TSURUGA

Panel meter with totalized function
Pulse input

471B

Quick Manual

Contents

Introduction

About this booklet

Thank you for purchasing our digital panel meter 471B. 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 injure 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.

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 471B. It immediately starts to operate after turning the power ON.
- 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

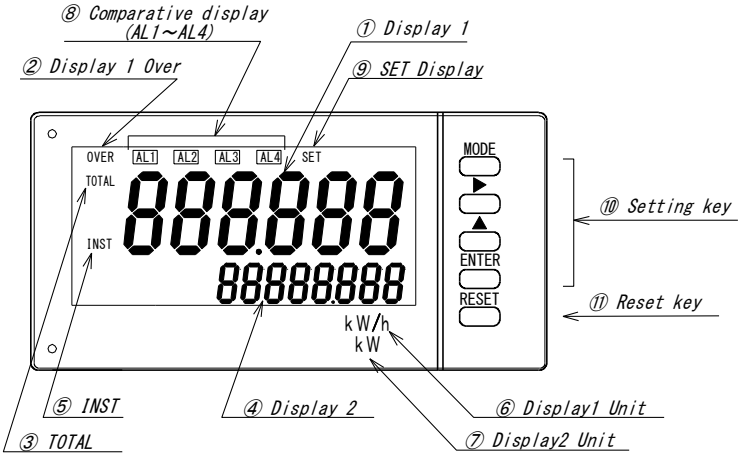
For the safe use of this product, users must follow the following caution.

⚠ Caution

- If the product is installed inside the cabinet, provision for the proper heat dissipation should be done to prevent the temperature to exceed more than 50 ℃ inside the cabinet.
- Do not mount the product in quite near 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℃ to 65℃

Nomenclature

Operation Panel



No.	Name	Function
①	Display 1	Instantaneous or totalized value display Red or green can be select for display color
②	Display 1 Over	Light on when instantaneous value display 1 exceeds 999999. Light on when totalized value display 1 exceeds 999999.
③	TOTAL	Light on with red color during display 1 is totalized value
④	Display 2	Instantaneous or totalized value display in while color
⑤	INST	Light on with red color during display 1 is instantaneous value
⑥	Display1 Unit	Pasting position of instantaneous and totalization unit seal
⑦	Display2 Unit	Pasting position of instantaneous and totalization unit seal
⑧	Comparative display	The comparison status of the comparison output is displayed.
⑨	SET Display	Light on during setting mode

Nomenclature（contd.）

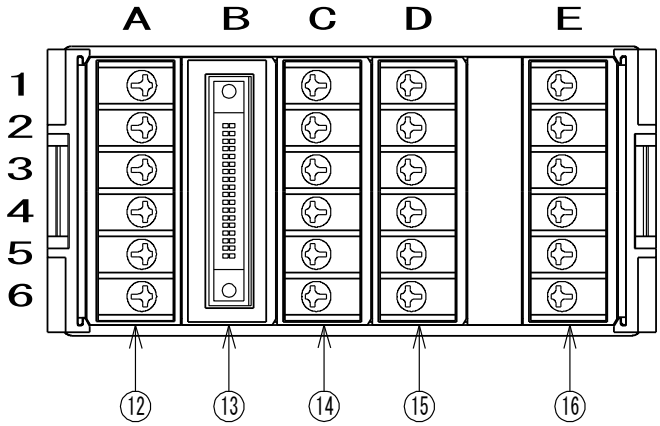
No.	Name	Function	
⑩	Setting key	MODE	During measurement mode : Change to Setting mode、Adjustment mode During setting mode : Change to each code No.
		▶	During measurement mode : Invalid During setting mode : Digit selection of setting value
		▲	During measurement mode : Invalid（Except when switching to diagnostic mode) During setting mode : Change of setting value
		ENTER	During measurement mode : Invalid During setting mode : Set value changed to saved measurement mode
⑪	Reset key	RESET	During measurement mode : Display shows “0”.（If the Reset totalizing function is set, set the totalized to initial value) During setting mode : Setting mode changes to measurement mode without saving the set value.

LED Display

0	1	2	3	4	5	6	7	8	9	DP	マイナス
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	K	L	M	n	o	P	q	r	S	t	U	v	w	x	y	z

Rear Panel



No.	Name	Function
⑫	Terminal A1～A6	Sensor power supply, Input、P.O output terminal
⑬	BCD OUTPUT CONNECTOR	Open collector NPN transistor output
	Terminal RS-232C	B1～5:RS-232C communication, B6: Vacant terminal
	Terminal RS-485	B1:+, B2:-, B4～5: Terminating resistance, B3, B6:Vacant terminal
⑭	Terminal C1～C6	C1～3:Control input terminal, C4:Vacant terminal、C5～6:Analog output terminal
⑮	Terminal D1～D6	D1～6:Compare output terminals of AL1 to AL4
⑯	Terminal E1～E6	E1,E3:Power supply terminal, E5:Ground terminal E2,E4,E6:Vacant terminal

※The specification of ⑬, C5 to C6 of ⑭ and ⑮ are option.

Installation

Installation Conditions

Power supply	AC100 to 240V　50/60Hz、DC24V、DC110V
Voltage tolerance of power supply	AC90 to 250V、DC24V±10%、DC100 to 170V
Power consumption	During AC100V: Approx. 11VA、During AC200V: Approx. 15VA During DC24V: Approx. 250mA、During DC110V: Approx. 50mA
Operating ambient temperature	0 to 50℃, 40 to 85%RH（No condensation）
Storage temperature	−20 to 65℃（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
Withstanding 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　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

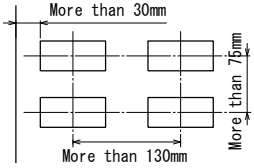
Accessories

Make sure that the following things beside the main body part are included.

- 471B main unit
- Bracket 2 pcs.
- 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: $92^{+0.8}_{0}$ × $45^{+0.6}_{0}$ mm

Panel thickness: 0.6 to 3.5mm (Degree of protection IP65)
3.6 to 10mm (Degree of protection IP20)

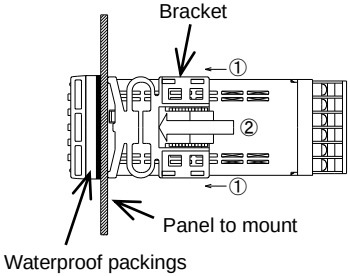
If the material of the panel is aluminum, it may be deformed due to its weak strength. So, it is recommended to use the thickness of aluminum panel sheet at least 1.5mm.

Mounting Method to Panel

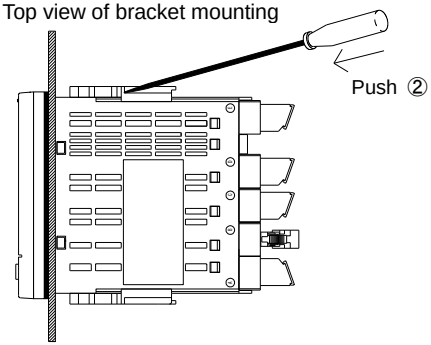
1 Insert the main unit fitted with the waterproof packings into the hole, from the panel front, and insert the attached bracket to the ditch on both sides of the main unit. Push the bracket as shown by arrow ① until the main unit is stably stays and fix the bracket. The packings functions as stopper too, so do not remove it. Refer to the side view of the bracket mounting.

