CE

【 Operation Manual 】

Compact digital meter

MODEL：SP－243 Series

(Analog input type)

Series name	Output	Input	Color	Function
SP－243				Preset output two points (NPN open collector output) DC power supply(DC24V)
	AV3			Analog voltage output (DC1-5V)
	AV4			Analog voltage output (DC0-5V)
	AV5			Analog voltage output (DC0-10V)
	AI			Analog current output (DC4-20mA)
		A2		Analog current input (DC4-20mA)
		A3		Analog voltage input (DC1-5V)
		A4		Analog voltage input (DC0-5V)
		A5		Analog voltage input (DC0-10V)
			No code	Gray
			K	Black

⚠ Caution
For professional use only or designed for use by a licensed electrician only.

⚠ Caution
Check if the label (model name) of the unit and your desired product specification correspond before use.

【The 7th edition 20 Aug. 2020】
@SP－243CE（7）－E

Precautions

Please read this operation manual including the following precautions carefully to ensure safe use of your meter.

⚠ Warning • • • The following cases that may cause death or serious injury.

1. Do not wire while power is supplied. There is a risk of electric shock and fire.
2. Do not touch the terminals while power is supplied. There is a risk of electric shock.
3. Do not disassemble or touch the inside of the product.
   There is a risk of electric shock and fire.
4. Do not use the product in places with flammable gas or ignitable substances.
5. Prepare the emergency stop or build a fail-safe system, etc. for when a product is break down or abnormality operating.

⚠ Caution • • • That may cause Minor injury or Property damage.

1. Use the product at the rated range power supply voltage and load.
2. Do not use the product at the following environment.
   - Where there is exposed to metal powder, dust, water, chemicals, oil, etc.
   - Where there is corrosive gas.
   - Outdoors or in direct sunshine.
   - Where condensation occurs.
   - Temperature and humidity outside the rated range.
   - Where there is vibration or impact.
3. Do not let metal powder, dust, water, chemicals or oil into the product.
   There is a risk of break down or fire.
4. Check periodically for defects and abnormalities.
5. If the product is break down, firing, emitting smoke, overheating, abnormal noise, etc. turn off the power immediately and stop using it.
6. Install a switch or circuit breaker where it can be operated immediately in an emergency, Then indicate that is a shutoff device.
7. Do not place the product and wiring near noise sources.
8. If there is a possibility of invasion the lightning surges, install countermeasure parts such as a lightning arrestor in outside.
9. It can be used almost at the same time as the power is turned on, but requires 30 minutes of power to meet all performance requirements.
10. When cleaning, wipe with a dry cloth. Do not use organic solvents such as benzine, thinner and alcohol.
11. If the waterproof packing is used in a deteriorated state, the waterproof and dustproof function will be impaired. Inspect and trade it periodically.

Contents

1．About confirmation of an attachment and a guaranteed period

About confirmation of an attachment.

When you received as a product, please confirm whether it includes the following.

（1）ＳＰ－２４３(The chosen specification) ・・・・・・・・・・・・・・・・・・・・1

（2）Fitting for fixing the body(Attachment) ・・・・・・・・・・・・・・・・・・・1

（3）ＳＰ－２４３ Operation manual(Attachment) ・・・・・・・・・・・・・・・・1

（4）Rubber packing(Gray)(Attachment)・・・・・・・・・・・・・・・・・・・・・1
※Choosing option K, color is black.

（5）Unit label(Attachment) ・・・・・・・・・・・・・・・・・・・・・・・・・・1

If there are the mistaking parts and the missing parts, please inform a dealer or us.（There is a case that you don't attach by convenience.）

About a guaranteed period and a guaranteed area.

1．Guaranteed period

The period a product guarantees is 4 years from a delivered day.

2．Guaranteed area

If we trouble by responsibility in whole guaranteed period, it's repaired without charge at our factory. But if a product conflicted in the following matter, it isn't a guarantee target. Please understand.

① Case of outside of the product specifications.

② Case of User-conducted alterations and modifications of the unit

③ Case of besides our responsibility.

④ Case of safekeeping and transportation beyond the product specification condition.

⑤ Case of an accident.

2. Specifications

【 Standard specifications 】

Item		Specifications
Operation form		Ratemeter／Totalizer
Operation system		A/D conversion operation The resolution : About 1/7000 （To full scale input.）
LOW cut-off		Inputs within 0-29 % (selectable) of the maximum analog input are cut off.
Display	Display	Red LED : 5 digits (upper row) Character height : 7mm (range : 0-99999)
	Indication change	The Indication of Ratemeter／Totalizer is changed by DISP . (It is necessary to set the mode №5.)
	Totalize indication LED	Case of the display of totalize, "T" LED lights up. (Green)
Rate meter	Measurement accuracy	±0.3%±1 digit for analog input（23℃）
	Scaling	Setting the indication value in the maximum analog input (selectable) Range : 0.001-10000
	Indication area	0－10000 ※When indication overflowed, "9999.9" flashes on and off (Decimal point position is linked to setting)
	Decimal point	Displays 1 to 4 decimal points. (selectable)
	Sampling time	Rate reading averaged by 0.1-100.0 sec. (selectable)
	Least significant digit	Real, fixed at 0, or 0/5 (selectable)
Totalizer	Measurement accuracy	±0.3%±1 digit for analog input（23℃）
	Scaling	Setting the maximum total per an hour
	Indication area	0－99999
	Decimal point	Displays 1 to 4 decimal points. (selectable)
	Overflow Indication	「99999」 flashing, 5 digits endless, or 10 digits. (selectable)
	Synchronization pulse output	Synchronization with totalizer reading (enable/disable selectable) Synchronization pulse output : 1-4 digits, output width : 0.01-1.99 sec. (selectable) Signal level : NPN open collector output, rating DC30V 50mA (max.) 〔Use terminals no. 3-4 (OUT1) ※Do not use preset output.〕
	Offset	Offset value setting can establish the indication value after a reset at the reach of 0-99999. (selectable)
Auxiliary input	EXT input	Reset / Hold / Inhibit / Indication change (selectable) • When specified, input from the rear terminal board causes the current reading to go on "hold". • Input for more than 50 ms is on for a reset, inhibit, indication change. 〔NPN open collector input and contact input are possible.〕
Sensor input	Input terminal	Input terminals no. 8-9
	Current input(A2)	DC4-20mA Input impedance : 250Ω
	Voltage input(A3)	DC1-5V Input impedance : 220kΩ
	Voltage input(A4)	DC0-5V Input impedance : 220kΩ
	Voltage input(A5)	DC0-10V Input impedance : 220kΩ
	Temperature caracteristic	±100ppm／℃ （0～50℃）

Preset output	Output terminal		Output terminals no. 3-4 (OUT1), 5-4 (OUT2) ("COM" is common.)
	Comparative System		Upper limit, lower limit (immediately) and lower limit (delay). (selectable)
	Output mode		Comparison, maintenance and 1 shot. (selectable)
	1 shot time		Up to 30 ms-2 s, 8 stages. (selectable)
	Preset value setting		The Presetting program mode setting is also selectable.
	Output judgment		Judgment output is compared with the indication value by pre-set value.
	Output circuit		Two-points NPN open collector output, maximum rating : DC30V 50mA max
	Output indication		During presetting output, the OUT1 and OUT2 LEDs (Orange) are activated.
	Output reset		It's reset by (RST) key at the front or EXT input.
	Time to prohibit judgment		The presetting output function is disabled for the specified time interval following power ON or reset. Up to 1 s-60 s, 9 stages. (selectable) 〔A lower limit (delay) doesn't function.〕
Others	Data backup		Each mode setting value and totalized value is memorized by FRAM (The memory number of times is within 100,000 times, About 10 year safekeeping.)
	Mode protect function		Change by mode protect function setting It's possible to change it by 「OFF」 setting. It's impossible to change it by 「ON」 setting.
	Warm up time		After turning on the power, more than 30 minutes.
	Power supply		DC24V (±10%)
	Power consumption		7VA max
	Temperature/ humidity conditions		0～50℃ 30～80%RH (Non-condensing)
	Dimensions/ weight		W48×H24×D64mm Approx 50g (An installation adapter isn't included.)
	Color	No code	Gray
		Option	Black
	Material of the case		ABS
	Safety class		IP66 (front)
	EMC		EN61326-1 EN55011(Group1 ClassA)、EN61000-4-2、EN61000-4-3、EN61000-4-4、EN61000-4-5、EN61000-4-6

【 Option 】

≪ Analog output : AV3～5／AI ≫

Output terminal		Output terminals no. 11-12.
Output setting		Setting of instruction value at the maximum analog output value.
Voltage output	AV3	DC1－ 5V Load impedance 2kΩ or more.
	AV4	DC0－ 5V Load impedance 2kΩ or more.
	AV5	DC0－10V Load impedance 2kΩ or more.
Current output (AI)		DC4～20mA Load impedance 500Ω or less.
Measurement choice		"The indication value synchronizing" "The inner measured value synchronizing" (selectable) ※Ratemeter／Totalizer
Output accuracy		Within ±0.3%F.S. for indicated value. (at 23℃)
Temperature caracteristic		±100ppm／℃ (0～50℃)
Output response		Approx 20ms (But, an output change is time until the 90% arrival.)
Maximum output resolving ability		14 bits D／A conversion operation 13000 resolution. AV3 DC1－ 5V : 13000 ※ AV4 DC0－ 5V : 13000 ※ AV5 DC0－10V : 13000 ※ AI DC4－20mA : 13000 ※ ※Maximum output area : It's possible to output to 102.4% to the maximum of each output. ※An analog output is outputting calculation to the indication value shown to 7segment LED. Therefore the resolution sometimes falls from 13000 by setting of mode b,C.

