

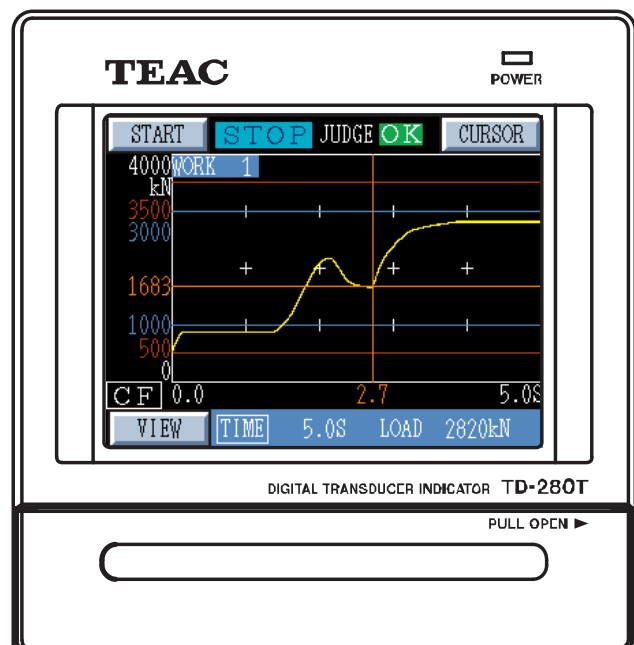
TEAC

DIGITAL TRANSDUCER INDICATOR

TD-280T

OPERATION MANUAL

Please read this book carefully before using this product



Introduction

Thank you very much for purchasing TD-280T digital indicator unit.


To ensure optimum performance and proper and safe operation, please read this book carefully and understand it thoroughly before using the instrument.


Information and data about this product, contained in this book, are simply for reference purposes; the Company does not guarantee any intellectual property rights or any other rights of a third party regarding this information or data. Accordingly, the Company does not bear any responsibility for infringement of the intellectual property rights of a third party, and any problems incurred by the use of the products listed herein.

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For Your Safety

This document describes the safety instructions for the operation of the TD-280T. Before operating the product, read this document carefully to familiarize yourself with the product.

 Warning	Follow the instructions below to avoid risk of serious personal injury and death.
Never use beyond the rated specifications as there is a danger of property damage, injury, fire or electrical shock.	
Never use in flammable gaseous environments including the following locations as there is a danger of explosion.	
<ul style="list-style-type: none"> · Locations subject to corrosive or flammable gases · Locations subject to water, oil or chemical splash 	
If the product malfunctions (any smoke, odor or noise is present), stop operating the product immediately and unplug the power cord as there is a danger of fire or electrical shock.	
Never attempt to disassemble the product.	
Carefully check connections and wiring before applying power.	
Be sure to ground the product (with ground resistance of 100 Ω or less).	
The electric shock protection class of this product is Class I. The product must be grounded to the protective ground terminal for protection against electric shock.	
To allow the operator to immediately shut off the power to the product, install a switch or circuit breaker that complies with both IEC60947-1 and IEC60947-3 requirements near the product. The switch or breaker installed must also indicate that it functions to shut off the power to the TD-280T.	
Double insulation or reinforced insulation must be provided between the TD-280T and an external device connected to it and between the external device and its power source.	

 Caution	Follow the instructions below to avoid risk of personal injury or property damage.
Disconnect the power cord when performing the following.	
<ul style="list-style-type: none"> · Attaching or detaching optional connectors · Wiring or connecting cables to terminal blocks · Connecting the ground line 	
Wait for at least five seconds between turning on and off.	
Never touch the rear panel or connectors while the product is turned on.	
When connecting to the signal I/O connector, check the signal name and the pin assignment to prevent a false connection. Be sure to shut off the power to the product as well when making a connection.	
Use a shielded cable when connecting to a load-cell, external I/O or option.	
Take adequate measures when operating in the following locations.	
<ul style="list-style-type: none"> · Near a power line · Where a strong electric or magnetic field is present · Where static electricity or noise such as from a relay is generated 	
Do not install under the following environments.	
<ul style="list-style-type: none"> · Locations subject to temperatures exceeding the specified temperature and humidity ranges · Locations with high salt or iron content · Locations under direct vibration or shock · Outdoor, or locations with an altitude of higher than 2,000 m 	
Do not operate a damaged unit.	
The TD-280T is classified as an open-type (built-in) device and must be installed inside a control panel.	
If the top cover and the panel are dirty, wipe them with a soft cloth lightly dampened with a solution of a neutral detergent and water, and then wipe them again with a damp, well wrung-out cloth. DO NOT use a chemically treated dust cloth, paint thinner, or other flammable solvents. Using any of them could damage the coating of the product.	
If the product is used in a manner unintended by the manufacturer, the product safety may be adversely affected.	

Repair of failures

This product has passed exhaustive inspections before being shipped from the factory.

Broken or defective TD-280T shall be repaired or replaced in accordance with the service standards set out by TEAC. In any case, our liability for damages resulting from any defect or deficiencies in TD-280T shall be limited to repair or replacement of TD-280T.

However, this shall not apply to cases in which the manufacturer is liable under the product liability law.

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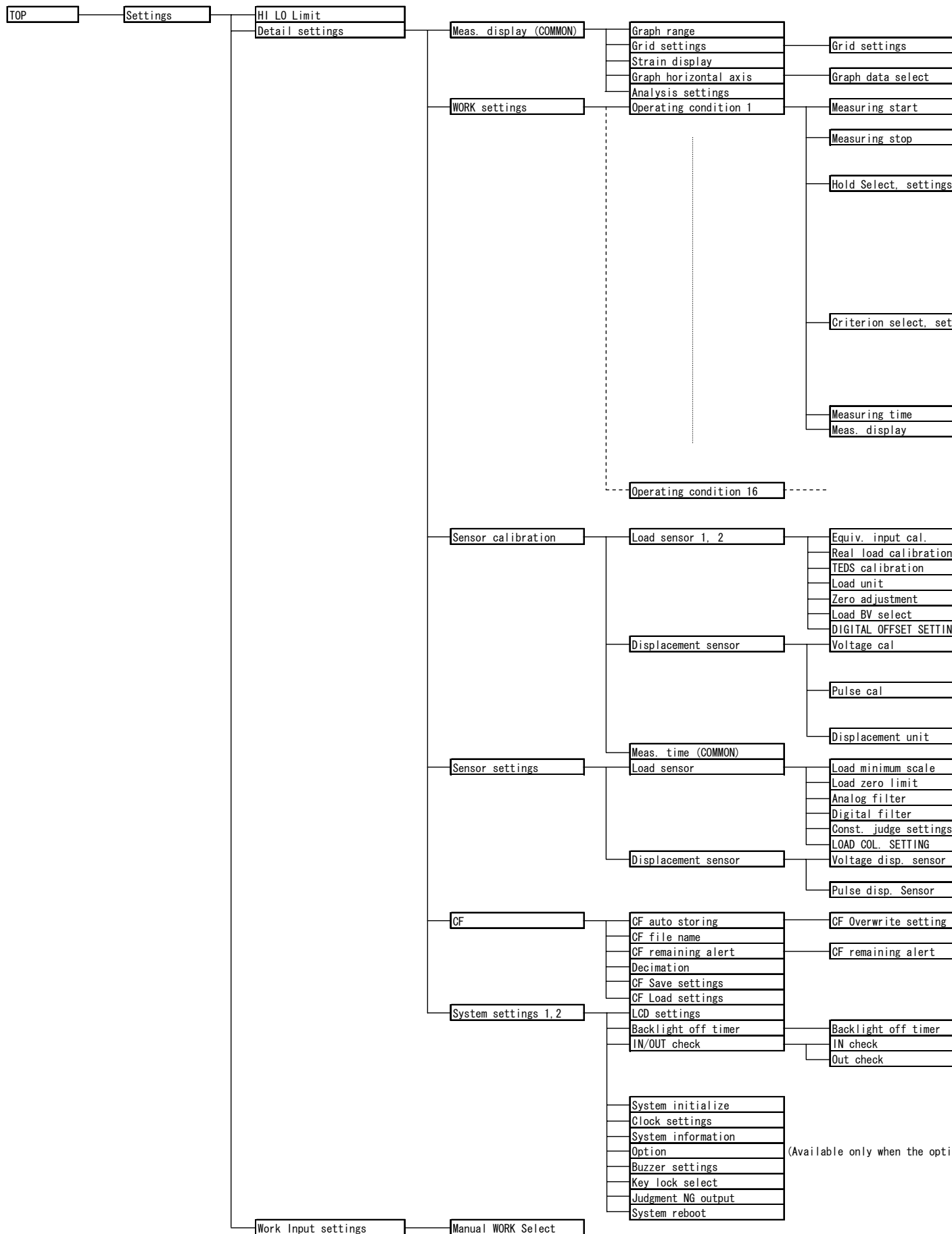
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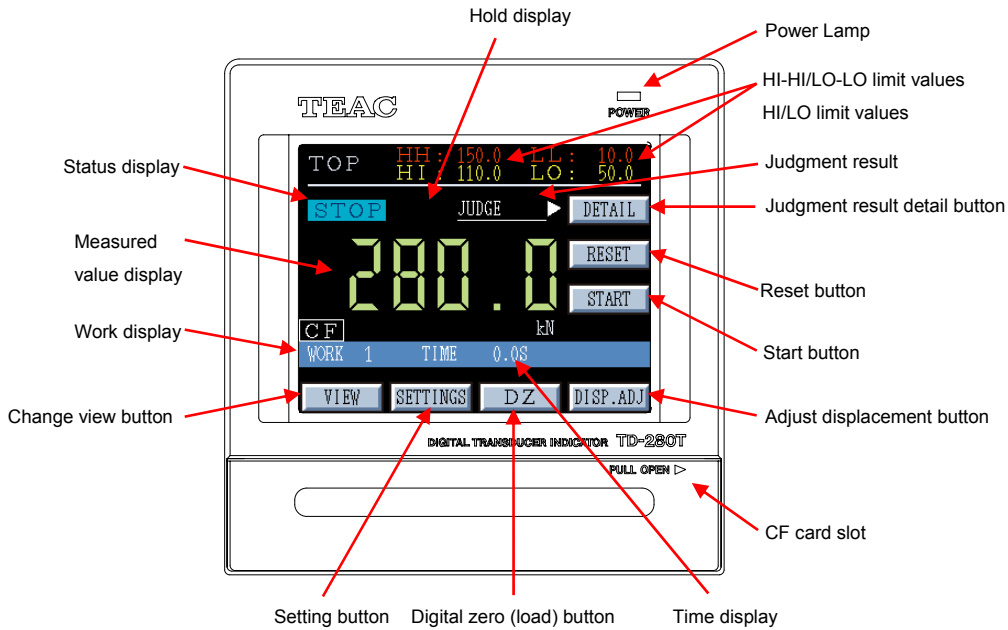
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1. Names of Parts and Functions

1-1 Front Panel

1-1-1 Digital Display Screen (TOP Screen)



Power Lamp : Turns on when power is supplied.

HI-HI/LO-LO limit values : Indicates the settings of HI-HI/LO-LO limit values.

HI/LO limit values : Indicates the settings of HI/LO limit values.

Status display : Indicates the operational state of this indicator.

Status	Description
STOP	Indicates that measurement is stopped.
RDY	Indicates that the system is waiting for the measuring start conditions (if set) to be met.
REC	Indicates that measurement is started.

Hold display : Gives a display as shown below when a hold condition is met during measurement.

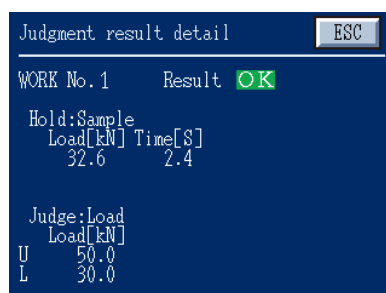
Hold setting	Display
Sample	HOLD
Peak	PEAK
Displacement peak	DISP. PK

Judgment result : If you set the judgment function, a measured value is judged to display the result.

Judgment settings	Display	Description
None		Judgment is not performed.
Load: HI/LO limits	H	The measured value is larger than the HI limit value.
	OK	The measured value is within the HI and LO limit values.
	L	The measured value is smaller than the LO limit value.
	NG	Failed to hold data.
Load: HI/LO limits, HI-HI/LO-LO limits	HH	The measured value is larger than the HI-HI limit value.
	H	The measured value is larger than the HI limit value.
	OK	The measured value is within the HI and LO limit values.
	L	The measured value is smaller than the LO limit value.
	LL	The measured value is smaller than the LO-LO limit value.
	NG	Failed to hold data.
Displacement: HI/LO limits	H	The measured value is larger than the HI limit value.
	OK	The measured value is within the HI and LO limit values.
	L	The measured value is smaller than the LO limit value.
	NG	Failed to hold data.

Special judgment	Display	Description
Inflection-point trigger peak	HL	Failed to detect an inflection point.
		The load value of the point of inflection is less than minimum load value.
	LL	Analysis range is outside measurement data.
		The load value satisfied a condition of the measurement end without surpassing an analysis start level.
Many	HL	Both HI and LO are detected.
	LL	Hold position is beyond measurement data.
Multiple zone	OK	Measured value is within the set zone.
	NG	Measured value is outside the set zone.

Judgment result detail button : Displays details of the comparison result.



Example of "Judgment result detail" screen

Measured value display : Indicates a load value that the indicator receives.

Reset button : Stop measurement; and also to clear measured data, hold values, and judgment results.

Start button : Starts measurement.

Work display : Indicates a selected work number. A number followed by the letter "M" indicates that the number is manually set.

Time display : Usually, indicates measuring time. However, hold time is indicated when peak hold or external sample hold is set.

Change view button : Changes the view to the graphic screen.

Setting button : Navigates you to the settings screen, from which you can perform various settings. Selecting this button clears measured data, hold values, and judgment results.

Digital zero (load) button : Sets an input load value as digital zero.

