

CR06
CR01/CR02
HYBRID RECORDER
COMMUNICATION COMMAND
INSTRUCTION MANUAL



HXPCR06mnC0005E

June 2017




HXPCR06mnC0005E


For safety using

Thank you for purchasing our CR06/CR01/CR02 Hybrid Recorder.

In order to this instrument to exhibit all of its functions effectively and correctly, read and understand this instruction manual thoroughly before using the instrument.

The symbols below are used on this instrument for the cautioning information.

| Symbols used on the instrument | |
|---|--|
|  | This shows "Caution for handling". This symbol is used on the parts need to reference the instruction manual for saving human body and the instrument. |
|  | This shows "Protective grounding". Be sure to provide protective grounding prior to operate this instrument. |
|  | This shows "Risk of electric shock". This symbol is used on the parts, which has a risk of electric shock. |

| Be sure to observe the following warnings/cautions and those provided in the text in order to secure safety in handling the instrument. | |
|---|---|
|  WARNING | |
| General | In order to prevent electric shock; be sure to disconnect this instrument from the main power source when wiring it. |
| Protective Grounding | <ol style="list-style-type: none">(1) In order to prevent an electric shock; be sure to provide protective grounding prior to turning on this instrument.(2) Do not cut a protective grounding conductor or disconnect protective grounding. |
| Power Source | <ol style="list-style-type: none">(1) Make sure that the supply voltage for this instrument conforms to the voltage of the supply source.(2) Attach a protective cover prior to turning on this instrument. |
| Working Environment | Do not operate this instrument in the environment where it is exposed to a combustible/explosive/corrosive gas or water/steam. |
| Input and Output Wiring | Provide input and output wiring after turning off the power. |



CAUTION

Input and Output Wiring

Do not use empty terminals for other purposes such as relaying, etc.

Transportation

When transporting this instrument or the equipment with this instrument incorporated in it, take measures to prevent opening the door and falling out the inner module.

Inside of Instrument

Do not touch the switches, etc. inside this instrument. Also, do not replace the main unit or PRINTed circuit boards. When this is neglected, we cannot guarantee functioning of the instrument. Contact our dealer where you purchased the instrument, or our sales representative.

[Note]

Instruction Manual

- (1) Deliver this instruction manual to an end user.
- (2) Prior to handling this instrument, be sure to read this manual.
- (3) If you have any questions on this manual or find any errors or omissions in this manual, contact our sales representative.
- (4) After reading this manual, keep it carefully by the instrument.
- (5) When the manual is lost or stained, contact our sales representative.
- (6) It is prohibited to copy or reproduce this manual without our permission.

Installation

- (1) When installing this instrument, put on a protective gear such as safety shoes, helmet, etc. for your safety.
- (2) Do not put your foot on the installed instrument or get on it, because it is dangerous.

Maintenance

Only our serviceman or persons authorized by our company are allowed to remove and take the inner module, the main unit and PRINTed circuit boards apart.

Disposal

- (1) Dispose the replaced batteries in a correct way.
- (2) Do not incinerate plastics of maintenance parts and replacement parts. A harmful gas may be produced.

Cleaning

- (1) Use dry cloth to clean the surface of this instrument.
- (2) Do not use any organic solvent.
- (3) Cleaning the instrument after turning off the power.

Revisions

This instruction manual is subject to change without prior notice.

Using procedure for this manual



1.Using procedure

This instruction manual consists of “For safety using”, “Contents” and “Chapter 1 to Chapter 6” as bellow.
Read the applying sections for your purpose to use this instrument.

| Chapter and TITLE | For purchase and install | For initial setting and change setting | For daily operation | For using communication | For maintenance and trouble-shooting |
|------------------------------------|--------------------------|--|---------------------|-------------------------|--------------------------------------|
| For safety using (page 1) | ◎ | ◎ | ◎ | ◎ | ◎ |
| 1. INTRODUCTION | ◎ | | | ◎ | |
| Original protocol | | | | | |
| 2. THE RECEPTION OF DATA | | ○ | | ◎ | ○ |
| 3. DATA TRANSMISSION | | ○ | | ◎ | ○ |
| 4. NOTE OF DATA COMMUNICATION | | ○ | | ◎ | ○ |
| ModbusRTU protocol | | | | | |
| 5. OVERVIEW | | ○ | | ◎ | ○ |
| 6. DATA TRANSMISSION AND RECEPTION | | ○ | | ◎ | ○ |

- ◎ : Be absolutely certain to read this.
○ : Be certain to read this if you need.

The symbols below are used on the warning and cautioning information in this manual.

| Symbols used on this manual | |
|--|--|
|  WARNING | Failure to observe this information could result in death or injury. Be absolutely certain to read this. |
|  CAUTION | Failure to observe this information could damage the instrument. Be certain to read it. |
| [Note] | This is cautionary information for correct use of the instrument. Be certain to read it. |
| [Reference] | This is information to help you use the functions of this instrument more effectively. |

2. Guide of Instruction manual

The instruction manuals of this instrument are as the table below.

| | Name | Part No. | Outline |
|---|---|------------------|---|
| 1 | CR06 Hybrid Recorder instruction manual | MANUAL CR06 | Explanation for installing, wiring, standard operation. And setting or operation for using this instrument. |
| 2 | CR01/C02 Hybrid Recorder instruction manual | MANUAL CR01/CR02 | Explanation for installing, wiring, standard operation. And setting or operation for using this instrument. |
| 3 | CR06 CR01/CR02 Hybrid Recorder Communication Command instruction manual | HXPCR06mnC0005E | Explanation for reading and writing data of the recorder by communication function. |

This manual →

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1. INTRODUCTION

1.1 General Description

This instruction manual describes the communication command of the CR06/CR01/CR02 Recorder. Please refer to the instruction manual (MANUAL CR06, MANUAL CR01/02) for the transmission of the measurement data, a setup of communication and wiring.

| contents | Wiring and communication procedure | Request measurement value | Setting of the recorder | Control of the recorder |
|---|------------------------------------|---------------------------|-------------------------|-------------------------|
| CR06/CR01/CR02 Hybrid Recorder instruction manual (MANUAL CR06, MANUAL CR01/CR02) | ○ | ○ | | |
| CR06/CR01/CR02 Hybrid Recorder Communication Command instruction manual (HXPCR06mnC0005E) | | | ○ | ○ |

1.2 Difference in RS-485, RS-232C

There is no difference between RS-232C and RS-485 about the communication command in this Recorder. But, wiring and signal level are different.

1.3 Original Protocol - Basic item about the command

The communication command consists of a command distinction code, a parameter, delimiter(comma), and terminator. The format of the command is as follows.

(Example) SR02 VOLT,200mV,0, 20000 (terminator)

Command distinction code:

This code is defined by two characters the capital letter. (Exp. SR)

If the command needs a channel number, a channel number is described behind the distinction code.

Parameter: Each parameter is divided with comma.

All the setting value is shown with the integer. (The plus sign can be omitted.)

The space character in the input parameter is ignored. The other side, the space character in the unit code, the comment printout code and the tag printout code isn't ignored. The parameter can be omitted unless the parameter is varied. But, a comma(,) can't be omitted. Comma which is in front of the terminator can be omitted.

(Example) SR02, VOLT, , , (CR) (LF)

← Omission is possible

The date parameter, the time parameter and the channel number parameter have fixed length. When that parameter length is different, these data induce errors.

(1) Date YY/MM/DD (8 characters)

(2) Time HH:MM:SS (8 characters)

(3) Channel Number: CHXX (2characters)

1.4 Basic item about the Modbus RTU protocol

Modbus protocol is a Modicon Inc. (AEG Schneider Automation International SAS) is a communication protocol that was developed for the PLC, are listed in the protocol specification (PI-MBUS-300 Rev.J).

Please refer to the same specification for the specification of the Modbus protocol.

In this manual, we describe the function code and data content of mainly Modbus protocol that can be used in the present equipment.

2. ORIGINAL PROTOCOL - THE RECEPTION OF THE DATA

2.1 Setup command

2.1.1 Setup command list

Table 2.1 Setup command list

| Command | Setting item | The number of the parameters | Contents of a parameter |
|---------|---|------------------------------|---|
| SR | Setting the range | MAX 7 | Channel, Mode, Range (Reference Channel) Span lower limit value. Span higher limit value. Scaling lower limit value. Scaling higher limit value |
| SA | Setting the Alarm | 7 | Channel, Alarm level Alarm on/off Alarm type, Alarm set point Relay on/off, Relay No. |
| SN | Setting the Unit | 2 | Channel, Unit |
| SC | Setting the Chart Speed | 1 | 1st Chart speed |
| SD | Setting the Date/Time | 2 | Date, time |
| SF | Setting the Digital Print | 2 | Channel Digital print on/off |
| ST | Setting the Tag | 2 | Channel, Tag characters |
| SG | Setting the Comment | 2 | Comment number, Comment characters |
| SZ | Setting the Zone recording | 3 | Channel, Left position, Right position |
| SP | Setting the Partial Compression/Expansion recording | 4 | Channel, Partial on/off Compression Expansion |
| SE | Setting the Chart Speed | 1 | 2nd chart speed |
| SY | Copying the Setting data | 2 | Copy-from channel Copy-to channel |
| SS | Setting the recording cycle | 1 | Recording Cycle (Multipoint type only) |

2.1.2 Setting of INPUT RANGE/RECORD SPAN

The input range and record span of each channel is set up as follows.

<Format>

SR(CH),(Mode),(Pr1),(Pr2),(Pr3),(Pr4),(Pr5),(Pr6),(Pr7)(CR)(LF)

CH: Specify the channel number to set.

Mode: The input mode is set up.