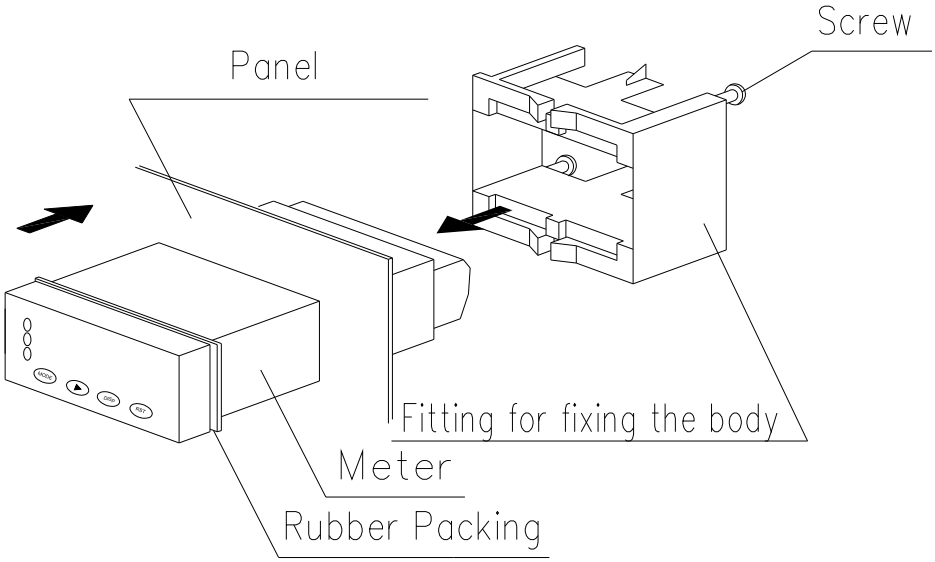
3. Mounting meter

How to mount meter

1. Cut the panel to insert the meter from the front.
2. Slide fittings for fixing from the rear to fix the body.
   At this time, if the body is not secured tightly, fasten screws a little more.

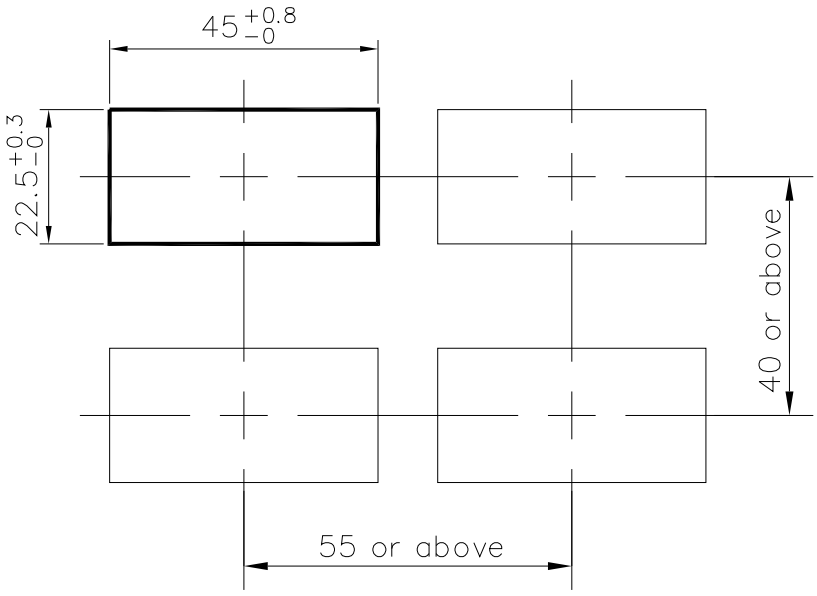
• Fit the body on to a panel 1.0-4.0 mm in thickness.

Fig.1



Panel cutout dimensions and, pitch for mounting two or more meters.

Fig.2



(Unit : mm)

※When using by protection against dust and waterproofing in forebody (IP66), please use rubber packing.

4. Connecting terminal boards

Terminal boards

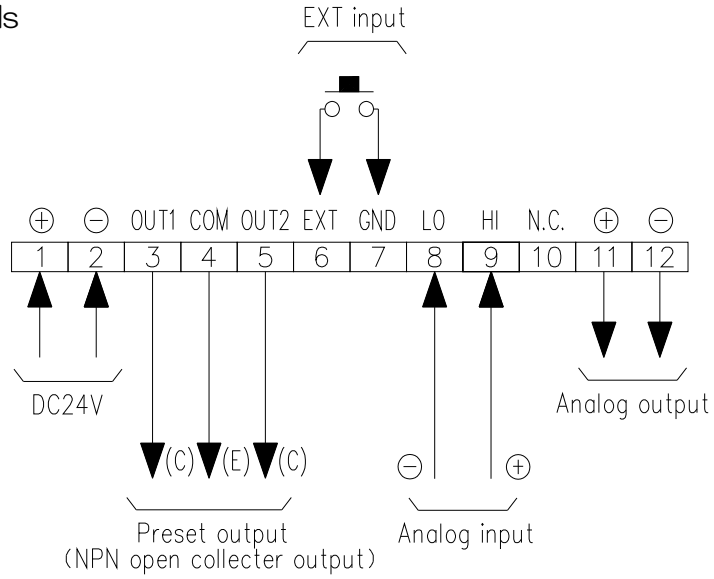
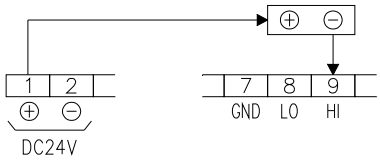


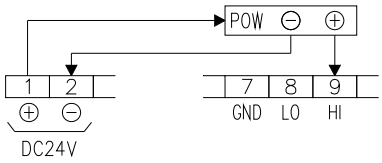
Fig.3

Terminal pitch : 3．5mm (Phoenix : SMKDS1/12-3.5)
Wire : AWG30～16 (SQ Conversion : 0．05～1．3mm²)
Convering off : 5．0mm

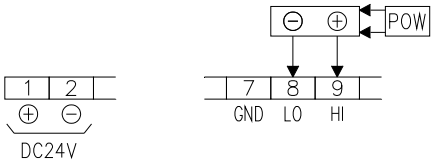
2-wire (2-wire transmission type)sensor Fig.4



Analog 3-wire type sensor Fig.5



Analog 4-wire type sensor Fig.6



⚠ <Caution> Always turn the power OFF before commencing any wiring work.

⚠ <Caution> Please confirm the specification.

⚠ <Caution> DC power supply connections
If the + and - are connected in reverse by mistake, the internal protective circuit is activated to stop the reverse current flow. In this case, disconnect, then reconnect correctly normal operation.

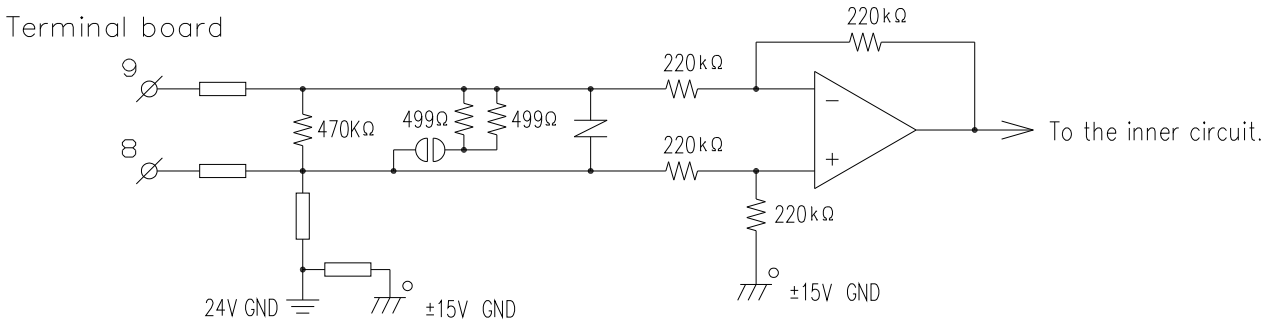
⚠ <Caution> The input/output wiring scheme varies with sensor type. Please refer to the connection diagrams (Figs. 4-6) above for wiring details, to avoid damage to the sensor or input/output circuits.

⚠ <Caution> When making a connection to the terminal board, make sure the lead wire is fully and firmly inserted.

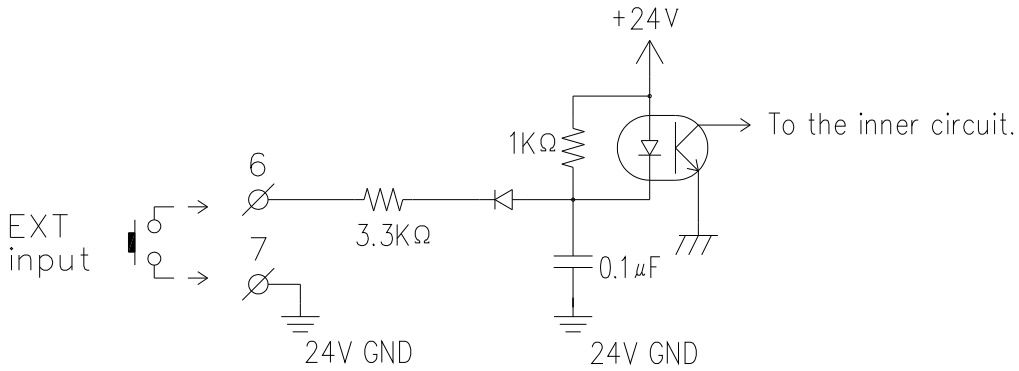
⚠ <Caution> Please tighten a screw of the terminal stand surely.

