

TD - 320A  
DIGITAL INDICATOR  
OPERATIONAL MANUAL

FEB. 1994  
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## 1. MAIN FEATURES

### ◆ EASY CALIBRATION

Various types of calibration like the Equivalent Input Calibration are extremely easily carried out by simple key-operation.

### ◆ EASY KEY-OPERATION

Function-Oriented System provides very simple and easy functional setting.

### ◆ NOV RAM

NOV RAM (non-volatile memory) is built-in so that important data such as entered values and calibration values will not be cancelled in case of power failure.

### ◆ EXCELLENT STABILITY

Low Noise Pre-amplifier ensures remarkable stability of indicated values.

### ◆ HIGH SPEED CONVERSION

High speed conversion (1066 cycles per second)  
Digital Peak Hold is free from drooping of values.

### ◆ SERIAL DATA OUTPUT

Dual-Wire Serial Output is equipped as standard so that the Large-sized Display, Printer, Analogue Converter (4 20mA, 0 10V) for SI/F Series can be directly connected to TD-320A.

### ◆ OPTIONAL UNITS

BCD Data Output, RS-232C Communication Interface

### ◆ HIGH NOISE-RESISTANCE

All the digital in/ outputs including the Serial Output and BCD Data Output are insulated with photocouplers.

### ◆ SELF-CHECK (SELF-DIAGNOSIS) FUNCTION

Internal circuits are automatically checked and errors are detected.

2. PREPARATION




ANY DAMAGES DURING TRANSPORTATION ?

Right after being delivered to your hand, please unpack the shipping case and make sure if nothing has been damaged during its transportation.

CORRECT ITEMS DELIVERED ?

Packing List is attached to the shipping case. Please make sure if the delivered goods are right items that you ordered.

STANDARD ACCESSORIES ACCOMPANIED ?

AC Power Cord		1 Unit
Spare Fuse (0.5A)		1 Piece
Mini-Screwdriver		1 Unit
B.C.D Output Connector (when OP-3 TD-3203 ordered)		1 Unit
Operation Manual for TD-320A		1 Copy

TD-320A is carefully manufactured and thoroughly inspected by our qualified engineers before its shipment from our factory. Therefore, its quality and function are fully guaranteed by us. However, in case of any damages or erroneous functions found, please immediately report to us such conditions directly or via our sales agent from whom you purchased.

When you return TD-320A to us for its repair, please pack it just in the same way and in the same box as it was delivered to you. If you no longer have the same box and packing materials, you are requested to pack it as follows.

- (1) First, TD-320A shall be wrapped with a strong wrapping paper or plastic sheet.
- (2) Please use a carton box of which size shall be about 10 cm larger than each corner of the housing size of TD-320A .
- (3) In the space between TD-320A and the carton box, some shock-absorbing materials shall be filled.
- (4) The carton box shall be sealed firmly with an adhesive tape and reinforced by a tape-band if necessary.

### 3. SAFTY MEASURE

When you start operating TD-320A Digital Indicator, you are requested to pay your special attention to the following points.

◆ TD-320A MUST BE GROUNDED

In order to avoid any hazards of electric shocks and static electricity, the Terminal F.G in the rear panel must be grounded.

The F.G terminal is connected to the ground terminal of the noise filter of the AC power input part and the frame.

The terminal 19 is for connecting the shield of the transducer input cable to the frame.

◆ DANGEROUS OPERATING AREA

TD-320A must not be operated in areas where any inflammable gas or steam is existing. If you have any question on this matter, please contact us.

◆ POWER SUPPLY SOURCE

The power input terminal of AC 90~110 V, 50/60 Hz as standard.

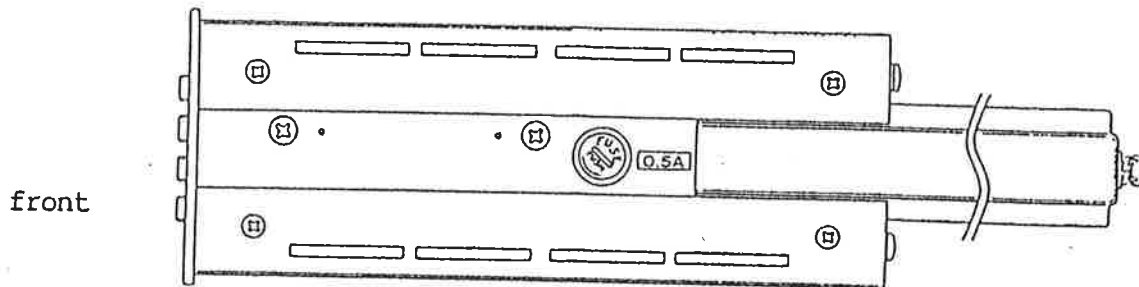
◆ OPERATING AND STORAGE TEMPERATURE

Operating temperature:  $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$

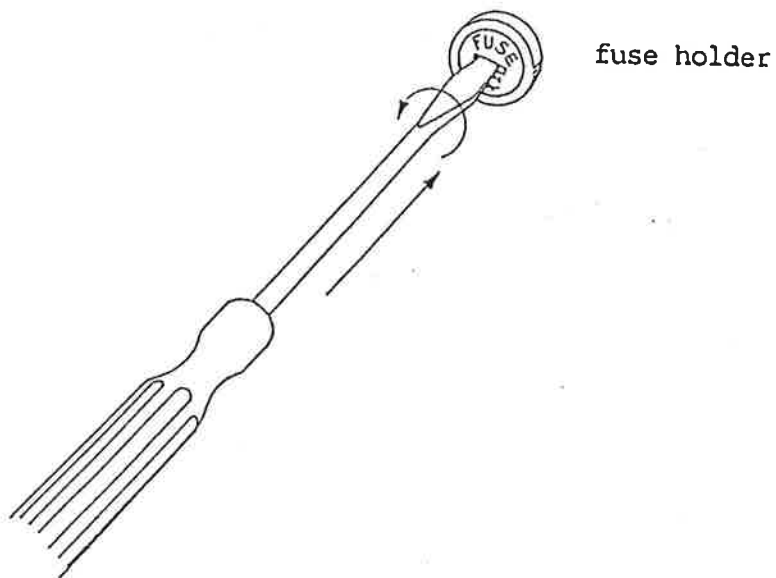
Storage temperature :  $-40^{\circ}\text{C} \sim +80^{\circ}\text{C}$