Pr_N: The number of Pr_N varies depend on the contents of Mode.

(1) Setting of the record skip.

The record of the channel, which specified with CH is stopped.

(The pen of pen type recorder is fixed on the zero point.)

CH: Setting Channel 01~06(The pen type is 01~02.).

Mode: SKIP

Example) SR05,SKIP(CR)(LF)

The 5th channel doesn't record.

(2) Setting of the Voltage, the Current, the Thermocouple or the RTD input range.

CH: Setting Channel 01~06(The pen type is 01~02.).

Mode: VOLT,TC or RTD

Pr1: Range

Pr2: Left end(Zero Input Value)

Pr3: Right end(Span Input Value)

} Refer to table 2.2.

Example) SR02,TC,K,0,3000(CR)(LF)

The input of 2nd channel is recorded in Thermocouple type K 0.0-300.0 °C

(3) The setting of Difference/Sum/Mean operation.

CH: Setting Channel 01~06(The pen type is 01~02.).

Mode: DELT,SIGM or MEAN

Pr1: Reference Channel

·Choose a smaller channel than CH.

·The reference channel must be VOLT, TC, RTD or SCL mode.

Pr2: Left end(Zero Input Value)

Pr3: Right end(Span Input Value)

} Refer to table 2.2.

Example) SR05,02,DELT,0,3000(CR)(LF)

The output of the 5th channel shows a difference between the input of the 5th channel and the 2nd channel (CH5-CH2). In this case, the input range of 5th channel becomes the same as 2nd channel.

(4) The setting of Scaling.

CH: Setting Channel 01~06(The pen type is 01~02.).

Mode: SCL

Pr1: VOLT, TC, RTD

Pr2: Scaling Mode

Pr3: Left End(Zero Input Value)

Pr4: Right End(Span Input Value)

} Refer to table 2.2.

Pr5: Scaling Left End

Pr6: Scaling Right End

Pr7: Decimal point position (0~4)

Example) SR04,SCL,RTD,PT,0, 3000,0,30000,2(CR)(LF)

[CAUTION]

Pr5 - 7 can be omitted. If you omit the parameters, three parameters must be omitted simultaneously.

(5) The setting of Square Root

CH: Setting Channel 01~06(The pen type is 01~02.).

Mode: SQRT

Pr1: Range(Only VOLT Input)

Pr2: Left End(Zero Input Value)

Pr3: Right End(Span Input Value)

} Refer to table 2.2.

Pr4: Scaling Left End

Pr5: Scaling Right End

Pr6: Decimal point position (0~4)

Example) SR03,SQRT,mA,400,2000,0,10000,2(CR)(LF)

[CAUTION]

Pr5 - 7 can be omitted. If you omit the parameters, three parameters must be omitted simultaneously.

(6) The setting of Decade

CH: Setting Channel 01~06(A pen type is 01~02.).

Mode: DECAD

Pr1: Range(Only VOLT Input)

Pr2: Left End(Zero Input Value)

Pr3: Right End(Span Input Value)

} Refer to table 2.2.

Pr4: Scaling Left End

Pr5: Scaling Right End

Example) SR01,DECAD,10mV,0,1000,10E+01,10E+06(CR)(LF)

Table 2.2 Setting range

| Input Range | Range or Scaling Mode | Zero Input Value (Left End) | Span Input Value (Right End) | Decimal Point (Fixation) | Note |
|-------------|-----------------------|-----------------------------|------------------------------|--------------------------|-------------|
| VOLT | 10mV | -1000 | 1000 | 2 | ±10mV |
| | 20mV | 0 | 2000 | 2 | 0~20mV |
| | 50mV | 0 | 5000 | 2 | 0~50mV |
| | 200mV | -2000 | 2000 | 1 | ±200mV |
| | 1V | -1000 | 1000 | 3 | ±1V |
| | 5V | 0 | 5000 | 3 | 0~5V |
| | 10V | -10000 | 10000 | 2 | ±10V |
| | mA | 400 | 2000 | 2 | 4~20mA |
| TC | B | 0 | 18200 | 1 | 0~1820°C |
| | | 320 | 33080 | 1 | 32~3308°F |
| | R | 0 | 17600 | 1 | 0~1760°C |
| | | 320 | 32000 | 1 | 32~3200°F |
| | S | 0 | 17600 | 1 | 0~1760°C |
| | | 320 | 32000 | 1 | 32~3200°F |
| | K | -2000 | 13700 | 1 | -200~1370°C |
| | | -3280 | 24980 | 1 | -328~2498°F |
| | E | -2000 | 8000 | 1 | -200~800°C |
| | | -3280 | 14720 | 1 | -328~1472°F |
| | J | -2000 | 11000 | 1 | -200~1100°C |
| | | -3280 | 20120 | 1 | -328~2012°F |
| | T | -2000 | 4000 | 1 | -200~400°C |
| | | -3280 | 7520 | 1 | -328~752°F |
| | C | 0 | 23200 | 1 | 0~2320°C |
| | | 320 | 42080 | 1 | 32~4208°F |
| | Au-Fe | 10 | 3000 | 1 | 1~300K |
| | N | 0 | 13000 | 1 | 0~1300°C |
| | | 320 | 23720 | 1 | 32~2372°F |
| | PR40-20 | 0 | 18800 | 1 | 0~1880°C |
| | | 320 | 34160 | 1 | 32~3416°F |
| | PLII | 0 | 13900 | 1 | 0~1390°C |
| | | 320 | 25340 | 1 | 32~2534°F |
| | U | -2000 | 4000 | 1 | -200~400°C |
| -3280 | | 7520 | 1 | -328~752°F | |
| L | -2000 | 9000 | 1 | -200~900°C | |
| | -3280 | 16520 | 1 | -328~1652°F | |
| RTD | Pt100 | -2000 | 6500 | 1 | -200~650°C |
| | | -3280 | 12020 | 1 | -328~1202°F |
| | JPt100 | -2000 | 6300 | 1 | -200~630°C |
| | | -3280 | 11660 | 1 | -328~1166°F |

Example) When decimal point position is "1", the input value "1000" is recognized as "100.0".

2.1.3 Setting of Alarm

The Alarm of each channel is set up as follows.

<Format>

SA(CH),(LEVEL),(ON/OFF),(TYPE),(VALUE),(RLY ON/OFF),(RLY No.)(CR)(LF)

| Item | Contents | Setting Range | Note |
|------------|----------------|--------------------------------|--------------------|
| CH | Channel number | 01~06(multi) 01~02(pen) | |
| LEVEL | Alarm Level | 1~4 | |
| ON/OFF | Alarm ON/OFF | ON or OFF | It can be omitted. |
| TYPE | Alarm Type | H:Upper-limit L:Lower-limit | It can be omitted. |
| VALUE | Set Value | | It can be omitted. |
| RLY ON/OFF | Relay ON/OFF | ON or OFF | It can be omitted. |
| RLY No. | Relay No. | I01~I06(multi) I01~I03(pen) | It can be omitted. |

Part of underline can be omitted.

2.1.4 Setting of the Unit

The Unit of each channel is set up as follows.

<Format>

SN(CH),(UNIT)(CR)(LF)

CH: Setting Channel 01~06(The Pen type is 01~02.).

UNIT: The Unit is set up with the code as shown in table 2.3.(Within 6 characters.)

When you use the code beyond 7F_{HEX}, the data length must be used as 8 bit.

Please refer to the chapter 7.2.7 of the instruction manual (MANUAL CR06, MANUAL CR01/CR02) for the data length setting.

2.1.5 Setting of the 1st chart speed

The 1st chart speed is set up as follows.

<Format>

SC(CHART SPEED)(CR)(LF)

The chart speed is chosen from the following table.

CHART SPEED (Multipoint type)

| | | | | | | | | | |
|-----|-----|------|------|-----|-----|-----|-----|-----|-----|
| 0 | 1 | 2 | 3 | 4 | 5 | 10 | 15 | 20 | 25 |
| 30 | 40 | 50 | 60 | 75 | 80 | 90 | 100 | 120 | 150 |
| 160 | 180 | 200 | 240 | 300 | 360 | 375 | 450 | 600 | 720 |
| 750 | 900 | 1200 | 1500 | | | | | | |

CHART SPEED (Pen type)

| | | | | | | | | | |
|-------|------|------|------|------|------|------|------|------|-------|
| 5 | 10 | 15 | 20 | 25 | 30 | 40 | 50 | 60 | 75 |
| 80 | 90 | 100 | 120 | 150 | 160 | 180 | 200 | 240 | 300 |
| 360 | 375 | 450 | 600 | 720 | 750 | 900 | 1200 | 1500 | 1800 |
| 2400 | 3000 | 3600 | 4500 | 4800 | 5400 | 6000 | 7200 | 9000 | 10800 |
| 12000 | | | | | | | | | |

2.1.6 Setting of the date/time

The date/time of the internal watch of the recorder is set up as follows.

<Format>

SD (DATE), (TIME) (CR) (LF)

DATE: YY/MM/DD

(YY) Year 00~99

(MM) Month 01~12

(DD) Day 01~31

TIME: HH:MM:SS

(HH) Hour 00~23

(MM) Minute 00~59

(SS) Second 00~59

2.1.7 Copying the Setting Data of the channel

The setup data of the channel can be copied on other channels.

<Format>

SY (CHS), (CHD) (CR) (LF)

CHS: Copy-from Channel 01~05 (The Pen type is 01 only.)

CHD: Copy-to Channel (CHS < CHD)

The copy-to channel must set larger value than copy-from channel.

2.1.8 Setting of the Printing cycle (Multipoint type only)

The Printing cycle of the recorder is set up as follows.