5. Construction of input/output circuit

1. Senser input : Voltage / current input Fig.7

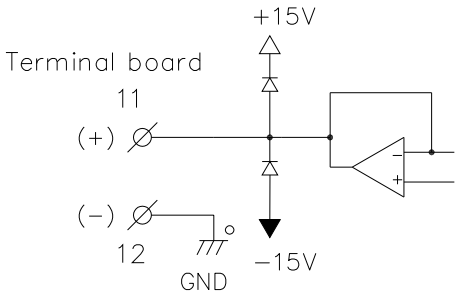


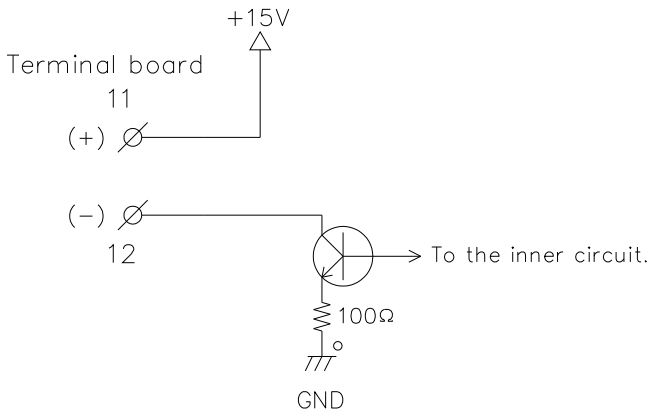
2. EXT input : NPN open collector input Fig.8



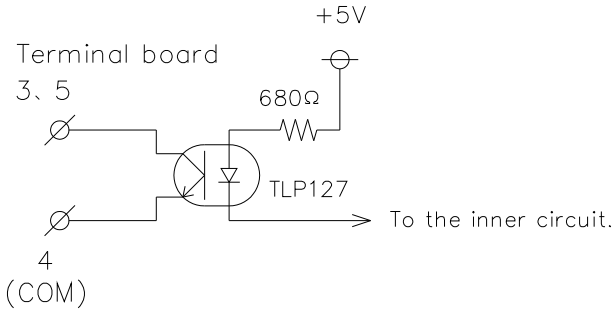
3. Analog output :

Voltage output（ＡＶ３～５） Fig.9　　Current output（ＡＩ） Fig.１０





4. Preset output/
Synchronization pulse output（NPN open collector output） Fig.１１



6. Names and functions of components on front

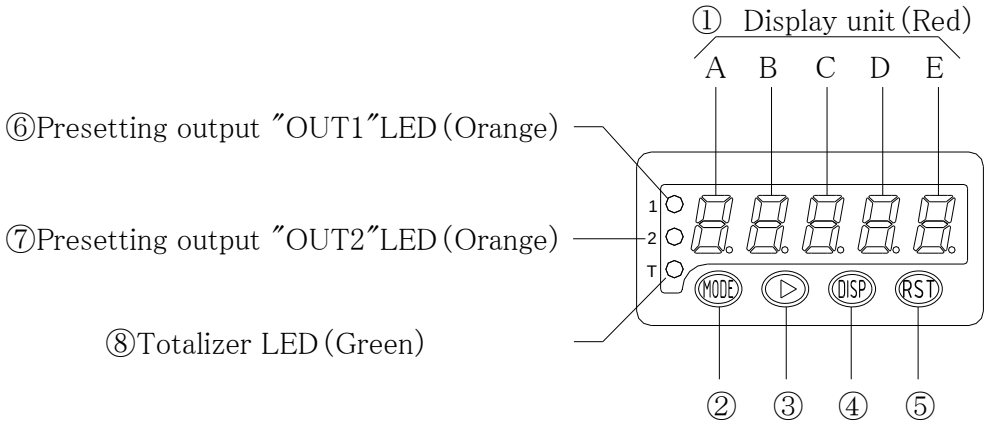


Fig.1 2

①Display unit (Red)

Measurement state : A measured value is indicated.

Setting state :
A・・・・・ Mode No. is indicated.
B to E・・・The present set value is indicated.

: Whole pre-set value setting indicates the present set value.

: Whole offset value setting indicates the offset value.

: It indicates "L-oFF" and "L-on" at the time of mode protect function setting.
: AnA,An-1-4 and the present bit value are indicated at the time of analog input and analog output adjustments mode setting.

②Mode key (MODE)

Turning on the power state : When a power supply is supplied while is pushing down (MODE), a test mode functions.

(A stop of the test mode function is power supply off.)

Measurement state : When (▶) is pressing for 2 sec. or more, while is pushing down (MODE), mode setting is called.

: When (MODE) is pressing for 2 sec. or more, pre-set value is called.

: When (DISP) is pressing for 2 sec. or more, while is pushing down (MODE), offset value setting is called.

Setting state : Mode No. (indicator A) is switched.
(1→2→3・・・9→A→b→C→1 Rise)

: OUT1,2 is switched at the time of pre-set value setting.

: An-1-4 is switched at the time of analog input and analog output adjustments mode setting.

③Shift key (▶)

Measurement state : (▶) is used to call the mode setting.
(It's on for more than 2 seconds with (MODE).)

: (▶) is used to call the mode protect function,
or used to change it.
(It's on for more than 2 seconds. →The state indicates it. →It's on for more than 8 seconds just as it is. →Change) 《L-oFF ⇔ L-on》

Setting state : (▶) moves the flash figure when each setting, to the right.

: When (MODE) is pressing while is pushing down (▶),
mode setting is switched, ″the down movement″ (Indicator A).
(C→b→A・・・4→3→2→1→C Descent)

: The output bit values decreases in An-3 and 4 at the time of analog input and analog output adjustments mode setting.

④Display key (DISP)

Turning on the power state : When a power supply is supplied while is pushing (DISP), analog input and analog output adjustments mode setting.

(A stop of the analog input and analog output adjustments mode setting is power supply off.)

Measurement state : (DISP) is used to call the offset value setting.
(It's on for more than 2 seconds with (MODE).)

: (DISP) is used to switch the ratemeter／totalizer.
(″ Mode №5″ in setting is needed.)

Setting state : (DISP) changes the flash figure when each setting.

: The output bit values increases in An-3 and 4 at the time of analog input and analog output adjustments mode setting.

: While (DISP) is being pressed, can confirm the registered bit value at an adjusting analog input and analog output. ″An-1-2″

⑤Reset key (RST)

Turning on the power state : Throw power supply in with (RST) pressed to initialize the settings.

Measurement state : Resets the totalizer without interrupting or resetting the rate reading. It also resets the presetting output.
(When doing input (terminats №6-7), setting of″ mode №5″ is needed.)

Setting state : (RST) is used to register and make it measurement status.

: The bit value of “An-1-4” is registered at the time of analog input and analog output adjustments mode setting.

⑥・⑦Presetting output LED (Orange)

Measurement state : It lights up ″OUT1,2″ at the presetting output.

: It lights up ″OUT1″ at the synchronization pulse output selection.

Setting state : The presetting output LED lights up at the time of the presetting output value setting.

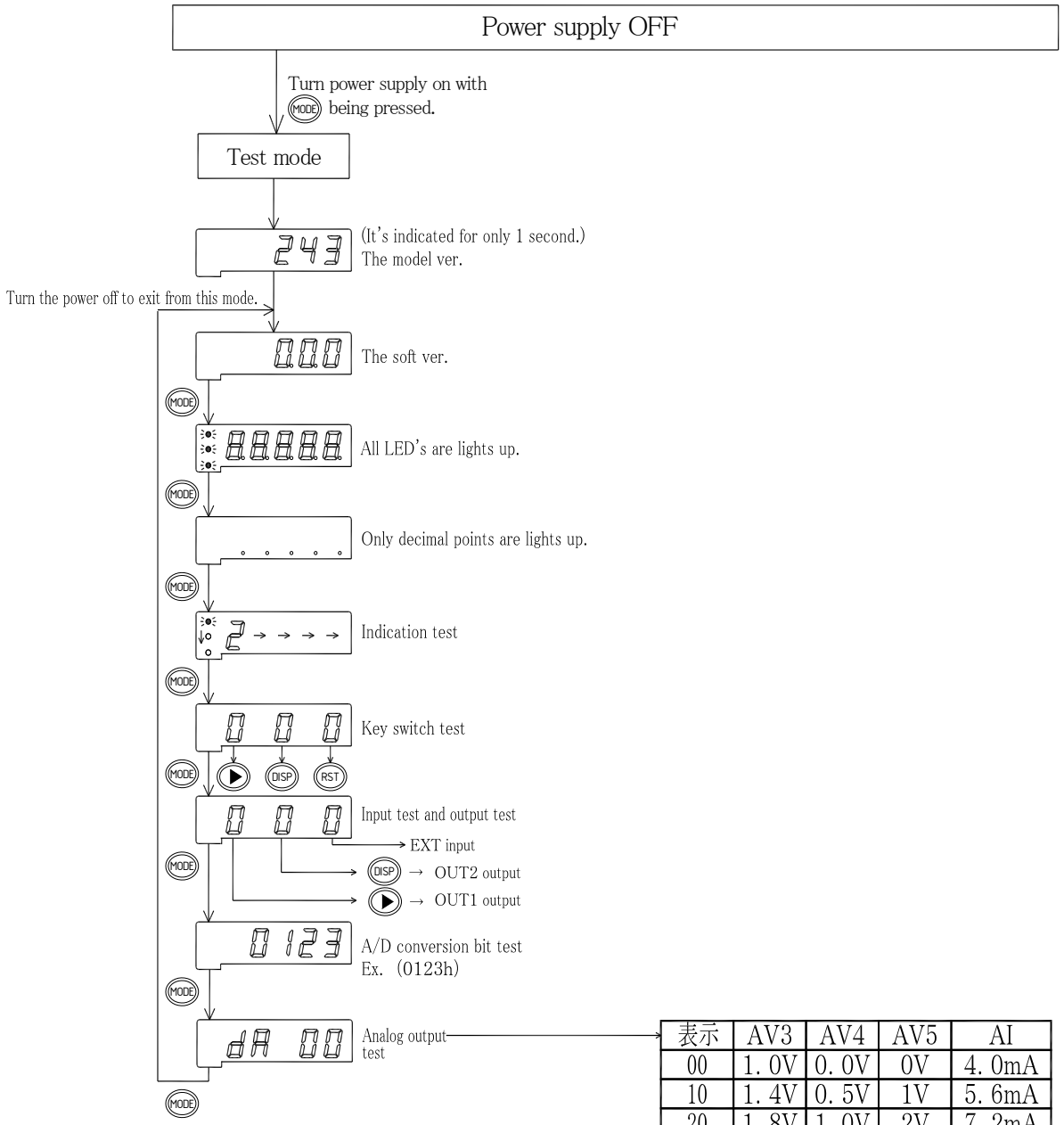
⑧Totalizer LED (Or ”×10 ＬＥＤ”) (Green)

Measurement state : It lights up at totalizer.

