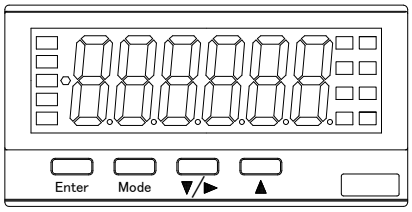
5 1/2 Digit Digital Meter Relay

AM-756

Instruction Manual



WARNING	This symbol indicates instances where incorrect use may result in death or serious injury, or cause serious damage to property.
CAUTION	This symbol indicates instances where improper use may result in injury to the operator or serious damage to property.

WARNING

(1) The insulation class of this device is outlined below. Please ensure the insulation class of this device satisfies your usage requirements before setting up the device.

——— Basic insulation

— — — — Functional insulation

AC Power Source	Comparative Output	
	Input	Sensor Power Source
	External Control, BCD Output, Analog Output	

DC Power Source	Comparative Output	
	Input	Sensor Power Source
	External Control, BCD Output, Analog Output	

(2) Please do not disassemble this device or make improvements or repairs. Doing so may cause sudden fire, electrocution or injury.
(3) In order to ensure power to equipment, including this device, is cut in the event of failure, please ensure an external breaker is installed and appropriately labeled so that it may be used to cut power to this device when a malfunction occurs.
(4) In order to prevent device damage and failure, please ensure the voltage used matches the device's power rating.
(5) In order to prevent electrocution and device failure, please do not turn the power on until all wiring has been completed.
(6) Before supplying power to this device, please ensure you check that the device has been correctly wired. Incorrect wiring may cause device failure, fire, electrocution or malfunction.
(7) In order to prevent electrocution or fire in the equipment, please check that there is clearance around the device before activating power.
(8) Please do not touch the terminals while power is being supplied to the device. Doing so may result in electrocution or malfunction.

CAUTION

(1) Application of voltage or current exceeding the maximum input tolerance may damage the device.
(2) Please ensure the voltage used is within the specified voltage range. Failure to do so may cause fire, electrocution or malfunction.
(3) Please note that the contents of this manual are subject to change without notice as the product is upgraded.
(4) The information contained herein is considered accurate to the best of our knowledge. However, should there be any errors or omissions, please contact the distributor or our company.
(5) After reading this manual, please keep it readily available for future reference.

·Usage Conditions

Place of Installation: Indoors only
Rated Altitude: 2000m or less
Overvoltage Category: II
Pollution Level: 2
Operating Ambient Temperature and Humidity: 0～50°C 35～85%RH (Non Condensing)
Vibration (durability): 10 to 55 Hz (Half amplitude 0.15mm) X, Y, Z directions 30 min.
Impact (durability): 100m/s^2 6 directions, 3 times each (up and down, forward and back, left to right)
Protective Structure: Equivalent to IP40 (front section)
Connecting Wire Length: Input and output signal lines and control line – less than 30m in length

·Safety Precautions

(1) Watanabe Electric Industry Co., Ltd assumes no responsibility for any special damage, indirect loss or passive loss caused by this device.
(2) This device has been developed, designed and manufactured on the premise that it is to be used as general machinery. Please ensure attention is paid to safety by adopting such means as a fail-safe design and a redundancy design, and by conducting regular checks on the device, particularly when it is being used for purposes such as the following, where safety is of utmost importance.
- Safety devices used for personal protection
- Rail, aviation and vehicular equipment
- Medical equipment
- Incineration systems, nuclear systems
- Other purposes conforming to the conditions above which require high levels of safety

(3) Please do not use this device for applications which directly affect human lives.
(4) When this device is to be used in conjunction with other products, please check for conformance with specifications, provisions of law and regulations before use to ensure compatibility.
(5) As the operating life of the comparative output relays varies greatly depending on switching capacity and conditions, please ensure the relays are used within their rated load and electrical life. Using deteriorated relays could result in insulation failure between circuits or burnout of the relays themselves.
(6) This device requires more than 40 minutes warm up time from when power is activated in order to operate within its degree of accuracy.
(7) Please do not wipe this device with alcohol, paint thinner, benzene, acetone or other organic solvents. When wiping the device, please use a neutral detergent.

·Table of Contents

1 Before Use

Thank you for purchasing the AM-756 Digital Meter Relay. Please ensure this instruction manual is kept on hand for users of this device. Please inspect the product for any signs of shipping damage and contact your dealer or Watanabe Electric Industry Co., Ltd if anything comes to your attention.

1-1 Model Configuration

The model configuration of the AM-756 is shown below. Please check that the product received matches the product ordered.

AM-756-□□-□ □-□

- Comparative Output
  - 0. Off
  - 1. Relay output
  - 2. Photocoupler output
- Options
  - 0. Off
  - 1. External control
  - 2. BCD output (TTL) + external control
  - 3. BCD output (OC) + external control
  - 4. Analog output + external control
- Power
  - 1. 100 to 240VAC
  - 2. 12 to 48VDC
- Input
  - DV.
    - ±199.999mV
    - ±1999.99mV
    - ±19.9999V
    - ±199.999V
  - 23. ±19.9999mA
  - 24. ±199.999mA
  - DB.
    - 1 to 5V
    - 4 to 20mA
    - ±199.999mV
- Series Name
- Basic Model Name

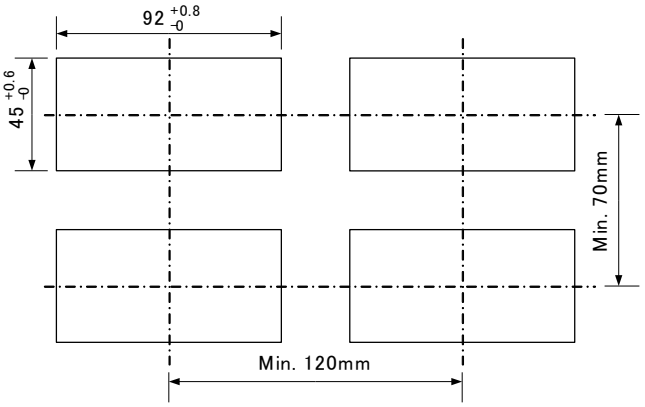
1-2 Accessories

1 instruction manual
1 unit sticker
2 terminal covers for 6P terminal block (attached to main unit for shipment)
2 case attachment bands (attached to main unit for shipment)
・When BCD output is included as an option:
1 connector (8822E-036-171-F (manufactured by KEL))

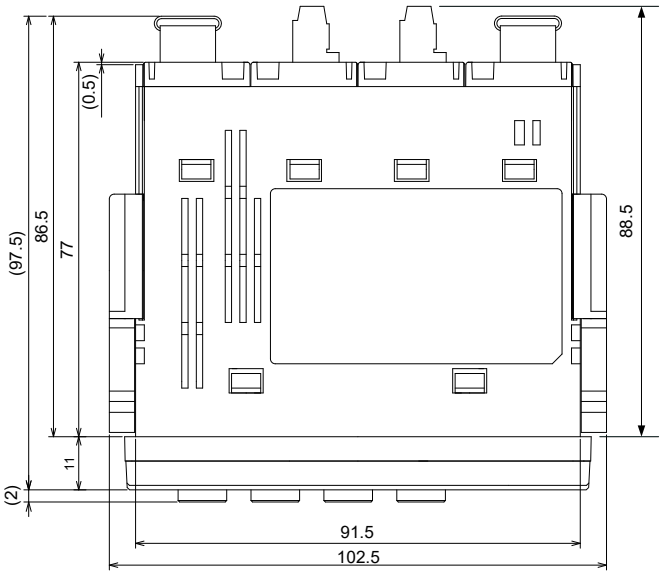
2 Installation

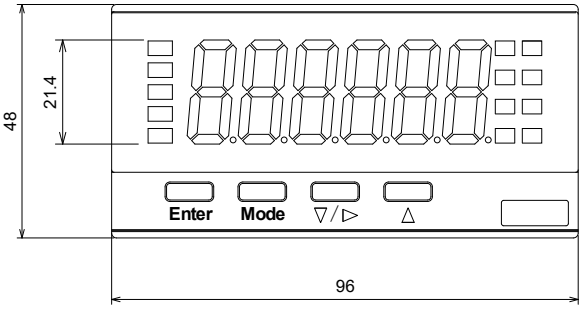
2-1 Panel Cutout Size

The panel cutout size for mounting the AM-756 Digital Meter Relay is shown in the diagram below.



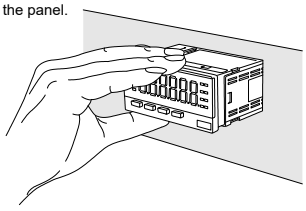
2-2 External Dimensions



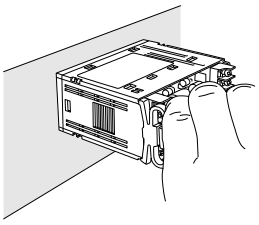


2-3 Mounting the Unit on the Panel

1) After removing the mounting bands from the main unit, please insert the unit from the front side of the panel.



2) Fix the unit in place from the rear of the panel using the mounting bands to the left and right.



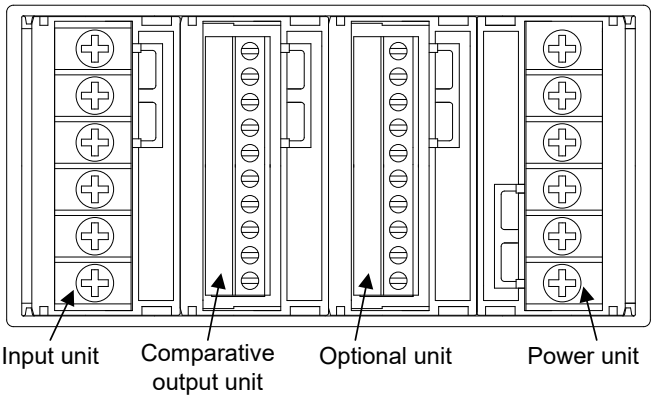
⚠ CAUTION

(1) Panel board thickness should be 0.8 to 5mm.
(2) Please do not install the device in the following locations.
- ・ Locations with sudden changes in temperature resulting in condensation.
- · Locations with corrosive gases (particularly sulfide gas, ammonia etc.) or flammable gases.
- · Locations where the main unit may be subjected to vibration or impact.
- · Locations where the unit may come in contact with water, oil, chemicals, steam or vapor.
- · Locations with high concentrations of dust, salinity or iron particles.
- · Locations with large inductive interference resulting in static electricity, magnetic fields or noise.
- · Locations exposed to direct sunlight.
- · Locations where heat accumulation from radiant heat and other sources occurs.

(3) In order to ensure heat dissipation is not obstructed, please allow room around the device for heat to be released and ensure the device's ventilation holes and surroundings are not obstructed. When installing this device inside other equipment, check the heat release to ensure the temperature inside the equipment does not exceed 50°C.
(4) Please install this device horizontally.

3 Terminal Description and Connection Method

3-1 Rear View

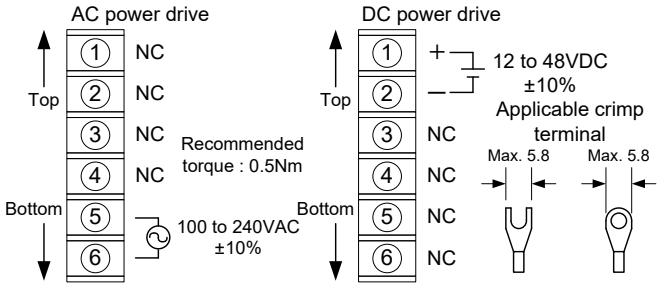


CAUTION

(1) Units may not be changed by the customer.
(2) Do not use different models of these units.

3-2 Power Connection

M3 screw terminal (terminal cover included)



*NC Terminal: unconnected

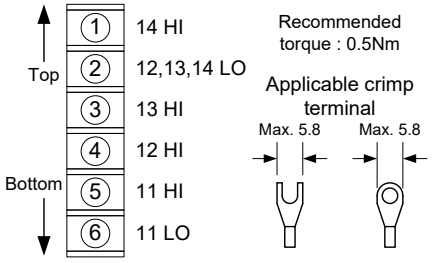
CAUTION

(1) Please ensure supply voltage is within device's power rating and that power-up and cut-off are instantaneous.
(2) Please wait for ten seconds or more before activating power each time.
(3) Please do not use the NC terminals as relay terminals.

