first
Frame length	Variable (to a maximum of 17 bytes)

<sup>\*1</sup>: Centralized control scheme

Control scheme in which the transmitting station (computer) controls the operation of all receiving stations (inverters) by means of information transferred between the transmitting station and the receiving stations. All inverters connected to the network act as slaves that operate on a request from the computer.

<sup>\*2</sup>: Changes to the communication baud rate and to the parity setting do not take effect until the inverter is turned back on or reset.

<sup>\*3</sup>: In ASCII mode, every message is written in 8-bit alphabetic codes conforming to JIS-X-0201 (ANSI), and transmitted with a vertical parity bit specified by JIS-X-5001 (ANSI) added to it. The parity bit, which is set to odd parity by default, can be changed to odd parity or non-parity, from either the operation panel or the computer.

<sup>\*4</sup>: Here are the default character transmission formats.

- Characters received by the inverter: 11 bits (1 start bit + 8 bits + 1 parity bit + 1 stop bit)

... Standard default setting

START BIT	BIT0	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	PARITY BIT	STOP BIT
--------------	------	------	------	------	------	------	------	------	---------------	-------------

The inverter receives one stop bit.

(The computer can be set so as to send 1, 1.5 or 2 stop bits.)

- Characters sent from the inverter: 12 bits (1 start bit + 8 bits + 1 parity bit + 2 stop bits)

... Standard default setting

START BIT	BIT0	BIT1	BIT2	BIT3	BIT4	BIT5	BIT6	BIT7	PARITY BIT	STOP BIT	STOP BIT
--------------	------	------	------	------	------	------	------	------	---------------	-------------	-------------

The inverter sends two stop bits.

(The computer can be set so as to receive 1, 1.5 or 2 stop bits.)

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### 3. Exchange of data between the computer and the VF-S9

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#### 3.1. Brief explanation of the sequence

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When an inverter is linked with a computer or when an inverter acts as a slave in inverter-to-inverter communications, it remains in wait states and acts as a slave that operates on a request from the computer or the master inverter. In inverter-to-inverter communications, the master inverter only sends data to the slave inverter(s) but not receives any data from the slave inverter(s).

A start code is used to automatically identify the mode in which data is transmitted: ASCII mode or binary mode. Inverter-to-inverter communications are carried out in binary mode. For the VF-S9 (hereinafter referred to as the inverter), the inverter-to-inverter communications function is provided only for inverters with CPU version V110 or later.

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##### ■ ASCII mode

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- (1) In ASCII mode, the start code is “(.”  
The inverter rejects all data items entered before the “(.” If two or more “(.” are entered, the “(.” entered last will be judged valid and all “(.” entered before will be ignored. If the “(.” is not recognized because of a format error or for any other reason, no error code will be returned since the data is not recognized at all. In such cases, the inverter regards the data received as a transmission error, rejects it and goes back into a start code wait state.
- (2) When an inverter number is added behind the “(.” communications will take place if the number matches up with that assigned to the inverter. If not, the inverter will go back into a start code wait state.
- (3) The inverter stops receiving data on receipt of the CR (carriage return) code inserted in the designated position. If the size of the data transmitted exceeds the maximum allowable size (17 bytes) or if the CR code cannot be found in the designated position within 1 second, the inverter will regard the data received as a transmission error and go back into a start code wait state.
- (4) If no communications take place within the time specified using the timer function, the computer will regard it as a communication error and trip the inverter. The timer setting is cleared when the timer is turned on or initialized. For details, see Section 8.1, “Timer function.”
- (5) On executing the command received, the inverter returns data to the computer. The VF-S9 series of inverters are designed to process communication data during idle time when they are not performing their main task: controlling the operation of a machine. Therefore, there is no guarantee for the response time.

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**■ Binary mode**

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- (1) In binary mode, the start code is "2FH(/)." The inverter rejects all data items entered before the "2FH(/)." If two or more "2FH(/)" are entered, the "2FH(/)" entered last will be judged valid and all "2FH(/)" entered before will be ignored. If the "2FH(/)" is not recognized because of a format error or for any other reason, no error code will be returned since the data is not recognized at all.
- (2) If an inverter number is added behind the "2FH(/)," communication will be established only when the inverter number matches. If not, the inverter will reject the data received on receiving the specified number of characters (or one second after the receipt of the data if the inverter cannot receive the specified number of characters within one second), and then it will go back into a 2FH wait state. If the inverter number does not match, the inverter will go back into a start code wait state.
- (3) The inverter stops receiving data on receipt of a command and the number of bytes of data specified by the command. If the inverter cannot receive the specified number of bytes of data within the specified time (1 second), it will regard the data received as a transmission error, reject it and go back into a start code (2FH) wait state.
- (4) If no communications take place within the time specified using the timer function, the computer will assume that a communication error has occurred and trip the inverter. The timer function is disabled when the inverter is turned on or initialized. For details, see Section 8.1, "Timer function."
- (5) On executing the command received, the inverter returns data to the computer. The VF-S9 series of inverters are designed to process communication data during idle time when they are not performing their main task: controlling the operation of a machine. Therefore, there is no guarantee for the response time.

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**■ Note**

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It takes about 1 second for the inverter to complete the initial setup process and to get ready for communications after it has been turned on.  
If control power supply is cut off because of a momentary power failure, communications will be interrupted.

## 3.2. Transmission errors

The table below lists errors that may occur during communications.

■ Table of errors

Error name	Description	Error code
Impossible to execute	The command is impossible to execute, though communication was established normally. →Writing data into a parameter whose setting cannot be changed during operation (e.g., maximum frequency) <sup>*1</sup> , writing data into a parameter while $\frac{t}{t_{UP}}$ is in progress, specifying an internal command, and so on <sup>*2</sup>	0000
Data error	Invalid data is specified.	0001
Communication number error	There is no communication number that matches.	0002
Command error	The command specified does not exist.	0003 (ASCII mode) No code returned (Binary mode)
Checksum error	The sum differs.	0004
Format error	The data transmission format does not match. A parity, overrun or framing error has occurred. <sup>*3</sup> The CR code was not received within 1 second (ASCII mode), the specified number of bytes of data were not received within 1 second (binary mode), or the communication number is of 0 to 3 digits. →For example, in the case of "(R11) CR," "11) CR" is recognized as a communication number and the data received is judged that it contains no CR code, with the result that a format error occurs.	No code returned
Inverter number error	The inverter number is of one digit. The inverter number does not match. (If the inverter number does not match, no processing will be carried out and no data will be returned, though it is not regarded as an error.)	No code returned

<sup>\*1</sup> : For parameters whose settings cannot be changed during operation, see 11.1, Table of parameters."

<sup>\*2</sup> : If a command error occurs, no data will be returned. However, if an internal command (M) is used, it will cause an impossible-to-execute error and an error code will be returned.

<sup>\*3</sup> : Parity error : The parity does not match.  
Overrun error : A new data item is entered while the data is being read.  
Framing error : The stop bit is placed in the wrong position.

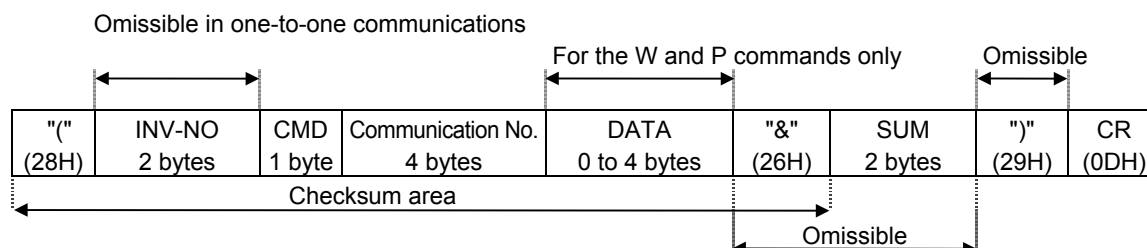


## 4. Data transmission formats

### 4.1. Data transmission formats used in ASCII mode

A communication number is used to specify a data item, all data is written in hexadecimal, and JIS-X-0201 (ASCII (ANSI))-compliant transmission characters are used.

(1) Computer → VF-S9 (ASCII mode)



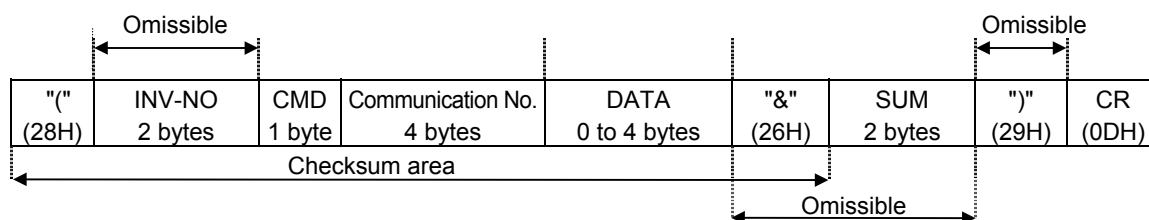
1. "(" (1 byte) : Start code in ASCII mode
2. INV-NO (2 bytes) : Inverter number (Omissible in one-to-one communications)  
... 00 (30H, 30H) to 63 (36H, 33H).  
Note: In ASCII mode, an inverter number should be specified in decimal.  
The command is executed only when the inverter number in the data received matches up with that specified from the operation panel. If the inverter number does not match or if the inverter number is of one digit, the data will be judged invalid and no data will be returned.
3. CMD (1 byte) : Command (For details, see the table below.)
4. Communication number (4 bytes) : Communication number (See 11.1, "Parameter data.")
5. Data (0 to 4 bytes) : Write data (valid for the W and P commands only)
6. "&" (1 byte) : Checksum discrimination code (omissible) When omitting this code, you also need to omit the checksum.
7. Sum (2 bytes) : Checksum (omissible)  
ASCII-coded value of the last two digits (4 bits/digit) of the sum of a series of bits (ASCII codes) from the start code to the checksum discrimination code.  
Ex.: (R0000&??) ... 28H+52H+30H+30H+30H+30H+26H=160H  
The last two digits represent the checksum. = 60  
When omitting the checksum, you also need to omit the checksum discrimination code.
8. ")" (1 byte) : Stop code (omissible)
9. CR (1 byte) : Carriage return code

#### ■ Details of commands and data

CMD (1 byte)	Write data (0 to 4 bytes) Hexadecimal number
R (52H): RAM read command	No data
W (57H): RAM/EEPROM write command	Write data (0 to FFFF)
P (50H) RAM write command	Write data (0 to FFFF)

## (2) VF-S9 → computer (ASCII mode)

## 1) When data is processed normally



1. " ( " (1 byte) : Start code in ASCII mode
2. INV-NO (2 bytes) : Inverter number ... 00 (30H, 30H) to 63 (36H, 33H)  
The command is executed only when the inverter number in the data received matches up with that specified from the operation panel. If the inverter number does not match or if the inverter number is of one digit, the data will be judged invalid and no data will be returned. (If the inverter number is omitted from the data received, it will not be returned.)
3. CMD (1 byte) : Command ... The command is also used for a check when an inverter is tripped.  
Under normal conditions..... The uppercase letter R, W or P is returned, depending on the command received: R, W or P command.  
When an inverter is tripped..... The lowercase letter r, w or p is returned, depending on the command received: R, W or P command.  
(The command received is returned with 20H added to it.)
4. Communication number : The communication number received is returned.
5. Data (4 bytes) : Data ... The data read in is returned for the R command, while the data received is returned for the W and P commands. If the data received is composed of less than 4 digits, it will be converted into 4-digit data and returned.  
Ex.: (W123412) → (W12340012)
6. "&" (1 byte) : Checksum discrimination code (omitted if it is not found in the data received)
7. Sum (2 bytes) : Checksum ... ASCII-coded value of the last two digits (4 bits/digit) of the sum of a series of bits (ASCII codes) from the start code to the checksum discrimination code.  
(If the checksum discrimination code is omitted from the data received, it will not be returned.)
8. " ) " (1 byte) : Stop code (If the stop code is omitted from the data received, it will not be returned.)
9. CR (1 byte) : Carriage return code

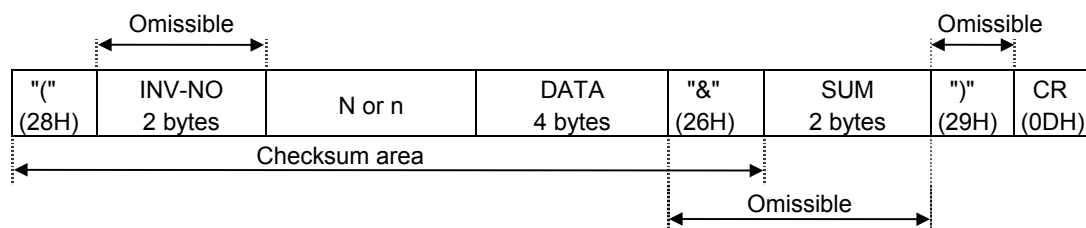
Note : If the reset command is issued, the return data may be cleared halfway through the transmission, depending on the timing.

