

Instrumentation Amplifiers
WGA-710B
SERIES

Operation
Manual

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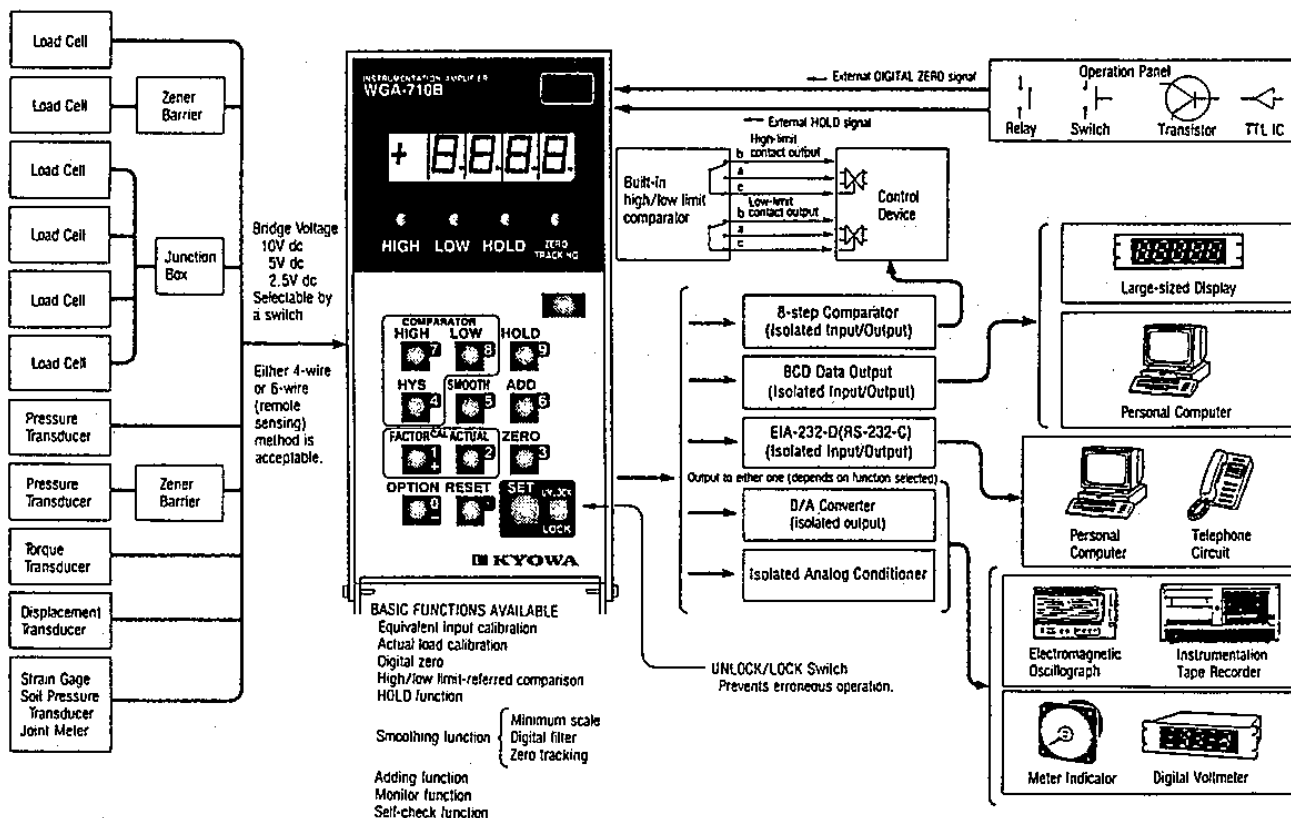
Thank you for your purchase of the instrumentation amplifier in the WGA-710B series. The compact and lightweight unit is designed to be used with strain-gage transducers for accurate measurement of physical variables such as load, pressure, torque and displacement. The following features make it useful not only for a control system but also as a multi-purpose amplifier for strain-gage transducers. Read this operation manual carefully in order to make full use of the high performance capabilities of the instrumentation amplifier.

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

Features

- Can be set up for direct reading of physical variables through simple key operation, even with the International System of Units.
- Key lock function prevents erroneous operation.
- Allows selection of a bridge excitation voltage suitable for the transducer used.
- Remote sensing circuit in the bridge power supply ensures accurate measurement even with an extension cable used between a sensor and the amplifier.
- Provides a function to check a measurement against high/low limits.
- HOLD function available in various modes permits exact measurement of a fluctuating event.
- Allows monitoring of the function setting status or direct reading of a transducer output.
- Nonvolatile memory stores the digital zero, calibration parameter and selected functions, thereby ensuring immediate setup for continued measurement.

Typical System using WGA-710B



Standard accessories

The amplifier comes with the following accessories. After unpacking, check to be sure that all the listed accessories are included.

AC power cable (approx. 2m long)	1
Spare fuse (0.5A)	1
Miniature screwdriver for connecting cables to the terminal board	1
Unit label	1
BCD output connector (only on WGA-710B-1, -12 and -14 models)	1
Waranty card	1
Instruction manual	1

Models

The WGA-710B series is available in 36 models in all.
Make sure that you have the model you have specified in your order.

Function Model	AC voltage [V]	Upper/lower limits comparator	Peak hold function	BCD data output	EIA-232-D (RS-232-C)	Non- insulated analog conditioner	D-A converter	Insulated analog conditioner	8-step compara- tor
WGA-710B-0	100	✓	✓						
WGA-710B-0 A115	115	✓	✓						
WGA-710B-0 A200	200	✓	✓						
WGA-710B-0 A220	220	✓	✓						
WGA-710B-1	100	✓	✓	✓					
WGA-710B-1 A115	115	✓	✓	✓					
WGA-710B-1 A200	200	✓	✓	✓					
WGA-710B-1 A220	220	✓	✓	✓					
WGA-710B-2	100	✓	✓		✓				
WGA-710B-2 A115	115	✓	✓		✓				
WGA-710B-2 A200	200	✓	✓		✓				
WGA-710B-2 A220	220	✓	✓		✓				
WGA-710B-3	100	✓	✓			✓			
WGA-710B-3 A115	115	✓	✓			✓			
WGA-710B-3 A200	200	✓	✓			✓			
WGA-710B-3 A220	220	✓	✓			✓			
WGA-710B-4	100	✓	✓				✓		
WGA-710B-4 A115	115	✓	✓				✓		
WGA-710B-4 A200	200	✓	✓				✓		
WGA-710B-4 A220	220	✓	✓				✓		
WGA-710B-5	100	✓	✓					✓	
WGA-710B-5 A115	115	✓	✓					✓	
WGA-710B-5 A200	200	✓	✓					✓	
WGA-710B-5 A220	220	✓	✓					✓	
WGA-710B-6	100	✓	✓						✓
WGA-710B-6 A115	115	✓	✓						✓
WGA-710B-6 A200	200	✓	✓						✓
WGA-710B-6 A220	220	✓	✓						✓
WGA-710B-12	100	✓	✓	✓	✓				
WGA-710B-12 A115	115	✓	✓	✓	✓				
WGA-710B-12 A200	200	✓	✓	✓	✓				
WGA-710B-12 A220	220	✓	✓	✓	✓				
WGA-710B-14	100	✓	✓	✓			✓		
WGA-710B-14 A115	115	✓	✓	✓			✓		
WGA-710B-14 A200	200	✓	✓	✓			✓		
WGA-710B-14 A220	220	✓	✓	✓			✓		

Handling precautions

Grounding

To prevent an electrical shock hazard and electrostatic interference, be sure to connect the rear panel GND terminal to the ground. The GND terminal, which is connected to the enclosure of the amplifier, will be connected to the shield wire of the transducer's input cable.

Power Supply

A maximum power consumption of the amplifier is 20VA. Where the mains supply voltage is not stable, it is recommended to use an isolated constant-voltage transformer.

Avoid using in extremely high or low temperatures.

The instrumentation amplifier performs to the specifications in an operating temperature range of -10°C to $+40^{\circ}\text{C}$. When using in direct sunlight, prepare a sunscreen. Also, take proper measures to keep it warm when using in a cold place.

Avoid using under humid conditions.

Use it in a relative humidity below 80%. Exposure to rain or use in a highly humid place causes troubles such as lowered insulation resistance.

Do not use in a dusty place.

Dust entering inside lowers the performance. Take care to avoid dust not only when operating but also during storage.

Precautions against severe vibration

Severe or continuous vibration may cause a measurement error or troubles. Also, take care not to drop it or give a strong impact during transportation.

Do not use in a hazardous environment.

Do not use in an environment involving inflammable gases or steam. Consult your Kyowa distributor for operation under such the hazardous environment.

Mating transducers

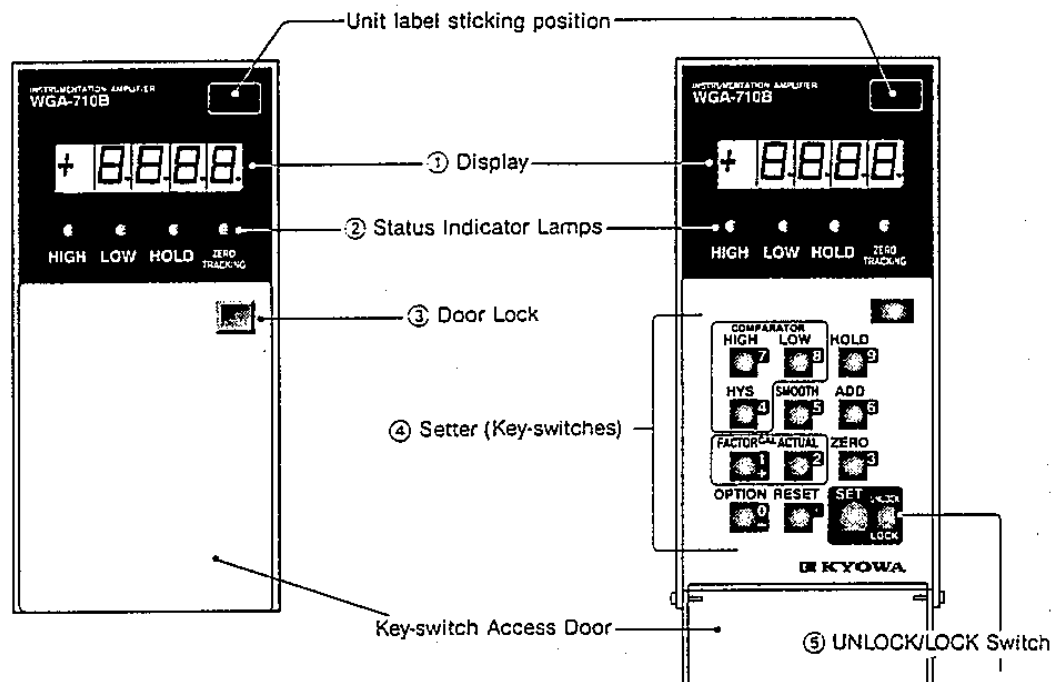
Basically, the WGA-710B instrumentation amplifiers are so designed to connect to strain-gage transducers. If operation in conjunction with other types of transducers is required, consult your Kyowa distributor.

Caution

- In this operation manual, a strain-gage transducer is referred to as a transducer for simplicity.
- Hereinafter, an output of strain-gage transducer is expressed in mV/V. This unit indicates an output voltage in mV for a bridge excitation voltage of 1V.
For example, an output of 2mV/V becomes 20mV ($=2\text{mV/V} \times 10\text{V}$) if the bridge excitation voltage is switched to 10V.
- In some description, values are expressed using the International System of Units as translated.

1. Parts and functions

1-1. Front Panel



- ① Display Usually, it displays a measured value according to the output of the transducer. But in an event of overflow, it displays an alarm message as follows.

OFL 1 : An input signal goes below -3.2mV/V .
 OFL 2 : An input signal exceeds $+3.2\text{mV/V}$.
 OFL 4 : A measured value exceeds 9999.

Alarm messages "OFL 1" and "OFL 2" are caused by an input signal which exceeds a measuring range of -3.2mV/V to $+3.2\text{mV/V}$ due to erroneous connection or breakdown of the transducer, overload, cable disconnection, inferior contact or too large initial unbalance. Alarm message "OFL 4" is caused by erroneous setting for calibration.

During key-switch operation, the display indicates the setting value.

② Status Indicator Lamps

- HIGH Lamp Illuminates when a reading exceeds the preset high limit, thereby indicating that the high-limit relay is operating.
 LOW Lamp Illuminates when a reading is below the preset low limit, thereby indicating that the low-limit relay is operating.
 HOLD Lamp Keeps illuminating when a reading on the display is a peak value which may be replaced with a succeeding higher peak value. It blinks when a reading on the display is a value which is kept fixed.
 ZERO TRACKING Lamp Illuminates to indicate zero tracking in progress.

③ Door Lock Use to open/close the key-switch access door.

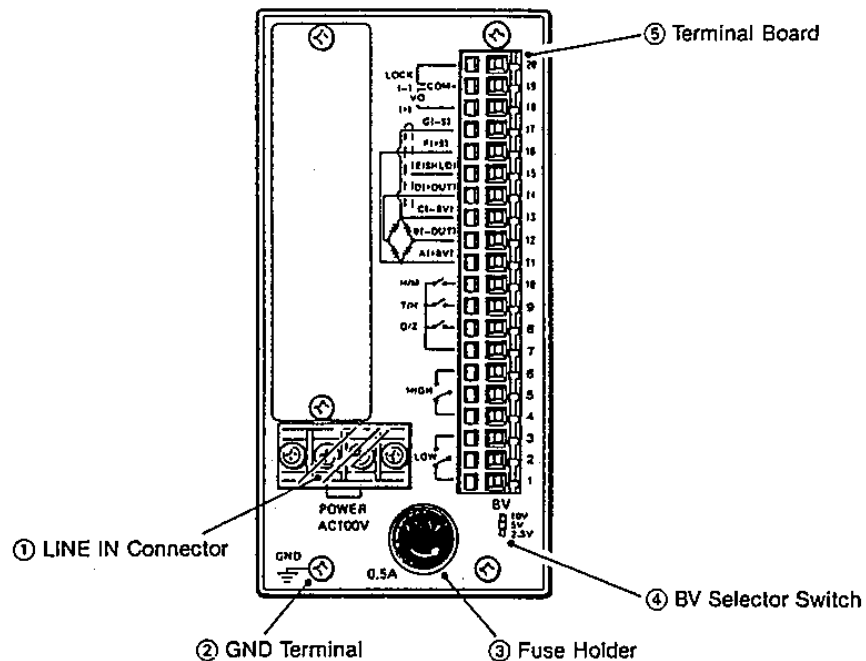
④ Setter (Key-switches) Allow the operator to set various measuring conditions including a calibration parameter and high/low limits. With an exception, these key-switches are given dual role—selection of a setting item and numeric input with a + or – sign. The keys function as follows.

Selection of Setting Item Numeric Input

HIGH 7	High limit.....	Digit 7
LOW 8	Low limit.....	Digit 8
HYS 4	Hysteresis width used for high/low limit comparison	Digit 4
HOLD 9	HOLD mode selection/HOLD status switchover	Digit 9
SMOOTH 5	Minimum scale, digital filter, zero tracking.....	Digit 5
ADD 6	Adding (shift) value	Digit 6
FACTOR 1+	Equivalent input calibration	Digit 1 or + sign
ACTUAL 2	Actual load calibration	Digit 2
ZERO 3	Digital zero	Digit 3
OPTION 0-	Full-scale value of D/A converter output	Digit 0 or – sign
RESET .	Key operation cancel or original input monitor	Decimal point
SET □	Acknowledges a selection, saves an input value, executes a command, etc.	

⑤ UNLOCK/LOCK Switch Permits the operator to protect setting conditions against erroneous operation. Set the switch to the UNLOCK position when operating key-switches for registration of measuring conditions. After setting or adjustment is complete, set the switch to the LOCK position, which makes the ^{SET}□ key invalid.

1-2. Rear Panel



- ① **LINE IN Connector** Be sure to connect to the mains power supply specified for the model of the instrumentation amplifier.
- ② **GND Terminal** Be sure to ground the instrument through this GND terminal so as to prevent an electrical shock hazard and electrostatic interference.
- ③ **Fuse Holder** Has a fuse inserted. Since no power switch is provided on the instrumentation amplifier, remove the fuse if only the instrumentation amplifier needs to be unavoidably turned off for maintenance or other purposes.
- ④ **BV Selector Switch** Selects a bridge excitation voltage from 10, 5 and 2.5V. It is recommended to select a larger voltage as far as allowed for the transducer connected. When selecting, be sure to turn off the system.
Also, perform calibration setting and execution after selecting a bridge excitation voltage.

⑤ Terminal Board.....

No.	Name	Description
20	LOCK	Shorting to terminal 19 prohibits calibration.
19	COM	Voltage output and CAL LOCK signals common
18	VO	Voltage output signal
17	G	Bridge voltage remote sense (–)
16	F	Bridge voltage remote sense (+)
15	E	Shield
14	D	Bridge output signal (+)
13	C	Bridge excitation (–)
12	B	Bridge output signal (–)
11	A	Bridge excitation (+)
10	H/M	HOLD command (H/M)
9	T/H	HOLD command (T/H)
8	D/Z	Digital zero command (D/Z)
7		External signal common
6	HIGH	High-limit relay contact output (a contact)
5		High-limit relay contact output (c)
4		High-limit relay contact output (b contact)
3	LOW	Low-limit relay contact output (a contact)
2		Low-limit relay contact output (c)
1		Low-limit relay contact output (b contact)

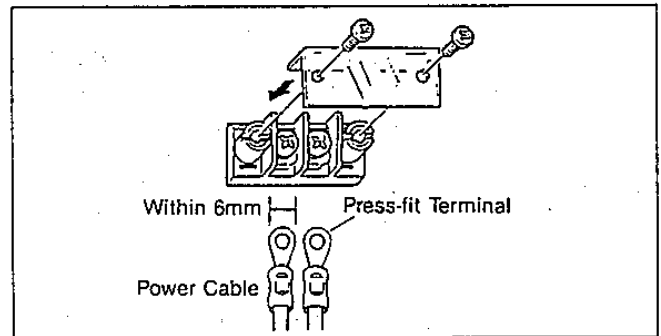
2. Connections

2-1. Connecting Power Cable to LINE IN Connector

Make sure that the mains supply voltage is as rated for the model in the WGA-710B series. Then connect the accessory power cable to the LINE IN connector. If a power cable other than included in accessories is used, attach press-fit terminals (M3) to both ends of the conductors.

Caution

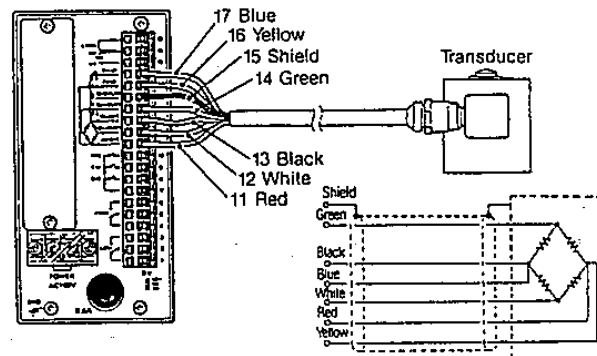
In case power line noise prevails, be sure to use an isolated constant-voltage transformer, etc.



2-2. Connecting Transducer

The cable of transducer may have four or six leadwires. Shown below is the connection of six leadwires to terminals on the rear panel. If blue and yellow leadwires are not connected to terminals 16 and 17, the WGA-710B operates as with the 4-wire method. (A 4-leadwire cable does not include yellow and blue

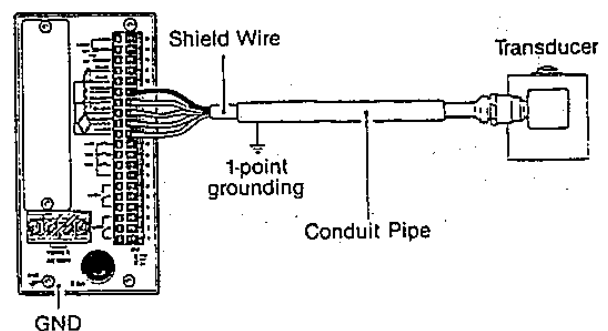
leadwires. Do not connect any to terminals 16 and 17.) When six leadwires of the transducer are connected as shown, the remote sensing circuit on the bridge power supply is made effective to correct a voltage fall due to cable resistance. This ensures highly accurate measurement if the cable is extended.