#### 4. FUSE REPLACEMENT

- 1.) Remove the screws in the rear panel and pull out the rails.



- 2.) Turn the screwdriver counterclockwise and pull out the fuse holder. The capacity of the fuse is 0.5A.

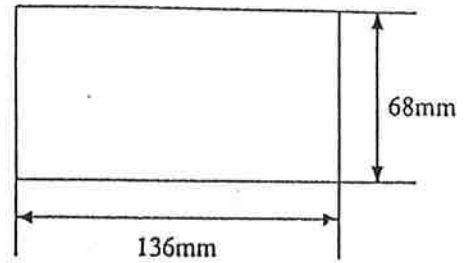


- 3.) Insert a new fuse into the fuse holder and fit the holder, turning it clockwise.

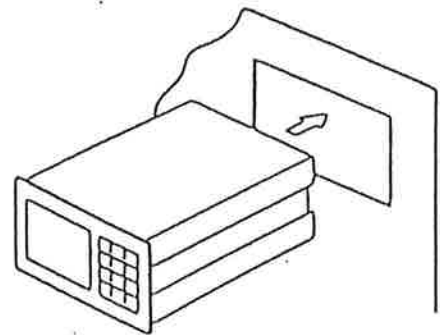


## 5. INSTALLATION

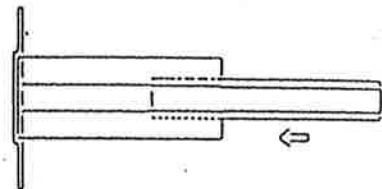
- 1.) Cut out a panel.  
size 136 W × 68 H



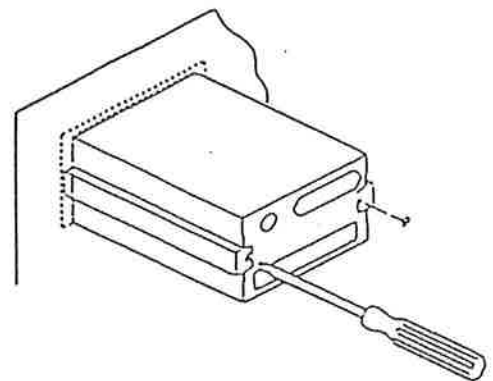
- 2.) Remove the metal fittings of TD-320A and insert it into the panel.



- 3.) Insert the metal fittings from the rear to the both sides of TD-320A.

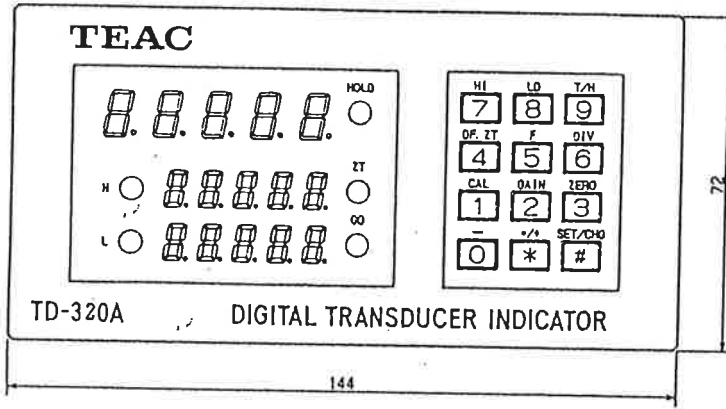


- 4.) Fix the metal fittings firmly with 4mm vis.

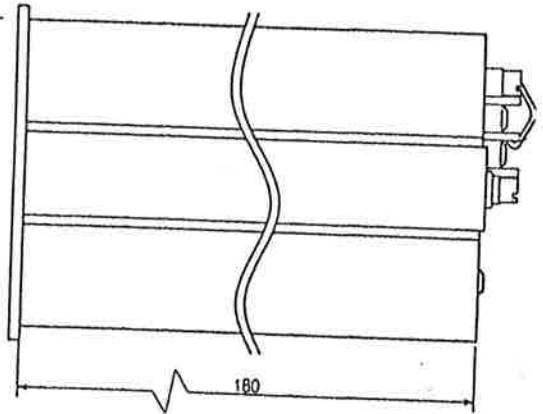


When it is necessary to be moved after installation, be careful any strong shocks or vibrations will not be given to TD-320A.