Adjust displacement button : Adjusts displacement (voltage or pulse) input to a predetermined adjustment-value. To set an adjustment value, access the following screens.

◇ **For voltage displacement:**

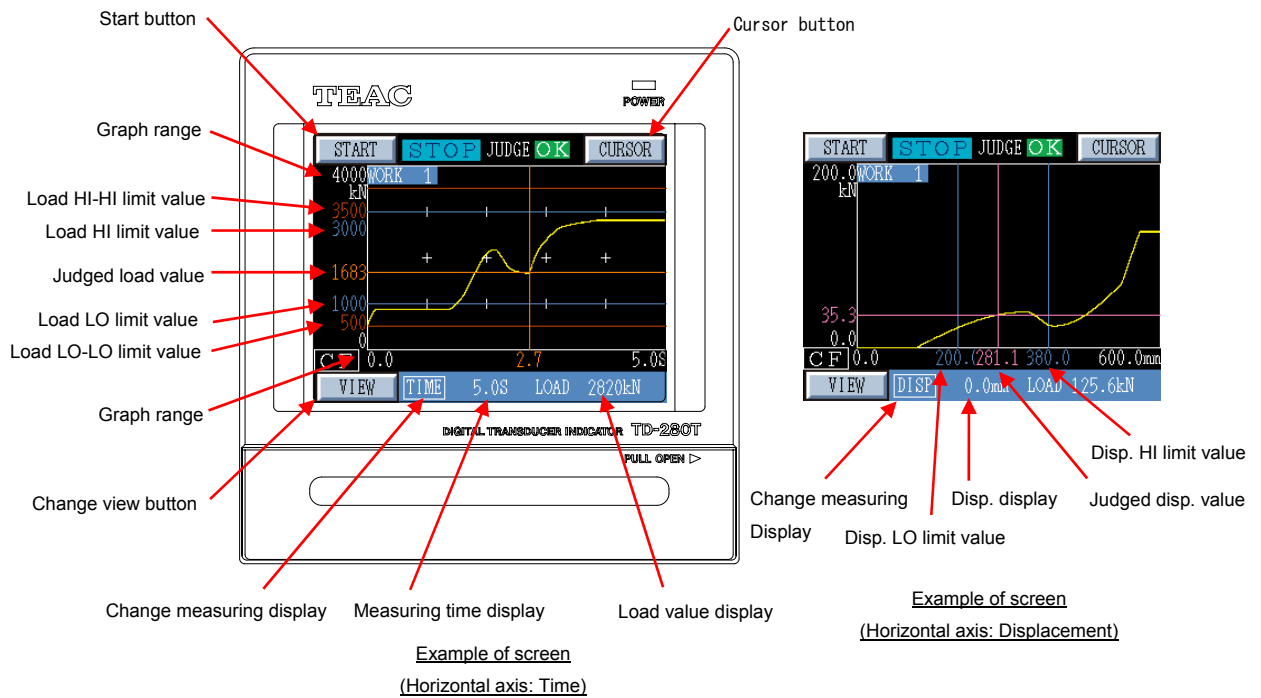
"SETTINGS"→"DETAIL SET"→"SENSOR CAL."→"DISP." (horizontal axis)→"DISP.VOLT"→"SETTINGS"→"DISP.ADJUST"

◇ **For pulse displacement:**

"SETTINGS"→"DETAIL SET"→"SENSOR CAL."→"DISP." (horizontal axis)→"DISP.PULSE"→"SETTINGS"→"DISP.ADJUST"

CF card slot : When you insert the CF card to or remove it from the indicator, pull the cover toward you to open it.

1-1-2 Graph Display Screen



Start button : Starts or stops measurement.

Cursor button : Displays a cursor. You can move the cursor, display a cursor value, and scale up or down the waveform. Also you can scale up or down the horizontal axis with a cursor position centered.

Graph range : Indicates a predetermined graph range. Graph is plotted within this graph range.

Load HI-HI limit value: Indicates the settings of the load HI-HI limit value.

Load HI limit value : Indicates the settings of the load HI limit value.

Judged load value : Indicates a load value which was judged and time, when a load judgment function is set.

Load LO limit value : Indicates the settings of the load LO limit value.

Load LO-LO limit value: Indicates the settings of the load LO-LO limit value.

Change view button : Changes the view to the digital display screen (TOP screen).

Change measuring display : Enables you to change measuring display (axis, scale, grid, etc).

Measuring time : Indicates measuring time.

Load value display : Indicates a load value that the indicator receives.

Displacement HI limit value : Indicates the settings of the displacement HI limit value.

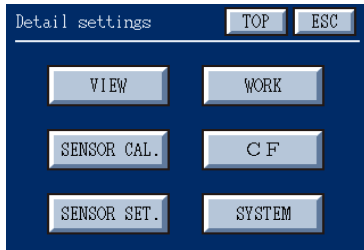
Judged displacement value : Indicates a displacement value which was judged and a load value, when a displacement judgment function is set.

Displacement LO limit value: Indicates the settings of the displacement LO limit value.

Displacement display: Indicates a displacement value which this indicator receives.

1-1-3 Display of Operation Panel

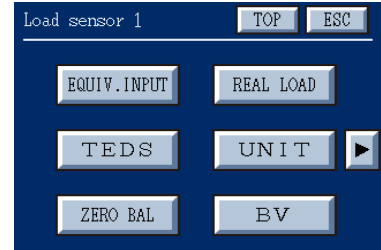
TD-280T is equipped with the touch panel LCD display for initializing sensors or performing various operations. On this panel, the setting selection display, the strain display, the graph display, or other can be selected.



Settings screen



Strain screen



Load sensor calibration screen



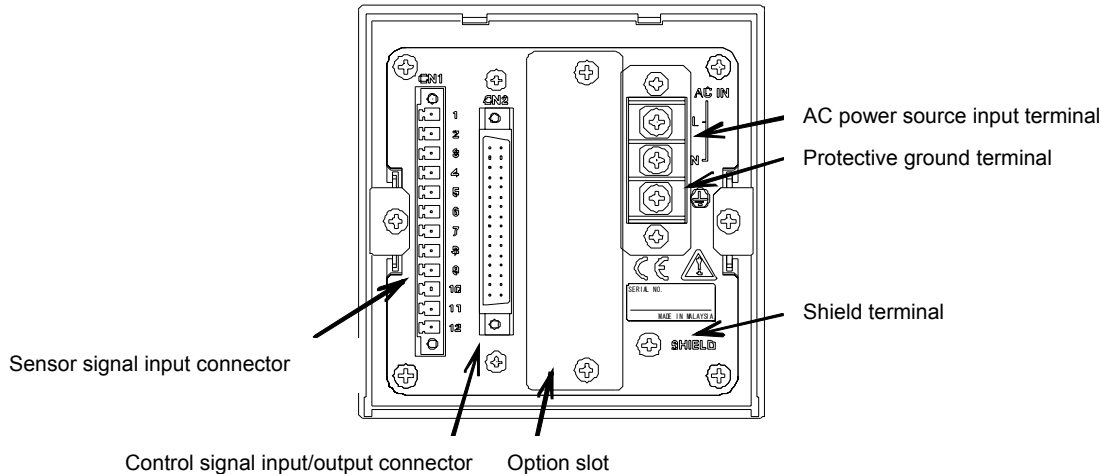
Caution

Use your finger to push the touch panel lightly. Do not push the touch panel using a firm object or a sharp-tipped object. Otherwise, the touch panel might be damaged.

Do not push more than one location of the touch panel at a time. If you do so, TD-280T may not recognize your operation correctly.

Note:

1-2 Rear Panel



1-2-1 Protective Ground Terminal

This is a protective ground terminal screw. Be sure to ground the protective ground terminal to prevent electric shocks and failures due to static electricity.

1-2-2 Shield Terminal (SHIELD)

This is a frame ground terminal.

1-2-3 Option Slot

Either of the following options can be mounted (Factory pre-installed option).

- D/A converter
- RS-232C interface

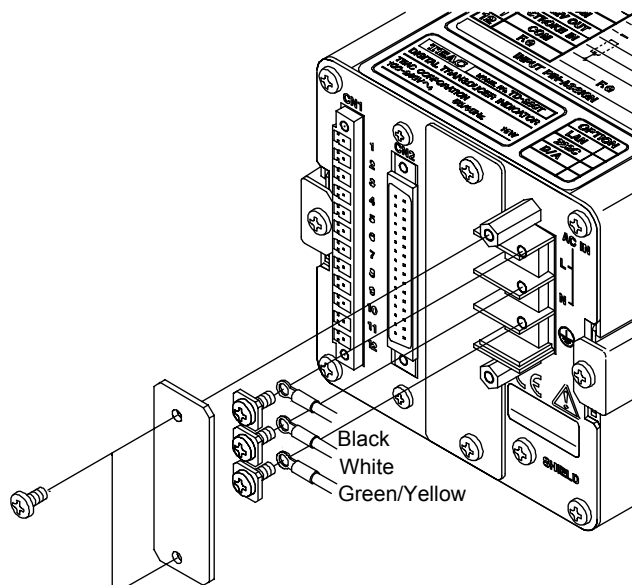
1-2-4 AC power Source Input Terminal (AC IN)

The AC power input voltage is 100–240 V AC.

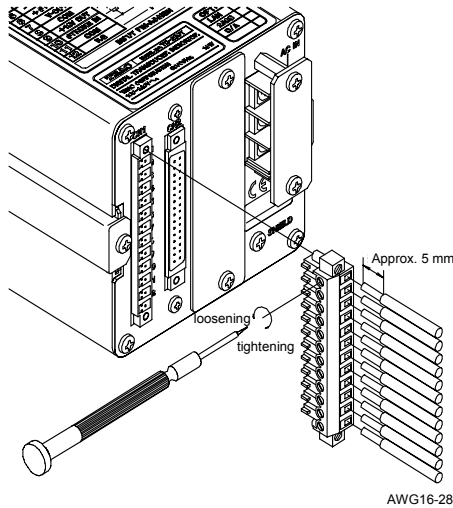
For power supply connection, use power wires that are 0.326 to 2.081 mm² in cross-sectional area (22 to 14 AWG).

Connect those wires to the terminal block by using crimp connectors (for M4, 8.5 mm or less in width).

- Power cord wire colors (for the provided AC power cord)
 - L : Black
 - N : White
 - FG : Green/yellow (protective ground)
- The provided AC power cord is only intended for use within Japan, rated for 10 A at 125 V AC. If you want to use the TD-280T at a voltage exceeding the specified voltage or overseas, be sure to use another AC power cord that is more appropriate for your operating
- The frequency is 50 / 60 Hz.



1-2-5 Sensor Signal Input Connector



Strip about 5 mm of insulation off each signal wire and lightly twist the bare wire to fit the terminal hole. Use a mini screwdriver to connect the wires. Applicable wire is 1.5φ or less (AWG 28 – 16). Pull the connected cable lightly and check that the cable is securely clamped. In particular, make sure that the sensors are firmly connected.

Compatible connector

Phoenix Contact (supplied with this instrument)
MC 1.5/12-STF-5.08

1	TEDS
2	GND
3	+EXC (A)
4	-SIG (B)
5	-EXC (C)
6	+SIG (D)
7	V-OUT
8	COM
9	+12V OUT
10	STROKE IN
11	COM
12	F. G

1, 2: TEDS Sensor Data Input

A TEDS sensor has an NDI-7P output, and so a TEDS conversion cable is used for connection.

1..... + (Orange)
2..... COM (Green)

3–6: Terminal for connecting a strain gauge sensor.

3..... +EXC (Red A)
4..... -SIG (Black B)
5..... -EXC (Blue C)
6..... +SIG (White D)

7, 8: Terminal for outputting a voltage proportional to the sensor input.

Output voltage is approx. 1 V per 1 mV/V sensor input.

7..... Voltage output (0 to approx. ±3 V)
8..... COM

9–11: Input/output terminals for a voltage-output displacement sensor.

Power supply and input terminals for a voltage-output displacement sensor.

If you do not use a displacement sensor, there is no need to connect these terminals.

9..... +12 V OUT (displacement-sensor power supply: MAX 250 mA)
10..... STROKE IN (0 to ±10 V)
11..... COM



Caution

Pin No. 9, 11 (+12 V OUT) of the sensor signal input connector and pin No. A7, A8 (displacement-sensor power supply +5 V) of the control signal input/output connector cannot be used together at once.

12: F.G (Frame Ground)

Terminal for connecting the shield (outer sheath) of a load sensor or displacement sensor.

1-2-6 Control Signal Input/Output Connector

Pin No.	In/Out	Signal Name		Pin No.	In/Out	Signal Name	
A1	IN	Load Digital Zero		B1	IN	Work Select 1	
A2	IN	Displacement Position Adjustment (Preset)		B2	IN	Work Select 2	
A3	IN	Measurement Start/Stop		B3	IN	Work Select 3	
A4	IN	Hold Command (Displacement)		B4	IN	Work Select 4	
A5	IN	Hold Command (Load)		B5	IN	External Judgment Reset	
A6	IN	Reset		B6	—	Signal COM	
A7	Out	Displacement-Sensor Power Supply (+5 V)		B7	—	Signal COM	
A8	—	Displacement-Sensor Power Supply (COM)		B8	—	Signal COM	
A9	Out	Judgment Output	Load	LL	B9	—	Signal COM
A10	Out			LO	B10	IN	Differential Pulse Output Displacement Sensor: Phase A-
A11	Out			GO	B11	IN	Differential Pulse Output Displacement Sensor: Phase B-
A12	Out			HI	B12	Out	Judgment Completed
A13	Out		Disp.	HH	B13	Out	Measurement Completed
A14	Out			LO	B14	Out	Load Normal
A15	Out			GO	B15	IN	Differential Pulse Output Displacement Sensor: Phase A+
A16	Out			HI	B16	IN	Differential Pulse Output Displacement Sensor: Phase B+

Compatible Connector: Fujitsu Connector FCN-361J032-AU
Cover FCN-360C032-B

Signal Name and Function

- A1 : Load Digital Zero** Performs digital zero for a load value on the ON edge. However, the digital zero function is not available if the current load value exceeds the “zero limit setting” when the “**zero balance**” value of a load sensor calibration is set as zero.
- A2 : Displacement Position Adjustment** Presets a value of “Displacement Position Adjustment” (set by selecting “**SENSOR CAL.**”→”**DISP.**”(horizontal axis)→”**DISP.VOLT/DISP.PULSE**” to the counter (Default: 0.0 mm) on the ON edge.
- A3 : Measurement Start/Stop** Typically, measurement is ready on the ON edge and measurement is terminated on the OFF edge. An actual measurement is started based on the conditions for starting/stopping the measurement which are set on a work-by-work basis. A measurement can be started based on either (1) the start signal or (2) a combination of the start signal and load values. A measurement can be stopped in the same fashion.
- A4 : Hold Command (Displacement)** Functions as a displacement value hold timing contact signal. During “Displacement Sample Hold,” holds and judges the displacement value at the ON timing. However, when a signal makes an ON-OFF-ON transition, the displacement value is held at the first ON timing of the measurement. Indication of load and displacement values is also held, but the waveform (data) continues to be displayed.

