Instruction Manual
Digital Meter Relay Model 4257

1. Preface

- Please take care that this instruction manual is certainly delivered to the person in charge of operating this instrument.
- Unpack the product and confirm that the following items are included.
  (1) 4257 main unit   (2) Instruction manual   (3) Stickers of units
  (4) Sticker to indicate comparison system (models provided with HI, GO, and LO only)
  (5) A connector is attached when the meter relay is provided with an optional data output.
- Cautions for use
  For safety use, please observe the following cautions.

⚠ CAUTION

- **No power on-off switch is provided on the model 4257 so it immediately starts to work when connected to the power source. The rated data of this instrument is, however, defined with the pre-heating for 15 minutes or more.**
- **When the model 4257 is mounted into a system cabinet, take care for ventilation so that the inside temperature will not exceed 50°C.**
- **Do not use the instrument in such places as follows as it may cause break-down or malfunction of the instrument.**
  Places where: - Exposed to rain, water drops or direct sunlight.
  **   - High temperature or humidity, much dust or corrosive gas.**
  **   - Affected by external noise, radio waves or static electricity.**
  **   - Where there is constant vibration or shock.**

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2. Standard Specifications

■ Model Designation

Model Name 4257 -□-□-□-□-□-□
           1   2   3   4   5   6

【1】Measuring Input

● DC Input

Model	Measuring Range	Input Resistance	Accuracy *	Overload
4257-01	±9.999mV	100MΩ	±(0.1% of rdg + 2digits)	DC±50V
4257-02	±99.99mV	100MΩ	±(0.05% of rdg + 1digit)	DC±250V
4257-03	±999.9mV	100MΩ	±(0.05% of rdg + 1digit)	DC±250V
4257-04	±9.999V	10MΩ	±(0.05% of rdg + 1digit)	DC±250V
4257-05	±99.99V	10MΩ	±(0.05% of rdg + 1digit)	DC±500V
4257-06	±699.9V	10MΩ	±(0.1% of rdg + 2digits)	DC±750V
4257-09	1~5V	1MΩ	±(0.05% of rdg + 2digits)	DC±250V
4257-V2	0~5V	1MΩ	±(0.05% of rdg + 2digits)	DC±250V
4257-11	±9.999μA	10kΩ	±(0.1% of rdg + 1digit)	DC±2mA
4257-12	±99.99μA	1kΩ	±(0.1% of rdg + 1digit)	DC±20mA
4257-13	±999.9μA	100Ω	±(0.1% of rdg + 1digit)	DC±50mA
4257-14	±9.999mA	10Ω	±(0.1% of rdg + 1digits)	DC±150mA
4257-15	±99.99mA	1Ω	±(0.1% of rdg + 1digit)	DC±500mA
4257-16	±999.9mA	0.1Ω	±(0.2% of rdg + 2digits)	DC±2A
4257-19	4~20mA	12.5Ω	±(0.1% of rdg + 2digits)	DC±150mA

* Accuracy: Defined at 23°C±5°C, 45~75%RH.
  Temperature coefficient:
  4257-01, -04~09, V2, -11~15, -19 …………….. ±150ppm/°C
  4257-02~03 …………….. ±100ppm/°C
  4257-16 …………………..±200ppm/°C
  Defined at the working temperature range 0~50°C.

● **AC Input (real effective value)**

Model	Measuring Range	Input Resistance	Accuracy *	Overload
4257-22	99.99mVrms	10MΩ	±(0.2% of rdg + 5digits)	AC10V
4257-23	999.9mVrms	10MΩ	±(0.2% of rdg + 5digits)	AC100V
4257-24	9.999Vrms	10MΩ	±(0.2% of rdg + 5digits)	AC700V
4257-25	99.99Vrms	10MΩ	±(0.2% of rdg + 5digits)	AC700V
4257-26	699.9Vrms	10MΩ	±(0.3% of rdg + 5digits)	AC700V
4257-32	99.99µArms	1kΩ	±(0.3% of rdg + 5digits)	AC20mA
4257-33	999.9µArms	100Ω	±(0.3% of rdg + 5digits)	AC50mA
4257-34	9.999mArms	10Ω	±(0.3% of rdg + 5digits)	AC150mA
4257-35	99.99mArms	1Ω	±(0.3% of rdg + 5digits)	AC500mA
4257-36	999.9mArms	0.1Ω	±(0.5% of rdg + 10digits)	AC2A
4257-37	5.000Arms	0.01Ω	±(0.5% of rdg + 10digits)	AC10A

* Accuracy: Defined at 23ºC±5ºC, 45~75%RH.
　　　　　　Defined for sine wave input of input frequency 40Hz~1kHz.
　　　　　　±0.15% of FS for the input 10% or less of max. input value.
Temperature coefficient: ±300ppm/ºC
Crest factor: 4 (up to 1000V for the model –26)

【2】**Power Supply Voltage**

Code	Power Source Voltage
A	AC100~240V
B	DC12~24V

【3】**Data Output**

Code	Specifications	Output Impedance	Tolerable Load Resistor
Blank	No output	--------------------	--------------------
03	Analog output DC ±1V	0.1Ω or less	200Ω or more
04	Analog output DC ±5V	0.1Ω or less	1kΩ or more
05	Analog output DC ±10V	0.1Ω or less	2kΩ or more
09	Analog output DC 1~5V	0.1Ω or less	1kΩ or more
23	Analog output DC ±1mA	5MΩ or more	0~10kΩ
24	Analog output DC ±5mA	5MΩ or less	0~2kΩ
29	Analog output DC 4~20mA	5MΩ or less	0~600Ω
BP	BCD output (TTL level, positive logic)	--------------------	--------------------
BN	BCD output (TTL level, negative logic)	--------------------	--------------------
DN	BCD output (Transistor output, sink type)	--------------------	--------------------

【4】**Alarm Output**

Code	Specifications
Blank	Relay contact output
TN	Open collector output (NPN)

【5】**Comparison System**

Code	Description
Blank	HI, GO, LO ※
H	HI, GO, －
L	－, GO, LO

※HH, GO, H (Higher High, High limit)
can be changed to L, GO, LL (Low,
Lower Low limit).

【6】**Display Color**

Code	Description
Blank	Red LED
G	Green LED

■**General Specifications**

Display　　　　　　　　: 0~9999 red or green LED (character height 15mm) with zero-suppress function.
Scaling Function　　　: Full scale display value -9999~+9999 (0~9999 AC input)
　　　　　　　　　　　　Offset display value -9999~+9999 (0~9999 AC input)
Zero-Set Function　　: Function to electrically set an initial input value to zero.
Offset Fixing Function : Function to fix a display reading of input less than offset value to the offset value.
Decimal Point　　　　: Arbitrary setting (front setting or remote control).
Over-range Indication　: Blinking with 130% display.
　　　　　　　　　　　　When exceeded 9999, blinking with 0000.
　　　　　　　　　　　　For the model of the rated value 699.9V, blinking with full scale value.
Resolution　　　　　　: 1/10000
Sampling Rate　　　　: Approximately 15 times/sec.　　For DC power source, either rate can be selected.
Display Cycle　　　　: Function to select either cycle of 67ms, 400ms, 1s, 2s, 4s, or 5s is provided.
Input Type　　　　　　: Single ended, floating input.
A/D Conversion　　　: Δ-Σ conversion system.
Noise Rejection　　　: Normal mode (NMR)　　　　　　　50dB or more (DC input models)
　　　　　　　　　　　　Common mode (CMR)　　　　　　110dB or more
　　　　　　　　　　　　Power source line penetrating noise　1000V

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| Peak/Bottom Memory, Amplitude Display	:	Display of max., min. or amplitude between them is possible. Selectable by switch on front panel.
Averaging Function	:	Average of display data is calculated in fixed duration or in moving.
Cut-off Function	:	0~19.9%.
Comparison Digits	:	4 digits for numeral and 1 digit for polarity (no polarity for AC input models).
Output Selection	:	Comparison output is selectable by switch setting for actual value, peak memory value, bottom memory value or amplitude.
Comparator System	:	Independent setting for 2 points. Arbitrary setting for 2 high limits and 2 low limits. (for the models with HI, GO, LO specifications only) CPU comparison judgement system Function to switch over equal GO judgement or equal NG judgement is provided.
Setting Method	:	Digital switch setting.
Hysteresis Width Setting	:	1~999 Common setting for 2 comparison outputs.
Comparator Display	:	LED display. HI (red), GO (green), LO (yellow)
Comparator Output	:	Relay contact output: One 1a contact each for HI, GO, LO Contact capacity AC125V 0.5A resistive load. AC250V 0.1A resistive load. Open collector output (NPN): HI, GO, LO Output rate DC30V 30mA (Max) Output saturated voltage DC1.6V or less
Output Delay	:	ON delay. 0~60 sec., resolution 1 sec., adjustable to arbitrary value by the front panel switch.
Hold Function	:	Measured data, peak/bottom memory value, amplitude and comparator output are held. Not isolated from the input.
Reset Function	:	Resets (makes OFF) the alarm output. Not isolated from the input.
Insulation Resistance	:	DC500V 100MΩ or more.
Withstanding Voltage	:	Input, output terminals - Case : AC1500V each for 1 min. Power supply terminals - Case : AC1500V each for 1 min. Power supply terminals – Input, output terminals : AC1500V each for 1min.
Power Source Voltage	:	AC100~240V 50/60Hz DC12~24V
Tolerance of Source Voltage	:	AC90~250V DC9~32V
Power Consumption	:	Approx. 5VA at AC100V input, approx. 7VA at AC200V input. Approx. 180mA at DC12V input, approx. 90mA at DC24V input.
Operating Temperature	:	0~50°C
Storage Temperature	:	-20~70°C
Weight	:	Approx. 450g
Mounting Method	:	Fastening from rear of the panel by metal brackets.

■Unit Labels (attached)

Labels of different units are attached to the instruments.
Select and adhere the label of required unit:
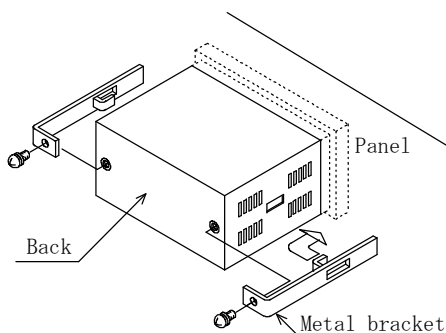V, mV, kV, rpm, ppm, A, mA, μA, m³/h, Torr, W, kW, %, mm, mmHg, °C, kg, m, Pa, m/min, kPa, Mpa, N

Note: Actual characters of the units printed on the stickers may be different from the above characters.

■Dimensions

● With analog output

● With BCD output

Unit:mm
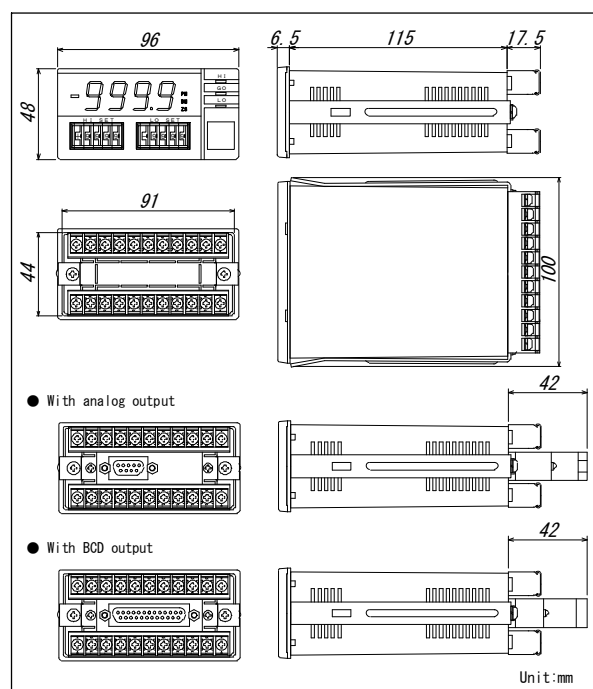
■Installation

Remove the metal bracketsat both sides,
insert the instrument from the front
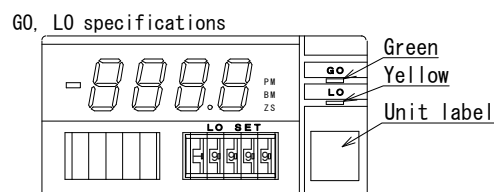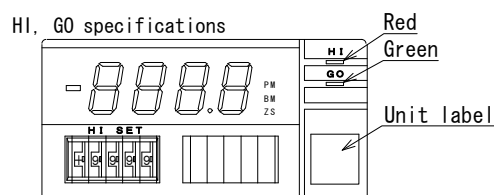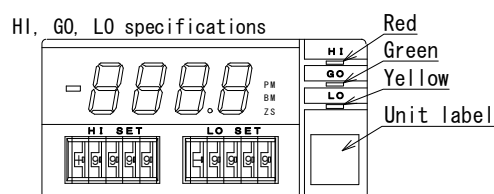and fix it by the brackets.

