Instruction manual for JC□ -13A (C5) communication

No.JC1CE1 July 2001

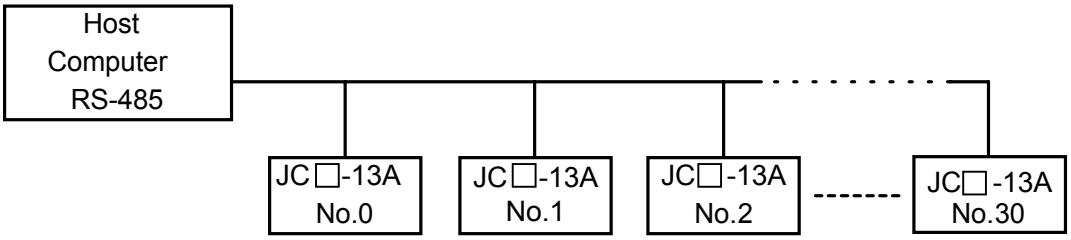
To prevent accidents arising from the use of this controller, please ensure the operator using it receives this manual.

⚠ Warning

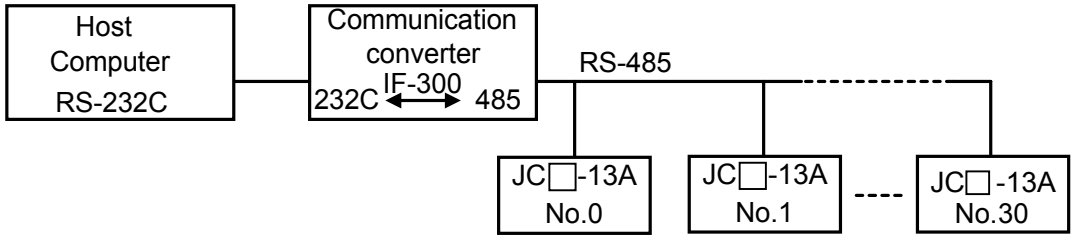
Turn the power supply to the instrument OFF before wiring or checking. Working or touching the terminal with the power switched ON may result in Electric Shock which may cause severe injury or death.

1. System configuration

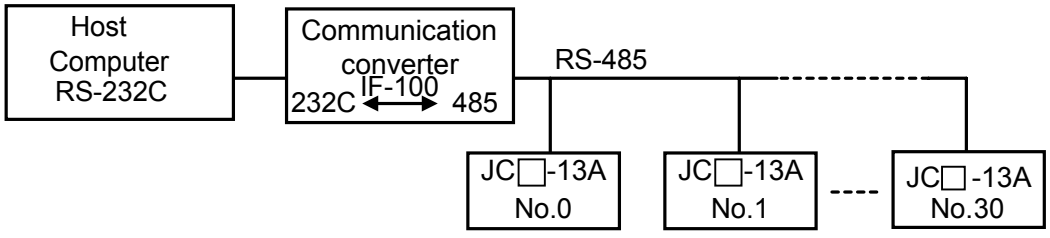
RS-485 Multi-drop connection communication (Option: C5)



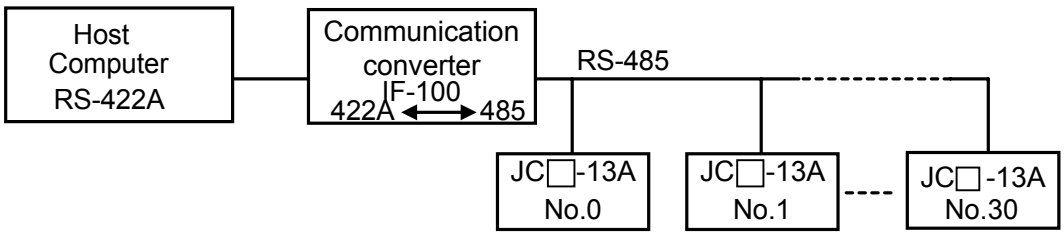
(Fig.1-1)



(Fig.1-2)



(Fig.1-3)



(Fig.1-4)