- A5 : Hold Command (Load)
 Functions as a load value hold timing contact signal. During "Sample Hold", holds and determines the load value at the ON timing.
 However, when a signal makes an ON-OFF-ON transition, the load value is held at the first ON timing of the measurement.
 Indication of load values is also held, but the waveform (data) continues to be displayed.
- A6 : Reset
 Used to abort all the current operations, regardless of whether they completed successfully or not, and discard the measurement data, if errors or other abnormal conditions occur.
 The indicator will return back to the state it was when last powered on (The settings are retained).
- A7 : Displacement-Sensor Power Supply
 +5 V output terminal of displacement-sensor power supply (Maximum: 500 mA)
- A8 : Displacement-Sensor Power Supply (COM)
 COM terminal of displacement-sensor power supply



Caution

Pin No. 9, 11 (+12 V OUT) of the sensor signal input connector and pin No. A7, A8 (displacement-sensor power supply +5 V) of the control signal input/output connector cannot be used together at once.

- A9 (LL) : Load Judgment Output
- A10 (LO) : Compares a load value held in each hold mode with the load judgment values to produce a NO/GO result, during measurement.
- A11 (GO)
- A12 (HI)
- A13 (HH)
- A14 (L0) : Displacement Judgment Output
- A15 (G0) : Compares a displacement position value when a load values is held in each hold mode with the displacement judgment values to produce a NO/GO result.
- A16 (H1)
- B1: (Work Select 1) : External entry of a work number. It is necessary to set this entry prior to A3
- B2 (Work Select 2) : "Measurement Start/Stop."
- B3 (Work Select 3) : Note that this entry is available only if "SETTINGS"→"WORK INPUT"→"EXT INPUT" is chosen.
- B4 (Work Select 4)
- B5 : External Judgment Reset
 Resets a Load Judgment Output (A9, A10, A11, A12, A13, A14, A15, A16).
 Resets the load judgment output of a hold value and switches to continuous judgment output when continuous judgment is "enabled."
 Hold and judgment indications in the screen remain unaffected.
- B6, B7, B8, B9 : Signal COM
 COM (common) terminal for input/output signals.
- B12 : Judgment Completed
 Available in a Hold mode which uniquely determines a load hold point, such as Sample Hold. Turns ON when the Hold mode is completed. Turns OFF when a new measurement start/stop signal is received.
- B13 : Measurement Completed
 Turns ON when measurement is completed and data is stored in CF.
 Now ready for a new measurement.

- B14 : Load Normal Turns OFF when errors associated with load cells, such as digital zero limit, sensor errors, or display value overflow, are detected.
- B10 : Differential Pulse Output Displacement Sensor: Phase A-
Phase A- of a differential pulse output displacement sensor. This also functions as input for one-phase.
- B11 : Differential Pulse Output Displacement Sensor: Phase B-
Phase B- of a differential pulse output displacement sensor. This functions as input for two-phase.
- B15 : Differential Pulse Output Displacement Sensor: Phase A+
Phase A+ of a differential pulse output displacement sensor. This also functions as input for one-phase.
- B16 : Differential Pulse Output Displacement Sensor: Phase B+
Phase B+ of a differential pulse output displacement sensor. This functions as input for two-phase.

To select the output type (One-phase or Two-phase) of a differential pulse displacement sensor, select "**SENSOR SET.**"→"**DISP.**"→"**PULSE**"→"**TYPE**" to set your sensor type.

If you do not use a differential pulse displacement sensor, there is no need to set the sensor type.

1-2-7 Input Signal Timing

For input/output signal timing, see a timing chart for each hold mode.

To check the status of each input and output signal, select "**SETTINGS**"→"**DETAIL SET**"→"**SYSTEM**"→"**IN/OUT**"→"**INPUT**" to monitor the status of each external input contact of the indicator in real time.

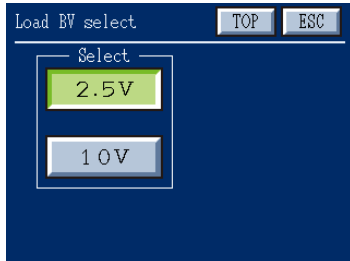
Status signals output from the indicator and each judgment output line of the load contacts can be individually turned on or off by selecting "**IN/OUT**"→"**OUTPUT.**"

2. Connection

2-1 Connecting Strain Gauge Sensor

◇ Setting bridge voltage

Set a bridge voltage in accordance with the specifications of a sensor before connecting the sensor.
Note that selecting an incorrect bridge voltage may damage the sensor.



From the TOP screen, choose “**SETTINGS**”→“**DETAIL SET**”→“**SENSOR CAL.**”→“**LOAD-CELL**”→“**BV**” to set a bridge voltage.

Select a bridge voltage in accordance with the specifications of a sensor to be connected to TD-280T.

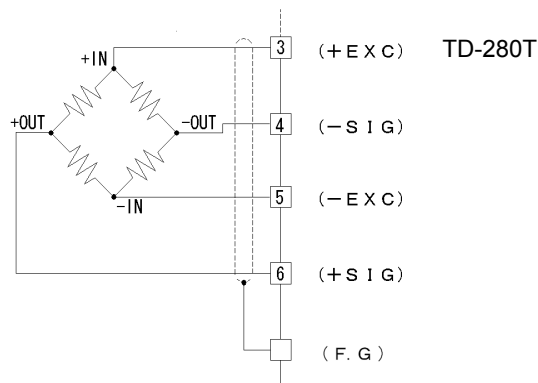
Bridge voltage can be set to 2.5 V or 10 V.



Caution

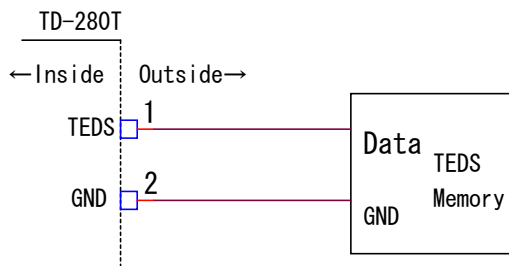
Be sure to set a bridge voltage before connecting a sensor.
Incorrect connection may damage the sensor.

◇ Connecting Sensor



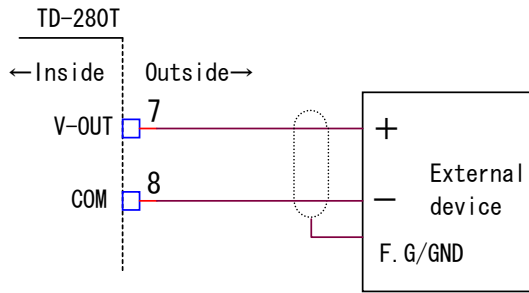
For 6-wire load cell, short-circuit +EXC with +SENSE and -EXC with -SENSE; and connect to terminal No.3 (+EXC) and terminal No.5 (-EXC).

2-2 Connecting TEDS Memory



You need to connect TEDS memory to TD-280T when using a TEDS sensor.
Otherwise, leave it unconnected.

2-3 Connecting Voltage Output (V-OUT)



V-OUT is not isolated from the internal circuit. Use a shield cable for connecting V-OUT with an external device and keep an extended wiring cable as short as possible.

Do not short-circuit the voltage output; and do not applying external voltage.

Doing so may cause a failure.

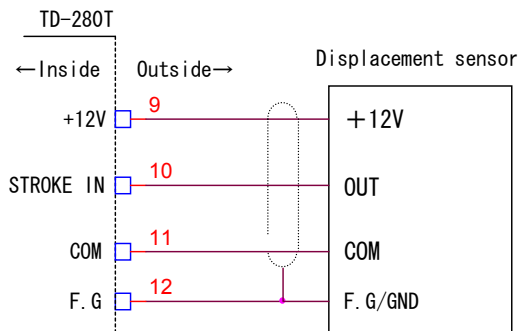
When you do not use the voltage output, leave it unconnected.

Output voltage is approx. 1 V per 1 mV/V (sensor input). This value is voltage output after zero balance of a sensor is achieved.

2-4 Connecting Displacement Sensor

◇ Connecting displacement sensor

• Connecting voltage output sensor

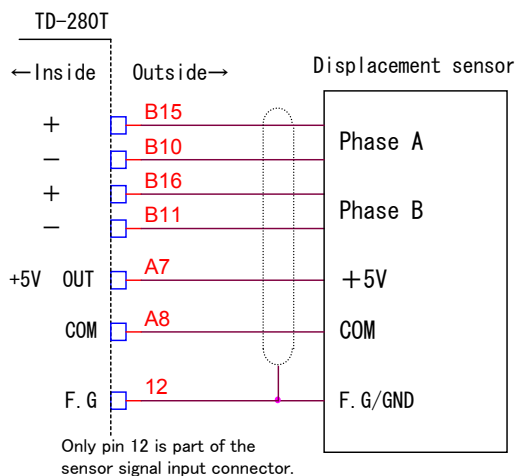


Input: ± 10 V

Pin No. 9 (+12 V power supply) provides 250 mA (maximum) as a power source for the sensor.

Sensor signal input connector

• Connecting pulse output sensor



Connect a differential square-wave output type displacement sensor.

TD-280T receives the differential output (RS422 level) signal from the sensor and converts it to a TTL level.

Pin No. A7 (+5 V power supply) provides 500 mA (maximum) as a power source for the sensor.

When the displacement sensor requires a power supply of +12 V, use the displacement sensor power supply (+12 V, pin No. 9) of the sensor input connector.

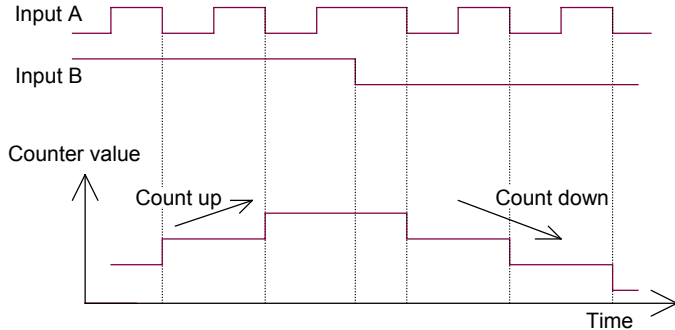
Control signal input/output connector

- The displacement sensor power supply (pin No. 9) of the sensor input connector provides a fixed output of +12 V.

◇ **Internal count for pulse sensor output**

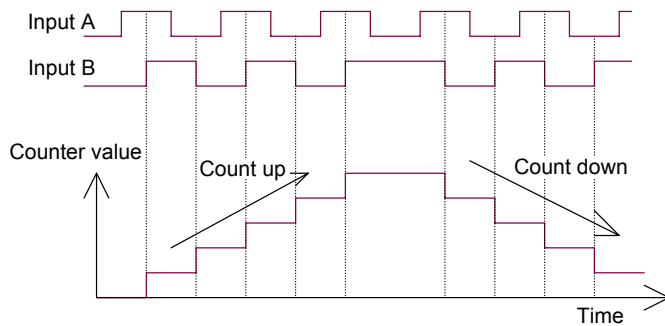
TD-280T has two modes for the output signal of a pulse displacement sensor. In one mode, only the phase A is counted, and in the other mode, the phases A, B (two-phase signal) are counted. The sensor type **A** and the sensor type **A·B** count values differently as shown below.

• **For sensor type A**



Pulses at Input A are counted. Input B controls count direction (count-up or count-down). The counter counts at the falling edge (ON) of the pulse signal at Input A; counts up when Input B is turned off (HI); and counts down when Input B is turned on (LO).

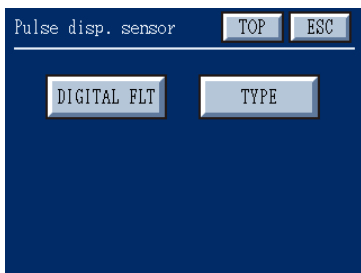
• **For sensor type A·B**



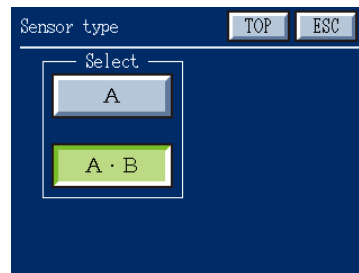
The counter counts at both the rising and falling edges of the pulse signal at Input B. The behavior of the counter (up-counting or down-counting) depends on the state (ON or OFF) of the pulse at Input A. Refer to the table on the next page.

◇ **Sensor type settings**

From the Displacement sensor screen, select **"PULSE"** and set **"DIGITAL FLT"** and **"TYPE"** of a pulse type displacement sensor.



