MAC6/MAP6 SERIES
Digital Controller
Communication Interface
(RS－485 RS-232C)
Instruction Manual

Thank you for purchasing SHIMAX product. Please check that the product is the one you ordered. Please operate after you read the instruction manual and fully understand it.

This instructions manual describes the communication interface, or option function of digital controller MAC6/MAP6. See the attached main body's instructions manual about operation of MAC6/MAP6 , and the details of each parameter.

Table of Contents

1. Outline

The MAC6/MAP6 communication interface has adopted the communication method of RS-485 and RS-232C.
The various data can be set up with the signal based on EIA standard, or it can read with the personal computer etc.

RS-232C and RS-485 are data communication standards established by the Electronic Industries Association of the U.S. (EIA). The standards cover electrical and mechanical aspects, that is, matters related to applicable hardware but not the data transmission procedure of software. Therefore, it is not possible to communicate unconditionally with an apparatus which has the same interface. Hence, users need to have sufficient knowledge of specifications and transmission procedure.

RS-485 is the data communication standard decided by the Electronic Industries Alliance (EIA).
This standard specified so-called electric and mechanical hardware.
The software portion of the data transmission procedure is not specified.
Therefore, the set with the same interface cannot always communicate each other.
Therefore, the customer fully needs to understand specification and the transmission procedure beforehand.

Use of RS-485 makes it possible to carry out parallel connection of two or more MAC6/MAP6.
Not many personal computers seem to support this interface.
RS-232C ⟺ RS-485
However, use of the line converter makes it possible.

2. Specification

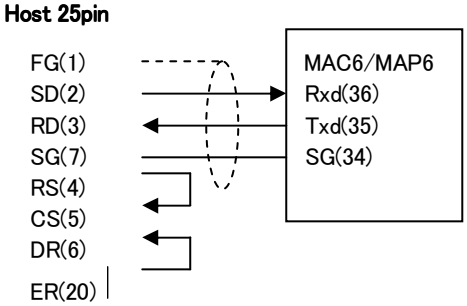
Protocol	: SHIMAX standard serial protocol, MODBUS ASCII, MODBUS RTU
Signal level	: in conformity with EIA RS-485
Communication method	: RS-232C 3-line half duplex system RS-485 Two-wire system Half duplex Multidrop (bus) system
Synchronic system	: Start-stop Synchronous system
Communication range	: RS-485 Maximum 500m totally (depends on the environmental condition)
Transmission speed	: 1200, 2400, 4800, 9600 and 19200, 38400 bps
Transmission procedure	: No procedure
Start bit	: 1 bit
Data length	: 7 bits, 8 bits (MODBUS RTU is fixed to 8 bits)
Parity bit	: nothing, the even number, odd number
Stop bit	: 1 bit, 2 bits
Communication code	: ASCII code (SHIMAX standard serial protocol, MODBUS ASCII) binary code (MODBUS RTU)
Connectable maxim number	: 32 (including a host controller)
Insulation	: Not insulate to analog output. MAC6/MAP6 is basic insulation to various input and output, and electric power source

*MODBUS is a registered trademark of Schneider Electric.

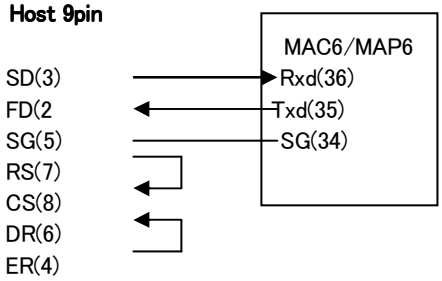
3. Connection with Host Computer

3-1 RS-232C

Host 25pin



Host 9pin



3-2. RS-485

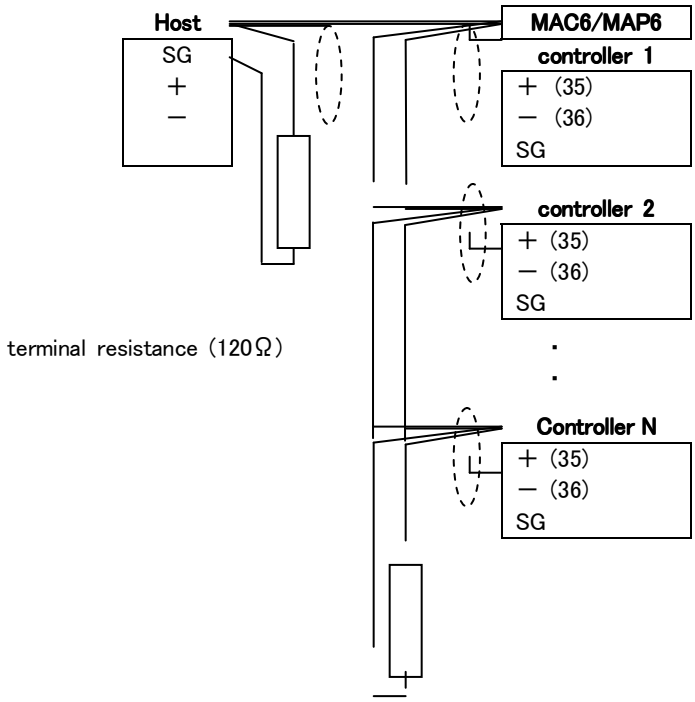
The input-and-output logic level of MAC6/MAP6 is fundamentally as follows.

mark (1) state　　- terminal　＜　+ terminal

mark (0) state　　- terminal　＞　+terminal

However, + terminal and - terminal of the controller are high impedance until just before starting transmission, the above-mentioned level is output.　(See **3-2. Control of Three State Control**)

[RS-485]



Note 1: Attach 1/2W 120Ω terminal resistance of between the host side and one end terminal equipment (between + and -) at the time of operation.

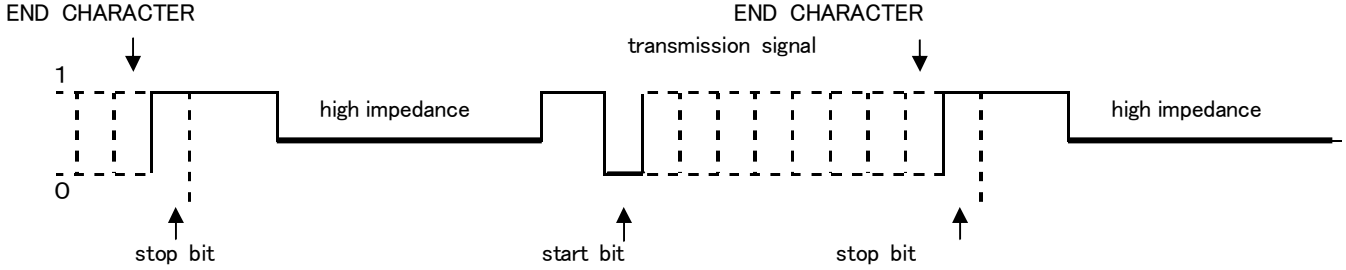
Note 2: Please be sure to connect one side of a shield to the ground.
When wiring by a shielding wire cannot be performed, the customer should take the measure against lightning surge.

3-2. Control of Three State Output

RS-485 is a multidrop system. Transmitting output is always high impedance at the time of un-communicating and reception, in order to avoid the collision of a transmitted signal.

Just before transmitting, it changes to a normal output state from high impedance. And it returns to high impedance again at the same time transmission is completed.

However, the control of 3 state control has about 2 msec (MAX.) time-lag. Set up more than several msec delay time, when the host side starts transmission immediately after the end of reception.



4. Setup Concerning Communication

MAC6/MAP6 has 13 kinds of parameters concerning communication after Mode 12
These cannot perform setting change by communication except for a communication memory mode setup.
Perform it by a front key.

MENU key

4-1. Setup of Communication Speed

Initial value : 9600bps
Setting range : 1200bps ,2400bps, 4800bps, 9600bps, 19200bps & 38400bps
The transmission speed for transmitting data to a host is chosen and set up.

MENU key

4-2. Setup of Communication Data Length

Initial value : 7
Setting range : 7, 8
Communication data bit length is chosen and set up. (Fixed at 8 bits at the time of MODBUS RTU setup)

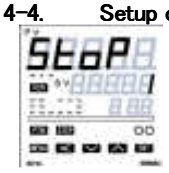
MENU key

4-3. Setup of Communication Parity

Initial value : none
Setting range : none, odd number, even number
Communication parity is chosen and set up.

MENU key

4-4. Setup of Communication Stop Bit



Initial value : 1
Setting range : 1,2
Communication stop bit is chosen and set up.

MENU key

4-5. Setup of BCC Operation Type

Initial value : none
Setting range : none,Add,Add2,Xor,LrC,Cr16
BCC operation type is chosen. The content selected here determines the protocol.

choice	operation method	protocol
non	none	SHIMAX standard serial protocol
Add	addition	
Add2	addition + complement of 2	
Xor	exclusive OR	
Lrc	LRC	MODBUS ASCII
Cr 16	CRC-16	MODBUS RTU

MENU key

4-6. Setup of Start Character

Initial value : STX
Setting range : ATX
Control code to be used is chosen. (Effective only when SHIMAX standard serial protocol is on)

choice	start character	text end character	end character
STX	STX(02H)	ETX(03H)	CR(0DH)
ATX	"@"(40H)	":"(3AH)	CR(0DH)

MENU key

4-7. Setup of Communication Address (Slave Address)

Initial value : 1
Setting range : MAST1, MAST2 ,1～255
RS-485 adopts the multidrop system and up to 255 equipments (maximum) are connectable.
By allotting an address (machine No.) to the each equipment, only specified-address holding equipment can respond.

MENU key

Note 1: An address can be set up to 1～255.
Note 2: The numbers of addresses you can appoint as a slave is 1～247 in the specification of MODBUS. (Since appointment is possible in 1～255)
Note 3: When decrement is further carried out from Address 1, and decided, MAC6/MAP6 operates as master mode (MAST)
Note 4: MAST 1 can communicate by the setting 4-8
MAST 2 can communicate RUN, STBY status with the setting 4-8

4-8. Setup of Master Mode

Initial value : SV
Setting range : SV,OUT1,OUT2 O1SC O2SC
The type of data that should be transmitted to the slave side is chosen, at the time of master mode.
(A screen is displayed only at the time of master mode)
SV: Transmit the present Execution SV to a slave.
out 1 : Transmit the present value of Out1
out2: Transmit the present value of Out2
o 1Sc: As the data converted with the measuring range by the side of master, output % of output 1 is transmitted to slave.
o2Sc: As the data converted with the measuring range by the side of master, output % of output 2 is transmitted to slave.
At the time of out 1 and out 2, (measuring range span × output %) + measuring range lower limit is the actual transmit data.

4-9. Setup of Start Slave Address

Initial value : 1
Setting range : bcAS、1～255
At a maximum, data can be continuously transmitted up to 255 equipments, at the time of master mode.
The start number of the slave address which transmits data is chosen here.

MENU key (Screen is displayed only at the time of master mode)

4-10. Setup of End Slave Address

Initial value : 31
Setting range : 1～255
At a maximum, data can be continuously transmitted up to 31 equipments, at the time of master mode.
The end number of the slave address which transmits data is chosen here.

MENU key (A screen is displayed only at the time of master mode)

Note 1: End slaved dress can be set up only within the limits of start slave address～start slave address +30.
Set start and end slave address in the same value if transmitting object is only one.

4-11. Setup of Write-in Data Address

Initial value :0300H
Setting range :0000H～FFFFH
The data address by the side of the slave which rewrites data is chosen, at the time of master mode.
(A screen is displayed only at the time of master mode)

MENU key

Note 1: In a digital controller of SHIMAX, 0300H is, as standard, assigned as SV 1.

4-12. Setup of Delay Time

Initial value :20
Setting range:1～500(msec)
The minimum delay time, from receiving a communication command to actual transmission, can be set up.

MENU key Note 1:A certain line converter may require longer time for 3 state control, and a signal collision may occur in the case of RS-485.
If delay time is lengthened, it is avoidable.
Caution is required when especially the transmission speed is slow. (1200 bps, 2400 bps, etc.)
Note 2: The actual delay time, from receiving communication command to actual transmission, is the sum total of the above-mentioned delay time, and the processing time by software.
Especially in the case of write command, command processing time may require around 400 msec.

