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Instruction Manual
WGA-800CSERIES
Instrumentation Amplifiers

*Thank you for your purchase of this KYOWA
WGA-800C Series Signal Conditioner. Read this
instruction manual carefully, in order to make
full use of the high performance capabilities of
the instrument.*

*Do not operate the instrument in a manner other
than instructed in this manual.*

Outline

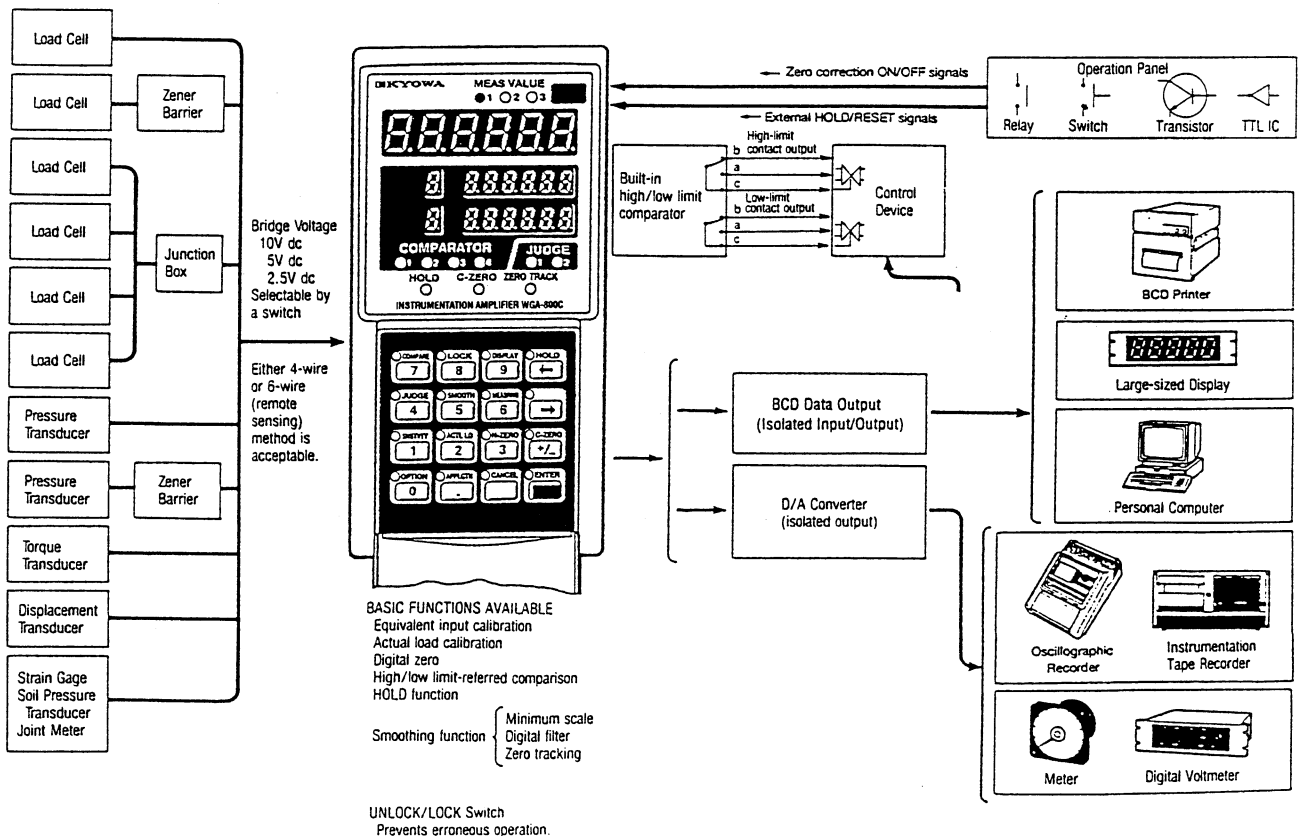
The WGA-800C series (hereafter referred to as WGA-800C) is a series of new, high speed, high performance and versatile signal conditioners designed for use with strain gage transducers to measure and indicate physical variables including load, pressure, displacement, etc.

Backed by the following modern features, the WGA-800C efficiently serves in the core of various control systems and as an amplifier of all kinds of strain gage transducers.

Features

- A broad measuring range up to $\pm 8\text{mV/V}$.
- Lock function that prevents erroneous operation.
- Selectable bridge excitation voltages (BV) to meet transducers in use.
- Bridge excitation (BV) circuit incorporating a remote sensing circuit enables accurate measurement on extended sensor cables, as well.
- 4-division comparator functions, each of which can be set to upper and lower limits. Comparison results denote measurement qualities.
- Various hold function modes enable accurate measurement and evaluation of high-speed phenomenon.
- Parameters having been set to various functions can be monitored. Also direct reading of transducer outputs is possible.
- Non-volatile memory stores and protects against power failure all these values – zero correction and calibration adjusting values as well as various functions' parameters so that measurement can readily start anew upon recovery of power.
- High-speed internal A-D converter (2000times/second) enables equally high-speed data processing.
- Operable on a wide range of power voltages, from 85 to 264Vac.

System configuration



Safety Precautions (should be read before using the instrument.)

Before using the instrument, please read the instruction manual thoroughly. Be sure to operate the instrument in the right manner, taking

great care to preserve safety. The safety precautions described in this manual are classified into two groups, [Warnings] and [Cautions].



Warnings

Improper handling may cause a dangerous situation, in which death or serious injury may be caused to the operator.



Cautions

Improper handling may cause a dangerous situation, in which injury to the operator and/or damage to property may be caused.

Even those items classified as Cautions may lead to more serious results than stated according to circumstances. Both the Warnings and Cautions contain

important instructions: they should be observed with great care.



Warnings

- (1) If failure of this instrument may possibly cause a secondary harm to your system, be sure to take a proper technological measure to avoid this harm. If not, trouble may occur resulting from erroneous output or operation of the instrument.
- (2) Be sure to switch the power off before installing or wiring the instrument.
If not, the operator may receive an electric shock and/or the instrument may be damaged.
- (3) Be sure to put the cover on the terminal board after installation or wiring, or an electric shock may be caused.
- (4) Do not use the instrument in environments where inflammable gas or vapor exists, or ignition may occur to cause danger.
- (5) Immediately pull out the power plug if the instrument has failed or if the instrument gives out smoke or strange smell or sound.
If used continuously, the instrument may cause a fire or an electric shock. Contact KYOWA representative for repair.
- (6) Immediately pull out the power plug if water or foreign matter has entered the instrument.
If used continuously, the instrument may cause a fire or an electric shock. Contact KYOWA representative for repair.
- (7) Do not place a container in which liquid is kept on the instrument. If the liquid gets spilt or enters the instrument, a fire or an electric shock may be caused.
- (8) Prevent foreign matters from entering the instrument, or a fire or an electric shock may be caused.
- (9) Do not remodel the instrument, or a fire or an electric shock may be caused.
- (10) Avoid damage to the power cable, or a fire or an electric shock may be caused.
Avoid scratching, remodeling, placing a heavy matter on, heating, forcibly bending or pulling the power cable.
- (11) Whenever damage to the power cable is found, it should no longer be used. Or else, a fire or an electric shock may be caused.
- (12) Do not operate the instrument on power voltages other than the one specified. Or else, a fire or an electric shock may be caused.
- (13) Do not use the instrument in environments where it is exposed to high humidity, dust or carbon black. Or else, a fire or an electric shock may be caused.
- (14) To pull out the power cable from the receptacle, be sure to hold the very plug body.
- (15) Do not pull the power cable or cut it with scissors or pinchers. Damage to the cable may cause a fire or an electric shock.
- (16) If the power receptacle is found loose, do not use it, or a fire or an electric shock may be caused.
- (17) Keep the plug out from the receptacle unless the instrument is operated. If not, a fire or an electric shock may be caused.
- (18) Have KYOWA representative to clean inside the instrument once a year. If the instrument is dusty inside without being cleaned for a long time, a fire or malfunction may be caused. It is very effective to clean it just before the high-humidity rainy season. Contact KYOWA representative to find cost of cleaning.
- (19) Use the specified fuse for replacement.
If a fuse larger in capacity or electric wire is used, a fire may be caused.

- | | |
|--|---|
| <p>(20) Do not disassemble the instrument, or a failure or malfunction may be caused.
If the instrument has failed, contact KYOWA representative for repair.</p> <p>(21) If it has started to thunder, avoid touching the instrument and cables.
If not, an electric shock may be caused.</p> <p>(22) Avoid pulling out and pushing in the power plug with the wet hand, or an electric shock may be caused.</p> | <p>(23) Before moving the instrument, pull out the power plug.
If not, contact with a high voltage may occur to cause an electric shock.</p> <p>(24) Before connecting the cable, be sure to pull the power plug out. If not, contact with a high voltage may occur to cause an electric shock.</p> <p>(25) Be sure to ground the protective grounding terminals.
If not, an electric shock or a malfunction of the instrument may be caused.</p> |
|--|---|

Cautions

- | | |
|---|--|
| <p>(1) Before wiring, make sure that the instrument's rated power voltage is satisfied and that the terminal arrangement is correct, and after that, perform wiring in the correct manner.</p> <p>(2) Before moving the instrument, be sure to shut off the power supply, and disconnect the power cable.</p> | <p>(3) Do not remodel the instrument, or else a failure or malfunction of the instrument or injury to the operator or a fire may be caused.</p> <p>(4) Operate the instrument conforming to the operating conditions described in this manual.
If not, a malfunction or failure of the instrument may be caused.</p> |
|---|--|

Standard accessories

The WGA-800C comes with the following standard accessories. When unpacking, check to be sure that all the listed accessories are included.

Power cable (either one of the following two)	
• AC specifications	AC power cable (approx. 2m) for 100Vac 1
• DC specifications	Power cable is not attached.
Spare fuse (either one of the following two)	
• AC specifications	0.5A time-lag fuse 1
• DC specifications	3A time-lag fuse 1
Unit label 1	
BCD output connector (57-30360, a product of Daiichi Denshi Kogyo or equivalent)	
• On models having 1 unit of BCD output (-10AC/AD, -12AC/DC, -13AC/DC).....	1
• On models having 2 units of BCD output (-11AC/DC)	2
Warranty..... 1	
Instruction manual 1	

Models

18 models in all are provided.

After unpacking, check to be sure that you have the right model.

Model	Power requirement		Function card							
			Installed to Slot No.1				Installed to Slot No.2			
	85 to 264Vdc	11 to 30Vdc	N/A	BCD	D-A	EIA-232-D	N/A	BCD	D-A	EIA-232-D
WGA-800C-00AC	✓		✓				✓			
WGA-800C-10AC	✓			✓			✓			
WGA-800C-20AC	✓				✓		✓			
WGA-800C-30AC	✓					✓	✓			
WGA-800C-11AC	✓			✓				✓		
WGA-800C-12AC	✓			✓					✓	
WGA-800C-13AC	✓			✓						✓
WGA-800C-22AC	✓				✓				✓	
WGA-800C-23AC	✓				✓					✓
WGA-800C-00DC		✓	✓				✓			
WGA-800C-10DC		✓		✓			✓			
WGA-800C-20DC		✓			✓		✓			
WGA-800C-30DC		✓				✓	✓			
WGA-800C-11DC		✓		✓				✓		
WGA-800C-12DC		✓		✓					✓	
WGA-800C-13DC		✓		✓						✓
WGA-800C-22DC		✓			✓				✓	
WGA-800C-23DC		✓			✓					✓

Accessory cables (option)

These cables are optionally available. If your strain gage transducer has a connector on it, use one of the cables listed below to connect the transducer directly to the WGA-800C.

The cables are available in two types – 4-conductor and 6-conductor.

Length	0.5m	1m	2m	5m
4-conductor	U-33	U-34	U-35	U-36
6-conductor	U-29	U-30	U-31	U-32

Handling precautions

Read this instruction manual thoroughly before you start to operate the WGA-800C.

- **Grounding**

In order to prevent an electric shock and electro-magnetic noise, be sure to ground the [GND] terminal provided on the rear panel.

THE [GND] terminal is connected to the shield wire of the transducer cable and also to the mainframe.

- **The WGA-800C's current consumption is 20VA at its maximum.**

If it is to be operated under a poor power condition, we advise you to use an insulated constant voltage transducer, etc.

- **Avoid extremely high or low temperature environments.**

The WGA-800C will perform to the specifications when used within a temperature range of -10 to +50°C.

Prepare a sunscreen or shield the unit from the direct rays of the sun. When using it in extremely cold, take proper measures to maintain the unit's temperature within the specified range.

- **Avoid use in high humidity environments.**

Operate the WGA-800C in a humidity range below 85%R.H. Exposure to rain, or use in very humid conditions may cause deterioration of internal insulation, or cause other problems within the instrument.

- **Do not use in a dusty environment**

Dust entering the instrument will lower the unit's performance. Take care to avoid dust during operation and storage.

- **Avoid strong vibrations**

If the WGA-800C is subjected to strong vibrations or continued vibrations, faulty measurement or a failure of the instrument may occur. During transit, take care not to drop it or give a strong impact, or else a failure of the instrument may be caused.

- **Avoid use in dangerous environments**

Do not use the WGA-800C in environments exposed to inflammable gas or inflammable steam. Or, it may take fire to cause danger. Whenever it is to be used in an environment liable to cause danger, contact KYOWA in advance for necessary advice.

- **To prevent short-circuiting and electric shock, make sure that:**

- (1) The cable fixing screws on the terminal board are tight.
- (2) The terminal cover is attached to the terminal board.

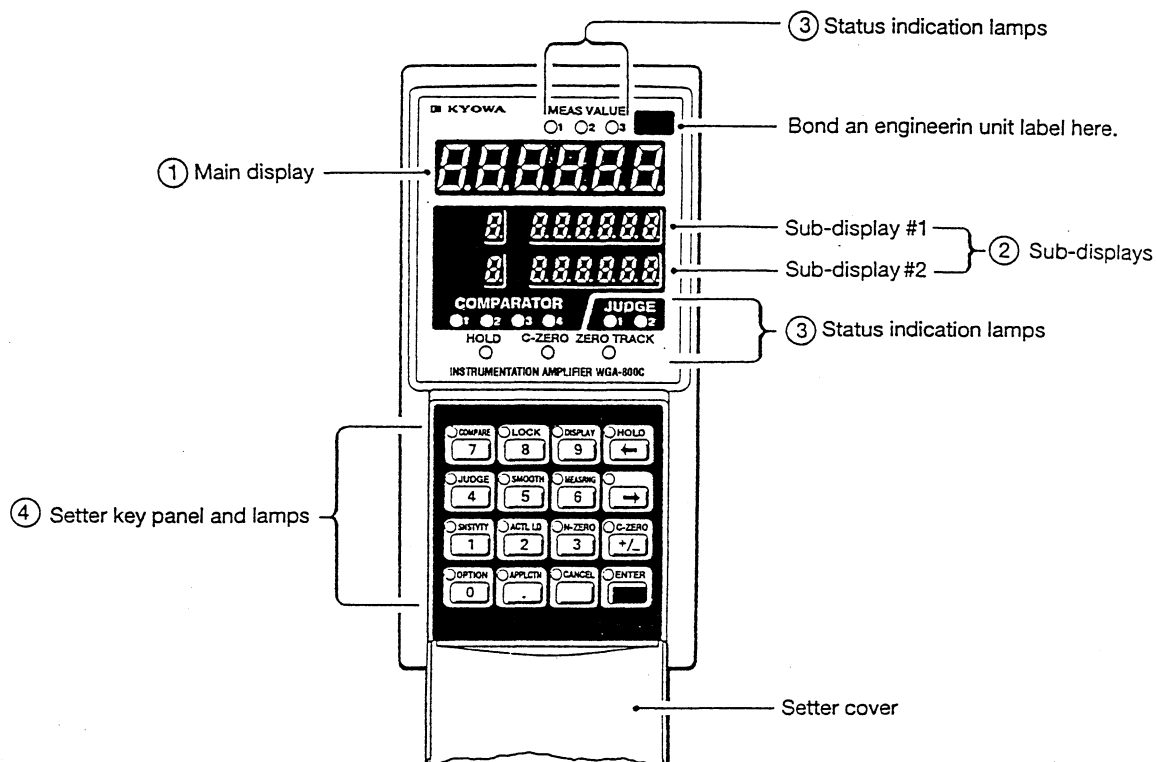
- **The WGA-800C adopts such a construction that its input terminals accept strain gage transducers in principle.**

NOTES

- A strain gage transducer is referred to as a transducer on occasion in this manual.
- The rated output of a strain gage transducer is expressed in the unit of [mV/V] or [μ V/V].
These units express output voltages in [mV] or [μ V] against 1V bridge excitation.
From this, 2mV/V means that if a bridge is excited by 10V, an output voltage will be 20mV (=2mV/V x 10V). (2000 μ V/V x 10V = 20000 μ V = 20V).
- Expressions using SI units are used on occasion in this manual.

1. Controls and functions

1-1 Front panel



① Main display

- Displays measured values and various parameters.
- Presents error messages and warning message if abnormality should occur.

② Sub-displays (#1 and #2)

- Displays the number of a comparator number and a parameter having been set to that comparator.
- Displays a parameter which is being set.

③ Status indication lamps

- Measured value #1 Indicates that the value appearing on the main display is Measured Value #1.
- Measured value #2 Indicates that the value appearing on the main display is Measured Value #2.
- Measured value #3 Indicates that the value appearing on the main display is Measured Value #3.
- Comparator #1 Lights up when Comparator #1's Comparison Result is on [ON] position.
Flickers when Comparator #1 is being monitored or set.
- Comparator #2 Lights up when Comparator #2's Comparison Result is on [ON] position.
Flickers when Comparator #3 is being monitored or set.
- Comparator #3 Lights up when Comparator #3's Comparison Result is on [ON] position.
Flickers when Comparator #3 is being monitored or set.
- Comparator #4 Lights up when Comparator #4's Comparison Result is on [ON] position.
Flickers when Comparator #4 is being monitored or set.

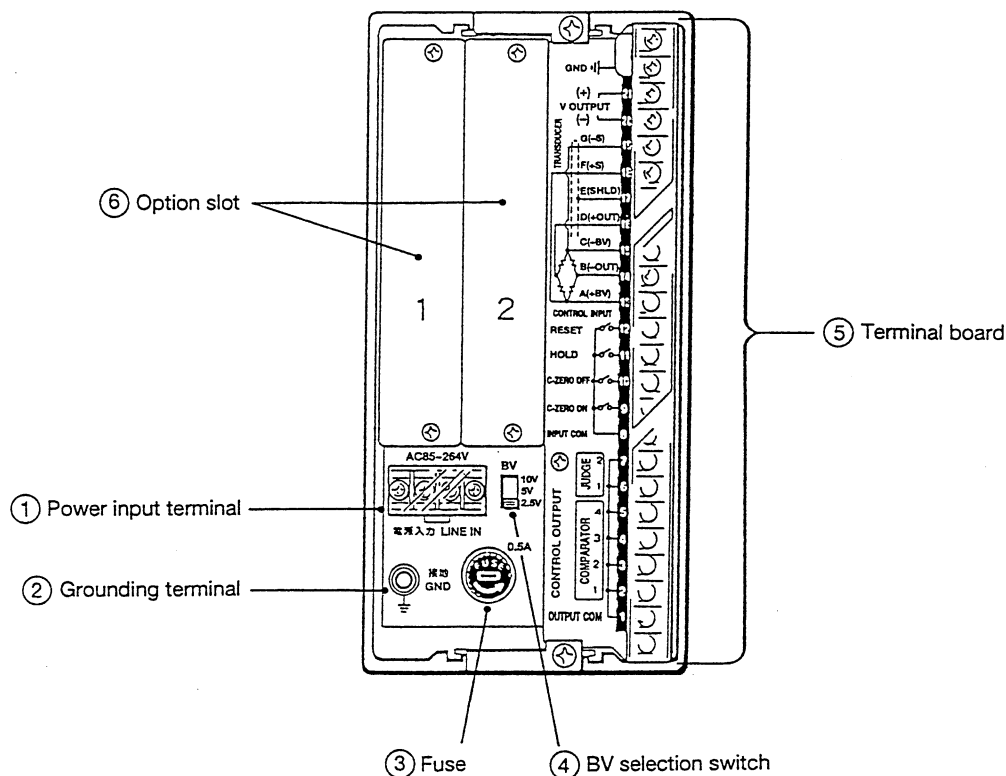
- Judging Device #1 Lights up when Judging Device #1's Judgement is in [ON] position.
Flickers when Judging Device #1 is being monitored or set.
- Judging Device #2 Lights up when Judging Device #2's Judgement is in [ON] position.
Flickers when Judging Device #2 is being monitored or set.
- Hold Indicates progressing of a measuring period or a hold period.
Lights up during a measuring period, and flickers during a hold period.
- Zero correction Lights up during execution of zero correction.
- Zero tracking Lights up during zero tracking.

④ Setter key panel and lamps

- Use these key switches to set various functions.
The key switches have two different roles – one is to set a function, and the other is to enter a number.

OPTION 	...Sets an option to be inserted in Slot #1 or 2.....	Numeral 0
SNSTVITY 	...Calibration by registering sensitivity	Numeral 1
ACTL LD 	...Calibration by loading an actual load	Numeral 2
N-ZERO 	...Initial unbalance.....	Numeral 3
JUDGE 	...Sets Judging Devices.....	Numeral 4
SMOOTH 	...Sets Analog Filter, a minimum scale division unit, zero tacking, or moving average	Numeral 5
MEASRNG 	...Selects and sets a measuring function	Numeral 6
COMPARE 	...Sets Comparators' comparison values, etc.	Numeral 7
LOCK 	...Sets calibration lock or user-defined lock.....	Numeral 8
DISPLAY 	...Switches over Main Display or other.....	Numeral 9
HOLD 	...Switches over a measuring period or a holding period	Moves to left from the flickering point
		Moves to right from the flickering point
C-ZERO 	...Sets and executes zero correction.....	Minus sign
APPLCTN 	...Sets various functions' application	Decimal point
CANCEL 	...Cancels attempted setting	
ENTER 	...Enters (registers) setting or a keyed in value	

1-2 Rear panel



- ① **Power input terminal** It is a power input terminal. Connect it to an AC output of 85 ~264Vac.
- ② **Grounding terminal** It is a grounding terminal. Be sure to ground this terminal for protection against lightning and static electricity.
- ③ **Fuse** It is a 0.5A fuse.
- ④ **BV selection switch** Use it to switch over a bridge voltage to another. Select a suitable one from 10V, 5V and 2.5V. For how to select, see [2-4 BV switch]. After selection of a bridge excitation voltage, proceed to [4-1 Calibration].
As shipped from the factory, a bridge excitation voltage is set at 2.5V.

⑤ Terminal board

No.	Name	Function
22	Grounding	
21	Voltage output (+)	Voltage output for monitoring
20	Voltage output (-)	Voltage output signal common
19	Transducer	G (-S)
18		F (+S)
17		E (Shield)
16		D (+Output)
15		C (-BV)
14		B (-Output)
13		A (+BV)
12	Control input	RESET command
11		HOLD command
10		Zero correction OFF
9		Zero correction ON
8		Input common
7	Control output	Judgement #2
6		Judgement #1
5		Comparison #4
4		Comparison #3
3		Comparison #2
2		Comparison #1
1		Output common

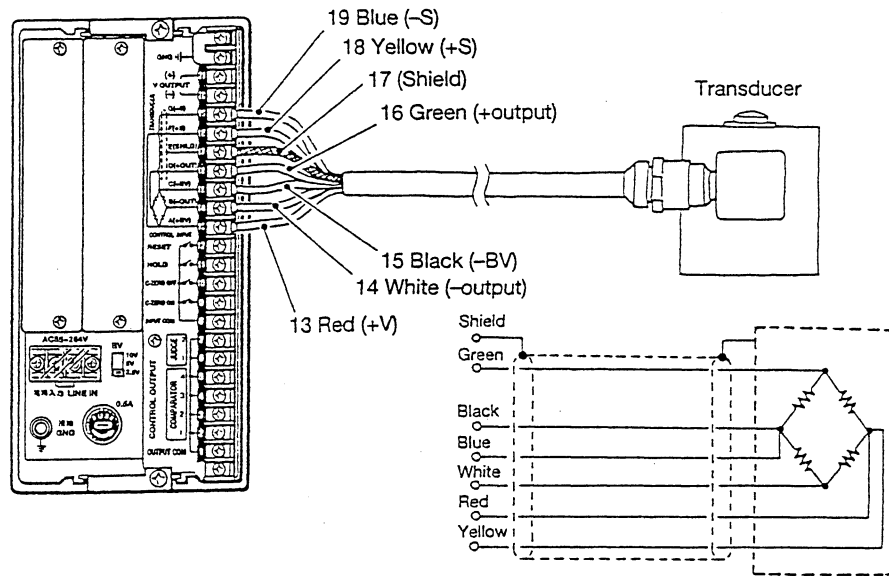
- ⑥ Option slots These slots accept two option units selected from among three – BCD output, D-A converter and EIA-232-D. Note however that only one unit of EIA-232-D is installable together with another unit of different kind.

(2) Connection of a 6-wire system transducer

Shown below is how to connect a 6-wire system transducer.

Provided that transducer wires are not connected to Terminal #18 and #19, a transducer acts as the 4-wire system.

Connection of a 6-wire system transducer activates the remote sensing circuit in the bridge excitation circuit. Remote sensing is a function whereby a voltage decrease due to cable resistance is corrected. This function enables high accuracy of measurement on an extended cable, as well.

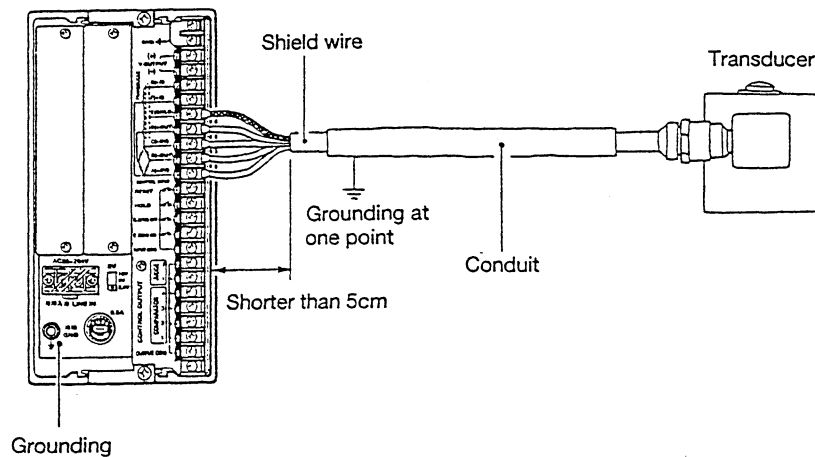


(The representative cable classification by coloring for KYOWA transducers)

CAUTIONS

- When you expect much external noise at a measuring site, take care of the following when connecting a transducer.

- Use an input cable as much short as possible, and also use a shielded one. In addition, ground the [GND] terminal at the same electric potential as a measuring object to which a transducer is installed.
- If the input cable crosses or parallels a power line, cover the power line with a conduit if possible. If it is impossible, cover the input cable instead with a conduit, and further ground the conduit at one point.



2-3 Parallel connection of transducers

Parallel connection of up to four transducers is possible if they are strain gage transducers, each having 350Ω bridge resistance. These transducers should however be of the same type and provide the same capacity.

Once transducers are thus connected in parallel, the whole can act as one unit of transducer.

For instance, parallel connection of four 10-ton (98.07kN) capacity load cells enables measurement of a load of up to 40 tons (392.28kN).

[Example] Using four 10-ton capacity load cells connected in parallel

Load cell	Capacity	Rated output
1st load cell	10-ton	1.9mV/V
2nd load cell	10-ton	2.0mV/V
3rd load cell	10-ton	2.1mV/V
4th load cell	10-ton	2.2mV/V

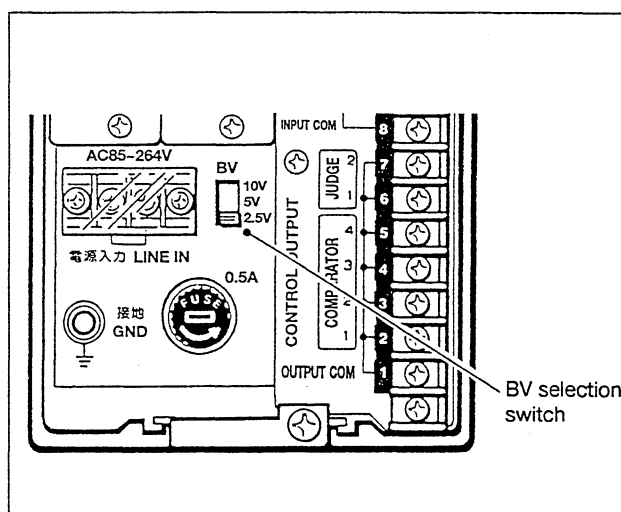
Total capacity: 10 tons x 4 = 40 tons

Total rated output: $(1.9+2.0+2.1+2.2)/4=2.05\text{mV/V}$

From this, the load cells can act a transducer whose capacity is 40 tons and rated output is 2.05mV/V.

2-4 Switching over BV switch

To switch BV (bridge voltage) over to a suitable one, refer to the resistance value of a transducer in use and set the BV bridge selection switch accordingly.



Input/output resistance range VS. measuring range

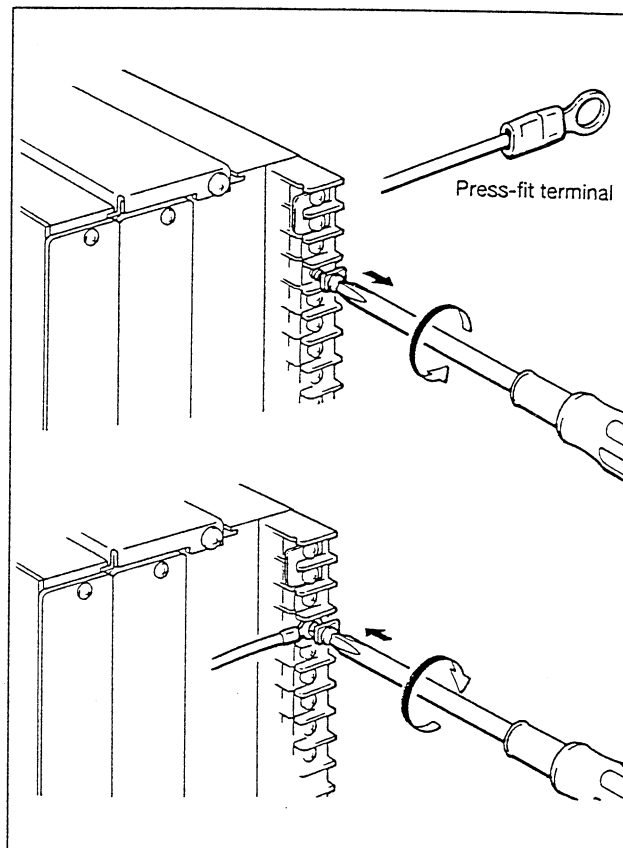
BV	Transducer's connection resistance range	Number of transducers connectable in parallel	Transducer's measuring range
10V	80~10kΩ	350Ω x up to 4 units	±2mV/V (4000x10 ⁻⁶ strain)
5V	60~10kΩ	350Ω x up to 5 units	±4mV/V (8000x10 ⁻⁶ strain)
2.5V	40~10kΩ	350Ω x up to 8 units 120Ω x up to 3 units	±8mV/V (16000x10 ⁻⁶ strain)

The relation between mV/V, μV and 10⁻⁶ strain in the expression of a transducer's rated output:

[Example] 2mV/V = 2000μV/V = 4000x10⁻⁶ strain

2-5 How to use the terminal board

- (1) We recommend that you attach a press-fit terminal to a cable that you will use.
The suitable size of a press-fit terminal is:
1.25~3A or 1.25~3B or their equivalents.
Use a press-fit terminal as follows.
- (2) Remove the cover from the terminal board then remove the screw from a targeted terminal.
- (3) Let the screw go through a press-fit terminal, then tighten the screw onto a terminal.
- (4) Never fail to put the terminal cover back to its place.



2-6 Installation onto a panel

Make a hole, whose size is shown at right, into a panel, then follow procedures, (2) to (5). To install, use the attached fixtures.

- (1) Make a hole in a panel.
The size of a hole: 186mm in height x 92mm in width.

Panel cut size

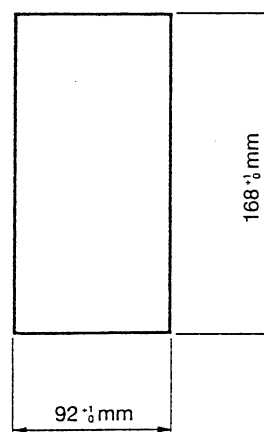
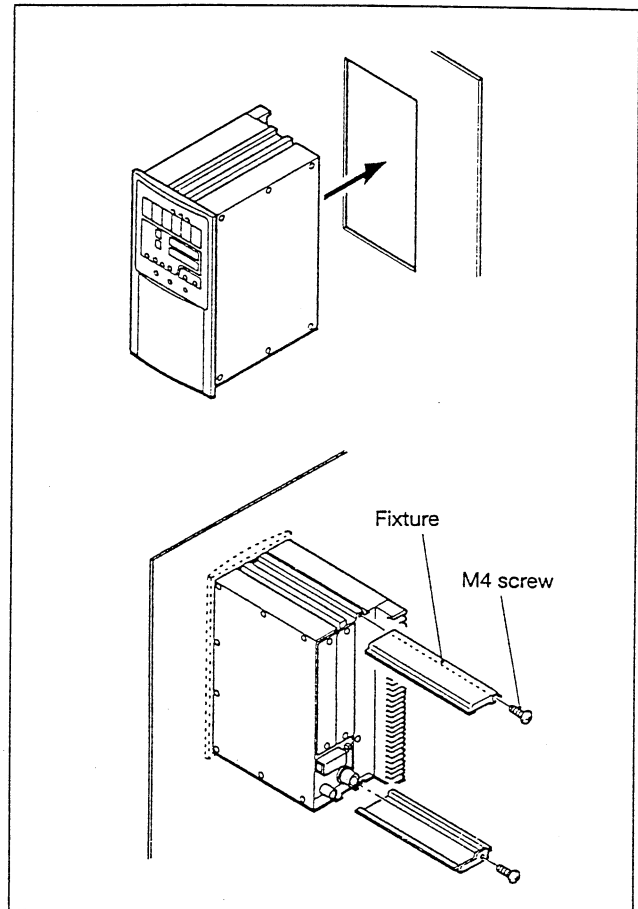


Plate thickness: 2~5mm

- (2) Loosen M4 screws that fasten two fixtures, one each on the top and bottom of the mainframe, then remove the fixtures.
- (3) Insert the mainframe into the hole in a panel.
- (4) Insert the top fixture, then the bottom fixture from the back.
- (5) Tighten the screws to fix the mainframe securely.

CAUTION

During transit of the WGA-800C after panel-installation, take care to avoid a strong shock or vibration. Do not put a thing on it or give a force.



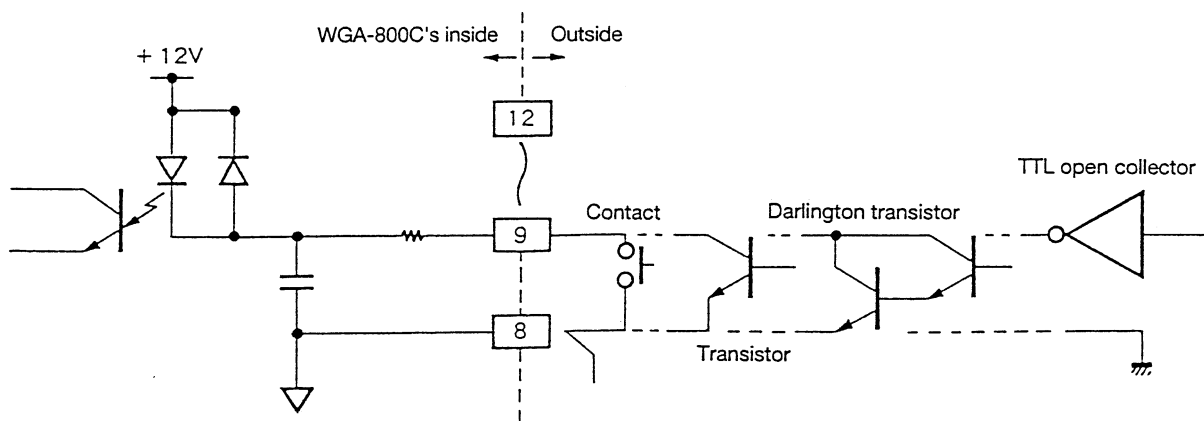
2-7 Connection of control input

Terminals for control input are provided by #8, 9, 10, 11 and #12 terminals of the terminal board provided on the rear.

Either contact (relay, switch) or non-contact (TTL open-collector, transistor) input will do.

- #8: Common terminal
- #9: Zero correction ON command
- #10: Zero correction OFF command
- #11: HOLD and measuring period command
- #12: HOLD reset command

Control input



CAUTION

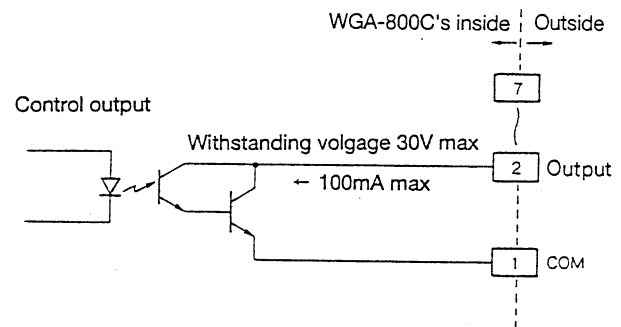
- The element of control input requires 10mA or more current.
- Leakage current on the element of control input must be below 50 μ A when it is put [OFF].
- A voltage on the element of control input must be below 2V when it is put [ON] (short-circuited).

2-8 Connection of control output

Terminals for control output (open collector) are provided by #1, 2, 3, 5, 6 and 7 terminals of the terminal board provided on the rear.

- #1: Common terminal
#2, 3, 4, 5: Comparator's output
#6, 7: Judging Device's output

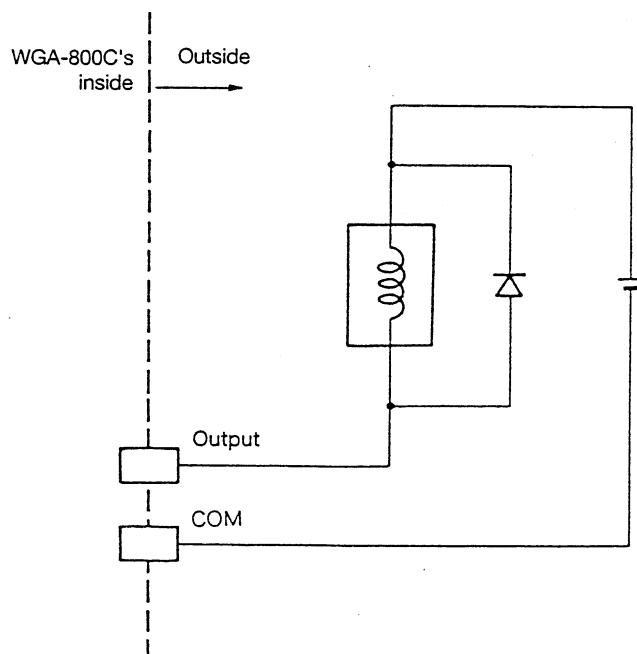
Control output



The input circuit and the internal circuit are electrically isolated from each other by the photo-coupler.

CAUTION

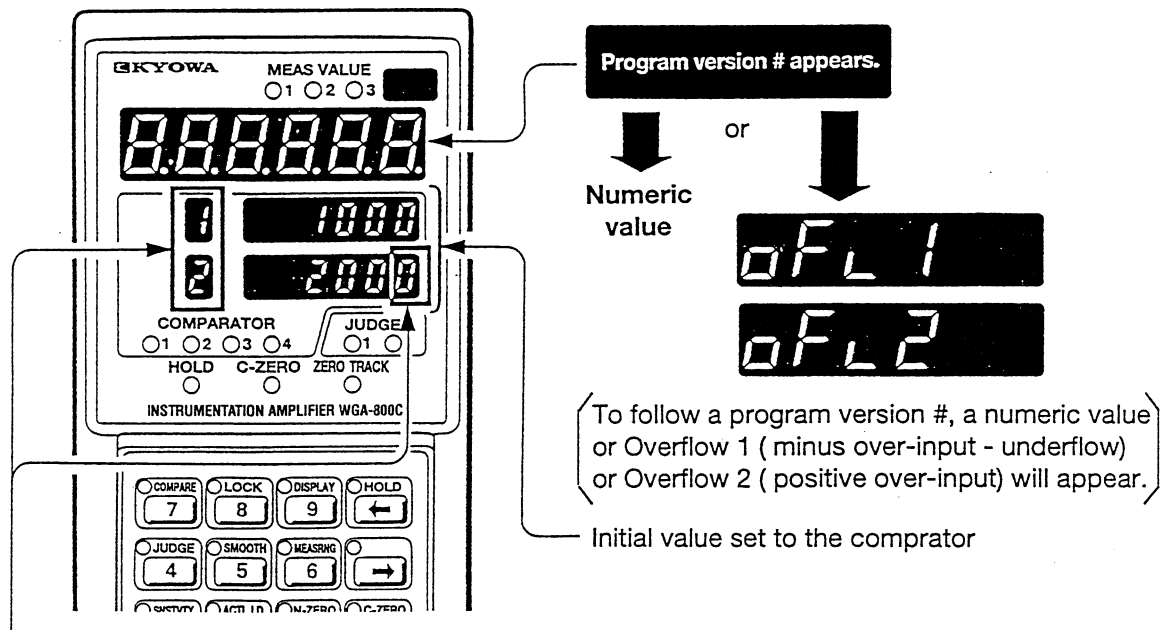
- To connect a relay to control output, add an diode in parallel to the coil of a relay.
 - Absence of a diode can cause damage.
 - Insert a surge killer in the contact of a relay.
- For detailed information about a surge killer, ask the manufacturer of a relay in use.



3. Before operation or setting

3-1 Connection to AC outlet

- (1) Make sure that the accessory AC power cable is connected to the power input terminal.
- (2) Connect transducer/s you will use.
- (3) Make sure that the BV (bridge excitation voltage) selection switch is in the proper position.
- (4) Insert the AC plug in a proper AC outlet. The WGA-800C will be then powered and present the following display.



- The meanings of letters that will appear.

i ~ y	Comparator #
o	Lower case oMeans rated output
i	Lower case iMeans indicated value
h	Lower case hMeans hysteresis
L	Upper case LMeans trigger level
d	Lower case dMeans delay
p	Lower case pMeans period (period of time)
100.5	Lower case sMeans second

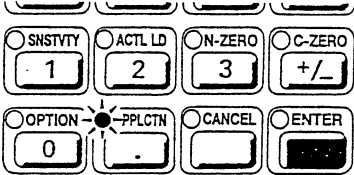
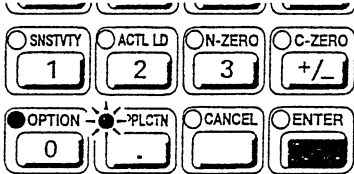
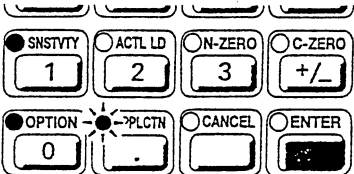
NOTES

The WGA-800C and its accessory cable do not have a power ON/OFF switch.

3-2 Execution of a simplified self-test

We recommend that you perform a simplified self-test on the WGA-800C and connected transducer/s to be sure of their normal operating conditions and correct connections. For details of a self-test, see [4-9-2 Self-test].

• **Key operation** Lamp indication: ● lights up; ○ goes out; ⚡ flickers; ⚡ momentarily illuminates

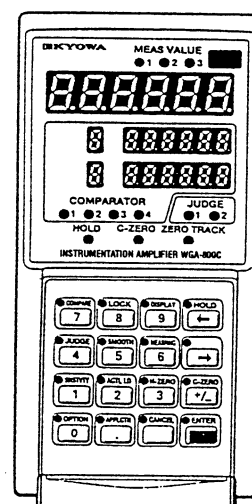
Key to be operated	Lamp indication on Setter
① APPLCTN 	
② OPTION 	
③ SNSTVY 	
④ ENTER 	• Start of check sequence 1. Check sequence 1 (all lamps go on.)

When operating keys, take care —

Take care to proceed to next key operation within 12 seconds after you pushed a key.
If not, attempted key operation will automatically turn invalid.

This rule governs all key operations.

If this should happen, start key operation anew from the beginning.



A simplified self-test now starts

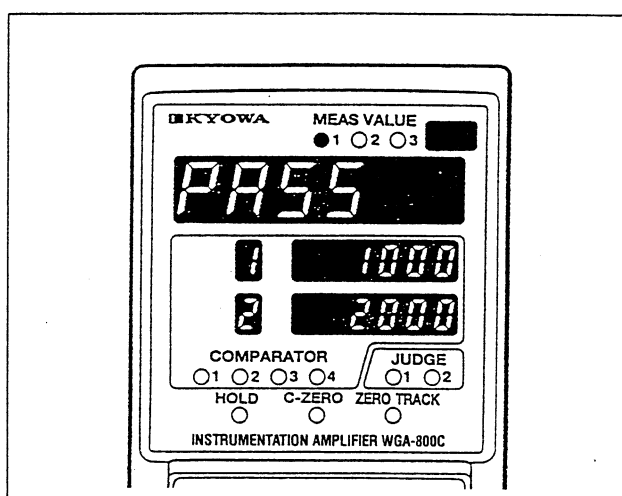
- **What are checked**

- The internal circuit and program are automatically checked, and the results are presented on the display for your review.

Check sequence	Display	Main check object
1	All lamps light up.	Start of a check
2	<i>c 1</i>	Status indicating lamps
3	Numerals	Display
4	<i>c 2</i>	ROM
5	<i>c 3</i>	RAM
6	<i>c 4</i>	Display circuit
7	<i>PASS</i>	End

- "PASS" appears for about 12 seconds, and after that, the display goes back to the state that precedes the self-test.

A push of  key immediately restores the state that precedes the self-test.



- If malfunction should be found through a self-test, a corresponding error message will appear (see the table at right).
- If any one of the error messages should appear, contact your KYOWA representative.

Error message	Error state
<i>Err-00</i>	ROM malfunction
<i>Err-01</i>	RAM malfunction
<i>Err-02</i>	Display circuit malfunction
<i>Err-03</i>	Non-volatile memory writing malfunction

CAUTION

If Error message of " *oFL 1* " or " *oFL 2* " appears, take Non-load Zero. For how to take, see [4-1-1 Non-load Zero].

If Non-load Zero effected cannot remove either error

message, check and correct possible malconnection of a transducer and/or its cable. Then, take Non-load Zero again. If all this fails to remove an error message, see [6. Troubleshooting].

4. Functions

4-1 Calibration

A transducer's output is correlated with a measured value through calibration.

Two types of calibration is available. One is done by

registering sensitivity, and the other is done by loading an actual load.

Execute calibration by either method.

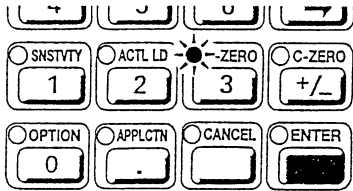
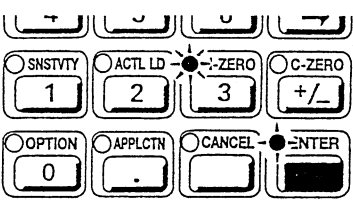
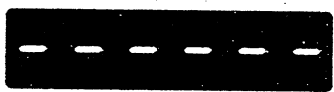
4-1-1 Non-load Zero

Using this function, you can establish a reference point of measured values. This is pretty much same as re-

setting a pointer to '0' before you puts an object on a scale. Execute this function before calibration.

- To execute this function, carry on the following key operations.

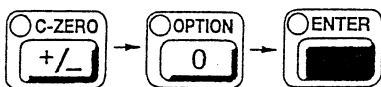
(2) **Key operation** Lamp indication: ● lights up; ○ goes out; ☼ flickers; -●- momentarily illuminates

Key operation	Lamp indication on Setter	Reading on Display
(1) Non-load Zero N-ZERO 		Regular reading
② ENTER  (The lamp illuminates momentarily upon a push of the key.)		 Dotted line appears momentarily. Nothing appears on Sub-display #1 and 2.  "0" appears after removal of initial unbalance.

CAUTION

- During illumination of ^{C-ZERO}○ lamp, the display may not read "0". In this case, let the lamp go off by cancelling zero correction as follows.

[Cancellation of zero correction]



- In execution of Non-load Zero, unstable input may happen to disable zeroing. In this case, Error Message of " $\square FL \square$ (Non-load Zero Error)" will appear on the main display. If it should happen, check and correct the wiring. Also note that a range of Non-load Zeroing varies according to a bridge voltage in use. ($\pm 2\text{mV/V}$ against BV 10V; $\pm 4\text{mV/V}$ against BV 5V; and $\pm 8\text{mV/V}$ against BV 2.5V)
- If over-input occurs, the main display will present Error Message " $\square FL 1$ (Underflowing input)" or " $\square FL 2$ (Overflowing input)".

4-1-2 Calibration by registering sensitivity

By registering a transducer's rated output, you can achieve calibration without loading an actual load. This we call calibration by registering sensitivity.

Suppose that you are using a transducer, whose

rated capacity is 500N and rated output is 2.0003mV/V. In order to read 500.0 against a load of 500N that you will give to the transducer, do as follows.

[Example: Calibration sheet of Compression load cell LUH]

500N is expressed as 500.0

2000.3μV/V=2.0003mV/V

検査成績表 CALIBRATION SHEET

型 式 名 Model	LUH-50KF	検査年月日 Inspected date	2000. 4. 6	製造番号 Serial No.	EM0660002
定 格 容 量 Rated Capacity	500N(50.986kgf)	温 度 Temp.	23 °C	湿 度 Humidity	50 %RH

1. 定格出力
Rated output

2000.3	μV/V
4000.7	× 10 ⁻⁶ ※

2. 非直線性

0.02 %R.O.

Lamp flickers then keeps illuminating,

SNSTVITY
1

ENTER

2

0

0

0

3

ENTER

Key in as follows to enter 2.0003mV/V. A decimal point is fixed, and so you need not to enter it.

Key in as follows to read 500.0.

0

5

0

0

.

0

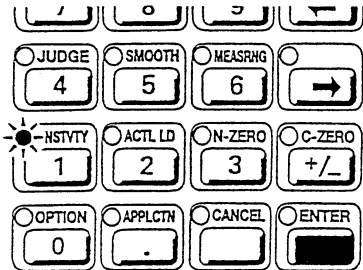
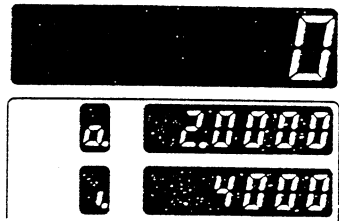
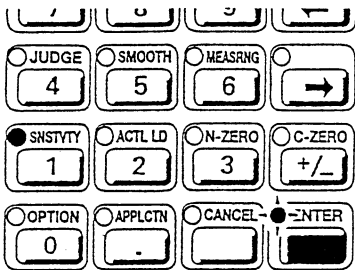
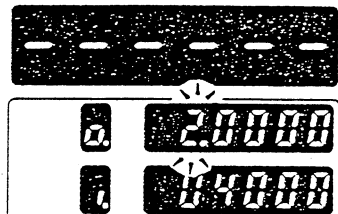
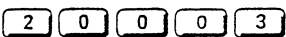
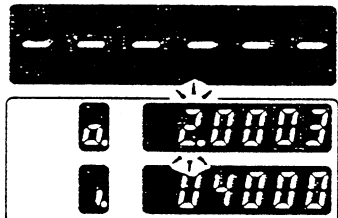
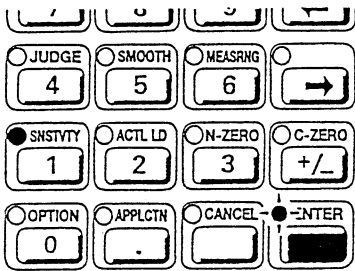
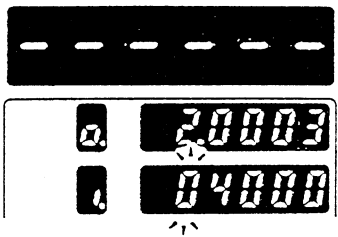
ENTER

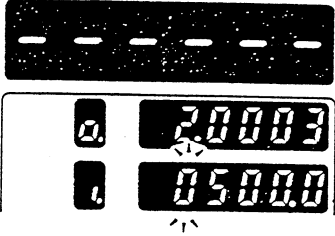
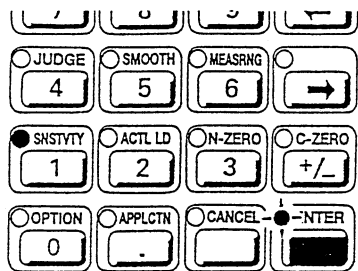
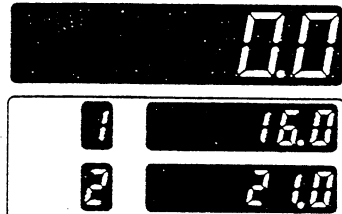
NOTE

The rated output of a transducer can be expressed in two ways – 2.0003mV/V and 2000.3μV/V for instance. The WGA-800C is so designed to accept the former expression of mV/V.