<Format>

SS (PRINTING CYCLE) (CR) (LF)

PRINTING CYCLE: 10,20,30 and 60 (sec)

2.1.9 Setting of the Zone Recording

The Zone Recording of each channel is set up as follows.

<Format>

SZ (CH), (LEFTPOSITION), (RIGHTPOSITION) (CR) (LF)

CH: Setting Channel 01~06 (The Pen type is 01~02.)

LEFTPOSITION: 0~95%

RIGHTPOSITION: 5~100%

Part of underline can be omitted. The original setup is inherited when it omits.

2.1.10 Setting of the Partial Compression/Expansion

The Partial Compression/Expansion recording of each channel is set up as follows.

<Format>

SP(CH),(ON/OFF),(BOUNDARY POSITION),(BOUNDARY VALUE)(CR)(LF)

CH: Setting Channel 01~06(The Pen type is 01~02.).

ON/OFF: Partial Compression/Expansion function ON or OFF

BOUNDARY POSITION: 1~99%

BOUNDARY VALUE:

CH is VOLT,TC,RTD,DELTA,SIGM or MEAN mode: In the span data

CH is SCALE,SQRT,DECAD mode: In the scale data

Part of underline can be omitted. The original setup is inherited when it omits.

2.1.11 Setting of the Digital Print ON/OFF

The Digital Print ON/OFF of each channel is set up as follows.

<Format>

SF(CH),(ON/OFF)(CR)(LF)

CH: Setting Channel 01~06(The Pen type is 01~02.).

ON/OFF: ON or OFF

2.1.12 Setting of the Tag Character

The Tag Character of each channel is set up.

<Format>

ST(CH),(TAG)(CR)(LF)

CH: Setting Channel 01~06(The Pen type is 01~02.).

TAG: The Tag Character is set up with the character code shown by the table 2.3.

(Multipoint type is within 7 characters. Pen type is within 5 characters.)

When you use the character code beyond 7F_{HEX}, the data length of communication function must be used as 8 bit. Please refer to the chapter 7.2.7 of the instruction manual (MANUAL CR06, MANUAL CR01/CR02) for the data length setting.

2.1.13 Setting of the Comment Character

The Comment Character to print by the Digital Input is set up.

<Format>

SG(Cn),(COMMENT)(CR)(LF)

Cn: Comment Number(1~3)

COMMENT: A Comment Character is set up with the character code shown by the table 2.3.

(Multipoint type is within 16 characters. Pen type is within 12 characters.)

When you use the character code beyond 7F_{HEX}, the data length of communication function must be used as 8 bit. Please refer to the chapter 7.2.7 of the instruction manual (MANUAL CR06, MANUAL CR01/CR02) for the data length setting.

Character Code Table

Table 2.3 Character Code Table

| | 2* | 3* | 4* | 5* | 6* | 7* | A* | B* | C* | D* | E* | F* |
|----|----|----|----|----|----|----|----|----|----|----|----|----|
| *0 | SP | 0 | @ | P | | p | 0 | 0 | | Π | | π |
| *1 | ! | 1 | A | Q | a | q | 1 | 1 | A | P | α | ρ |
| *2 | " | 2 | B | R | b | r | 2 | 2 | B | Σ | β | σ |
| *3 | # | 3 | C | S | c | s | 3 | 3 | Γ | T | γ | τ |
| *4 | \$ | 4 | D | T | d | t | 4 | 4 | Δ | Υ | δ | υ |
| *5 | % | 5 | E | U | e | u | 5 | 5 | E | Φ | ε | φ |
| *6 | & | 6 | F | V | f | v | 6 | 6 | Z | X | ξ | χ |
| *7 | ' | 7 | G | W | g | w | 7 | 7 | H | Ψ | η | ψ |
| *8 | (| 8 | H | X | h | x | 8 | 8 | Θ | Ω | θ | ω |
| *9 |) | 9 | I | Y | i | y | 9 | 9 | I | | ι | |
| *A | * | : | J | Z | j | z | | | K | | κ | |
| *B | + | ; | K | [| k | { | + | + | Λ | | λ | |
| *C | , | < | L | ¥ | l | | ± | ∓ | M | △ | μ | |
| *D | - | = | M |] | m | } | | | N | ▴ | ν | |
| *E | . | > | N | ^ | n | — | - | - | ≡ | ▾ | ξ | |
| *F | / | ? | O | — | o | | o | o | O | ▾ | o | |

Example) The character code "43_{HEX}" represents as the character "C".

2.2 Control command

2.2.1 Control command list

Table 2.4 Control command list

| Command | Control Item | The number of parameter | The explanation of operation |
|---------|---|-------------------------|--|
| PS0 | Recording Start | — | This command is the same as RUN key. |
| PS1 | Recording Stop | — | |
| MP0 | Manual Print starting | — | This command is the same as key operation of "Manual Print". |
| MP1 | Manual Print stop | — | |
| LS0 | List Print starting | — | This command is the same as key operation of "List Print". |
| LS1 | List Print stop | — | |
| SU0 | Engineering List Print starting | — | This command is the same as key operation of "Engineering List Print". |
| SU1 | Engineering List Print stop | — | |
| UD0 | Chooses an Auto Display | — | When choosing the manual display, channel number can be set. But, the channel number can be omitted. Exp.)Display the measurement value of 5th channel. UD 1, 05(CR) (LF) |
| UD1 | Chooses a Manual Display | 1 | |
| UD2 | Chooses a Date Display | — | |
| UD3 | Chooses a Time Display | — | |
| UD4 | Chooses a Display OFF | — | |
| PR0 | Communication comment print out (Sync printout) | 2 | The printout of characters which is received by the communication. |
| PR1 | Communication comment print out (Async printout) | 2 | The parameter consist of printout colors and the printout characters. |
| BO0 | Byte output order (High byte earlier) | 2 | This command only affects the binary mode. |
| BO1 | Byte output order (Low byte earlier) | 2 | (Please refer to the chapter 8 of the instruction manual for details.) (MANUAL CR06, MANUAL CR01/CR02) |
| TS0 | Chooses of the measurement value output | — | This command chooses send data. The send data actually uses LF command, FM command. (Please refer to the chapter 8 of the instruction manual for details.) (MANUAL CR06, MANUAL CR01/CR02) |
| TS1 | Chooses of the setting value output.(Refer to Chapter 3) | — | |
| TS2 | Chooses of the decimal point position and the unit character output. | — | |
| FM0 | The ASCII output of the measurement data. | 2 | This command outputs a measurement value. The parameter consists of the output starting channel and output ending channel. (Please refer to the chapter 8 of the instruction manual for details.) (MANUAL CR06, MANUAL CR01/CR02) |
| FM1 | The Binary output of the measurement data. | 2 | |
| LF | The output of the setting value, the unit character and the decimal point position. | 2 | This command outputs a setting value. The parameter consists of the output starting channel and output ending channel. (Please refer to the chapter 8 of the instruction manual for details.) (MANUAL CR06, MANUAL CR01/CR02) |

2.2.2 Recording Start/Stop

This command starts or stops recording of the recorder.

<Format>

PS0(CR)(LF) ...The recorder starts the record.

PS1(CR)(LF) ...The recorder stops the record.

2.2.3 Manual Print Start/Stop

This command starts or stops printing of the "Manual print".

<Format>

MP0(CR)(LF) ...The manual print is started.

MP1(CR)(LF) ...The manual print is stopped.

2.2.4 List Print Start/Stop

This command starts or stops printing of the "List print".

<Format>

LS0(CR)(LF) ...The list print is started.

LS1(CR)(LF) ...The list print is stopped.

2.2.5 Engineering list Print Start/Stop

This command starts or stops printing of the "Engineering list print".

<Format>

SU0(CR)(LF) ...The Engineering list print is started.

SU1(CR)(LF) ...The Engineering list print is stopped.

2.2.6 Choice of the display contents.

This command chooses the display mode of the recorder.

The Auto Display, the Manual Display, the Date Display, the Time Display and Display OFF can be chosen.

When receiving this command, the display of recorder changes automatically.

<Format>

UD0(CR)(LF) •••••Auto Display
UD1,(CH)(CR)(LF) •••••Manual Display
UD2(CR)(LF) •••••Date Display
UD3(CR)(LF) •••••Time Display
UD4(CR)(LF) •••••Display OFF

CH: The manual display channel 01~06(The Pen type is 01~02.).

The underline part can be omitted.

2.2.7 Communication comment print out

This command prints the character strings, which is received by the communication.

Please refer to table 2.3 for the character code. When you use the character code beyond 7FHEX, the data length of communication function must be used as 8 bit. Please refer to the chapter 7.2.7 of the instruction manual (MANUAL CR06, MANUAL CR01/CR02) for the data length setting.

<Format>

PR0, (COLOR), (TEXT)(CR)(LF) •••••The Sync printout.

PR1, (COLOR), (TEXT)(CR)(LF) •••••The Async printout.

COLOR: Choose a printout color. (The Pen type is only PRP.)

PRP:Purple RED:Red BLK:Black GRN:Green BRN:Brown BLU:Blue

TEXT: Maximum character number of Multipoint type is 47.

Maximum character number of Pen type is 21.

3. ORIGINAL PROTOCOL - DATA TRANSMISSION

3.1 Getting the Set Value

When the recorder receives "(TS1) + (ESC T) + (LF)", the recorder sends the setting value continuously according to the following table 3.1.

