

12. FR-ZRS SERIAL INTERFACE UNIT

12.1 Features

The FR-ZRS serial interface unit is connected with a computer (e.g. a personal computer, a FA computer), by a communication cable to allow inverters to be run and monitored and parameters to be read and written by user programs.

- Allows the inverters to be run and monitored and the parameters to be read and written by the user programs of the computer.
- The interface to the computer conforms to the RS422 and RS485 standards to allow up to 32 inverters to be controlled concurrently.
- The twisted pair communication cables noise-free communication.
- Allows the inverter to be used with a computer conforming to the RS232C standard by using a converter available on the market.

12.2 Structure

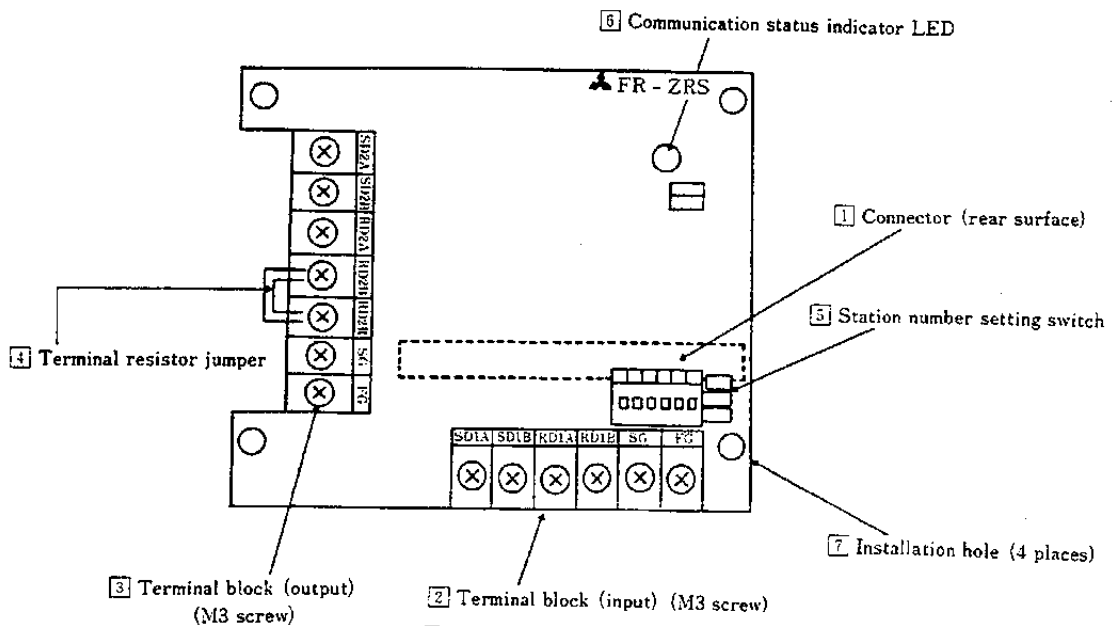


Fig. 12.1 Structure

12.3 Specifications

- | | |
|--|--|
| <ul style="list-style-type: none"> ① Power supply ② Conforming standards ③ Transmission form ④ Communication cable ⑤ Transmission distance ⑥ Number of inverters connected ⑦ Applicable computer ⑧ Applicable inverter | <ul style="list-style-type: none"> ● Control power : Supplied by inverter. ● Communication power : 5VDC, max. 60mA ● EIA Standards common to RS 422 and RS485 ● Multidrop link system ● Twisted pair cable ● Max. 500m overall ● RS422 computer interface : Max. 10 ● RS485 computer interface : Max. 32 ● Computer with RS422 or RS485 interface ● All models of the FR-Z200-N series (with communication) and FR-Z300 series inverters |
|--|--|

⑨ Communication specifications

Table 12. 1

Item		Specifications						
Communication speed		9600*1/4800/2400/1200/600/300 baud rates selected.						
Inverter response time		Time between the start of communication by the computer and the start of control (e.g. start, stop) by the inverter.						
		Communication speed (baud)	9600	4800	2400	1200	600	300
		Response time (msec)	Approx. 12.5	Approx. 25	Approx. 50	Approx. 100	Approx. 200	Approx. 400
		Depends on communication speed.						
Control procedure		Asynchronous system						
Communication system		Half duplex system						
Character system		ASCII (7 bits)						
Stop bit length		1/1.5/2*1 bits selected.						
Check system	Parity check	Available (even*1/odd)/unavailable						
	Sum check	Available *1. Factory-set values						

12.4 Configuration
 (1) Basic configuration

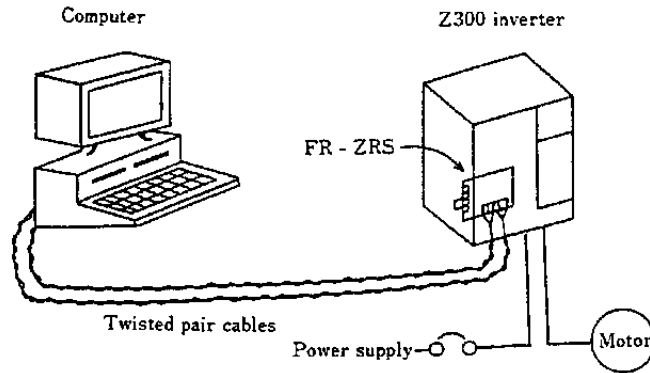


Fig. 12. 2

(2) Typical system configurations

① Inverter used with computer equipped with RS485 or RS422 interface

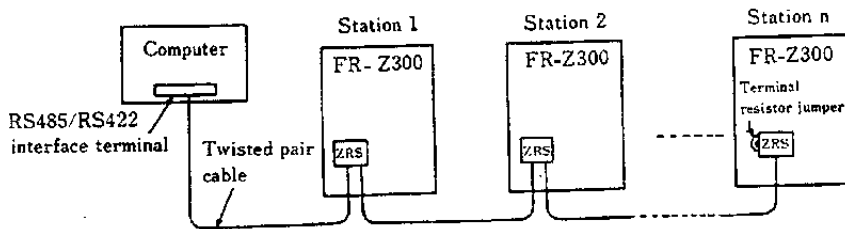
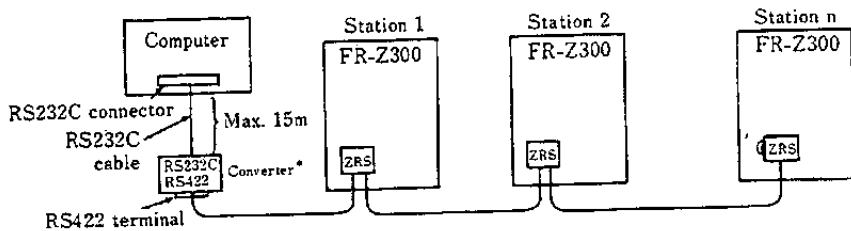