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.

Side view of bracket mounting



Top view of bracket mounting



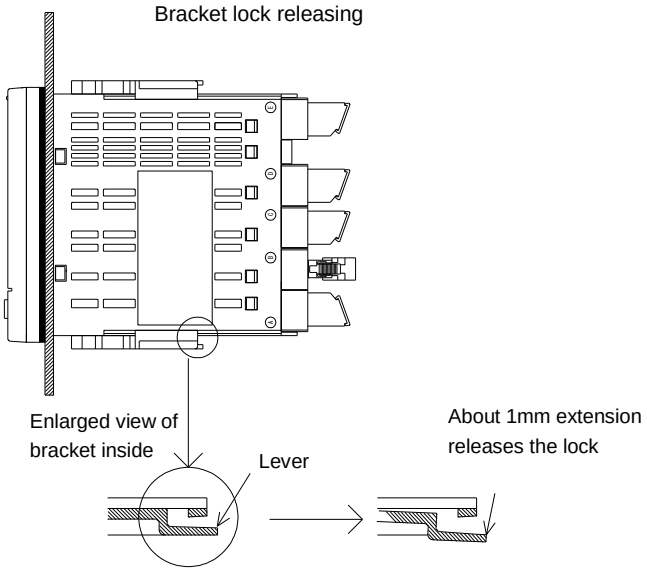
⚠Caution

- When pushing by screwdriver, apply it to the arrow ②
  The pushing of other part may cause the damage of bracket.

Dismounting

1 By extending with fingers the lever outward by about 1mm, as shown in the bracket lock releasing figure, the lever lock can be released.

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 for long time or the stress to it by metallic piece like screwdriver 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

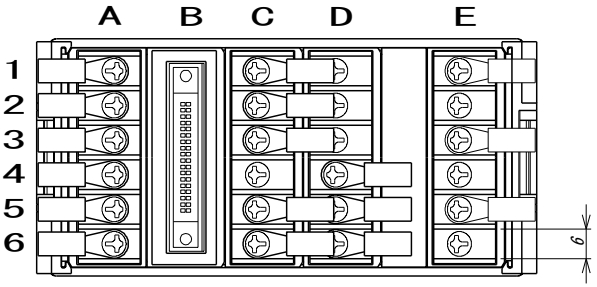
- Power supply and load should be within the suitable range as prescribed in specification. Negligence may cause the damage of products.
- Power supply should reach the rated power within a second.
- After the power is OFF, pause more than 10 seconds before the power ON again.
- Do not use the product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

◆Others caution during wiring

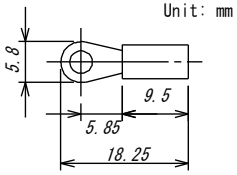
- Always use input line and power line independently. If input line and power line are wired in parallel, it may cause an in stability of the display.
- When the auxiliary relay is operated by the relay output to run the electro- magnetic switch or big size relay, take the noise preventive measures.
  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.

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

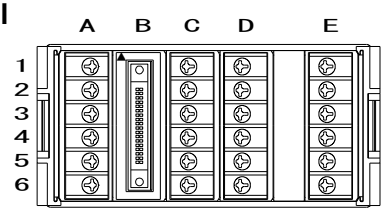


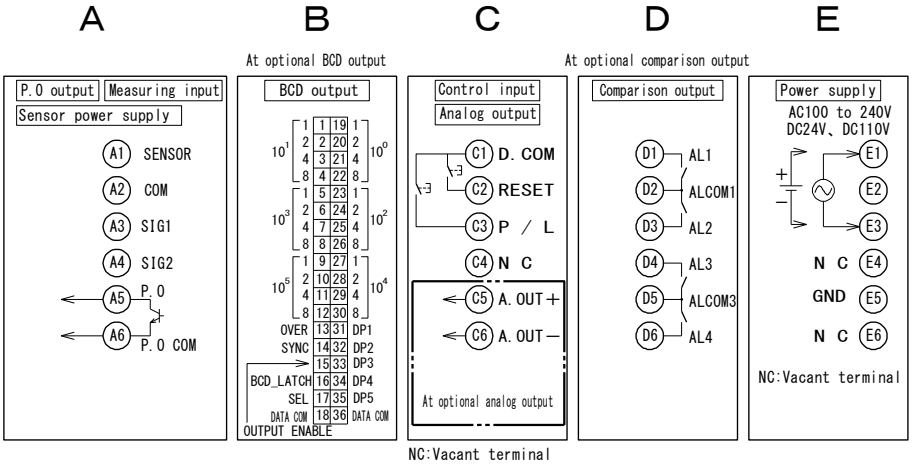
⚠ Caution

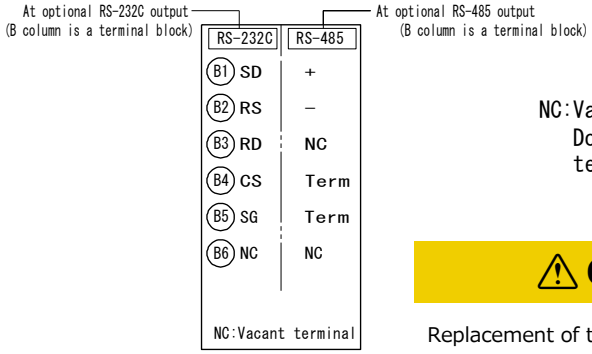
- For the C column and D column terminal blocks, apply one crimp terminal per one terminal block.
- Do not do the parallel connection, using two crimp terminals (overlaying) at the same terminal block. It stresses the internal PCB and so on and may cause the failure or trouble. As for the A column and E column terminal blocks, up to two crimp terminals per terminal block are acceptable.

Terminal layout and explanation

Rear side terminal





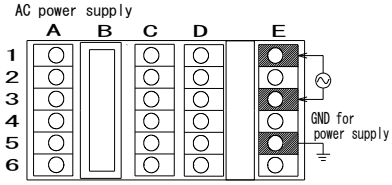


NC:Vacant terminal
Do not use as relay terminal etc.

⚠ Caution

Replacement of the units by customers themselves may cause the damage of the equipment and Tsuruga Electric Corporation may not be able to respond in this case.

Power supply connection

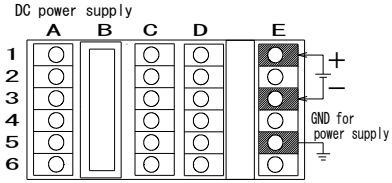


Connect the power supply at Terminal No.E1-E3.

Power supply voltage is written on the Terminal nameplate at the time of product shipment.