So you need to enter a five-digit number.
Another example: 2mV/V in place of 2000μV/V.

(1) Key operation Lamp indication: ● lights up; ○ goes out; ☼ flickers; -●- momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
① 		 As shipped, the above values read.
②  (The lamp illuminates momentarily upon a push of the key.)		
③ Input a rated output X . X X X X (Five digits with a fixed decimal point) X . X X X X mV/V	Type numeral keys. (Renewal is possible any number of times. After five digits are filled, the 6th numeral goes in the top of next five digits.) In this sample, 2.0003 is keyed in. 	
④  (The lamp illuminates momentarily upon a push of the key.)		

Key to be operated	Lamp indication on Setter	Reading on Display
⑤ Entering a desired reading Key in as follows to enter [-] sign.  × × × ×  × (In case of five digits plus a decimal point with a prefix of [-] sign.)	Type numeral keys. (Renewal is possible any number of times. After five digits are filled, the 6th numeral goes in the top of next five digits.) By a push of  key, [+] and [-] alternates with each other. [-] can be keyed in at any time during operation of numeral keys. In this sample, 0500.0 is keyed in.      	
⑥ End of setting  (The lamp illuminates momentarily upon a push of the key.)		 Regular display is recovered. If a decimal point is added and registered in Procedure (5), Main display as well as Sub-display #1 and #2 (comparison value) will also show that decimal point.

NOTES

- To add [-] (a minus sign) to a numeric value, use  key. Each time this key is pushed, [+] and [-] alternate with each other. [-] can be keyed in at any time during key operation. Note that [+] will not appear on the display even if it is keyed in.
- If a keyed-in rated output value is larger than a measuring range, Error Message " $\square FL 5$ (over-calibration-sensitivity)" appears on the main display. See [4-9-3 Table of Error/Warning Messages].
- At the time when Lock is effected on settings, Error Message $LOC-C$ or $LOC-U$ will appear on the main display for about 12 seconds, and after that, regular display will return. See [4-1-5 How to lock the settings].
- As shipped, a rated output value is set at 2.000 mV/V to read 4000 on the display.

4-1-3 Calibration by loading an actual load

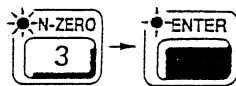
In this calibration an actual load is given to a transducer and a reading on the WGA-800C is correlated with that load.

- (1) Take non-load Zero on the WGA-800C which is free from any load so that you will read "0" on the display. Give an actual load to a transducer, and

under this condition, register a reading value. A reading value is saved in the nonvolatile memory each time.

[Example]: Operate keys as follows, in order to read 50.0 when a transducer, whose rated output is 100N, is given a 50N load.

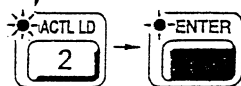
- (1) Execute Non-load Zero (the transducer must be free from any load).



You will then read "0 (zero)".

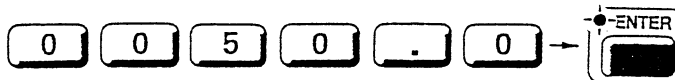
- (2) Now give an actual load of 50N to the transducer.

Lamp flickers then keeps illuminating.



In this situation, the "0", the top of a reading, will flicker for about 12 seconds.

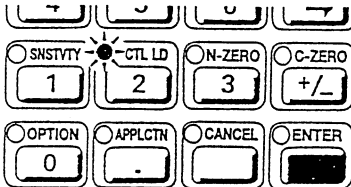
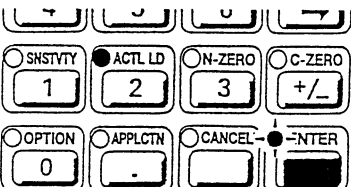
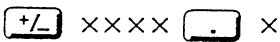
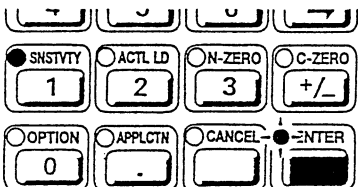
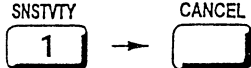
- (3) While the "0" is flickering, key in a numerical value so that you will read 50.0.



NOTES

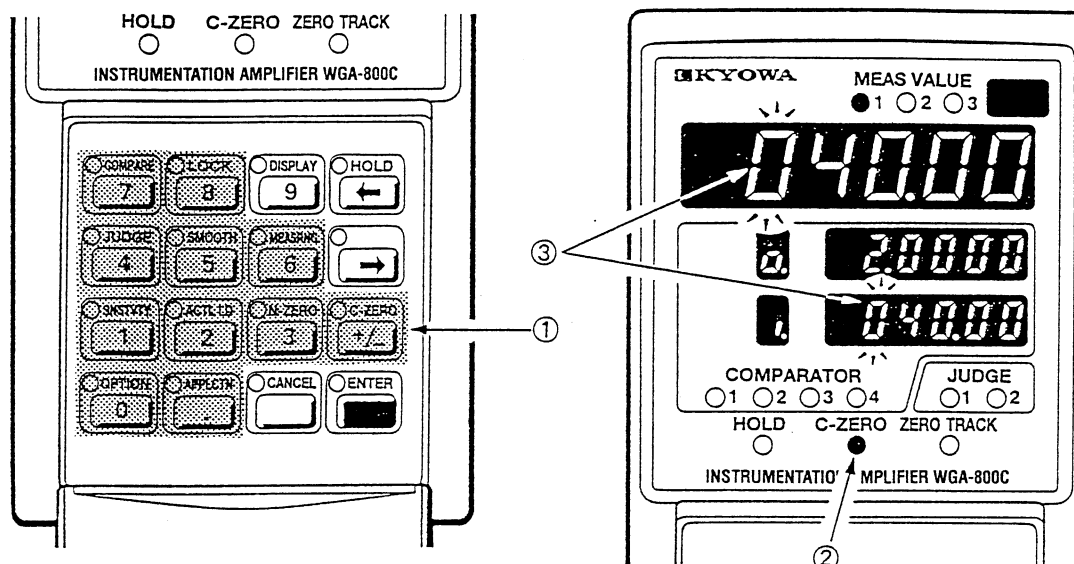
- In this method of calibration Non-load Zero may be found to have drifted when a given load is removed.
This can happen due to effect of mechanical "flexion" or abrasion on a measuring object. If it should happen, repeatedly give a load to the transducer a few times, thereby removing zero drift, and after that, execute calibration.
- If a keyed-in rated output is larger than a measuring range, Error Message "OFL 5" (over-calibration-sensitivity) appears on the main display. See [4-9-3 Table of Error/Warning Messages].

(2) Key operation Lamp indication: ● lights up; ○ goes out; ☼ flickers; -●- momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
① Execution of Non-load Zero	(For details, see [4-1-1 Non-load Zero], page 21.)	The main display reads "0".
② While a 50N load is being given, press this key. 		As shipped, the main display is so set as to read as follows. (Nothing appears on Sub-display #1 and #2.) 
③  (Lamp momentarily illuminates upon a push the button.)		
④ Enter a desired reading. Use the following keys to enter a [-] sign and a decimal point.  (In case of five digits plus a decimal point with a prefix of [-] sign)	Type numeral keys. (Renewal is possible any number of times. After five digits are filled, the 6th numeral goes in the top of next five digits.) By a push of  key, [+] and [-] alternate with each other. [-] can be keyed in any time during operation of numeral keys. In this sample, 0050.0 is keyed in. 	
⑤ End of setting  (Lamp illuminates momentarily upon a push of the key.)		Regular display is recovered. If a decimal point is added and registered in procedure (4), Main display as well as Sub-display #1 and #2 (comparison value) will also show that decimal point.
⑥ Confirmation Push Cancel key after you have confirmed calibration. 		Sub-display #1 will present a reading of output voltage (in mV/V) against an actual load of 50N. Sub-display #2 will present a desired reading you have entered in Procedure (4).

4-1-4 How to cancell setting halfway

Here's how to cancel setting halfway in case you have pushed wrong keys.



No.	Cancellation to be made	How to cancel
①	To cancel setting while a key lamp is flickering or illuminating.	If a key lamp is flickering or illuminating in the shadow area of the panel, just push Cancellation key  , and attempted setting will be cancelled.
②	To put off Zero correction lamp.	Push the following keys in the order shown and Zero lamp will go out.  →  → 
③	To cancel setting of a decimal point	If it is during flickering of the top numeral of a numeric value on the main display or on Sub-display #1, just push  key, and a decimal point will then be removed in the middle course of setting.
NOTES The existence of a decimal point in Sub-display #1 is innate, so it cannot be removed.		
④	To cancel [-] sign	 Key lets only [-] sign appear on the display and not [+] key. By a push of this key, [+] and [-] alternates with each other. [-] can be cancelled at any time during operation of numeral keys.

4-1-5 How to lock settings

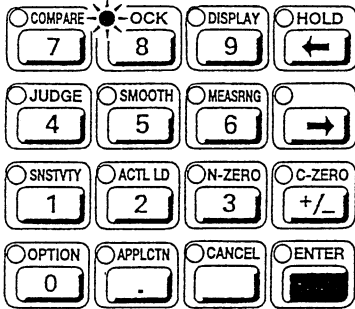
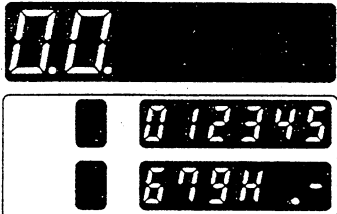
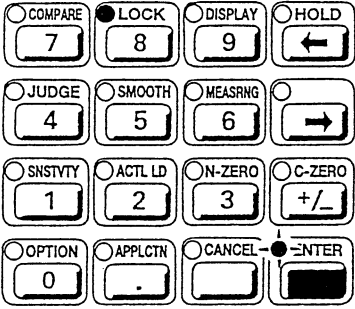
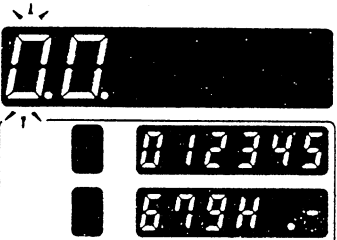
This function can lock calibration and all other settings you have made to protect them from later erroneous key operation that may occur. Make sure that you lock a setting each time you have made it to ensure its safety.

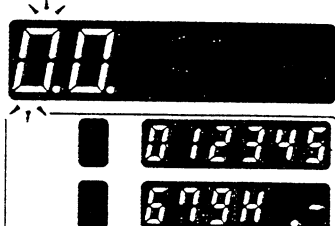
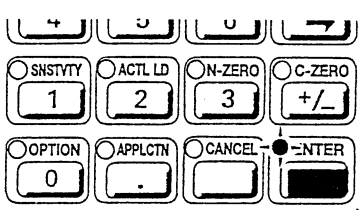
Against error in locking operation, Error Message `LOC-C` or `LOC-U` will appear for about 12 seconds on the main display.

- Calibration lock Prohibits setting of a calibration value.
(Included are calibration by registering sensitivity, calibration by loading an actual load, and No-load Zero.)
- User-specifiable lock This lock function lets the user lock desired settings. Defaults are: prohibition of all keys except the lock key. In addition, functions that use keys the user specified are prohibited.

(1) Key operation — Calibration lock and User-specifiable lock

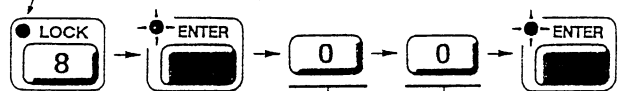
Lamp indication: ● lights up; ○ goes out; ⚡ flickers; -●- momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
① LOCK 8		The main display shows the state of lock, and Sub-display #1 and #2 shows key numbers which the user specified through the user-specifiable lock. Shown below is the default mode. 
② ENTER		The top digit flickers on the main display. 

Key to be operated	Lamp indication on Setter	Reading on Display				
③ Setting Lock X . X . └─ User-specifiable lock └─ Calibration lock Lock setting <table><tr><td>0</td><td>Cancel Lock</td></tr><tr><td>1</td><td>Execute Lock</td></tr></table>	0	Cancel Lock	1	Execute Lock	Type numeral keys. (Renewal is possible any number of times. After five digits are filled, the 6th numeral goes in the top of next five digits.) To cancell all existing locks, type [00,00].	If 1.0 reads on the display, it is the indication of Calibration lock. If 0.1 reads, it is the indication of User-specifiable lock. If 1.1 reads, it is the indication of both Calibration and User-specifiable locks. 
0	Cancel Lock					
1	Execute Lock					
④ End of setting In the end of setting, push this key to register that setting. ENTER 		Regular display is recovered.				

(2) How to unlock Calibration or User-specified lock items

Lamp flickers then keeps illuminating



Push keys in this sequence, and either or both will then be unlocked.

└─ Unlocks User-specified items

└─ Unlocks Calibration

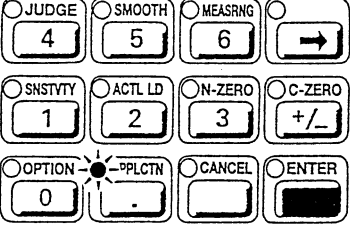
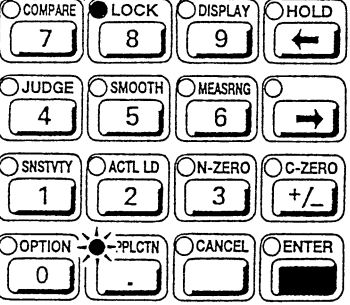
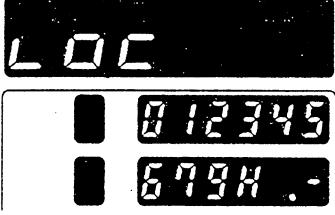
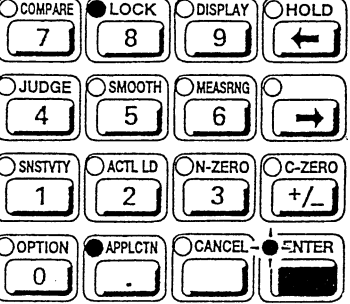
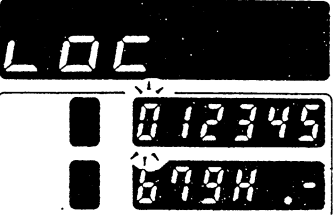
(3) How to set (renew) items to be locked by User-specifiable lock

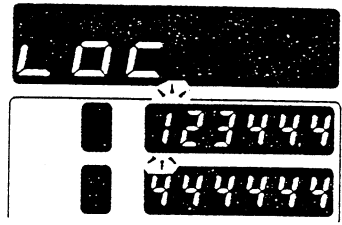
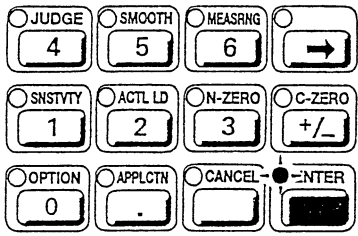
Items to be locked or unlocked are shown at right. (Note that  key cannot be locked.)

Defaults are [0, 1, 2, 3, 4, 5, 6, 7, 9, H, ., and -].

Key No.	Item	Reading on Sub-display #1, 2	Key No.	Item	Reading on Sub-display #1, 2
0	Option		6	Measuring function	
1	Sensitivity registration		7	Comparison	
2	Actual load		9	Display switching-over	
3	Non-load Zero		←	Hold	
4	Judgement		.	Application	
5	Smoothing		±	Zero correction	

(4) Keyoperation Lamp indication: ● lights up; ○ goes out; flickers; momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
① 		
② 		Sub-display #1 and #2 give numbers that represent locked user-specified items. 
③ 		

Key to be operated	Lamp indication on Setter	Reading on Display
④ Key in the number/s that represent the user-specified item/s you wants to lock. <u>XX...X</u> Up to 12 keys in all can be typed.	Type numeral keys. (Renewal is possible any number of times. When five digits are filled, the 6th numeral typed goes into the top of next five digits.) (A push of  key moves the flickering cursor light to left.)  key acts to enter H (Hold).	
⑤ End of setting 		Regular display is recovered.

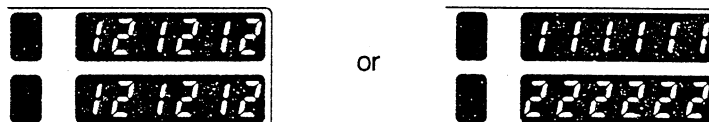
NOTES

- During entering user-specified item/s to lock, a push of  key enters H (Hold) but it does not move the cursor.
- As default, all the user-specified items are locked. When renewing this setting, take care that: You delete item number(s) which you do not want to lock. Do this by entering item number(s) you want to lock. So same numbers will then appear

on either or both Sub-display #1 #2. But this doesn't matter.

Sub-display #1 and #2 provide 6 digits each, and thus 12 digits altogether. Having deleted item number(s) you do not want to lock, you will have all these digits filled with only item numbers you want to lock.

[Example] To set sensitivity registration and actual load calibration, enter numerals as either one of the following.



or

4-2 Smoothing

Smoothing is a function whereby measured values are made stable, receiving fluctuating signals from a transducer. For this smoothing, four different methods

are provided. They are: Analog filter, Minimum scale division unit, Zero tracking and Average moving.

4-2-1 Analog filter

The analog filter cuts off high-frequency components from signals received from a transducer. The WGA-800C provides four different cut-off frequencies for selection: 1Hz, 20Hz, 200Hz and No filter (2kHz). Default is [0].

Key number	Analog filter cut-off frequency
0	200Hz
1	20Hz
2	1Hz
3	No filter (2kHz)

4-2-2 Minimum scale division

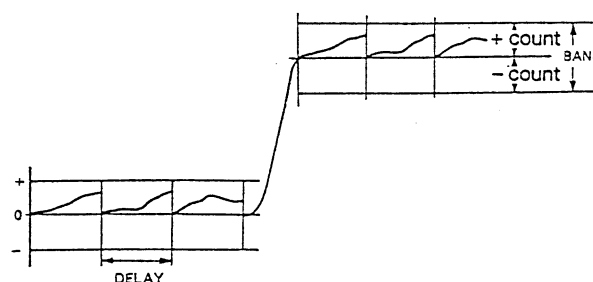
- A minimum scale division means a smallest unit by which measured signal are read. Signal fluctuations below this unit do not appear on the display, accordingly.
- Referring to the table at right, select a suitable division. Default is [0].

Key number	Smallest unit	Key number	Smallest unit
0	1 count	5	50 counts
1	2 counts	6	100 counts
2	5 counts	7	200 counts
3	10 counts	8	500 counts
4	20 counts	9	1000 counts

4-2-3 Zero tracking

- This function automatically corrects subtle zero point drifts. It effectively reduces measurement error inducible to zero drifts on a transducer or on the WGA-800C as well as zero drifts caused by deposits on a measuring object.
- By this function, zero drifts below a certain level which occurred during a certain period of time are brought to zero, automatically. The following two factors are to be preliminarily set. Time factor (DELAY), and Amount of a change (BAND).

Zero tracking operation



- Once Tracking Delay Time and Tracking Band Width have been established, zero drifts below that band width are corrected to zero at each tracking delay time. This correction value is added to a zero correction value.

Tracking Delay

Key No	Delay time
0	None
1	10 seconds
2	5 seconds
3	2 seconds
4	1 second
5	0.5 seconds
6	0.2 seconds
7	0.1 second

Default: [0]

Tracking Band

Key No.	Band width
0	None
1	1/4 counts
2	1/2 counts
3	1 count
4	2 counts
5	5 counts

Default: [0]

4-2-4 Moving average time

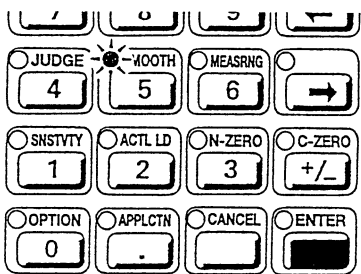
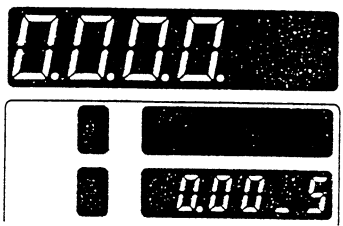
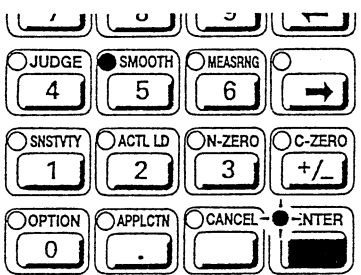
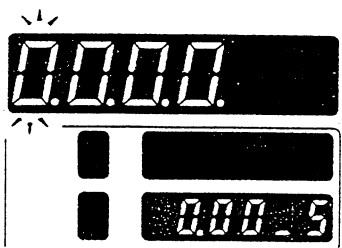
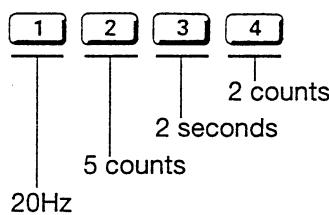
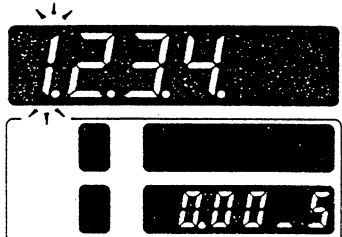
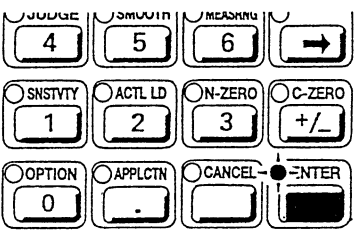
This is a function whereby several signals are averaged to eliminate fluctuations in reading.

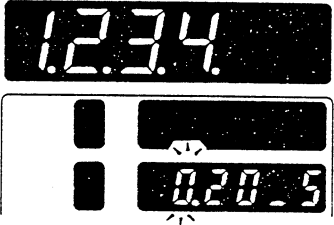
- Moving average time is to be set in a range of:
0.00~2.00 seconds
Default: [0.00] second

NOTES

- Use of the smoothing function ensures high resolution. For measurement of a high-speed phenomenon, however, take care to set the function at a possibly low smoothing ability.
- A voltage output (at #20 and 21 in the terminal board on the rear) will have the same frequency characteristic as one which is set to the analog filter.

(1) Key operation Lamp indication: ● lights up; ○ goes out; ✨ flickers; -●- momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Displays
① SMOOTH 5		Main display reads smoothing parameters. Sub-display #2 reads a moving average time parameter. Sub-display #1 appears blank. 
② ENTER		The top digit on Main display flickers. 
③ Enter smoothing parameters. X. X. X. X. Tracking band Tracking delay Smallest scale division Analog filter	Type numeral keys. (See [4-2-1], [4-2-2] and [4-2-3].) In this example, key in 1, 2 and 3.  20Hz 5 counts 2 seconds 2 counts	
④ ENTER		The second top digit flickers on Sub-display #2. 

Key to be operated	Lamp display on Setter	Reading on Display
⑤ Enter a moving average time. X.XX _ S Moving average time (in second) (0.00~2.00 seconds)	Type numeral keys. In this sample, enter 0.2 seconds. 0 2 0	
⑥ End of setting ENTER	4 5 6 → SNSTVTY ACTL LD ON-ZERO C-ZERO 1 2 3 +/- OPTION APPLCTN CANCEL ENTER 0 .	Regular display is recovered.

NOTES

- Status indicating lamp ^{ZERO TRACK} illuminates to indicate Zero tracking which has been set.
- Zero tracking does not function if "0" is set to Zero tracking delay or to Zero tracking band.
- If BCD data output, an option, is in use, the setup of stabilized output interlocks with that of Zero tracking provided that the latter has been set.
- If the setup of Zero tacking is renewed while BCD data output is in use, the main display will give Warning message "ch-[]". Note however that the renewal of Zero tracking setup is valid.

4-3 Zero correction

Set Zero correction mode and execute zero correction, and the main display will then read a remainder after subtraction of a zero correction value from a total load value.

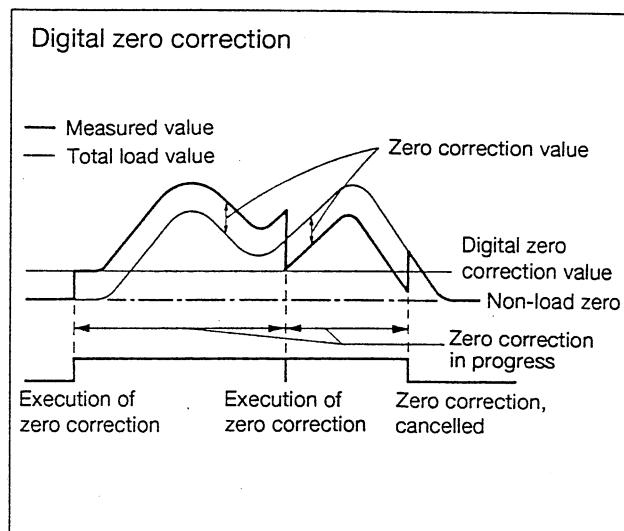
4-3-1 Zero correction modes

a) Digital zero correction (Zero correction mode 0)

- Set a digital zero correction value and execute correction, and a measured value will then equal a digital zero correction value. Hence, a zero correction value is a remainder after subtraction of a digital zero correction value from a total load value.
- By setting a digital zero correction value to "00000", a measured value can be made "0" each time zero correction is made (it is made "0" digitally).

$$\text{Zero correction value} = \text{Total load value} - \text{Digital zero correction value}$$

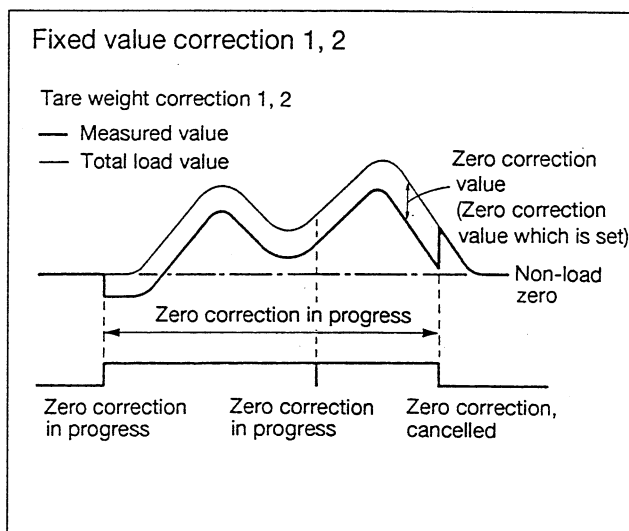
$$\text{Measured value} = \text{Total load value} - \text{Zero correction value}$$



b) Fixed value correction 1 (Zero correction mode 1)

- Set a zero correction value and execute zero correction, and a measured value will then be a remainder after subtraction of a zero correction value from a total load value. An actual zero correction value affected equals a preset zero correction value.

$$\text{Measured value} = \text{Total load value} - \text{Actual zero correction value (Preset zero correction value)}$$



c) Fixed value correction 2 (Zero correction mode 2)

- A total load value at the time of setting Zero correction mode 2 is registered as a zero correction value. How to operate is same as the above fixed value correction 1.
- Default: [0] (Mode 0)

TIPS

Non-load zero and Zero correction

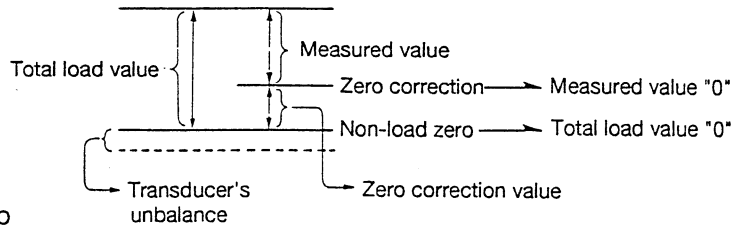
• Non-load zero

Use this function to bring to analog zero a transducer's unbalance as well as its zero drift, which have occurred at the time of installation.

• Zero correction

- Use this function to subtract a tare weight value from a total load value after having made a measured value to read "0" through Non-load zero.
- Suppose that a digital zero correction value has been made to read "00000" by setting Zero correction mode to [0]. In this case, a measured value is made to read "0" each time zero correction is executed.

[Example]



NOTES

- Zero correction operation is interrupted if power failure or power switching off occurs. After recovery of power, let $C-ZERO$ light up and execute necessary zero correction anew.

To do this, operate these keys in order –  → 

Note that in this case a same measured value as one that precedes power interruption may or may not be obtained.

- How to interrupt (switch [OFF]) Zero correction

Operate these keys in order –  →  →  , and Zero correction operation will be interrupted.

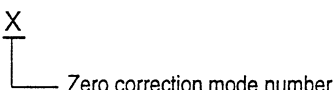
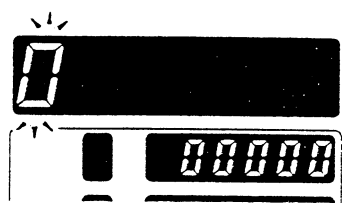
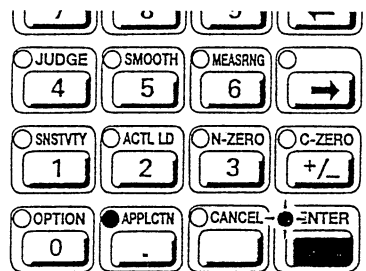
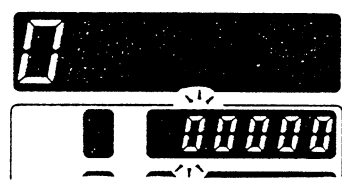
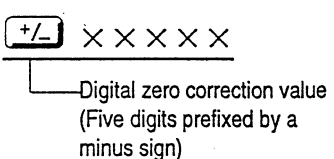
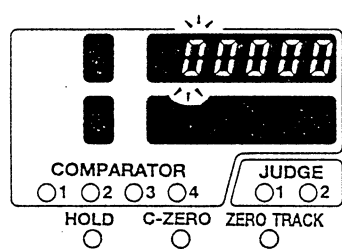
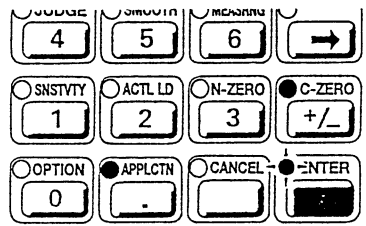
- Provided that zero tracking is active in smoothing operation, a zero tracking value is added to a zero correction value. This means that a zero correction value affected actually may not be equal to a zero correction value which has been preset.
- Measuring functions such as Peak HOLD measuring and Average value measuring work on measurement loads.

(1) Zero correction mode key operation

Lamp indication: ● lights up; ○ goes out;

flickers; -●- momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display								
① APPLCTN	4 5 6 → SNSTVTY 1 ACTL LD 2 N-ZERO 3 C-ZERO +/- OPTION 0 APPLCTN . CANCEL ENTER	Regular display								
② C-ZERO	4 5 6 → SNSTVTY 1 ACTL LD 2 N-ZERO 3 C-ZERO +/- OPTION 0 APPLCTN . CANCEL ENTER	Mode [0] is the default.								
③ ENTER	4 5 6 → SNSTVTY 1 ACTL LD 2 N-ZERO 3 C-ZERO +/- OPTION 0 APPLCTN . CANCEL ENTER	Zero correction mode appears on Main display.								
④ Enter a zero correction mode (In the case of setting Mode #2) X Zero correction mode number Zero correction modes <table><tr><th>Key to be typed</th><th>Mode</th></tr><tr><td>0</td><td>Digital zero correction</td></tr><tr><td>1</td><td>Fixed value correction #1</td></tr><tr><td>2</td><td>Fixed value correction #2</td></tr></table>	Key to be typed	Mode	0	Digital zero correction	1	Fixed value correction #1	2	Fixed value correction #2	Type a numeral key.	
Key to be typed	Mode									
0	Digital zero correction									
1	Fixed value correction #1									
2	Fixed value correction #2									
⑤ ENTER	4 5 6 → SNSTVTY 1 ACTL LD 2 N-ZERO 3 C-ZERO +/- OPTION 0 APPLCTN . CANCEL ENTER	Regular display is recovered.								

Key to be operated	Lamp indication on Setter	Reading on Display
With Mode #2, make sure to register a numerical value, which is given on Main display, as a correction value. By this, the setting is completed. (This is effective only for measurement of a total load value.) With all modes, key operations up to ③ are same.		Regular display is recovered.
④ Enter a zero collection mode (In the case of setting Mode #0 or #1) 	Type a numeral key, 0 or 1.	
⑤ 		Zero correction mode appears on Main display. With Mode #0 or #1, an adding value or a zero correction value appears on Sub-display #1. 
(6) • With Mode #0, enter a digital zero correction value. 	Type numeral keys. You can prefix a minus (-) sign either during or in the end of typing numerals. It automatically goes on the top of a number you type.	
⑦ 		Regular display is recovered.

4-3-2 Execution and cancellation of Zero correction

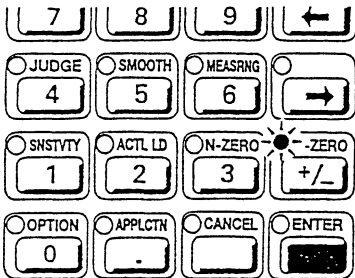
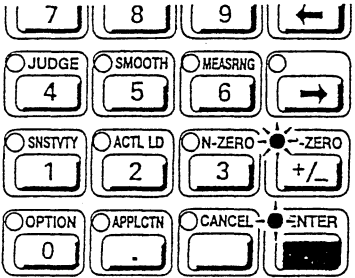
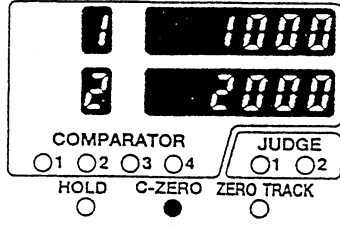
(1) Operation

Execution of a specified zero correction mode and measurement.

(2) Key operation

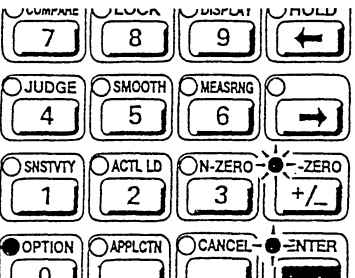
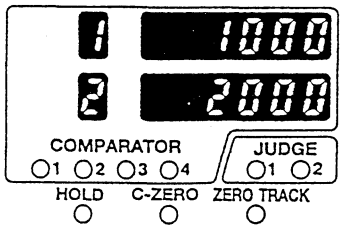
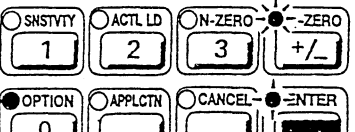
• Execution of zero correction

Lamp indication: ● lights up; ○ goes out; ✨ flickers; -●- momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
① C-ZERO 		Regular display
② ENTER 		Regular display returns after correction of zero. 

- Status indicating lamp $\overset{\text{C-ZERO}}{\circ}$ illuminates during execution of zero correction measurement.

• Cancellation of zero correction

Key to be operated	Lamp indication on Setter	Reading on Display
① C-ZERO 		
② OPTION 		
③ ENTER 		

- State indicating lamp $\overset{\text{C-ZERO}}{\circ}$ goes out upon cancellation of zero correction measurement.

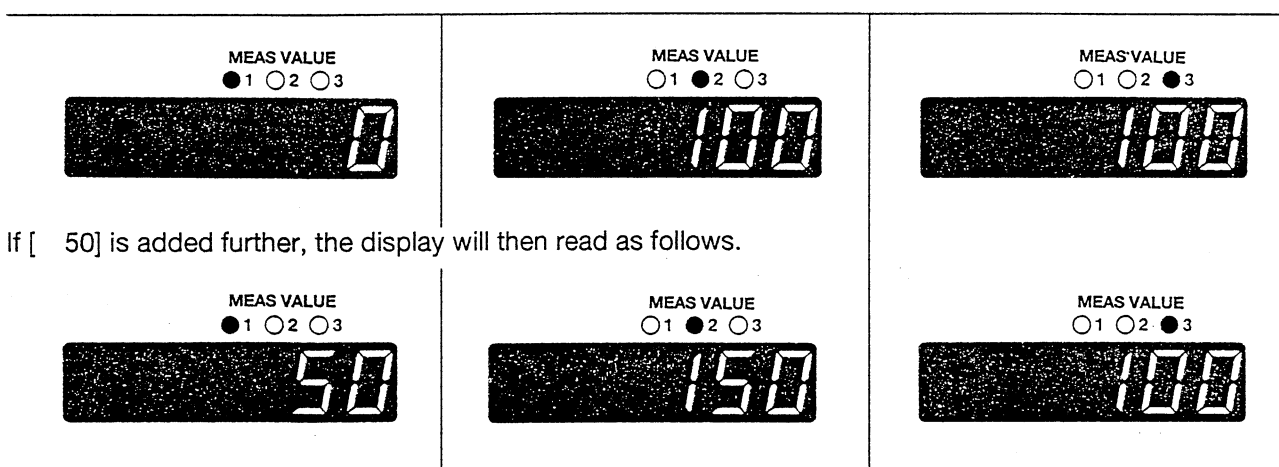
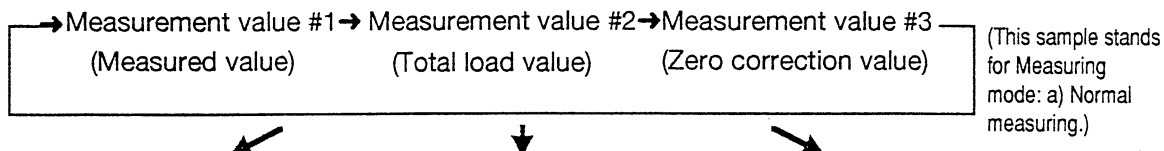
• Key operation examples

- When a digital zero correction value has been set to "00000" in Mode [0]

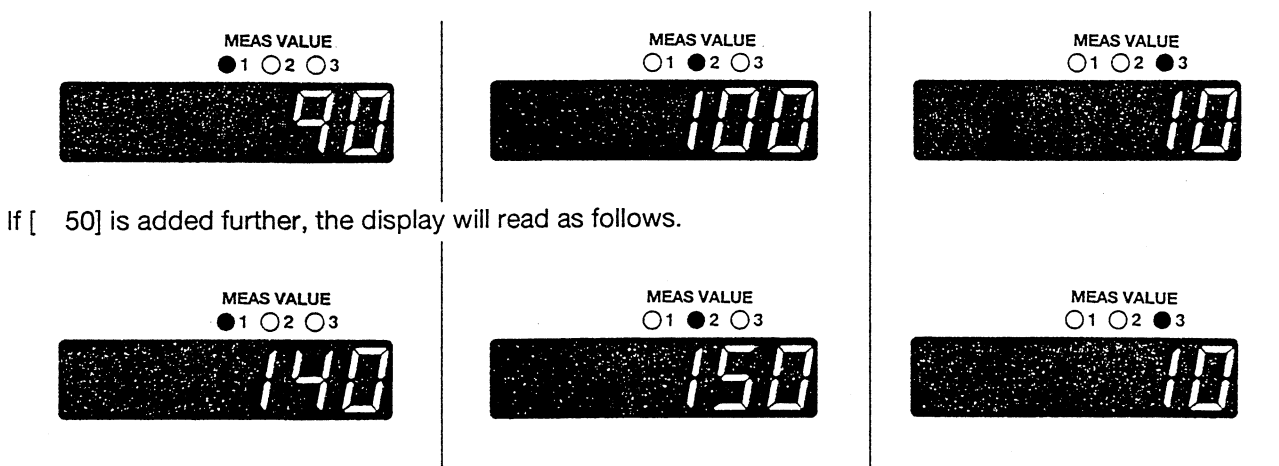
[Example] The display presents [100], which is a measurement value before zero correction(, and which equals a total load value).

In this situation, zero correction is executed as follows.

 →  And after this, push . Each push of this key switches over a measured value from one to another. When measurement is completed, bring back Measurement value #1 onto Display.



[Example] In Mode #1 or #2, the display reads [100], which is a measured value before zero correction(, and which equals a total load value) while a preliminarily registered zero correction value is [10].



- To execute zero correction with an external input signal

Using Zero correction [ON]/[OFF] provided in the terminal board on the rear, you can execute the same zero correction or cancellation as above.

To execute zero correction.....Short-circuit Terminal #8 and #9 (Zero correction [ON])

To cancel zero correction.....Short-circuit Terminal #8 and #10 (Zero correction [OFF])

For how to wire, see [2-7 Connection of control input]

4-4 Comparison function

The comparison function is a function which compares a measurement value with a comparison value, and puts out the result of comparison.

Four comparators are in use, and to each of which the user can set all these – a comparison value, allotment (to a measurement value), upper/lower limits, output mode, delay mode, hysteresis width and delay time. The result of comparison is given to the terminal board on the rear as well as to comparator indicators on the front panel —

COMPARATOR
○1 ○2 ○3 ○4

If the comparison result is in [ON] position, the [Cmpr] lamp of that comparator lights up.

During monitoring a comparator's function as well as during setting a comparator, both the comparator number lamp and [Cmpr] lamp light up.

You can set suitable functions to respective comparators independently of each other. The functions are: allotment (to a measurement value), upper/lower limits, output mode, operation mode, delay mode, hysteresis mode and delay time.

4-4-1 Allotment

A comparator's comparison value is to be allotted to one of Measurement values, #1 to #3 which are classified through the measuring function.

If [No allotment] is set to a comparator who has an ON/OFF parameter of comparison result, Warning message " $ch - 02$ " will appear on Main display.

Numeral key	Allot Comparison value to:
0	No allotment
1	Measurement value #1
2	Measurement value #2
3	Measurement value #3

Default: [0 (No allotment)]

[Example] When WGA-800B is in the normal measuring mode ...

In this mode, Measurement value #1 denotes a measured value (a net value), and Measurement value #2, a total load value (a gross value).

So you allot Measurement value #1 to Comparator #1, and Measurement value #2 to Comparator #2, and you can then conveniently compare a net weight value with a gross weight value.

4-4-2 Upper/lower limits

Set a comparator to either Upper limit mode or Lower limit mode.

If it is set to Upper limit mode, it is switched [ON] when measured values have exceeded a preset comparison value, and switched [OFF] when measured values have gone below a preset comparison value.

Numeral key to be typed	Mode	Operation
0	Lower limit	Comparator is switched [ON] against measured values below a preset comparison value.
1	Upper limit	Comparator is switched [OFF] against measured values in excess of a preset comparison value.

Default: [1 (Upper limit mode)]

[Example] Suppose that Comparator #1 is set to Upper limit mode, and Comparator #2 to Lower limit mode, and the following table will then hold.

Comparison requirement	Control output		Lamp indication	
	Comparison #1	Comparison #2	Comparator #1	Comparator #2
Measured value $\geq$ Upper limit value	ON	OFF	Lights up	Goes out
Upper limit value $>$ Measured value $>$ Lower limit value	OFF	OFF	Goes out	Goes out
Measured value $\leq$ Lower limit value	OFF	ON	Goes out	Lights up

4-4-3 Output modes

- Now set a comparator's output(open collector output) to either positive(nomral) or negative(invert) logic.

Numeral key	Mode	Operation
0	Normal (positive)	Comparator's output is switched [ON] when Comparison result is in the [ON] position.
1	Invert (negative)	Comparator's output is switched [ON] when Comparison results is in the [OFF] position.

Defalut: [0 (normal)]

4-4-4 Operation modes

- Select an operation mode between Constant comparison and Comparison at HOLD.

Numeral key	Mode	Operation
0	Constant com- parison	Constant comparison is made to output a comparison result whenever preset requirements have been met.
1	Comparison at HOLD	Comparison is made when one measuring has ended (at HOLD) to output a comparison result.

Default: [0 (constant comparison)]

4-4-5 Delay modes

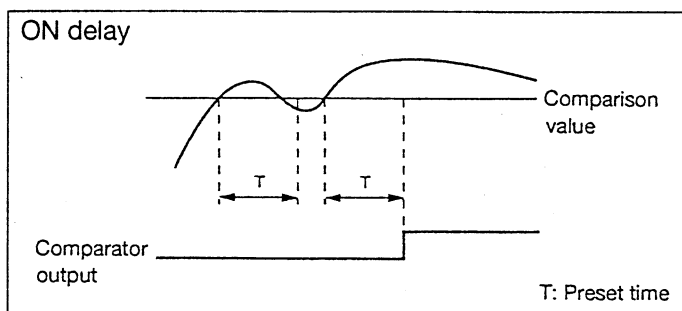
- Select between ON delay and OFF delay, and also set a delay time.

Numeral key	Mode	Operation
0	N/A	Sub-display #2 appears blank.
1	ON delay	With an upper (lower) limit comparator, its comparison result is switched [ON] if an upper (lower) limit has been continuously exceeded for a longer time than a preset time.
2	OFF delay	With an upper (lower) limit comparator, its comparison result is switched [OFF] if signals have gone down (up) as much as a preset hysteresis width continuously for a longer time than a preset time after Comparison result was switched [ON].
3	ON & OFF delay	Both [ON] delay and [OFF] delay operate.

Default: [0 (N/A)]

• ON delay

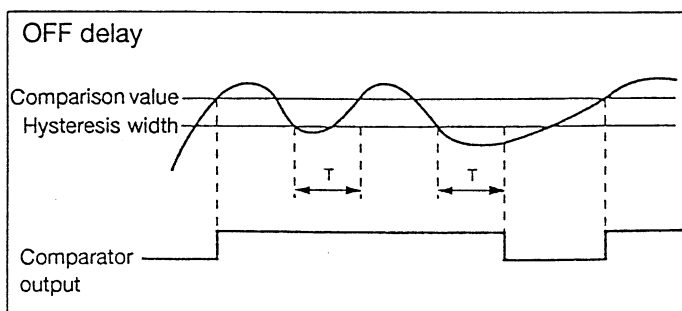
An upper (lower) limit comparator switches on its comparison result if measured values have gone above (below) a preset comparison value continuously for a longer time than a preset time.



• OFF delay

An upper (lower) limit comparator switches off its comparison result if measured values have gone down (up) as much as a hysteresis width continuously for a longer time than a preset time after a comparator outputted a comparison result against signals having exceeded an upper (lower) limit.

(Note that a comparator switches on its comparison result for a longer time than a preset delay time always.)



- Delay time
A delay time length can be set in a range from 0.00 to 9.99 seconds.

NOTES

- When you have selected one of delay modes, #1, 2 and 3, make sure to set a delay time. If [0] is selected, a delay time cannot be set.
- A delay mode cannot be set in [1 (comparison at HOLD)] operation mode.

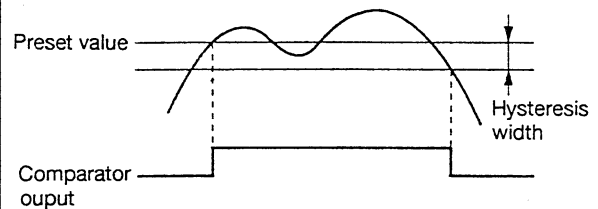
4-4-6 Hysteresis width

To set a hysteresis width is to provide a non-sensitive zone within a comparison value.

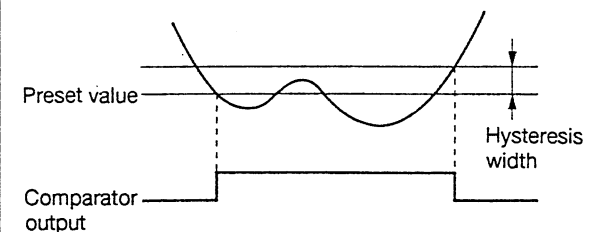
A comparison result of an upper limit comparator is switched [ON] when measured values have gone above a preset comparison value, and switched [OFF] when measured values have gone below a preset comparison value.

But, if once a hysteresis width is set, it is switched [OFF] when measured values have gone further down as much as that hysteresis width.

With a comparator being set to an upper limit



With a comparator being set to a lower limit



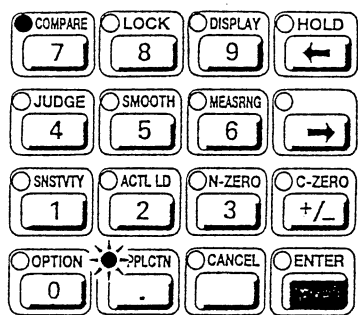
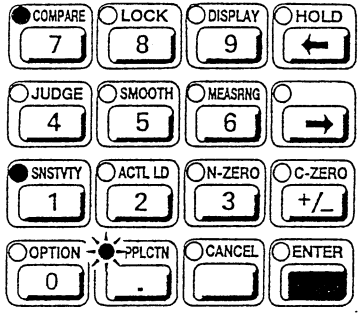
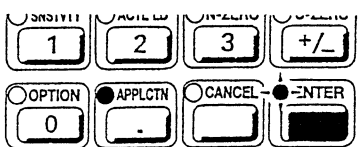
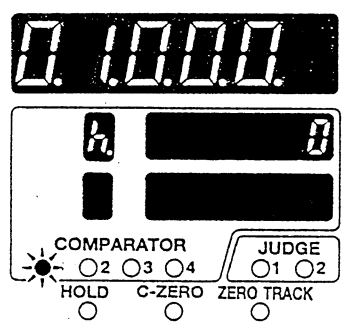
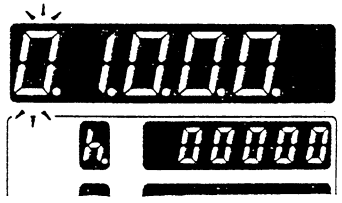
4-4-7 How to set comparator function

When setting this comparator function, make sure to display.

allot a comparator to any one of Measurement values, #1, #2 and #3. If it is allotted to [0 (no allotment)], Warning message " ch-02 " will appear on Main

To remove Warning message " ch-01 " or " ch-02 ", push either  or  key.

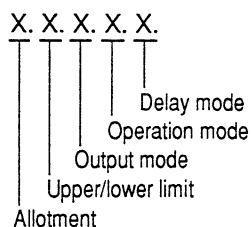
Lamp indication: ● lights up; ○ goes out;  flickers;  momentarily illuminates

Key to be operated	Lamp display on Setter	Reading on Display
① 		Regular display
② 		③ Enter a comparator number. X └─ Comparator number (1~4)
④ 	Key in 1 (See [4-4-1 Allotment].) 	
		

Key to be operated	Lamp display on Setter	Reading on Display
--------------------	------------------------	--------------------

- This setting example presupposes Operation mode is set at [1].

⑤ Set up Comparator function.



Type numeral keys.

(Renewal is possible any number of times.
After five digits are filled, the 6th numeral
goes into the top of next five digits.)

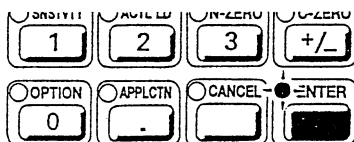
In tis sample, [1111] is keyed in.