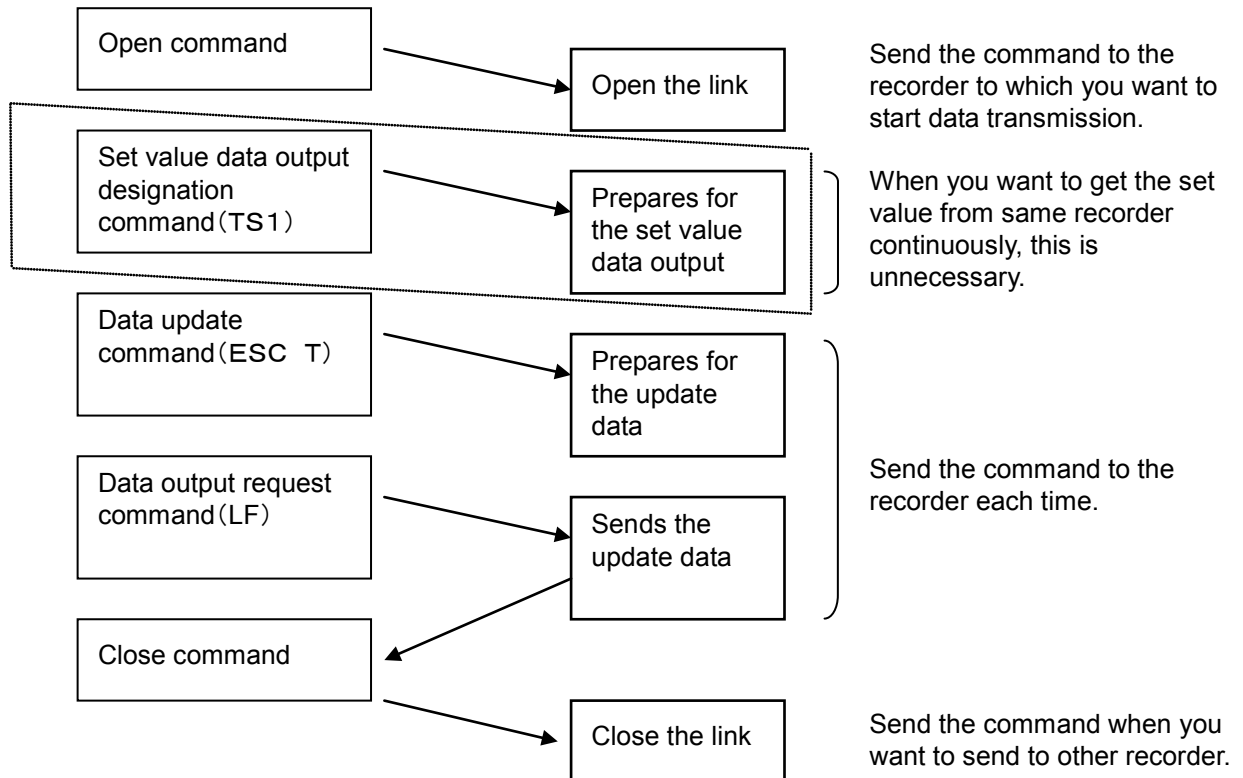
The output formats of each command are as same as that of format when it set up.

Table 3.1 Order of the set value transmission

| Order | Command | Description |
|-------|---------|---|
| 1 | PS | Recording/Stop |
| 2 | SR | Input range, recording span |
| 3 | SN | Unit |
| 4 | SA | Alarm |
| 5 | SC | 1st chart speed |
| 6 | SS | Analog printing period |
| 7 | SZ | Zone recording |
| 8 | SP | Partial compression/expansion recording |
| 9 | SF | Digital printing |
| 10 | ST | Tag character |
| 11 | SG | Comment character |
| 12 | SE | 2nd chart speed |
| 13 | UD | Display indication mode |
| 14 | EN | End |

Send the set value in this order

3.2 Data Reception Example



4. ORIGINAL PROTOCOL - NOTES OF COMMUNICATION

4.1 Half-Duplex Transmission

The recorder side is the half-duplex transmission. The recorder cannot receive the data while sending the data. When the host computer sends the next data, all the receiving data must be completed.

4.2 Multiple access

Don't open another recorder when one recorder is opened on the same line.

4.3 Continuation of Opening the Link

Don't take interval for a long time, after sending the open command.

The syntax error may occur when not sending data some time.

Be sure to send the close command "ESC C" when you do not use the communication.

If the syntax error occurs, send the status output command "ESC S" to reset the error.

(※ The close command cannot reset the syntax error.)

4.4 Outputting the Status

When the open-link recorder has a data error on its link, the recorder saves the error in the internal status area as a communication error. The "ESC S" command can read this status.

Issuing this command clears the on-going error. Refer to chapter 8.5 in the instruction manual. (MANUAL CR06, MANUAL CR01/CR02)

Be sure to reset the error when data set to recorder. When no error reset, you may not be able to judge command, which the error specify.

5. Modbus RTU PROTOCOL - OVERVIEW

5.1 Modbus RTU Protocol

| Item | Specification |
|---------------------|--|
| Interface | RS-485/RS-232C |
| Protocol | Modbus RTU |
| Communication speed | 1200 /2400 /4800 /9600 /19200/ 38400 [bps] |
| Parity | None/Even/Odd |
| Data length | 8bit (※) |
| Stop bit | 1bit / 2bit |
| Slave address | 1~247 (0 invalid) |

※ Please use in 8bit data length When using the ModbusRTU protocol.
Can't be performed successfully communication If you using 7bit.

5.2 Add new items and Map version

Depending on the version up of the recorder, there is that the contents of the Modbus map is hanged.
If the Modbus map is modified, Modbus map version (address 30025) will also be updated.

Newly added setting items are available in the corresponding version or later. (Table below)

| Body version | Map version | Contents | Note |
|----------------|-------------|---|------|
| before Ver4.00 | — | ModbusRTU is not available. | |
| Ver4.00 | 01 | The first release of the Modbus RTU function. | |

[CAUTION]

In the old version, you can't use features added in the new version.
In that case, there is a possibility that it does not work properly when reading / writing to the address of the newly added function.

6. Modbus RTU PROTOCOL - DATA TRANSMISSION AND RECEPTION

6.1 Communication Protocol

This equipment is compatible with Modbus RTU protocol.

Data format of the protocol is as below. It is composed of slave address, function code, data, and CRC section.

Modbus RTU Data format

| | | | |
|--------------------------|--------------------------|--------------------|----------------|
| Slave address (1byte) | Function code (1byte) | Data (variable) | CRC (2byte) |
|--------------------------|--------------------------|--------------------|----------------|

6.2 Function codes

Function code that can be used in this equipment is as follows.

| Code | Function | Maximum data length | Modbus original function (reference) |
|------|--------------------------------|---------------------|--------------------------------------|
| 03H | Setting data read | 123 words | Data read from holding register |
| 04H | Input data read | 123 words | Data read from input register |
| 06H | One-time setting data write | 1 words | Data write to holding register |
| 10H | Continuous setting data writes | 123 words | Data write to holding register |

6.3 Error response

In accordance with the communication protocol for the pertinent function code, if an error occurs during command transmission, an error response is returned in the fixed format described in this section.

■ Example of slave response (function code = 06H, command error = 10H)

| Configuration | Data length | Data |
|-----------------------------------|-------------|------|
| Slave address | 1 | — |
| Function code + 80H | 1 | 86H |
| Error code | 1 | 10H |
| Error check (Only for Modbus RTU) | 2 | CRC |
| Total number of bytes | 5 | — |

● Error codes and their occurrence conditions.

| Error code | Description | Occurrence condition(s) |
|------------|-----------------------------|---|
| 01H | Invalid function code | An unsupported function code is specified. |
| 02H | Invalid register address | The relative address range exceeds "9999." |
| 03H | Invalid number of registers | - The length of the accessed data is "0" or the sum of the relative address and data length exceeds the limit. - It is assumed that two or more function codes, each executable for one area, are involved. - Data longer than 2 words is specified for a one-time write command. - The data length exceeds 123 words. |
| 04H | Device error | The received data is shorter than the predefined data length. |
| 10H | Command error | An attempt at a write over an area exceeding the writable range. |

6.4 Reading of input register area

The input register area is a read-only area.

The current measured value and the current time are mapped. Specify the start address (relative) and data count (assuming that one word is two bytes) of the data to be read.

6.4.1 Reading of input register area

Function code : 04H

- Example of master transmission (with a start address of 0032H and a data count of 2 words)

| Component | | Data length | Data |
|-----------------------|-------------------------------------|-------------|---------------|
| Slave address | | 1 | — |
| Function code | | 1 | 04H |
| Data | Relative start address (high-order) | 1 | 00H |
| | Relative start address (low-order) | 1 | 32H |
| | Read data count (high-order) | 1 | 00H |
| | Read data count (low-order) | 1 | 02H |
| Error check | | 2 | CRC (16 bits) |
| Total number of bytes | | 8 | |

- Example of slave response (with a start address of 0032H and a data count of 2 words)

| Component | | Data length | Data |
|-----------------------|----------------------|-------------|---------------|
| Slave address | | 1 | — |
| Function code | | 1 | 04H |
| Data | Number of data bytes | 1 | 04H |
| | Data 1 (high-order) | 1 | 00H |
| | Data 1 (low-order) | 1 | 09H |
| | Data 2 (high-order) | 1 | 00H |
| | Data 2 (low-order) | 1 | 0AH |
| Error check | | 2 | CRC (16 bits) |
| Total number of bytes | | 9 | |