○AC power supply

AC100 to 240V 50/60Hz
permissible range AC 90 to 250V



○DC power supply

For DC 24V, Permissible range DC24V±10%
For DC110V, Permissible range DC100 to 170V

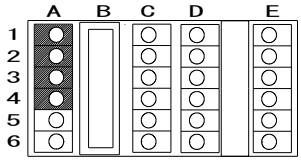
⚠Caution

- 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

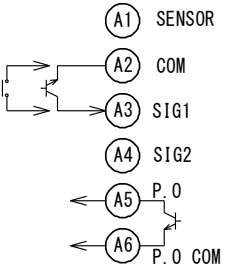
  In case of fear that the noise is frequently generated on the power source line, it is effective to earth the ground terminal directly to the ground. If the instrument is not affected by environmental noise, the grounding can be omitted. In this case, take care for the ground terminal not to touch other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

Connection of input signal

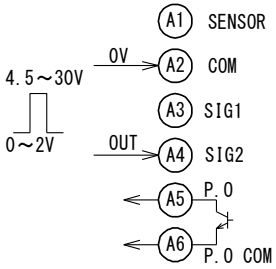
Power supply for the sensor is connected from terminal No.A1-A2. If the power supply of sensor is applied from external sources, the connection of terminal No. A1 will not be required. When sensor power source is not used, A1 will be vacant and do not used it for other purpose.



○ Connection example of non voltage contact or NPN open collector



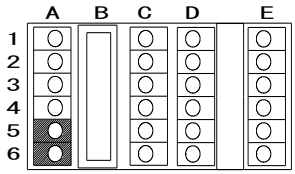
○ Connection example of voltage pulse output



Caution

If sensor power supply terminal A1 is accidentally short-circuited with COM terminal A2, it may cause malfunction of the sensor. At that time, guarantee of the counter value can't be given because of error in internal memory writing.

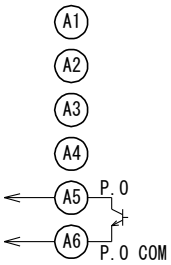
Connection of P.O output



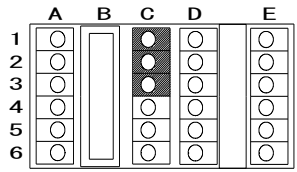
Terminal No. A5 and A6 give the output the total sync pulse of NPN open collector.

Please connect the load with the contact capacity within the specification range.

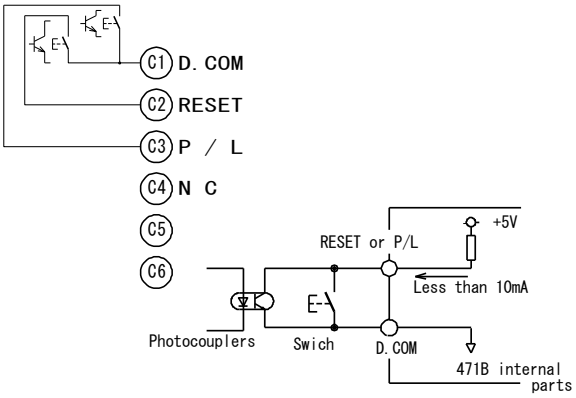
(Refer page 23『General specification』)



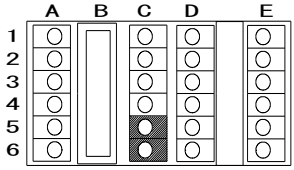
Connection of Control signal



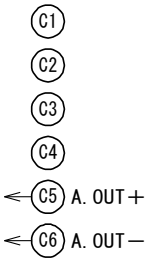
Please input the control signal. The configuration is as follows.



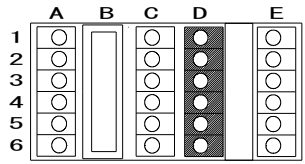
Connection of Analog output



The analog output is can be obtained from the Terminal No.C5-C6.
Allowable load resistance should be connected within the specified range.
（Refer page 22『Specification』）



Connection of comparison outputs（AL1, AL2, AL3, AL4）



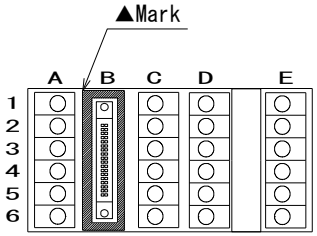
Comparison output scan be obtained in terminal No.
D2-D1、D2-D3、D5-D4 and D5-D6

Instantaneously
Instantaneous value <lower limit set value : AL1 D2-D1
Instantaneous value> upper limit set value : AL2 D2-D3

Totalization
6 digits under accumulation totalized value> upper limit set value : AL3 D5-D4
Lower 6 digits totalized value> upper upper limit set value : AL4 D5-D6

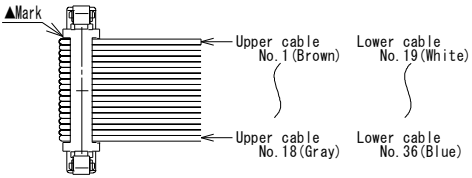
Contact capacity : AC/DC250V 200mA

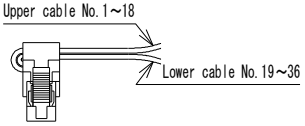
Connection of BCD output



Data output 6 digits Open collector (NPN) configuration is as shown in the connector arrangement table of BCD output shown in page 11.

Control input pin 16 BCD_LATCH, 17 SEL, 15 OUTPUT ENABLE are as shown in the connector arrangement table of BCD output, shown in page 11.

