

Tachometer

# 471C

## Quick Manual



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# Introduction

This model is tachometer. Signal from rotor is displayed as rotation speed.

## About this booklet

Thank you for purchasing our Tachometer 471C. Before use of the product, read this quick manual carefully and thoroughly, and keep it available for routine reference.

If the product is not used in the specified way decided by manufacturer, the functions protected and guaranteed by manufacturer may be lost.

The following symbol marks are used in this quick manual for the safety use of the product.



This is the warning to avoid danger. Severe injury or fatal accident may occur to the user in case the product is mishandled.



This is the caution to avoid danger. Minor injury to the user or physical obstacle may occur in case the product is mishandled.

## Precautions

For the safe use of this product, users must follow the following warning and caution.

### **Warning**

- There is no power on-off switch on the model 471C. It immediately starts to operate by connecting with power supply.
- Never touch the terminals when power is ON. There may be risk of electric shock.

### **Caution**

- The rated data for warm up is specified for more than 15 minutes.
- When the front panel or the case becomes dirty, wipe it with soft cloth. If the dirt is difficult to remove, wipe it lightly with the soft moist cloth with mild detergent diluted with water and finish by wiping with a dry cloth. Do not use organic solvent like benzene or paint thinner as they may deform or discolor the surface of the case.

# Installation precautions

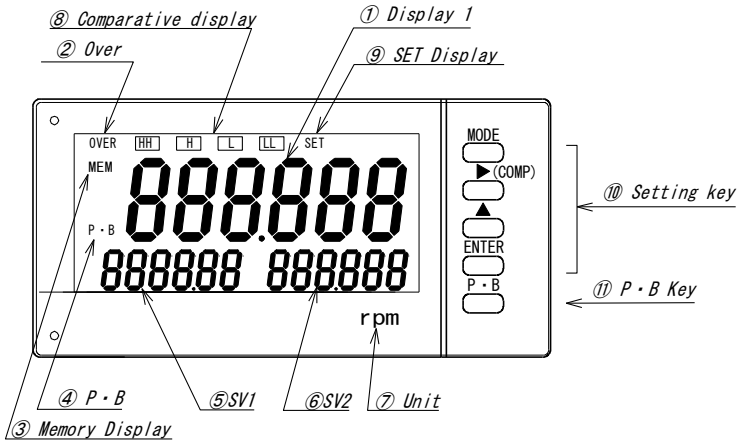
For the safe use of this product, users must follow the following caution.

### **Caution**

- If the product is installed inside the cabinet, provision for the proper heat dissipation should be done to prevent the temperature exceeding more than 50 °C inside the cabinet.
- Do not mount the product narrow distance. The rise of temperature may decrease the life of the product.
- Do not use the products in the following places. It may be the cause of damage or malfunction.
  - \* Wet place (rain, water drops), direct sunlight
  - \* Place having high temperature, humidity, dust and corrosive gases
  - \* Place having excessive noise, waves, static electricity
  - \* Place having lots of vibration and shock
- Store the product in the specified temperature range between -20°C to 65°C.

# Nomenclature

## Operation panel



No.	Name	Function
①	Display 1	Process value (Current value) is displayed. Red or green can be selected for display color.
②	Over	Light on when display 1 exceeds 999999. Display color: Red
③	MEM	Light on when memory-enable set is ON (Code No.40) . Display color: Red
④	P · B	Light on when P.B is displayed. Display color: Red
⑤	SV1	Either peak value or comparator value set by customer can be displayed. Display color: White
⑥	SV2	Either bottom value or comparator value set by customer can be displayed. Display color: White
⑦	Unit	Pasting position of Unit sticker
⑧	Comparative display	The comparison status of the comparison output is displayed.
⑨	SET Display	Light on during setting mode.

# Nomenclature (contd.)

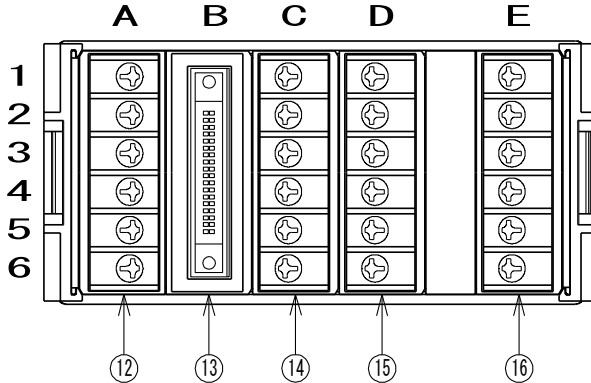
No.	Name	Function	
⑩	Setting key	MODE	During measurement mode : Change to Setting mode, Adjustment mode During setting mode : Change to each code No.
		▼(COMP)	During measurement mode: Set comparison value During setting mode: Select the digit to change
		▲	During measurement mode: Teaching function (Except when switching to diagnosis mode) During setting mode : Change of setting value
		ENTER	During measurement mode : Invalid During setting mode : Set value changed to saved measurement mode
⑪	P · B key	P · B	During measurement mode : Reset Peak and Bottom value During setting mode: Setting mode changes to measurement mode without saving the set value.

## Liquid Crystal Display

0	1	2	3	4	5	6	7	8	9	DP	minus
0	1	2	3	4	5	6	7	8	9	.	-

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	b	C	d	E	F	G	H	I	J	P	L	n	o	p	q	r	S	f	U	u	y	H	Y	:	

# Rear panel



No.	Name	Function
⑫	Terminal A1 to A6	A1, A2 : Sensor power supplies A3, A4 : Input terminals A5, A6 : Vacant terminals
⑬	BCD output connector	Open collector NPN transistor output
	Terminal RS-232C	B1 to B5:RS-232C communication B6: Vacant terminal
	Terminal RS-485	B1: + B2: - B4, B5: Terminal resistances B3, B6: Vacant terminals
⑭	Terminal C1 to C6	C1 to C4: Input terminals of controlling comparator C5, C6: Analog output terminals
⑮	Terminal D1 to D6	D1 to D6: HH, H, L and LL output terminals
⑯	Terminal E1 to E6	E1, E3: Power supply terminals E5: Ground terminal
		E2, E4, E6: Vacant terminals

※ ⑬, ⑭ and ⑮ are option specification

# Installation

## Installation conditions

Power supply	AC100 to 240V 50/60Hz, DC24V		
Voltage tolerance of power supply	AC90 to 250V, DC24V±10%		
Power consumption	During AC100V: Approx. 9VA, During AC200V: Approx. 12VA During 24VA: Approx. 200mA		
Operating ambient temperature	0 to 50°C, 40 to 85%RH (No condensation)		
Storage temperature	-20 to 65°C (No condensation)		
Weight	Approx. 300g		
Mounting method	Tighten from behind the panel with exclusive mounting bracket.		
Insulation resistance	Measuring input terminals – External Case	DC 500 V, More than 100 MΩ	
	Power supply terminal – External Case	DC 500 V, More than 100 MΩ	
	Power supply terminal – Measuring input	DC 500 V, More than 100 MΩ	
	Measuring input terminals – BCD output	DC 500 V, More than 50 MΩ	
	Measuring input terminals – Analog output	DC 500 V, More than 50 MΩ	
Withstand voltage	Measuring input terminals – External Case	AC 2000 V for one minute	
	Power supply terminal – External Case	AC 2000 V for one minute	
	Power supply terminal – Measuring input	AC1500 V for one minute	
	Measuring input terminals – BCD output, RS-232C, RS-485	AC 500 V for one minute	
	Measuring input terminals – Analog output	AC 500 V for one minute	
Protective structure	Front operation unit	IP65, Case part except front side	IP20,
	Terminal block	IP00	

## Accessories

Make sure that the following items are included with product supplied.

- 471C main unit
- Bracket 2pcs.
- Waterproof packing
- Quick Manual (This booklet)  
(For the model with RS-232C or RS-485, exclusive quick manual is included.)
- Unit Sticker
- Connector (2m with flat cable) (In case of BCD Output model)



# Mounting method

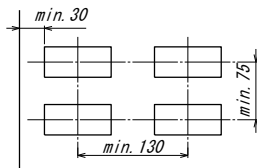
## Mounting pitch

Panel cutout dimensions:  $92^{+0.8}_0 \times 45^{+0.6}_0$  mm

Panel thickness: 0.6 to 3.5mm (Degree of protection IP65)

3.6 to 10mm (Degree of protection IP20)

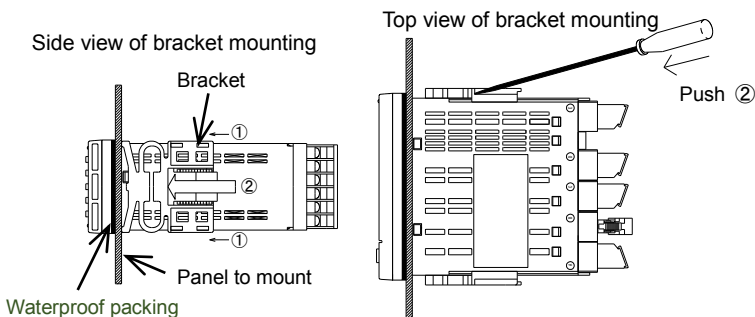
If the material of the panel is aluminum, it may be deformed due to its weak strength. So, it is recommended to use the thickness of aluminum panel sheet with at least 1.5mm.



Mounting pitch (Refer to the Right figure)

## Mounting method to panel

- 1** Insert the main unit fitted with the waterproof packing into the hole, from the panel front, and insert the attached bracket to the ditch on both sides of the main unit. Press the bracket as shown by arrow ① until the main unit is stably stays and fix the bracket. Do not remove it as the packing acts as stopper too. Refer to the side view drawing of the bracket mounting shown below.
- 2** To fix the main unit more firm, press the back part (center part) of the bracket indicated by arrow ② by screwdriver, which enhances the stopper strength.