## 2) When data is not processed normally (ASCII mode)

If a communication error occurs, a communication error command (N or n) and an error identification number will be returned to the computer.

If the checksum code is contained in the data received, it will be added to the data to be returned.

If the inverter number does not match, however, no data will be returned to avoid a data crash.



N or n (1 byte) : Communication error command ... The command is also used for a check when an inverter is tripped.

An "N" is returned under normal conditions, while an "n" is returned when the inverter is tripped.

Data (4 bytes) : Error code (0000~0004)

0000 ..... Impossible to execute (Although communication is established normally, the command cannot be executed because it is to write data into a parameter whose setting cannot be changed during operation (e.g., maximum frequency) or the EEPROM is faulty.)

0001 ..... Data error (The data is outside the specified range or it is composed of too many digits.)

0002 ..... Communication number error (There is no communication number that matches.)

0003 ..... Command error (There is no command that matches.)

0004 ..... Checksum error (The checksum result differs.)

)" (1 byte) : Stop code ... This code is omitted if it is not found in the data received.

#### ■ Examples:

(N0000&5C)<sub>CR</sub> ..... Impossible to execute (e.g., a change of maximum frequency data during operation)

(N0001&5D)<sub>CR</sub> ..... Data error (Data is outside the specified range.)

(N0002&5E)<sub>CR</sub> ..... No communication number (There is no communication number that matches.)

(N0003&5F)<sub>CR</sub> ..... There is no command that matches. (Commands other than the R, W and P commands)

(Ex.: L, S, a, b, m, r, w, t ...)

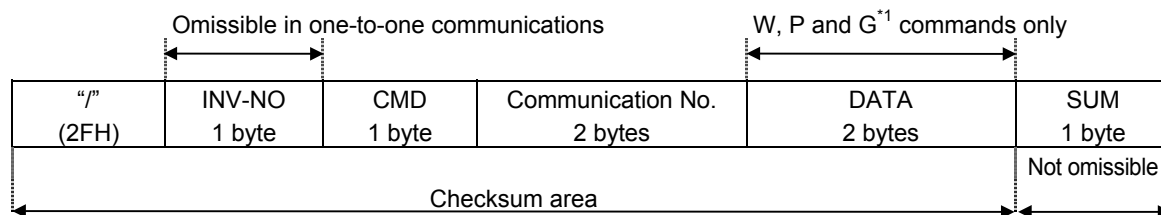
(N0004&60)<sub>CR</sub> ..... Checksum error (The checksum result differs.)

No data returned ..... Even though there is no format error (e.g., data with no CR) and the inverter number matches, there may be cases where no data is returned, depending on the timing.

## 4.2. Data transmission formats used in binary mode

A communication number is used to specify a data item, data is written in hexadecimal form, and data in transmission characters are represented by binary codes (HEX codes).

(1) Computer → VF-S9 (Binary mode)



1. 2FH ("2FH") (1 byte) : Start code in binary mode
2. INV-NO (1 byte) : Inverter number (Omissible in one-to-one communications) ... 00H to 3FH  
The command is executed only when the inverter number matches up with that specified from the operation panel.  
If the inverter number does not match, the data will be judged invalid and no data will be returned.
3. CMD (1 byte) : Command (For details, see the table below.)  
52H (R) command : The size of the data following CMD is fixed to 3 bytes.  
(Communication number: 2 bytes, checksum: 1 byte)  
57H (W), 50H (P) and 47H (G) \*1 commands :  
The size of the data following CMD is fixed to 5 bytes.  
(Communication number: 2 bytes, data: 2 bytes, checksum: 1 byte)  
Any command other than the above is rejected and no error code is returned.
4. Communication number (2 bytes) : Communication number (See 11, "Parameter data.")
5. Data (2 bytes) : Write data (valid for the 57H (W), 50H (P) and 47H (G) \*1 commands only)  
... 0000H to FFFFH (Dummy data 0000H is required for the 47H (G) \*1 command.)
6. Sum (2 bytes) : Checksum (not omissible) 00H to FFH  
Value of the last two digits (1 byte) of the sum of a series of bits (codes) from the start code of the data returned to the data (or to the communication number for the 52H (R) command)  
Ex.: 2F 52 00 00 ?? ... 2F+52+00+00=81  
The last two digits (??) represent the checksum. = 81

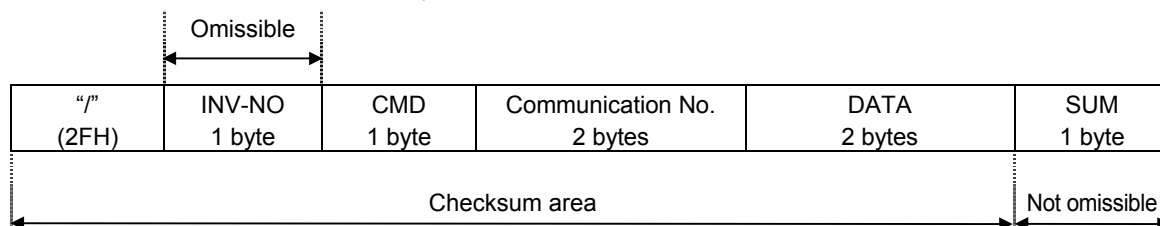
### ■ Details of commands and data

CMD (1 byte)	Write data (2 bytes) Hexadecimal number
52H (R): RAM read command	No data
57H (W): RAM/EEPROM write command	Write data (0000H to FFFFH)
50H (P): RAM write command	Write data (0000H to FFFFH)
47H (G): RAM read command	Dummy data (0000H)

\*1 : The 47H (G) command is available for inverters with CPU version V110 or later.

## (2) VF-S9 → computer (Binary mode)

## 1) When data is processed normally



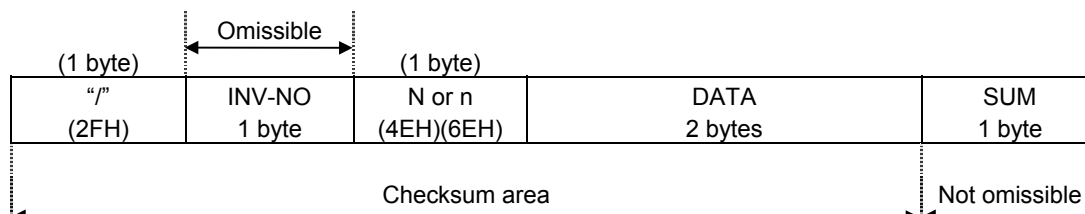
1. 2FH ("/") (1 byte) : Start code in binary mode
  2. INV-NO (1 byte) : Inverter number ... 00H to 3FH  
 The command is executed only when the inverter number in the data received matches up with that specified from the operation panel.  
 If the inverter number does not match, the data will be judged invalid and no data will be returned.  
 (If the inverter number is omitted from the data received, it will not be returned.)
  3. CMD (1 byte) : Command ... The command is also used for a check when the inverter is tripped.  
 Under normal conditions .....52H (R), 57H (W), 50H (P) or 47H (G) \*1 is returned, depending on the command received.  
 When the inverter is tripped ..... The lowercase letter 72H (r), 77H (w), 70H (p) or 67H (g) \*1 is returned with 20H added to it, depending on the command received.
  4. Communication number (2 bytes) : The communication number received is returned.
  5. Data (2 bytes) : Data ... 0000H to FFFFH  
 The data read is returned for the 52H (R) and 47H (G) commands\*1, while the data written is returned for the 57H (W) and 50H (P) commands.
  6. Sum (1 byte) : Checksum (not omissible) 00H to FFH  
 Value of the last two digits (1 byte) of the sum of a series of bits (codes) from the start code to the data.
- \*1 : The 47H (G) command is available for inverters with CPU version V110 or later.

Note : If the reset command is issued, the return data may be cleared halfway through the transmission, depending on the timing.

## 2) When data is not processed normally (Binary mode)

If a communication error occurs, a communication error command (4EH (N) or 6EH (n)), an error identification number and the checksum will be returned to the computer.

If the inverter number does not match, no data will be returned to avoid a data crash.



N or n (1 byte) : Communication error command ... This command is also used for a check when the inverter is tripped.

"4EH (N)" is returned under normal conditions, while "6EH (n)" is returned when the inverter is tripped.

Data (2 bytes) : Error code (0000~0004)

0000 .....Impossible to execute (Although communication is established normally, the command cannot be executed because it is to write data into a parameter whose setting cannot be changed during operation (e.g., maximum frequency) or the EEPROM is faulty.)

0001 .....Data error (The data is outside the specified range or it is composed of too many digits.)

0002 .....Communication number error (There is no communication number that matches.)

0004 .....Checksum error (The checksum result differs.)

No code returned.....Command error, format error (failure to receive the specified number of bytes within 1 second, or a parity, overrun or framing error) or the inverter number does not match.

#### ■ Examples:

2FH, 4EH, 00H, 00H, 7DH .... Impossible to execute (e.g., a change of maximum frequency data during operation)

2FH, 4EH, 00H, 01H, 7EH .... Data setting error (The data specified falls outside the specified range.)

2FH, 4EH, 00H, 02H, 7FH .... No communication number (There is no communication number that matches.)

2FH, 4EH, 00H, 04H, 81H..... Checksum error (The checksum result differs.)

No data returned ..... If a format error occurs (failure to receive the specified number of bytes within 1 second), if the inverter number does not match, or if a command error occurs.

## 5. Data transmission commands

### Notice

▼ The EEPROM is good for 10,000 times of reprogramming.  
Do not write data into the same parameter stored in the EEPROM more than 10,000 times. Unless it is absolutely necessary to store data in the EEPROM, use the P command to write it into the RAM.

### 5.1. Commands available in ASCII mode

#### 1) **W** (RAM<sup>\*2</sup>/EEPROM<sup>\*3</sup> write)

This command is used to rewrite data into the parameter specified using a communication number. It writes data into the RAM and EEPROM. For parameters whose settings cannot be stored in the EEPROM (e.g., parameter with the communication No. FA00), the W command writes data into the RAM only. It cannot be used to write data into read-only parameters (e.g., parameter with the communication number FD?? or FE??). All data is returned as word data. When writing data, the command checks if the data is within the adjustment range specified for the parameter (see 11, "Parameter data."). If the data entered is outside the specified range, an error will occur and the data will be rejected.

Ex. : Setting of the automatic acceleration/deceleration parameter

•Computer→S9	•S9→Computer	: Communication No. 0000	= Automatic acceleration/deceleration
(W00000)	(W00000000)	: Data 0	= Invalid

#### 2) **P** (RAM<sup>\*2</sup> write)

This command is used to rewrite data into the parameter specified using a communication number. It writes data into the RAM only. It cannot be used to write data into any read-only parameters. All data is returned as word data. When writing data, the command checks if the data is within the adjustment range specified for the parameter. If the data entered is outside the specified range, an error will occur and the data will be rejected.

Ex. : Setting of the automatic acceleration/deceleration parameter

•Computer→S9	•S9→Computer	: Communication No. 0000	= Automatic acceleration/deceleration
(P00000)	(P00000000)	: Data 0	= Invalid

#### 3) **R** (Data read)

This command is used to read the setting of the parameter specified using a communication number. All data is returned as word data (4 digits).

