JIR-301-M, C5

No.JIR3CE2 2004.05

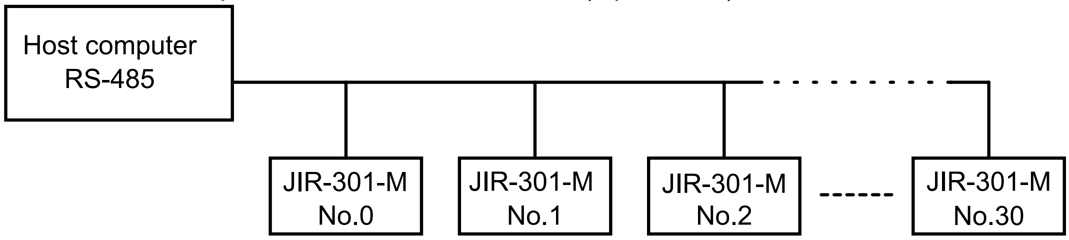
To prevent accidents arising from the misuse of this controller, please ensure the operator receives this manual.

⚠ Warning

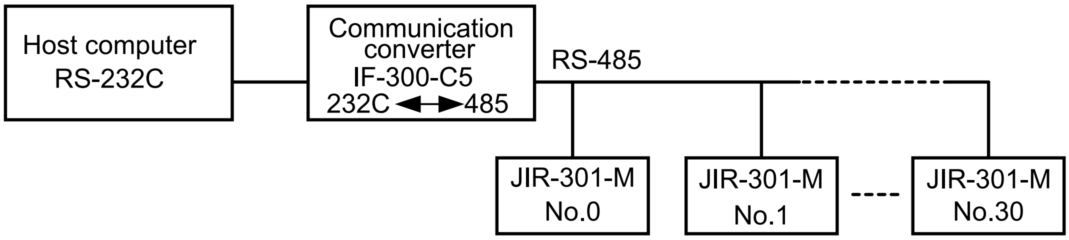
Turn the power supply to the instrument off before wiring or checking it.
Working or touching the terminal with the power switched on may result in severe injury or death due to Electric Shock.

1. System configuration

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



(Fig. 1-1)



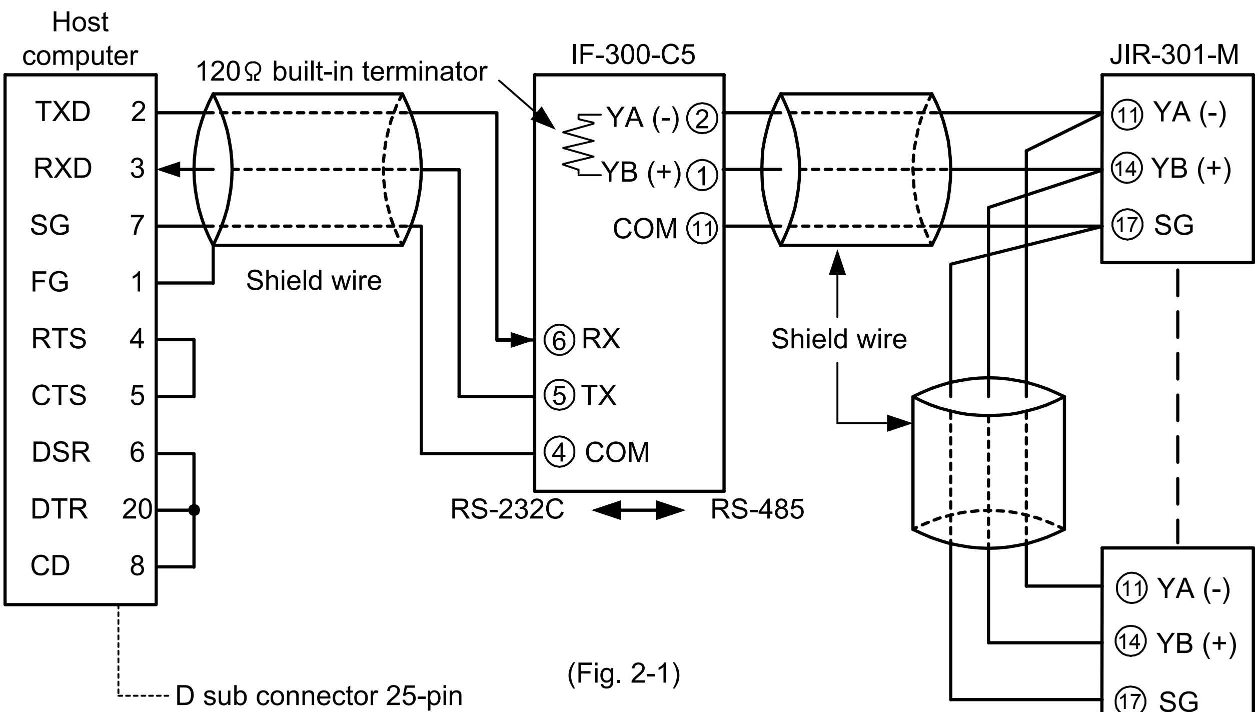
(Fig. 1-2)

Communication converter IF-300-C5 (sold separately) is only available for Shinko protocol.
For the Modbus protocol, use a commercially available communication converter.