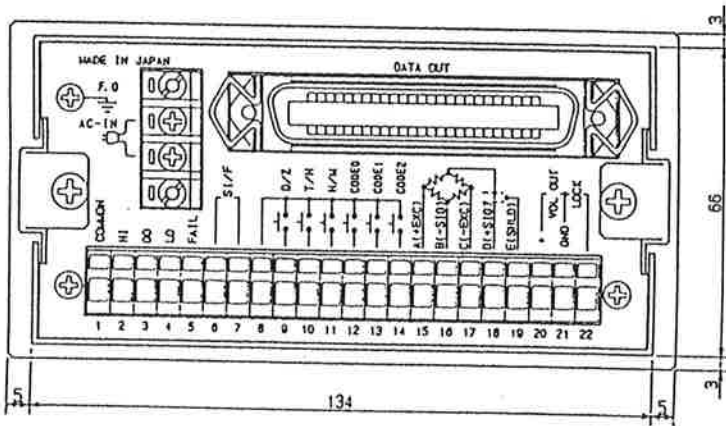
6. DIMENSIONS



FRONT PANEL



SIDE VIEW



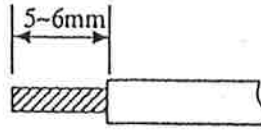
REAR PANEL

UNIT: mm

## 7. CONNECTION GUIDE (TERMINAL BOARD AT REAR PANEL)

### ◆ Connection of the Cage Clamping System Terminals

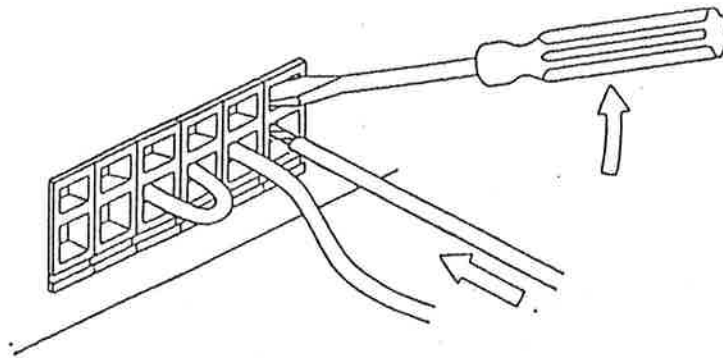
1.) Peel the cover, 5~6 mm long, of the cable to be connected.



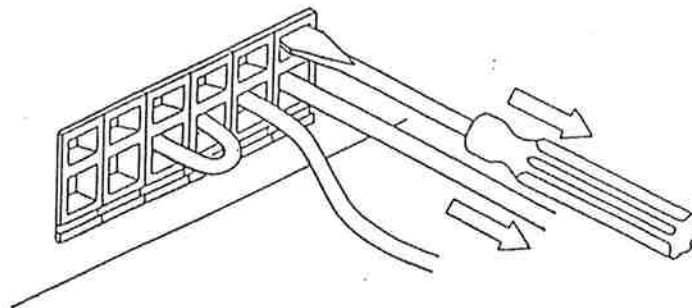
2.) Twist the bare wire so as to be easily inserted into the terminal hole.

3.) Insert the screwdriver attached to TD-320A into the upper hole and lift it upward.

4.) Insert the twisted wires into the lower hole.



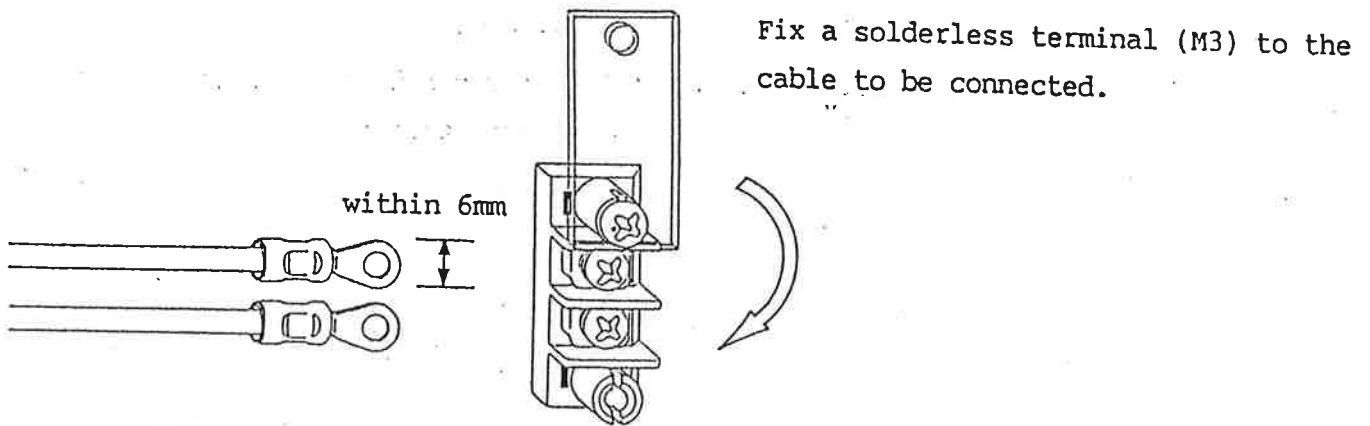
5.) Pull the screwdriver out from the upper hole.



6.) Make sure if the cable is clamped firmly and would not come out even if it is pulled out with a little force.

- \* The size of the cable is 0.2~2.5 mm<sup>2</sup>.
- \* It is not necessary to solder the cable wires or to fix a solderless terminal for connection.
- \* If several cables are to be connected to the same hole, twist those cable wires together and then insert them into the hole.