Caution

If measurement seems to be adversely affected by much external noise, take the following countermeasures in connection of the transducer.

- Make the input cable as shortest possible and use a shield wire. Also, be sure to ground the WGA-710B via the rear panel GND terminal.
- If the input cable crosses, or is laid along with, a power line, cover the power line with a conduit pipe or the like. If it is impossible, cover the input cable with a conduit pipe and ground the conduit pipe at a point.



2-3. Connecting Transducers in Parallel

The WGA-710B can connect to strain-gage transducers providing a bridge resistance in a range of 87.5Ω to $10k\Omega$. Accordingly, it allows parallel connection of up to four strain-gage transducers of 350Ω bridge resistance, provided that the transducers are of the same model and have the same capacity. Transducers thus connected in parallel can be handled as a single unit. For instance, if three load cells with a rated capacity of 10 tons (98.07KN) are connected in parallel, the WGA-710B can measure a load of up to 30 tons (294.2KN).

2-5. Connecting Leadwires to Terminals

Except for LINE IN connector, GND terminal and output connector for an optional provision, input/output terminals are arranged on the cage clamp terminal board.

To connect leadwires to these terminals:

- (1) Strip the tip of leadwire by 5 to 6 mm.
- (2) Twist the tip so that it may not be loose.
- (3) Insert the accessory screwdriver strongly into the hole at the left on the terminal board. Then bend it leftward.
- (4) Insert the leadwire into the hole at the right on the terminal board, while taking care that the tip may not be loose.
- (5) Pull out the screwdriver.
- (6) Lightly pull the leadwire to make sure that it is securely clamped.

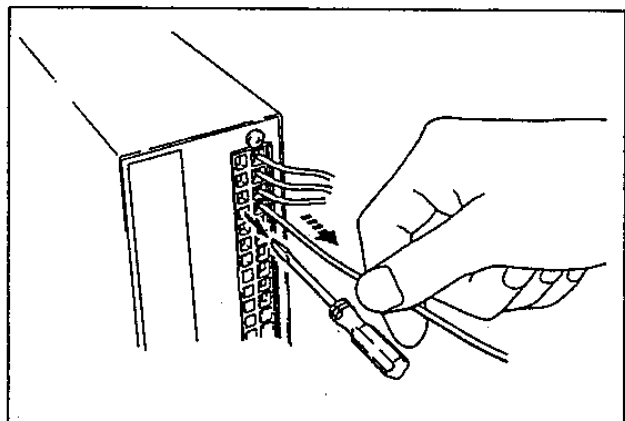
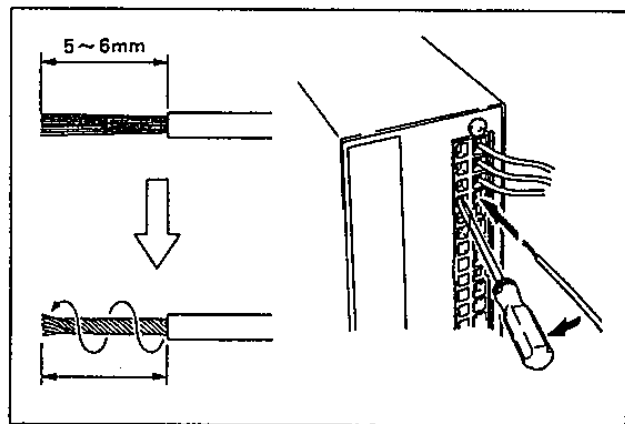
Caution

- A sectional area of the leadwire should be in a range of 0.2 to 2.5 mm^2 .
- The tip of leadwire should not be attached with a press-fit terminal nor soldered.
- When connecting two or more leadwires to a terminal, twist them together in advance.

2-4. Switching BV

To switch over BV (a bridge voltage) to another, do it using a pointed matter such as the attached screwdriver.

- (1) Select the largest possible voltage from among 10, 5 and 2.5V within the allowable bridge voltage range of the transducer in use.



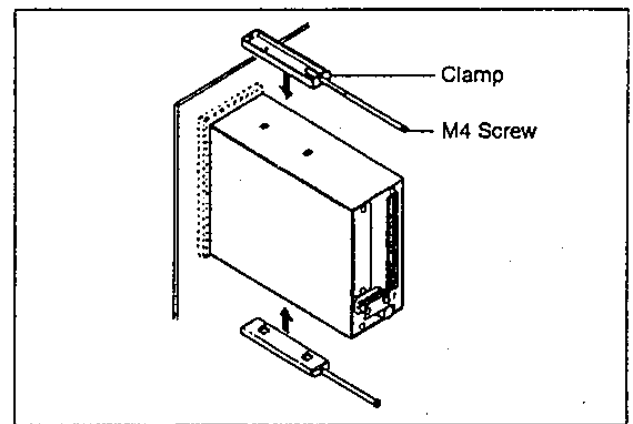
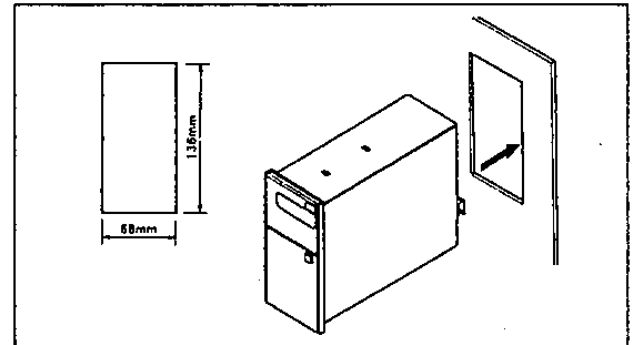
2-6. Mounting WGA-710B onto Panel

To mount the WGA-710B onto a panel, take the following procedures.

- (1) Bore the panel to make a hole of 136mm high by 68mm wide.
- (2) Remove clamps on top and bottom of WGA-710B. Remove the protective cap which is attached to the tip of each M4 screw.
- (3) Insert the WGA-710B into the hole on the panel from the rear of WGA-710B.
- (4) Insert clamps from the rear of WGA-710B at the top and bottom.
- (5) Fix the WGA-710B onto the panel by tightening M4 screws into clamps.
- (6) The models vary in depth. So observe the following depth requirements.
WGA-710B-X: 240mm where X is [0], [4], [5], or [6];
280mm where X is [1] or [2];
300mm where X is [12] or [14]

Caution

When transporting the WGA-710B mounted onto a panel, take care not to give it a strong impact or vibration. Also, avoid putting any matter onto the WGA-710B or applying a force.



2-7. Connecting to External Signals (D/Z, T/H and H/M)

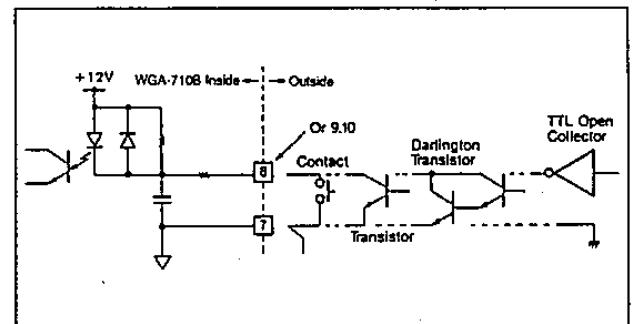
Rear panel terminals 7, 8, 9 and 10 are provided to input external signals.

Signals may be input either through a contact of relay or switch, or with no contact through a TTL open collector or transistor.

With terminal 7 as the common terminal, terminal 8 is for external digital zero command D/Z, and terminals 9 and 10 are for external HOLD commands T/H and H/M, respectively.

Caution

- The external signal element should allow a current flow of 10mA minimum in it.
- Under an OFF (open) condition, the external signal element should not give a leakage current of more than 100μA.
- Under an ON (shorted) condition, the external signal element should not give a voltage of more than 2V.



3. Setup

3-1. Precautions

- (1) When the image of a key,  for example, appears independently in the following, it means that the key is to be pressed.
- (2) The  key is effective only when the UNLOCK/LOCK switch at the right is set to the UNLOCK position. When conducting adjustment or function setting, therefore, first set the UNLOCK/LOCK switch to the UNLOCK position. Also, be sure to set it to the LOCK position after adjustment or setting is complete.
- (3) Unless any key operation is made for over 12 seconds after the press of a key, the SET mode is automatically aborted and the display returns

to the ordinary mode to indicate a measured value. In such the case, the setting value, which was input halfway, is made invalid. Proceed anew from the first step for entering the value.

- (4) Press the  key to cancel a key operation sequence. Note that, however, this key has a role to input a decimal point in a calibration parameter and cannot be used to cancel a key operation sequence for entering a calibration parameter.

3.2 How to Use the Setter (Key Switches)

This setter performs two different roles — item selection and numeric input.

The setter acts as the item selection keys.....



A preset value appears.



Press the  key to shift to numeric input.



The setter turns into the numeric keys.



To register what you have keyed in, press the  key.



To set another item, start from selection of that item.

At the initial stage, each key in the setter is given a role to select an item to be set.

You may renew your selection any number of times until the  is pressed.

Once you have selected an item, the display will present the preset value of that item while the key will blink.

Now, press the  key to shift to numeric input. The key, which you pressed to select the item, will stop blinking and keep illuminating while the top digit will blink on the display.

From this time on, the setter keys will act as the numeric keys to let you enter one digit each time in the blinking place. Each time you enter a digit, blinking moves to the next lower place, thus travelling from the top digit to the last. When you have entered the last digit, the top digit will restart blinking.

So you can renew what you have entered, if necessary.

Make sure that the numeric value appearing on the display is correct, then press the  key (no matter what digit is blinking). The value will then be registered, and the display will also return to the mode that reads transducer signals.

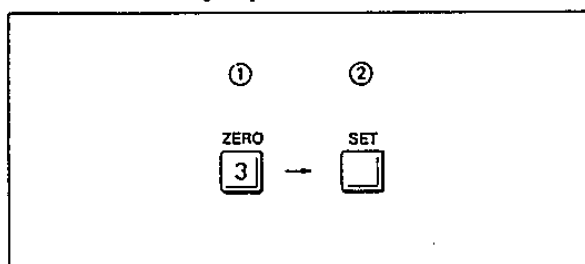
Caution

Operation keys adopt an object-priority system. Thus,  and  keys are effective to input minus and plus signs, respectively, only when inputting them in high/low limits and adding value. Similarly, the  key is effective to input a decimal point only when inputting it in a calibration parameter. A decimal point in other than calibration parameter is automatically put on the display.

3-3. Digital Zero Setting

The digital zero function permits the operator to set a reference point for readings. The effect is similar to setting a meter pointer at "0" before putting a matter on a weighing machine. With the WGA-710B, a digital zero can be obtained in either of the following two ways.

(1) Front Panel Key Operation



- ① With the UNLOCK/LOCK switch set to the UNLOCK position, press the  key. The key will blink.
- ② Then press the  key. A value on the display will be "0."

(2) External Command

Short rear panel terminals 7 and 8 (D/Z). A value on the display will be "0." The front panel UNLOCK/LOCK switch may be in any position.

Caution

If an adding value is set at other than "0000," activating the digital zero function does not display "0" but the set adding value.

3-4. Calibration

The term "calibration" used here indicates the method of interrelating the output of strain-gage transducer with a reading on the display.

Two methods are provided — calibration by registering sensitivity and calibration using an actual load. Perform calibration through either method.

3-4-1. Calibration by Registering Sensitivity

This method of calibration is performed by registering the rated output of a transducer. This method eliminates the need for applying an actual load to the transducer. Suppose that the transducer provides a rated capacity of 100kg and a rated out of 2.008mV/V, and a load of 100kg (980.7N) is to cause a reading of 980.7 on the display. Setting procedures are as follows.

(1) Unlocking Calibration Prohibit Status

Break open rear panel terminals 19 and 20 (LOCK).
(As shipped, the switch is at the UNLOCK position.)
Set the UNLOCK/LOCK switch to the UNLOCK position.

(2) Entering Rated Output of Transducer

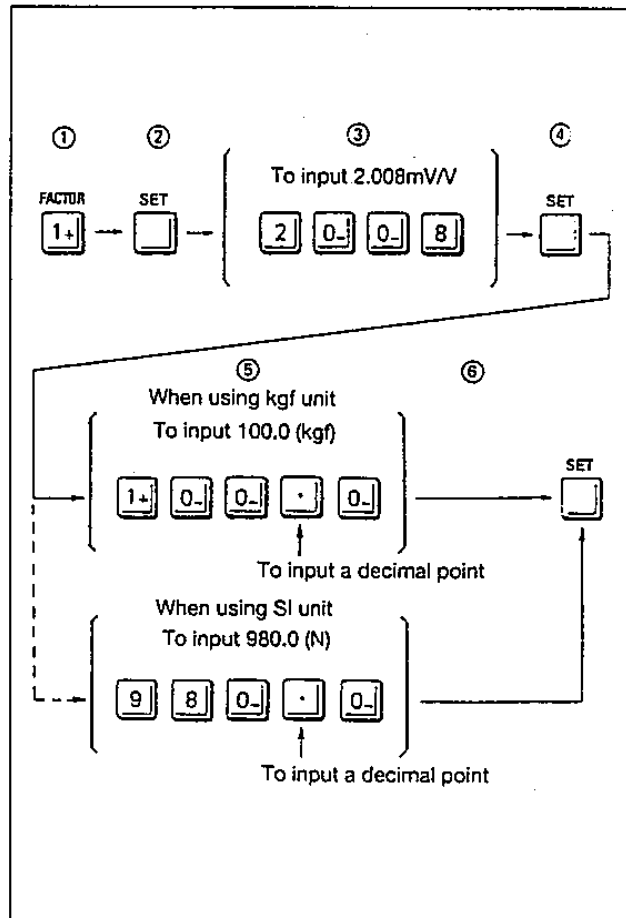
- ① Press the **FACTUR** key. The key will blink and the preset rated output will appear on the display.
- ② Press the **SET** key. The highest-place digit will blink on the display.
- ③ Input the rated output of the transducer with four digits.
The decimal point position is fixed. Do not press the **RESET** key.
The input value may be changed if required until the **SET** is pressed.
- ④ Press the **SET** key. The preset value which is to be displayed when the rated load is applied to the transducer, will appear on the display with the highest-place digit blinking.
- ⑤ Input the value which is to be displayed when the rated load is applied to the transducer, using four digits plus a decimal point.
- ⑥ Press the **SET** key. The input calibration parameters will be saved.

(3) Locking Calibration Prohibit Status

Short-circuit rear panel terminals 19 and 20 (LOCK) to prevent erroneous operation. Then, set the UNLOCK/LOCK switch to the LOCK position.

Caution

- Since the WGA-710B uses an automatic calibration adjustment system by internal calculation, any values can be entered for calibration parameters. However, it is recommended to set so that a reading for 1mV/V is lower than 3125. If not, a reading may fluctuate by 2 or more digits.
- To short-circuit terminals 19 and 20 (calibration LOCK) on the terminal board on the rear panel, use shortest possible wiring. Long wiring can pick up noise to result in erroneous operation.



3-4-2. Actual Load Calibration

The actual load calibration is the method of applying an actual known load to the transducer and entering a value to be displayed for that load.

Suppose that the transducer provides a rated capacity of 100kgf (980.7N) and a load of 50kgf (490.3N) is to cause a reading of 50.0. Setting procedures are as follows.

(1) Unlocking Calibration Prohibit Status

Break open rear panel terminals 19 and 20 (LOCK). Set the UNLOCK/LOCK switch to the UNLOCK position.

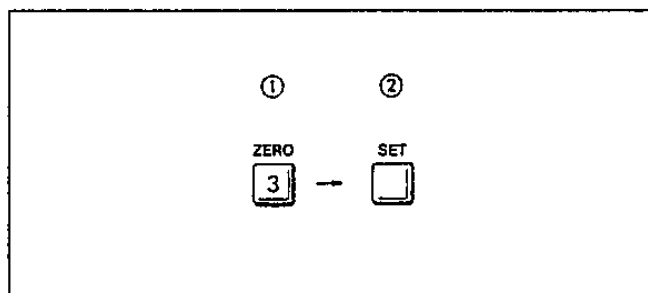
(2) Zero Adjustment

Place the transducer in no load condition. Then perform the following.

- ① Press the  key. The key will blink.
- ② Press the  key. A reading on the display will be "0."

Caution

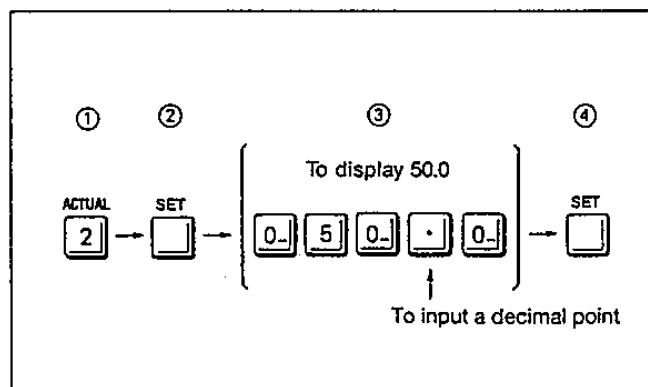
- When using the digital zero function for the actual load calibration, set the adding value at "0000".
- To short-circuit terminals 19 and 20 on the terminal board on the rear panel, use shortest possible wiring. Long wiring can pick up noise to result in erroneous operation.



(3) Entering a Value to be Displayed for a Certain Load

Apply a load of 50kgf (490.3N) to the transducer and perform the following key operation.

- ① Press the  key. The key will blink and the preset value will appear on the display.
- ② Press the  key. The highest-place digit will blink on the display.
- ③ Input a value to be displayed for a load of 50kgf, using four digits plus a decimal point.
- ④ Press the  key. The input value will be saved.



(4) Locking Calibration Prohibit Status

Short-circuit rear terminals 19 and 20 (LOCK) to prevent erroneous operation.

Set the UNLOCK/LOCK switch to the LOCK position.

4. Settings for basic functions

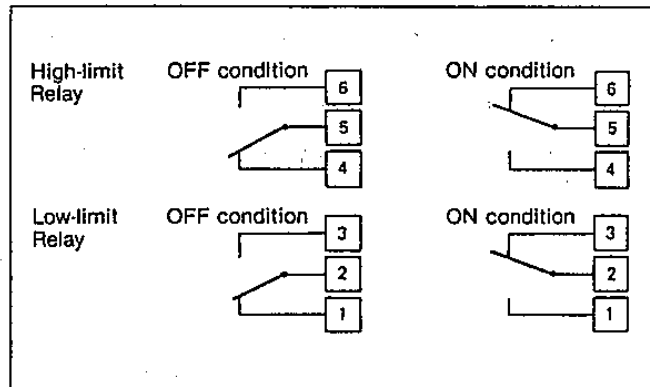
4-1. High/Low Limit-referred Comparison

The WGA-710B provides a function to compare a reading with high/low limits. The result of comparison is sent to appropriate terminals on the rear panel while it is indicated by HIGH and LOW lamp status on the front panel as shown at right.

High limit should be higher than low limit.

Comparison Results	Relays		Indicator Lamps	
	High Limit	Low Limit	HIGH	LOW
Power OFF	OFF	OFF	OFF	OFF
Reading $\geq$ High limit	ON	OFF	ON	OFF
Reading < High limit	OFF	OFF	OFF	OFF
Reading > Low limit	OFF	OFF	OFF	OFF
Reading $\leq$ Low limit	OFF	ON	OFF	ON

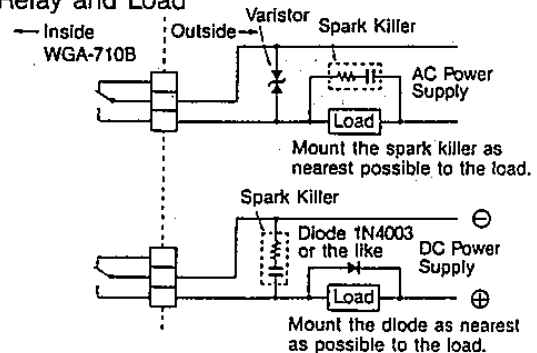
The status of internal relays is as shown at the right.