3-3 Input Connection

M3 screw terminal (terminal cover included)

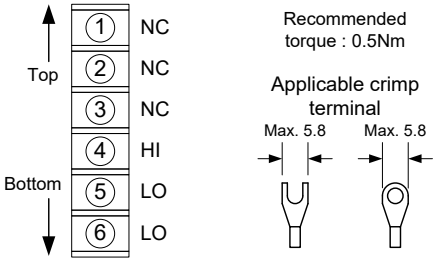
3-3-1 DV Range (Direct voltage input)



Terminal No.	Name	Details
1	14 HI	±199.99V input (14 range) + terminal
2	12,13,14 LO	12, 13, 14 range - terminals
3	13 HI	±19.9999V input (13 range) + terminal
4	12 HI	±1.99999V input (12 range) + terminal
5	11 HI	±0.199999V input (11 range) + terminal
6	11 LO	±0.199999V input (11 range) - terminal

The input range settings parameters can be used to change the input range.
*** Please do not connect anything to terminals other than those for the range used.**
Factory Setting: 11 ranges (± 0.199999V)

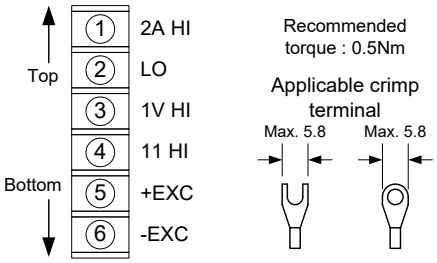
3-3-2 23, 24 Range (Direct current input)



Terminal No.	Name	Details
1	NC	Unconnected * Please do not use these terminals as relay terminals.
2	NC	
3	NC	
4	HI	+ Terminal
5	LO	- Terminals (connected internally)
6	LO	

* Input range settings cannot be made.

3-3-3 DB Range (Process input)



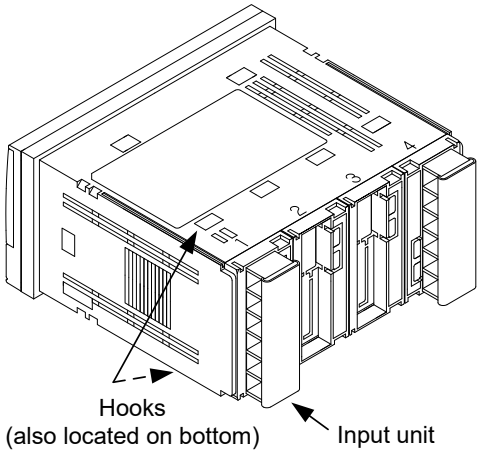
Terminal No.	Name	Details
1	2A HI	4 to 20mA (±20mA) input (2A range) + terminal
2	LO	- terminal
3	1V HI	1 to 5 V (±5V) input (1V range) + terminal
4	11 HI	±0.199999V input (11 range) + terminal
5	+EXC	Sensor power output + terminal
6	-EXC	Sensor power output - terminal

The input range settings parameters can be used to change the input range.
*** Please do not connect anything to terminals other than those for the range used.**
Factory Setting: 1V range (±5V)

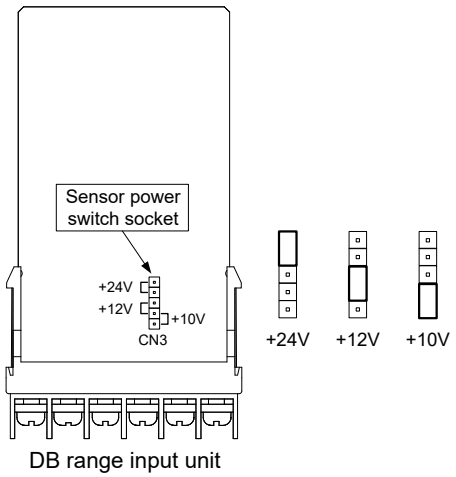
・ Switching Sensor Power Voltage

This device is set to a factory setting of +24V. Therefore, when using the device at +12V and +10V, please adjust the sensor power voltage according to the instructions below.

(1) Turn off the device and leave for a minimum period of 10 minutes. Next, pushing in the upper and lower hooks on the case, pull out the input unit.



(2) Switch the sensor power switch socket as shown in the diagram below.



DB range input unit

(3) After completing the switch, install the input unit according to the guides found on the interior of the main unit case.

(4) Connect the input unit connector (female) to the main unit connector (male) ensuring they are firmly connected.

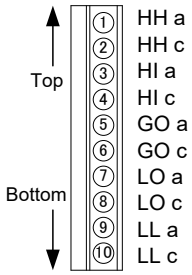
⚠CAUTION

Please turn off the device and wait for a minimum of 10 minutes before commencing any work on the device. Failure to do so may result in electrocution or fire.

3-4 Comparative Output Connection

3.81mm pitch European terminal board

3-4-1 Relay Output

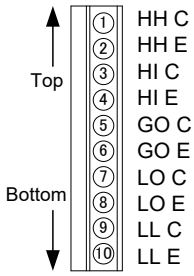


Adaptable wire: AWG24 to 16
Length of stripped wire: 6 to 7mm

Recommended torque : 0.18Nm

Terminal No.	Name	Details
1	HH a	HH Output relay a-contact terminal
2	HH c	HH Output relay COM terminal
3	HI a	HI Output relay a-contact terminal
4	HI c	HI Output relay COM terminal
5	GO a	GO Output relay a-contact terminal
6	GO c	GO Output relay COM terminal
7	LO a	LO Output relay a-contact terminal
8	LO c	LO Output relay COM terminal
9	LL a	LL Output relay a-contact terminal
10	LL c	LL Output relay COM terminal

3-4-2 Photocoupler Output



Adaptable wire: AWG24 to 16
Length of stripped wire: 6 to 7mm

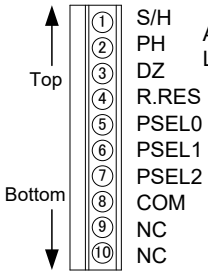
Recommended torque : 0.18Nm

Terminal No.	Name	Details
1	HH C	HH Output photocoupler Collector terminal
2	HH E	HH Output photocoupler Emitter terminal
3	HI C	HI Output photocoupler Collector terminal
4	HI E	HI Output photocoupler Emitter terminal
5	GO C	GO Output photocoupler Collector terminal
6	GO E	GO Output photocoupler Emitter terminal
7	LO C	LO Output photocoupler Collector terminal
8	LO E	LO Output photocoupler Emitter terminal
9	LL C	LL Output photocoupler Collector terminal
10	LL E	LL Output photocoupler Emitter terminal

3-5 Option Connection

3-5-1 External Control

3.81mm pitch European terminal board



Adaptable wire: AWG24 to 16
Length of stripped wire: 6 to 7mm

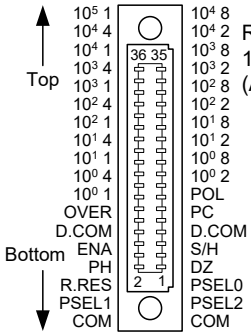
Recommended torque : 0.18Nm

Terminal No.	Name	Details
1	S/H	Start/Hold control terminal
2	PH	Peak hold control terminal
3	DZ	Digital zero control terminal * Becomes effective when parameters settings are set to external control
4	R.RES	Relay reset control terminal
5	PSEL0	Pattern select control terminals 0 to 2
6	PSEL1	* Becomes effective when parameters settings are set to external control
7	PSEL2	
8	COM	External control common terminal
9	NC	Do not connect anything to these terminals.
10	NC	Please do not use NC terminals as relay terminals.

3-5-2 BCD Output + External Control

1.27mm pitch, one-touch insertion/ejection, 2 piece connector (manufactured by KEL)

Receptacle Section: 8822E-036-171-F (manufactured by KEL)
(accompanying item)

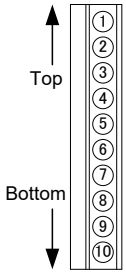


Receptacle section adaptable wire
1.27mm pitch universal flat cable
(AWG28)

Terminal No.	Name	Details	Terminal No.	Name	Details
1	COM	External control common terminal	19	10^0 8	BCD data output
2	COM		20	10^1 1	
3	PSEL2	Pattern select control terminals 0 to 2 *1	21	10^1 2	
4	PSEL1		22	10^1 4	
5	PSEL0		23	10^1 8	
6	R.RES	Relay reset control terminal	24	10^2 1	
7	DZ	Digital zero control terminal *1	25	10^2 2	
8	PH	Peak hold control terminal	26	10^2 4	
9	S/H	Start/Hold control terminal	27	10^2 8	
10	ENA	BCD enable input	28	10^3 1	
11	D.COM	BCD common terminals	29	10^3 2	
12	D.COM		30	10^3 4	
13	PC	BCD printing command signal	31	10^3 8	
14	OVER	BCD over range output	32	10^4 1	
15	POL	BCD polarity output	33	10^4 2	
16	10^0 1	BCD data output	34	10^4 4	
17	10^0 2		35	10^4 8	
18	10^0 4		36	10^5 1	

*1 Becomes effective when parameters settings are set to external control

3-5-3 Analog Output + External Control
3.81mm pitch European terminal board

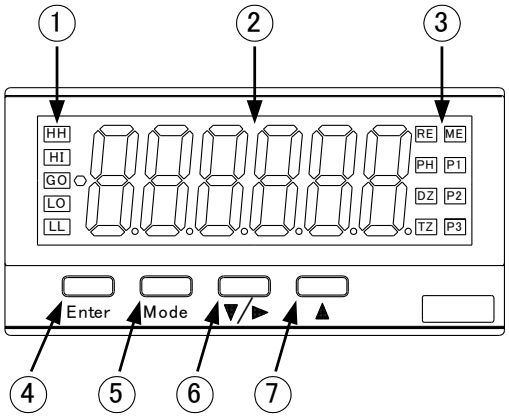


Adaptable wire: AWG24 to 16
Length of stripped wire: 6 to 7mm
Recommended torque : 0.18Nm

Terminal No.	Name	Details
1	S/H	Start/Hold control terminal
2	PH	Peak hold control terminal
3	DZ	Digital zero control terminal * Becomes effective when parameters settings are set to external control
4	R.RES	Relay reset control terminal
5	PSEL0	Pattern select control terminals 0, 1 * Becomes effective when parameters settings are set to external control * PSEL2 Terminal is permanently OFF
6	PSEL1	
7	COM	External control common terminal
8	VOUT+	Analog output (voltage) + terminal
9	IOUT+	Analog output (current) + terminal
10	AO-	Analog output - terminal

4 Setting of Parameters

4-1 Component Names and Functions



No.	Name		Main Functions: During Measurement Mode	Main Functions: During Settings Mode
1	Comparative Output Display		Displays comparative judgment results	Extinguished (Comparative output OFF)
2	Main Display		Displays measurement values	Displays group name, parameters, set values
3	Function Indicators	RE	Unused	
		PH	Lights up when peak hold control terminal is activated	
		DZ	Lights up when digital zero function is activated	
		TZ	Lights up when tracking zero function is activated	
		ME	Lights up when digital zero backup is activated	
		P1 P2 P3	Pattern select function pattern number indicator (Refer to chart below)	
4	Enter Key		Switches to setting mode (long key press)	Return, cancels changes to set values
5	Mode Key		Switches to maximum / minimum value display (long key press)	Select, Enter
6	Shift / Decrement Key		Digital zero control *1 (long key press)	Shifts to the next parameter down, Changes number of digits in settings
7	Increment Key		Switches pattern select number(long key press) *1	Shifts to the next parameter up, Positive settings

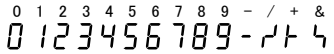
*1 Function becomes effective when the parameters are set to enable front panel key settings

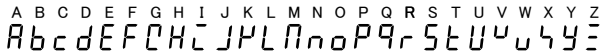
・ Pattern Number Display

Pattern No.	P1 Display	P2 Display	P3 Display
1	-	-	-
2	**P1**	-	-
3	-	**P2**	-
4	**P1**	**P2**	-
5	-	-	**P3**
6	**P1**	-	**P3**
7	-	**P2**	**P3**
8	**P1**	**P2**	**P3**

4-2 Display and Character Representations

Indications on the main display and their corresponding characters are as follows.