: When totalizer is being ″x 10″, it'll change to a flash.
(″ Mode №7″ in setting is needed.)

7. The setting menu

≪The test mode function≫

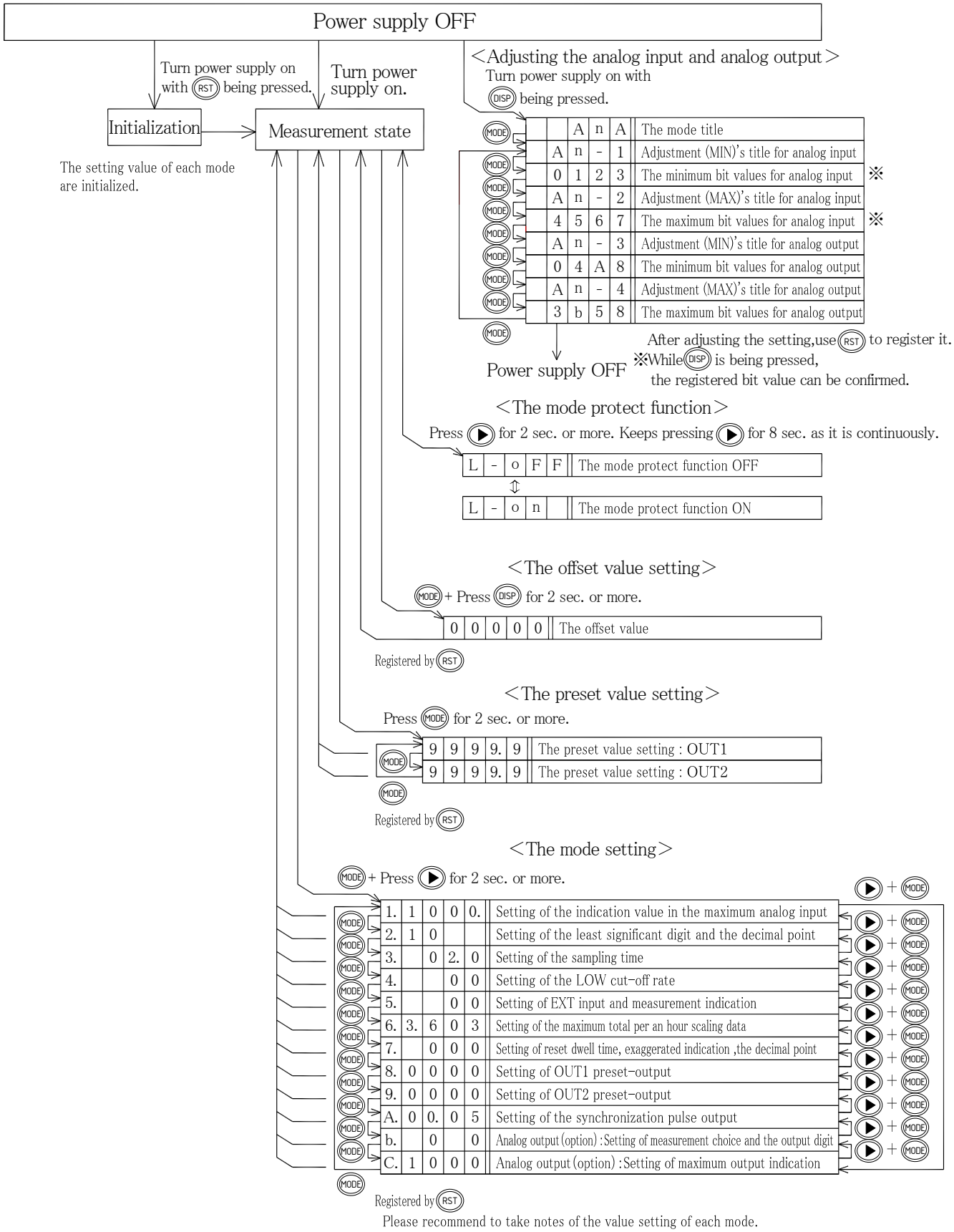


表示	AV3	AV4	AV5	AI
00	1. 0V	0. 0V	0V	4. 0mA
10	1. 4V	0. 5V	1V	5. 6mA
20	1. 8V	1. 0V	2V	7. 2mA
30	2. 2V	1. 5V	3V	8. 8mA
40	2. 6V	2. 0V	4V	10. 4mA
50	3. 0V	2. 5V	5V	12. 0mA
60	3. 4V	3. 0V	6V	13. 6mA
70	3. 8V	3. 5V	7V	15. 2mA
80	4. 2V	4. 0V	8V	16. 8mA
90	4. 6V	4. 5V	9V	18. 4mA
100	5. 0V	5. 0V	10V	20. 0mA

▶ :Descent

DISP :Rise

≪The setting menu≫



8. Initial setting values and initialization

If the specifications desired by the user are requested prior to shipment, the meter will be set these settings.
Otherwise, the regular factory settings are shown below.

Value setting of each mode Table.1

Mode №.	Initial setting				Notes				Mode contents
A	B	C	D	E	B	C	D	E	
1.	1	0	0	0.					Setting of the indication value in the maximum analog input
2.	1	0					—	—	Setting of the least significant digit and the decimal point
3.		0	2.	0	—				Setting of the sampling time
4.			0	0	—	—			Setting of the LOW cut-off rate
5.			0	0	—	—			Setting of EXT input and measurement indication
6.	3.	6	0	3					Setting of the maximum total per an hour (scaling data)
7.		0	0	0	—				Setting of reset dwell time, exaggerated indication ,the decimal point
8.	0	0	0	0					Setting of OUT1 preset-output
9.	0	0	0	0					Setting of OUT2 preset-output
A.	0	0.	0	5					Setting of the synchronization pulse output
b.		0		0	—		—		Analog output : Setting of measurement choice (option) and the output digit
C.	1	0	0	0					Analog output : Setting of maximum output (option) indication

Presetting output set value Table.2

Presetting output	Initial setting					Notes				
	A	B	C	D	E	A	B	C	D	E
OUT1	9	9	9	9.	9					
OUT2	9	9	9	9.	9					

Offset set value Table.3

Offset	Initial setting					Notes				
	A	B	C	D	E	A	B	C	D	E
Indication	0	0	0	0	0					

〔Initialization〕
Throw power supply in with (RST) pressed to initialize the settings.

After the initialization, the set values will be as shown in Table 1, Table 2 and Table 3.
Counter data and the mode protect function are also cleared.

⚠ <Caution>
※Since an initialization changes all existing setting values to the initial setting values, be sure to record all the setting values before an initialization.

※In case the computer froze when unusual functioning occurred with the normal operation, initialize according to the above procedure and set the desired value again.

9. Content and seting the each mode

≪1. Operating method (the mode setting)≫

When doing mode setting, please operate as follows.

Operation key	Indication	Procedure
MODE ＋ ▶	A B C D E 1. **1** 0 0 0.	While pushing down MODE key, press ▶ for 2 sec. or more. ″1″ appears in displays A ,the value setting for mode №.1 is shown.
▶	A B C D E 1. 1→**0**→0→0.	A figure of flash indication is shifted. Each time the key is pressed, a flash figure is shifted,to the right.
DISP	A B C D E 1. 1 **1** 0 0. 0→9	DISP changes the flash figure. Each time the key is pressed, a flash figure is rising up. （0→1→・・・→9→0→1・・・） ※In Situation, doesn't indicate by a setting figure, up to nine.
MODE	A B C D E **2.** 1 0 1-C	The mode №. is changed. Each time MODE is pressed, the mode №. is rising. 〔Rise〕 （1→2→・・・→C→1→2・・・） All modes are ″1-C″. When the mode №. reached ″C″, return to ″1″.
While is pushing down ▶ MODE	A B C D E **C.** 1 0 0 0 C-1	The mode №. is changed. When MODE is pressing , while is pushing down ▶ ,the mode №. is descent. 〔Descent〕 （C→b→・・・→1→C→b・・・） When the mode №. reached ″1″, return to ″C″. When ▶ key is released, it'll be 〔Rise〕.
RST		After adjusting the setting, use RST to **register** it. **The display returns to the readings following registration.**

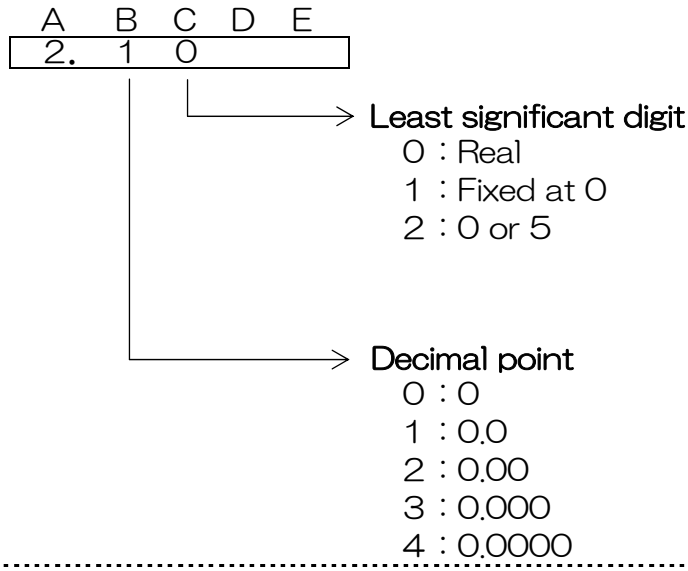
⚠ <Caution>

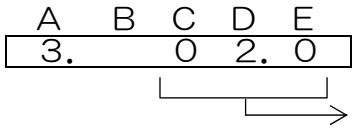
※Please make the mode protect function ″L-off″ at the mode setting. If it's a condition of ″L-on″, it can't be changed.