Caution

- These relays should be used within the rating of 250V ac, 0.5A with the resistance load. Application of a voltage or current exceeding the rating shortens their service life as well as causing troubles. Especially, a short-circuit current shall not be applied to these relays.
- To minimize noise effect, mount a spark killer or the like onto the load to which these relays are connected.
- No shield cable is required but wiring between these relays and the load should be laid separately from the power line or a line containing much noise.

• Typical Connections between High/Low Limit Relay and Load

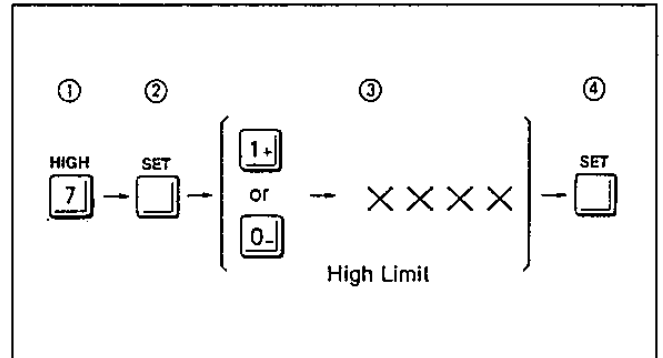


- Shizuki spark killer SK50Y104R120 is recommended.

4-1-1. Setting High/Low Limits

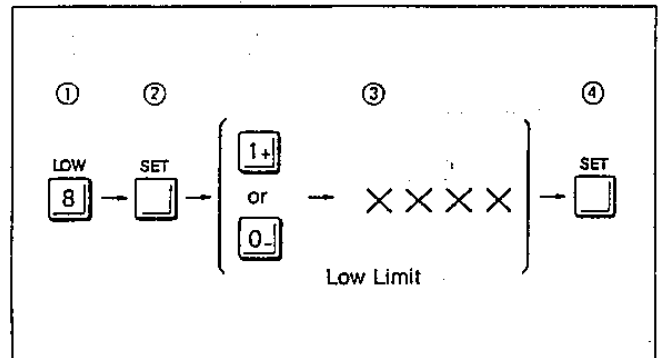
(1) High Limit

- ① Press the ^{HIGH} key. The key will blink and the pre-set high limit will appear on the display.
- ② Press the ^{SET} key. The plus or minus sign prefixed to the high limit will blink.
- ③ First input the plus or minus sign, then input a desired high limit with four digits. A decimal point is automatically put at the same position as on the preset calibration value.
- ④ Press the ^{SET} key. The input high limit will be saved.



(2) Low Limit

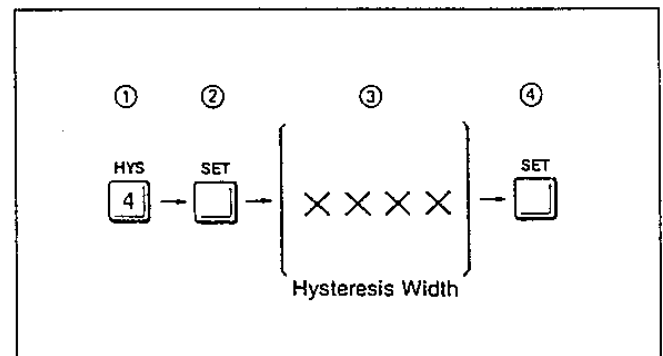
- ① Press the ^{LOW} key. The key will blink and the pre-set low limit will appear on the display.
- ② Press the ^{SET} key. The plus or minus sign prefixed to the low limit will blink.
- ③ First input the plus or minus sign, then input a desired low limit with four digits. A decimal point is automatically put at the same position as on the preset calibration value.
- ④ Press the ^{SET} key. The input low limit will be saved.



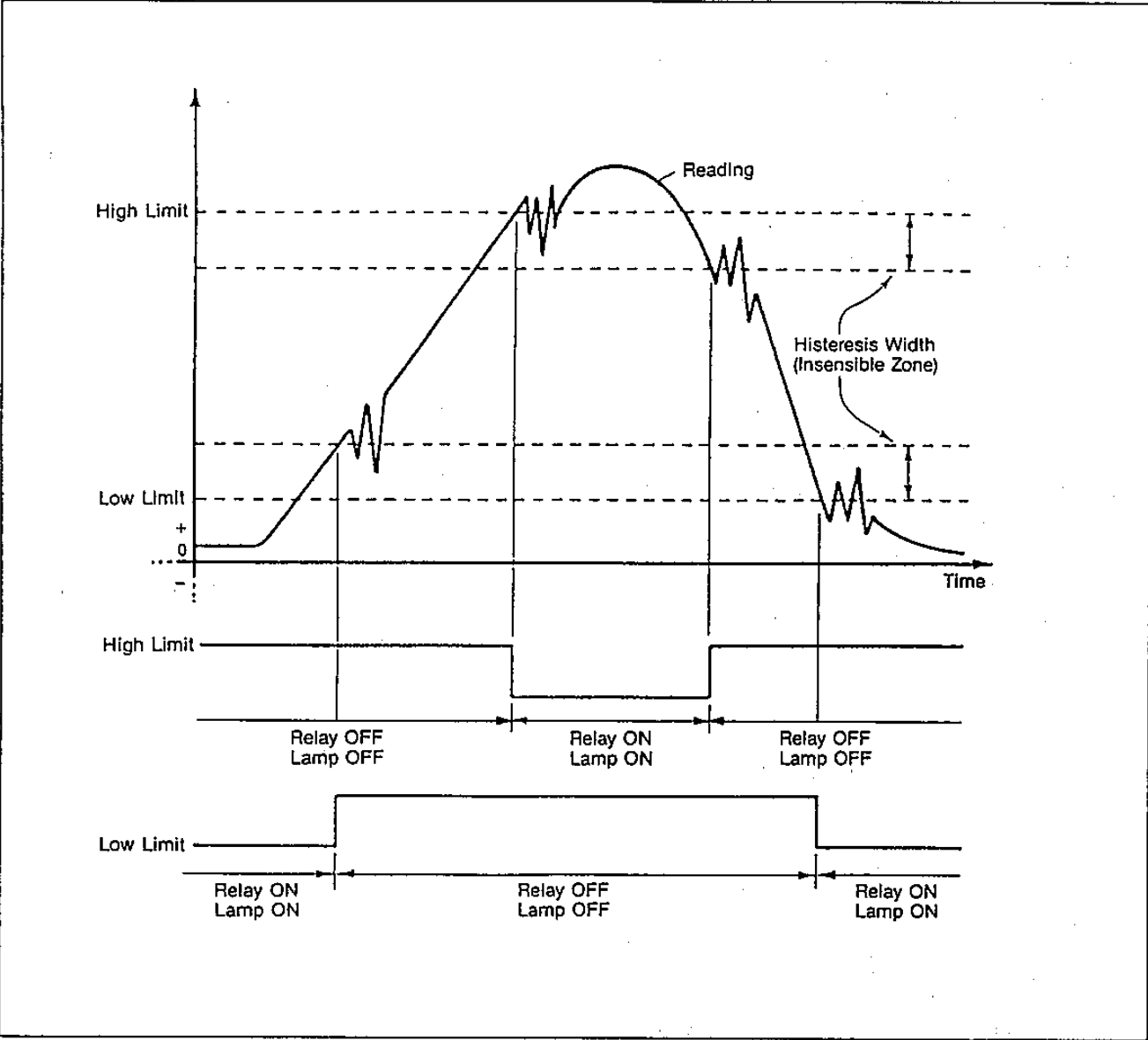
4-1-2. Setting Hysteresis Width as Insensible Zone

The WGA-710B has a function to provide an insensible zone for comparison of a reading with high/low limits. Take the high limit for instance. Usually, the WGA-710B outputs the HIGH LIMIT signal when a reading exceeds the preset high limit, and stops outputting when a reading returns just below the high limit. The hysteresis function permits the operator to set a hysteresis width for such the effect that the WGA-710B stops outputting when a reading falls further by a set hysteresis width below the high limit.

- ① Press the ^{HYS} key. The key will blink and the pre-set hysteresis width will appear on the display.
- ② Press the ^{SET} key. The highest-place digit of the hysteresis width will blink.
- ③ Input a desired hysteresis width with four digits. A decimal point is automatically put at the same position as on the preset calibration value.
- ④ Press the ^{SET} key. The input hysteresis width will be saved.



Operation Timing in Comparison of Readings with High/Low Limits



4-2. HOLD Function

HOLD modes may be roughly classified into two modes. One is to hold a reading obtained at some optional time point until aborted by a key operation. The other is to hold the most recent peak value which may be automatically replaced with a succeeding higher peak value. These two modes can be used in combination.

4-2-1. Selecting a HOLD Mode

Select one from five HOLD modes through the following key operation.

- ① With the UNLOCK/LOCK set to the UNLOCK position, press the **HOLD 9** key. Then perform the following key operation within 12 seconds.
- ② Press the **SET** key. The **HOLD 9** key will blink and the preset mode number will blink on the display.
- ③ Input a desired mode number.
- ④ Press the **SET** key. The input mode number will be saved.

If mode 4 "Time-specified Peak HOLD" is selected, the preset time period the WGA-710B is to keep a peak value which may be replaced with a succeeding higher peak value, will appear on the display. Perform the following key operation to set a new desired time period.

- ⑤ Input a desired time period with four digits in a range of 00.01 to 99.99 seconds. The position of a decimal point is fixed.
- ⑥ Press the **SET** key. The input time period will be saved.

4-2-2. Mode 1 "Optional Point HOLD"

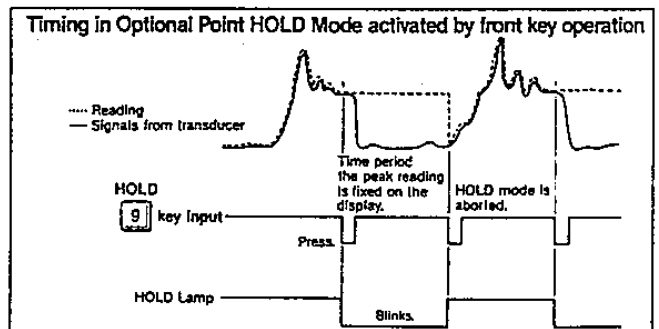
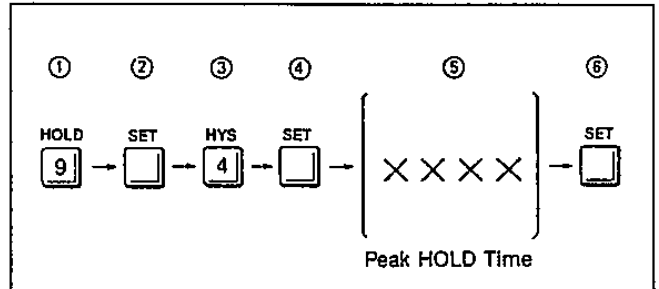
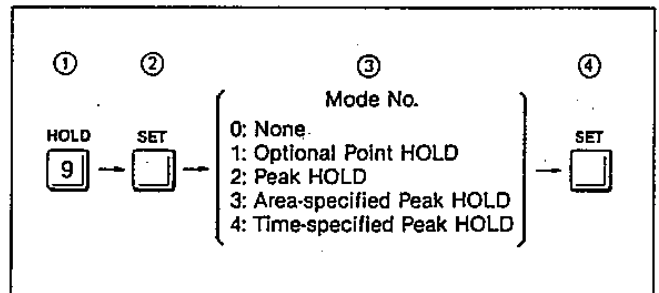
In the Optional Point HOLD mode, the operator can let the display keep a reading at some specific time point by either of the following two ways.

(1) Activation by Front Panel Key Operation

- ① Press the **HOLD 9** key. A reading at that time point will be kept on the display. At the same time the HOLD lamp will keep blinking.
- ② Press the **HOLD 9** key once more. The HOLD lamp will fade out and a current reading will be sequentially displayed.

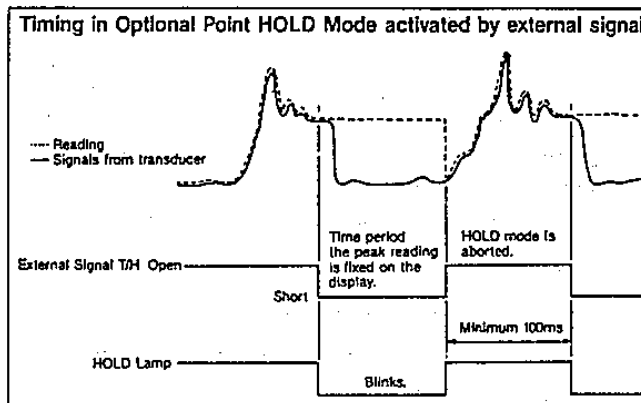
Caution

- Be sure to select "0" in HOLD mode selection unless any HOLD mode is used.
- The HOLD function can be activated by either front key operation or external signals (T/H and T/M) applied to rear panel terminals. For front key operation, break open terminals 7 and 9 for the external T/H signal as well as terminals 7 and 10 for the external T/M signal. Also take care not to press the **HOLD 9** key when the HOLD function is so set as to be activated by an external signal.



(2) Activation by External Signal

- ① Short-circuit rear panel terminals 7 and 9 (T/H). A reading at that time will be kept on the display. At the same time the front panel HOLD lamp will blink.
- ② Break open terminals 7 and 9 (T/H). The HOLD lamp will fade out and a current reading will be sequentially displayed.

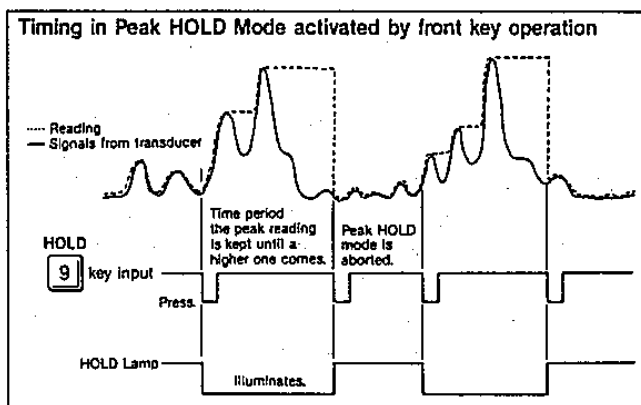


4-2-3. Mode 2 "Peak HOLD"

In the Peak HOLD mode, the most recent peak value is kept on the display. The peak value is a maximum value in the positive direction even for the negative area.

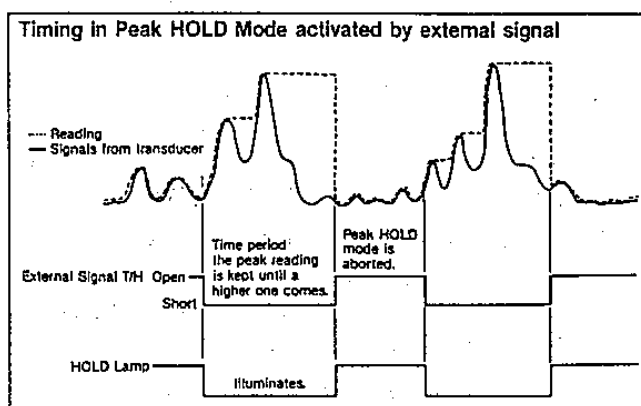
(1) Activation by Front Panel Key Operation

- ① Press the **HOLD 9** key. The HOLD lamp will illuminate and the display will keep the most recent peak value which may be replaced with a succeeding higher value.
- ② Press the **HOLD 9** key once more. The HOLD lamp will fade out and the Peak HOLD mode will be aborted. Thereafter, a current reading will be sequentially displayed.



(2) Activation by External Signal

- ① Short-circuit rear panel terminals 7 and 9 (T/H). The HOLD lamp will illuminate and the display will keep the most recent peak value which may be replaced with a succeeding peak value.
- ② Break open terminals 7 and 9 (T/H). The HOLD lamp will fade out and the Peak HOLD mode will be aborted. Thereafter, a current reading will be sequentially displayed.



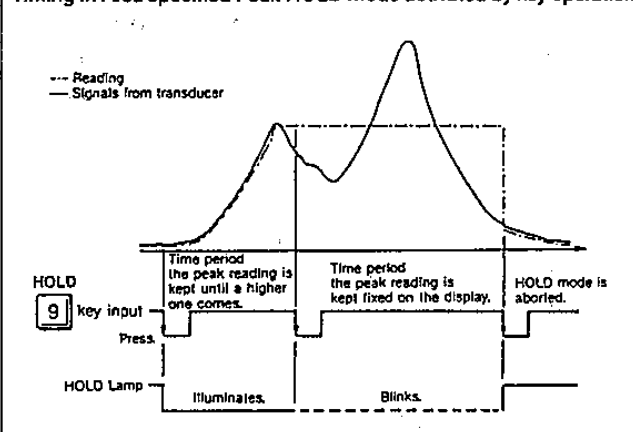
4-2-4. Mode 3 "Area-specified Peak HOLD"

In this mode, the first press of the $\boxed{9}$ key lets the display keep the most recent peak value which may be sequentially replaced with a succeeding higher value. The second press of the key lets the current highest peak value be fixed on the display.

(1) Activation by Front Panel Key Operation

- ① Press the $\boxed{9}$ key. The HOLD lamp will illuminate and the display will keep the most recent peak value which may be sequentially replaced with a succeeding higher peak value.
- ② Press the $\boxed{9}$ key once more. The current peak value on the display at that time will be kept fixed and the HOLD lamp will blink as with the Optional Point HOLD mode.
- ③ Press the $\boxed{9}$ key once more. The HOLD lamp will fade out and the HOLD mode will be aborted. Thereafter, a current reading will be sequentially displayed.

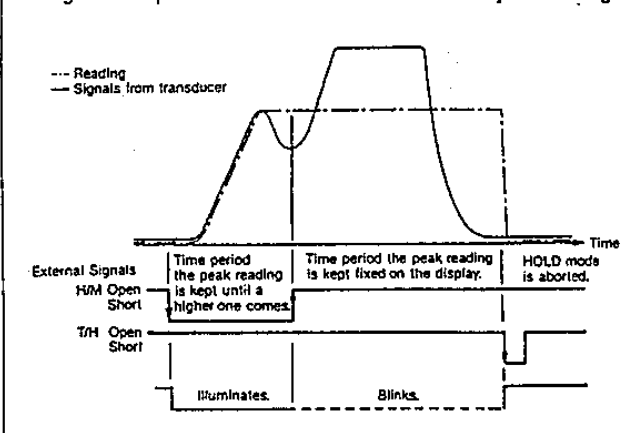
Timing in Area-specified Peak HOLD Mode activated by key operation



(2) Activation by External Signal

- ① Short-circuit rear panel terminals 7 and 10 (H/M). The HOLD lamp will illuminate and the display will keep the most recent peak value which may be sequentially replaced with a succeeding higher peak value.
- ② Break open terminals 7 and 10 (H/M). The current peak value on the display at that time will be kept fixed and the HOLD lamp will blink.
- ③ Short-circuit terminals 7 and 9 (T/H). The HOLD lamp will fade out and the HOLD mode will be aborted. Thereafter, a current reading will be sequentially displayed.

Timing in Area-specified Peak HOLD Mode activated by external signal

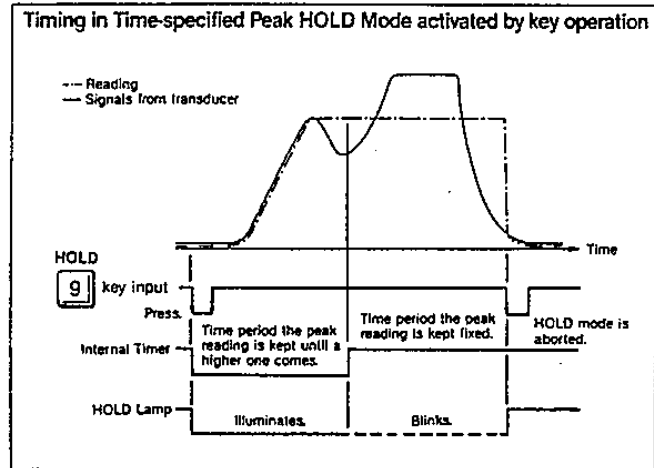


4-2-5. Mode 5 "Time-specified Peak HOLD"

In this mode, the display keeps the most recent peak value which may be sequentially replaced with a succeeding higher value in the preset time period. After then, the reading on the display at that time point is kept fixed as the highest peak during that time period.