Pulse disp. Sensor screen











Sensor type screen



◇ **Behavior of counter for sensor type A**

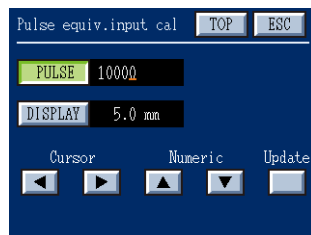
Input A	Input B	Behavior of counter
	HI	Counter up
	LO	Counter down

Count at falling edge (from HI to LO)

◇ Behavior of counter for sensor type A, B

Input A	Input B	Behavior of counter
HI		Count up
LO		
	LO	
	HI	
HI		Count down
LO		
	HI	
	LO	

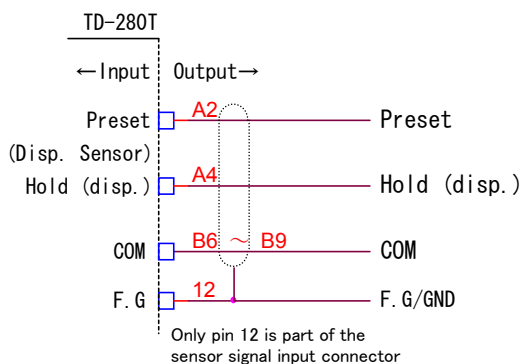
 Count at falling edge
(from HI to LO)
 Count at rising edge
(from LO to HI)



Pulse equiv. input cal screen

Set the pulse and the display value in the Pulse equiv. input cal screen in accordance with the specifications of your sensor.

◇ Connecting external signal for displacement sensor



Control signal input connector

The external control signal inputs for a displacement sensor are as follows.

Preset

When this Preset terminal is externally turned on, a value which has been set by selecting the “DISP. ADJUST” in the Pulse cal screen is displayed as a current displacement value.

Hold (Displacement)

When this Hold (Displacement) terminal is externally turned on, displacement at that time is held. This function is effective for the hold mode settings. A value which has been set by selecting the “DISP. ADJUST” in the Pulse cal screen is displayed as a current displacement value.

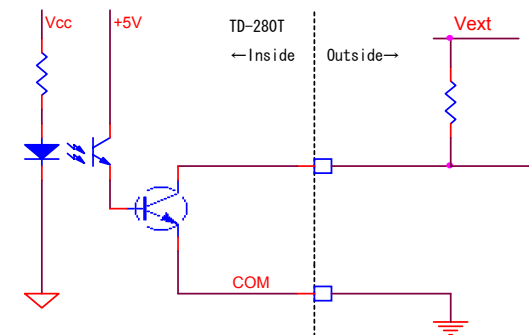


Pulse disp. Adjust screen

2-5 Connecting Control Signal Input/Output

2-5-1 Connecting External Output

Output equivalent circuit



Open collector output capacity: 30 V (max), 30mA (max).

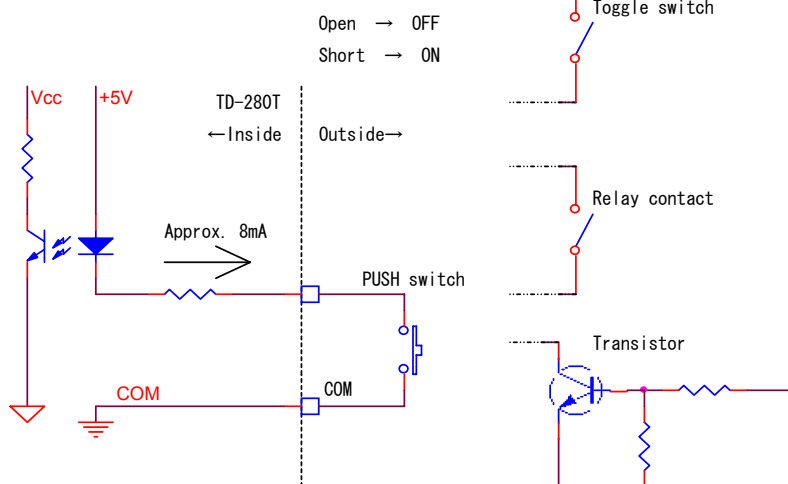
Every control signal output is designed to be electrically isolated from the internal circuit by the photocouplers.

State of output transistor

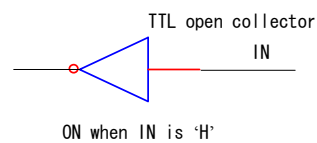
Output data	Transistor
0	OFF
1	ON

2-5-2 Connecting External Input

Input equivalent circuit



+5V power supply is electrically isolated from TD-280T internal power supply



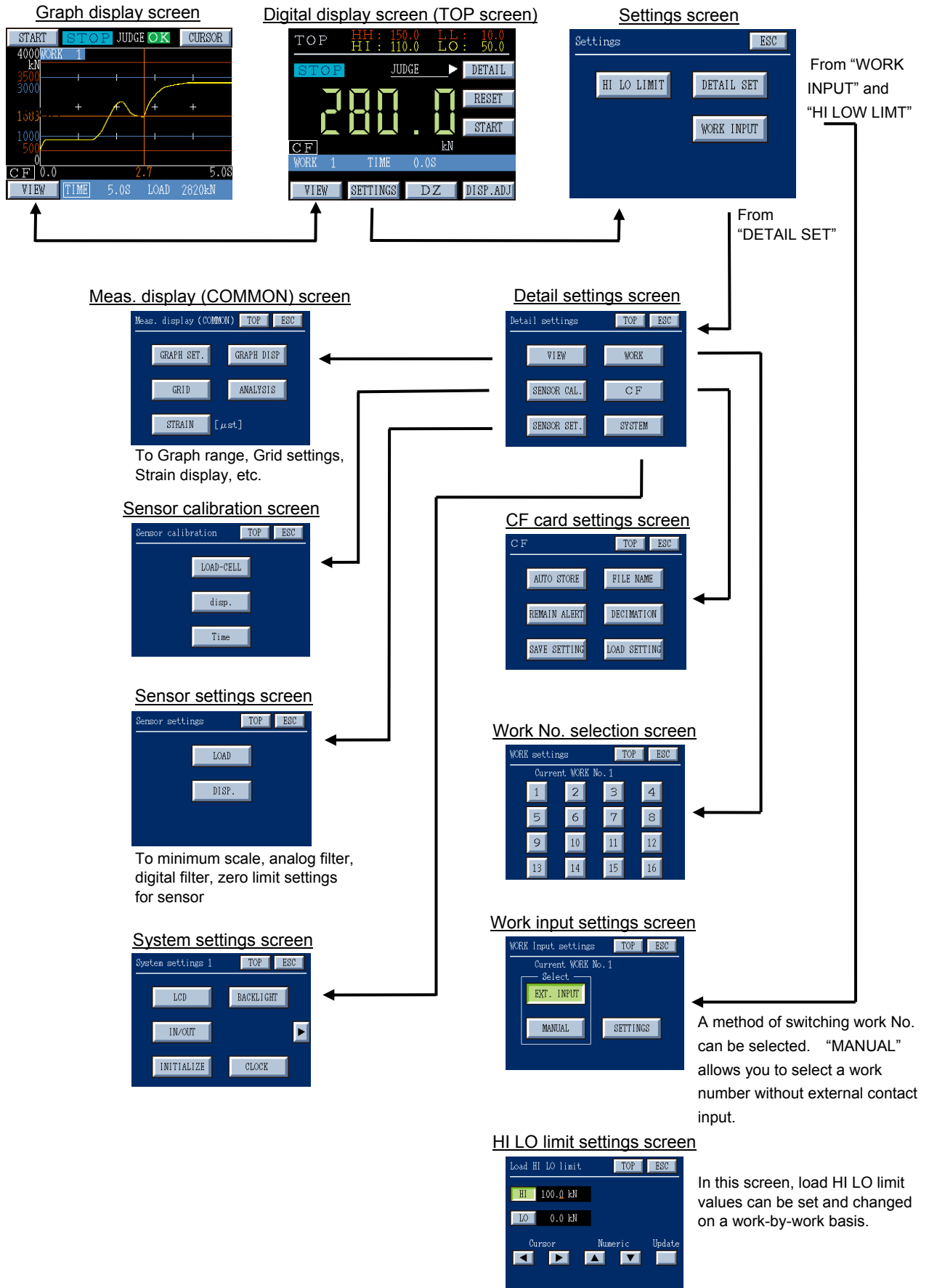
Because a current of approx. 8 mA flows into the external contact when it is turned ON, use a contact element which withstands 10 mA or more.

Avoid applying external voltage.

Every control signal input is designed to be electrically isolated from the main circuit by the internal isolated power supply (5 V).

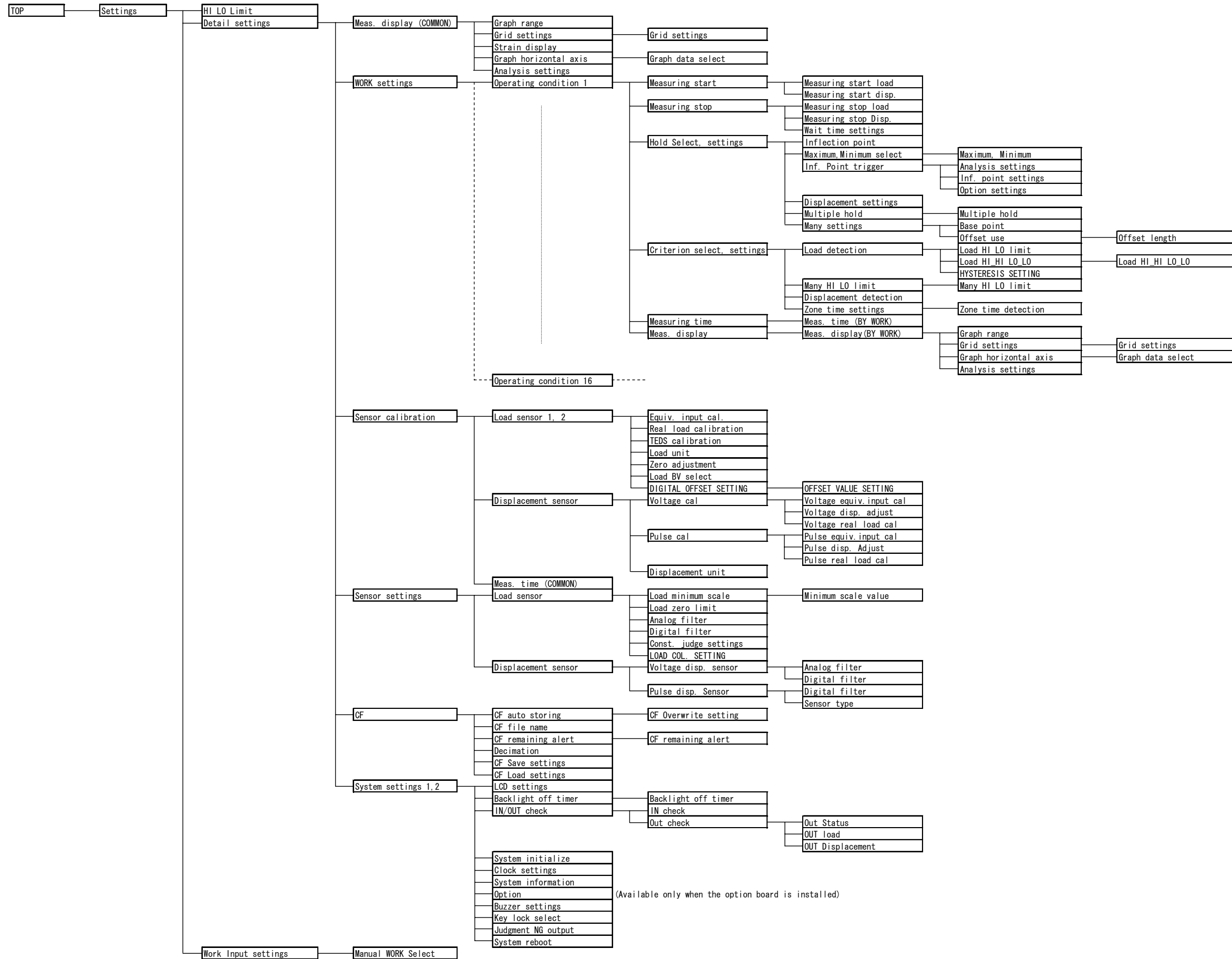
3. Setting Mode Configuration

3-1 Screen Configuration



"TOP" button (if available) on each screen allows you to return to the digital display screen (TOP screen).

3-2 Hierarchy of Setting Screens



4. Calibration of Sensor

4-1 Calibration of Load

“Calibration” refers to an operation for matching between the TD-280T and a strain gauge sensor.

The TD-280T offers the three calibration methods as described below.

Here is the calibration of load. For displacement, two calibration methods are supported: equivalent input calibration and real load calibration.

◇ Equivalent input calibration

This approach uses no actual loads but key entry of the rated output value (mV/V) of the strain gauge sensor and the rated capacity (value to be displayed). This method is simple and employed when actual loads cannot be applied.

For example, gain will be automatically determined and displayed by entering the values indicated as follows:

For load: 2.001 mV/V-100 N

For pressure: 2.002 mV/V-10.00 MPa

For torque: 2.502 mV/V-15.00 N·m

At the time of factory shipment, a data sheet is attached to a strain gauge sensor, indicating the following values.

Rated Capacity····· Load (Unit: kg, ton, etc.)

Rated Output····· Voltage (Unit: mV/V)

Nonlinearity····· %R.O

Hysteresis····· %R.O

Input Terminal Resistance····· Ω

Output Terminal Resistance····· Ω

Zero Balance····· $\times 10^{-6}$ strain

The rated capacity and rated output are the necessary values for equivalent calibration.

For a TEDS sensor, these data are stored on the internal memory.

◇ Real load calibration

It is an accurate and low-error calibration method by applying a real load to the strain gauge sensor and entering the display value (load value) set on the equivalent input calibration screen.

◇ TEDS calibration

It is a calibration method using the data stored in a TEDS memory in which the rated output value (mV/V) and the rated capacity of a strain gauge sensor are recorded.

Two types of TEDS-compatible memories are available: 1 kBit and 4 kBit. TD-280T supports only 4 kBit memory.