2. Wiring connection

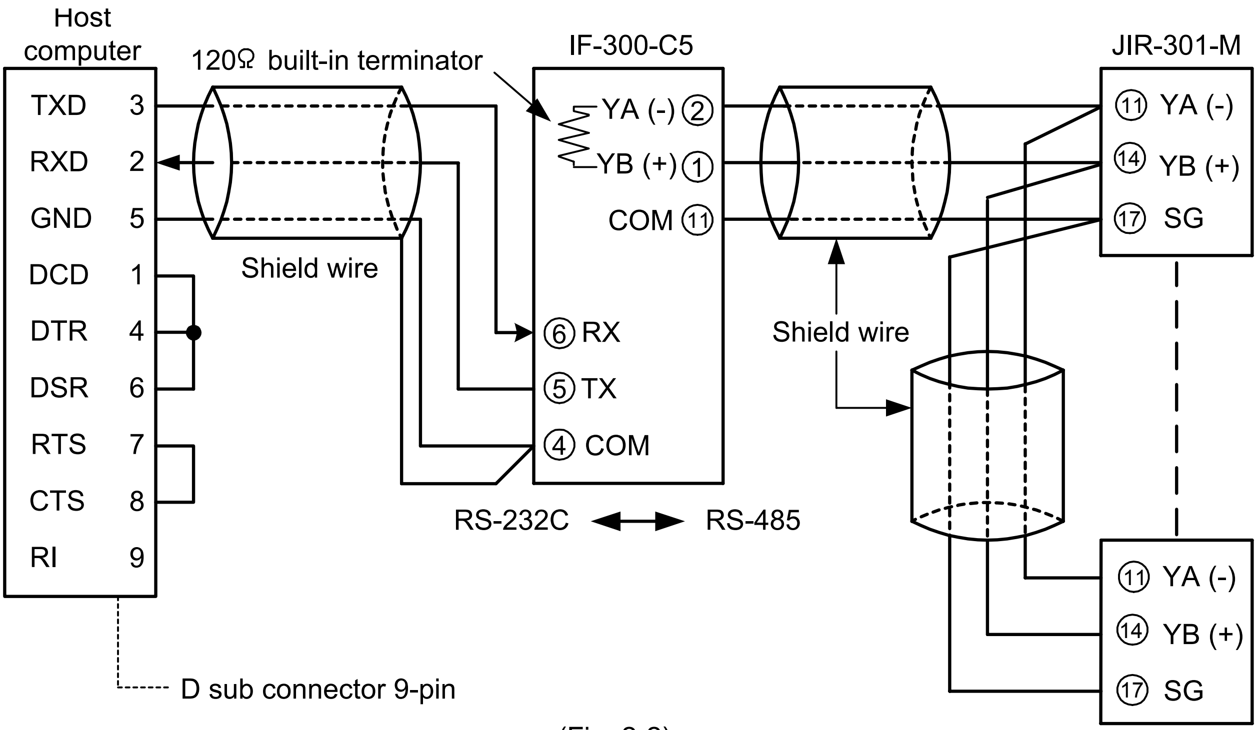
When using communication converter IF-300-C5 (RS-232C)

- Connector: D sub 25-pin
  Connection: RS-232C ◄──► RS-485 (Communication speed: 2400, 4800, 9600, 19200bps)



(Fig. 2-1)

• Connector: D sub 9-pin
Connection: RS-232C ←→ RS-485 (Communication speed: 2400, 4800, 9600, 19200bps)



(Fig. 2-2)

Shield wire

Connect only one side of the shield wire to the FG or GND terminal so that the current cannot flow to the shield wire.

(If both sides of the shield wire are connected to the FG or GND terminal, the circuit will be closed between the shield wire and the ground. As a result, current will run through the shield wire and this may create noise.)

Never fail to ground FG and GND terminals.

Terminator (Terminal resistor)

Do not connect terminator with the communication line because each JIR-301-M has built-in pull-up and pull-down resistors instead of a terminator.

Please use the IF-300-C5 (sold separately) as a communication converter.