Ex: Setting of the automatic acceleration/deceleration parameter

•Computer→S9	•S9→Computer	: Communication No. 0000	= Automatic acceleration/deceleration
(R00000)	(R00000000)	: Data 0000	= Invalid

## 5.2. Commands available in binary mode

### 1) 57H ("W" RAM<sup>\*2</sup>/EEPROM<sup>\*3</sup> write)

This command is used to rewrite data into the parameter specified using a communication number. It writes data into the RAM and EEPROM. For parameters whose settings cannot be stored in the EEPROM (e.g., parameter with the communication No. FA00), the W (57H) command writes data into the RAM only. It cannot be used to write data into read-only parameters (e.g., parameter with the communication number FD?? or FE??). All data is returned as word data. When writing data, the command checks if the data is within the adjustment range specified for the parameter (see 11, "Parameter data."). If the data entered is outside the specified range, an error will occur and the data will be rejected.

Ex. : Setting of the automatic acceleration/deceleration parameter

•Computer → S9	•S9 → Computer:
2FH, 57H, 00H, 00H, 00H, 00H, 86H	2FH, 57H, 00H, 00H, 00H, 00H, 86H
Communication No. (2 bytes) 00H, 00H ; Automatic acceleration/deceleration,	
Data (2 bytes) 00H, 00H; Invalid	

### 2) 50H ("P" RAM<sup>\*2</sup> write)

This command is used to rewrite data into the parameter specified using a communication number. It writes data into the RAM only. It cannot be used to write data into any read-only parameters. All data is returned as word data. When writing data, the command checks if the data is within the adjustment range specified for the parameter. If the data entered is outside the specified range, an error will occur and the data will be rejected.

Ex. : Setting of the automatic acceleration/deceleration parameter

•Computer → S9	•S9 → Computer:
2FH, 50H, 00H, 00H, 00H, 00H, 7FH	2FH, 50H, 00H, 00H, 00H, 00H, 7FH
Communication No. (2 bytes) 00H, 00H ; Automatic acceleration/deceleration,	
Data (2 bytes) 00H, 00H; Invalid	

### 3) 52H ("R" RAM<sup>\*2</sup> read)

This command is used to read the setting of the parameter specified using a communication number. All data is returned as word data.

Ex. : Reading of the automatic acceleration/deceleration parameter

•Computer → S9	•S9 → Computer:
2FH, 52H, 00H, 00H, 81H	2FH, 52H, 00H, 00H, 00H, 00H, 81H
Communication No. (2 bytes) 00H, 00H ; Automatic acceleration/deceleration,	
Data (2 bytes) 00H, 00H; Invalid	

### 4) 47H ("G" RAM<sup>\*2</sup> read) \* This command is available for inverters with CPU version V110 or later.

This command is used to read the parameter data specified using a communication number. All data is returned as word data. This command is different from the 52H (R) command in that the computer requires dummy data to issue this command. To control the operation of multiple inverters connected to a two-wire line via RS485 converters, and so on, the 47H (G) command is used instead of the 52H (R) command. In a two-wire network, the host computer receives the data returned from multiple inverters simultaneously, and therefore the 47H (G) command is more suitable than the 52H (R) command. This is because, in the case of the 52H (R) command, the number of bytes (number of codes) received is different from the number of bytes returned if the data received contains operation data, while, in the case of the 47H (G) command, the number of bytes (number of codes) received is always the same as the number of bytes returned.

Ex. : Reading of the acceleration parameter

•Computer → S9	•S9 → Computer:
2FH, 47H, 00H, 09H, 00H, 00H, 7FH	2FH, 47H, 00H, 09H, 00H, 64H, E3H
Communication No. (2 bytes) 00H, 09H; acceleration	
Data (2 bytes) 00H, 64H; 10.0 seconds	

#### ■ Explanation of terms

<sup>\*2</sup> : The RAM stores data used actually for operating the inverter. All data stored in it is cleared when the power is turned off, and parameter data stored in the EEPROM is copied to the RAM each time the inverter is turned on.



<sup>\*3</sup> : The EEPROM stores parameter settings and so on used for operating the inverter. Data stored in it is retained even after the power is turned off, and it is copied to the RAM each time the inverter is turned on or reset.

## 6. Communication parameters

The communication baud rate, parity, inverter number, and communication error trip time can be changed from both the operation panel and the computer. Note that there are two types of parameters: parameters whose settings take effect immediately after the setting and parameters whose settings do not take effect until the inverter is turned back on or reset.

### (1) Communication baud rate

(Communication No.: 800, Parameter name: *F800*)

0 : 1200 bps, 1 : 1400 bps, 2 : 4800 bps

3 : 9600 bps, 4 : 19200 bps

- The same baud rate should be specified for the computer and every inverter on the network.
- The setting of this parameter does not take effect until the power is turned back on.
- If different baud rates are specified for the computer and an inverter, data received from one of them will be rejected by the other.

### (2) Parity (Communication No.: 801, Parameter name: *F801*)

0 : Non parity, 1 : Even parity, 2 : Odd parity

- The same parity should be specified for the computer and every inverter on the network.
- The setting of this parameter does not take effect until the power is turned back on.
- If the parity does not match, the data received will be rejected.

### (3) Inverter number (Communication No.: 802, Parameter name: *F802*)

CPU version V101: Selectable from among 0 to 63

CPU version V110 or later: Selectable from among 0 to 255

(The inverter numbers you can select are between 0 and 99 in ASCII mode, and between 0 and 63 in binary mode. Numbers 100 to 255 are provided as bus options.)

- A different inverter number should be assigned to each inverter on the network.
- The setting of this parameter takes effect immediately.
- If the inverter number does not match, the data received will be rejected.

### (4) Communication error trip time

(Communication No.: 803, Parameter name: *F803*)

0 : No trip, Adjustable within a range of 0 to 100 (1 = Approx. 1.2 sec.)

- Communication error trip time can be set for each individual inverter on the network.
- The setting of this parameter takes effect immediately.
- If communication error trip time is set for an inverter, the computer will start to measure time when it first receives data from the inverter after the setting. If no data is sent from the inverter within the specified time, a communication error trip will occur. (For details, see 8.1, "Timer function.")

### (5) Send wait time setting (for V110 and later)

(Communication No.: 805, Parameter name: *F805*)

If send wait time is set for an inverter, the inverter will send data only after the send wait time or more has passed.

0 : Disabled, Adjustable within a range of 1 to 200 (1 = Approx. 10 ms)

- The setting of this parameter takes effect immediately.

## (6) Inverter-to-inverter communication setting

(For V110 and later)

(Communication No.: 806, Parameter name: *F B 0 6*)

0 : Disabled (Slave)

1 : Master (Frequency instruction)

2 : Master (Output frequency)

- Only one inverter should be designated as the master.

If two or more inverters on the same network are designated as masters, communications will not take place normally because of a data crash.

- To enable this parameter, the frequency setting mode parameter FMOd needs to be set to 3.
- The setting of this parameter does not take effect until the inverter is turned on or reset.

## 7. Commands and monitoring from the computer

Across the network, instructions (commands and frequency instructions) can be sent to each inverter and the operating status of each inverter can be monitored.

### 7.1. Communication commands (commands from the computer)

The VF-S9 series of inverters give priority to commands and frequency instructions entered from the computer across the network. For this reason, they have the mode of enabling commands and frequency instructions entered across the network, regardless of the setting of the command mode selection parameter ( $\text{CND}$ ) enabling commands from the operation panel or terminal board, or the setting the frequency setting mode selection parameter ( $\text{FND}$ ) enabling frequency instructions entered using the internal potentiometer, operation panel or terminal board.

To enable communication commands (commands from the computer), set bit 15 of the communication No. FA00 parameter to 1 (enabled), and to enable frequency instructions from the computer, set bit 14 of the communication No. FA00 parameter to 1 (enabled). Once priority is given to commands and frequency instructions from the computer, they have priority until they are disabled manually (bit 15 of the communication No. FA00 parameter: 0), or until the inverter is turned off or reset, or until the inverter is reset to the standard default settings ( $\text{LSP}$ ).

#### (1) Communication commands (commands from the computer)

(Communication No. FA00: Communication command)

Table 1 below shows the bit composition of the communication No. FA00 parameter.

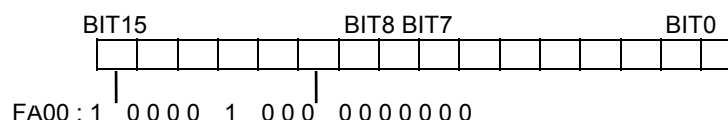
To enable commands from the computer, turn on bit 15 of the FA00. The setting of this parameter is valid regardless of the setting of the command mode selection parameter ( $\text{CND}$ ). The setting of the FA00 cannot be stored in the EEPROM. To write data into the FA00, therefore, use the P command (RAM write command).

Table 1 Data composition of communication commands (communication No.: FA00)

Bit	Specifications	0	1
15	Communication command enabled	Disabled	Enabled
14	Communication frequency instruction enabled	Disabled	Enabled
13	Reset	OFF	Reset
12	Emergency stop	OFF	Emergency stop
11	Coast stop	OFF	Coast stop
10	Run/stop	Stop	Run
9	Forward/reverse run	Forward run	Reverse run
8	Jog run	OFF	Jog run
7	DC braking	OFF	DC braking
6	Acceleration/deceleration pattern selection (1 or 2)	Acceleration 1	Deceleration 2
5	PI control	PI control permitted	PI control prohibited
4	Switching to No. 2 electronic-thermal	No. 1 electronic-thermal	No. 2 electronic-thermal
3	Preset-speed operation frequencies 4	OFF	ON
2	Preset-speed operation frequencies 3	OFF	ON
1	Preset-speed operation frequencies 2	OFF	ON
0	Preset-speed operation frequencies 1	OFF	ON

Ex.: Forward run command (PFA008400)

Set bit 15 (communication command enabled) to bit 10 (operation command) to 1.



Ex.: Reverse run (PFA008600), (PFA00C600)

8600H : To disable frequency instructions from the computer

C600H : To enable also frequency instructions from the computer

Ex.: Slowdown stop (PHA008000), (PFA00C0000)

8000H : To disable frequency instructions from the computer

C000H : To enable also frequency instructions from the computer

Note : If the reset command is executed, the reset program may start and abort the transmission of return data.

## (2) Frequency setting from the computer

(Communication No. FA01: Communication frequency)

To enable frequency instructions from the computer, turn on bit 14 of the FA00. The setting of bit 14 of the FA00 (enabling frequency instructions from the computer) is valid regardless of the setting of the frequency setting mode selection parameter (*F70d*).

To set operation frequencies from the computer, using the FA01, use hexadecimal numbers (unit: 1 = 0.01 Hz (unit)). The setting of the FA01 cannot be stored in the EEPROM. To write data into the FA01, therefore, use the P command (RAM write command).

Ex.: Instruction for an operation frequency of 80 Hz (PFA011F40)

80 Hz = 80 / 0.01 = 8000 = 1F40H

## (3) TYP processing from the computer (Communication No. 0007: TYP)

Like other operation parameters, this parameter can be set independently of the setting of the command mode selection parameter. Use the communication No. 0007 parameter to write data.

VF-S9: 1 to 6

If you use the P command (RAM write command), the change you made to this parameter will not affect the setting of the parameter you made last from the operation panel, since the setting of the parameter that was made from the operation panel is read from the EEPROM into the RAM each time the inverter is turned on. To store the setting of this parameter in the EEPROM, therefore, you need to use the W command (RAM/EEPROM write command).

Note : When *EEP* processing is carried out, the reset program may start and abort the transmission of return data. Therefore, communications do not take place during initialization.

## 7.2. Monitoring from the computer

### (1) Status monitor

The parameters with the communication Nos. FC90 and FE00 to FE14 allow you to monitor the operating status of the inverter.

(See 11.1, "Table of parameters.")

- 1) Operation frequency monitor : Communication No. FE00

If a trip occurs, the frequency immediately before its occurrence will be retained.

If you want to always monitor the current operation frequency without retaining the frequency immediately before the occurrence of a trip, use the communication No. FD00 parameter.

- 2) Inverter operating status : Communication No. FE01 (See Table 2 below.)

If a trip occurs, the operating status immediately before its occurrence will be retained.

- 3) Past trip codes : Communication Nos. FE10 to FE13

(See 11.2, "Table of trip codes.")