Panel cut-out dimension: $92^{+0.8}/_0 \times 45^{+0.6}/_0$ mm
Allowable panel thickness: 0.6~6mm
Note: Recommended thickness for the panel of aluminum is
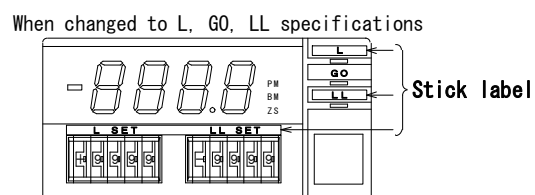1.5mm or more to avoid deformation of the panel.
Optimum torque of fixing screws: 0.25~0.39N・m

■Front Panel View of Each Comparator System

HI, GO, LO specifications

Red
Green
Yellow
Unit label

When changed to HH, GO, H specifications

Stick label

HI, GO specifications

Red
Green
Unit label

Digital switch 2 is
replaced with spacer,
and display LED for
comparator output of
LO is not mounted.

When changed to L, GO, LL specifications

Stick label

GO, LO specifications

Green
Yellow
Unit label

Digital switch 1 is
replaced with spacer,
and display LED for
comparator output of
HI is not mounted.
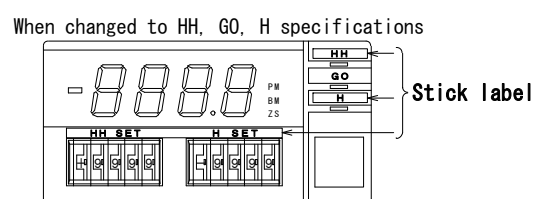
○ For the AC input models, the polarity section of digital switch is replaced with the spacer.
○ In case that the comparator system is changed for the HI, GO, LO specifications model,
stick a label of comparator system attached to the instrument.

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3. Data Output (Option)

■Analog Output Specification

● Measuring input and analog output are isolated.
● Change of output   :   Either output, current value, peak memory value, bottom memory value or
                                      amplitude, is output by switch setting.

     Scaling   :   Arbitrary range is output at the rated output, by switch setting.
     Tolerable error   : $\pm0.15\%$ of SPAN at $23^{\circ}C\pm2^{\circ}C$ to the display value,.
     Temperature coefficient : ±200ppm/$^{\circ}$C.
     Linearity   :   0.1% of SPAN.
     Resolution   :   1/2000
     Output cycle   :   67ms

■BCD Output Specification

● Measuring input and BCD data input/output are isolated.
● Either output, current value, peak memory value, bottom memory value or amplitude, can be selected with remote control.
● Display value and output data are independent of each other.
● Setting of front switch allows to change the output cycle and data as follows:
     1) To output the same data as displayed at display cycle.
     2) To output the measured data at sampling rate.
       It follows the standard zero set and cut-off functions, but not the 10^{0} digit fixing or averaging transaction.

● **TTL output (BP: Positive logic, BN: Negative logic)**
     Data output   :   Parallel BCD (1-2-4-8) code, latch output.
                            TTL level (CMOS compatible), Fo=2
     Control output   :   Over (OVER), polarity (POL), synchronization signal (SYNC)
                            TTL level (CMOS compatible), Fo=2
                            (At over: logic 1, at + polarity: logic 1)
     Control input   :   Latch (LATCH)
                            Data output and control output are held but the display is not held.
                            Active "L" $I_{IL} \leqq -1$mA, "L"=0~1.5V, "H"=3.5~5V
                            Memory function
                            (PEAK MEMORY, BOTTOM MEMORY, MEMORY RESET)
                            Active "L" $I_{IL} \leqq -1$mA, "L"=0~1.5V, "H"=3.5~5V
                            Data enable (OUTPUT ENABLE)
                            Active "H" $I_{IL} \leqq -1$mA, "L"=0~1.5V, "H"=3.5~5V

● **Transistor output (DN: Sink type)**
     Output capacity :   DC30V 30mA MAX
     Data output   :   Parallel BCD (1-2-4-8) code, latch output.
                            Transistor ON with "1", transistor OFF with "0".
     Control output   :   Over (OVER), polarity (POL), synchronization signal (SYNC)
                            Transistor "ON" with over display
                            Transistor "ON" with + polarity
                            Transistor "ON" for 10ms synchronized with the measured data conversion.
     Control input   :   Latch (LATCH)
                            Data output and control output are held but the display is not held.
                            Memory function
                            (PEAK MEMORY, BOTTOM MEMORY, MEMORY RESET)
                            Active "ON"
                            Data enable (OUTPUT ENABLE)
                            Active "OFF"

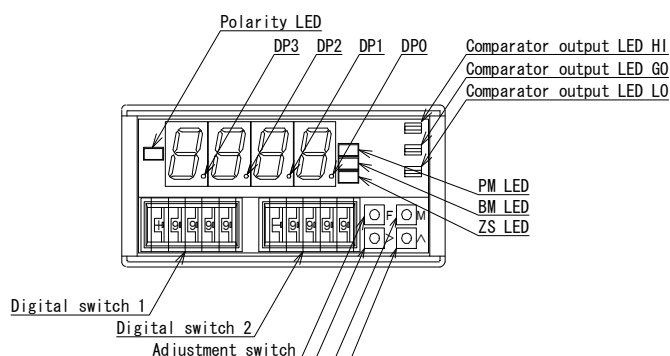# 4. Setting of Each Function

■Removal of Front Panel

Insert (-) screwdriver into the dips at the low end of instrument and remove the front panel.
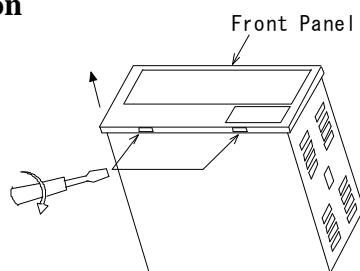
Front Panel

Wrench the panel open with (-) screwdriver.

■Layout of Front Panel Inside

Polarity LED

DP3 DP2 DP1 DP0

Comparator output LED HI
Comparator output LED GO
Comparator output LED LO

PM LED
BM LED
ZS LED

Digital switch 1

Digital switch 2

Adjustment switch

● Function of Each Switch

Function Switch │F│ : Change of mode between measuring and setting.
Change of function group in setting mode.

Mode Switch │M│ : Change of memory display in measurement mode.
Change of setting parameters in setting mode.

Shift Switch │>│ : Setting of value of each function and change.

Up Switch │∧│ : Setting of value of each function and change.
(When ∧ and > are simultaneously pressed for
3 seconds ore more in measuring mode, it resets
the memory.)

● Status of LED

Lit up

Blinking

Turned off

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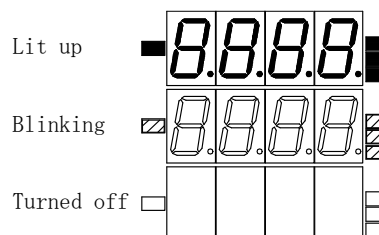
■Outline of Setting

Functions such as display scaling, averaging etc. are divided into 4 groups.
Depending upon the function to set, select the setting from among the following outline.
Note) During the setting mode, comparator output just before entering the setting is held.

Refer to article 4.1
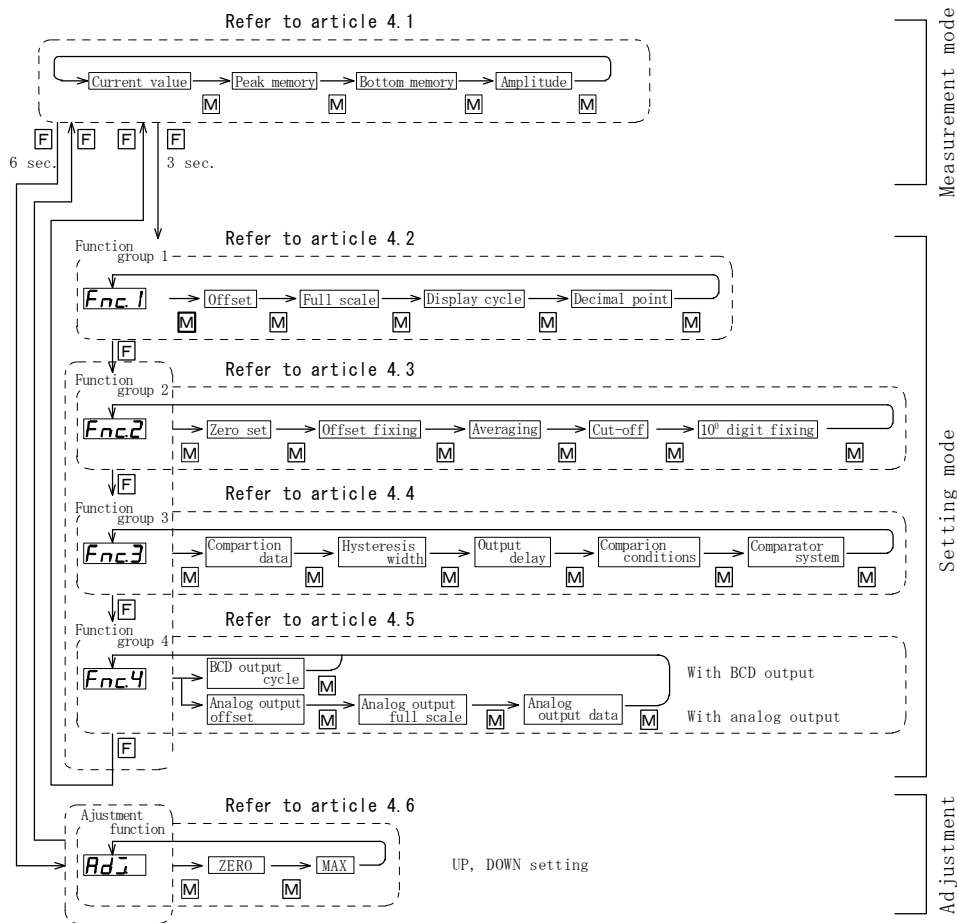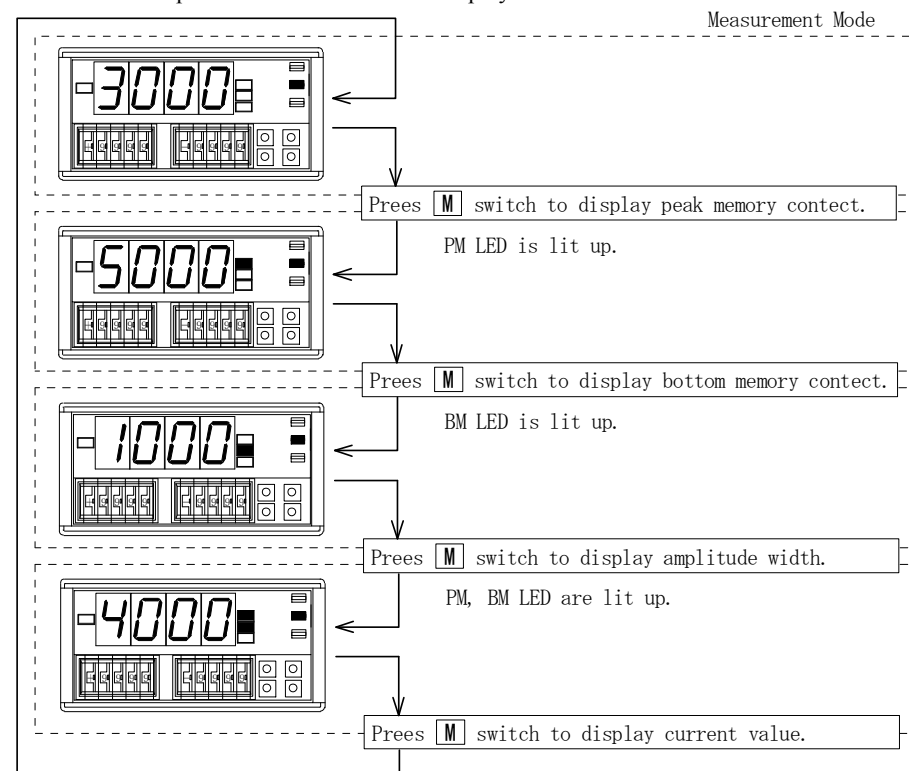Current value → Peak memory → Bottom memory → Amplitude

6 sec.   3 sec.