◆ Connection of the power input terminals



[AC IN]

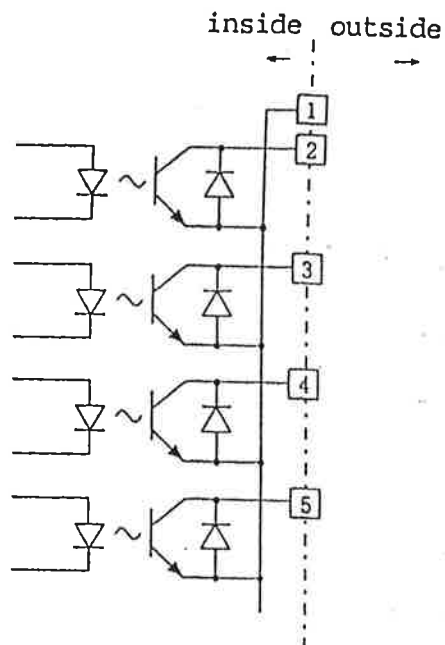
The power input terminal of AC 90~110 V, 50/ 60 Hz as standard.

[F.G]

The ground terminal. In order to protect TD-320A from any hazard of electric shocks and static electricity, the FG terminal must be grounded with a thick cable (about  $0.75 \text{ mm}^2$ ).

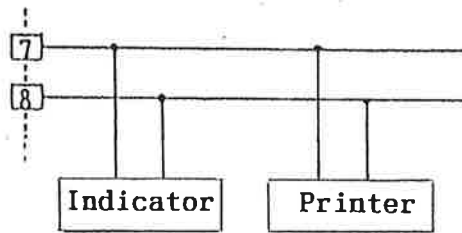
[No 1, 2, 3, 4, 5] COMMON, HIGH, GO, LO, FAIL

The output circuits of the HI, GO, LO and FAIL signals are open-collectors. The number 1 is a common. The capacity of the open-collector output is 30mA and its withstand voltage is 30V.



[6,7] SI/F SERIAL OUTPUT

Terminal 7 and 8 are of Non-Polarity. External S I/F can be connected in parallel upto 3 units. Shielded Cables are not required, but the cables should be connected separately from AC lines and other lines with noises.

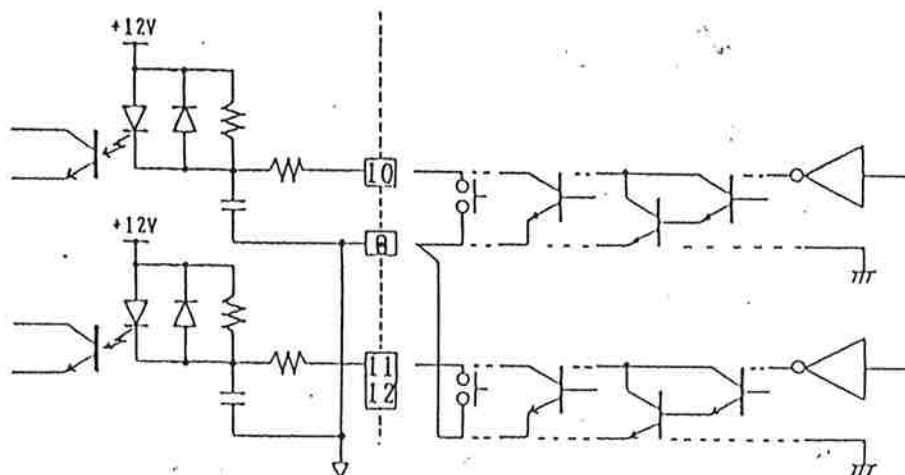


[8,9,10,11,12,13,14,] D/Z, T/H, H/M (DIGITAL ZERO and TRACK-HOLD COMMAND INPUT)

CODE 0 CODE2 (HIGH/LOW LIMIT VALUE)

The connections are shown below. Terminal 9 is for Common.

Input can be made both for connecting points like Relay and Switch, and for non-connecting points like TTL Open Collector and Transistor.



Shielded Cables are not required, but the cables should be connected separately from AC lines and other lines with noises.

CAUTION

CAUTION FOR D/Z, T/H, H/M EXTERNAL INPUT

- (1) External elements shall withstand 10 mA or more current flowing in circuits.
- (2) Current Leakage of external elements shall be within 100  $\mu$ A.
- (3) External elements shall be of 2V or less voltage when Terminal 9-10, 9-11 and 9-12 are in a short-circuit.

## (15, 19) TRANSDUCER INPUT

Upto the unit of 350 Family transducers can be connected in parallel with each other.

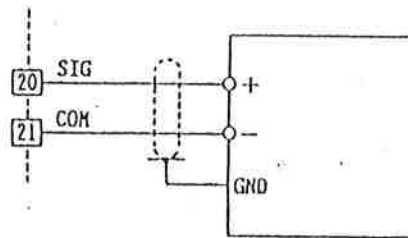
For further details, please refer to TRANSDUCER CONNECTION in "11".

## (20, 21) VOLT OUTPUT

Voltage Output terminals.

Terminal 20 is for signal and

Terminal 21 is for common.



### CAUTION

#### CAUTION TO VOLTAGE OUTPUT

- (1) VOL OUT is not isolated from the internal circuits.  
When connecting to an external equipment, the shielded cable should be used and its length should be within 2 or 3 meters.  
If a longer cable is used, it might be influenced by noise.
- (2) Do not have it short-circuited for a longer time than one hour.  
Otherwise, it will cause troubles.
- (3) Do not apply an external voltage to the Voltage Output Terminals.  
Otherwise, it will break TD-300A ..

## (22) LOCK (CALIBRATION LOCKOUT)

This terminal is not for external interface. (Do not use it for external.)