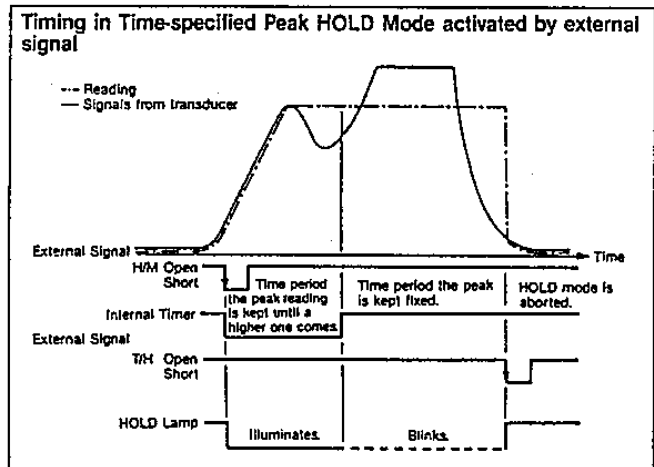
(1) Activation by Front Panel Key Operation

- ① Press the **HOLD 9** key. The HOLD lamp will illuminate and the display will keep the most recent peak value which may be sequentially replaced with a succeeding higher peak value in the specified time period.
- ② When the specified time period has elapsed, the HOLD lamp will blink and the current reading, that is, the highest peak during the specified time period, will be kept fixed on the display.
- ③ Press the **HOLD 9** key. The HOLD lamp will fade out and the HOLD mode will be aborted. Thereafter, a current reading will be sequentially displayed.



(2) Activation by External Signal

- ① Short-circuit rear panel terminals 7 and 10 (H/M). The HOLD lamp will illuminate and the display will keep the most recent peak value which may be sequentially replaced with a succeeding higher peak value in the specified time period.
- ② When the specified time period has elapsed, the HOLD lamp will blink and the current reading on the display, that is, the highest peak during that time period will be kept fixed on the display.
- ③ Short-circuit terminals 7 and 9 (T/H). The HOLD lamp will fade out and the HOLD mode will be aborted. Thereafter, a current reading will be sequentially displayed.



Caution

If the power fails during operation in any of HOLD modes, the reading on the display is lost. If terminals 7 and 9 (T/H) or 7 and 10 (H/M) are kept as shorted during power failure, the display keeps an unstable reading when the power is recovered. So, break open these terminals once in an event of power failure.

4-3. Smoothing Function

The smoothing function allows the operator to stabilize a reading when the signal from the transducer fluctuates. There are three ways of smoothing—(1) Minimum scale, (2) Digital filter, and (3) Zero tracking.

A minimum scale is the minimum units by which a reading is varied, and signals fluctuating within the scale does not affect a reading.

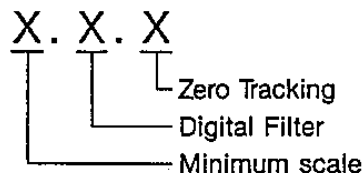
A digital filter averages signals from the transducer to stabilize a reading. The greater the number of moving average times, the higher the stabilization effect but the slower the response time becomes.

The zero tracking function is to automatically correct the zero point which delicately drifts. This function is useful to minimize a measuring error caused by not only zero drift on the transducer and amplifier but also zero drift due to dust deposits on the subject site. In the zero tracking, zero drift below a certain level is automatically corrected in a certain time period. Several combinations of level (band) and time (delay) are available for selection.

4-3-1. Selecting Smoothing Parameters

Perform the following key operation to select smoothing parameters.

- ① Press the  key. The key will blink and preset numbers for minimum scale, digital filter and zero tracking will appear on the display.

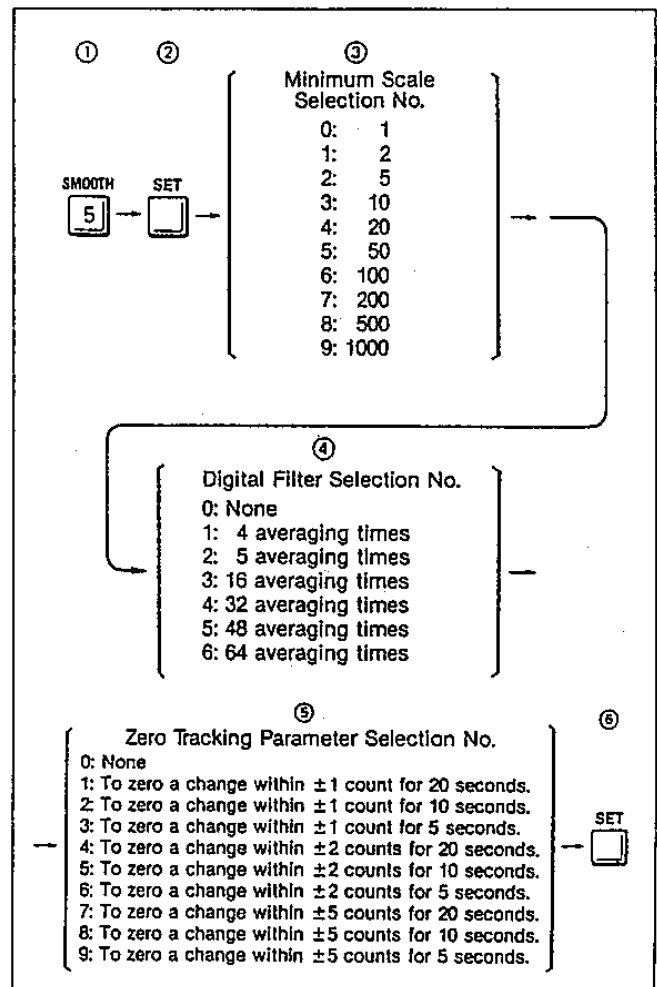
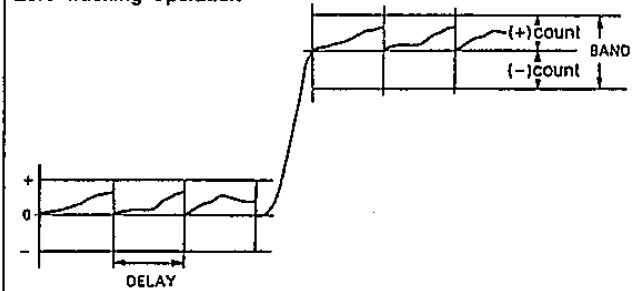


- ② Press the  key. The number for the preselected minimum scale will blink.
- ③ Select a desired minimum scale by inputting the number.
- ④ Select the type of a desired digital filter by inputting the number.
- ⑤ Select a desired set of zero tracking parameters by inputting the number.
- ⑥ Press the  key. Selections thus input will be saved.

Caution

- Zero tracking is not suitable for use in measurement of slowly changing physical variables. In such the case, input "0" (none) when selecting a set of zero tracking parameters.
- The zero point, which is automatically corrected through zero tracking, is cleared when setting for the smoothing function is made anew or when the power fails. When restarting measurement, use the digital zero function described in 3-3.

Zero Tracking Operation



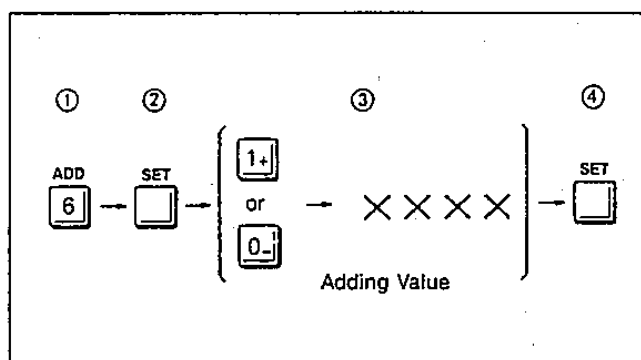
4-4. Adding (Shift) Function

The adding (shift) function permits the operator to add a known plus or minus value, such as a tare weight, to an original measured value so as to obtain a target reading on the display.

4-4.1. Setting an Adding Value

Perform the following key operation to save an adding value, e.g. a known tare weight, to a reading.

- ① Press the **ADD** **[6]** key. The key will blink and the preset adding value will appear on the display.
- ② Press the **SET** **[]** key. The plus or minus sign prefixed to the preset adding value will blink.
- ③ First select the plus or minus sign, then input a desired adding value with four digits. A decimal point will be automatically put at the same position as on the calibration value.
- ④ Press the **SET** **[]** key. The input adding value will be saved.



Caution

- An entered value with a negative sign prefixed is subtracted from a current reading.
- Activation of the digital zero function after setting an adding value displays that set value.

4-5. Monitor Function

The monitor function allows the operator to check prevailing setting conditions. By writing down the setting conditions, for example, the operator can substitute an equivalent input calibration for an actual load calibration at the time of replacing the transducer. In the monitor mode, each key-switch calls a setting condition as follows.

Key	Monitored Item
HIGH [7]	High limit
LOW [8]	Low limit
HYS [4]	Hysteresis width (insensible zone)
SMOOTH [5]	Minimum scale, digital filter setting and zero tracking parameters in numbers
ADD [6]	Adding (shift) value
FACTORY [1]	Input equivalent calibration value in mV/V
ACTUAL [2]	Actual load calibration value
OPTION [0]	Full-scale value of A/D converter provided for models in WGA-710B-4 series
INPUT []	Output from the transducer in mV/V. This is not available if the WGA-710B is in any of HOLD modes.

Caution

- After adjustment or setting is complete, set the UNLOCK/LOCK switch to the LOCK position. This makes the **[]** key invalid, thereby preventing erroneous setting through careless key operation. The monitor function is effective under this condition where the UNLOCK/LOCK switch is set in the LOCK position.
- When a key is pressed, the corresponding setting value is displayed for approximately 12 seconds. After then, the display returns to the ordinary measuring mode. If the ordinary measuring mode is desired before 12 seconds, press the **NEXT** **[]** key.
- The key, which is pressed to monitor a setting value, blinks.
- Setting values are saved in the nonvolatile memory and backed against power failure.

4-6. Self-check Function

The self-check function can be used in two modes—(1) Self-test and (2) Status check.

4-6-1. Self-test Mode

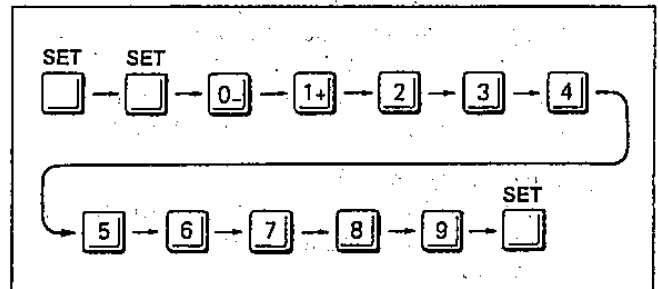
In the self-test mode, the WGA-710B automatically checks indicators, internal circuits and memories for any possible errors. If an error is detected in an internal circuit or memory, the error code is displayed. In such a case, contact your Kyowa distributor.

(1) Executing Self-test

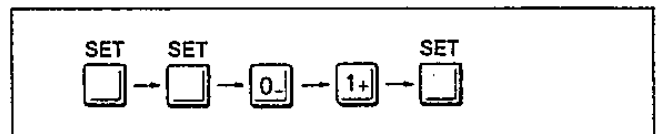
First set the UNLOCK/LOCK switch to the UNLOCK position. Then proceed to either of the following two ways.

① Fundamental Method

This method allows checking of not only internal circuits and memories but also key-switches. It is recommended to use this method though it may seem troublesome.



② Simplified Method



(2) Self-testing Contents

Self-testing is performed in the following sequences.

Check Sequence	Indication	Major Checking Items	Time Taken (seconds)
1	All segments of the display illuminate.	Start	1
2		Status indicator lamps	4
3	All digits are sequentially displayed in all places.	Display	7
4		Interrupt circuit	0.5
5		A/D converter circuit	1
6		RAM	1
7		ROM	1
8		End	12

① **Check Sequence 1**

All segments of the display illuminates for approximately 1 second, thereby indicating that self-testing is started.

② **Check Sequence 2**

Status indicator lamps sequentially illuminate one by one, thereby allowing the operator to ensure the correct operation of these lamps.

③ **Check Sequence 3**

Each set of the same digits in four places is sequentially displayed one by one, thereby allowing the operator to ensure the correct operation of the display.

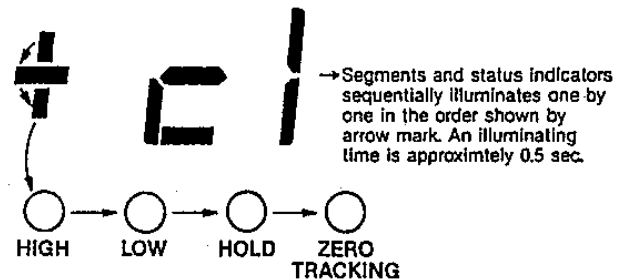
④ **Check Sequences 4 through 7**

In approximately 1 second after sequence 3, self-testing automatically proceeds to check sequences 4 through 7. A sequence in progress is indicated by the number on the display.

⑤ **Check Sequence 8**

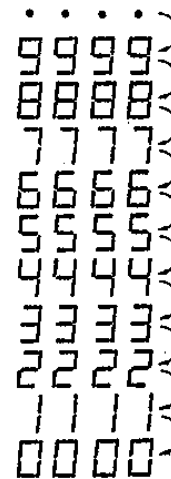
Test result "PASS" is displayed, thereby allowing the operator to ensure the correct operation of the WGA-710B.

Illuminating Order in Check Sequence 2



Illuminating Order in Check Sequence 3

From decimal points to digits 9 through to digits 0



If an error is found in an internal circuit or memory, a corresponding error code is displayed for 12 seconds.

Note

- If a status indicator lamp does not illuminate in sequence 2 or proper digits are not displayed in sequence 3, or if an error code is displayed, the WGA-710B is defective. Contact your Kyowa distributor.
- When self-testing is complete, the WGA-710B returns to the ordinary measuring mode. If desired, the operator can escape immediately from the self-testing mode with test result "PASS" on the display by pressing the  key.

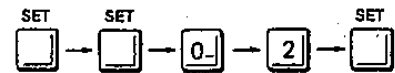
Error Code	Faulty Item
E - 00	ROM
E - 01	RAM
E - 02	Interrupt circuit
E - 05	A/D converter circuit

4-6-2. Status Check

In the status check mode, the WGA-710B displays the suffix code, which indicates an additional function provided for the model, and the set bridge excitation voltage.

(1) Executing Status Check

First set the UNLOCK/LOCK switch to the UNLOCK position. Then operate key-switches in the order shown at the right. The WGA-710B starts checking its own status.



A check result will be displayed as follows.

X-YY

YY	Bridge Excitation Voltage
2.5	2.5V dc
05	5V dc
10	10V dc

X	Option/s attached	Model
0	Standard (no option attached)	WGA-710B-0 A000
1	BCD data output	WGA-710B-1 A000
2	EIA-232-D (RS-232-C)	WGA-710B-2 A000
4	D-A converter	WGA-710B-4 A000
5	Isolated analog signal conditioner	WGA-710B-5 A000
6	8-step comparator	WGA-710B-6 A000
A	BCD data output EIA-232-D (RS-232-C)	WGA-710B-12 A000
C	BCD data output D-A converter	WGA-710B-14 A000

Suffix "A000" to each model number indicates the rated supply voltage. (Refer to page 3.)

Caution

- After the self-test or status check is complete, be sure to set the UNLOCK/LOCK switch to the LOCK position.
- A test or check result is displayed for 12 seconds, and after then the WGA-710B returns to the ordinary measuring mode. If a quick

return to the ordinary measuring mode is desired, press the  key.

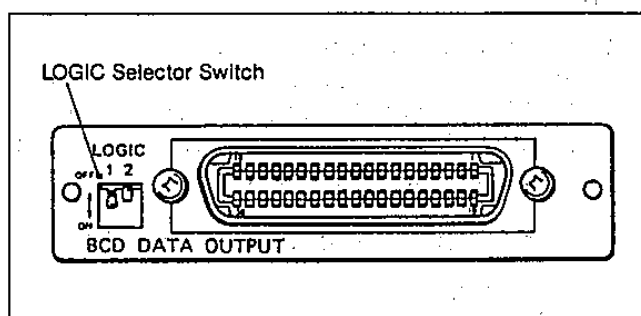
- The self-test or status check may be executed at any time. Note that, however, such operation as comparison of readings against high/low limits and HOLD sequence is interrupted.

5. Settings for additional functions (depend on models)

5-1. BCD Data Output (WGA-710B-1 Series)

The BCD output is the interface to send readings on the display to, and receive commands from, an external instrument in the BCD system. Its connection to a computer, process controller or sequencer facilitates not only data tabulation and logging but also system control.

The input/output circuit is electrically isolated from the internal circuit by the photo-coupler.



5-1-1. Connector Pin Assignment

Pin No.	I/O	Signal Name	Pin No.	I/O	Signal Name
1	—	COM	19	—	COM
2	O	Data 1	20	—	Blank
3	O	Data 2	21	—	Blank
4	O	Data 4	22	—	Blank
5	O	Data 8	23	—	Blank
6	O	Data 10	24	—	Blank
7	O	Data 20	25	—	Blank
8	O	Data 40	26	—	Blank
9	O	Data 80	27	—	Blank
10	O	Data 100	28	O	Minus (polarity)
11	O	Data 200	29	O	Overflow
12	O	Data 400	30	O	EOC*
13	O	Data 800	31	I	HOLD
14	O	Data 1000	32	I	Output Prohibit
15	O	Data 2000	33	—	Blank
16	O	Data 4000	34	—	Blank
17	O	Data 8000	35	—	Blank
18	—	Blank	36	—	Blank

*End of Conversion

The output connector is the Dai-ichi Denshi 57-40360 or the equivalent.

5-1-2. Signal Logic

A signal logic can be selected by logic selector switches.

- (1) Setting the LOGIC 1 switch to the ON position selects a negative logic for the following signals:

BCD data output

Minus polarity output

Overflow output

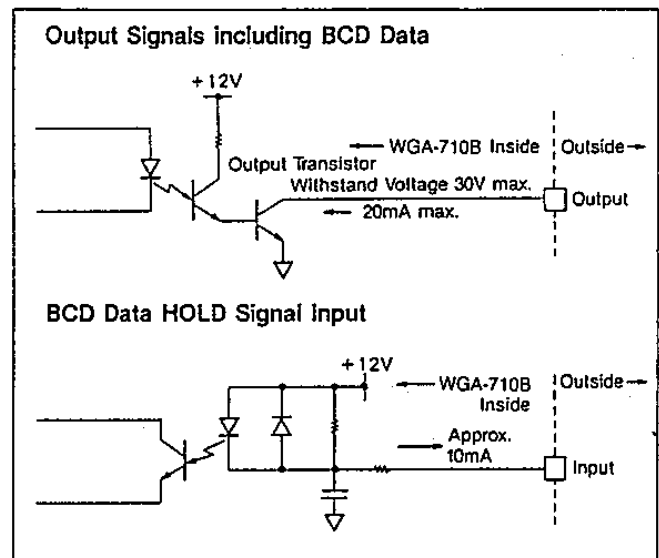
Setting it to the OFF position selects a positive logic.

- (2) Setting the LOGIC 2 switch to the ON position

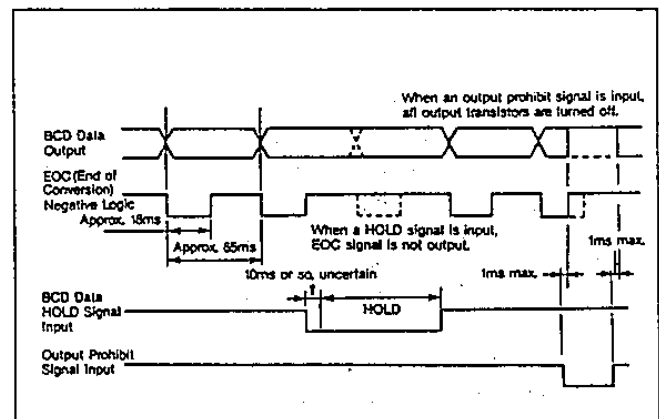
selects a positive logic for the EOC output signal.