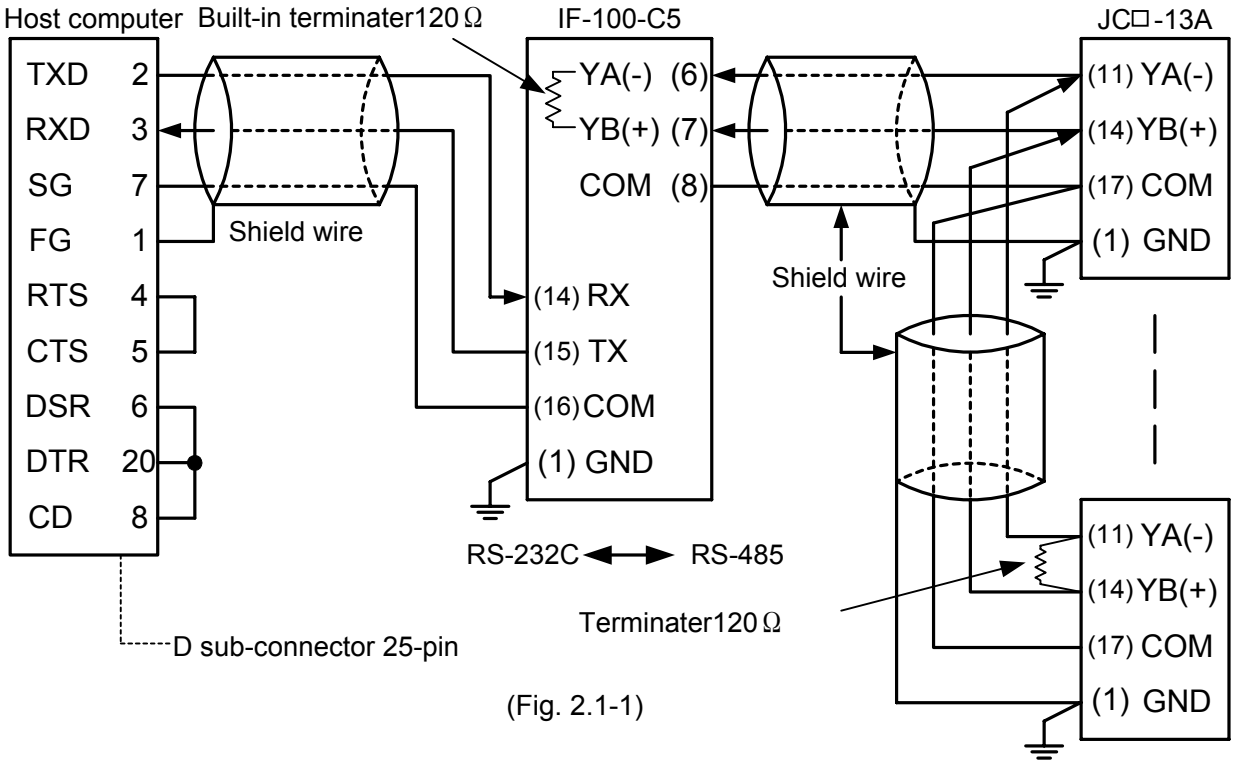
2. Wiring connection

2.1 When communication converter IF-100-C5 (RS-232C) is used:

• Connector: D sub-connector 25-pin

Connection: RS-232C ◄——► RS-485 (Data transfer rate: 2400, 4800, 9600bps)

Use communication converter (IF-300-C5) when communicating at the rate 19200bps.

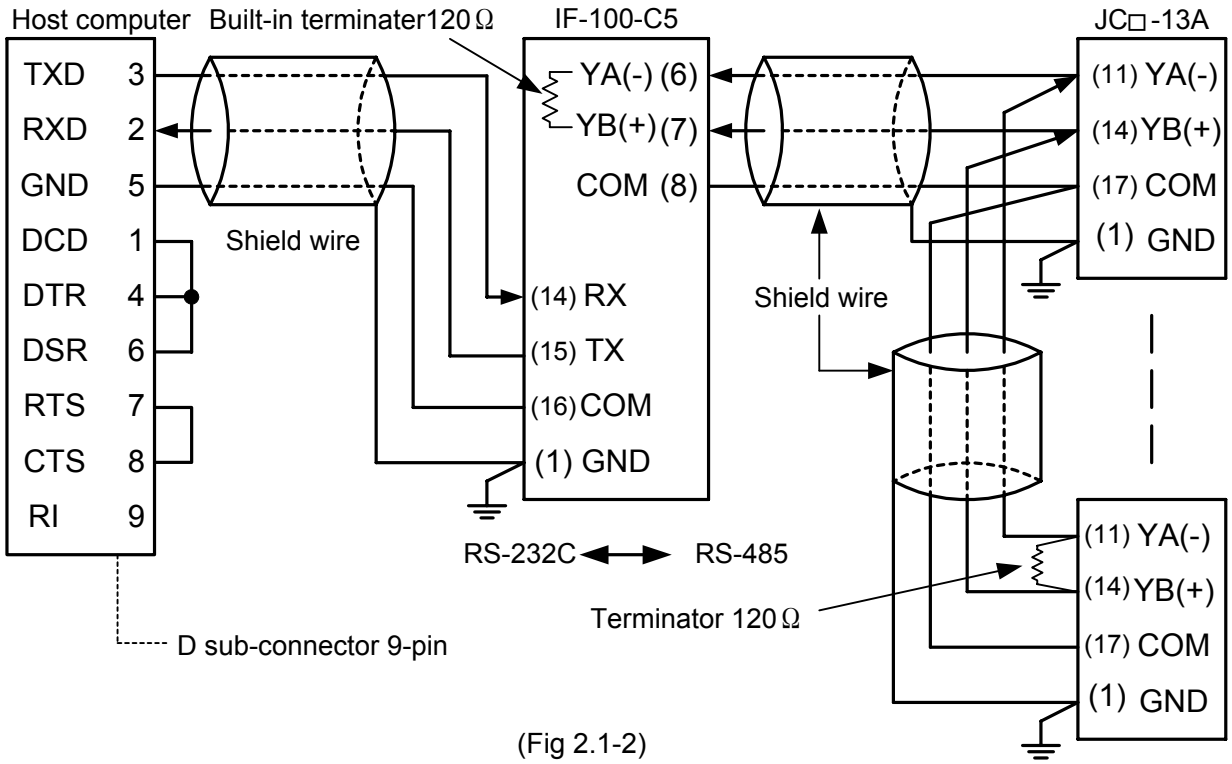


(Fig. 2.1-1)

Connector: D sub-connector 9-pin

Connection: RS-232C ◄——► RS-485 (Data transfer rate: 2400, 4800, 9600bps)