4-13. Setup in Communication Memory Mode

Initial value :RAM
Setting range: RAM,MIX,EEP
Since write cycle of nonvolatile memory EEPROM is limited, the life of EEPROM becomes shorter when data is frequently rewritten by communication.

MENU key Set up RAM mode when data is frequently rewritten by communication. Life of EEPROM can be lengthened, if only RAM data is rewritten without rewriting EEPROM.

choice	content of processing
rAM	In this mode, in changing data by communication, only RAM is rewritten. RAM data will be eliminated if power is turned OFF without rewriting to EEPROM. If power is turned on again, it will start by the data memorized by EEPROM.
MIX	In this mode, the data of FIX-SV 1-4 and OUT 1 ～ 2 manual output value is written only in RAM, and the other data are written in RAM and EEPROM.
EEP	Every time the data is changed by communication, rewriting of RAM and EEPROM is performed. The data is saved even if power is turned off.

5. Outline of Standard Serial Communications Protocol

MAC6/MAP6 adopts SHIMAX standard serial communications protocol.
Change of data is possible with the same communication format, even if the different series of equipment which adopts the standard serial protocol is connected.

5-1. Communication Procedure

(1) The relation between master and slave
- The personal computer, PLC (host) is master side.
- MAC6/MAP6 is slave side.
- Communication begins by the communication command from the master side, and end by the communication response from the slave side.
  However, communication response is not performed when abnormalities, such as communication format error or BCC error, have been recognized.

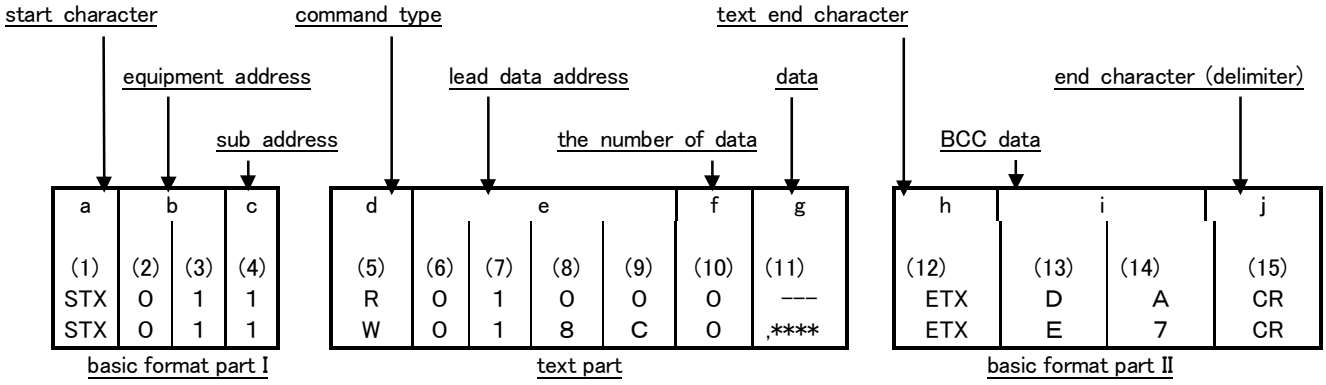
(2) Communication procedure
The slave side answers the master side, transmitting right shifts mutually, and communication procedure is performed.

(3) Timeout
After receiving a start character, when reception of an end character is not completed within 1 second, it is considered as a timeout. Wait another command (new start character).
In setting up timeout by the host side, set it up with 1 second or more.

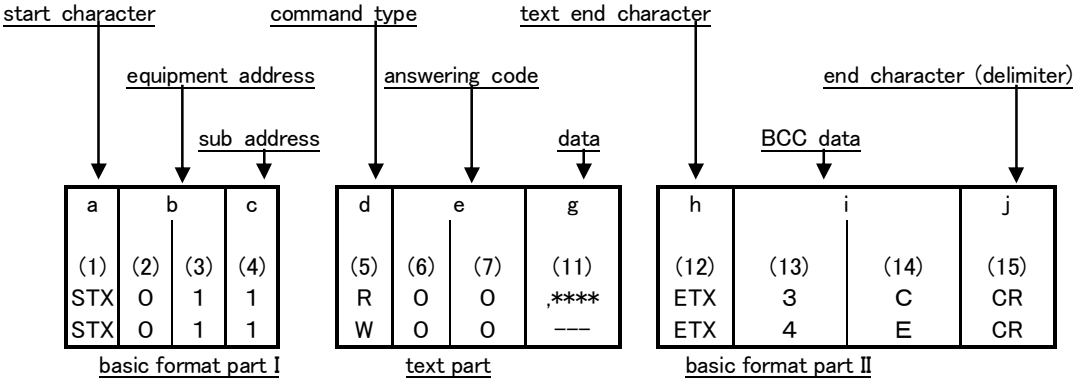
5-2. Communication Format

(1) Communication format outline
Communication format consists of basic format part I, text part, and basic format part II.

1) Outline of communication command format



2) Communication answering format



- Basic format part I, II is common at the time of Read command (R), Write command (W), and communication response.
  The each-time operation result data is inserted into BCC data, < i (13), (14) >.
- Text part changes with command type, data address, communication responses, etc.

(2) Details of Basic format part I

a: Start character [(1): single-digit / STX (02H), or "@" (40H)]

- The character shows that this is head of communication.
- If start character is received, it will be judged as the 1st letter of new communication.
- A start character and the end character of text are chosen by a pair.

(See **4-5. Setup of Start Character)**

STX (02H) ----chosen by ETX (03H)
"@"(40H) ----chosen by ":" (3AH).

b: Equipment address [(2), (3):double-digit]

- Appoint the equipment for communication.
- Address can be appointed in 1～255 (decimal number).
- Binary digit 8 bit data (1:0000 0001 - 255:1111 1111) are divided into top 4 bits and 4 bits of low ranks, and are changed into ASCII data.

(2): Data from which high 4 bits is converted into ASCII.
(3): Data from which low 4 bits is converted into ASCII.

c: Sub address [(4): single-digit]

-It is being fixed to (4) =1 (31H), because MAC6/MAP6 is single loop equipment.
- When other addresses are appointed, it gives no response as sub address error.

(3) Details of Basic format part II

h: Text end character (12): single-digit / ETX (03H), or ":" (3AH)]

- It shows that the text part has just finished.

i: BCC data [(13) (14):double-digit]

- BCC data checks communication data's abnormality.
- When BCC error is shown as a result of BCC operation, it gives no response.
- There are the four following types of BCC operations.

(BCC operation type can be set up by **4-6. Setup of BCC Operation Type**)

1) None
BCC operation is not performed. (13) and (14) are omitted.
2) Addition
Addition operation is performed in the unit of ASCII data 1 character (1 byte), from start character (1) to text end character (12).
3) Addition + Complement of 2
Addition operation is performed in the unit of ASCII data 1 character (1 byte), from start character (1) to text end character (12). From the operation result, low rank 1 byte's complement of 2 is taken.
4) Exclusive OR
XOR (exclusive OR) operation is performed in the unit of ASCII data 1 character (1 byte), from immediately after start character < equipment address (2) >to text end character (12). .

- Regardless of data bit length (7 or 8), calculate in the unit of 1 byte (8 bits).
- According to the above-mentioned operation result, the low rank 1 byte data is divided into top rank 4 bits and 4 bits of low rank, and is changed into ASCII data.

(13): Data from which high 4 bits is converted into ASCII.
(14): Data from which low 4 bits is converted into ASCII.

Example 1: BCC At setup of Addition at the time of Read command (R).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(12)	(13)	(14)	(15)
STX	0	1	1	R	0	1	0	0	0	ETX	D	A	CR

02H + 30H + 31H + 31H + 52H + 30H + 31H + 30H + 30H + 30H + 03H = 1DAH

Addition result (1DAH)'s low 1 byte = DAH

(13) : "D" = 44H 、(14): "A" = 41H

Example 2 : BCC At setup of Addition + Complement of 2 at the time of Read command (R)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(12)	(13)	(14)	(15)
STX	0	1	1	R	0	1	0	0	0	ETX	2	6	CR

02H + 30H + 31H + 31H + 52H + 30H + 31H + 30H + 30H + 30H + 03H = 1DAH

Addition result's (1 DAH) low rank 1 byte = DAH
Complement of 2 low 1 byte (DAH) =26

(13) : "2" = 32H , (14) : "6" = 36H

Example 3: BCC At Exclusive OR setup at the time of Read command (R).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(12)	(13)	(14)	(15)
STX	0	1	1	R	0	1	0	0	0	ETX	5	0	CR

30H ⊕31H ⊕31H ⊕52H ⊕30H ⊕31H ⊕30H ⊕30H ⊕30H ⊕03H = 50H

⊕ = XOR (exclusive OR)
low rank 1 byte of operation result (50H) = 50H

(13) : "5" = 35H , (14) : "0" = 30H

j: End character (delimiter) [(15): single-digit / CR]
- This shows the end of communication.

(4) Basic format part I, II Common conditions

1) When the following abnormalities have been recognized in the basic format part, no answer is given.
   - when there happened hardware error. (overrun, flaming, parity error)
   - when equipment address and sub address differ from the address of appointed equipment.
   - when character is not in the proper position that determined in the above-mentioned communication format.
   - when the operation result of BCC differs from BCC data.
2) Binary digit (binary) data is converted into ASCII data every 4 bits.
3) In a hexadecimal number, <A>～<F> are converted into ASCII data using a capital letter.

(5) Text part outline

Text part changes with the type of command, and communication responses.

. See **5-3. Read command (R) details** as well as **5-4. Write command (W) details** about details of text part.

d: Command type [(5):single-digit],

- "R" (52H/capital letter): This shows that they are read command and read command response.
  Used when various data are read out (or read in) to a personal computer, PLC, etc.
- "W" (57H/capital letter): This shows that they are write command and write command response.
  Used when various data are written in (or changed) from a personal computer, PLC, etc.
- On occasions when unusual characters other than "R" and "W" have been recognized, it gives no response.

e: Lead data address [(6), (7), (8), (9): four-digit]

- At the time of a Read command (R) and a Write command (W), read-out and the lead data address of writing place is appointed.
- Lead data address is appointed as binary digit data of 16 bits (1 word /0～65535).
- 16 bit data are divided every 4 bits, and are converted into ASCII data.

binary digit (16 bits)	D15,D14,D13,D12	D11,D10, D9, D8	D7, D6, D5, D4	D3, D2, D1, D0
	0 0 0 0	0 0 0 1	1 0 0 0	1 1 0 0
hexadecimal number	0H	1H	8H	CH
	"0"	"1"	"8"	"C"
ASCII data	30H	31H	38H	43H
	(6)	(7)	(8)	(9)

- See **8. Communication Data Address List** about data address

f: The number of data [(10): single-digit]

- At the time of a Read command (R) and a Write command (W), the numbers of read-out and write-in data are appointed.
- The number of data is appointed by converting binary digit 4 bit data into ASCII data.
- At the time of a Read command (R), it is possible to appoint in the following range.
  "0"(30H) (one) ～" 9" (39H) (ten)
- Being fixed to "0" (30H) (one) at the time of Write command (W).
- The actual number of data is < the number of data =appointed data value + 1 >

g: Data [(11): the number of digit is determined by data number]

- Write-in data at the time of Write command (W) (changed data) as well as the read-out data at the time of Read command (R) response are appointed.
- The data format is as follows.

g(11)

	1st data				2nd data					n-th data			
	high			lower	high			lower		high			lower
"," 2CH	1	2	3	4	1	2	3	4		1	2	3	4

- Quotation (", "2CH) are, without fail, added to the head of data, and subsequent portion is data.
- The sign which divides between data and data is not employed.
- The number of data is determined with the number of data of communication command format f :(10).
- One data is expressed in the unit of binary digit, 16 bits (1 word) except decimal point.
- The positions of a decimal point differ from data to data.
- 16 bit data are divided every 4 bits, and each is converted into ASCII data.
- See **5-3. Read Command (R) Details,**and **5-4. Write Command (W) Details** about the details of data

e: Answering code [(6), (7):double-digit]

- Appointment of the answering code to Read command (R) and Write command (W).
- Binary digit 8 bit data (0～255) are divided into high rank 4 bits and low rank 4 bits, and each is converted into ASCII data.
  (6): Data from which high 4 bits is converted into ASCII.
  (7): Data from which low 4 bits is converted into ASCII.
- In the case of normal response, "0" (30H) and "0" (30H) are appointed.
- In the case of abnormal response, abnormal code N0. is converted to ASCII data and appointed.
- See **5-5. Answering Code Details** about details of answering code.