- (3) A negative logic is applied to the following signals:
 HOLD input signal HOLD mode is effected when this signal is at a low level.
 Output Prohibit signal input Output is prohibited when this signal is at a low level.

5-1-3. Equivalent Circuit



5-1-4. Signal Timing



Caution

- When using the EOC signal to read BCD data and polarity and overflow signals in a negative logic, pick them up within 40ms from the rising edge (the point the low level changes to the high level).
- When using the BCD data HOLD signal, read BCD data 10ms after placing the BCD data HOLD signal in a low level. BCD data does not change when the HOLD signal is at a low level.
- The BCD data HOLD signal does not place the display in the HOLD mode.
- The display follows key operation for reading but the BCD data HOLD signal keeps a reading just before the key operation.
- BCD data output does not include a decimal point. When the output prohibit signal is put at a low level, all output transistors are turned off, thereby making the BCD data output invalid. Thus, by controlling the input of an output prohibit signal, the operator can sequentially read BCD data from the two or more units of WGA-710B which are connected in parallel.
- COM of BCD Data Output is connected to External Signal Common on the mainframe.

5-2. EIA-232-D (RS-232-C) <WGA-710B-2 Series>

The EIA-232-D (RS-232-C) is the interface to transmit readings on the display and status signals to an external instrument or receive external high/low limit setting signals. Its connection to a computer, process controller or sequencer facilitates not only data tabulation and logging but also system control.

5-2-1. Connector Pin Assignment

Pin No.	Signal Name	Description
2	TXD	Output signal
3	RXD	Input signal
4	RTS	Constantly at high level
7	SG	Signal ground
20	DTR	Constantly at high level

The connector is Dai-ichi Denshi 17-13250-27 or the equivalent.

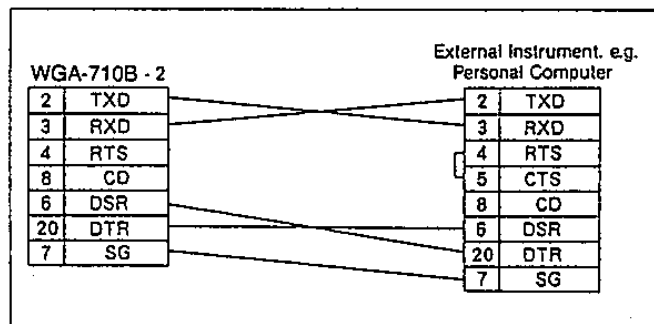
5-2-2. Signal Specifications

Signal format: Full duplex
Transfer system: Start-stop synchronous
Transfer speed: 4800 bps
Bit configuration: Start 1 bit
Data 7 bits
Parity 1 bit (odd)
Stop 1 bit
Output code: ASCII

5-2-3. Connecting to External Instrument

- (1) To connect the EIA-232-D connector to an external instrument such as a personal computer, use the cable which is wired as shown at the right. This connection diagram is applied when the external instrument is a data terminal equipment (DTE).

If the external instrument is a data circuit terminating equipment (DCE), use the cable of which signal wires are connected straightly.



- (2) Place the EIA-232-D on the external instrument in the following conditions:

Transfer speed: 4800 bps
Data bits: 7 bits
Parity bit: 1 bit (Odd)
Stop bit: 1 bit
Code: ASCII

Caution

Avoid connection of this interface to instruments which do not feature the EIA-232-D (RS-232-C) interface specifications, or else trouble will occur.

5-2-4. Table of Commands

┐ Indicates a space.

Kind	Function	Command Code	Parameter
Reading	Sends out readings on the display and status signals (Mode 0)	"MOD ┐ 0" or "MO"	_____
Declaration of transmission of request command	Declares transmission of request command (Mode 1)	"MOD ┐ 1" or "M1"	_____
Reading	Request Command (1) Requests display	"GDT" or "RA"	_____
	Request Command (2) Requests status signals	"GST" or "RB"	_____
	Request Command (3) Request High/Low limit values	"GET" or "W"	"A ± High limit value" "B ± Low limit value"
Setting	Request Command (4) Sets High/Low limit values	"SET" or "W"	"A ± High limit value" "B ± Low limit value" Set value
Setting and reading	Request Command (5) Sets and transmits High/Low limit values	"SGT" or "W"	"A ± High limit value" "B ± Low limit value" Set value

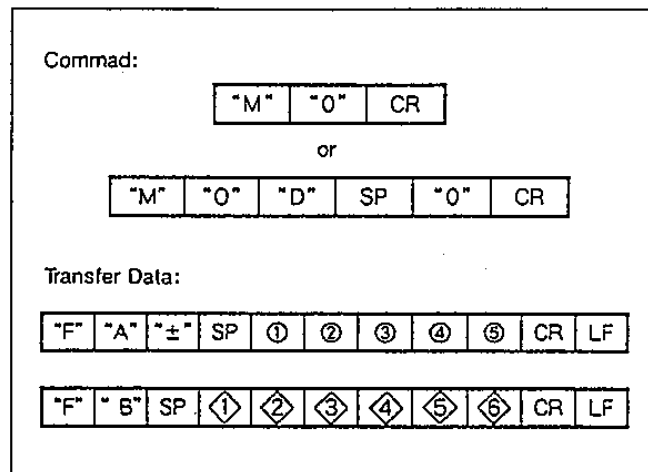
5-2-5. Mode Setting

The following two modes are available.

- Mode 0: This mode transmits readings on the display and status signals.
- Mode 1: This mode transmits one time only the data requested by a request command. The mode also enables to write or read high/low limits.

5-2-6. Mode 0 Operation

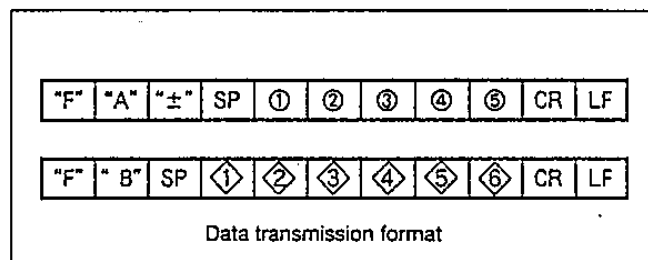
(1) To select Mode 0



When mode 0 is selected, a set of a reading and status data is sequentially transferred to the external instrument.

In the string shown at the right, places of ① to ⑤ are for a reading including a decimal point. If no decimal point is included, the highest-place digit ① is "0". In places of ① to ⑥, "1" or "0" will be put to indicate the status of the instrument. The table at the right shows the status "1" in these places indicates.

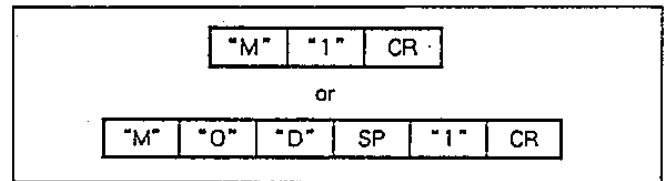
The MD is "0" when a fluctuation of reading for 5 seconds is lower than ± 1 count, and becomes "1" when a fluctuation exceeds ± 1 count. If zero tracking is made effective, the MD is "0" when a fluctuation in the preset zero tracking time period is lower than the preset count/s, and becomes "1" when a fluctuation exceeds the count/s.



Place	Name	Status "1" in the place indicates
①	HI	High-limit relay is in operation.
②	LO	Low-limit relay is in operation.
③	HOLD	HOLD or PEAK HOLD mode is in operation.
④	ZT	Zero tracking is in operation.
⑤	ALM	The alarm is activated to indicate overflow or other abnormal status.
⑥	MD	Reading is not stabilized.

5-2.7. Mode 1 Operation

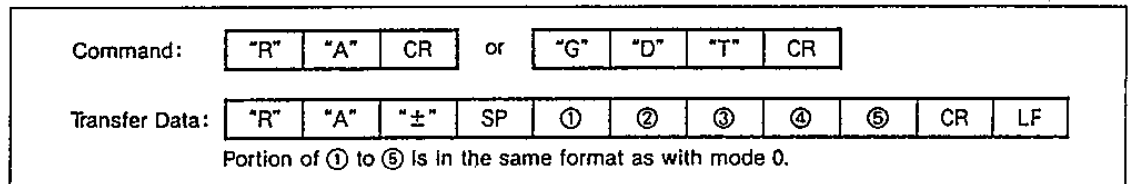
(1) To select Mode 1



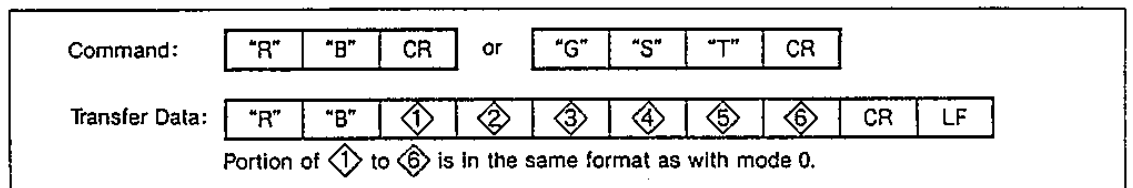
When the interface is set at mode 1, it waits for a request command. When a request command is given, the data requested by the command is sent only one time via the interface. Request commands are available in five different types.

- Request to send a reading
- Request to send status data
- High/low limit setting command
- Request to send high/low limits
- Request to set high/low limits, then send them back

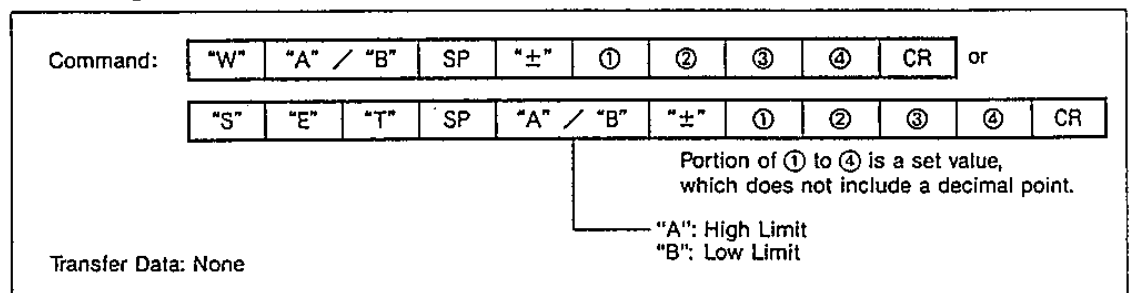
(2) Request to Send a Reading



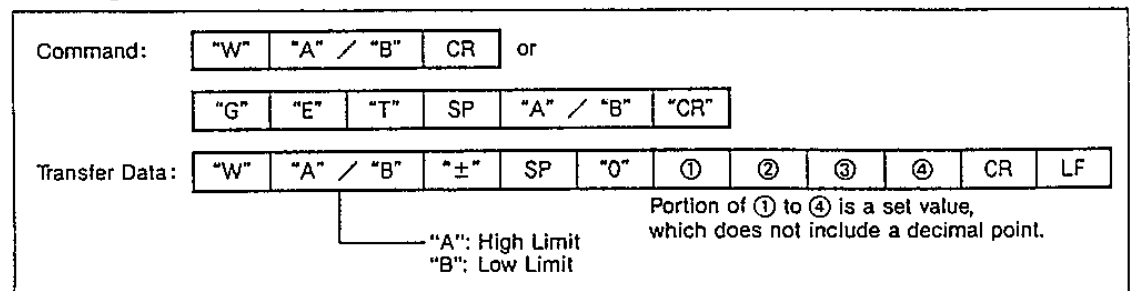
(3) Request to Send Status Data



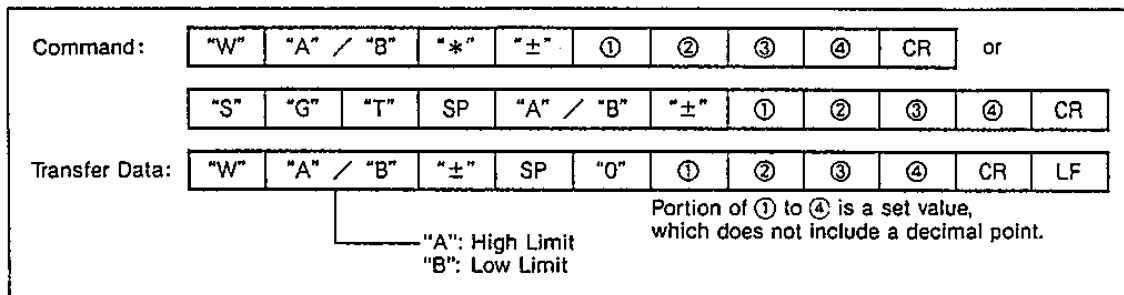
(4) High/Low Limit Setting Command



(5) Request to Send High/Low Limits



(6) Request to Set High/Low Limits, then Send Them Back

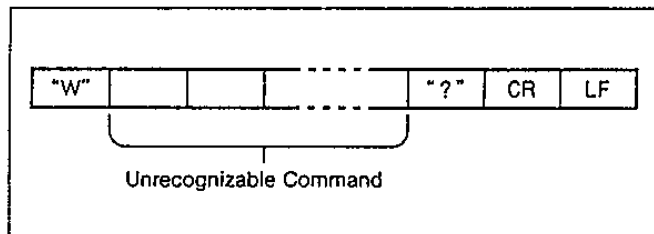


(7) If a command is not recognized

If a command through this interface is not recognized, the character string is sent back in a format shown at the right.

Note

SP, CR and LF in input/output formats correspond to "20", "0D" and "0A" of ASCII codes, respectively.



(8) Sample program

- Sample program NEC PC-9801

```
10  '*****
20  '
30  '      SAMPLE PROGRAM
40  '      Execution of a request command in Mode 1
50  '      Set EIA-232-D (RS-232-C) as follows
60  '
70  '          Character length: 7 bits
80  '          Parity:          Odd
90  '          Stop bit:       1 bit
100 '          Baud rate:      4800
110 '
120 '*****
130 '
140 '
150 SCREEN 3:CLS 3
160 CONSOLE 0,25,0
170 '
180 OPEN "COM:071" AS #1          ' Line opening
190 D$="MOD 1"+CHR$(&HD)
200 PRINT #1,D$;                 ' Setting Mode 1
210 FOR I=1 TO 8000:NEXT I       ' Waiting
220 IF LOC(1)=0 THEN 240         ' Checking to find if or not buffer data exist
230 D$=INPUT$(LOC(1),#1)         ' Reading dummy and clearing buffer
240 CLOSE #1                     ' Line closing
250 '
260 INPUT "Input Request Command"; COMND$
270 OPEN "COM:071" AS #1         ' Line opening
280 PRINT #1,COMND$+CHR$(&HD);   ' Setting Request Command
290 FOR I=1 TO 8000:NEXT I       ' Waiting
300 IF LOC(1)=0 THEN CLOSE #1:GOTO 260 ' Checking to find if or not buffer data exist
310 D$=INPUT$(LOC(1),#1)
320 PRINT D$                     ' Displaying input data
330 CLOSE #1                     ' Line closing
340 '
350 BEEP
360 GOTO 260
370 END
```

Caution

This sample program is for the N-88 Japanese language BASIC (86) (MS-DOS version) and has been verified on the NEC PC-9801 and its equivalent. This does not, however, guarantee operation on other computers.

To use a computer providing a faster calculation speed, increase the number of [8000] in the 210th and 290th lines.

- Screen display at the time of execution of this sample program

COMMAND WORD? SGT A+2000
WA+ 0200

COMMAND WORD? GDT
RA+ 02994

COMMAND WORD? GST
RB 100000

COMMAND WORD?

(9) Sample program

• Sample program

```

*****
*
*      *** SAMPLE PROGRAM for WGA-710B on IBM-PC ***
*
*      Execution of a request command in Mode 1
*
*      RS-232-C Conditions:
*      Protocol           : free run
*      Data format        : ASCII
*      Character length   : 7 bits
*      Parity             : Odd
*      Stop bit           : 1 bit
*      Baud rate          : 4800 bps
*      Language           : QuickBASIC V4.5
*                        or VisualBASIC
*
*      Function  : Sample Program for WGA-710B on IBM-PC
*      Filename   : WGASMP02.BAS
*
*                        KYOWA ELECTRONIC INSTRUMENTS CO.,LTD.
*
*****

CLOSE
CLS
TRM$ = CHR$(13)           ' Termination code
GOSUB Open.RS             ' RS-232-C line Opening
TRD$ = "MOD 1": GOSUB Trnsfr ' Setting "MOD1"
CLOSE #1                 ' RS-232-C Line Closing

MainLoop:
  INPUT "COMMAND WORD": COMND$ ' Input Command
  GOSUB Open.RS                ' RS-232-C Line Opening
  TRD$ = COMND$: GOSUB Trnsfr  ' Command Sending
  GOSUB DATAREAD               ' Read Data
  CLOSE #1                    ' RS-232-C Line Closing
  GOTO MainLoop               ' Loop

Trnsfr:
  PRINT #1, TRD$ + TRM$:      ' Command Sending
  RETURN

DATAREAD:
  IF LOC(1) <> 0 THEN CLOSE #1: GOSUB Open.RS ' Omit "LF"
  LINE INPUT #1, TRNSDATA$
  PRINT TRNSDATA$            ' Displaying Data
  RETURN

Open.RS:
  OPEN "COM1:4800,0,7,1,BIN,CS0,DS0" FOR RANDOM AS #1
  WC = 2000: GOSUB Wt        ' Waiting
  RETURN

Wt:
  FOR I = 0 TO WC: NEXT I    ' Waiting loop
  RETURN

END

```

Caution

This sample program is for QuickBASIC (V4.5) and its operability has been verified on IBM-PC and its equivalent. This does not, however, guarantee operability on other computers. To use a computer providing a faster calculation speed, increase the number of Variable [wc].

• Screen display at the time of execution of this sample program

```

COMMAND WORD? SGT A+2000
WA+0200
COMMAND WORD? GDT
RA+02994
COMMAND WORD? GST
RB 100000
COMMAND WORD?

```

IBM PC is a registered trademark of International Business Machines Corporation.

5-3. D-A Converter (WGA-710B-4 Series)

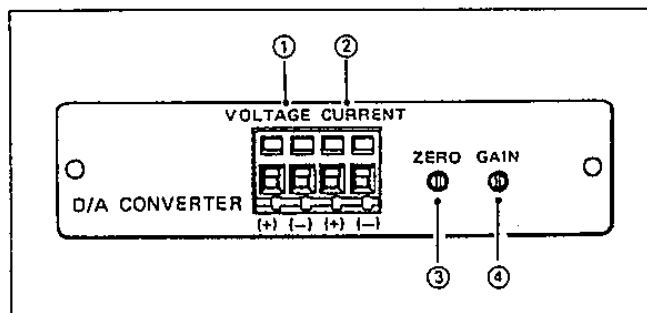
Two instruments permit the operator to obtain analog signals—the isolated analog signal conditioner and the D-A converter. The table below shows a comparison between the two. Use either instrument to obtain analog signals.

	D-A Converter (WGA-710B-4)	Insulated Analog Conditioner (WGA-710B-5)	Analog Conditioner (WGA-710B-3)
Signal source	Converts readings into analog signals. Enables such functions as digital zero, HOLD, and smoothing.	Amplifies transducer signals directly.	Amplifies transducer signals directly.
Response	Sampling rate: approx. 15 times/second. Is inferior to the analog conditioner in response capability.	Frequency response range: DC~5kHz	Frequency response range: DC~10KHZ
Output adjustment	Achievable using the keys on the front panel.	Zero balancing range: $\pm 2.5\text{mV/V}$ Gain adjusting range: 1.0~3.0mV/V signals can be adjusted to 10V, using the trimmer on the rear panel	Zero balancing range: $\pm 2.5\text{mV/V}$ Gain adjusting range: 0.5~3.0mV/V signals can be adjusted to 10V.
Output format	Voltage output: 0~10V Current output: 4~20mA (corresponds to 0~10V) Is isolated from the mainframe circuit. Is free from external noise.	Voltage output: $\pm 10\text{V}$ Current output: 4~20mA (corresponds to 0~10V) Is isolated from the mainframe circuit. Prevents conduction of external noise.	Voltage output: $\pm 10\text{V}$ Current output: 4~20mA (corresponds to 0~10V) Is isolated from the mainframe circuit. Is apt to be affected more by external noise than D-A converter.