To monitor the current trip code, use the communication No. FC90 parameter.

- 4) Input terminal : Communication No. FE06 (See Table 3.)

- 5) Output terminal : Communication No. FE07 (See Table 4.)

### (2) Others

For the settings of parameters, see 11.1, "Table of parameters.")

Table 2 Data composition of inverter operating status (FE01)

Bit	Specifications	0	1
15	(Reserved)	—	—
14	(Reserved)	—	—
13	(Reserved)	—	—
12	Emergency stop	—	Emergency stop
11	Coast stop	—	Coast stop
10	Run/stop (See Note 1.)	Stop	Run
9	Forward/reverse run	Forward run	Reverse run
8	Jog run	—	Jog run
7	DC braking	—	DC braking
6	Acceleration/deceleration pattern selection (1 or 2)	Acceleration/deceleration 1 pattern	Deceleration/deceleration 2 pattern
5	PI control	PC control permitted	PI control prohibited
4	Switching to No. 2 electronic-thermal	No. 1 electronic-thermal	No. 2 Electronic-thermal
3	(Reserved)	—	—
2	(Reserved)	—	—
1	(Reserved)	—	—
0	(Reserved)	—	—

Note 1 : DC braking at the end of operation is regarded as part of operation.

\* Terminal board monitor

A function can be selected for each terminal, using a parameter. Before monitoring the status of a terminal, check what function is assigned to it.

Table 3 Data composition of input terminals (FE06)

Bit	Terminal name	Parameter title	Function	Data when terminal is ON
0	F	<i>F 1 1 1</i>	Input terminal 1	1H
1	R	<i>F 1 1 2</i>	Input terminal 2	2H
2	RST	<i>F 1 1 3</i>	Input terminal 3	4H
3	S1	<i>F 1 1 4</i>	Input terminal 4	8H
4	S2	<i>F 1 1 5</i>	Input terminal 5	10H
5	S3	<i>F 1 1 6</i>	Input terminal 6	20H

Ex. : FE06 data when the S1 and F terminals are ON: 1H + 8H = 9H

Table 4 Data composition of output terminals (FE07)

Bit	Terminal name	Parameter title	Function	Data when terminal is ON
0	RY	<i>F 1 3 0</i>	Output terminal 1	1H
1	OUT	<i>F 1 3 1</i>	Output terminal 2	2H
2	FL	<i>F 1 3 2</i>	Output terminal 3	4H

Ex. : FE07 data when both the OUT1 and OUT2 terminals are ON: 1H + 2H = 3H

## 8. Functions

### 8.1. Timer function

The communications function of the VF-S9 series of inverters includes a communication timer function that can be used to detect breaks in cables, and so on. The timer function is designed to trip an inverter if the inverter has not received any data within the time specified using this function. (E r 5 will be displayed.)

#### ■ How to set the timer

The communication error trip time parameter (**F 8 0 3**) is set to 0 (timer off) by default.

† Timer adjustment range

About 1 sec. (01H) to about 100 sec. (64H) / Timer off (0H)

#### ■ How to start the timer

If the timer is set from the operation panel, it will start automatically the instant when communication is established for the first time after the setting.

If the timer is set from the computer, it will start automatically the instant when communication is established after the setting.

If the timer setting is stored in the EEPROM, the timer will start when communication is established for the first time after the power has been turned on.

Note that, if the inverter number does not match or if a format error occurs, preventing the inverter from returning data, the timer function will assume that no communication has taken place and will not start.

#### ■ How to disable the timer

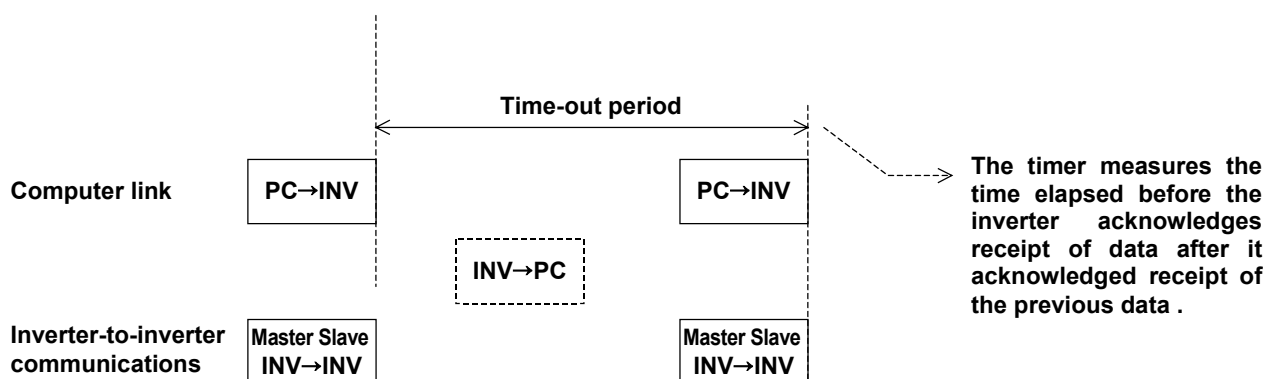
To disable the timer, set its parameter to 0.

Ex. : To disable the timer function from the computer (To store the timer setting in the EEPROM)

Computer → Inverter  
(W08030)

Inverter → Computer  
(W08030000) ..... (Sets the timer parameter to 0 to disable it.)

#### ■ Timer





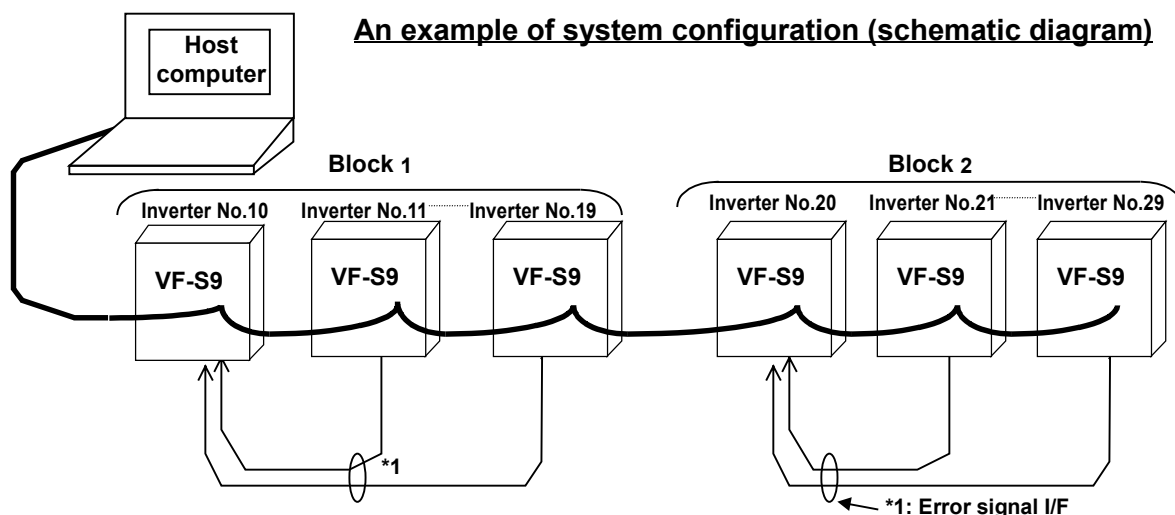
## 8.2. Broadcast communications function

The broadcast communications function enables the computer to issue a command simultaneously to (or to write data into) multiple inverters on the network.

It supports the data write commands (W and P), but not the data read commands (R and G).

As is the case with one-to-one communications, it supports up to 100 inverters bearing a number between 0 and 99 (00H to 63H) in ASCII mode, or up to 64 inverters bearing a number between 0 and 63 (00H and 3FH) in binary mode. For the return of data from inverters to the computer, the number of inverters that can return data is limited to avoid a data crash. (See the explanation below.)

If the same inverter number is assigned to two different inverters on the same network, the data returned from one inverter will crash against the data returned from the other. To avoid this, never assign the same inverter number to different inverters connected to the same network.



When sending data simultaneously to multiple inverters (broadcast communications), the host computer adds an asterisk (\*) to the inverter number of each of them in ASCII mode. This asterisk serves as a wildcard that stands for any number between 0 and 9. The asterisk is replaced by Q when data is received by each inverter, and the inverter whose number matches up with that number returns data to the computer on behalf of the other inverters. The other inverters do not return any data to the computer. Therefore, in order for the representative inverter to send a trip signal to the computer if a problem arises in the network, the failed inverter needs to provide the representative inverter with failure information using a terminal board signal. To check details of the problem, the host computer accesses each individual inverter, specifying its inverter number, when the system is out of operation. To make the computer issue a command to all inverters in block 1 or block 2 shown in the figure above, you need to specify 1\* or 2\*, respectively. In this system, inverter No. 10 in block 1 and inverter No. 20 in block 2 return data to the computer. Specifying \*\* enables broadcast communications. At that time, the inverter with the inverter number 00 returns data to the computer. The use of binary codes instead of ASCII codes reduces the number of characters to transmit, and thus further increases the data transfer rate. In that case, however, asterisks (\*) cannot be used. In binary mode, overall broadcast communications can be carried out by specifying ff instead of the number of each destination inverter. In broadcast communications in binary mode, the inverter with the inverter number 00 returns data to the computer.

\* If you set a time-out period to enable the function of tripping an inverter upon the occurrence of an abnormal condition, the inverter will output a signal through an output terminal to report the occurrence of a problem to the representative inverter.

## ■ “Overall” broadcast communications (ASCII mode/binary mode)

### ↓ ASCII mode

If you enter \*\* in the inverter number position of the data transmission format, broadcast communications will take place and the computer will issue a command to every eligible inverter\* connected to the network. (\*: Inverter with a number between 0 and 99 (00 to 63H))

### ↓ Binary mode

If you enter FF in the inverter number position of the data transmission format, broadcast communications will take place, and the computer will issue a command to every eligible inverter\* connected to the network. (\*: Inverter with a number between 0 and 63 (00 to 3FH))

<Inverter that returns data to the computer>

Data is returned from the inverter bearing the inverter number 00 only.

If you do not want inverters to return data, do not assign the number 00 to any inverter on the network.

## ■ “Group” broadcast communications (ASCII mode only)

If you put \*? in the inverter number position of the data transmission format, data will be sent simultaneously to all inverters bearing a number whose digit in the ten's place in decimal notation is ?.

If you put ?\* in the inverter number position of the data transmission format, the data will be sent simultaneously to all inverters bearing a number whose digit in the one's place in decimal notation is ?.

(?: Any number between 0 and 9.)

<Inverter that returns data to the computer>

Data is returned only from the inverter bearing the smallest number in the same group of inverters (i.e., inverter whose number in the position of \* is 0).

If you do not want inverters to return data to the computer, do not assign a number having a 0 in the position of \* to any inverter on the network.)

## ■ Examples of broadcast communications

Ex: Set the frequency setting for communication to 60Hz.

### ① Host computer → Multiple inverters: broadcast communications

\*\* (Broadcast communication symbol) + data to transmit

Example of transmission of data from computer to inverter: (\*\*W12341234)<sub>CR</sub>

Example of data returned from inverter to computer: (00W12341234)<sub>CR</sub>

Data is returned from the inverter numbered 00 only, while commands are issued to all inverters connected to the network.

### ② Host computer → A specific group of inverters: group communications (ASCII Mode)

\* (Group number (inverter number)) + data to transmit

Example of transmission of data from computer to inverters: (\*9W12341234)<sub>CR</sub>

Example of data returned from inverter to computer: (09W12341234)<sub>CR</sub>

Data is returned only the inverter numbered 09 only, while commands are issued to a maximum of 10 inverters bearing the number 09, 19, 29, 39, ... or 99.