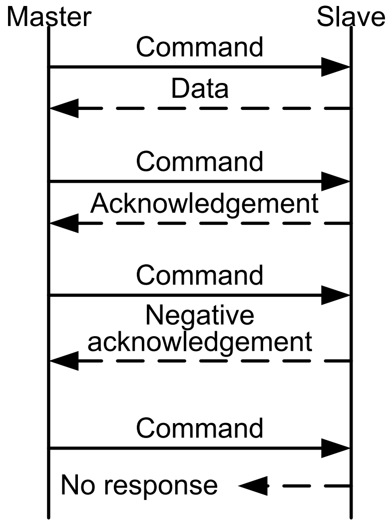
3. Setup of the JIR-301-M

• It is necessary to set the instrument number individually to the JIR-301-M when communicating by connecting plural units with serial communication (option C5).
Select a communication speed of the JIR-301-M in accordance with that of the host computer.

• For the instrument number setting and communication speed selection, refer to the instruction manual for the JIR-301-M.

4. Communication procedure

Communications starts with command transmission from the host computer (hereafter Master) and ends with the response of the JIR-301-M (hereafter Slave).



(Fig.4-1)

- **Response with data**
  When the master sends the reading command, the slave responds with the corresponding setting value or current status.
- **Acknowledgement**
  When the master sends setting command, the slave responds by sending an acknowledgement after the processing is terminated.
- **Negative acknowledgement**
  When the master sends a non-existent command or a value outside the setting range, the slave returns a negative acknowledgement as a response.
- **No response**
  The slave will not respond to the master when global address is set, or when there is a communication error (framing error or checksum error), or when LRC or CRC discrepancy is detected.

Communication timing of the RS-485 (option C5)

Slave side

When the slave starts transmission through the RS-485 communication line, the slave is arranged so as to provide an idle status (mark status) **transmission period of 1 or more characters** before sending the response to ensure the synchronization on the receiving side.
The slave is arranged so as to disconnect the transmitter from the communication line **within a 1 character transmission period** after sending the response.

Master side (Notice on programming)

Set the program so that the master can disconnect the transmitter from the communication line **within a 1 character transmission period** after sending the command in preparation for reception of the response from the slave.
To avoid the collision of transmissions between the master and the slave, send the next command after carefully checking that the master received the response.

Note:

When the master communicates with the slave through the communication converter (IF-300-C5), it is not required to manage the transmission timing described above, because the converter automatically sets the transmission timing interpreting the protocol.

5. Shinko protocol

5.1 Command configuration

All commands are composed of ASCII. The data (setting value, decimal number) is represented with hexadecimal number, and ASCII code is used.
The negative numbers are represented with 2's complement.

(1) Setting command

Header (02H)	Address	Sub address (20H)	Command type (50H)	Data item	Data	Checksum	Delimitter (03H)	
1	1	1	1	4	4	2	1	← Number of characters

(Fig. 5.1-1)

(2) Reading command

Header (02H)	Address	Sub address (20H)	Command type (20H)	Data item	Checksum	Delimitter (03H)	
1	1	1	1	4	2	1	← Number of characters

(Fig. 5.1-2)

(3) Response with data

Header (06H)	Address	Sub address (20H)	Command type (20H)	Data item	Data	Checksum	Delimitter (03H)	
1	1	1	1	4	4	2	1	← Number of characters

(Fig. 5.1-3)

(4) Acknowledgement

Header (06H)	Address	Checksum	Delimitter (03H)	
1	1	2	1	← Number of characters

(Fig. 5.1-4)

(5) Negative acknowledgement

Header (15H)	Address	Error code	Checksum	Delimiter (03H)	
1	1	1	2	1	← Number of characters

(Fig. 5.1-5)

Header : Control code to represent the beginning of the command or the response.
ASCII codes are used.
Setting command, Reading command : 02H fixed
Response with data, Acknowledgement: 06H fixed
Negative acknowledgement : 15H fixed

Address : Numbers by which the master discerns each slave.
Instrument number 0 to 94 (00H to 5EH) and Global address 95 (5FH)
The numbers (20H to 7EH) are used by giving 20H of bias.
95 (7FH) is called **Global address**, which is used when the same command is sent to all the slaves connected. However, a response is not returned.

Sub address : 20H fixed

Command type : Code to discern Setting command (50H) and Reading command (20H)

Data item : Data classification of the command object
Composed of hexadecimal 4 digits (Refer to the Communication command table)

Data : The contents of data (setting value) depends 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 represent the end of command
03H fixed

Error code : Represents an error type. Composed of hexadecimal 1 digit.
1 (31H)-----Non-existent command
2 (32H)-----Not used
3 (33H)-----Setting outside the setting range
4 (34H)-----Status unable to set (e.g. AT is performing)
5 (35H)-----During setting mode by key operation

5.2 Checksum calculation

Checksum is used to detect receiving errors in the command or data.
Set the program for the master side as well to calculate the checksum of the response data from the slaves so that the communication errors can be checked.

The ASCII code (hexadecimal) corresponding to the characters which range from the address to that before the checksum is converted to binary notation, and the total value is calculated. The lower 2-digits of the total value are converted to 2’s complements and then to hexadecimal figures, that is, ASCII code for the checksum.