4-3 Parameter Groups

The parameters are classified into the following groups in accordance with their main objectives. When changing the parameters, bring up the display for the group to which the parameter in question belongs.

No.	Group Name	Setting Details	Group Classification
1	InPt	Input	Condition data
2	Func	Function	
3	diSP	Display	
4	nEt	Display scaling	Pattern data *3
5	coM	Comparative output *1	
6	oPt	Option *2	Condition data
7	LinE	Linearize	
8	Prot	Protect	-
9	Monit	Monitor	

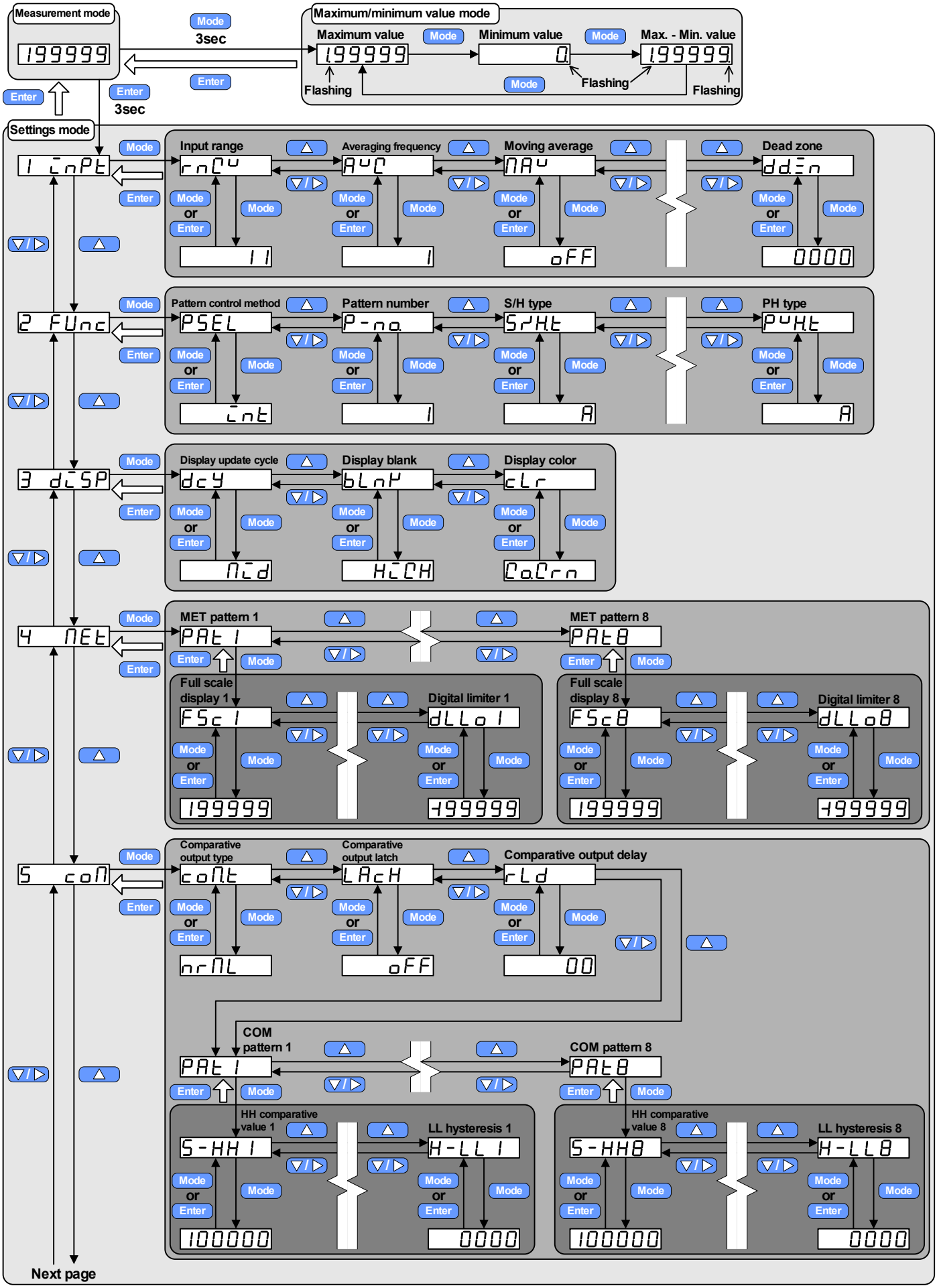
*1 The “COM” group is not displayed when there is no comparative output.
*2 The “OPT” group is not displayed when there is no option, and during external control.
*3 Some “COM” group parameters are classified as condition data.

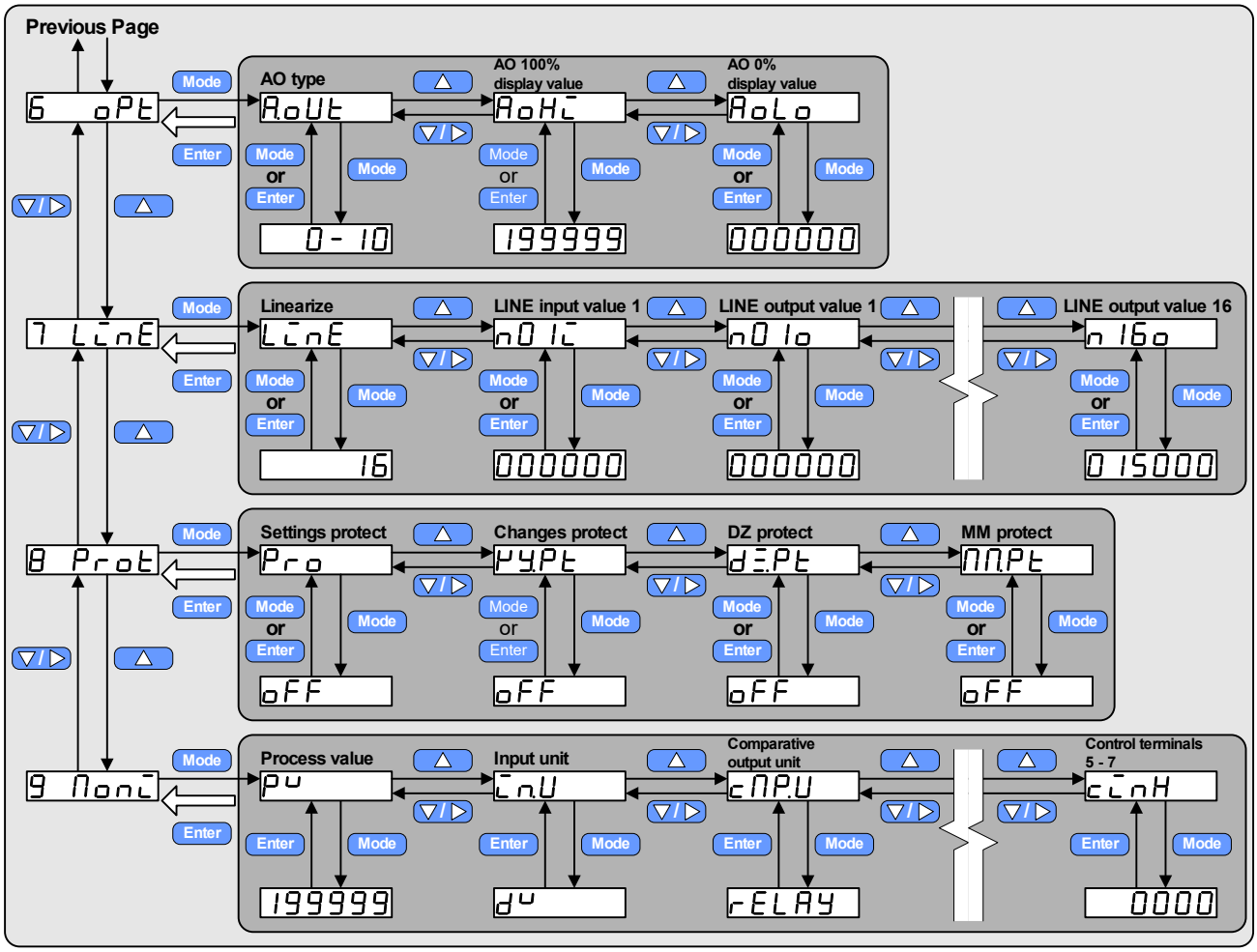
4-4 Shifting to Parameter Setting Mode

The basic operating system for checking parameter setting values is shown in the diagram below.

* The diagram below uses the AM-756-DV-□41 operating system (voltage input, analog output + external control, relay output) as a typical example.

Some of the parameters and values displayed below may not be displayed for other ranges.





*** Key-repeat will occur when the ▲ or ▽/▷ keys are held down.**

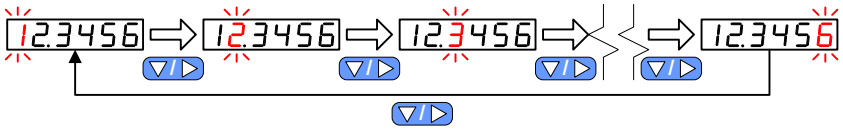
4-5 Changing Parameter Settings

The diagram below shows the basic operating system for changing parameter settings.

(1) Number Set Value

□Changes number of digits in settings

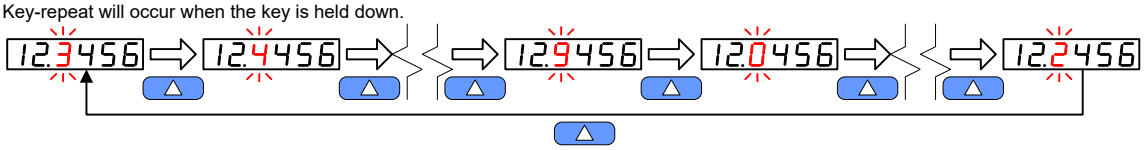
Move the digit point by pressing the ▽/▷ key.



□Changing Values

Increase the value of the flashing digit by 1 by pressing the ▲ key.

Key-repeat will occur when the key is held down.

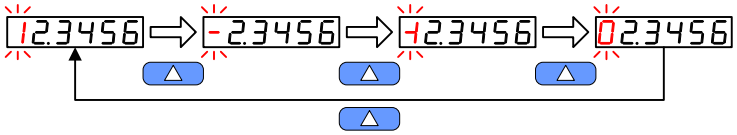


□Changing Polarity

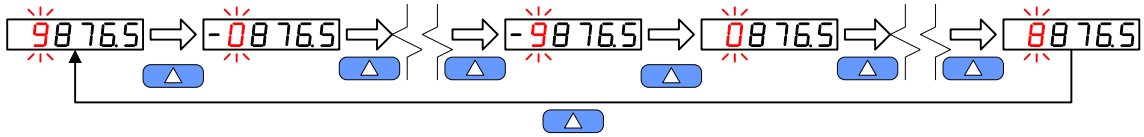
Press the ▲ key when the most significant digit is at its maximum value.

* Key-repeat will occur when the key is held down.

For a six digit setting:



For a five digit setting:



* The polarity will not change when negative settings are not possible.

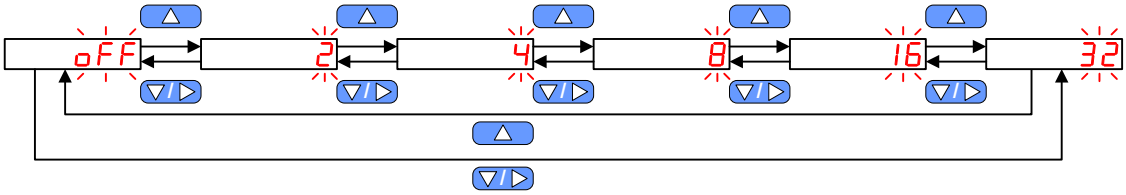
(2) Other Changes

Changing Values (Fixed numerical values, name display)

The set values can be changed one parameter at a time by pressing the △ or ▽/▷ key.

Key-repeat will occur when the keys are held down.