Please refer to Calibration in " " "

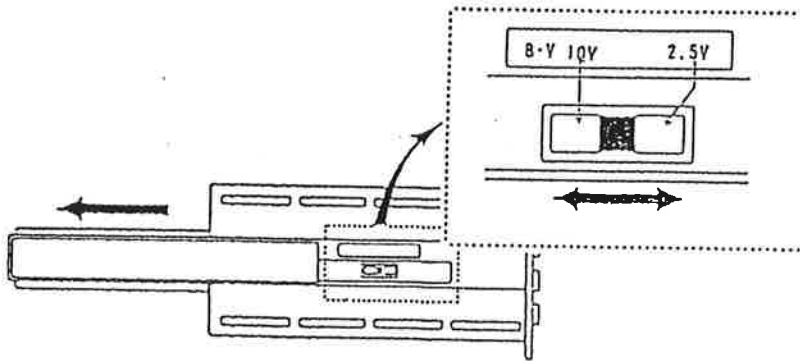
## 8.CONNECTION OF A TRANSDUCERS

The excitation voltage of TD-320A can be switched to DC10V or DC2.5V. One four-wire type transducer of  $350\Omega$  can be connected.

### 1) Selection of the excitation voltage

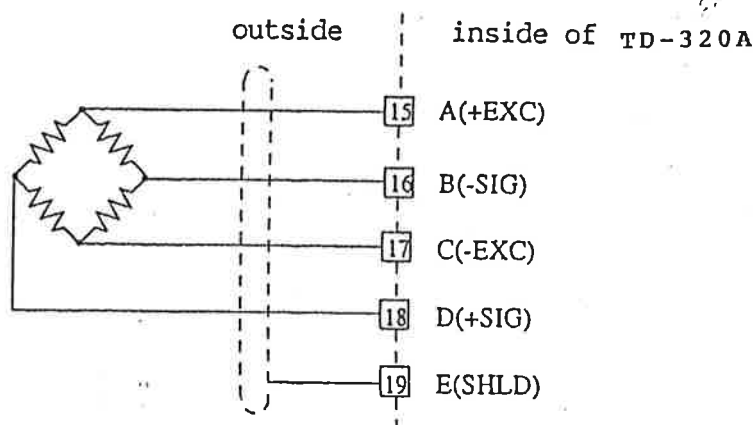
Make sure that the excitation voltage indicated on the upper cover of TD-320A is suited to that of the transducer. The excitation voltage of TD-320A must be within the recommended excitation voltage of the transducer.

In general, select 10V for a transducer whose excitation voltage is more than 10V, and select 2.5V for less than 10V.



If you apply higher voltage than the recommended excitation voltage of the sensor, the sensor will have heat and the drift will be bigger and the sensor will be likely to be broken.

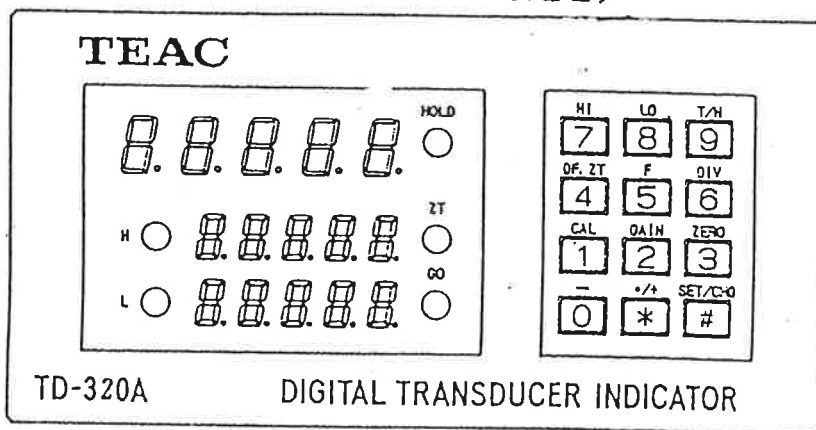
### 2) Connection of a transducer



Connect a transducer to TD-320A with four-wire shielded cable separately from AC power wiring and other noise generating wiring. Use a thick cable (about  $0.75\text{mm}^2$ ) for the Terminal 19 and ground it.

## 9. FUNCTIONAL DESCRIPTION

(FRONT PANEL)



### STATUS INDICATOR UNIT

These LEDs indicate the present conditions of TD-320A under a normal operation. During presetting, LEDs indicate the functions being preset. However, the following only describe under a normal operating conditions.

[HI]

ON, When an indicated value is higher than the upper limit preset value, and the high limit transistor is operated.

[LO]

ON, When an indicated value is lower than the lower limit preset value, and the low limit transistor is operated.

[HOLD]

ON, when an indicated value equals to the hold preset value.

There are two kinds of Hold Functions (i.e. SAMPLE-HOLD and PEAK-POINT-HOLD). In both cases, an indicated value shows that it is at the same value as that of External T/H Signal or T/H Key Setting.

[ZT]

ON, when Zero Tracking is working.

[GO]

ON, When an indicated value is between lower and higher limit, and the go signal transistor is operated.



## NUMERICAL INDICATOR

A measured value and each value of the setting items are indicated. Usually a value corresponding to the output of a transducer or an overflowed value is indicated.