Checksum calculation example

A1: 100℃ (0064H)
Address (instrument number): 0 (20H)

- 1’s complement: Reverse each binary bit. 0 will become 1 and vice versa.
- 2’s complement: Add 1 to 1’s complement.

[e.g.] ← Checksum calculation range →

STX			P	0	0	0	1	0	0	6	4	E	5	ETX

[Characters above are represented by ASCII]

02H	20H	20H	50H	30H	30H	30H	31H	30H	30H	36H	34H	45H	35H	03H

Checksum

```
[Hexadecimal]    [Binary]
     20H         0010 0000
     20H         0010 0000
     50H         0101 0000
     30H         0011 0000        [1's complement]   1110 0100
     30H         0011 0000                         +         1
     30H         0011 0000        [2's complement]   1110 0101
     31H         0011 0001
     30H         0011 0000        [Hexadecimal]         E    5
     30H         0011 0000
     36H         0011 0110
  +  34H         0011 0100
              10 0001 1011        [ASCII]             45H  35H
                                                      Checksum
```

5.3 Contents of the command

Notes on the setting command and reading command

- Possible to set the setting value by setting command of the communication function even if the setting value is locked.
- Although the options are not applied, setting the items for the options is possible by the setting command, however, they will not function.
- The memory can store up to 1,000,000 (one million) entries.
  If the number of setting times exceeds the limit, it cannot memorize the data. So frequent transmission via communication is not recommended.
- When connecting plural slaves, the address (instrument number) 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 communication speed of the slave cannot be set by communication function.

Setting command

- The settable range is the same as the one by key operation.
  For the communication command, refer to the communication command table of this manual.
- All commands are composed of ASCII.
- The data (setting value, decimal) is converted to hexadecimal figures, and ASCII is used.
  The negative number is represented with 2's complement. When the data (setting value) has a decimal point, the whole number without a decimal point is used.

Reading command

- All commands are composed of ASCII.
- The data (setting value, decimal) is converted to hexadecimal figures, and ASCII is used.
  The negative number is represented by 2's complement. When the data (setting value) has a decimal point, the response is returned as a whole number without a decimal point.

6. Modbus protocol

6.1 Transmission mode

There are 2 transmission modes (ASCII and RTU) in Modbus protocol.

6.2 ASCII mode

Hexadecimal (0 to 9, A to F), which is divided into high order (4-bit) and low order (4-bit) out of 8-bit binary data in command is transmitted as ASCII characters.

Data format	Start bit	: 1 bit
	Data bit	: 7 bits
	Parity	: Even/No/Odd (Selectable)
	Stop bit	: 1 bit/2 bits (Selectable)
	Error detection	: LRC (Longitudinal Redundancy Check)
	Data interval	: 1 second or less

(1) Message configuration

ASCII mode message is configured to start by [: (colon)(3AH)] and end by [CR (carriage return) (0DH) + LF (Line feed)(0AH)]. (See Fig. 6.2-1)

Header (:)	Slave address	Function code	Data	Error check LRC	Delimiter (CR)	Delimiter (LF)

(Fig. 6.2-1)

(2) Slave address

Slave address is an individual instrument number on the slave side and is set within the range 00H to 5FH (0 to 95).
The master identifies slaves by the slave address of the requested message. The slave informs the master which slave is responding to the master by placing its own address in the response message.
[Slave address 00H (broadcast address) can identify all the slaves. However slaves do not respond.]

(3) Function code

The function code is the command code for the slave to undertake the following action types (Table 6.2-1).

(Table 6.2-1)

Function code	Contents
03 (03H)	Reading the setting value and information from slaves
06 (06H)	Setting to slaves

Function code is used to discern whether the response is normal (acknowledgement) or if any error (negative acknowledgement) has occurred when the slave returns the response message to the master.
When acknowledgement is returned, the slave simply returns the original function code.
When negative acknowledgement is returned, the MSB of the original function code is set as 1 for the response.
(For example, when the master sends request message setting 10H to function code by mistake, slave returns 90H by setting the MSB to 1, because the former is an illegal function.)
For negative acknowledgement, abnormal code (Table 6.2-2) below is set to the data of response message and returned to the master in order to inform it that what kind of error has occurred.

(Table 6.2-2)

Abnormal code	Contents
1 (01H)	Illegal function (Non-existent function)
2 (02H)	Illegal data address (Non-existent data address)
3 (03H)	Illegal data value (Value out of the setting range)
17 (11H)	Illegal setting (Unsettable status)
18 (12H)	Illegal setting (During setting mode by keypad, etc)

(4) Data

Data differs depending on the function code.
A request message from the master side is composed of data item, number of data and setting data.
A response message from the slave side is composed of number of bytes, data and abnormal code in negative acknowledgement. Effective range of data is –32768 to 32767 (8000H to 7FFFH).