Fig. 12. 3. 1

② Inverter used with computer equipped with RS232C interface



*The converter available on the market should be prepared by the user.

Fig. 12. 3. 2

⑨ Communication specifications

Table 12. 1

Item		Specifications						
Communication speed		9600*1/4800/2400/1200/600/300 baud rates selected.						
Inverter response time		Time between the start of communication by the computer and the start of control (e.g. start, stop) by the inverter.						
		Communication speed (baud)	9600	4800	2400	1200	600	300
		Response time (msec)	Approx. 12.5	Approx. 25	Approx. 50	Approx. 100	Approx. 200	Approx. 400
		Depends on communication speed.						
Control procedure		Asynchronous system						
Communication system		Half duplex system						
Character system		ASCII (7 bits)						
Stop bit length		1/1.5/2*1 bits selected.						
Check system	Parity check	Available (even*1/odd)/unavailable						
	Sum check	Available *1. Factory-set values						

12.5 Wiring

(1) Connection of one computer and one inverter

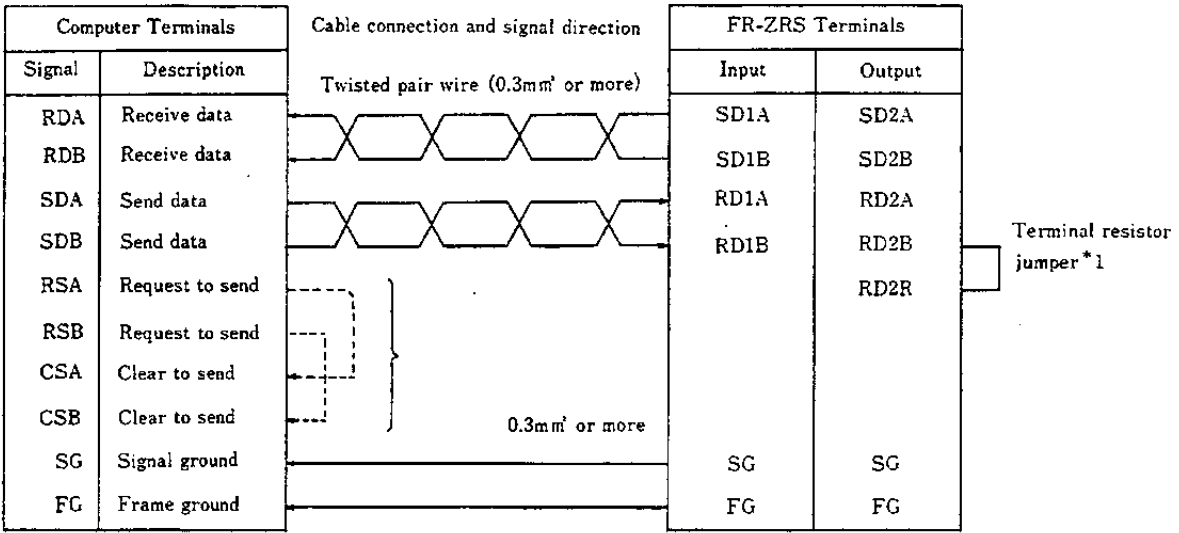


Fig. 12.4

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

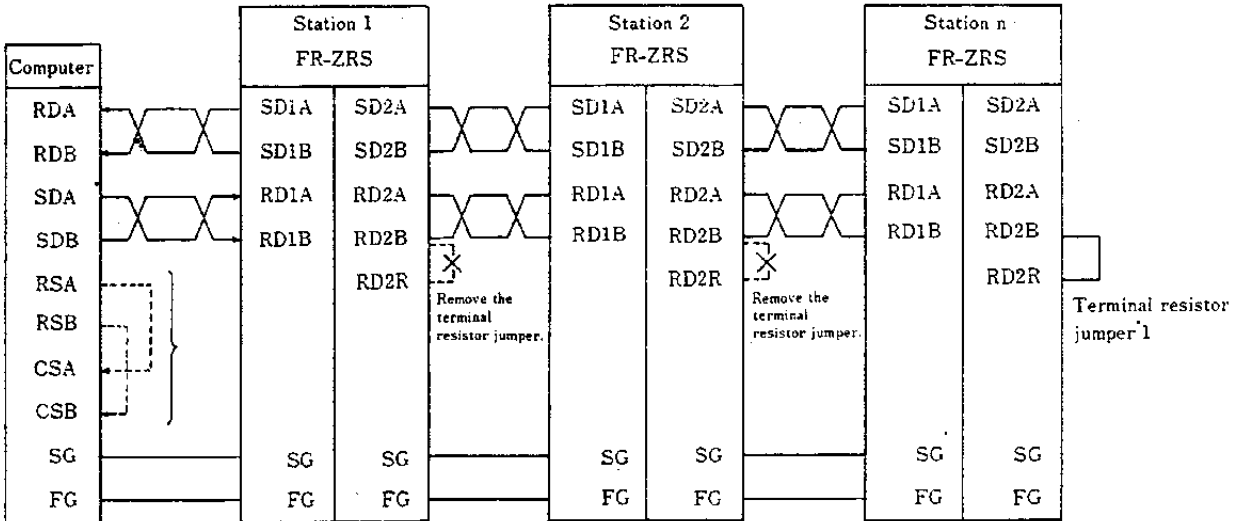


Fig. 12.5

* 1. The terminal resistor jumper should only be connected to the remotest FR-ZRS unit.