By setting Operation mode to "1",
both Delay mode indication and
Sub-display #1 indication go out.

Allotment	Upper/lower limit	Output mode	Operation mode	Delay mode
0 No allotment	0 Lower limit	0 Normal	0 Constant comparison	0 No delay
1 Measurement value #1	1 Upper limit	1 Invert	1 Comparison at HOLD	1 Delay ON
2 Measurement value #2				2 Delay OFF
3 Measurement value #3				3 ON & OFF delay

⑥ End of setting



Regular display is recovered.

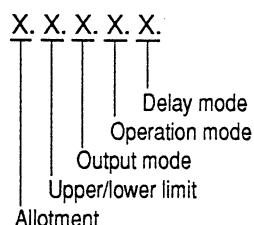
NOTES

- You need to set Allotment to any one of Measurement values, #1 to #3, in order to activate Comparison function.
- If Operation mode is set at "1", you can enter neither Hysteresis width nor Delay mode.

Key to be operated	Lamp indication on Setter	Reading on display
--------------------	---------------------------	--------------------

- This setting example presupposes Operation mode is set at [0].
Key operations up to ④ are same as before.

⑤ Setup Comparatr function.



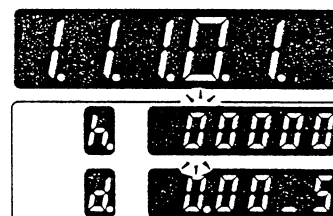
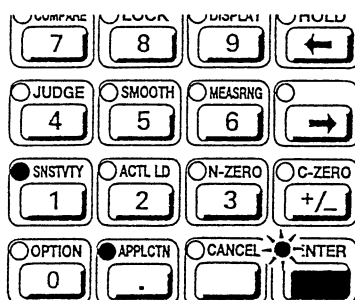
Type numeral keys.

In this sample, [11101] is keyed in.

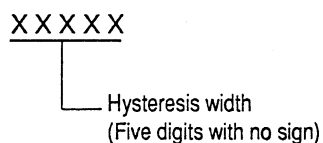


Allotment	Upper/lower limit	Output mode	Operation mode	Delay mode
0 No allotment	0 Lower limit	0 Normal	0 Constant comparison	0 No delay
1 Measurement value #1	1 Upper limit	1 Invert	1 Comparison at HOLD	1 Delay ON
2 Measurement value #2				2 Delay OFF
3 Measurement value #3				3 ON & OFF delay

⑥

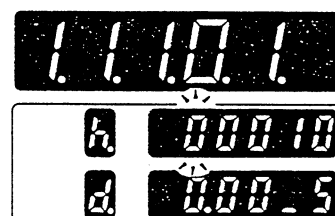


⑦ Enter Hysteresis width
(Enter in Sub-display #1.)

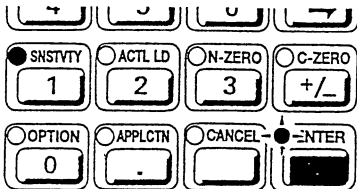
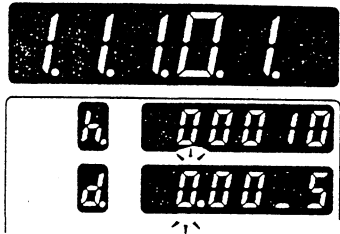
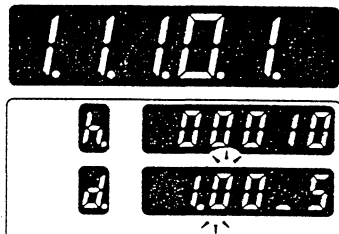
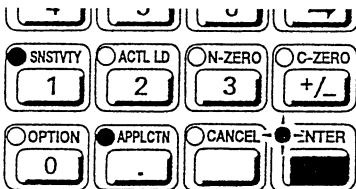


Type numeral keys.

In this sample, 00010 is keyed in.



- Enter a hysteresis width if need be.

Key to be operated	Lamp indication on Setter	Reading on Display
⑧ 		
⑨ Enter Delay time <u>X.XX_S</u> Delay time (0.00-9.99 seconds with a decimal point fixed)	Type numeral keys. In this sample, 1.00 is keyed in.	
⑩ End of setting 		Regular display is recovered.

NOTES

If No allotment is set to a comparator which has an [ON/OFF] parameter, Warning message " $\epsilon h - 02$ " will appear on Main display. But this setting is valid. To remove the warning message and return to the regular display, push  key.

4-4-8 How to set Comparison values

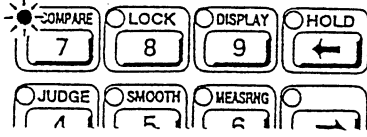
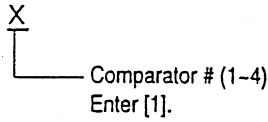
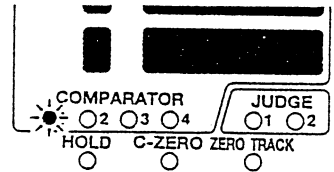
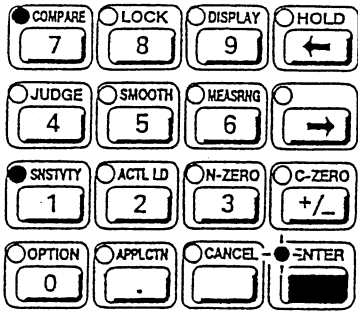
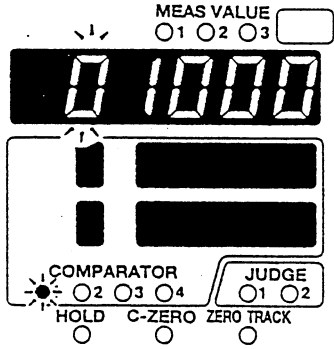
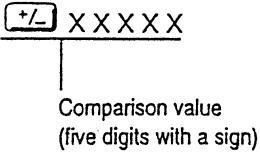
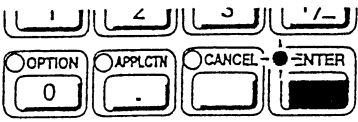
- Here's how to set Comparators' respective Comparison values independently of each other.
- Defaults are: 1000, 2000, 3000 and 4000 in order of Comparator numbers, 1 to 4.

If no allotment has been made in advance, Warning message " ϵ h - 0 ! " will appear on Main display. But the setting itself is valid.

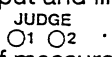
(1) Key operation

Make sure to take to this setting only after you have achieved the setting of Comparison function.

Lamp indication: ● lights up; ○ goes out; ⚡ flickers; -●- momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
① 		Regular display
② Enter a comparator number. 	Type a numeral key.	The number lamp of a comparator flickers on Main display. 
③ 		A current comparison value appear on Main display. (Shown below is a default value) 
④ Enter a comparison value 	Type numeral keys. You can prefix a minus (-) sign either during or in the end of typing numerals. It automatically goes onto the top of a number you type. In this sample, enter 01200.	
⑤ End of setting 		Main display will return to Regular display, and Sub-display #1 will present a renewed value.

4-5 Judging function

The criteria of judgement are set up through combinations of [ON/OFF] of four comparators. Judgement is made in the form of open-collector output and illumination of lamps on the front panel – . Use this function to judge the quality of measured

values. Two judging devices are provided, each producing its own judgement.

Prior to setting the criteria of judgement, never fail to properly set comparators to be used. See [4-4-8 How to set comparison values].

4-5-1 How to set output modes

- Set a judging device's open-collector output to either Normal or Invert logic.

Numeral key	Mode	Contents
0	NORMAL (positive) AND	When Judging criteria accord with Comparator, Judging device's result is switched [ON], then Judging output is switched [ON].
1	INVERT (negative) AND	When Judgement criteria accord with Comparator, Judging device's result is switched [ON], then Judging output is switched [OFF].
2	NORMAL (positive) OR	When any one of Judging criteria is satisfied by Comparator, Judging device's result is switched [ON], then Judging output is switched [ON].
3	INVERT (negative) OR	When any one of Judging criteria is satisfied by Comparator, Judging device's result is switched [ON], then Judging output is switched [OFF].

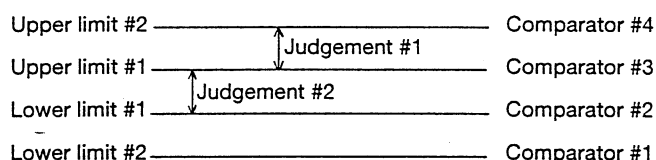
- Default: [0 (normal)]

4-5-2 How to set criteria

- Set criteria using the combination of ON, OFF and invalidity on each of the four comparators.
- Default
 Judging device #1 [0_1. 0. . .]
 Judging device #2 [0_ . . 1. 0.]
- Set computing logic on comparator outputs, and judgement signals will then be outputted.

Numeral key	Operation
0	OFF
1	ON
.	Invalid

[Example 1] Set the comparators as follows.

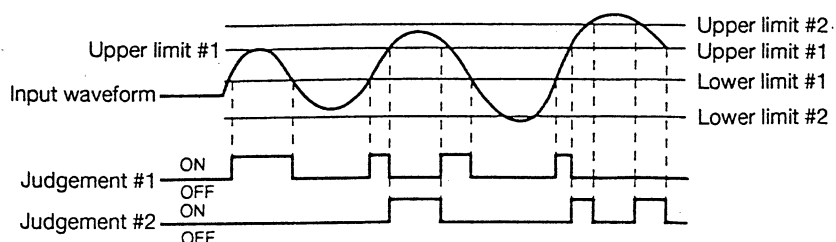


To set Judgement #1's criteria at "Lower limit #1<[OK]<Upper limit #2", set the comparators respectively as follows:

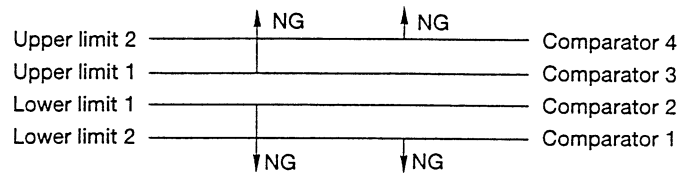
Comparator #1 to INVALID; Comparator #2 to OFF;
 Comparator #3 to OFF; Comparator #4 to INVALID;
 Output mode to NORMAL AND

To set Judgement #2's criteria at "Upper limit #1<[OK]<Upper limit #2

Comparator #1 to Invalid; Comparator #2 to Invalid;
 Comparator #3 to ON; Comparator #4 to OFF;
 Output mode to NORMAL AND



[Example 2] Set the comparators as follows.

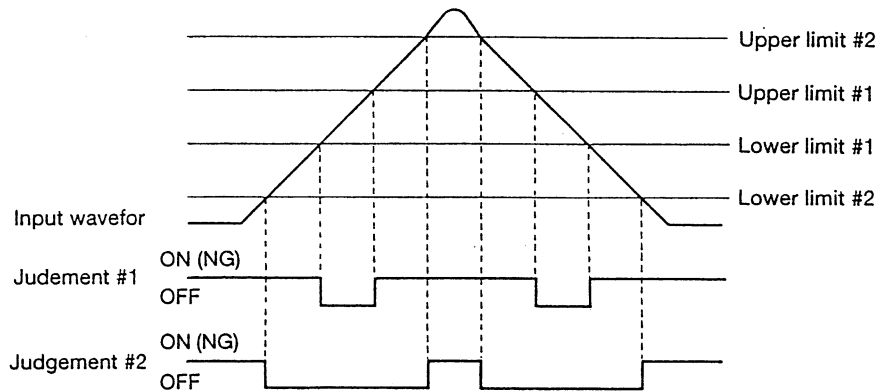


To set Judgement #1's criteria at $NG < \text{Lower limit \#1}$, Upper limit $\#1 < NG$, set the comparators respectively as follows.

Comparator #1 to INVALID; Comparator #2 to ON;
 Copmparator #3 to ON; Comparator #4 to INVALID;
 Ouput mode to NORMAL OR

To set Judgement #2's criteria at $NG < \text{Lower limit \#2}$, Upper limit $\#2 < NG$, set the comparators respectively as follows.

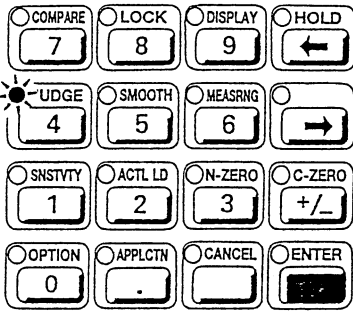
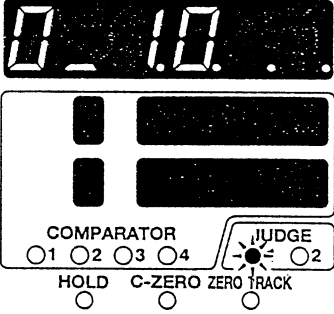
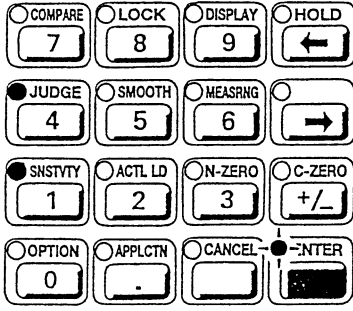
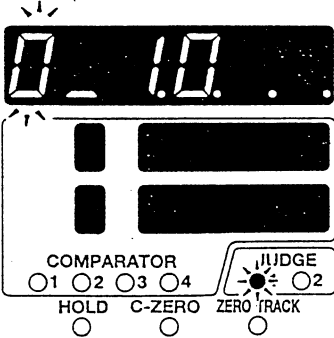
Comparator #1 to ON; Comparator #2 to INVALID;
 Comparator #3 to INVALID; Comparator #4 to ON;
 Ouput mode to NORMAL OR

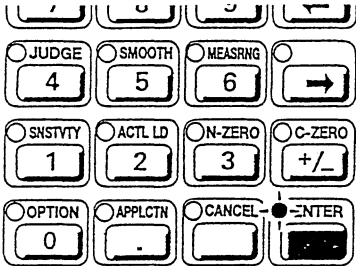


(1) Key operation

Make sure to carry on this operation only after you have set Comparison function.

Lamp indication: ● lights up; ○ goes out; ✨ flickers; -●- momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
① 		Regular display
② Enter a Judging device #. X └ Judging device # (1 or 2)	(Judging device # is a sample.) Type a numeral key. In this sample, [1] is keyed in.	(Shown below is a default value.) Main display shows a Judging device #, which has been entered. Sub-display #1 and 2 appear blank. 
③ 		

Key to be operated	Lamp indication on Setter	Reading on Display										
④ Enter a judgement criterion. X _ X . X. X. X. Comparator #4 Comparator #3 Comparator #2 Comparator #1 Output mode Comparator's judging criterion <table><tr><td>0</td><td>Normal</td></tr><tr><td>1</td><td>Invert</td></tr></table> <table><tr><td>0</td><td>OFF</td></tr><tr><td>1</td><td>ON</td></tr><tr><td>.</td><td>Invalid</td></tr></table>	0	Normal	1	Invert	0	OFF	1	ON	.	Invalid	Type numeral keys. In this sample, [0. 00.] is keyed in.	 Comparator #1: Invalid Comparator #2: OFF Comparator #3: OFF Comparator #4: Invalid
0	Normal											
1	Invert											
0	OFF											
1	ON											
.	Invalid											
⑤ End of setting 		Regular display is recovered.										

NOTE

If No allotment is set to a comparator which has an ON/OFF parameter, Warning message " ch - 0 ! " will appear on Main display. But this setting itself is valid.

4-6 How to set measuring function

Ten measuring modes are provided. In addition, six user-specifiable modes are provided for optional selection of a measuring signal zone. All this lets you the user command the type of measuring he desires.

They include: Peak-HOLD, bottom-HOLD, simultaneous HOLD (of the 1st and 2nd peak values), and duration-specified measuring, etc. .

- **Measuring modes**.....Select a suitable mode from the following ten. (See also page 77.)

Measuring mode #	Mode	Definition/Operation
0	a) Normal measuring	Performs normal measuring.
1	b) HOLD measuring at an optional point	Holds a measured value upon arrival of a HOLD signal.
2	c) Average value measuring	Finds an average value of signals in a measuring signal zone as well as duration of signals (up to 60 seconds).
3	d) High-speed peak HOLD measuring	Performs a peak HOLD operation in a measuring signal zone, and after termination of a measuring zone, performs a HOLD operation (analog HOLD operation).
4	e) High-speed bottom HOLD measuring	Performs a bottom HOLD operation in a measuring signal zone, and after termination of a measuring zone, performs a HOLD operation (analog bottom HOLD operation).
5	f) Peak & bottom HOLD operation	Performs a peak and bottom HOLD operation in a measuring signal zone, and after termination of a measuring zone, performs a HOLD operation.
6	g) Simultaneous peak HOLD operation	Seeks a deepest valley during a measuring signal zone, measures a peak (1st peak) value that immediately precedes that valley, together with a later peak (2nd peak) value, and after termination of a measuring zone, holds those values.
7	h) Peak & time measuring	Measures duration of signals (up to 60 seconds) larger than a preset level as well as their peak value, and holds the both.
8	i) Time measuring	Measures a period of time between Comparator #1's switching [ON] and Comparator #2's switching [ON].
9	j) Pressing input measuring	A measuring signal zone starts upon switching [ON] of Comparator #1, and a value which has preceded abrupt change in values is held.

Default: [0]

- **User specified modes**.....Select a suitable measuring period from the following six.

Specifiable mode #	Mode	Definition/Operation
0	a) Externally sets a measuring signal ZONE.	Where a HOLD signal exists is a measuring signal ZONE.
1	b) Externally sets a measuring PERIOD.	A measuring signal ZONE is specified by a period of time.
2	c) Sets a measuring signal ZONE by specifying Level Trigger's Upper limit.	Where input signals stay above a preset level is a measuring signal ZONE.
3	d) Sets a measuring signal ZONE by specifying Level Trigger's Lower limit	Where input signals stay below a preset level is a measuring signal ZONE.
4	e) Sets a measuring PERIOD by specifying Level Trigger's Upper Limit.	A measuring signal ZONE starts when input signals go above a preset level, and continues for a specified period of time.
5	f) Sets a measuring PERIOD by specifying Level Trigger's Lower Limit.	A measuring signal ZONE starts when input signals go below a preset

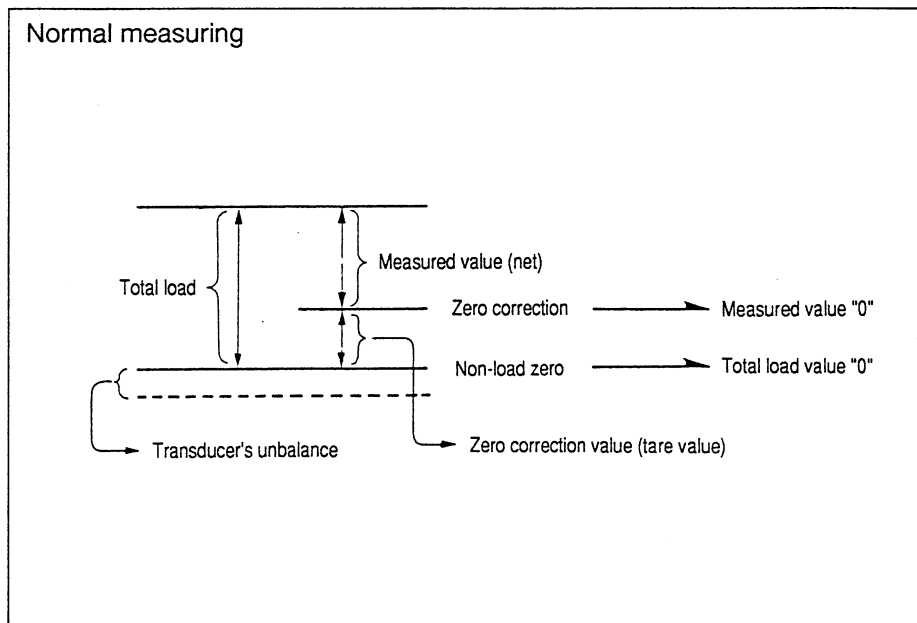
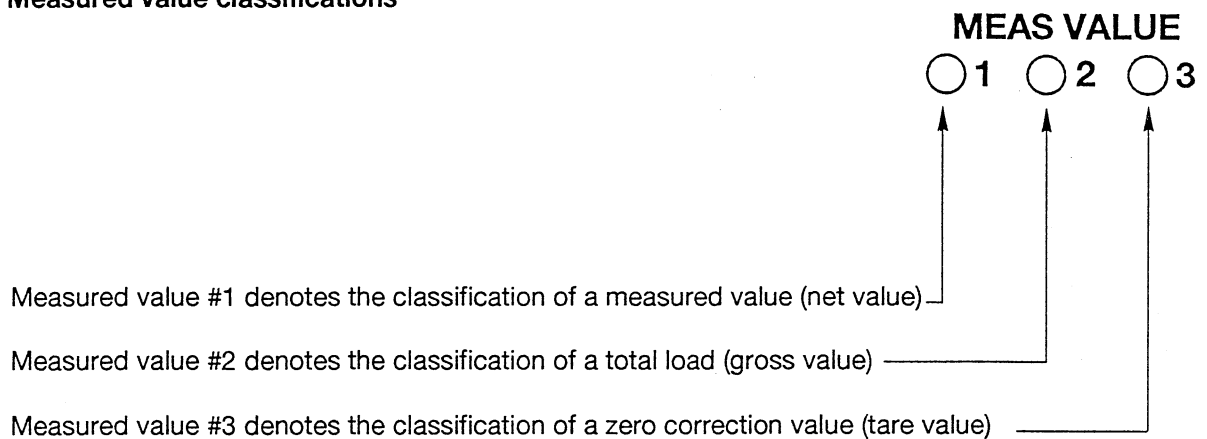
Default: [0]

4-6-1 How to set a measuring mode

a) Normal measuring (Measuring mode 0)

- In this mode, measured values are presented at all times on Main display. Use this mode for ordinary measuring.
- You cannot use a user-specifiable mode in this measuring mode.

(1) Measured value classifications



b) HOLD measuring at an optional point (Measuring mode #1)

- Use this mode to hold a measured value at an optional point.
The lamp #1 will light up on the front panel upon holding a measured signal value.
- A user-specifiable mode is automatically set to [0 (Externally sets a measuring signal ZONE)].

(1) To operate using front panel keys

① To start measuring

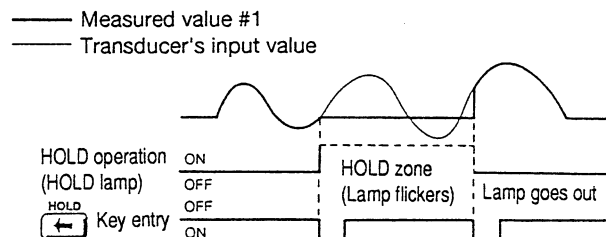
Push  key, and a measured value will be held and  lamp will flicker.

② To terminate measuring

Again push  key, and HOLD will be cancelled and  lamp will go out.

From this time on, normal measuring will be restored.

Optional point HOLD mode (through key operation)



(2) To operate using an external control signal

① To start measuring

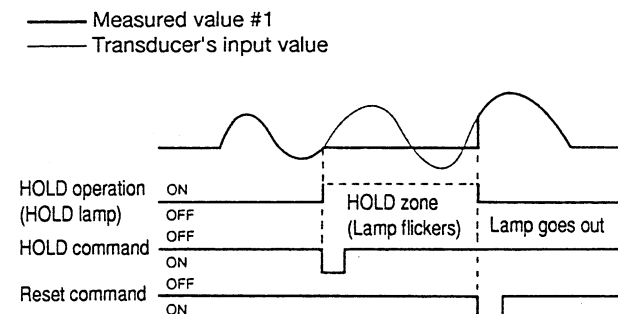
Short-circuit #8 and #11 in the terminal board on the rear (i.e. execute an input common hold command) on the terminal board of the rear panel for 5ms or longer. This holds a measured value and lets  lamp flicker.

② To terminate measuring

Short-circuit #8 and #12 (i.e. execute an input common reset command) for 5ms or longer.

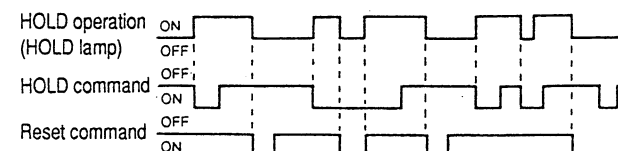
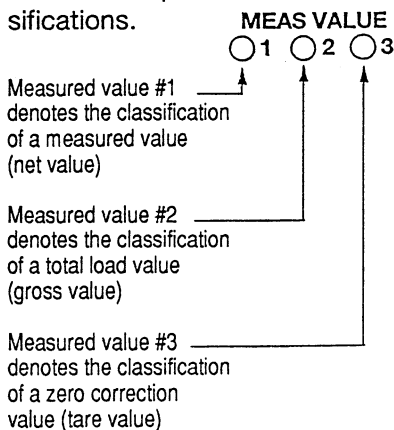
This cancels HOLD and lets  lamp go out. From this time on, normal measuring is restored.

Optional point HOLD mode (through external control input)



(3) Measured value classifications

The three number lamps light up to indicate their respective measured value classifications.



(c) Average value measuring (Measuring mode #2)

- Use this measuring mode to obtain an average of signal values measured in a measuring signal zone (selected using one of the user-specifiable modes). The #1 lamp lights up to indicate the measured value classification. MEAS VALUE
●1 ○2 ○3

In addition, the #3 lamp lights up to indicate the classification of a measuring period of time (60.00 seconds, maximum) for that zone. MEAS VALUE
○1 ○2 ●3

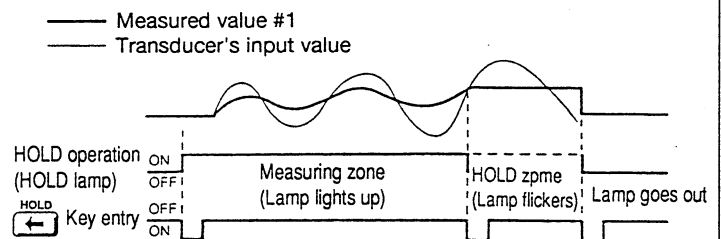
- Select a suitable mode from six in all.

• Operate keys as follows when you have selected Mode [0 (Externally sets a measuring signal zone)].

(1) To operate using front panel keys

- ① To start measuring in a signal zone
Push  key, and measuring will start, and  lamp will light up.
- ② To terminate measuring in a signal zone
Again push  key. This terminates measuring and lets  lamp go out. An average signal value as well as time data are held.
- ③ To terminate measuring
Again push  key. This cancels HOLD and lets  lamp go out. After all this, normal measurement is restored.

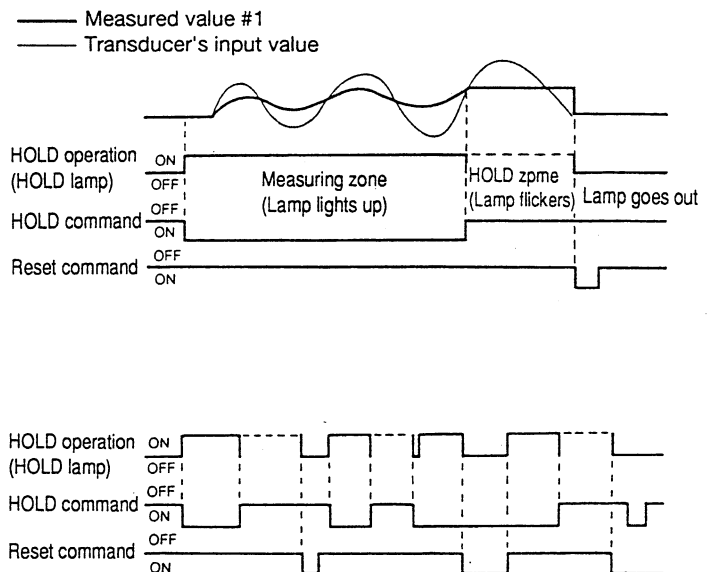
Average value measuring (through key operation)



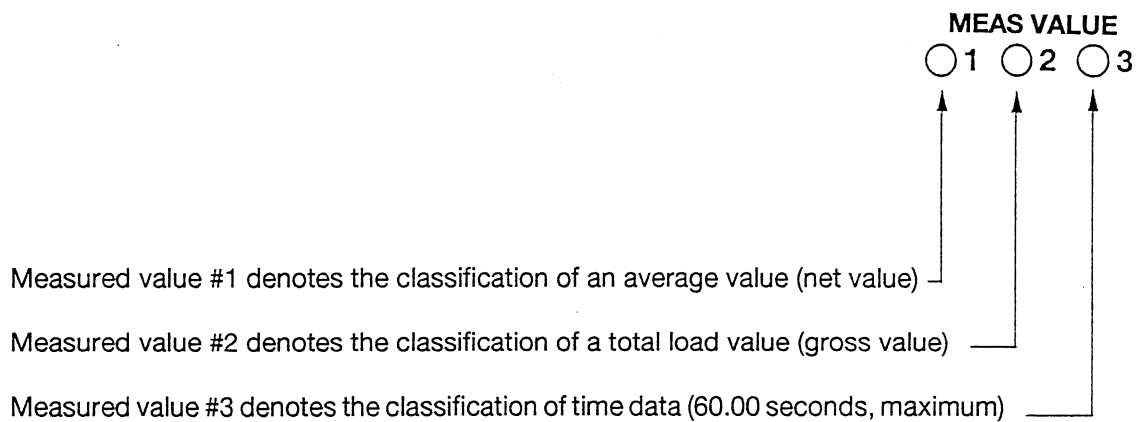
(2) To operate using an external contact signal

- ① To start measuring in a signal zone
Short-circuit #8 and #11 in the terminal board on the rear (i.e. execute an input common hold command). This starts measuring and lets  lamp go out.
- ② To terminate measuring in a signal zone
Cancel short-circuit on #8 and #11. This terminates measuring and lets  lamp change to flickering. An average signal value as well as time data are held.
- ③ To terminate measuring
Short-circuit #8 and #12 (i.e. execute an input common reset command) for 5ms or longer. This cancels HOLD and lets lamp  go out. After all this, normal measuring is restored.

Average value measuring (through external control input)



(3) Measured value classifications



NOTE

If you use a user-specifiable mode other than Mode [0] in the foregoing sample to specify a measuring signal zone, you will have a different timing chart too. See [4-6-2 User-specifiable modes].

High-speed peak HOLD measuring (Measuring mode #3)

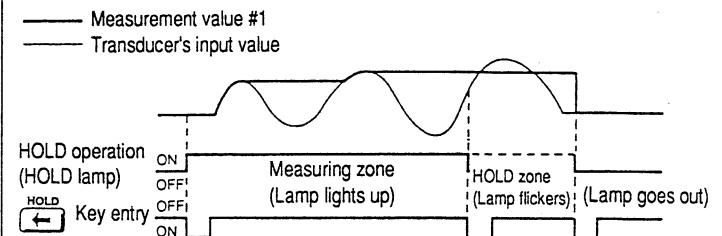
- Using the analog peak-hold function jointly, this function serves detection and holding of a peak signal value (a largest signal value) on a high-speed phenomenon during a measuring signal zone which is to be set with a user-specifiable mode. The measured value classification is indicated by a number lamp. ● 1 ○ 2 ○ 3
- To set a measuring signal zone, use either [0 (Externally sets a measuring signal zone)] or [1 (Externally sets a measuring period)].

• Operate keys as follows when you have selected Mode [0 (Externally sets a measuring signal zone)]

(1) To operate using front panel keys

- ① To start measuring in a signal zone
Push  key, and measuring will start, and  lamp will light up.
- ② To terminate measuring in a signal zone
Again push  key. This holds a peak value (a largest measured value), and lets  lamp go out.
- ③ To terminate measuring
Push  key once more. This cancels HOLD and lets  lamp go out. After all this, normal measuring is restored.

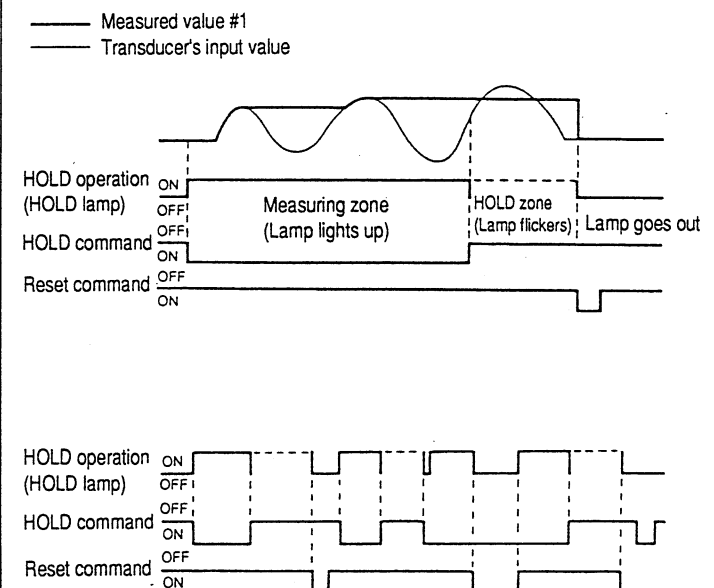
High-speed peak hold measuring (through key operation)



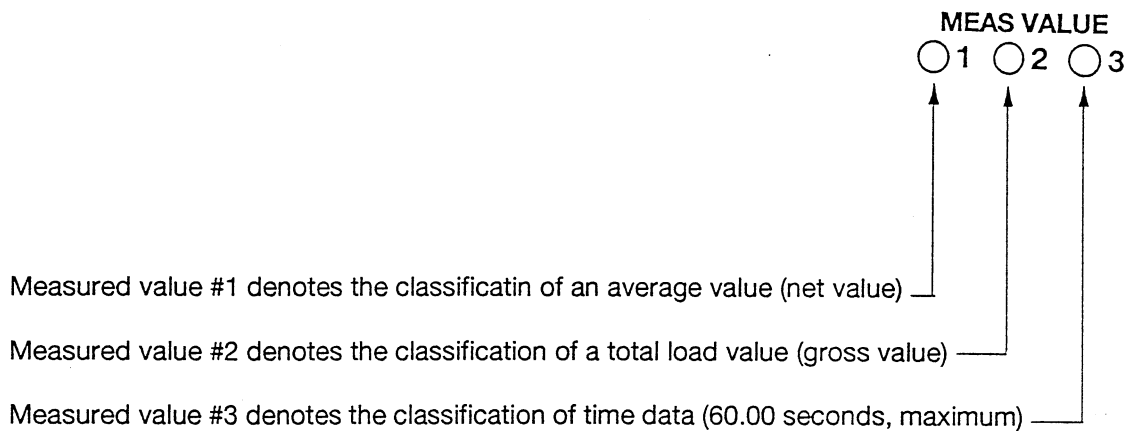
(2) To operate using an external contact signal

- ① To start measuring in a signal zone
Short-circuit #8 and #11 in the terminal board on the rear (i.e. execute an input common hold command). This starts measuring and lets  lamp light up.
- ② To terminate measuring in a signal zone
Cancel short-circuit on #8 and #11. This terminates measuring and lets  lamp change to flickering. A peak signal value collected in a measuring signal zone is held.
- ③ To terminate measuring
Short-circuit #8 and #12 (i.e. execute an input common reset command) for 5ms or longer. This terminates HOLD and lets  lamp go out. After all this, normal measurement is restored.

High-speed peak hold measuring (through external control input)



(3) Measured value classifications



NOTES

- If you have set Mode [1 (Externally sets a measuring period)] in the foregoing sample, you will have a different timing chart too. See [4-6-2 User-specifiable modes].
- Take the utmost care to set up a suitable smoothing function when you are to measure a

peak value on a high-frequency phenomenon, using a high-speed peak hold function. If a moving average time is long on an analog filter, it may result in a low peak value measured. Therefore set a shortest possible moving average time.

e) High-speed bottom hold measuring (Measuring mode #4)

- Using the analog peak-hold function jointly, this function serves detection and holding of a bottom signal value (a smallest signal value) on a high-speed phenomenon during a measuring signal zone which is set with a user-specifiable mode.

The measured value classification is indicated by a number lamp. $\overset{\text{MEAS VALUE}}{\bullet 1 \ 0 2 \ 0 3}$

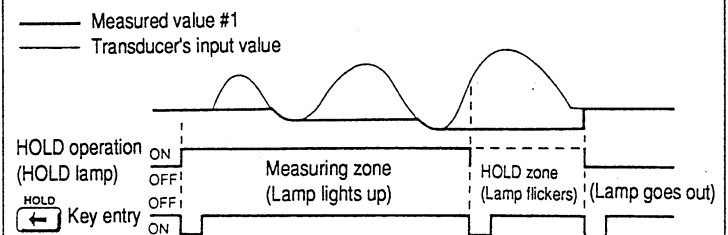
- To set a measuring signal zone, use either [0 (Externally sets a measuring signal zone)] or [1 (Externally sets a measuring period)].

• Operate keys as follows when you have selected Mode [0 (Externally sets a measuring signal zone)]

(1) To operate using front panel keys

- ① To start measuring in a signal zone
Push  key, and measuring will start, and $\overset{\text{HOLD}}{\bullet}$ lamp will light up.
- ② To terminate measuring in a signal zone
Again push  key. This holds a peak value (a largest measured value), and lets $\overset{\text{HOLD}}{\odot}$ lamp go out.
- ③ To terminate measuring
Push  key once more. This cancels HOLD and lets $\overset{\text{HOLD}}{\odot}$ lamp go out. After all this, normal measuring is restored.

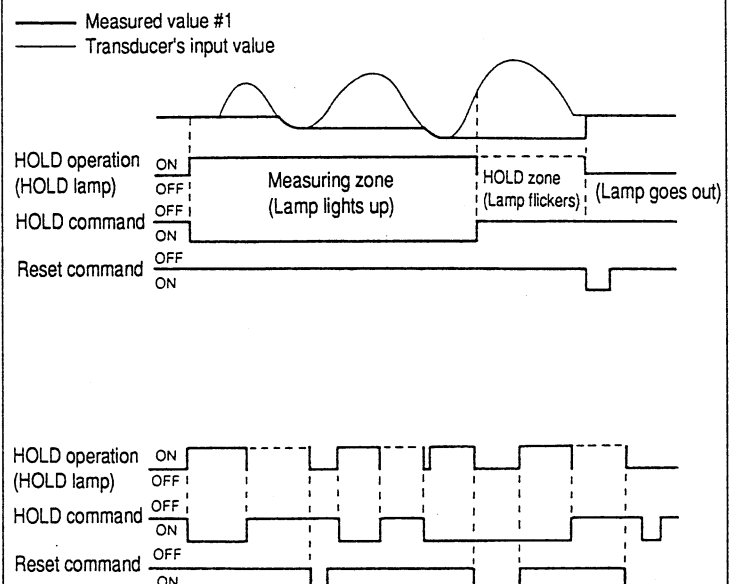
High-speed peak hold measuring (through key operation)



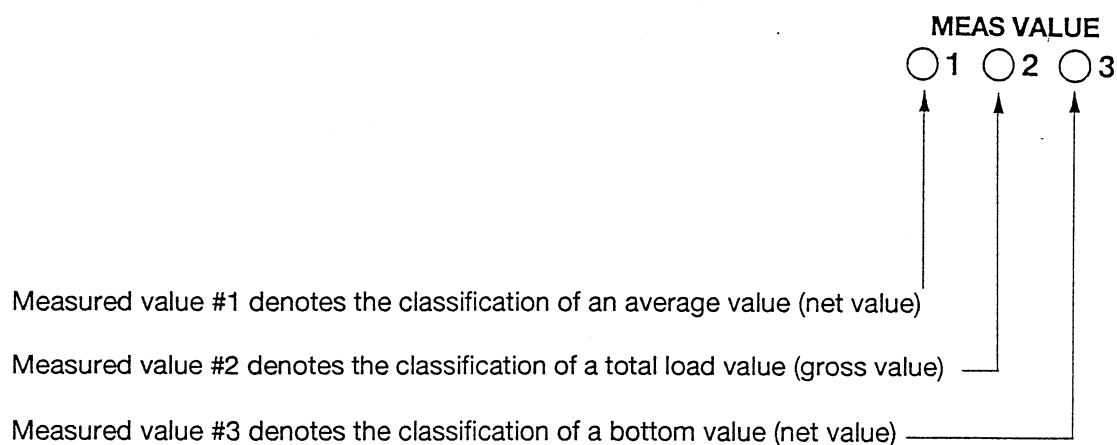
(2) To operate using an external contact signal

- ① To start measuring in a signal zone
Short-circuit #8 and #11 in the terminal board on the rear (i.e. execute an input common hold command). This starts measuring and lets $\overset{\text{HOLD}}{\bullet}$ lamp light up.
- ② To terminate measuring in a signal zone
Cancel short-circuit on #8 and #11. This terminates measuring and change $\overset{\text{HOLD}}{\odot}$ lamp to flickering. A bottom signal value collected in a measuring signal zone is held.
- ③ To terminate measuring
Short-circuit #8 and #12 (i.e. execute an input common reset command) for 5ms or longer. After all this, normal measurement is restored.

High-speed peak hold measuring (through external control input)



(3) Measured value classifications



NOTES

- If you have used Mode [1(Externally sets a measuring period)] in the foregoing sample, you will have a different timing chart too. See [4-6-2 User-specifiable modes].
- Take the utmost care to set up a suitable smoothing function when you are to measure a bottom value on a high-frequency phenomenon, using a high-speed bottom hold function. If a moving average time long on an analog filter it may result in a low bottom value measured. Therefore set a shortest possible moving average time.

f) High-speed peak & bottom hold measuring (Measuring mode #5)

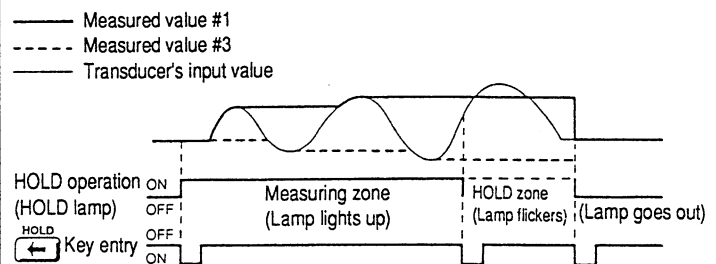
- Use this function to detect and hold a peak value (a largest signal value) as well as a bottom value (a smallest signal value) on a phenomenon in a measuring signal zone which is set with a user-specifiable mode. A peak value is classified as #1 value and a bottom value as #3 value. Classification lamps respectively light up to indicate these as follows: $\bullet_1 \circ_2 \circ_3$ and $\circ_1 \circ_2 \bullet_3$
- Select a measuring signal zone from six user-specifiable modes in all.

• Operate keys as follows when you have selected Mode [0 (Externally sets a measuring signal zone)]

(1) To operate using front panel keys

- ① To start measuring in a signal zone
Push $\leftarrow$ key, and measuring will start, and $\bullet$ lamp will light up.
- ② To terminate measuring in a signal zone
Again push $\leftarrow$ key. This holds a peak value and also a bottom value detected in a measuring signal zone.
- ③ To terminate measuring
Push $\leftarrow$ key once more. This cancels HOLD and lets $\circ$ lamp go out. After all this, normal measuring is restored.

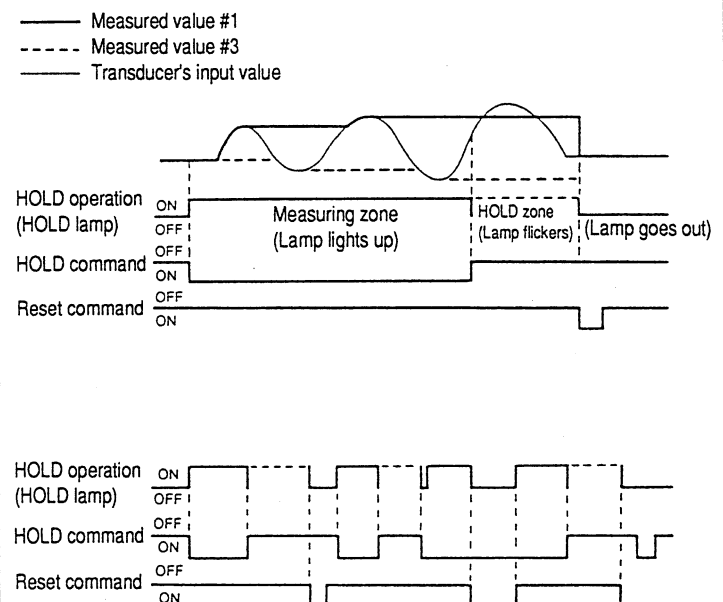
Peak & bottom hold measuring (through key operation)



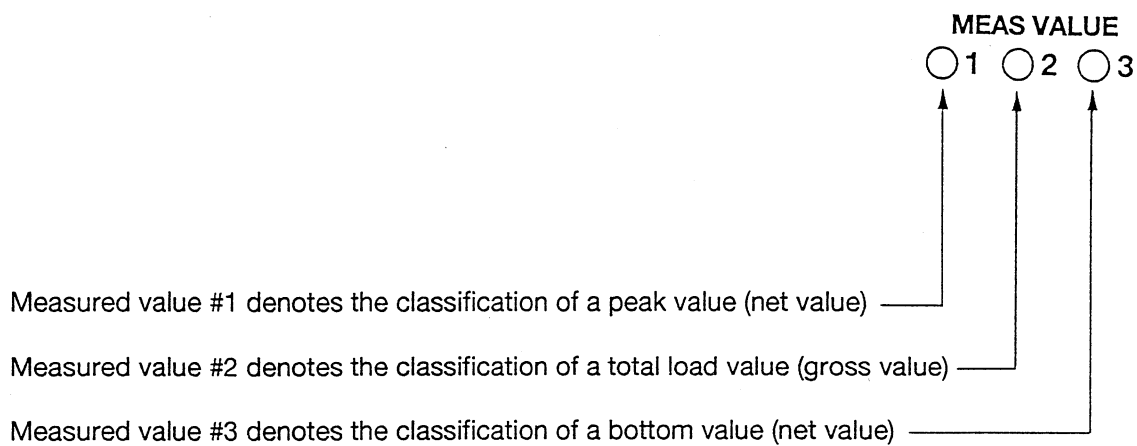
(2) To operate using an external contact signal

- ① To start measuring in a signal zone
Short-circuit #8 and #11 in the terminal board on the rear (i.e. execute an input common hold command). This starts measuring and lets $\bullet$ lamp light up.
- ② To terminate measuring in a signal zone
Cancel short-circuit on #8 and #11. This terminates measuring and change $\bullet$ lamp to flickering. Both peak and bottom values collected in a measuring signal zone are held.
- ③ To terminate measuring
Short-circuit #8 and #12 (i.e. execute an input common reset command) for 5ms or longer. After all this, normal measurement is restored.

Peak & bottom hold measuring (through external control input)



(3) Measured value classifications



NOTE

If you have used a user-specifiable mode other than Mode [0] in the foregoing sample to specify a measuring signal zone, you will have a different timing chart too. See [4-6-2 User-specifiable modes].

g) Simultaneous peak hold measuring (Measuring mode #6)

- Use this function to seek a deepest valley during a measuring signal zone, to collect a peak (1st peak) value which immediately precedes that valley, together with a later peak (2nd peak) value, and to hold the both.

The 1st peak value is classified as #1 measured value, a valley value as #2 measured value, and the 2nd peak value as #3 measured value.

These are indicated respectively by classification

lamps as follows: MEAS VALUE 1 2 3, MEAS VALUE 1 2 3 and MEAS VALUE 1 2 3

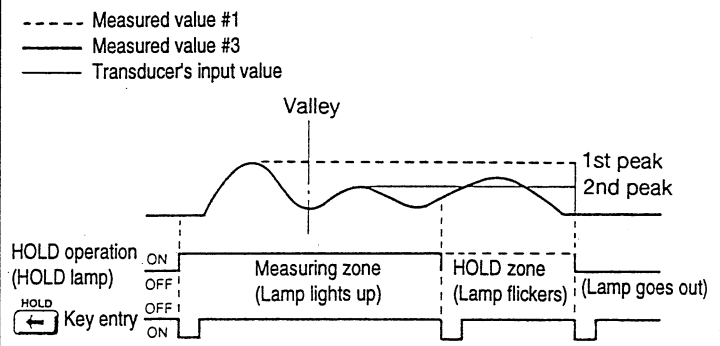
- Select a suitable mode from four user-specifiable modes to specify a measuring signal zone. Two modes cannot be used. They are: Mode [3 (Internally sets a measuring signal zone by specifying a level trigger's lower limit)] and Mode [5 (Internally sets a measuring period by specifying a level trigger's lower limit)].

• Operate keys as follows when you have selected Mode [0 (Externally sets a measuring signal zone)]

(1) To operate using front panel keys

- ① To start measuring in a signal zone
Push  key, and measuring will start, and  lamp will light up.
- ② To terminate measuring in a signal zone
Again push  key. This holds a peak value and a bottom value as well, which were detected in a signal zone.
- ③ To terminate measuring
Push  key once more. This cancels HOLD and lets  lamp go out.
After all this, normal measuring is restored.

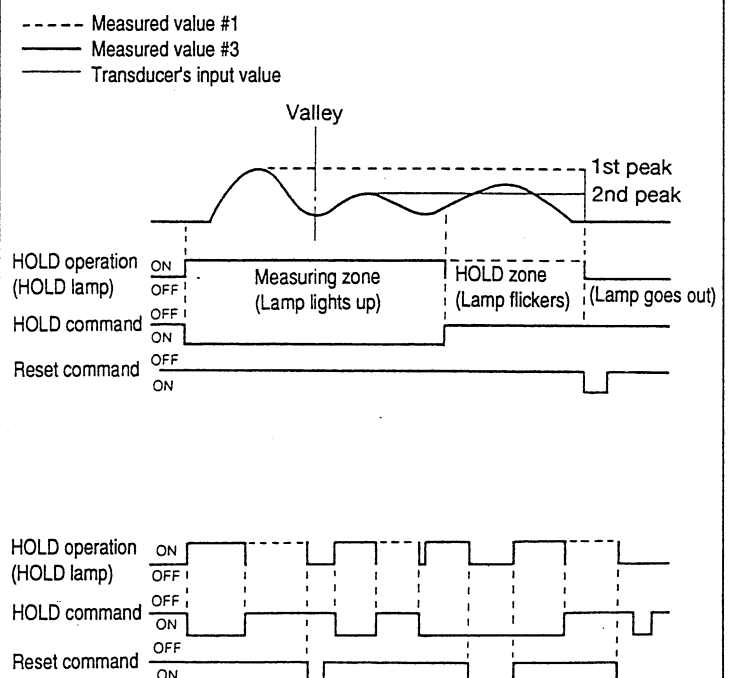
Peak & bottom hold measuring (through key operation)



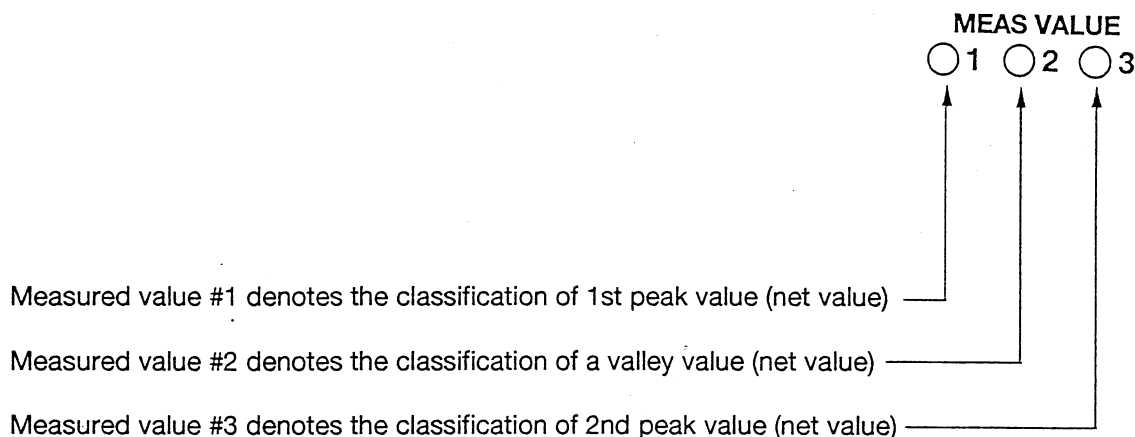
(2) To operate using an external contact signal

- ① To start measuring in a signal zone
Short-circuit #8 and #11 in the terminal board on the rear (i.e. execute an input common hold command). This starts measuring and lets  lamp light up.
- ② To terminate measuring in a signal zone
Cancel short-circuit on #8 and #11. This terminates measuring and change  lamp to flickering.
Both peak and bottom values, which were collected in a measuring signal zone, are held.
- ③ To terminate measuring
Short-circuit #8 and #12 (i.e. execute an input common reset command) for 5ms or longer.
After all this, normal measurement is restored.