Function group 1 — Refer to article 4.2
Fnc.1 → Offset → Full scale → Display cycle → Decimal point

Function group 2 — Refer to article 4.3
Fnc.2 → Zero set → Offset fixing → Averaging → Cut-off → 10⁰ digit fixing

Function group 3 — Refer to article 4.4
Fnc.3 → Compartion data → Hysteresis width → Output delay → Comparion conditions → Comparator system

Function group 4 — Refer to article 4.5
Fnc.4 → BCD output cycle   With BCD output
→ Analog output offset → Analog output full scale → Analog output data   With analog output

Ajustment function — Refer to article 4.6
Adj → ZERO → MAX   UP, DOWN setting

Measurement mode / Setting mode / Adjustment

- To change each setting, press `>` switch.
- When returning from setting mode to measuring mode, the setting is memorized in the EEPROM. Display is then turned off once.
- Comparator system can not be set in case of single point setting of HI, GO or GO, LO.
- When the average calculation is moving average, the display cycle is fixed to 67ms and it can not be changed.
- For the models without data output, there is no setting of function group 4.

4.1 Change of display, memory

4.1.1 Change of display

It is possible to select a data to display.

Measurement Mode

Prees M switch to display peak memory contect.

PM LED is lit up.

Prees M switch to display bottom memory contect.

BM LED is lit up.

Prees M switch to display amplitude width.

PM, BM LED are lit up.

Prees M switch to display current value.

4.1.2 Explanation of memory function

● Peak/bottom memory, amplitude function
   Max. value (peak value), min. value (bottom) can be
   memorized and displayed.   An amplitude (max. - min. value)
   can also be displayed.

● Reset of peak/bottom memory
- Reset from the panel front:
   When $\boxed{\wedge}$ and $\boxed{>}$ are simultaneously pressed for 3 sec.
   or more, the display is turned off once and the memory is reset.
- Reset from the memory reset terminal (MR):
   Refer to the lower terminal arrangement and its explanation.
- Reset by power OFF:
   When the power is turned OFF, the peak/bottom memory
   values are reset.
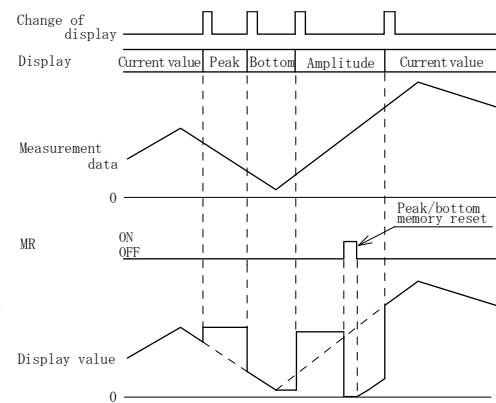
When the MR input terminal is ON, the memory data
is continuously updated, so the current value is
displayed and output.   In case of amplitude, however,
it is current value – current value, making 0 display.

4.2 Setting of function group 1

4.2.1 Display scaling - offset

● Offset display can be set to an arbitrary value.
   Adjustable range of offset value: -9999~9999 (0~9999 in case of AC input)
   Example: With the rated input 1~5V, the display at the input 1V is adjusted from 0 to 1000.
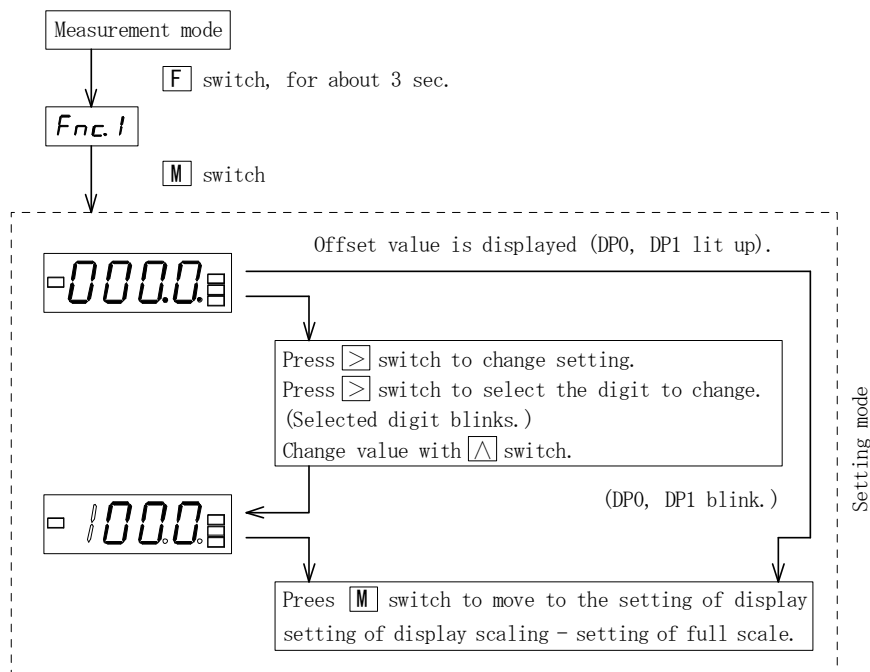
● Offset value display means the
   display at the input of 0mV(V,
   μA, mA, A).
   It is however, at the input of 1V
   and 4mA respectively for the
   input rate 1~5V, 4~20mA.

4.2.2 Display scaling - full scale

● Full scale display can be set to an arbitrary value.
   Adjustable range of offset value: -9999~9999 (0~9999 in case of AC input)
   Example: With the rated input 1~5V, the display at the input 5V is adjusted from 9999 to 5999.
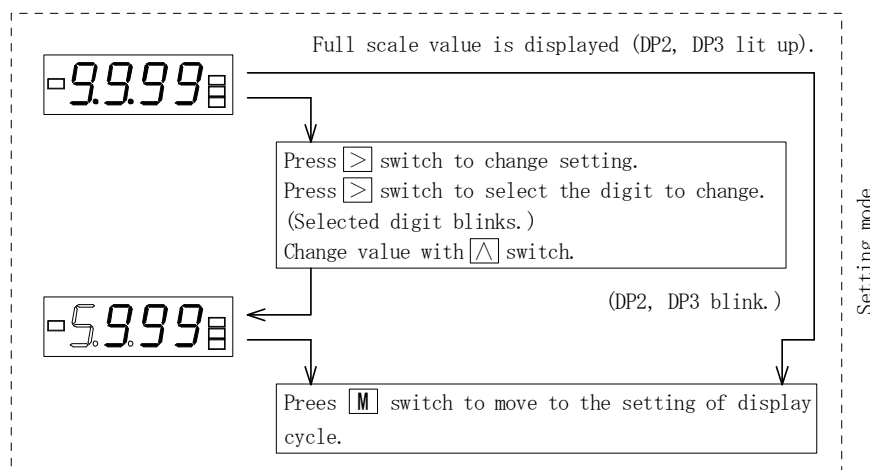

● Full scale display means the
   display at the input of max. value
   of the rated input.

● If the scaling is changed, peak
   memory and bottom memory are
   reset to the current value.

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4.2.3 Display cycle
● Display cycle of the display data can be slowed.
Sampling rate of the measurement does not vary even if the display cycle is slowed.
Example: Display cycle is changed from 67ms to 400ms.
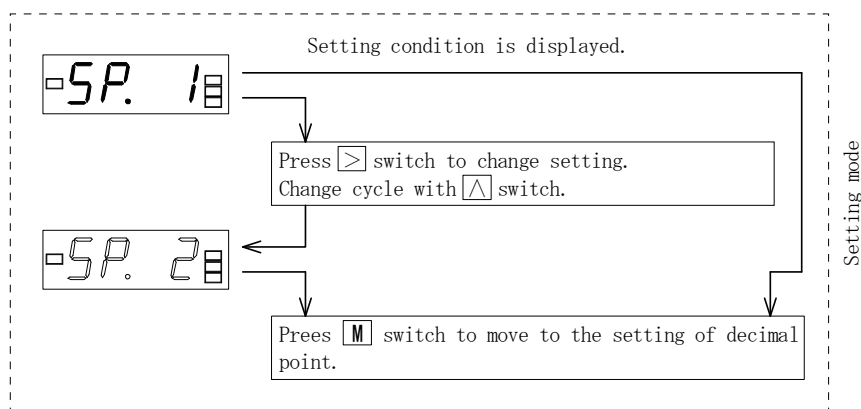
Display	Display Cycle
SP.1	67ms
SP.2	400ms
SP.3	1 s
SP.4	2 s
SP.5	4 s
SP.6	5 s
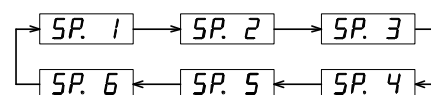
When the average calculation is of moving average, $5P.\Pi$ is displayed.
If a change of setting is tried in this case, $E\ulcorner\ulcorner$ is displayed and returns to $5P.\Pi$ display.

4.2.4 Decimal point
● Decimal point can be set to an arbitrary position.
Example: No decimal point is changed to the digit 10^1.
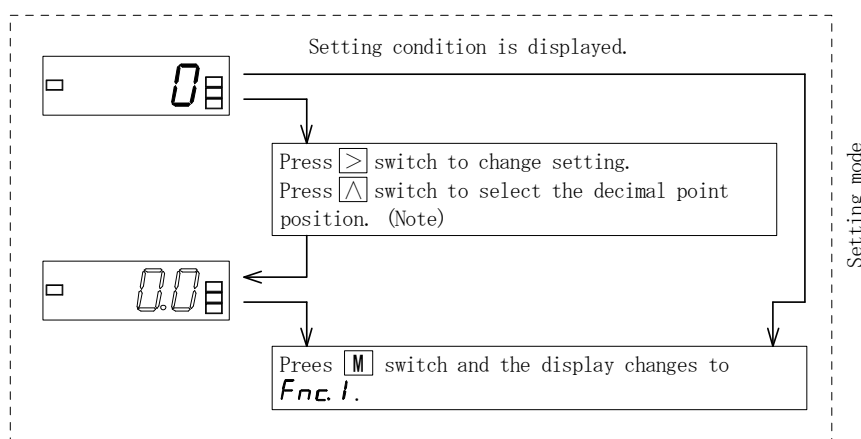
Note:

$\square$	:	Nil
$\square.\square$	:	DP1
$\square.\square\square$	:	DP2
$\square.\square\square\square$	:	DP3
$o\,u\,t$	:	Remote control ※

$\boxed{\wedge}$ switch: changes the setting in the order of Nil→DP1→DP2→DP3 →Remote-control→Nil

※When the remote control is selected, it allows the control of decimal point from the terminal block.