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

12.6 Operational Functions

(1) Operation mode

- ① PU operation.....Controls the inverter from the keyboard of the parameter unit (referred to as the "PU") installed to the inverter.
- ② External operation.....Controls the inverter by switching on/off external signals connected to the control circuit terminals of the inverter.
- ③ Data link operation.....Controls the inverter in accordance with the user program of the programmable controller (PC) via the FR-ZDL data link unit.
- ④ ZRS operation.....Controls the inverter in accordance with the computer program via the FR-ZRS serial interface unit.
(Setting appropriate values in parameters. 57 and 58 allows the operation signal and running frequency to be entered from the control circuit terminals.
See Section 12.9 (4).)

■ Operation mode switching

Table 12. 2

Symbol	Switching	Description
Ⓐ	External mode PU mode	Press the corresponding key on the PU.
Ⓑ	External mode data link mode	By PC user program.
Ⓒ	External mode ZRS mode	By computer user program. See Section 12.8 (4).

- Switching conditions : The inverter is at a stop.

Both the forward and reverse commands are off.

- ★ When parameter 79 has been set to "3," the inverter is switched to ZRS mode when the inverter is powered up or reset. (See Section 12.10.)

(2) Functions available in different operation modes

Table 12. 3

Place of Control	Item	Operation Mode			
		ZRS Mode	Data Link Mode	External Mode	PU Mode
User program from computer	Operation command	Yes*1	No	No	No
	Running frequency setting	Yes*1	No	No	No
	Monitoring	Yes	Yes	Yes	Yes
	Parameter write	Yes (during a stop)	No	No	No
	Parameter read	Yes	Yes	Yes	Yes
	Inverter reset	Yes*2	No	No	No
Control circuit terminals	Operation command	Yes*1	Yes*1	Yes	No
	Running frequency setting	Yes*1	Yes*1	Yes	No
	Inverter reset	Yes	Yes	Yes	Yes

* 1 . Depends on the set values of Pr. 57 and Pr. 58 at the Pr. 51 set value of 0 or 1. (See Section 12.9 (4).)

* 2 . The inverter cannot be reset at occurrence of ZRS communication alarm.

(3) Input from computer to inverter

① Operation commands... Any of the following commands can be given

Bit 0 : Current input selection (AU)

1 : Forward run (STF)

2 : Reverse run (STR)

3 : Low speed (RL)

4 : Middle speed (RM)

5 : High speed (RH)

6 : Second acceleration/deceleration selection (RT)

7 : Output stop (MRS)

② Running frequency : The output frequency of the inverter can be set in binary, 16 bits and 0.01Hz increments.

③ Inverter reset

The inverter can be reset from the computer.

④ Parameter set value write

Allows parameter set values to be written for the items in the data code list in Sections 12 and 13.

(4) Input from inverter to computer

① Inverter status... Any of the following 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 occurrence

② Inverter monitoring

● Output frequency... Binary, 0.01Hz increments

● Output current... Binary, 0.1A increments

● Output frequency... Binary, 0.1V increments

● Alarm definition... Binary. (Four most recent alarm records can be monitored.)

③ Parameter set value read

Allows parameter set values to be read for the items in the data code list in Sections 12 and 13.

(5) Operation at alarm occurrence

Table 12.4

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

(6) Inverter reset

Table 12.5

Resetting Method	Operating Mode			
	ZRS operation	Data link operation	External operation	PU operation
Computer program	Yes*1	Yes	No	No
Connect terminals RES and SD	Yes	Yes	Yes	Yes
Switch off inverter power	Yes	Yes	Yes	Yes

* 1. The inverter cannot be reset from the computer at occurrence of a line fault.

2. Resetting the inverter from the computer switches to external operation mode. To resume the ZRS operation, switch to ZRS operation by the computer program.

12.7 Operation

(1) General operation (See Fig. 12.6.)

- 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 interface level conforming to RS485 standard and transmitted to the inverter by the driver.
- ③ The communication data is received by the receiver in the FR-ZRS unit, converted into parallel signals by the communication LSI, and entered into 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-ZRS unit and is then converted into the RS422 or RS485 interface level and returned to the computer by driver.
- ⑥ The reply data is received by the receiver in the computer and entered into CPU, which then reads and checks the data in accordance with the user program.