5-3. Read command (R) Details

Read command (R) is used when it reads in (take in) various data from a personal computer, PLC, etc.

(1) Read command (R) format

- Text part format at the time of Read command (R) is as follows.

(Basic format part I and II are common to all the commands and responses.)

text part

d	e				f
(5)	(6)	(7)	(8)	(9)	(10)
R	0	4	0	0	4
52H	30H	34H	30H	30H	34H

d: this means Read command.
e: lead data address of read-out data is appointed.
f: appointment of the number of data that should be read out of lead data address.

- The above-mentioned command is as follows.

read-out lead data address = 0400H (hexadecimal number)
= 0000 0100 0000 0000 (binary digit)

the number of read-out data = 4H (hexadecimal number)
= 0100 (binary digit)
= 4 (decimal number)

(the actual number of data) = 5 (4+1)

Namely, read-out of five data from the data address 0400H is being appointed.

(2) The normal response format at the time of Read command (R)

- The normal response format (text part) to Read command (R) is as follows.

(Basic format part I and II are common to all the commands and responses.)

text part

d	e		g													
(5)	(6)	(7)	(11)													
				1st data				2nd data						5th data		
R	0	0	,	0	0	1	E	0	0	7	8		0	0	0	3
52H	30H	30H	2CH	30H	30H	31H	45H	30H	30H	37H	38H		30H	30H	30H	33H

- d (5) : <R (52H)> which shows that it is the response of Read command (R) is inserted.
- e (6),(7) : < 00 (30H, 30H) > ,which shows the normal response of Read command (R), is inserted.

– g (11) : The response data of Read command (R) is inserted.
The format of data is as follows.

1. At first, < , (2CH) >, which shows the head of data, is inserted.
2. Next, from <the data of read-out lead data address>,
   the same number of data as <the number of read-out data> is inserted in order.
3. Nothing is inserted between data.
4. One data consists of binary digit data, 16 bits (1 word) except a decimal point.
   Data is converted into ASCII data every 4 bits and inserted.
5. The positions of a decimal point differ from data to data.
6. The number of characters of response data is as follows.
   the number of character = 1 + 4 × the number of read-out data

– The following data is answered as response data, in order, to the above-mentioned Read command (R).

lead of read-out data address (0400H)

number of read-out data (4H : 5)

	data address 16 bits (1 word)	data 16 bits (1 word)	
	Hexadecimal number	Hexadecimal number	decimal number
0	0400	001E	30
1	0401	0078	120
2	0402	001E	30
3	0403	0000	0
4	0404	0005	5

(3) The abnormal response format at the time of Read Command (R)

– The abnormal response format (text part) to Read command (R) is as follows.
(Basic format part I and II are common to all the commands and responses.)

text part

d	e	
(5)	(6)	(7)
R	0	7
52H	30H	37H

– d (5): <R (52H) >, which shows the answer of read command, is inserted.
– e (6), (7): answering code, which shows abnormal response of Read command (R), is inserted.
– See **5-5. Answering Code Details** about the details of abnormal code.
– Response data is not inserted in abnormal response.

5-4. Write Command (W) Details

Write command (W) is used when various data is written in (or changed) from a personal computer, PLC, etc.

1) Write command (W) format

-The text part format at the time of the Write command (W) is as follows.

(Basic format part I and II are common to all the commands and responses.)

text part

d	e				f	g				
(5)	(6)	(7)	(8)	(9)	(10)	(11)				
						write-in data				
W	0	4	0	0	0	,	0	0	2	8
57H	30H	34H	30H	30H	30H	2C H	30H	30H	32H	38H

- d: This shown Write command. It is being fixed as "W" (57H).
- e: The lead data address of Write-in (change) data is appointed.
- f: The number of write-in (change) data is appointed.
  The number of write-in data is fixed as "0" (30H) One.
- g: Write-in (change) data is appointed.
  1. <, (2CH) >, which shows the lead of data, is inserted.
  2. Next, write-in data is inserted.
  3. Data consists of binary digit data,16 bits (1 word) except a decimal point, and it is converted into ASCII data every 4 bits, and inserted.
  4. The positions of a decimal point differ from data to data.

- The above-mentioned command is as follows.

  Write-in lead data address = 0400H (hexadecimal number)
  = 0000 0100 0000 0000 (binary digit)
  The number of write-in data = 0H (hexadecimal number)
  = 0000 (binary digit)
  = 0 (decimal number)
  (the actual number of data) =One (0+1)
  Write-in data = 0028 (hexadecimal number)
  = 0000 0000 0010 1000 (binary digit)
  = 40 (decimal number)
  Data address 0400H, write-in (change) of one data (40: decimal number) is appointed.

address(400H) ⟶ 0
the number of write-in data
One(01)

data address 16 bits (1 word)		data 16 bits (1 word)	
hexadecimal number	decimal number	hexadecimal number	Decimal number
0400	1024	0028	40
0401	1025	0078	120
0402	1026	001E	30

(2) The normal response format at the time of W0rite command (W)

- The normal response format (text part) to Write command (W) is as follows.

(Basic format part I and II are common to all the commands and responses.)

text part

d	e	
(5)	(6)	(7)
W	0	0
57H	30H	30H

- d (5) : <W (57H)>, which shows response of Write command (W), is inserted.
- e (6), (7): <00 (30H, 30H)>, which shows normal response of Write command (W), is inserted.

(3) The abnormal answer format at the time of Write Command (W)

- The abnormal answer format (text part) to a Write Command (W) is as follows.
  (Basic format part Ⅰ and Ⅱ are common to all the commands and responses.)

text part

d	e	
(5)	(6)	(7)
W	0	9
57H	30H	39H

- d (5) : <W (57H)>, which shows answer of Write command (W), is inserted.
- e (6), (7) : Abnormal response, which shows abnormal answer of Write command (W), is inserted.
- See **5-5. Answering Code Details** about details of abnormal code.

5-5. Answering Code Details

1) The type of answering code

- The communication answer to Read command (R) and Write command (W) always contains the answering code.
- An answering code is roughly divided into two kinds.

Answering code { Normal answering code / Abnormal answering code

- Answering code consists of binary digit, 8 bit data (0～255).
- The type of answering code is as follows.

Answering Code List

answering code		code type	content of code
binary	ASCⅡ		
0000 0000	"0","0" :30H,30H	normal answer	- Normal answering code
0000 0111	"0","7" :30H,37H	Format error of text part	- when number other than 0～9 is appointed as the number of data - when ones other than 0～9 and A～F are included - when quotation ", "are not given to the appointed position
0000 1000	"0","8" :30H,38H	Data address Error in the number of data	- when non-existing address is appointed - when read-only is written - when write-only is read - when numbers other than zero are appointed as the number of data, at the time of W command
0000 1001	"0","9" :30H,39H	Data error	- when the write-in data exceeds the settable range
0000 1010	"0","A" :30H,41H	Execution command error	- when execution command is received in the unsuitable state (when rewriting of RUN/STBY is performed even though RUN/STBY is assigned to DI)
0000 1011	"0","B" :30H,42H	Write mode error	- when write command is received under circumstances where data rewriting is impossible (such case as rewriting of manual output value is performed during AUTO execution)
0000 1100	"0","C" :30H,43H	Specification option error	- when the write command which contains unlisted specification or option's data is received

(2) The priority of answering code

As the value of answering code becomes low, the priority of answering code becomes high.
When plural answering codes occur, the high priority answering code is returned.

5-6. Communication Data Address Details

1) Data address
- As for a data address, a binary digit (16 bit data) is expressed with a hexadecimal number every 4 bits.

2) About read-out (read)/write-in (write).
- R/W is the data in which read-out and writing are possible
- R is read-only data.
- W is data only for writing.
- When the data address only for writing is appointed in Read command (R), and read-only data address is appointed in Write command (W), data address error is shown. And abnormal answering code, ="0" , "8" (30H, 38H), "data format of text part, data address, and errors in the number of data" ,is answered.

3) Data address and the number of data
- When the data address, which is not listed in data address, is appointed as lead data address, data address error is shown. And abnormal answering code, ="0" ,"8" (30H, 38H), "data format of text part, data address, and errors in the number of data", is answered.
- When the data address, to which the number of data is added, becomes outside of listed data address, in the area of outside-address, "0000 H" (30H, 30H, 30H, 30H) is answered always as data.

4) Data
- Since each data does not have a decimal point (16 bit data), the check of data type and decimal point is needed. (See instruction manual of main body)
- In the case of the data whose unit is UNIT, measuring range determines the position of decimal point.
- All the data is treated as binary digit with a code (16 bit data: -32768 ～ 32767).

Example: Method to express data with a decimal point

		hexadecimal number
20.0	→ 200	→ 00C8
100.00	→ 10000	→ 2710
-40.00	→ -4000	→ F060

Example: Method to express 16 bit data

data with code	
decimal number	hexadecimal number
0	0000
1	0001
≈	≈
32767	7FFF
-32768	8000
-32767	8001
≈	
-2	FFFE
-1	FFFF

5) Option-related parameter
- When the data address of parameter, which is not listed as an option, is appointed, the abnormal answering code , "0", "C" (30H, 43H) "specification, option error", is answered to Read command (R) and Write command (W).

6) The parameter which is not displayed in an operator display because of operation specification or setting specification
- The parameter, which is not displayed (not used) in an operator display because of operation specification or setup specification, is possible to read-out in communication.
  However, in write-in, the abnormal answering code,"0" ,"B" (30H, 42H) "write mode error", is answered.

6. Outline of MODBUS Communication Protocol

MODBUS has two kinds of modes or RTU mode and ASCI I mode, and according to the setting content of **4-6. Setup of BCC Operation Type**, it changes automatically.

Comparison of RTU and ASCI I code

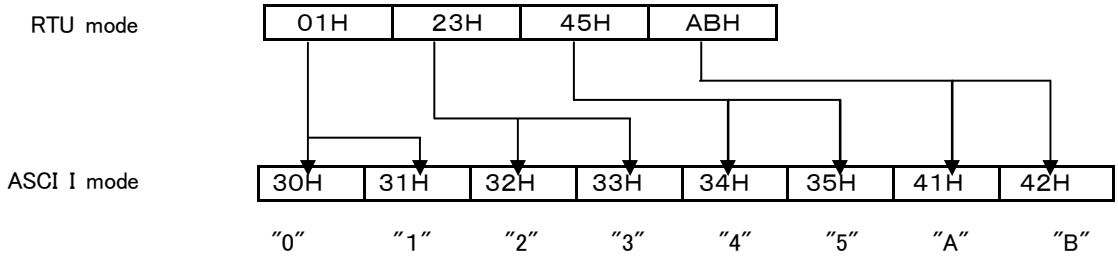
Item	RTU	ASC Ⅱ
transmission code	binary 8 bits	ASC Ⅱ
error-checking	CRC-16	LRC
start bit	1 bit	
data length	8 bits	7 bits / 8 bits
parity bit	none / even number / odd number	
stop bit	CRC-16	LRC
start character	none	":"(3AH)
end character	none	CR(0DH)+LF(0AH)
time interval of data	below time to be equivalent to 28 bits	one second or less

6-1. Communication Procedure

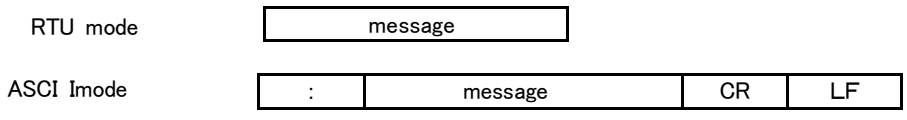
1) Relation between master and slave
- A personal computer and PLC (host) side is master side.
- MAC6/MAP6 is slave side.
- Communication is started by communication command from master side, and completed by communication answer from slave side. However, a communication answer is not performed when abnormalities, such as communication format error or BCC error etc., have been recognized.

2) Communication procedure
The slave side answers the master side, a transmitting right is transferred by turns, and a communication procedure is performed.

3) Communication data
RTU mode is 8-bit binary transmission.
In ASCII mode, 8-bit binary of RTU is converted to the two-letter ASCI I code and transmitted.