(5) Error check of ASCII mode

After calculating LRC (Longitudinal Redundancy Check) from the slave address to the end of data, the calculated 8-bit data is converted to two ASCII characters and is appended to the end of message.

How LRC is calculated

① Create a message in RTU mode.
② Add all the values from the slave address to the end of data. This is assumed as X.
③ Make a complement for X (bit reverse). This is assumed as X.
④ Add a value of 1 to X. This is assumed as X.
⑤ Set X as an LRC to the end of the message.
⑥ Convert the whole message to ASCII characters.

(6) ASCII mode message example

① **Reading (Address 1, PV)**

• A request message from the master
The number of data indicates the data item to be read and it is fixed as (30H 30H 30H 31H).

Header	Slave address	Function code	Data item	Number of data	Error check LRC	Delimiter	
(3AH)	(30H 31H)	(30H 33H)	(30H 30H 38H 30H)	(30H 30H 30H 31H)	(37H 42H)	(0DH 0AH)	
1	2	2	4	4	2	2	← Number of characters

(Fig. 6.2-2)

• A response message from the slave in normal status [When PV=600℃ (0258H)]
The number of response bytes indicates the number of bytes of the data which has been read, and it is fixed as (30H 32H).

Header	Slave address	Function code	Number of response bytes	Data	Error check LRC	Delimiter	
(3AH)	(30H 31H)	(30H 33H)	(30H 32H)	(30H 32H 35H 38H)	(41H 30H)	(0DH 0AH)	
1	2	2	2	4	2	2	← Number of characters

(Fig.6.2-3)

• A response message from the slave in abnormal status (When data item is mistaken)
The function code MSB is set to 1 for the response message in abnormal status [83H (38H 33H)].
If an abnormal code [02H (30H 32H): Non-existent data address] is returned, the error can be determined by reading this code.

Header	Slave address	Function code	Abnormal code	Error check LRC	Delimiter	
(3AH)	(30H 31H)	(38H 33H)	(30H 32H)	(37H 41H)	(0DH 0AH)	
1	2	2	2	2	2	← Number of characters

(Fig.6.2-4)

② **Reading (Address 1, A1)**

• A request message from the master

Header	Slave address	Function code	Data item	Number of data	Error check LRC	Delimiter	
(3AH)	(30H 31H)	(30H 33H)	(30H 30H 30H 31H)	(30H 30H 30H 31H)	(46H 41H)	(0DH 0AH)	
1	2	2	4	4	2	2	← Number of characters

(Fig. 6.2-5)

The number of data means the data item to be read, and it is fixed as (30H 30H 30H 31H).

• A response message from the slave in normal status (When SV=100℃)

Header	Slave address	Function code	Number of response bytes	Data	Error check LRC	Delimiter	
(3AH)	(30H 31H)	(30H 33H)	(30H 32H)	(30H 30H 36H 34H)	(39H 36H)	(0DH 0AH)	
1	2	2	2	4	2	2	← Number of characters

(Fig.6.2-6)

The number of response bytes means the number of bytes of the data which has been read, and it is fixed as (30H 32H).

• A response message from the slave in abnormal status (When data item is mistaken)

Header	Slave address	Function code	Abnormal code	Error check LRC	Delimiter	
(3AH)	(30H 31H)	(38H 33H)	(30H 32H)	(37H 41H)	(0DH 0AH)	
1	2	2	2	2	2	← Number of characters

(Fig. 6.2-7)

The function code MSB is set to 1 for the response message in abnormal status (83H).
If an abnormal code (02H: Non-existent data address) is returned, the error can be determined by reading this code.

③ **Setting (Address 1, A1=100℃)**

• A request message from the master

Header	Slave address	Function code	Data item	Data	Error check LRC	Delimiter	
(3AH)	(30H 31H)	(30H 36H)	(30H 30H 30H 31H)	(30H 30H 36H 34H)	(39H 34H)	(0DH 0AH)	
1	2	2	4	4	2	2	← Number of characters

(Fig. 6.2-8)

• A response message from the slave in normal status

Header	Slave address	Function code	Data item	Data	Error check LRC	Delimiter	
(3AH)	(30H 31H)	(30H 36H)	(30H 30H 30H 31H)	(30H 30H 36H 34H)	(39H 34H)	(0DH 0AH)	
1	2	2	4	4	2	2	← Number of characters

(Fig. 6.2-9)

• A response message from the slave in abnormal status (When a value out of the setting range is set.)
The function code MSB is set to 1 for the response message in abnormal status (86H).
If an abnormal code (03H: Value out of the setting range) is returned, the error can be determined by reading this code.

Header	Slave address	Function code	Abnormal code	Error check LRC	Delimiter	
(3AH)	(30H 31H)	(38H 36H)	(30H 33H)	(37H 36H)	(0DH 0AH)	
1	2	2	2	2	2	← Number of characters

(Fig. 6.2-10)

6.3 RTU mode

8-bit binary data in command is transmitted as it is.