(2) Function block diagram

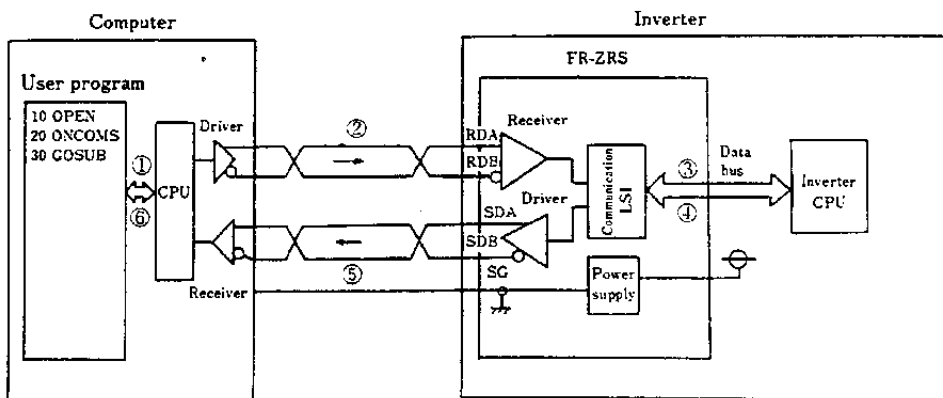


Fig. 12.6

12.8 Programming

(1) Communication protocol

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

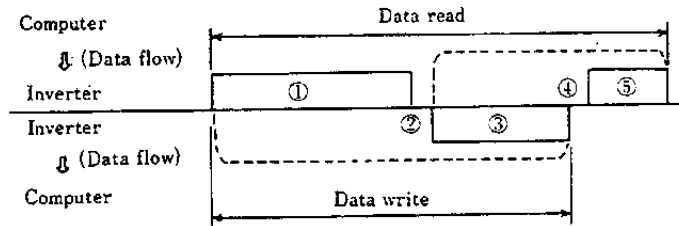


Fig. 12. 7

(2) Communication Timing and Data Format Types

Table 12. 6

No.	Operation	Operation Command	Running Frequency	Parameter Write	Inverter Reset	Monitoring	Parameter Read
①	Communication request is send 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 by inverter.	Request accepted when no error detected.	C	C	C	Absent	E E'
		Request rejected when error detected.	D	D	D	Absent	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.	No processing when no error detected	Absent	Absent	Absent	Absent	G
	3 re-outout when error detected	Absent	Absent	Absent	Absent	Absent	H

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

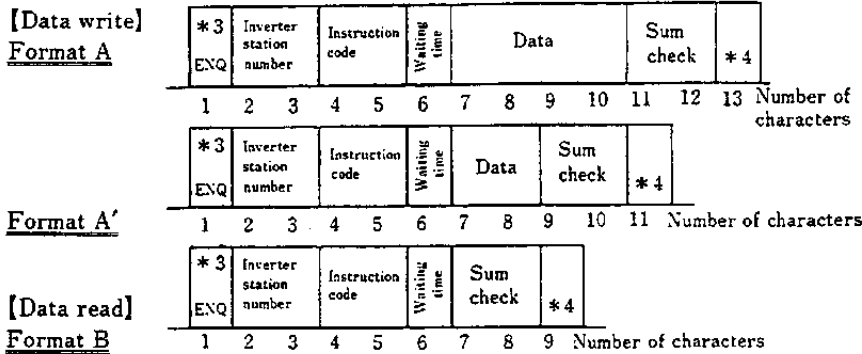
(3) Data format

Data is used in hexadecimal.

Data is automatically converted into ASCII when transferred between the computer.

① Data format types

(1) Communication request data sent by computer to inverter



* 3. Control code (See Table 12. 7.)

* 4. CR and LF codes
On some computers, the CR (Carriage Return) and LF (Line Feed) codes are automatically set at the end of a data group when data is transmitted from the computer to the inverter.

Fig. 12. 8. 1

(2) Reply data given by inverter to computer during data write

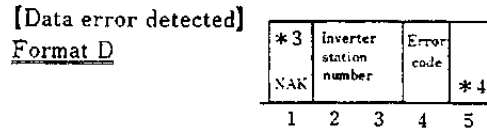
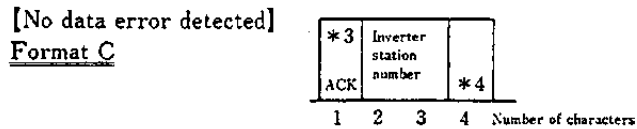


Fig. 12. 8. 2

Fig. 12. 8. 3

(3) Reply data given by inverter to computer during data read

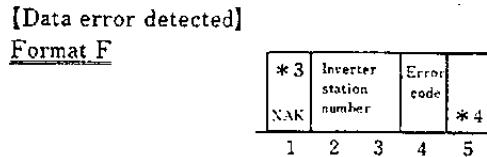
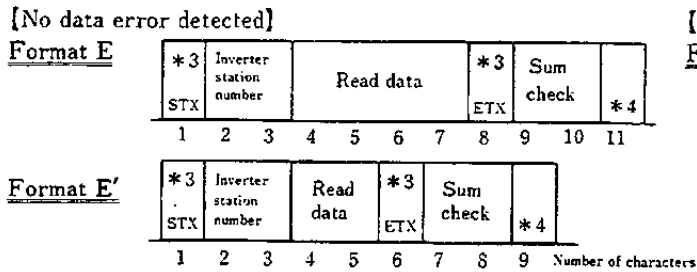


Fig. 12. 8. 4

Fig. 12. 8. 5

(4) Reply data given by computer to inverter during data read

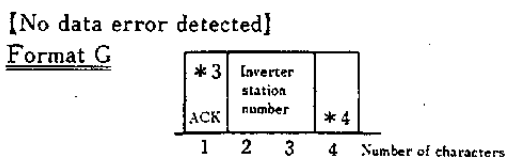


Fig. 12. 8. 6

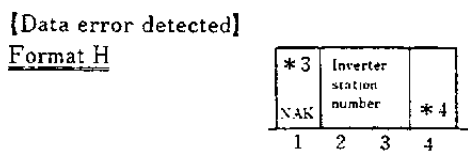


Fig. 12. 8. 7

② Control codes

Table 12.7

Signal	ASCII Code	Description	Signal	ASCII Code	Description
NUL	H 0 0	Null (No processing)	ACK	H 0 6	Acknowledge (No data error detected)
STX	H 0 2	Start of Text (Start of data)	LF	H 0 A	Line Feed
ETX	H 0 3	End of Text (End of data)	CR	H 0 D	Carriage Return
ENQ	H 0 5	Enquiry (Communication request)	NAK	H 1 5	Negative Acknowledge (Data error detected)

(4) Program example

To switch operation mode to ZRS operation.

Program

Line number

```

10 OPEN "COM1 : 9600, E, 7, 2, HD" AS #1
20 COMST 1, 1, 1 : COMST 1, 2, 1
30 ON COM(1) GOSUB : *REC
40 COM(1)ON
50 DS="01E110003"
60 S = 0
70 FOR I = 1 TO LEN (DS)
80 AS = MIDS(DS, I, 1)
90 A = ASC (AS)
100 S = S + A
110 NEXT I
120 DS = CHR$ (&H5) + DS + RIGHTS (HEXS(S), 2)
130 PRINT #1, DS
140 GOTO 50
1000 *REC
1010 IF LOC(1) = 0 THEN RETURN
1020 PRINT "RECEIVE DATA"
1030 PRINT INPUTS (LOC(1), #1)
1040 RETURN

```

I/O file initialization

- ☆ Communication file open
- ☆ Circuit control signal (RS, ER) ON/OFF setting
- ☆ Interrupt definition at data receiving
- ☆ Interrupt enable

Transmission data setting

Sum code calculation

- ☆ Addition of control code and sum code

Data transmission

Interrupt data receiving

- ☆ Interrupt occurrence at data receiving.