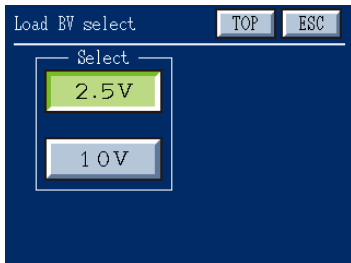
4-2 Before Calibration

◇ Setting bridge voltage

Set a bridge voltage in accordance with the specifications of a strain gauge sensor.

Note that selecting an incorrect bridge voltage may damage the sensor.

From the TOP screen, select “**SETTINGS**”→“**DETAIL SET**”→“**SENSOR CAL.**”→“**LOAD-CELL**”→“**BV**” to set a bridge voltage.



Load B.V select screen (with 2.5 V selected)



Caution

Be sure to set a bridge voltage before connecting a sensor.
Incorrect connection may damage the sensor.

◇ In case that indication is “unstable”/Zero balance is not achieved

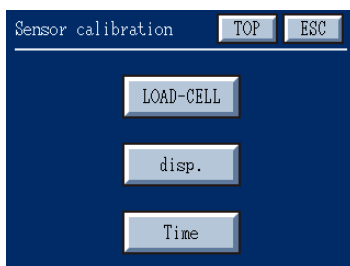
If indication is unstable when a strain gauge sensor is connected and powered on or if zero balance is not achieved at the moment of calibration, the zero adjustment range (0 to ± 2 mV/V) may be exceeded.

In this case, switch to the “Strain display” mode (by choosing “**SETTINGS**”→“**DETAIL SET**”→“**VIEW**”→“**STRAIN**”) and check the indicated value.

In this mode, a strain value which includes offset is shown as a sensor output. A sensor output of ± 3 mV/V is indicated as 0 to ± 6000 μst .

4-3 Sensor Calibration

From the TOP screen, select “**SETTINGS**”→“**DETAIL SET**”→“**SENSOR CAL.**”





Sensor calibration screen

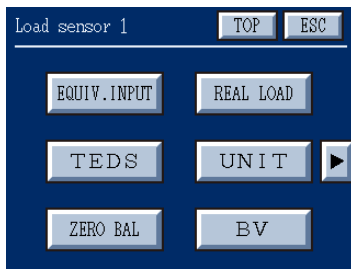
In the Sensor calibration screen, specify settings for load sensor and displacement sensor calibrations and measuring time.

4-3-1 Calibrating Load Sensor

From the Sensor calibration screen, select “**LOAD-CELL**” to display the Load sensor 1 screen.

In the Load sensor screen, specify settings for equivalent calibration, TEDS calibration, zero adjustment, real load calibration, unit select, BV select, and digital offset.

Pushing  on the Load sensor 1 screen advances to the Load sensor 2 screen, and pushing  on the Load sensor 2 screen returns to the Load sensor 1 screen.



Load sensor 1 screen



Load sensor 2screen

Prior to each calibration, select “**ZERO BAL**” on the Load sensor screen to perform zero adjustment. Be sure to perform the zero adjustment to record an initial zero point of a connected sensor. This zero point serves as a base point of “**zero limit**” value, which is available in the Load sensor screen.

Further, push the “**UNIT**” button to set the unit of a load sensor.

Seven types of units are supported: N, kN, g, kg, MPa, kPa, and Nm.

4-3-1-1 Equivalent Input Calibration





From the Load sensor 1 screen, select “**EQUIV. INPUT.**”





Equiv. input cal. screen

Enter a rated output based on the data sheet of the connected sensor.

Next, enter a rated capacity on the entry screen based on the data sheet of the sensor as well.

Set values by selecting “R.O.” or “DISPLAY” (“R.O.” is selected in the figure on the left), using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “Update” button to confirm.

To change the decimal point position of the indicated value, place the cursor over the decimal point, and use the   key to move the decimal point.

4-3-1-2 Real Load Calibration

Prior to performing a real load calibration, select “**EQUIV. INPUT**” and set an actual load value as “**DISPLAY**” value in the Equivalent input calibration screen. This load value is reflected in “**Real load calibration.**”



Real load calibration screen

From the Load sensor 1 screen, select “**REAL LOAD**” to perform “**ZERO**” and “**MEASURE.**”

ZERO (Zero point measurement): With the load sensor unloaded, push the “**ZERO**” button to set the zero point of the sensor.

A bar is displayed indicating the zero point amount. The indicated value is zero.

If the indicated value is stable or non-zero is indicated, check the sensor and sensor cable.

Zero point is adjustable within a range of about ± 2 mV/V.

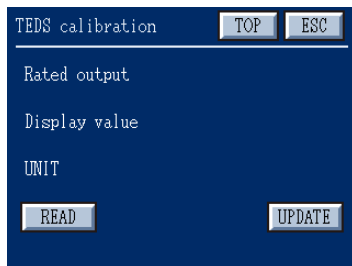
MEASURE (Span adjustment): Place a weight to be measured on the sensor and push the “**MEASURE**” button.

A bar is displayed indicating the amount of displacement. When your desired display appears, push the “OK” button to terminate the processing. Just as in the case of zero point measurement, if the indicated value is stable or non-zero is indicated, check the sensor and sensor cable.

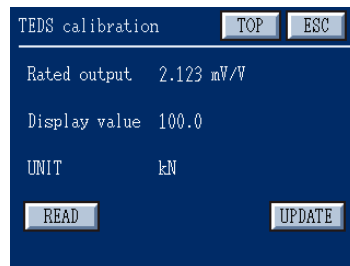
Perform “ZERO” and “MEASURE” and then push the “UPDATE” button. The real load calibration will take effect.

4-3-1-3 TEDS Calibration

From the Load sensor 1 screen, select “TEDS.”



TEDS calibration screen



Example of screen after data read

Push the “READ” button on the TEDS calibration screen.

When read is completed, the rated output of the sensor as well as display value (rated capacity) and its unit are displayed on the screen. Then push the “UPDATE” button to complete the calibration.

Caution) You need to connect a TEDS-capable sensor to TD-280T if performing TEDS calibration.

◇ **Rated capacity display digit in TEDS calibration**

A TEDS calibration performs a sensitivity calibration by retrieving the memory data in the sensor. A sensor is available in various rated capacities (display values).

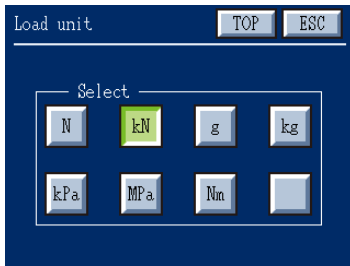
In TEDS calibration, TD-280T displays rated capacity values as shown in the table below.

The TEDS calibration data is stored in TD-280T. Thus, if any changes to display values are required after the calibration is performed, return to the Equivalent input calibration screen and change the value of “**DISPLAY**” and its decimal point position.

TEDS calibrated data (mV/V) display values	Indicator display number of digits after the decimal point
1N	1. 000
2N	2. 000
3N	3. 000
4N	4. 000
5N	5. 00
10N	10. 00
20N	20. 00
30N	30. 00
40N	40. 00
50N	50. 0
100N	100. 0
200N	200. 0
300N	300. 0
400N	400. 0
500N	500
1KN	1. 000
2KN	2. 000
3KN	3. 000
4KN	4. 000
5KN	5. 00

4-3-1-4 Selecting Load Unit

From the Load sensor 1 screen, select “**UNIT.**”



Load unit screen

Set the unit of load.

Available settings: N, kN, g, kg, kPa, MPa, Nm, or NONE.

4-3-1-5 Adjusting Zero Point

From the Load sensor 1 screen, select “**ZERO BAL.**”

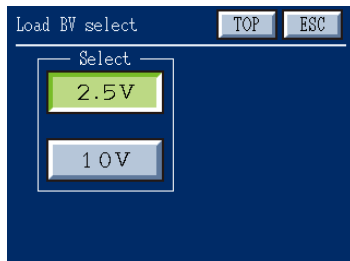


Zero adjustment screen

Be sure to perform the zero adjustment to record an initial zero point of a connected sensor. The zero point serves as a base point for measurement.

4-3-1-6 Selecting BV (Bridge Voltage)

From the Load sensor 1 screen, select “**BV.**”



Load BV select screen

Set a bridge voltage (EXC) in accordance with the specifications of the sensor.

Available settings: either 2.5 V or 10 V.

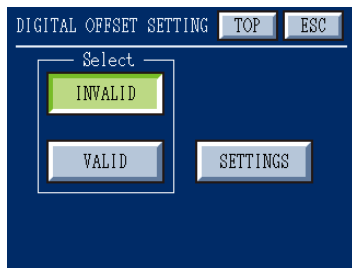


Caution

Be sure to set a bridge voltage before connecting a sensor.
Incorrect connection may damage the sensor.

4-3-1-7 Setting Digital Offset (Tare)

From the Load sensor 2 screen, select “**DIG. OFFSET.**”



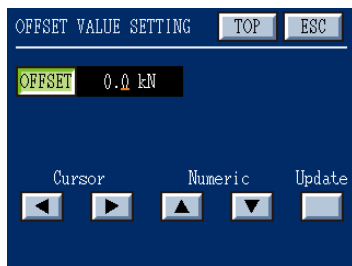
DIGITAL OFFSET SETTING screen

The digital offset function displays a value obtained by subtracting a set digital offset value from a measured value.

This function is disabled for the real load calibration.





INVALID : The digital offset function is disabled.

VALID : The digital offset function is enabled.





OFFSET VALUE SETTING screen

Select “**SETTINGS**” on the DIGITAL OFFSET SETTING screen to set a digital offset value.

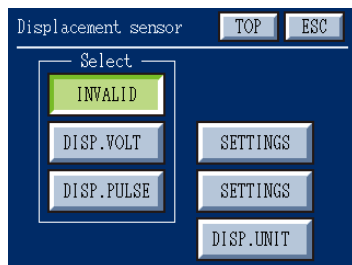
Set values by using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “Update” button to confirm.

Set the sign by placing the cursor to the leftmost position, and using the

  key to determine the sign.

4-3-2 Setting Displacement Sensor

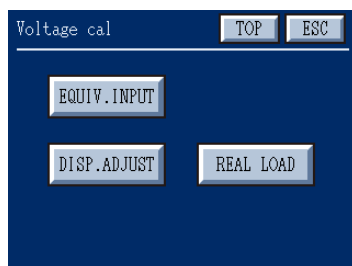
From the Sensor calibration screen, select “**DISP.**” to display the Displacement sensor screen.



The Displacement sensor screen allows you to select no displacement sensor, voltage output displacement sensor, or pulse output displacement sensor; and then to set equivalent input calibration, displacement adjustment values, and real load calibration.

4-3-2-1 Setting Voltage Output Displacement Sensor

From the Displacement sensor screen, select “**SETTINGS**” next to “**DISP. VOLT.**”



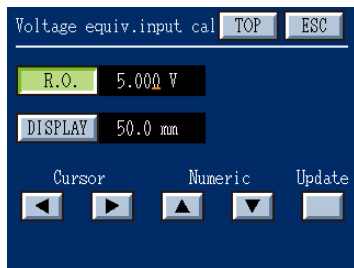
Voltage displacement cal. screen

Like load sensors, equivalent input calibration and real load calibration are available.

Equiv. Input (Equivalent input calibration): Enter a rated output and a rated capacity (the amount of displacement) based on the data sheet of the connected sensor. Maximum output voltage from the sensor is ± 10 V.

REAL LOAD (Real load calibration): Actually move the displacement sensor from the zero position to the full scale position to perform calibration.

4-3-2-1-1 Equivalent Input Calibration









Voltage equivalent input calibration screen

From the Voltage cal screen, select “**EQUIV. INPUT.**”

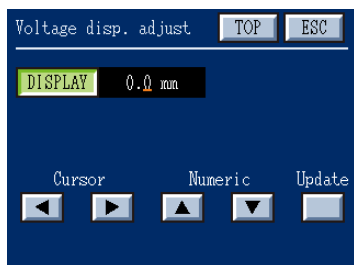
Enter the amount of displacement (mm) and a rated output (voltage) based on the data sheet of the connected displacement sensor.

Next, enter a rated capacity on the entry screen based on the data sheet of the sensor as well.

Set values by selecting “R.O.” or “DISPLAY” (“R.O.” is selected in the figure on the left above), using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “**Update**” button to confirm.

To change the decimal point position of the indicated value, place the cursor over the decimal point, and use the   key to move the decimal point.





4-3-2-1-2 Setting Displacement Adjustment Value



Displacement adjustment value setting screen

From the Voltage cal screen, select “**DISP. ADJUST.**”

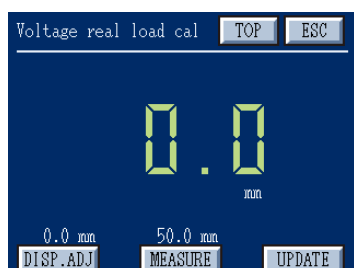
The zero point value (preset position) of a displacement sensor can be set in advance by entering the numerical value.

Set values by using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “**Update**” button to confirm.

When you push the “**DISP. ADJ**” button on the TOP screen or “**Displacement Position Adjustment**” signal is externally input, this set value is preset as displacement.

(initial value: 0)

4-3-2-1-3 Real Load Calibration



Real load calibration screen

From the Voltage cal screen, select “**REAL LOAD.**”

DISP. ADJ (Displacement adjustment): Set the displacement sensor to your intended zero point (base point), and push the “DISP. ADJ” button. A bar is displayed indicating the zero point amount. The display value is zero.

However, if a displacement adjustment value is set to non-zero, the value is displayed here.

MEASURE (Span adjustment): Apply a specified amount to the displacement sensor, and push the “MEASURE” button. A bar is displayed indicating the amount of displacement, and then your desired display appears.

However, if the displacement adjustment value is set to non-zero, a value after the set displacement adjustment value is added is displayed.

Perform “DISP. ADJ” and “MEASURE” and then push the “UPDATE” button to take effect.