Data format	Start bit	: 1 bit
	Data bit	: 8 bits
	Parity	: Even/No/Odd (Selectable)
	Stop bit	: 1 bit/2 bits (Selectable)
	Error detection	: CRC-16 (Cyclic Redundancy Check)
	Data interval	: 3.5 characters transmission time or less

(1) Message configuration

RTU mode is configured to start after idle time is processed for more than 3.5 character transmission and end after idle time is processed for more than 3.5 character transmission. (See Fig. 6.3-1)

3.5 idle characters	Slave address	Function code	Data	Error check CRC	3.5 idle characters

(Fig. 6.3-1)

(2) Slave address

Slave address is an individual instrument number on the slave side and is set within the range 00H to 5FH (0 to 95).

The master identifies slaves by the slave address of the requested message.

The slave informs the master which slave is responding to the master by placing its own address in the response message.

[Slave address 00H (broadcast address) can identify all the slaves. However slaves do not respond.]

(3) Function code

The function code is the command code for the slave to undertake the following action types (Table 6.3-1).

(Table 6.3-1)

Function code	Contents
03 (03H)	Reading the setting value and information from slaves
06 (06H)	Setting to slaves

Function code is used to discern whether the response is normal (acknowledgement) or if any error (negative acknowledgement) has occurred when the slave returns the response message to the master.

When acknowledgement is returned, the slave simply returns the original function code.

When negative acknowledgement is returned, the MSB of the original function code is set as 1 for the response.

(For example, when the master sends request message setting 10H to function code by mistake, slave returns 90H by setting the MSB to 1, because the former is an illegal function.)

For negative acknowledgement, abnormal code (Table 6.3-2) below is set to the data of response message and returned to the master in order to inform it that what kind of error has occurred.

(Table 6.3-2)

Abnormal code	Contents
1 (01H)	Illegal function (Non-existent function)
2 (02H)	Illegal data address (Non-existent data address)
3 (03H)	Illegal data value (Value out of the setting range)
17 (11H)	Illegal setting (Unsettable status)
18 (12H)	Illegal setting (During setting mode by key operation, etc)

(4) Data

Data differs depending on the function code.

A request message from the master side is composed of data item, number of data and setting data.

A response message from the slave side is composed of number of bytes, data and abnormal code in negative acknowledgement. Effective range of data is –32768 to 32767 (8000H to 7FFFH).

(5) Error check of RTU mode

After calculating CRC-16 (Cyclic Redundancy Check) from the slave address to the end of data, the calculated 16-bit data is appended to the end of message in sequence from low order to high order.

How CRC is calculated

In the CRC system, the information is divided by a polynomial series. The remainder is added to the end of the information and then transmitted. The generation of the polynomial series is as follows.

(Generation of the polynomial series: $X^{16} + X^{15} + X^{2} + 1$)

① Initialize the CRC-16 data (assumed as X) (FFFFH).

② Calculate exclusive OR (XOR) with the 1st data and X. This is assumed as X.

③ Shift X one bit to the right. This is assumed as X.

④ When a carry is generated as a result of the shift, XOR is calculated by X of ③ and the fixed value (A001H). This is assumed as X.
If a carry is not generated, go to step ⑤.

⑤ Repeat steps ③ and ④ until shifting 8 times.

⑥ XOR is calculated with the next data and X. This is assumed as X.

⑦ Repeat steps ③ to ⑤.

⑧ Repeat steps ③ to ⑤ up to the last data.

⑨ Set X as CRC-16 to the end of message in sequence from low order to high order.

(6) RTU mode message example

① **Reading (Address 1, PV)**

• Request message from the master

The number of data indicates the data item to be read, and it is fixed as (0001H).

3.5 idle characters	Slave address (01H)	Function code (03H)	Data item (0080H)	Number of data (0001H)	Error check CRC (85E2H)	3.5 idle character s
	1	1	2	2	2	← Number of characters

(Fig. 6.3-2)

• Response message from the slave in normal status [When PV=600℃ (0258H)]
The number of response bytes indicates number of bytes of the data which has been read, and it is fixed as (02H).

3.5 idle characters	Slave address	Function code	Number of response bytes	Data	Error check CRC	3.5 idle characters
	(01H)	(03H)	(02H)	(0258H)	(B8DEH)	
	1	1	1	2	2	← Number of characters

(Fig. 6.3-3)

• Response message from the slave in abnormal status (When data item is mistaken)
The function code MSB is set to 1 for the response message in abnormal status (83H).
If an abnormal code (02H: Non-existent data address) is returned, the error can be determined by reading this code.

3.5 idle characters	Slave address	Function code	Abnormal code	Error check CRC	3.5 idle characters
	(01H)	(83H)	(02H)	(C0F1H)	
	1	1	1	2	← Number of characters

(Fig. 6.3-4)

② **Reading (Address 1, A1)**

• Request message from the master
The number of data indicates the data item to be read, and it is fixed as 0001H.