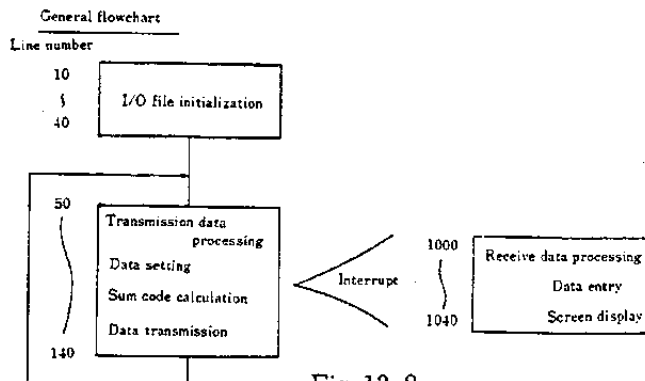
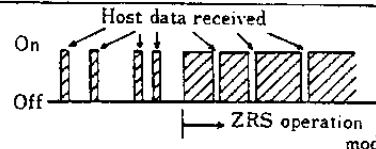


Fig. 12.9

12.9 Adjustment and Setting

(1) Functions of the parts (See Fig. 12. 1.)

Table 12. 8

No.	Name	Description
1	Connector	Used to interface the inverter printed circuit board. Correctly fit this connector to inverter connector pins. (See Section 1. 3.)
2	Terminal block (input)	For serial signal input/output. See Section 12. 5 for the wiring method. (Terminal intervals : 7. 62mm, terminal screw size : M3)
3	Terminal block (output)	
4	Terminal resistor jumper	Used to connect the terminal resistor contained in the FR-ZRS unit. (See Section 12. 5.) Inverter having final station number : Connect terminals RD2B and RD2R. Other inverters : Remove the jumper.
5	Station number setting switch	Used to set the inverter station number between 0 and 31. (See Section 12. 9, paragraph 2.)
6	Communication indicator LED	In other than ZRS operation mode, lit to indicate that host data has been received. In ZRS operation mode, extinguished to indicate that host data has been received. 
7	Installation holes (4 places)	Used to fasten the unit to the inverter printed circuit board using the supplied installation pins (See Section 1. 3.)

(2) Setting the station numbers to the inverters

Set station numbers to the inverters using the switch (SW1) on the FR-ZRS unit.

Station number must be set before powering up the inverter. Changing any station number during operation disallows data communication to be made and the inverter to be stopped.

① Setting method... See Fig. 12. 10.

Turn on the switch(es) corresponding to the station number, e. g.

To select station number 1 : Turn on switch 6 corresponding to station number indication 1.

To select station number 26 : Turn on switches 2, 3 and 5 corresponding to station number indications 16, 8 and 2. (26 = 16 + 8 + 2)

To select station number 0 : Turn off all switches.

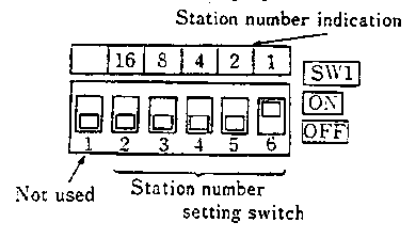


Fig. 12. 10

Example of Setting " Station Number 1 "

② The station number may be set between 0 and 31. When the RS422 interface is used, the station number may be set between 0 and 31 but the number of inverters connected must be within 10.

③ Station numbers cannot be repeated. (Use of the same station number for different inverters will cause communication error.)

④ Any station number setting switch must be in either the ON or OFF position and not midway ON and OFF to ensure normal data communication.

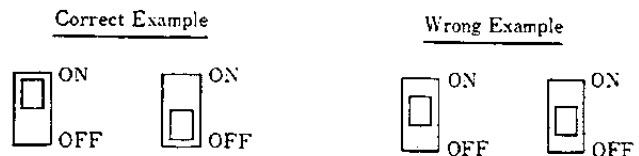


Fig. 12. 11

⑤ Station numbers do not have to be sequential and may be skipped, e. g. as shown in Fig. 12. 12.

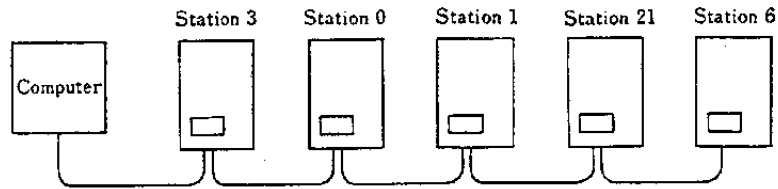


Fig. 12. 12 Station Number Setting Example

(3) Initial parameter settings

The initial parameter settings must be made in accordance with Table 12. 9 to start communication between the computer and inverter.

Data communication cannot be made without initial setting or if there is any setting fault.

Table 12. 9 Initial Parameter Settings

Item	Parameter No.**	Data Set Value	Description
1 Allowable communication time interval value	56	0	ZRS operation disabled
		0.1 to 999.9	Allowable value (in 0.1 second increments)
		65535	Communication check stop
2 Allowable number of communication error retry times	55	0 to 10	Indicates the allowable number of error times. Factory-set to 1. Communication speed
3 Communication speed	69 (63)	300, 600, 1200, 2400, 4000, 9600	Indicates communication speed (baud).
4 Stop bit length	70 (64)	1.0	Stop bit length = 1 bit
		1.5	Stop bit length = 1.5 bits
		2.0	Stop bit length=2 bits
5 Parity check	71 (65)	0	No parity check performed
		1	Odd parity check performed
		2	Even parity check performed
6 CR, LF instruction presence/absence	61 (72)	0	Both CR and LF absent.
		1	CR only present.
		2	Both CR and LF present.
7 Pull-up/pull-down circuit operation selection*	60 (59)	0	No operation performed.
		1	Inverter of station 1 only operated.