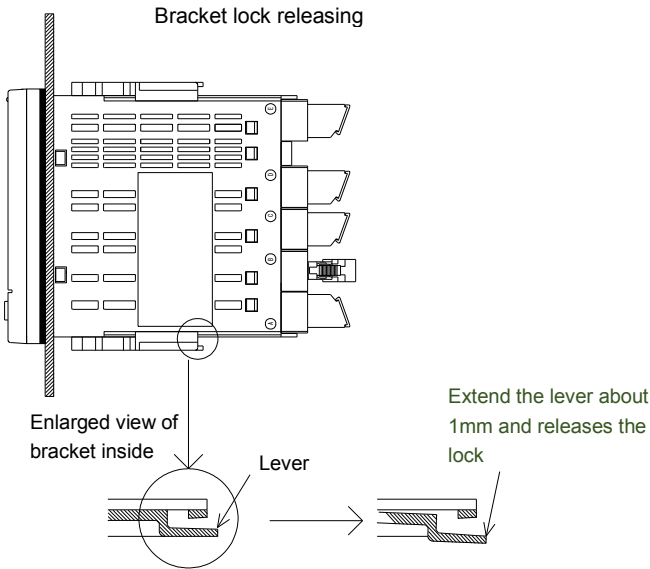


### ⚠ Caution

- When the bracket is pressed by minus screwdriver, press it to the direction as shown in arrow ②.  
The pressing of other part may cause the damage of bracket.

## Dismounting

- 1** The lever lock of bracket can be released by extending the lever outward about 1 mm by fingers as shown in figure below.
- 2** Keep extending the lever outward, slide the bracket backward of the main unit and remove it from the ditch.



### **Caution**

The extension of the lever or the stress to it by metallic piece like screwdriver for a long time may damage the lever.

# Wiring method

Remove the terminal base cover of the rear side terminal and conduct the wiring. Make sure that the terminal base cover is attached after wiring. If both options of comparison output and analog output are used, first complete the wiring of the comparison output and then start the wiring of analog output.

## Notes for wiring

---

### Warning

- To avoid an electrical shock, turn the power off when wiring.
- Do not conduct wiring at moistened place or by wetted hands. There may be risk of electric shock.
- Do not touch the terminals when turning the power on. There may be risk of electric shock.

### Caution

- Power supply and load should be within the suitable range as prescribed in specification. Negligence may cause the damage of products.
- Power supply should reach the rated power within a second.
- After the power is OFF, pause more than 10 seconds before the power ON again.
- Do not use the product with wrong wiring. It may be the cause of product damage.

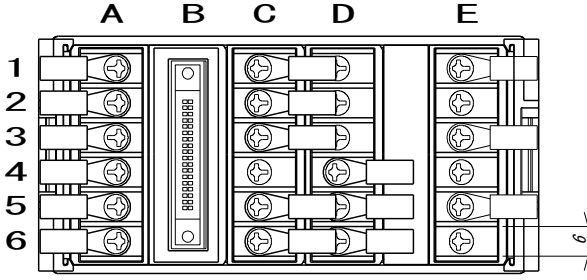
#### ◆ Others caution during wiring

- Always use input line and power line independently. If input line and power line are wired in parallel, it may cause an in stability of the display.
- When the auxiliary relay is operated by the relay output to run the electro- magnetic switch or big size relay, take the noise preventive measures.  
In case that the noise is frequently occurred, it will be effective to store the product in the shielded housing or to insert the power source line filter or insulated transformer.

# Installation (contd.)

## About the crimp terminal

### Direction of crimp terminal



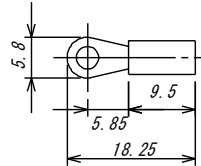
Recommended crimp terminal : V1.25-FS3

(Made of Fuji Terminal Industry Co., Ltd)

Ext. diameter of covered cable : Max.φ3.3

Terminal screw : M3

Crimp terminal: Refer figure at the right

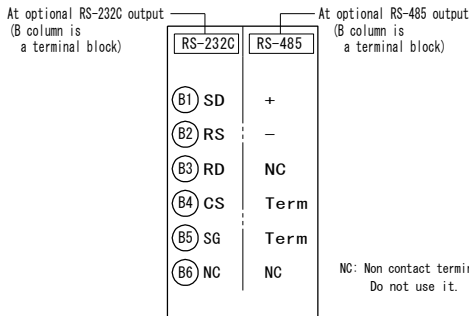
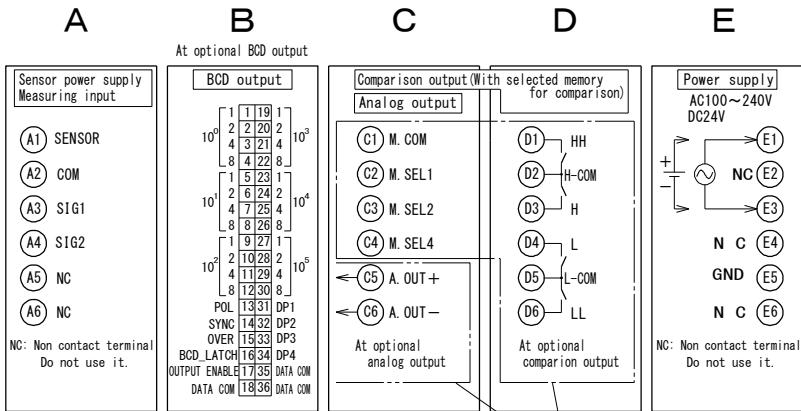
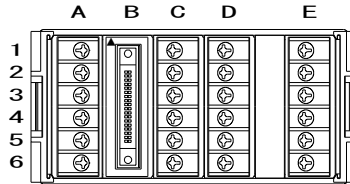


## ⚠ Caution

- For the column B (RS-232C and RS-485), column C and D terminal blocks, apply just one crimp terminal per terminal location.
- Do not wire the parallel connection, using two crimp terminals (overlying) at the same terminal location. It stresses the internal PCB and may cause the failure or trouble. As for the A column and E column terminal blocks, up to two crimp terminals per terminal location are acceptable.

# Terminal layout and explanation

## Rear side terminal



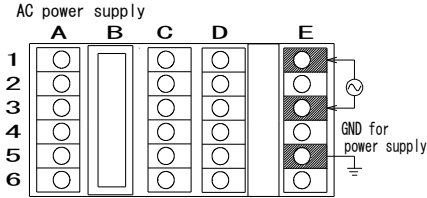
When there is no option, it becomes NC (Vacant terminal).

## ⚠ Caution

- Replacement of the above terminal units by customers themselves is prohibited because it may be the cause the damage of the product.

# Installation (contd.)

## Power supply connection



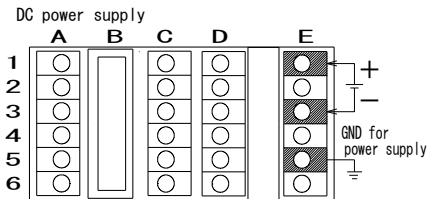
Connect the power supply at terminal No. E1-E3.

Power supply voltage is mentioned on the terminal nameplate at the time of shipment.

○ AC power supply

AC100 to 240V 50/60Hz

Permissible range AC 90 to 250V



○ DC power supply

DC 24V

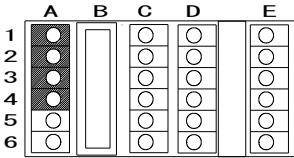
Permissible range DC24V±10%

## ⚠ Caution

- Do not use the voltage out of permissible range. It may be the cause of equipment damage.
- Power on / off, power supply should reach up to rated voltage or shut down within 1 second.
- After the power is OFF, pause more than 10 seconds before the power ON again.
- GND (ground) terminal

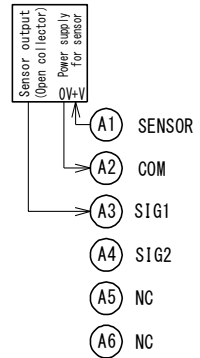
In case of frequent noise generation on the power source line, it is effective to earth the ground terminal directly to the ground. If the instrument is not affected by environmental noise, the grounding can be omitted. In this case, take care for the ground terminal not to touch other input terminals, as it is charged with neutral electric potential of power source voltage.

## Connection of input signal



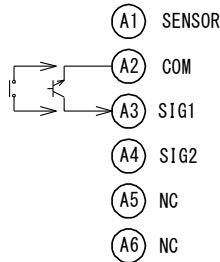
Power supply for the sensor is connected from terminal No. A1-A3. If the power supply of sensor is applied from external sources, the connection of terminal No. A1 will not be required. When sensor power source is not used, A1 will be vacant and do not used it for other purpose.

- + Sensor power supply  
Connection example of (+V, 0V)

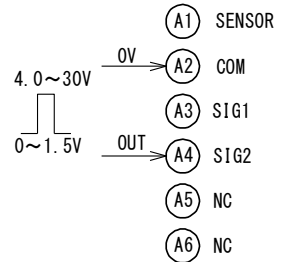


- Connection example of measurement input

No voltage contact or  
NPN open collector sensor



Voltage pulse output  
sensor

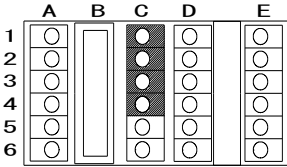


## ⚠ Caution

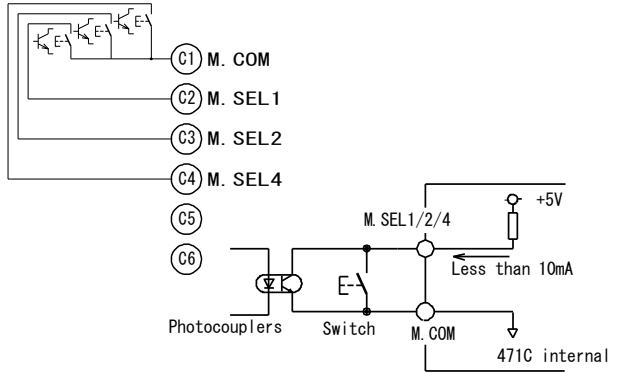
- If sensor power supply terminal A1 is accidentally short-circuited with COM terminal A2, it may cause malfunction of the product.