### ③ Host computer → Multiple inverters: broadcast communications (Binary mode)

Example of transmission of data from computer to inverters: 2F FF 50 FA 01 17 70 00

Example of data returned from inverter to computer: 2F 00 50 FA 01 17 70 01

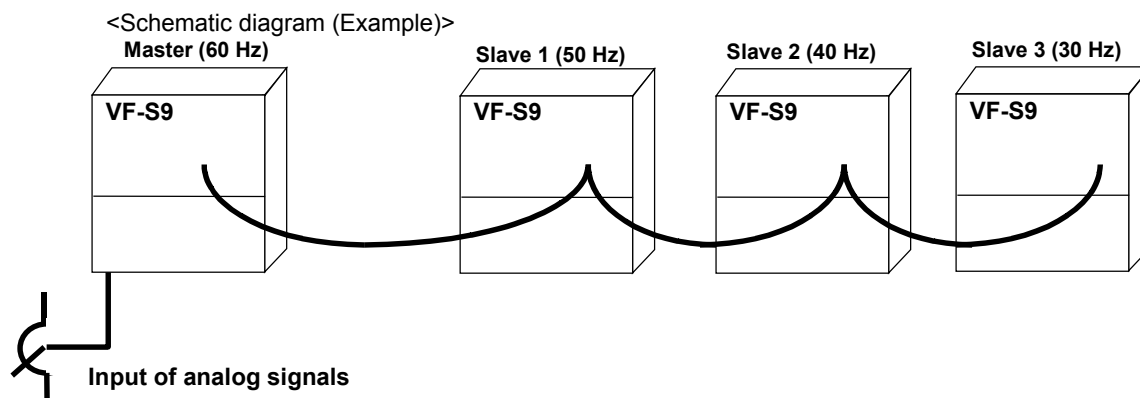
Data is returned only the inverter numbered 00.

Commands are transmitted all enable inverters.

### 8.3. Inverter-to-inverter communications function (For V110 and later)

The inverter-to-inverter communications function can be used to perform the proportional-speed control of multiple inverters without using a host computer, such as a PLC or a PC. In inverter-to-inverter communications, commands are entered from the operation panel of the master inverter or by means of analog signals.

The inverter-to-inverter communications function allows you to make the master inverter repeatedly send the data you selected using a parameter to every slave inverter on the network. The master inverter gives instructions to the slave inverters, using the S command, but the slave inverters return no data to the master inverter. Using this function, you can establish a network that allows the simple synchronized control and proportional-speed control of multiple inverters.



#### ■ Parameter settings

Designate one inverter as the master and the other inverters on the network as slaves.

\* If you designate two or more inverters connected to the same line as masters, a data crash will result. To avoid this, do not specify more than one inverter as the master.

#### ● Inverter-to-inverter communication selection parameter ( $F805$ ) ..... default setting = $0$ (Slave)

‡ Setting for the master inverter

From between  $1$  and  $2$ , choose the data to be sent from the master to its slaves. ( $1$ : Frequency instruction,  $2$ : Output frequency)

‡ Setting for the slave inverters

Select "Slave operation" (=  $0$  ... default setting).

\* The setting of this parameter does not take effect until the inverter is turned off, then turned back on.

#### ● Speed command selection parameter ( $F00d$ ) ..... default setting = $2$ : Internal potentiometer

Using the  $F00d$  parameter, specify the controller through which you want to issue speed commands to the inverters.

‡ Setting for inverters other than the master inverter

Select "Not serial communication" ( $F00d \neq 3$ ).

‡ Setting for the slave inverters

Select "Serial communication" ( $F00d = 3$ ).

## Notes:

- Set a send wait time for the master inverter. (F805)
- The master inverter issues operation speed commands to the slave inverters, but it does not send run/stop signals. Therefore, you need to set run and stop signals for each slave inverter or set the parameters for starting and stopping each slave inverter according to the frequency standard (F241: Operation starting frequency, F242: Operation starting frequency hysteresis, F243: Operation stopping frequency). In addition, if an interface cable breaks, the slave inverters will not stop but continue to operate according to the instruction they received last. Therefore, you should also set a communication trip time (F803) so that, if an interface cable breaks, communications will be cut off to trip the slave inverters. The master inverter will not trip even if an interface cable breaks. So if you want to trip it, you will have to interlock the master inverter with the slave inverters, using FL failure relay contacts.

## ■ Related communication parameters

Set or change the following parameters, as required.

● Communication baud rate (F800) ... default setting = 3: 9600 bps

Specify the same baud rate for every inverter (both the master and the slaves) on the network.

● Parity (F801) ... default setting = 1: Even parity

Specify the same parity for every inverter (both the master and the slaves) on the network.

● Send wait time (F805) ... default setting = 0

Slaves may fail to receive data from the master, depending on the load condition or the baud rate. If this happens to your inverters, you should set a send wait time for the master inverter.

(Guide for setting: 0.01 to 0.03 sec. (10 to 30 ms))

● Time-out period (F803) ... default setting = 0

If an interface cable breaks, the slave inverters will not stop but continue to operate according to the instruction they received last. To trip the inverters, set a time-out period for each of them. (Ex.: F803 = 1) The master inverter will not stop even if an interface cable break. So if you also want to trip it, you will have to interlock it with the slave inverters, using FL failure relay contacts.

## ■ Examples of parameter settings

Master-related parameters

F806 : 1 Frequency instruction % (100% at FH)  
 F800 : 3 Communication baud rate (9600 bps)  
 F801 : 1 Parity check (even parity)  
 CMOD : 1 Operation panel  
 FMOD : 0 Terminal board (analog input)  
 F805 : 0.02 Send wait time (20 msec.)

Slave-related parameters

F806 : 0 Slave  
 F803 : 1 Communication error trip time (1 sec.)  
 F800 : 3 Communication baud rate (same as the rate set for the master)  
 F801 : 1 Parity check (same as the parity set for the master)  
 CMOD : 0 Terminal board (F and ST terminals used for operation)  
 (F241: Frequency instructions can be used to start and stop inverters if the operation starting frequency parameter is so set.  
 <For speed control>  
 FMOD : 3 Serial communication

### 8.3.1. Proportional-speed control (For V110 and later)

● Data (frequency instruction) sent from the master in inverter-to-inverter communications

$$f_c (\%) = \frac{\text{Frequency instruction from the master} \times 10000}{\text{Master-side maximum frequency}} \quad (1 = 0.01\%)$$

\* If the calculation result is less than 1 (0.01%), it will be omitted. Therefore, an error of 0.01% maximum can be produced.

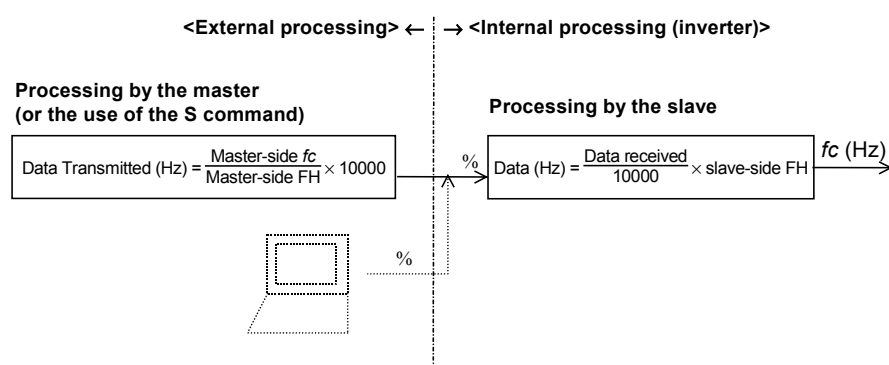
● Conversion of the frequency instruction the slave has received

The value converted using the following formula is written into the RAM.

$$f_c (\text{Hz}) = \frac{\text{Data received (\%)} \times \text{slave-side maximum frequency}}{10000} \quad (1 = 0.01\%)$$

\* If the calculation result is less than 1 (0.01%), it will be omitted. Therefore, an error of 0.01% maximum can be produced.

[Proportional-speed control diagram]



In inverter-to-inverter communications, “data received” in the formula shown below refers to the data transmitted from the master. When an inverter is linked with a computer, “data received” in the formula refers to the data transmitted from the computer, and the result of a calculation made using the following formula is the frequency instruction given to the inverter.

$$f_c = \frac{\text{Data received (\%)} \times \text{slave-side maximum frequency}}{10000} \quad (\text{Hz})$$

Example

Unit: Hz

	Maximum frequency	Frequency instruction
Master (Fc)	100.0Hz	50.0Hz
Slave 1	90.0Hz	45.0Hz
Slave 2	80.0Hz	40.0Hz

$$\text{Master : } f_c (\%) = \frac{50.0 \times 10000}{100.0} = 5000\%$$

$$\text{Slave 1 : } f_c (\text{Hz}) = \frac{5000 \times 9000}{10000} = 4500 = 45 \text{ Hz}$$

$$\text{Slave 2 : } f_c (\text{Hz}) = \frac{5000 \times 8000}{10000} = 4000 = 40 \text{ Hz}$$

## 8.4. Send wait time setting function (for V110 and later)

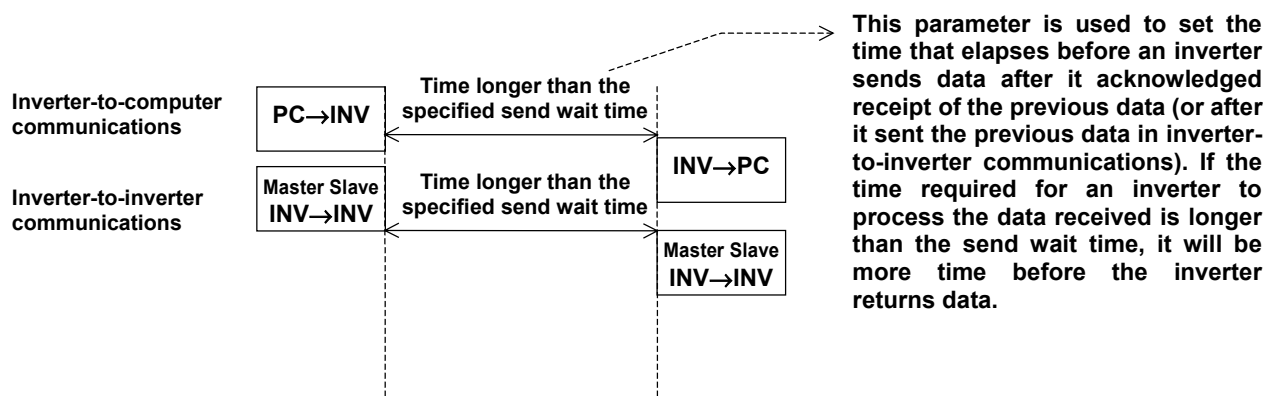
The function is useful, for example, when:

- Inverters return data so quickly that the computer cannot receive or process it properly.
- It takes time for the RS 485/RS232C converters to switch back and forth between send and receive modes.
- In inverter-to-inverter communications, the master sends data so quickly that the slaves cannot process it properly.

“Parameter name: *F805*, communication No.: 0805”

**Parameter description** : This parameter allows you to set the time that elapses before an inverter returns data to the computer (or the master sends data to a slave(s) in inverter-to-inverter communications) after it received the previous data from the computer (or after it sent the previous data in inverter-to-inverter communications). If the time required for an inverter to process the data received is longer than the time set using this parameter, the former will take priority over the latter. (The purpose of this parameter is to prevent an inverter from returning or sending data at time intervals shorter than the time set using this parameter.)

**Adjustment range** : *0.01* to *2.00* sec. (10 to 2000 ms)  
When this parameter is set to *0*, it is disabled and the inverter returns or sends data as quickly as it can. If you want inverters to return data as quickly as possible, then set this parameter to *0*.



## 9. Examples of the use of communication commands

Here are some examples of the use of communications commands provided for the VF-S9 series of inverters.

Inverter numbers and checksum used in ASCII mode are omitted from these examples.

### ■ Examples of communications

† To run the motor in forward direction with the frequency set to 60 Hz from the computer

<ASCII mode>

Computer → Inverter  
(PFA011770)CR

Inverter → Computer  
(PFA011770)CR

..... Set the operation frequency to 60 Hz.  
( $60 \div 0.01 \text{ Hz} = 6000 = 1770\text{H}$ )

(PFA00C400)CR

(PFA00C400)CR

..... Set to "forward run" with commands and frequency instructions from the computer enabled.