★Indicates a factory set value.

* Pull-up, pull-down circuit operation selection

To prevent the output form being in high impedance state, computers generally contain a fail-safe circuit which pulls the signal line up/down.

If the computer used does not include this circuit, the pull-up/pull-down operation may be performed for only the inverter having station number 1.

** Parameter numbers in parentheses indicate those of the FR-Z200-N series inverters (with communication function).

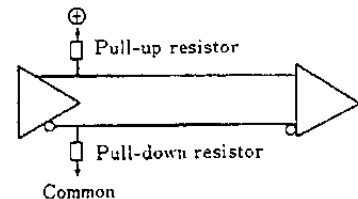


Fig. 12. 13

(4) Selection of control place

In ZRS operation mode, operation can be performed by signals from external terminals in accordance with the conditions set in parameter 57 (operation command control place selection) and parameter 58 (speed command control place selection).

Table 12. 10 Selection of Control Place

Control Place Selection		Functions Equivalent to External Terminals														
Pr. 57 (operation command)	Pr. 58 (speed command)	STF	STR	STOP	JOG	RT	2	4	1K	1E	RH, RM, RL	AU	RES	MRS	OH	CS
0 : Computer	0 : Computer	COM	COM	—	—	COM	COM	—	AUX	AUX	COM	BO	BO	BO	EX	EX
0 : Computer	1 : External terminal	COM	COM	—	—	COM	EX	EX	EX	EX	EX	BO	BO	BO	EX	EX
1 : External terminal	0 : Computer	EX	EX	EX	EX	EX	COM	—	AUX	AUX	COM	BO	BO	EX	EX	EX
1 : External terminal	1 : External terminal	EX	EX	EX	EX	EX	EX	EX	EX	EX	EX	BO	BO	EX	EX	EX

Note Ex : Control by signal from external terminal is only valid.

COM : Control from computer user program is only valid.

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.

12. 10 Operation Mode at Power On or Instantaneous Power Failure

Parameter 79 (operation mode) allows the operation mode to be defined at power on or power restoration after instantaneous power failure.

Table 12. 11

Parameter Set Value	Operation Mode	Mode at Power On or Power Restoration after Instantaneous Power Failure
0	PU or external operation	External operation mode is selected.
1	External operation	External operation mode is selected.
2	PU operation	PU operation mode is selected.
3	ZRS operation	ZRS operation mode is selected. (Need not be switched by program.)
4	ZRS restart after instantaneous power failure	Installation of the FR-ZRS unit causes automatic restart to be made under the pre-instantaneous power failure conditions and ZRS operation to be continued without any communication signal given by the computer.

* If an instantaneous power failure occurs during ZRS operation, the computer program stops and remains stopped when the power is restored.

12. 11 Precautions

(1) Programming instructions

① The inverter does not accept any invalid data from the computer. The user program must therefore include a retry program for invalid data.

② Any data communication request (e. g. operation command, monitor) is given by the computer and the inverter does not voluntarily return data to the computer. Hence, the user program should be written so that the computer gives a data read request as required for monitoring, etc.

(2) Operating instructions

① An allowed communication time interval value of the inverter must be set before starting operation. If the allowed communication time interval value is not set, operation is disabled by an interlock which has been provided to prevent hazard.

- ② Data communication is not made automatically but made only once when a communication request is given by the computer. Hence, the inverter cannot be stopped if communication is disabled during operation due to an open signal line, etc. After the allowed communication time interval has elapsed, the inverter is brought to an alarm stop (E. OPT).

Connect the inverter terminals RES and SD or switch the power off to coast the inverter to a stop.

12.12 Troubleshooting

- (1) Inverter cannot read data from computer.
 - ① Computer conforming to RS422 or RS485 standard ?
 - ② FR-ZRS unit and communication cables connected properly ? (Check for contact fault, open wire, incorrect polarity, etc.)
 - ③ Initial setting of the inverter correct ?
 - ④ Inverter station numbers set properly? (Check for unmatched with program and repeated station numbers)
 - ⑤ Correct communication request program executed by computer ?
- (2) Operation mode is not switched to ZRS operation.
 - ① Inverter in external operation mode? Signal entered into external terminal STF of STR ?
 - ② Correct operation mode switching program executed ?
- (3) Inverter cannot be started in ZRS mode.
 - ① Inverter starting program executed properly ?
 - ② Control place select conditions in Section 12.9(4) defined properly ?
 - ③ Inverter output provided ?
 - ④ Allowable communication time interval value set properly ?
- (4) Inverter is brought to alarm stop during run due to communication fault
 - ① FR-ZRS unit and communication cables connected properly? (Check for contact fault, open wire, etc.)
 - ② Computer without fault ?
 - ③ Program written to allow communication request to be given by computer periodically ?
 - ④ Allowable communication time interval set properly ?
 - ⑤ Format of data transferred correct ?

12. 13 Instruction Code and Data List (for FR-Z300 series)