6.4.2 Input Register Area Map

【Input Register Area Map】Function code: 04H

| Address | Relative address (HEX) | Name | Array | Content | Remarks |
|---------|------------------------|--------------------------|-------|---------|--|
| 30001 | 0 | Model type (1/8) | 1 | ASCII | Multipoint type : "MULTI" Pen type : "PEN" After the blank |
| 30002 | 1 | Model type (2/8) | 2 | | |
| 30003 | 2 | Model type (3/8) | 3 | | |
| 30004 | 3 | Model type (4/8) | 4 | | |
| 30005 | 4 | Model type (5/8) | 5 | | |
| 30006 | 5 | Model type (6/8) | 6 | | |
| 30007 | 6 | Model type (7/8) | 7 | | |
| 30008 | 7 | Model type (8/8) | 8 | | |
| 30009 | 8 | Software version (1/16) | 1 | ASCII | Version information on a system. |
| 30010 | 9 | Software version (2/16) | 2 | | |
| 30011 | A | Software version (3/16) | 3 | | |
| 30012 | B | Software version (4/16) | 4 | | |
| 30013 | C | Software version (5/16) | 5 | | |
| 30014 | D | Software version (6/16) | 6 | | |
| 30015 | E | Software version (7/16) | 7 | | |
| 30016 | F | Software version (8/16) | 8 | | |
| 30017 | 10 | Software version (9/16) | 9 | | |
| 30018 | 11 | Software version (10/16) | 10 | | |
| 30019 | 12 | Software version (11/16) | 11 | | |
| 30020 | 13 | Software version (12/16) | 12 | | |
| 30021 | 14 | Software version (13/16) | 13 | | |
| 30022 | 15 | Software version (14/16) | 14 | | |
| 30023 | 16 | Software version (15/16) | 15 | | |
| 30024 | 17 | Software version (16/16) | 16 | | |
| 30025 | 18 | Modbus map version | 1 | Binary | |
| 30026 | 19 | Reserve | | | |
| 30027 | 1A | Reserve | | | |
| 30028 | 1B | Reserve | | | |
| 30029 | 1C | Reserve | | | |
| 30030 | 1D | Reserve | | | |
| 30031 | 1E | Reserve | | | |
| 30032 | 1F | Reserve | | | |
| 30033 | 20 | Reserve | | | |
| 30034 | 21 | Reserve | | | |
| 30035 | 22 | Reserve | | | |
| 30036 | 23 | Reserve | | | |
| 30037 | 24 | Reserve | | | |
| 30038 | 25 | Reserve | | | |
| 30039 | 26 | Reserve | | | |
| 30040 | 27 | Reserve | | | |
| 30041 | 28 | Reserve | | | |
| 30042 | 29 | Reserve | | | |
| 30043 | 2A | Reserve | | | |
| 30044 | 2B | Reserve | | | |
| 30045 | 2C | Reserve | | | |
| 30046 | 2D | Reserve | | | |
| 30047 | 2E | Reserve | | | |
| 30048 | 2F | Reserve | | | |
| 30049 | 30 | Reserve | | | |

| Address | Relative address (HEX) | Name | Array | Content | Remarks |
|---------|------------------------|-------------------------------|-------|--|--|
| 30050 | 31 | Reserve | | | |
| 30051 | 32 | Year | | 0~99 | Every second update |
| 30052 | 33 | Month | | 1~12 | |
| 30053 | 34 | Day | | 1~31 | |
| 30054 | 35 | Hour | | 0~24 | |
| 30055 | 36 | Minute | | 0~59 | |
| 30056 | 37 | Second | | 0~59 | |
| 30057 | 38 | Recording status | | 0~1 | 0: Recording not in progress 1: Recording in progress |
| 30058 | 39 | Chart sensor status | | 0~1 | 0: With chart 1: Without chart |
| 30059 | 3A | Manual print status | | 0~1 | 0: Print stops 1: During printing |
| 30060 | 3B | List print status | | 0~1 | 0: Print stops 1: During printing |
| 30061 | 3C | Engineering list print status | | 0~1 | 0: Print stops 1: During printing |
| 30062 | 3D | Reserve | | | |
| 30100 | 63 | Reserve | | | |
| 30101 | 64 | Channel status | CH01 | 00bit: Alarm 1 1= ON 0= OFF 01bit: Alarm 2 1= ON 0= OFF 02bit: Alarm 3 1= ON 0= OFF 03bit: Alarm 4 1= ON 0= OFF | |
| 30102 | 65 | | CH02 | | |
| 30103 | 66 | | CH03 | | |
| 30104 | 67 | | CH04 | | |
| 30105 | 68 | | CH05 | | |
| 30106 | 69 | | CH06 | | |
| 30107 | 6A | Measurement data (BIN) | CH01 | -32000~32000 | Data of more than ±32000, the minus side will be 8181H, the plus side will be 7E7EH. |
| 30108 | 6B | | CH02 | | |
| 30109 | 6C | | CH03 | | |
| 30110 | 6D | | CH04 | | |
| 30111 | 6E | | CH05 | | |
| 30112 | 6F | | CH06 | | |
| 30113 | 70 | Decimal point position | CH01 | 0~4 | |
| 30114 | 71 | | CH02 | | |
| 30115 | 72 | | CH03 | | |
| 30116 | 73 | | CH04 | | |
| 30117 | 74 | | CH05 | | |
| 30118 | 75 | | CH06 | | |
| 30119 | 76 | Measurement data (Float) | CH01 | Float (high-order 2 byte) Float (low-order 2 byte) | |
| 30120 | 77 | | | | |
| 30121 | 78 | | CH02 | | |
| 30122 | 79 | | | | |
| 30123 | 7A | | CH03 | | |
| 30124 | 7B | | | | |
| 30125 | 7C | | CH04 | | |
| 30126 | 7D | | | | |
| 30127 | 7E | | CH05 | | |
| 30128 | 7F | | | | |
| 30129 | 80 | | CH06 | | |
| 30130 | 81 | | | | |

| Address | Relative address (HEX) | Name | Array | Content | Remarks |
|---------|------------------------|------------|-------|---------|------------------|
| 30131 | 82 | Unit (1/4) | CH01 | | Current unit |
| 30132 | 83 | Unit (2/4) | | | |
| 30133 | 84 | Unit (3/4) | | | |
| 30134 | 85 | Unit (4/4) | | | |
| 30135 | 86 | Unit (1/4) | CH02 | | Current unit |
| 30136 | 87 | Unit (2/4) | | | |
| 30137 | 88 | Unit (3/4) | | | |
| 30138 | 89 | Unit (4/4) | | | |
| 30139 | 8A | Unit (1/4) | CH03 | | Current unit |
| 30140 | 8B | Unit (2/4) | | | |
| 30141 | 8C | Unit (3/4) | | | |
| 30142 | 8D | Unit (4/4) | | | |
| 30143 | 8E | Unit (1/4) | CH04 | | Current unit |
| 30144 | 8F | Unit (2/4) | | | |
| 30145 | 90 | Unit (3/4) | | | |
| 30146 | 91 | Unit (4/4) | | | |
| 30147 | 92 | Unit (1/4) | CH05 | | Current unit |
| 30148 | 93 | Unit (2/4) | | | |
| 30149 | 94 | Unit (3/4) | | | |
| 30150 | 95 | Unit (4/4) | | | |
| 30151 | 96 | Unit (1/4) | CH06 | | Current unit |
| 30152 | 97 | Unit (2/4) | | | |
| 30153 | 98 | Unit (3/4) | | | |
| 30154 | 99 | Unit (4/4) | | | |
| 30155 | 9A | Reserve | | | |
| ... | ... | | | | Unused or later. |
| 39999 | 270E | | | | |

6.5 Reading and writing of the holding register area

The holding register area is a read-write area. Parameter settings and the start and stop command of the recording state are mapped. For read, specify the start address (relative) and data count (assuming that one word is two bytes) of the data to be read. For write, specify the start address and the data to be written.

6.5.1 Reading of the holding register area

It is used when calling the parameters that are currently set.

Also, it can not be read in the case of the operation command system. It becomes writing only.

Function code (Reading): 03H

■ Example of transmitting master(starting address=00C8H, data length=2words)

| Component | | Data length | Data |
|-----------------------|-------------------------------------|-------------|---------------|
| Slave address | | 1 | — |
| Function code | | 1 | 03H |
| Data | Relative start address (high-order) | 1 | 00H |
| | Relative start address (low-order) | 1 | C8H |
| | Read data count (high-order) | 1 | 00H |
| | Read data count (low-order) | 1 | 02H |
| Error check | | 2 | CRC (16 bits) |
| Total number of bytes | | 8 | |

■ Example of slave's responding (starting address=0032H, data length =2words)

| Component | | Data length | Data |
|-----------------------|----------------------|-------------|---------------|
| Slave address | | 1 | — |
| Function code | | 1 | 03H |
| Data | Number of data bytes | 1 | 04H |
| | Data 1 (high-order) | 1 | 00H |
| | Data 1 (low-order) | 1 | 05H |
| | Data 2 (high-order) | 1 | 00H |
| | Data 2 (low-order) | 1 | 00H |
| Error check | | 2 | CRC (16 bits) |
| Total number of bytes | | 9 | |

6.5.2 Writing of the holding register area (Single)

It is used when carrying out a set of command operations or parameters.

In the case of operation command, it will take effect immediately when you send.

In the case of parameter settings, it is reflected by sending a separate "settings save" command (address 40104 (relative address 0067H)).

Function code(Writing): 06H

■ Example of transmitting master(starting address=00C8H, data =5)

| Component | | Data length | Data |
|-----------------------|-------------------------------------|-------------|---------------|
| Slave address | | 1 | — |
| Function code | | 1 | 06H |
| Data | Relative start address (high-order) | 1 | 00H |
| | Relative start address (low-order) | 1 | C8H |
| | Write data (high-order) | 1 | 00H |
| | Write data (low-order) | 1 | 05H |
| Error check | | 2 | CRC (16 bits) |
| Total number of bytes | | 8 | |

■ Example of slave's responding (starting address=00C8H, data =5)

| Component | | Data length | Data |
|-----------------------|-------------------------------------|-------------|---------------|
| Slave address | | 1 | — |
| Function code | | 1 | 06H |
| Data | Relative start address (high-order) | 1 | 00H |
| | Relative start address (low-order) | 1 | C8H |
| | Write data (high-order) | 1 | 00H |
| | Write data (low-order) | 1 | 05H |
| Error check | | 2 | CRC (16 bits) |
| Total number of bytes | | 8 | |

6.5.3 Writing of the holding register area (Continuation)

Time setting command and the like, and then used when the data needs to send in succession.