# Installation (contd.)

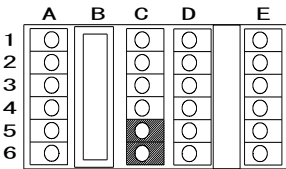
## Connection of selected memory for comparison



Input signals is set during the selection of memory of comparative setting value. The configuration is as below. Refer P.28 to confirm the Enable /Disable function of comparative output.

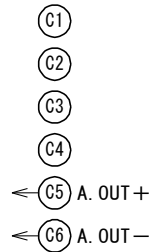


## Connection of analog output

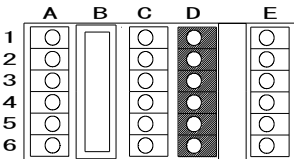


The analog output can be obtained from the Terminal No.C5-C6. Use analog output within the specified range of allowable load resistance.

(Refer Page 26 『Model Configuration』)



## Connection of comparison outputs (HH,H,L,LL)



Comparison output can be obtained in terminal No.

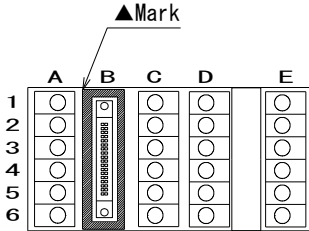
02-01, 02-03, 05-04 and 05-06.

Equal NG	Equal GO	
Displayed value $\geq$ Higher (HH) set value	Displayed value $>$ Higher (HH) set value	HH: 02-01
Displayed value $\geq$ High(H) set value	Displayed value $>$ High(H) set value	H: 02-03
Displayed value $\leq$ Low(L) set value	Displayed value $<$ Low(L) set value	L: 05-04
Displayed value $\leq$ Lower(LL) set value	Displayed value $<$ Lower(LL) set value	LL: 05-06

Contact capacity : AC/DC250V 200mA

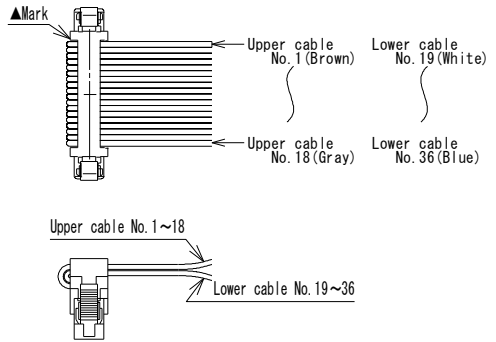


## Connection of BCD output



The configuration of 6 digits data output open collector (NPN) is shown as the connector arrangement of BCD output in page 11.

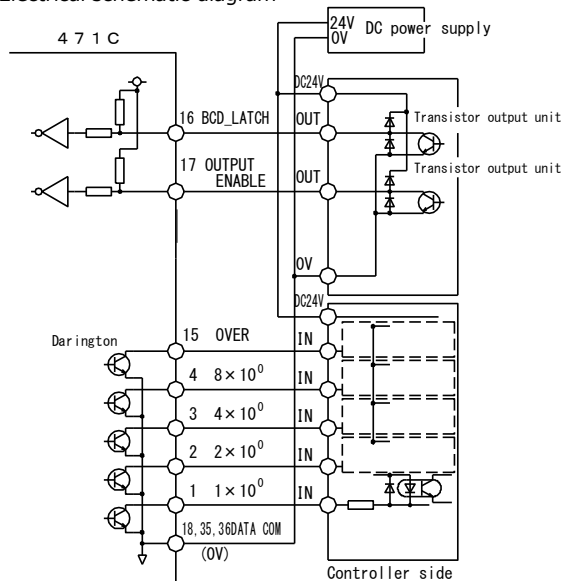
Control input pin 16 BCD\_LATCH, 17 OUTPUT ENABLE are shown in P.11 as the connector arrangement.



Accessory: Cable (5808-05) 2m

Connector (8822E-036-171-F, Kel Corp.)

## Electrical schematic diagram



# Usage of Function Code

## Function code list

### ● Display functions

Code No.	Function	Display 1	Setting range	Default Value
00	Key protect	KEY.	OFF, ON	OFF
01	Scale $\alpha$	SCALE	000001E-9 to 999999E-0	000001E-0
02	Decimal point	dP	0/0.0/0.00/0.000/0.0000/0.00000	0
03	Input frequency filter	FLFr.	0.02kHz/10kHz/30kHz/100kHz	10kHz
04	Display cycle	rRFE	00.1 to 19.9s	01.0
05	Number of moving average	nRAE.	01 to 10	1
06	Min. revolution No.	nMin.	000000 to 999999	000000
07	Cut-off time	CUT	000.1 to 150.0	006.0
08	Predicted function	PF.	OFF (Invalid) /ON (Valid)	OFF
09	Display of SV1, SV2	SVb.	OFF-OFF, PM-BM / OFF,HH,H,L,LL,PM-BM *1)	PM-BM
10	Display switch-off function	FURn.	0(OFF)/1(All display)/2(SV1, SV2), 0 to 99 minutes	0.01
11	Display color	Colo.	R(Red), G(Green)	G(Green)

\* 1) Display settings of HH,H,L,LL become enable, when comparison output function is on.

### ● Option comparison output function (HH,H,L,LL)

Code No.	Function	Display 1	Setting range	Default Value
40	Memory-enable	MEM.	OFF(Invalid) /ON(Valid)	OFF
41	HH compared value	RL.HH	000000 to 999999 *2)	999999
42	H compared value	RL.H	000000 to 999999 *2)	999999
43	L compared value	RL.L	000000 to 999999 *2)	000000
44	LL compared value	RL.LL	000000 to 999999 *2)	000000
45	Hysteresis	HYS.	01 to 99	01
50	Power-on delay	PdLY	1 to 99 seconds	1
51	HH comparison function	F.r.n.HH	OFF/ON	ON
52	H comparison function	F.r.n.H	OFF/ON	ON
53	L comparison function	F.r.n.L	OFF/ON	ON
54	LL comparison function	F.r.n.LL	OFF/ON	ON
55	Comparison condition	EQUL	GO (Equal 'GO'), NG (Equal 'NG')	GO

\* 2) The settings of MEM 1 to 8 become enable, when code No.40 'Memory-enable' function is on.

### ● Option BCD output, Analog output

Code No.	Function	Display 1	Setting range	Default Value
70	BCD logic switching	bPn	0: Negative, 1: Positive	0: Negative
76	Digit selection	dSEL.	0 (Last 4digits), 1 (Middle 4 digits), 2 (First 4 digits)	0
79	Full-scale	R.FUL.	0 to 9999	9999

● Option RS-232C, RS-485 output

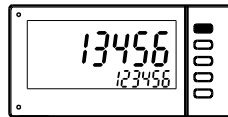
Code No.	Function	Display 1	Setting range	Default Value
80	Baud rate	<i>bAUD.</i>	4800, 9600, 19200bps	9600bps
81	Parity	<i>PARIT</i>	non(None), odd(Odd no.), even(Even no.)	non
82	BCC switching	<i>bCC</i>	ON, OFF	OFF
83	Device number	<i>rS.no.</i>	0 to 99	00

## Setting method of code No.

This is the basic input method of function code.

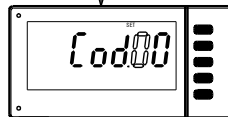
Following the setting of the Code No., perform the function setting on the following pages.

### Measurement Operation

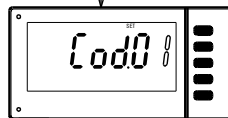


MODE  
Press 1 sec.

### Mode Setting (Set Code No.)



▶, ▲  
Select the Code No.



MODE  
Confirm

To function setting

Identification of the key color during set up is as follows.

Black key: Valid key

White key: Invalid key

[Common during the Setting mode]

During setting mode, if the key is not operated for about 5 minutes, the operation returns into measurement mode automatically. At this time, the setting contents are not saved.

Again, if P·B key is pressed for more than 1 second, the setting value which may be under changing process becomes invalid and returns to measuring process.

# Usage of Function Code (contd.)

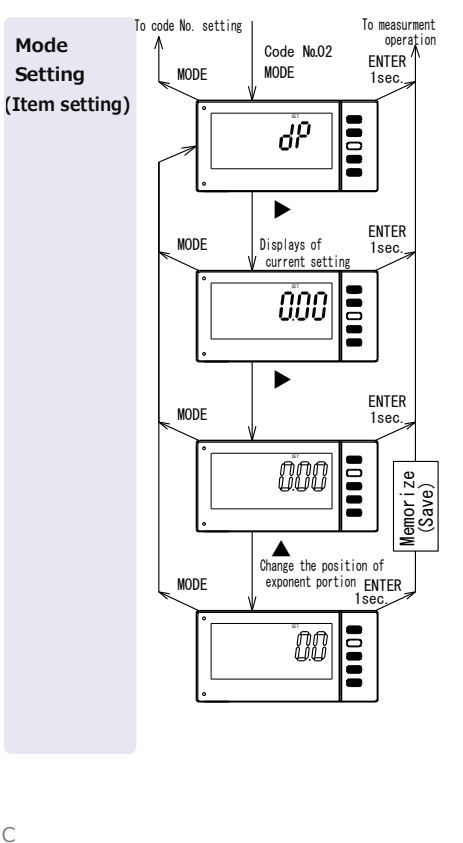
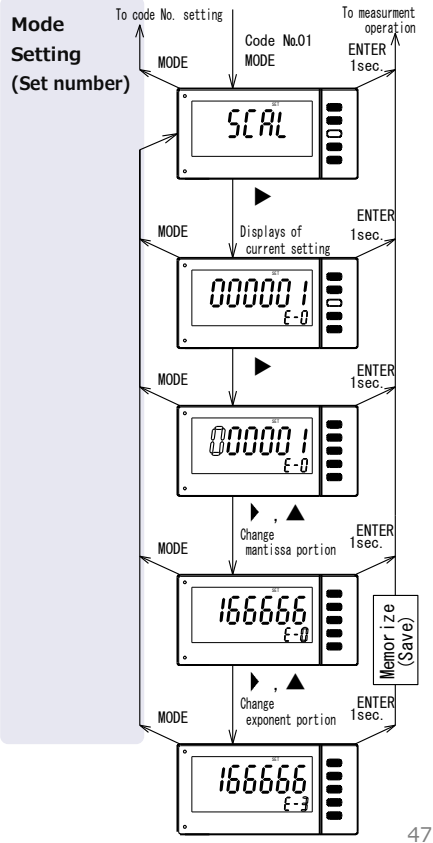
## Function setting method

The following is an example of the input function setting. Refer this page when changing to the setting other than factory setting value. Continue the following operation of the function setting after completion of setting method of code No. mentioned in previous page (page 17).