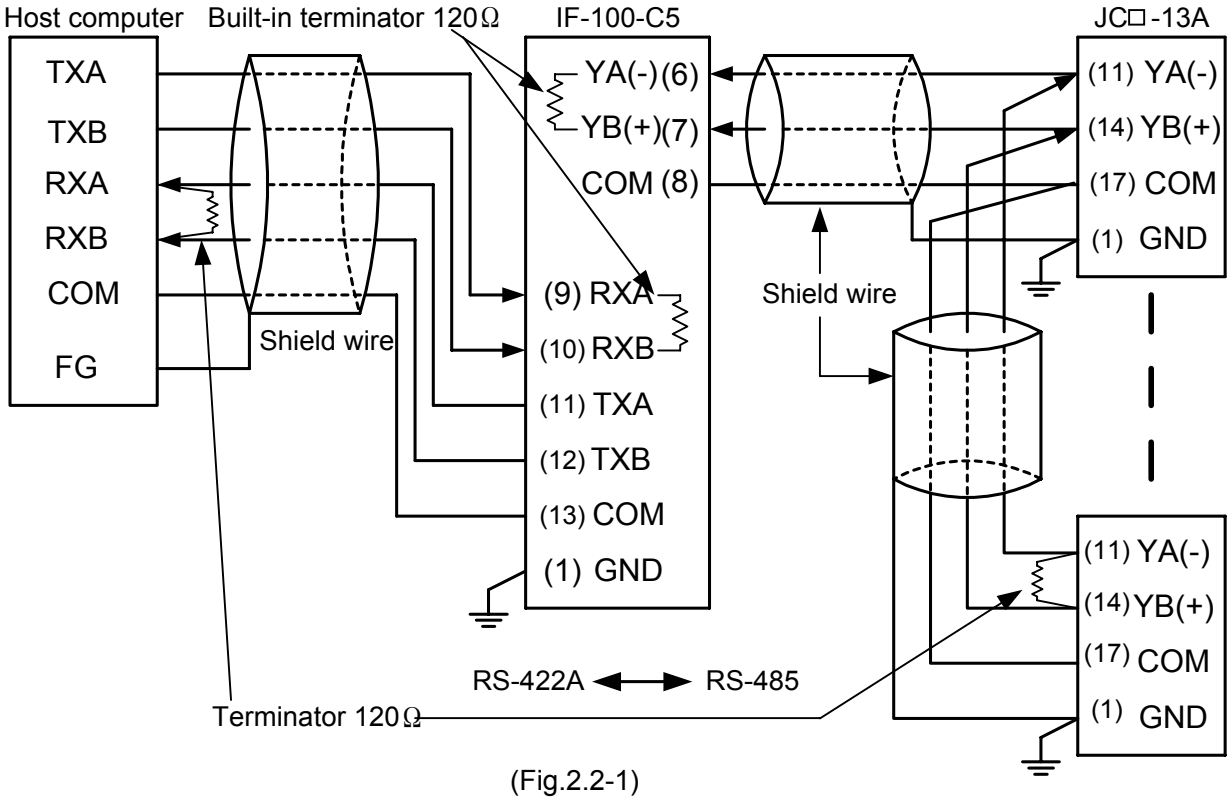
Use communication converter (IF-300-C5) when communicating at the rate 19200bps.



(Fig 2.1-2)

2.2 When communication converter IF-100-C5 (RS-422A) is used;

Connection: RS-232C ◄——► RS-485 (Data transfer rate: 2400, 4800, 9600bps)

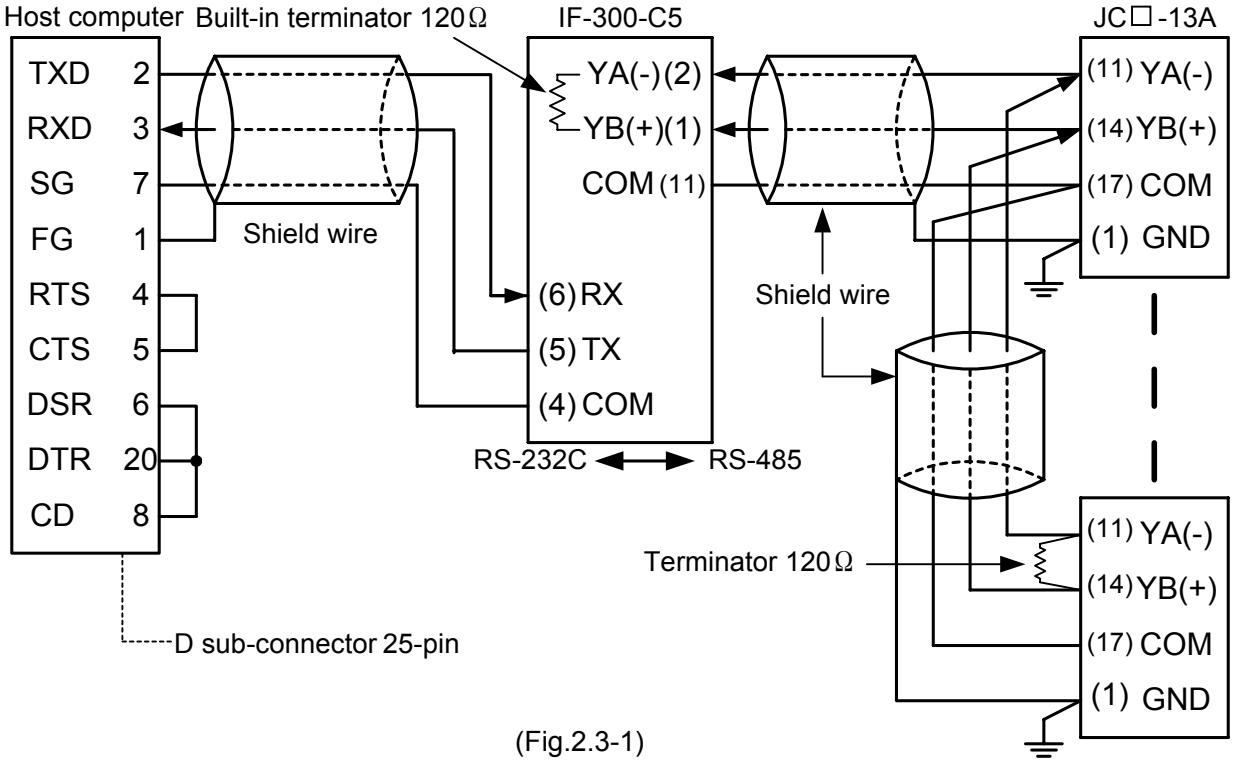


(Fig.2.2-1)