In the case of operation command, it will take effect immediately when you send.

In the case of parameter settings, it is reflected by sending a separate "settings save" command (address 40104 (relative address 0067H)).

Corresponding to that memory map is part. Please refer to Section 6.5.4 for the area which is corresponding.

Function code(Writing): 10H

■ Master transmission example (Start address =006EH, Number of data =7words)

Data =AA01H, 000FH, 0001H, 0002H, 0017H, 001EH, 0000H)

(Clock set command January 2, 2015 23:30:00)

| Component | | Data length | Data |
|---------------------------|---------------------------------------|-------------|------------|
| Slave address | | 1 | - |
| Function code | | 1 | 10H |
| Data | Relative start address (high-order) | 1 | 00H |
| | Relative start address (low-order) | 1 | 6EH |
| | Number of write register (high-order) | 1 | 00H |
| | Number of write register (low-order) | 1 | 07H |
| | Cut the number of bytes | 1 | 0EH |
| | Write data 1 (high-order) | 1 | AAH |
| | Write data 1 (low-order) | 1 | 01H |
| | Write data 2 (high-order) | 1 | 00H |
| | Write data 2 (low-order) | 1 | 0FH |
| | Write data 3 (high-order) | 1 | 00H |
| | Write data 3 (low-order) | 1 | 01H |
| | Write data 4 (high-order) | 1 | 00H |
| | Write data 4 (low-order) | 1 | 02H |
| | Write data 5 (high-order) | 1 | 00H |
| | Write data 5 (low-order) | 1 | 17H |
| Write data 6 (high-order) | 1 | 00H | |
| Write data 6 (low-order) | 1 | 1EH | |
| Write data 7 (high-order) | 1 | 00H | |
| Write data 7 (low-order) | 1 | 00H | |
| Error check | | 2 | CRC(16bit) |
| Total number of bytes | | 23 | - |

■ Slave response example (Response of Start address =006EH, Number of data =7words)

| Component | | Data length | Data |
|-----------------------|---------------------------------------|-------------|------------|
| Slave address | | 1 | - |
| Function code | | 1 | 10H |
| Data | Relative start address (high-order) | 1 | 00H |
| | Relative start address (low-order) | 1 | 6EH |
| | Number of write register (high-order) | 1 | 00H |
| | Number of write register (low-order) | 1 | 07H |
| Error check | | 2 | CRC(16bit) |
| Total number of bytes | | 8 | - |

6.5.4 Holding register area map

【Holding register area map】Faction Code:03H(Reading),06H(Writing),10H(Continuous writing)

| Address | Relative address (HEX) | Name | Array | Content | Remarks |
|--------------------------|------------------------|----------------------------|-------|-----------------------------|---|
| 40001 | 0 | Reserve | | | Unused |
| ... | | | | | |
| 40100 | 63 | Reserve | | | |
| Operation command | | | | | |
| 40101 | 64 | Recording start / stop | | AA01 : Start AA00 : Stop | Invalid except left. The disabled in selecting DI. |
| 40102 | 65 | Reserve | | | |
| 40103 | 66 | Reserve | | | |
| 40104 | 67 | Save the settings | | AA01 : Save | Invalid except left. |
| 40105 | 68 | Manual print | | AA01 : Start AA00 : Stop | |
| 40106 | 69 | LIST print | | | |
| 40107 | 6A | ELIST print | | | |
| 40108 | 6B | Comments 1 print | | AA01 : Sync AA02 : Async | |
| 40109 | 6C | Comments 2 print | | | |
| 40110 | 6D | Comments 3 print | | | |
| 40111 | 6E | Clock set | | AA01 : Run | AA01 ignored except 7 words continuous writing only valid Clock sets in the received values. When isn't time has come ignored (month = 0, etc.). |
| 40112 | 6F | Year(00~99)' 2 digits | | | |
| 40113 | 70 | Month(01~12) | | | |
| 40114 | 71 | Day(01~31) | | | |
| 40115 | 72 | Time(00~23) | | | |
| 40116 | 73 | Minute(00~59) | | | |
| 40117 | 74 | Second(00~59) | | | |
| 40118 | 75 | Reserve | | | |
| 40119 | 76 | Reserve | | | |
| 40120 | 77 | Reserve | | | |
| 40121 | 78 | Communication printing set | | AA01 : Sync AA02 : Async | AA01 and AA02 ignored except Multipoint type : 3~26 words Pen type : 3~13 words Continuous writing only valid |
| 40122 | 79 | Printing color | | 0~5 | Pen type recorder is invalid. |
| 40123 | 7A | Printing character (01/24) | | ASCII | Multipoint type : 0~47 character Pen type : 0~21 character |
| 40124 | 7B | Printing character (02/) | | | |
| 40125 | 7C | Printing character (03/) | | | |
| 40126 | 7D | Printing character (04/) | | | |
| 40127 | 7E | Printing character (05/) | | | |
| 40128 | 7F | Printing character (06/) | | | |
| 40129 | 80 | Printing character (07/) | | | |
| 40130 | 81 | Printing character (08/) | | | |
| 40131 | 82 | Printing character (09/) | | | |
| 40132 | 83 | Printing character (10/) | | | |
| 40133 | 84 | Printing character (11/) | | | |
| 40134 | 85 | Printing character (12/) | | | |
| 40135 | 86 | Printing character (13/) | | | |
| 40136 | 87 | Printing character (14/) | | | |
| 40137 | 88 | Printing character (15/) | | | |
| 40138 | 89 | Printing character (16/) | | | |
| 40139 | 8A | Printing character (17/) | | | |

【Holding register area map】Function Code:03H(Reading),06H(Writing),10H(Continuous writing)

| Address | Relative address (HEX) | Name | Array | Content | Remarks |
|--|------------------------|--|-------|----------------------|--|
| 40140 | 8B | Printing character (18/) | | | |
| 40141 | 8C | Printing character (19/) | | | |
| 40142 | 8D | Printing character (20/) | | | |
| 40143 | 8E | Printing character (21/) | | | |
| 40144 | 8F | Printing character (22/) | | | |
| 40145 | 90 | Printing character (23/) | | | |
| 40146 | 91 | Printing character(24/24) | | | |
| 40147 | 92 | Reserve | | | |
| ... | | | | | |
| 40200 | C7 | Reserve | | | |
| Setup mode parameters (channel) | | | | | |
| 40201 | C8 | Mode | CH1 | 0~6 , 8 (7: Error) | (※1) Mode |
| 40202 | C9 | Input type | | 0~34 | (※2) Range code |
| 40203 | CA | Reference channel | | 0~4 | CH1 configurable value : None(Setting disable) CH2 configurable value: 0 CH3 configurable value: 0~1 CH4 configurable value: 0~2 CH5 configurable value: 0~3 CH6 configurable value: 0~4 |
| 40204 | CB | Measurement range (L) | | depends on the range | (※2) Measurement range |
| 40205 | CC | Measurement range (H) | | depends on the range | (※2) Measurement range |
| 40206 | CD | Scaling range (L) | | -32000~32000 | (※3) Depends on the Scaling |
| 40207 | CE | Scaling range (H) | | -32000~32000 | (※3) Depends on the Scaling |
| 40208 | CF | Decimal point position | | 0~4 | Only when a Scaling is "ON" , this setting is enable. |
| 40209 | D0 | Unit (1/3) | | ASCII | Units at the time of the scaling "ON" (Note. 1) |
| 40210 | D1 | Unit (2/3) | | | |
| 40211 | D2 | Unit (3/3) | | | |
| 40212 | D3 | Reserve | | | |
| 40213 | D4 | Tag (1/4) | | ASCII | Multipoint type : 7 character Pen type : 5 character |
| 40214 | D5 | Tag (2/4) | | | |
| 40215 | D6 | Tag (3/4) | | | |
| 40216 | D7 | Tag (4/4) | | | |
| 40217 | D8 | Digital print ON/OFF | | 0~1 | 0 : OFF 1 : ON |
| 40218 | D9 | Partial compression / expansion ON/OFF | | 0~1 | 0 : OFF 1 : ON |
| 40219 | DA | Zone L | | 0~99 | |
| 40220 | DB | Zone H | | 1~100 | |
| 40221 | DC | Partial compression boundary point position. | | 1~99 | |
| 40222 | DD | Partial compression boundary point measurements. | | depends on the range | Scaling "ON" : Depends on the scaling Other : measurement range. (※3) Scaling dependent |

(Note 1) The setting of the unit is enabled, the range setting is only case of "SCALE", "SQRT", "DECAD", "DELT", "SIGM", "MEAN".

(However, "DELT" "SIGM" "MEAN" is valid only when the range setting of the reference channel is "SCALE".)

Otherwise the range setting, the unit is automatically determined according to the range.