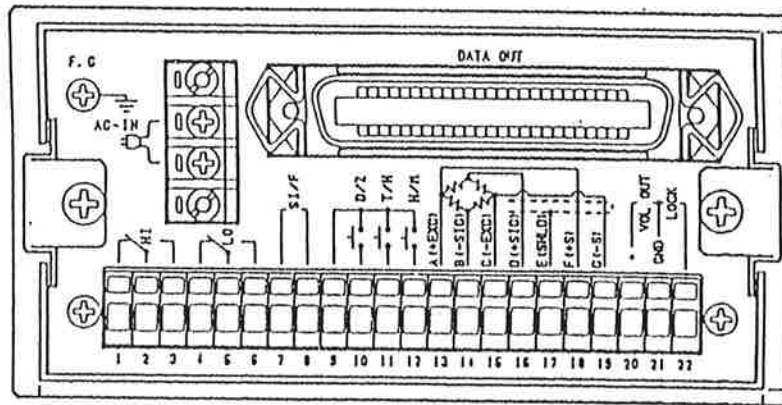
- OF L 1 (overflow 1) : minus overflow of the A/D converter
- OF L 2 (overflow 2) : plus overflow of the A/D converter
- OF L 4 (overflow 4) : indicated value overflowed (indicated value > 9999)

- \* Overflow 1 and 2 are alarm indications caused by mis-connection or a breakdown of a transducer, overload, a snapping or bad connection of a wire etc.
- \* Overflow 4 is an alarm indication caused by mis-inputting of calibration.

## SETTING KEY PAD

- ... minus sign and digit '0'
- 
- ... decimal point, plus sign and cancellation
- SET/CHO  
 ... set value input start command and set value entry command
- CAL  
 ... equivalent input calibration and digit '1'
- GAIN  
 ... actual load calibration and digit '2'
- ZERO  
 ... digital zero and digit '3'
- DEZT  
 ... selection of digital filter or zero tracking and digit '4'
- F  
 ... digital tare subtraction and digit '5'
- DIV  
 ... minimum scale value and digit '6'
- HI  
 ... high limit and digit '7'
- LO  
 ... low limit and digit '8'
- T/H  
 ... selection of the hold mode, hold command and digit '9'

( REAR PANEL )



[AC-IN]

Input power supply terminal.

[F.G.]

Ground terminal. To protect from any damages of electric or electrostatic shocks, this terminal should be grounded.

[No.1,2] HI OUT

The output of the HI signal are open-collectors. The number 1 is a common. ON, When an indicated value is higher than the upper limit preset value.

[No.1,3] GO OUT

The output of the GO signal are open-collectors. The number 1 is a common. ON, When an indicated value is between lower and higher limit.

[No.1,4] LO OUT

The output of the LO signal are open-collectors. The number 1 is a common. ON, When an indicated value is lower than the lower limit preset value.

[No.1,5] FAIL OUT

The output of the FAIL signal are open-collectors. The number 1 is a common. ON, When it is normal operation.

[ No 6 and 7] SI/ F

The exclusive serial data output for connecting an external display and a printer etc.

[ No 8 and 9] D/Z

The digital zero command input. The digital zero is carried out when these terminals are short-circuited. This input does not work when the terminal 21 and 22 are opened.

[ No 8, 10 and 11] T/H, H/M

The hold command input. There are four kinds of hold mode.

[ No 8, 12, 13 and 14] CODE 0, 1 and 2

Select the high and low limit values among the eight preset limit values. Refer to the section 'Multiple High and Low Limit Comparison'.

[ No 15, 16, 17, 18 and 19] Sensor input

One sensor of 350 $\Omega$  can be connected.

[ No 20 and 21] VOL OUT

The analogue output terminals. Voltage corresponding to the input of a sensor is outputted. The output level is about 2V per input of 1mV/V.

[ No 21 and 22] LOCK

The calibration inhibiting input terminals. When these terminals are short-circuited, calibration is inhibited and the initial zero cannot be changed. In order to prevent mis-operation, short-circuit these terminals after calibration.

FUSE

A fuse whose capacity is 0.5A is inserted into the power source (AC IN).

OP SPACE

The following are Optional Functions.

- (1) B.C.D Data Output TD-3203
- (2) RS-232C Data Output TD-3204

## 10. KEY-SWITCH OPERATION

### ● KEY-SWITCH OPERATION BASED ON OBJECT PRIORITY ORDER

Key-Switch has two different operation functions (i.e. Presetting Subject and Figure Input) and is operated in Automatic Priority Order.

#### TEN-KEY AS SELECTION SWITCHES

Presetting Subjects can be selected by Ten-Key. Selections can be repeated and revised as many times as necessary. Once # Key is pushed, the selection is finalized and the function is commanded or the pre-setting is registered.

#### PRESETTING DATA DISPLAY

If a presetting subject is selected, its preset data are shown in the display panel. At the same time, [HI] LED is flashing to indicate the condition. [LO], [HOLD], [ZT] and [GO] are shown in the page

#### PRESETTING TO BE STARTED BY # KEY

Push # Key so that you can input a figure as a selecting subject. [HI] LED is changed from flashing to lighting, and MSD (Most Significant Digit) of a displayed figure is flashing.

#### TEN-KEY AS FIGURE INPUT SWITCHES

TEN-KEY is turned from Function Keys to Figure Keys. A flashing point is the place where you can input a figure. When a figure is input, a flashing point is shifted to its next digit (i.e. the second largest digit).

If LSD (Least Significant Digit) is input, the largest digit starts flashing again. If wanted, a new figure can be input again for correction.

#### REGISTRATION BY # KEY

If a displayed figure is correct and corresponds to your aiming subject, its registration can be made by pushing the # Key regardless a flashing point. Now, a transducer input is to be displayed.

If a new registration is required, start again selecting a presetting of subject.