Code No.01 『Scale α』	Code No.02 『Decimal point』
Mantissa and exponent portion of scale α can be set. $\text{display} = f \times \alpha$ f: Input frequency, α: Scale value Setting range : $000001 \times 10^{-9} \text{ to } 999999 \times 10^{-0}$	The decimal point at an arbitrary position can be lit up. The decimal point is not linked with the setting of Scale α. It's just a function to display the decimal point of indication externally. Setting range : $0/0.0/0.00/0.000/0.0000/0.00000$

Ex.) Change from 000001E1-0 to 166666E-3.

Ex.) Change from 0.00 to 0.0.

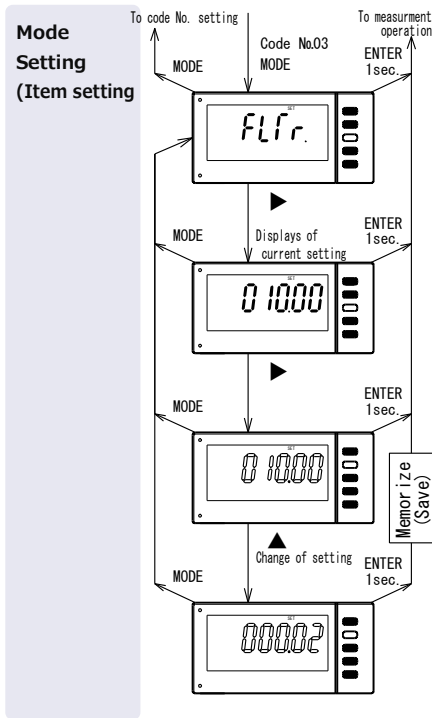


**Code No.03 『Input frequency filter』**

The High limit of Input frequency can be set.  
Set the Input frequency filter bigger than the max. frequency of Input signal.

Setting range : 100.00 : 0.0067Hz to 100kHz  
 030.00 : 0.0067Hz to 30kHz  
 010.00 : 0.0067Hz to 10kHz  
 000.02 : 0.0067Hz to 20 Hz

Ex.) Change from 10kHz (010.00) to 20Hz (000.02)

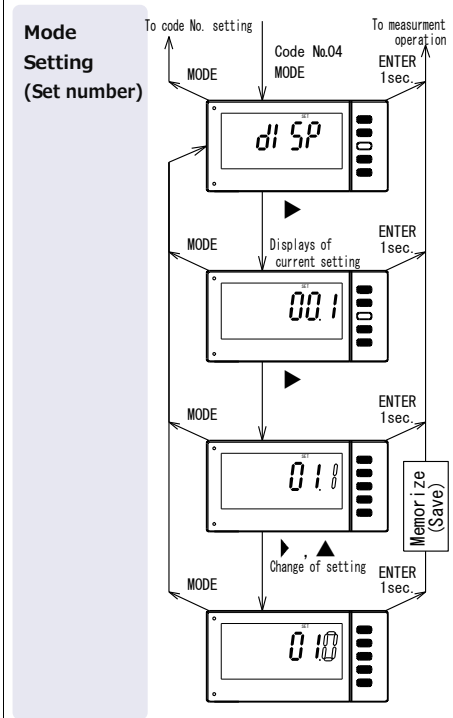


**Code No.04 『Display cycle』**

Averaged of new display cycle is shown.

Setting range : 00.1s to 19.9s

Ex.) Change from 00.1 to 01.0



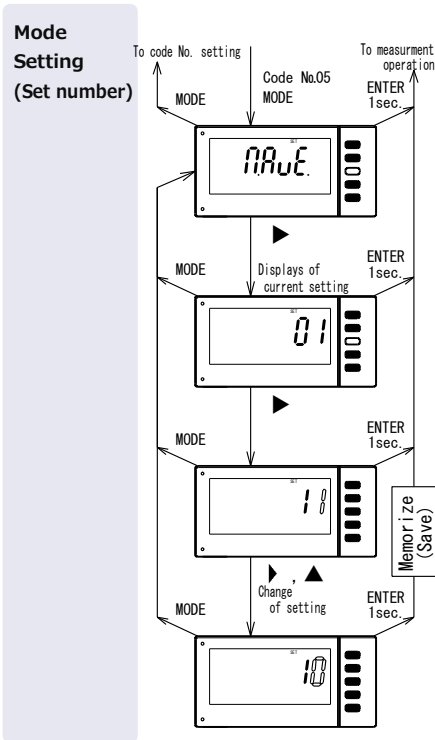
# Usage of Function Code (contd.)

## Code No.05 『Number of moving average』

The measured value of display cycle calculated by the moving average is displayed.

Setting range : 01 to 10 times

Ex.) Change from 01 to 10.

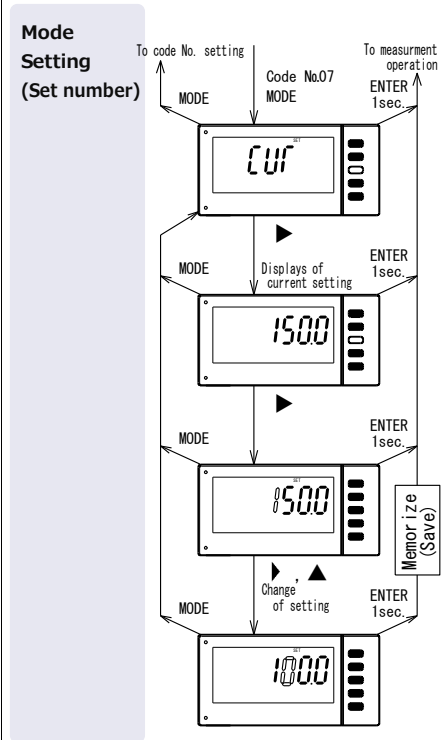


## Code No.07 『Cut-off time』

'0' display is shown when no signal comes over the Cut-off time regardless of display cycle. Set time longer than min. frequency time of input signal.

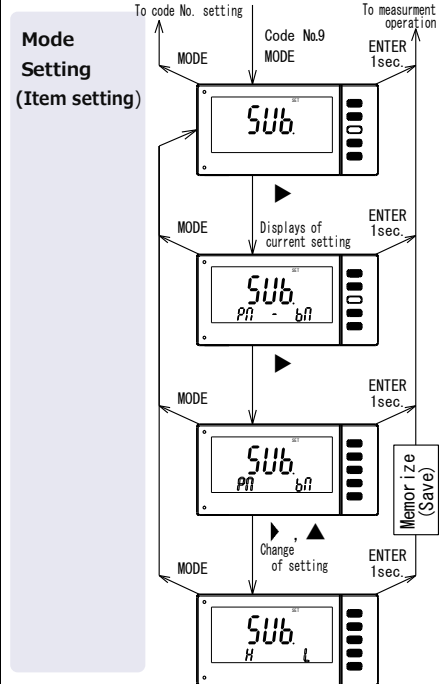
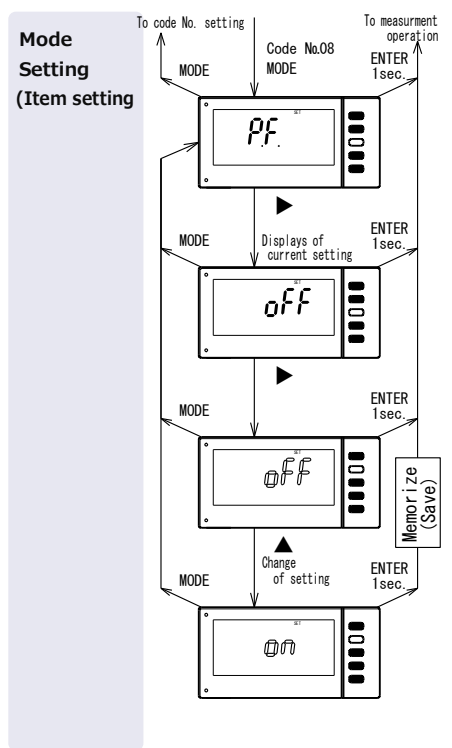
Setting range : 000.1 to 150.0s.

Ex.) Change from 150.0 to 100.0.



Code No.08 『Predicted operation function』	Code No.09 『SV1,SV2 display』
<p>Display of linear calculation is predicted in between after the stoppage of pulse input to Cut-off time.</p> <p>Setting range : ON (Valid) OFF (Invalid)</p>	<p>The values of SV1 and SV2 can be set here.</p> <p>1) Without Comparison output Setting range : OFF (SV1, SV2 No Display) PM BM (SV1:PM, SV2:BM)</p> <p>2) With Comparison Output Setting range : PM BM fixed (SV1:PM, SV2:BM) OFF, HH, H, L, LL (SV1, SV2)</p>

Ex.) Change from OFF to ON. Ex.) Change 2)With Comparison output from SV1:PM, SV2:BM to SV1:H, SV2:L.