【Holding register area map】Function Code:03H(Reading),06H(Writing),10H(Continuous writing)

| Address | Relative address (HEX) | Name | Array | Content | Remarks |
|---------|------------------------|---------------------------|-------|--|---|
| 40223 | DE | Alarm 1 action ON/OFF | CH1 | 0~1 | 0 : OFF 1 : ON |
| 40224 | DF | Alarm 1 type | | 0~1 | 0 : H 1 : L |
| 40225 | E0 | Alarm 1 Set value | | -32000~32000 | (※3) Depends on the Scaling |
| 40226 | E1 | Alarm 1 RLY output ON/OFF | | 0~1 | 0 : OFF 1 : ON |
| 40227 | E2 | Alarm 1 DO No. | | 0~5 | Multipoint type : 0~ 5 (RLY1~RLY6) Pen type : 0~ 2 (RLY1~RLY3) |
| 40228 | E3 | Alarm 2 action ON/OFF | | 0~1 | 0 : OFF 1 : ON |
| 40229 | E4 | Alarm 2 type | | 0~1 | 0 : H 1 : L |
| 40230 | E5 | Alarm 2 Set value | | -32000~32000 | (※3) Depends on the Scaling |
| 40231 | E6 | Alarm 2 RLY output ON/OFF | | 0~1 | 0 : OFF 1 : ON |
| 40232 | E7 | Alarm 2 DO No. | | 0~5 | Multipoint type : 0~ 5 (RLY1~RLY6) Pen type : 0~ 2 (RLY1~RLY3) |
| 40233 | E8 | Alarm 3 action ON/OFF | | 0~1 | 0 : OFF 1 : ON |
| 40234 | E9 | Alarm 3 type | | 0~1 | 0 : H 1 : L |
| 40235 | EA | Alarm 3 Set value | | -32000~32000 | (※3) Depends on the Scaling |
| 40236 | EB | Alarm 3 RLY output ON/OFF | | 0~1 | 0 : OFF 1 : ON |
| 40237 | EC | Alarm 3 DO No. | | 0~5 | Multipoint type : 0~ 5 (RLY1~RLY6) Pen type : 0~ 2 (RLY1~RLY3) |
| 40238 | ED | Alarm 4 action ON/OFF | | 0~1 | 0 : OFF 1 : ON |
| 40239 | EE | Alarm 4 type | | 0~1 | 0 : H 1 : L |
| 40240 | EF | Alarm 4 Set value | | -32000~32000 | (※3) Depends on the Scaling |
| 40241 | F0 | Alarm 4 RLY output ON/OFF | | 0~1 | 0 : OFF 1 : ON |
| 40242 | F1 | Alarm 4 DO No. | | 0~5 | Multipoint type : 0~ 5 (RLY1~RLY6) Pen type : 0~ 2 (RLY1~RLY3) |
| 40243 | F2 | Reserve | | | |
| ... | | | | | |
| 40250 | F9 | Reserve | | | |
| 40251 | FA | Scaling range (L) | | 2 words continuous writing only is valid. (※4)float Format | |
| 40252 | FB | (float) | | | |
| 40253 | FC | Scaling range (H) | | 2 words continuous writing only is valid. (※4)float Format | |
| 40254 | FD | (float) | | | |
| 40255 | FE | Alarm1 set value (float) | | 2 words continuous writing only is valid. (※4)float Format | |
| 40256 | FF | Alarm1 set value (float) | | | |
| 40257 | 100 | Alarm2 set value (float) | | 2 words continuous writing only is valid. (※4)float Format | |
| 40258 | 101 | Alarm2 set value (float) | | | |
| 40259 | 102 | Alarm3 set value (float) | | 2 words continuous writing only is valid. (※4)float Format | |
| 40260 | 103 | Alarm3 set value (float) | | | |
| 40261 | 104 | Alarm4 set value (float) | | 2 words continuous writing only is valid. (※4)float Format | |
| 40262 | 105 | Alarm4 set value (float) | | | |

【Holding register area map】Function Code:03H(Reading),06H(Writing),10H(Continuous writing)

| Address | Relative address (HEX) | Name | Array | Content | Remarks |
|--------------------------------------|------------------------|----------------------------------|-------|------------------|---|
| 40263 | 106 | Reserve | CH01 | | |
| ... | | | | | |
| 40300 | 12B | Reserve | | | |
| 40301 | 12C | Mode | CH02 | Input channel | |
| ... | | | | | |
| 40400 | 18F | Reserve | | | |
| 40401 | 190 | Mode | CH03 | Input channel | |
| ... | | | | | |
| 40500 | 1F3 | Reserve | | | |
| 40501 | 1F4 | Mode | CH04 | Input channel | |
| ... | | | | | |
| 40600 | 257 | Reserve | | | |
| 40601 | 258 | Mode | CH05 | Input channel | |
| ... | | | | | |
| 40700 | 2BB | Reserve | | | |
| 40701 | 2BC | Mode | CH06 | Input channel | |
| ... | | | | | |
| 40800 | 31F | Reserve | | | |
| Setup mode parameters (Other) | | | | | |
| 40801 | 320 | Recording paper feed speed (1st) | | Multipoint: 0~33 | (※5) Recording paper feed speed |
| 40802 | 321 | Recording paper feed speed (2nd) | | Pen type: 0~40 | |
| 40803 | 322 | Recording period | | 0~3 | (Multipoint Type only) 0: 10sec 1: 20sec 2: 30sec 3: 60sec |
| 40804 | 323 | Reserve | | | |
| 40805 | 324 | Comment (1/8) | Cmt1 | ASCII | Multipoint type : 0~8 Words Pen type : 0~6 Words |
| 40806 | 325 | Comment (2/8) | | | |
| 40807 | 326 | Comment (3/8) | | | |
| 40808 | 327 | Comment (4/8) | | | |
| 40809 | 328 | Comment (5/8) | | | |
| 40810 | 329 | Comment (6/8) | | | |
| 40811 | 32A | Comment (7/8) | | | |
| 40812 | 32B | Comment (8/8) | | | |
| 40813 | 32C | Reserve | | | |
| 40814 | 32D | Reserve | | | |
| 40815 | 32E | Comment (1/8) | Cmt2 | ASCII | Multipoint type : 0~8 Words Pen type : 0~6 Words |
| 40816 | 32F | Comment (2/8) | | | |
| 40817 | 330 | Comment (3/8) | | | |
| 40818 | 331 | Comment (4/8) | | | |
| 40819 | 332 | Comment (5/8) | | | |
| 40820 | 333 | Comment (6/8) | | | |
| 40821 | 334 | Comment (7/8) | | | |
| 40822 | 335 | Comment (8/8) | | | |
| 40823 | 336 | Reserve | | | |
| 40824 | 337 | Reserve | | | |

【Holding register area map】Faction Code:03H(Reading),06H(Writing),10H(Continuous writing)

| Address | Relative address (HEX) | Name | Array | Content | Remarks |
|-------------------------------|------------------------|-----------------------------|-------|---|---|
| 40825 | 338 | Comment (1/8) | Cmt3 | ASCII | Multipoint type : 0~8 Words Pen type : 0~6 Words |
| 40826 | 339 | Comment (2/8) | | | |
| 40827 | 33A | Comment (3/8) | | | |
| 40828 | 33B | Comment (4/8) | | | |
| 40829 | 33C | Comment (5/8) | | | |
| 40830 | 33D | Comment (6/8) | | | |
| 40831 | 33E | Comment (7/8) | | | |
| 40832 | 33F | Comment (8/8) | | | |
| ... | | | | | |
| 40900 | 383 | Reserve | | | |
| Engineering parameters | | | | | |
| 40901 | 384 | Burnout | CH1 | 0~1 | 0:OFF 1:ON |
| 40902 | 385 | Offset | | ± 32000 | |
| 40903 | 386 | Offset DP | | 0~4 | |
| 40904 | 387 | RJC setting | | 0~2 | 0:INT 1:EXT 2:CH |
| 40905 | 388 | RJC EXT fixed value | | -32000~32000 | Uv |
| 40906 | 389 | RJC CH destination | | Multipoint type :0~5 Pen type:0~1 | |
| 40907 | 38A | Printing color | | 0~5 | (Multipoint type only) (※6)Printing color |
| 40908 | 38B | Digital filter | | 0~10000 | (Pen type only) Decimal point:4-digit fixed |
| 40909 | 38C | Reserve | | | |
| 40910 | 38D | Reserve | | | |
| 40911 | 38E | Burnout | CH2 | | Same as CH1 |
| ... | | | | | |
| 40920 | 397 | Reserve | | | |
| 40921 | 398 | Burnout | CH3 | | Same as CH1 |
| ... | | | | | |
| 40930 | 3A1 | Reserve | | | |
| 40931 | 3A2 | Burnout | CH4 | | Same as CH1 |
| ... | | | | | |
| 40940 | 3AB | Reserve | | | |
| 40941 | 3AC | Burnout | CH5 | | Same as CH1 |
| ... | | | | | |
| 40950 | 3B5 | Reserve | | | |
| 40951 | 3B6 | Burnout | CH6 | | Same as CH1 |
| ... | | | | | |
| 40960 | 3BF | Reserve | | | |
| 40961 | 3C0 | Hysteresis setting | | 0~1 | 0:OFF 1:ON |
| 40962 | 3C1 | Alarm printing function | | 0~2 | 0:OFF 1:Alarm printing 1 2:Alarm printing 2 |
| 40963 | 3C2 | RUN trigger setting | | 0~1 | 0:INT 1:EXT |
| 40964 | 3C3 | CH / TAG printing switching | | 0~1 | 0:CH 1:TAG |