4-3-2-2 Setting Pulse Output Displacement Sensor

From the Displacement sensor screen, select “**SETTINGS**” next to “**DISP. PULSE.**”



Displacement pulse cal. screen

Like load sensors, equivalent input calibration and real load calibration are available.

Equiv. Input (Equivalent input calibration): Enter the pulsed quantity associated with the amount of displacement based on the data sheet of the connected sensor.

REAL LOAD (Real load calibration): Actually move the displacement sensor from the base point (zero point) position to the full scale position to perform calibration.

4-3-2-2-1 Equivalent Input Calibration







Pulse equiv. input cal screen

From the Pulse cal screen, select “**EQUIV. INPUT.**”

In “**DISPLAY,**” enter the amount of displacement (mm) of your device such as a displacement gauge. In “**PULSE,**” enter the number of output pulses.

Up to a maximum of 65535 pulses can be counted.

The initial value of the counter is set in the **Pulse disp. adjust** screen.

Set values by selecting “**PULSE**” or “**DISPLAY**” (“**PULSE**” is selected in the figure on the left above), using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “**Update**” button to confirm.

To change the decimal point position of the display value, place the cursor over the decimal point, and use the   key to move the decimal point.

Example of setting

Resolution [μ m]	Pulse	Display value [mm]	Maximum measured length [mm]
0.5	1000	0.5	32.76
1		1.0	65.53
2		2.0	131.0
5		5.0	327.6
10		10.0	655.3



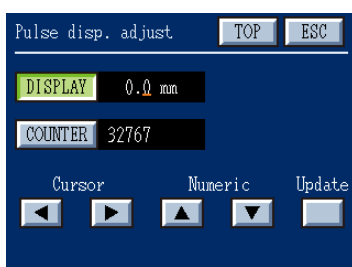
Caution

Up to a maximum of 65535 pulses can be counted.

Values higher than 65535 will cause overflow error, and values lower than zero will cause underflow error.

Performing displacement adjustment clears counts.

4-3-2-2-2 Setting Displacement Adjustment Value



From the Pulse cal screen, select “**DISP. ADJUST.**”





The adjustment value (preset position) of a displacement sensor can be set in advance by entering the numerical value.

DISPLAY: Numerically enter the zero point value of a displacement sensor.

When you push the “**DISP. ADJ**” button on the TOP screen or “**Displacement Position Adjustment**” signal is externally input, this set value is preset as displacement.

(Initial value: 0.0 mm)

COUNTER: The internal 16 bit counter can count from 0 to 65535. However, in some cases, a count value may be as high as 65535 or more, or may be as low as 0 or less. To maintain effective balance between them, position the center of the sensor at 32767. (Initial value: 32767)

Set values by selecting “DISPLAY” or “COUNTER” (“DISPLAY” is selected in the figure on the left above), using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “Update” button to confirm.

4-3-2-2-3 Real Load Calibration



Pulse real load cal screen

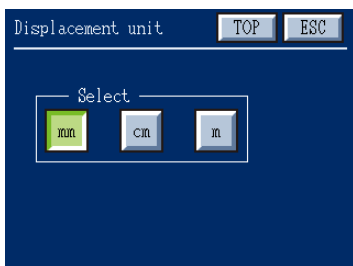
From the Pulse cal screen, select “**REAL LOAD.**”

DISP. ADJ (Zero point adjustment): Set the displacement sensor to your intended base point (zero point), and push the “**DISP. ADJ**” button. A bar is displayed indicating the zero point amount. The display value is zero. However, if non-zero is set in “**DISP**” of the Pulse disp. adjust screen, the set value is displayed.

MEASURE (Span adjustment): Apply a specified amount to the displacement sensor, and push the “**MEASURE**” button. A bar is displayed indicating the amount of displacement, and then your desired display appears. However, if the displacement adjustment value is set to non-zero, a value after the set displacement adjustment value is added is displayed.

Perform “**DISP. ADJ**” and “**MEASURE**” and then push the “**UPDATE**” button to take effect.

4-3-2-3 Setting Displacement Unit



Displacement unit screen

From the Displacement sensor screen, select “**DISP. UNIT.**”

Set the unit of displacement.

Available settings: mm, cm, or m.

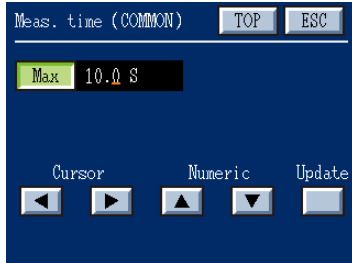
4-3-3 Setting Measuring Time

From the Sensor calibration screen, select “**TIME.**”

Measuring time is set along the time axis (horizontal axis) of the graph display screen.

A measuring time of 0.1 to 30.0 seconds can be set.





A set time serves as the maximum time (from the start of measurement).

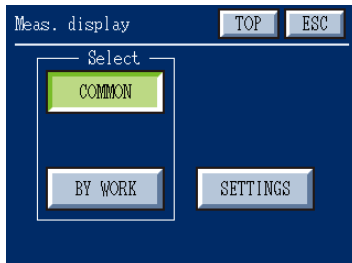


Meas. Time (COMMON) screen

Set the maximum measuring time in the Meas. Time (COMMON) screen.

A measuring time of 0.1 to 30.0 seconds can be set.

Set values by using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “**Update**” button to confirm.



Measuring time screen of each work

The measuring time which is set here is applied when you select “**COMMON**” in measuring time setting for each work.

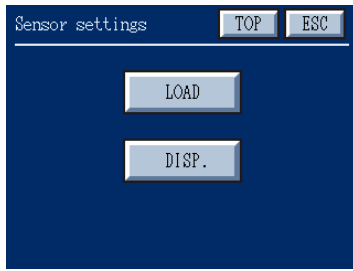
To select “**COMMON,**” from the TOP screen, select “**SETTINGS**”→“**DETAIL SET**”→“**WORK**”→“**Work No.**” (1 to 16)→“**MEAS.TIME**” to access the Measuring time screen.

If you want to set a measuring time on a work-by-work basis, select “**BY**

WORK”→“**SETTINGS**” in the Measuring time screen to enter a desired value.

5. Sensor Settings

Determine detail settings for load and displacement sensors.



Sensor settings screen

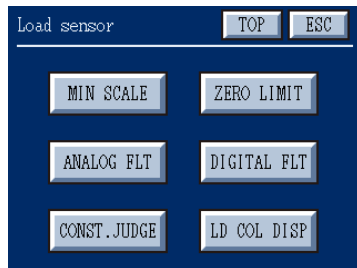
The Load sensor screen allows you to determine settings for a minimum scale value, digital/analog filters, constant judgment, a zero limit value, and load color display.

The displacement sensor screen allows you to determine settings for analog and digital filters.

5-1 Load Sensor Settings

Specify load sensor settings for a minimum scale value, digital and analog filters, a zero limit value, constant judgment, and load color display.

From the Sensor settings screen, select “**LOAD.**”

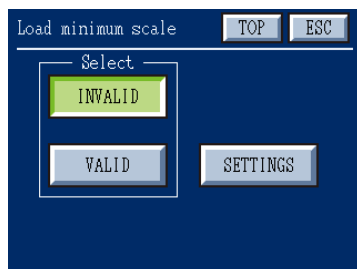


Load sensor screen

The Load sensor screen allows you to determine settings for “**MIN SCALE**”, “**ZERO LIMIT**”, “**ANALOG FLT**”, “**DIGITAL FLT**”, “**CONST. JUDGE**” and “**LD COL DISP.**”

5-1-1 Minimum Scale Settings

From the Load sensor screen, select “**MIN SCALE.**”

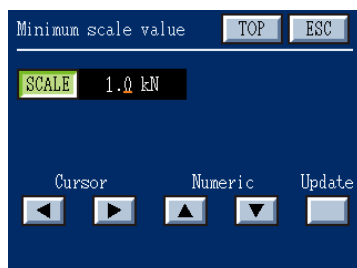


Load minimum scale screen

Select whether the minimum scale settings for load value display are enabled or disabled.

INVALID: The minimum scale settings are disabled.





VALID : The minimum scale settings are enabled.



Minimum scale value screen

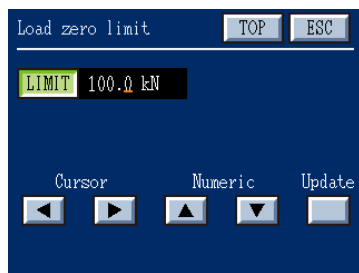
On the “Load minimum scale” screen, select “**SETTINGS**” to enter a minimum scale value.

All load values are truncated according to the specified value.

Set values by using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “**Update**” button to confirm.

5-1-2 Zero Limit Settings





From the Load sensor screen, select “ZERO LIMIT.”



Load zero limit screen

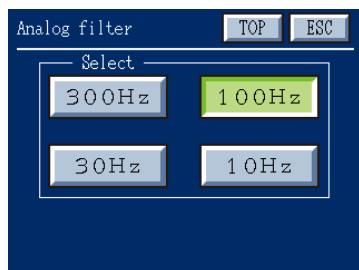
Specify a range where the “DZ” (Digital Zero) function is effective.

The Digital Zero function performs comparison based on the load value set in “ZERO BAL” on the Load sensor 1 screen (accessible from the Sensor calibration screen). If the load value detected when the DZ button is pressed exceeds the zero limit value specified here, the Digital Zero function will not work. This will prevent possible failures of the load sensor, such as a shift of the zero point.

Set values by using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “Update” button to confirm.

5-1-3 Analog Filter Settings

From the Load sensor screen, select “ANALOG FLT.”



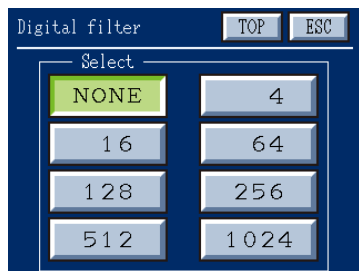
Analog filter screen

This analog filter has a cutoff frequency of 10Hz, 30Hz, 100Hz or 300Hz, and is connected upstream of the A/D converter.

When necessary, such as when load values are unstable, select an appropriate frequency.

5-1-4 Digital Filter Settings

From the Load sensor screen, select “DIGITAL FLT.”

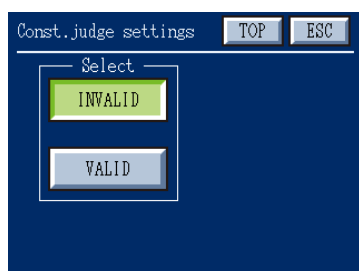


Digital filter screen

This digital filter utilizes the moving average technique. Select the number of measurements: NONE, 4, 16, 64, 128, 256, 512 or 1024.

5-1-5 Constant Judge Settings

From the Load sensor screen, select “CONST. JUDGE.”



Const. judge settings screen

When enabled, until a measured value is held, results obtained by judging the present value according to the judgment conditions are always output.

After a measured value is held, results obtained by judging the held value according to the judgment conditions are output.

When “NONE” is selected on the Criterion select screen, judgment results are not output.

INVALID: After a value is held, results obtained by comparing the held value with the load H_H/L_L limits and HI/LO limits are always output (Before a value is held, results are not output).

VALID : Results obtained by comparing the present value with the load

H_H/L_L limits and HI/LO limits are always output.
After a value is held, results obtained by comparing the held value with the load H_H/L_L limits and HI/LO limits are always output.

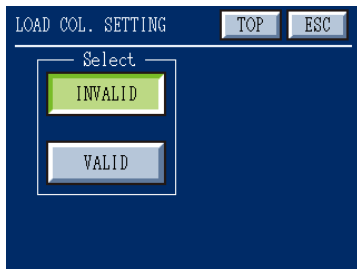


Caution

If you select “**MULTIPLE**”, “**INF.TRG**”, or “**MANY**” on the Hold Select screen, stable judgment is disabled. In this case, if you select “**VALID**”, your settings are ignored.

5-1-6 Load Value Color Display Settings

From the Load sensor screen, select “**LD COL DISP.**”



LOAD COL. SETTING screen

When enabled, load values are displayed in different colors according to the judgment results. Red indicates H_H and L_L limit values, yellow indicates HI and LO limit values, and green indicates a normal value.

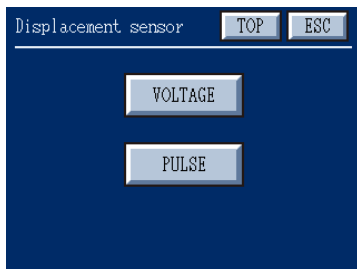
INVALID: Values are displayed in pale yellow.

VALID : Values are displayed in different colors according to the judgment results.

5-2 Displacement Sensor Settings

Specify displacement sensor settings for digital and analog filters and the type of pulse sensor.

From the Sensor settings screen, select “**DISP.**”.



Displacement sensor screen

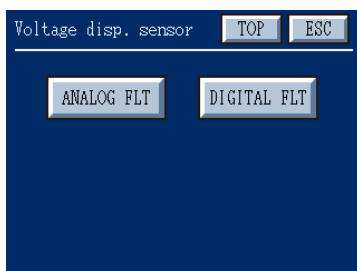
Select the type of displacement sensor you want to set.

VOLTAGE: Specify settings for voltage displacement sensors.

PULSE : Specify settings for pulse displacement sensors.

5-2-1 Voltage Displacement Sensor Settings

From the Displacement sensor screen, select “**VOLTAGE.**”

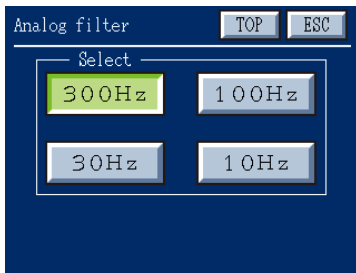


Voltage disp. sensor screen

The Voltage disp. sensor screen allows you to determine setting for analog and digital filters.