Peak & bottom hold measuring (through external control input)



(3) Measured value classifications



NOTE

- If you have used a user-specifiable mode other than Mode [0] in the foregoing sample to specify a measuring signal zone, you will have a different timing chart too. See [4-6-2 User-specifiable modes].

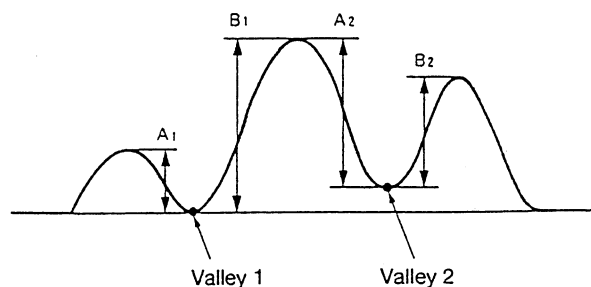
TIPS

- Depth of a valley

A valley is a portion of a signal waveform between two specified peak magnitudes of the same polarity. The depth of a valley is denoted by the difference from a smaller peak magnitude, either preceding or succeeding that valley point. A deepest valley is a valley whose difference is largest.

- Peak A1 is smaller than Peak B1 in magnitude, so Valley 1's depth is denoted by Peak A1 magnitude.

- As for Valley 2, Peak A2 is compared with Peak B2 in magnitude. Because B2's magnitude is smaller than the other, Valley 2's depth is denoted by Peak B2's magnitude.
- When Valley 1 and Valley 2 are compared, Valley 2 has a larger value. So Valley 2 (B2) is the deepest valley.



h) Peak & time measuring (Measuring mode #7)

- With this mode, a measuring zone starts where input signals cross a preset level upwards, and ends where input signals cross the said level downwards. A peak value (a largest value) as well as time data about duration of signals are measured and held.
- A measured value is classified as #1 value, and time data (60 seconds, max.) as #3 value. These are respectively indicated by Classification number lamps,

MEAS VALUE

● 1 ○ 2 ○ 3

and

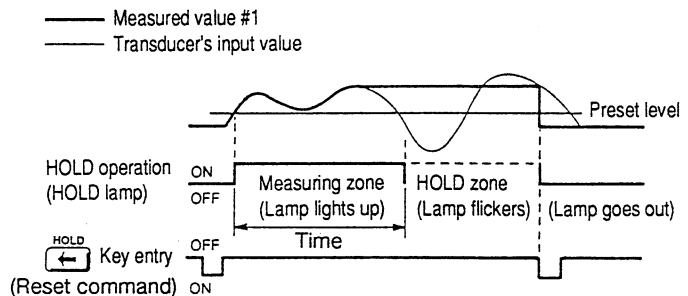
MEAS VALUE

○ 1 ○ 2 ● 3
- A user-specifiable mode is fixed to [2 (Internally sets a measuring signal zone by specifying a level trigger's upper limit)].

(1) To operate using front panel keys

- ① To start measuring in a signal zone
Make sure that  lamp light is out. If it is found otherwise, push  key to let it go out. When input signals go above a preset level in this situation, a measuring period starts, and  lights up.
- ② To terminate measuring in a signal zone
When input signals go below a preset level, measuring terminates and  lamp changes to flickering. A peak value collected in a signal zone as well as time data about measuring duration are held.
- ③ To terminate measuring
A push of  key terminates measuring and lets  lamp go out. If input signals go again above a preset level, measuring restarts automatically.

Peak & time measuring (through key operation)



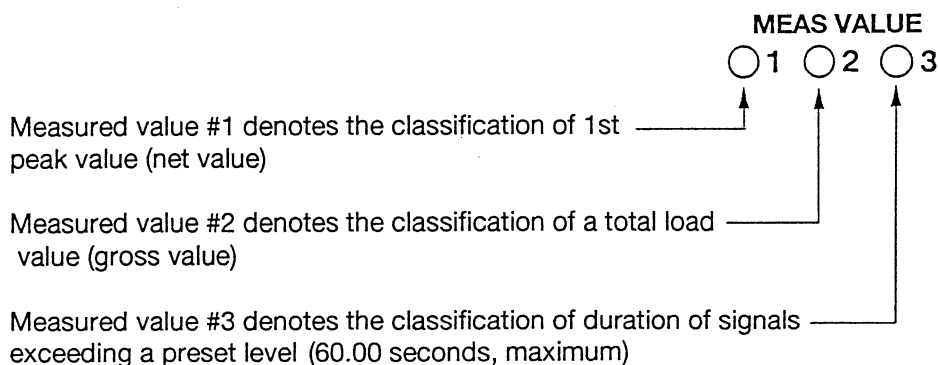
NOTES

- When operating using an external control input and a reset command, measuring is disabled if a reset command is in the [ON (i.e. short-circuited)] position. Therefore pay attention to the duration of a reset command.
- Also note that a HOLD command is ignored.

(2) To operate using an external contact signal

Short-circuit #8 and #12 in the terminal board on the rear (i.e. execute an input common reset command) for 5ms or longer. This has same effect as a push of  key. For more information about key operation, see the preceding [(1) To operate using front panel keys].

(3) Measured value classification



i) Time measuring (Measuring mode #8)

- Use this function to measure a period of time (60.00 seconds, maximum) which starts with switching [ON] of Comparator #1 and terminates with switching [ON] of Comparator #2. A measured value is classified as #3 value, and this classification is indicated by #3 classification lamp –  .
- NO user-specifiable mode can be used.

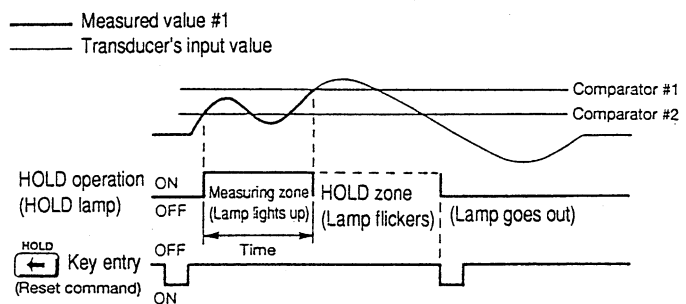
(1) To operate using front panel keys

- ① To start measuring in a signal zone
Make sure that  lamp light is out. If it is found otherwise, push  key to let it go out. If Comparator #1 is switched [ON] in this situation, measuring starts, and  lights up.
- ② To terminate measuring in a signal zone
At the time when Comparator #2 is switched [ON], measuring terminates and the lamp changes to  . Time data about duration of measuring is held and its classification value number is indicated by the #3 value classification lamp  .
- ③ To terminate measuring
A push of  key terminates measuring and lets  go out. If Comparator #1 is switched [ON] again, measuring restarts automatically.

(2) To operate using an external contact signal

Short-circuit #8 and #12 in the terminal board on the rear (i.e. execute an input common reset command) for 5ms or longer. This has same effect as a push of  key. For more information about key operation, see the preceding [(1) To operate using front panel keys].

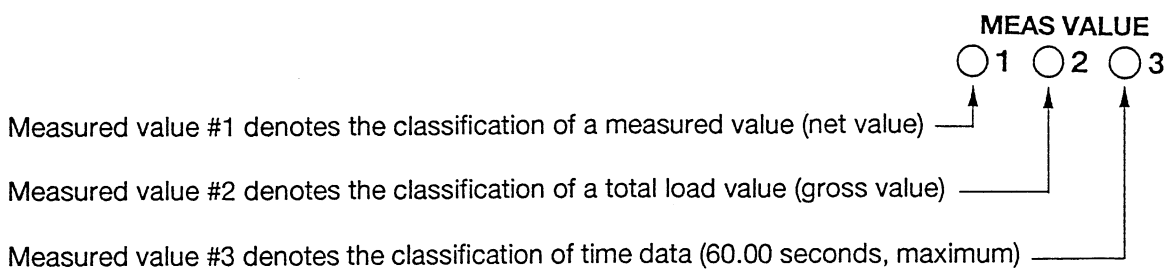
Peak & time measuring (through key operation)



NOTES

- When operating using an external control input and a reset command, measuring is disabled if a reset command is in the [ON (i.e. short-circuited)] position. Therefore pay attention to the duration of a reset command.
- Also note that a HOLD command is ignored.

(3) Measured value classification



j) Pressing input measuring (Measuring mode #9)

- With switching [ON] of Comparator #1, a measuring signal zone starts. If measured values in this zone vary exceeding a preset value (judging width) during a preset period of time (judging time), the measured value preceding the stated change in values is held as a measurement value of pressing input and indicated as #1 classified value.

In addition, the detected change in values (pressing input judging value) is measured through the peak holding operation and indicated as #3 classification value.

- No user-specifiable mode can be used.

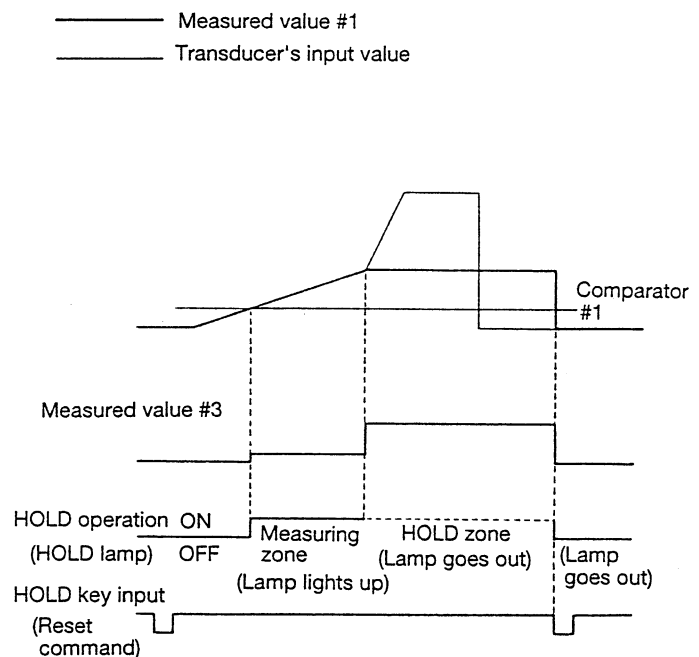
(1) To operate using front panel keys

- To start measuring in a signal zone
Make sure that  lamp light is out. If it is found otherwise, push  key to let it go out. If Comparator #1 is switched [ON] in this situation, measuring starts, and  lights up.
- To terminate measuring in a signal zone
When inputted signals have varied more than a judging width during a judging time, measuring terminates and the lamp changes to . Measured pressing input and pressing input judging value are maintained.
- To terminate measuring
A push of  key terminates measuring and lets  go out. If Comparator #1 is switched [ON] again, measuring restarts automatically.

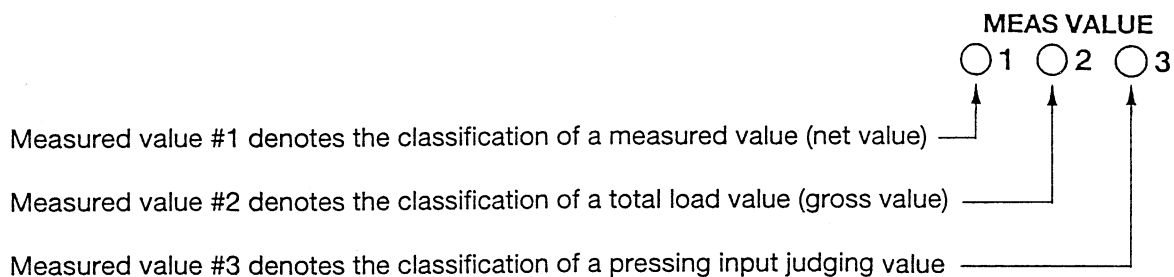
(2) To operate using an external contact signal

Short-circuit #8 and #12 in the terminal board on the rear (i.e. execute an input common reset command) for 5ms or longer. This has same effect as a push of  key. For more information about key operation, see the preceding [(1) To operate using front panel keys].

Pressing input measuring (through key operation)



(3) Measured value classification



Pressing input operation

(1) Parameters

Register the following parameters.

- Trigger level : Comparator #1's comparison value
- Judging time : Sampling time length for comparison between data
- Judging width : Data width whereby judgement is made on pressing input

(2) Measurement values

The following measurement values are indicated.

- Measured value #1: Measured pressing input value
- Measured value #2: Total load value
- Measured value #3: Pressing input judging value
= Data width between two peak values held per sampling time

(3) Operation

Operation starts when incoming signals exceed the trigger level (Comparator #1's comparison value).

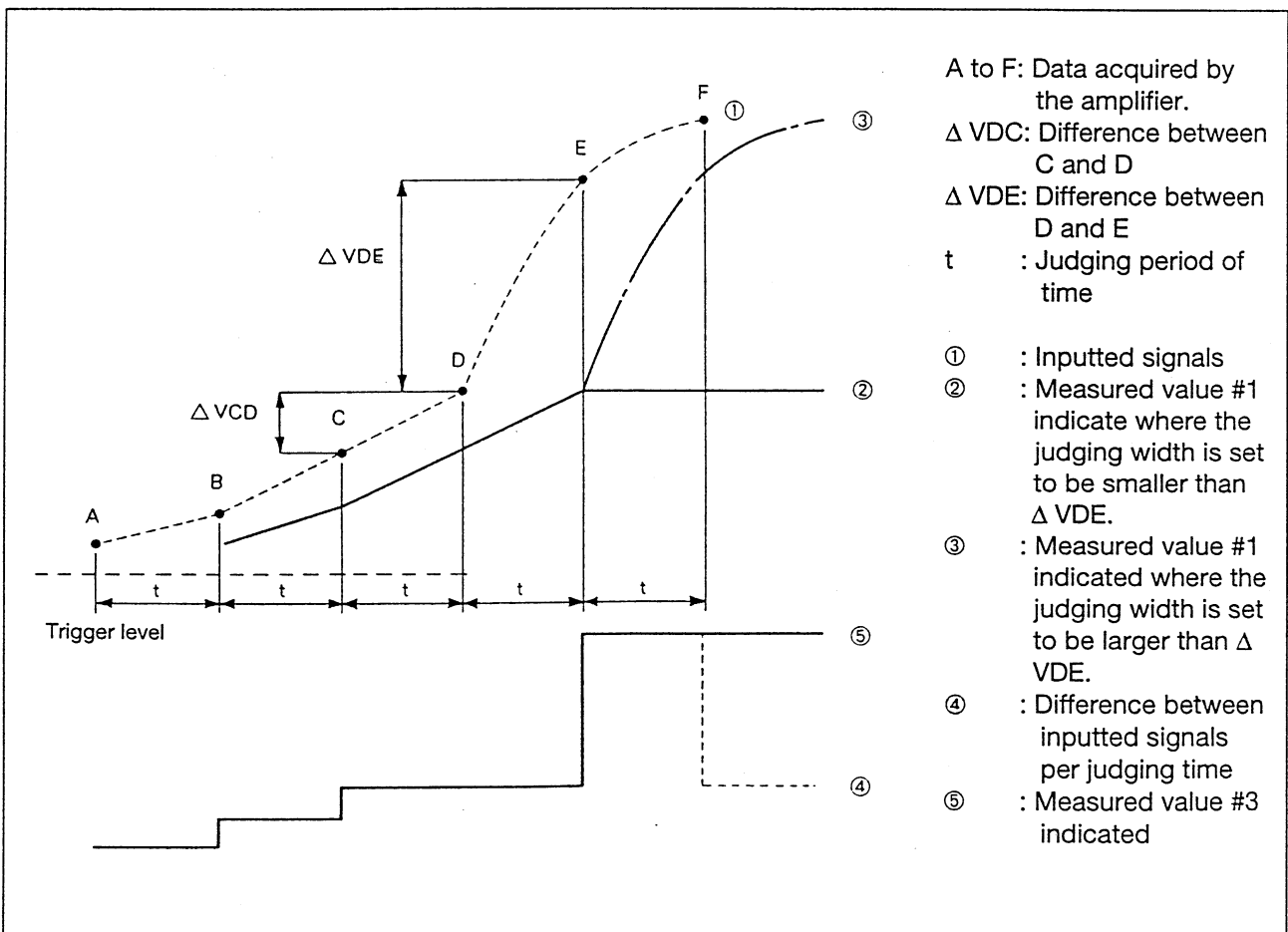
Data width per sampling time is calculated and compared with the preset judging width.

If the data width is found to be larger than the

judging width, the preceding data is judged to be the pressing input and the data value is held as Measured value #1. The difference between the two peak values held is also held as Measured value #3.

In the figure shown below, D is taken as a pressing input and held as Measured value #1.

Also, VDE is held as Measured value #3.



4-6-2 User-specifiable modes

- User-specifiable modes let you specify a measuring signal zone to measure signals using various measuring modes. Select a suitable user-specifiable mode from among six provided.
- To start and terminate measuring in a signal zone as well as to start and terminate measuring itself, you can use  key on the front panel or an external control input (hold/reset commands) in the termi-

nal board on the rear.

Priority is given in order of: A reset command comes, a hold command, and  key.

When you use  key on the front panel, therefore make sure that no reset nor hold command is short-circuited to the input common.

a) User-specifiable mode [0 (Externally sets a measuring signal zone)]

Where a HOLD signal exists is a measuring signal zone.

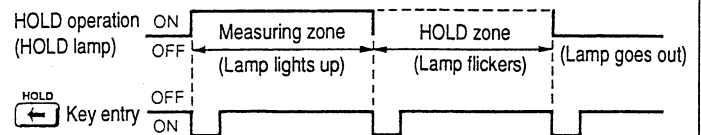
(1) To operate using front panel keys

- ① To start measuring in a signal zone
A push of  key starts measuring and lets  lights up.
- ② To terminate measuring in a signal zone
Another push of  key terminates measuring and lets  lamp change to flickering.
This holds measured values collected in a measuring signal zone.
- ③ To terminate measuring
A further push of  key cancels HOLD and lets  lamp go out.

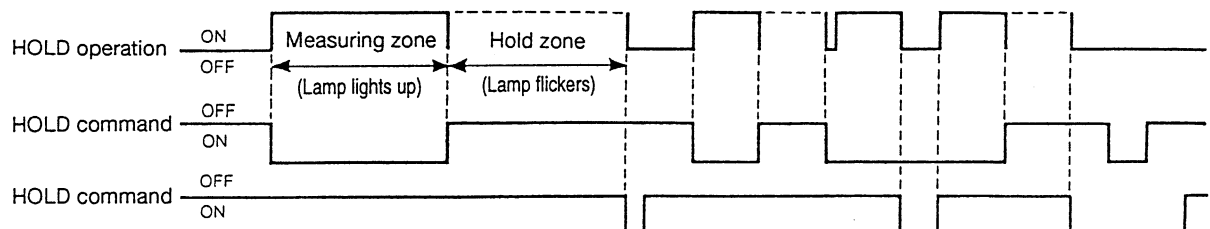
(2) To operate using an external contact signal

- ① To start measuring in a signal zone
Short-circuit #8 and #11 in the terminal board on the rear (i.e. execute an input common reset command). This starts a measuring and lets  lamp light up.
- ② To terminate measuring in a signal zone
Cancel short-circuit on #8 and #11 (i.e. execute an input common hold command). This terminates measuring and change  lamp to flickering.
- ③ To terminate measuring
Short-circuit #8 and #12 (i.e. execute an input common reset command) for 5ms or longer. This cancels HOLD and lets  lamp go out.

Externally setting a measuring signal zone (through key entry)



Externally setting a measuring signal zone (through external control input)



b) User-specifiable mode [1 (Externally sets a measuring period)]

This mode lets you set a measuring signal zone by specifying a measuring period (60 seconds, maximum).

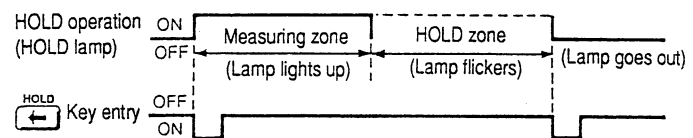
(1) To operate using front panel keys

- ① To start measuring in a signal zone
A push of  key starts measuring and lets  lights up.
- ② To terminate measuring in a signal zone
Another push of  key terminates measuring and lets  lamp change to flickering.
This holds measured values collected in a measuring signal zone.
- ③ To terminate measuring
A further push of  key cancels HOLD and lets  lamp go out.

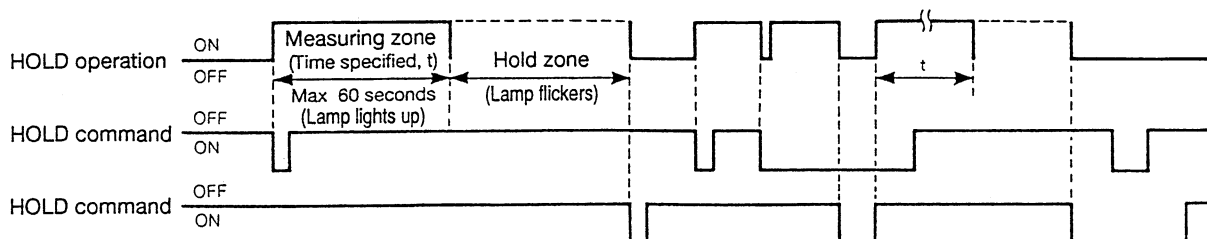
(2) To operate using an external contact signal

- ① To start measuring in a signal zone
Short-circuit #8 and #11 in the internal board on the rear (i.e. execute an input common reset command) for 5ms or longer. This starts measuring and let  lamp light up.
- ② To terminate measuring in a signal zone
Cancel short-circuit on #8 and #11. This terminates measuring and change  lamp to flickering.
- ③ To terminate measuring
Short-circuit #8 and #12 (i.e. execute an input common reset command) for 5ms or longer. This cancels HOLD and lets  lamp go out.

Externally setting a measuring period (through key entry)



Externally setting a measuring period (through external control input)



c) User-specifiable mode [2 (Sets a measuring signal zone by specifying a level trigger's upper limit)]

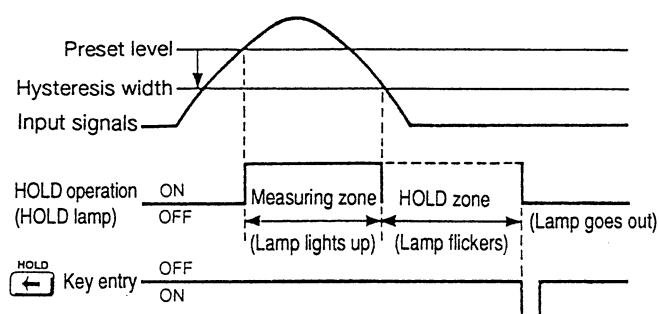
This mode lets you set an upper limit value to a level trigger as well as a hysteresis width.

A measuring signal zone is such that measuring starts where input signal values go above a preset upper limit value and terminates where input signal values go down as much as a hysteresis width below a preset upper limit value.

(1) To operate using front panel keys

- ① To start measuring in a signal zone
When input signals go above a preset level, measuring starts and  lights up.
- ② To terminate measuring in a signal zone
When input signals go down as much as a hysteresis width below a preset level, measuring terminates and  changes to flickering. Measured values collected during in a signal zone are held.
- ③ To terminate measuring
A push of  key cancels HOLD and lets  lamp go out.

Setting a measuring signal zone by specifying a level trigger's upper limit (through key entry)

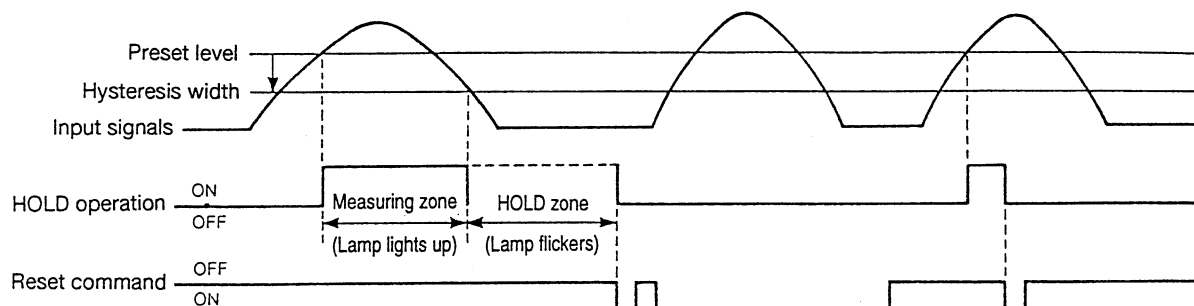


(2) To operate using an external contact signal

- ① To start measuring in a signal zone
When input signals go above a preset level, measuring starts and  lights up.
- ② To terminate measuring in a signal zone
When input signals go down as much as a hysteresis width below a present level, measuring terminates, and  goes out. Measured vlaues collected in a signal zone are held.

- ③ To terminate measuring
Shot-circuit #8 and #12 in the terminal board on the rear (i.e. execute an input common reset command) for 5ms or longer. This cancels HOLD and lets  go out.

Setting a measuring signal zone by specifying a level trigger's upper limit (through external control input)



d) User-specifiable mode [3 (Sets a signal ZONE by specifying a level trigger's lower limit)]

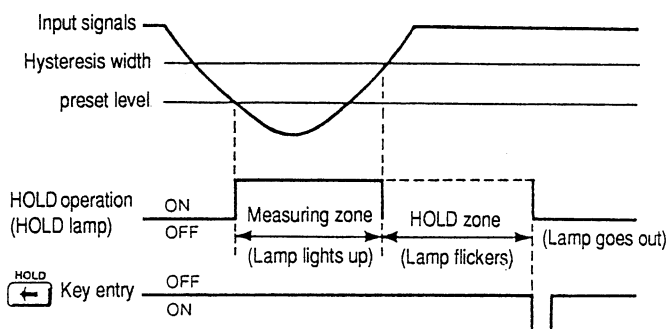
This mode lets you set a lower limit to a level trigger value as well as a hysteresis width.

A measuring zone is such that measuring starts when input signals go below a trigger level and terminates when input signals go down as much as a hysteresis width above a lower limit.

(1) To operate using front panel keys

- ① To start measuring in a signal zone
Measuring starts when input signals go over a preset level and **HOLD** lights up.
- ② To terminate measuring in a signal zone
When input signals down as much as a hysteresis width above a preset level, measuring terminates and **HOLD** changes to flickering. Measured values collected in a signal zone are held.
To terminate measuring
- ③ A push of  key cancels HOLD and lets **HOLD** lamp go out.

Setting a measuring signal zone by specifying a level trigger's lower limit (through key entry)

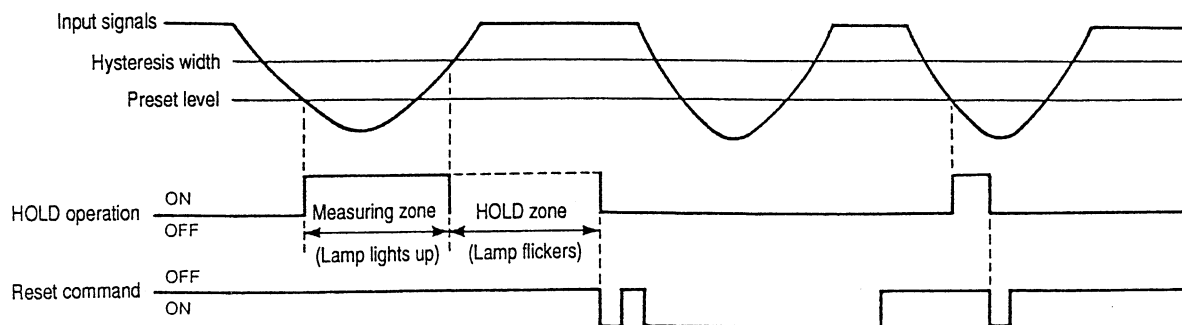


(2) To operate using an external contact signal

- ① To start measuring in a signal zone
When input signals go below a preset level, measuring starts and **HOLD** lights up.
- ② To terminate measuring in a signal zone
When input signals go above as much as a hysteresis width above a preset level, measuring terminates, and **HOLD** flickers. Measured values collected in a signal zone are held.

- ③ To terminate measuring
Shot-circuit #8 and #12 (i.e. execute an input common reset command) for 5ms or longer. This cancels HOLD and lets **HOLD** go out.

Setting a measuring signal zone by specifying a level trigger's lower limit (through external control input)



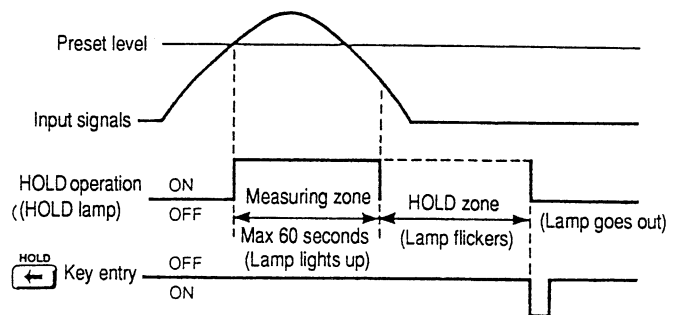
e) User-specifiable mode [4 (Sets a measuring period by specifying a level trigger's upper limit)

This mode lets you set an upper limit value to a level trigger as well as a measuring period of time (60 seconds, maximum). A measuring signal zone is such that measuring continues for a specified period of time after input signals go above a preset trigger level.

(1) To operate using front panel keys

- ① To start measuring in a signal zone
Measuring starts when input signals go above a preset level and  lamp lights up.
- ② To terminate measuring in a signal zone
After a specified period of time, measuring terminates, and  lamp changes to flickering.
Measured values collected in a signal measuring zone are held.
- ③ To terminate measuring
A push of  key cancels HOLD and lets  lamp go out.

Setting a measuring period by specifying a level trigger's upper limit (through key entry)

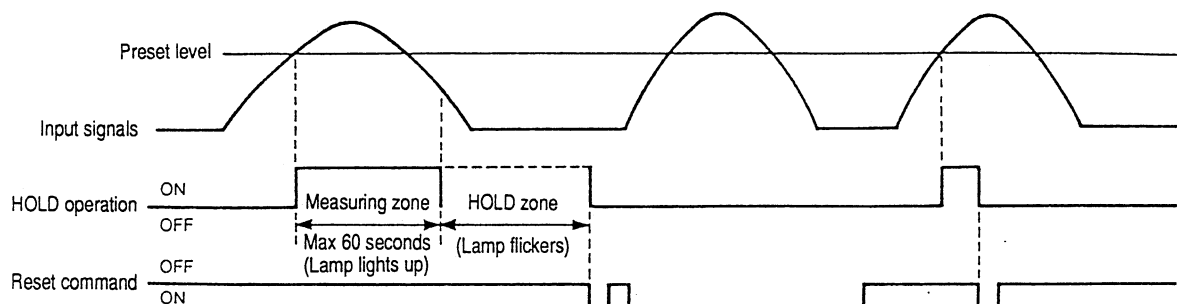


(2) To operate using an external contact signal

- ① To start measuring in a signal zone
When input signals go above a preset level, measuring starts and  lamp lights up.
- ② To terminate measuring in a signal zone
After a specified period of time, measuring terminates, and  lamp changes to flickering.
Measured values collected in a measuring signal zone are held.

- ③ To terminate measuring
Shot-circuit #8 and #12 in the terminal board on the rear (i.e. execute an input common reset command) for 5ms or longer.
This cancels HOLD and lets  lamp go out.

Setting a measuring period by specifying a level trigger's upper limit (through external control input)



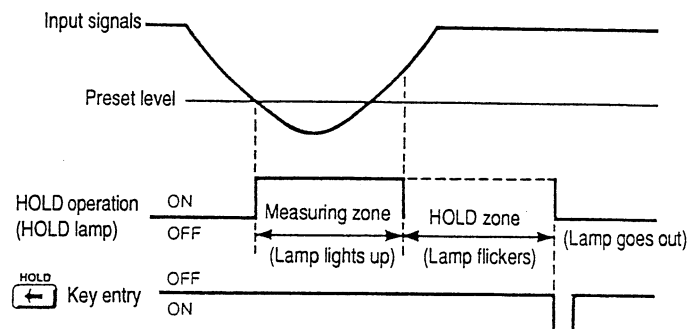
f) User-specifiable mode [5 (Sets a measuring period by specifying a level trigger's lower limit)

This mode lets you set a lower limit value to a level trigger as well as a measuring period of time (60 seconds, maximum). A measuring signal zone is such that measuring continues for a specified period of time after input signals go below a preset trigger level.

(1) To operate using front panel keys

- ① To start measuring in a signal range
Measuring starts when input signals go below a preset level and  lamp lights up.
- ② To terminate measuring in a signal zone
After a specified period of time, measuring terminates, and  lamp changes to flickering.
Measured values collected in a signal zone are held.
- ③ To terminate measuring
A push of  key cancels HOLD and lets  lamp go out.

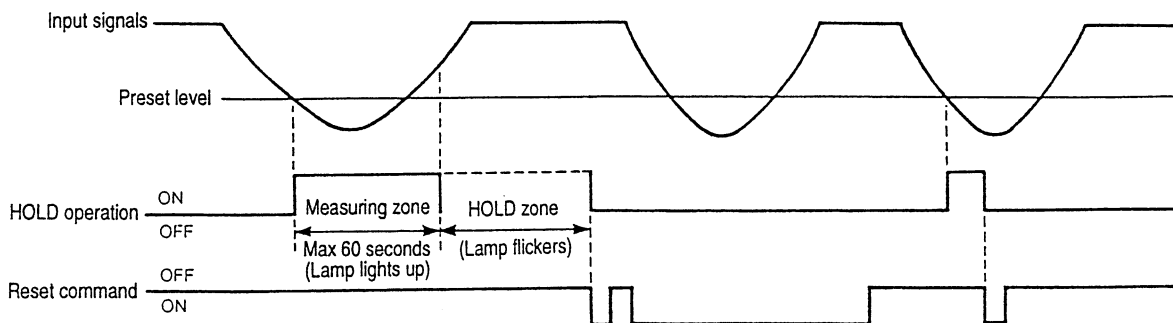
Setting a measuring period by specifying a level trigger's lower limit (through key entry)



(2) To operate using an external contact signal

- ① To start measuring in a signal zone
When input signals go below a preset level, measuring starts and  lamp lights up.
- ② To terminate measuring in a signal zone
After a specified period of time, measuring terminates, and  lamp changes to flickering.
Measured values collected in a signal measuring zone are held.
- ③ To terminate measuring
Short-circuit #8 and #12 in the terminal board on the rear (i.e. execute an input common reset command) for 5ms or longer.
This cancels HOLD and lets  lamp go out.

Setting a measuring period by specifying a level trigger's lower limit (through external control input)



• Table of measuring functions

Measuring mode		Measured value classification			User-specifiable mode					
					0	1	2	3	4	5
		Measured value #1	Measured value #2	Measured value #3	External signal		Level trigger			
					Zone specified	Time specified	Up-per limit	Lower limit	Up-per limit	Lower limit
0	Normal measuring	Measured value (net)	Total load value (gross load)	Zero correction value (tare value)	X	X	X	X	X	X
1	HOLD measuring at an optional point	Measured value at an optional point	Total load value	Zero correction value	○	X	X	X	X	X
2	Average value measuring	Average value measured	Total load value	Time (second)	○	○	○	○	○	○
3	High-speed peak HOLD measuring	High-speed peak value measured	Total load value (slow falling)	Zero correction value	○	○	X	X	X	X
4	High-speed bottom HOLD measuring	High-speed bottom value measured	Total load value (slow rising)	Zero correction value	○	○	X	X	X	X
5	Peak & bottom HOLD measuring	Peak value measured	Total load value	Bottom value measured	○	○	○	○	○	○
6	Simultaneous peak HOLD measuring	1st peak value measured	Valley value measured	2nd peak value measured	○	○	○	X	○	X
7	Peak & time measuring	Peak value measured	Total load value	Time (second)	X	X	○	X	X	X
8	Time measuring	Measured value	Total load value	Time (second)	X	X	X	X	X	X
9	Pressing input measuring	Pressing input measured	Total load value	Pressing input judging value	X	X	X	X	X	X

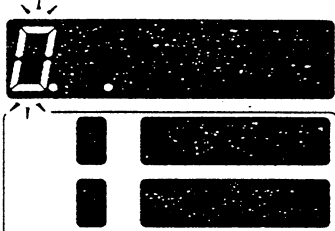
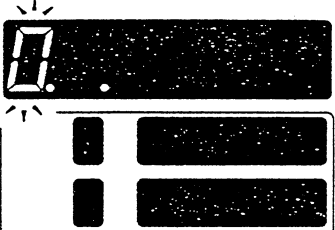
4-6-3 How to set measuring functions

Lamp indication: ● lights up; ○ goes out; ✨ flickers; -● momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display																																																																																																	
① MEASRNG 6	COMPARE7 LOCK8 DISPLAY9 HOLD JUDGE4 SMOOTH5 MEASRNG6 SENSVTY1 ACTL LD2 N-ZERO3 C-ZERO+/- OPTION0 APPLCTN. CANCEL ENTER	• In Measuring Mode 0: Main display reads the mode number 0; Sub-display #1 and #2 appear blank. 0																																																																																																	
② ENTER	JUDGE4 SMOOTH5 MEASRNG6 SENSVTY1 ACTL LD2 N-ZERO3 C-ZERO+/- OPTION0 APPLCTN. CANCEL ENTER	0																																																																																																	
③ Enter a measuring mode number and a user-specifiable mode number. X. X. User-specifiable mode Measuring mode <table><tr><th rowspan="3"></th><th rowspan="3"></th><th colspan="2">External signal</th><th colspan="4">Level trigger</th></tr><tr><th rowspan="2">Zone specified</th><th rowspan="2">Time specified</th><th colspan="2">Zone specified</th><th colspan="2">Time specified</th></tr><tr><th>Upper limit</th><th>Lower limit</th><th>Upper limit</th><th>Lower limit</th></tr><tr><td>0</td><td>Normal measuring</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr><tr><td>1</td><td>HOLD measuring at an optional point</td><td>○</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr><tr><td>2</td><td>Average value measuring</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr><tr><td>3</td><td>High-speed peak HOLD measuring</td><td>○</td><td>○</td><td>X</td><td>X</td><td>X</td><td>X</td></tr><tr><td>4</td><td>High-speed bottom HOLD measuring</td><td>○</td><td>○</td><td>X</td><td>X</td><td>X</td><td>X</td></tr><tr><td>5</td><td>Peak & bottom HOLD measuring</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td><td>○</td></tr><tr><td>6</td><td>Simultaneous peak HOLD measuring</td><td>○</td><td>○</td><td>○</td><td>X</td><td>○</td><td>X</td></tr><tr><td>7</td><td>Peak & time measuring</td><td>X</td><td>X</td><td>○</td><td>X</td><td>X</td><td>X</td></tr><tr><td>8</td><td>Time measuring</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr><tr><td>9</td><td>Pressing input measuring</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td></tr></table>			External signal		Level trigger				Zone specified	Time specified	Zone specified		Time specified		Upper limit	Lower limit	Upper limit	Lower limit	0	Normal measuring	X	X	X	X	X	X	1	HOLD measuring at an optional point	○	X	X	X	X	X	2	Average value measuring	○	○	○	○	○	○	3	High-speed peak HOLD measuring	○	○	X	X	X	X	4	High-speed bottom HOLD measuring	○	○	X	X	X	X	5	Peak & bottom HOLD measuring	○	○	○	○	○	○	6	Simultaneous peak HOLD measuring	○	○	○	X	○	X	7	Peak & time measuring	X	X	○	X	X	X	8	Time measuring	X	X	X	X	X	X	9	Pressing input measuring	X	X	X	X	X	X	NOTE Modes marked by X cannot be used.
				External signal		Level trigger																																																																																													
				Zone specified	Time specified	Zone specified		Time specified																																																																																											
	Upper limit	Lower limit				Upper limit	Lower limit																																																																																												
0	Normal measuring	X	X	X	X	X	X																																																																																												
1	HOLD measuring at an optional point	○	X	X	X	X	X																																																																																												
2	Average value measuring	○	○	○	○	○	○																																																																																												
3	High-speed peak HOLD measuring	○	○	X	X	X	X																																																																																												
4	High-speed bottom HOLD measuring	○	○	X	X	X	X																																																																																												
5	Peak & bottom HOLD measuring	○	○	○	○	○	○																																																																																												
6	Simultaneous peak HOLD measuring	○	○	○	X	○	X																																																																																												
7	Peak & time measuring	X	X	○	X	X	X																																																																																												
8	Time measuring	X	X	X	X	X	X																																																																																												
9	Pressing input measuring	X	X	X	X	X	X																																																																																												
④ ENTER		Regular display is restored.																																																																																																	

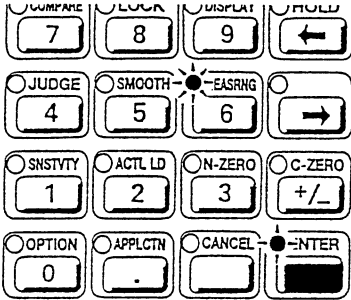
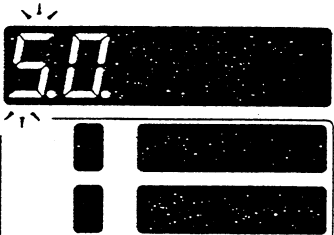
Example: a) Setting Normal measuring mode

Lamp indication: ● lights up; ○ goes out; ✨ flickers; -●- momentarily illuminates

Key to be oprated	Lamp indication on Setter	Reading on Display
① MEASRNG 6 ② ENTER	COMPARE 7 LOCK 8 DISPLAY 9 HOLD JUDGE 4 SMOOTH 5 EASRNG 6 SNSTVTY 1 ACTL LD 2 N-ZERO 3 C-ZERO +/- OPTION 0 APPLCTN CANCEL ENTER	• In Measuring Mode 0: Main display reads the mode number 0; Sub-display #1 and #2 appear blank. 
Enter a measuring mode number and a user-specifiable mode number X. X. └ User-specifiable mode (Nil) └ Measuring mode 0 ③ 0 ④ ENTER	In this sample, [0] is keyed in.	Sub-display #1 and #2 appear blank.  Regualr display is restored.

Example: f) Setting Peak & bottom HOLD measuring mode (and User specifiable mode 0)

Lamp indication: ● lights up; ○ goes out; ⚡ flickers; -●- momentarily illuminates

Key to be oprated	Lamp indication on Setter	Reading on Display
① MEASRNG 6 ↓ ② ENTER 		• In Measuring Mode 0: Main display reads the mode number 0; Sub-display #1 and #2 appear blank. 
Enter a measuring mode number and a user-specifiable mode number X. X. └─ User-specifiable mode 0 └─ Measuring mode 5 ③ 5 ↓ ④ 0 ↓ ⑤ ENTER 	In this sample, [50] is keyed in.	Sub-display #1 and #2 appear blank.  Regualr display is restored.

Example: f) Setting Peak & bottom HOLD measuring mode (and User specifiable mode 1)

Lamp indication: ● lights up; ○ goes out; ✨ flickers; ⚡ momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
① MEASRNG 6 ② ENTER		• In Measuring Mode 0: Main display reads the mode number 0; Sub-display #1 and #2 appear blank.
Enter a measuring mode number and a user-specifiable mode number X. X. └─ User-specifiable mode 0 └─ Measuring mode 5 ③ 5 ④ 1 ⑤ ENTER	In this sample, key in [51].	
⑥ Enter a period of time XX.XX—S └─ Period of time to be specified (00.00–60.00 seconds with a fixed decimal point)	In this sample, key in 10.00 (seconds).	Sub-display #1 appears blank, and Sub-display #2 gives a specified time.
⑦ End of setting ENTER		Regular display is restored.
Confirm a registered value ① MEASRNG 6 → ② CANCEL		

Example: f) Setting Peak & bottom HOLD measuring mode (and User specifiable mode 2)

Lamp indication: ● lights up; ○ goes out; ✨ flickers; -● momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
① MEASRNG 6 ↓ ② ENTER		In Measuring Mode 0: Main display reads the mode number 0; Sub-display #1 and #2 appear blank.
Enter a measuring mode number and a user-specifiable mode number X. X. └─ User-specifiable mode 2 └─ Measuring mode 5 ③ ④ ⑤ 5 2 ENTER	In this sample, [52] is keyed in.	
⑥ Enter a trigger level +/- XXXXX └─ Trigger level (5 digits and a prefixed sign) ⑦ ENTER	In this sample, 00500 is keyed in. (You can prefix a minus (-) sign either during or in the end of typing numerals. It automatically goes on the top of a number you type.)	Sub-display #1 shows a trigger level; Sub-display #2 shows a hysteresis width.
⑧ Enter a hysteresis width XXXXX └─ Hysteresis width (5 digits with no prefix)	In this sample, 00005 is keyed in.	Sub-display #2 shows a hysteresis width.
⑨ End of setting ENTER		Regular display is restored.
Confirm a registered value ① MEASRNG ② CANCEL 6		

Example: f) Setting Peak & bottom HOLD measuring mode (and User specifiable mode 3)

Lamp indication: ● lights up; ○ goes out; ✨ flickers; ⚡ momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
① MEASRNG 6 ↓ ② ENTER ENTER		In Measuring Mode 0: Main display reads the mode number 0; Sub-display #1 and #2 appear blank.
Enter a measuring mode number and a user-specifiable mode number X. X. └─ User-specifiable mode 3 └─ Measuring mode 5 ③ ④ ⑤ 5 → 3 → ENTER 5 3 ENTER	In this sample, [53] is keyed in.	
⑥ Enter a trigger level +/- XXXXX └─ Trigger level (5 digits and a prefixed sign) ⑦ ENTER ENTER	In this sample, 00500 is keyed in. (You can prefix a minus (-) sign either during or in the end of typing numerals. It automatically goes on the top of a number you type.)	Sub-display #1 shows a trigger level; Sub-display #2 shows a hysteresis width.
⑧ Enter a hysteresis width XXXXX └─ Hysteresis width (5 digits with no prefix)	In this sample, 00005 is keyed in.	Sub-display #2 shows a hysteresis width.
⑨ End of setting ENTER ENTER		Regular display is restored.
Confirm a registered value ① MEASRNG ② CANCEL 6 → 6 CANCEL		

Example: f) Setting Peak & bottom HOLD measuring mode (and User specifiable mode 4)

Lamp indication: ● lights up; ○ goes out; ✨ flickers; -●- momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
① MEASRNG 6 ↓ ② ENTER		In Measuring Mode 0: Main display reads the mode number 0; Sub-display #1 and #2 appear blank.
Enter a measuring mode number and a user-specifiable mode number X. X. └─ User-specifiable mode 3 └─ Measuring mode 5 ③ ④ ⑤ 5 4 ENTER	In this sample, [53] is keyed in.	
⑥ Enter a trigger level +/- X X X X X └─ Trigger level (5 digits and a prefixed sign) ⑦ ENTER	In this sample, 00500 is keyed in. (You can prefix a minus (-) sign either during or in the end of typing numerals. It automatically goes on the top of a number you type.)	Sub-display #1 shows a trigger level; Sub-display #2 shows a hysteresis width.
⑧ Enter a period of time X X . X X _S └─ Period of time to be specified. (00.00~60.00 seconds with a fixed decimal point)	In this sample, 10.00 (seconds) are keyed in.	
⑨ End of setting ENTER		Regular display is restored.
Confirm a registered value. ① MEASRNG ② CANCEL 6 →		

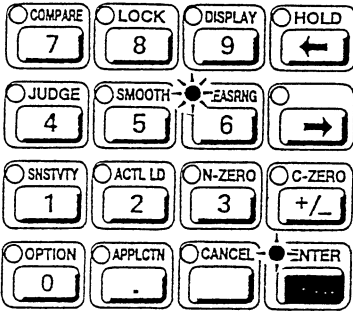
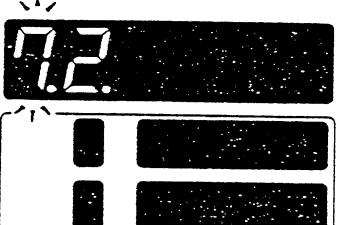
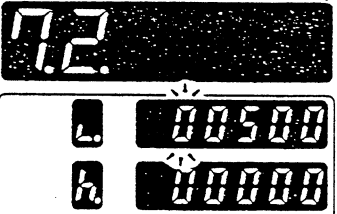
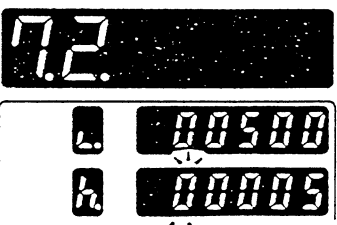
Example: f) Setting Peak & bottom HOLD measuring mode (and User specifiable mode 5)

Lamp indication: ● lights up; ○ goes out; ✨ flickers; ✨ momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
① MEASRG 6 ↓ ② ENTER ENTER		• In Measuring Mode 0: Main display reads the mode number 0; Sub-display #1 and #2 appear blank.
Enter a measuring mode number and a user-specifiable mode number X. X. └─ User-specifiable mode 5 └─ Measuring mode 5 ③ ④ ⑤ 5 → 5 → ENTER	In this sample, [55] is keyed in.	
⑥ Enter a trigger level +/- X X X X X └─ Trigger level (5 digits and a prefixed sign) ⑦ ENTER ENTER	In this sample, 00500 is keyed in. (You can prefix a minus (-) sign either during or in the end of typing numerals. It automatically goes on the top of a number you type.)	Sub-display #1 shows a trigger level; Sub-display #2 shows a hysteresis width.
⑧ Enter a period of time X X . X X _ S └─ Period of time to be specified. (00.00-60.00 seconds with a fixed decimal point)	In this sample, 10.00 (seconds) are keyed in.	
⑨ End of setting ENTER ENTER		Regular display is restored.
Confirm a registered value ① MEASRG ② CANCEL 6 →		

Example: h) Setting Peak & time measuring mode

Lamp indication: ● lights up; ○ goes out; ✨ flickers; -●- momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
①  ② 		• In Measuring Mode 0: Main display reads the mode number 0; Sub-display #1 and #2 appear blank. 
Enter a measuring mode number and a user-specifiable mode number X. X. └─ User-specifiable mode └─ Measuring mode 7 ③  ④ 	In this sample, [7] is keyed in. Key in 7 to set Measuring mode 7, and <u>User-specifiable mode 2 will then be automatically registered.</u>	
⑤ Enter a trigger level  X X X X X └─ Trigger level (5 digits and a prefixed sign) ⑥ 	In this sample, 00500 is keyed in. (You can prefix a minus (-) sign either during or in the end of typing numerals. It automatically goes on the top of a number you type.)	Sub-display #1 shows a trigger level; Sub-display #2 shows a hysteresis width. 
⑦ Enter a hysteresis width X X X X X └─ Hysteresis width (5 digits with no prefix)	In this sample, 00005 are keyed in.	Sub-display #2 shows a hysteresis width. 
⑧ End of setting 		Regular display is restored.
Confirm a registered value ①  ② 		

Example: i) Setting Time measuring

- Prior to setting this measuring function, make sure that what allotments Comparator #1 and #2 have.

- How to make sure of allotments

To make sure of Comparator #1.....Push these keys    and Main display will appear as .

 This denotes the allotment.

To make sure of Comparator #2.....Push these keys    and Main display will appear as .

 This denotes the allotment.