4.3 Setting of function group 2
4.3.1 Zero set
● Initial input value can be set to zero electrically.
Example: Disabled zero set function is made to be able.
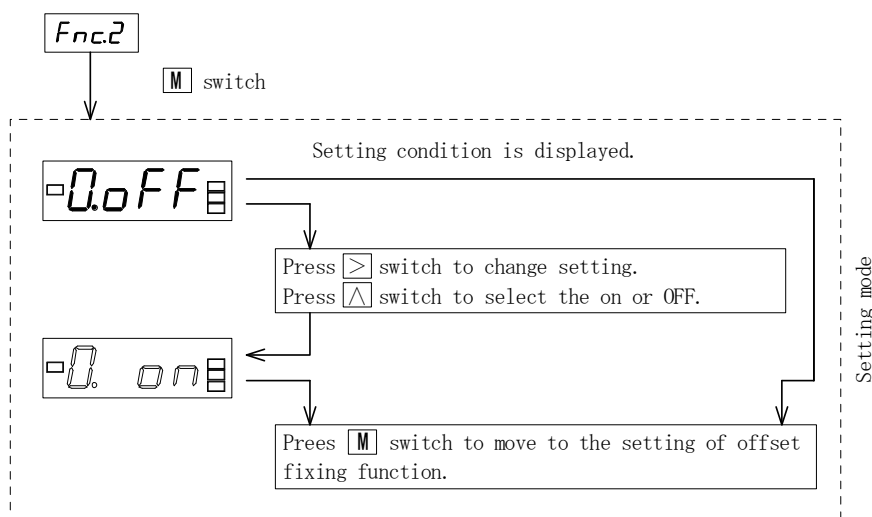
● When the zero set function is made to be able and the zero set terminal is short-circuited to the COM terminal, the display becomes the offset value (the value set at the article 4.2.1)

Example: When the scaling is 0~1000 and the zero set is made with the display 100, the original scaling 0~1000 corresponds to -100~0~900.

$\square.o\,n$:Zero-set functions
$\square.o\,F\,F$: Zero-set does not function

When the setting is made to on, zero set LED is lit up.

4.3.2 Offset fixing
● Display of the input less than offset value can be fixed to the offset value.
  Example: Disabled offset function is made to be able.

```
┌─────────────────────────────────────────────────────┐
│  o.oFF          Setting condition is displayed.      │
│        │                                             │
│        ↓                                             │
│  ┌──────────────────────────────────────┐           │
│  │ Press > switch to change setting.     │           │
│  │ Press △ switch to select the on or OFF.│          │
│  └──────────────────────────────────────┘           │
│  o. on  ←                                            │
│        │                                             │
│        ↓                                             │
│  ┌──────────────────────────────────────┐           │
│  │ Prees M switch to move to the setting │           │
│  │ of average calculation function.      │           │
│  └──────────────────────────────────────┘           │
└─────────────────────────────────────────────────────┘
```
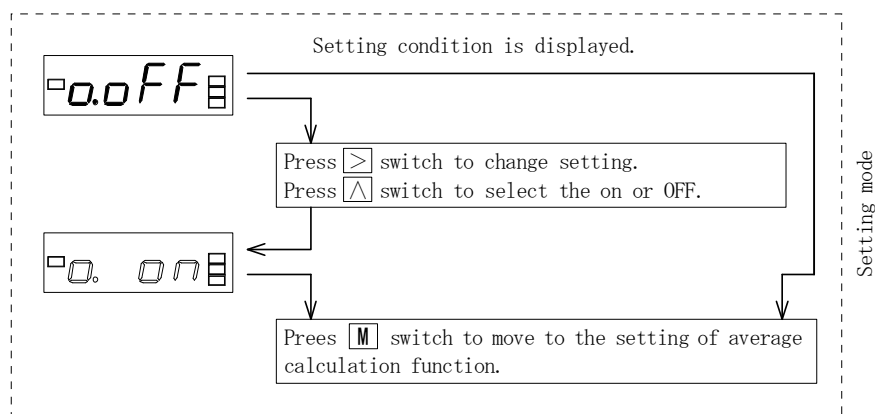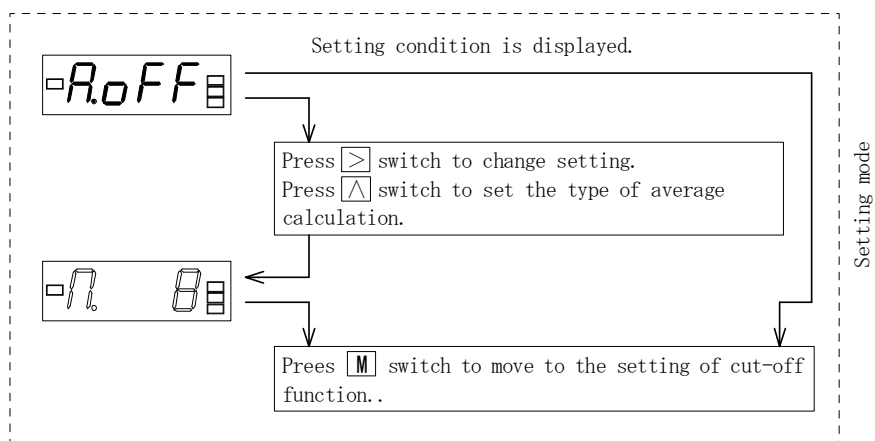Setting mode

● When the offset fixing function is allowed and the display scaling is set to 1000~5000, with the rated input 4~20mA, the display is fixed to 1000 even if the input 4mA or less is applied.

● For the AC input models, they work as the offset fixing function is able, regardless of setting of the function is disabled or able.

o. on : Offset fixing functions
o.oFF : Offset fixing does not function

When the offset fixing function is changed, peak memory and bottom memory are set to current values.

4.3.3 Average calculation
● Average calculation is made either in fixed duration (fixed sample data during display cycle time) or in moving (continuously updated sample data).
  Example: No average calculation is changed to moving average of 8 sample data.

```
┌─────────────────────────────────────────────────────┐
│  A.oFF          Setting condition is displayed.      │
│        │                                             │
│        ↓                                             │
│  ┌──────────────────────────────────────┐           │
│  │ Press > switch to change setting.     │           │
│  │ Press △ switch to set the type of     │           │
│  │ average calculation.                  │           │
│  └──────────────────────────────────────┘           │
│  n. 8  ←                                             │
│        │                                             │
│        ↓                                             │
│  ┌──────────────────────────────────────┐           │
│  │ Prees M switch to move to the setting │           │
│  │ of cut-off function..                 │           │
│  └──────────────────────────────────────┘           │
└─────────────────────────────────────────────────────┘
```
Setting mode

Relation between display cycle and the numbers of data sampling of per-display-cycle averaging:

Display cycle	Numbers of data
SP.1	No averaging
SP.2	6 times
SP.3	15 times
SP.4	30 times
SP.5	60 times
SP.6	75 times

Content of averaging

Display	Content
A.oFF	No averaging
A. on	Per-display-cycle Av.
n. 2	Moving Av., 2 times
n. 4	Moving Av., 4 times
n. 8	Moving Av., 8 times
n. 16	Moving Av., 16 times
n. 32	Moving Av., 32 times

4.3.4 Cut-off
● This is the function to cut an unstable zone around input of zero.
  The zone cut off becomes offset value.   The value of zone to cut is set by % to the rated input.
  Example: No cut-off function is changed to have cut-off of the input 10% or less.
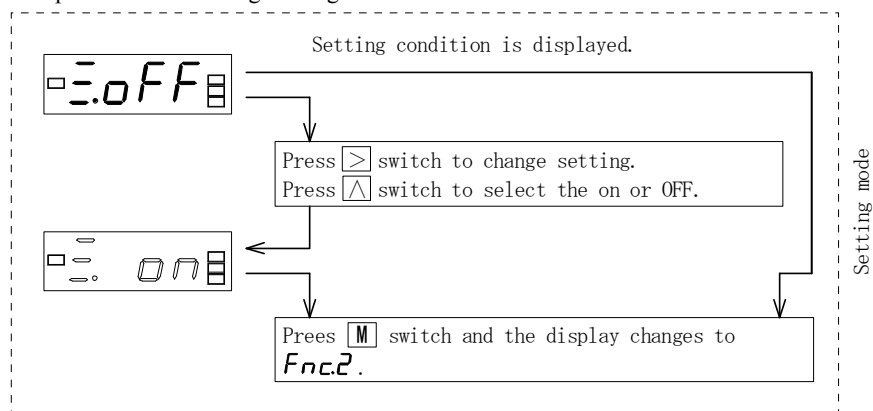
```
┌─────────────────────────────────────────────────────┐
│  C.00.0          Setting condition is displayed.     │
│        │                                             │
│        ↓                                             │
│  ┌──────────────────────────────────────┐           │
│  │ Press > switch to change setting.     │           │
│  │ Press > switch to select the digit to │           │
│  │ change.                               │           │
│  │ (Selected digit blinks.)              │           │
│  │ Change value with △ switch.           │           │
│  └──────────────────────────────────────┘           │
│  C. 10.0  ←                                          │
│        │                                             │
│        ↓                                             │
│  ┌──────────────────────────────────────┐           │
│  │ Prees M switch to move to the setting │           │
│  │ of 10¹ digit fixing function.         │           │
│  └──────────────────────────────────────┘           │
└─────────────────────────────────────────────────────┘
```
Setting mode
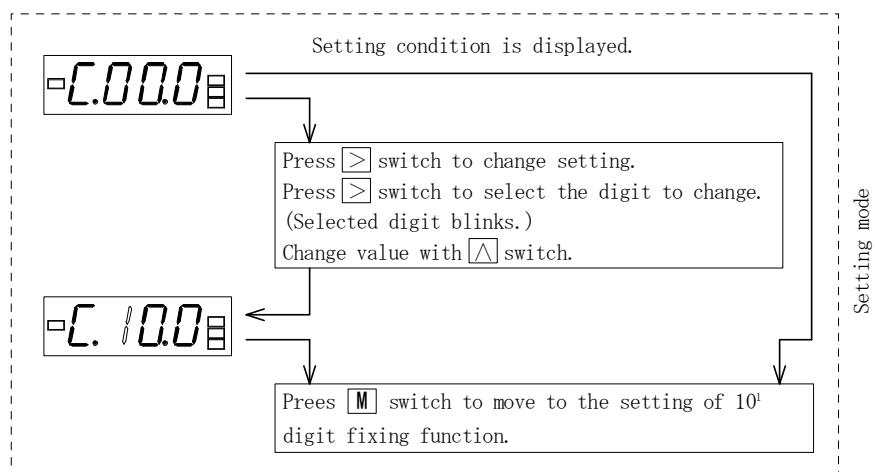
Adjustable range: 00.0~19.9%, however, the cut-off function is disabled when 00.0 is set.

Adjustable range for the AC input models is 00.1~19.9%.

4.3.5 Fixing of 10^0 digit

● 10^0 digit can forcedly be set to zero.
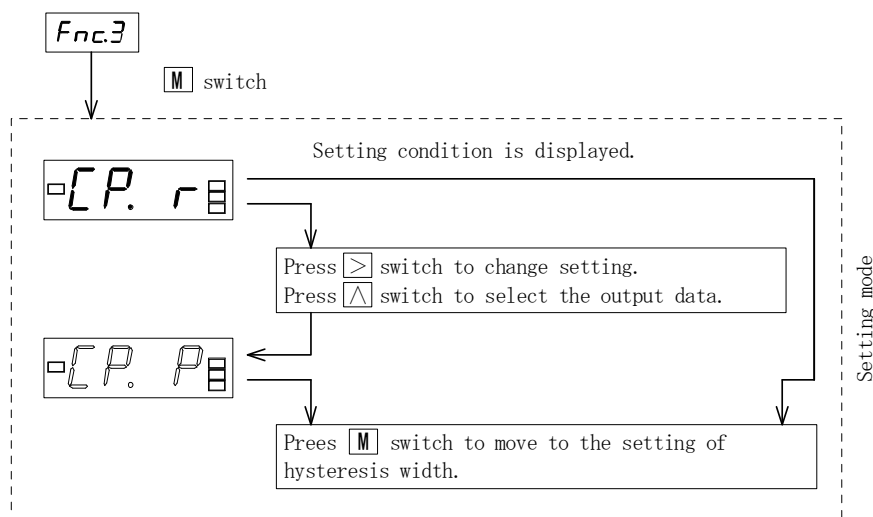Example: Disabled 10^0 digit fixing function is made to be able.

Setting condition is displayed.

$\Xi.oFF$

Press $>$ switch to change setting.
Press $\wedge$ switch to select the on or OFF.

$\Xi.\ on$

Prees M switch and the display changes to $Fnc.2$.