2.3 When communication converter IF-300-C5 (RS-232C) is used:

• Connector: D sub-connector 25-pin

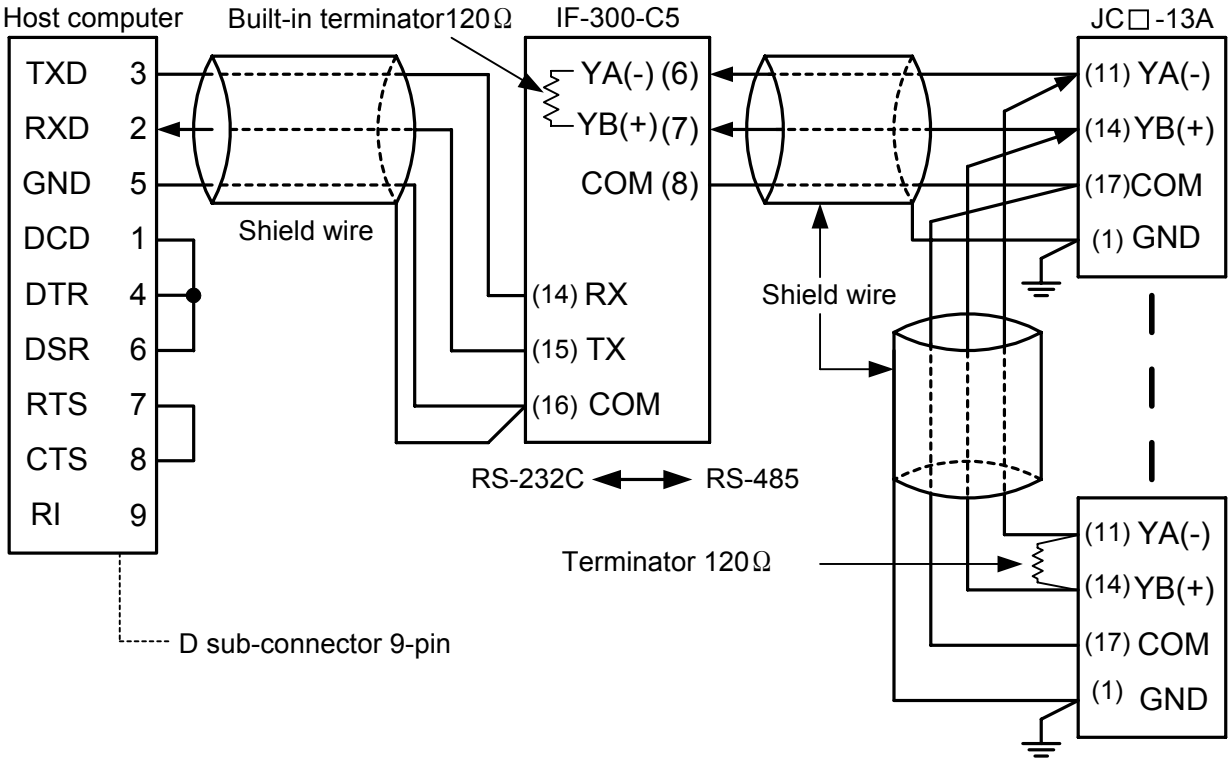
Connection: RS-232C ◄——► RS-485 (Data transfer rate: 2400, 4800, 9600, 19200bps)



(Fig.2.3-1)

• Connector: D-sub connector 9-pin

Connection: RS-232C ◄——► RS-485 (Data transfer rate: 2400, 4800, 9600, 19200bps)



(Fig.2.3-2)

Shield wire

Connect only one side of shield wire to FG or GND terminal so as not to allow current to flow to shield section.

If both sides of shield section are connected to FG or GND terminal, closed circuit will be made between shield wire and ground. As a result of this, current runs in a shield wire and **the noise may easily occur by the current.**

Never fail to ground FG or GND terminal.

Terminator

The longer communication line becomes, the worse the transmission waveform becomes because of reflection, and it may lead to the malfunction of communication.

To protect communication from this effect, set the terminator at the end of communication cable.

Communication converter IF-100-C5 and IF-300-C5 are sold separately.

3. Setting the instruments

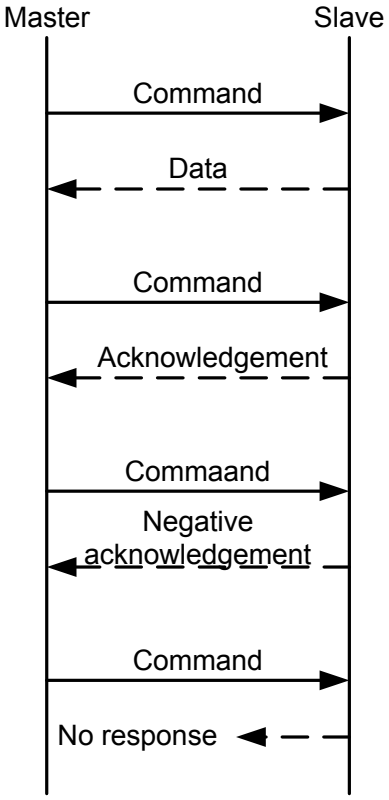
• It is necessary to set the instrument number individually to the instruments when plural units are connected in serial communication (Option: C5).