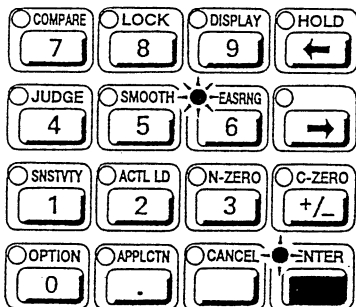
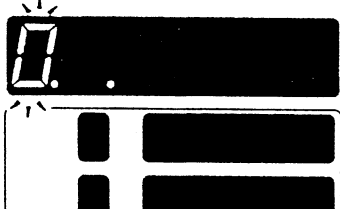
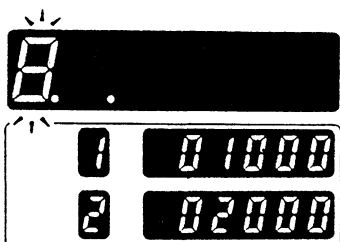
The top numeral denotes each comparator's allotment.

If it reads 1 or 2, it is OK'd.

If it reads 0, Warning message "ch-01" will appear after you have finished this [i) Setting Time measuring]. So do not fail to make sure of a correct allotment.

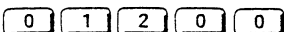
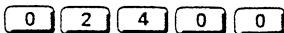
Also if the top numeral should read 3, this measuring function will not work in a correct manner.

Lamp indication: ● lights up; ○ goes out; ✨ flickers; ✨- momentarily illuminates

Key to be operated	Lamp indication on Setter	Reading on Display
①  ② 		• In Measuring Mode 0: Main display reads Mode number 0; Sub-display #1 and #2 appear blank. 
Enter a measuring mode number and a user-specifiable mode number. X. X. — User-specifiable mode (nil) — Measuring mode ③ 	Sub-displays, #1 and #2, can show comparison values whose renewal is in progress.	At this stage, Sub-display #1 and #2 respectively show comparison values which were formerly registered. 

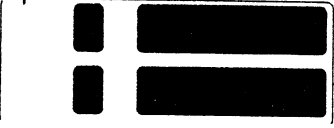
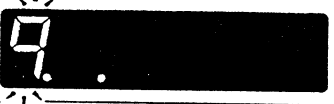
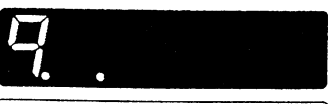
- To renew comparators' comparison values, operate keys as follows.

Lamp indication: ● lights up; ○ goes out; ☼ flickers; -●- momentarily illuminates

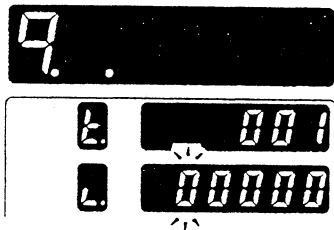
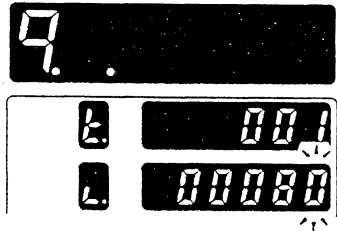
Key to be operated	Lamp indication on Setter	Reading on Display
④ Enter Comparator #1's renewal comparison value. 	In this sample, 01200 is keyed in. 	Sub-display #1 shows a renewed comparison value; and Sub-display #2 shows a comparison value which was formerly registered. 
⑤ Enter Comparator #2's comparison value. 	In this sample, 02400 is keyed in. 	Sub-displays, #1 and #2, respectively show their comparison values which have been renewed. 
⑥ End of setting 		Regular display is restored. Both Sub-display #1 and #2 have their renewed comparison values registered.

Example: j) Setting Pressing input hold operation

Lamp indication: ● lights up; ○ goes out; ☼ flickers; -●- momentarily illuminates

Key to be operated	Lamp display on Setter	Reading on Display
① Measuring function MEASRNG 		
② Setting ENTER 		
③ Enter a measuring mode X. X. — User-specifiable mode (nil) — Measuring mode ④ Setting ENTER 	In this sample, [9] is keyed in. 	
⑤ Enter Comparator #1's comparison value. ± X X X X — 5 digits and a prefixed sign ⑥ Setting ENTER 	In this sample, 1000 is keyed in.     	  
⑦ Enter judging time X X X — Number from 1 to 500 Time t = a registered value X 2ms	In this sample, 1 (2ms) is keyed in.   	  

Lamp indication: ● lights up; ○ goes out; ✨ flickers; ⚡ momentarily illuminates

Key to be operated	Lamp display on Setter	Reading on Display
⑧ Setting ENTER 	Sub-display #1 and #2 respectively show Judging time and judging width.	
⑨ Enter Judging width. XXXXX _____ A five-digit number	In this sample, 80 is keyed in. 0 0 0 8 0	
⑩ ENTER 		Regular display is restored.

- **Other measuring modes**

How to set other measuring modes is same as [5] Peak & bottom hold measuring combined with User-specifiable mode [0].

So enter proper numeric values where it is necessary. The rest of operation is pretty much same.

NOTES

- Measuring function settings are versatile, including 9 major settings and 24 different combinations in all. So select one that best matches your measuring purpose.

If measuring is expected to continue for a long time, we recommend to lock your setting according to the instructions given in [4-1-5 How to lock settings].

- Readings on Main display vary according to an activated measuring mode as well as to a switch-

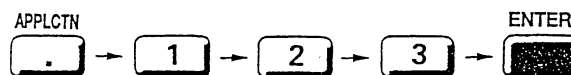
ed-on classification number, [#1, 2 or 3], on measurement value. So you may as well let Main display present what you need chiefly.

This does not, however, apply to the case that the display is locked using the user-specifiable lock.

- When you have attempted renewal of a setting, Main display may read "LOC-U" or "LOC-C" on occasion. In this case, unlock that setting, and after that, perform the targeted renewal.

TIP

If you are to renew setting/s from the first step (starting with default/s), push the following keys in order.



Main display will then read *PASS* (PASS) and a program version number, then go to a default value. Note however that you cannot initialize

these default values : Non-load zero: calibration by setting sensitivity: and calibration by loading an actual load.

4-7 Display function

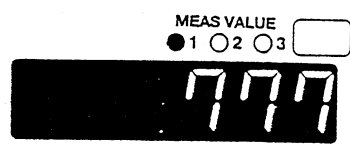
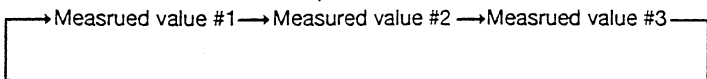
- By switching over Main display, you can review measured values classified as #1, 2 and 3.
- You can review optional comparators' comparison values on Sub-display #1 and 2.

4-7-1 Switching over Main display

- To switch over a measured value to another of different classification on Main display, operate keys as follows.

(1) Key operation

Lamp indication: ● lights up; ○ goes out; ✱ flickers; -●- momentarily illuminates

Key to be operated	Lamp display on Setter	Reading on Display
① Each push of  key lets Main display give a measured value of different classification.		(Shown below is just a sample number.) 
		
Normally, let Classification #1 lamp light up. ● 1 ○ 2 ○ 3		

4-7-2 How to set Sub-displays

- Here's how to set a display mode and a comparator # and its comparison value on sub-displays.
- Two sub-display modes are provided as follows.

Numerical key	Display mode	Operation
0	Fixed mode	Enters the number of a comparator whose data are to be given on sub-displays.
1	Automatic mode	Data of a comparator whose data are closest to a measured value is automatically selected from among those allotted to a value appearing on Main display.
2	Measured value	Specify Measured value # to be displayed on Sub-display.

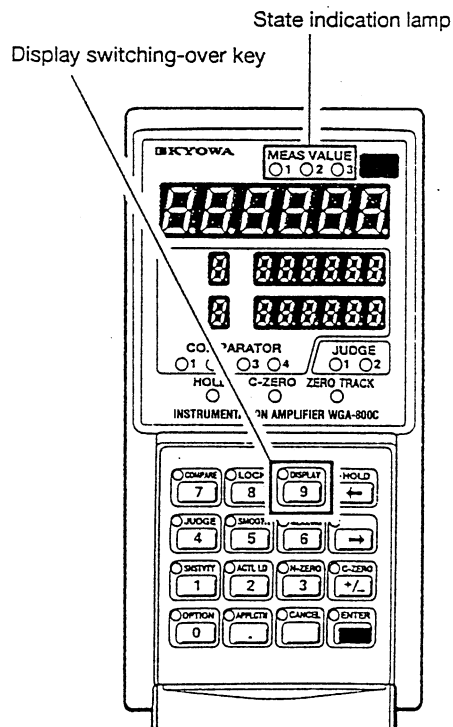
Default: [0]

With Sub-mode #0	
Numerical key	Sub-display #1
0	No display
1	Comparator #1
2	Comparator #2
3	Comparator #3
4	Comparator #4

Default: [1]

With Sub-mode #2	
Numerical key	Sub-display #1,2
0	No display
1	Meas. value #1
2	Meas. value #2
3	Meas. value #3

Default: [2]



NOTES

- In the automatic mode, Sub-display #1 and #2 settings are invalid.
- A comparator number will not appear on Sub-display if a comparison value is not allotted to it.

(1) Key operation

Lamp indication: ● lights up; ○ goes out; ✨ flickers; -●- momentarily illuminates

Key to be operated	Lamp display on Setter	Reading on Display																														
① APPLCTN		Regular display																														
② DISPLAY		Main display reads a display mode and comparator numbers. (A mode number and numeric values shown below are defaults.)																														
③ ENTER																																
④ Enter numerals to set Sub-displays X. X. X. └─ Sub-display #2 └─ Sub-display #1 └─ Sub-display mode <table><tr><th colspan="2">Sub-display mode</th></tr><tr><td>0</td><td>Fixed mode</td></tr><tr><td>1</td><td>Automatic mode</td></tr><tr><td>2</td><td>Measured value</td></tr></table> <table><tr><th colspan="2">Sub-display (Mode #0)</th></tr><tr><td>0</td><td>No display</td></tr><tr><td>1</td><td>Comparator #1</td></tr><tr><td>2</td><td>Comparator #2</td></tr><tr><td>3</td><td>Comparator #3</td></tr><tr><td>4</td><td>Comparator #4</td></tr></table> <table><tr><th colspan="2">Sub-display (Mode #2)</th></tr><tr><td>0</td><td>No display</td></tr><tr><td>1</td><td>Meas. value #1</td></tr><tr><td>2</td><td>Meas. value #2</td></tr><tr><td>3</td><td>Meas. value #3</td></tr></table>	Sub-display mode		0	Fixed mode	1	Automatic mode	2	Measured value	Sub-display (Mode #0)		0	No display	1	Comparator #1	2	Comparator #2	3	Comparator #3	4	Comparator #4	Sub-display (Mode #2)		0	No display	1	Meas. value #1	2	Meas. value #2	3	Meas. value #3	Type numeral keys. In this sample, [1014] are keyed in.	
Sub-display mode																																
0	Fixed mode																															
1	Automatic mode																															
2	Measured value																															
Sub-display (Mode #0)																																
0	No display																															
1	Comparator #1																															
2	Comparator #2																															
3	Comparator #3																															
4	Comparator #4																															
Sub-display (Mode #2)																																
0	No display																															
1	Meas. value #1																															
2	Meas. value #2																															
3	Meas. value #3																															
⑤ ENTER		Comparator numbers and data to appear on Sub-displays can be changed.																														

4-7-3 How to monitor Sub-displays

- Sub-display #1 and #2 respectively show Comparator numbers and comparison values having been set. The former shows data of Comparator #1 and 3; and the latter, data of #2 and 4. Data of Comparator #1 and 2 appear first, and those of Comparator #3 and 4 next, lasting for 12 seconds respectively.
- The automatic Sub-display mode disables this monitoring.

(1) Key operation

Lamp indication: ● lights up; ○ goes out; ✨ flickers; -●- momentarily illuminates

Key to be operated	Lamp display on Setter	Reading on Display
① COMPARE 7		Regular display
② DISPLAY 9		Regular display
③ ENTER		(Shown below are default values) Sub-display #1 and 2 shows Comparator numbers and Comparison values respectively. Data of Comparator #1 and 2 appear first, and those of Comparator #3 and 4 next, lasting for 12 seconds each.

NOTE

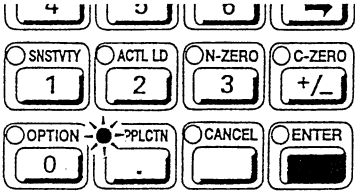
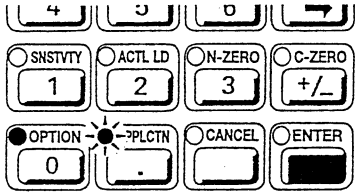
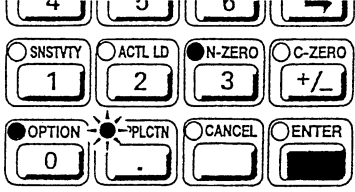
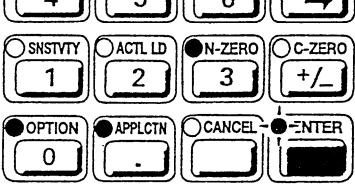
This monitoring of Sub-displays is disabled in the case that Mode 7 (comparison) user-specifiable setting lock has been registered and executed.

4-7-4 Original value display

Main display presents the reading of a transducer's current output voltage (Original value) in mV/V.

(1) Key operation

Lamp indication: ● lights up; ○ goes out; ✨ flickers; -●- momentarily illuminates

Key to be operated	Lamp display on Setter	Reading on Display
① 		Regular display
② 		Regular display
③ 		Regular display
④ Register sub-display setting. 		Main display reads Original value (for 12 seconds). Sub-display #1 and 2 appear blank. (Shown below is a sample.) 

NOTES

- This Original value display is disabled in the case that User-specifiable lock (Application) has been registered and executed.
- If your amplifier has a D-A converter built-in, avoid

this Original value monitoring during measurement, or the D-A converter may produce uncertain voltages.

4-8 Monitor function

This monitor function lets you review, for 12 seconds, parameters you have used to set various settings. To interrupt this function, push  key. See the following table for what key(s) you are to use to activate what monitor function.

Monitoring object	Key(s) to be operated	Monitor function
Option #1	 → 	This function lets you monitor parameters set to an option which is inserted in Option slot #1, (provided that an option PCB exists).
Option #2	 → 	This function lets you monitor parameters set to an option which is inserted in Option slot #2, (provided that an option PCB exists).
Sensitivity registration		This function lets you monitor a transducer's output value (in the unit of mV/V) used at the time of calibration as well as the reading of a current load.
Actual load		This function lets you monitor the reading of a load measured through actual load calibration.
Judging device #1	 → 	This function lets you monitor parameters (an output mode, a combined comparator, and combined judging criterions) used to set Judging device #1.
Judging device #2	 → 	This function lets you monitor parameters (an output mode, a combined comparator, and combined judging criterions) used to set Judging device #2.
Smoothing function		This function lets you monitor parameters (an analog filter, a smallest scale division, and a zero tracking mode and a moving average time) used to set Smoothing function.
Measuring function		This function lets you monitor parameters (a measuring mode, a user-specifiable mode, and their respective setup parameters) used to set a measuring function.
Comparator #1	 → 	This function lets you monitor a comparison value set to Comparator #1.
Comparator #2	 → 	This function lets you monitor a comparison value set to Comparator #2.
Comparator #3	 → 	This function lets you monitor a comparison value set to Comparator #3.
Comparator #4	 → 	This function lets you monitor a comparison value set to Comparator #4.

Monitoring object	Key(s) to be operated	Monitor function
Comparator switching (See Note below.)	COMPARE 7 → DISPLAY 9 → ENTER	This function lets you monitor Comparison values of Comparator #1 and 2, and after that, those of Comparator #3 and 4 in succession.
State of lock effected	LOCK 8	This function lets you monitor the state of lock on either Calibration lock or User-specifiable lock.
Measured values (See Note below.)	DISPLAY 9 → DISPLAY 9	This function lets you monitor measured values whose classifications are indicted by $\overset{\text{MEAS VALUE}}{\bigcirc_1 \bigcirc_2 \bigcirc_3}$. After monitoring, let Classification #1 lamp light up $\bullet_1$.
Comparator #1 function	APPLCTN . → COMPARE 7 → SNTVITY 1	This function lets you monitor Comparator #1's function (an allotment, upper/lower limits, an output mode, a delay mode, hysteresis width, and delay time).
Comparator #2 function	APPLCTN . → COMPARE 7 → ACTL LD 2	This function lets you monitor Comparator #2's function (an allotment, upper/lower limits, an output mode, a delay mode, hysteresis width, and delay time).
Comparator #3 function	APPLCTN . → COMPARE 7 → N-ZERO 3	This function lets you monitor Comparator #3's function (an allotment, upper/lower limits, an output mode, a delay mode, hysteresis width, and delay time).
Comparator #4 function	APPLCTN . → COMPARE 7 → JUDGE 4	This function lets you monitor Comparator #4's function (an allotment, upper/lower limits, an output mode, a delay mode, hysteresis width, and delay time).
Setting of Sub-displays	APPLCTN . → DISPLAY 9	This function lets you monitor a setting of Sub-displays (a display mode and a comparator on display).
Zero correction mode	APPLCTN . → C-ZERO +/-	This function lets you monitor a zero correction mode.

NOTE: This monitor function is disabled in the case that User-specifiable lock 7 (Comparison) or 9 (Display switching over) is registered and executed.

Other functions

4-9-1 Status check

- Execute this function in the case that the amplifier is built in equipment and you cannot therefore have access to the amplifier's rear panel. You will then be

able to make sure of the type of an internal option, what bridge voltage is used and also of an external control input.

(1) Key operation

Lamp indication: ● lights up; ○ goes out; ✨ flickers; -●- momentarily illuminates

Key to be operated	Lamp display on Setter	Reading on Display												
① APPLCTN - ② OPTION 0 ③ ACTL LD 2	JUDGE 4 SMOOTH 5 MEASURING 6 → SNSTVITY 1 ● ACTL LD 2 ○ N-ZERO 3 ○ C-ZERO +/- ● OPTION 0 ● PLCTN - ○ CANCEL ○ ENTER	Regular display												
④ To make sure of an internal option and a bridge voltage ENTER	○ COMPARE 7 ○ LOCK 8 ○ DISPLAY 9 ○ HOLD ← JUDGE 4 SMOOTH 5 MEASURING 6 → SNSTVITY 1 ● ACTL LD 2 ○ N-ZERO 3 ○ C-ZERO +/- ● OPTION 0 ● APPLCTN - ○ CANCEL ● ENTER	Status indication on Main display (a sample) 0.125 Option (Slot #2) Bridge voltage Option (Slot #1) Option Bridge voltage <table><tr><td>0</td><td>No option</td><td>2.5</td><td>2.5V</td></tr><tr><td>1</td><td>BCD data output</td><td>05</td><td>5V</td></tr><tr><td>2</td><td>D-A converter</td><td>10</td><td>10V</td></tr></table>	0	No option	2.5	2.5V	1	BCD data output	05	5V	2	D-A converter	10	10V
0	No option	2.5	2.5V											
1	BCD data output	05	5V											
2	D-A converter	10	10V											
⑤ To make sure of a control input ENTER		Contact input indication on Main display (A sample) 0000 Reset command Hold command Zero correction [OFF] Zero correction [ON] Contact input <table><tr><td>0</td><td>OFF</td></tr><tr><td>1</td><td>ON</td></tr></table> Regular display is restored after 12 seconds.	0	OFF	1	ON								
0	OFF													
1	ON													

4-9-2 Self-test

(1) Operation

- This function automatically checks the internal circuit and the built-in program. The result of a check is given on Main display for your review.
- The table at right shows check sequences, lamp indications, readings and check objects.

Check sequence	Lamp indication • Leading on display	Chief operation
1	All lamps light up.	Start
2	<i>c 1</i>	State indication lamp
3	Check numerals.	Displays
4	<i>c 2</i>	ROM
5	<i>c 3</i>	RAM
6	<i>c 4</i>	Display circuit
7	<i>PASS</i>	End

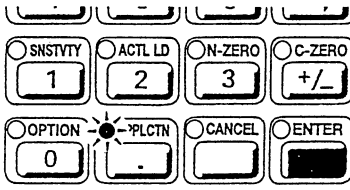
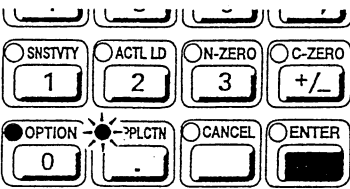
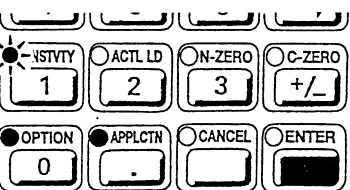
- If an error is discovered by a self-test, Main display gives an error message. At right is a table of error messages.
- If you read an error message on Display, contact your KYOWA representative.

Error message	State of error
<i>Err-00</i>	ROM malfunction
<i>Err-01</i>	RAM malfunction
<i>Err-02</i>	Display circuit malfunction
<i>Err-03</i>	Nonvolatile memory writing malfunction

(2) Key operation

• Simplified self-test

Lamp indication: ● lights up; ○ goes out; ✱ flickers; -●- momentarily illuminates

Key to be operated	Lamp display on Setter	Reading on Display
① APPLCTN 		Regular display
② OPTION 		Regular display
③ SNSTVY 		Regular display

Key to be operated

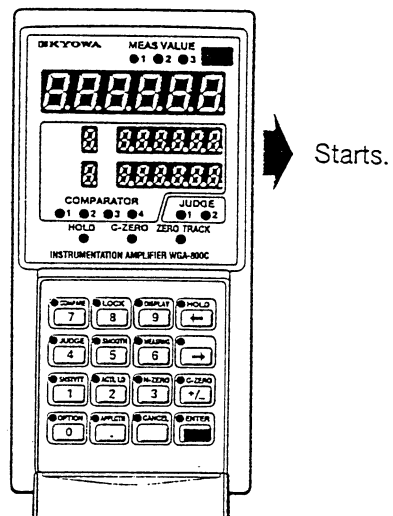
④

ENTER

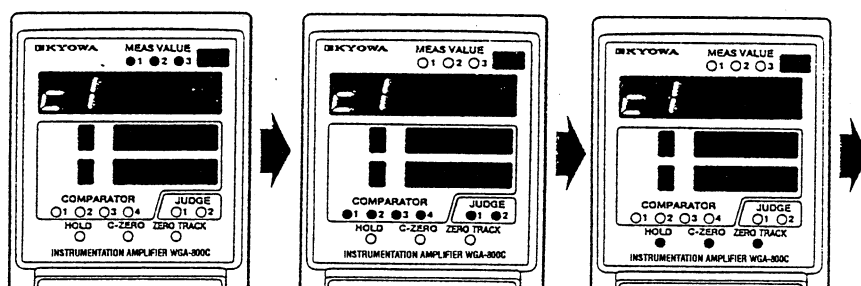


• Start of check sequences

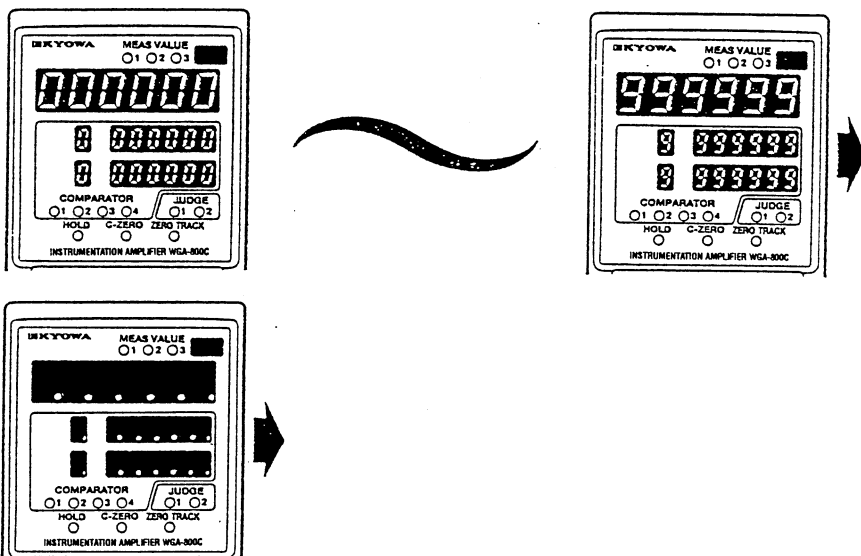
1. Sequence 1 (All lamps light up)



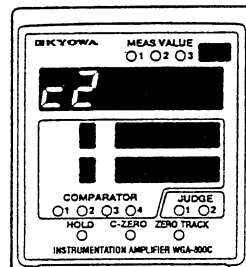
2. Status indication lamps



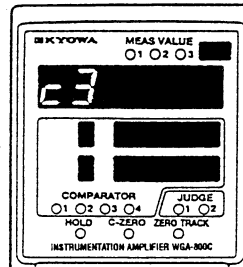
3. Displays



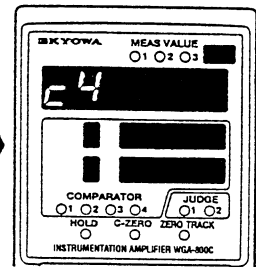
4. ROM



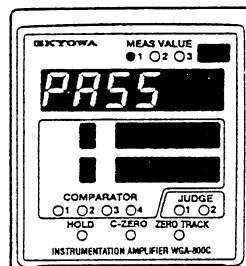
5. RAM



6. Display circuit



7. End



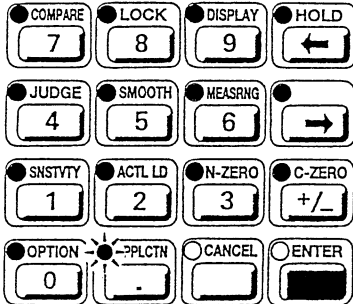
PASS appears for 12 seconds.
After that, the screen display
that preceded a self-test will
return.

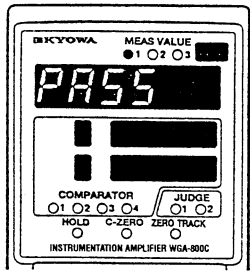
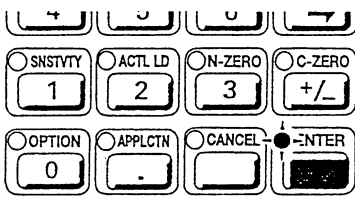
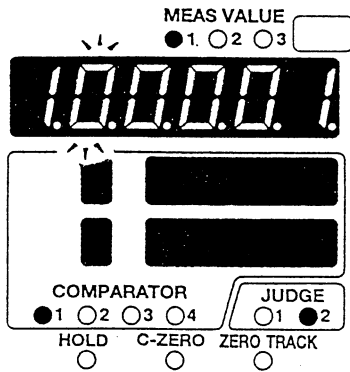
NOTE

This simplified self-test cannot test operation of an external control output connected. Therefore execute a regular Self-test in order to test operation of an control output.

• Self-test

Lamp indication: ● lights up; ○ goes out; ⚡ flickers; -●- momentarily illuminates

Key to be operated		Lamp display on Setter	Reading on Display
①	APPLCTN 		Regular display
②	OPTION 		
③	SNSTVITY 		
④	ACTL LD 		
⑤	N-ZERO 		
⑥	JUDGE 		
⑦	SMOOTH 		
⑧	MEASRNG 		
⑨	COMPARE 		
⑩	LOCK 		
⑪	DISPLAY 		
⑫	HOLD 		
⑬			
⑭	C-ZERO 		
⑮	ENTER 	• Start of check sequences Same operations (lamp indications and display readings) as stated in Page 92 are performed.	

Key to be operated	Lamp display on Setter	Reading on Display				
⑩ End of check sequences PASS appears for 12 seconds, and after that, the screen display will return to what appeared before a self test. But if you desire to confirm operations of Comparators and Judging devices, push Enter key before PASS disappears.						
ENTER 		• The setup of Control outputs appears. (In this sample, all outputs are set to OFF, i.e. to 0). 				
⑪ Confirmation of operations of Comparators and judging devices <u>(Note that a simplified self-test cannot do this.)</u> Set ON or OFF to each check item of a self-test. X. X. X. X. X. X. Judging output #2 Judging output #1 Comparator output #4 Comparator output #3 Comparator output #2 Comparator output #1 <table><tr><td>0</td><td>OFF</td></tr><tr><td>1</td><td>ON</td></tr></table> Push Enter key each time to register a check item to ON or OFF, or else that item's operation cannot be confirmed.	0	OFF	1	ON	Type numeral keys. (By setting respective check items to ON or OFF in sequence, you can check status lamp indications and external instruments' operations any number of times.)	Example: Suppose that you have set Comparator output #1 and Judging output #2 to [ON], corresponding status indication lamps light up as shown below. 
0	OFF					
1	ON					
⑫ ENTER 		PASS appears for 12 seconds, and after that, the screen display will return to what appeared before a self-test. To interrupt a self-test, push Cancel key.				

4-9-3 Table of error/warning messages

(1) Error messages and definitions

Error message	Meaning
<i>Err-00</i>	ROM malfunction
<i>Err-01</i>	RAM malfunction
<i>Err-02</i>	Display circuit malfunction
<i>Err-03</i>	Non-volatile memory writing malfunction

Error message	Meaning	Definition								
oFL0	Non-load zero	• Initial unbalance range has been exceeded.								
	(Non-load zero is impossible.)	• Input signals have been found unstable.								
oFL1	Underflowing input	• Input signals have underflowed a measuring range.								
oFL2	Overflowing input	• Input signals have overflowed a measuring range								
oFL3	Underflowing display	• Displayed input signals have underflowed -99999.								
oFL4	Overflowing display	• Displayed input signals have overflowed 99999.								
oFL5	Over-sensitivity for calibration	• Sensitivity has gone above one of the below numeric values at the time of calibration. • When BV (a bridge voltage) was renewed, the rated output has gone above the measuring range of that bridge voltage. <table><tr><th>BV (V)</th><th>Sensitivity (mV/V)</th></tr><tr><td>2.5</td><td>8.4000</td></tr><tr><td>5</td><td>4.2000</td></tr><tr><td>10</td><td>2.1000</td></tr></table>	BV (V)	Sensitivity (mV/V)	2.5	8.4000	5	4.2000	10	2.1000
BV (V)	Sensitivity (mV/V)									
2.5	8.4000									
5	4.2000									
10	2.1000									
LOC - C	Calibration lock is in [ON] position.	Calibration was attempted while the calibration lock was in the [ON] position, and the attempt has been neglected accordingly.								
LOC - U	User-specifiable lock is in [ON] position.	Operation of a key was attempted while the user-specifiable lock was in the [ON] position on that key, and the attempt has been neglected accordingly.								

* How to remove error messages

Err-00 ~ 03 denotes a failure of the amplifier, and cannot therefore be removed.

oFL0 ~ 5 will be removed by achieving a correct setting.

LOC-c, u automatically disappears after 12 seconds.

(2) Warning messages and definitions

Warning message	Meaning	Definition
ch-01	Confirm Comparator allotment. This message will appear against situations stated at right. A push of Cancel key removes the message, but it does not cancel the existing setting.	• An attempt has been made to allot a comparison value to Comparator whose allotment is "0". • An attempt has been made to allot Judging output to Comparator whose allotment is "0". • An attempt has been made to allot a measured value of other than time to Comparator whose allotment is time data. • An attempt has been made to allot time data to Comparator whose allotment is a measured value and not time data. (Check that the setting of Comparator is correct.)
ch-02	Confirm Judging device's setting. A push of Cancel key removes the message, but it does not cancel the existing setting .	• An attempt has been made to allot "0" to Comparator, whose allotment is a judging output criterion, at the time of setting a comparator function. (Check that the setting of Judging device is correct.)
ch-03	Confirm BCD output. A push of Cancel key removes the message, but it does not cancel the existing setting.	• An attempt has been made to renew the setting of zero tracking while BCD output is equipped. (Check the setting of BCD output.)

(3) Other

- A corrective action against erroneous key entry attempted

Attempted key entry	Corrective action
A should-not-be numerical value was keyed in and Enter key has been pushed to register when setting a measuring mode, etc.	A screen display that lets you set the targeted mode will return, and there will be flickering a possibly largest numeral (numeric value) allowed for setting.

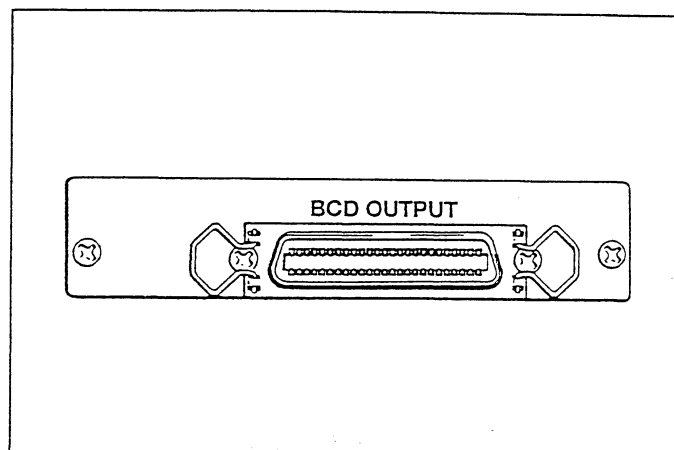
5. Functions on particular models

5-1 BCD output

This function is operable only on models (WGA-800C-10AC, -11AC and -12AC) whose option slot on the rear is equipped with BCD output facility.

This BCD output facility is formed by an interface that outputs reading values or measured values in the form of binary code. The interface connects the amplifier with a computer, process controller or a sequencer, and helps the user to conveniently control, total and record data collected by the amplifier.

Its input/output circuit and internal circuit are electrically isolated from each other by a photocoupler.



(1) Connector pin numbers and signal names

Pin #	Signal name		Pin #	Signal name	
	BCD output	Binary output		BCD output	Binary output
1	COM		19	COM	
2	Data 1 x 10 ⁰ outut	Data 2 ⁰ (1) output	20	Data 1 x 10 ⁵	Data 2 ¹⁶ (17) output
3	2 x 10 ⁰ outut	2 ¹ (2)	21	Data 2 x 10 ⁵	Data 2 ¹⁷ (18) output
4	4 x 10 ⁰ outut	2 ² (3)	22	Data 4 x 10 ⁵	OFF at all times
5	8 x 10 ⁰ outut	2 ³ (4)	23	Data 8 x 10 ⁵	OFF at all times
6	1 x 10 ¹ output	2 ⁴ (5)	24	N/A	
7	2 x 10 ¹ output	2 ⁵ (6)	25	N/A	
8	4 x 10 ¹ output	2 ⁶ (7)	26	N/A	
9	8 x 10 ¹ output	2 ⁷ (8)	27	Stabilized output	
10	1 x 10 ² output	2 ⁸ (9)	28	Negative (polarity) output	OFF at all times
11	2 x 10 ² output	2 ⁹ (10)	29	Over output	
12	4 x 10 ² output	2 ¹⁰ (11)	30	EOC (End of Conversion) output	
13	8 x 10 ² output	2 ¹¹ (12)	31	Hold input #1 (contact)	
14	1 x 10 ³ output	2 ¹² (13)	32	Output prohibition input #1 (contact)	
15	2 x 10 ³ output	2 ¹³ (14)	33	Hold input #2 (TTL level)	
16	4 x 10 ³ output	2 ¹⁴ (15)	34	Output prohibition input #2 (TTL level)	
17	8 x 10 ³ output	2 ¹⁵ (16)	35	N/A	
18	DC12V		36	12Vdc	

The output connector is an equivalent to 57-40360 (a product of DAI-ICHI DENSHI KOGYO).

NOTE

The type of outputted binary data is offset binary.

Display	99999	Data	18	16	12	8	4	1
			0	1	1	0	0	1
1			0	0	0	0	0	0
0			0	0	0	0	0	0
-1			1	1	1	1	1	1
-99999			1	0	0	1	0	1

(2) Signal logic

① Logic of an output signal can be selected through key operation.

② An input signal is fixed to negative logic.

Hold input.....Negative logic (Hold at "L")

Output prohibition input...Negative logic (Prohibition at "L")

(3) Selection of an input signal

Select it between the following two so as to meet external equipment's specification.

Connector terminal's contact input

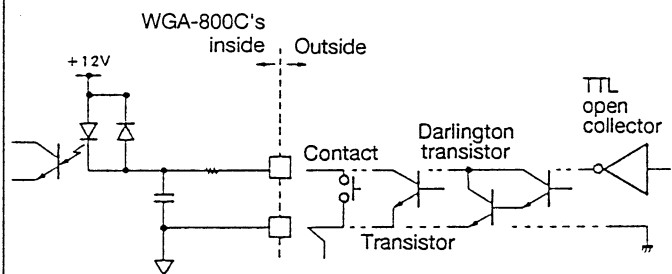
TTL level input

Hold input #1 (contact) and output prohibition input #1 (contact)

① Use either for a switch contact, or for a relay output from a computer, sequencer or a transistor.

[Equivalent circuit]

Hold input #1 and output prohibition input (contact)

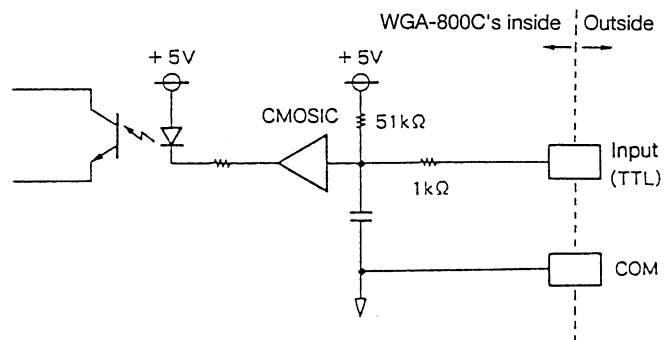


② Hold input #2 (TTL level) and output prohibition input #2 (TTL level)

Use either for a TTL output from a computer or sequencer.

[Equivalent circuit]

Hold input #2 and output prohibition input #2 (TTL)



CAUTION

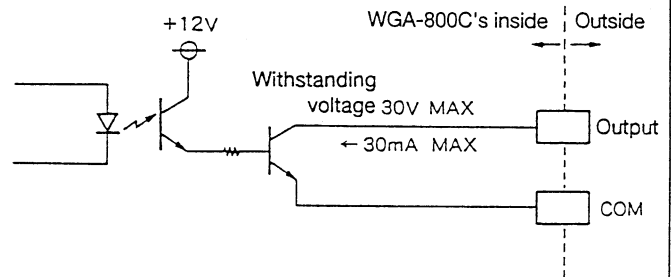
A relay output or a transistor output is connectable. Avoid inputting a voltage from external equipment, or the amplifier will be damaged. For such connection, a leakage current needs to be below 10μA when switched [OFF].

(4) Output signals

CAUTION

Dull transmission of waveforms may occur according to external equipment connected so that data transmission at the specified speed may be impossible. Check waveforms under transmission to see if the connected equipment is suitable.

[Equivalent circuit] Output signal

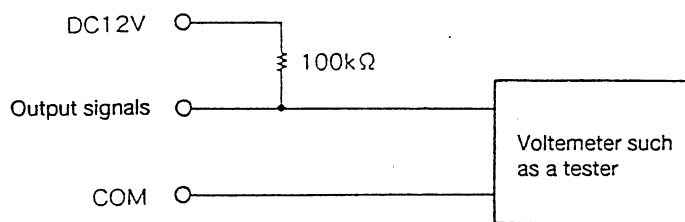


CAUTION

12Vdc is to be connected to Pin #18 and 36 as shown below. It is to be used to confirm output signals from the amplifier.

Do NOT use it to power an external sequencer, or else the amplifier may be damaged.

[Example]



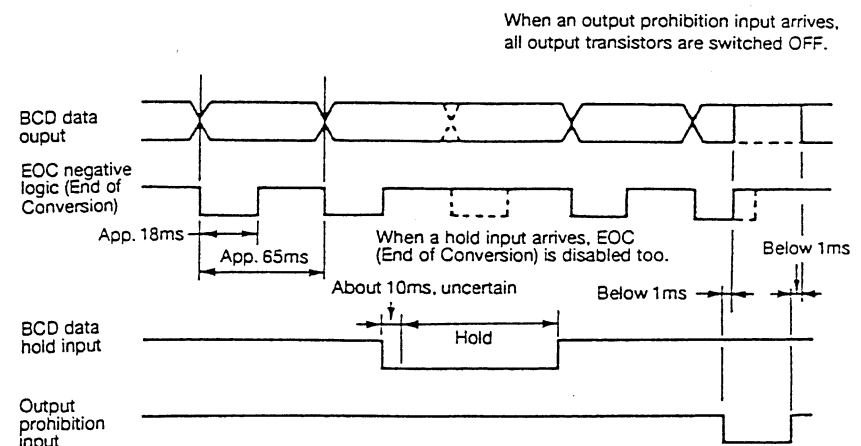
App. 0V is outputted when Output transistor is switched [ON].

App. 12V is outputted when Output transistor is switched [OFF].

(5) Signal timing

Transmission mode	T1	T2
0 BCD 15 times/sec	App.18ms	App.65ms
1 Binary 31 times/sec	App.16ms	App.32ms
2 62 times/sec	App. 8ms	App.16ms
3 125 times/sec	App. 4ms	App. 8ms
4 250 times/sec	App. 2ms	App. 4ms

Signal timing



NOTES

- To read data through EOC (End of Conversion), do it within 40ms from a rising edge (where "L" turns "H") and read BCD data, a polarity thereof and over-data as well.
- To read data through holding BCD data, do it 10ms or longer after a hold input turned into "L". BCD data do not vary as long as they are at "L".
- A BCD data holding input does not hold readings of BCD data on Display.
- During key operation, Display continues to give readings that vary in response to key operation. By contrast, outputted BCD data are held as they were immediately before a start of key operation.
- Outputted BCD data do not include decimal points.
- By turning an output prohibition input into "L", all output transistors are switched [OFF] (turned invalid).
- It is possible to read out in sequence BCD data outputted from several BCD facilities connected in parallel.
- COM of a BCD data output is connected to the mainframe's control input common.

(6) Operation

- Measured values are binary coded and are outputted through open collector.
Output.....Data in five digits, minus, over, EOC, stabilized output
Input.....Hold, output prohibition

(7) Key operation

Lamp indication: ● lights up; ○ goes out; - flickers; - momentarily illuminates

Key to be operated	Lamp display on Setter	Reading on Display						
① OPTION 0		Regular display						
② Enter a slot number. X Slot number (1 or 2) 1		Main display gives an option number at its left end, and a measuring value classification number at its right end. Sub-display #1 gives a BCD output setting parameters while Sub-display #2 shows blank. (Shown below are defaults.) Option number Measured value classification # 1 Option numbers <table border="1"> <tbody> <tr> <td>01</td> <td>BCD data output</td> </tr> <tr> <td>02</td> <td>D-A converter</td> </tr> <tr> <td>03</td> <td>EIA-232-D</td> </tr> </tbody> </table>	01	BCD data output	02	D-A converter	03	EIA-232-D
01	BCD data output							
02	D-A converter							
03	EIA-232-D							

Key to be operated	Lamp display on Setter	Reading on Display								
③ ENTER	COMPARE 7 LOCK 8 DISPLAY 9 HOLD JUDGE 4 SMOOTH 5 MEASRG 6 SNSTVY 1 ACTL LD 2 N-ZERO 3 C-ZERO +/- OPTION 0 APPLCTN . CANCEL ENTER	01 00.000								
④ Enter a classification # of measured value. Classification # of measured value X	Type a numeral key. In this sample, [1] is keyed in.	01								
Measured value classification....To select data for BCD output, specify a desired classification number from the following four. <table><tr><td>0</td><td>Measured value on Display (the measured value given on Main display)</td></tr><tr><td>1</td><td>Measured value of classification #1</td></tr><tr><td>2</td><td>Measured value of classificatoin #2</td></tr><tr><td>3</td><td>Measured value of classification #3</td></tr></table>			0	Measured value on Display (the measured value given on Main display)	1	Measured value of classification #1	2	Measured value of classificatoin #2	3	Measured value of classification #3
0	Measured value on Display (the measured value given on Main display)									
1	Measured value of classification #1									
2	Measured value of classificatoin #2									
3	Measured value of classification #3									
⑤ ENTER	JUDGE 4 SMOOTH 5 MEASRG 6 SNSTVY 1 ACTL LD 2 N-ZERO 3 C-ZERO +/- OPTION 0 APPLCTN . CANCEL ENTER	01 00.000								

Key to be operated	Lamp display on Setter	Reading on Display
⑨ End of setting 		Regular display is restored.

(8) Other

- If Zero tracking is active, Stability time and Stability width will be automatically set to Tracking delay and Tracking band of Zero tracking, respectively.
- If the amplifier is equipped by two BCD output boards, Stability time and Stability width of the board in Option slot #1 will have priority.

NOTE

A stabilized output is detected against the measured value of a total load. For this reason, a stabilized output may fail on occasion if with HOLD mode in action for measuring.

Be therefore sure that you are in Measuring mode [0 (normal measuring)] whenever you are after a stabilized output.

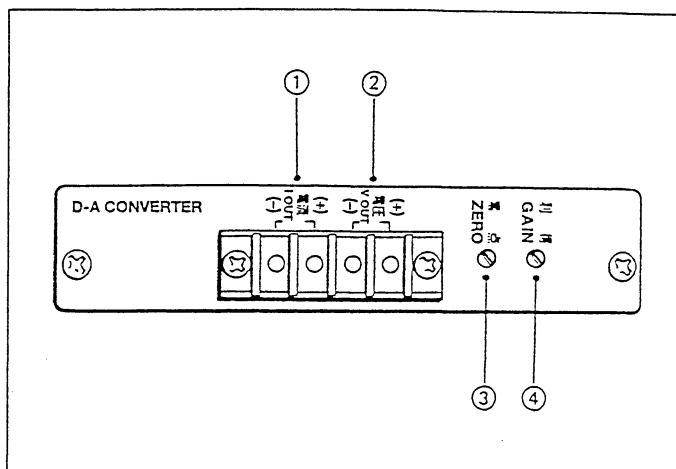
5-2 D-A converter

This function is operable only on models (WGA-800C'-12AC, -20AC and -22AC) whose option slot on the rear is equipped with a D-A converter.

Measured values are presented in the analog form through the function. Available are voltage outputs up to $\pm 10V$ as well as current outputs in a range from 4 to 20mA. Note that these outputs are electrically isolated from the mainframe's circuits.

(1) Terminals and controls

- ① Current output terminal
- ② Voltage output terminal
- ③ Zero trimmer
- ④ Gain trimmer



NOTE

As shipped, both Zero trimmer and Gain trimmer have been adjusted. So they need no adjustment normally.

If necessary, you can further adjust Zero or Gain in a range of $\pm 5\%$ ($\pm 0.5V$).

In the case that you have turned Gain trimmer, a later attempt to obtain a full scale of $\pm 10V$ may fail on occasion. If it should happen, properly turn Gain trimmer again, and you will then obtain $\pm 10V$.

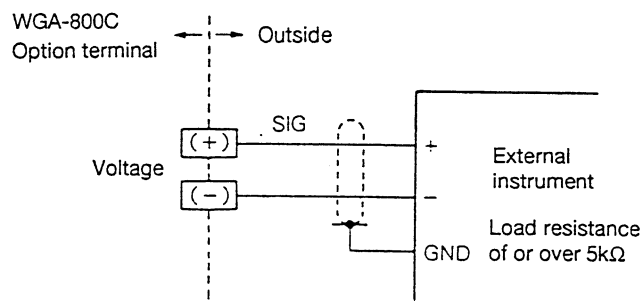
(2) Operational features

	D-A converter
Signal source	Converts measured values into analog signals. Such functions as digital zeroing, signal holding, smoothing, etc. are executable.
Response	Sampling rate: 500 times/second (250 times/second on two D-C converters equipped)
Output adjustment	Output adjustment is possible using keys on the front panel.
Output modes	Voltage output: $\pm 10V$ Current output: 4~20mA (corresponding to voltage output of 0~10V) Electrical isolation from the mainframe's circuits. Free from external noise.

(3) How to output voltage signals

Connect an external instrument (whose load resistance is $5k\Omega$ or higher) to the amplifier's respective (+) and (-) voltage output terminals.

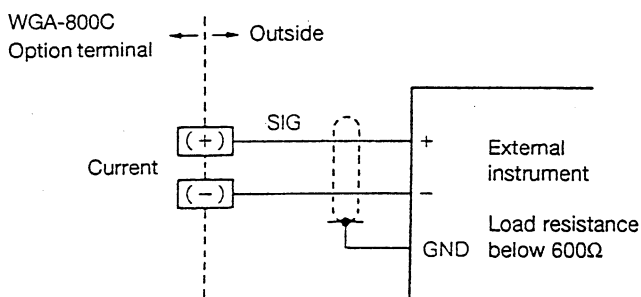
Voltage output signal



(4) How to output current signals

Connect an external instrument (whose load resistance is below 600Ω) to the amplifier's respective (+) and (-) current output terminals.

Current output signal



(5) Zero scale setting function

Through operating keys on the front panel, D-A converter's voltage output (4mA in current output) can be set to zero against whatever digital reading on Display.

(6) Full scale setting function

Through operating keys on the front panel, D-A converter's voltage output can be set to a full-scale voltage of 10V (20mA in current output) against whatever digital reading on Display.

(7) Selection of data to output to D-A converter

Select data from the following four types to output to D-A converter: a reading value on Main display, respective measured values classified as #1, 2 and 3.

CAUTIONS

- Voltage output and current output are completely interlocked. 10V corresponds to 20mA, and 0V to 4mA. They cannot be adjusted independently of each other.
- D-A converter's basic resolution power is 1/7092. A voltage output is incremental/decremental in approximately 1.4mV ($10V/7092$) increments/decrements; and a current output is incremental/decremental in approximately $2.3\mu A$ ($<20mA \sim 4mA> / 7092$) increments/decrements.
- Do NOT give an external voltage to the amplifier, or the amplifier is damaged.
- Do NOT short-circuit the voltage output terminal for over one hour, or the amplifier may fail.

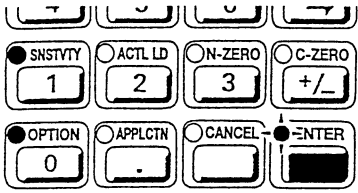
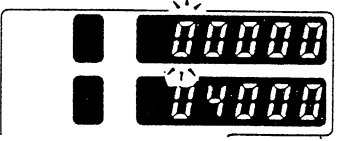
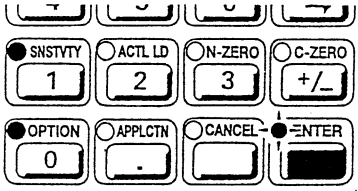
• **Key operation**

Lamp indication: ● lights up; ○ goes out; ✨ flickers; -●- momentarily illuminates

Key to be operated	Lamp display on Setter	Reading on Display
① OPTION 0		Regular display
② Enter a slot number X Slot number (1 or 2) 1		Main display gives an option number at its left end, and a measuring value classification number at its right end. Sub-display #1 gives a zero scale value, and Sub-display #2, a full scale value. (Shown below are defaults.) Option number Measured value classification #
③ ENTER		COMPARATOR JUDGE
④ Enter a classification # of measured value. X Classification # of measured value	Type a numeral key.	

Measured value classification...To select data for D-A output, specify a desired classification number from the following four.

0	Measured value on Display (the measured value given on Main display)
1	Measured value of classification #1
2	Measured value of classificatoin #2
3	Measured value of classification #3

Key to be operated	Lamp display on Setter	Reading on Display
⑤ 		
⑥ Enter a zero scale value.  X X X X X Five digits added by a sign	Type numeral keys. Zero scale....D-A output can be set to zero agasint whatever value on Display. A minus (-) sign can be entered either during or at the end of typing numerals.	
⑦ 		
⑧ Enter a full scale value.  X X X X X Five digits added by a sign	Type numeral keys. Zero scale....D-A output can be set to zero agasint whatever value on Display. A minus (-) sign can be entered either during or at the end of typing numerals.	
⑨ 		Regular display is restored.

NOTES

The D-A converter outputs do not have connection with time.
Do NOT therefore select a measured value of Classification #3 (time-related classification provided in Measuring modes [2], [7] and [8]).