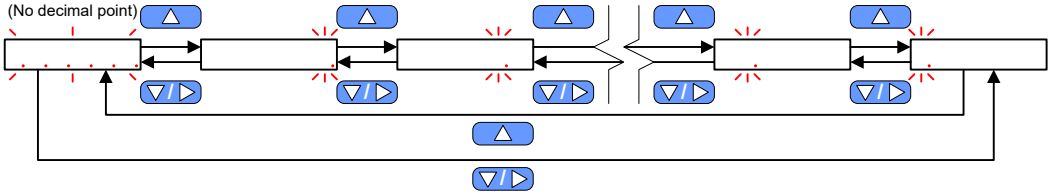
E.g. MAV Setting Value



Changing Values (Decimal point)

Pressing the △ or ▽/▷ key moves the decimal point one space at a time.

Key-repeat will occur when the keys are held down.



(3) Enter/Cancel

・ Entering Changes to Set Values

Pressing the Mode key after set values have been changed sets the changed values and saves them to the E²PROM.

N.B.) Please do not turn off power to the device while the E²PROM is saving data.

The display will return to the parameter name display.

N.B.) If the display does not return to the parameter name display even upon pressing the Mode key, this indicates that the changed set value exceeds the possible settings range. In this case, please change the value so that it falls within the range or cancel the setting change.

・ Canceling Changes to Set Values

Pressing the Enter key during the changing of a set value cancels the value change.

The set value will revert to the value preceding the change.

The display will return to the parameter name display.

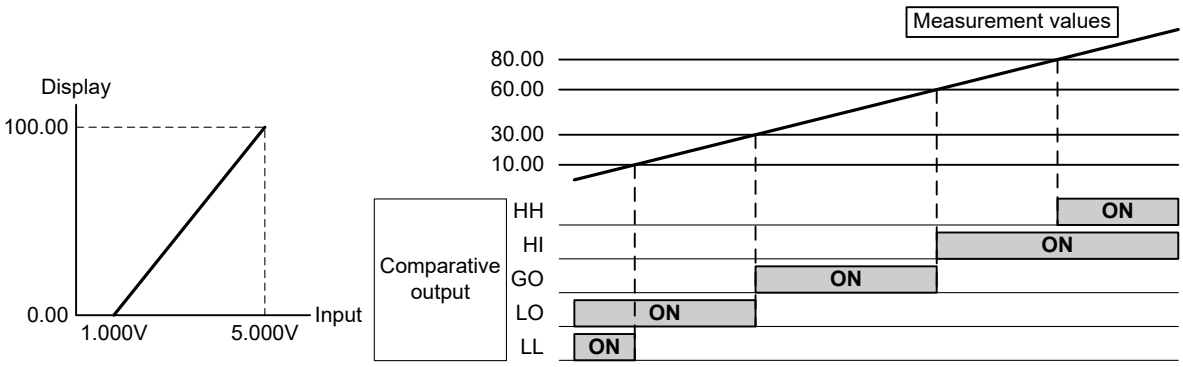
5 Example Default Setting

As a typical example, the default position setting for the AM-756-DV-□0-1 (voltage input, no option, relay output) is shown.

・ ±19.99999V range (13 ranges), 1 to 5V input is displayed as 0.00 to 100.00.

・ Comparative output HH ON when display exceeds 80.00, comparative output HI ON when display exceeds 60.00.

・ Comparative output LL ON when display is less than 10.00, comparative output LO ON when display is less than 30.00.



The default position is set using the following procedure.

5-1 Power On

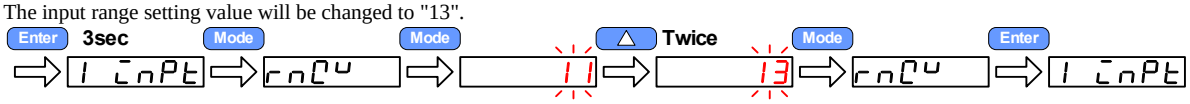
(1) Check that all wiring to the device is correct.

(2) Turn on the power.

(3) Wait until the measurement values are displayed.

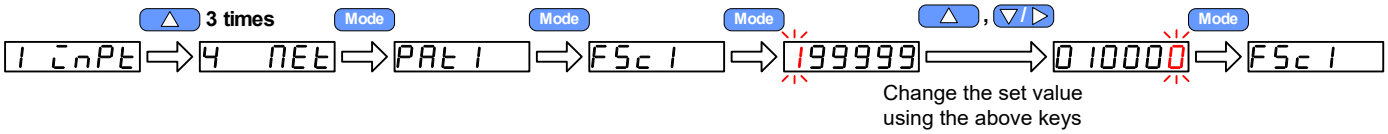
5-2 Range Settings

The input range setting value will be changed to "13".

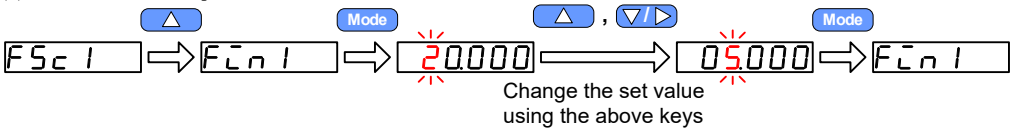


5-3 Displaying Scaling Settings

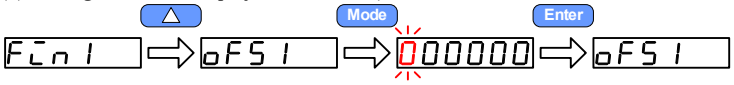
(1) Set the full scale display value to "10000".



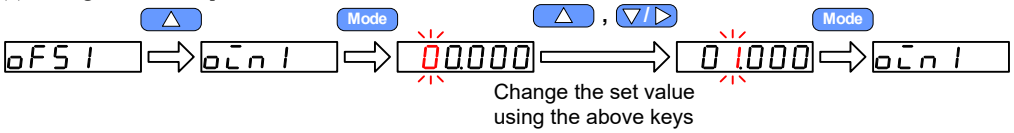
(2) Set the full scale input value to "5.000".



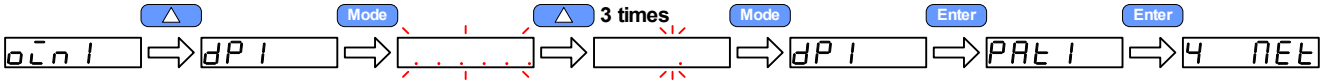
(3) Change the offset display value to "0". (As the default value is "0", this will not be changed.)



(4) Change the offset input value to "1.000".

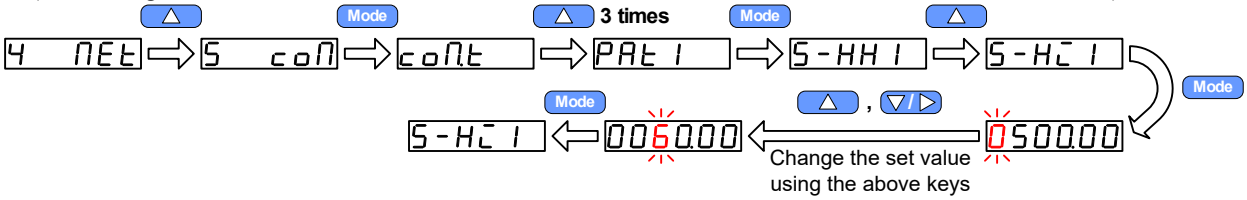


(5) Set the position of the decimal point to "0.00".

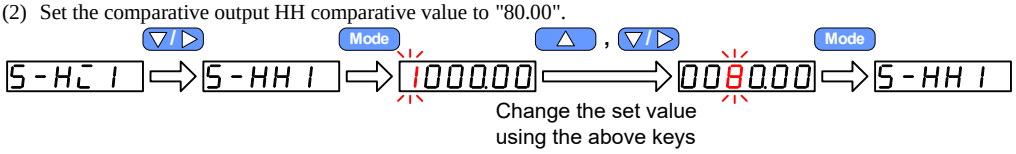


5-4 Comparative Output Settings

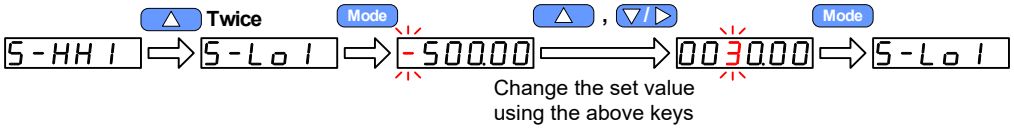
(1) Set the Comparative Output HI Comparative Value to "60.00".
(As the setting condition is HH > HI, the value of HH cannot be lower than the value of HI. Therefore, enter the HI value first.)



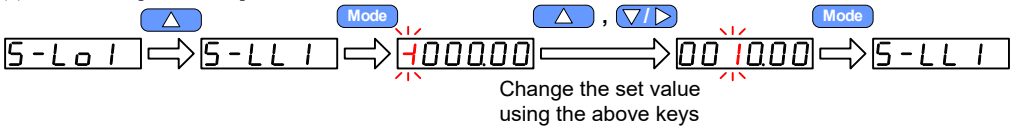
(2) Set the comparative output HH comparative value to "80.00".



(3) Set the comparative output LO comparative value to "30.00".

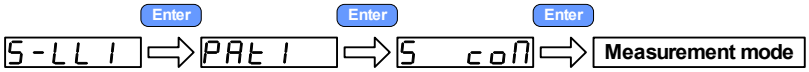


(4) Set the comparative output LL value to "10.00".



5-5 Return to Measurement Mode

Return to measurement mode and commence measurement.



6 Parameter List

6-1 InPt Group

Menu Display	Parameter Name	Setting Range	Default Value	Description	Display Conditions
rnGu	Input range (DV range)	11: ±199.999mV 12: ±1999.99mV 13: ±19.9999V 14: ±199.999V	11	Sets the input range. * Input terminals differ according to the range.	Input: DV (Voltage input)
rnGA	Input range (2□range)	23: ±19.9999mA 24: ±199.999mA	Depends on purchased range	Confirms the input range. **N.B.) Settings cannot be changed.**	Input: 2□ (Current input)
rnGb	Input range (DB range)	1V: 1 to 5V (±5V) 2A: 4 to 20mA (±19.9999mA) 11: ±199.999mV	1V	Sets the input range. * Input terminals differ according to the range. When settings are changed, the full scale input value and offset input value are rewritten and saved to the E^2PROM. **N.B.) Parameter settings cannot be made while changed settings are being saved to the E^2PROM.**	Input: DB (Process)
AvG	Averaging frequency	1: 1 time (50 times/sec) 2: 2 times (25 times/sec) 5: 5 times (10 times/sec) 20: 20 times (2.5 times/sec) 50: 50 times (1 time/sec) 100: 100 times (0.5 times/sec)	1	Sets the number of averaging times for measurement data (sampling rate). Sampling constantly occurs at 50 times/ sec, and this data is averaged by the set number of times. *The values in parenthesis are the sampling rates.	-
MAv	Moving Average	OFF: OFF 2: 2 times 4: 4 times 8: 8 times 16: 16 times 32: 32 times	OFF	Sets the number of moving averaging times for the measurement data.	-
dZbU	Digital Zero Backup	OFF: Backup off ON: Backup on	OFF	Sets whether to back up the digital zero value to the E^2PROM when digital zero is activated.	-
dZc	Digital Zero Control Method	INT: Front panel keys EXT: External control terminal	INT	Sets the digital zero control method.	Option: any apart from NO
dZ	Digital Zero Value	-199999 to 199999 [digit]	0	Sets the digital zero value when digital zero is ON. **N.B.) If settings are made while digital zero is OFF, they will be updated when digital zero is turned ON.**	-
trt	Tracking Zero Correction Time	0 to 99 [sample]	0	Sets the correction time of the tracking zero function when digital zero is used. A setting of 0 disables tracking zero. Correction Time (sec) = Set Value × 0.02 × AVG Set Value.	-
tru	Tracking Zero Correction Width	1 to 99 [digit]	1	Sets the correction width of the tracking zero function when digital zero is used.	-
Sud	Step Wide	1: 0 to 9 2: 0, 2, 4, 6, 8 5: 0, 5 10: 0	1	Sets the variation width of the least significant digit displayed. * The numbers that can be displayed as the least significant digit are shown after the setting values.	-
ddZn	Dead Zone	0 to 9999 [digit]	0	Displays input from 0 to ± (set range) as 0.	-

6-2 FUnc Group

Menu Display	Parameter Name	Setting Range	Default Value	Description	Display Conditions
PSEL	Pattern Select Control Method	INT: front panel keys, parameter EXT: External control terminal	INT	Sets the pattern select control method.	Option: any apart from NO
P-no	Pattern Number	1 to 8	1	Sets the pattern number to be used. **N.B.) Settings cannot be made when PSEL = "EXT".**	-
SrHt	Start/Hold Type	A: Free Run B: One Shot	A	Sets how the Start/Hold control terminal function is to be activated.	Option: any apart from NO
SrHd	Start/Hold Delay	0 to 999 [sample]	0	Sets the delay time from when the Start/Hold control terminal is put into start mode until the signal is read. Delay time (sec) = Set value × 0.02 × AVG Set value	
PuH	Peak Hold Type Select	PH: Peak hold VH: Valley hold PVH: Peak valley hold	PH	Sets the type of HOLD for the peak hold control terminal function.	
PuHt	Peak Hold Type	A: Real display B: Result display	A	Sets how HOLD is activated for the peak hold control terminal function.	