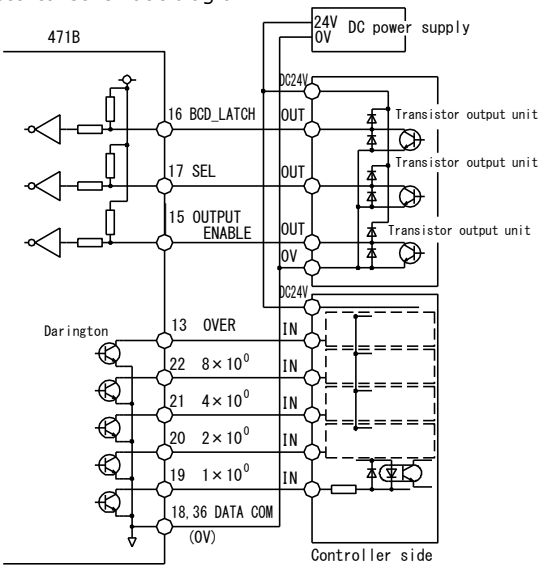




Accessory: Cable (5808-05) 2m

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 protection	KEY.	OFF, ON	OFF
01	Totalized pulse coefficient	rPLS	9999E-0 to 0001E-9	0001E-0
02	Converted value of instant pulse	iPLS	1000E-0 to 0001E-6	0001E-0
03	Unit of instant time	Unit	2(hour), 1(minute), 0(second)	0(second)
04	Filter of input frequency	FLt	2(HF), 1(MF), 0(LF)	2(HF)
05	Cut off time	CUt	0.1 to 199.9	199.9
06	Instantaneous display cycle	diSP	0 (100ms), 1(1s), 2(5s)	0(100ms)
07	Totalized decimal point	t dP	0, 0.0, 0.00, 0.000, 0.0000, 0.00000	0
08	Instant decimal point	i dP	0, 0.0, 0.00, 0.000, 0.0000, 0.00000	0
09	Initial totalizing value	i nI.	0 to 999999	0
10	Display 1 switching	i.t.	0(Instantaneous), 1(Totalization)	0(Inst.)
11	Display color	CoLo.	R(Red), G(Green)	G(Green)
12	Reset totalizing function	i.rSt	OFF, ON	OFF
13	Synchronized totalization pulse division	P.o r	0(1/1), 1(1/10), 2(1/100)	0(1/1)
14	Synchronized totalization pulse width	P.o Y	0(100ms), 1(50ms), 2(10ms)	0(100ms)
15	Display switch-off function	tUrn.	0(Invalid)/1(All display)/2(Display2), 0 to 99 minute	2(Display2),01
16	Invalid of reset key	rSt	0 (Invalid), 1(Valid)	1(Valid)
17	Pause / Latch	PL.	0 (Pause), 1 (Latch)	0(Pause)
18	Over display of display 1	ouEr	OFF, ON	OFF

●Comparison outputs function

Code No.	Function	Display 1	Setting range	Default value
41	AL1 Comparative value	AL. 1	0 to 999999	0
42	AL2 Comparative value	AL. 2	0 to 999999	999999
43	AL3 Comparative value	AL. 3	0 to 999999	999999
44	AL4 Comparative value	AL. 4	0 to 999999	999999
45	Batch switching	b.SEL.	0(ALARM),1(BATCH)	0(ALARM)
46	AL3 Output width	Y1 d.3	0.1s,0.2s,0.5s,1.0s,-(Continuous)	0.1s
47	AL4 Output width	Y1 d.4	0.1s,0.2s,0.5s,1.0s,-(Continuous)	0.1s
48	AL4 Auto reset	A.rSt	OFF,ON	OFF

●Analog output function

Code No.	Function	Display 1	Setting range	Default value
75	Analog output switching	A.SEL.	0(Instantaneous), 1(Totalization)	0(Inst.)
79	Full scale (Totalization)	A.FUL.	200 to 999999(Totalization)	200

●RS-232C, RS-485 output function

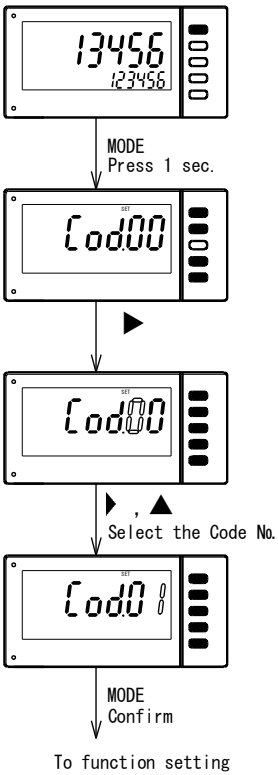
Code No.	Function	Display 1	Setting range	Default value
80	Baud rate	bAUd.	4800,9600,19200bps	9600bps
81	Parity	PArIT	non(none), odd(odd no.), even(even no.)	non(none)
82	BCC switching	bCC	ON, OFF	OFF
83	Device number	rS.no.	0 to 99	00

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 Setting
(Set Code No.)



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

Black key: Valid key

White key: Invalid key

[Common matters 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.

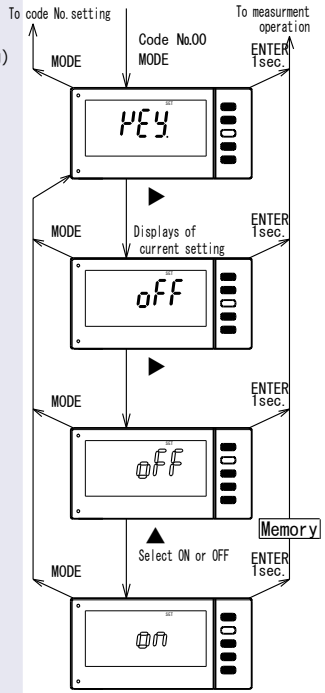
Again, if the reset key is pressed more than 1 second, setting value which was under changing process before becomes invalid and returns to measurement operation undergoing mode.

Function setting method

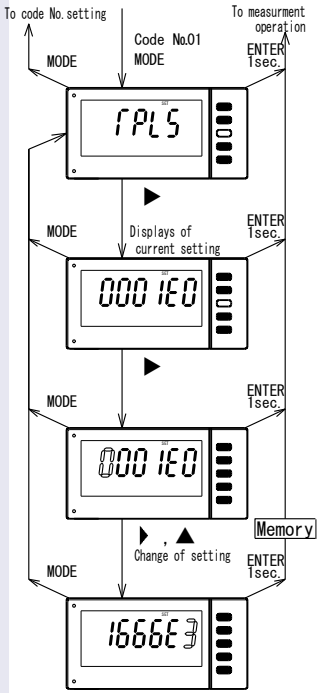
The following is an example of the input function setting. Please refer this page when changing to the setting other than factory setting value. Please continue the operation of the function setting after referring Code No. setting method only.

Code No.00『Key protection』	**Code No.01『Totalized pulse coefficient』**
When the key protection mode is made ON, function other than the Key protection can be forbidden to use. Setting range : ON [Key protection is on.] OFF [Key protection is off]	Totalized pulse coefficient can be set. The totalized pulse coefficient can be set by multiplying 4 digits of the mantissa and one digit of the exponent per pulse Setting range : 1×10^{-9} to 9999×10^{0} The exponent part is not indicated by 'minus'.
Change from "OFF" to "ON"	Change from 0001E0 to 1666E3

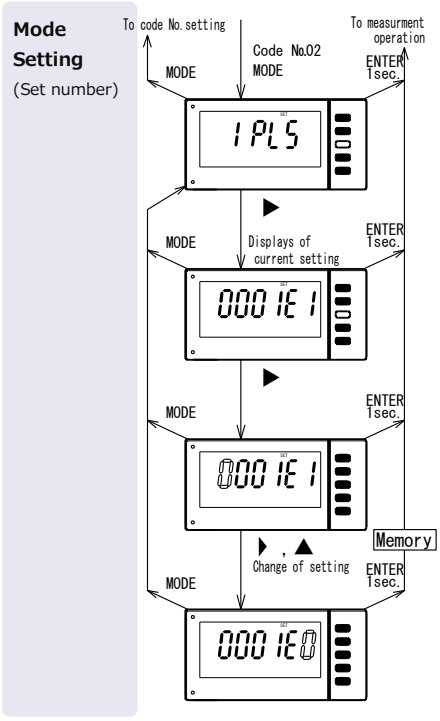
Mode Setting
(Item setting)