Setting mode

$\Xi.\ on$: 10^0 digit fixing functions.
$\Xi.oFF$: 10^0 digit fixing does not

4.4 Setting of function group 3

4.4.1 Comparison data

● Data to compare can be selected from actual value, peak memory value, bottom memory value or amplitude.
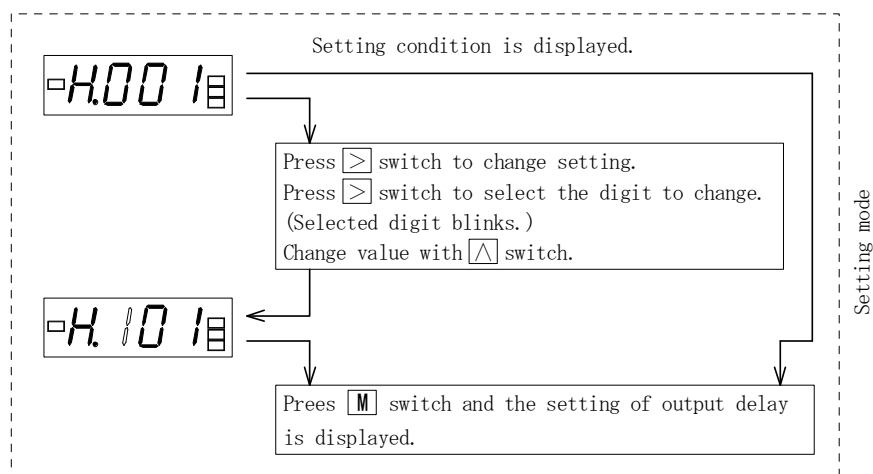Example: Data to compare for alarm setting is changed from actual value to peak memory value.

$Fnc.3$

M switch

Setting condition is displayed.

$CP.\ r$

Press $>$ switch to change setting.
Press $\wedge$ switch to select the output data.

$CP.\ P$

Prees M switch to move to the setting of hysteresis width.

Setting mode

$CP.\ r \rightarrow CP.\ P \rightarrow CP.\ b \rightarrow CP.Pb$
Current value — Peak memory — Bottom memory — Amplitude

4.4.2 Hysteresis width

● Width of hysteresis can be set (common for two points).
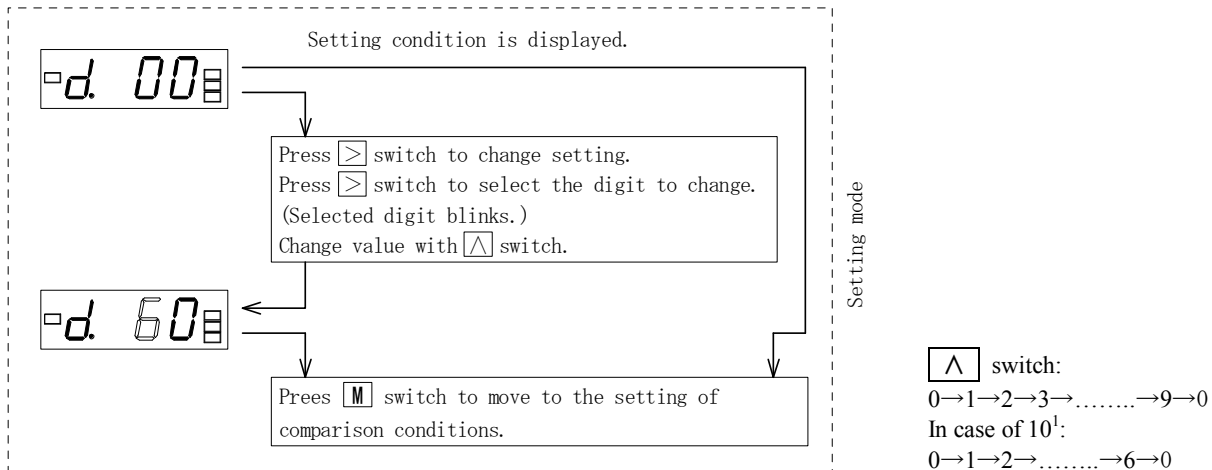Adjustable rage: 1~999
Example: Set value of hysteresis width is changed from 1 to 101.

Setting condition is displayed.

$H.001$

Press $>$ switch to change setting.
Press $>$ switch to select the digit to change.
(Selected digit blinks.)
Change value with $\wedge$ switch.

$H.101$

Prees M switch and the setting of output delay is displayed.

Setting mode

$\wedge$ switch:
$0\rightarrow1\rightarrow2\rightarrow3\rightarrow........\rightarrow9\rightarrow0$
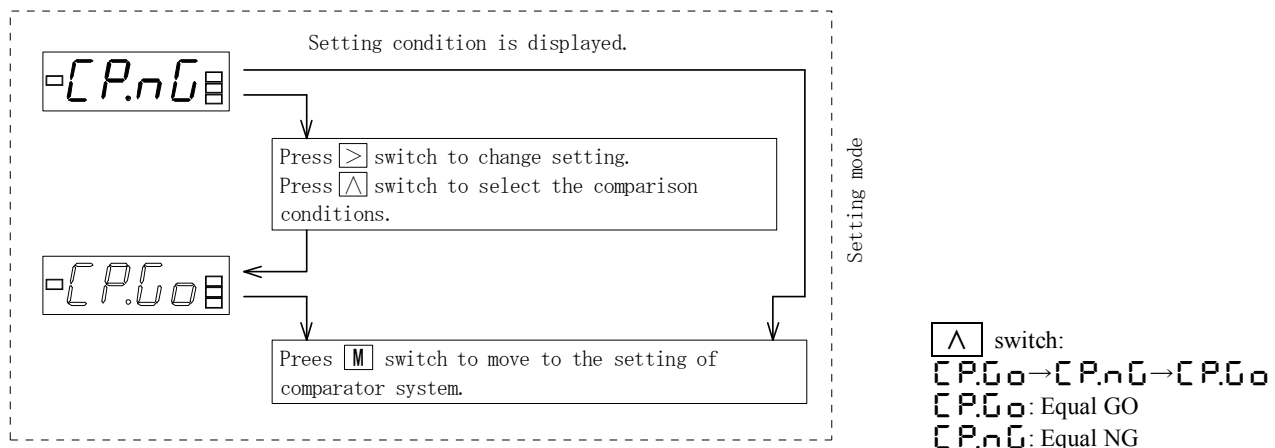
4.4.3 Output delay
● Output delay can be set (common for two points).
Adjustable rage: 0~60 sec. (resolution 1 sec.)
Example: On delay time of comparator output is changed from 0 sec. To 60 sec.

Setting condition is displayed.

`d. 00`

Press ⊳ switch to change setting.
Press ⊳ switch to select the digit to change.
(Selected digit blinks.)
Change value with ∧ switch.

`d. 60`

Prees M switch to move to the setting of comparison conditions.

Setting mode

∧ switch:
$0 \to 1 \to 2 \to 3 \to \ldots\ldots \to 9 \to 0$
In case of 10^{1}:
$0 \to 1 \to 2 \to \ldots\ldots \to 6 \to 0$

Note: It is not possible to set the value more than 60.
If the value more than 60 is set, it is not allowed to exit from the setting mode.
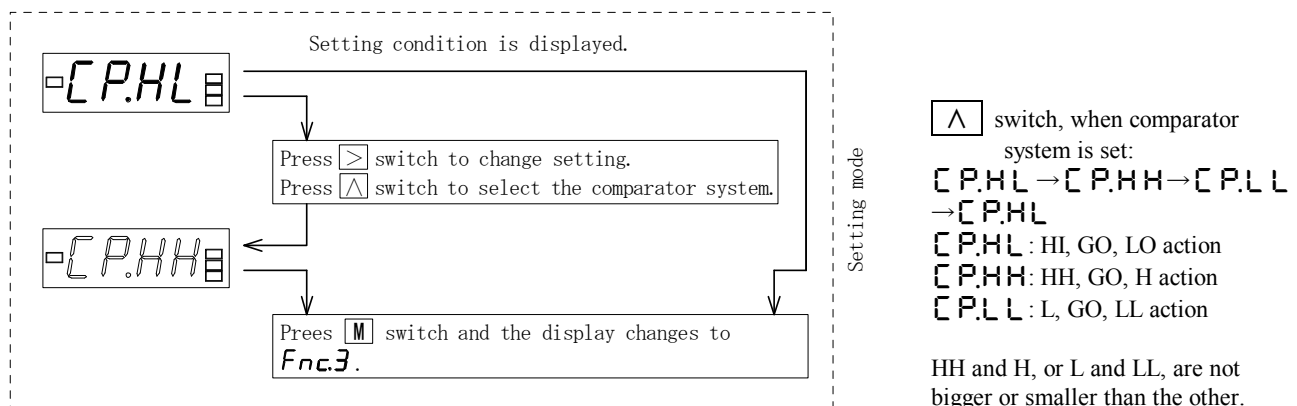
4.4.4 Comparison conditions
● Change-over of equal GO/NG
Example: Transaction to be taken when the comparator data and the comparator set
value are equal, from NG (alarm output) to GO (no alarm output).

Setting condition is displayed.

`CP.nG`

Press ⊳ switch to change setting.
Press ∧ switch to select the comparison conditions.

`CP.Go`

Prees M switch to move to the setting of comparator system.

Setting mode

∧ switch:
`CP.Go→CP.nG→CP.Go`
`CP.Go`: Equal GO
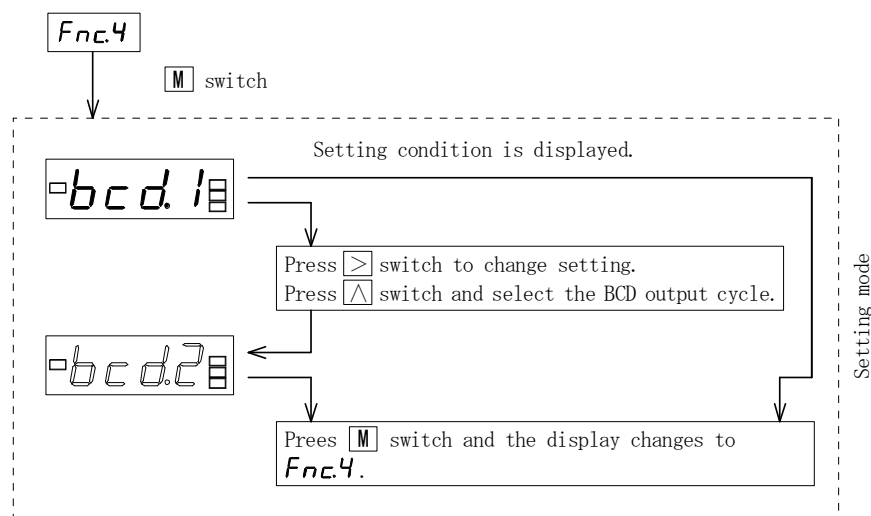`CP.nG`: Equal NG

4.4.5 Comparison conditions
● Models of comparator system HI, GO, LO can be changed to have HH, GO, H
(Higher High limit, High limit) or L, GO, LL (Low limit, Lower Low limit).
● Models of comparator system HI, GO (High limit only) or GO, LO (Low limit only) do not have this function.
Example: Comparator output is changed from HI, GO, LO to HH, GO, H (High limit, High limit)

Setting condition is displayed.

`CP.HL`

Press ⊳ switch to change setting.
Press ∧ switch to select the comparator system.

`CP.HH`

Prees M switch and the display changes to `Fnc.3`.

Setting mode

∧ switch, when comparator system is set:
`CP.HL→CP.HH→CP.LL`
`→CP.HL`
`CP.HL`: HI, GO, LO action
`CP.HH`: HH, GO, H action
`CP.LL`: L, GO, LL action

HH and H, or L and LL, are not bigger or smaller than the other.

4.5 Setting of function group 4

4.5.1 BCD output cycle (when provided with BCD output)

● It is possible to set to output the BCD data either with display cycle or with sampling rate.

```
┌─────────┐
│  Fnc.4  │
└─────────┘
    │  M  switch
```

Setting condition is displayed.

```
┌──────────┐
│  bcd. 1  │
└──────────┘
```

Press ▷ switch to change setting.
Press △ switch and select the BCD output cycle.

```
┌──────────┐
│  bcd.2   │
└──────────┘
```

Prees M switch and the display changes to Fnc.4.