Select the data transfer rate of JC □ -13A in accordance with the host computer.

• Refer to the JC□ -13A instruction manual as for instrument number setting and transfer rate selection.

4. Communication procedure

Communication starts with command transmission of the host computer and ends with the response of JC □-13A.



• Response with data

When Master sends reading command, Slave returns the corresponding setting value or current status.

• Acknowledgement

When Master sends setting command, Slave returns the acknowledgement as a response after the processing is terminated.

• Negative acknowledgement

When Master sends non-existent command or value outside the setting range, Slave returns the negative acknowledgement.

• No response

Slave will not respond when framing error or checksum error has been detected nor when global address is set.

(Fig.4-1)

Communication timing of the RS-485 (Option: C5)

Slave side;

When a slave starts transmission to RS-485 communication line, the JC□- 13A is arranged so as to provide 1 character transmission period or more of idle status (mark status) before sending the response to ensure the synchronization on the receiving side.

The JC□- 13A is arranged so as to disconnect the transmitter from the communication line within the period of 1 character transmission after sending the response.

Master side

Set the program so that the host computer can provide 1 character transmission period or more of idle status (mark status) before sending the command to ensure the synchronization on the receiving side when the host computer starts the transmission to RS-485 communication line.

Set the program so that the host computer can disconnect the transmitter from the communication line within the period of 1 character transmission after sending the command in preparation for reception of the response from the JC series.

To avoid the collision of transmissions between the host computer and the JC series, send the next command after checking that the host computer received the response.

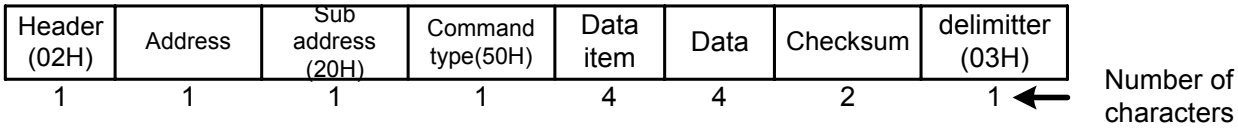
When the host computer communicates with the JC □-13A through the line converter (IF-100-C5, IF-300-C5, sold separately), it is not required to manage the transmission timing described above because the converter takes the timing interpreting the protocol automatically.

5. Shinko protocol

5.1 Command configuration

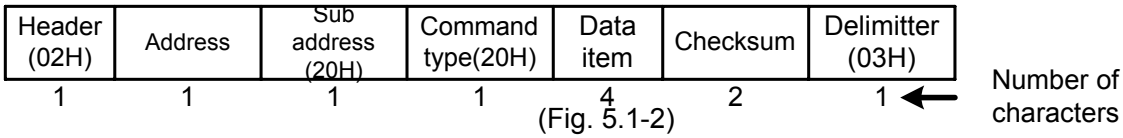
All commands are composed of ASCII.
The data (setting value, decimal number) is converted to Hexadecimal and ASCII codes are used for the command.
Negative numbers are represented by the 2's complement.

(1) Setting command



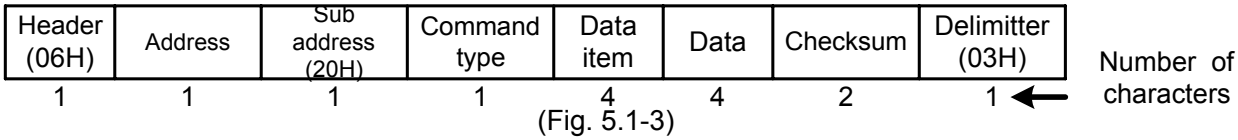
(Fig. 5.1-1)

(2) Reading command



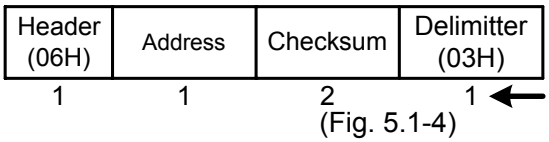
(Fig. 5.1-2)

(3) Response with data



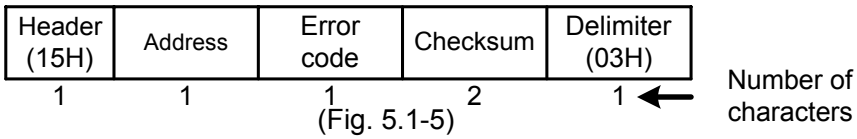
(Fig. 5.1-3)

(4) Acknowledgement



(Fig. 5.1-4)

(5) Negative acknowledgement



(Fig. 5.1-5)

Header : Control code that represents the beginning of the command or response and ASCII is used.
Setting command, Reading command : (02H) fixed
Response with data, Acknowledgement : (06H) fixed
Negative acknowledgement : (15H) fixed

Address : Numbers by which a master discerns slaves with.
Instrument number 0 to 95 (20H to 7FH)
The numbers are used by giving 20H of bias, because 00H to 1FH are used for control code.
95 (7FH) is called **Global address**, which is used when the same command is sent to all the slaves connected. However, the response is not returned.