#### NOTICE

- (1) Presetting Unit is based on First Priority Object System and therefore, + Key, - Key, Decimal Point, etc. become effective only when it is in order.
- (2) Only when a registration of Upper/Lower Limit Presettings is input, Minus by 0 Key and Plus by \* Key become effective.
- (3) Key becomes Decimal Point Function Key only while registering figure for Simulative Calibration and for Real Loaded Calibration. In the other cases, Decimal Point is automatically determined and displayed.

status display LED					item selection key	setting item
HI	LO	HOLD	ZT	GO		
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text" value="0"/>	self-check
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="text" value="1"/> CAL	entry of an output value of a sensor for the equivalent input calibration
	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text" value="2"/> GAIN	entry of a value for the equivalent input calibration and actual load calibration
	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="text" value="3"/> ZERO	entry of a zero point for calibration and the auto zero
	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text" value="4"/> DEZT	selection of the digital filter or zero tracking
	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="text" value="5"/> F	digital tare subtraction
	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text" value="6"/> DIV	minimum scale value
	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="text" value="7"/> HI	high limit
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text" value="8"/> LO	low limit
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="text" value="9"/> THI	selection of the hold mode

----- LED is off.  
 ----- LED is on.  
 ----- LED is on or blinking.

After pressing a key, do not allow more than twelve seconds for pressing the next key; otherwise, the mode will automatically return to a display of a value of a sensor and all the inputted values become ineffective. Return to selection of the setting item if you will continue setting.

## 11. CALIBRATION

### EQUIVALENT INPUT CALIBRATION

What is Equivalent Input Calibration? Calibration can be done just by registering a rated output of transducer, but not by input of an actual load.

For Example :

Heavy Weight Measurement : 2.001 mV/V - 100.0 kgf

Pressure Measurement : 2.002 mV/V - 10.00 kgf/cm<sup>2</sup>

Torque Measurement : 2.502 mV/V - 15.00 kgf·m

By registering the above values, Gain will be automatically adjusted and fixed.

### ◆ EQUIVALENT INPUT CALIBRATION PROCEDURE

Release LOCK (Terminal 21 and 22) located at the rear panel.

Make Terminal 21 and 22 (LOCK) open.

If LOCK is made by KEY-SWITCH, release it as follows.



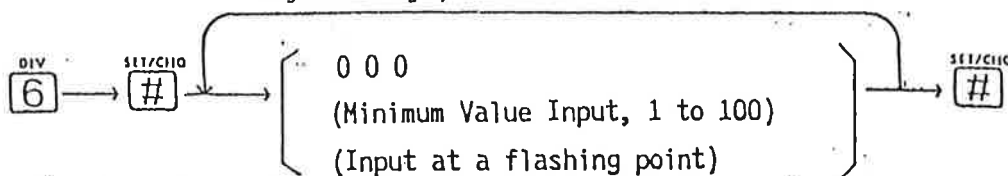
### NOTICE

LOCK by Terminal Board and LOCK by KEY-SWITCH are both for the LOCK Function (Double Function). If LOCK is made by the both, you have to release the both LOCKs.

For KEY-SWITCH LOCK, please refer to KEY-SWITCH LOCK FUNCTION in the page 33.

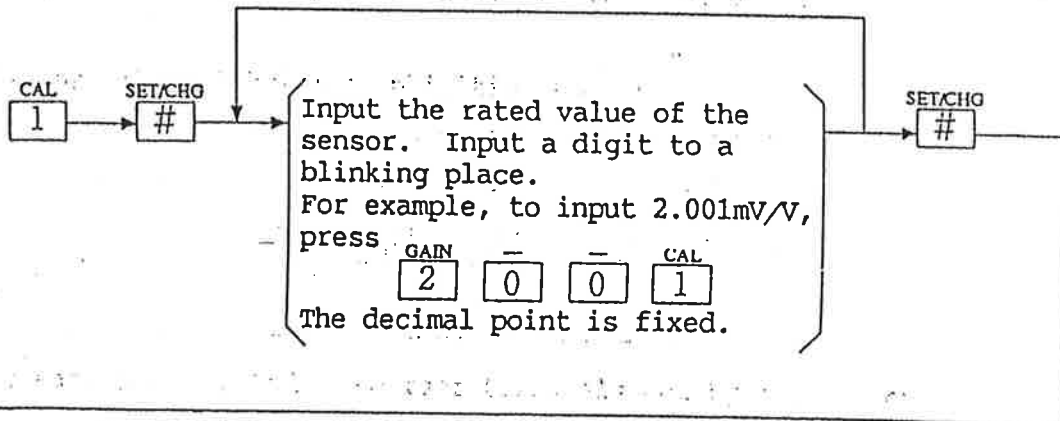
Register the minimum figure for digital value changes (i.e. select a figure among 1 to 100). When TD-320A is delivered to you, 001 was registered for this purpose. If necessary, this registration can be done as follows.

Registration can be repeated after Input of LSD (Least Significant Digit) is finished.

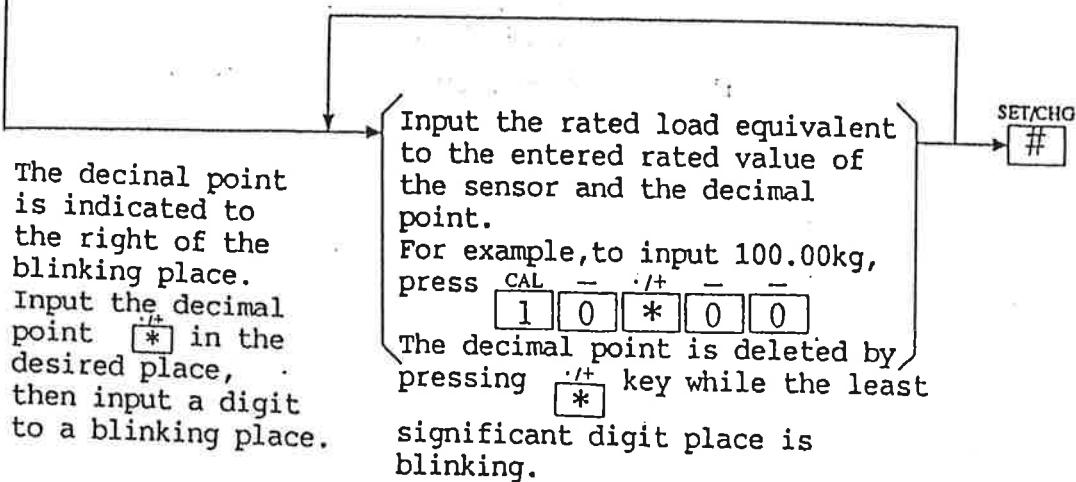


1) Enter the rated value of the transducer

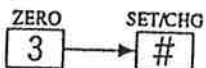
After the least significant digit is inputted, you can re-input a value from the most significant digit.