<Binary mode>

Computer → Inverter  
2F 50 FA 01 17 70 01  
2F 50 FA 00 C4 00 3D

Inverter → Computer  
21 50 FA 01 17 70 01  
2F 50 FA 00 C4 00 3D

† Jog run

<ASCII mode>

Computer → Inverter  
(W02600064)CR

Inverter → Computer  
(W02600064)CR

..... Sets the jog run frequency to 1 Hz.  
( $1 \div 0.01 = 100 = 64\text{H}$ )

(PFA008500)CR

(PFA008500)CR

..... Jog run command

<Binary mode>

Computer → Inverter  
2F 57 02 60 00 64 4C  
2F 50 FA 00 85 00 FE

Inverter → Computer  
2F 57 02 60 00 64 4C  
2F 50 FA 00 85 00 FE

† To monitor the operation frequency (during 60 Hz operation)

<ASCII mode>

Computer → Inverter  
(RFD00)CR

Inverter → Computer  
(RFD001770)CR

..... Set the operation frequency to 60 Hz.  
( $60 \div 0.01 \text{ Hz} = 6000 = 1770\text{H}$ )

<Binary mode>

Computer → Inverter  
2F 52 FD 00 7E

Inverter → Computer  
2F 52 FD 00 17 70 05

† To monitor the status of the inverter

<ASCII mode>

Computer → Inverter  
(RFE01)CR

Inverter → Computer  
(rFE010040)CR

..... Acceleration/deceleration 2, stop, trip (r command)

<Binary mode>

Computer → Inverter  
2F 52 FE 01 80

Inverter → Computer  
2F 72 FE 01 00 40 E0

‡ To check the trip code (when the inverter is tripped because of  $\overline{E} r r 5$ )

: See Table of trip codes.

<ASCII mode>

Computer → Inverter  
(RFC90)CR

Inverter → Computer  
(rFC900018)CR

.....  $\overline{E} r r 5$  trip

<Binary mode>

Computer → Inverter  
2F 52 FC 90 0D

Inverter → Computer  
2F 72 FC 90 00 18 45

‡ To monitor the current

<ASCII mode>

Computer → Inverter  
(RFE03)CR

Inverter → Computer  
(RFE03077B)CR

..... Current:  $1915 \div 100 = 19.15\%$

<Binary mode>

Computer → Inverter  
2F 52 FE 03 82

Inverter → Computer  
2F 52 FE 03 07 7B 04

‡ To set the deceleration time (to 10 sec)

<ASCII mode>

Computer → Inverter  
(W00100064)CR

Inverter → Computer  
(W00100064)CR

..... Set the deceleration time to 10 sec.  
( $10 \div 0.1 = 100 = 0064H$ )

<Binary mode>

Computer → Inverter  
2F 57 00 10 00 64 FA

Inverter → Computer  
2F 57 00 10 00 64 FA



## 10. Examples of RS232C communication programs

Ex.1 J3100 BASIC program for monitoring the operation frequency continuously (Retention of frequency data immediately before the occurrence of a trip) (RS232C, ASCII mode)  
(Toshiba version of Advanced BASIC-86 Ver. 3.01.05J)

### 1) Examples of programs

10 OPEN "COM1:9600,E,8,1" AS #1	--- 9600 baud, even parity, 8-bit length, 1 stop bit
20 A\$="FE00"	--- Specifies the communication number for monitoring the operation frequency.
30 PRINT #1,"("+R"+A\$+)"	--- Transmits data to the inverter. Note: The carriage return code is added automatically.
40 INPUT#1,B\$	--- Receives data returned from the inverter.
50 AAA\$="&H"+MID\$(B\$,7,4)	--- Extracts only data items from the data returned.
60 F\$=LEFT\$(STR\$(VAL(AAA\$)/100),6)	--- Converts data into decimal form.
70 PRINT "Operation frequency =";F\$+"Hz"	--- Displays the operation frequency.
80 GOTO 20	--- Repeats.

### 2) Examples of program execution results (stop command issued during 80 Hz operation)

```

Operation frequency =80Hz
Operation frequency =79.95Hz
      :
      :
Operation frequency =0Hz

```

Ex.2 BASIC program for executing an input command with checksum (RS232C, ASCII mode)  
(Toshiba version of Advanced BASIC-86 Ver. 3.01.05J)

♫ Checking if the maximum frequency setting has been changed correctly

1) Examples of programs

```

10 OPEN "COM1:9600,E,8,1" AS #1 --- 9600 baud, even parity, 8-bit length, 1 stop bit
20 INPUT "Send Data=";A$ --- Reads in data to be sent to the inverter.
30 S$="("+A$+"&" --- Adds "(" and "&" to the read data in.
40 S=0
50 L=LEN(S$)
60 FOR I=1 TO L
70 S=S+ASC(MID$(S$,I,1))
80 NEXT I
90 CHS$=RIGHT$(HEX$(S),2)
100 PRINT #1,"("+A$+"&"+"CHS$+"")" --- Sends the data including the checksum result to the
inverter.
110 INPUT #1,B$ --- Receives data returned from the inverter.
120 PRINT "Receive data= ";B$ --- Displays the data received.
130 GOTO 20 --- Repeats.

```

Calculates the number of bits (checksum).

2) Examples of program execution results

```

Send Data=? R0011 --- Reads the maximum frequency (0011).
Receive Data= (R00111F40&3D) --- 1F40 (Maximum frequency: 80 Hz)
Send Data=? W00111770 --- Changes the maximum frequency to 60 Hz (1770).
Receive Data= (W00111770&36)
Send Data=? R0011 --- Reads the maximum frequency (0011).
Receive Data= (R00111770&31) --- 1770 (Maximum frequency: 60 Hz)

```

## Ex.3 BASIC program for communication tests (RS232C, ASCII mode)

(Toshiba version of Advanced BASIC-86 Ver. 3.01.05J)

## 1) Examples of programs

```

100 INPUT "Baud rate=9600/4800/2400/1200";SPEED$ ---- Selects a baud rate.
110 INPUT "Parity=even(E)/odd(O)";PARITY$ ---- Selects parity.
120 OPEN "COM1:"+SPEED$+" "+PARITY$+",8,1"AS #1
130 INPUT "Send data";B$ ---- Enters a command.
140 PRINT #1,B$
150 C$=""
160 T=TIMER
170 COUNT=(TIMER-T)
180 IF COUNT >3 THEN 270
190 IF COUNT <0 THEN T=TIMER ---- Prevents an increase in the number
                                of digits.
200 IF LOC(1)= 0 THEN A$="":GOTO 220
210 A$=INPUT$(1,#1)
220 IF A$ <>CHR$(13) THEN 240 ---- Carriage return (CR) to finish
230 GOTO 290 reading in.
240 IF A$="" THEN 160
250 C$=C$+A$
260 GOTO 160
270 COLOR @0,7:PRINT "!!! There is no data to return. !!!";COLOR @7,0:PRINT
280 GOTO 130 ---- Repeats.
290 PRINT A$;
300 C$=C$+A$
310 PRINT "Return data=";c$;
320 GOTO 130 ---- Repeats.

```

## 2) Examples of program execution results (In this example, the inverter number is 00.)

```

Baud rate=9600/4800/2400? 9600 ---- Selects 9600 baud.
Parity=even(E)/odd(O)? E ---- Select E (even parity).
Send data? (00R0011) ---- Carries out test communications.
Return data= (00R00111770)
Send data? () ---- Error
!!! There is no data to return. !!! ---- No data is returned.
Send data? (R0011)
Return data= (R00111770)
Send data?
:
:

```

---

## 11. Parameter data

---

This Chapter explains the parameters provided for the VF-S9 series of inverters. When using the communications function, use the tables of parameters shown below to check communication numbers, upper and lower limits, and so on.

---

### 11.1. Table of parameters

---

Each table of parameters shown below is composed of the following items:

- (1) Communication number ..... Refers to the number assigned to each parameter for communications purposes. A communication number is needed to specify a parameter from the computer.
- (2) Title ..... Refers to codes displayed on the inverter's operation panel. "-" in the title column indicates that no code is displayed on the operation panel.
- (3) Unit ..... Refers to the basic unit of each data item. For example, the basic unit of acceleration time is 0.1 seconds. To set an acceleration time of 10 seconds from the computer, 0064 (100) needs to be entered.
- (4) Writing during operation ..... The parameters marked with X cannot be changed while the inverter is in operation.

■ Basic parameters (Group No.: 00)

Communi- cation No.	Title	Function	Upper limit	Lower limit	Unit	Writing during operation
0000	<i>AV1</i>	Automatic acceleration/deceleration	2	0	-	⚡
0001	<i>AV2</i>	Automatic torque boost	1	0	-	⚡
0002	<i>AV3</i>	Automatic environment setting <sup>*1</sup>	1	0	-	⚡
0040	<i>AV4</i>	Automatic function setting	4	0	-	⚡
0003	<i>CMD</i>	Command mode selection	1	0	-	⚡
0004	<i>FND</i>	Frequency setting mode selection	2/3 <sup>*2</sup>	0	-	⚡
0005	<i>FNSL</i>	Meter selection	5/11 <sup>*2</sup>	0	-	⚡
0006	<i>FN</i>	Meter adjustment	FF(255)	0	-	⚡
0007	<i>LYP</i>	Standard setting mode selection	6	0	-	⚡
0008	<i>Fr</i>	Forward/reverse run selection (Operation Panel)	1	0	-	⚡
0009	<i>ACC</i>	Acceleration time 1	8CA0(3600)	1(0.1)	0.1s	⚡
0010	<i>DEC</i>	Deceleration time 1	8CA0(3600)	1(0.1)	0.1s	⚡
0011	<i>FH</i>	Maximum frequency	9C40(400.0)	BB8(30.0)	0.01Hz	⚡
0012	<i>UL</i>	Upper limit frequency	<i>FH</i>	32(0.5)	0.01Hz	⚡
0013	<i>LL</i>	Lower limit frequency	<i>UL</i>	0(0.0)	0.01Hz	⚡
0014	<i>uL</i>	Base frequency	9C40(400.0)	9C4(25.0)	0.01Hz	⚡
0015	<i>Pt</i>	V/F control mode selection	4/5 <sup>*2</sup>	0	-	⚡
0016	<i>ub</i>	Torque boost	BB8(30.0)	0	0.01%	⚡
0041	<i>THR</i>	Motor electronic-thermal protection level 1	64(100)	A(10)	1%	⚡
0017	<i>OLN</i>	Electronic-thermal protection characteristics selection	7	0	-	⚡
0018	<i>sr1</i>	Preset speed operation frequencies 1	<i>UL</i>	<i>LL</i>	0.01Hz	⚡
0019	<i>sr2</i>	Preset speed operation frequencies 2	<i>UL</i>	<i>LL</i>	0.01Hz	⚡
0020	<i>sr3</i>	Preset speed operation frequencies 3	<i>UL</i>	<i>LL</i>	0.01Hz	⚡
0021	<i>sr4</i>	Preset speed operation frequencies 4	<i>UL</i>	<i>LL</i>	0.01Hz	⚡
0022	<i>sr5</i>	Preset speed operation frequencies 5	<i>UL</i>	<i>LL</i>	0.01Hz	⚡
0023	<i>sr6</i>	Preset speed operation frequencies 6	<i>UL</i>	<i>LL</i>	0.01Hz	⚡
0024	<i>sr7</i>	Preset speed operation frequencies 7	<i>UL</i>	<i>LL</i>	0.01Hz	⚡

<sup>\*1</sup>: The setting of this parameter is valid only when the parameter is set from the operation panel. Do not set it from the computer. (If the automatic environment setting parameter is set from the computer, it will not function.)

<sup>\*2</sup>: These values apply to inverters with CPU version V110 or later.