Sub address : (20H) fixed
Command type : Code to discern Setting command (50H) and Reading command (20H)
Data item : Data classification for the command object
Composed of hexadecimal 4 digits (Refer to the Communication table)
Data : The contents of Data (setting value) differ depending on the setting command
Composed of hexadecimal 4 digits (Refer to the Communication command table)
Checksum : 2-character data to detect communication errors
Delimiter : Control code to indicate the end of command (03H) fixed
Error code : Indicates error type Composed of hexadecimal 1 digit
1 (31H)-----Non-existent command
2 (32H)-----Not used
3 (33H)-----Out of the setting value range
4 (34H)-----Status unable to set (e.g. AT is performing)
5 (35H)-----In setting mode by key operation

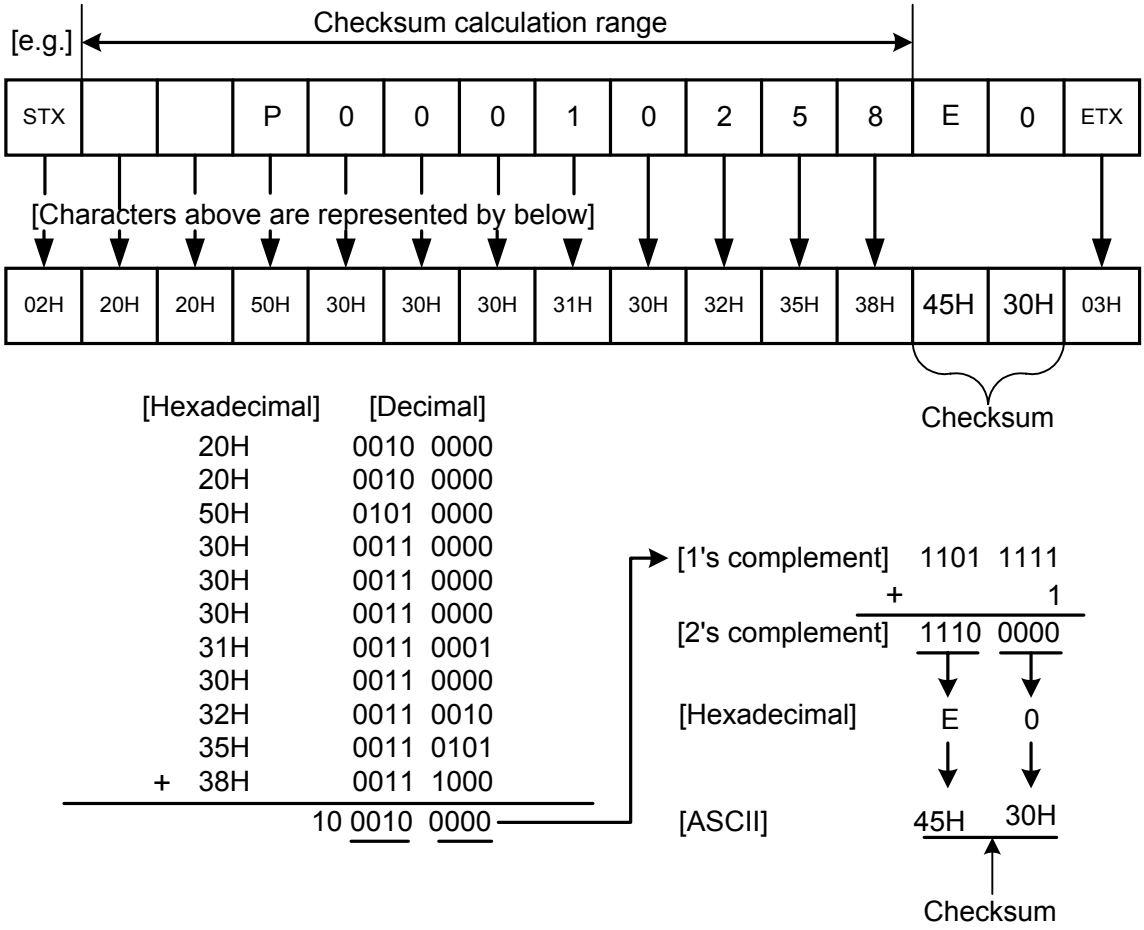
5.2 Checksum calculation

Checksum is used for detecting receiving errors of command or data.
Make a program for the host computer side as well to calculate the checksum of the response data from the slaves so that the communication errors can be checked.

ASCII (hexadecimal) corresponding to the character from the address (instrument number) to the character before the checksum is converted to binary notation, and the total value is made. The lower 2-digit of the total value are converted to 2's complements and then to hexadecimal number, that is, ASCII code for the checksum.

● **Checksum calculation example** is shown as follows.
Main setting value: 600℃ (0258H)
Address (instrument number): 0 (20H)

• 1's complement: Make each bit of binary 0 and 1 reverse.
• 2's complement: Add 1 to 1's complement.



5.3 Command contents

Notice of setting and reading command

- Possible to set the setting value by setting command of the communication function even if setting value is locked
- Even if the option is not applied, it is possible to set by setting command, however, the contents of the command is ineffective.
- The life of memory is approximately 1,000,000 (one million) in number of times of writing. If the number of times exceeds the limit, it cannot memorize data.
- When connecting plural JC series, instrument numbers must not be duplicated.
- When sending a command by Global address [95 (7FH)], the same command is sent to all the slaves connected. However, the response is not returned.
- The instrument number and data transfer rate of JC series cannot be set by communication. Set them by front key operations of the JC series.

Setting command

- The settable range is the same as the one by key operation.
  Refer to the communication command table of this manual as for communication command.
- All commands are composed of ASCII.
- The data (setting value) is converted to hexadecimal number, and ASCII is used.
  Negative number is represented by 2's complement.
  When the data (setting value) has a decimal point, use the whole number the decimal point is omitted.

Reading command

- All commands are composed of ASCII.
- The data (setting value) is converted to hexadecimal number, and ASCII is used.
  Negative number is represented by 2's complement.
  When the data (setting value) has a decimal point, use the whole number the decimal point is omitted.