6-3 dISP Group

Menu Display	Parameter Name	Setting Range	Default Value	Description	Display Conditions
dcy	Display Update Cycle	SSLO: 1 time/sec SLO: 2 times/sec MID: 10 times/sec FAST: 20 times/sec	MID	Sets the main display update cycle.	-
bLnP	Display Blank	HIGH: Bright MID: Medium ON: Main display extinguished	HIGH	Sets the display brightness and extinguishes the main display.	-
cLr	Display Color (Comparative output off)	GRN: Green RED: Red	GRN	Sets the main display color.	Comparative output: Off
cLr	Display Color (Comparative output on)	GRN: Green RED: Red GO.GRN: GO is green, other readouts are red GO.RED: GO is red, other readouts are green	GO.GRN	Sets the main and comparative output display colors.	Comparative output: Relay, photocoupler

6-4 nEt Group

Menu Display	Parameter Name	Description Display	Conditions
PAt 1 to PAt8	Scaling Patterns 1 to 8	Switches to the parameter settings for scaling patterns 1 to 8.	-

・Scaling Pattern 1 to 8 Parameters

Menu Display	Parameter Name	Setting Range	Default Value	Description	Display Conditions
FSc 1 to FSc8	Full-scale Display Values 1 to 8	-199999 to 199999	199999	Sets the value displayed when input is full-scale input values.	-
FIn 1 to FIn8	Full-scale Input Values 1 to 8	Changes according to input range. *See chart below.	See chart below.	Sets the input value when the full-scale display value is displayed.	-
oFS 1 to oFS8	Offset Display Values 1 to 8	-199999 to 199999	0	Sets the display value when input is offset display values.	-
oIn 1 to oIn8	Offset Input Values 1 to 8	Changes according to input range. *See chart below.	See chart below.	Sets the input value for offset display values.	-
dP 1 to dP8	Decimal Point Positions 1 to 8	No decimal point, XXXXXX**. to** X.XXXXX	No decimal point	Sets the position of the decimal point.	-
dLHI 1 to dLHI8	Digital Limiter HI 1 to 8	-199999 to 199999	199999	Sets the upper limit of the displayable range. When the measured value is greater than the set value, the displayed value will be limited by the set value.	-
dLLo 1 to dLLo8	Digital Limiter LO 1 to 8	-199999 to 199999	-199999	Sets the lower limit of the displayable range. When the measured value is less than the set value, the displayed value will be limited by the set value.	-

・FIN, OIN Setting Ranges for Each Input Range

Input Range Set Value	Input Range	Full Scale Input Value FIN 1 to 8		Offset Input Value OIN 1 to 8	
		Setting Range	Default Value	Setting Value	Default Value
11	±0.2V	-0.20000 to 0.20000	0.20000	-0.20000 to 0.20000	0.00000
12	±2V	-2.0000 to 2.0000	2.0000	-2.0000 to 2.0000	0.0000
13	±20V	-20.000 to 20.000	20.000	-20.000 to 20.000	0.000
14	±200V	-200.00 to 200.00	200.00	-200.00 to 200.00	0.00
23	±20mA	-20.000 to 20.000	20.000	-20.000 to 20.000	0.000
24	±200mA	-200.00 to 200.00	200.00	-200.00 to 200.00	0.00
1V	±5V	-5.0000 to 5.0000	5.0000	-5.0000 to 5.0000	1.0000
2A	±20mA	-20.000 to 20.000	20.000	-20.000 to 20.000	4.000

N.B.) When the input range setting is changed using DB Range (process input), all FIN and OIN setting values revert to their default values and are saved to the E^2PROM.

6-5 coN Group

Menu Display	Parameter Name	Setting Range	Default Value	Description	Display Conditions
coNt	Comparative Output Type	NRML: Normal output ZONE: Zone output	NRML	Selects comparative output type. * Condition data group	Comparative output: Relay, photocoupler
LAcH	Comparative Output Latch	OFF: Latch function off ON: Latch function on	OFF	Holds status (latches) when comparative output judgment is a judgment other than GO. Latch can be cancelled with the following procedure: 1. Go to parameter settings mode. 2. Turn the relay reset control terminal ON. * Condition data group	
rLd	Comparative Output Delay	0 to 99 [CNT]	0	Sets the length of time actually taken for comparative judgment output to deactivate when comparative judgment switches from ON to OFF. Delay time (msec) = Set value × 20msec * Condition data group	
PAt 1 to PAt8	Comparative Output Patterns 1 to 8	-	-	Switches to the parameter settings for comparative output patterns 1 to 8	

・Comparative Output Pattern 1 to 8 Parameters

Menu Display	Parameter Name	Setting Range	Default Value	Description	Display Conditions
S-HH 1 to S-HH8	HH Comparison Set Values 1 to 8	-199999 to 199999 N.B.) Settings may be made within identical patterns under the following conditions. **S-HH > S-HI > S-LO > S-LL**	100000	Measurement value >= HH set value → HH output ON * Decimal point position depends on the decimal point position in identical patterns.	Comparative output: Relay, photocoupler
S-HI 1 to S-HI8	HI Comparison Set Values 1 to 8		50000	Measurement value >= HI Set value → HI output ON * Decimal point position depends on the decimal point position in identical patterns.	
S-Lo 1 to S-Lo8	LO Comparison Set Values 1 to 8		-50000	Measurement value <= LO set value → LO output ON * Decimal point position depends on the decimal point position in identical patterns.	
S-LL 1 to S-LL8	LL Comparison Set Values 1 to 8		-100000	Measurement value <= LL set value → LL output ON * Decimal point position depends on the decimal point position in identical patterns.	
H-HH 1 to H-HH8	HH Hysteresis 1 to 8	0 to 9999	0	Measurement value < (HH set value － HH Hysteresis) → HH output OFF * Decimal point position depends on the decimal point position in identical patterns.	
H-HI 1 to H-HI8	HI Hysteresis 1 to 8			Measurement value < (HI set value － HI Hysteresis) → HI output OFF * Decimal point position depends on the decimal point position in identical patterns.	
H-Lo 1 to H-Lo8	LO Hysteresis 1 to 8			Measurement value > (LO set value + LO Hysteresis) → LO output OFF * Decimal point position depends on the decimal point position in identical patterns.	
H-LL 1 to H-LL8	LL Hysteresis 1 to 8			Measurement value > (LL set value + LL Hysteresis) → LL output OFF * Decimal point position depends on the decimal point position in identical patterns.	

6-6 oPt Group

Menu Display	Parameter Name	Setting Range	Default Value	Description	Display Conditions
AoUt	Analog Output Type	0-10: 0 to 10V output 1-5: 1 to 5V output 0-1: 0 to 1V output 4-20: 4 to 20mA output	0-10	Selects output type when analog output selected.	Option: Analog output
AoHI	Analog Output 100% Display Value	-19999 to 199999	199999	Sets display value when analog output is 100%.	
AoLo	Analog Output 0% Display Value	-19999 to 199999	0	Sets display value when analog output is 0%.	
bcdL	BCD Output Logic	NEG: Negative logic POS: Positive logic	NEG	Selects BCD output logic. * Open collector is normal.	Option: BCD output

6-7 LInE Group

Menu Display	Parameter Name	Setting Range	Default Value	Description	Display Conditions
LInE	Linearize Point	OFF: Linearize Off 2: 2-point correction 4: 4-point correction 8: 8-point correction 16: 16-point correction	OFF	Selects Linearize function ON/OFF and number of correction points.	-

Menu Display	Parameter Name	Setting Range	Default Value	Customer Setting Value	Description	Display Conditions
n01i	Linearize Input Value 1	-199999 to 199999 [digit] Setting Condition: N02i > N01i	0		Input Value 1: Linearize pre-correction display	LINE set value: 2, 4, 8, 16
n01o	Linearize Output Value 1	-199999 to 199999 [digit] Setting Condition: N02o > N01o	0		Output Value 1: Linearize post-correction display	
n02i	Linearize Input Value 2	-199999 to 199999 [digit] Setting Condition: N03i > N02i > N01i	1000		Input Value 2: Linearize pre-correction display	
n02o	Linearize Output Value 2	-199999 to 199999 [digit] Setting Condition: N03o > N02o > N01o	1000		Output Value 2: Linearize post-correction display	
n03i	Linearize Input Value 3	-199999 to 199999 [digit] Setting Condition: N04i > N03i > N02i	2000		Input Value 3: Linearize pre-correction display	LINE Set Value: 4, 8, 16
n03o	Linearize Output Value 3	-199999 to 199999 [digit] Setting Condition: N04o > N03o > N02o	2000		Output Value 3: Linearize post-correction display	
n04i	Linearize Input Value 4	-199999 to 199999 [digit] Setting Condition: N05i > N04i > N03i	3000		Input Value 4: Linearize pre-correction display	
n04o	Linearize Output Value 4	-199999 to 199999 [digit] Setting Condition: N05o > N04o > N03o	3000		Output Value 4: Linearize post-correction display	
n05i	Linearize Input Value 5	-199999 to 199999 [digit] Setting Condition: N06i > N05i > N04i	4000		Input Value 5: Linearize pre-correction display	LINE Set Value: 8, 16
n05o	Linearize Output Value 5	-199999 to 199999 [digit] Setting Condition: N06o > N05o > N04o	4000		Output Value 5: Linearize post-correction display	
n06i	Linearize Input Value 6	-199999 to 199999 [digit] Setting Condition: N07i > N06i > N05i	5000		Input Value 6: Linearize pre-correction display	
n06o	Linearize Output Value 6	-199999 to 199999 [digit] Setting Condition: N07o > N06o > N05o	5000		Output Value 6: Linearize post-correction display	
n07i	Linearize Input Value 7	-199999 to 199999 [digit] Setting Condition: N08i > N07i > N06i	6000		Input Value 7: Linearize pre-correction display	
n07o	Linearize Output Value 7	-199999 to 199999 [digit] Setting Condition: N08o > N07o > N06o	6000		Output Value 7: Linearize post-correction display	
n08i	Linearize Input Value 8	-199999 to 199999 [digit] Setting Condition: N09i > N08i > N07i	7000		Input Value 8: Linearize pre-correction display	
n08o	Linearize Output Value 8	-199999 to 199999 [digit] Setting Condition: N09o > N08o > N07o	7000		Output Value 8: Linearize post-correction display	
n09i	Linearize Input Value 9	-199999 to 199999 [digit] Setting Condition: N10i > N09i > N08i	8000		Input Value 9: Linearize pre-correction display	LINE Set Value: 16
n09o	Linearize Output Value 9	-199999 to 199999 [digit] Setting Condition: N10o > N09o > N08o	8000		Output Value 9: Linearize post-correction display	
n10i	Linearize Input Value 10	-199999 to 199999 [digit] Setting Condition: N11i > N10i > N09i	9000		Input Value 10: Linearize pre-correction display	
n10o	Linearize Output Value 10	-199999 to 199999 [digit] Setting Condition: N11o > N10o > N09o	9000		Output Value 10: Linearize post-correction display	
n11i	Linearize Input Value 11	-199999 to 199999 [digit] Setting Condition: N12i > N11i > N10i	10000		Input Value 11: Linearize pre-correction display	
n11o	Linearize Output Value 11	-199999 to 199999 [digit] Setting Condition: N12o > N11o > N10o	10000		Output Value 11: Linearize post-correction display	
n12i	Linearize Input Value 12	-199999 to 199999 [digit] Setting Condition: N13i > N12i > N11i	11000		Input Value 12: Linearize pre-correction display	
n12o	Linearize Output Value 12	-199999 to 199999 [digit] Setting Condition: N13o > N12o > N11o	11000		Output Value 12: Linearize post-correction display	
n13i	Linearize Input Value 13	-199999 to 199999 [digit] Setting Condition: N14i > N13i > N12i	12000		Input Value 13: Linearize pre-correction display	
n13o	Linearize Output Value 13	-199999 to 199999 [digit] Setting Condition: N14o > N13o > N12o	12000		Output Value 13: Linearize post-correction display	
n14i	Linearize Input Value 14	-199999 to 199999 [digit] Setting Condition: N15i > N14i > N13i	13000		Input Value 14: Linearize pre-correction display	
n14o	Linearize Output Value 14	-199999 to 199999 [digit] Setting Condition: N15o > N14o > N13o	13000		Output Value 14: Linearize post-correction display	
n15i	Linearize Input Value 15	-199999 to 199999 [digit] Setting Condition: N16i > N15i > N14i	14000		Input Value 15: Linearize pre-correction display	
n15o	Linearize Output Value 15	-199999 to 199999 [digit] Setting Condition: N16o > N15o > N14o	14000		Output Value 15: Linearize post-correction display	
n16i	Linearize Input Value 16	-199999 to 199999 [digit] Setting Condition: N16i > N15i	15000		Input Value 16: Linearize pre-correction display	
n16o	Linearize Output Value 16	-199999 to 199999 [digit] Setting Condition: N16o > N15o	15000		Output Value 16: Linearize post-correction display	