The D/A converter permits the operator to obtain analog signals linked with digital readings on the display. A maximum range of voltage output is 0 to 10V, and a maximum range of current output is 4 to 20mA. Voltage and current outputs are electrically isolated from the internal circuit.

5-3-1. Parts Identification

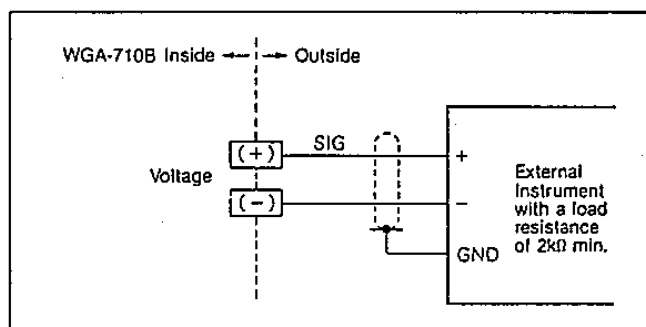
- ① Voltage Output Terminals
- ② Current Output Terminals
- ③ Zero Trimmer
- ④ Gain Trimmer



The gain trimmer has been adjusted when delivered from the factory. Usually, it need not be adjusted by the operator. These zero and gain trimmers allow adjustment in a range of $\pm 10\%$ ($\pm 1\text{V}$).

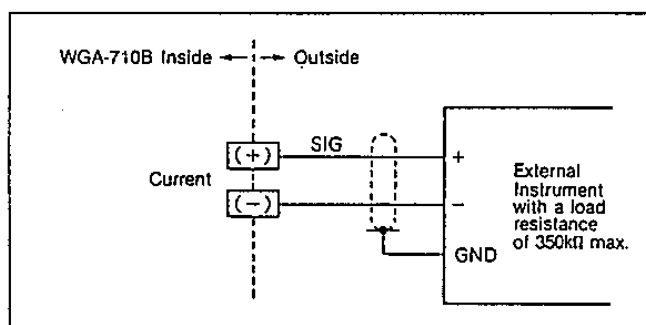
5-3-2. How to Take out Voltage Output Signals

Connect an external instrument to voltage output terminals (+) and (-).



5-3-3. How to Take out Current Output Signals

Connect an external instrument to current output terminals (+) and (-). The input resistance of the external instrument should be lower than 350Ω.



Caution

- The voltage output is fully linked with the current output. So calibration of the voltage output at 0 to 10V automatically sets the current output at a range of 4mA to 20mA. They cannot be adjusted individually.
- The basic resolution of the D/A converter is 1/3296. So the voltage output changes by ap-

proximately 3mV (10V/3296) and the current output changes by approximately 5μA [(20-4mA)/3296].

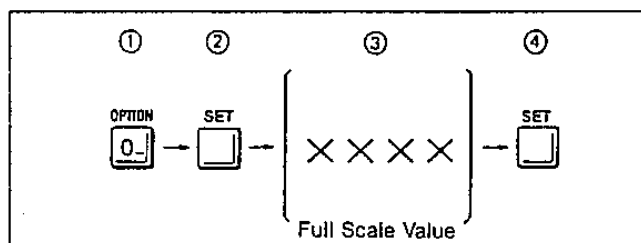
- Do not apply an external voltage to these terminals. Or otherwise, they may be damaged.
- Do not short voltage output terminals for over one hour. Or otherwise, troubles will result.

5-3-4. Defining a Desired Digital Value for Full Scale Value

Take the following steps to define a desired digital value for the full-scale value. The D/A converter will output the full-scale value (10V or 20mA) when the digital indication on the display reaches the set digital value. If "0000" is defined for the full-scale value or if calibration is performed, the reading which is to correspond to a maximum output of the transducer or which is set by actual load calibration (the value monitored with the **ACTUAL** **2** key) is the full-scale value of the D/A converter.

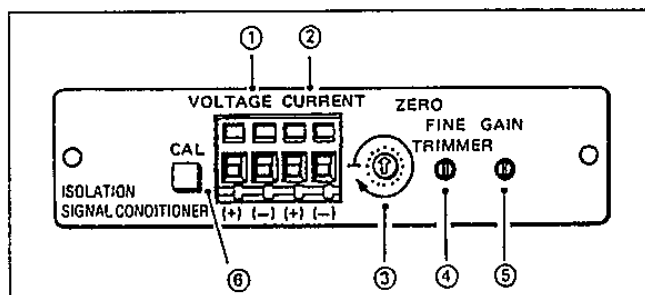
- ① Press the **OPTION** **0-** key. The key will blink and a preset full-scale value will appear on the display.
- ② Press the **SET** key. The highest-place digit will blink on the display.

- ③ Input a desired full-scale value with four digits.
- ④ A decimal point will be automatically put at the same position as on the present calibration value.
- ⑤ Press the **SET** key. The input full-scale value will be saved.



5-4. Non-isolated Analog Signal Conditioner (WGA-710B-3) Isolated Analog Signal Conditioner (WGA-710B-5)

The analog conditioner is equipped with zero balance and gain adjusting functions. It provides a voltage output of $\pm 10\text{V}$ max. and a current output in a range of 4 to 20mA.



5-4-1. Parts Identification

- | | |
|----------------------------|---|
| ① Voltage Output Terminals | |
| ② Current Output Terminals | |
| ③ Coarse Zero Control..... | Place the transducer in no load condition, then adjust this 16-position control so that a voltage at output terminals is minimum. An adjustable range is $\pm 2.5\text{mV/V}$. |
| ④ Fine Zero Trimmer | Adjust this trimmer so that the voltage which remains despite the adjustment of the coarse zero control becomes zero (0V). An adjustable range is approx. $\pm 0.3\text{mV/V}$ at the input. |
| ⑤ Gain Trimmer | Apply to the transducer a load which is to cause a reading of the full scale value. Then adjust this trimmer so that a voltage at voltage output terminals ① becomes $+10\text{V}$. An adjustable range is 1 to 3.0mV/V .
The current output has been so adjusted at the factory that it is in a range of 4 to 20mA when the voltage output is calibrated at a range of 0 to $+10\text{V}$. If the current output is mainly used, adjust control ③ and trimmers ④ and ⑤ while monitoring the current given at current output terminals ②. |
| ⑥ CAL Button | Applies a signal simulating an input of 1mV/V . The calibration signal has no relation with any digital reading. |

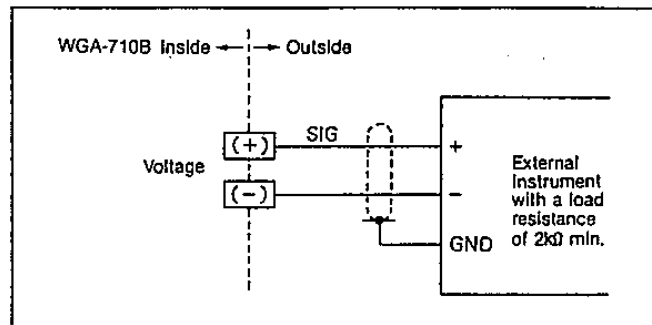
Caution

When delivered from the factory, voltage and current outputs are so adjusted that an input of 2mV/V causes a full-scale output of 10V and 20mA, respectively.

When adjusting them, use the voltmeter and ammeter of which the accuracy is 1/10,000.

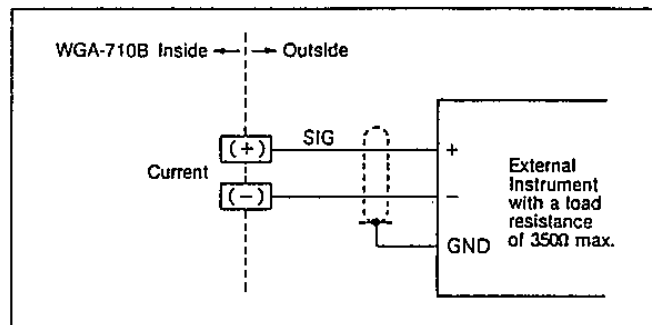
5-4-2. How to Take out Voltage Output Signals

Connect the external instrument to voltage output terminals (+) and (-).



5-4-3. How to Take out Current Output Signals

Connect the external instrument to current output terminals (+) and (-). The input resistance of the external instrument should be lower than 350Ω.



5-4-4. Use of CAL Button

If it is difficult to apply to the transducer a load equivalent to a full-scale value, use the CAL button for gain adjustment. Press the CAL button to cause a signal which simulates an input of 1mV/V. Then, conduct gain adjustment so that the output voltage becomes a value calculated based on the full scale.

Example: To adjust gain so that an input of 500kgf (4903N) causes an output of 10V, with the transducer of which the rated capacity is 1000kgf (9807N) and rated output, 2.53mV/V.

- (1) Place the transducer in no load condition. Then adjust the coarse zero control and fine zero trimmer so that the voltage output becomes 0V.
- (2) While pressing the CAL button, adjust gain so that the voltage output becomes:

$$10[V] \div \left(\frac{500[\text{kgf}]}{1000[\text{kgf}]} \times 2.53 [\text{mV/V}] \right) = 7.905[V]$$

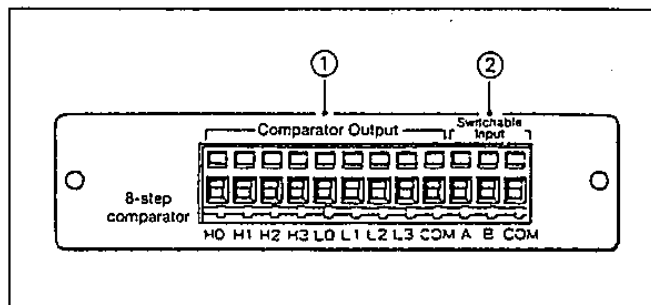
Caution

- The voltage output is fully linked with the current output. So calibration of the voltage output at 0 to 10V automatically sets the current output at a range of 4mA to 20mA. They cannot be adjusted individually.
- The analog conditioner outputs a signal proportionate to the output of the transducer. The signal does not coincide with a reading which is digitally processed through digital zeroing, etc.
- Do not apply an external voltage to the analog conditioner. Or otherwise, it will be damaged.
- Do not short voltage output terminals for over one hour. Or otherwise, troubles may results.
- The non-isolated analog signal conditioner is not isolated from the mainframe's internal circuit. To connect it with an external instrument, used a shield cable shorter than 3m. A longer cable is apt to be affected by noise.

5-5. 8-step Comparator <WGA-710B-6 Series>

The 8-step comparator works on 4 sets of high and low limits.

The results of comparison are given by 8 open collector outputs and also by 2 high and low relay outputs.



5-5-1. Descriptions of Parts

①.....

Comparator output terminals.

High limit comparator outputs, H0 to H3; and low limit comparator outputs, L0 to L3.

All of these are open collector outputs.

②.....

Switchable input terminals.

To switch over the high/low limit relay to the other, the terminal A or B is short-circuited to the COM terminal.

5-5-2. Switching the High/low Limit Relays

The high/low limit relays on the mainframe put out the working result on the high/low limits selected.

The high/low limit lamps, provided on the front panel, indicate the output status of the high/low limit relays.

(1) Input terminals v.s. high/low relays

The indication of "1" means that the input terminal is short-circuited to the COM terminal; and the indication of "0" means the input terminal is open.

Switchable Input Terminals		High Limit Relay	Low Limit Relay	Indication of Switched Input
A	B			
0	0	H0	L0	0
0	1	H1	L1	1
1	0	H2	L2	2
1	1	H3	L3	3

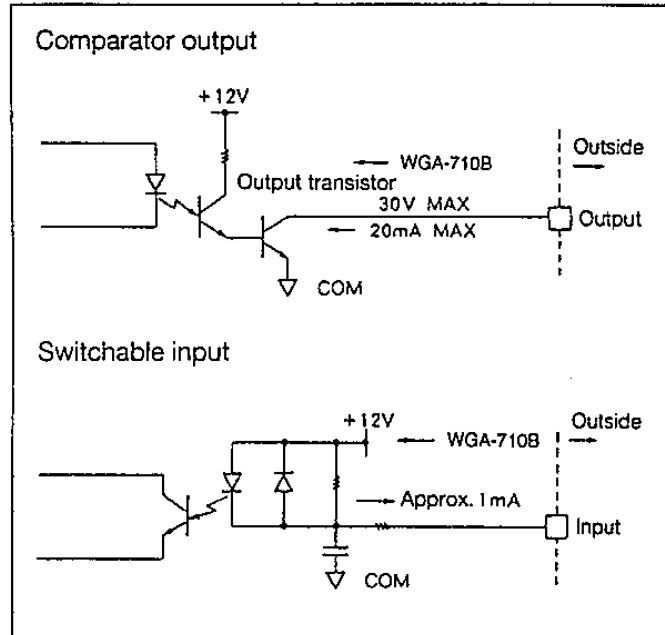
(2) Confirmation of the switched-on input terminal
Switch the option key, and the indication of "0", "2" or "3" will appear for 12 seconds.

Caution

- The comparison conditions and hysteresis operation are same as [4-1. High/Low Limits Comparison Functions]. Refer to it for details.

5-5-3. Equivalent Circuit

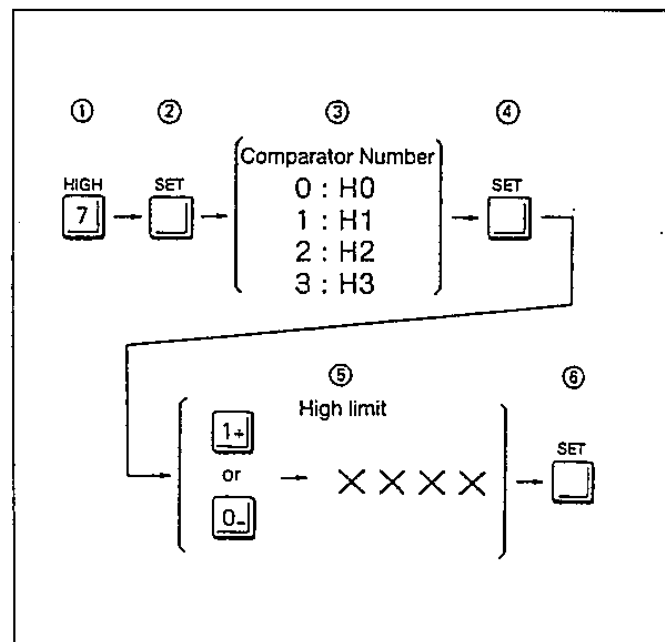
The input/output circuits are isolated from the internal circuits by the photocoupler.



5-5-4. Setting High Limit Values

- ① Press the limit key, and the key lamp will blink while the preset high limit value on the comparator will appear on the display.
- ② Press the key, and the number of the preset comparator will blink.
- ③ Key in the desired comparator number.
- ④ Press the key, and the comparator number will then be set. The display will also present the preset limit value while its "+" or "-" sign will blink.
- ⑤ Enter a desired four-digit number with a prefix of "+" or "-". The decimal point will automatically enter in the same place as the registered calibration.
- ⑥ Press the key, and the keyed-in high limit value will be registered.

In the same manner as above, register the high limit values on the comparators 0 to 3 respectively.



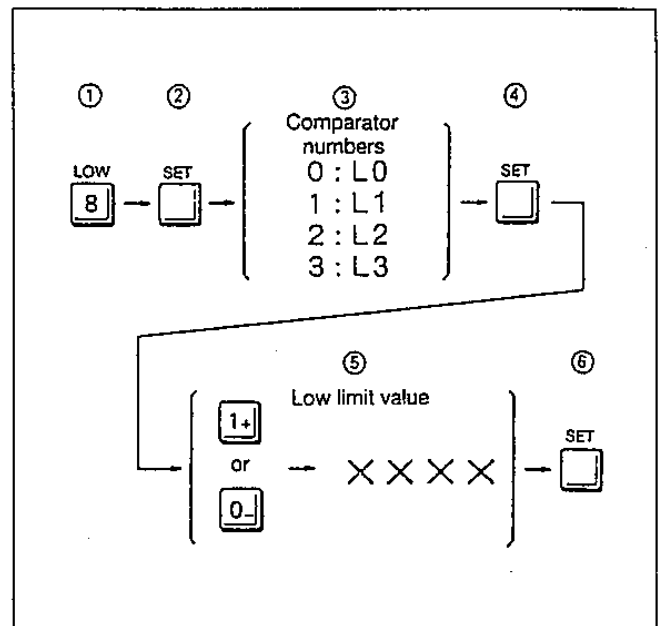
Caution

COM of the comparator outputs and switchable inputs are connected to the mainframe's external signal common.

5-5-5. Setting Low Limit Values

- ① Press the ^{LOW}
8 limit key, and the key lamp will blink while the preset low limit value on the comparator will appear on the display.
- ② Press the ^{SET}
 key, and the number of the preset comparator will blink.
- ③ Key in the desired comparator number.
- ④ Press the ^{SET}
 key, and the comparator number will then be set. The display will also present the preset limit value while its "+" or "-" sign will blink.
- ⑤ Enter a desired four-digit number with a prefix of "+" or "-". The decimal point will automatically enter in the same place as the registered calibration.
- ⑥ Press the ^{SET}
 key, and the keyed-in low limit value will be registered.

In the same manner as above, register the low limit values on the comparators 0 to 3 respectively.



5-5-6. Setting Hysteresis

Setting hysteresis is to set an insensitive zone for high/low limit comparison.

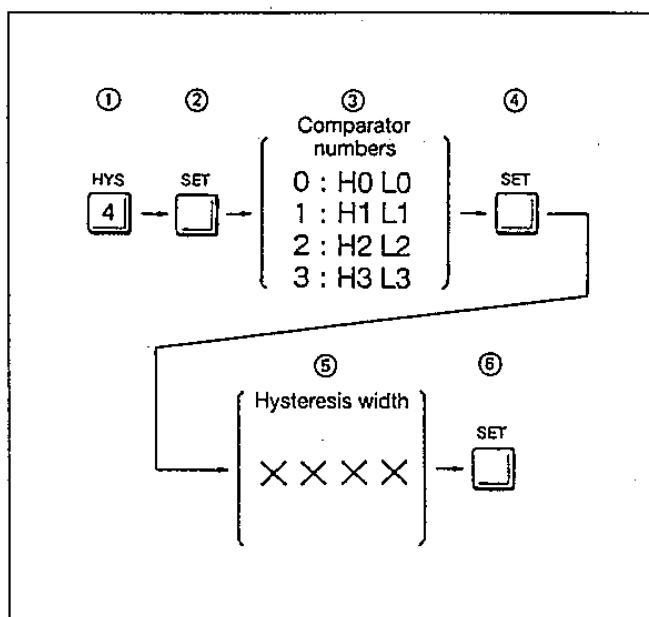
Generally, a high limit comparator output is turned [ON] when a reading exceeded the high limit, and [OFF] when a reading went below. By setting a hysteresis zone, an comparator output is turned [OFF] when a reading went further below that zone.

The width of a hysteresis zone is common to high/low limit comparators of the same number.

To set a hysteresis zone, proceed as follows.

- ① Press the  key, and the key lamp will blink, and the display will present the preset number of the comparator.
- ② Press the  key, and the number of the preset comparator will blink.
- ③ Key in the number of a desired comparator.
- ④ Press the  key, and the comparator number will then be registered. The display will also present the preset value, and the top digit will blink.
- ⑤ Key in the width of hysteresis zone using a 4-digit number using a 4-digit number.
The decimal point will automatically enter in the same place as the registered calibration.
- ⑥ Press the  key, and the keyed in hysteresis width will then be registered.

In the same manner as above, register hysteresis zones to the comparators 1 to 3 respectively.