4) Message frame composition
RTU mode consists of only messages.
ASCII mode is consists of start character":" (3AH) + message + end character, CR (0DH) +LF (0AH).
message



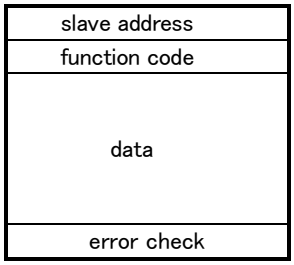
5) Timeout
- RTU mode
When message stops during time equivalent to 28 bits, it is regarded as the end of message.
When a blank arises during time equivalent to 28 bits in the middle of message transmitting, it is judged as the end of message. It is an imperfect message, therefore slave performs no response.
* Reference: time equivalent to 28 bits (unit = msec)
1200bps:23.4 2400bps:11.7 4800bps:5.9 9600bps:3.0 19200bps:1.5 38400bps:0.8
- ASCI I mode
After receiving start character, it results in timeout when reception of end character is not completed within 1 second. And it waits for the other command (new start character).

6-2. Communication Format

1) Composition of message

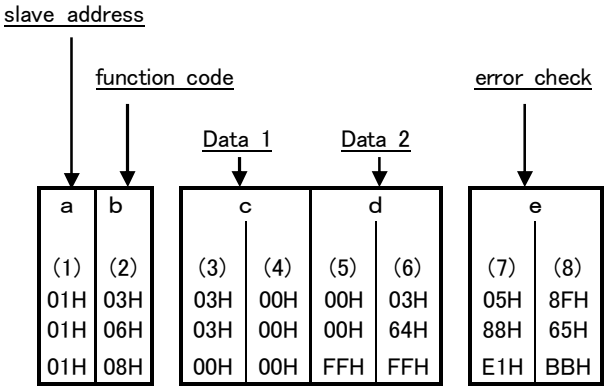
The MODBUS message has the following composition in RTU and ASCI I mode.

All the message components are treated not by a decimal number but by a hexadecimal number.



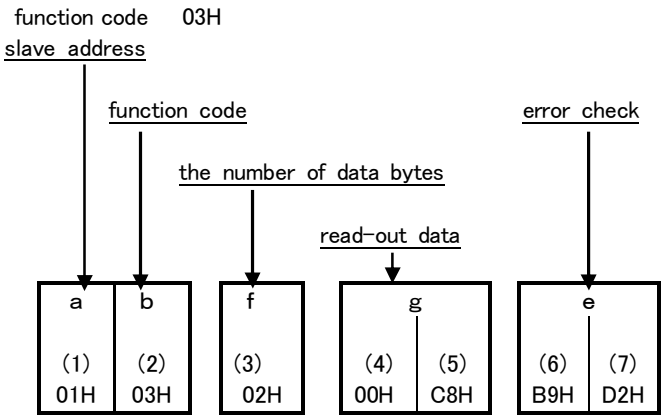
2) Communication command format (MODBUS: Described by RTU because RTU is foundation)

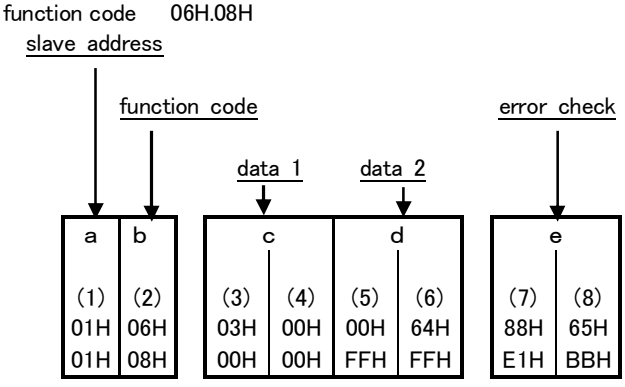
– As for the message from master, message length is being fixed regardless of the function code.



3) Communication answer format (MODBUS: Described by RTU because RTU is foundations)

– The answer from a slave differs in message length along with a function code.





a: Slave address

- The message which the master sent is received by all the connected equipment. Only the slave congruous with message's slave address answers the message.
- In MAC6/MAP6, 1～255 (01 H～FFH) can be appointed as slave address.
  Note: In MODBUS specification, address which can be appointed to slave is 1～247 (01 H～F 7H)

b: Function code

- A code number shows the function to perform.

function code	function
03H	data read-out
06H	data writing
08H	loopback test

c: Data 1

- Composition of data differs along with function code.

d: Data 2

- Composition of data differs along with function code.

function code	data 1 content	data 2 content
03H	data address	the number of read-out
06H	data address	write-in data
08H	fixed as 0000H	arbitrary data

e: Error checking

- Error-checking system differs along with MODBUS mode.
  RTU mode : CRC-16
  ASCⅡ mode : LRC
- See **6-3. Error Checking** about details concerning error checking.

f: The number of data bytes

- The number of read-out data bytes at the time of data read-out.
- Read-out demand is word unit; therefore it is twice of the number of read-out.

the number of read-out		the number of data bytes	
decimal number	hexa-decimal number	decimal number	hexa-decimal number
1	01H	2	02H
2	02H	4	04H
3	03H	6	06H
4	04H	8	08H
5	05H	10	0AH
6	06H	12	0CH
7	07H	14	0EH
8	08H	16	10H
9	09H	18	12H
10	0AH	20	14H

g: Read-out data

- The data along with read-out demand is inserted.
- Along with the number of read-out, data length varies and there is no data breaking.
  The number of read-out is: 1 = 2 bytes, 3 = 6 bytes, and 10 = 20 bytes.

6-3. Error Checking

Error checking is calculated by the sending side and the result is attached to the end of outgoing message.
Error checking of incoming message is calculated by the reception side.
The result is checked if it is the same as received error checking.
If the check results met, incoming message is judged to be right, and answer operation to reception is started.
If it differs, data is judged as abnormal, and slave performs no response.

(1)CRC-16

CRC-16 is 2 bytes (16 bits) of error-checking code.
CRC-16 is calculated in the following procedures from slave address to the end of data.

1. to initialize CRC register by FFFFH.
2. Exclusive OR with CRC register and the first 1 byte of message.
   A calculation result is written in CRC register.
3. Shift 1 bit of CRC registers to the right.
4. If carry fragment (shift-out bit) is 1, exclusive OR with CRC register and A001H.
   The calculation result is written in CRC register.
5. Repeat 3. and 4. until it shifts eight times.
6. Exclusive OR with CRC register and 1 byte next to message.
   The calculation result is written in CRC register.
7. 3.～ 6. is repeated to all the data except CRC.
8. Data byte is calculated to the end. The computed CRC register value is assigned to a message in order of low rank and high rank.

(2) LRC

LRC calculates from slave address to the end of data in the following procedures.
(Note: LRC calculation is performed by RTU binary, the antecedent method of ASCⅡ binary)

1. Addition, from the lead of data (slave address) to the end, is carried out.
   When a calculation result exceeds FFH, the value beyond 100H is omitted.(153H is treated as 53H)
2. The complement of addition's result (bit reversal) is taken, and 1 is added to the result.
3. The above-mentioned value works as the LRC code.
4. The LRC code is assigned to the end of message, and the whole is converted into the ASCⅡ character.

6-4. Data Read-out (Function Code 03H) Details

Function code 03H is used on occasions when it reads (takes in) various data from a personal computer, PLC, etc.

(1) Data read-out format

- The format at the time of data read-out is as follows.

a	b	c		d		e		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	error checking in ASCⅡ mode
01H	03H	04H	00H	00H	03H	04H	FBH	the portion of (7), (8) is as follows
								LRC:F5H

a: Slave address
b: Data read-out function code
c: Read-out lead data address
d: The number of read-out data from lead data address
* The numbers of data which can be read is 1～10.
Therefore, binary code permitted here is 0001H～000AH, and error code is returned if value other than the above is appointed.
e: Error checking

- The above-mentioned command is as follows.
Read-out lead data address = 0400H (hexadecimal number)
The number of read-out data = 0003H (hexadecimal number)
Three data read-out is appointed from data address 0400H

(2) The normal answer format at the time of data read-out

- The normal answer format to function code 03H is as follows.

a	b	f	g						e		
			0400H		0401H		0402H				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	error checking in ASCI Imode
01H	03H	06H	00H	1EH	00H	78H	00H	1EH	89H	66H	the portion of (10), (11) is as follow
											LRC:42H

a: Slave address
b: Function code
f: The number of read-out data bytes
* three data read-out, so 6 bytes read-out. Therefore, it is 06H.
g: Read-out data
1. The same number of data as that of read-out data is inserted from read-out's data of lead data address, in order.
2. Nothing is inserted between data.
3. One data consists of binary digit 16 bits data(1 word) except for a decimal point.
4. Each data has position of peculiar decimal point.
e: Error checking

read-out lead data address

(0400H) ⟶ 1
number of read-out data 2
(0003H : 3) 3

data address 16 bits (1 word)	data 16 bits (1 word)	
hexadecimal number	hexadecimal number	decimal number
0400	001E	30
0401	0078	120
0402	001E	30

(3) The abnormal answer format at the time of data read-out

a	b	h	e		
(1)	(2)	(3)	(4)	(5)	error checking at the time of the ASCⅡ mode
01H	83H	03H	01H	31H	the portion of (4), (5) is as follow
					LRC: 79H

a: Slave address
b: Function code
* At the time of error, reception function code +80H is shown. It informs abnormal answer.
h: Error code
* See **6-8. Error Message Details** about details of error code.
e: Error checking

6-5. Data Write-in (Function Code 06H) Details

Function code 06H is used on occasions when it writes in (changes) various data from a personal computer, PLC, etc.

(1) Data write-in format

- The format at the time of data writing is as follows.

a	b	c		d		e	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
01H	06H	03H	00H	00H	64H	88H	65H

error checking at the time of ASCⅡ mode
the portion of (7), (8) is as follows
LRC: 92H

a: Slave address
b: Data write-in function code
c: A write-in data address
d: Write-in data
1. Data consists of binary digit 16 bits data (1 word) except for a decimal point.
2. Each data has position of peculiar decimal point.

e: Error checking

- The above-mentioned command is as follows.

write-in lead data address = 0300H (hexadecimal number)
write-in data = 0064H (hexadecimal number)
= 100 (decimal number)

Writing of the data addresses, 0300H (100:10 decimal numbers), is appointed.

address (0300H) ⟶
write-in data (0064H)

data address 16 bits (1 word)	data 16 bits (1 word)	
hexadecimal number	hexadecimal number	decimal number
0300	0064	100
0301	0000	0
0302	0000	0

(2) The normal answer format at the time of data writing

- The normal answering format to function code 06H is as follows.

a	b	c		d		e	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
01H	06H	03H	00H	00H	64H	88H	65H

error checking at the time of ASCⅡmode
the portion of (7), (8) is as follows
LRC: 92H

* The same one as the outgoing message from master is answered.

(3) The abnormal answer format at the time of data writing

a	b	h	e	
(1)	(2)	(3)	(4)	(5)
01H	86H	02H	C3H	A1H

error checking at the time of ASCⅡmode
the portion of (4), (5) is as follows
LRC: 77H

a: Slave address
b: Function code
* At the time of error, reception function code +80H is shown. It informs abnormal answer.
h: Error code
* See **6-8. Error Message Details** about error code details.
e: Error checking

6-6. Loopback Test (Function Code 08H) Details

The function code 08H returns the message from master as response massage as it is.
It is used as communication diagnosis between master and slave.

(1) Loopback format
- The format at the time of a loopback test is as follows.

a	b	c		d		e	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
01H	08H	00H	00H	FFH	FFH	E1H	BBH

error checking at the time of ASCII mode
the portion of(7), (8) is as follows
LRC:F9H

a: Slave address
b: Data write-in function code
c: Test code
* Fixed as 0000H
d: Arbitrary data
* arbitrary 16 bit data of 0000H～FFFFH
e: Error checking

(2) Loopback normal answer format
- The normal answer format to the function code 08H is as follows.

a	b	c		d		e	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
01H	08H	00H	00H	FFH	FFH	E1H	BBH

error checking at the time of ASCII mode
the portion of(7), (8) is as follows
LRC:F9H

* The same one as the outgoing message from master is answered.