■ Extended parameters (Input/output parameters. Group No.: 01)

Communi- cation No.	Title	Function	Upper limit	Lower limit	Unit	Writing during operation
0100	<i>F 100</i>	Low-speed signal output frequency	<i>F H</i>	0(0.0)	0.01Hz	⚡
0101	<i>F 101</i>	Speed reach setting frequency	<i>F H</i>	0(0.0)	0.01Hz	⚡
0102	<i>F 102</i>	Speed reach detection band	<i>F H</i>	0(0.0)	0.01Hz	⚡
0103	<i>F 103</i>	ST signal selection	3	0	-	⚡
0104	<i>F 104</i>	RST signal selection	1	0	-	⚡
0105	<i>F 105</i>	Movement of F/R input at same time <sup>*3</sup>	1	0	-	⚡
0110	<i>F 110</i>	Always active function selection	33(51)/ 35(55) <sup>*2</sup>	0	-	⚡
0111	<i>F 111</i>	Input terminal selection 1	33(51)/ 35(55) <sup>*2</sup>	0	-	⚡
0112	<i>F 112</i>	Input terminal selection 2	33(51)/ 35(55) <sup>*2</sup>	0	-	⚡
0113	<i>F 113</i>	Input terminal selection 3	33(51)/ 35(55) <sup>*2</sup>	0	-	⚡
0114	<i>F 114</i>	Input terminal selection 4	33(51)/ 35(55) <sup>*2</sup>	0	-	⚡
0115	<i>F 115</i>	Input terminal selection 5	33(51)/ 35(55) <sup>*2</sup>	0	-	⚡
0116	<i>F 116</i>	Input terminal selection 6	33(51)/ 35(55) <sup>*2</sup>	0	-	⚡
0130	<i>F 130</i>	Output terminal selection 1	1D(29)/ 29(41) <sup>*2</sup>	0	-	⚡
0131	<i>F 131</i>	Output terminal selection 2	1D(29)/ 29(41) <sup>*2</sup>	0	-	⚡
0132	<i>F 132</i>	Output terminal selection 3	1D(29)/ 29(41) <sup>*2</sup>	0	-	⚡
0170	<i>F 170</i>	Base frequency 2	9C40(400.0)	9C4(25.0)	0.01Hz	⚡
0172	<i>F 172</i>	Torque boost 2	BB8(30.0)	0	0.01%	⚡
0173	<i>F 173</i>	Motor electronic-thermal protection level 2	64(100)	A(10)	1%	⚡

<sup>\*2</sup> : These values apply to inverters with CPU version V110 or later.

<sup>\*3</sup> : This parameter is added to inverters with CPU version V110 or later.

■ Extended parameters (Frequency parameters. Group No.: 02)

Communi- cation No.	Title	Function	Upper limit	Lower limit	Unit	Writing during operation
0200	<i>F 2 0 0</i>	Frequency priority selection	5	0	-	⚡
0201	<i>F 2 0 1</i>	VIA/II input point 1 setting	64(100)	0	1%	⚡
0202	<i>F 2 0 2</i>	VIA/II input point 1 frequency	9C40(400.0)	0(0.0)	0.01Hz	⚡
0203	<i>F 2 0 3</i>	VIA/II input point 2 setting	64(100)	0	1%	⚡
0204	<i>F 2 0 4</i>	VIA/II input point 2 frequency	9C40(400.0)	0(0.0)	0.01Hz	⚡
0210	<i>F 2 1 0</i>	VIB input point 1 setting	64(100)	0	1%	⚡
		Frequency UP response time	64(10.0)	0(0.0)	0.1s	⚡
0211	<i>F 2 1 1</i>	VIB input point 1 frequency	9C40(400.0)	0(0.0)	0.01Hz	⚡
		Frequency UP step width	9C40(400.0)	0(0.0)	0.01Hz	⚡
0212	<i>F 2 1 2</i>	VIB input point 2 setting	64(100)	0	1%	⚡
		Frequency DOWN response time	64(10.0)	0(0.0)	0.1s	⚡
0213	<i>F 2 1 3</i>	VIB input point 2 frequency	9C40(400.0)	0(0.0)	0.01Hz	⚡
		Frequency DOWN step width	9C40(400.0)	0(0.0)	0.01Hz	⚡
0240	<i>F 2 4 0</i>	Starting frequency setting	3E8(10.0)	32(0.5)	0.01Hz	⚡
0241	<i>F 2 4 1</i>	Operation starting frequency	<i>F H</i>	0(0.0)	0.01Hz	⚡
0242	<i>F 2 4 2</i>	Operation starting frequency hysteresis	<i>F H</i>	0(0.0)	0.01Hz	⚡
0250	<i>F 2 5 0</i>	DC braking starting frequency	<i>F H</i>	0(0.0)	0.01Hz	⚡
0251	<i>F 2 5 1</i>	DC braking current	64(100)	0	1%	⚡
0252	<i>F 2 5 2</i>	DC braking time	C8(20.0)	0(0.0)	0.1s	⚡
0254	<i>F 2 5 4</i>	Motor shaft fixing control <sup>*3</sup>	1	0	-	⚡
0256	<i>F 2 5 6</i>	Auto stop of continuous running at LL <sup>*3</sup>	FF(25.5)	0(0.0)	0.1s	⚡
0260	<i>F 2 6 0</i>	Jog run frequency	7D0(20.0)	0(0.0)	0.01Hz	⚡
0261	<i>F 2 6 1</i>	Jog run stopping pattern	2/5 <sup>*2</sup>	0	-	⚡
0270	<i>F 2 7 0</i>	Jump frequency 1	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0271	<i>F 2 7 1</i>	Jumping width 1	BB8(30.0)	0(0.0)	0.01Hz	⚡
0272	<i>F 2 7 2</i>	Jump frequency 2	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0273	<i>F 2 7 3</i>	Jumping width 2	BB8(30.0)	0(0.0)	0.01Hz	⚡
0274	<i>F 2 7 4</i>	Jump frequency 3	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0275	<i>F 2 7 5</i>	Jumping width 3	BB8(30.0)	0(0.0)	0.01Hz	⚡
0280	<i>F 2 8 0</i>	Preset speed operation frequencies 1	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0281	<i>F 2 8 1</i>	Preset speed operation frequencies 2	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0282	<i>F 2 8 2</i>	Preset speed operation frequencies 3	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0283	<i>F 2 8 3</i>	Preset speed operation frequencies 4	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0284	<i>F 2 8 4</i>	Preset speed operation frequencies 5	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0285	<i>F 2 8 5</i>	Preset speed operation frequencies 6	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0286	<i>F 2 8 6</i>	Preset speed operation frequencies 7	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0287	<i>F 2 8 7</i>	Preset speed operation frequencies 8	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0288	<i>F 2 8 8</i>	Preset speed operation frequencies 9	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0289	<i>F 2 8 9</i>	Preset speed operation frequencies 10	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0290	<i>F 2 9 0</i>	Preset speed operation frequencies 11	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0291	<i>F 2 9 1</i>	Preset speed operation frequencies 12	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0292	<i>F 2 9 2</i>	Preset speed operation frequencies 13	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0293	<i>F 2 9 3</i>	Preset speed operation frequencies 14	<i>U L</i>	<i>L L</i>	0.01Hz	⚡
0294	<i>F 2 9 4</i>	Preset speed operation frequencies 15	<i>U L</i>	<i>L L</i>	0.01Hz	⚡

<sup>\*2</sup> : This value applies to inverters with CPU version V110 or later.

<sup>\*3</sup> : These parameters are added to inverters with CPU version V110 or later.

■ Extended parameters (Operation mode parameters. Group No.: 03)

Communi- cation No.	Title	Function	Upper limit	Lower limit	Unit	Writing during operation
0300	<i>F 300</i>	PWM carrier frequency	A5(16.5)	14(2.0)	0.1KHz	⚡
0301	<i>F 301</i>	Auto-restart control selection	6(6)/ D(13) <sup>*2</sup>	0	-	⚡
0302	<i>F 302</i>	Regenerative power ride-through control	1/2 <sup>*2</sup>	0	-	⚡
0303	<i>F 303</i>	Retry selection	A(10)	0	1 time	⚡
0304	<i>F 304</i>	Dynamic braking selection	2	0	-	⚡
0305	<i>F 305</i>	Overvoltage stall operation	1/2 <sup>*2</sup>	0	-	⚡
0306	<i>F 306</i>	Output voltage adjustment	7D(125)/ 96(150) <sup>*2</sup>	0	1%	⚡
0307	<i>F 307</i>	Supply voltage compensation	5	0	-	⚡
0308	<i>F 308</i>	Braking resistor operation rate	64(100)	1	%ED	⚡
0312	<i>F 312</i>	Random mode	1	0	-	⚡
0319	<i>F 319</i>	Voltage gain of overexcitation <sup>*3</sup>	FF(255)	0	-	⚡
0320	<i>F 320</i>	Drooping gain <sup>*3</sup>	FA(25.0)	0(0.0)	0.1%	⚡
0323	<i>F 323</i>	Drooping insensitive torque band <sup>*3</sup>	64(100)	0(0)	1%	⚡
0360	<i>F 360</i>	PI control	1	0	-	⚡
0362	<i>F 362</i>	Proportional gain	2710(10000)	1	0.01	⚡
0363	<i>F 363</i>	Integral gain	2710(10000)	1	0.01	⚡

<sup>\*2</sup> : These values apply to inverters with CPU version V110 or later.

<sup>\*3</sup> : These parameters are added to inverters with CPU version V110 or later.

■ Extended parameters (Torque boost parameters. Group No.: 04)

Communi- cation No.	Title	Function	Upper limit	Lower limit	Unit	Writing during operation
0400	<i>F 400</i>	Auto-tuning	2	0	-	⚡
0401	<i>F 401</i>	Slip frequency	32(5.0)	0.0	0.1HZ	⚡
0402	<i>F 402</i>	Motor primary constant	FF(255)	0	-	⚡
0403	<i>F 403</i>	Motor secondary constant	FF(255)	0	-	⚡
0404	<i>F 404</i>	Motor excitation constant	FF(255)	0	-	⚡
0405	<i>F 405</i>	Magnification of load inertial moment	C8(200)	0	Times	⚡
0408	<i>F 408</i>	Rated capacity ratio of motor to inverter	1	0	-	⚡

■ Extended parameters (Acceleration/deceleration time parameters. Group No.: 05)

Communi- cation No.	Title	Function	Upper limit	Lower limit	Unit	Writing during operation
0500	<i>F 500</i>	Acceleration time 2	8CA0(360.0)	1(0.1)	0.1s	⚡
0501	<i>F 501</i>	Deceleration time 2	8CA0(360.0)	1(0.1)	0.1s	⚡
0502	<i>F 502</i>	Acceleration/deceleration 1 pattern	2	0	-	⚡
0503	<i>F 503</i>	Acceleration/deceleration 2 pattern	2	0	-	⚡
0504	<i>F 504</i>	Acceleration/deceleration pattern selection (1 or 2)	1	0	-	⚡
0505	<i>F 505</i>	Acceleration/deceleration 1 and 2 switching frequency	UL	0(0.0)	0.01Hz	⚡

■ Extended parameters (Protection parameters. Group No.: 06)

Communi-	Title	Function	Upper limit	Lower limit	Unit	Writing
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Parameter No.	Parameter	Function	Upper limit	Lower limit	Unit	Writing during operation
0600	<i>F 6 0 0</i>	Motor electronic-thermal protection level 1	64(100)	A(10)	1%	⚡
0601	<i>F 6 0 1</i>	Stall prevention level	C8(200)	A(10)	1%	⚡
0602	<i>F 6 0 2</i>	Inverter trip retention selection	1	0	-	⚡
0603	<i>F 6 0 3</i>	External input trip stop mode selection	2	0	-	⚡
0604	<i>F 6 0 4</i>	Emergency DC braking time	C8(20.0)	0(0.0)	0.1s	⚡
0605	<i>F 6 0 5</i>	Output phase failure detection mode selection	2	0	-	⚡
0608	<i>F 6 0 8</i>	Input phase failure detection mode selection	1	0	-	⚡
0610	<i>F 6 1 0</i>	Small current trip selection	1	0	-	⚡
0611	<i>F 6 1 1</i>	Small current (trip/alarm) detection current	64(100)	0	1%	⚡
0612	<i>F 6 1 2</i>	Small current (trip/alarm) detection time	FF(255)	0	1s	⚡
0613	<i>F 6 1 3</i>	Selection of output short-circuit detection pulse during start-up <sup>*3</sup>	3	0	-	⚡
0615	<i>F 6 1 5</i>	Over-torque trip selection	1	0	-	⚡
0616	<i>F 6 1 6</i>	Over-torque (trip/alarm) level	C8(200)/ FA(250) <sup>*2</sup>	0	1%	⚡
0618	<i>F 6 1 8</i>	Over-torque detection time	64(10.0)	0(0.0)	0.1s	⚡
0619	<i>F 6 1 9</i>	Over-torque (trip/alarm) level hysteresis	64(100)	0	1%	⚡
0626	<i>F 6 2 6</i>	Overvoltage limit operation level <sup>*3</sup>	96(150)	32(50)	1%	⚡
0627	<i>F 6 2 7</i>	Undervoltage trip selection	2	0	-	⚡
0692	<i>F 6 9 2</i>	Meter bias	32(50)	0	1%	⚡

<sup>\*2</sup> : This value applies to inverters with CPU version V110 or later.