5.4 Communication command table

When the data (setting value) has a decimal point, remove the decimal point and represent it as a whole number then convert the whole number to hexadecimal number.

Command type	Data item	Data
20H/50H	0001H: First main setting value	Setting value
20H/50H	0002H: Second main setting value	Setting value
20H/50H	0003H: Auto-tuning or Auto-reset Perform/Cancel	0000H: Cancel 0001H: Perform
20H/50H	0004H: Main proportional band setting	Setting value
20H/50H	0005H: Cooling proportional band setting	Setting value
20H/50H	0006H: Integral time setting	Setting value
20H/50H	0007H: Derivative time setting	Setting value
20H/50H	0008H: Main proportional cycle setting	Setting value
20H/50H	0009H: Cooling proportional cycle setting	Setting value
20H/50H	000AH: Not used	
20H/50H	000BH: Alarm 1 (A1) setting	Setting value
20H/50H	000CH: Alarm 2 (A2) setting	Setting value
20H/50H	000DH: Not used	
20H/50H	000EH: Not used	
20H/50H	000FH: Heater burnout alarm setting	Setting value
20H/50H	0010H: Loop break alarm action time setting	Setting value
20H/50H	0011H: Loop break alarm action span setting	Setting value
20H/50H	0012H:Setting value lock designation (*1)	0000H: Unlock 0001H: Lock 1 0002H: Lock 2 0003H: Lock 3
20H/50H	0013H: Main setting value high limit setting	Setting value

20H/50H	0014H: Main setting value low limit setting	Setting value
20H/50H	0015H: Sensor correction value setting	Setting value
20H/50H	0016H: Overlap band/Dead band setting	Setting value
20H/50H	0017H: Not used	
20H/50H	0018H: Scaling high limit setting	Setting value
20H/50H	0019H: Scaling low limit setting	Setting value
20H/50H	001AH: Decimal point place selection	0000H:XXXX (No decimal point) 0001H:XXX.X (1 digit after decimal point) 0002H:XX.XX (2 digits after decimal point) 0003H:X.XXX (3 digits after decimal point)
20H/50H	001BH:PV filter time constant setting	Setting value
20H/50H	001CH: Main output high limit setting	Setting value
20H/50H	001DH: Main output low limit setting	Setting value
20H/50H	001EH: Main control output ON/OFF action hysteresis setting	Setting value
20H/50H	001FH: Cooling action mode selection	0000H: Air cooling (Linear characteristic) 0001H: Oil cooling (1.5^{th} power characteristic) 0002H: Water cooling (2^{nd} power characteristic)
20H/50H	0020H: Cooling output high limit setting	Setting value
20H/50H	0021H: Cooling output low limit setting	Setting value
20H/50H	0022H: Cooling output ON/OFF action hysteresis	Setting value
20H/50H	0023H: Alarm 1 (A1) action selection (*2) 0024H: Alarm 2 (A2) action selection (*2)	0000H: No alarm action 0001H: High limit alarm 0002H: Low limit alarm 0003H: High/Low limits alarm 0004H: High/Low limit range alarm 0005H: Process high alarm 0006H: Process low alarm 0007H: High limit alarm w/standby 0008H: Low limit alarm w/standby 0009H: High/Low limits alarm w/standby
20H/50H	0025H: Alarm 1 (A1) action hysteresis	Setting value
20H/50H	0026H: Alarm 2 (A2) action hysteresis	Setting value
20H/50H	0027H: Not used	
20H/50H	0028H: Not used	
20H/50H	0029H: Alarm 1(A1) action delayed timer setting	Setting value
20H/50H	002AH: Alarm 2(A2) action delayed timer setting	Setting value
20H/50H	002BH: Not used	
⋮	⋮	
20H/50H	0036H: Not used	
20H/50H	0037H: Control output OFF function designation	0000H:ON 0001H:OFF
20H/50H	0038H: Not used	
⋮	⋮	
20H/50H	003FH: Not used	
20H/50H	0040H: Alarm 1(A1) Energized/ Deenergized	0000H: Energized 0001H: Deenergized
20H/50H	0041H: Alarm 2 (A2) Energized/ Deenergized	0000H: Energized 0001H: Deenergized
20H/50H	0042H: Not used	
20H/50H	0043H: Not used	

20H/50H	0044H: Input type selection (*3)	Multi-input 0000H: K 0 to1370℃ 0001H: J 0 to1000℃ 0002H: E 0 to 800℃ 0003H: Pt100 -199.9 to 850.0℃ 0004H: JPt100 -199.9 to 500.0℃ 0005H: Pt100 -200 to 850℃ 0006H: JPt100 -200 to 500℃ 0007H: K 0 to 2500℉ 0008H: J 0 to 1800℉ 0009H: E 0 to 1500℉ 000AH: Pt100 -199.9 to 999.9℉ 000BH: JPt100 -199.9 to 900.0℉ 000CH: Pt100 -300 to1500℉ 000DH: JPt100 -300 to 900℉ DC-input: 0000H: 0 to 20mA -1999 to 9999 0000H: 0 to 1V -1999 to 9999 0000H: 0 to 10V -1999 to 9999 0001H: 4 to 20mA -1999 to 9999
20H/50H	0045H: Control action selection	0000H: Heating (Reverse action) 0001H: Cooling (Direct action)
20H/50H	0046H: Not used	
20H/50H	0047H: AT bias setting	Setting value
50H	0070H:Key operation change flag clearing	0001H: All clearing
20H	0080H: PV (Input) value reading	Present PV (Input) value
20H	0081H: MV (Control output manipulating value) reading	Present MV (Manipulated variable)
20H	0082H: MV (Cooling output manipulating value) reading	Present MV (Manipulated variable)
20H	0083H: Present main setting value reading	Setting value
20H	0084H: Not used	
20H	0085H: Control output status reading	0000 0000 0000 0000 2^{15} to 2^{0} 2^0 digit: Control output (OUT1) 0: OFF 1: ON 2^1 digit: Control output (OUT2) 0: OFF 1: ON 2^2 digit: Alarm1 (A1) output 0: OFF 1: ON 2^3 digit: Alarm 2 (A2) output 0:OFF 1:ON 2^4 digit: Not used (Always 0) 2^5 digit: Not used (Always 0) 2^6 digit: Heater burnout alarm output 0:OFF 1:ON 2^7 digit: Loop break alarm output 0:OFF 1:ON 2^8 digit: Overscale 0:OFF 1:ON 2^9 digit: Underscale 0:OFF 1:ON 2^{10} digit to 2^{14} digit : Not used (Always 0) 2^{15}: Changed by key operation or not 0: Not changed 1: Changed
20H	0086H: 1st or 2nd main setting value reading	Changed by key operation or not 0: Not changed 1: Changed
20H	0087H: Not used	