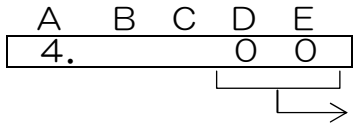
About the contents of the mode protect function, please refer to, ″10.The mode protect function″.

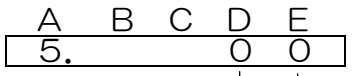
≪2. Content of the each mode and set value≫

Mode №.	Ratemeter : Setting of the indication value in the maximum analog input
1	A B C D E 1. 1 0 0 0. → Indication value 0.001-9999 （The decimal point can be set.） ※When it's set as 0000, it'll be the following scaling data by correlation with the decimal point location. 0000. → 10000. 000.0 → 1000.0 00.00 → 100.00 0.000 → 10.000 Please set the indication value which is at the time of the maximum analog input. It's indicated at the gradient between 2 points from ″0″. ⚠ <Caution> ※″Mode 2. Setting of the decimal point″ is the setting which makes a decimal point indicate. Therefore it's unrelated to the decimal point location of this setting. Attention please. 〔Ex.〕 It'll be the following setting to make it indication for ″1.234″ at the maximum analog input of 10V. 4 digits and decimal point The decimal point location A B C D E Mode №.1 1. 1. 2 3 4 A B C D E Mode №.2 2. 3 ＊

Mode No.	Ratemeter : Setting of the least significant digit and the decimal point
2	
	【Decimal point】 The location of the decimal point setting. (Ratemeter)
	【Least significant digit】 The form of indication for the least significant digit (digit on the right end) is selected. 0 : Real・・・・・・・・・Synchronized at the sampling time. 1 : Fixed at 0 ・・・・Always, "0". 2 : 0 or 5・・・・・・・・0-4 are expressed as 0, and 5-9 as 5. ⚠ <Caution> ※This setting is effective in avoiding flickering of least significant least significant digit.

Mode No.	Ratemeter : Setting of the sampling time
3	
	【Sampling time】 Input signals are read by this time, and its average value is calculated and indicated. Therefore, input signals are averaged and renewed by the set time. Use this setting for preventing flickering and for stabilizing indications. When 0.00 sec. is set, it is 100 seconds.

Mode No.	Ratemeter : Setting of the LOW cut-off rate
4	 LOW cut-off rate 00-29 (%) ("00" is a shut down.) 【LOW cut-off rate】 In cases where inputs falling below a certain percentage of the current/ voltage input are not needed, the % value is inputted. Inputs of this value or lower are disregarded without being included in rate and total readings. 〔Ex.〕 When it's set the low cut rate "10%" by "0-10V" input type, does not measure by less than 1V of voltage input.

Mode No.	Setting of EXT input and measurement indication
5	 Indicator 0 : Rate meter/totalizer is switched. 1 : Rate meter is fixed. 2 : Totalizer is fixed. EXT input 0 : Reset 1 : Hold 2 : Inhibit 3 : Indication change 【Indicator】 0 : Rate meter/totalizer is switched. Rate meter/totalizer is switched in (DISP) . 1 : Rate meter is fixed. Rate meter is fixed and indicated. 2 : Totalizer is fixed. Totalizer is fixed and indicated.

【ＥＸＴ input】
The function of “terminals №. 6-7” can be registered. (selectable)

0 : Reset
Totalizer is made offset value.
When the presetting output (OUT1,2) is output, it is released.

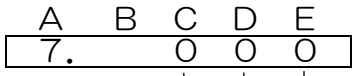
1 : Hold
During input on, ″Hold″ is indicated the present value.
〔Operating state : flash〕
※Even the state of a hold is calculated by a computer, and the presetting output is output by calculation.

2 : Inhibit
During input on, ″Inhibit″ restrains sensor input.
〔Operating state : non flash〕

3 : Indication change
During input on, rate meter/totalizer is switched.

⚠ <Caution>
※When choosing 1 or 2 by an indicator, an indication change doesn't function.

Mode №.	Totalizer : Setting of the maximum total per an hour (scaling data)
6	A B C D E 6. 3. 6 0 3 → Exponential value (10ⁿ) n= 0 - 5 → Scaling data 0.01-9.99 (Fixed decimal place) (Do not specify 0.00)
	The total value per an hour in the maximum analog input is specified by inputting a 3-digit value for B-D, and the exponential value (power of 10) for E. The setting range is 0.01-999000.
	〔Ex.〕 In case of the maximum total per an hour is ″1000″. 1000=1.00 ×10 ³ Setting will be as follows. ↑ ↑ BCD E A B C D E 6. 1. 0 0 3

Mode №.	Totalizer : Setting of reset dwell time, exaggerated indication ,the decimal point
7	 **Decimal point** 0 : 0 1 : 0.0 2 : 0.00 3 : 0.000 4 : 0.0000 **Overflow indication** 0 : 99999 flashing 1 : 5 digits endless 2 : A place shift is carried out in the 1st excess. 〔″ T″LED flashes on and off. 〕 Furthermore, when exceeded : 99999 flashing. **Reset time** 0 : 2 sec. 1 : Immediate (at ON edge)
	【Reset time】 Reset time for the front Reset key is specified. 0 : 2 sec. After the Reset key is pressed for 2 seconds or longer, the reading is reset. 1 : Immediate The reading is reset immediately when the Reset key is pressed. ⚠ <Caution> **※While (RST) and ″Reset″ of the EXT input are input, the presetting output is suspended.** ※″Reset″ of the EXT input is always immediately. ※ (RST) and ″Reset″ of the EXT input is made offset value. ※Rate meter isn't reset.

【Overflow indication】
The function of “overflow indication ” can is registered.（selectable）

0 : 99999 flashing
Counting from 0, when the total exceeds 99999, the indication flashes.
（※ Internal totaling is continued. To resume totaling from 0, reset.）

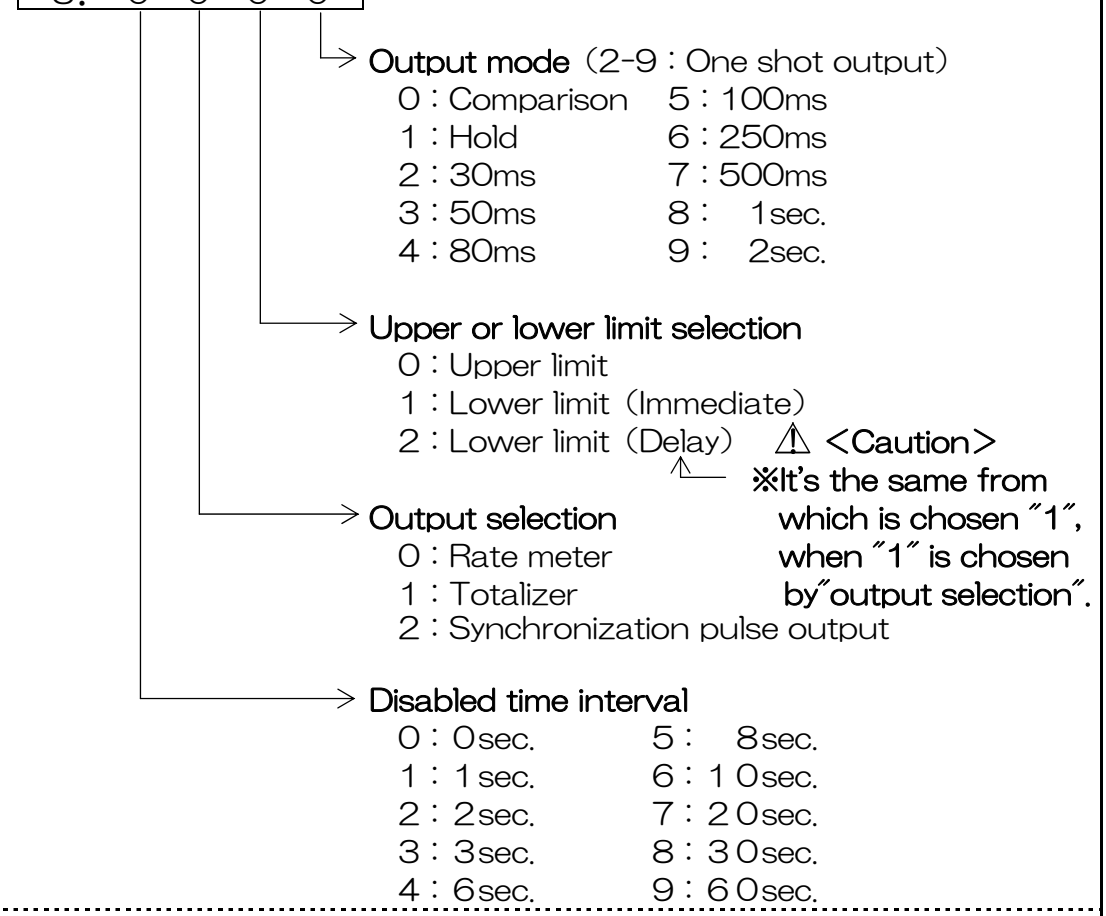
1 : 5 digits endless
Display is continued endlessly. When the total exceeds 99999, the totaling is resumed from 00000.

2 : Display shift to the digit to the left when the total exceeds 99999 to the 1st time. （″T″LED flashes on and off.）
Once again when the total exceeds 99999, the indication flashes.
（Indication shifts to the left.）

（※ Internal totaling is continued. To resume totaling from 0, reset.）

⚠ <Caution>
※The analog output setting is registered by ″totalizer″,and if the total exceeds 99999,the analog output value is shifted in the state biggest (102.4%).