After the least significant digit is inputted, you can re-input a value from the most significant digit.



2) Enter the zero point without any load (input is zero).



The zero point entered here is the initial zero point data, not the normal digital zero.

3) Inhibit calibration (LOCK).

Short-circuit the terminal 21 and 22 of the rear terminals in order to prevent mis-operation.

Calibration values and the zero point are stored in the NOV RAM (non-volatile memory) so that they will not be cancelled in case of power failure.



◆ ACTUAL LOAD CALIBRATION

What is Actual Load Calibration ?

When a transducer is loaded actually, its indicated value is converted to a certain figure, which is called as Actual Load Calibration.

◆ ACTUAL LOAD CALIBRATION PROCEDURE

Release LOCK by disconnecting Terminal 21 and 22 at the rear panel.

(Terminal 21 and 22 are open now.)

If LOCK is made by KEY-SWITCH, release it as follows.



NOTICE

LOCK by Terminal Board and LOCK by KEY-SWITCH are both for LOCK Function (Double Function). If LOCK is made by the both, you have to release the both LOCKs.

For KEY-SWITCH LOCK, please refer to KEY-SWITCH LOCK FUNCTION in the page 33.

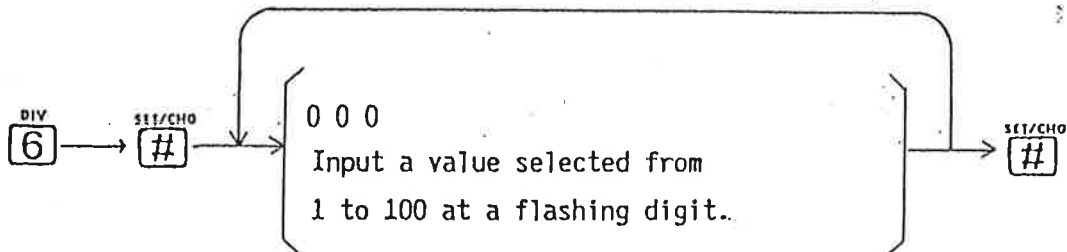
Register Minimum Stepping Value.

Select a value between 1 to 100 as Minimum Stepping Value.

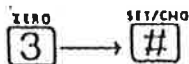
When delivered from our factory, 001 is registered already. If you use this value, you do not have to register it again.

The following is the registration procedure.

Registration can be repeated after Input of LSD (Least Significant Digit) is finished.



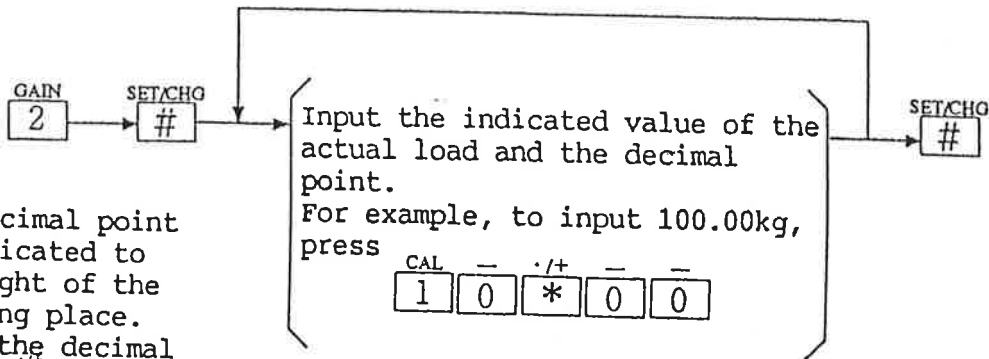
Register Zero Point under Non-Loaded (Input Zero) Condition.



NOTICE

Zero Point Data registered here are Initial Zero Point Data, not Digital Zero under a normal operation.

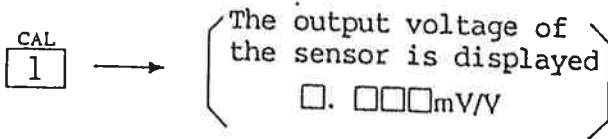
- 4) Apply an actual load to the transducer and enter the indicated value.



The decimal point is indicated to the right of the blinking place. Input the decimal point  $\boxed{.}$  in the desired place, then input a digit to a blinking place.

The decimal point is deleted by pressing  $\boxed{.}$  key while the least significant digit place is blinking.

- 5) The output voltage of the transducer can be indicated. Record this value so that the equivalent input calibration can be carried out with this value when TD-320A is broken and replaced with a new one and gain calibration is carried out.



- 6) Inhibit calibration (LOCK).  
Short-circuit the terminal 21 and 22 of the rear terminals in order to prevent mis-operation.

Calibration values and the zero point are stored in the NOV RAM (non-volatile memory) so that they will not cancelled in case of power failure.