3.5 idle characters	Slave address	Function code	Data item	Number of data	Error check CRC	3.5 idle characters
	(01H)	(03H)	(0001H)	(0001H)	(D5CAH)	
	1	1	2	2	2	← Number of characters

(Fig. 6.3-5)

• Response message from the slave in normal status (When SV=100℃)
The number of response byte indicates number of bytes of the data which has been read, and it is fixed as 02H.

3.5 idle characters	Slave address	Function code	Number of response bytes	Data	Error check CRC	3.5 idle characters
	(01H)	(03H)	(02H)	(0064H)	(B9AFH)	
	1	1	1	2	2	← Number of characters

(Fig. 6.3-6)

• Response message from the slave in abnormal status (When data item is mistaken)
The function code MSB is set to 1 for the response message in abnormal status (83H).
If an abnormal code (02H: Non-existent data address) is returned, the error can be determined by reading this code.

3.5 idle characters	Slave address	Function code	Abnormal code	Error check CRC	3.5 idle characters
	(01H)	(83H)	(02H)	(C0F1H)	
	1	1	1	2	← Number of characters

(Fig. 6.3-7)

③ **Setting (Address 1, A1=100℃)**

• Request message from the master

3.5 idle characters	Slave address	Function code	Data item	Data	Error check CRC	3.5 idle characters
	(01H)	(06H)	(0001H)	(0064H)	(D9E1H)	
	1	1	2	2	2	← Number of characters

(Fig. 6.3-8)

• Response message from the slave in normal status

3.5 idle characters	Slave address	Function code	Data item	Data	Error check CRC	3.5 idle characters
	(01H)	(06H)	(0001H)	(0064H)	(D9E1H)	
	1	1	2	2	2	← Number of characters

(Fig. 6.3-9)

• Response message from the slave in abnormal status (When a value out of the setting range is set)

3.5 idle characters	Slave address	Function code	Abnormal code	Error check CRC	3.5 idle characters
	(01H)	(86H)	(03H)	(0261H)	
	1	1	1	2	← Number of characters

(Fig. 6.3-10)

The function code MSB is set to 1 for the response message in abnormal status (86H).
If an abnormal code (03H: Value out of the setting range) is returned, the error can be determined by reading this code.

7. Communication command table

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

Shinko command type	Modbus function code	Data item	Data
20H/50H	03H/06H	0001H: A1 setting	Setting value, Decimal point omitted
20H/50H	03H/06H	0002H: A2 setting	Setting value, Decimal point omitted
20H/50H	03H/06H	0003H: A3 setting	Setting value, Decimal point omitted
20H/50H	03H/06H	0004H: Setting value lock selection (*1)	0000H: Unlock 0002H: Lock 2 0001H: Lock 1 0003H: Lock 3
20H/50H	03H/06H	0005H: Sensor correction value setting	Setting value, Decimal point omitted
20H/50H	03H/06H	0006H: Scaling high limit setting	Setting value
20H/50H	03H/06H	0007H: Scaling low limit setting	Setting value
20H/50H	03H/06H	0008H: 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	03H/06H	0009H: PV filter time constant setting	Setting value, Decimal point omitted
20H/50H	03H/06H	000AH: A1 hysteresis setting	Setting value, Decimal point omitted
20H/50H	03H/06H	000BH: A2 hysteresis setting	Setting value, Decimal point omitted
20H/50H	03H/06H	000CH: A3 hysteresis setting	Setting value, Decimal point omitted
20H/50H	03H/06H	000DH: A1 action selection (*2) 000EH: A2 action selection (*2)	0000H: No alarm action 0001H: High limit alarm 0002H: Low limit alarm 0003H: High limit alarm with standby 0004H: Low limit alarm with standby
20H/50H	03H/06H	000FH: A3 action selection (*2)	0000H: No alarm action 0001H: High limit alarm 0002H: Low limit alarm 0003H: High limit alarm with standby 0004H: Low limit alarm with standby 0005H: High/Low limit range alarm
20H/50H	03H/06H	0010H: Transmission output high limit setting	Setting value
20H/50H	03H/06H	0011H: Transmission output low limit setting	Setting value
20H/50H	03H/06H	0012H: A1 action Energized/ Deenergized selection	0000H: Energized 0001H: Deenergized
20H/50H	03H/06H	0013H: A2 action Energized/ Deenergized selection	0000H: Energized 0001H: Deenergized
20H/50H	03H/06H	0014H: A3 action Energized/ Deenergized selection	0000H: Energized 0001H: Deenergized
20H/50H	03H/06H	0015H: A1 action delayed timer setting	Setting value
20H/50H	03H/06H	0016H: A2 action delayed timer setting	Setting value
20H/50H	03H/06H	0017H: A3 action delayed timer setting	Setting value
20H/50H	03H/06H	0018H: Not used	
20H/50H	03H/06H	0019H: Input type selection	0000H: K [–200 to 1370℃] 0001H: K [–199.9 to 400.0℃] 0002H: J [–200 to 1000℃] 0003H: R [0 to 1760℃] 0004H: S [0 to 1760℃] 0005H: B [0 to 1820℃] 0006H: E [–200 to 800℃] 0007H: T [–199.9 to 400.0℃] 0008H: N [–200 to 1300℃]

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

(*2) When alarm action type is changed, the alarm setting value reverts to the default value and alarm output status is also initialized.