Note : The display turns off, when the setting values and HH, H, L, LL Comparison function (Code No.51. 52. 53. 54) are off.

Function mentioned above are the main setting methods. The setting of the other operation methods are also like the setting method of the Code No.01 to 09. The detail description of the setting ranges are omitted here. Please perform the other setting when necessary referring the Function Code List mentioned on Page 16.

# Usable Operation

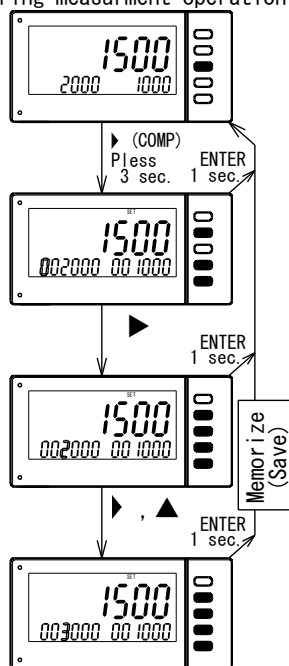
## Changing comparison values of SV1 and SV2

When comparison values of SV1 and SV2 are displaying, the values of SV1 and SV2 can be changed easily without using setting mode.

The Comparison values on SV1 and SV2 can be changed by pressing ▼(COMP) key for more than 3 sec.

Ex.) Change from 'SV1 002000、SV2 001000' to 'SV1 003000、SV2 001000'.

During measurement operation



During setting,  
if 'P.B' key is pressed for more than 1 sec,  
new setting value becomes invalid and returns  
to measuring operation.

Note: This function cannot be used when Key-protection is valid.  
To use this function, cancel Key-protection.



# Teaching function

When the actual revolution number can be confirmed, the scaling calculation can be omitted. The change of display values and error correction can be adjusted by using front panel keys only.

Teaching function can not be used, when revolution number is set beyond its range and "Err" is displayed.

The calculated value of Scale  $\alpha$  is rounded up avoiding the decimal figure.

Setting value may not be displayed depending on the setting of input and Teaching function value.

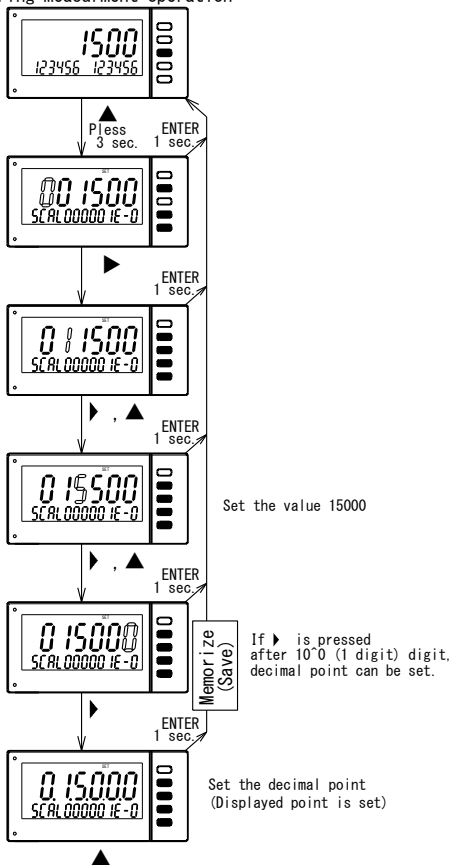
When  $\blacktriangle$  Key is pressed for more than 3 sec., Teaching function can be activated.

Ex.) Change from the display of 1500 to 150.00

Note: This function can not be used, when Key-protection is valid.

To use this function, cancel Key-protection.

During measurement operation



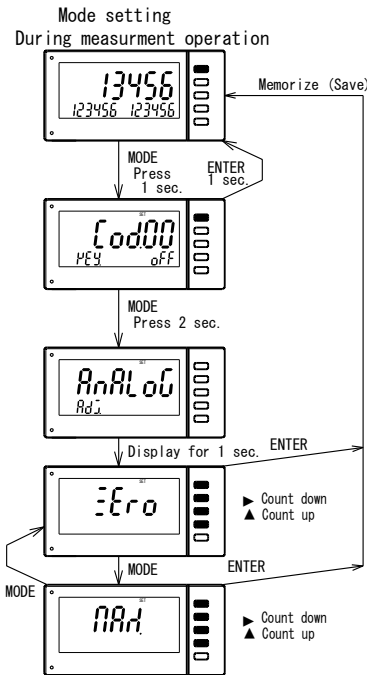
During setting,

if 'P.B' key is pressed for more than 1 sec, new setting value becomes invalid and returns to measuring operation.

# Adjustment of analog output (Option)

Fine Adjustment of Analog output (Option) can be done.

If MODE is pressed continuously during measurement, 'AnALoG AdJ.' is displayed and fine adjustment can be done.



Adjust output by multi-meter etc.

Analog rated output	Adjustment point
0 ~ 5V	0V
0 ~ 10V	0V
1 ~ 5V	1V
4 ~ 20mA	4mA

Adjust output by multi-meter etc.

Analog rated output	Adjustment point
0 ~ 5V	5V
0 ~ 10V	10V
1 ~ 5V	5V
4 ~ 20mA	20mA

Note: This function can not be used, when Key-protection is valid.  
To use this function, cancel Key-protection.

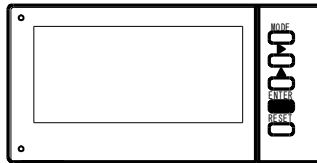
# Restore to the factory setting

For the following case, restore to the factory setting first and then change to setting depending on the specification and suitable requirement.

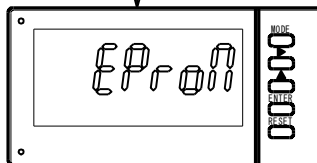
- When display function or each output function of this model are required to change because of the change of specification of sensor or measuring device.
- When this model is used to instrumentation system having different specification.

Restore to the factory.

Power off



Power ON while pressing Enter  
for more than 5 sec.

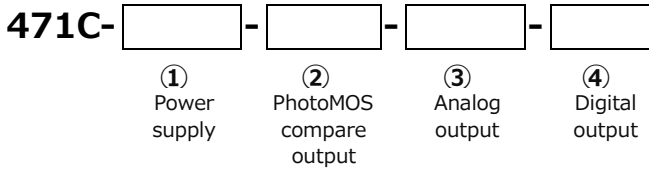


If Enter is released,  
setting returns to factory default value.

※ By doing this, the setting range of Function code (Code No.01~83) and 『Adjustment of Analog Output(Optional)』 returns to the factory setting.

# Specification

## Model configuration



Addition No.	Function	Symbol	Contents	
①	Power supply	A	AC100 to 240V	
		9	DC24V	
②	PhotoMOS compare output	X	No output	
		2	4 photoMOS Relays (HH, H, L, LL)	
③	Analog output	X	No output	Allowable load resistance
		04	DC0~5V	More than 1kΩ
		05	DC0~10V	More than 1kΩ
		09	DC1~5V	More than 1kΩ
		29	DC4 to 20mA	Less than 510Ω
④	Digital output	X	No output	
		DN	BCD output	Open collector output (NPN)
		E0	RS-232C	
		E1	RS-485	

## General specification

Measurement input	SIG1 : No-voltage contact or NPN open collector Open collector residual voltage less than 3V Contact capacity DC12V 10mA SIG2 : Voltage pulse Input resistance approx. 24k $\Omega$ L=0 to 1.5V, H=4.0 to 30V
Display (LCD)	7 segment display Display 1 :Character height 15.2mm Red/Green SV1,SV2: Character height 7.6mm White color With zero suppress function
Display range	display 1 : 0 to 999999 SV1,SV2: 0 to 999999
Decimal point	10 <sup>1</sup> , 10 <sup>2</sup> , 10 <sup>3</sup> , 10 <sup>4</sup> , 10 <sup>5</sup> Optional selection (External control not allowed)
Over display	display 1 OVER Light up during over (Red) Exceeds 999999, OVER Light up - - - - - displayed
Display cycle	Approx. 0.1 to 19.9s
Cut-off time	Approx. 0.1 to 150.0s
Min. Rotation number	000000 to 999999
Moving average Number	1 to 10 times
Input Frequency	0.0067Hz to 100kHz 0.0067Hz to 30kHz 0.0067Hz to 10kHz 0.0067Hz to 20 Hz
Display scale	display = f $\times$ $\alpha$ f:Input frequency, $\alpha$ : Scale value 00001 $\times 10^{-9}$ to 99999 $\times 10^{-0}$
Display accuracy	$\pm$ (0.008% + 1digit) at 23 $^{\circ}$ C $\pm$ 5 $^{\circ}$ C 45 to 75%RH
Power supply line mixed noise	1000V (AC power supply)
Sensor power supply	DC12V $\pm$ 10% 80mA

# Option Output

## PhotoMOS compare output

This is the setting change method of photoMOS compare output. Continue the following operation after the steps (Setting method of Code No.) mentioned on page 17.

**Code No.40 『Memory enable』**

**Code No.41 『HH compared value』**

**Code No.42 『H compared value』**

**Code No.43 『L compared value』**

**Code No.44 『LL compared value』**

This is the function where selected memory of comparison can be set On or OFF.

The compared value of HH, H, L, LL can be set.