(3) The abnormal answer format at the time of loopback

a	b	h	e	
(1)	(2)	(3)	(4)	(5)
01H	88H	02H	C7H	C1H

error checking at the time of ASCII mode
the portion of(4), (5) is as follows
LRC:75H

a: Slave address
b: Function code
* At the time of error, reception function code +80H is shown. It informs abnormal answer.
h: Error code
* See **6-8. Error Message Details** about error code details.
e: Error checking

6-7. No Response Conditions

Slave does not answer when the following abnormalities have been recognized.
- when hardware error takes place (overrun, framing, parity error)
- when slave address differs from its own address
- when the data interval of message is long.
  (RTU: time to be equivalent to 28 bits or more ASCⅡ: one second or longer)
- when CRC-16 or LRC differs.
- when the message from master is not regulated one (Message is too long etc.,)

6-8. Error Message Details

Error code corresponding to the type of error is answered, when error other than no response condition is detected.

(1) Abnormal answer format

a	b	h	e	
(1)	(2)	(3)	(4)	(5)
01H	83H	03H	01H	31H

error checking at the time of ASCⅡ mode
the portion of (4), (5) is as follows
LRC:79H

a: Slave address

b: Function code

1. At the time of error, reception function code +80H is shown. It informs abnormal answer.
2. +80H is not shown at the time of function code beyond 80H, and returned as it is.

h: Error code

＊See the following table.

e: Error checking

Error Code	Content of Errors
01H	Function code error – when function code other than regulated one is received (All other than three sorts,< 03H, 06H, 08H>, correspond to this category)
02H	Address error – when it is written in the address only for reading – when the address only for writing is read – when a test code is not 0000H at the time of loopback test – when non-existing address is appointed in the lead of read-out or write-in address. (not yet added option etc. is included)
03H	Data error – when write-in data exceeds the writable data range (when ones other than 0 and 1 are written in AUTO/MANU switching etc.) – when the written-in value had been already filled by other one, in the item only for an exclusion setup (DI corresponds to this) – when the number of read-out data and the number possible to read-out is different.(In MAC6/MAP6, read-out is permitted between 1～10.) An error code is answered when read-out is 0, or over 11. – when the number of read-out data and the number possible to read-out is different.(In MAC6/MAP6, read-out is permitted between 1～10.) – when parameter is rewritten under circumstances a change is not permitted (Items such as:at the time of change by key operation, a screen displays nothing or a change is impossible)

(2) The priority of error code

The priority of error code becomes high as the value of error code becomes small. On occasions when plural error codes occur, the high priority error code is returned.

Example: Even if there are data error and address errors, 01H is returned when function code error is detected.

6-9. Communication Data Address Details

(1) Data address
- As for data address, binary digit (16 bit data) is expressed with hexadecimal number every 4 bits.

(2) About read-out (read)/write-in (write).
- R/W is the data in which read-out and writing are possible
- R is read-only data
- W is data only for writing.
- when the data address only for writing is appointed in data read-in (Function code 03H),
- when the read-only data address is appointed in data write-in (Function code 06H), it becomes address error and error code 02H is answered.

(3) Data address and the number of data
- When the data address, which is not described in data address, is appointed as lead data address,it becomes address error and error code 02H is answered.
- When the data address, to which the number of data is added, becomes outside of listed data address, in the area of outside-address, as data 0000 H is answered always.

(4) Data
- Since each data does not have a decimal point (16 bit data), the check of data type and decimal point is needed. (See the instruction manual of main body)
- In the case of the data whose unit is UNIT, measuring range determines the position of a decimal point.
- All the data is treated as binary digit with a code (16 bit data: -32768 ～ 32767).

Example: Method to express data with a decimal point

		Hexadecimal data
20.0	→ 200	→ 00C8
100.00	→ 10000	→ 2710
-40.00	→ -4000	→ F060

Example: Method to express 16 bit data

data with code	
decimal number	hexadecimal number
0	0000
1	0001
≈	≈
32767	7FFF
-32768	8000
-32767	8001
≈	
-2	FFFE
-1	FFFF

(5) An option-related parameter
- When the data address of the parameter, which is not listed as an option, is appointed, it results in an error both at Read command (R) and Write command (W).And error code 02H is answered

(6) The parameter which is not displayed in an operator display because of operation specification or setting specification
-The parameter, which is not displayed (not used) in an operator display because of operation specification and setup specification, is possible to read-out in communication.
However, write-in becomes data error and error code 03H is answered.

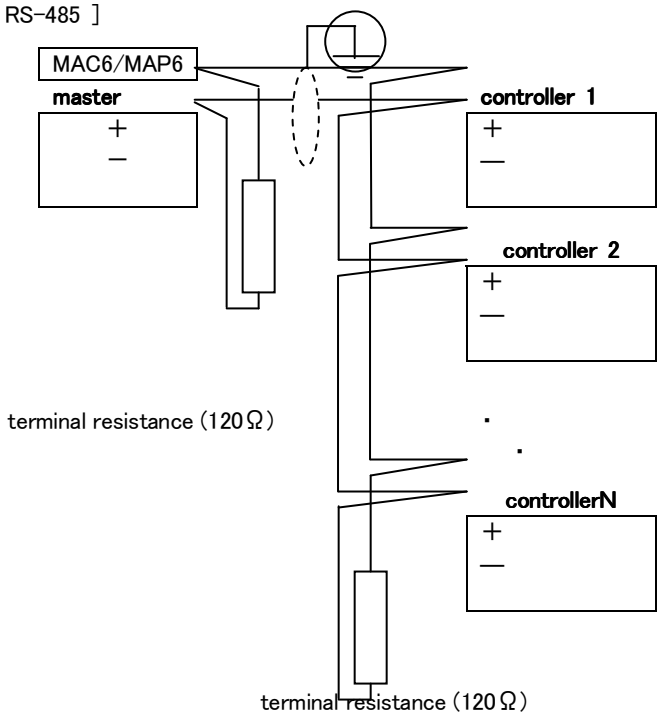
7. Communication Master Mode Outline

In 5. Standard Serial Communications Protocol Outline and 6. MODBUS Communications Protocol Outline, MAC6/MAP6 is explained on the assumption that it mainly works as the slave side.

If master mode ([illegible]) is chosen in slave address setup, MAC6/MAP6 operates as the master side which transmits SV value to the slave side.

7-1. Master/Slave Connection

[RS-485]



Note 1: Use MAC6/MAP6 by attaching terminal resistance of 1/2W 120Ω, between one master and one end terminal (between + and −)
Operation cannot be guaranteed on occasions when terminal resistance is attached to the other point.

Note 2: Be sure to perform wiring with a shielding wire and to connect one side of shield to the ground.
A customer needs to take measures against a lightning surge, when wiring by shielding wire cannot be performed.

Note 3: Use only one master in one communication loop.
Operation in the case of using two or more sets of master cannot be guaranteed.

7-2. Communication Details

(1) Transmit data from master
SV data corresponding to master mode setup is transmitted to the equipment of start～end slave address. Next, it is written in the address set up in the write-in data address.

(2) Communications protocol
It follows the communications protocol set up by BCC operation type.

(3) Delay time
After data is received from slave and delay time standby is performed, the following data is transmitted from master.

(4) Timeout
When normal answer data is not received even if it passes for 1 second after data is transmitted from master, data is transmitted to the next slave address.

(5) SV value to be transmitted
When SV value constantly changes in programming operation, and there are many slaves, slave side may take nonequivalent values if rewriting of all the slaves do not finish within SV renewal period (250Ω).

(6) Transmit data at the time of STBY (RST)
In the RST state in PROG mode, the start SV value is transmitted at the time of master mode SV.
In the STBY state in FIX mode, the present SV value is transmitted at the time of master mode SV.
(Measuring range lowest limit value is transmitted at master mode OUT 1, OUT 2)
Note: In both RUN and STBY state in FIX mode, the same data is sent at the time of master mode SV.

Data address table

Adress	Parameter	R/W
0040	Series 1 'M' 'A'	R
0041	Series 2 PROG '*' '6' *:C P	R
0042	Series 3 'A' 'O'	R
0043	Series 4 OUT1 'M' '#' #:C S I V Y X	R
0044	Software ver1 'O' '1'	R
0045	Software ver2 'O' 'O'	R
0046	Option 1 EV+OUT2 '*' '#' *:N E #:N C S I V E	R
0047	Option 2 DI+DO '*' '#' *:N D #:N J	R
0048	Opton 3 DO+AI '*' '#' *:N J H P #:N I V	R
0049	Option 4 AO+COM '*' '#' *:N T V #:N R W	R
004A	NOTE No,	R

0050	Device ID PV Ten thousand or one thousand digits ASCII code	R
0051	Device ID PV Ten thousand or one thousand digits ASCII code	R
0052	Device ID PV —, SV Ten thousand digits ASCII code	R
0053	Device ID SV One thousand or one hundred digits ASCII code	R
0054	Device ID SV Ten or one digits ASCII code	R

★For example 6730460426

Address	0x0050	0x0051	0x0052	0x0053	0x0054
Data	0x36, 0x37	0x33, 0x30	0x34, 0x36	0x30, 0x34	0x32, 0x36

It overflows LONG as a result of the check parity function, so I make them read by an ASCII code.

0100	Mesuring value HHHH, CJHH, b---:0x7FFF LLLL, CJLL:0x8000	R
0101	Excution SV value, within SV limiter	R
0102	Control Output 1 Value 0.0 ～100.0	R
0103	Control Output 2 Value 0.0 ～100.0	R
0104	Operation flagument D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0 0 0 0 0 0 0 AT/W 0 0 0 0 0 0 STBY MAN AT ※On at the time AT/W:AT standby On at the time STBY:STBY(RST) On at the time of MAN:MAN On at the time of AT:AT	R
0105	Event out flagment D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0 0 0 0 0 0 0 DO6 DO5 DO4 DO3 DO2 DO1 EV4 EV3 EV2 EV1 ※On at the time of EV3:EV3LED lighting On at the time of EV2:EV2LED lighting On at the time of EV1:EV1LED lighting	R
0106	FIX Excution SV No. 1～8	R
0107	Excution PID No.	R
0108	AI monitor	R
0109	CT 1 electric-current value	R
010A	CT2 electric-Current value	R
010B	DI input state flagment D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0 0 0 0 0 0 0 0 0 DI7 DI6 DI5 DI4 DI3 DI2 DI1	R

010D	Lacthing state Flagment D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0 0 0 0 0 0 0 DO6 DO5 DO4 DO3 DO2 DO1 EV4 EV3 EV2 EV1 ※In latching operating state, applicable bit turns ON at the time of event retention	R
010E	Relay ON/OFF Flagment D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0 0 0 0 0 0 0 DO6 DO5 DO4 DO3 DO2 DO1 EV4 EV3 EV2 EV1 ※NO/NC setting availavle therefore it will not be event on = relay on. At the time of Relay is ON , Flagment is ON	R

0120	Program operation Flagment D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0 PRG 0 0 0 0 UP LVL DW 0 0 0 0 SKIP 0 HOLD RUN ON at the time of PRG:PROG OFF at the time of FIX UP: ON during program is ascending LVL: ON during program flatness DW: ON during program is descending SKIP:ON at the time of SKIP execution HOLD: ON at the time of HOLD execution RUN: ON at the time of RUN	R
0121	Program excution No, No. 1～8	R

0123	Number of excution pattern ※Count the excution pattern 1～30001(Infinity Up to 30000 it clipped 30001 more than 30000)	R
0124	Excution step No, 1～96	R
0125	Excution step time MM:SS ,HH:MM 000:00 ～300:00 HHH.H 0000.1 ～3000.0 Infinity 30001	R
0126	Excution PID No.	R

0133	Remaining Excution pattern No, 0～29999(Infinity 30001)	R

0135	Remaining Excution step time MM:SS ,HH:MM 000:00 ～300:00 HHH.H 0000.1 ～3000.0 Infinity 30001	R

0142	servo position monitor	R

0180	FIX excution SV No. 1～8	W

0182	Control output 1 manual setting value ※Only at the time of manual	W
0183	Control output 2 manual setting value ※Only at the time of manual	W
0184	ＡＴ excution OFF:0 ON:1	W
0185	AUTO/MANU switching AUTO:0 MANU:1	W
0186	RUN/STBY switching RUN:0 STBY:1	W