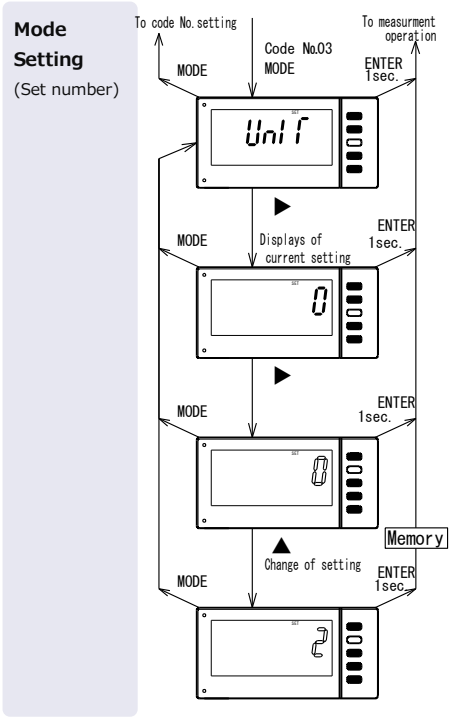


Mode Setting
(Set number)



Code No.02『Converted value of instant pulse』	Code No.03『Unit of instant time』
The magnification of a pulse can be set with maximum 4 digits of mantissa and exponent 1 digit in code No.02. Setting range : 1×10^{-6}～1000×10^{0} The exponent part is not indicated by 'minus'.	The unit of instant time can be set arbitrarily. This is the time unit to indicate the measurement data of which time span(second, minute or hour) to display. Setting range : 2(hour), 1(minute), 0(second)
Change from 0001E1 to 0001E0	Change from 0(second) to 2(hour)

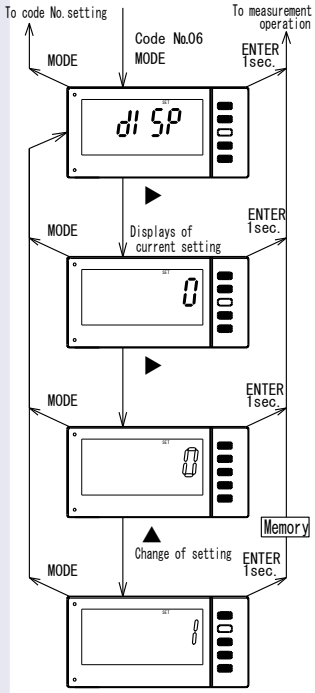




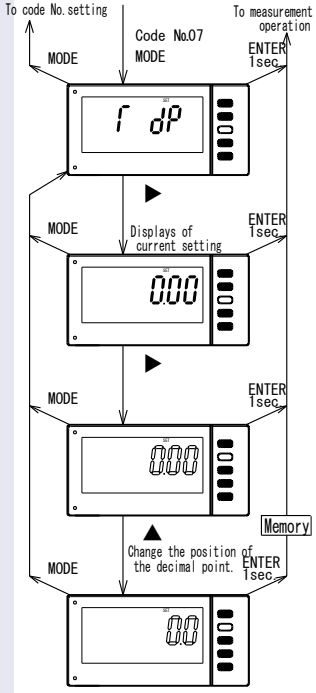
Usage of Function Code（contd.）

Code No.06『Instantaneous display cycle』	**Code No.07『Totalized decimal point』** **Code No.08『Instant decimal point』**
Select and set instantaneous display cycle from 100ms,1s,5s Setting range : 100ms(0), 1 s(1), 5s(2)	The decimal point at an arbitrary position can be lit up. The decimal point is not linked with the totalizing constant setting (it does not possess weight). 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
Change from 100ms(0) to 1 s(1)	Change to totalized decimal point from 0.00 to 0.0

Mode Setting
(Item setting)



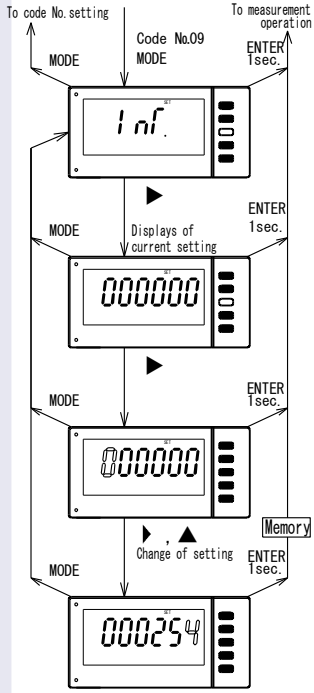
Mode Setting
(Item setting)



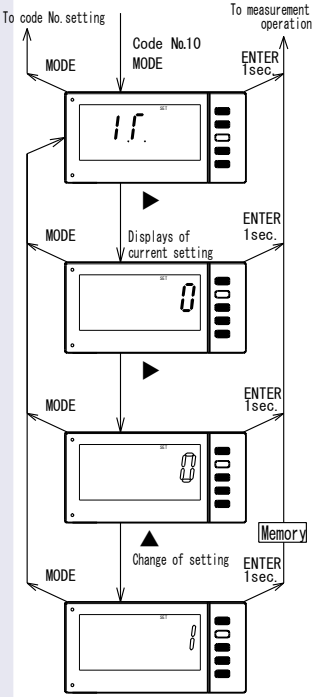
※ Display「r dP」during Cod.08

Code No.09『Initial totalizing value』	**Code No.10『Display 1 switching』**
Initial totalizing value is set if in case the display value of the counting start is specified. Setting range : 0 to 999999	Select display 1 for either totalized display or instantaneous display. Setting range : 0 ,Display 1:Instantaneous display Display 2:Totalized display 1 ,Display 1:Totalized display Display 2:Instantaneous display
Change from 0 to 254	Change display 1 from instantaneous display to totalized display

Mode Setting
(Set Number)



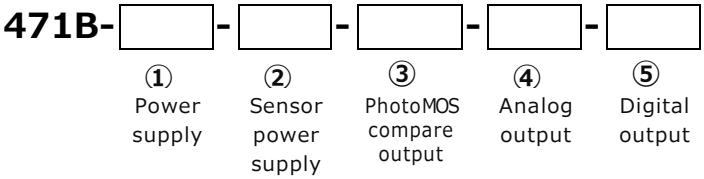
Mode Setting
(Item setting)



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.00 to 03 and No. 06 to 10. 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.

Specification

Model Configuration



Addition No.	Function	Symbol	contents	
①	Power supply	A	AC100 to 240V	
		9	DC24V	
		C	DC110V	
②	Sensor power supply	X	No power to sensor	
		3	DC12V±5% 150mA	
		5	DC24V±5% 50mA	
③	PhotoMOS compare output	X	No output	
		2	Four photoMOS Relays Expansion (AL1, AL2, AL3, AL4)	
④	Analog output	X	No output	Allowable load resistance
		04	DC0～ 5V	1kΩ以上
		05	DC0～10V	1kΩ以上
		09	DC1～ 5V	1kΩ以上
		29	DC4～20mA	510Ω以下
⑤	Digital output	X	No output	
		DN	BCD Output　Open collector output（NPN）	
		E0	RS-232C Output	
		E1	RS-485 Output	