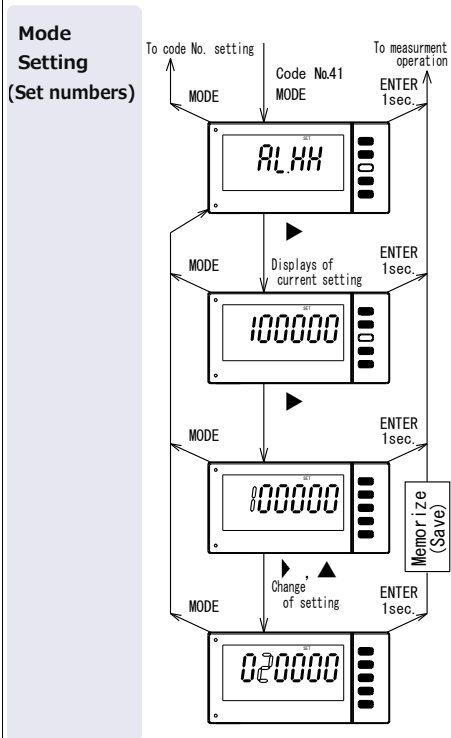
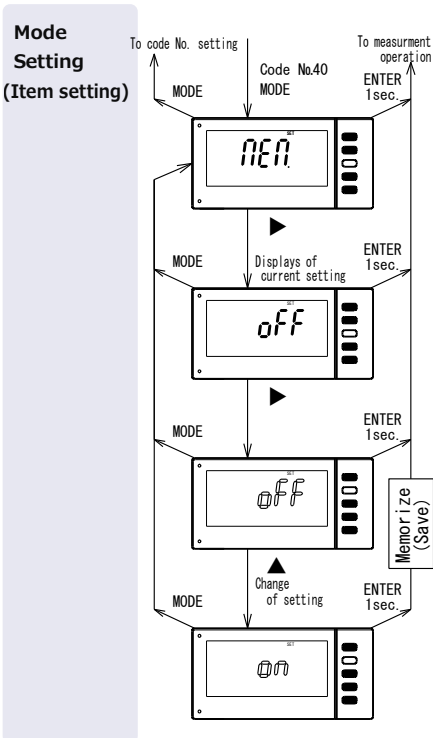
[When setting of 'Memory Enable'(CodeNo.40) is OFF]

Setting range : OFF (Invalid)  
ON (Valid)

Setting range : 0 to 999999

Ex.) Change from OFF to ON

Ex.) Change the compared value HH 100000 to 020000



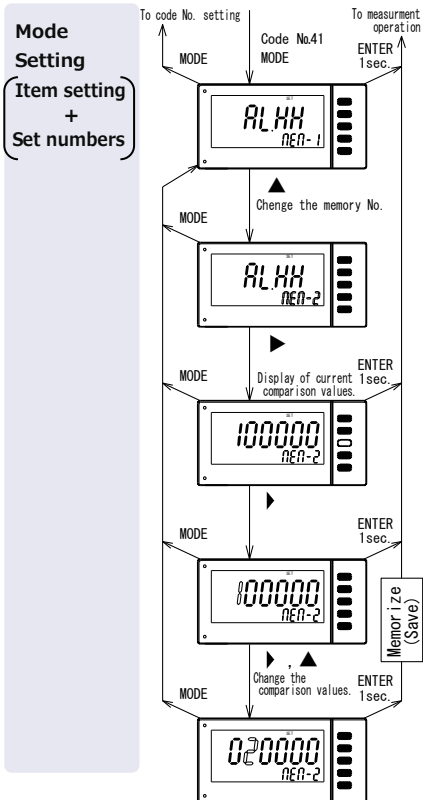
## コードNo.45 『Hysteresis』

The comparison value of HH, H, L, LL can be set.

【Setting of 'Memory Enable'(CodeNo.40) is ON】

Setting range : Memory No.1 to 8  
0 to 999999

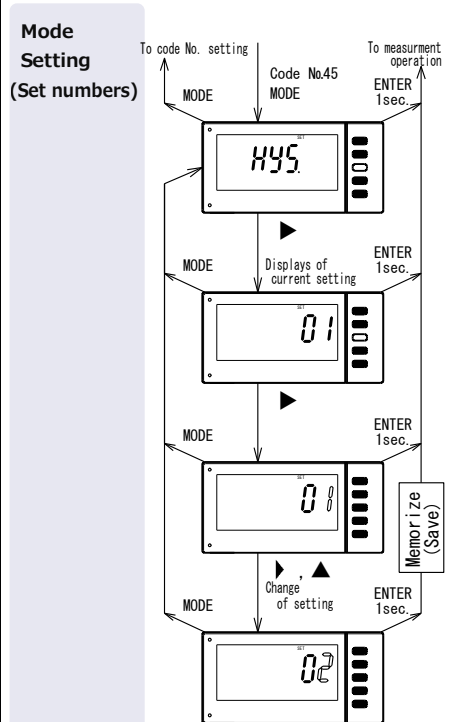
Ex.) Change comparison value HH Memory  
No.2 from 100000 to 020000.



The width of HH, H, L, LL comparison can be set.

Setting range : 01 to 99

Ex.) Change Hysteresis from 01 to 02.



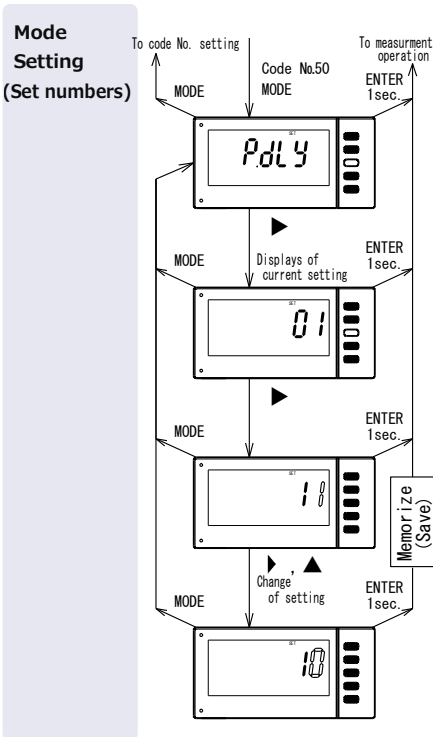
# Option Output (contd.)

## Code No.50 『Power-on delay』

When power is supplied, set the time until comparison output becomes ON.

Setting range : 01 to 99s

Ex.) Change from 01 to 10.



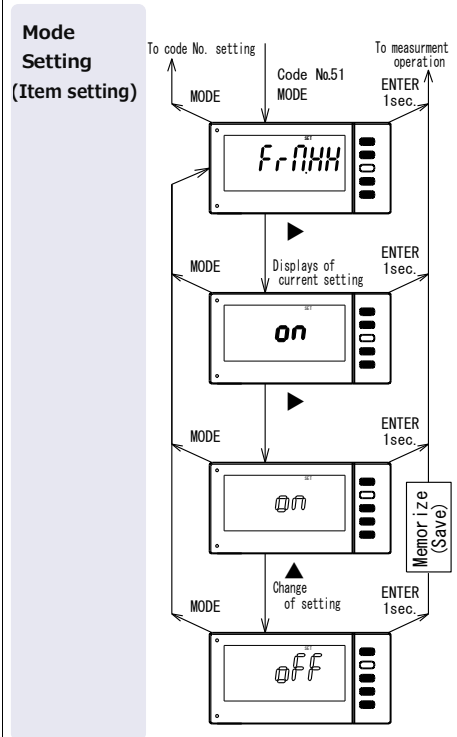
## Code No.51 『HH comparison function』 Code No.52 『H comparison function』 Code No.53 『L comparison function』 Code No.54 『LL comparison function』

The comparison function HH, H, L, LL can be set.

Setting selection:

- OFF (No Comparison function)
- ON (With comparison function)

Ex.) Change comparison value HH from ON to OFF.



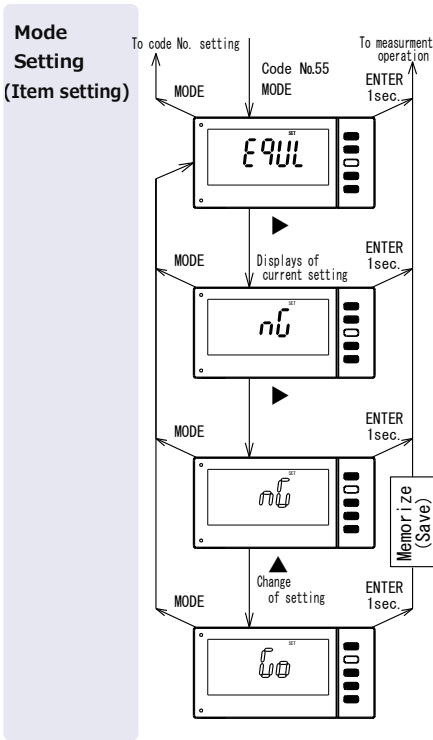


コードNo.55 『Comparison condition』

Switching the comparison condition of HH, H, L, LL to Equal NG or Equal GO can be done.

Setting selection : GO,NG

Ex.) Change from NG to GO.



## Option Output (contd.)

# Analog output

Refer page 9 for "Wiring method" of this manual for the connector arrangement. Also refer page 26 for "Model configuration" of the rated output and external resistance load.

The measurement input and the analog output are insulated.