0191	Hold excution OFF:0 ON:1	W
0192	Skip excution OFF:0 ON:1	W

0198	Latching release OFF:0 EV1:1 EV2:2 EV3:3 EV4:4 DO1:5 DO2:6 DO3:7 DO4:8 DO5:9 DO6:10	W

0300	ＦＩＸ Mode ＳＶ１	R/W
0301	ＦＩＸ Mode ＳＶ２	R/W
0302	ＦＩＸ Mode ＳＶ３	R/W
0303	ＦＩＸ Mode ＳＶ４	R/W
0304	ＦＩＸ Mode ＳＶ５	R/W
0305	ＦＩＸ Mode ＳＶ６	R/W
0306	ＦＩＸ Mode ＳＶ７	R/W
0307	ＦＩＸ Mode ＳＶ８	R/W

030A	ＳＶ limiter lower limit value	R/W
030B	ＳＶ limiter upper limit value	R/W

030C	RAMP mode 0,1,10,11,100,101,110,111,200,201,210,211	R/W
030D	RAMP Start SV	R/W
030E	RAMP time Unit 0:MMSS 1:HHMM 2:HHHH	R/W
030F	RAMPtime 000:01～300:00 (At time unit MMSS,HHMM) 0000.1～3000.0 (At time unit HHHH)	R/W

0314	AI scaling L	R/W
0315	AI scaling H	R/W
0316	AI offset -5000～5000	R/W
0317	AI filter 0～10000	R/W

031A	AI Mode 0:NON 1:SV 2:PV OF 3:OUT1L 4:OUT1H 5:MANU 1 6:OUT2L 7:OUT2H 8:MANU 2 9:EV1 10:EV2 11:EV3 12:EV4 13:DO1 14:DO2 15:DO3 16:DO4 17:DO5 18:DO6	R/W

031F	AI gain -5000～5000	R/W

0400	OUT1-PID1	proportional band 0:OFF 1～10000	R/W
0401		integration time 0:OFF 1～6000	R/W
0402		derivative time 0:OFF 1～3600	R/W
0403		manual reset -500～500	R/W
0404		differential gap Lo 1～10000	R/W
0405		output limiter lower limit 0～999	R/W
0406		output limiter upper limit 1～1000	R/W
0407		differential gap Hi 1～10000	R/W

0408	OUT1-PID2	proportional band 0:OFF 1～10000	R/W
0409		integration time 0:OFF 1～6000	R/W
040A		derivative time 0:OFF 1～3600	R/W
040B		manual reset -500～500	R/W
040C		differential gap Lo 1～10000	R/W
040D		output limiter lower limit 0～999	R/W
040E		output limiter upper limit 1～1000	R/W
040F		differential gap Hi 1～10000	R/W

0410	OUT1-PID3	proportional band 0:OFF 1～10000	R/W
0411		integration time 0:OFF 1～6000	R/W
0412		derivative time 0:OFF 1～3600	R/W
0413		manual reset -500～500	R/W
0414		differential gap Lo 1～10000	R/W
0415		output limiter lower limit 0～999	R/W
0416		output limiter upper limit 1～1000	R/W
0417		differential gap Hi 1～10000	R/W

0418	OUT1-PID4	proportional band 0:OFF 1～10000	R/W
0419		integration time 0:OFF 1～6000	R/W
041A		derivative time 0:OFF 1～3600	R/W
041B		manual reset -500～500	R/W
041C		differential gap Lo 1～10000	R/W
041D		output limiter lower limit 0～999	R/W
041E		output limiter upper limit 1～1000	R/W
041F		differential gap Hi 1～10000	R/W

0420	OUT1-PID5	proportional band 0:OFF 1～10000	R/W
0421		integration time 0:OFF 1～6000	R/W
0422		derivative time 0:OFF 1～3600	R/W
0423		manual reset -500～500	R/W
0424		differential gap Lo 1～10000	R/W
0425		output limiter lower limit 0～999	R/W
0426		output limiter upper limit 1～1000	R/W
0427		differential gap Hi 1～10000	R/W

0428	OUT1-PID6	proportional band 0:OFF 1～10000	R/W
0429		integration time 0:OFF 1～6000	R/W
042A		derivative time 0:OFF 1～3600	R/W
042B		manual reset -500～500	R/W
042C		differential gap Lo 1～10000	R/W
042D		output limiter lower limit 0～999	R/W
042E		output limiter upper limit 1～1000	R/W
042F		differential gap Hi 1～10000	R/W

0430	OUT1-PID7	proportional band 0:OFF 1～10000	R/W
0431		integration time 0:OFF 1～6000	R/W
0432		derivative time 0:OFF 1～3600	R/W
0433		manual reset -500～500	R/W
0434		differential gap Lo 1～10000	R/W
0435		output limiter lower limit 0～999	R/W
0436		output limiter upper limit 1～1000	R/W
0437		differential gap Hi 1～10000	R/W

0438	OUT1-PID8	proportional band 0:OFF 1～10000	R/W
0439		integration time 0:OFF 1～6000	R/W
043A		derivative time 0:OFF 1～3600	R/W
043B		manual reset -500～500	R/W
043C		differential gap Lo 1～10000	R/W
043D		output limiter lower limit 0～999	R/W
043E		output limiter upper limit 1～1000	R/W
043F		differential gap Hi 1～10000	R/W

0460	OUT2-PID1	proportional band 0:OFF 1～10000	R/W
0461		integration time 0:OFF 1～6000	R/W
0462		derivative time 0:OFF 1～3600	R/W
0463		Dead Band -20000～20000	R/W
0464		differential gap Lo 1～10000	R/W
0465		output limiter lower limit 0～999	R/W
0466		output limiter upper limit 1～1000	R/W
0467		differential gap Hi 1～10000	R/W

0468	OUT2-PID2	proportional band 0:OFF 1～10000	R/W
0469		integration time 0:OFF 1～6000	R/W
046A		derivative time 0:OFF 1～3600	R/W
046B		Dead Band -20000～20000	R/W
046C		differential gap Lo 1～10000	R/W
046D		output limiter lower limit 0～999	R/W
046E		output limiter upper limit 1～1000	R/W
046F		differential gap Hi 1～10000	R/W

0470	OUT2-PID3	proportional band 0:OFF 1～10000	R/W
0471		integration time 0:OFF 1～6000	R/W
0472		derivative time 0:OFF 1～3600	R/W
0473		Dead Band -20000～20000	R/W
0474		differential gap Lo 1～10000	R/W
0475		output limiter lower limit 0～999	R/W
0476		output limiter upper limit 1～1000	R/W
0477		differential gap Hi 1～10000	R/W

0478	OUT2-PID4	proportional band 0:OFF 1～10000	R/W
0479		integration time 0:OFF 1～6000	R/W
047A		derivative time 0:OFF 1～3600	R/W
047B		Dead Band -20000～20000	R/W
047C		differential gap Lo 1～10000	R/W
047D		output limiter lower limit 0～999	R/W
047E		output limiter upper limit 1～1000	R/W
047F		differential gap Hi 1～10000	R/W

0480	OUT2-PID5	proportional band 0:OFF 1～10000	R/W
0481		integration time 0:OFF 1～6000	R/W
0482		derivative time 0:OFF 1～3600	R/W
0483		Dead Band -20000～20000	R/W
0484		differential gap Lo 1～10000	R/W
0485		output limiter lower limit 0～999	R/W
0486		output limiter upper limit 1～1000	R/W
0487		differential gap Hi 1～10000	R/W

0488	OUT2-PID6	proportional band 0:OFF 1～10000	R/W
0489		integration time 0:OFF 1～6000	R/W
048A		derivative time 0:OFF 1～3600	R/W
048B		Dead Band -20000～20000	R/W
048C		differential gap Lo 1～10000	R/W
048D		output limiter lower limit 0～999	R/W
048E		output limiter upper limit 1～1000	R/W
048F		differential gap Hi 1～10000	R/W

0490	OUT2-PID7	proportional band 0:OFF 1～10000	R/W
0491		integration time 0:OFF 1～6000	R/W
0492		derivative time 0:OFF 1～3600	R/W
0493		Dead Band -20000～20000	R/W
0494		differential gap Lo 1～10000	R/W
0495		output limiter lower limit 0～999	R/W
0496		output limiter upper limit 1～1000	R/W
0497		differential gap Hi 1～10000	R/W

0498	OUT2-PID8	proportional band 0:OFF 1～10000	R/W
0499		integration time 0:OFF 1～6000	R/W
049A		derivative time 0:OFF 1～3600	R/W
049B		Dead Band -20000～20000	R/W
049C		differential gap Lo 1～10000	R/W
049D		output limiter lower limit 0～999	R/W
049E		output limiter upper limit 1～1000	R/W
049F		differential gap Hi 1～10000	R/W

04C0	Zone 1SP	R/W
04C1	Zone 2SP	R/W
04C2	Zone 3SP	R/W
04C3	Zone 4SP	R/W

04CA	Zone hysteresis 1～10000	R/W
04CB	Zone PID Mode 0:OFF 1:SV 2:PV	R/W

0500	EV1	Event operation mode 0:NON 1:HA 2:LA 3:IA 4:OA 5:SO 6:HD 7:LD 8:ID 9:OD 10:RUN 11:R_ON 12:R_OF 13:S_ON 14:S_OF 15:CT1_B 16:CT1_L 17:CT2_B 18:CT2_L 19:CT3_B 20:CT3_L 21:STP 22:P_E 23:END 24:HOLD 25:PROG 26:U_SL 27:D_SI 28:GUA 29:TS1 30:TS2 31:TS3 32:TS4	R/W
0501		Event setting Value -20003:STEP -20002:PTN -20001:SV_N ※-20001～-20003 are at HA,LA,HD,LD,ID,OD	R/W
0502		Event differential gap 1～10000	R/W
0503		Event standby operation 0:OFF 1～2	R/W
0504		Event setting value 2 (IA & OA can be set)	R/W
0505		Event latching ／Output characteristic D15-8 D0-0 Latching Output characteristic Upper 8digit ON/OFF of Event latching Lower 8digit NO/NC of Output characteristic Latching OFF:0 ON:1 Output characteristic NO:0 NC:1	R/W

0506	EV1	EV1 ON delay	0 - 30000 second	R/W
0507		EV1 OFF delay		R/W
050E	EV2	EV2 ON delay		R/W
050F		EV2 OFF delay		R/W
0516	EV3	EV3 ON delay		R/W
0517		EV3 OFF delay		R/W
051E	EV4	EV4 ON delay		R/W
051F		EV4 OFF delay		R/W

0526	DO1	DO1 ON delay	0 - 30000 second	R/W
0527		DO1 OFF delay		R/W
052E	DO2	DO2 ON delay		R/W
052F		DO2 OFF delay		R/W
0536	DO3	DO3 ON delay		R/W
0537		DO3 OFF delay		R/W
053E	DO4	DO4 ON delay		R/W
053F		DO4 OFF delay		R/W
0546	DO5	DO5 ON delay		R/W
0547		DO5 OFF delay		R/W
054E	DO6	DO6 ON delay		R/W
054F		DO6 OFF delay		R/W

0970	STEP_EV1	STEP Event1 setting Value (at RAM step No)	R/W
0971	STEP_EV2	STEP Event2 setting Value (at RAM step No)	R/W
0972	STEP_EV3	STEP Event3 setting Value (at RAM step No)	R/W
0973	STEP_EV4	STEP Event4 setting Value (at RAM step No)	R/W

0508	EV2	Event operation mod 0:NON1:HA 2:LA 3:IA 4:OA 5:SO 6:HD 7:LD 8:ID 9:OD 10:RUN 11:CT1_B 12:CT1_L 13:CT2_B 14:CT2_L 15:CT3_B 16:CT3_L 17:STP 18:P_E 19:END 20:HOLD21:PROG 22:U_SL 23:D_SI 24:GUA 25:TS1 26:TS2 27:TS3 28:TS4	R/W
0509		Event setting value -20003:STEP -20002:PTN -20001:SV_N ※-20001～-20003 are at HA,LA,HD,LD,ID,OD	R/W
050A		Event differential gap 1～10000	R/W
050B		Event standby operation 0:OFF 1～2	R/W
050C		Event setting value 2 ※At IA,OA	R/W
050D		Event latching ／Output characteristic details same as EV1 D15-8 D7-0 Latching characteristic Upper 8digit ON/OFF of Event latching Lower 8digit NO/NC of Output characteristic Latching OFF:0 ON:1 Output characteristic NO:0 NC:1	R/W