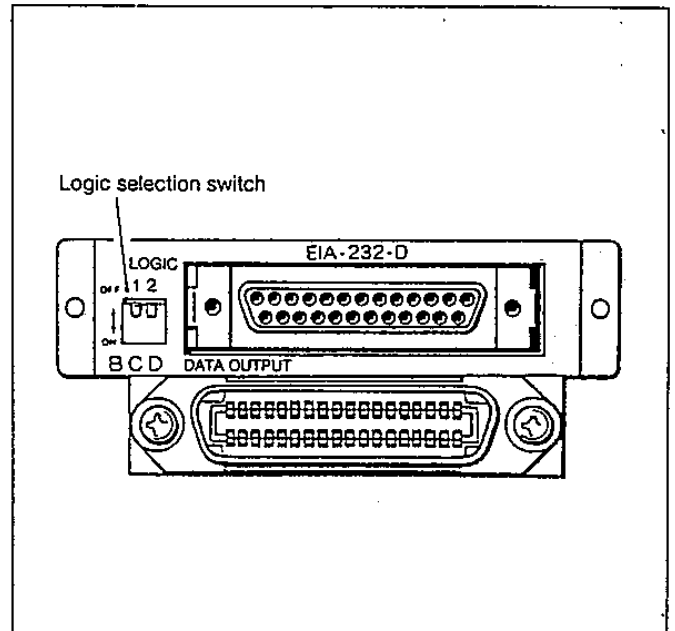
Caution

- A push of the [OPTION] key lets you monitor the number of the selected comparator.
- A push of the [HIGH], [LOW] and [HYSTERESIS] key lets you monitor the high limit value, low limit value and hysteresis value in that order.

5-6. BCD Data Output, EIA-232-D (RS-232-C) <WGA-710B-12 Series>

The models in this series permit simultaneous use of the BCD data output and the EIA-232-D (RS-232-C) interface. For the details, refer to their respective items.

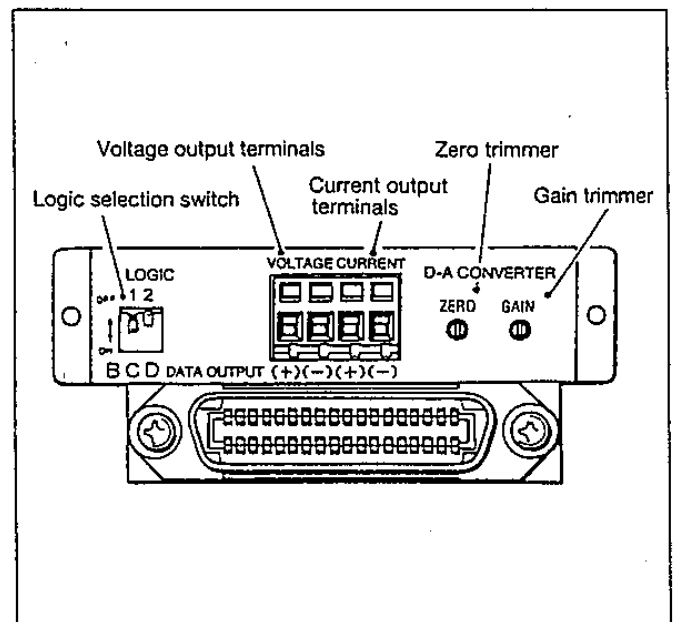
- 5-1. BCD Data Output page 28
- 5-2. EIA-232-D (RS-232-C) page 30



5-7. BCD Data Output, D-A Converter <WGA-710B-14 Series>

The models in this series permit simultaneous use of BCD data output and the D-A converter. For the details, refer to their respective items.

- 5-1. BCD Data Output page 28
- 5-3. D-A Converter page 36



6. Troubleshooting

If the instrument does not perform to the expected effect or if the operation is unstable, do not immediately determine that the instrument gets out of order but check whether or not the cause lies in environmental conditions. Also check conditions of the instrument using the self-check function. If the operation is abnormal despite good environmental conditions and satisfactory self-check results, contact your Kyowa distributor. If the instrument has been dam-

aged due to operation with a method other than instructed in this manual or if it was disassembled or remodelled by the user, we may refuse to repair.

6-1. Troubles vs. Countermeasures

Some troubles may have the causes in other than the instrument itself. Major conceivable troubles and countermeasures are as follows.

Troubles	Causes	Countermeasures
The instrument is not powered.	Unmatched supply voltage or disconnected power cable	Using an AC voltmeter, check that the AC supply voltage to rear LINE IN terminals is as specified for the model of WGA-710B series. If the supply voltage is as specified for the model, check for any possible disconnection of the power cable.
	Fuse is blown out. (Fuse should be a midget fuse of $\phi 5.2 \times 20\text{mm}$ and have a rating specified for the model)	Be sure to turn off the power before removing the fuse. If the fuse is blown out, replace. If the replacement fuse is blown out immediately upon power-up, the internal circuit may be abnormal. In such a case, contact your Kyowa distributor.
Keys are not effective.	Hangup (abnormal processing)	Turn off the power once. Then turn it on again. Normal operation will return if the cause was hangup.
Message "oFl1" or "oFl2" appears even if the transducer is placed in no load condition.	Erroneous connection of the transducer	Check whether or not the transducer is correctly connected. If not, connect it correctly referring to "2-2. Connecting Transducer."
	The transducer or transducer cable is disconnected or shorted.	Turn off the power and disconnect the transducer cable from the rear terminal board. Then measure the resistance between red and black leadwires of the transducer cable as well as between white and green leadwires. The resistance between red and black leadwires should be the input resistance of transducer (plus the resistance of extension cable if used). The resistance between white and green leadwires should be the output resistance (plus the resistance of extension cable if used). Input and output resistances of the transducer are described in the test record. (If the cable is extended, deduct the cable resistance from each measurement.) If a difference between a measurement and test record exceeds 5%, check the transducer and cable. Cable resistance 0.5mm ² leadwires: $0.040\Omega/\text{m} \times 2 \text{ leadwires} = 0.080\Omega/\text{m}$ 0.3mm ² leadwires: $0.067\Omega/\text{m} \times 1 \text{ leadwires} = 0.134\Omega/\text{m}$
	Inferior insulation of the transducer or transducer cable	Turn off the power and disconnect the transducer cable from the rear terminal board. Apply a voltage of 50V dc max. between the shield wire and any of red, white, black and green leadwires of the transducer cable and measure the insulation resistance between them. The insulation resistance should be 500M Ω min. But if it is below 1M Ω , check the transducer and transducer cable.

Troubles	Causes	Countermeasures
<i>(continued from the previous page)</i>	Damage of transducer due to overload, etc.	Initial balance of the transducer differs seriously from test record. Replace the transducer.
Message "oFL1" or "oFL2" appears when any load is applied to the transducer.	Damage of transducer due to overload, etc.	Place the transducer in no load condition. Press the  key. An initial input value will be displayed. Compare the value with the initial unbalance described in the test record or that at the normal status. If a difference between them exceeds 0.5mV/V, check the transducer.
	Large initial unbalance of transducer	If the sum of initial unbalance and rated output exceeds 3.2mV/V, adjust the initial unbalance using the method explained in "7. Adjusting initial unbalance of transducer using fixed resistor."
	Inferior insulation of the transducer or transducer cable	Check and take countermeasures using the same procedures as described in the above "Inferior insulation of the transducer or transducer cable."
Message "oFL4" appears.	Inferior calibration	Press the  key and write down the reading on the display. Then press the  key and write down the reading on the display. Suppose that these readings are A (mV/V) and B, respectively. If $\frac{B}{A \text{ (mV/V)}} \times \text{Rated output of transducer (mV/V)} > 9999,$ message "oFL4" may be displayed. Perform calibration anew.
	Inferior digital zeroing	Place the front panel UNLOCK/LOCK switch in the UNLOCK position. Then press  and  keys in that order. Normal operation will be recovered.
A reading on the display does not change despite a load applied to the transducer.	Erroneous connection of transducer	Check that the transducer is correctly connected. If not, connect correctly referring to "2-2. Connecting Transducer."
	The transducer or transducer cable is disconnected or shorted.	Check and take countermeasures using the same procedures as described in the above "The transducer or transducer cable is disconnected or shorted."
	Inferior calibration	Check a reading initiated by pressing the  key. If the reading is "0000," calibration is inferior and any load to the transducer is not reflected on a reading. Perform calibration anew.
	(Correct operation)	In the following cases, a reading on the display does not change unless some condition is satisfied (refer to "4. Settings for basic functions"). • The instrument is operating in the HOLD or Peak HOLD mode. The front panel HOLD lamp keeps illuminating in the HOLD mode and blinks in the Peak HOLD mode. • A minimum scale is set using the smoothing function. A reading on the display does not change unless a load to the transducer causes a change exceeding the set minimum scale.

Troubles	Causes	Countermeasures
A reading on the display fluctuates.	Inferior insulation of the transducer or transducer cable	Turn off the power and disconnect the transducer cable from the rear terminal board. Apply a voltage of 50V dc max. between the shield wire of transducer cable and any of red, white, black and green leadwires and measure the insulation resistance between them. The insulation resistance should be 500MΩ min. If it is lower than 20MΩ, a reading on the display may fluctuate. In such a case, check the transducer and transducer cable.
	Noise	If grounding is poor or the shield of the transducer cable is inferior, measurement may be influenced by noise, thereby making a reading fluctuate. Take measures referring to "2-2. Connecting Transducer" so as to eliminate external noise.
	Mechanical vibration given to the transducer	Install a damper or take some other proper measure so that any mechanical vibration may not be given to the transducer. Also, the digital filter of the smoothing function has the effect to stabilize a reading.

7. Adjusting initial unbalance of transducer using fixed resistor

If the transducer used has a large initial unbalance, a load of the rated capacity may let the measurement exceed the measuring range of WGA-710B. In such a case, mount a fixed resistor so that a load of the rated capacity may be measured within a measuring range of $\pm 3.2\text{mV/V}$. Take for instance a transducer of which the rated output is 3mV/V ; the initial unbalance, 1mV/V ; and the bridge resistance, 350Ω . A load of the rated output given to the transducer causes an output of 4mV/V . The following description is to adjust the output using a fixed resistor so that the output of 4mV/V may be measured within a measuring range of $\pm 3.2\text{mV/V}$.

7-1. Calculation of Fixed Resistance

- (1) If a fixed resistor is mounted to the effect that an initial unbalance is -1.5mV/V , the transducer output is -0.5mV/V with no load, and 2.5mV/V with the rated load applied. These values are covered by a measuring range of $\pm 3.2\text{mV/V}$.
- (2) To calculate the fixed resistance, use the following equation.

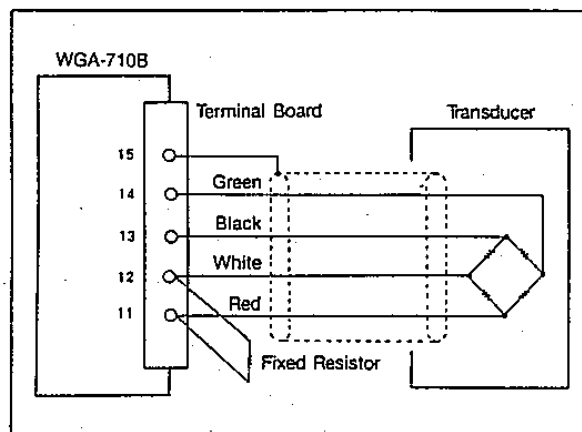
$$\text{Resistance} = \frac{R_g}{4 \times A}$$

Where, R_g : Bridge resistance (Ω)
 A : Adjusting value (mV/V)

Here, $R_g = 350\ (\Omega)$ and $A = 1.5\ (\text{mV/V})$. Substitute these values for " R_g " and " A " in the above equation, and a target resistance of approximately $58\text{k}\Omega$ will be obtained.

- (3) To adjust an initial unbalance toward the positive direction, mount a fixed resistor between white and black leadwires of the transducer. To adjust it toward the negative direction, mount a fixed resistor between red and white leadwires. In this example, an initial unbalance is adjusted toward the negative direction, so the fixed resistor will be mounted between red and white leadwires.

- (3) Turn off the power. Then mount the fixed resistor between red and white leadwires on the terminal board. In this example, the fixed resistor may be a $56\text{k}\Omega$ resistor which is easily available on the market.



It is recommended to use a fixed resistor of which the temperature factor is smallest possible ($50\text{ ppm}/^\circ\text{C}$ max.).

Twist leadwires of the resistor and those of the transducer cable in advance, then connect them to respective terminals. Also, take care that leadwires of the resistor may not contact other leadwires.

- (4) Turn on the power and press the $\boxed{\text{NEXT}}$ key. The WGA-710B will display an adjusted initial input value (approx. $-0.6\ [\text{mV/V}]$).
- (5) Perform calibration according to "3-4. Calibration."

7-2. Adjusting Procedures

- (1) Connect the transducer to the rear terminal board. Then turn on the WGA-710B. Place the transducer in no load condition.
- (2) Press the $\boxed{\text{NEXT}}$ key. The WGA-710B will display an initial input value (output of the transducer with no load applied). In this example, it will display approximately $1\ (\text{mV/V})$.

8. Using voltage output

The rear terminal board provides an output of the voltage proportionate to an output of the transducer. The output level is approximately 2V for a transducer output of 1mV/V.

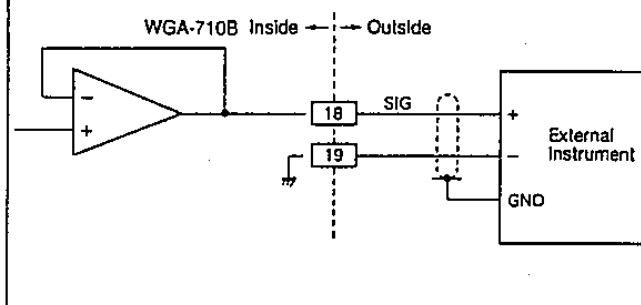
Use this voltage output for initial adjustment, maintenance/inspection and operation check.

It allows for recording of waveforms on a recorder or monitoring of vibration-initiated signals on an oscilloscope.

Caution

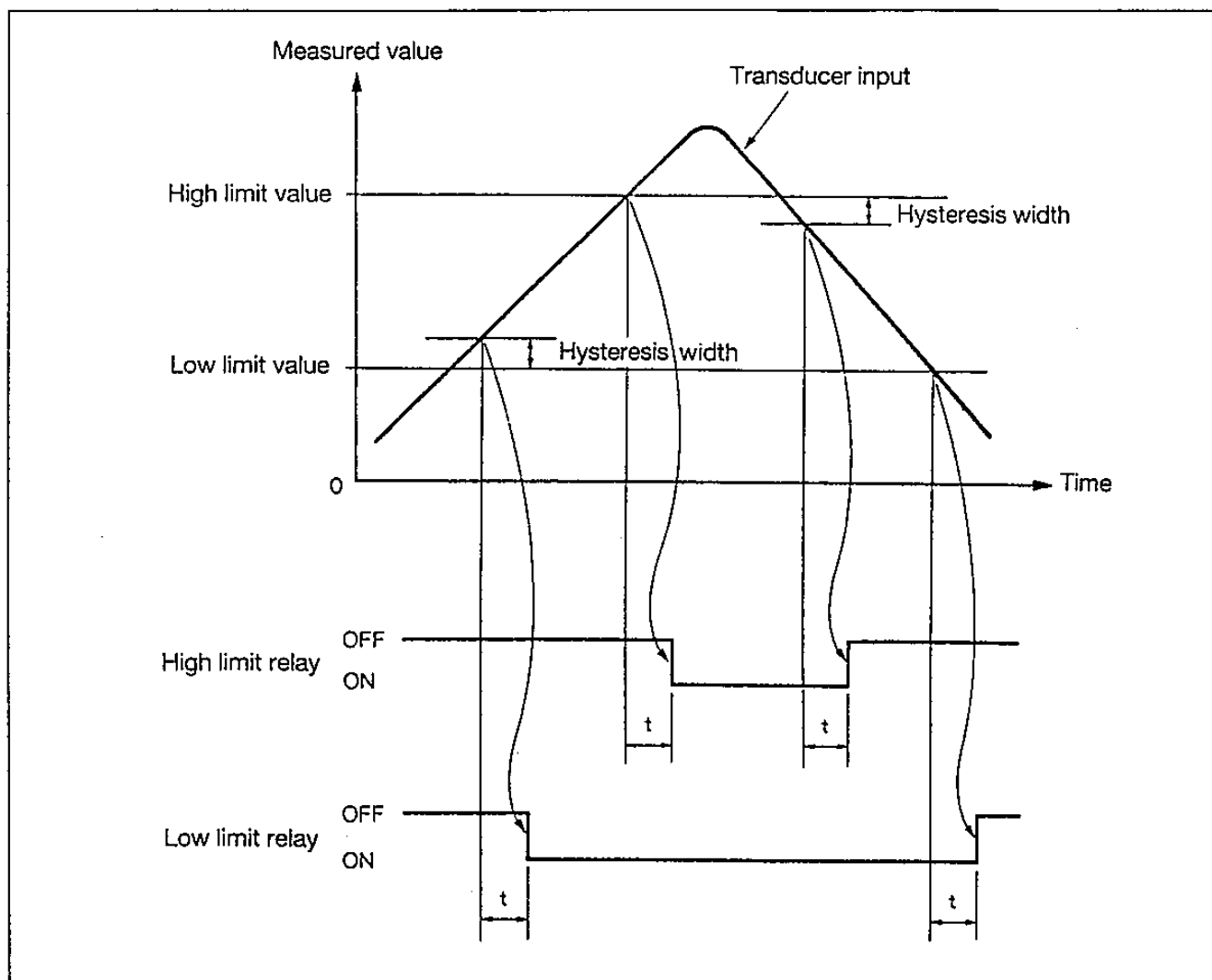
- The voltage output does not coincide with a digitally-processed reading on the display.
- A frequency response range of the voltage output is DC to approximately 1kHz.
- When the WGA-710B is operating in any of HOLD modes, these voltage output terminals provide an analog output of the value held.
- Since the voltage output is not isolated from the internal circuit, its connection to an external instrument should be made through a shielded cable of 3m long max. If the cable is too long, the output is apt to be influenced by noise.
- Do not short these voltage output terminals for over one hour. Or otherwise, troubles may result.
- Do not apply an external voltage to these terminals. Or otherwise, these terminals will be damaged.

Example of Connection between an output equivalent circuit and external instrument



9. Detailed operational time charts

9-1. Operational Time Chart — High/Low Limit Comparison Function



t: Below 200ms.....Response time

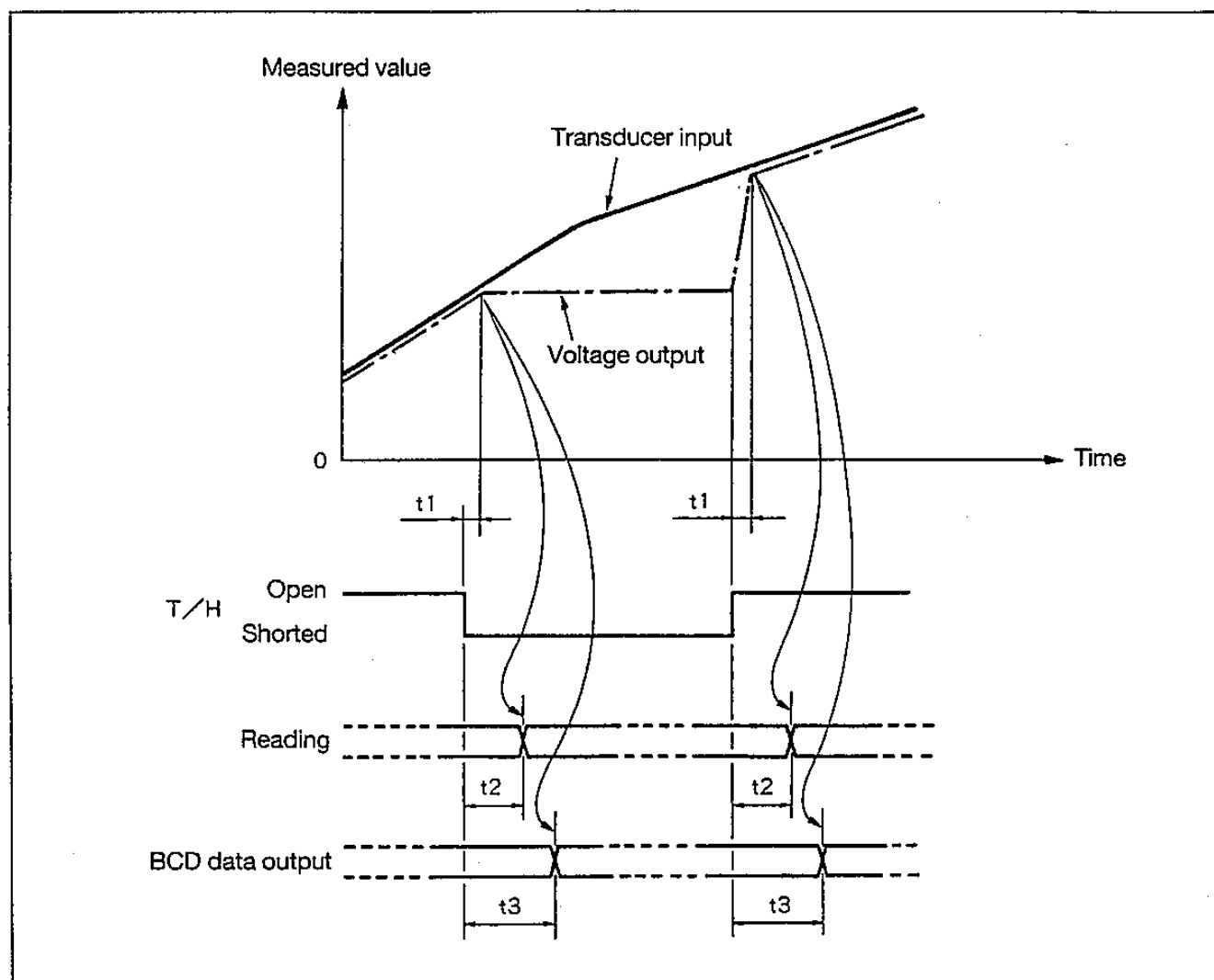
The delay of functioning of the high/low limit relays after receiving incoming signals in excess of the high/low limits.