5-2-1-1 Analog Filter Settings

From the Voltage disp. sensor screen, select “**ANALOG FLT.**”



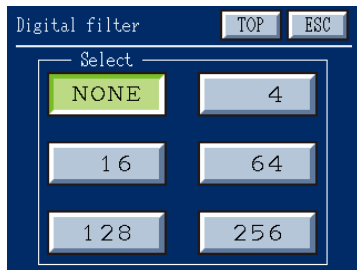
Analog filter screen

This analog filter has a cutoff frequency of 10Hz, 30Hz, 100Hz, or 300Hz, and is connected upstream of the A/D converter.

When necessary, such as when displacement values are unstable, select an appropriate frequency.

5-2-1-2 Digital Filter Settings

From the Voltage disp. sensor screen, select “**DIGITAL FLT.**”

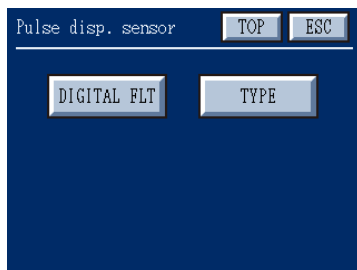


Digital filter screen

This digital filter utilizes the moving average technique. Select the number of measurements: NONE, 4, 16, 64, 128, or 256.

5-2-2 Pulse Displacement Sensor Settings

From the Displacement sensor screen, select “**PULSE.**”

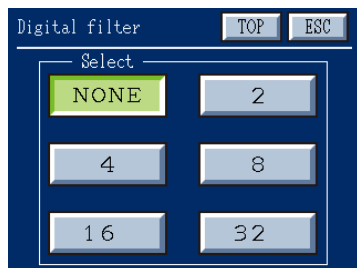


Pulse disp. sensor screen

The Pulse disp. sensor screen allows you to determine settings for digital filters and sensor type.

5-2-2-1 Digital Filter Settings

From the Pulse disp. sensor screen, select “**DIGITAL FLT.**”

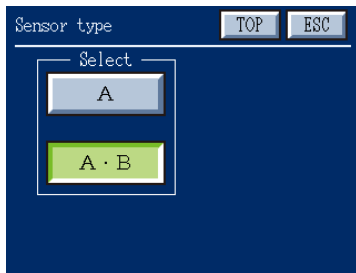


Digital filter screen

This digital filter utilizes the moving average technique. Select the number of measurements: NONE, 2, 4, 8, 16, or 32.

5-2-2-2 Type Settings

From the Pulse disp. sensor screen, select “TYPE.”



Sensor type screen

Specify the type of differential pulse output displacement sensor.

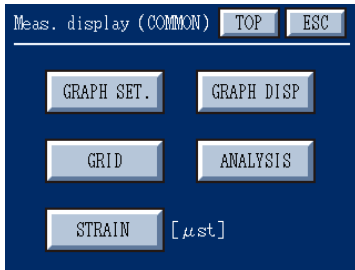
A: Select for one-phase sensors.

A · B: Select for two-phase sensors.

Note:

6. Measurement Display Settings

From the TOP screen, select “SETTINGS”→“DETAIL SET”→“VIEW.”

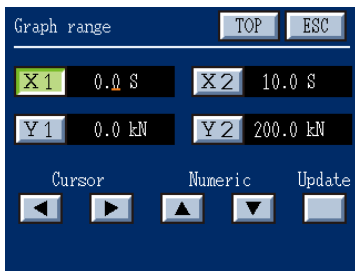


Meas. display (COMMON) screen

The Meas. Display (COMMON) screen allows you to determine settings for “GRAPH SET.”, “GRID”, and “STRAIN.”

6-1 Graph Range Settings

From the Meas. display (COMMON) screen, select “GRAPH SET.”



Graph range screen

Set the graph range.







- X1:** Set the plot start time along the horizontal axis. In most cases, enter 0.0 s.
- X2:** Set the plot stop time along the horizontal axis. In most cases, enter the measuring time.
- Y1:** Set the plot value along the load axis. In most cases, enter “0.”
- Y2:** Set the maximum plot value along the load axis. In most cases, enter the maximum load value of the load sensor.

When load and displacement are set as the vertical axis (refer to “6-4 Graph Display.”)

- Y1:** Set the plot value along the displacement axis.
- Y2:** Set the maximum plot value along the displacement axis.

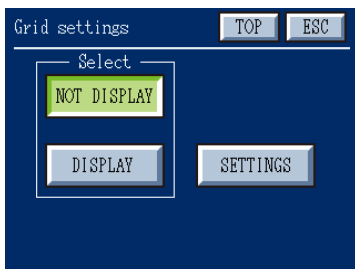


When load and displacement are set as the vertical axis

Set values by selecting an axis (X1, X2, Y1, Y2), using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “Update” button to confirm. Signs are set by moving to the leftmost position and using the   key (Y1,Y2).

6-2 Grid Settings

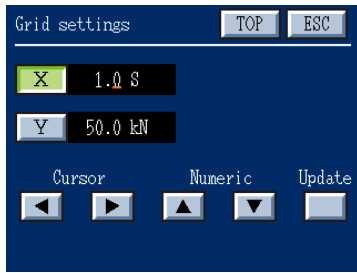
From the Meas. display (COMMON) screen, select “GRID.”



Grid settings screen

The Grid setting screen allows you to specify whether or not to display grid lines.





- NOT DISPLAY** : Grid lines are not displayed on graph screens.
- DISPLAY** : Grid lines are displayed on graph screens.



Grid settings screen

Select “**SETTINGS**” to set grid values.

- X**: Grid lines are plotted along the X axis which you set in “Graph range.”
When you select “Time” as the horizontal axis, about 1/5 to 1/10 of the time setting is suggested.
- Y**: Grid lines are plotted along the Y axis which you set in “Graph range.”
About 1/5 to 1/10 of the maximum plot value is suggested.

Set values by selecting an axis (X, Y), using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “**Update**” button to confirm.

6-3 Strain Display

The screen allows you to check the load sensor, and displays signals from the load sensor in units of the amount of strain.

It is recommended that you note down the strain value shown in “Strain display” when integrating TD-280T with your system.

From the Meas. display (COMMON) screen, select “**Strain.**”

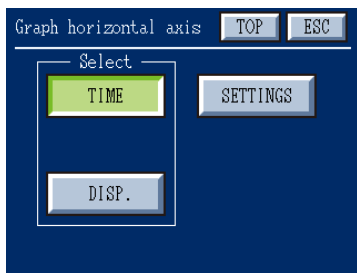


Strain display screen

An incoming value is displayed in strain mode (μst).

6-4 Graph Display

From the Meas. display (COMMON) screen, select “**GRAPH DISP**” to set the horizontal and vertical axes of the graph.

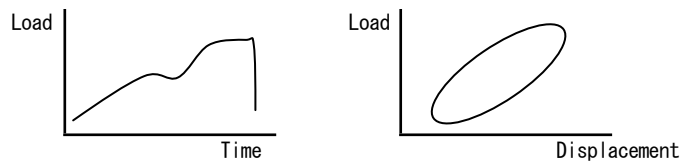


Graph horizontal axis screen

The Graph horizontal axis screen allows you to set the horizontal axis of the graph.

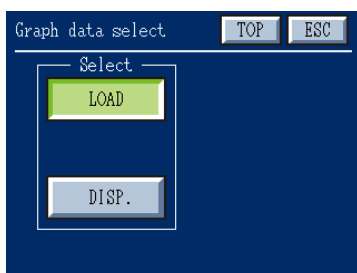
Select the unit of the horizontal axis of the graph.

- TIME** : Time is plotted along the horizontal axis.
- DISP.** : Displacement is plotted along the horizontal axis.



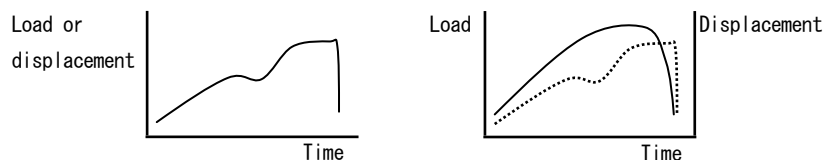
When you select “TIME” as the horizontal axis, push “**SETTINGS**” to select the vertical axis.

- LOAD** : Load is plotted along the vertical axis of the graph.
- DISP.** : Displacement is plotted along the vertical axis of the graph.



Graph data select screen

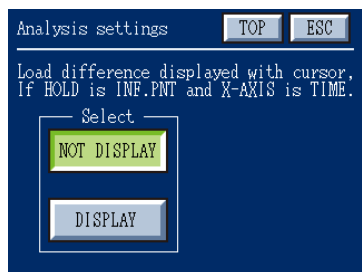
When both “LOAD” and “DISP.” are selected, load is plotted along the vertical axis (the left), displacement is plotted along the vertical axis (the right), and time is plotted along the horizontal axis.



Caution) To set displacement, from the TOP screen, you must select “**SETTINGS**”→“**DETAIL SET**”→“**SENSOR SET.**”→“**DISP.**” and then select either “**DISP.VOLT**” or “**DISP.PULSE**” to enable displacement.

6-5 Analysis Settings

When HOLD is INF.PNT, the inflection point is at the peak of load difference. But, from the load-time curve shown in the indicator, it is difficult to determine and set the load difference. The analysis settings screen allows you to plot the load difference over the load-time curve.



Analysis settings screen

When HOLD is INF.PNT and X-AXIS is TIME, load difference can be displayed along with the cursor.

NOT DISPLAY : Load difference is not displayed.

DISPLAY : Load difference is displayed.

◇ Displaying Load Difference



Graph screen

To display the load difference, select “**DISPLAY**” in the Analysis settings screen and then push the **CURSOR** button after the measurement is completed.

The figure on the left shows an example of load-time curve displayed on completion of measurement.



Load difference display

(if the conditions are not met)

The figure on the left shows an example of load-time curve displayed after the **CURSOR** is pushed.

The load difference is plotted in gray.

d:-0.1 in the upper left of the screen indicates the load difference at the cursor position.

The load difference is shown in green if the load value and load difference at the cursor point meet the flowing AND conditions, and otherwise shown in dark gray.

- the load value is larger than the detection start load value in the Inflection point hold.
- the load difference is larger than the load difference set in the Inflection point hold/
- the load value is increasing



Load difference display

(if the conditions are met)

Move the cursor to your desired inflection point and optimize the detection intervals A and B so that the load difference (d:) in the upper left is displayed in green and the slope of the load difference is largest.

◇ **Scaling the axis of the load difference graph**

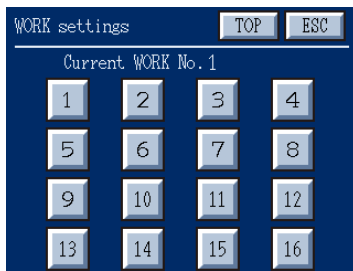
The load difference is scaled relative to a maximum load difference. It is automatically set to a maximum load difference times ± 1.25 .

Caution) the load difference is calculated after the load exceeds the detection start load value. Therefore, the load difference may not exist on the origin point along the horizontal axis.

Note:

7. Work Settings

7-1 Setting Work and Switching to a Different Work



Work settings screen

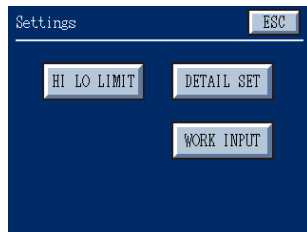
To select a work number and set the work, select “**SETTINGS**” → “**DETAIL SET**” → “**WORK.**” Set the operating condition for each work number.

Work settings allow you to program a maximum of 16 operating conditions.

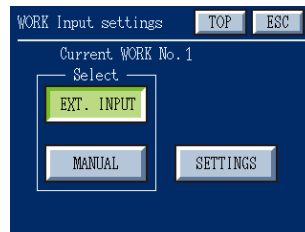
To switch to a different work, select “**SETTINGS**” → “**WORK INPUT**” from the TOP screen.

Select either “**EXT. INPUT**” or “**MANUAL.**” When you select “**MANUAL.**”, specify your desired **Work number (1 to 16)**.

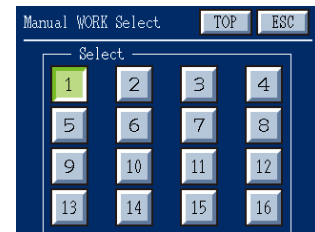
When you want to select a work number by using external signals (control signal inputs: B1, B2, B3, B4), select “**EXT. INPUT.**” In the external input mode, the external input signal given immediately before the measurement starts is applied. Once the measurement starts, if a different external input is given, the work number remains unchanged.



Settings screen



WORK Input settings screen



Manual WORK Select screen

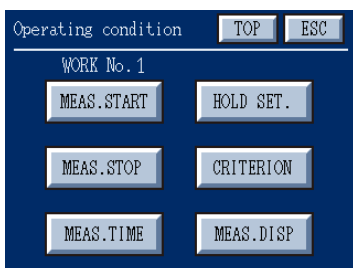


Caution

When using an external input signal to select a work number, make sure that a work number is selected before measurement starts.

7-2 Various Settings for Each Work

You can define various settings, such as measuring start/stop conditions, hold mode, and load criterion, for each work.



Operating condition screen

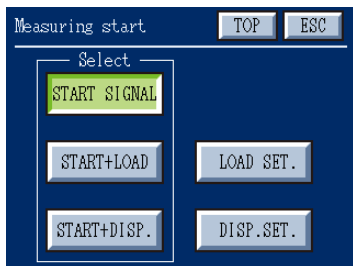
From the TOP screen, select “**SETTINGS**” → “**DETAIL SET**” → “**WORK**” → “**WORK No.**” (1 to 16) to set the operating conditions for each work number. Up to 16 works can be set.

The Operating condition screen contains “**MEAS. START**”, “**MEAS. STOP**”, “**MEAS. TIME**”, “**HOLD SET.**”, “**CRITERION**”, and “**MEAS. DISP.**”

7-2-1 Measuring Start Condition Settings

From the Operating condition screen, select “**MEAS. START.**”

As a measuring start condition, select “**START SIGNAL**” (the START button on the screen or an external measuring start/stop signal), “**START+LOAD**”, or “**START+DISP.**”



Measuring start screen

START SIGNAL: Measurement is started through a start signal (when the START button on the screen or an external measuring start/stop signal is turned ON).