N.B. 1) Setting data cannot be changed when the input of data falling outside the setting conditions is attempted. Please commence settings from the first or last linearize point.

N.B. 2) Occasionally, when changing the number of linearize points, linearize correction may not occur correctly if the setting conditions are not fulfilled. Please ensure that the linearize input and output values fulfill the setting conditions before commencing measurement.

6-8 Prot Group

Menu Display	Parameter Name	Setting Range	Default Value	Description	Display Conditions
Pro	Settings Protect	OFF: Display all PATN: No pattern display COND: No condition display ALL: All displays off	OFF	Hides parameters of set group. * For parameter groupings, please refer to "Parameter Settings Group".	-
HYPt	Set Value Changes Protect	OFF: Set values can be changed ON: Set values cannot be changed	OFF	Enables/disables changes to set parameter values. Even if set value change is disabled, display of the values is possible.	-
dZPt	Digital Zero Protect	OFF: Digital Zero enabled ON: Digital Zero disabled	OFF	Limits the digital zero function of the front panel keys. *The external control digital zero function is not limited.	-
MMPt	Maximum Minimum Values Protect	OFF: No limit CLR: Limit clear function CNG: Limit display switching	OFF	Limits switching between maximum and minimum values and value reset.	-

6-9 Monc グループ

Menu Display	Parameter Name	Setting Range	Description	Display Conditions
PV	Process Value	-199999 to 199999	Indicates the measurement value before PH *** Display only. Settings cannot be made.**	-
InU	Input Unit	DV: Direct voltage input A: Direct current input DB: Process input	Indicates the input unit currently connected. *** Display only. Settings cannot be made.**	-
cMPU	Comparative Output Unit	NONE: No comparative output PHOTO: Photocoupler output RELAY: Relay output	Indicates the comparative output unit currently connected. *** Display only. Settings cannot be made.**	-
oPtU	Optional Unit	NONE: No optional unit C IN: Control terminal BCD: BCD output A.O: Analog output	Indicates the optional unit currently connected. *** Display only. Settings cannot be made.**	-
cInL	External Control Terminals 1 to 4	0: OFF, 1: ON 4th bit: R:RESET 3rd bit: PSEL0 2nd bit: PSEL1 1st bit: PSEL2	Indicates the status of the external control terminal. *** Display only. Settings cannot be made.** * PSEL2 is permanently OFF during analog output.	Option: Any other than NO
cInH	External Control Terminals 5 to 7	0: OFF, 1: ON 3rd bit: S/H 2nd bit: PH 1st bit: DZ		

7 Function List

7-1 Measurement

7-1-1 Input

(1) Input Range (rnGU, rnGA, rnGb Parameters)

Input Set Value	Input Range	Possible Display Range	Resolution
11	±0.2V	Approx. ±0.21V	±199999
12	±2V	Approx. ±2.1V	
13	±20V	Approx. ±21V	
14	±200V	Approx. ±210V	
23	±20mA	Approx. ±21mA	
24	±200mA	Approx. ±210mA	
1V	±5V	Approx. ±5.25V	
2A	±20mA	Approx. ±21mA	

N.B.) Please do not connect unused terminals.

(2) Over range Warning

The main display will read oUEr or -oUEr under the following conditions.

・The value input is outside the possible display range.

・The measured value exceeds ±199999.

7-1-2 Scaling Function

Measurement values can be obtained using input values converted into arbitrary display values. Scales are converted by using the scaling setting of the currently selected pattern.

・Parameters Used: FSc1 to FScB , FCn1 to FCnB , oFS1 to oFSB , oCn1 to oCnB

・Calculation Formula

The scaling calculation formula is as follows.

$$\text{Measurement value} = \frac{\text{FSC - OFS}}{\text{FIN - OIN}} \times \text{Input value} + \left(\text{OFS - OIN} \times \frac{\text{FSC}-\text{OFS}}{\text{FIN - OIN}}\right)$$

* Negative scaling settings (reverse gradient) are also possible.

7-1-3 Digital Limiter Function

This function sets the upper and lower limits of the displayable range.

It is limited by the digital limit values of the presently selected pattern.

When the measurement value is greater than the set upper limit, the displayed value is limited by the set upper limit.

Upper Parameters: dLHC1 to dLHCB

When the measurement value is less than the set lower limit, the displayed value is limited by the set lower limit.

Lower Parameters: dLLo1 to dLLoB

7-2 Noise Elimination

7-2-1 Averaging Frequency

Measurement data obtained at 50 times/ sec is averaged at an interval set by the sampling rate. Measurement values, comparative output, analog output and BCD output are updated with their average values.

Parameter Used: AVC

7-2-2 Moving Average

Data which has been averaged by using the sampling rate interval is in turn averaged by the quantity of set data. With every sampling, the oldest data is discarded and new data is obtained and averaged.

Parameter Used: MAV

7-3 Measurement Value Correction

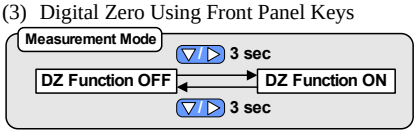
7-3-1 Digital Zero

(1) Digital Zero

The current measurement value can be shifted to zero by using either the external control terminal or front panel keys. When digital zero is on, the digital zero function is active, and when digital zero is off, the device runs on normal operation. When the digital zero function is on, the function message [DZ] illuminates, enabling visual confirmation of the operating status.

(2) Digital Zero Control Method
This enables selection of whether digital zero is controlled by using the external control terminal or the front panel keys.
Parameter Used: dEc

(3) Digital Zero Using Front Panel Keys



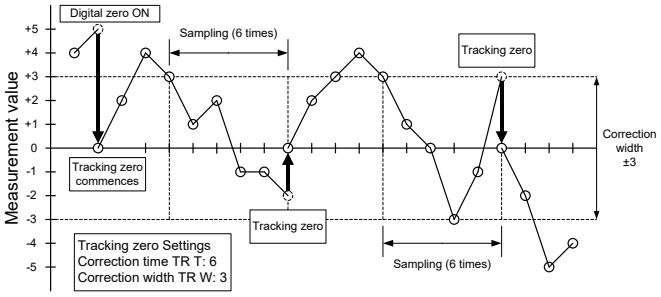
N.B.) Digital zero function cannot be activated with the front panel keys when the device is in setting mode or maximum minimum value mode.

(4) Digital Zero Value
The digital zero value used when the digital zero function is activated can be set arbitrarily. The set value is saved into the E^2PROM.
Parameter Used: dE

(5) Digital Zero Backup
The digital zero value used when the digital zero function is active can be saved to the E^2PROM. In addition, when the digital zero backup is activated, if the power is turned on while the device is in digital zero control mode, measurement will commence using the saved digital zero value.
Parameter Used: dEbU
N.B.) If the device is being used while alternating between the activation and deactivation of digital zero, please ensure the digital zero backup is turned off.

7-3-2 Tracking Zero Function

(1) Tracking Zero
This function measures values within the set tracking zero correction width, and when it reaches the number of samples set under tracking zero correction time, it converts the value of the last data measured to zero. If any of the measured values falls out of the correction range, the tracking zero function will not activate.
N.B.) The tracking zero function starts functioning when digital zero is activated.



(2) Tracking Zero Correction Time
This function sets the tracking zero correction time. When the correction time is set to zero, the tracking zero function is inactive. When the correction time is set to one or more the function indicator [TZ] will illuminate.
Parameter Used: tr t
Correction Time (sec) = TR T set value × 0.02 × AVG set value
E.g.) Tracking zero correction time (TR T) 50 [sample]
When AVG is 10:
Tracking correction time: 50 × 0.02 × 10 = 10 sec

(3) Tracking Zero Correction Width
This function sets the tracking zero correction width.
Tracking zero is activated when:
- (Tracking zero correction width) <= Measurement value <= + (Tracking zero correction width)
Parameter Used: tr u

7-3-3 Step Wide Function

This function changes the resolution of the least significant digit of the measurement value in order to prevent display drift.
Parameter Used: Sud

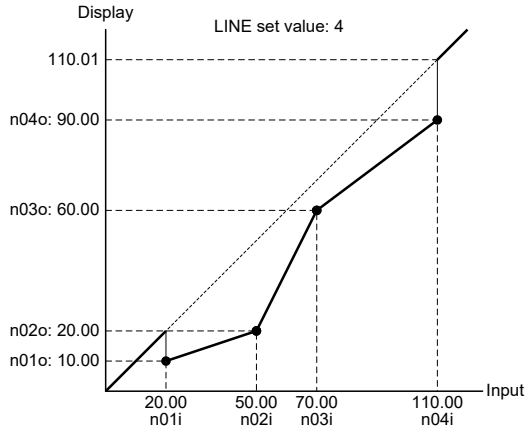
7-3-4 Dead Zone Function

This function displays ± (set range) from zero as "zero" in order to prevent display drift around zero.
Parameter Used: ddEn

7-3-5 Linearize Function

(1) Linearize
This function executes approximate line calculation at set points and corrects the measured values in order to correct input nonlinearity.
Input values which fall outside the set linearization range are output with no alteration.
Parameter Used: LinE, n01i to n16i, n01o to n16o

・Example setting



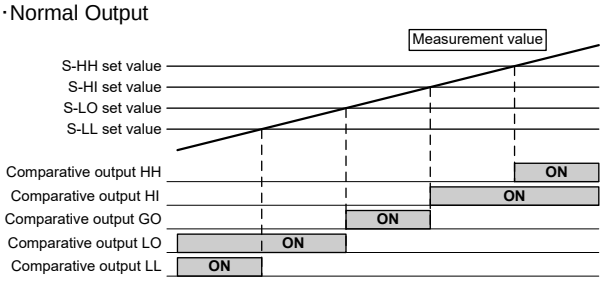
N.B.) If the linearize point changes do not fulfill the setting conditions, linearize correction may not execute correctly.
Please ensure that linearize input and output values fulfill the setting conditions before commencing measurement.