【Decimal point】
The location of the decimal point setting. （Totalizer）

Mode №.	Setting of OUT1 preset-output
8	A B C D E 8. 0 0 0 0  **Output mode** (2-9 : One shot output) 0 : Comparison 5 : 100ms 1 : Hold 6 : 250ms 2 : 30ms 7 : 500ms 3 : 50ms 8 : 1sec. 4 : 80ms 9 : 2sec. **Upper or lower limit selection** 0 : Upper limit 1 : Lower limit (Immediate) 2 : Lower limit (Delay) ⚠ <Caution> ※It's the same from which is chosen ″1″, when ″1″ is chosen by″output selection″. **Output selection** 0 : Rate meter 1 : Totalizer 2 : Synchronization pulse output **Disabled time interval** 0 : 0sec. 5 : 8sec. 1 : 1sec. 6 : 10sec. 2 : 2sec. 7 : 20sec. 3 : 3sec. 8 : 30sec. 4 : 6sec. 9 : 60sec.
	The presetting output compares display value with the preset value, and outputs it by the result. Refer to "12. Calling up and modifying the preset value setting " for setting the preset values.
	【Disabled time interval】 The time in seconds following power startup or reset at which the presetting output function is activated is specified. ⚠ <Caution> ※It also functions,during each setting. Attention please. ※It's the same from which is chosen ″0″, when ″2″ is chosen by″ upper or lower limit selection″.

【Output selection】
A display to compare with a preset value is chosen.
0 : Rate meter
Rate meter is compared with a preset value.

1 : Totalizer
Totalizer is compared with a preset value.

2 : Synchronization pulse output
It outputs synchronizing with totalizer. Refer to page 24.
In this case, a preset value is unrelated.

【Upper and lower limits selection】
Output condition is specified.
0 : Upper limit
It outputs, 「Indication value ≧ Preset value」

1 : Lower limit (Immediate)
It outputs, 「Indication value ≦ Preset value」

2 : Lower limit (Delay) **※Only when it's Rate meter, it functions.**
It outputs,
「Indication value ＞ Preset value → Indication value ≦ Preset value」

【Output mode】
The length of a presetting output is specified.
0 : Comparison
This is output when the indication value exceeds the upper/lower limit setting value (preset value). When the indication value returns to within the set range, the output is turned off.

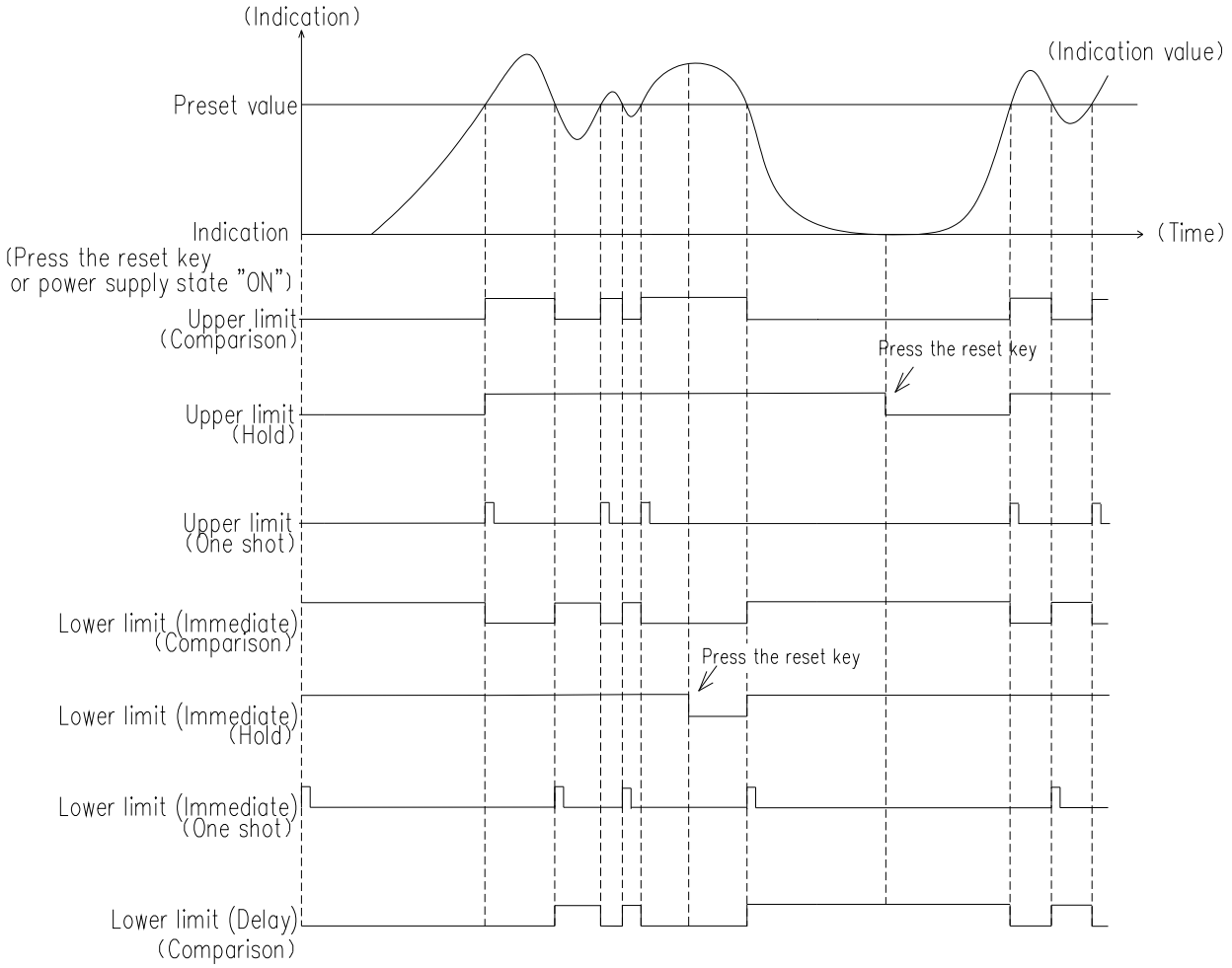
1 : Hold
This is output when the indication value exceeds the upper/lower limit setting value (preset value). The presetting output,once activated, is sustained until reset.

2～9 : One shot output
A pulse of pre-specified width is output once when the indication value exceeds the upper/lower limit setting value (preset value). "Output error : ±2ms"

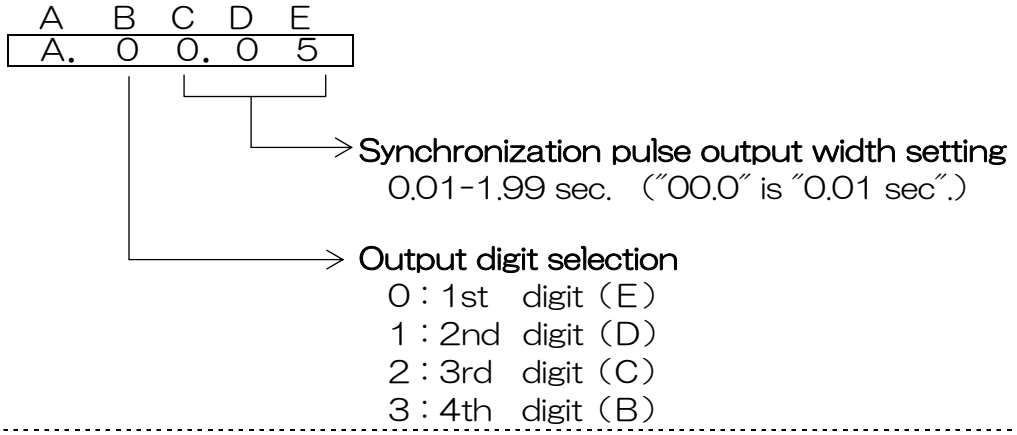
〔Ex.〕 The following settings are required in a case where the presetting function is to be activated 6 seconds following startup, and the presetting output is to be outputted and sustained when the reading exceeds the rate meter upper limit.
"Output selection : Rate meter"

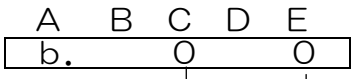
A	B	C	D	E
8.	4	0	0	1

【Chart at the timing of the presetting output】

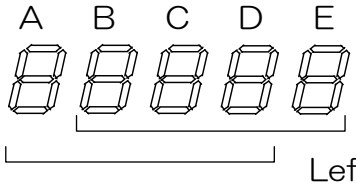


Mode №.	Setting of OUT2 preset-output
9	A B C D E 9. 0 0 0 0 **Output mode** (2-9 : One shot output) 0 : Comparison 5 : 100ms 1 : Hold 6 : 250ms ◆ 2 : 30ms 7 : 500ms ◆ 3 : 50ms 8 : 1sec. 4 : 80ms 9 : 2sec. ◆It outputs as ″one shot output″ at rate meter. It outputs as ″zero return″ at totalizer. **Upper or lower limit selection** 0 : Upper limit 1 : Lower limit (Immediate) 2 : Lower limit (Delay) ⚠ <Caution> ※It's the same from which is chosen ″1″, when ″1″ is chosen by″output selection″. **Output selection** 0 : Rate meter 1 : Totalizer **Disabled time interval** 0 : 0sec. 5 : 8sec. 1 : 1sec. 6 : 10sec. 2 : 2sec. 7 : 20sec. 3 : 3sec. 8 : 30sec. 4 : 6sec. 9 : 60sec.
	Each setting is the same as that of the mode №. 8 "Setting of OUT1 preset-output" .
	【zero return】 When the indication value exceeds the upper limit (preset value) , this outputs one pulse of the set width one time, and the indication is returned to the offset value and totaling is resumed. "Output error : ±2ms" In case of ″the upper limit″ does function , but in case of ″the lower limit″ doesn't function. ⚠ <Caution> ※The following settings are required . 「Preset value > Offset value」 Always reset before starting count.