【Holding register area map】Function Code:03H(Reading),06H(Writing),10H(Continuous writing)

| Address | Relative address (HEX) | Name | Array | Content | Remarks |
|---------|------------------------|--|-------|---------|--|
| 40965 | 3C4 | Logging print ON/OFF | | 0~1 | 0: OFF 1: ON |
| 40966 | 3C5 | Logging print interval | | 0~11 | (※7) Logging print interval |
| 40967 | 3C6 | Logging print reference time | | 0~23 | Unit: Hour |
| 40968 | 3C7 | Logging print criteria minute | | 0~59 | Unit: Minute |
| 40969 | 3C8 | Logging print Sync/Async | | 0~1 | 0: Sync 1: Async |
| 40970 | 3C9 | Record start/end print presence or absence | | 0~2 | 0: OFF 1: Sync 2: Async |
| 40971 | 3CA | Host address | | 1~32 | |
| 40972 | 3CB | Communication speed (Note. 1) | | 0~5 | 0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps 5: 38400 bps |
| 40973 | 3CC | Data length (Note. 2) | | 0~1 | 0: 7bit 1: 8bit |
| 40974 | 3CD | Parity (Note. 2) | | 0~2 | 0: Even 1: Odd 2: OFF |
| 40975 | 3CE | Stop bit (Note. 2) | | 0~1 | 0: 1bit 1: 2bit |
| 40976 | 3CF | Communication protocol | | 0~1 | 0: Original 1: ModbusRTU |
| 40977 | 3D0 | Logging print scale presence or absence | | 0~1 | (Multipoint type only) 0: OFF 1: ON |
| 40978 | 3D1 | Printing gap setting | | 0~1 | (Pen type only) 0: OFF 1: ON |
| 40979 | 3D2 | DI1 function | | 0~12 | (※8)DI function Can't select the same function in DI1,2,3. |
| 40980 | 3D3 | DI2 function | | 0~12 | (※8)DI function |
| 40981 | 3D4 | DI3 function | | 0~12 | (※8)DI function |
| 40982 | 3D5 | Reserve | | | Unused later |
| ... | | | | | |
| 49999 | 270E | Reserve | | | |

6.5.5 Holding register area setting range detail

Setting range of register on the map written in the ※ are listed below.

※1 Mode

| Value | Content | Remarks |
|-------|--------------------------------|--|
| 0 | Scaling OFF | |
| 1 | Scaling ON | |
| 2 | Square root calculation (SQRT) | It can be set only when the range code is 0 to 7 (voltage current range). |
| 3 | exponent display (DECAD) | It can be set only when the range code is 0 to 7 (voltage current range). |
| 4 | Difference calculation (DELT) | Change of input width after calculation, please change by entering a value in the "measurement range". |
| 5 | Sum calculation (SIGM) | Change of input width after calculation, please change by entering a value in the "measurement range". |
| 6 | Average calculation (MEAN) | Change of input width after calculation, please change by entering a value in the "measurement range". |
| 7 | Disable | If you select this, it will result in an error. |
| 8 | Skip | |

※2 Range code, Measurement range.

| Code | Input type | | Measurement range ※ |
|------|---------------------------------|-------------------|---------------------|
| 0 | DC voltage | ±10mV | (-10.00 to 10.00) |
| 1 | | 0-20mv | (0.00 to 20.00) |
| 2 | | 0-50mV | (0.00 to 50.00) |
| 3 | | ±200.0mV | (-200.0 to 200.0) |
| 4 | | ±1V | (-1.000 to 1.000) |
| 5 | | 0-5V | (-0.000 to 5.000) |
| 6 | | ±10V | (-10.00 to 10.00) |
| 7 | DC current | 4-20mA | (4.00 to 20.00) |
| 8 | TC (Unit:°C) (Au-Fe is K) | B | (0.0 to 1820.0) |
| 9 | | R1 | (0.0 to 1760.0) |
| 10 | | R2 | (0.0 to 1200.0) |
| 11 | | S | (0.0 to 1760.0) |
| 12 | | K1 | (-200.0 to 1370.0) |
| 13 | | K2 | (-200.0 to 600.0) |
| 14 | | K3 | (-200.0 to 300.0) |
| 15 | | E1 | (-200.0 to 800.0) |
| 16 | | E2 | (-200.0 to 300.0) |
| 17 | | E3 | (-200.0 to 150.0) |
| 18 | | J1 | (-200.0 to 1100.0) |
| 19 | | J2 | (-200.0 to 400.0) |
| 20 | | J3 | (-200.0 to 200.0) |
| 21 | | T1 | (-200.0 to 400.0) |
| 22 | | T2 | (-200.0 to 400.0) |
| 23 | | C | (0.0 to 2320.0) |
| 24 | | Au-Fe | (1.0 to 300.0) |
| 25 | | N | (0.0 to 1300.0) |
| 26 | | PR40-20 | (0.0 to 1880.0) |
| 27 | | PL2 | (0.0 to 1390.0) |
| 28 | | U | (-200.0 to 400.0) |
| 29 | L | (-200.0 to 900.0) | |
| 30 | RTD (Unit:°C) | Pt100-1 | (-200.0 to 650.0) |
| 31 | | Pt100-2 | (-200.0 to 200.0) |
| 32 | | JPt100-1 | (-200.0 to 630.0) |
| 33 | | JPt100-2 | (-200.0 to 200.0) |

※3 Depends on the Scaling

Scaling range, the alarm set value, partial compression boundary point measurement is depends on the holding register address 40201 "mode" and 40208 "decimal point position".

The set value is reflected in the form that is dependent on the "decimal point position" if the mode is scaling ON ("SCALE" and "SQRT"). In the case of OFF will reflect decimal point position of the range .

Example 1: "Scaling range (L)" set to 123.45 at Scaling "ON".

Holding register address "40208 (decimal point position)" : Set the value to 2.

Holding register address "40206(Scaling range (L))" : Set the value to 12345.

Example 2: "Alarm 1 Set value" set to 12.3 at Scaling "OFF" (In the case of range code 4 selection).

(Range code 4 $\pm 1V$ (Measurement range: -1.000~1.000))

Holding register address "40224(Alarm 1 Set value)" : Set the value to 12300.

※4 float(Floating point)

Floating-point notation in IEEE-compliant.

※5 Chart speed

There is a difference in the contents of the numbers in Multipoint type and Pen type.

[Multipoint type]

| Value | Speed (mm/h) | Value | Speed (mm/h) | Value | Speed (mm/h) | Value | Speed (mm/h) |
|-------|--------------|-------|--------------|-------|--------------|-------|--------------|
| 0 | 0 | 10 | 30 | 20 | 160 | 30 | 750 |
| 1 | 1 | 11 | 40 | 21 | 180 | 31 | 900 |
| 2 | 2 | 12 | 50 | 22 | 200 | 32 | 1,200 |
| 3 | 3 | 13 | 60 | 23 | 240 | 33 | 1,500 |
| 4 | 4 | 14 | 75 | 24 | 300 | | |
| 5 | 5 | 15 | 80 | 25 | 360 | | |
| 6 | 10 | 16 | 90 | 26 | 375 | | |
| 7 | 15 | 17 | 100 | 27 | 450 | | |
| 8 | 20 | 18 | 120 | 28 | 600 | | |
| 9 | 25 | 19 | 150 | 29 | 720 | | |

[Pen type]

| Value | Speed (mm/h) | Value | Speed (mm/h) | Value | Speed (mm/h) | Value | Speed (mm/h) | Value | Speed (mm/h) |
|-------|--------------|-------|--------------|-------|--------------|-------|--------------|-------|--------------|
| 0 | 5 | 10 | 80 | 20 | 360 | 30 | 2,400 | 40 | 12,000 |
| 1 | 10 | 11 | 90 | 21 | 375 | 31 | 3,000 | | |
| 2 | 15 | 12 | 100 | 22 | 450 | 32 | 3,600 | | |
| 3 | 20 | 13 | 120 | 23 | 600 | 33 | 4,500 | | |
| 4 | 25 | 14 | 150 | 24 | 720 | 34 | 4,800 | | |
| 5 | 30 | 15 | 160 | 25 | 750 | 35 | 5,400 | | |
| 6 | 40 | 16 | 180 | 26 | 900 | 36 | 6,000 | | |
| 7 | 50 | 17 | 200 | 27 | 1200 | 37 | 7,200 | | |
| 8 | 60 | 18 | 240 | 28 | 1500 | 38 | 9,000 | | |
| 9 | 75 | 19 | 300 | 29 | 1800 | 39 | 10,800 | | |

※6 Printing color

| Value | Content | Remarks |
|-------|---------|---------|
| 0 | Purple | |
| 1 | Red | |
| 2 | Green | |
| 3 | Blue | |
| 4 | Brown | |
| 5 | Black | |

※7 Logging print interval

| Value | Content | Remarks |
|-------|---------|---------|
| 0 | 10min | |
| 1 | 15min | |
| 2 | 20min | |
| 3 | 30min | |
| 4 | 1H | |
| 5 | 2H | |
| 6 | 3H | |
| 7 | 4H | |
| 8 | 6H | |
| 9 | 8H | |
| 10 | 12H | |
| 11 | 24H | |

※8 DI function

| Value | Content | Remarks |
|-------|---------------------------------|--------------------|
| 0 | OFF (No function) | |
| 1 | RCD (Recording Start/Stop) | ON:RUN OFF:STOP |
| 2 | SPEED (Chart speed change) | ON:Spd-1 OFF:Spd-2 |
| 3 | CMNT1 (Comment print (Sync)) | ON Rising:Start |
| 4 | CMNT2 (Comment print (Sync)) | |
| 5 | CMNT3 (Comment print (Sync)) | |
| 6 | MAN-P (Manual print (Sync)) | |
| 7 | TIM-P (Time print (Sync)) | |
| 8 | A. CMT1 (Comment print (Async)) | |
| 9 | A. CMT2 (Comment print (Async)) | |
| 10 | A. CMT3 (Comment print (Async)) | |
| 11 | AMAN. P (Manual print (Async)) | |
| 12 | ATIM. P (Time print (Async)) | |