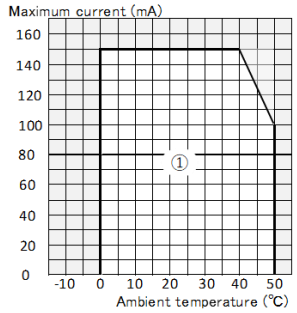
General specification

Display　(LCD)	7 segment display Display 1 side　Character height15.2mm Red／Green color 7 segment display Display 2 side　Character height 7.6mm　White color With zero suppress function
Display range	Display 1　Totalizer　: 0 to 999999（Lower 6 digits display ） Instant　: 0 to 999999 Display 2　Totalizer　: 0 to 99999999 Instant　: 0 to 999999

Decimal point	10^1,10^2,10^3,10^4,10^5 Optional selection (External control not allowed)
Over display	Display 1 OVER Light up during over (Red color) Totalizer : Display 1 When 999999 exceeds, Light up OVER (Light up until RESET input) Internal counter counts up to 99999999 Starts count from 0 when 99999999 exceeds Instant : When 999999 exceeds, Light up OVER, – – – – – – display
Display cycle	Totalizer Approx. 100ms, Instantaneous Approx. 100ms, 1 s, 5 s
Input frequency	HF: 0.01Hz to 1kHz Minimum input signal width ON/OFF: More than 50μs MF: 0.01Hz to 100Hz Minimum input signal width ON/OFF: More than 5ms LF: 0.01Hz to 20Hz Minimum input signal width ON/OFF: 25ms
Instantaneous value	Instantaneous measurement can convert the input frequency to unit time (hour, minute or second) and display Instantaneous value = Frequency x unit time × instantaneous pulse converted value Instantaneous unit time : hour : ×3600, minute : ×60, second : ×1
Totalizing	Totalized measurement is the value of the input pulse multiplied by the total pulse coefficient and displayed.
Display accuracy	Instant ± (0.05%+1digit) at 23℃±5℃ 45 to 75%RH
Synchronized totalize pulse output (P.O)	It is isolated from input. Output signal : Open collector (NPN), Output capacity : DC30V 200mA, Leakage current : Less than 0.1mA When the totalized pulse coefficient is exceeded more than 1, the output pulse is synchronized as input pulse.
Reset	Reset the totalized count to 0 (zero) or initial totalize value from the RESET key on the front panel or from the RESET terminal on the rear terminal board. The frequency division stage of the PO output is also cleared. No voltage contact or open collector (NPN) : DC5V 10mA Minimum pulse : 10ms
Power failure compensation	The measured value is stored and hold by nonvolatile memory. No counting during electricity failure. Data retention period: approx.10 year
Power supply line mixed noise	1000V (AC power supply)
Sensor power supply	DC12V±5% 150mA or DC24V±5% 50mA

Derating curve of sensor power supply
Reference : in case of 12V

Deterioration and breakage of internal parts may occur rarely. Use within the range of derating curve ①.



Optional output

PhotoMOS compare output

This is the setting change method of photoMOS compare output. operate following the setting code No. mentioned on page 17.

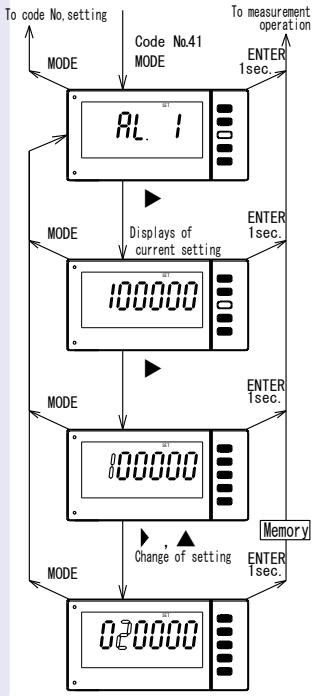
Code No.41『AL1 Comparative value 』
Code No.42『AL2 Comparative value 』
Code No.43『AL3 Comparative value 』
Code No.44『AL4 Comparative value 』

Set the comparative value of AL1,AL2,AL3,AL4

Setting range : 0 to 999999

Change of comparison output AL1 from 100000 to 20000

Mode Setting
(Set Number)



Code No.45『Batch switching』

AL3 to 4 totalized value alarm output, change of batch output totalized value alarm output can switch to upper limit and upper limit alarm output or totalized value batch output.
Regardless of the display, it compares sequentially with counter data.
Relay output delay is MAX. 35ms.
(Filter of input frequency : LF)

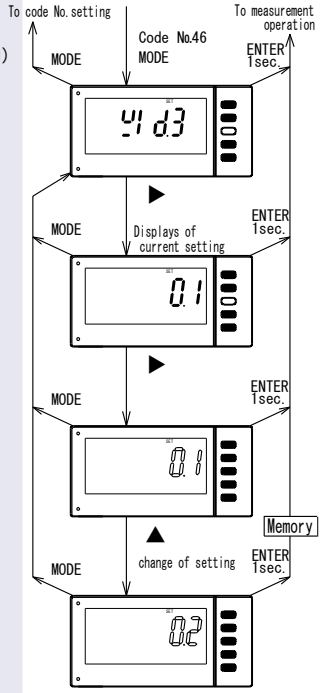
・Comparison condition
Totalized alarm output:
Totalized value＞Upper limit set value
・・・ AL3 ON (AL3 light up)
Totalized value＞Upper / upper limit set value
・・・ AL4 ON (AL4 light up)

Batch output :
In the two-stage setting of AL 3 and AL 4, when the totalized value becomes equal with the setting value, output of the relay is obtained with ON pulse.
Pulse width can be selected arbitrarily by code No. 46: AL3 output width, code No. 47: AL4 output width.
AL 4 is also equipped with an auto reset ON / OFF function of totalized value.

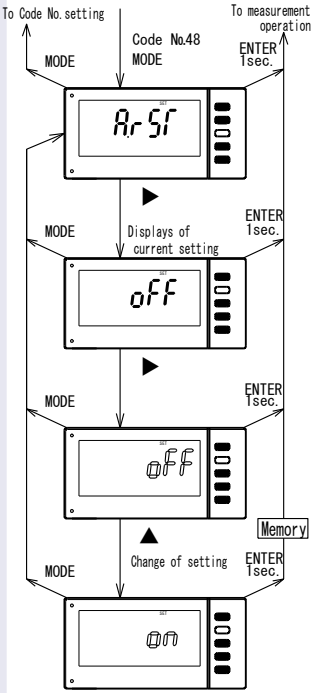
Setting range : 0 (Totalized alarm output)
1 (batch output)

Code No.46『AL3 Output width』 **Code No.47『AL4 Output width』**	**Code No.48『Auto reset』**
During batching of AL 3 to 4, select the time width with one shot of specified output. Note) Continuous output is turned OFF by RESET input. Setting range : 0.1s, 0.2s, 0.5s, 1.0s, -- (Continuous)	During batching of AL3 to 4, when AL4 auto reset is ON, reset is done when totalized value becomes AL4. If reset totalizing function is OFF, the totalized value will be 0. If reset totalizing function is ON, the totalized value will be equal to initial totalized value. Setting range : OFF、ON
Change the output width of AL3 from 0.1 s to 0.2 s.	Change of AL4 Auto reset from OFF to ON.