5-3 EIA-232-D (RS-232-C)

This function can be used on the models which are equipped with the EIA-232-D interface in the option slot on the rear panel.

The EIA-232-D data input/output interface is an interface which is used to transmit the amplifier's readings and status information to external equipment, and

register various setup parameters from on external equipment. Connect the amplifier to a computer, process controller or sequencer through this interface to conveniently achieve control of the amplifier and data collection/recording.

5-3-1 EIA-232-D (RS-232-C) interface

The following is an explanation of the EIA-232-D interface.

(1) Connector pin numbers and signal names

Pin number	Signal name	Remarks
1	FG	Safety grounding
2	TxD	Output signals
3	RxD	Input signals
4	RTS	"H" at all times
7	SG	Signal grounding
20	DTR	"H" at all times

The used connector is equivalent to 17-13250-27 (a product of Dai-ichi Denshi Kogyo).

(2) Signal specifications

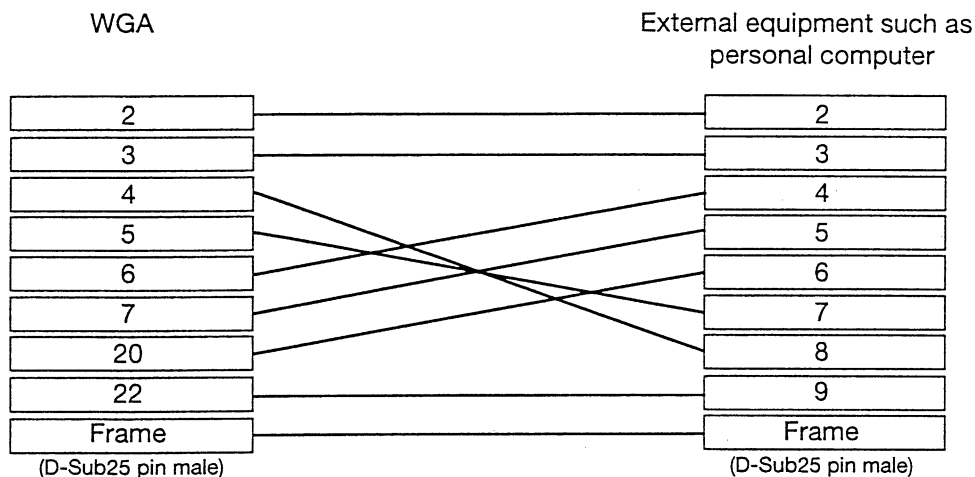
Signal specification	: Full duplex
Synchronization	: Start-stop system
Transmission speed	: 4800, 9600BPS
Bit structure	
Start	: 1 bit
Data	: 7 bits
Parity	: 1 bit (odd)
Stop	: 1 bit
Output code	: ASCII

(3) Connection with external equipment

① Connection cable

To connect with DTE (data terminal equipment) such as a personal computer, achieve connection as illustrated below.

To connect with DCE (data circuit terminal equipment), use a cable whose signal wires provide straight connections.



② Setting of external equipment

So set external equipment that it meets the signal specifications of WGA.

Transmission speed	: 4800, 9600BPS
Bit structure	
Start	: 1 bit
Data	: 7 bits
Parity	: 1 bit (odd parity)
Stop	: 1 bit
Output code	: ASCII

NOTE

WGA does not cope with XON/XOFF control, Send Break Signal, and S Paramter.

5-3-2 Outline of control commands

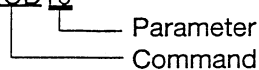
The following is an explanation of the formats and kinds of control commands which are outputted to the amplifier from external equipment such as a personal computer.

(1) Control command codes

- Control command conform to ASCII code (3 capital letters).
- According to the command characteristic, some control commands are suffixed by parameters, and others are not.
That is, some commands are formed by [command] added by [parameter], and others by just [command].

- The following samples show these structures of command.

- ① Command suffixed by parameter

MOD10


- ② Command without parameter
ZON

(2) Termination codes

- A termination code is added to the end of a control command.
- Different termination codes are used as follows.
 C_R : Command output to WGA
 $C_R L_F$: Data output from WGA

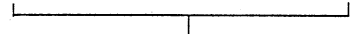
(3) Kinds of command

The following four kinds of control commands are used.

Read command..... Reads measured values or parameters that set WGA.
 Measure command....Controls measurement, etc.
 Set command.....Sets WGA.
 OthersOther commands

(4) Unrecognizable commands

- ① If an unrecognizable command is inputted, the character string of that command is returned in the following format.

W . . . ? $C_R L_F$

 Command that cannot be recognized

- ② The following are judged unrecognizable commands.

- The position of a decimal point or of "," or polarity is different from the format.
- The number of characters is different from the format.

NOTE

To use a control command, be sure to set in advance the transmission mode to 10, using "MOD" command.

(5) Table of control commands

Kinds	Contents	Commands
Read commands	Read measurement data Read status information Read various setup parameters Monitor original values	GDT GST PRR GOD
Measure commands	Hold Reset hold Switch zero correction ON Switch zero correction OFF	HLD RST ZON ZOF
Set commands	Set smoothing Set zero correction mode Set comparison function Set comparison value Set judging function Set measuring function Set main display Set sub-display Set option slot #1 Set option slot #2 No load zero Actual load Register/calibrate sensitivity Turn ON/OFF key lock Set lock key	SSM SZM SCF SCV SJF SMF SMD SSD OP1 OP2 ZAD VCL EIC LCK SLC
Other commands	Test bus line Read model name, etc. Read error contents, including overflow Set transmission mode Write setup parameters in NOVRAM	RS- SYS ERR MOD /M

NOTES

① If "/M" is suffixed to a set command, the command is registered in NOVRAM.
If a set command is keyed in without "/M" suffixed, the previous setting will accordingly return if once the power is switched off.

② When the lock is valid, setting is impossible.
In this case, the following message will be returned.

WLOCK ^C ^L
_R _F

5-3-3 Modes

(1) Kinds of mode

The mode means a basic format whereby the amplifier communicates with external equipment (such as a personal computer).

The following is the table of modes.

Mode	Contents
00	The selected measured values and status information are sent out in due order repeatedly.
01	Measured values #1 to #3 and status information are sent out in due order repeatedly.
02	The measured value and status information which are selected at the time of holding are sent out one time only.
03	The measured values #1 to #3 and status information are sent out in due order one time only.
10	Communication is carried out using control commands (read command, set command, etc.).

Notes: In the Mode 00 and 01 the amplifier continues to send data out.

If it is desired to stop it, set the Mode to 10, using the MOD command which is explained in the following.

(2) How to set a mode

Use the MOD command to set a mode.

The MOD command is explained below.

(In the following explanation, P1, D1, D2 ... and $c_{R F}^L$ respectively denote a parameter, data and termination code in that order.)

[MOD]

- Function : Sets a communication mode.
- Format : MODP1P1 c_R
- Paramter : P1

P1 : Mode

- Mode (P1P1) will then be as follows.
 - 00: Mode 00
 - 01: Mode 01
 - 02: Mode 02
 - 03: Mode 03
 - 10: Mode 10

(3) Data format for Mode 00

In the Mode 00, the selected measured values and status information are sent out in due order repeatedly.

D D1 ± D2 D2 D2 D2 D2 D2 $C_R^L F$

S D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 $C_R^L F$

D1 : The classification number of measured value to be sent out (1 character)

D2 : Measured value (7 characters)

(9 characters + $C_R^L F$)

D3 to D14 : Status information (12 characters)

(13 characters + $C_R^L F$)

- The classification numbers (D1) of data to be transmitted are as follows.

1: Measured value #1

2: Measured value #2

3: Measured value #3

- Measured value (D2) include a decimal point. It is sent out in due order starting with the top digit

If a decimal point is not included in the value, the top digit of D2 is filled by "0".

Example:

	±D2D2D2D2D2D2
where the value is 100.00	+100. 00
where the value is -10000	-010000
where time is 1.00 second	+001. 00

- Status information, D3 to D14, is expressed by "1" or "0".
"1" is sent out to express the following statuses.

D3: Comparator #1 is in the [ON] position

D4: Comparator #2 is in the [ON] position

D5: Comparator #3 is in the [ON] position

D6: Comparator #4 is in the [ON] position

D7: Judging device #1 is in the [ON] position

D8: Judging device #2 is in the [ON] position

D9: Measurement is in progress

D10: Hold operation is in progress

D11: Zero correction is in the [ON] position

D12: Zero tracking is in progress

D13: Overflow or other abnormality has occurred

D14: Readings are unstable

(4) Data format for Mode 01

In the Mode 01, measured values #1 to #3 and status information are sent out in due order repeatedly.

D1 ± D2 D2 D2 D2 D2 D2	$\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$	Measured value #1 data
D2 ± D2 D2 D2 D2 D2 D2	$\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$	Measured value #2 data
D3 ± D2 D2 D2 D2 D2 D2	$\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$	Measured value #3 data
S D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14	$\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$	Status

D2 : Measured value (7 characters, each)
(9 characters + $\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$)

D3 to D14 : Status information (12 characters)
(13 characters + $\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$)

- Measured value (D2) and status (D3 to D14) are same as the Mode 00.

(5) Data format for Mode 02

In the mode 02, the measured value and status information which are selected at the time of data holding are sent out one time only.

D D1 ± D2 D2 D2 D2 D2 D2	$\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$
S D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14	$\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$

D1 : The classification number of measured value to be sent out (1 character)

D2 : Measured value
(9 characters + $\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$)

D3 to D14 : Status information
(12 characters)
(13 characters + $\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$)

- The data classification number (D1) and measured value (D2) and status (D3 to D14) are same as the Mode 00.

(6) Data format for Mode 03

In the mode 03, the measured values #1 to #3 and satus information are sent out in due order one time only.

D1 ± D2 D2 D2 D2 D2 D2	$\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$	Measured value #1 data
D2 ± D2 D2 D2 D2 D2 D2	$\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$	Measured value #2 data
D3 ± D2 D2 D2 D2 D2 D2	$\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$	Measured value #3 data
S D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14	$\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$	Status

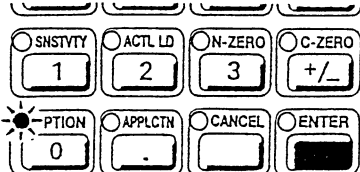
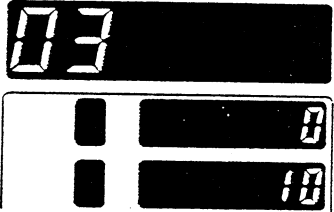
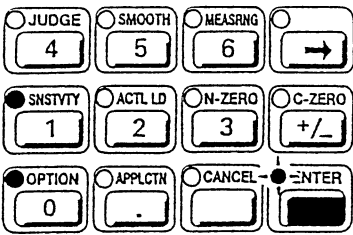
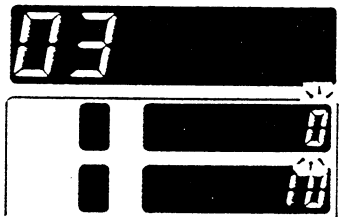
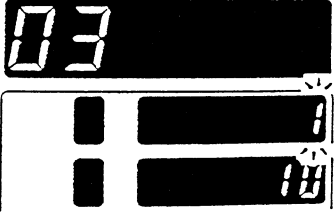
D2 : Measured value (7 characters, each)
(9 characters + $\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$)

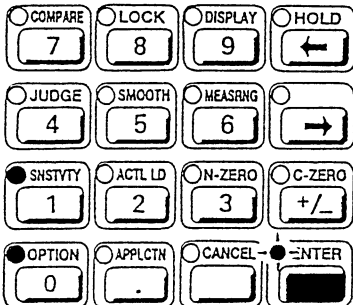
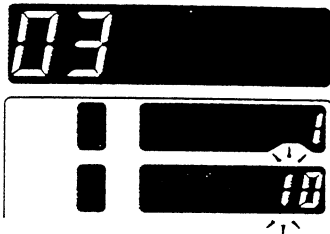
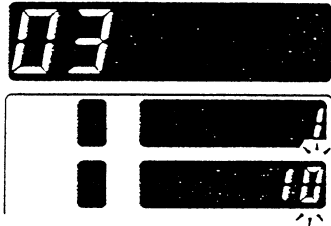
D3 to D14 : Status information (12 characters)
(13 characters + $\begin{matrix} C \\ R \end{matrix} \begin{matrix} L \\ F \end{matrix}$)

- Measured value (D2) and status (D3 to D14) are same as the Mode 00.

5-3-4 Key operation

Lamp indication: ● lights up; ○ goes out; ✨ flickers; - momentarily illuminates

Key to be operated	Lamp display on Setter	Reading on Display
① Option 		
② Entering a slot number X └ Slot number (1, 2) X X └ Option numbers 01: BCD output 02: D-A converter 03: EIA-232-D	In this sample, [1] is keyed in.	Main display reads an option number at its left; Sub-display #1 read a baud rate; and Sub-display #2, a transmission mode. 
③ Setting 		
④ Specifying a baud rate X └ Baud rate 0: 4800 bauds 1: 9600 bauds	In this sample, [1] is keyed in.	

Key to be operated	Lamp display on Setter	Reading on Display
⑤ Setting 		
⑥ Specifying a transmission mode XX — Transmission mode 00: Mode 00 01: Mode 01 02: Mode 02 03: Mode 03 04: Mode 10	In this sample, [10] is keyed in. (Request command)	
⑦ End of setting 		Regular display is restored.

5-3-5 Various control commands

The following explains various control commands and parameters that follows the former.
The control commands are valid only when the amplifier is in the mode 10.

(1) [GDT]

- Function : Transmits measured data one time only.
- Formate : GDTP1^{C_R}
- Parameter : P1 whose contents are described below.
 - The contents of transmission are as follows.
 - P1 0: Measure values #1 to #3 are sent out in due order.
 - 1: Measure value #1 is sent out.
 - 2: Measure value #2 is sent out.
 - 3: Measure value #3 is sent out.

- Transmission data format

(a) When P1 is 0

D 1 ± D2 D2 D2 D2 D2 D2	^{C_R} ^{L_F}	Measured value #1 data
D 2 ± D2 D2 D2 D2 D2 D2	^{C_R} ^{L_F}	Measured value #2 data
D 3 ± D2 D2 D2 D2 D2 D2	^{C_R} ^{L_F}	Measured value #3 data

D 2 : Measured value (6 characters each)
(9 characters + ^{C_R} ^{L_F})

(b) When P1 is 1 to 3

D D1 ± D2 D2 D2 D2 D2 D2	^{C_R} ^{L_F}
D1	: Classification number of measured value (1 character)
D2	: Measured value (6 characters)
	(9 characters + ^{C_R} ^{L_F})

- The formats of a measured value and classification number are same as the Mode 00.

(2) [GST]

- Function : Status information is sent out one time only.
- Format : GST^{C_R}
- Parameter : Nil
- Transmission data format

S D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14	^{C_R} ^{L_F}
D3 to D14	: Status (12 characters)
	(Status: 13 characters + ^{C_R} ^{L_F})

- The format of a measured value and classification number are same as the Mode 00.

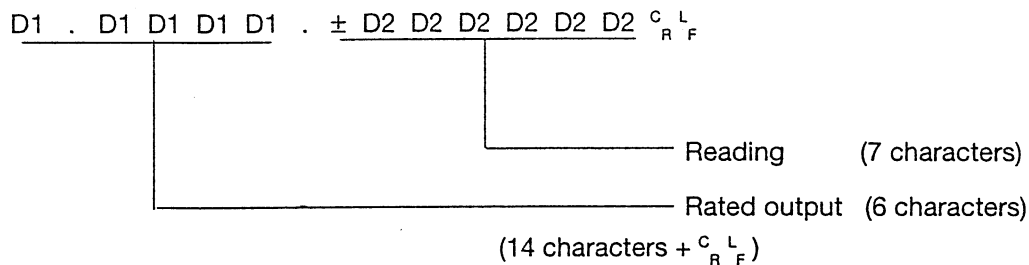
(3) [PRR]

- Function : Transmits the various parameters having been set to the amplifier.
- Format : PRRP1P1P1^{C_RL_F}
- Parameter : P1P1P1 whose contents are described below.

- P1P1P1
 - 010: Registered sensitivity value
 - 020: Smoothing function
 - 030: Zero correction mode
 - 041: Comparator #1's comparison function
 - 042: Comparator #2's comparison function
 - 043: Comparator #3's comparison function
 - 044: Comparator #4's comparison function
 - 051: Comparator #1's comparison value
 - 052: Comparator #2's comparison value
 - 053: Comparator #3's comparison value
 - 054: Comparator #4's comparison value
 - 061: Judging device #1's judging function
 - 062: Judging device #2's judging function
 - 070: Measuring function
 - 080: Main display
 - 090: Sub-display
 - 100: Option 1
 - 110: Option 2
 - 120: Condition of lock key

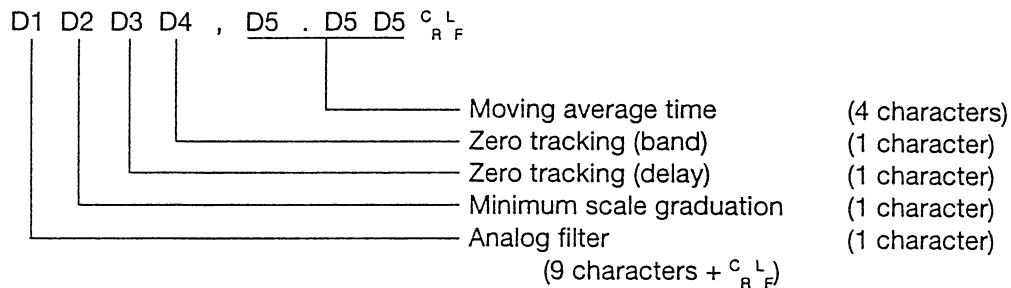
• Transmission data format

① When P1P1P1 is 010 (registered sensitivity value)



- Rated output (D1) is given by a value including a decimal point, and its unit is mV/V. (The position of a decimal point is fixed.)
- Reading (D2) is a value which is displayed when a rated output is outputted, and is formed by 7 characters including a decimal point and polarity indication.
Where the value does not include a decimal point, the top digits are filled by 0s.
(Example) Where display is set to +500, the reading will appear as +000500.

② When P1P1P1 is 020 (smoothing function)



- Analog filter (D1) parameters are as follows.

0: 200Hz
 1: 20Hz
 2: 1Hz
 3: No filter (2kHz)

- Minimum scale (D2) parameters are as follows.

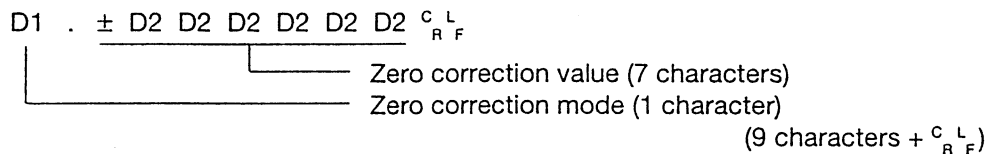
0: 1 count	5: 50 counts
1: 2 counts	6: 100 counts
2: 5 counts	7: 200 counts
3: 10 counts	8: 500 counts
4: 20 counts	9: 1000 counts

- Zero tracking parameters are as follows.

	D4	
0: N/A		0: N/A
1: 10 seconds		1: 1/4 count
2: 5 seconds		2: 1/2 count
3: 2 seconds		3: 1 count
4: 1 second		4: 2 counts
5: 0.5 seconds		5: 5 counts
6: 0.2 seconds		
7: 0.1 second		

- Moving average (D3) is expressed by four characters including a decimal point, and its unit is second. (The position of a decimal point is fixed.)

③ When P1P1P1 is 030 (zero correction mode)

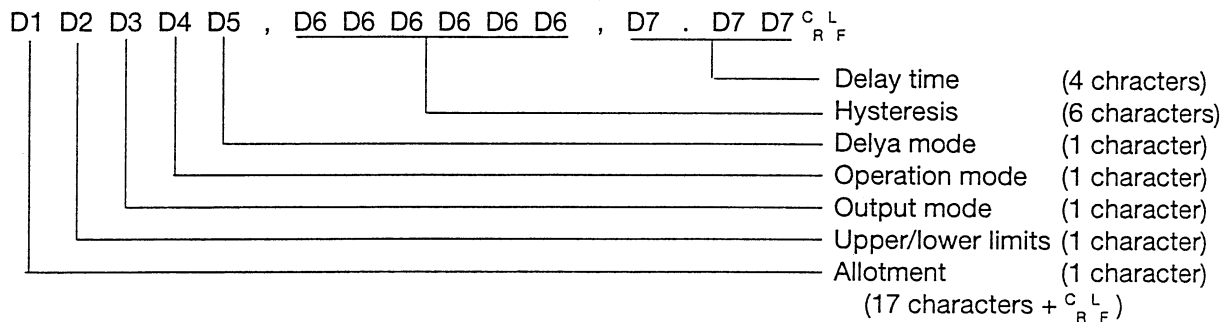


- Zero correction mode parameters are as follows.

0: Digital zero correction	(Zero correction mode 0)
1: Fixed value correction 1	(Zero correction mode 1)
2: Fixed value correction 2	(Zero correction mode 2)

- Zero correction value is a value expressed by 7 characters including a decimal point and polarity indication.
 Where the value does not include a decimal point, the top digits are filled by 0s.

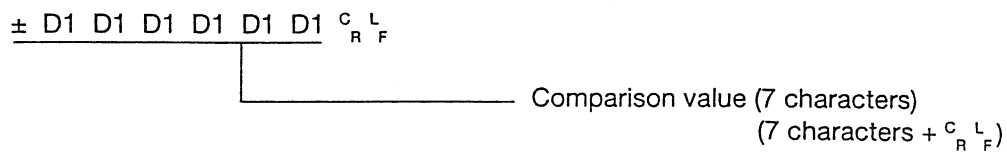
④ When P1P1P1 is 041 (Comparator #1's comparison function)



- Allotment (D1) parameters are as follows.
 - 0: No allotment
 - 1: Measure value #1
 - 2: Measrue value #2
 - 3: Measrue value #3
- Upper/lower limit (D2) parameters are as follows.
 - 0: Lower limit
 - 1: Upper limit
- Output mode (D3) parameters are as follows.
 - 0: Normal
 - 1: Invert
- Operation mode (D4) parameters are as follows.
 - 0: Comparison mode at all times
 - 1: Comparison mode when in HOLD operation
- Delay mode (D5) parameters are as follows.
 - 0: Nil
 - 1: ON delay
 - 2: OFF delay
 - 3: ON & OFF delay
- Hysteresis value (D6) is a value expressed by 6 characters including a decimal point. Where the value does not include a decimal point, the top digits are filled by 0s.
- Delay time value (D7) is a value expressed by 4 characters including a decimal point, and its unit is second.

⑤ When P1P1P1 is 042 to 044 (comparator #2 to #4), the same format as above is used.

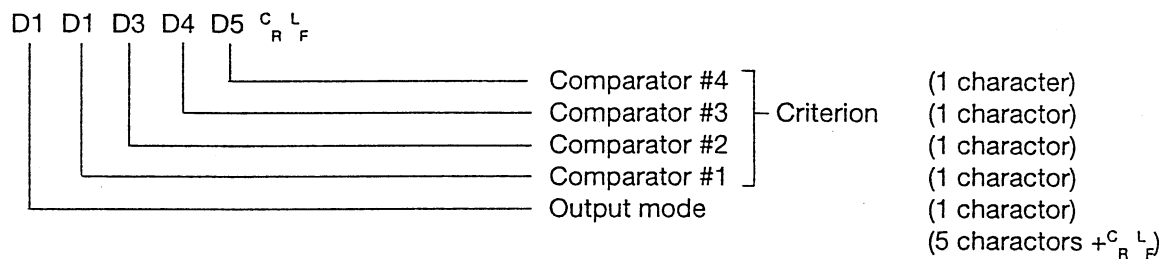
⑥ When P1P1P1 is 051 (Comparator #1's comparison value)



- Comparison value (D1) is a 7-digit value including a decimal point and polarity indication. Where the value does not include a decimal point, the top digits are filled by 0s.

⑦ The same format as above is used when P1P1P1 is 052 to 054 (Comparator #2 to #4's comparison values)

⑧ When P1P1P1 is 061 (Judging device #1's judging function)

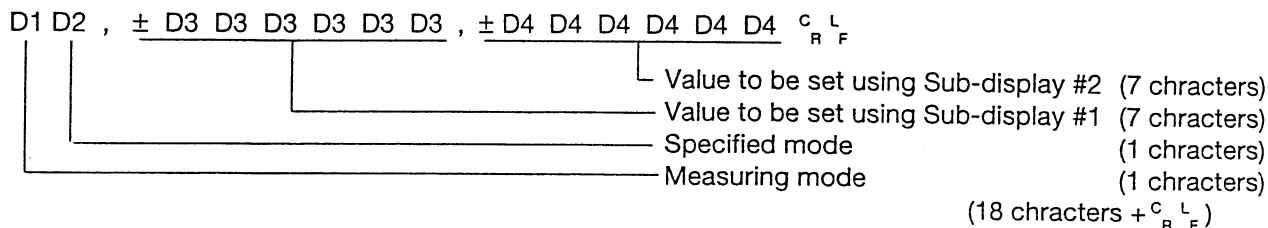


- Output mode (D1) parameters are as follows.
0: Normal
1: Invert
- Comparators #1 to #4 (D2 to D5) parameters are as follows.
0: OFF
1: ON
. : Invalid

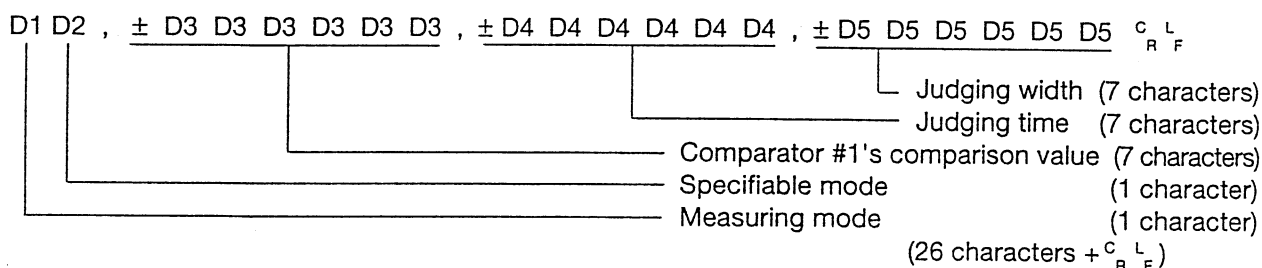
⑨ When P1P1P1 is 062 (Judging device #2's judging function), the same format as above is used.

⑩ When P1P1P1 is 070 (Measuring function)

(a) When measuring mode is 0 to 8



(b) When measuring mode is 9



• Measuring mode (D1) parameters are as follows.

0: Mode 0	5: Mode 5
1: Mode 1	6: Mode 6
2: Mode 2	7: Mode 7
3: Mode 3	8: Mode 8
4: Mode 4	9: Mode 9

• Measuring mode (D2) parameters are as follows.

: No specifiable mode

0: Specifiable mode 0	3: Specifiable mode 3
1: Specifiable mode 1	4: Specifiable mode 4
2: Specifiable mode 2	5: Specifiable mode 5

• If D3, D4 or D5 characters for transmission are less than the above, the top digits are filled by 0s.

Examples:

With Measuring mode 0

0 , + 0 0 0 0 0 0 , + 0 0 0 0 0 0 $C_R L_F$

With Measuring mode 5, Specifiable mode 1, and Specified time 10.00 seconds

51 , + 0 0 0 0 0 0 , + 0 1 0 . 0 0 $C_R L_F$

With Measuring mode 5, Specifiable mode 2, and Trigger level 100, and Hysteresis 10

52 , + 0 0 0 1 0 0 , + 0 0 0 0 1 0 $C_R L_F$

With Measuring mode 9, Comparator's comparison value 100.0, Detection time 5, and Detection width 10.0

9 , + 0 1 0 0 . 0 , + 0 0 0 0 0 5 , + 0 0 1 0 . 0 $C_R L_F$

⑪ When P1P1P1 is 080 (Main display)

D1 $\begin{smallmatrix} C & L \\ R & F \end{smallmatrix}$
 └─ Measure value # (1 character + $\begin{smallmatrix} C & L \\ R & F \end{smallmatrix}$) which reads on Main display

- Measure value # (D1) parameters are as follows.

- 1: Measure value #1
- 2: Measure value #2
- 3: Measure value #3

⑫ When P1P1P1 is 090 (Sub-display)

D1 D2 D3 $\begin{smallmatrix} C & L \\ R & F \end{smallmatrix}$
 └─ Sub-display 2 (1 character)
 └─ Sub-display 1 (1 character)
 └─ Sub-display mode (1 character)
 (3 characters + $\begin{smallmatrix} C & L \\ R & F \end{smallmatrix}$)

- Sub-display mode (D1) parameters are as follows.
 - 0: Fixed comparator
 - 1: Automatic comparator
 - 2: Measured value
- Sub-displays 1 and 2 (D2 and D3) parameters are as follows.

With Mode 0

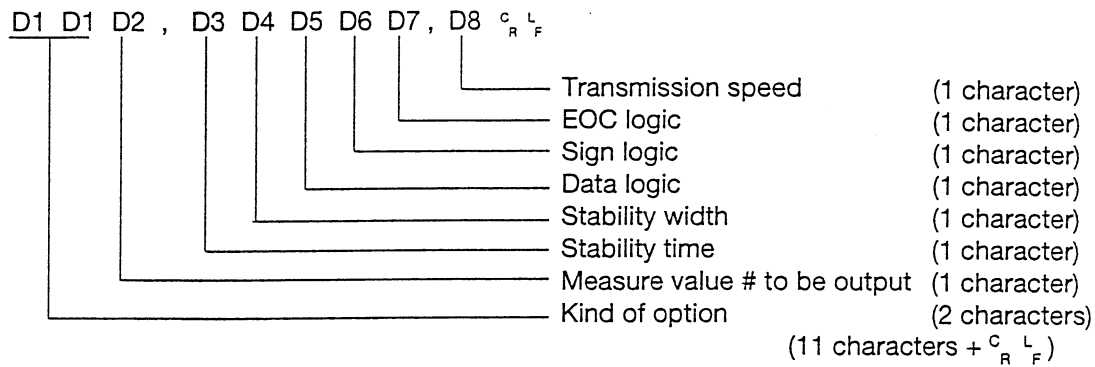
 - 0: No display
 - 1: Comparator #1
 - 2: Comparator #2
 - 3: Comparator #3
 - 4: Comparator #4

With Mode 2

 - 0: No display
 - 1: Measure value #1
 - 2: Measure value #2
 - 3: Measure value #3

⑬ When P1P1P1 is 100 (Option slot #1)

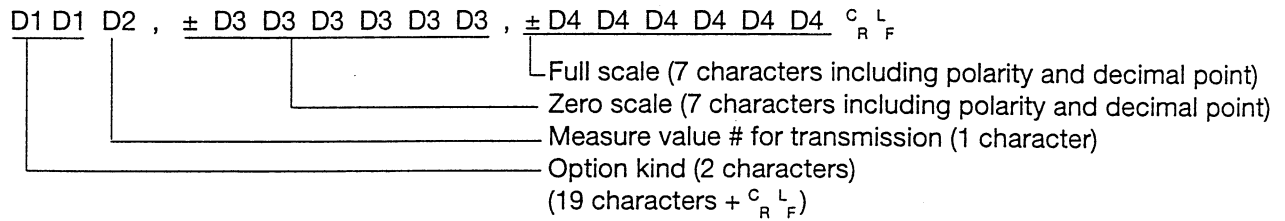
(a) With BCD



- Option kind (D1) parameters are as follows.
 - 00: No option is installed
 - 01: BCD
 - 02: D-A
 - 03: EIA-232-D
- Measure value # (D2) parameters are as follows.
 - 0: Reading value
 - 1: Measure value #1
 - 2: Measure value #2
 - 3: Measure value #3
- Stability time (D3) parameters are as follows.
 - 0: Nil
 - 1: 10 seconds
 - 2: 5 seconds
 - 3: 2 seconds
 - 4: 1 second
 - 5: 0.5 second
 - 6: 0.2 second
 - 7: 0.1 second
- Stability width (D4) parameters are as follows.
 - 0: Nil
 - 1: 1/4 count
 - 2: 1/2 count
 - 3: 1 count
 - 4: 2 counts
 - 5: 5 counts
- Data (D5), Sign (D6), and EOC (D7) parameters are as follows.
 - 0: Negative logic
 - 1: Positive logic
- Transmission speed (D8) parameters are as follows.

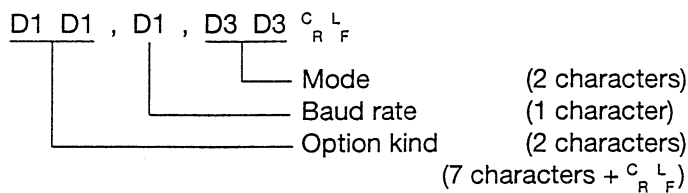
0: Approx. 15 times/second	BCD output
1: Approx. 31 times/second	Binary output
2: Approx. 62 times/second	Binary output
3: 125 times/second	Binary output
4: 250 times/second	Binary output

(b) With D-A converter



- Option kind (D1) and Measure value # (D2) parameters are common to BCD.

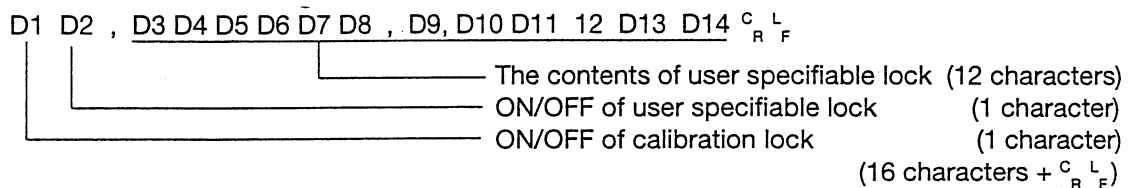
(c) With EIA-232-D



- Option kind (D1) parameters are common to BCD.
- Baud rate (D2) parameters are as follows.
0: 4800 bauds
1: 9600 bauds
- Mode (D3) parameters are as follows.
00: Mode 00
01: Mode 01
02: Mode 02
03: Mode 03
10: Mode 10

⑭ When P1P1P1 is 110 (Option slot #2), the same parameters as 100 (Option slot #1) are used.

⑮ When P1P1P1 is 120 (Lock)



- Parameters of Calibration lock (D1) and ON/OFF (D2) parameters of user specifiable lock are as follows.
0: Cancel
1: Execute
- Parameters of user specifiable lock (D3 to D14) are as follows.
0: Key 0
1: Key 1
2: Key 2
3: Key 3
4: Key 4
5: Key 5
6: Key 6
7: Key 7
9: Key 9
H: Hold key
•: Applications key
-: Zero correction key

(4) [GOD]

- Function : Sends out original value
- Format : GOD^C_R
- Parameter : N/A
- Transmission data format

D 0 $\pm$ D1 . D1 D1 D1 $^C_R ^L_F$

Measured value (6 characters including a decimal point and polarity indication)
(8 characters + $^C_R ^L_F$)

- The unit of measured value (D1) is mV/V.

(5) [HLD]

- Function : Starts measuring
- Format : HLD^C_R
- Parameter : N/A

(6) [RST]

- Function : Resets measuring
- Format : RST^C_R
- Parameter : N/A

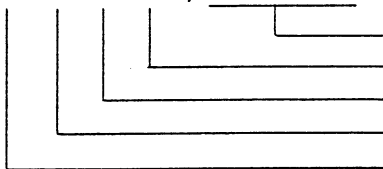
(7) [ZON]

- Function : Switches zero correction ON
- Format : ZON^C_R
- Parameter : N/A

(8) [ZOF]

- Function : Switches zero correction OFF
- Format : ZOF^C_R
- Parameter : N/A

(9) [SSM]

• Function	: Sets smoothing	
• Format	: SSMD1D2D3D4 , D5 . D5D5 ^{c_R}	
• Parameter	: D1 D2 D3 D4 , D5 . D5 D5	
		Moving average time (4 characters) Zero tracking (band) (1 character) Zero tracking (delay) (1 character) Minimum scale graduation (1 character) Analog filter (1 character) (Command 3 characters + 9 characters + ^{c_R})

- Analog filter (D1) parameters are as follows:

0: 200Hz
 1: 20Hz
 2: 1Hz
 3: No filter (2kHz)

- Minimum scale graduation (D2) parameters are as follows.

0: 1 count
 1: 2 counts
 2: 5 counts
 3: 10 counts
 4: 20 counts
 5: 50 counts
 6: 100 counts
 7: 200 counts
 8: 500 counts
 9: 1000 counts

- Zero tracing (D3, D4) parameters are as follows.

0: N/A	0: N/A
1: 10 seconds	1: 1/4 count
2: 5 seconds	2: 1/2 count
3: 2 seconds	3: 1 count
4: 1 second	4: 2 counts
5: 0.5 second	5: 5 counts
6: 0.2 second	
7: 0.1 second	

- Moving average (D5) is expressed by 4 characters, including a decimal point, in the unit of second.
 (The position of a decimal point is fixed.)

(10) [SZM]

- Function : Sets zero correction mode
 - Format : SZMD1, ±D2D2D2D2D2D2 ^c_R
 - Parameter : D1 , ± D2 D2 D2 D2 D2 D2
-
- Zero correction value (7 characters)

Zero correction mode (1 character)

(Command 3 characters + 9 characters + ^c_R)

- Zero correction mode (D1) parameters are as follows.
 - 0: Digital zero correction (Zero correction mode 0)
 - 1: Fixed value correction 1 (Zero correction mode 1)
 - 2: Fixed value correction 2 (Zero correction mode 2)
- Zero correction value is expressed by 7 characters including a decimal point and polarity indication.

If the value has no decimal point, fill the top digits of the value with 0s.

- Examples ① Suppose that the registered sensitivity value is 2.0000mV/V and the display reads 4000. To activate Zero correction mode 0 and set Zero correction value to 100, enter the following parameter.

SZM0, + 0 0 0 1 0 0 ^c_R

- ② Suppose that the registered sensitivity value is 2.0000mV/V and the display reads 4000.0. To activate Zero correction mode 1 and set Zero correction value to 100.0, enter the following parameter.

SZM1, + 0 1 0 0 . 0 ^c_R

- ③ Suppose that the registered sensitivity value is 2.0000mV/V and the display reads 4000. To activate Zero correction mode 2. (Zero correction value is represented by the total load which is available when Zero correction mode is established.)

SZM2, + 0 0 0 0 0 0 ^c_R

(11) [SCF]

• Function	: Sets Comparison function
• Format	: SCFD1D2D3D4D5D6, D7D7D7D7D7D7, D8 . D8D8 ^{c_R}
• Parameter	: D1 , D2 D3 D4 D5 D6 , D7 D7 D7 D7 D7 D7 . D8 . D8 D8

		Delay time	(4 characters)
		Hysteresis	(6 characters)
		Delay mode	(1 character)
		Operation mode	(1 character)
		Output mode	(1 character)
		Upper/lower limits	(1 character)
		Allotment	(1 character)
		Comparator #	(1 character)

(Command 3 characters + 19 characters + ^{c_R})

- Comparator # (D1) parameters are as follows.
 - 1: Comparator #1
 - 2: Comparator #2
 - 3: Comparator #3
 - 4: Comparator #4
- Allotment (D2) parameters are as follows.
 - 0: No allotment
 - 1: Measured value #1
 - 2: Measured value #2
 - 3: Measured value #3
- Upper/lower limits (D3) parameters are as follows.
 - 0: Lower limit
 - 1: Upper limit
- Output mode (D4) parameters are as follows.
 - 0: Normal
 - 1: Invert
- Operation mode (D5) parameters are as follows.
 - 0: All time comparison mode
 - 1: Comparison at holding mode
- Delay mode (D6) parameters are as follows.
 - 0: N/A
 - 1: Delay ON
 - 2: Delay OFF
 - 3: Delay ON & OFF
- Hysteresis (D7) value is expressed by 6 characters including a decimal point.
If the value has no decimal point, fill the top digits with 0s.
- Delay time (D8) value is expressed by 4 characters in the unit of second.
(The place of a decimal point is fixed.)
- Delay mode is valid only when the operation mode is at All time comparison mode.

- Examples

Suppose that the registered sensitivity value is 2.0000mV/V and the display reads 4000. To set Comparator #1's allotment to 1, Upper/lower limit to Upper, Output mode to Normal, Operation mode to All time comparison without delay, and Hysteresis to 100, enter the following parameter.

SCF1 1 1 0 0 0 , 0 0 0 1 0 0 , 0 . 0 0 ^C_B

Suppose that the registered sensitivity is 2.0000mV/V and the display reads 4000.0. To set Comparator #1's allotment to 1, Upper/lower limit to Upper, Output mode to Normal, Operation mode to Comparison at hold without delay, and Hysteresis to 100.0, enter the following parameter.

SCF1 1 1 0 1 0, 0 1 0 0. 0, 0. 0 0 ^c_B

Suppose that the registered sensitivity is 2.0000mV/V and the display reads 4000. To set Comparator #1's allotment to 1, Upper/lower limit to Upper, Output mode to Normal, Operation mode to All time comparison, Delay mode to ON, Delay time to 100ms, and Hysteresis to 100.0, enter the following parameter.

$$\text{SCF } 111001, 0100, 0, 0 \cdot 10^c_B$$

(12) [SCV]

- Function : Sets Comparison value
 - Format : SCVD1, $\pm$ D2D2D2D2D2 C_R
 - Parameter : D1 , $\pm$ D2 D2 D2 D2 D2 D2
- Comparison value (7 characters)

Comparator # (1 character)

(Command 3 characters + 9 characters + C_R)

- Comparator # (D1) parameters are as follows.
 - 1: Comparator #1
 - 2: Comparator #2
 - 3: Comparator #3
 - 4: Comparator #4
- Comparison value (D2) is expressed by 7 characters including a decimal point and polarity indication.

If the value has no decimal point, fill the top digits with 0s.

- **Examples** ① Suppose that the registered sensitivity value is 2.0000mV/V and the display reads 4000. To set Comparator #1's comparison value to 1000, enter the following parameter.

SCV 1, + 0 0 1 0 0 0^c_R

- ② Suppose that the registered sensitivity value is 2.0000mV/V and the display reads 4000.0. To set Comparator #1's comparison value to 1000.0, enter the following parameter.

SCV 1, +1000.0^c_B

(13) [SJF]

- Function : Sets Judging device
 - Format : SJFD1, D2D2D4D5D6 ^{c_R}
 - Parameter : D1 , D2 D3 D4 D5 D6
- | | | |
|------------------|-------------|---------------|
| Comparator #4 | } Criterion | (1 character) |
| Comparator #3 | | (1 character) |
| Comparator #2 | | (1 character) |
| Comparator #1 | | (1 character) |
| Output mode | | (1 character) |
| Judging device # | | (1 character) |

(Command 3 characters + 7 characters + ^{c_R})

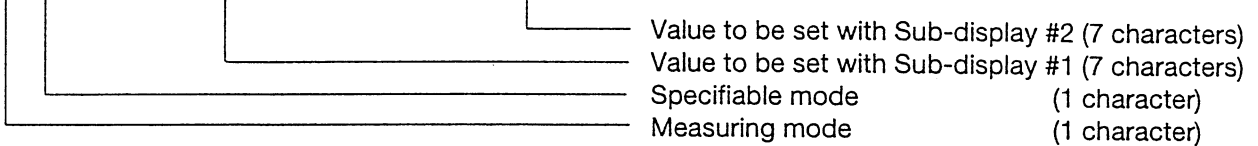
- Judging device # (D1) parameters are as follows.
 - 1: Judging device #1
 - 2: Judging device #2
- Output mode (D2) parameters are as follows.
 - 0: Normal AND (positive)
 - 1: Invert AND (negative)
 - 2: Normal OR (positive)
 - 3: Invert OR (negative)
- Comparator #1 to 4 (D3 to D6) parameters are as follows.
 - 0: OFF
 - 1: ON
 - .: Invalid
- Example To set Judging device #1's output mode to Normal AND, and as Comparison criteria, Comparator #1 and #2 to ON, and Comparator #3 and 4 to Invalid.

SJF1 , 011 . . ^{c_R}

(14) [SMF]

- Function : Sets Measuring function
- Format : SMFD1D2, D3D3D3D3D3D3D3, D4D4D4D4D4D4D4 (, D5D5D5D5D5D5D5) ^{c_R}
- Parameter :

D1 D2 , D3 D3 D3 D3 D3 D3 D3 , D4 D4 D4 D4 D4 D4 D4 (, D5 D5 D5 D5 D5 D5 D5)



(Measuring mode 0 to 8: Command 3 characters + 17 characters + ^{c_R})
 (Measuring mode 9: Command 3 characters + 25 characters + ^{c_R})

- Measuring mode (D1) parameters are as follows.
 - 0: Mode 0 (Normal measuring)
 - 1: Mode 1 (Optional point hold measuring)
 - 2: Mode 2 (Average measuring)
 - 3: Mode 3 (High-speed peak hold measuring)
 - 4: Mode 4 (High-speed bottom hold measuring)
 - 5: Mode 5 (Peak & bottom hold measuring)
 - 6: Mode 6 (Simultaneous peak hold measuring)
 - 7: Mode 7 (Peak & time measuring)
 - 8: Mode 8 (Time measuring)
 - 9: Mode 9 (Pressing input measuring)
- Specifiable mode (D2) parameters are as follows.
 - 0: Specifiable mode 0 (Externally specifies measuring signal zone)
 - 1: Specifiable mode 1 (Externally specifies measuring time)
 - 2: Specifiable mode 2 (Specifies level trigger zone • upper limit)
 - 3: Specifiable mode 3 (Specifies level trigger zone • lower limit)
 - 4: Specifiable mode 4 (Specifies level trigger time • upper limit)
 - 5: Specifiable mode 5 (Specifies level trigger time • lower limit)
- The contents of (D3), (D4) and (D5) vary according to measuring modes and specifiable modes. A trigger level, time and comparison value should therefore be set according to the measuring mode and specifiable mode in use.
 Set (D5) parameter when in the measuring mode 9.
 With (D3), (D4) and (D5), fill the top digits with 0s if the number of characters are less than the number stated above.

Examples: With Measuring mode 0
 SMF00, +000000, + 000000 ^{c_R}

With Measuring mode 5, Specifiable mode 1 and Specified time 10.00 seconds
 SMF51, +000000, +010.00 ^{c_R}

With Measuring mode 5, Specifiable mode 2, Trigger level 100 and Hysteresis 10
 SMF52, +000100, +000010 ^{c_R}

With Measuring mode 9, Comparator #1's comparison value 100.0, Judging time 5 and Judging width 10.0,
 SMF9, +0100.0, +000005, +0010.0 ^{c_R}

(15) [SMD]

- Function : Sets Main display
- Format : SMDD1 ^c_R
- Parameter : D1 ————— Measuring value # which reads on Main display
(Command 3 characters + 1 character + ^c_R)

- Measuring value # (D1) parameters are as follows.

- 1: Measuring value #1
- 2: Measuring value #2
- 3: Measuring value #3

(16) [SSD]

- Function : Sets Sub-display
- Format : SSDD1D2D3 ^c_R
- Parameter : D1 D2 D3

Sub-display #2 (1 character)
Sub-display #1 (1 character)
Sub-display mode (1 character)

(Command 3 characters + 3 characters + ^c_R)

- Sub-display mode (D1) parameters are as follows.

- 0: Fixed Comparator
- 1: Automatic Comparator
- 2: Measured value

- Sub-display #1, 2 (D2, D3) parameters are as follows.

With Mode 0

- 0: No display
- 1: Comparator #1
- 2: Comparator #2
- 3: Comparator #3
- 4: Comparator #4

With Mode 2

- 0: No display
- 1: Measure value #1
- 2: Measure value #2
- 3: Measure value #3

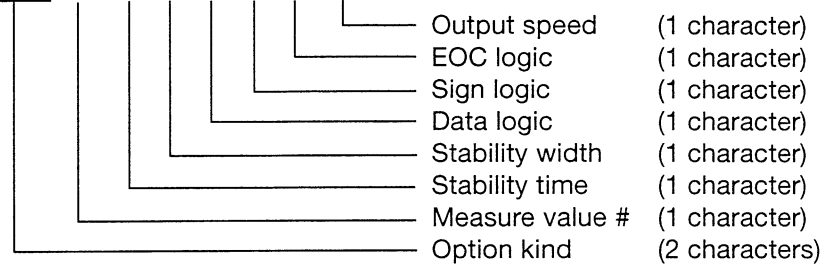
(17) [OP1]

Function : Sets Option slot #1

(a) When Option slot #1 is BCD

• Format : OP1D1D1D2, D3D4D5D6D7, D8 ^{C_R}

• Parameter : D1 D1 D2, D3 D4 D5 D6 D7, D8



(Command 3 characters + 11 characters + ^{C_R})

- Option kind (D1) parameters are as follows.
 - 00: Option is not installed
 - 01: BCD
 - 02: D-A
 - 03: EIA-232-D
- Measure value # (D2) parameters are as follows.
 - 0: Reading on display
 - 1: Measure value #1
 - 2: Measure value #2
 - 3: Measure value #3
- Stability time (D3) parameters are as follows.

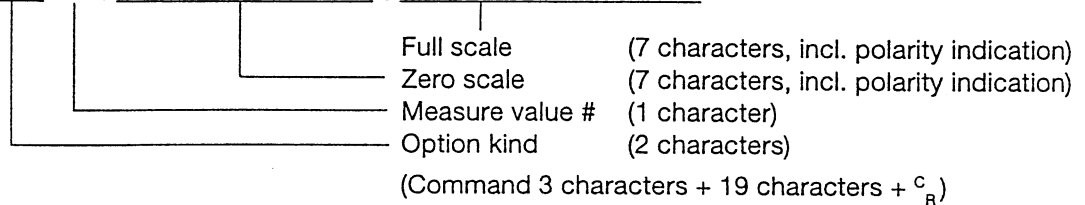
0: N/A	4: 1 second
1: 10 seconds	5: 0.5 second
2: 5 seconds	6: 0.2 second
3: 2 seconds	7: 0.1 second
- Stability width (D4) parameters are as follows.

0: N/A	3: 1 count
1: 1/4 count	4: 2 counts
2: 1/2 count	5: 5 counts
- Data logic (D5), Sign logic (D6) and EOC logic (D7) parameters are as follows.
 - 0: Negative logic
 - 1: Positive logic
- Output speed (D8) parameters are as follows.

0: Approx. 15 times/second	BCD output
1: Approx. 32 times/second	Binary output
2: Approx. 62 times/second	Binary output
3: 125 times/second	Binary output
4: 250 times/second	Binary output

(b) When Option slot #1 is D-A

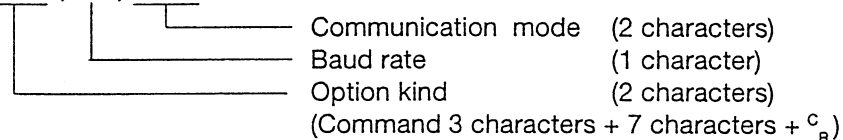
- Format : OP1D1D1D2, ±D3D3D3D3D3D3, ±D4D4D4D4D4D4^{c_R}
- Parameter : D1 D1 D2, ± D3 D3 D3 D3 D3 D3, ± D4 D4 D4 D4 D4 D4



- Option kind (D1) and Measure value # (D2) parameters are same as BCD.
- Zero scale (D3) and Full scale (D4) are expressed by 7 characters including a decimal point and polarity indication, respectively.
 If the value has no decimal point, fill the top digits with 0s.

(c) When Option 1 is EIA-232-D

- Format : OP1D1D1, D2, D3D3^{c_R}
- Parameter : D1 D1, D2, D3 D3



- Option kind (D1) parameters are same as BCD.
- Baud rate (D2) parameters are as follows.
 0: 4800
 1: 9600
- Communication mode (D3) parameters are as follows.
 00: Mode 00
 01: Mode 01
 02: Mode 02
 03: Mode 03
 10: Mode 10

(18) [OP2]

- Function : Sets Option slot #2
- Format : OP2 ***
- Parameters : *** are same as OP1

(19) [ZAD]

- Function : Executes no-load zero
- Format : ZAD^{c_R}
- Parameter : N/A

NOTE

Execution of ZAD command takes time. Proper response may therefore fail even if another command is received during the execution.