0510	EV3	Event operation mode details same as EV1	R/W
0511		Event setting value details same as EV1	R/W
0512		Event differential gap details same as EV1	R/W
0513		Event standby operation details same as EV1	R/W
0514		Event setting value 2 details same as EV1	R/W
0515		Event latching ／Output characteristic D15-8 D7-0 Latching characteristic Upper 8digit ON/OFF of Event latching Lower 8digit NO/NC of Output characteristic Latching OFF:0 ON:1 Output characteristic NO:0 NC:1	R/W

0518	EV4	Event operation mode 0:NON 1:HA 2:LA 3:IA 4:OA 5:SO 6:HD 7:LD 8:ID 9:OD 10:RUN 11:CT1_B 12:CT1_L 13:CT2_B 14:CT2_L 15:CT3_B 16:CT3_L 17:STP 18:P_E 19:END 20:HOLD 21:PROG 22:U_SL 23:D_SI 24:GUA 25:TS1 26:TS2 27:TS3 28:TS4	R/W
0519		Event setting value -20003:STEP -20002:PTN -20001:SV_N ※-20001～-20003 は HA,LA,HD,LD,ID,OD 時のみ	R/W
051A		Event differential gap 1～10000	R/W
051B		Event standby operation 0:OFF 1～2	R/W
051C		Event setting value 2 ※At IA,OA	R/W
051D		Event latching ／Output characteristic D15-8 D7-0 Latching characteristic Upper 8digit ON/OFF of Event latching Lower 8digit NO/NC of Output characteristic Latching OFF:0 ON:1 Output characteristic NO:0 NC:1	R/W

0520	DO1	DO operation mode 0:NON 1:HA 2:LA 3:IA 4:OA 5:SO 6:HD 7:LD 8:ID 9:OD 10:RUN 11:CT1_B 12:CT1_L 13:CT2_B 14:CT2_L 15:CT3_B 16:CT3_L 17:STP 18:P_E 19:END 20:HOLD21:PROG 22:U_SL 23:D_SI 24:GUA 25:TS1 26:TS2 27:TS3 28:TS4	R/W
0521		DO setting value	R/W
0522		DO differential gap 1～10000	R/W
0523		DO standby operation 0:OFF 1～2	R/W
0524		DO setting value 2 (IA & OA can be set)	

0525		Event latching ／Output characteristic D15-8　　D7-0 Latching　Output characteristic Upper 8digit ON/OFF of Event latching Lower 8digit NO/NC of Output characteristic Latching OFF:0 ON:1 Output characteristic　NO:0　NC:1	R/W

0528	DO2	DO mode　Details same as DO1	R/W
0529		DO setting value　Details same as DO1	R/W
052A		DO differential gap　Details same as DO1	R/W
052B		DO standby operation　Details same as DO1	R/W
052C		DO setting value 2　Details same as DO1	
052D		DO Latching／Output characteristic　Details same as DO1	R/W

0530	DO3	DO mode　Details same as DO1	R/W
0531		DO setting value　Details same as DO1	R/W
0532		DO differential gap　Details same as DO1	R/W
0533		DO standby operation　Details same as DO1	R/W
0534		DO setting value 2　Details same as DO1	R/W
0535		DO Latching／Output characteristic　Details same as DO1	R/W

0538	DO4	DO mode　Details same as DO1	R/W
0539		DO setting value　Details same as DO1	R/W
053A		DO differential gap　Details same as DO1	R/W
053B		DO standby operation　Details same as DO1	R/W
053C		DO setting value 2　Details same as DO1	R/W
053D		DO Latching／Output characteristic　Details same as DO1	R/W

0540	DO5	DO mode　Details same as DO1	R/W
0541		DO setting value　Details same as DO1	R/W
0542		DO differential gap　Details same as DO1	R/W
0543		DO standby operation　Details same as DO1	R/W
0544		DO setting value 2　Details same as DO1	R/W
0545		DO Latching／Output characteristic　Details same as DO1	R/W

0548	DO6	DO mode　Details same as DO1	R/W
0549		DO setting value　Details same as DO1	R/W
054A		DO differential gap　Details same as DO1	R/W
054B		DO standby operation　Details same as DO1	R/W
054C		DO setting value 2　Details same as DO1	R/W
054D		DO Latching／Output characteristic　Details same as DO1	R/W

0580	ＤＩ１　0:NON　1:SV1　2:SV2　3:SV3　4:SV4　5:SV5　6:SV6　7:SV7 8:SV8　9:SV_3B 10:RUN　11:PROG 12:MAN　13:AT　14:PTN1 15:PTN2 16:PTN3 17:PTN4 18:PTN5 19:PTN6 20:PTN7 21:PTN8 22:PTN3B　23:HOLD 24:SKIP 25:L_RS 26:LOCK　255:3B(compulsion occupation)	R/W
0581	ＤＩ２　same as DI1	R/W
0582	ＤＩ３　same as DI1	R/W
0583	ＤＩ４ same as DI1	R/W
0584	ＤＩ５ same as DI1	R/W
0585	ＤＩ６　0:NON　1:SV1　2:SV2　3:SV3　4:SV4　5:SV5　6:SV6　7:SV7 8:SV8　9:**** 10:RUN　11:PROG 12:MAN　13:AT　14:PTN1 15:PTN2 16:PTN3 17:PTN4 18:PTN5 19:PTN6 20:PTN7 21:PTN8 22:**** 23:HOLD 24:SKIP 25:L_RS 26:LOCK　255:3B(compulsion occupation) ※It basically same as DI1-5, but 9:SV_3B,22:PTN3B can not be allotted.	R/W
0586	ＤＩ７ same as DI6	R/W

0595	ＣＴ１ delay time　1～10000	R/W

0597	ＣＴ１ delay time　0:NON 1:OUT1 2:OUT2 3:EV1 4:EV2 5EV3 6:EV4	R/W

059D	ＣＴ２ delay time　1～10000	R/W

059F	ＣＴ２ delay time 0:NON 1:OUT1 2:OUT2 3:EV1 4:EV2 5EV3 6:EV4	R/W

05A0	Analogue output mode 0:NON 0:NON 1:PV 2:SV 3:DEV 4:OUT1 5:OUT2 6:CT1 7:CT2 8:SERVO	R/W
05A1	analogue output scale lower limit	R/W
05A2	analogue output scale upper limit	R/W

05B0	communication memory mode 0:RAM 1:MIX 2:EEP	R/W

05B4	analogue output limiter lower limit 0～1000	R/W
05B5	analogue output limiter upper limit 0～1000	R/W

0600	OUT1 Output characteristic 0:RA 1:DA	R/W
0601	OUT1 proportional cycle 5～3000 (Multiple of 5)	R/W

0604	OUT2 proportional cycle 5～3000 (Multiple of 5)	R/W

0607	OUT2 Output characteristic 0:RA 1:DA	R/W

060A	OUT1 soft start 5～3000 (Multiple of 5)	R/W
060B	OUT2 soft start 5～3000 (Multiple of 5)	R/W

0611	key lock 0:OFF 1～4	R/W

0642	servo FB filter 0～10000	R/W
064E	Servo AT ON/OFF 0:OFF 1:ON	

064F	servo close - open time 5～300	R/W
0650	servo FB characteristic 0:OP_CL 1:CL_OP	R/W
0651	servo FB existing 0:NON 1:FB	R/W
0652	servo dead band 1～1000	R/W
0653	servo differential gap 1～1000	R/W

065C	Dead band 1～1000	R/W
065D	inching band 0～1000	R/W
065E	inching cycle 5～50	R/W
065F	inching duty 1～1000	R/W

0700	PV gain -5000～5000	R/W
0701	PV offset -5000～5000	R/W
0702	PV filter 0～10000	R/W

0704	input temperature unit 0:℃ 1:F 2:K	R/W
0705	mesuring range refer to measuring code table	R/W
0706	Reference junction compensation 0:Internal 1:External	R/W

0707	Decimal point position 0:****0 1:***0.0 2:**0.00 3:*0.000 4:0.0000	R/W
0708	input scaling lower limit	R/W
0709	input scaling upper limit	R/W

070D	PV limiter Lo	R/W
070E	PV limiter Hi	R/W

0720	PV-SV correction point1	R/W
0721	PV-SV correction value1	R/W
0722	PV-SV correction point2	R/W
0723	PV-SV correction value2	R/W
0724	PV-SV correction point3	R/W
0725	PV-SV correction value3	R/W
0726	PV-SV correction point4	R/W
0727	PV-SV correction value4	R/W
0728	PV-SV correction point5	R/W
0729	PV-SV correction value5	R/W
072A	PV-SV correction point6	R/W

072B	PV-SV correction value6	R/W
072C	PV-SV correction point7	R/W
072D	PV-SV correction value7	R/W
072E	PV-SV correction point8	R/W
072F	PV-SV correction value8	R/W
0730	PV-SV correction point9	R/W
0731	PV-SV correction value9	R/W
0732	PV-SV correction point10	R/W
0733	PV-SV correction value10	R/W
0734	PV-SV correction point11	R/W
0735	PV-SV correction value11	R/W
0736	PV-SV correction mode 0:OFF 1:LINEA 2:PV_PV 3:SV_PV 4:AI_SV	R/W

0800	program mode FIX/PROG 0:FIX 1:PROG	R/W

0802	program pattern No, selection 1～8	R/W

0818	program pattern number 1,2,3,4,6,8	R/W
0819	time unit 0:MMSS 1:HHMM 2:HHHH	R/W
081A	power failure compensation 0:OFF 1:ON	R/W

0820	ＦＩＸ mode ＳＶ１ PID No. 1～8	R/W
0821	ＦＩＸ mode ＳＶ２ PID No. 1～8	R/W
0822	ＦＩＸ mode ＳＶ３ PID No. 1～8	R/W
0823	ＦＩＸ mode ＳＶ４ PID No. 1～8	R/W
0824	ＦＩＸ mode ＳＶ５ PID No. 1～8	R/W
0825	ＦＩＸ mode ＳＶ６ PID No. 1～8	R/W
0826	ＦＩＸ mode ＳＶ７ PID No. 1～8	R/W
0827	ＦＩＸ mode ＳＶ８ PID No. 1～8	R/W

0830	SV1-EV1	R/W
0831	SV1-EV2	R/W
0832	SV1-EV3	R/W
0833	SV1-EV4	R/W

0834	SV2-EV1	R/W
0835	SV2-EV2	R/W
0836	SV2-EV3	R/W
0837	SV2-EV4	R/W

0838	SV3-EV1	R/W
0839	SV3-EV2	R/W
083A	SV3-EV3	R/W
083B	SV3-EV4	R/W

083C	SV4-EV1	R/W
083D	SV4-EV2	R/W
083E	SV4-EV3	R/W
083F	SV4-EV4	R/W

0840	SV5-EV1	R/W
0841	SV5-EV2	R/W
0842	SV5-EV3	R/W
0843	SV5-EV4	R/W

0844	SV6-EV1	R/W
0845	SV6-EV2	R/W
0846	SV6-EV3	R/W
0847	SV6-EV4	R/W

0848	SV7-EV1	R/W
0849	SV7-EV2	R/W
084A	SV7-EV3	R/W
084B	SV7-EV4	R/W

084C	SV8-EV1	R/W
084D	SV8-EV2	R/W
084E	SV8-EV3	R/W
084F	SV8-EV4	R/W

0900	Pattern No. (RAM) 1～8	R/W
0901	Step No. (RAM) 1～96	R/W

0903	end step setup 1～96 (MAX value same as STEP No,)	R/W

0906	Start SV	R/W
0907	Gurantee soak zone 0:OFF 1:ON	R/W

0909	start mode setup 0:SV 1:PV	R/W

090C	Number of excution pattern setup 1～30000 30001 : Infinity	R/W

0910	PTN-EV1	R/W
0911	PTN-EV2	R/W
0912	PTN-EV3	R/W
0913	PTN-EV4	R/W

0950	step SV value	R/W
0951	step time 000:00～300:00 infinity:30001 (Unit MMSS,HHMM) 0000.0～3000.0 infinity:30001 (Unit HHHH) ＊MMSS,HHMM Display upper 3digt and lower 2digt at 5digit on decimal system *HHHH Display upper 3digt and lower 1digt at 4digit on decimal system	R/W
0952	Step out1 PIDNo. 1～8	R/W