Mode Setting
(Item setting)



Mode Setting
(Item setting)



Analog output

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

The measurement input and the analog output are insulated.

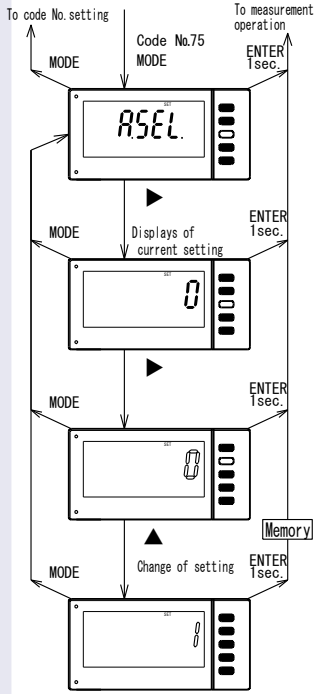
Accuracy	Instantaneous ± 0.1 % of SPAN at 23℃ ± 5℃ Totalized ± 0.5 % of SPAN at 23℃ ± 5℃
Output cycle	Approx. 100ms
Response speed	To output the totalizing value Maximum about 125ms Condition : Input frequency filter(LF), Totalized pulse Coefficient: More than 1 Analog output after 1 pulse input To output the Instantaneous value Condition : Input frequency (0→less than 10Hz), Input frequency filter(LF), Instantaneous display cycle(100ms), 0→output 100% Approx. (1/ input frequency) + 100ms + 125ms Condition : Input frequency (0→more than 10Hz), Input frequency filter(LF), Instantaneous display cycle(100ms), 0→output 100% Approx. 100ms+225ms
Selection output data	Selection in either setting mode or instantaneous / totalizer can be done. Output of instantaneous display : Setting of max. value（200 to 999999） Output of lower 6 digits totalized display : Setting of max. value（200 to 999999）
Output scaling（Totalizer）	Full scale　Setting range　200 to 999999

Function setting

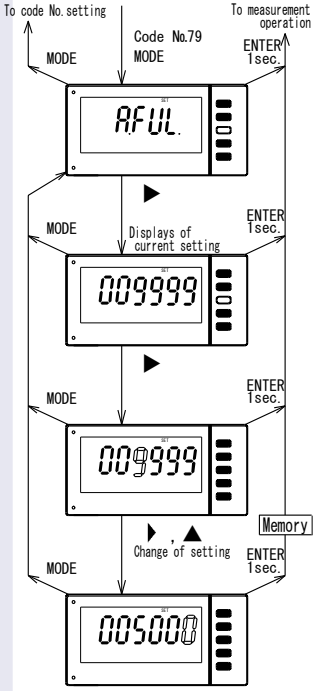
This is the setting change method of analog output. Operate following the setting code No. mentioned on page 17.

Code No.75『Analog output switching』	**Code No.79『Full scale of analog output』**
Select analog output of instantaneous or totalizer. Setting range : 0 (Instantaneous) 1 (Totalizer)	During analog output, the display equivalent to the max. value can be specified. Setting range : 200 to 999999
Change 0 (Instantaneous) to 1 (Totalizer)	Set display to 5000 for -29 (4 to 20mA output) rated value, when output is 20 mA

Mode Setting
(Item setting)



Mode Setting
(Set Number)



BCD output (Digital output)

Refer to "Wiring method" from this manual on page 9 for the connector arrangement.

The measurement input and the BCD output are insulated.

Output

Open collector	Sink type, Contact capacity　DC30V 10mA
Data BCD 6 digits	Lower 6 digits totalizer or output of instantaneous value
Over(OVER)	Totalizer :When 999999 exceeds, output become ON (Output becomes ON until RESET input is done) Instant :When the value of instant full scale exceeds 110%, Output become ON
Synchronization signal (SYNC)	Pulse output become ON approx. for 10ms Read the data at good SYNC rising time
Decimal point (DP1 to 5)	Output decimal point of totalizer or, instantaneous
BCD Output cycle	Approx. 100ms

Control input

Input current = Less than 1 mA, 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 counted continuously
Data enable（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)
Data select　(SEL)	Instantaneous output when the selection pin is opened or set to the H level. Totalizing output (Totalizer lower 6 digits) when the selection pin is short circuited with DATA COM or set to L level.

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www.tsuruga.co.jp

I-02453

TSURUGA

Panel meter with totalized function
Pulse input

471B

RS-232C
RS-485 Output

Quick Manual

Contents

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 injure 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 1B－□－□－□－□－□
①　②　③　④　⑤

⑤ Digital output

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

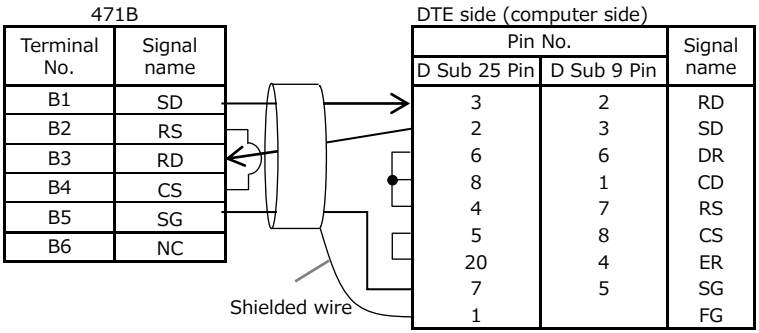
Common specification

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



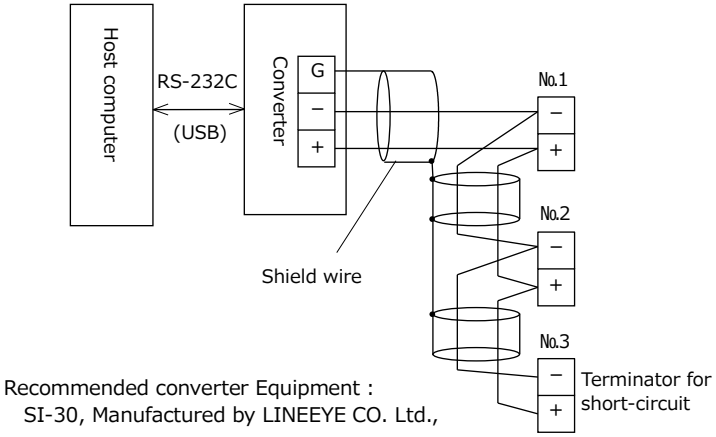
Optional : RS-232C cable 2 m (Model 5858-10)

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.



Recommended converter Equipment :
SI-30, Manufactured by LINEEYE CO. Ltd.,

Function code

Communication setting is done by front key operation. When changing to a setting other than the factory set value, please refer "Usage of Function Code" of the Quick Manual of model 471B on page 16.