7-4 Comparative Output

7-4-1 Comparative Output Type

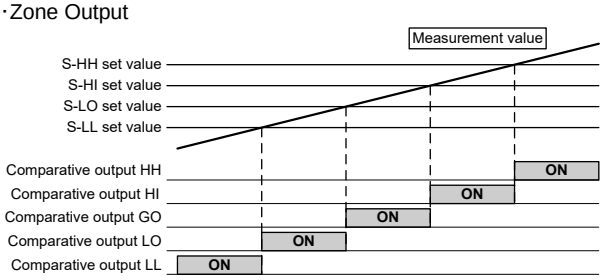
This function compares the measured values with the set comparative values and outputs the comparative output.
Setting Condition: HH judgment value > HI judgment value > LO judgment value > LL judgment value
Either normal or zone output can be selected.
Parameter Used: cont

・Normal Output



Comparative Output	Output OFF → ON Conditions
HH	Measurement value >= S-HH set value
HI	Measurement value >= S-HI set value
GO	HH, HI, LO, LL all OFF
LO	Measurement value <= S-Lo set value
LL	Measurement value <= S-LL set value

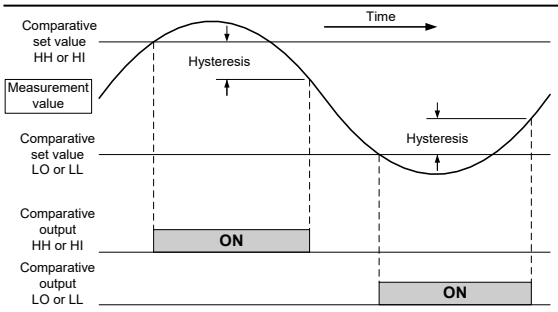
・Zone Output



Comparative Output	Output OFF → ON Conditions
HH	Measurement value >= S-HH set value
HI	S-HH set value >= Measurement value >= S-HI set value
GO	HH, HI, LO, LL all OFF
LO	S-LL set value <= Measurement value <= S-Lo set value
LL	Measurement value <= S-LL set value

7-4-2 Hysteresis

When comparative output changes from ON to OFF, if there is no variation in the measurement values exceeding the set hysteresis range, this function prevents the output from switching OFF. Hysteresis is not activated when comparative output changes from OFF to ON.



Comparative Output	Output OFF → ON Conditions
HH	Measurement value < (S-HH – H-HH)
HI	Measurement value < (S-HI – H-HI)
GO	One of HH, HI, LO, LL is ON (No Hysteresis)
LO	Measurement value > (S-Lo + H-Lo)
LL	Measurement value > (S-LL + H-LL)

7-4-3 Comparative Output Deactivation Delay Function

When the comparison results function is deactivated, this function will switch the comparative output deactivation delay ON for the set time duration only, then switch OFF.

Parameter Used: rLd

Delay Time (msec): RLD set value × 20msec

7-4-4 Comparative Output Latch Function

When comparative output reads any judgment other than GO, this status will be saved (latched).

Parameter Used: LAcH

To deactivate the latch function, please follow the following steps.

(1) Go to parameter setting mode.

(2) Turn the relay reset control terminal ON.

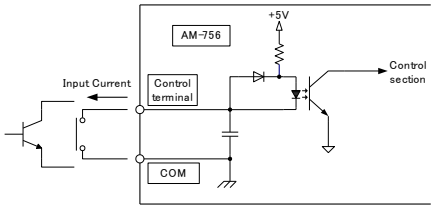
7-4-5 Comparative Output Reset Function

This function can be used to turn all comparative output results OFF using the relay reset control terminal.

7-5 External Control Terminal Function

7-5-1 External Control Terminal Specifications

ON voltage: 0 to 0.8V
OFF voltage: 4.5 to 5V
Input current:
Max. -3mA



・Please ensure that the supplied control terminal input is no-voltage contact input.

・When inputting with a transistor or similar device, please connect the device using open-collector output.

・As the contact current is low, please ensure a terminal for minute electric currents is used for contact input.

7-5-2 Peak Hold Function

(1) Peak Hold

This function can hold the maximum value (PH), minimum value (VH) or the difference between the maximum and minimum values (PVH) during measurement. Peak hold can be controlled with the external control terminal.

Parameter Used: PuH

(2) Operation Type

There are two peak hold types; Type A (real display) and Type B (result display).

Parameter Used: PuHt

・Type A: This operation type commences peak hold measurement when peak hold terminal is activated, and updates the peak hold value at each sampling rate. When peak hold terminal is deactivated, peak hold measurement ends and the device returns to routine measurement.

・Type B: This operation type updates peak hold values stored while peak hold terminal is OFF when peak hold terminal is activated, and saves the peak hold values until the next update.

7-5-3 Start/Hold Function

(1) Start/Hold

This function enables control over the commencement and ending of measurement using the external control terminal.

(2) Operation Type

There are two Start/Hold operation types; Type A (free run) and Type B (one shot).

Parameter Used: SrHt

・Type A: This operation type enters hold status when Start/Hold is ON, halting measurement. The comparative, analog and BCD outputs save the values recorded before HOLD was activated.

・Type B: This operation type executes one measurement only when Start/Hold switches from OFF to ON, updating the comparative, analog and BCD outputs. A HOLD status is maintained for everything else. Measurement values are only updated once, even if Start/Hold is switched on more than once during the sampling time.

(3) Start/Hold Response Time

Max. (10msec + (20msec × AVG set value))

(4) Start Delay

When the Start/Hold function is being used, it is possible to delay the commencement of measurement for a set period of time.

Parameter Used: SrHd

Start Delay Time (msec) = S/H.D set value × 20msec × AVG set value

7-5-4 Pattern Select

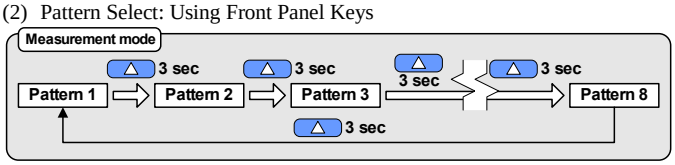
The external control terminal or front panel keys can be used to switch between the 8 comparative setting value patterns, hysteresis and scaling setting values.

(1) Pattern Select Method

Pattern select may be executed using the external control terminal, the front panel keys or through parameter settings.

Parameter Used: PSEL

(2) Pattern Select: Using Front Panel Keys



N.B.1) Even if pattern numbers are changed using the front panel keys, they will not be saved to the E^2PROM.

N.B.2) The front panel keys may not be used for the pattern select function method during setting mode or maximum minimum value mode.

(3) Pattern Select: Using Parameter Change

When the pattern selection method is set to “INT,” the set values can be changed using the parameter pattern numbers. When the set values are changed, the pattern number is saved to the E^2PROM and the set pattern is activated at the next start-up.

Parameter Used: P-no

(4) Parameter Select: Using Control Terminal

When the control terminal is used for pattern select, the patterns used can be switched by turning the pattern select control terminals ON and OFF.

Selected Pattern No.	PSEL0 Terminal	PSEL1 Terminal	PSEL2 Terminal
1	OFF	OFF	OFF
2	ON	OFF	OFF
3	OFF	ON	OFF
4	ON	ON	OFF
5	OFF	OFF	ON
6	ON	OFF	ON
7	OFF	ON	ON
8	ON	ON	ON

7-6 Display

7-6-1 Main Display Update Cycle

The main display update cycle can be changed. The display update cycle and sampling rate are not related.

Parameter Used: dcY

7-6-2 Display Blank

This function changes the display brightness and extinguishes the main display.

When the main display is extinguished, the comparative output display and function display will illuminate.

Parameter Used: bLnP

7-6-3 Display Color

This function enables the display color of the main display and comparative output display (only when comparative output is activated) to be set.
When comparative output is activated, different colors can be set for when there is and is not a GO judgment.
* The color displayed during relay reset will be the GO judgment color.

Parameter Used: cLr

7-6-4 Status Display

The status of measurement values, the input unit, the comparative output unit, the option unit and the external control terminal can be checked with the setting mode.

Parameters Used: Pu , InU , cMPU , oPtU , cInL , cInH

7-7 Other Functions

7-7-1 Protect

This function enables the setting of whether or not parameters are displayed or set, the limiting of digital zero functions using the front panel keys and the maximum and minimum value function limits.

Parameters Used: Pro , PyPt , dZPt , MMPt

7-7-2 Maximum and Minimum Values

(1) Maximum and Minimum Values

The maximum value, minimum value and the difference between the maximum and minimum values of the values measured can be confirmed using maximum and minimum value mode.
For details on displaying this data, please refer to the section entitled "Shifting to Parameter Setting Mode."
N.B. 1) Maximum and minimum values are for display only. This data cannot be output using comparative output, analog output or BCD output.
N.B. 2) The maximum displayable value for the difference between the maximum and minimum values is 199999. Any values exceeding this will be displayed as 199999.

(2) Clear Maximum and Minimum Values

Pressing the MODE key in maximum and minimum values mode for longer than three seconds enables the resumption of maximum and minimum value measurement with the maximum and minimum values reset.

7-7-3 Set Value Reset

All set values will be initialized when the device is started up while pressing the ENTER and MODE keys.
Initialization takes approximately 30 seconds. Please do not turn off the device during initialization. The initialization process cannot be stopped once activated.

The message "InIt-on" will blink on the main display during initialization. When the initialization of the setting values is complete, the device will revert to measurement mode.

7-8 Output

7-8-1 BCD (Binary Coded Decimal) Output

(1) BCD Output

BCD type measurement values are output from this device at intervals set by the sampling rate.

BCD Output Type	ON or "1"	OFF or "0"
Open collector	Transistor ON	Transistor OFF
TTL	+5V	0V

N.B. 1) The settings of each output are undefined at start up.
N.B. 2) Open collector output is NPN open collector output.
N.B. 3) When the computed result is "WAIT", the data output will be "000000".

(2) Over range Signal (OVER)

Output is activated when OVER is displayed.

(3) Polar Signal (POL)

Output is activated when the measurement value is negative.

(4) Print Command Signal (PC)

The print command signal is activated when BCD data output is complete and the output data has been determined. The length of time the signal is activated differs according to the averaging frequency setting.

Averaging Frequency (times)	1	2	5	10 ,20, 50, 100
PC ON Time (msec)	10	20	50	100

(5) BCD Enable Input (ENABLE)

When the ENABLE terminal and D.COM are shorted, data output, the over range signal, the polar signal and print command signal are all deactivated.
ON Voltage: 0 to 0.8V
OFF Voltage: 4.2 to 5V
Input Current: Max. -0.5mA

(6) BCD Output Logic

The function is used to select BCD Output logic.
* The only signal where logic is not inverted is the PC signal.

BCD Output Type	Logic Setting NEG	Logic Setting POS
Open Collector	Negative logic	Positive logic (PC: Negative logic)
TTL	Positive logic	Negative logic (PC: Positive logic)

Parameter Used: bcdL

7-8-2 Analog Output

(1) Analog Output

This function enables output of voltage and current values using measurement values converted using analog output scaling.
N.B. 1) Analog output is 0% during settings mode or when the measurement value is "WAIT".

(2) Analog Output Type

Analog Output Type	Output Range	0% Output Value	100% Output Value
0 to 10V	Approx. -0.5 to 10.5V	0V	10V
1 to 5V	Approx. 0.8 to 5.2V	1V	5V
0 to 1V	Approx. -0.05 to 1.05V	0V	1V
4 to 20mA	Approx. 3.2 to 20.8mA	4mA	20mA

N.B. 1) When measurement values fall out of the analog output range, output will be limited by the analog output range.
N.B. 2) The analog output will output measurement values converted by analog output scaling even when the OVER message is displayed.

Parameter Used: AoUt

(3) Analog Output Scaling

This function enables the output of arbitrarily converted measurement values as analog output values. The scale is converted using the analog output scaling setting of the selected pattern.

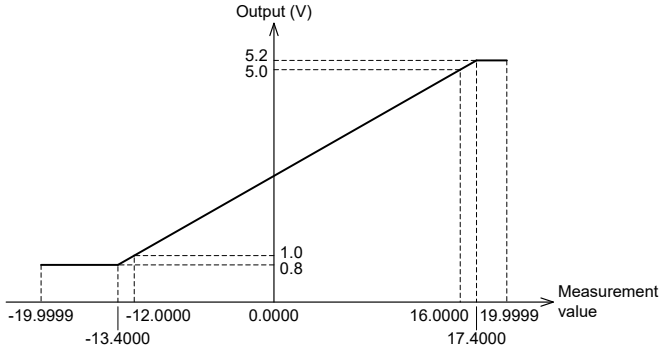
・Calculation Method

The analog output scaling calculation is as follows:

$$\text{Analog Output Value} = \frac{\text{100\% Output Value - 0\% Output Value}}{\text{AOHI} - \text{AOLO}} \times \text{Measurement Value} + \left(\text{0\% Output Value} - \text{AOLO} \times \frac{\text{100\% Output Value - 0\% Output Value}}{\text{AOHI} - \text{AOLO}}\right)$$

* Negative (reverse gradient) scaling settings are also possible.