Mode №.	Totalizer : Setting of the synchronization pulse output
A	⚠ <Caution> ※It will function, if the totalizer synchronous pulse output is set up by output selection of the mode №8. "The synchronization pulse is outputted from OUT1 (terminals no. 3-4).  【Output digit】 The digit whose change is to trigger the pulse output is specified. 【Pulse output width】 The output width of synchronization pulse is specified. ⚠ <Caution> ※Caution is required as the synchronization output pulse is renewed each time the output digit value changes ; if the pulse width is set longer than the time interval of the output digit change, the pulse output becomes continuous. ⚠ <Caution> ※When 0.01 sec. were set by a synchronization pulse output , an output response is faster than indication scan, so "OUT1 LED" sometimes doesn't light up. It's outputting.

Mode №.	Analog output : Setting of measurement choice and the output digit
b	※" Mode №.b" is an analog output option (AV3-5/AI type).  A B C D E b. 0 0 → Digit selection 0 : Right 4 digits : comparison (Display unit B C D E) 1 : Left 4 digits : comparison (Display unit A B C D) → Selecting between rate/total 0 : Rate meter (Synchronized with the indication value.) ◆ 1 : Rate meter (Synchronized with the calculation value.) ◆ 2 : Totalizer (Synchronized with the indication value.) 3 : Totalizer (Synchronized with the calculation value.) ◆Synchronized with the sampling time.
	【Selecting between rate/total】 The value to be outputted is selected. And the indication value or the calculation value is selected too. 0 : Rate meter (Synchronized with the indication value .) It outputs to the indication value. It outputs to the holding value,when ″1″ is chosen by″mode №.5 - Hold″. 1 : Rate meter (Synchronized with the calculation value.) It outputs to the calculation value. 2 : Totalizer (Synchronized with the indication value .) It outputs to the indication value. It outputs to the holding value,when ″1″ is chosen by″mode №.5 - Hold″. 3 : Totalizer (Synchronized with the calculation value.) It outputs to the calculation value.

【Digit selection】
It chooses ″the right 4 digits″ or″the left 4 digits″, and setting.



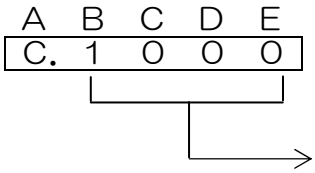
⚠ <Caution>
※An analog output is outputting calculation to the indication value shown to 7segment LED. Therefore the resolution sometimes falls from 13000 by setting of mode №b,C.
When the analog output maximum output indication value set ″more than 1300″and ″the left 4 digits″, it will be 13000 resolutions,basically.

<Addition about the analog output resolution>
The setting of analog output sets each 4 digits of left and right. But that's compared by at most 5 digits (left 4digits) by calculation. The analog output is outputting to the indication value into which the reach from a least significant digit to the highest rank figure was divided by 13000 resolutions in relation to mode C″. (the indication value to the 1bit)

〔Ex.〕 The settings in a case where the analog output is synchronized with the rate reading, with a maximum output when the reading is 10, would be as follows.

<Condition>
Mode №b : Digit selection → Left 4 digits
Mode №C : Setting of maximum output indication → 0001

(Result)
Digital/analog converter is 0-13000 bits to indication value 0-10.
Therefore analog is output every 1300 bits to a change in the indication value ″1″.
Therefore the resolution is 10 resolution.

Mode №.	Analog output : Setting of maximum output indication
C	**※" Mode №.C" is an analog output option (AV3-5/AI type).**  Set an indication value of the time when the analog output is maximum. Set a value in four digits, neglecting the decimal point. For example, both 500.0 and 50.00 are all right. (It sets as ″5000″ in this case.) 〔Ex.〕 The settings in a case where the analog output is synchronized with the rate reading, with a maximum output when the reading is 5000, would be as follows. A B C D E b. 0 0 C : 0 〔Rate meter (Synchronized with the indication value .) 〕 E : 0 〔Digit selection (Right 4 digits)〕 A B C D E C. 5 0 0 0 B-E 〔Setting of maximum output indication:5000〕 ⚠ <Caution> ※Even if the indication value goes over the indication value setting of analog maximum output,it outputs the setting of analog maximum output indication value. The limited on 102.4%. ※When setting mode №. d as (0000), an analog output is **always 102.4%.** ※If the indication value goes over the indication value setting of analog maximum output ,the limit reaches to 102.4%. After that,it outputs by the limited value (102.4%). **※If it's always overflow indication in spite of rate meter and totalizer, it always outputs by the limited value (102.4%).** 〔Ex.〕 When it will be making the overflow indication by setting of the biggest indication and the left 4 digitsat at ″mode №. b,C″, it'll be 102.4% immediately.

10. The mode protect function

When the mode protect function is made effective, (DISP) operation is invalid by mode setting.
Therefore the set value can't be changed.

In an early stage,the mode protect function is invalid .

When doing the mode protect function setting, please operate as follows.

≪Operation of the mode protect≫

Operation key	Indication	Procedure
(▶)	A B C D E 1○ 2○ L − o F F T○ (The mode protect:present)	Press the key for 2 sec. or more. The present mode protect state is displayed . 〔The regular factory setting is "L-oFF" .〕
(▶)	A B C D E 1○ 2○ L − o n T○ (The mode protect:change)	Keep pressing (▶) for 8 sec as it's continuously, the state of mode protect is changed. ※" OFF → ON" or "ON → OFF"
(▶)		It usually returns when (▶) is stopped being pressed.

⚠ <Caution>
※The preset value setting and the offset value setting always can be changed.
※The mode protection function becomes "OFF" , when it's initialized.

11. Calling up and modifying the offset value setting

The preset totalizer reading value to be displayed directly following a reset is specified.
For example, if the offset value is set at "01000", the reading becomes "1000" when reset, and the count resumes from "1000".
In order to start the count from "0", the offset value should be set as "00000".
The possible range for offset is 0-99999.
The procedure for setting the offset value is described below.

≪Operation of the offset value setting≫

※When there are no customer requests,the initial value setting is "00000".

Operation key	Indication	Procedure
(MODE) + (DISP)	A B C D E 1○ 2○0 0 0 0 0 T●	While pushing down (MODE) key, press (DISP) for 2 sec. or more. "T" LED lights up and the present offset value is displayed.
(▶)	A B C D E 1○ 2○ 0→0→0→0→0 T● └———←———┘	Shifts the flashing indication to the digit to the right. Each time (▶) is pressed, shifts the indication to one right.
(DISP)	A B C D E 1○ 2○0 1 0 0 0 T●	Changes the value of the flashing digit. Each time (DISP) is pressed, the number goes up by one. (0→1→・・・→9→0→・・・)
(RST)		After adjusting the setting, use (RST) to **register it.** **The display returns to the readings following registration.**

≪After registration≫

(RST)	A B C D E 1○ 2○ 1 0 0 0 T●	The registered offset value can be displayed by pressing (RST) . The totalizer count is resumed from this value.

⚠ <Caution>

※The mode protection function is invalid.
(Please refer to "10. The mode protect function ".)

※The decimal point is interlocked with the mode №7.

※When using "zero return" by mode №9, please be sure to set the preset value by the following condition.

Always reset before starting count.

「Preset value ＞ Offset value」

12. Calling up and modifying the preset value setting

Set the preset values. ″OUT1 , OUT2”.
The setting ranges are 0-99999.
The procedure for setting the preset value is described below.

≪Operation of the preset value setting≫

Operation key	Indication	Procedure
(MODE)	A B C D E 1● 2○9 9 9 9. 9 T○	Press (MODE) for 2 sec. or more. ″OUT1″ LED lights up and the present preset value is displayed.
(▶)	A B C D E 1● 2○9→9→9→9.→9 T○ └―――←――┘	Shifts the flashing indication to the digit to the right. Each time the key is pressed, shifts the indication to one right..
(DISP)	A B C D E 1● 2○9 0 9 9. 9 T○	Changes the value of the flashing digit. Each time (DISP) is pressed, the number goes up by one. （0→1→・・・→9→0→・・・）
(MODE)	A B C D E 1○ 2●9 9 9 9. 9 T○	The OUT2 led lights up and the preset value setting for OUT2 is shown. Press (▶) and (DISP) to set the desired setting value.
(RST)		After adjusting the setting, use (RST) to **register it.** **The display returns to the readings following registration.**

⚠ <Caution>

※Which of the totalizer or rate meter is the preset values used by must be selected according to the mode №8 and the mode №9.

※The decimal point is interlocked with the mode №2 for rate meter and the mode №7 for totalizer.

※The mode protection function is invalid.
（Please refer to ″10. The mode protect function ″.）

13. Adjusting analog input and analog output

⚠ <Caution>

※It's being adjusted according to an analog input type and an analog output option, but when being adjusted by yourself, please setting it with the following procedure.

When a power supply is supplied while is pressing (DISP), analog input and analog output adjustments mode setting.

※"An-1 , 2" is an analog input adjustment.

Operation key	Indication	Procedure
(DISP)	A B C D E 1○ 2○ A n A T○	When a power supply is supplied while is pressing (DISP), "AnA" is displayed.
(MODE)	A B C D E 1○ 2○ A n − 1 T○	When (MODE) is pressed, "An-1" is displayed. **An analog input adjustment (minimum) is performed.**
(MODE)	A B C D E 1○ 2○ 0 1 2 3 T○ ↖ (The bit values)	When (MODE) is pressed while inputting analog minimum input of the relevant analog type "A2-5", the bit value by the analog minimum input is indicated.
(RST)		When (RST) is pressed, the bit value as of **it is registered** as a lower limit.
(DISP)	「An-1,2」 「0 1 2 3.」 When indicating the registered bit value, it lights up.	While (DISP) is being pressed, the registered bit value can check it. (It functions by "An-1,2".) ※When indicating the registered bit value, a decimal point of a least significant digit lights up.
(MODE)	A B C D E 1○ 2○ A n − 2 T○	When (MODE) is pressed, "An-2" is displayed. **An analog input adjustment (maximum) is performed.**
(MODE)	A B C D E 1○ 2○ 4 5 6 7 T○ ↖ (The bit values)	When (MODE) is pressed while inputting analog maximum input of the relevant analog type "A2-5", the bit value by the analog maximum input is indicated.
(RST)		When (RST) is pressed, the bit value as of **it is registered** as a upper limit.