Accuracy	$\pm(0.5\% \text{ of F.S.})$ at $23^{\circ}\text{C}\pm 5^{\circ}\text{C}$
Output cycle	Approx. 100ms
Response speed	Approx. $(1/\text{Input frequency}) + 100\text{ms} + 125\text{ms}$ Condition Input frequency (0→less than 10Hz), Input frequency filter (0.02kHz), Display cycle(100ms),0→100% output Approx. 100ms + 225ms Condition Input frequency (0 → more than 10Hz), Input frequency filter (0.02kHz), Display cycle (100ms),0→100% output
Select the digit of output data	Selection of Display 1 and setting mode can be selected either one type of first 4 digits or middle 4 digits or last 4 digits from 6 digit display .
Output Scaling	Full scale setting range 0000 to 9999

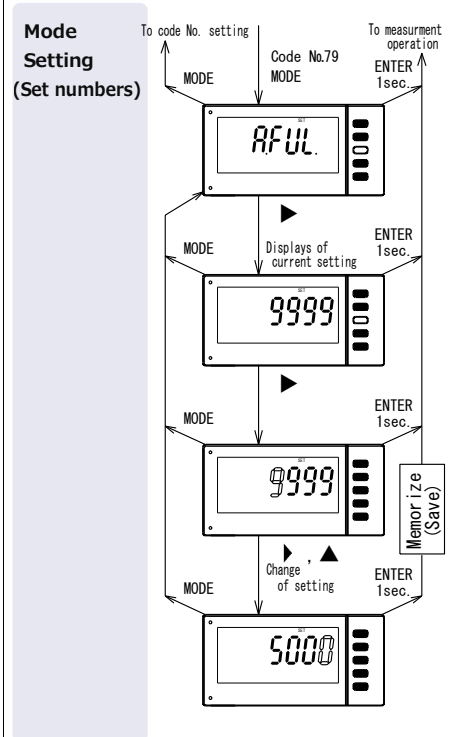
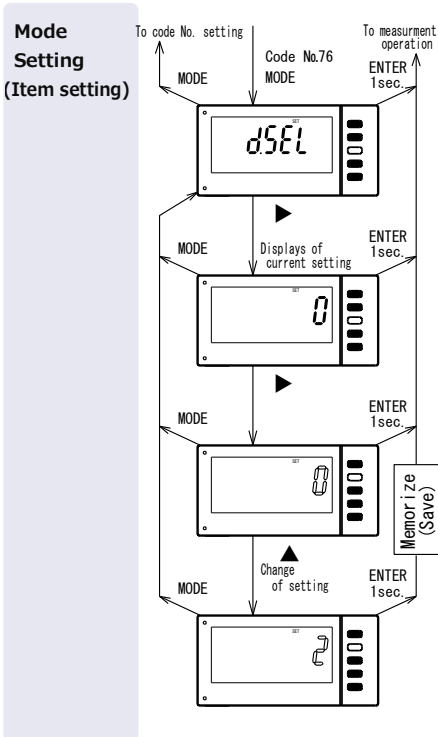
## Function setting

This is the setting change method of analog output. Continue the following operation after the steps (Setting method of Code No.) mentioned on page 17.

Code No.76 『Selection of digit』	Code No.79 『Full scale of analog output』
<p>Out of 6 digits, analog output can be obtained by 4 digits conversion. That 4 digits can be selected from the last 4 digits, middle 4 digits or the first digits.</p> <p>Setting selection: 0 (last 4 digits), 1 (middle 4 digits) , 2 (first 4 digits)</p>	<p>The display equivalent to the max. value can be specified.</p> <p>Setting range : 0000 to 9999</p>

Ex.) Change from 0(last 4 digits) to 2(first 4 digits) .

Ex.) Change of analog display setting from full scale 9999 to 5000.



## Option Output (contd.)

# BCD output (Digital output)

Refer page 9 for "Wiring method" of this manual for the connector arrangement.

The measurement input and the BCD output are insulated.

### Output

Open collector	Sink type, Contact capacity	DC30V10mA
Data BCD 6 digits	display 1 output	ON(Negative logic), OFF(Positive logic)
Over (OVER)	Exceeds 999999, output	ON(Negative Logic), OFF(Positive Logic)
Decimal point (DP1 to 4)	Output in correspond to the display of decimal point	ON(Negative logic), OFF(Positive logic)
Polarity (POL)	+	OFF(Negative logic), ON(Positive logic)
Logic switching	Logical setting of Data, Over, Decimal point and Polarity can be set to switch.	
Synchronization signal (SYNC)	Pulse output become ON approx. for 10ms Read the data at good SYNC rising time.	
BCD output cycle	Approx. 100ms	

### Control input

Input current	Less than 1mA, OFF(H Level)=3.5 to 5V, ON (L Level)=0 to 1.5V
BCD_Latch (BCD_LATCH)	When BCD_Latch pin is short circuited with DATA COM or set to L level, only BCD is retained. Display is done continuously.
Data enable (OUTPUT ENABLE)	When data enable pin is released (OFF), output data (OVER INCLUDED) is obtained. When data enable pin is shorted with DATA COM pin or set to L level, data (OVER INCLUDED) becomes OFF state, SYNC output is prohibited, and the connect to the system data bus becomes easy. (Display is not retained).

Accessory : BCD Cable 2m (Model 5808-05)

## Function setting

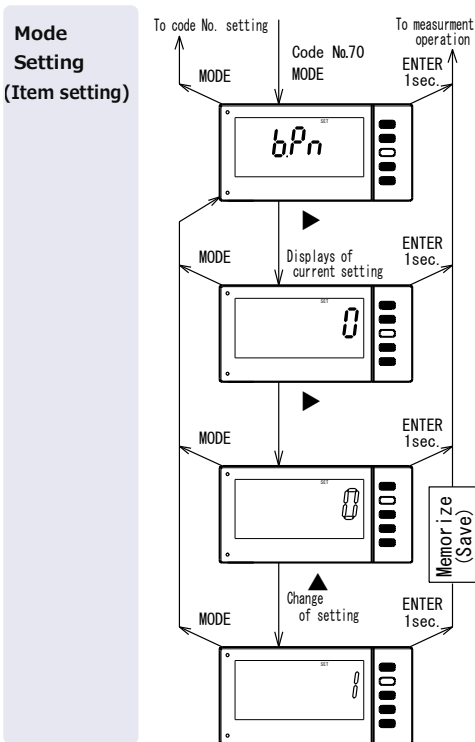
This is the setting change method of BCD output logic switching. Continue the following operation after the steps (Setting method of Code No.) mentioned on page 17.

### Code No.70 『BCD output logic switching』

Logic setting of BCD data, over, decimal point and polarity can be set to switch.

Setting selection: 0 (Negative logic), 1 (Positive logic)

Ex.) Change from 0(Negative logic) to 1 (Positive logic) .







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Tachometer

471C

# RS-232C RS-485 Output

## Quick Manual



# Contents

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# About this booklet

Thank you for purchasing Tsuruga product. This is the quick optional manual for RS-232C, RS-485 output. Refer the quick manual of the main body for cautions beside the usage the RS-232C, RS-485 output, installation, operation etc.

Before use of the product, read this quick manual carefully and thoroughly, and keep it available for routine reference.

The following symbol marks are used in this quick manual for the safety use of the product.



**Warning**

This is the warning to avoid danger. Severe injury or fatal accident may occur to the user in case the product is mishandled.



**Caution**

This is the caution to avoid danger. Minor injury to the user or physical obstacle may occur in case the product is mishandled.

# Model name for communication output

4 7 1 C-□-□-□-□  
① ② ③ ④

④ Digital output

Addition No.	Output specification
E0	RS-232C output
E1	RS-485 output

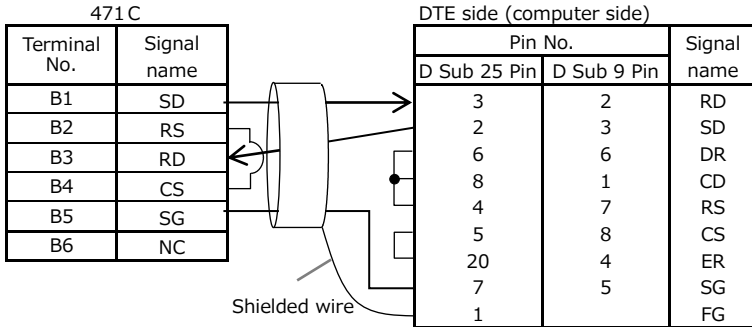
## Common specification

The measurement input and the communication I / O are insulated.

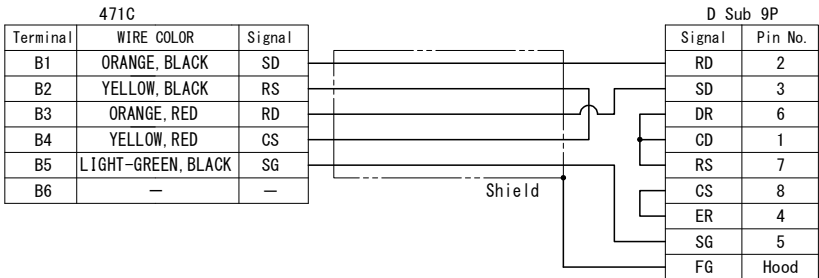
Transmission method	Asynchronous half duplex method
Transmission speed	4800,9600, 19200bps
Data length	8bit
Parity	None, even number, odd number
Stop bit	1bit
Data	Conform to JIS 8 unit code
X Parameters	None

# Connector arrangement and connection method

## RS-232C



Optional : RS-232C cable 2 m (Model 5858-10)



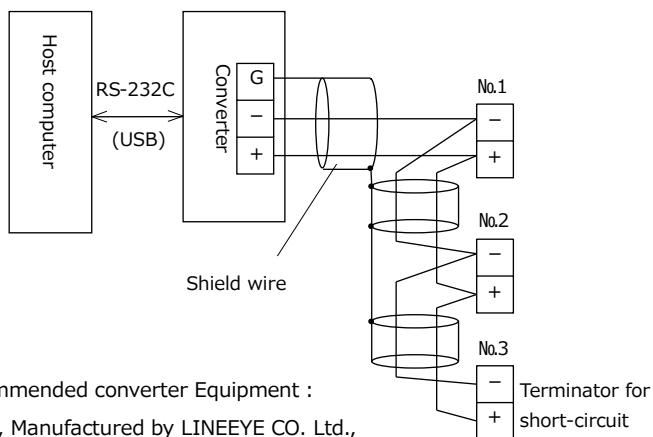
Fixed screw : #4-40 inch short screw

## RS-485

Terminal No.	Signal name	Description
B1	+	"+" Indicates non-inverted output
B2	-	"-" indicates inverted output
B3	NC	
B4	Term	When the terminals are short-circuited, a terminating resistor of 200 Ω is connected in parallel to the line.
B5	Term	
B6	NC	

## Connection

RS-485 can be linked up to 32 computers including the host computer. It is necessary to specify the end station for the both end of the equipment in the transmission line. Make short circuit the terminator for specific end station. Lead wire for short-circuit is not included. Besides that, conduct the setting of the terminator by RS-232C/RS-485 converter.