Caution

When the digital filter is activated, its operational delay occurs. Suppose that the filter's moving average is set to 16 times, a sampling period per one time is approximately 65ms. So a delay at this time is calculated as: $65\text{ms} \times (16-1) = 975\text{ms}$ (about 1 second). This much delay is added to a delay of the high/low limit relays, readings and BCD output.

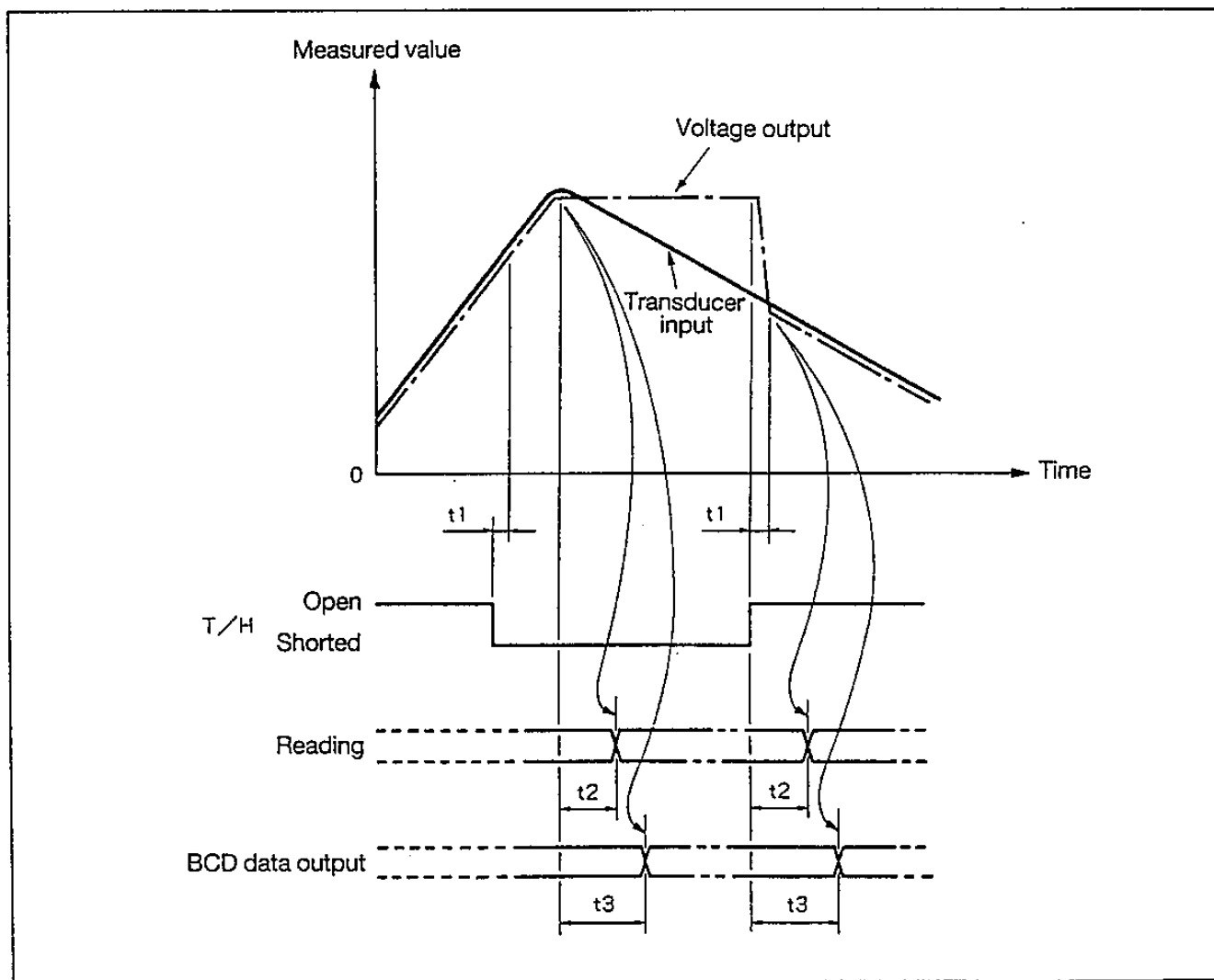
9-2. Operational Time Chart – Peak Hold Function

(1) Holding an optional point (Hold Mode 1)



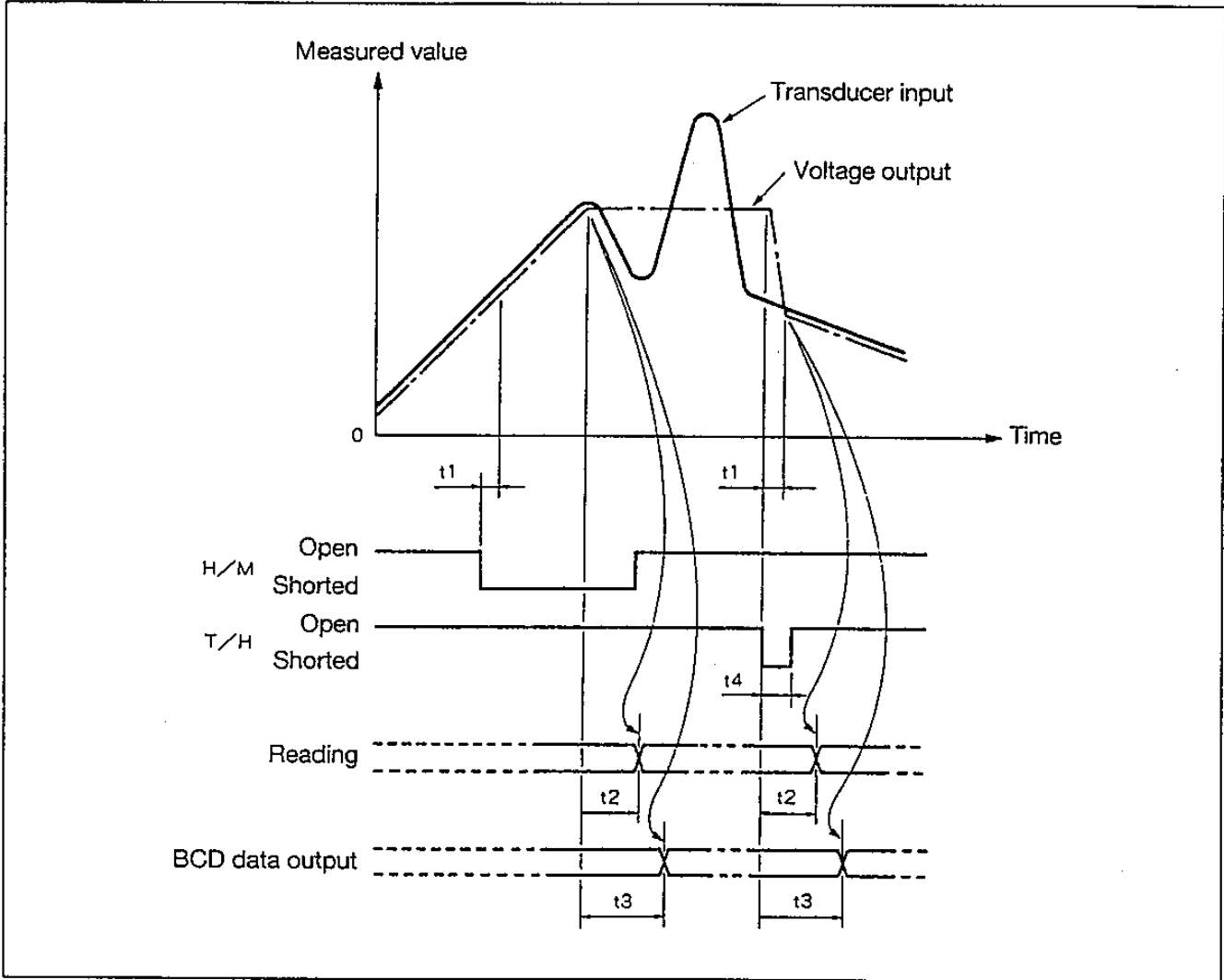
- t_1 : Below 1ms.....The delay of holding a voltage output signal after short-circuiting external T/H signals (opening H/M signals).
Or the delay of cancelling the hold of a voltage output signal after opening external T/H signals.
- t_2 : Below 200ms.....The delay of displaying a signal after holding.
Or the delay of displaying a signal after releasing.
- t_3 : Below 250ms.....The delay of outputting a BCD datum after holding .
Or the delay of outputting a BCD datum after releasing.

(2) Holding a peak value (Hold Mode 2)



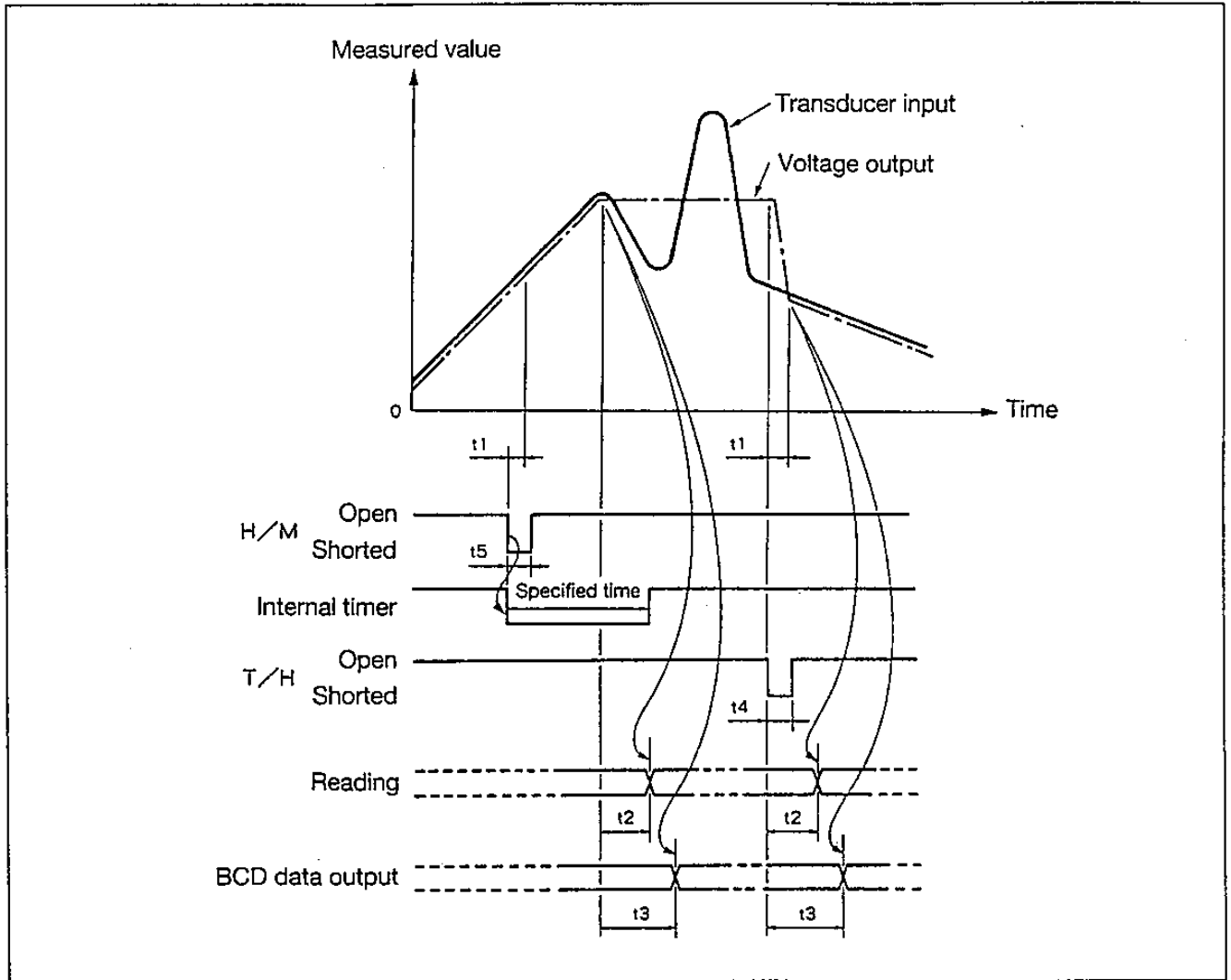
- t_1 : Below 1ms.....The delay of a start of holding a peak value of voltage outputs signals after short-circuiting external T/H signals.
Or the delay of cancelling the hold of a voltage output signal after opening external T/H signals.
- t_2 : Below 200ms.....The delay of displaying a peak value after holding.
Or the delay of displaying a peak value after releasing from the hold.
- t_3 : Below 250ms.....The delay of outputting a BCD datum after peak-holding.
Or the delay of outputting a BCD datum after releasing it from the hold.

(3) Area-specified Peak Holding (Hold Mode 3)



- t1: Below 1ms.....The delay of a start of holding a peak voltage output signal after short-circuiting external H/M signals.
Or the delay of releasing a voltage output signal from the hold after short-circuiting external T/H signals (H/M signals are open).
- t2: Below 200ms.....The delay of displaying of a peak value after holding.
Or the delay of displaying a peak value after releasing from the hold.
- t3: Below 250ms.....The delay of outputting a BCD datum after holding a peak value.
Or the delay of outputting a BCD datum after releasing from the hold.
- t4: Over 1ms.....The pulse width necessary to cancel the hold.

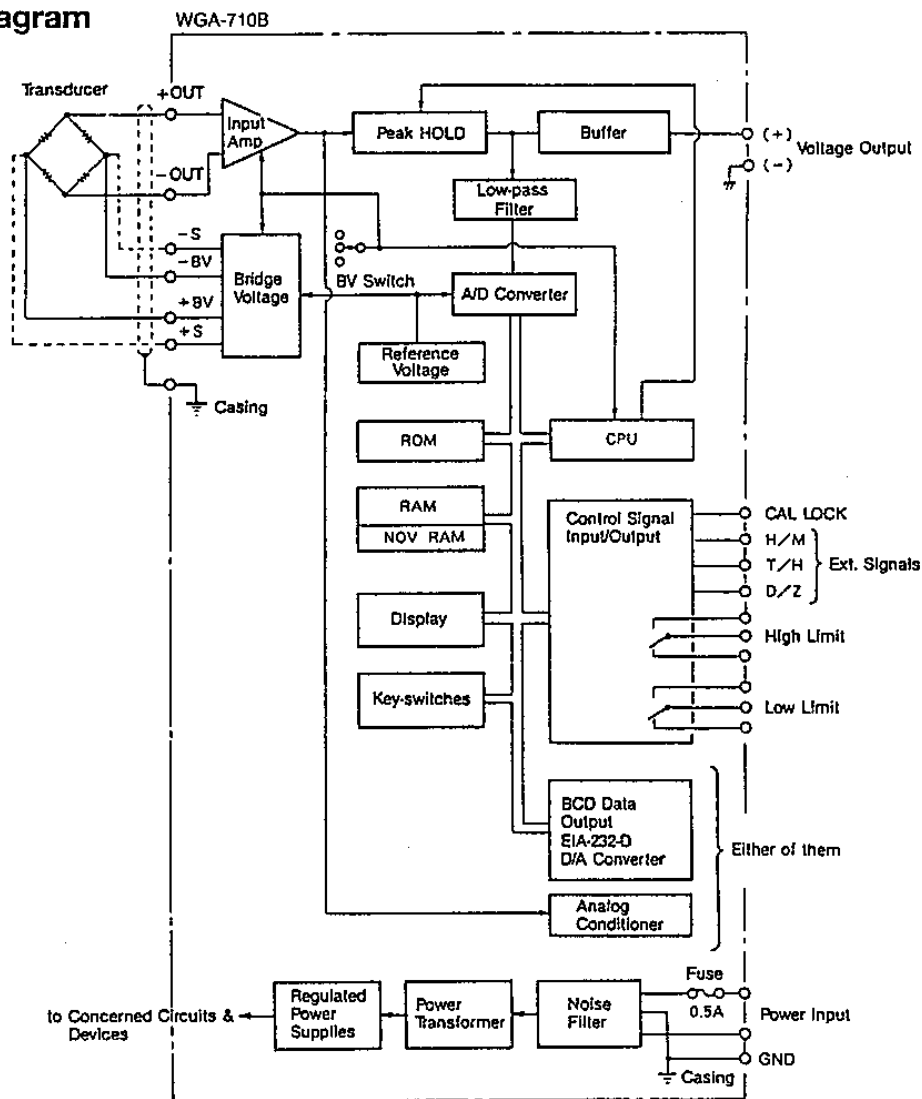
(4) Time-specified Peak Hold (Hold Mode 4)



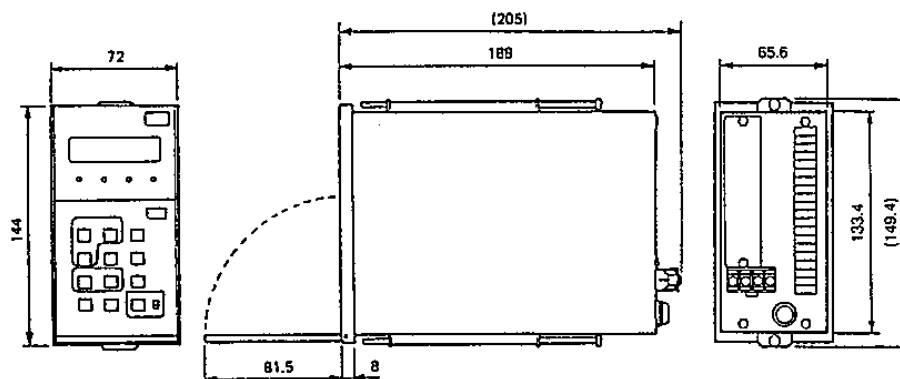
- t_1 : Below 1ms.....The delay of a start of holding a peak value of voltage output signals after short-circuiting external H/M signals.
Or the delay of cancelling the hold of a voltage output signal after short-circuiting external T/H signals (H/M signals, open).
- t_2 : Below 1ms.....The delay of displaying a peak value after holding.
Or the delay of displaying a peak value after releasing from the hold.
- t_3 : Below 250ms.....The delay of outputting a BCD datum after holding a peak value.
Or the delay of outputting a BCD datum after releasing from the hold.
- t_4 : Over 1ms.....The pulse width necessary to cancel the hold.
- t_5 : Over 1ms.....Or the pulse width necessary to start peak holding.

10. Block diagram

10-1. Block Diagram



10-2. Dimensional Drawing



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