In case of ″A3(1-5V)″

Item	Voltage
Adjustment (MIN)	1.000V
Adjustment (MAX)	5.000V

In case of ″A4(0-5V)″

Item	Voltage
Adjustment (MIN)	0.000V
Adjustment (MAX)	5.000V

In case of ″A5(0-10V)″

Item	Voltage
Adjustment (MIN)	0.000V
Adjustment (MAX)	10.000V

In case of ″A2(4-20mA)″

Item	Current
Adjustment (MIN)	4.000mA
Adjustment (MAX)	20.000mA

※″An-3-4″ is an analog output adjustment (option).
When an analog output option is not, setting of ″An-3,4″ isn't necessary.

(MODE)	A B C D E 1○ 2○ A n − 3 T○	When (MODE) is pressed, ″An-3″ is displayed. **An analog output adjustment (minimum) is performed.**
(MODE)	A B C D E 1○ 2○ 0 4 A 8 T○ (The bit values)	Please adjust the bit value to the output minimum value of ″AV3-5,AI″. When (DISP) is pressed,**the bit values increases** . When (▶) is pressed,**the bit values decreases** . **〔The variable range is 01EC-0764.〕**
(RST)		After adjusting the setting, use (RST) to **register** the lower bit values .
(MODE)	A B C D E 1○ 2○ A n − 4 T○	When (MODE) is pressed, ″An-4″ is displayed. **An analog output adjustment (maximum) is performed.**
(MODE)	A B C D E 1○ 2○ 3 b 5 8 T○ (The bit values)	Please adjust the bit value to the output maximum value of ″AV3-5,AI″. When (DISP) is pressed,**the bit values increases** . When (▶) is pressed,**the bit values decreases** . **〔The variable range is 389C-3E14.〕**
(RST)		After adjusting the setting, use (RST) to **register** the upper bit values .
Turn the power "OFF"		After registration , the power supply state is "OFF".
Turn the power "ON"	A B C D E 1○ 2○ Measurement state T○	When the power supply state is "ON" once again, a measured value indicates.

In case of "AV3(1-5V)"

Item	Voltage
Adjustment (MIN)	1.000V
Adjustment (MAX)	5.000V

In case of "AV4(0-5V)"

Item	Voltage
Adjustment (MIN)	0.000V
Adjustment (MAX)	5.000V

In case of "AV5(0-10V)"

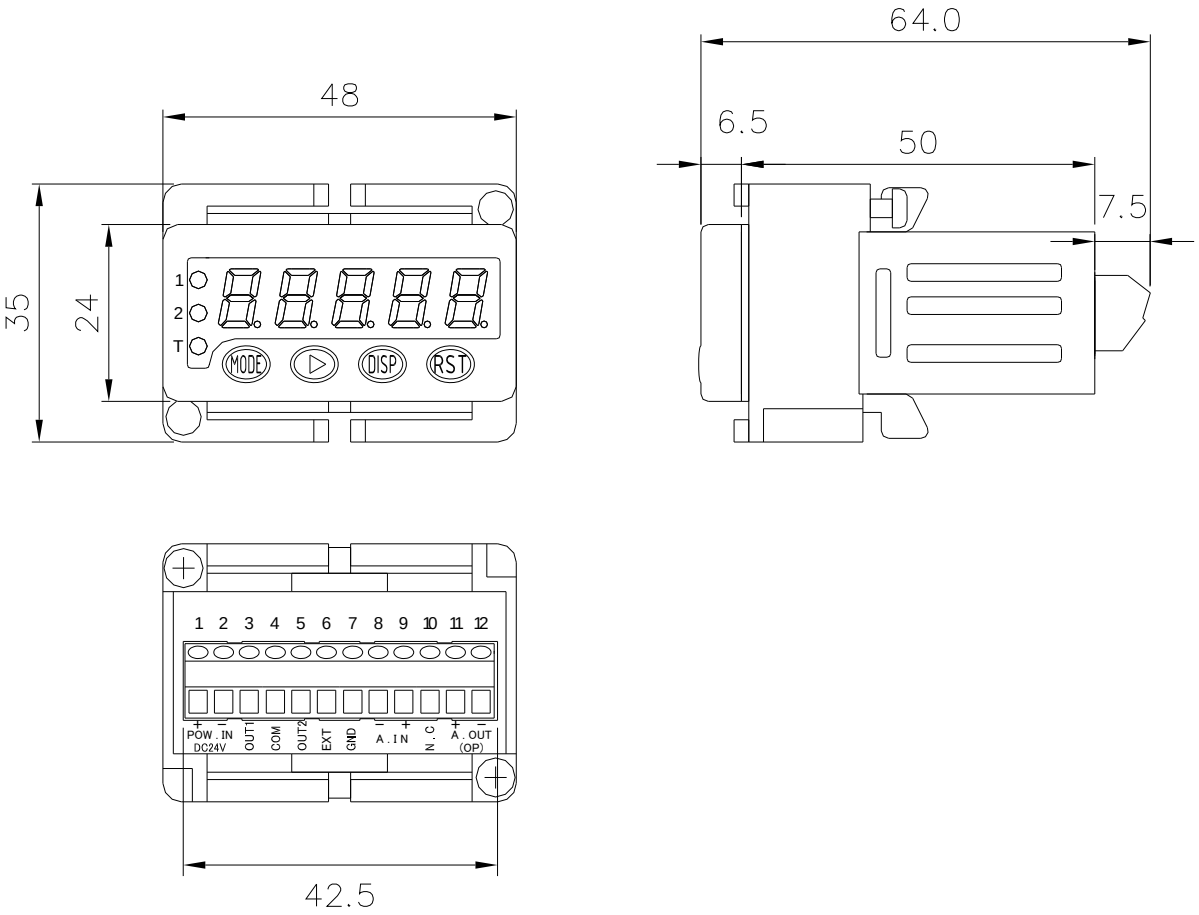
Item	Voltage
Adjustment (MIN)	0.000V
Adjustment (MAX)	10.000V

In case of "AI(4-20mA)"

Item	Current
Adjustment (MIN)	4.000mA
Adjustment (MAX)	20.000mA

14. External dimensions

External dimensions Fig.13



(Unit : mm)

15. About a noise countermeasure

When influence of noise occurred, please be careful about the following.

When doing a blackout and a malfunction by influence of noise, please be initialized. (Refer to page 12)
Please take notes of the value setting of each modes.
If it becomes normal, please take the following measure.
And please setting it once again.

（1）Please use 3 cores of shielding wire for a sensor , separate as much as possible from a source of noise.

（2）Please avoid a source of noise (power supply line and inverter), make it as short as possible. After that,please install a sensor code.

（3）Please separate from a power supply line,in a case affected by noise. And please install a EMI filter.

（4）The manner of the sensor cord installation.
When there is a power supply line near the sensor cord, a surge and noise are influenced.
Therefore , install a sensor cord independently or for 50 cm or more.

Fig.14

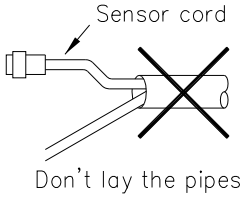
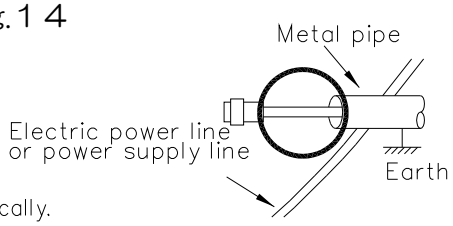
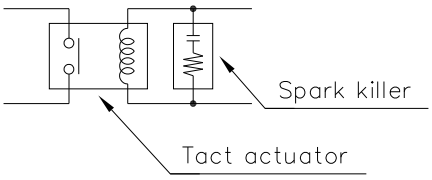


Fig.15



（5）When being affected than other equipment, please use a spark killer like Fig.16 and take a measure.

Fig.16



（6）If there is an unclear point, please even consult with use about a dealer or us.

16. Troubleshooting

When abnormality occurred, please check it as follows.

No.	Problem	Checking point	Solution
1	Display does not appear at all.	→Has it connected with the rear terminal correctly? Is the screw tightened certainly? Is the polarity of the 24V DC line correct?	→Connect correctly according to "Connecting terminal boards" (Refer to page 5). ↓ When display still does not appear, have it serviced.
2	Unusual LED lighting, key switch operation, preset - output, synchronization pulse, analog output	→Check with the test mode (Refer to page 10).	→Initialize (Refer to page 12). ↓ When it still does not resume normal status, have it serviced.
3	Rate meter remains at "0" and does not count.	→Is the setting for each mode correct? ↓ →Is the sensor input normal? ↓ ↓ →Is the distance of the sensor normal? ↓ →Is the input system of this meter suitable for the output signal of the sensor?	→Check the setting again (Refer to page 14-27). →Check the connection of the sensor (Refer to page 5). Check with the test mode (Refer to page 10). →The sensor lamp flash is confirmed. Voltage/current is measured. →Operation manual check. ↓ When it still does not resume normal status, have it serviced.
4	Indicator is flashing "99999".	→Check whether the scaling is not too large. (Rate meter) ↓ →Overflow indication. (Totalizer) ↓ →Influence of noise.	→Change the scaling data. (Refer to page 14 for mode No.1, page 17 for mode No.6 and page 18-19 for mode No.7.) About a noise countermeasure →Refer to page 34 for "About a noise countermeasure". ↓ When it still does not resume normal status, make a contact to a dealer or us.

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Please note that the communication costs shall be borne by the customer.

※All specifications may be changed without notice.