E.g.) 5V output when 16.0000 is displayed, 1V output when -12.0000 is displayed
A.OUT set value: 1 to 5, AOHI set value: 16.0000, AOLO set Value: -12.0000



8 Specifications

・Input Specifications

Measurement function: Direct voltage / Direct current
Operating system: ΔΣ Conversion system
Input circuit: Single-ended type
Resolution: ±199999
Sampling rate: 50 times/ sec
Display: Offset ±199999, Full Scale ±199999

・DV Range (Direct Voltage Input)

Range	Measurement Range	Accuracy (23±3°C, 35 to 85%RH)	Input Impedance	Maximum Allowable Input
11	±199.999mV	±(0.03% of rdg + 15digit)	10 MΩ or less	±50V
12	±1999.99mV	±(0.02% of rdg + 10digit)		
13	±19.9999V	±(0.03% of rdg + 10digit)	Approx. 1MΩ	±250V
14	±199.999V			

・2□ Range (Direct Current Input)

Range	Measurement Range	Accuracy (23±3°C, 35 to 85%RH)	Input Impedance	Maximum Allowable Input
23	±19.9999mA	±(0.04% of rdg + 10digit)	Approx. 10Ω	±50mA
24	±199.999mA	±(0.06% of rdg + 10digit)	Approx. 1Ω	±500mA

・DB Range (Process Input)

Range	Measurement Range	Accuracy (23±3°C, 35 to 85%RH)	Input Impedance	Maximum Allowable Input
1V	1 to 5V (±5V)	±(0.04% of FS + 5digit)	Approx. 1MΩ	±250V
2A	4 to 20mA (±20mA)		Approx. 10Ω	±50mA
11	±199.999mV	±(0.03% of FS + 5digit)	10Ω or more	±50V

* The accuracy and resolution for Ranges 1V and 2A are the specifications at ±5V and ±20mA respectively.
Sensor power (Isolated input): DC12V±10% 50mA, or DC24V±10% 25mA, or DC10V±10% 60mA
* Sensor source voltage switched using sockets.

・Display Specifications

Main display section: Red / green 7 segment LED, height approx. 20mm
Display range: -199999 to 199999

・Comparison Section Specifications

Comparison results: HH, HI, GO, LO, LL (5 points)
Setting conditions: HH judgment value > HI judgment value > LO judgment value > LL judgment value
Comparative output type: Normal output, Zone output
Pattern Selection: Switching between 8 comparative setting value patterns possible using key panel or control terminals
Hysteresis: 4 point independent
Relay output: Contact capacity 1a contact, AC 250V/DC30V 1A (resistance load), Electrical life 50,000 times (rated load)
Minimum application load (as reference): 10mA (DC 5V)

Photocoupler output: Output rating DC 30V 20mA (MAX), output saturation voltage Max. 1.2V

・General Specifications

Operating temperature/humidity ranges: 0 to 50°C, 35 to 85% RH (non-condensing)
Storage temperature/humidity ranges: -10 to 70°C, 60% RH or less (non-condensing)
Power: AC 100 to 240V±10%, DC 12 to 48V±10%
Power consumption: Approx. 12VA max. (AC power), 6W max. (DC power)
External dimensions: 96mm (W) × 48mm (H) × 97.5mm (D) (without optional unit installed)
Weight: Approx. 200 to 300g
Insulation withstands Voltage:
AC 500V per minute between input terminal and each of the output, control terminal and sensor power source
AC 1500V per minute between power terminal and each of the input, output, control terminal and sensor power source (AC Power Supply)
AC 500V per minute between power terminal and each of the input, output, control terminal and sensor power source (DC Power Supply)
Insulation Resistance: Min. 100MΩ between the abovementioned terminals when DC 500V is applied
Memory Backup: E^2PROM, Writing frequency: 10,000 times

Accompanying Items: Instruction manual

・Option Specifications

・External Control (Isolated input)
Number of terminals: 7 inputs
Functions: Start/Hold, Peak Hold, Digital Zero, Relay Reset, Pattern Selection 0, 1, 2
Input: No-voltage contact, NPN Open Collector Input

・BCD Output + External Control
BCD Output (Isolated input)
Output format: BCD code
NPN open collector input: DC 30V 10mA (MAX), Output saturated voltage Max. 1.2V
TTL output: Positive logic TTL level (CMOS compatible), Fan-out 2
Output: BCD signal, print command (PC), pole (POL), over range (OVER)
Control Input: ENABLE
・External Control (Isolated input)
Number of Terminals: 7 inputs
Functions: Start/Hold, Peak Hold, Digital Zero, Relay Reset, Pattern Selection 0, 1, 2
Input: No-voltage contact, NPN open collector input

・Analog Output + External Control
Analog Output (Isolated input)

Output Type	Load Resistance	Accuracy (23±5°C, 35 to 85%RH)	Ripple
0 to 10V	10kΩ or more	±0.1% of FS	50mVp-p
0 to 1V			
1 to 5V			
4 to 20mA	550Ω or less		25mVp-p (at resistance of 250Ω)

Conversion System: D/A Conversion System
Resolution: 15 bit equivalent
Response Time: Approx. 80msec (10 → 90%, sampling rate 50 times/min, no moving average)
・External Control (input and isolation)
Number of terminals: 6 inputs
Functions: Start/Hold, Peak Hold, Digital Zero, Relay Reset, Pattern Selection 0, 1
Input: No-voltage contact, NPN open collector input

9 Trouble Shooting

9-1 Error Messages

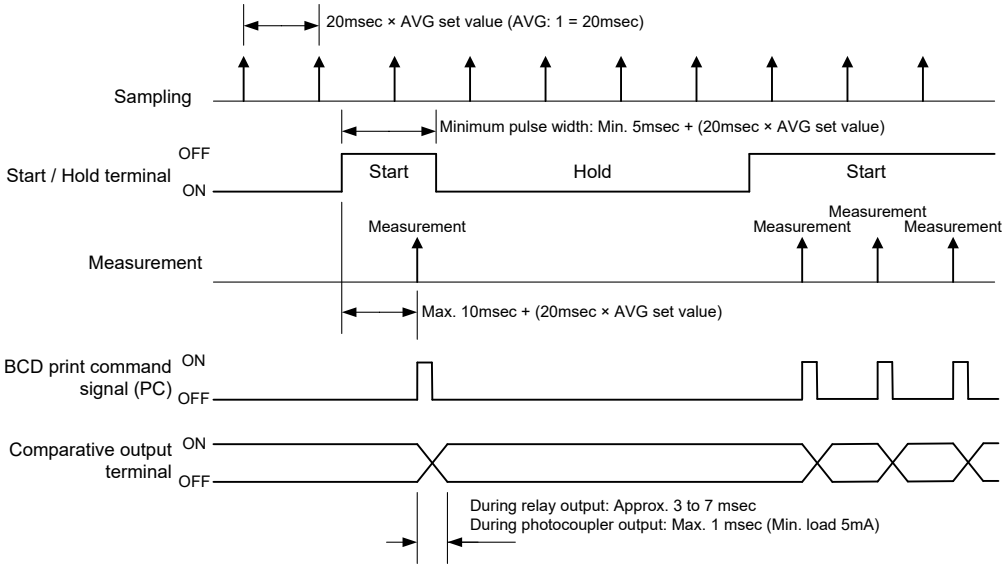
Error Message	Possible Cause	Solution
oUEr -oUEr	Value exceeding the input range	Please adjust the input value so it is within the display range.
	Value exceeding the display range	Please input a measurement value that is less than ±199999.
uACt	Start/Hold function is in HOLD mode.	Please set the Start/Hold function to start mode. Please set the start delay function to 0.
	Peak hold is Type B and the peak hold value has not been updated.	Please update the peak hold value. Please switch the peak hold type to A.
	Both Start/Hold type and peak hold type are Type B.	Please switch either the Start/Hold type or peak hold type to A.
roMErr	The set value has not been properly written due to the power being cut while the setting value was being written or similar reason.	In order to restore to previous status, it is necessary to initialize the set values. This can be achieved by re-starting the system. During initialization, InIroN will appear on the display, and when initialization is complete, the screen will revert to the normal display. As the set values will be initialized, please change the set values again. * If the roMErr message appears even after executing initialization several times, the cause could be that the possible numbers of saves to the E^2PROM has been exceeded and settings may no longer be able to be saved. In this case, please consult your dealer or Watanabe Electric Industry directly.
UErr	The input unit has not been properly inserted in the main unit.	Please firmly connect the input unit connector (male) to the main unit connector (female).

9-2 Trouble Shooting

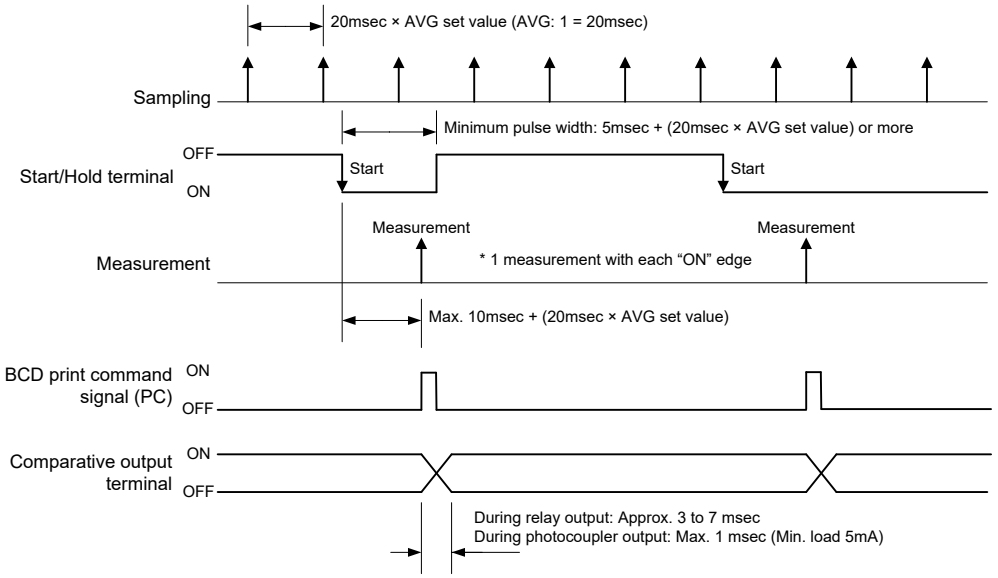
Problem	Possible Cause	Solution
The monitor display is blank.	The display blank function is set to extinguish display.	Turn OFF the extinguish display function.
The set values cannot be changed.	The set value changes protect function is ON.	Turn OFF the set value change protect function.
The set values can be changed but the changed values cannot be saved.	The changed set values exceed the set range.	Please change the set values so they fall within the set range and save them.
The set values are not displayed.	The settings protect function is ON.	Turn OFF the settings protect function.
Voltage is not output to the sensor power terminal.	Current exceeding the allowable current output is flowing to the sensor power terminal and the output protection circuits have been activated.	Please change the sensor power terminal load so it is less than the allowable current output and re-start the device.
The external control terminal does not operate.	The control method during the digital zero, and pattern selection functions is set to "INT".	Please change the control method to "EXT".
Linearize does not operate correctly.	The linearization set value does not fulfill the setting conditions.	Please set the linearization set value so that it fulfills the condition NXX > N(XX – 1) XX: 01 to 16

10 Timing Chart

10-1 Start/Hold A Type



10-2 Start/Hold B Type



11 Warranty and After-sales Service

11-1 Warranty

The warranty period for this product is one year from the date of delivery. If any malfunctions occur during this period that is clearly judged to be caused by a defect attributable to Watanabe Electric Industry Co, Ltd, Watanabe Electric Industry Co., Ltd will make repairs free of charge.

11-2 After-sales Service

This product was manufactured, tested, inspected and shipped under strict quality control measures. Should the product break down, please return the product to the dealer or directly to Watanabe Electric Industry Co., Ltd. It would be appreciated if you would give a detailed account of the defect and enclose it with the product.

watanabe
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