20H	00A0H: CPU Version number reading	CPU Version number
20H	00A1H: Instrument status reading	0000 0000 0000 0000 2^{15} to 2^{0} 2^0 digit: Not used (Always 0) 2^1 digit: Cooling function 0: OFF 1: ON 2^2 digit: Alarm 1(A1) function 0: OFF 1: ON 2^3 digit: Alarm 2(A2) function 0: OFF 1: ON 2^4 digit: Not used (Always 0) 2^5 digit: Not used (Always 0) 2^6 digit: Heater burnout alarm function 0: OFF 1: ON 2^7 digit: Loop break alarm function 0: OFF 1: ON 2^8 digit: Input type selection 0:Multi-input 1:DC input 2^9 digit to2^{15} digit: Not used (Always 0)
20H	00A3H:Data item changed by key operation	Changed data item code

(*1) When Lock 3 is designated, the setting data is not saved in memory.
This is why setting value reverts to the one before Lock 3 is set when power is turned off.

(*2) When alarm action mode is changed via communication, alarm setting value is cleared to 0.
Also alarm output status is initialized.

(*3) When in DC input, 0001H is fixed range (4 to20mA –1999 to9999) but 0000H is the range that is ordered

* Notice

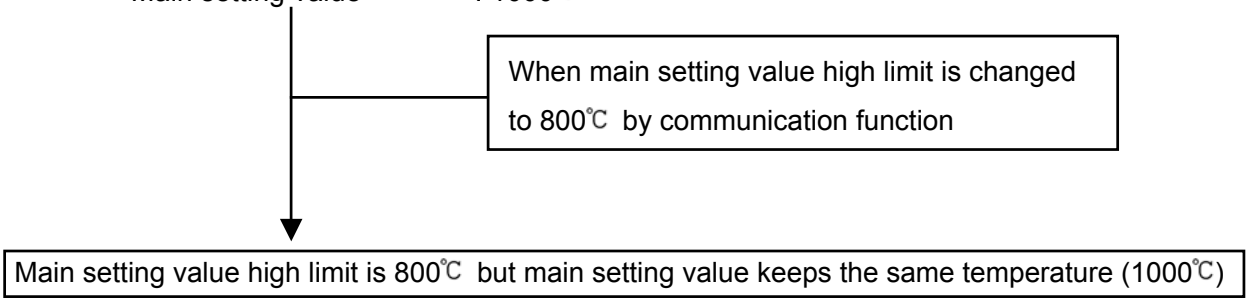
When data setting is changed by key operation at the front panel of the instrument, the data that is related to the changed item is also changed automatically as shown the example 1 below. However, when the data setting is changed by communication function, the related data does not change as shown the example 2 below. (Only the changed data changes.)

(Example 1) Main setting value high limit: 1370℃
Main setting value : 1000℃

When main setting value high limit is changed to 800℃ by key operation at the front panel of the instrument

Both main setting value high limit and main setting value are changed to 800℃

(Example 2) Main setting value high limit: 1370℃
Main setting value : 1000℃



6. Specifications

Communication	: Half-duplex
Data transfer rate	: 9600bps (2400, 4800, 9600, 19200bps) Selectable by key operation
Synchronous system	: Start-stop
Code form	: ASCII
Error correction	: Command request repeat system
Error detection	: Parity check, Checksum
Data format	Start bit: 1
	Data bit: 7
	Parity : Even
	Stop bit: 1

7. Troubleshooting

If any malfunction occurs, refer to the following items after checking the power supply of the host computer and the JC series.

• Phenomenon: If it is unable to communicate.

Check the following
The connection or wiring of communication is not securely done.
The burnout or imperfect contact on the communication cable and the connector.
Data transfer rate of the JC series coincides with that of the host computer.
The data bit, parity and stop bit of the host computer whether they accord with those of the JC series.
The instrument number of the JC series coincides with that of the command.
The instrument numbers are duplicated in multiple JC series.
When communicating by RS-485 (option:C5) without IF-100-C5 or IF-300-C5 (communication converter), make sure that the program is proper for the transmission timing.

• Phenomenon: Though it is able to communicate, 'NAK' is responded.

Check the following
The command code is surely existent or not.
Whether the setting command exceeds the setting range or not.
In case of the situation being unable to set (such as AT performing)
The operation mode whether being under the setting mode by the key operation

◆ If you have any inquiries, please consult our agency or the shop where you purchased the unit.

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OVERSEAS DIVISION

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