(20) [VCL]

- Function : Executes actual load calibration
- Format : VCL ± D1D1D1D1D1D1 ^{c_R}
- Parameter : D1 — Value which reads on Display (6 characters)
(Command 3 characters + 7 characters + ^{c_R})

- Value which reads on Display is a 7-character value including a decimal point and polarity indication.
To omit a decimal point, fill the top digits with 0s.

NOTE

Execution of VCL command takes time. Proper response may therefore fail even if another command is received during the execution.

(21) [EIC]

- Function : Executes calibration of registered sensitivity
 - Format : EICD1.D1D1D1D1, ±D2D2D2D2D2D2 ^{c_R}
 - Parameter : D1 . D1 D1 D1 D1 , ± D2 D2 D2 D2 D2 D2
- Value which reads at the time of rated output (7 characters)
Sensor's rated output (6 characters)
(Command 3 characters + 14 characters + ^{c_R})
- Sensor's rated output is expressed by 6 characters, including a decimal point, in the unit of mV/V.
(The place of a decimal point is fixed.)
 - Value which reads on Display at the time of rated output (D2) is expressed by 7 characters, including a decimal point and polarity indication/
If the value has no decimal point, fill the top digits with 0s.

(22) [LCK]

- Function : Sets Lock
 - Format : LCKD1D2 ^{c_R}
 - Parameter : D1 D2
- Sets user-specifiable lock to ON or OFF.
Sets calibration lock to ON or OFF
(Command 3 characters + 2 characters + ^{c_R})

- ON/OFF parameters of Calibration lock (D1) and user specifiable lock (D2) are as follows.
0: Cancel
1: Execute

(23) [SLC]

- Function : Sets the contents of user-specified lock
- Format : SLCD1D2D3D4D5D6, D7D8D9D10D11D12^{C_R}
- Parameter : D1 D2 D3 D4 D5 D6 , D7 D8 D9 D10 D11 D12
D1 to D12: The contents of user-specified lock (12 characters)
(Command 3 characters + 13 characters + ^{C_R})
- The contents of user-specified lock (D1 to D12) are as follows.

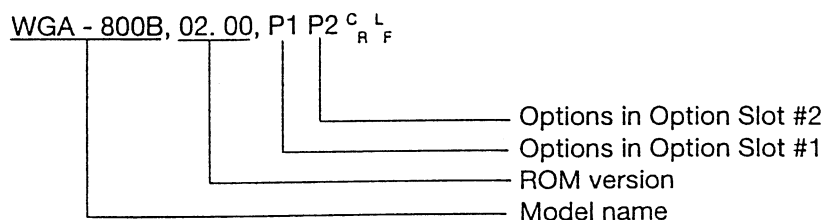
0: "0" key	6: "6" key
1: "1" key	7: "7" key
2: "2" key	9: "9" key
3: "3" key	H: Hold key
4: "4" key	•: Application key
5: "5" key	–: Zero correction key

(24) [RS –]

- Function :Bus line test
- Format :RS –^{C_R}
- Parameter :N/A
- Upon correct reception of the test signals, "RS-232C" is transmitted in response.

(25) [SYS]

- Function : Reads the model name, etc.
- Format : SYS^{C_R}
- Parameter : N/A



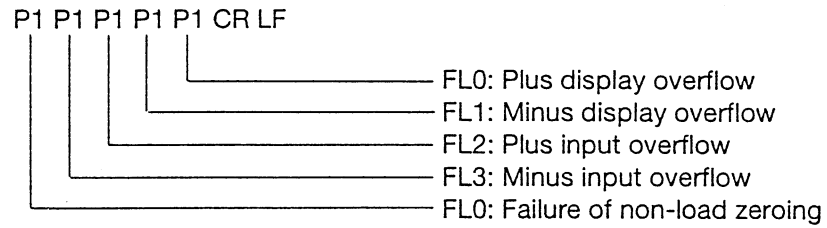
- The contents of Option Slot #1 (P1) and #2 (P2) are as follows.

0: N/A
1: BCD
2: D-A
3: EIA-232-D

(26) [ERR]

- Function : Reads an error number
- Format : ERR^C_R
- Parameter : N/A

- Transmission data format



(27) [/M]

- Function : Writes setup parameters in NOVRAM (non-volatile memory).
- Format : $***** , /M^C_R$
- Parameter : N/A

- Enter a delimiter after the setting command.
Example: To write parameters that set smoothing.

SSM000, 0. 00, $/M^C_R$

5-3-6 Sample program

(1) Sample program 1

```
' SAMPLE1. BAS
' -----
'   >>> Sample Program 1 <<<
'
' *Conditions of RS-232-C
'   board rate   : 9600
'   start bit    : 1
'   data length  : 7
'   parity       : odd
'   stop bits    : 1
'
' *Language      : Quick BASIC V4.5
'
' KYOWA ELECTRONIC INSTRUMENT CO., LTD
' -----

CLS

CR$ = CHR$(&HD)           ' Termination code(CR)
wait1 = 100000            ' Waiting timer

GOSUB RsOpen
PRINT #1, "MOD10" + CR$;  ' set "mode10"
CLOSE #1

Main:
  LINE INPUT "Input Command "; A$      ' Input Control command
  PRINT "Command = "; A$                ' Display Input command
  GOSUB RsOpen                          ' Open RS-232-C
  PRINT #1, A$ + CR$;                  ' Transfer Command

Wait. Loop:
  FOR i = 0 TO wait1                  ' Waiting
  NEXT i

Receive. Data:
  IF EOF(1) THEN GOTO EndofProcess
  LINE INPUT #1, R$                    ' Receive data
  IF LEFT$(R$, 1) = CHR$(&10A) THEN R$ = RIGHT$(R$, LEN(R$) - 1)
  ' Omit "LF"
  CLOSE #1

Print. Data:
  PRINT "Data has been received."
  PRINT "Received data : "; R$          ' Display received data
  PRINT
  GOTO EndofProgram

EndofProcess:
  CLOSE #1
  PRINT "No data has been received."
  PRINT

EndofProgram:
  GOTO Main

END

RsOpen: ' Open RS_line(7bits, odd parity, 1 stop bit)
  OPEN "COM1:9600, 0, 7, 1, BIN" FOR RANDOM AS #1
  RETURN
```

(2) Screen page executing Sample program 1

```
Input Command RS-  
Command =      RS-  
Data has been received.  
Received data : RS-232C  
  
Input Command SSM20001.00  
Command =      SSM20001.00  
Data has been received.  
Received data : WSSM20001.00?  
  
Input Command SSM2000,1.00  
Command =      SSM2000,1.00  
No data has been received.  
  
Input Command _
```

NOTES

If this instrument can not recognize data as a command – data which was received from external equipment, the instrument transmits in turn "W ****?" (*** denote data that could not be recognized).

(See the above screen page executing Sample program 1.)

When producing a program that sets the WGA, it is recommended to make sure that the instrument has returned data in response to the control command transmitted.

(3) Sample program 2

```

SAMPLE2. BAS
-----
  *** Sample Program 2 ***

*Conditions of RS-232-C
  board rate   : 9600
  start bit    : 1
  data length  : 7
  parity       : Odd
  stop bits    : 1

*Language      : Quick BASIC V4.5

KYOWA ELECTRONIC INSTRUMENT CO.,LTD
-----

DIM SS$(20)

CR$ = CHR$(&HD)          ' Termination code(CR)
wait1 = 100000           ' Waiting timer
x = 10: y = 3

GOSUB RsOpen
PRINT #1, "MOD10" + CR$: ' scl "model0"
FOR i = 0 TO wait1: NEXT i
CLOSE #1

CLS
FOR i = 0 TO wait1: NEXT i

Set. Mode:
GOSUB RsOpen
PRINT #1, "MOD01" + CR$: ' Transfer Command

Display. Screen: ' Draw screen
CLS
LOCATE y, x: PRINT "Meas data 1"
LOCATE y + 1, x: PRINT "Meas data 2"
LOCATE y + 2, x: PRINT "Meas data 3"
LOCATE y + 4, x: PRINT "Status"
LOCATE y + 14, x: PRINT "Data error"
LOCATE y + 16, x: PRINT "Press any key to stop"
LOCATE y + 5, x + 15: PRINT " : : : : : : : : : : : "
LOCATE y + 6, x + 15: PRINT " : : : : : : : : : : : Stable"
LOCATE y + 7, x + 15: PRINT " : : : : : : : : : : : error"
LOCATE y + 8, x + 15: PRINT " : : : : : : : : : : : zero tracking"
LOCATE y + 9, x + 15: PRINT " : : : : : : : : : : : zero compensation"
LOCATE y + 10, x + 15: PRINT " : : : : : : : : : : : hold"
LOCATE y + 11, x + 15: PRINT " : : : : : : : : : : : measurement period"
LOCATE y + 12, x + 15: PRINT " : : : : : : : : : : : judge(1,2)"
LOCATE y + 13, x + 15: PRINT " : : : : : : : : : : : comparater(1,2,3,4)"

Get. Data:
k = 0
WHILE k < 1          ' Loop
  LINE INPUT #1, A$
  IF LEFT$(A$, 1) = CHR$(&HA) THEN A$ = RIGHT$(A$, LEN(A$) - 1)
  ' Omit "LF"
  AA$ = MID$(A$, 1, 2) ' Extract Status
  IF AA$ = "D1" THEN    ' Meas Data 1
    M1$ = A$
  ELSEIF AA$ = "D2" THEN ' Meas Data 2
    M2$ = A$
  
```

```

ELSEIF AA$ = "D3" THEN      ' Meas Data 3
    M3$ = A$
ELSEIF AA$ = "S0" THEN      ' Status
    S$ = A$
ELSEIF AA$ = "S1" THEN
    S$ = A$
ELSE
    ER$ = A$                ' Other(Error) Data
END IF
LOCATE y, x + 15: PRINT M1$  ' Display Meas Data
LOCATE y + 1, x + 15: PRINT M2$
LOCATE y + 2, x + 15: PRINT M3$
FOR j = 1 TO 13              ' Display Status
    SS$(j) = MID$(S$, j, 1)
    LOCATE y + 4, x + 13 + j * 2: PRINT SS$(j)
NEXT j
LOCATE y + 14, x + 15: PRINT ER$
k$ = INKEY$                  ' Check any key
IF k$ <> "" THEN
    k = 1
ELSE
    k = 0
END IF
WEND
PRINT #1, "MODE10" + CR$:
CLOSE #1

```

END

```

RsOpen: ' Open RS_line(7bits, odd parity, 1 stop bit)
OPEN "COM1:9600, 0, 7, 1, BIN" FOR RANDOM AS #1
RETURN

```

(4) Screen page executing Sample program 2

```

Meas data 1      D1+0000009
Meas data 2      D2+0000009
Meas data 3      D3+0000000

Status           S 1 0 0 0 1 0 0 0 0 0 0 0
                  : : : : : : : : : :
                  : : : : : : : : : : Stable
                  : : : : : : : : : : error
                  : : : : : : : : : : zero tracking
                  : : : : : : : : : : zero compensation
                  : : : : : : : : : : hold
                  : : : : : : : : : : measurement period
                  : : : : : : : : : : judge(1,2)
                  : : : : : : : : : : comparater(1,2,3,4)

Data error

Press any key to stop

```

NOTES

The performance of the sample programs introduced in this manual has been proven with Microsoft Corporation's Visual BASIC for MS-DOS V1.00 on Fujitsu Ltd.'s FMV Series personal computer. This does not guarantee the performance of the programs on other computers. If your computer is slow in processing speed, lengthen wait time (WAIT 1).

6. Troubleshooting

If the amplifier does not function as expected or is found unstable, do not immediately take it that the amplifier has failed, but check the operating environment for possible causes.

Also execute the self-test (self-diagnostic) function, thus discover and remove the cause of a malfunction. If all this fails to recover normal operation, contact your

KYOWA representative.

KYOWA may deny repairs when the product has been damaged through improper usage (i.e. not conforming to guidelines described in this manual), or when the product has been disassembled or modified by the user.

6-1 Troubles and remedies

Some troubles can be caused by faults other than in the amplifier. Causes of such troubles and remedies are introduced in the table below.

Trouble	Cause	Remedy
The power switch cannot turn the amplifier on.	AC power cable	Check that AC power is supplied to the input terminal on the rear, using an AC voltmeter. Also check to be sure that the power cable is not broken.
	Broken fuse	Remove the fuse after switching the amplifier off. If the fuse is found melted, replace it with another. If a replacement fuse melts again, the cause can be a failure of the circuit. In this case, contact your KYOWA representative.
Keys on the setter freeze.	Hang-up (faulty calculation)	Switch the amplifier off, and switch it on again. If the cause is hang-up, normal operation will be restored.
<u>LOC</u> C or <u>LOC</u> U error message appears during key operation on the setter.	Error in operation	Make sure of the settings which are locked. [4-1-5 How to lock settings] and [4-9-3 Table of error/warning messages].

Trouble	Cause	Remedy
<u>oFLO</u> , <u>oFL1</u> or <u>oFL2</u> appears on the amplifier which is free from loads.	Mistaken connection of a transducer	Check that the connection of a transducer is correct. If found otherwise, correct it according to [2-2 Connection of a transducer].
	Broken wire or short-circuiting of the transducer or of the transducer cable.	Switch the amplifier off, then remove the transducer cable from the terminal on the rear. Measure resistance between the cable's red and black wires as well as between the white and green wires. The resistance between the red and black wires should be equal to the transducer's input resistance (added by the cable resistance in case of cable extension). The resistance between the white and green wires should be equal to the output resistance (added by the cable resistance in case of cable extension). Compare the measured resistance with the respective input and output resistance described in the transducer's calibration sheet. (In case of cable extension, the cable resistance must be deducted from the respective measured values.) If comparison discovers a difference of over 5%, check the transducer or its cable. [Cable resistance] 0.5mm ² conductor: $0.040\Omega/\text{m} \times 2(\text{wires}) = 0.080\Omega/\text{m}$ 0.3mm ² conductor: $0.067\Omega/\text{m} \times 2(\text{wires}) = 0.134\Omega/\text{m}$ *Wire colors stated above are KYOWA colors.
	Deterioration of the transducer's or cable's insulation resistance	Switch the amplifier off, then remove the transducer cable from the terminal on the rear. Measure insulation resistance between the shield wire and the red wire (any one of red, white, black and green wires will do) where an applied voltage is below 50Vdc. If resistance of over 500M Ω is found, there's no problem. If resistance is found less than 1M Ω , it can result in the appearance of <u>oFL1</u> or <u>oFL2</u> . In this case, check the transducer and its cable. *Wire colors stated above are KYOWA colors.
	Damage to the transducer due to over-loading, etc.	The cause can be initial unbalance in the transducer. Replace the transducer with one known to be good.
	Error in operation	Execute non-load zeroing without fail each time you have connected a transducer. Note that the initial unbalance value varies if a transducer is replaced. Hence, the need for execution of non-load zeroing.
<u>oFL3</u> or <u>oFL4</u> appears on the amplifier which is free from loads.	Error in operation	Execute non-load zeroing without fail each time you have connected a transducer. Note that the initial unbalance value varies if a transducer is replaced. Hence, the need for execution of non-load zeroing.

Trouble	Cause	Remedy
oFL0, oFL1 or oFL2 appears on the amplifier when it is given a load.	Deterioration of the transducer's or cable's insulation resistance	Apply the same remedy given for the preceding trouble [Deterioration in the transducer's or cable's insulation resistance.
	Mistaken measuring range	The amplifier's measuring range varies by switching over BV (a bridge excitation voltage) from one to another. Make sure of the rated output of a transducer to be connected, and set a suitable excitation voltage each time.
oFL3 or oFL4 appears on the amplifier when it is given a load.	Mistaken measuring range	The amplifier's measuring range varies by switching over BV (a bridge excitation voltage) from one to another. Make sure of the rated output of a transducer to be connected, and set a suitable excitation voltage each time.
	Faulty calibration	Read numerical values which will appear on Sub-displays upon a push of Sensitivity registration key. Suppose that Sub-display #1 reads A [mV/V], and Sub-display #2 reads B. As such, if a value obtained by $\frac{B}{A [mV/V]} \times \text{Transducer's rated output [mV/V]}$ exceeds ± 99999 , oFL3 or oFL4 may appear on occasion. In this case, execute calibration again.
A reading on Display does not change irrespective of a load given to the transducer.	Mistaken connection of a transducer.	Apply the same remedy given for the preceding trouble [Mistaken connection of a transducer].
	Broken wire or short-circuiting of the transducer or of the cable	Apply the same remedy given for the preceding item [Broken wire or short-circuiting of the transducer or of the transducer cable].
	Faulty calibration	Make sure of the reading which will appear by a push of Actual load key. If it reads "00000", the reading will not change on Display. In this case, execute calibration again.
	Error in operation	The reading on Display does not change under the conditions as follows. Make sure of how to use functions once again. • HOLD or Peak HOLD is in action. The HOLD lamp is lighted or is flickering. • The smallest scale division is in use for Smoothing function. • A reading does not vary against signal values changing below the scale division value. • Zero correction value is on Display. • Time is on Display. Time display does not change unless it is during a measuring period. • Measured value classification #3 lamp is lighted.

Trouble	Cause	Remedy
Main display reads one of the following error messages. <i>Err-00</i> <i>Err-01</i> <i>Err-02</i> <i>Err-03</i>	ROM malfunction RAM malfunction Display circuit malfunction Non-volatile memory writing malfunction	Contact your KYOWA representative.
Readings on Display fluctuate.	Deterioration in the transducer's or cable's insulation resistance.	Switch the amplifier off, then remove the transducer cable from the terminal on the rear. Measure insulation resistance between the cable's shield wire and red wire (any one of red, white, black and green wires will do) where an applied voltage is below 50Vdc. If resistance of over 500Ω is found, there's no problem. If resistance is found less than 20MΩ, it can result in fluctuation of readings. In this case, check the transducer or its cable. *Wire colors stated above are KYOWA colors.
	Noise effect	The cause can be external noise. This occurs if grounding or cable shielding is not sufficient. See [2-2 Connection of a transducer] and perform proper shielding against external noise.
	Mechanical vibrations affected on the transducer	Avoid mechanical vibrations on the transducer by providing a damper, etc. Also setting of a moving average time for Smoothing function can stabilize fluctuating readings. Note however that this moving average performs moving average operation not only on readings but also on measured values during a measuring period. Hence, the need for careful adoption of moving average whenever high-speed phenomena are measured.
A comparator does not function or functions unexpectedly.	Error in operation	A comparator will not function if it is set to [No allotment]. Also if a wrong classification of measured value is allotted, a comparator will function in an unexpected manner. Take care to perform correct allotment to comparators.
The hold lamp does not light up despite the hold switch and incoming external signals.	Error in operation The Ext. reset switch is in [ON] position.	In the case that a measuring period was set to [Level trigger], the hold lamp lights up when a load value has crossed a preset level. Renew a measuring period so as to meet the measuring purpose.

7. How to use voltage output

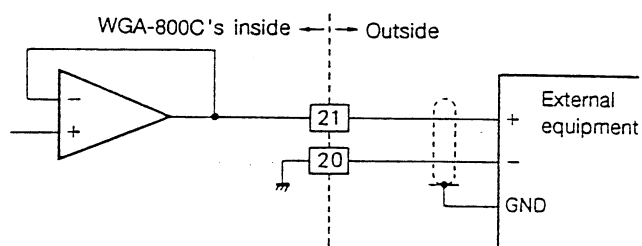
A voltage output is available on the terminal board provided on the amplifier's rear.

Bdridge voltage	Output voltage per transducer's rated output
2.5V	App. 10V per 8 [mV/V]
5V	App. 10V per 4 [mV/V]
10V	App. 10V per 2 [mV/V]

Use this voltage output to perform initial balancing, maintenance and inspection as well as operational testing.

It also lets you to record waveforms on a recorder or to review vibration-generated output signals on an oscilloscope, etc.

Example connection of equivalent output circuit with external equipment



NOTES

- Execution of Non-load zero brings a voltage output to 0V (± 0.2 V or less).
- Despite execution of Zero correction, a voltage output does not change. It does not agree with a measured value which has been digitally processed.
- Response frequency of a voltage output ranges from DC to approx. 2kHz.
(It varies according to a setting of the analog filter. See [4-2-1 Analog filter].)
- A voltage output is not electrically isolated from the internal circuitry. To connect it to an external instrument, therefore use a shielded cable which is shorter than 3 meters. A longer cable is apt to be affected by noise.

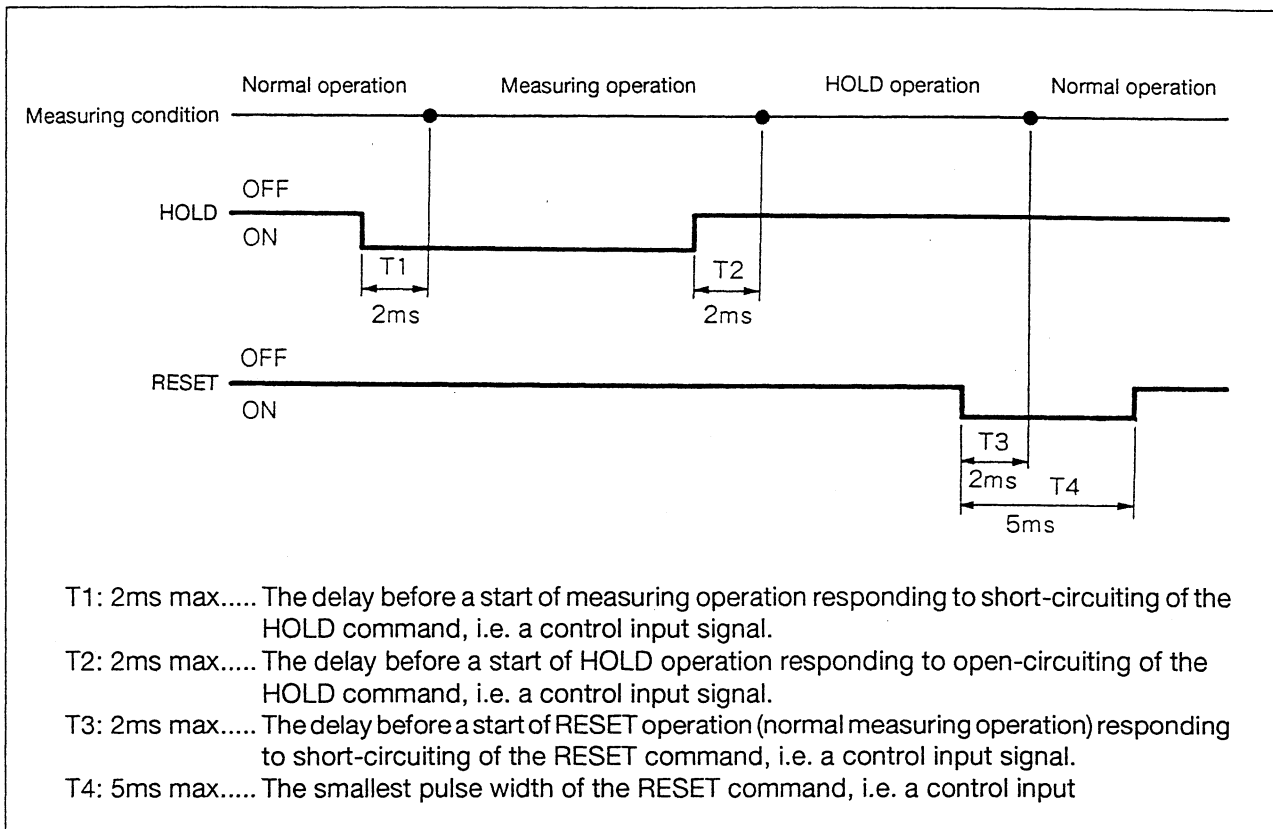
CAUTIONS

- Do NOT short-circuit the voltage output terminal for longer than one hour, or the amplifier will fail.
- Do NOT give an external voltage, or the amplifier will be damaged.

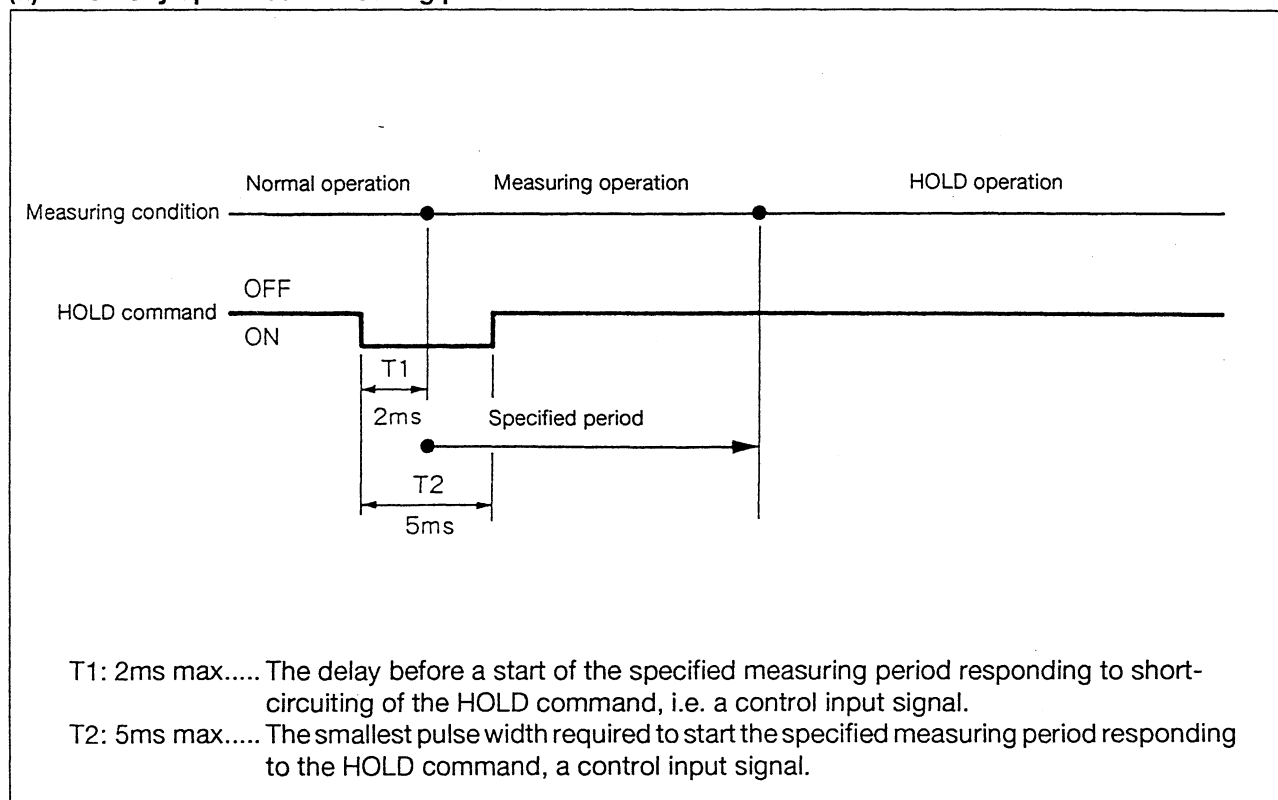
8. Operational timing charts in detail

8-1 Timing charts responding to Hold and Reset commands

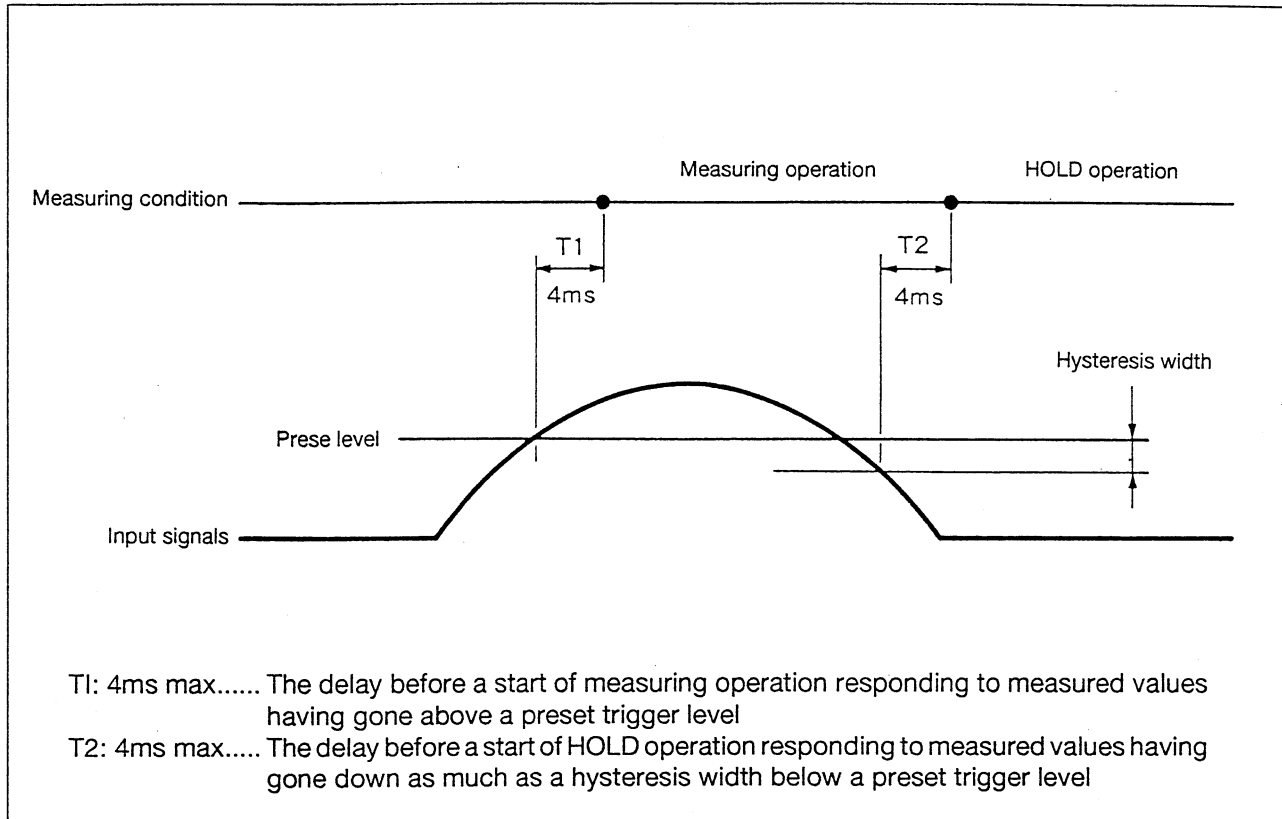
(1) Externally specified measuring zone (by HOLD/RESET commands)



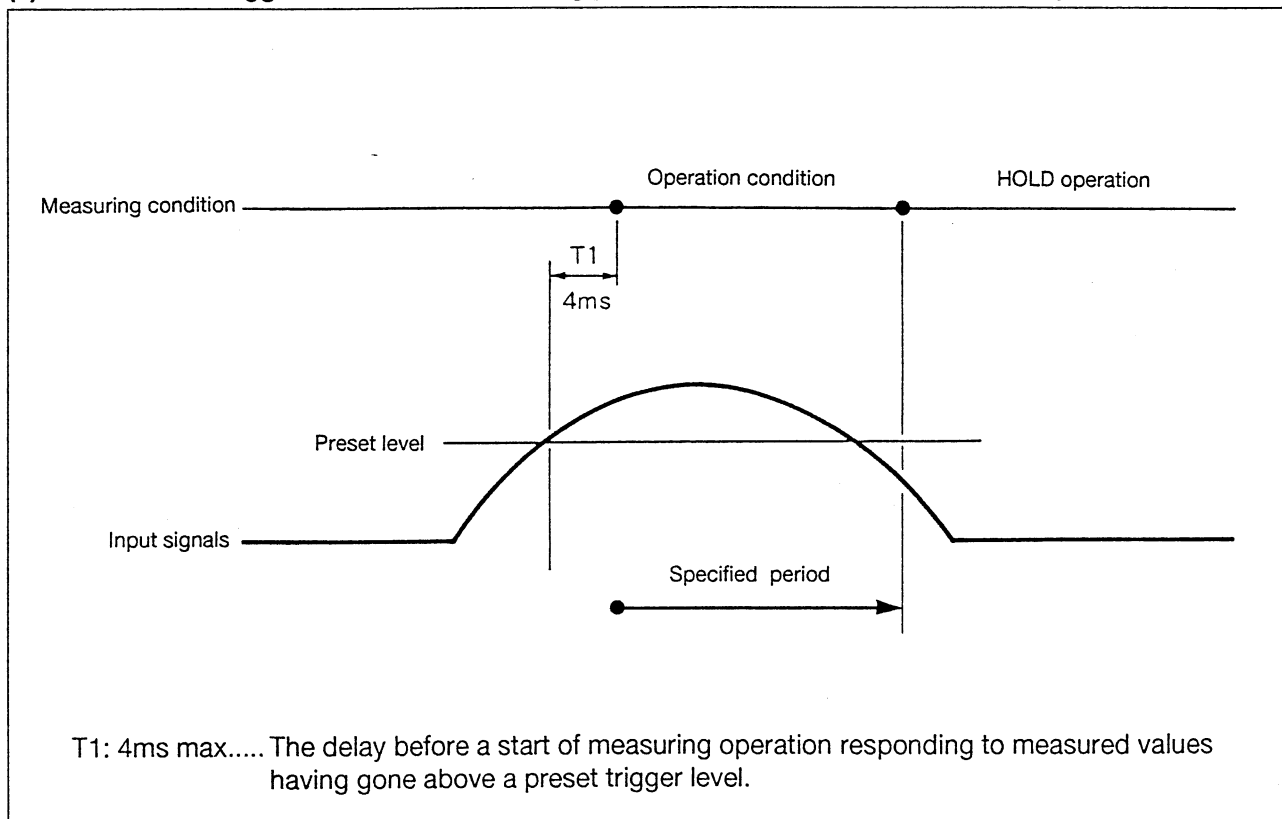
(2) Externally specified measuring period



(3) Internal level trigger in action • Measuring signal zone specified (against Upper limit)

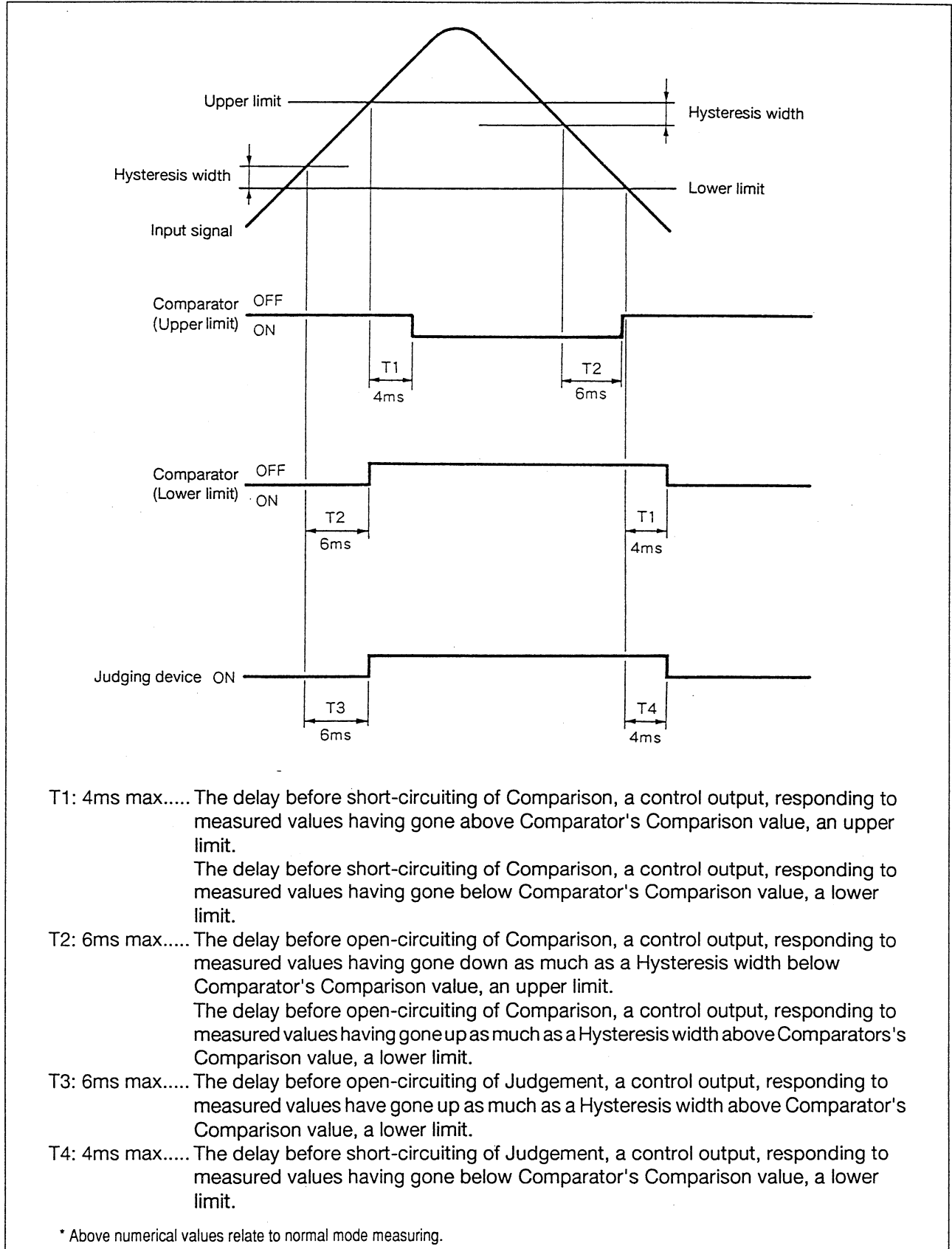


(4) Internal level trigger in action • Measuring period specified (against Upper limit)

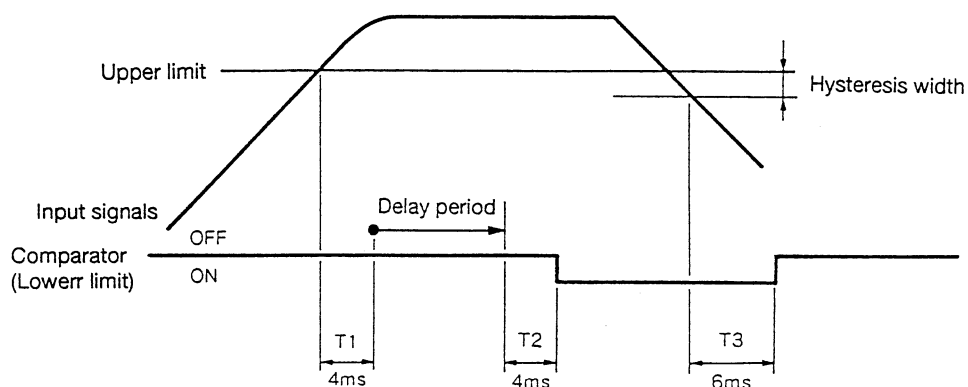


8-2 Timing chart – Comparison function • Judging function

(1) Upper•lower limits (no delay)



(2) Upper limit (ON delay)



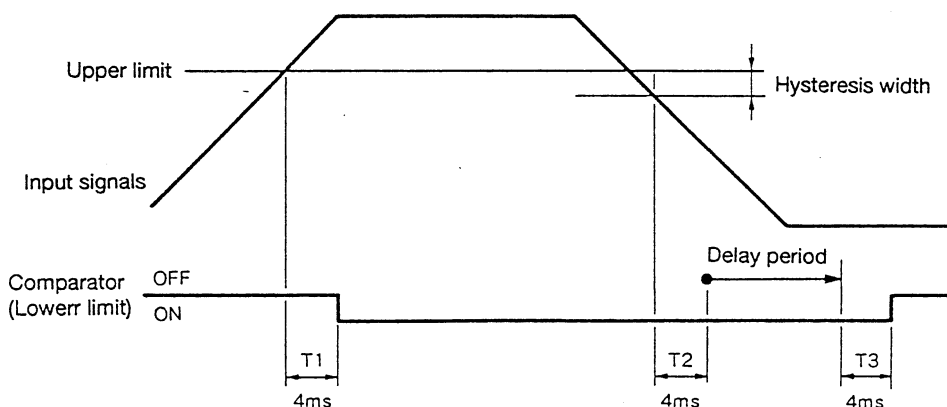
T1: 4ms max..... The delay before a start of a delay period respnding to measured values having gone above Comparator' Comparison value, an upper limit.

T2: 2ms max..... The delay before short-circuiting of Comparator, a control output, responding to a delay period having elapsed.

T3: 6ms max..... The delay before open-circuiting of Comparator, a control output, responding to measured values having gone down as much as a Hysteresis width below Comparator's Comparison value, an upper limit.

The delay before open-circuiting of Comparator, a control output, responding to measured values having gone up as much as a Hysteresis width above Comparator's Comparison value, a lower limit.

(3) Upper limit (OFF delay)



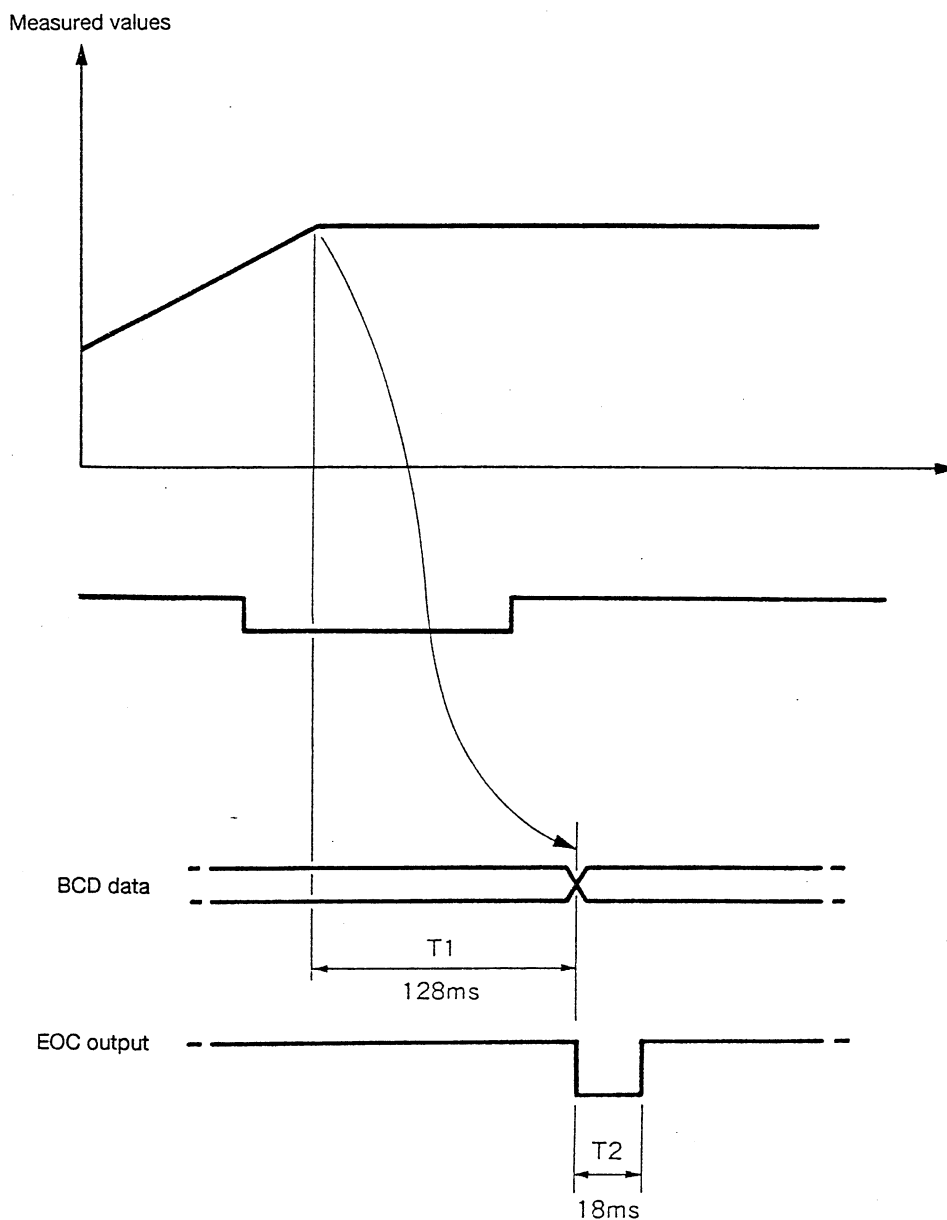
T1: 4ms max..... The delay before short-circuiting of Comparison, a control output, responding to measured values have gone above Comparator's Comparison value, an upper limit.
The delay before short-circuiting of Comparison, a control output, responding to measured values having gone below Comparator's Comparison value, a lower limit.

T2: 4ms max..... The delay before a start of a delay period responding to measured values having gone down as much as Hysteresis width below Comparator's Comparison value, an upper limit.

T3: 4ms max..... The delay before open-circuiting of Comparator, a control output, responding to a delay period having elapsed.

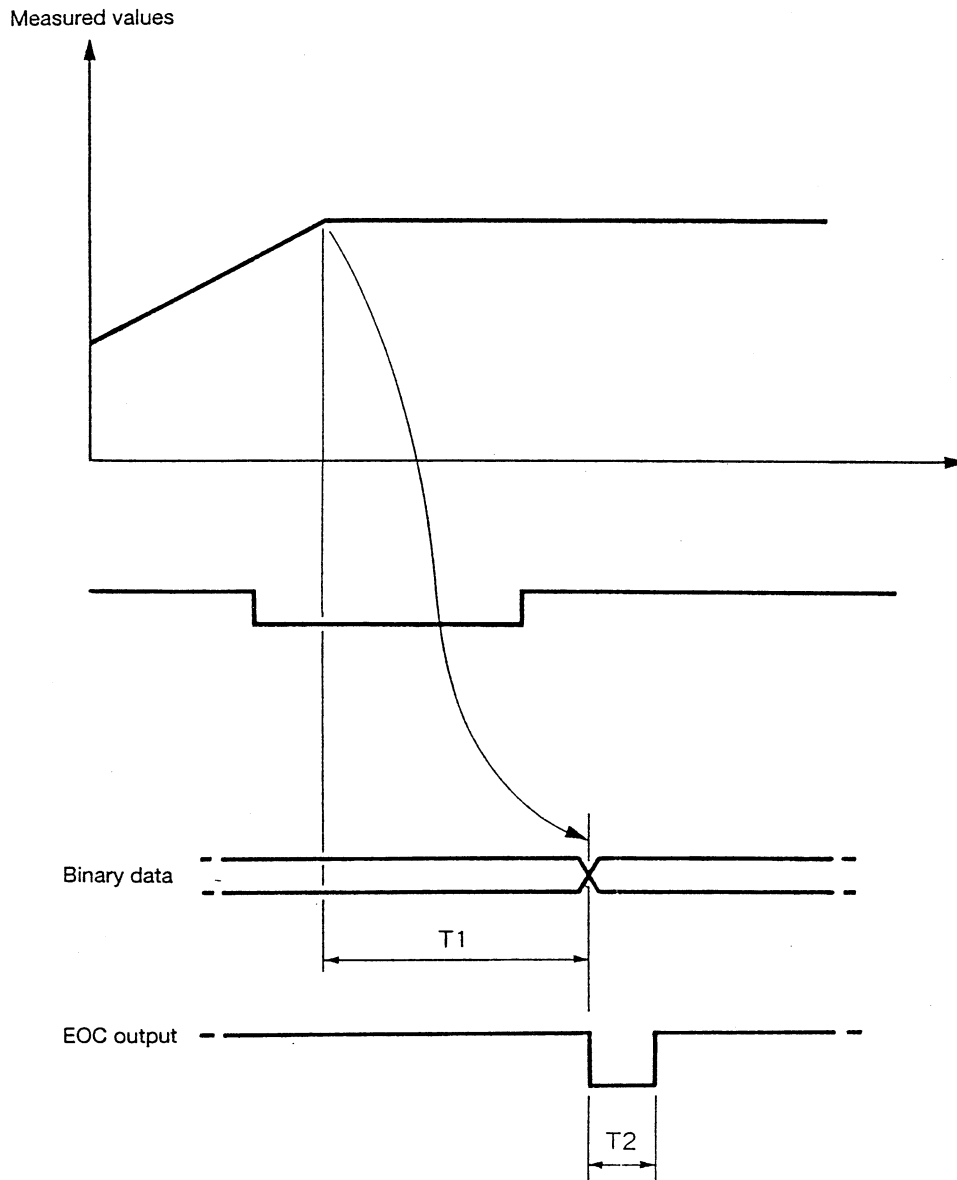
8-3 Timing chart – Display reading • BCD output

(1) BCD output time chart



T1: 128ms max....A delay before a start of outputting BCD after having held measured values.
T2: 18ms max.....A period of time required to end conversion after settlement of BCD.

(2) Binary output time chart



Transmission mode	T1 (MS)	T2 (MS)
1	32 Max.	16 Max.
2	16 Max.	8 Max.
3	8 Max.	4 Max.
4	4 Max.	2 Max.

T1: A delay before a start of outputting Binary Data after having held measured values.
T2: A period of time required to end conversion after settlement of Binary Data.

9. Specifications

9-1 Specifications

AMPLIFIER

Number of channels	1																																								
Applicable transducers	Strain gage transducers (up to four 350Ω transducers are connectable in parallel.)																																								
Applicable bridge resistance	80Ω~10kΩ at 10V bridge excitation 60Ω~10kΩ at 5V bridge excitation 40Ω~10kΩ at 2.5V bridge excitation																																								
Bridge excitation voltage	10Vdc, 5Vdc, 2.5Vdc (switchable) Remote sensing, possible Cable resistance (one way) possible for remote sensing <table><tr><th>Bridge voltage</th><th colspan="7">Bridge resistance (Ω)</th></tr><tr><th></th><th>40~</th><th>60~</th><th>80~</th><th>87.5</th><th>120~</th><th>175~</th><th>350~</th></tr><tr><td>10V</td><td></td><td></td><td>0~ 30</td><td>0~ 36</td><td>0~ 60</td><td>0~100</td><td>0~200</td></tr><tr><td>5V</td><td></td><td>0~ 90</td><td>0~130</td><td>0~150</td><td>0~200</td><td>0~200</td><td>0~200</td></tr><tr><td>2.5V</td><td>0~150</td><td>0~ 200</td><td>0~200</td><td>0~200</td><td>0~200</td><td>0~200</td><td>0~200</td></tr></table> The above table descriptions provide that a cable length is 1km, maximum. (For information, a 10m long cable's one way resistance is approximately 0.4Ω against a conductor's cross section area of 0.5mm², and approximately 0.27Ω against a conductor's cross section area of 0.75mm².)	Bridge voltage	Bridge resistance (Ω)								40~	60~	80~	87.5	120~	175~	350~	10V			0~ 30	0~ 36	0~ 60	0~100	0~200	5V		0~ 90	0~130	0~150	0~200	0~200	0~200	2.5V	0~150	0~ 200	0~200	0~200	0~200	0~200	0~200
Bridge voltage	Bridge resistance (Ω)																																								
	40~	60~	80~	87.5	120~	175~	350~																																		
10V			0~ 30	0~ 36	0~ 60	0~100	0~200																																		
5V		0~ 90	0~130	0~150	0~200	0~200	0~200																																		
2.5V	0~150	0~ 200	0~200	0~200	0~200	0~200	0~200																																		
Measuring range	±2mV/V (±4000x10 ⁻⁶ strain) against 10V bridge excitation ±4mV/V (±8000x10 ⁻⁶ strain) against 5V bridge excitation ±8mV/V (±16000x10 ⁻⁶ strain) against 2.5V bridge excitation																																								
Non-load zero (Zero point) adjusting range	Same as measuring range Both analog and digital calculation																																								
Smoothing	Analog: 2-pole linear phase filter Cutoff frequencies: 1, 20, 200Hz, flat (2kHz) Digital: Moving average system Average time: 0.00 (nil) ~2.00 seconds																																								
Peak-bottom detection response frequency	DC~1kHz (+1dB, -2dB)																																								
Nonlinearity	±0.01%F.S. or better at 10V bridge excitation; ±0.02%F.S. or better at 5, 2.5V bridge excitation																																								
A-D converter	Conversion speed: 2000 times/second Resolution: 16 bits (-32768~32767 counts) App 0.76μV _{RTI} /LSB																																								
Stability	Zero point: ±0.25μV _{RTI} /°C or better Sensitivity: ±0.005%/°C or better																																								
Analog monitor	Voltage output: ±(10±200mV) (against a 5kΩ or higher load) Residual voltage at a zero point: ±200mV																																								
Time measuring	Measuring period: 0.00~60.00 seconds Resolution: 0.01 second Accuracy: ±0.001 second																																								

PROCESSOR

Display

Main display: Presents measured values, etc.
 Numerical value reading:
 ± 99999 , max (a decimal point can be entered optionally)
 Character height: 14.4mm
 Color: Green color 7-segment LEDs
 Sub-displays: Present two comparators' respective numbers and comparison values, etc.
 Numerical value reading:
 ± 99999 , max (a decimal point can be entered optionally)
 Character height: 8.0mm
 Color: Green color 7-segment LEDs
 Status indication lamps:
 Comparison output indication: 4 red color LED lamps
 Judging output indication: 2 red color LED lamps
 Measured value classification number indication:
 3 green color LED lamps
 HOLD indication: 1 green color LED lamp
 Zero correction indication: 1 green color LED lamp
 Zero tracking indication: 1 green color LED lamp

Operation switches

Ten keys and function keys (16 keys in all)

Measuring functions

10 modes:
 Normal measuring mode
 HOLD measuring at an optional point mode
 Average value measuring mode
 High-speed peak-HOLD measuring mode
 High-speed bottom-HOLD measuring mode
 Peak & bottom HOLD measuring mode
 Simultaneous peak-HOLD measuring mode
 Peak & time measuring mode
 Time measuring mode
 Pressing input measuring

Measured value readings on Display

Main display gives measured values classified into three types, which are switchable from one to another.