Data Code		Data (Parameter)					
Read	Write	Parameter No.	Function	Setting range	Data range	Data increments	Default value
H00	H80	0	Torque boost (manual)	0 to 30%	0 to 300	0.1%	* 1
H01	H81	1	Maximum frequency	0 to 120Hz	0 to 12000	0.01Hz	12000
H02	H82	2	Minimum frequency	0 to 60Hz	0 to 6000	0.01Hz	0
H03	H83	3	V/F (base frequency)	50 to 360Hz	5000 to 36000	0.01Hz	6000
H04	H84	* 4	3-speed setting (high speed)	0 to 360Hz	0 to 36000	0.01Hz	6000
H05	H85	* 5	3-speed setting (middle speed)	0 to 360Hz	0 to 36000	0.01Hz	3000
H06	H86	* 6	3-speed setting (low speed)	0 to 360Hz	0 to 36000	0.01Hz	1000
H07	H87	7	Acceleration time	0.1 to 3600 seconds	0 to 36000	0.1 seconds	* 1
H08	H88	8	Deceleration time	0.1 to 3600 seconds	0 to 36000	0.1 seconds	* 1
H09	H89	9	Electronic overcurrent protector	0 to 999.9A	0 to 9999	0.1A	* 1
H0A	*H8A	*10	DC dynamic brake operating frequency	0 to 60Hz	0 to 6000	0.01Hz	300
H0B	H8B	11	DC dynamic brake operation time	0 to 10 seconds	0 to 100 * 2	0.1 seconds	5
H0C	H8C	12	DC dynamic brake voltage	0 to 20%	0 to 20	1%	* 1
H0D	H8D	13	Starting frequency	0.5 to 10Hz	50 to 1000	0.01Hz	50
H0E	H8E	14	Applied load selection	0 to 3, 10 to 13	0 to 3, 10 to 13	Integer	0
H0F	H8F	15	Jog frequency	0 to 360Hz	0 to 36000	0.01Hz	500
H10	H90	16	Jog acceleration/deceleration time	0.1 to 3600 seconds	1 to 36000	0.1 seconds	5
H11	H91	17	External thermal relay input selection	0, 1, 100, 101	0, 1, 100, 101	Integer	0
H12	H92	18	High-speed maximum frequency	120 to 360Hz	12000 to 36000	0.01Hz	12000
H13	H93	19	Base frequency voltage	0 to 500V	0 to 500 * 3	1V	65535
H14	H94	20	Frequency at 5V input	1 to 360Hz	100 to 36000	0.01Hz	6000
H15	H95	21	Frequency at 20mA input	1 to 360Hz	100 to 36000	0.01Hz	6000
H16	H96	22	Stall prevention activation level	0 to 200%	0 to 200	1%	0
H17	H97	23	Triplex deceleration time	0.1 to 3600 seconds	0.1 to 36000	0.1 seconds	* 1
H18	H98	*24	Multi-stage speed setting (speed 4)	0 to 360Hz	0 to 36000 * 2	0.01Hz	65535
H19	H99	*25	Multi-stage speed setting (speed 5)	0 to 360Hz	0 to 36000 * 2	0.01Hz	65535
H1A	H9A	*26	Multi-stage speed setting (speed 6)	0 to 360Hz	0 to 36000 * 2	0.01Hz	65535
H1B	H9B	*27	Multi-stage speed setting (speed 7)	0 to 360Hz	0 to 36000 * 2	0.01Hz	65535
H1C	H9C	28	Multi-stage speed input compensation selection	0, 1, 2	0, 1, 2	Integer	0
H1D	H9D	29	Acceleration/deceleration pattern selection	0, 1, 2, 3	0, 1, 2, 3	Integer	0
H1E	H9E	30	Regeneration brake operating factor	0 to 30%	0 to 30	1%	* 1
H1F	H9F	31	Frequency jump 1A	0 to 360Hz	0 to 36000 * 2	0.01Hz	65535
			Stop frequency at backlash acceleration (Pr.29 = 3)	0 to 360Hz	0 to 36000	0.01Hz	100
H20	HA0	32	Frequency jump 1B	0 to 360Hz	0 to 36000 * 2	0.01Hz	65535
			Stop time at backlash acceleration (Pr.29 = 3)	0 to 360 seconds	0 to 36000	0.1 seconds	5
H21	HA1	33	Frequency jump 2A	0 to 360Hz	0 to 36000 * 2	0.01Hz	65535
			Stop frequency at backlash deceleration (Pr.29 = 3)	0 to 360Hz	0 to 36000	0.01Hz	100
H22	HA2	34	Frequency jump 2B	0 to 360Hz	0 to 36000 * 2	0.01Hz	65535
			Stop time at backlash deceleration (Pr.29 = 3)	0 to 360 seconds	0 to 36000	0.1 seconds	5
H23	HA3	35	Frequency jump 3A	0 to 360Hz	0 to 36000 * 2	0.01Hz	65535
H24	HA4	36	Frequency jump 3B	0 to 360Hz	0 to 36000 * 2	0.01Hz	65535
H25	HA5	37	Speed display	0 to 10	0 to 10	Even number	0
				11 to 9998	11 to 9998	1rpm	
H26	HA6	38	FM terminal output reference frequency	1 to 360Hz	100 to 36000	0.01Hz	6000
H27	HA7	39	Energizing current at automatic torque boost	0 to 215A	0 to 215 * 10	1A	* 1
			Slip compensation energizing current (Pr. 59 = 2)	0 to 215A	0 to 2150	0.1A	Rated current/2
H28	HA8	40	Torque boost (automatic)	0 to 200%	0 to 200	1%	0
			Slip compensation speed gain (Pr. 59 = 2)	0 to 1000%	0 to 1000	1%	100
H29	HA9	41	Up-to-frequency sensitivity	1 to 100%	1 to 100 * 2	1%	10
H2A	HAA	42	Output frequency detection	0.5 to 360Hz	0 to 36000 * 4	0.01Hz	600
H2B	HAB	43	Output frequency detection at reverse run	0.5 to 360Hz	0.5 to 36000 * 5	0.01Hz	65535
			Second output frequency detection (Pr. 41 = 65535)	0.5 to 360Hz	0.5 to 36000	0.01Hz	600
H2C	HAC	44	Second acceleration/deceleration time	0.1 to 3600 seconds	1 to 36000	0.1 seconds	50
H2D	HAD	45	Second deceleration time	0.1 to 3600 seconds	1 to 36000 * 2	0.1 seconds	65535