## Function code

Communication setting is done by front key operation. When changing to a setting other than the factory set value, please refer " Setting method of code No." of the Quick Manual of model 471C on page 17.

<b>Baud rate</b> (Code No.80) :	Baud rate can be selected. Setting Range 4800, 9600, 19200bps
<b>Parity</b> (Code No.81) :	Parity can be selected. Setting Range non(None), odd(Odd no.), even(Even no.)
<b>BCC switching</b> (Code No.82) :	Selection with or without BCC can be done. The results obtained by calculating the exclusive OR from immediately after STX value to EXT (EXT included), are added after the ETX. Setting Range ON, OFF
<b>Device number</b> (Code No.83) :	Device number can be selected. Setting Range 0 to 99

# Communication command (RS-232C, RS-485 common)

## Caution

About the command when power is turned ON,

- When the power is turned ON, supply power should rise up to the rated voltage within 1 second.
- There have been some cases of not being able to response the command even 3 seconds after the power supply reached the rated voltage because of initialization of 471C. As there may be cases of responding undefined data too, it is highly advised to communicate only after it has reached to rated voltage more than 3 seconds.

## Instructions about the comment

---

- If there is BCC function, BCC is added after the ETX

The results obtained by calculating the exclusive OR from immediately after STX value to EXT (EXT included), are added after the ETX.

- Configuration of frame

Command frame :

STX + Device No. + Command + ETX + (BCC)

Response frame :

STX + Device No. + Exit code + Response + ETX + (BCC)

- Only first 4 characters of the command letters will be valid.

Example) "RMREAD" → "RMRE"

- Setting items represented either by numbers or characters will be valid.

Example) "WC52 0" or "WC52 OFF"

- Number setting

Set a value that does not include the decimal point of the display. (display cycle , cut-off time , comparison value, analog output full scale)

- Exit code : Returns to reception status of the command frame

Exit code	Contents
A (41H)	Normal end
B (42H)	Under setting (In case of communication during setting)
C (43H)	Setting error (Out of setting range or error)
D (44H)	BCC error (If BCC function is available)
P (50H)	Command error (When the received command becomes unable to analyze)

Response during the command error

STX	Device No.:00	Exit code	ETX	(BCC)
(02H)	(30H)	(30H)	(50H)	(03H)

Response during the setting time.

STX	Device No.:00	Exit code	ETX	(BCC)
(02H)	(30H)	(30H)	(42H)	(03H)

## Command/Response

### ◆ Measurement command

Command : RMREaD Current value of requested data

Response : Response to RMREAD

### ◆ Current value of requested data

Command : RMREaD Read out current value data

Response : Response to RMREAD

Data format

\_+1.99999E+3

(a) (b)

+1000.00

(a)	_ (20H space) : Within measurement range * (2AH) : 6 digits over
(b)	Measurement value

Command frame :

STX	Device No.:00	R	M	R	E	A	D	ETX (BCC)
02H	30H	30H	52H	4DH	52H	45H	41H	44H

Response :

STX	Device No.:00	Exit code	_	+	1	.	0	0	0	0	0
02H	30H	30H	41H	20H	2BH	31H	2EH	30H	30H	30H	30H

E	+	3	ETX (BCC)
45H	2BH	33H	03H

## Reading of the device information

Command : IDNT? Reading of the device information

Response : Response to IDNT

471C, No. 949-100 [Model No., Software registration No. (Tsuruga)]

Command frame :

STX	Device No.:	00	I	D	N	T	?	ETX	(BCC)
02H	30H	30H	49H	44H	4EH	54H	3FH	03H	

Response :

STX	Device No.:	00	Exit code	4	7	1	C	,	N	o	.	9	4	9	-	1	0	0	ETX	(BCC)
02H	30H	30H	41H	34H	37H	31H	43H	2CH	4EH	6FH	2EH	39H	34H	39H	2DH	31H	30H	30H	03H	

## Reading of judgment

Command : ALARM Reading of Judgment

Response : Response to ALARM

※It provides the status of comparison output. In the example, it is the sum of the weights of HH and H (01+02=03) . Please, refer the Judgment Command on page 9 for the detail reference.

01 (HH output)

Command frame :

STX	Device No.:	00	A	L	A	R	M	ETX	(BCC)
02H	30H	30H	41H	4CH	41H	52H	4DH	03H	

Response :

STX	Device No.:	00	Exit code	0	1	ETX	(BCC)
02H	30H	30H	41H	30H	31H	03H	

## Reading of setting data

Command : RC41 HH comparison value setting reading  
(HH comparison value 002000 read)

Response : Response to RC41

002000

Command frame :

STX	Device No.:	00	R	C	4	1	ETX	(BCC)
02H	30H	30H	52H	43H	34H	31H	03H	

Response :

STX	Device No.:	00	Exit code	0	0	2	0	0	0	ETX	(BCC)
02H	30H	30H	41H	30H	30H	32H	30H	30H	30H	03H	



## Setting of data setting

NOTE) When setting value of input frequency filter is changed during the measurement process, measurement is stopped. The measurement can be started again after completion required setting parameter.

Command : WC41\_002000 HH comparison value setting  
(HH comparison value set to 002000)

Response : Response to WC41\_002000  
002000

Command frame :

STX	Device No.:00	W	C	4	1	_	0	0	2	0	0	0	0	ETX (BCC)
02H	30H	30H	57H	43H	34H	31H	20H	30H	30H	32H	30H	30H	30H	03H

Response :

STX	Device No.:00	Exit code	0	0	2	0	0	0	ETX (BCC)
02H	30H	30H	41H	30H	30H	32H	30H	30H	03H

## Memory control command

- Write commend

Write the setting data into the EEPROM

Command : STOR

Response : Exit code

Command frame :

STX	Device No.:00	S	T	O	R	ETX (BCC)
02H	30H	30H	53H	54H	4FH	03H

レスポンス :

STX	Device No.:00	Exit code	ETX (BCC)
02H	30H	30H	41H 03H

Normal exit

- Memory Initialization

Setting data resets to the value during the factory shipment time. But, the transmission speed, parity, BCC switch and device number cannot brought bring to default value.

Command : DEFAULT

Response : Exit code

Command frame :

STX	Device No.:00	D	E	F	A	U	L	T	ETX (BCC)
02H	30H	30H	44H	45H	46H	41H	55H	4CH	03H

Response :

STX	Device No.:00	Exit code	ETX (BCC)
02H	30H	30H	41H 03H

Normal exit

## Command list

Setting command	Required setting command		Specified setting command		
	Command	Response	Command frame	Response	Setting item, Range
Scale $\alpha$	RC01	999999E-0	WC01 999999E-1	999999 E-1	000001~999999
Decimal point	RC02	0	WC02 1	1	0(0), 1(0.0), 2(0.00), 3(0.000),4(0.0000), 5(0.00000)
Input frequency filter	RC03	0	WC03 1	1	0(0.02kHz), 1(10kHz), 2(30kHz),3(100kHz)
Display cycle	RC04	001	WC04 199	199	001~199(0.1~19.9)
Number of moving average	RC05	01	WC05 10	10	01~10
Min. revolution No.	RC06	000000	WC06 999999	999999	000000~999999
Cut-off time	RC07	0000	WC07 1500	1500	0000~1500(0.0~150.0)
Predicted function	RC08	0	WC08 1	1	0 (Invalid), 1(Valid)
Display of SV1, SV2	RC09	1,1	WC09 3,4	3,4	SV1,SV2:0(OFF),1(PM), 2(HH),3(H),4(L),5(LL)
Display switch-off function	RC10	1,99	WC10 1,99	1,99	0 (Invalid), 1(All display) 2(SV1,SV2),0~99
Display color	RC11	0	WC11 1	1	0(RED),1(GREEN)
Memory-enable	RC40	0	WC40 1	1	1(ON)/ 0(OFF)
HH compared value	RC41	999999	WC41 999999	999999	000000~999999
H compared value	RC42	999999	WC42 999999	999999	000000~999999
L compared value	RC43	999999	WC43 999999	999999	000000~999999
LL compared value	RC44	999999	WC44 999999	999999	000000~999999
Hysteresis	RC45	0	WC45 01	01	01~99
Power-on delay	RC50	1	WC50 01	01	01~99
HH comparison function	RC51	0	WC51 1	1	1(ON)/ 0(OFF)
H comparison function	RC52	0	WC52 1	1	1(ON)/ 0(OFF)
L comparison function	RC53	0	WC53 1	1	1(ON)/ 0(OFF)
LL comparison function	RC54	1	WC54 0	0	1(ON)/ 0(OFF)
Comparison condition	RC55	0	WC55 0	0	0(GO)/ 1(NG)
Digit selection of analog output	RC76	0	WC76 0	0	0 (Last 4digits), 1 (Middle 4 digits), 2 (First 4 digits)
Full scale of analog output	RC79	9999	WC79 9999	9999	0000~9999
Key protection	RC00	1	WC00 0	0	1(ON), 0(OFF)

Command of measurement data	Required measurement data command	
	Command	Response
Measurement data	RMREaD	_+1.00000E+3

Judgment command (Result output of currently judgment)	Judgment request command			
	Command	Response	Item	
HH, H, L, LL	ALARM	00	Output status	
			Weight of data	
			HH	01
			H	02
			L	04
			LL	08

Memory control command	Required control command		Specified control command	
	Command	Response	Command frame	Response
Write			STOR	Exit code
Initialization			DEFAULT	Exit code

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