Types of measured values: 3

Classification #1 measured values

Classification #2 measured values

Classification #3 measured values

Measuring modes and measured value classifications

Measuring mode	Classification #1 measured value	Classification #2 Measured value	Classification #3 Measured value
Normal measuring	Measured value (net)	Total load (gross) value	Zero correction (tare) value
HOLD measuring at an optional point	Value at an optional point	Total load (gross) value	Zero correction (tare) value
Average value measuring	Average value	Total load (gross) value	Time (second)
High-speed peak HOLD measuring	High-speed peak value	Total load (gross) value (slow falling)	Zero correction (tare) value
High-speed bottom HOLD measuring	High-speed bottom value	Total load (gross) value (slow rising)	Zero correction (tare) value
Peak & bottom HOLD measuring	Peak value	Total load (gross) value	Bottom value
Simultaneous peak HOLD measuring	1st peak value	Valley value	2nd peak value
Peak & time measuring	Peak value	Total load (gross) value	Time (second)
Time measuring	Measured value (net)	Total load (gross) value	Time (second)
Pressing input measuring	Pressing input measured value	Total load (gross) value	Pressing input judging quantity

Measuring zone

Four types of measuring signal zones can be set to measuring function modes respectively.

Measuring signal zones:

Specifiable by external measuring signals —

Measuring signal zone

Measuring period

Specifiable by input level trigger's upper/lower limit

Measuring signal zone by upper limit

Measuring signal zone by lower limit

Measuring signal period by upper limit

Measuring signal period by lower limit

Measuring zone VS. measuring function mode

Measuring zone (period) Measuring mode	Zone specifiable by external signals	Period specifiable by external signals	Level trigger			
			Zone specifiable		Period specifiable	
			Upper limit	Lower limit	Upper limit	Lower limit
Normal measuring	Not specifiable					
HOLD measuring at an optional point	○	X	X	X	X	X
Average value measuring	○	○	○	○	○	○
High-speed peak HOLD measuring	○	○	X	X	X	X
High-speed bottom HOLD measuring	○	○	X	X	X	X
Peak & bottom HOLD measuring	○	○	○	○	○	○
Simultaneous peak HOLD measuring	○	○	○	X	○	X
Peak & time measuring (in seconds)	X	X	○	X	X	X
Time measuring (in seconds)	Till signals cross Comparator #2, starting from #1.					
Pressing input measuring	Till signals cross Judging width after Comparator #1's switching ON.					

○: Specifiable X: Not specifiable

Comparison function

Measured value #1, #2 and #3, i.e. comparison values, are respectively allotted to four comparators to operate comparison.

Number of comparison points: 4

Measuring range: 00000~±99999

Items to be set: Comparison value allotment

Upper/lower limits

Hysteresis width

Comparison logic switching over

Normal: Transistor is switched [ON] against [ON] position of Comparator output.

Invert: Transistor is switched [OFF] against [ON] position of Comparator output.

Operational mode:

Constant comparison mode

Comparison mode at HOLD

ON delay

OFF delay

Delay time: 0.00~9.99 seconds

Judging function

Judging signals are outputted after logic calculation of Comparison output.

Comparison points: 2

Items to be set: Logic switching over

Normal (positive) AND	When Judging criteria accord with Comparator, Judging device's result is switched [ON], then Judging output is switched [ON].
Inverter (negative) AND	When Judging criteria accord with Comparator, Judging device's result is switched [ON], then Judging output is switched [OFF].
Normal (positive) OR	When any one of criteria is satisfied by Comparator, Judging device's result is switched [ON], then Judging output is switched [ON].
Inverter (negative) OR	When any one of criteria is satisfied by Comparator, Judging device's result is switched [ON], then Judging output is switched [OFF].

Control input	Number of input signal types: 4 Zero correction ON command Zero correction OFF command HOLD command RESET command (HOLD reset) Input method: Non-voltage contact signal or Open collector signal (provided that 12Vdc can be loaded and 10mA current can flow)
Control output	Number of output signal types: 6 Comparison output types: 4 Judgement output types: 2 Output method: Open collector: Max applicable voltage: 30Vdc Max applicable current: 100mA Residual voltage: 1V or less
Calibration function	Calibration through input of numerical values Calibration through an actual load
Zero (tare) correction function	Mode 0: A digital zero correction value is keyed in preliminarily, and a measured value is made to equal that value in response to correction demanded. Mode 1: A zero correction value is keyed in preliminarily, and that value is deducted from a total load value in response to correction demanded. Mode 2: A measured value is obtained preliminarily as a zero correction value, and that value is deducted from a total load value in response to correction demanded.
Input original value	Presented on Main display. Accuracy: 0.1%F.S.
Monitor function	Transducer's output value (in mV/V) at the time of calibration and a reading at that time A reading value at the time of actual load calibration Settings of options Settings of Judgement outputs Setting of Smoothing function (analog filter, smallest scale division, zero tracking, moving average) Setting of Measuring function (measuring mode, user-specifiable modes and their settings) Comparison values set to Comparators (independent monitoring, alternative monitoring) Comparison functions of Comparators (allotment, upper/lower limits, output mode, operation mode, delay mode, hysteresis width, delay time) Lock settings (calibration lock, user-specifiable lock) Settings of Sub-displays (display mode, comparators on display) Zero correction mode
Zero tracking function	Time (tracking delay: nil, 0.1, 0.2, 0.5, 1, 2, 5, 10 seconds) Width (tracking band, nil, 1/4, 1/2, 1, 2, 5 counts)
Smallest scale division counting	1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 counts
Setting lock function	Calibration lock / Lock prohibition relating to calibration User-specifiable locks / Lock prohibition on optional keys

Self-test function

Test items: Status indication lamps

Displays

ROM

RAM

Display circuit

Test results indicated on:

Main display

Check items:

Availability or unavailability of option/s

Bridge voltage

Zero correction, ON/OFF of HOLD/RESET command

Check results indicated on:

Main display

GENERAL SPECIFICATIONS

Operating temperature range-10~50°C, 20~85%R.H. (no dew condensing)

Input/output terminalsM3 screw fixing terminal board (applicable press-fit terminal: 1.25-3A or 1.25-3B, or their equivalents)

Power requirements85Vac~264Vac (50/50Hz, mono-phase), 20VA or less

Dimensions & weight96(W)x192(H)x150(D)mm (excluding protrusions); app 1.8kg (excluding function cards attachable)

Panel cut size92 +1, -0 (W)x186 +1, -0 (H)mm
Plate thickness, 2~5mm

STANDARD ACCESSORIES

- **AC power cable**
(usable for 100Vac only, app 2 meter long, with a round press-fit M3 terminal)
- **Fuse (0.5A, time-lag fuse)**
- **Label to indicate an engineering unit**
- **BCD output connector**
(Equivalent to 57-30360 - a product of Dai-ich Denshi Kogyo -
on WGA-800C-10AC, 11AC, 12AC and 13AC [two on WGA-800C-11AC])
- **Warranty**
- **Instruction manual**

Specifications – Attachable function cards

• BCD DATA OUTPUT CARD

Output	BCD Output: Data, 20 bits (4-bit x 5) Sign, 1 bit Over, 1 bit Stability, 1 bit EOC (BUSY), 1 bit Binary output: Data, 18 bits Over, 1 bit Stability, 1 bit BOC (BUSY), 1 bit Output form: Open collector Max applicable voltage, 30Vdc Max applicable current, 30mA Residual voltage, 1V or less Insulation against mainframe circuits: Withstanding insulation voltage, 500Vac, 1 minute
Input	Number of input channels: 2 Inputs: Data hold Output prohibition Input signal systems: 2 LOGIC signal; Low, 1.5V or below High; 3.5V or higher Connection of open-collector's signals, possible Open collector or non-voltage contact signal: Possible provided that 12Vdc can be loaded and 10mA current can flow.
Settings	Allotment of a measured value: Selectable from four – a reading on Display and measured values of classification #1 thru #3 Stability time (delay): Nil, 0.1, 0.2, 0.5, 1, 2, 5, 10 seconds Band: Nil, 1/4, 1/2, 1, 2, 5 counts Data output logic switching over: Possible to output a stability detection signal where varied signals stay within a preset time and width. Sign output logic switching over EOC output logic switching over

• D-A CONVERTER CARD

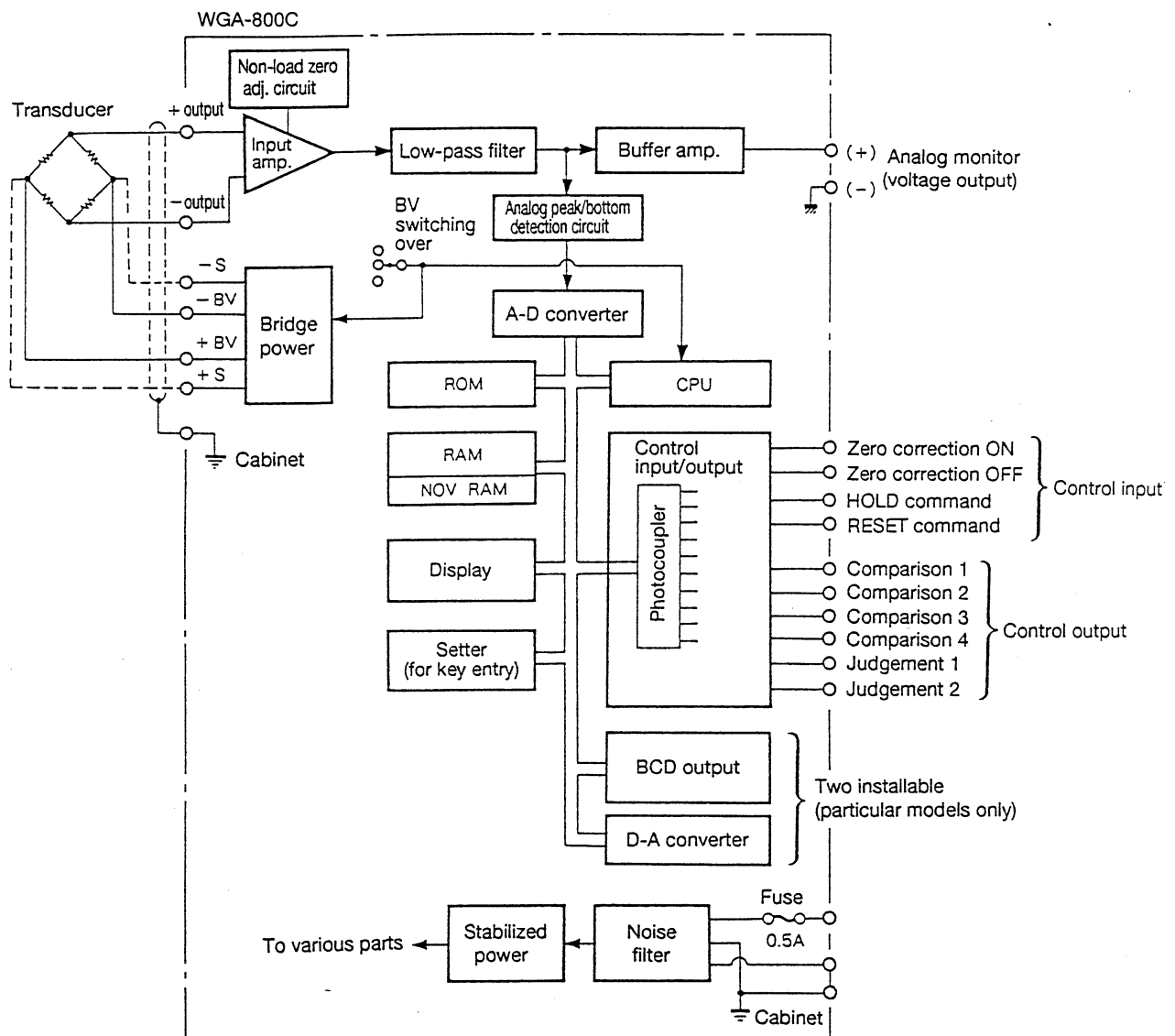
Output	2 systems Voltage output: $\pm 10V$ (against a $5k\Omega$ or higher load) Current output: 4~20mA (against a 600Ω or lower load) (4~20mA output against voltage output of 0~10V) Insulation against mainframe's circuit: Withstanding insulation pressure, 500Vac, 1 minute (Not insulated between voltage output and current output.)
Adjusting range	Zero point: $\pm 5\%$ F.S. or higher Sensitivity: $\pm 5\%$ or better
Resolution	14 bits (10V/7092)
Non-linearity	0.05%F.S.

Conversion speed	500 times/second (250 times/second on 2 cards installed)
Settings	Allotment of a measured value: Selectable from four – a reading on Display and measured values of classification #1 thru #3 Zero scale value Full scale value

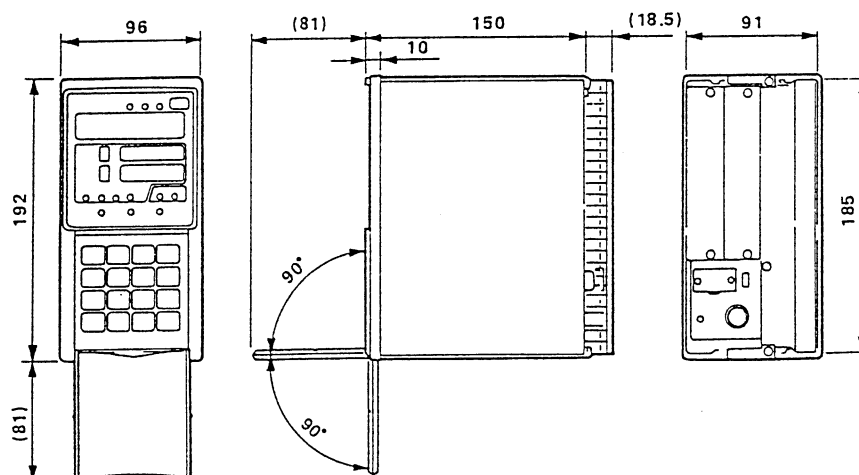
• **EIA-232-D (RS-232-C) Card**

Signal specification	EIA-232-D (RS-232-C), full duplex
Synchronization	Start and stop system
Transmission speed	4800, 9600BPS
Bit structure	Start 1 bit Data 7 bits (ASCII code) Parity 1 bit (odd parity) Stop 1 bit
Connector	17-13250-27 (Product of Dai-ichi Denshi Kogyo)

9-2 Block diagram



9-3 Dimensional drawing



10. Guide to Settings

Function Setting and Execution Procedures

This section of the instruction manual aims to provide the users with a quick guide to how to set and execute various functions.
Read and understand the preceding sections thoroughly before you operate keys.

 This mark asks the user to key in or is to show a numeral.

 This mark shows that nothing is to appear, i.e. it should-be blank.

 This mark shows that [±] is to be keyed in or to appear (+ does not appear).

Key name abbreviations and meanings

 COMPARE 7	 LOCK 8	 DISPLAY 9	 HOLD
Compare, comparison	Lock settings	Display switching over	Hold, holding
 JUDGE 4	 SMOOTH 5	 MEASURING 6	
Judge, judgement	Smooth, smoothing	Measuring functions	
 SENSITIVITY 1	 ACTL LD 2	 ON-ZERO 3	 C-ZERO +/-
Sensitivity registration	Actual load	No-load ZERO	Correct ZERO
 OPTION 0	 APPLCTN	 CANCEL	 ENTER
Option	Applications	Cancel, cancellation	Enter, register, set

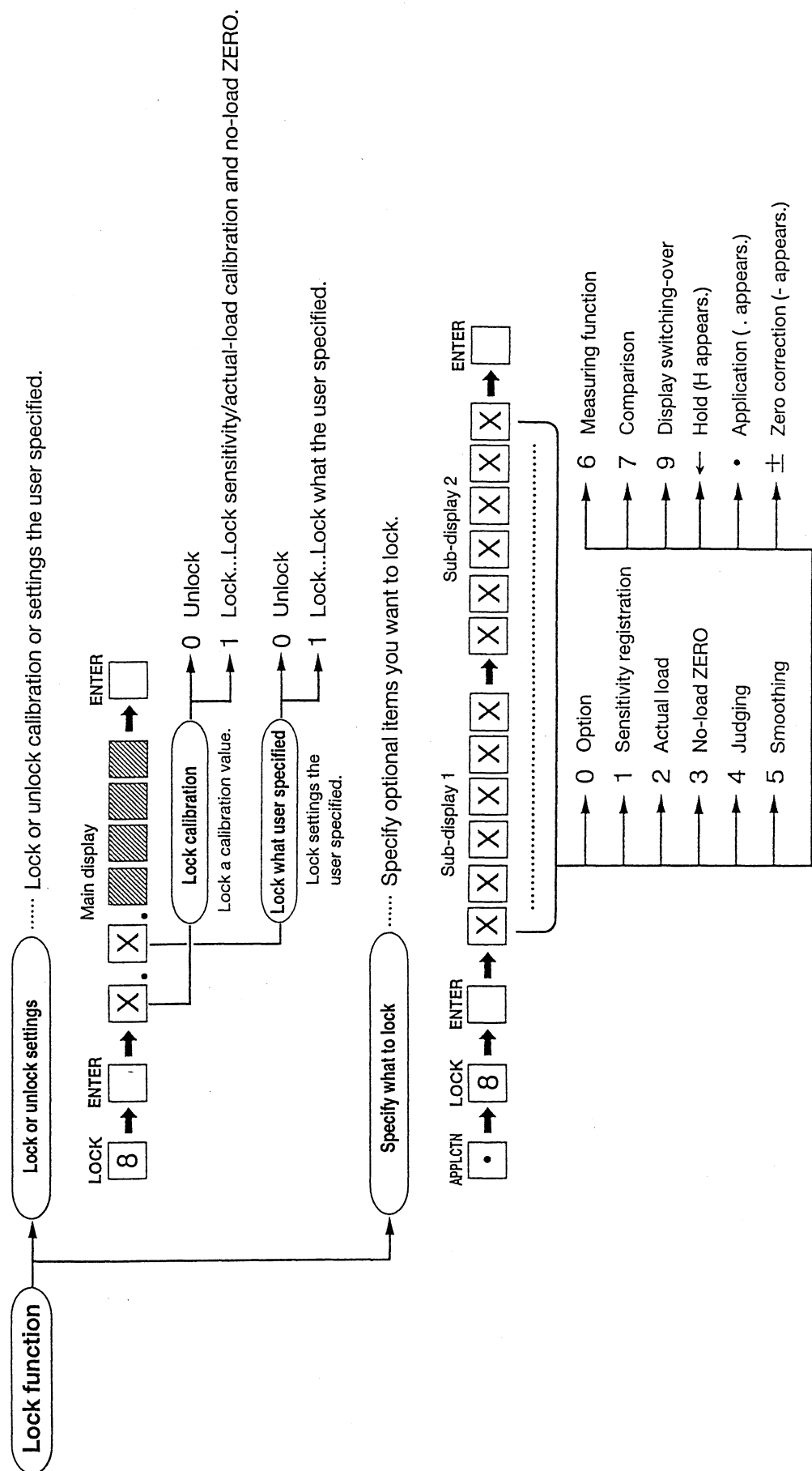
Some expressions in the pages of this section may differ on occasion from those in the preceding pages. This is so just for shortening.

By calibration, the transducer's output is correlated to a measuring value. Calibration is done either by registering sensitivity or loading an actual load. Do not fail to perform calibration with either method.



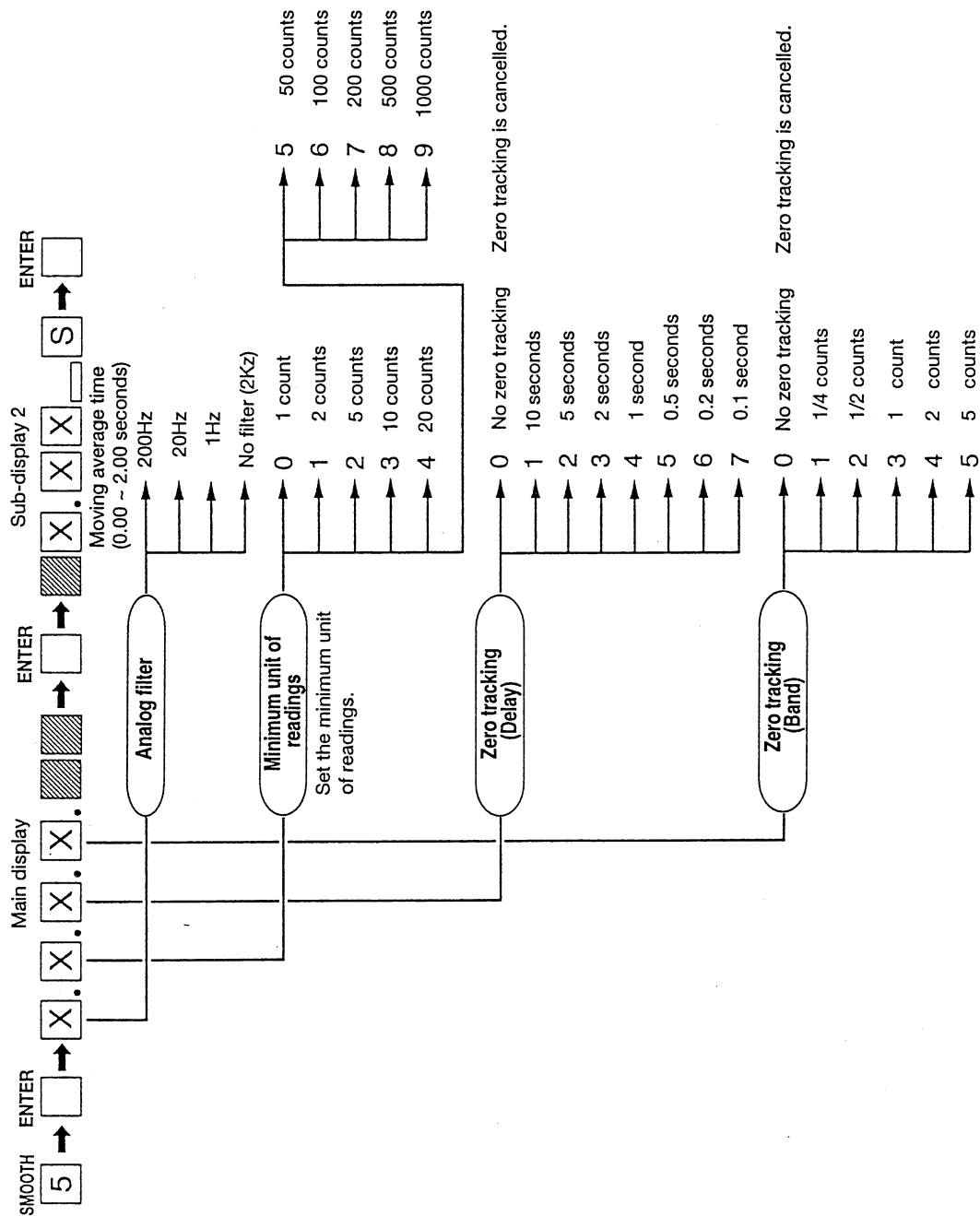
2. Lock function

Lock settings you have achieved, including a calibration value, functions and others, to protect them against renewal due to later mistaken pushes of keys.

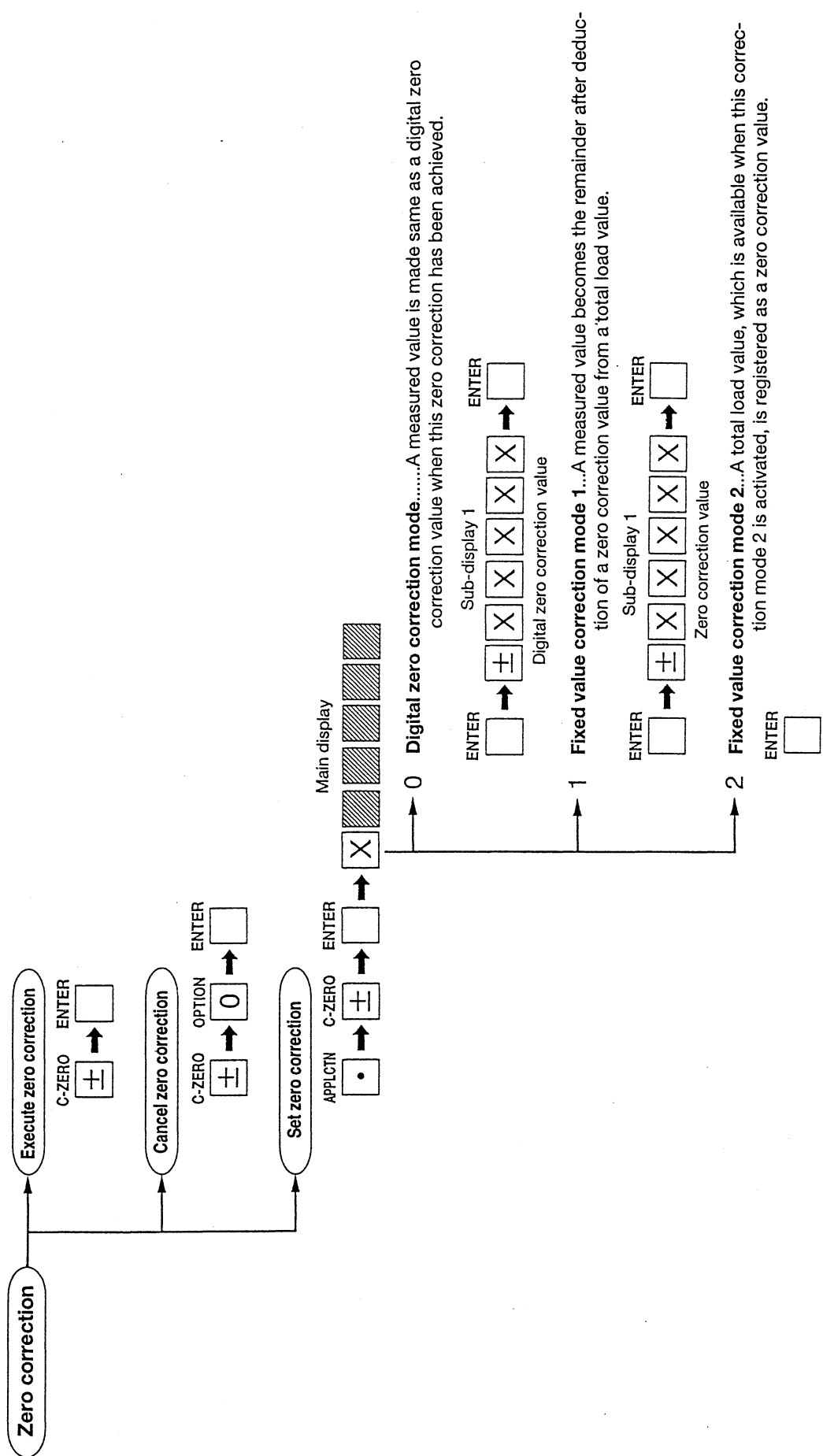


3. Smoothing function

Use this function to stabilize measurement values when transducer signals fluctuate.

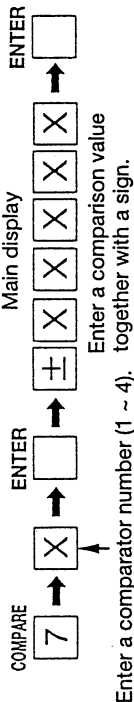


4. Zero correction



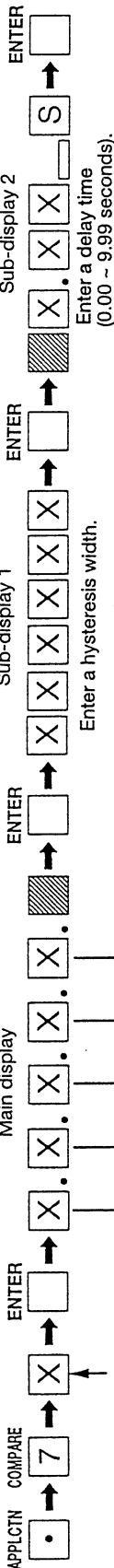
5. Comparator function

Set comparison values

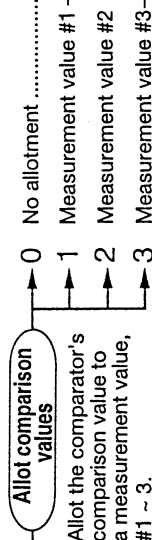


Enter a comparator number (1 ~ 4). together with a sign.

Set comparator functions



Enter a comparator number (1 ~ 4).



The measurement values, #1~#3, classified through the measuring function.

The comparator is switched [ON] when a measurement value has gone below the lower limit. (Hysteresis is set to the [+] side.)

The comparator is switched [ON] when a measurement value has gone above the upper limit. (Hysteresis is set to the [-] side.)

When a comparison result is in the [ON] position, the comparator output is switched [ON].

When a comparison result is in the [OFF] position, the comparator output is switched [ON].

Constant comparison is made to put out a comparison result whenever conditions have been met.

Comparison is made when one measuring has ended (at HOLD) to put out a comparison results. Delay mode & hvs. width disabled.

Nothing appears in Sub-display 2.

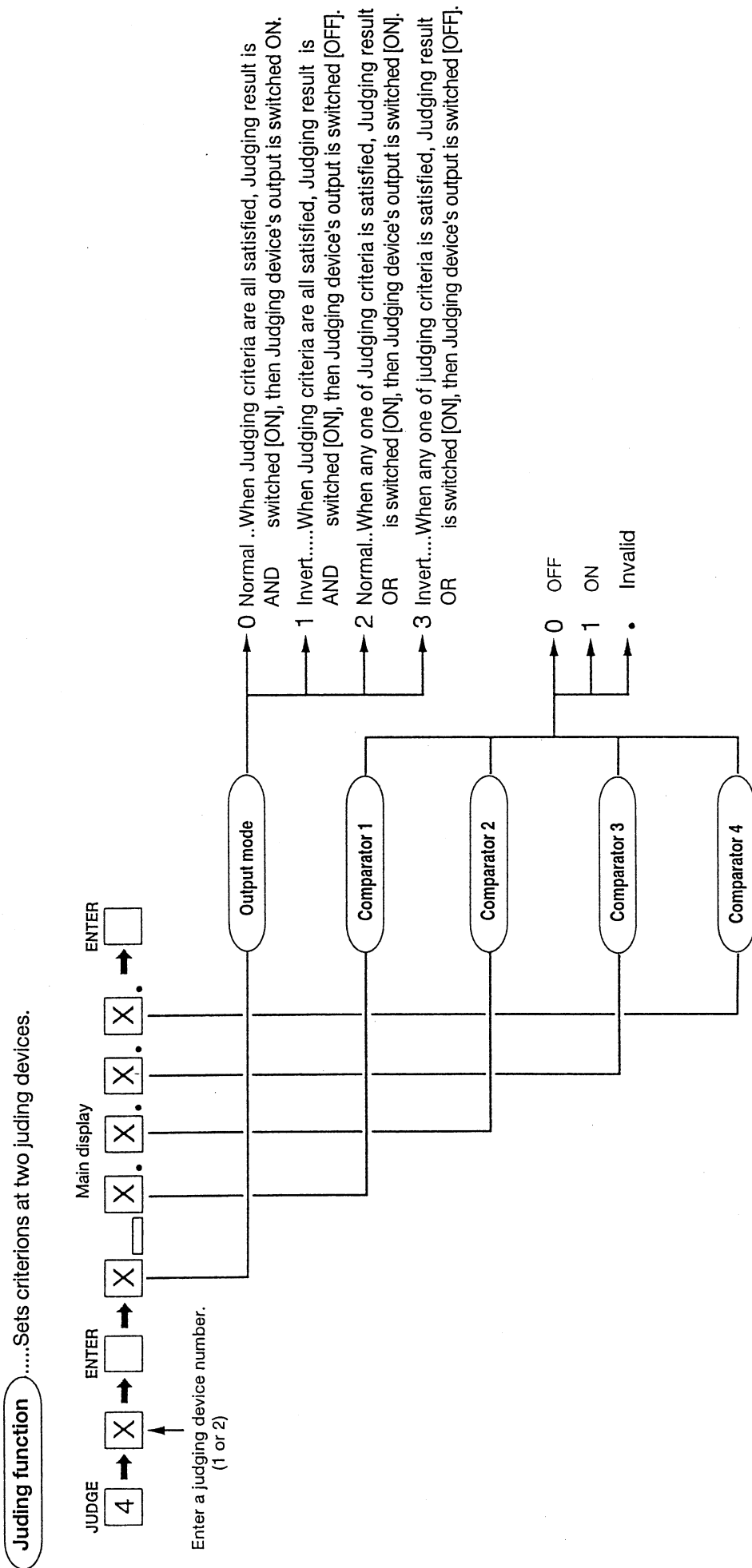
A comparison result is turned [ON] if an upper or lower limit has been continuously exceeded for longer than a set time.

A comparison result is turned [OFF] if a set hysteresis width has been continuously exceeded for longer than a set time after a comparison was turned [ON].

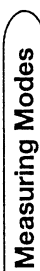
Both ON delay and OFF delay function.

6. Judging function

A Judging output is switched [ON] when each comparator's output conditions have satisfied the judging criteria which have been set.



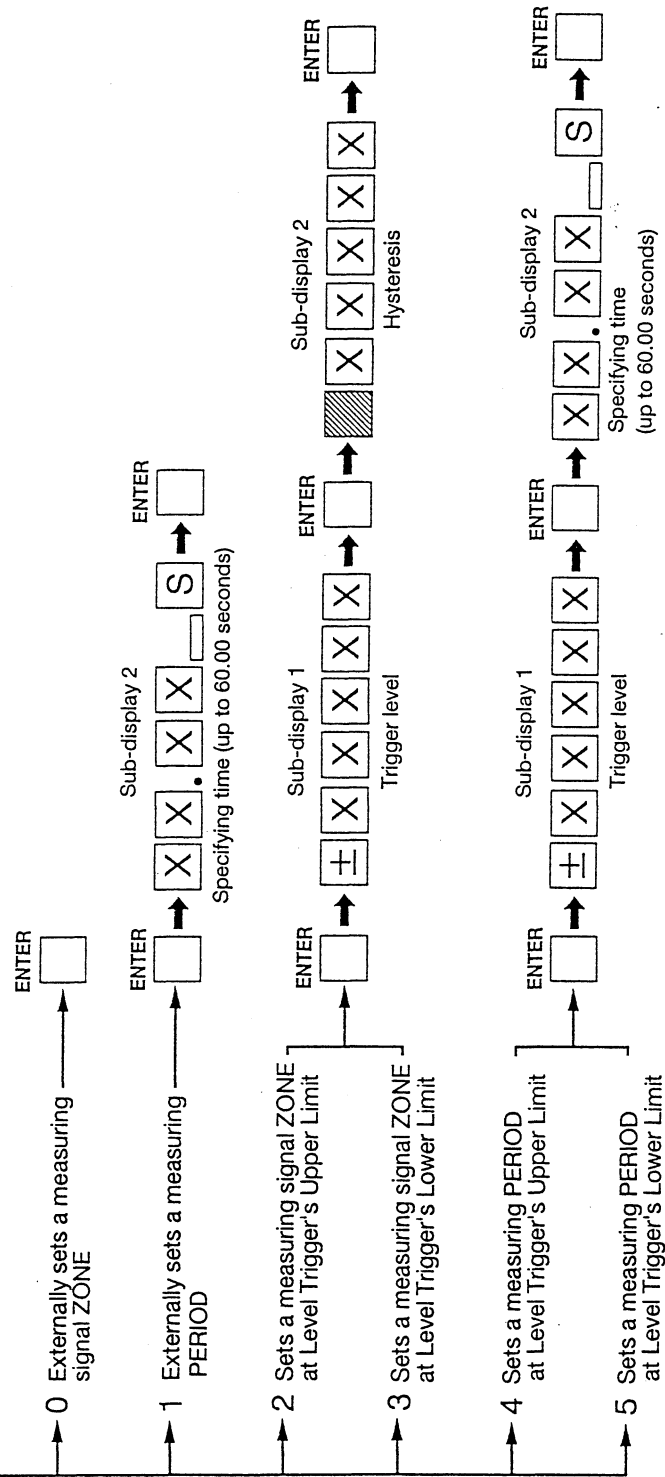
The diagram illustrates the measuring module interface. It features a 'MEASURING' section with a display showing the number '6' and an 'ENTER' button. A 'Main display' section shows a sequence of boxes, some containing an 'X' and others with a diagonal hatching pattern. A 'Measuring Module' label is positioned at the bottom right.



- 0 Normal measuring —————→
- 1 HOLD measuring Holds a measured value upon arrival of a HOLD signal. —————→
- 2 Average value Finds an average value of signals in a measuring zone as well as duration of signals (up to 60 seconds) measuring —————→
- 3 High-speed Holds a peak value in a measuring signal zone, and peak HOLD measuring after termination of a measuring zone, performs HOLD operation (also using Analog P.H. circuit). —————→
- 4 High-speed Measures a bottom value during a measuring signal bottom HOLD measuring and after termination of a measuring zone, performs HOLD operation (also Analog B.H. circuit). —————→
- 5 Peak & bottom Measures peak and bottom values in a measuring HOLD measuring zone, and after termination of a measuring zone, performs HOLD operation. —————→
- 6 Simultaneous Seeks a deepest valley during a measuring zone, peak HOLD measuring and collects a peak (1st peak) value that immediately precedes the valley, together with a later peak (2nd peak) value, and after termination, holds them. —————→
- 7 Peak & time Finds duration (up to 60 seconds) of signal values measuring larger than a preset level as well as their peak value, then holds the both. —————→
- 8 Time measuring Measures a period of time between switching [ON] of Comparator #1 and that of Comparator #2, then hold it. —————→
- 9 Pressing input Holds the value that precedes an abrupt change in measured values in the measuring zone which has started when Comparator #1 turned [ON]. —————→

User-specifiable modes					
	Externally sets a measuring signal zone	Externally sets a measuring signal period	Sets a measuring signal zone by Level Trigger's Upper Limit	Sets a measuring signal zone by Level Trigger's Lower limit	Sets a measuring period by Level Trigger's Upper Limit
					Sets a measuring period by Level Trigger's Lower Limit
0	X	X	X	X	X
1	X	X	X	X	X
2	X	X	X	X	X
3	X	X	X	X	X
4	X	X	X	X	X
5	X	X	X	X	X
Measured values					
	Measured value 1	Measured value 2	Measured value 3		
	Measured qty. (Net)	Total load (Gross)	Zero correction qty.		
	Measured qty. at optional point	Total load	Zero correction qty.		
	Average qty. measured	Total load	Time (sec)		
	High-speed peak qty. measured	Total load (Slow falling)	Zero correction qty.		
	High-speed bottom qty. measured	Total load (Slow rising)	Zero correction qty.		
	Peak qty. measured	Total load	Bottom qty. measured		
	No.1 peak qty. measured	Valley qty. measured	No.2 peak qty. measured		
	Peak qty. measured	Total load	Time (sec)		
	Qty. measured	Total load	Time (sec)		
	Pressing input measured	Total load	Pressing input judging qty.		

User-specifiable modes



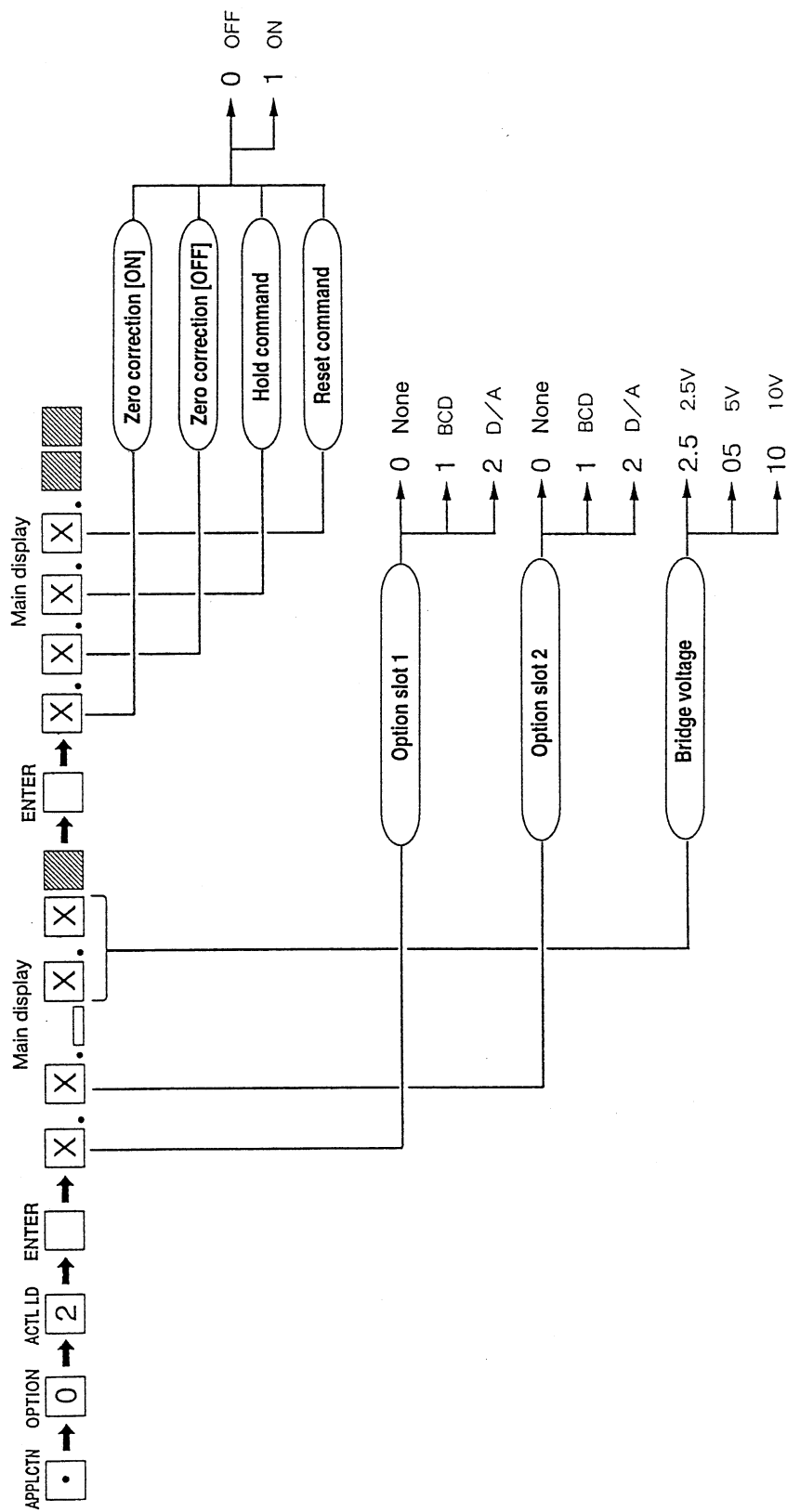
9. Original value reading

The reading of a transducer's current output is presented in mV/V on the main display.



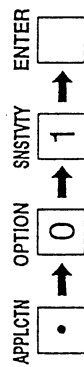
10. Status check function

This function lets you make sure of the types and bridge voltages of built-in optional devices as well as control commands given to them.



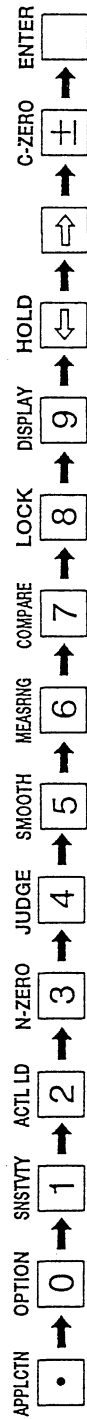
11. Self-test

Easy self-test

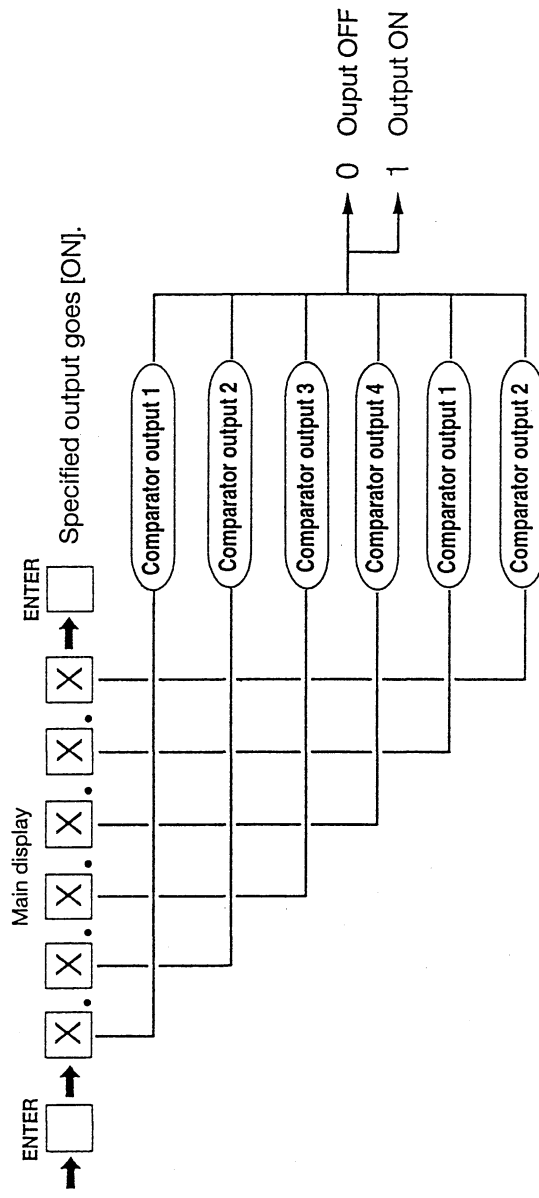


"PASS" will then appear for 12 seconds on the main display.

Self-test



"Pass" appears for 12 seconds on the main display.



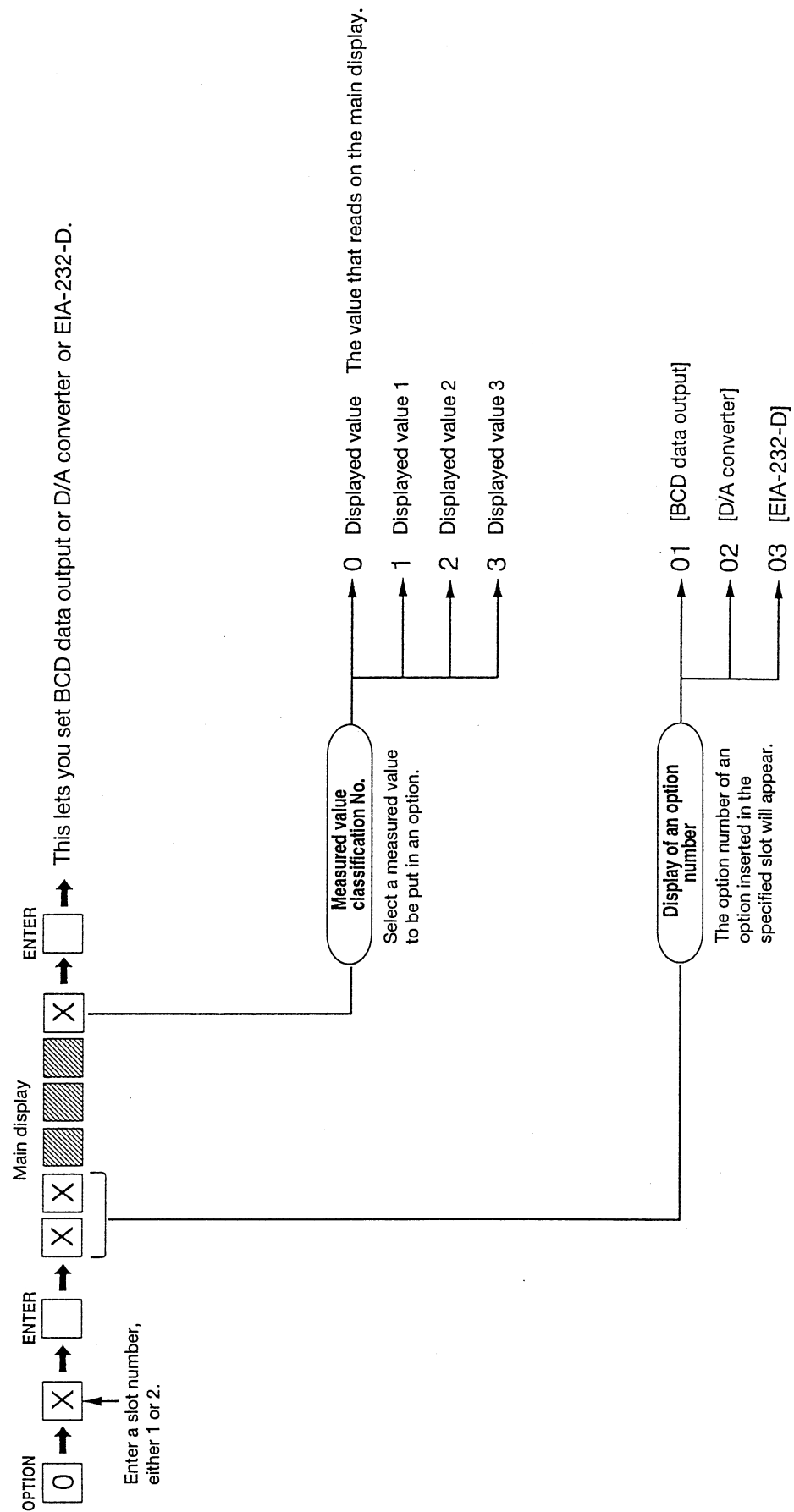
12. Restoring initial values

Various setting values can be put back as they were at the time of shipment from the factory.
Note however that the calibration value for no-load ZERO cannot be initialized.

APPLCTN	SNSTVTY	ACTLLD	N-ZERO	ENTER
•	1	2	3	

13. BCD data output & D/A converter

These two functions are respectively available on specific models.
How to set them is as follows.





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