			0009H: PL-Ⅱ [0 to 1390℃] 000AH: C (W/Re5-26) [0 to 2315℃] 000BH: Pt100 [–199.9 to 850.0℃] 000CH: JPt100 [–199.9 to 500.0℃] 000DH: Pt100 [–200 to 850℃] 000EH: JPt100 [–200 to 500℃] 000FH: K [–320 to 2500℉] 0010H: K [–199.9 to 750.0℉] 0011H: J [–320 to 1800℉] 0012H: R [0 to 3200℉] 0013H: S [0 to 3200℉] 0014H: B [0 to 3300℉] 0015H: E [–320 to 1500℉] 0016H: T [–199.9 to 750.0℉] 0017H: N [–320 to 2300℉] 0018H: PL-Ⅱ [0 to 2500℉] 0019H: C (W/Re5-26) [0 to 4200℉] 001AH: Pt100 [–199.9 to 999.9℉] 001BH: JPt100 [–199.9 to 900.0℉] 001CH: Pt100 [–300 to 1500℉] 001DH: JPt100 [–300 to 900℉] 001EH: 4 to 20mA DC [–1999 to 9999] 001FH: 0 to 20mA DC [–1999 to 9999] 0020H: 0 to 1V DC [–1999 to 9999] 0021H: 0 to 5V DC [–1999 to 9999] 0022H: 1 to 5V DC [–1999 to 9999] 0023H: 0 to 10V DC [–1999 to 9999]
50H	06H	0070H: Key operation change flag clearing	0000H: No action 0001H: All clearing
20H	03H	0080H: PV (input value) reading	Present PV, Decimal point omitted
20H	03H	0081H: Status reading	0000 0000 0000 0000 2^{15} to 2^{0} 2^{0} digit: A1 output 0: OFF 1: ON 2^{1} digit: A2 output 0: OFF 1: ON 2^{2} digit: A3 output 0: OFF 1: ON 2^{3} digit: Overscale 0: OFF 1: ON 2^{4} digit: Underscale 0: OFF 1: ON 2^{5} to 2^{14} digit: Not used (Always 0) 2^{15} digit: Key operation change 0: No 1: Yes
20H	03H	00A1H: Instrument specification flag	0000 0000 0000 0000 2^{15} to 2^{0} 2^{0} digit: A1 function 0: Not applied 1: Applied 2^{1} digit: A2 function 0: Not applied 1: Applied 2^{2} digit: A3 function 0: Not applied 1: Applied 2^{3} digit: Communication function 0: Not applied 1: Applied 2^{4} digit: Transmission output 0: Not applied 1: Applied 2^{5} to 2^{15} digits: Not used (Always 0)

8. Specifications

Cable length	: Maximum communication distance 1.2km Cable resistance: Within 50Ω (Terminator is not necessary or 120Ω or greater on one side.)
Communication line	: Based on EIA RS-485
Communication method	: Half-duplex
Communication speed	: 9600bps (2400, 4800, 9600, 19200bps) Selectable by keypad operation
Synchronous system	: Start-stop synchronous
Code form	: ASCII, binary
Error correction	: Command request repeat system
Error detection	: Parity check, Checksum (LRC), CRC
Data format	Start bit : 1 Data bit : 7, 8 Parity : Even, Odd, No parity Stop bit : 1, 2

9. Troubleshooting

If any malfunctions occur, refer to the following items after checking the power supply to the master and the slave.

• **Problem: If it is unable to communicate**

Check the following
The connection or wiring of the communication cable is not secure.
Burnout or imperfect contact on the communication cable and the connector.
Communication speed of the slave does not coincide with that of the master.
The data bit, parity and stop bit of the master do not accord with those of the slave.
The instrument number of the slave does not coincide with that of the command.
The instrument numbers are duplicated in multiple slaves.
When communicating without using communication converter (IF-300-C5), make sure that the program is appropriate for the transmission timing.

• **Problem: Although communication is occurring, the response is 'NAK'**.

Check the following
Check whether a non-existent command code has been sent or not.
The setting command data goes outside the setting range of the slave.
The controller cannot be set when functions such as AT is performing.
The operation mode is under the front keypad operation setting mode.

For further inquiries, please consult our agency or the shop where you purchased the unit.

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