Setting mode

b c d. 1: Outputs the BCD data at display cycle.
b c d.2: Outputs the BCD data at sampling rate.

When the BCD output cycle is set to the sampling rate, BCD data is disabled for the following functions:
- 10^0 digit fixing function (BCD data is output as of function OFF).
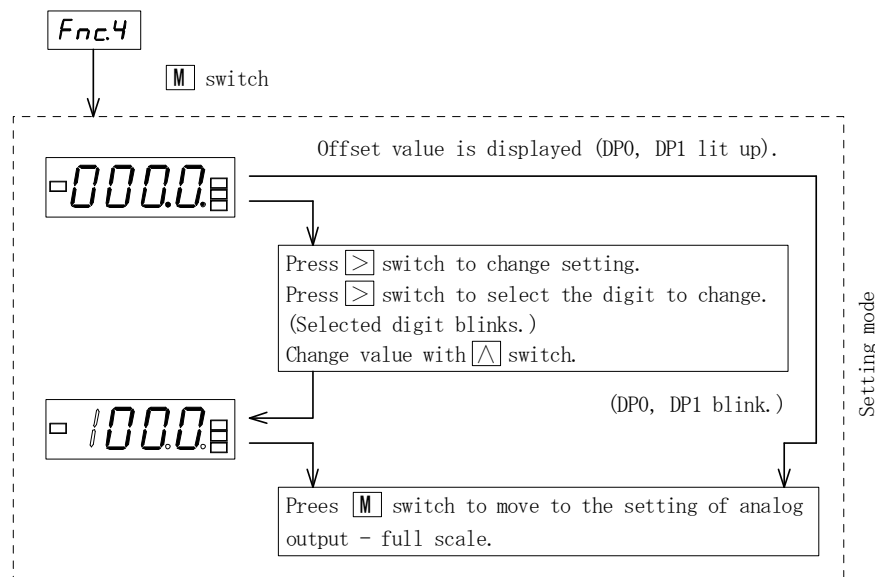- Average calculation (BCD data is output as of function OFF).

Note: When the BCD output cycle is set to the sampling rate, the timing of data renewal changes, so the display and the BCD data may not correspond with each other.

4.5.2 Analog output − Offset (when provided with analog output)

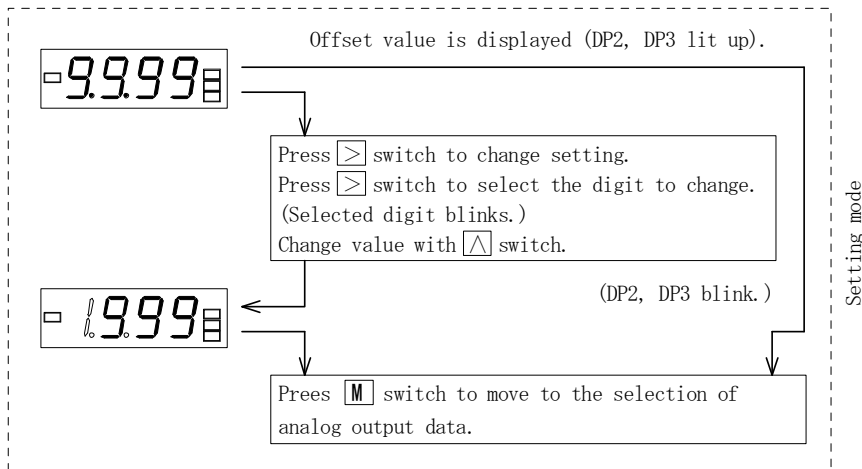● Offset can be set to an arbitrary value.
Offset: Within the display range (within 130% of input).
Example: With the rated input 4~20mA, the display at the input 4mA is adjusted from 0 to 1000.

```
┌─────────┐
│  Fnc.4  │
└─────────┘
    │  M  switch
```

Offset value is displayed (DP0, DP1 lit up).

```
┌──────────┐
│  000.0.  │
└──────────┘
```

Press ▷ switch to change setting.
Press ▷ switch to select the digit to change.
(Selected digit blinks.)
Change value with △ switch.

(DP0, DP1 blink.)

```
┌──────────┐
│  100.0.  │
└──────────┘
```

Prees M switch to move to the setting of analog output − full scale.

Setting mode

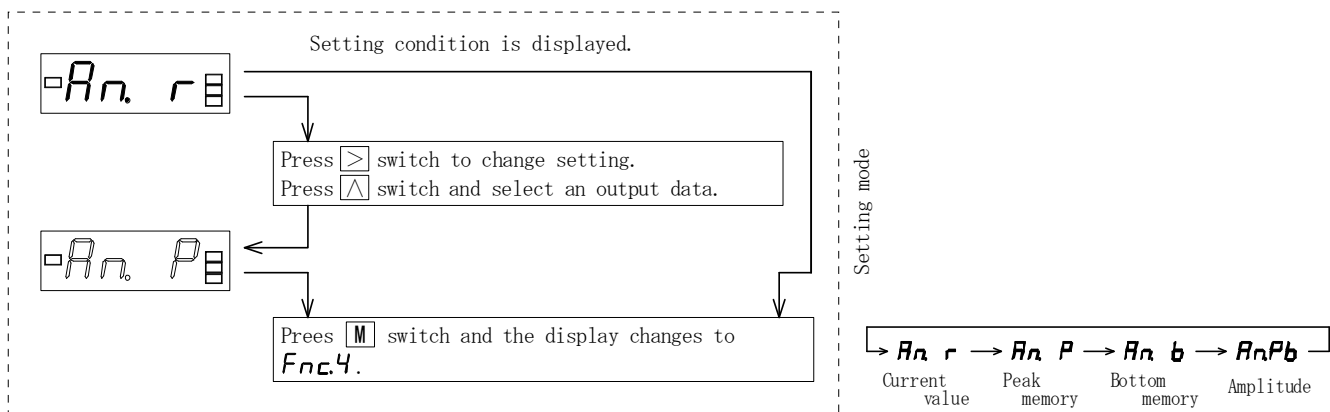### 4.5.3 Analog output − Full scale (when provided with analog output)

● Full scale can be set to an arbitrary value.
  Full scale: Within the display range (within 130% of input).
  Example: With the rated input 4~20mA, the display at the input 20mA is adjusted from 9999 to 1999.

```
  ┌──────────────────────────────────────────────────────────┐
  │  ⊟9.9.99⊟     Offset value is displayed (DP2, DP3 lit up). │
  │                                                            │
  │          ┌──────────────────────────────────────────┐     │
  │          │ Press ⊳ switch to change setting.         │     │
  │          │ Press ⊳ switch to select the digit to change. │ │
  │          │ (Selected digit blinks.)                  │     │
  │          │ Change value with △ switch.               │     │
  │          └──────────────────────────────────────────┘     │
  │                              (DP2, DP3 blink.)             │
  │  ⊟ 1.9.99⊟                                                 │
  │                                                            │
  │          ┌──────────────────────────────────────────┐     │
  │          │ Prees M switch to move to the selection of │    │
  │          │ analog output data.                       │     │
  │          └──────────────────────────────────────────┘     │
  └──────────────────────────────────────────────────────────┘
```

Setting mode

● If the setting is made to out of display range, it is not allowed to return to measurement mode.
● Depending upon the content of setting, the setting to out of display range may be possible, but the output value will have a limit.
● Offset>full scale (reverse positioning) is also possible.
● In case that the offset and full scale are set to the same value, 0% is output as analog output.
● When the display scaling is changed, the set value of analog output is changed to the same value as display scaling accordingly.
● When the display scaling is change,

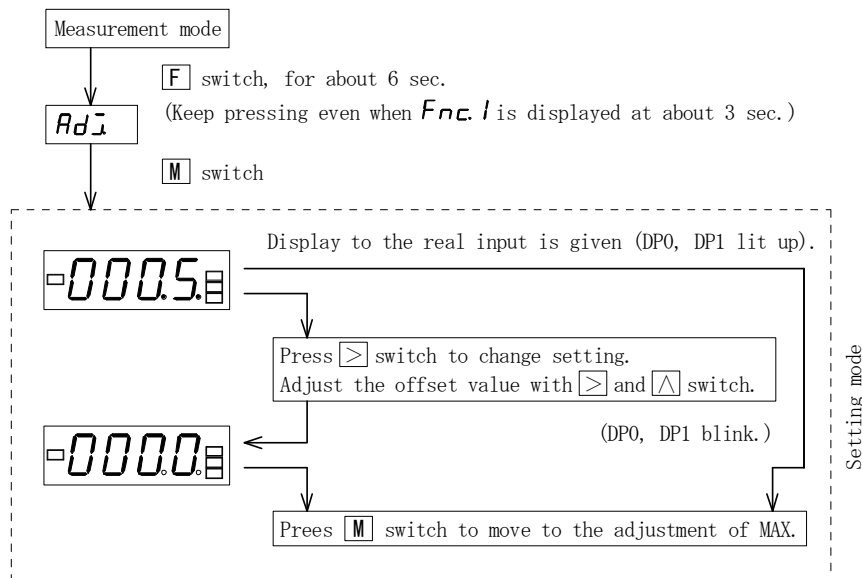### 4.5.4 Analog output data (when provided with analog output)

● Analog output data can be selected from actual value, peak memory value, bottom memory value or amplitude.
  Offset: Within the display range (within 130% of input).
  Example: Analog output data is changed from actual value to memory value.
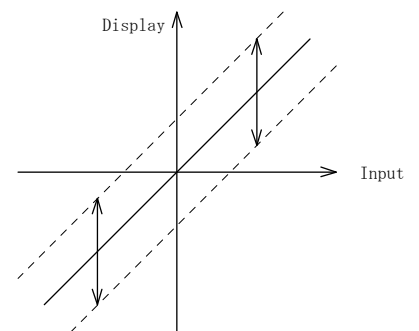
```
  ┌──────────────────────────────────────────────────────────┐
  │  ⊟An. r⊟      Setting condition is displayed.             │
  │                                                            │
  │          ┌──────────────────────────────────────────┐     │
  │          │ Press ⊳ switch to change setting.         │     │
  │          │ Press △ switch and select an output data. │     │
  │          └──────────────────────────────────────────┘     │
  │                                                            │
  │  ⊟An. P⊟                                                   │
  │          ┌──────────────────────────────────────────┐     │
  │          │ Prees M switch and the display changes to │     │
  │          │ Fnc.4.                                    │     │
  │          └──────────────────────────────────────────┘     │
  └──────────────────────────────────────────────────────────┘
```

Setting mode

```
 ┌→ An r → An P → An b → AnPb ─┐
    Current   Peak      Bottom    Amplitude
    value     memory    memory
```

4.6 Adjustment function

4.6.1 Zero adjustment

● Fine adjustment for the displayed offset value of calibration data is possible with real input.
Example: Adjust a 5, which is displayed at the input of 1V with rated input 1~5V, to 0.

Measurement mode

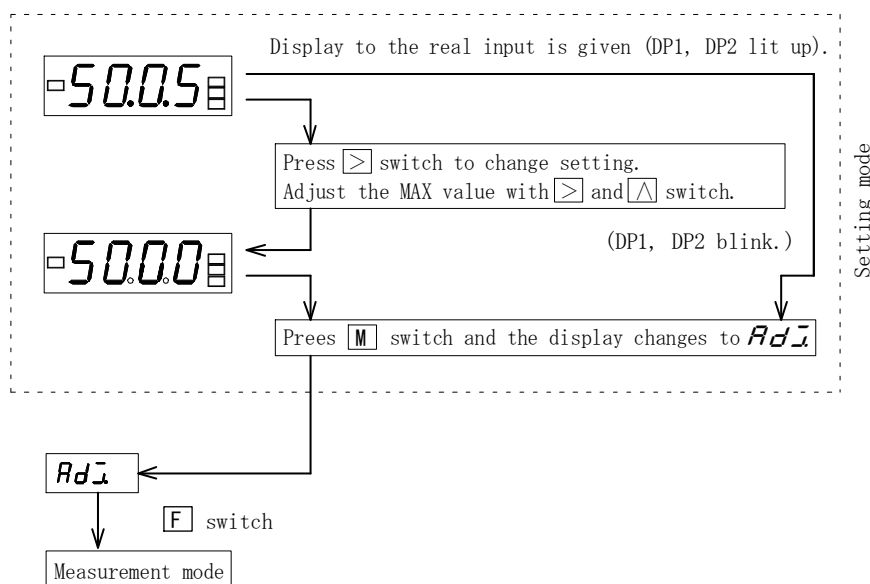F switch, for about 6 sec.