0960	Time signal 1	ON time -1:OFF ＊Besides same as Step time	R/W
0961		OFF time -1:OFF ＊Besides same as Step time	R/W
0962	Time signal 2	ON time -1:OFF ＊Besides same as Step time	R/W
0963		OFF time -1:OFF ＊Besides same as Step time	R/W
0964	Time signal 3	ON time -1:OFF ＊Besides same as Step time	R/W
0965		OFF time -1:OFF ＊Besides same as Step time	R/W
0966	Time signal 4	ON time -1:OFF ＊Besides same as Step time	R/W
0967		OFF time -1:OFF ＊Besides same as Step time	R/W

0A00	OUT1-PID1	A parameter 0～100	R/W
0A01		B parameter 0～100	R/W
0A02		C parameter 0～100	R/W

0A08	OUT1-PID2	Aparameter 0～100	R/W
0A09		Bparameter 0～100	R/W
0A0A		Cparameter 0～100	R/W

0A10	OUT1-PID3	Aparameter 0～100	R/W
0A11		Bparameter 0～100	R/W
0A12		Cparameter 0～100	R/W

0A18	OUT1-PID4	Aparameter 0～100	R/W
0A19		Bparameter 0～100	R/W
0A1A		Cparameter 0～100	R/W

0A20	OUT1-PID5	Aparameter 0～100	R/W
0A21		Bparameter 0～100	R/W
0A22		Cparameter 0～100	R/W

0A28	OUT1-PID6	Aparameter 0～100	R/W
0A29		Bparameter 0～100	R/W
0A2A		Cparameter 0～100	R/W

0A30	OUT1-PID7	Aparameter 0～100	R/W
0A31		Bparameter 0～100	R/W
0A32		Cparameter 0～100	R/W

0A38	OUT1-PID8	Aparameter 0～100	R/W
0A39		Bparameter 0～100	R/W
0A3A		Cparameter 0～100	R/W

0A60	OUT2-PID1	Aparameter 0～1.00	R/W
0A61		Bparameter 0～100	R/W
0A62		Cparameter 0～100	R/W

0A68	OUT2-PID2	Aparameter 0～100	R/W
0A69		Bparameter 0～100	R/W
0A6A		Cparameter 0～100	R/W

0A70	OUT2-PID3	Aparameter 0～100	R/W
0A71		Bparameter 0～100	R/W
0A72		Cparameter 0～100	R/W

0A78	OUT2-PID4	Aparameter 0～100	R/W
0A79		Bparameter 0～100	R/W
0A7A		Cparameter 0～100	R/W

0A80	OUT2-PID5	Aparameter 0～100	R/W
0A81		Bparameter 0～100	R/W
0A82		Cparameter 0～100	R/W

0A88	OUT2-PID6	Aparameter 0～100	R/W
0A89		Bparameter 0～100	R/W
0A8A		Cparameter 0～100	R/W

0A90	OUT2-PID7	Aparameter 0～100	R/W
0A91		Bparameter 0～100	R/W
0A92		Cparameter 0～100	R/W

0A98	OUT2-PID8	Aparameter 0～100	R/W
0A99		Bparameter 0～100	R/W
0A9A		Cparameter 0～100	R/W

0B00	selection of PID method 1～2	R/W
0B01	Input sampling period 0:50msec 1:167msec 2:250msec 3:500msec	R/W
0B02	Bar graph LED allotment selection 0:NON 1:DEV 2:OUT1 3:OUT2 4:S_TIM 5:P_STP 6:P_CNT 7:SERVO	R/W
0B03	LED Brightness selection 1～4	R/W
0B04	LED Contrast selection 1～3	R/W

★The additional address by which below can access only the time of infrared rays communication

8000	Board rate	0:1200 2:2400 3:4800 4:9600 5:19200 6:38400	R/W
8001	Data lenght	7～8	R/W
8002	Data parity	0:NON 1:ODD 2:EVE	R/W
8003	Stop bit	1～2	R/W
8004	Start character	0:STX 1:ATT	R/W
8005	BCC Mode	0:NON 1:ADD 2:ADD2 3:XOR 4:LRC 5:CR16	R/W
8006	Address	-1:MAST2 0:MAST1 1～255	R/W
8007	Delay time	1～500	R/W
8008	Memory mode	0:RAM 1:MIX 2:EEP	R/W

8010	HOST Mode	0:SV 1:OUT1 2:O1SC 3:OUT2 4:O2SC	R/W
8011	HOST Address area L	0:BCAS 1～255	R/W
8012	HOST Address area H	1～255	R/W
8013	HOST Write-in Data Address	0x0000～0xFFFF(16bitDat ALL Acceptable)	R/W

Protcol	SHIMAX standard	Modbus ASCII	Modbus RTU
Start bit	1bit		
Data bit	7 ／ 8 bit		8 bit fixed
Parity bit	Non ／ Even ／ Odd		
Stop bit	1 ／ 2		
Error check	Non / Add two's cmp/XOR	LRC	CRC-16
Data communication interval	Less than 1sec		Less than 28bit time
Function code	R(Read) W(Write) B(broad cast)	03(Read) 06(Write) 08(loop back)	
Address	1～255	0(broad cast) 1～255	
Communication speed	1200 ／ 2400 ／ 4800 ／ 9600 ／ 19200 ／ 38400 bps		
R/W memory address	HEX 4 digit		
Start charactor ／End charactor	STX_ETX_CR @ _ : _CR	:_CR_LF	Non
The number of simultaneous reading data	1～10		
The number of simultaneous writing in data	1 fixed		
Delay time	1～500ms		

Measuring code table

Thermo couple										
Character	Code	℃		Centigrade	℉		Fahrenheit	K		Kelvin
r 1	01	−50. 0	～	1760. 0	−50. 0	～	3200. 0	220. 0	～	2030. 0
K 1	02	−270. 0	～	1370. 0	−450. 0	～	2500. 0	0. 0	～	1640. 0
K2	03	0. 0	～	800. 0	0. 0	～	1500. 0	270. 0	～	1070. 0
K3	04	−200. 0	～	400. 0	−300. 0	～	700. 0	70. 0	～	670. 0
K4	05	0. 0	～	300. 0	0. 0	～	600. 0	270. 0	～	570. 0
J 1	06	−200. 0	～	1200. 0	−320. 0	～	2200. 0	70. 0	～	1470. 0
J2	07	0. 0	～	600. 0	0. 0	～	1100. 0	270. 0	～	870. 0
t 1	08	−270. 0	～	400. 0	−450. 0	～	700. 0	0. 0	～	670. 0
E 1	09	−270. 0	～	1000. 0	−450. 0	～	1800. 0	0. 0	～	1270. 0
S 1	10	−50. 0	～	1760. 0	−50. 0	～	3200. 0	220. 0	～	2030. 0
U 1	11	−200. 0	～	400. 0	−300. 0	～	700. 0	70. 0	～	670. 0
n 1	12	−270. 0	～	1300. 0	−450. 0	～	2300. 0	0. 0	～	1570. 0
b 1	13	0. 0	～	1820. 0	0	～	3300	270. 0	～	2090. 0
S-26	14	0. 0	～	2320. 0	0	～	4200	270. 0	～	2590. 0
PL2	15	0. 0	～	1390. 0	0. 0	～	2500. 0	270. 0	～	1660. 0
RTD										
P 1	16	−200. 0	～	850. 0	−300. 0	～	1500. 0	70. 0	～	1120. 0
P2	17	−200. 00	～	300. 00	−300. 0	～	600. 0	70. 00	～	570. 0
P3	18	−100. 00	～	300. 00	−150. 0	～	600. 0	170. 0	～	570. 0
P4	19	−100. 00	～	200. 00	−150. 0	～	400. 0	170. 0	～	470. 0
P5	20	−100. 00	～	100. 00	−150. 00	～	200. 00	170. 0	～	370. 0
P6	21	0. 00	～	200. 00	0. 0	～	400. 0	270. 0	～	470. 0
P7	22	0. 00	～	100. 00	0. 00	～	200. 00	270. 0	～	370. 0
P8	23	−50. 00	～	50. 00	−60. 00	～	120. 00	220. 00	～	320. 00
P9	24	−20. 000	～	30. 000	0. 00	～	100. 00	250. 00	～	300. 00
JP 1	25	−200. 0	～	500. 0	−300. 0	～	900. 0	70. 0	～	770. 0
JP2	26	−20. 000	～	300. 00	−300. 0	～	600. 0	70. 00	～	570. 0
JP3	27	−100. 00	～	300. 00	−150. 0	～	600. 0	170. 0	～	570. 0
JP4	28	−100. 00	～	200. 00	−150. 0	～	400. 0	170. 0	～	470. 0
JP5	29	−100. 00	～	100. 00	−150. 00	～	200. 00	170. 00	～	370. 0
JP6	30	0. 00	～	200. 00	0. 0	～	400. 0	270. 0	～	470. 0
JP7	31	0. 00	～	100. 00	0. 00	～	200. 00	270. 0	～	370. 0
JP8	32	−50. 00	～	50. 00	−60. 00	～	120. 00	220. 0	～	320. 00
JP9	33	−20. 000	～	30. 000	0. 00	～	100. 00	250. 00	～	300. 00
Liner input										
n 1	34	−100	～	100	mV		Scaling−20000～32000 Span 10～50000 or less Decimal point Non 0. 1～0. 0001			
n2	35	0	～	100						
n3	36	0	～	50						
n4	37	10	～	50						
n5	38	0	～	20						
n6	39	−10	～	10						
n7	40	0	～	10						
U 1	41	−10	～	10	V					
U2	42	0	～	10						
U3	43	0	～	5						
U4	44	1	～	5						
U5	45	0	～	2						
U6	46	−1	～	1						
U7	47	0	～	1						
nA 1	48	0	～	20	mA					
nA2	49	4	～	20						

9-2. Event Code Table

function		No,	Note
No allotment	non	0	
Upper limit absolute value alarm	HA	1	
Lower limit absolute value alarm	LA	2	
Within Absolute Value alarm	ĪA	3	
Without Absolute Value alarm	oA	4	
Scale over alarm	So	5	
Upper limit deviation value alarm	Hd	6	
Lower limit deviation value alarm	Ld	7	
Within deviation alarm	Īd	8	
Without deviation alarm	od	9	
RUN signal	run	10	
CT1 Control loop alarm(heater braking)	ct1_b	11	CT
CT1 Control loop alarm (loop)	ct1_L	12	CT
CT2 Control loop alarm (Heater braking)	ct2_b	13	CT
CT2 Control loop alarm (loop)	ct2_L	14	CT
3 phases Control loop alarm(Heater braking)	ct3_b	15	CT
3 phases Control loop alarm (loop)	ct3_L	16	CT
Step signal	StP	17	Program
Pattern end signal	P_E	18	Program
Program end	End	19	Program
Step hold signal	HoLd	20	Program
Program signal	ProG	21	Program
Up slope signal	u_SL	22	Program
Down slope signal	d_SL	23	Program
Guarantee signal	GuA	24	Program
Time signal 1	tS1	25	Program
Time signal 2	tS2	26	Program
Time signal 3	tS3	27	Program
Time signal 4	tS4	28	Program

10. ASCII Code Table

	b７～b５	０００	００１	０１０	０１１	１００	１０１	１１０	１１１
b４～b１		0	1	2	3	4	5	6	7
０００００	0	NUL	TC7(DLE)	ＳＰ	0	@	P	`	p
０００１	1	TC1(SOH)	DC1	!	1	A	Q	a	q
０００１０	2	TC2(STX)	DC2	”	2	B	R	b	r
０００１１	3	TC3(ETX)	DC3	#	3	C	S	c	s
０１００	4	TC4(EOT)	DC4	$	4	D	T	d	t
０１０１	5	TC5(ENQ)	TC8(NAK)	%	5	E	U	e	u
０１１０	6	TC6(ACK)	TC9(SYN)	&	6	F	V	f	v
０１１１	7	BEL	TC10(ETB)	’	7	G	W	g	w
１０００	8	FE0(BS)	CAN	(	8	H	X	h	x
１００１	9	FE1(HT)	EM	)	9	I	Y	i	y
１０１０	A	FE2(LF)	SUB	*	:	J	Z	j	z
１０１１	B	FE3(VT)	ESC	＋	;	K	[	k	{
１１００	C	FE4(FF)	IS4(FS)	,	<	L	＼	l	|
１１０１	D	FE5(CR)	IS3(GS)	－	=	M	]	m	}
１１１０	E	SO	IS2(RS)	.	>	N	^	n	～
１１１１	F	SI	IS1(US)	／	?	O	_	o	DEL

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