Data Code (Hexadecimal)		Data (Parameter)					
Read	Write	Parameter No.	Function	Setting range	Data range	Data increments	Default value
H 2 E	H A E	46	Second torque boost	0 to 30%	0 to 300 * 2	0.1%	65535
H 2 F	H A F	47	Second V/F (base frequency)	50 to 360Hz	3000 to 36000 * 2	0.01Hz	65535
H 3 0	H B 0	48	Second stall prevention activation level (current)	0 to 200%	0 to 200	1%	150
H 3 1	H B 1	49	Second stall prevention activation level (frequency)	0 to 360Hz	0 to 36000	0.01Hz	0
H 3 2	H B 2	50	BCD input (bias)	0 to 360Hz	0 to 36000	0.01Hz	0
H 3 3	H B 3	51	BCD input (gain)	0 to 360Hz	0 to 36000 * 2	0.01Hz	6000
H 3 4	H B 4	52	Binary input (bias)	0 to 360Hz	0 to 36000	0.01Hz	0
H 3 5	H B 5	53	Binary input (gain)	0 to 360Hz	0 to 36000 * 2	0.01Hz	6000
H 3 6	H B 6	54	Digital input compensation selection	0, 1	0, 1	Integer	0
H 3 7	H B 7	55	Number of retry times	0 to 10	0 to 10	Integer	0
			Speed feedback range (Pr. 59 = 1)	0.1 to 360Hz	10 to 36000 * 7	0.01Hz	300
H 3 8	H B 8	56	Communication check time interval	0 to 999.8 seconds	0 to 9998 * 2	0.1 seconds	0
			Speed feedback gain (Pr. 59 = 1)	0.1 to 100	0.1	Integer	1
H 3 9	H B 9	57	Operation command control place selection	0, 1	0, 1	Integer	4
			Number of motor poles at speed feedback (Pr. 59 = 1)	2, 4, 6, 8	2, 4, 6, 8	Integer	4
H 3 A	H B A	58	Speed command control place selection	0, 1	0, 1	Integer	0
			Direction of encoder rotation (Pr. 59 = 1)	0, 1	0, 1	Integer	1 *
H 3 B	H B B	59	Speed feedback parameter selection	0, 1, 2	0, 1, 2	Integer	0
H 3 C	H B C	60	Full-up resistor connection	0, 1	0, 1	Integer	0
			Upper limit (Pr. 59 = 1)	0 to 100%	0 to 100 * 2	1%	65535
H 3 D	H B D	61	CR, CF instruction selection	0, 1, 2	0, 1, 2	Integer	1
			Lower limit (Pr. 59 = 1)	0 to 100%	0 to 100 * 2	1%	65535
H 3 E	H B E	62	PI control set value	0 to 100%	0 to 10000	0.01%	0
H 3 F	H B F	63	Alarm code output selection	0, 1, 2	0, 1, 2	Integer	0
H 4 0	H C 0	64	Polarity reversible operation selection	0, 1	0, 1	Integer	0
H 4 2	H C 2	66	Cushion time for automatic restart after instantaneous power failure/commercial power supply-inverter switch-over	0.1 to 5 seconds	1 to 50	0.1 seconds	5
H 4 3	H C 3	67	Reset time for automatic restart after instantaneous power failure/commercial power supply-inverter switch-over	0.1 to 5 seconds	1 to 50 * 7	0.1 seconds	65535
			Communication speed (300, 600, 1200, 2400, 4800, 9600 bauds)	300 to 9600 bauds	300 to 9600	Integer	9600
H 4 5	H C 5	69	PI control proportional zone (Pr. 59 = 1)	1 to 1000%	1 to 100 * 8	1%	100
			Stop bit length	1.0, 1.5, 2.0	1.0, 1.5, 2.0	0.1	2.0
H 4 6	H C 6	70	PI integral time (Pr. 59 = 1)	0.1 to 3600 seconds	1 to 3600 * 9	0.1 seconds	1
			Parity check	0, 1, 2	0, 1, 2	Integer	2
H 4 7	H C 7	71	PI action selection (Pr. 59 = 1)	0, 1	0, 1	Integer	0
			Load meter at zero scale	Output current (Pr. 74 = 0)	0 to 500A	0 to 5000	0.1A
H 4 8	H C 8	72	Output frequency (Pr. 74 = 1)	0 to 360Hz	0 to 36000	0.01Hz	0
			Output voltage (Pr. 74 = 2)	0 to 700V	0 to 7000	0.1V	0
			Load meter at full scale	Output current (Pr. 74 = 0)	0 to 500A	0 to 5000	0.1A
H 4 9	H C 9	73	Output frequency (Pr. 74 = 1)	0 to 360Hz	0 to 36000	0.01Hz	0
			Output voltage (Pr. 74 = 2)	0 to 700V	0 to 7000	0.1V	0
			Load meter output selection	0, 1, 2	0, 1, 2	Integer	0
H 4 A	H C A	74	Parameter all clear mode	0, 1	0, 1	Integer	0
H 4 C	H C C	*76	PU monitor display switching	0, 1, 2, 3, 4	0, 1, 2, 3, 4	Integer	0
			Td compensation (Pr. 75 = 7263)	0, 1	0, 1	Integer	0
H 4 D	H C D	77	Parameter write disable selection	0, 1	0, 1	Integer	0
H 4 E	H C E	78	Reverse run prevention selection	0, 1, 2	0, 1, 2	Integer	0
H 4 F	H C F	79	Operation mode selection	0, 1, 2, 3, 4	0, 1, 2, 3, 4	Integer	0
			C-1	Frequency meter calibration	0 to 360Hz	0 to 36000	0.01Hz
		C-2	Frequency setting voltage (bias)	0 to 120Hz	0 to 12000	0.01Hz	0
		C-3	Frequency setting voltage (gain)	1 to 380Hz	100 to 38000	0.01Hz	6000
		C-4	Frequency setting current (bias)	0 to 120Hz	0 to 12000	0.01Hz	0
		C-5	Frequency setting current (gain)	1 to 360Hz	100 to 36000	0.01Hz	6000

* 1 : Depends on the inverter capacity. (For details, see the instruction manual.) * 2 : 65535 (not set)
 * 3 : 65535 (without voltage compensation) * 4 : 65535 (during PU operation) * 5 : 65535 (both forward and reverse runs)
 * 6 : 0 (without feedback) * 7 : 65535 (without restart), 0 (optimum value) * 8 : 65535 (I control only) * 9 : 65535 (P control only)
 * 10 : 65535 (rated current/2) * Write during run is allowed.