(Keep pressing even when $Fnc.1$ is displayed at about 3 sec.)

Adj

M switch

Display to the real input is given (DP0, DP1 lit up).

$-000.5.$

Press > switch to change setting.
Adjust the offset value with > and ∧ switch.

(DP0, DP1 blink.)

$-000.0.$

Prees M switch to move to the adjustment of MAX.

Setting mode

Display line vertically moves.

Display / Input

| > | switch counts down |
| ∧ | switch counts up |

When the scaling width is narrow,
It takes some time to start count.
Keep pressing the switch for a while.

4.6.2 Max adjustment

● Fine adjustment for the max. value of calibration data is possible with real input.
In this case, make an adjustment with the input as close as possible to the max. value of the rated input.
Example: Adjust a 50055, which is displayed at the input of 5V with rated input 1~5V, to 5000.

Display to the real input is given (DP1, DP2 lit up).

$-50.0.5$

Press > switch to change setting.
Adjust the MAX value with > and ∧ switch.

(DP1, DP2 blink.)

$-50.0.0$

Prees M switch and the display changes to Adj

Setting mode

Adj

F switch

Measurement mode

Inclination of display line changes.
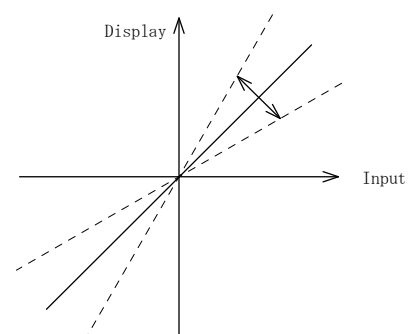
Display / Input

| > | switch counts down |
| ∧ | switch counts up |

When the scaling width is narrow,
It takes some time to start count.
Keep pressing the switch for a while.

■**Initial setting at factory before delivery**

Mode	Function		Set Value	
Measurement display	Change of display		Display of current value	
Fnc.1	Offset		000.0.	
	Full scale		9.9.9.9	※1
	Display cycle		SP.2	
	Decimal point		out	
Fnc.2	Zero set		0.oFF	
	Offset fixing		o.oFF	
	Average calculation		A. on	
	Cut-off		C.00.0	DC input
			C.00.1	AC input
	10⁰ digit fixation		Σ.oFF	
Fnc.3	Comparator data		CP.r	
	Hysteresis width		H00.1	
	Output delay		d. 00	
	Comparison conditions		CP.nG	
	Comparator system		CP.HL	※2
Fnc.4	BCD output cycle		bcd.1	
	Analog	Offset	000.0.	
		Full scale	9.9.9.9	
		Output data	An. r	

※1: Product of the rated input -06 and -26 are set to 6.9.9.9.
Product of rated input -37 is set to 5.0.0.0.
※2: This function is not provided for the model of either contact (-H or -L) only.

5. Terminal Arrangement and Explanation

⚠ CAUTION
● **Do not use the meter with wrong wiring as it may cause breakage of meter or equipment connected.** ● **To avoid an electric shock;** 　**- Turn off the power when the wiring work is done.** 　**- Do not do the wiring work in the humid environment or with the wet hands.** 　**- Do not touch the power source terminals while the meter is powered.**

■Terminal Arrangement

● Upper Row Terminals

Terminal Code	IN Hi	IN Lo	COM	DP1	DP2	DP3	MR	HOLD	ZS
	1	2	3	4	5	6	7	8	9
Function	+	−	Common	10^1 dig.	10^2 dig.	10^3 dig.	Memory Reset	Hold	Zero-Set
	Input			Decimal Point					

● Lower Row Terminals

(Relay contact output) **Note**: ( )=DC power source models

Terminal Code	Ha	Hc	Ga	Gc	La	Lc	RESET	P2(+)	P1(-)
	1	2	3	4	5	6	7	8	9
Function	a contact	Common	a contact	Common	a contact	Common			
	HI contact output		GO contact output		LO contact output		Reset	Power Source	

○ Terminal numbers 5 and 6 of the models of HI, GO comparator output are NC.
○ Terminal numbers 1 and 2 of the models of GO, LO comparator output are NC.
○ When the comparator system of the model with comparator output HI, GO, LO is changed, stick the attached label of comparator system on to the existing label of the lower row terminals as shown below.

● When changed to HH, GO, H specifications

	①	②	③	④	⑤	⑥	⑦	⑧	⑨
Label→	HHa	HHc	GOa	GOc	Ha	Hc	| RESET	P2(+)	P1(-)

● When changed to L, GO, LL specifications

	①	②	③	④	⑤	⑥	⑦	⑧	⑨
Label→	La	Lc	GOa	GOc	LLa	LLc	| RESET	P2(+)	P1(-)

(Open collector output)

Terminal Code	HI	TCOM	GO	TCOM	LO	TCOM	RESET	P2(+)	P1(-)
	1	2	3	4	5	6	7	8	9
Function	Collector	Common	Collector	Common	Collector	Common			
	HI output		GO output		LO output		Reset	Power Source	

○ Terminal numbers 5 and 6 of the models of HI, GO comparator output are NC.
○ Terminal numbers 1 and 2 of the models of GO, LO comparator output are NC.
○ When the comparator system of the model with comparator output HI, GO, LO is changed, stick the attached label of comparator system on to the existing label of the lower row terminals as shown below.

● When changed to HH, GO, H specifications

	①	②	③	④	⑤	⑥	⑦	⑧	⑨
Label→	HH	TCOM	GO	TCOM	H	TCOM	| RESET	P2(+)	P1(-)

● When changed to L, GO, LL specifications

	①	②	③	④	⑤	⑥	⑦	⑧	⑨
Label→	L	TCOM	GO	TCOM	LL	TCOM	| RESET	P2(+)	P1(-)

5.3min. 4.4max. 6max. φ3.2min.

Terminal screws: M3
Fastening torque: 0.46~0.62N・m
Crimp terminal: As shown on the right.
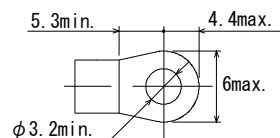
■**Explanation of Terminals**

● **Measurement Inputs (IN Hi, IN Lo)**
Make connections of measurement inputs with correct polarity.   Connect the measurement input of higher electric potential to Hi.
Ensure to make an independent wiring respectively for the input and power source line.   If the wiring of input and power source line
are made in parallel, it may cause unstable reading.

● **Common (COM)**
Common terminal for hold, zero-set, memory reset, decimal point and reset.

● **Remote Control of Decimal Point (DP1~DP3)**
Decimal point can be displayed at an arbitrary position by remote control, by setting
the decimal point setting switch inside the front panel.   Make a short-circuit between
between the decimal point 10^1~10^3 (DP1~DP3) and DPCOM.   (Active "L")
No decimal point is lit up if two or more of DP1~DP3 are set together.
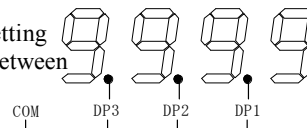
● **Hold (HOLD)**
The measured data are held by making a short-circuit between
Active "L" I_{IL}≦1mA, "L"=0~0.8V, "H"=3.5~5V

● **Zero Set (ZS)**
Zero set function can be effected by making the zero-set ON with front switch operation.   When the zero-set function is in operation,
the ZS LED is lit up.   The zero-set value is stored in the EEPROM (retaining term for about 10 years).
Active "L" I_{IL}≦1mA, "L"=0~0.8V, "H"=3.5~5V
○ How to set
1. Make zero-set ON by the switch inside the front panel.
2. Input a zero-set value and have the zero-set terminal short-circuited with the common terminal.   The display value becomes 0 at
   this time (in case that the offset value is 0).
3. Open the zero-set terminal.   Then, the zero-set value is stored in the memory and the zero-set functions starts.
   Display value = Input value - Zero-set value
○ Reset of Zero-set Function
1. The zero-set function can be reset by making the zero-set OFF the switch inside the front panel.
   The zero-set value is still stored in the memory.

● **Memory Reset Terminal (MR)**
○ By short-circuiting the memory reset terminal to the COM terminal, the peak memory value and bottom memory value are cleared
   and a new memory is started.
○ During the short-circuiting of the memory reset terminal, the peak memory value and bottom memory value are current values.
   Active "L" I_{IL}≦1mA, "L"=0~0.8V, "H"=3.5~5V

● **Reset Terminal (RESET)**
By short-circuiting the reset terminal to the COM terminal, the comparator output is reset.
Active "L" I_{IL}≦1mA, "L"=0~0.8V, "H"=3.5~5V

Note: COM, DP1~DP3, HOLD, ZS, MR and RESET terminals are
           not isolated from the input, so, in case of controlling the terminal
           of each function, it is recommended to use a photo-coupler, relay,
           switch and so on.   Also, in case that the plural numbers of
           the instruments are controlled, make the control insulating each
           instrument individually.
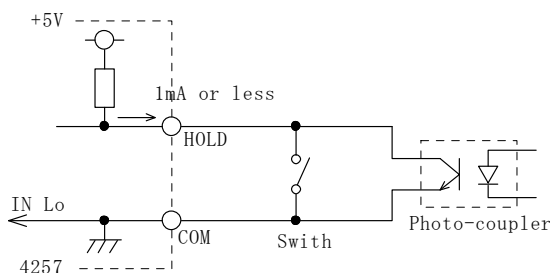
● **Comparator Output**
○ Relay contact output (Ha, Hc, Ga, Gc, La, Lc)

① ② ③ ④ ⑤ ⑥
Ha Hc Ga Gc La Lc
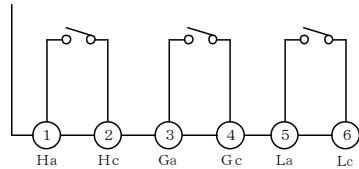
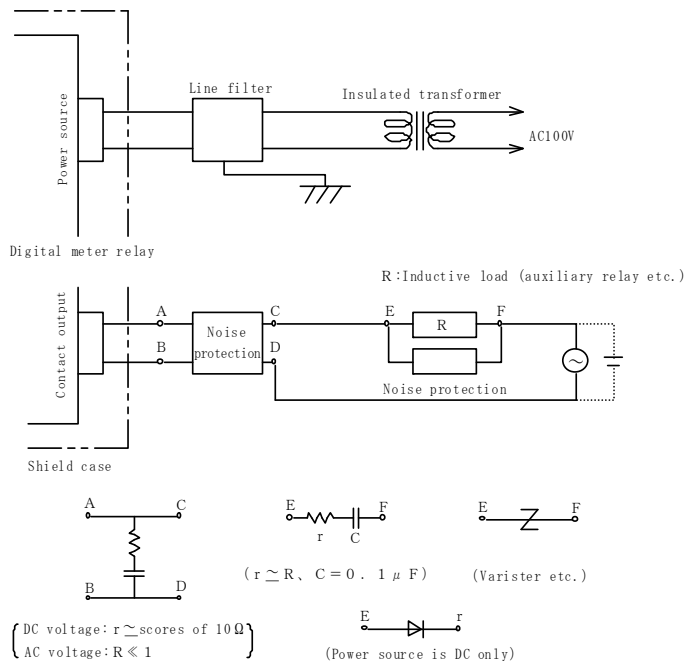Case of the model with
comparator output HI, GO, LO

Contact capacity AC125V 0.5A (resistive load)
Contact capacity AC250V 0.1A (resistive load)

When an electromagnetic contactor or big size relay is operated with an auxiliary relay connected
to the relay output, be sure to take a protective measure to noise.
In case that the noise is frequently generated, it is effective to put the digital meter relay in the shielded
case and to insert a power line filter or isolation transformer.
For the protective circuits of contact output, refer to the following figures.