<sup>\*3</sup> : These parameter are added to inverters with CPU version V110 or later.

#### ■ Extended parameters (Operation panel parameters. Group No.: 07)

Communication No.	Parameter	Function	Upper limit	Lower limit	Unit	Writing during operation
0700	<i>F 7 0 0</i>	Prohibition of change of parameter settings	2/7 <sup>*2</sup>	0	-	⚡
0701	<i>F 7 0 1</i>	Unit selection	3	0	-	⚡
0702	<i>F 7 0 2</i>	Free unit selection	4E20(200.0)	64(0.01)	0.01	⚡
0710	<i>F 7 1 0</i>	Standard monitor display selection	5/6 <sup>*2</sup>	0	-	⚡

<sup>\*2</sup> : These values apply to inverters with CPU version V110 or later.

### ■ Extended parameters (Communication parameters. Group No.: 08)

Communi- cation No.	Title	Function	Upper limit	Lower limit	Unit	Writing during operation
0800	<i>F800</i>	Communication baud speed	4	0	-	⚡
0801	<i>F801</i>	Parity	2	0	-	⚡
0802	<i>F802</i>	Inverter number	3F(63)/ FF(255) <sup>*2</sup>	0	-	⚡
0803	<i>F803</i>	Communication error trip time	64(100)	0	-	⚡
0805	<i>F805</i>	Communication interval <sup>*3</sup>	C8(2.00)	0(0.00)	0.01s	⚡
0806	<i>F806</i>	Inverter-drive communication <sup>*3</sup>	2	0	-	⚡
0880	<i>F880</i>	Free notes <sup>*3</sup>	FFFF(65535)	0	-	⚡

<sup>\*2</sup> : This value applies to inverters with CPU version V110 or later.

<sup>\*3</sup> : These parameters are added to inverters with CPU version V110 or later.

### ■ Instruction parameter (Group No.: FA)

Communi- cation No.	Title	Function	Upper limit	Lower limit	Unit	Writing during operation
FA00	-	Command from the computer <sup>*4</sup>	FFFF(65535)	0	-	⚡
FA01	-	Operation frequency instruction (computer) <sup>*4</sup>	<i>F H</i>	0(0.0)	0.01Hz	⚡
FA02	-	Operation frequency instruction (operation panel)	<i>F H</i>	0(0.0)	0.01Hz	⚡

<sup>\*4</sup> : The settings of these parameters are stored in the RAM only. To write data into them, use the P command.

These parameters do not function unless the mode in which commands or frequency instructions can be issued from the computer is enabled. For the ways of enabling it, see 7.1, "Commands from the computer."

### ■ Status monitor parameters (Group No.: FC) \* This group of parameters are read-only (monitor-only) parameters.

Communi- cation No.	Title	Function	Unit
FC90	-	Current trip	-
FC91	-	Current alarm	-

The FC 91 parameter supports inverters with CPU version V110 or later.

### ■ Frequency monitor parameter (Group No.: FD) \* This group of parameters are read-only (monitor-only) parameters.

Communi- cation No.	Title	Function	Unit
FD00	-	Operation frequency (current frequency)	0.01Hz

■ Status monitor parameters (Group No.: FE) \* This group of parameters are read-only (monitor-only) parameters.

Communication No.	Title	Function	Unit
FE00	-	Operation frequency (retained in case of a trip <sup>*5</sup> )	0.01Hz
FE01	-	Operating status (retained in case of a trip <sup>*5</sup> )	-
FE02	-	Operation frequency instruction (actual instruction <sup>*6</sup> )	0.01Hz
FE03	-	Electric current display	0.01%
FE04	-	Voltage in DC section	0.01%
FE05	-	Output voltage	0.01%
FE06	-	Input terminal information	-
FE07	-	Output terminal information	-
FE08	-	CPU version	-
FE09	-	EEPROM version	-
FE10	-	Past trip 1	-
FE11	-	Past trip 2	-
FE12	-	Past trip 3	-
FE13	-	Past trip 4	-
FE14	-	Cumulative operation time	1H
FE15	-	Frequency instruction after PI calculation <sup>*3</sup>	0.01Hz
FE20	-	Torque current	0.01%
FE22	-	VIA input frequency (PI feed-back value)	0.01%
FE26	-	Inverter load factor	1%
FE28	-	PBR overload factor	1%
FE30	-	Output power	0.1%
FE35	-	VIA monitor <sup>*3</sup>	0 ~ 1023 (10 bit)
FE36	-	VIB monitor <sup>*3</sup>	0 ~ 1023 (10 bit)
FE45 <sup>*7</sup>	-	CMOd status <sup>*3</sup>	-
FE46 <sup>*8</sup>	-	FMOd status <sup>*3</sup>	-
FE70	-	Rated current <sup>*3</sup>	0.1A
FE71	-	Rated voltage <sup>*3</sup>	1V

<sup>\*3</sup> : These parameters are added to inverters with CPU version V110 or later.

<sup>\*5</sup> : If a trip occurs, data immediately before its occurrence is displayed.

<sup>\*6</sup> : For inverters with CPU version V101, the frequency instruction after a PI calculation is displayed in PI control mode.  
For inverters with CPU version V110 or later, the frequency instruction before a PI calculation is displayed even in PI control mode.

<sup>\*7</sup> : FE45 (*CMOd* status)  
0 : Terminal command mode  
1 : Operation panel command mode  
2 : Communication command mode

<sup>\*8</sup> : FE46 (*FMOd* status)  
0 : Terminal frequency setting mode  
1 : Operation panel frequency setting mode  
2 : Communication frequency setting mode  
3 : Internal potentiometer frequency setting mode

## 11.2. Table of trip codes

Use the communication No. FC90 parameter to check the cause of a trip.

Currently, no trip condition is assigned to the trip code in each shaded area.

Display	Data	Error description
<i>nErr</i>	0000	No error
<i>OC1</i>	0001	Over-current during acceleration
<i>OC2</i>	0002	Over-current during deceleration
<i>OC3</i>	0003	Over-current during constant speed operation
<i>OCL</i>	0004	Short circuit in load or arm at start-up
<i>OCA</i>	0005	Short circuit in arm
<i>OC2A</i>	0006	Reserved
<i>OC2B</i>	0007	Reserved
<i>EPH1</i>	0008	Input phase failure
<i>EPH0</i>	0009	Output phase failure
<i>OP1</i>	000A	Overvoltage during acceleration
<i>OP2</i>	000B	Overvoltage during deceleration
<i>OP3</i>	000C	Overvoltage during constant speed operation
<i>OL1</i>	000D	Inverter overload
<i>OL2</i>	000E	Motor overload
<i>OLr</i>	000F	DC braking resistor overload
<i>OH</i>	0010	Overheat trip
<i>E</i>	0011	Emergency stop
<i>EEP1</i>	0012	EEPROM fault (writing error)
<i>EEP2</i>	0013	Reserved
<i>Err1</i>	0014	Reserved
<i>Err2</i>	0015	RAM fault
<i>Err3</i>	0016	ROM fault
<i>Err4</i>	0017	CPU fault trip
<i>Err5</i>	0018	Communication error trip
<i>Err6</i>	0019	Reserved
<i>Err7</i>	001A	Reserved
<i>Err8</i>	001B	Reserved
<i>Err9</i>	001C	Reserved
<i>UC</i>	001D	Small current trip
<i>UP1</i>	001E	Undervoltage trip
<i>UP2</i>	001F	Reserved
<i>OL</i>	0020	Over-torque trip
<i>EF1</i>	0021	Reserved
<i>EF2</i>	0022	Ground fault
<i>EFU</i>	0023	Reserved
<i>OCr</i>	0024	Reserved
<i>OC1P</i>	0025	Reserved
<i>OC2P</i>	0026	Reserved
<i>OC3P</i>	0027	Reserved
<i>EtA</i>	0028	Auto-tuning error
<i>EtYP</i>	0029	Inverter mismatch
<i>OH2</i>	002E	External electronic-thermal input

## 11.3. Alarm codes

Use the communication No. FC91 parameter to check the cause of an alarm.  
These codes apply to inverters with CPU version V110 and later.

Bit	Description	Bit	Description	Bit	Description
0	OC alarm	4	OP alarm	8	Ot alarm
1	Inverter overload alarm	5	UV alarm	9	PBROL alarm
2	Motor overload alarm	6	-	10	-
3	OH alarm	7	UC alarm	11	-

\* NOTE

	Indicated
OC alarm	<i>L</i>
Inverter overload alarm	<i>L</i>
Motor overload alarm	<i>L</i>
OH alarm	<i>H</i>
OP alarm	<i>P</i>
UV alarm	<i>NOFF</i>

OC	Over current
OL	Over load
OH	Over heat
UV	Under voltage
UC	Under Current
Ot	Over torque
PBROL	Overload of braking resister

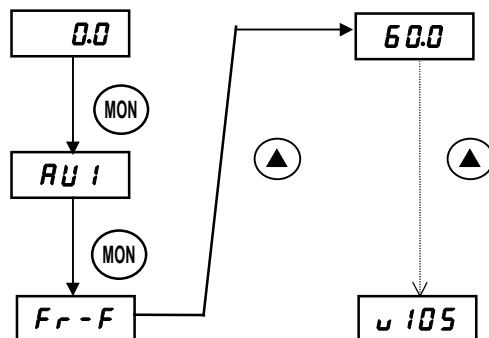
## Appendix 1 How to check the CPU version

Some items in this manual apply only to inverters with a specific version of CPU. So before first using your inverter, check the version of its CPU.

### ■ How to check the version of the CPU

‡ Check using the operation panel

Ex. When the power is on (when the inverter is not tripped)



‡ Check using the computer (Example)

Computer → Inverter  
(RFE08)

Inverter → Computer  
(RFE080069)

..... The CPU version is V105. (Example)

## Appendix 2 Table of data codes

### ■ JIS codes

Higher order Lower order	0	1	2	3	4	5	6	7
0	NUL	TC <sub>7</sub> (DLE)	(SP)	0	@	P	`	p
1	TC <sub>1</sub> (SOH)	DC <sub>1</sub>	!	1	A	Q	a	q
2	TC <sub>2</sub> (STX)	DC <sub>2</sub>	"	2	B	R	b	r
3	TC <sub>3</sub> (ETX)	DC <sub>3</sub>	#	3	C	S	c	s
4	TC <sub>4</sub> (EOT)	DC <sub>4</sub>	\$	4	D	T	d	t
5	TC <sub>5</sub> (ENQ)	TC <sub>8</sub> (NAK)	%	5	E	U	e	u
6	TC <sub>6</sub> (ACK)	TC <sub>9</sub> (SYN)	&	6	F	V	f	v
7	BEL	TC <sub>10</sub> (ETB)	'	7	G	W	g	w
8	FE <sub>0</sub> (BS)	CAN	(	8	H	X	h	x
9	FE <sub>1</sub> (HT)	EM	)	9	I	Y	i	y
A	FE <sub>2</sub> (LF)	SUB	*	:	J	Z	j	z
B	FE <sub>3</sub> (VT)	ESC	+	;	K	[	k	{
C	FE <sub>4</sub> (FF)	IS <sub>4</sub> (FS)	,	<	L	¥	l	
D	FE <sub>5</sub> (CR)	IS <sub>3</sub> (GS)	-	=	M	]	m	}
E	SO	IS <sub>2</sub> (RS)	.	>	N	^	n	~
F	SI	IS <sub>1</sub> (US)	/	?	O	_	o	DEL

CR: Carriage return

Ex.: Code 41 = Character A