Baud rate (Code No. 80) :	Baud rate can be selected. Setting range 4800, 9600, 19200bps
Parity (Code No. 81) :	Parity can be selected. Setting range non(None), odd(Odd no.), even(Even no.)
BCC switching (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 ETX (ETX included), are added after the ETX. Setting range ON,OFF
Device number (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 in 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 471B. 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 ETX (ETX 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)

- Both capital and small letters can be used for command characters.
- Only first 4 characters of the command letters will be valid.
  Example) "RLATCH" → "RLAT"
- Setting items represented either by numbers or characters will be valid.
  Example) "WC12 0" or "WC12 OFF"
- Number setting

  Set a value that does not include the decimal point of the display. (Instantaneous full scale, initial totalized value, 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 commend

Command : TREAD Totalized value of requested data

Response : Response to TREAD（Totalized value of measurement data）

Command : IREAD Instantaneous value requested data

Response : Response to IREAD（Instantaneous value of measurement data）

◆Totalized value of requested data

Command : TREAD Read out totalized value data

Response : Response to TREAD

Data format

_+1.9999999E+3

ⓐ ⓑ

+1000.0000

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

Command frame :

STX	Device:00		T	R	E	A	D	ETX	(BCC)
02H	30H	30H	54H	52H	45H	41H	44H	03H	

Response :

STX	Device:00		Exit code	_	+	1	.	0	0	0	0	0	0	0
02H	30H	30H	41H	20H	2BH	31H	2EH	30H	30H	30H	30H	30H	30H	30H

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

◆ **Instantaneous value requested data**

Command : IREAD Read out integrated value data

Response : Response to IREAD

Data format

_+1.99999E+0
ⓐ ⓑ

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

+1000.00

Command frame :

STX	Device No.:00		I	R	E	A	D	ETX	(BCC)
02H	30H	30H	49H	52H	45H	41H	44H	03H	

Response :

STX	Device No.:00		Exit code	_	+	1	.	0	0	0	0	0	E	+	3	ETX	(BCC)
02H	30H	30H	41H	20H	2BH	31H	2EH	30H	30H	30H	30H	30H	45H	2BH	33H	03H	

Reading of the device information

Command : IDNT? Reading of the device information

Response : Response to IDNT

471B, No. 888-101 [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	B	,
02H	30H	30H	41H	34H	37H	31H	42H	2CH

N	o	.	8	8	8	-	1	0	1	ETX	(BCC)
4EH	6FH	2EH	38H	38H	38H	2DH	31H	30H	31H	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 AL1 and AL2（01+02=03）. Please, refer the Judgment command on page 11 for the detail reference.

01（AL1 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 AL1 comparison value setting reading

(AL1 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

Command : WC41_002000 AL1 comparison value setting

(L1 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	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	30H	03H	

Reading of control command

The contents set by control command is read out.

Command : RLATCH Reading of Latch

Response : Response to RLATCH

0 (OFF)

Command frame :

STX	Device No.:00		R	L	A	T	C	H	ETX	(BCC)
02H	30H	30H	52H	4CH	41H	54H	43H	48H	03H	

Response :

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

Setting of control command

Command : WLATCH_0 Reading of Latch

Response : Response to WLATCH_0

0 (OFF)

Command frame :

STX	Device No.:00		W	L	A	T	C	H	_	0	ETX	(BCC)
02H	30H	30H	57H	4CH	41H	54H	43H	48H	20H	30H	03H	

Response :

STX	Device No.:00		Exit code		0	ETX	(BCC)
02H	30H	30H	41H		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	52H	03H	

Response :

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	54H	03H	

Response :

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

Command list

Setting command	Required setting command		Required setting command		
	Command	Response	Command frame	Response	Setting item, range
Totalized pulse coefficient	RC01	0001E-0	WC01 0001E-1	0001E-1	9999E-0 to 0001E-9
Converted value of instant pulse	RC02	0000E-0	WC02 1000E-2	1000E-2	1000E-0 to 0001E-6
Unit of instant time	RC03	0	WC03 1	1	2(hour),1(minute),0(second)
Filter of input frequency	RC04	0	WC04 1	1	2(HF),1(MF),0(LF)
Cut off time	RC05	0.1	WC05 001.0	001.0	0.1 to 199.9
Instantaneous display cycle	RC06	1	WC06 1	1	0(100ms),1(1s),2(5s)
Totalized decimal point	RC07	2	WC07 1	1	0(0),1(0.0),2(0.00),3(0.000), 4(0.0000),5(0.00000)
Instant decimal point	RC08	0	WC08 1	1	0(0),1(0.0),2(0.00),3(0.000), 4(0.0000),5(0.00000)
Initial totalizing value	RC09	0	WC09 999999	999999	0 to 999999
Display 1 switching	RC10	0	WC10 1	1	0(Inst.), 1(Totalizer)
Display color	RC11	0	WC11 1	1	0(RED),1(GREEN)
Reset totalizing function	RC12	0	WC12 1	1	1(ON),0(OFF)
Synchronized totalization pulse division	RC13	0	WC13 1	1	0(1/1),1(1/10),2(1/100)
Synchronized totalization pulse width	RC14	0	WC14 1	1	0(100ms),1(50ms),2(10ms)
Display switch-off function	RC15	1,99	WC15 1,99	1,99	0(Invalid)/ 1(All display)/ 2(Display2), 0～99
Invalid of reset key	RC16	0	WC16 1	1	0 (Invalid), 1(Valid)
Pause/Latch	RC17	0	WC17 1	1	0(PAUSE),1(LATCH)
Over display of display1	RC18	0	WC18 1	1	1(ON),0(OFF)
AL1 Comparative value	RC41	999999	WC41 999999	999999	0 to 999999
AL2 Comparative value	RC42	999999	WC42 999999	999999	0 to 999999
AL3 Comparative value	RC43	999999	WC43 999999	999999	0 to 999999
AL4 Comparative value	RC44	999999	WC44 999999	999999	0 to 999999
Batch switching	RC45	0	WC45 1	1	0(ALARM),1(BATCH)
AL3 Output width	RC46	0	WC46 1	1	0(0.1s),1(0.2s),2(0.5s), 3(1.0s),4(Continuous)
AL4 Output width	RC47	0	WC47 1	1	0(0.1s),1(0.2s),2(0.5s), 3(1.0s),4(Continuous)
AL4 Auto reset	RC48	1	WC48 0	0	1(ON),0(OFF)
Analog output switching	RC75	0	WC75 0	0	0(Inst.), 1(Totalizer)
Full scale of analog output	RC79	999999	WC79 999999	999999	200 to 99999
Key protection	RC00	1	WC00 0	0	1(ON),0(OFF)

Command of measurement data	Required measurement data command	
	Command	Response
Totalized value measurement data	TREAD	_+1.0000000E+3
Instantaneous value measurement data	IREAD	_+1.00000E+3

Judgment command (Result output of currently judgment)	Judgment request command			
	Command	Response	Item	
AL1 to 4	ALARM	00	Output status	Weight of data
			AL1	01
			AL2	02
			AL3	04
			AL4	08

Control command	Required control command		Specified control command		
	Command	Response	Command frame	Response	Item
Latch	RLATCH	1	WLATCH 1	1	1(ON),0(OFF)
Pause	RPAUSE	0	WPAUSE 1	1	1(ON),0(OFF)
Reset	RALRST	1	WALRST 1	1	1(ON),0(OFF)

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

MEMO

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