○ Open collector output (HI, TCOM, GO. TCOM, LO, TCOM)

① ② ③ ④ ⑤ ⑥
HI TCOM GO TCOM LO TCOM
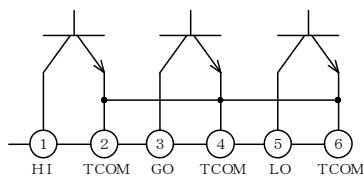
Case of the model with
comparator output HI, GO, LO

Output capacity: DC30V 30mA
Output saturated voltage: DC1.6V or less
Transistor output is isolated from the input terminals.

● **Power Supply 〔P1(-), P2(+)〕**
The power source voltage to be supplied to the instrument is specified on the terminal plate at delivery from factory.
○ AC power source .... Use the instrument within the range AC90~250V
○ DC power source .... Use the instrument within the range DC9~32V
　　　　　　　Connect + side to P2(+) and - side to P1(-).

⚠ CAUTION

● **Do not use the product with the voltage out of the rated range as it may cause breakage
of the products.**

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■**Arrangement & Explanation of Middle Row Connector**

● **Analog output**

Function	Pin No.		Function
NC	5	9	NC
NC	4	8	NC
NC	3	7	NC
NC	2	6	A. OUT-
A. OUT+	1		

Connector: Sub D 9P plug type.
Type XM2C-0912

○ Voltage or current signal corresponding to the input signal is output at the analog output A.OUT+ and A.OUT-.
The analog output is isolated from the measuring input and HOLD terminal.
Make a connection confirming the polarity.

● **BCD output**

Function		Pin No.			Function
10^1	1	1	14	1	10^0
	2	2	15	2	
	4	3	16	4	
	8	4	17	8	
10^3	1	5	18	1	10^2
	2	6	19	2	
	4	7	20	4	
	8	8	21	8	
POL		9	22		MEMORY RESET
OVER		10	23		OUTPUT ENABLE
SYNC		11	24		LATCH
DATA COM		12	25		PEAK MEMORY
BOTTM MEMORY		13			

Connector: Sub D 25P socket type.
Type XM3B-2522

■**TTL output**

● **Rated input & output**

Input/Output Signal		TYPE-BP	TYPE-BN	Rate
Output	$\times 10^0 \sim \times 10^3$	Positive logic	Negative logic	TTL level Fo=2 CMOS compatible
	POL	+="H", −="L"	+="L", −="H"	
	OVER	"H" at over	"L" at over	
	SYNC	"L" pulse of 10ms		
Input	LATCH	Held by short-circuit ("L")		$I_{IL} \leqq$ -1mA "L"=0~1.5V, "H"=3.5~5V
	ENABLE	Allowed by open ("H") Prohibited by short-circuit ("L")		
	MEMORY RESET	Reset by short-circuit ("L")		
	PEAK/BOTTOM MEMORY	Refer to each article.		

● **Measurement data output ($10^0 \sim 10^3$)**
Parallel BCD (1-2-4-8) code, latch output.   The output is Tri-state type, so a connection to the data bus is easy.

● **Polarity output (POL)**
Polarity of measured data is output from the pin ⑨.

● **Over-range output (OVER)**
When the display is over-range, the output is made at the pin ⑩.
When the input exceeded 130%, 130% display data and OVER data are output as measurement data.
When the display exceeded 9999, the dada 0 and OVER data are output.

● **Synchronization signal output (SYNC)**
"L" pulse of 10ms synchronized with the display cycle is output at the pin ⑪.   Read in the data at the rising point of this SYNC.
In case of connection to the multiple data bus, the wired OR connection is possible.

● **Data enable input (OUTPUT ENABLE)**
When the pin ㉓ is opened ("H"), the data (including POL, OVER) are output.
When it is short-circuited ("L") with the DATA COM (pin ⑫), the data (including POL, OVER) becomes "high impedance" state.   In this state, the output of SYNC is prohibited and the connection to data bus is easy.

● **Latch input (LATCH)**
By short-circuiting the pints ㉔ and DATA COM (pin ⑫) or making them "L", the BCD data is held (the display is not held).

● **Peak Memory (PEAK MEMORY), Bottom Memory (BOTTOM MEMORY)**
By operating the pints ㉕, ⑬ and DATA COM (pin ⑫), the output data can be changed to the actual value, peak value, bottom value or amplitude.

Signal Name	Actual Value	Peak Value	Bottom Value	Amplitude
Peak Memory (pin ㉕)	Open "H"	Short-circuit "L"	Open "H"	Short-circuit "L"
Bottom Memory (pin⑬)	Open "H"	Open "H"	Short-circuit "L"	Short-circuit "L"

● **Memory Reset (MEMORY RESET)**
By short-circuiting the pints ㉒ and DATA COM (pin ⑫), the peak memory and bottom memory values are re-written to the actual values.

● **Data Common (DATA COM)**
Pin ⑫ is common for the measurement data output, POL, OVER, SYNC, LATCH OUTPUT ENABLE, PEAK MEMORY, BOTTOM MEMORY, MEMORY RESET.

● **NC**
NC pins are open pins but do not use them as relay terminal.
Note: Data output and control signals are unified to the TTL level, so ensure not to apply the voltage DC5V or higher.
Arrange the wiring of data output and control input/output signal lines apart from the power source line, relays or magnet switches etc. of big capacity, as well as the input line.

■ **Transistor output**
In case that the BCD output of plural numbers of the instrument is connected to one PC, the wired OR connection is possible for the measured data (including POL, OVER), SYNC.

● **Rated input & output**

Signal Code		Item	TYPE-DN
Output	$\times 10^0 \sim 10^3$	Output type	Sink type
	POL OVER SYNC	Output capacity	DC30V 30mA MAX, Saturated voltage 1.6V or less
Input	LATCH ENABLE MEMORY RESET PEAK MEMORY BOTTOM MEMORY	Signal level	Input power source = 1mA or less OFF (H)=3.5V~5V, ON(L)=0~1.5V

● **Measurement Data Output ($\times 10^0 \sim \times 10^3$)**
Parallel BCD (1-2-4-8) code, latch output.
Transistor ON with the measured data "1". Transistor OFF with the measured data "0".

● **Polarity Output (POL)**
Polarity of measured data is output from the pin ⑨.
Transistor ON when the display value is (+). Transistor OFF when the display value is (-).

● **Over-range Output (OVER)**
When the display is over-range, the output is made at the pin ⑩.
In case that the input exceeds 130%, the output of measured data is 130% display data and OVER data.
When the display exceeds 9999, the data 0 and OVER data are output.

● **Synchronization Signal Output (SYNC)**
"ON" pulse of 10ms which is synchronized with the display cycle is output at the pin ⑪.
Read in the data at the rising point (ON→OFF) of this SYNC.

● **Data Enable Input (OUTPUT ENABLE)**
When the pin ㉓ is opened, the data (including POL, OVER) and SYNC are output.
When it is short-circuited with the DATA COM (pin ⑫), the data (including POL, OVER) becomes "OFF" state.
In this state, the output of SYNC is prohibited, so the connection to data bus is easy.

● **Latch (LATCH)**
By short-circuiting the pints ㉔ and DATA COM (pin ⑫), the data is held (the display is not held).

● **Peak Memory (PEAK MEMORY), Bottom Memory (BOTTOM MEMORY), Amplitude**
By operating the pints ㉕, ⑬ and DATA COM (pin ⑫), the output data can be changed to the actual value, peak value, bottom value or amplitude.

Signal Name	Actual Value	Peak Value	Bottom Value	Amplitude
Peak Memory (pin ㉕)	Open	Short-circuit	Open	Short-circuit
Bottom Memory (pin⑬)	Open	Open	Short-circuit	Short-circuit

● **Memory Reset (MEMORY RESET)**

By short-circuiting the pints ㉒ and DATA COM (pin ⑫), the peak memory and bottom memory values are re-written to the actual values.

● **Data Common (DATA COM)**

Pin ⑫ is common for the measurement data output, POL, OVER, SYNC, LATCH OUTPUT ENABLE, PEAK MEMORY, BOTTOM MEMORY, MEMORY RESET.
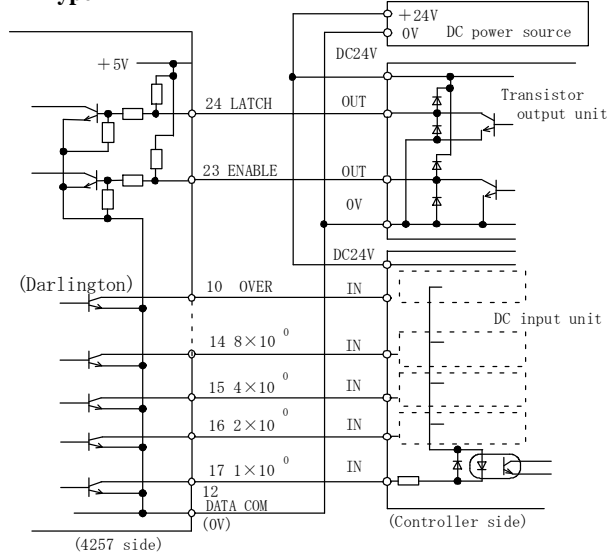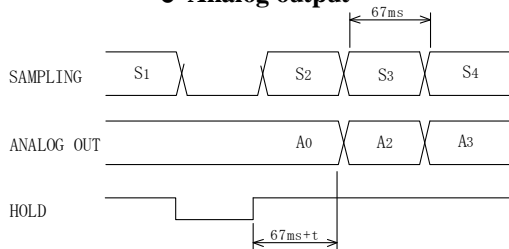
● **NC**

NC pins are open pins but do not use them as relay terminal.

Note: Arrange the wiring of data output and control input/output signal lines apart from the power source line, relays or magnet switches etc. of big capacity, as well as the input line.
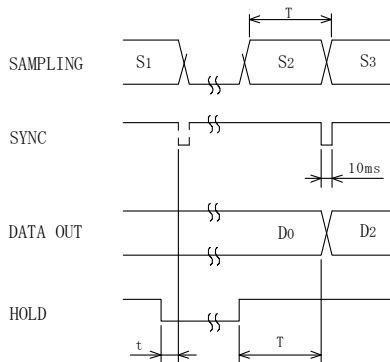
■**Connection Example**

Sink Type

(4257 side)　　　　　　　　　　　　　(Controller side)

■**Timing Chart**

● **Analog output**

t: Internal transaction time approx. 15ms.

●**BCD data & LATCH**

P or B, PB : Peak memory value, bottom memory value or amplitude.
t : Internal transaction time approx. 15ms.
T : Display cycle or sampling rate.
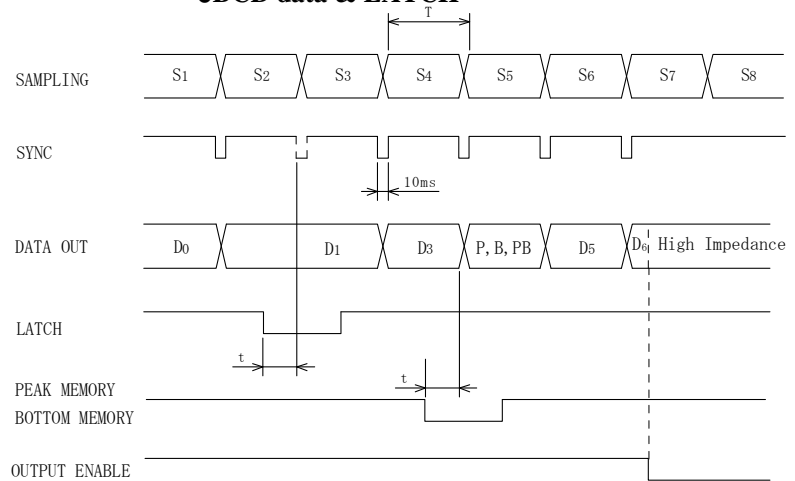
● **BCD data & HOLD**

t : Internal transaction time approx. 15ms.
T : Display cycle or sampling rate.

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■**Maintenance**

Store the instrument within the rated storage temperature (-20~70°C).   When the front panel or the case is cleaned, use soft cloth dipped with cleaner liquid.   Do not use organic solvent like benzene or paint thinner as they may deform or discolor the case.

■**Calibration**

In order to maintain long term accuracy, periodical calibration at an interval of about one year is recommended.

For calibration, refer to the article 4.6 Adjustment function.

Also, make a calibration in the ambient condition of 23°C±5°C, 75%RH or less.

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