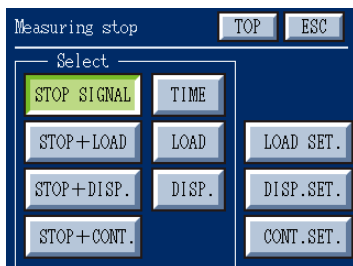
START+LOAD : Measurement is started through a start signal and when the load value set in “**LOAD SET.**” is exceeded (AND condition).

START+DISP. : Measurement is started through a start signal and when the displacement value set in “**DISP. SET.**” is exceeded (AND condition).

7-2-2 Measuring Stop Condition Settings

From the Operating condition screen, select “**MEAS. STOP.**”

As a measuring stop condition, select “**STOP SIGNAL**” (when the measuring time expires or when an external measuring start/stop signal is turned OFF), “**STOP+LOAD**”, or “**STOP+DISP.**”



Measuring stop screen

STOP SIGNAL : Measurement is stopped through a stop signal (when the measuring time expires or an external measuring start/stop signal is turned OFF.)

TIME : Measurement is stopped when the measuring time expires (irrelative of whether or not an external measuring start/stop signal is turned OFF).

STOP+LOAD : Measurement is stopped through a stop signal or when the following conditions are met (OR condition).

Measurement is stopped differently depending on which value (measuring start load or measuring stop load) is large.

• **Measuring start load ≤ measuring stop load:**

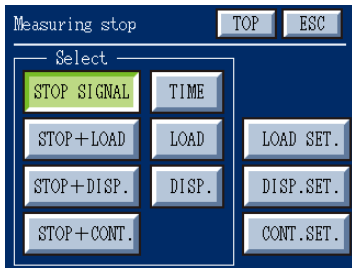
Measurement is stopped when the load value is larger than the measuring start load and measuring stop load values.

• **Measuring start load > measuring stop load:**

Measurement is stopped after the load value is equal to or larger than the measuring start load value and when the load value is equal to or less than the measuring stop load value.

Measuring start load and measuring stop load values are set in “**LOAD SET.**” on the “Measuring start” and “Measuring stop” screens, respectively.

LOAD : Measurement is stopped when the measuring time expires or when the above-listed load setting conditions are met (irrelative of whether or not an external measuring start/stop



Measuring stop screen

signal is turned OFF).

STOP+DISP. : Measurement is stopped through a stop signal or when the following conditions are met (OR condition).

Measurement is stopped differently depending on which setting (measuring start displacement or measuring stop displacement) is large (The value set in "LOAD SET." on the "Measuring start" screen is referred to as a measuring start load value, even when "START SIGNAL" is selected).

• **Measuring start displacement ≤ measuring stop displacement:**

Measurement is stopped when the displacement value is larger than the measuring start displacement and measuring stop displacement values.

• **Measuring start displacement > measuring stop displacement:**

Measurement is stopped after the displacement value is equal to or larger than the measuring start displacement value and when the displacement value is equal to or less than the measuring stop displacement value.

Measuring start displacement and measuring stop displacement values are set in "**DISP.SET.**" on the Measuring start and Measuring stop screens, respectively.

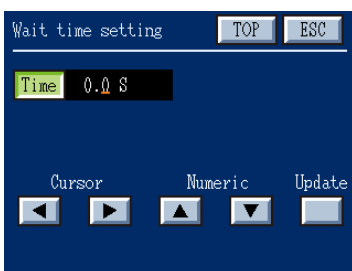
DISP. : Measurement is stopped when the measuring time expires or when the above-listed displacement setting conditions are met (irrelative of whether or not an external measuring start/stop signal is turned OFF).

STOP+CONT. : Measurement is performed continuously (continuous measurement.)





During continuous measurement, measurement data can not be recorded on a CF card.

Select "**CONT.SET.**" to set the wait time.

The wait time is a time interval between when a measuring time expires and when the next measurement is performed. On the graph display screen, each time a measuring time expires, erase the plotted graph so that a new graph is plotted for each measurement.



Wait time settings screen

You can set a wait time between 0.0 and 99.9 seconds. Set values by using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the "**Update**" button to confirm.



Caution

- When you select "STOP+CONT.", measurement data can not be recorded on a CF card. In addition, DZ (Digital Zero) is disabled during continuous measurement.
- When you set a wait time of 0 seconds, a measurement completed output signal is turned ON for about 0.5 milliseconds.

◇ **Stopping Continuous Measurement**

Continuous measurement can be stopped in the following ways:

- Turn OFF the external measuring start/stop signal.
- When the continuous measurement is started through the START button, push the START button again.

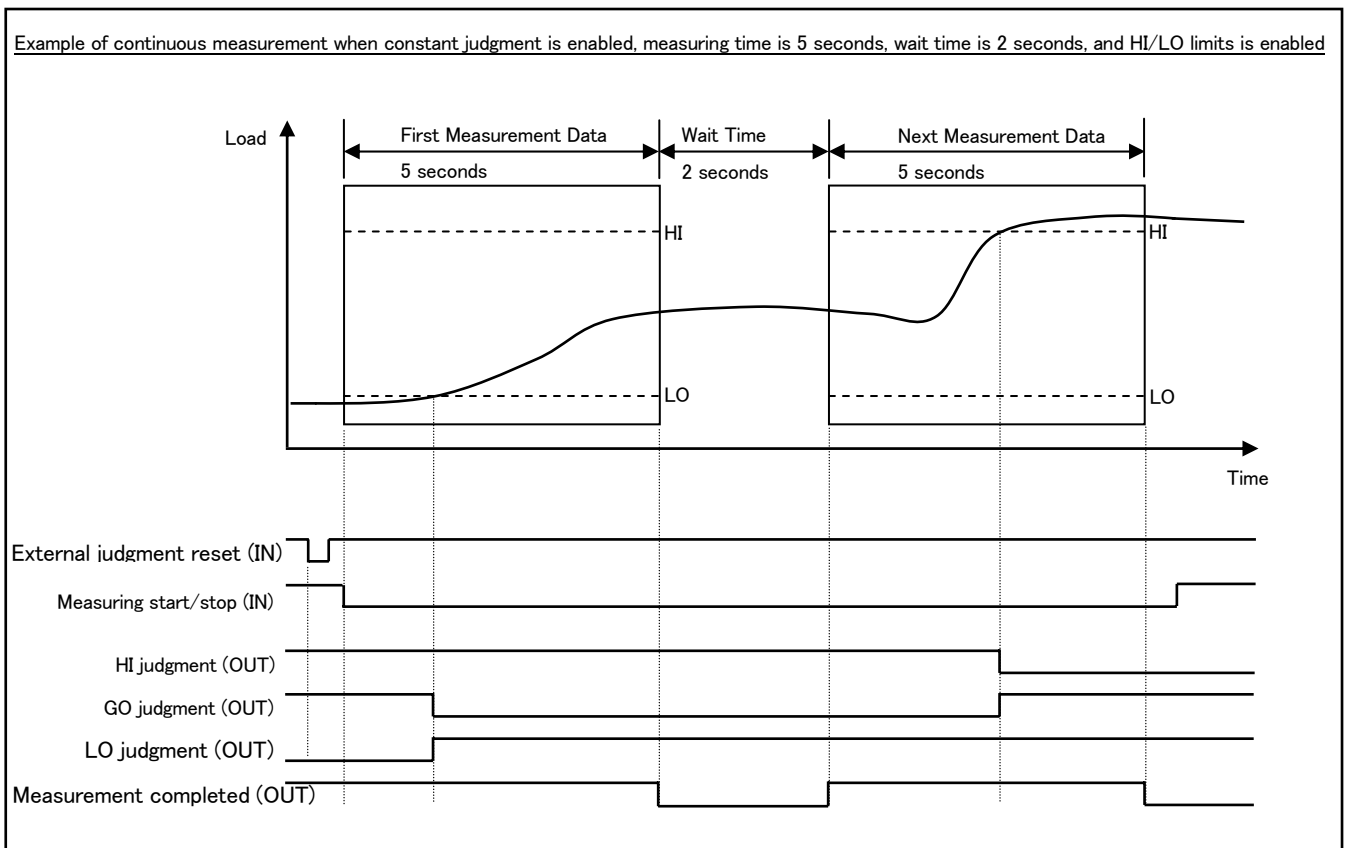
◇ **Switching to a Different Work Number during Continuous Measurement**

When you select “STOP+CONT.”, you can switch to a different work number for each measuring time.

A work number is checked on completion of measurement (when the measuring time expires.) Therefore, the next work number needs to be determined at least 0.1 seconds before the present measurement is completed. When switching to a different work number and performing continuous measurement, set “STOP + CONT.” in all work numbers which you want to use.

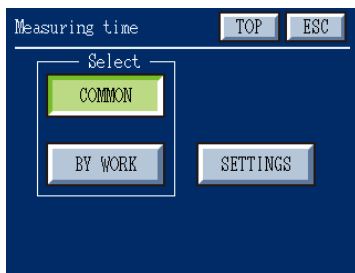
◇ **Judgment Result Display and Completed Signal**

- When HOLD is PEAK or INF.PNT, too short wait time does not allow for enough time to check judgment result of held values on the screen. After judgment result is displayed, the next measurement may be started immediately.
- During continuous measurement, judgment completed signal (if the judgment condition is true) and measurement completed signal are turned ON for each measuring time. When you set a wait time of 0 seconds, a completed signal is turned ON for about 0.5 milliseconds.

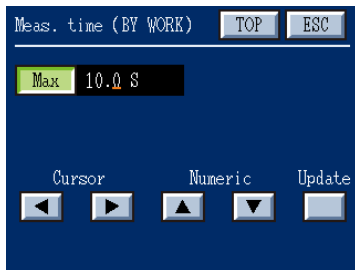


7-2-3 Measuring Time Settings

From the Operating condition screen, select **“MEAS. TIME”** to set the maximum measuring time.



Measuring time screen







Meas. time (BY WORK) screen

COMMON : The measuring time which is set by selecting **“SETTINGS”**→**“DETAIL SET”**→**“SENSOR CAL.”**→**“TIME”** from the TOP screen is applied.

BY WORK: The measuring time which is set by using the **“SETTINGS”** button in the Measuring time screen is applied. Select when you want to set a measuring time on a work-by-work basis.

Select **“SETTINGS”** in the Measuring time screen to set a measuring time for this work. The measuring time set here is applied when **“BY WORK”** is selected.



You can set a measuring time between 0.1 and 30.0 seconds.

Set values by using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the **“Update”** button to confirm.

7-2-4 Setting Hold Conditions

From the Operating condition screen, select **“HOLD SET.”**

Select how load and displacement values are held during a measuring period and specify the settings.

Pushing  on the Hold Select screen advances to the Hold Settings screen and pushing  on the Hold Settings screen returns to the Hold Select screen.



Hold Select screen

In the Hold Select screen, select a hold type.

NONE : Tracking display without peak or other hold.

SAMPLE : Holds the load value when an external **“hold (load)”** signal is turned ON during a measuring period. If a signal makes a continuous ON/OFF transition during a measuring period, the load value at the first ON transition is held.

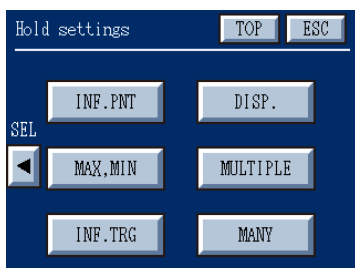
PEAK : Holds the maximum load value obtained during a measuring period.

INF.PNT : According to the conditions set by choosing **“INF.PNT”** on the Hold settings screen, captures an inflection point of load values during a measuring period and hold the load value at the moment.

MAX, MIN : According to the conditions set by choosing **“MAX, MIN”** on the Hold settings screen, when the difference between the peak and valley loads multiplied by the scaling factor exceeds the predefined level, holds the value at the peak as the maximum value and the value at the valley as the minimum value.

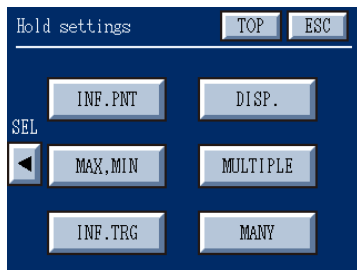
DISP. PK : Holds the maximum displacement value obtained during a measuring period.

DISP. : Holds the load value when the value set by choosing **“DISP.”** on the Hold settings screen is obtained during a measuring period.



Hold settings screen

- DISP.SMP** : Holds the displacement value when an external “hold (displacement)” signal is turned ON during a measuring period. If a signal makes a continuous ON/OFF transition during a measuring period, the displacement value at the first ON transition is held.
- MULTIPLE** : According to the hold conditions set by choosing “**MULTIPLE**” on the Hold settings screen, perform a multiple-zone judgment (up to three hold values can be set).
- INF.TRG** : Holds the peak load value before the inflection point set by choosing “INF.TRG” on the Hold settings screen.
- MANY** : Holds the load value at a point offset from the base point (either a measuring start position or a peak position) for displacement set by selecting “**MANY**” on the Hold settings screen (up to five displacement offset points can be set).



Hold settings screen

In the Hold settings screen, set the hold conditions.

INF.PNT : Set the detection conditions of an inflection point.

MAX,MIN : Select either MAX or MIN and set their detection conditions.

INF.TRG : Set the analysis conditions, detection conditions of an inflection point, and quick hold.

DISP. : Set the displacement value which you want to hold.

MULTIPLE : Set the hold conditions of the three zones.

MANY : Set the base point and offset for displacement.



Caution

If you select “**MULTIPLE**”, “**INF.TRG**”, or “**MANY**” on the Hold Select screen, constant judgment is disabled. In this case, if you select “**VALID**” for constant judgment, your settings are ignored (Refer to “5-1-5. Constant Judge Settings.”)

Note:

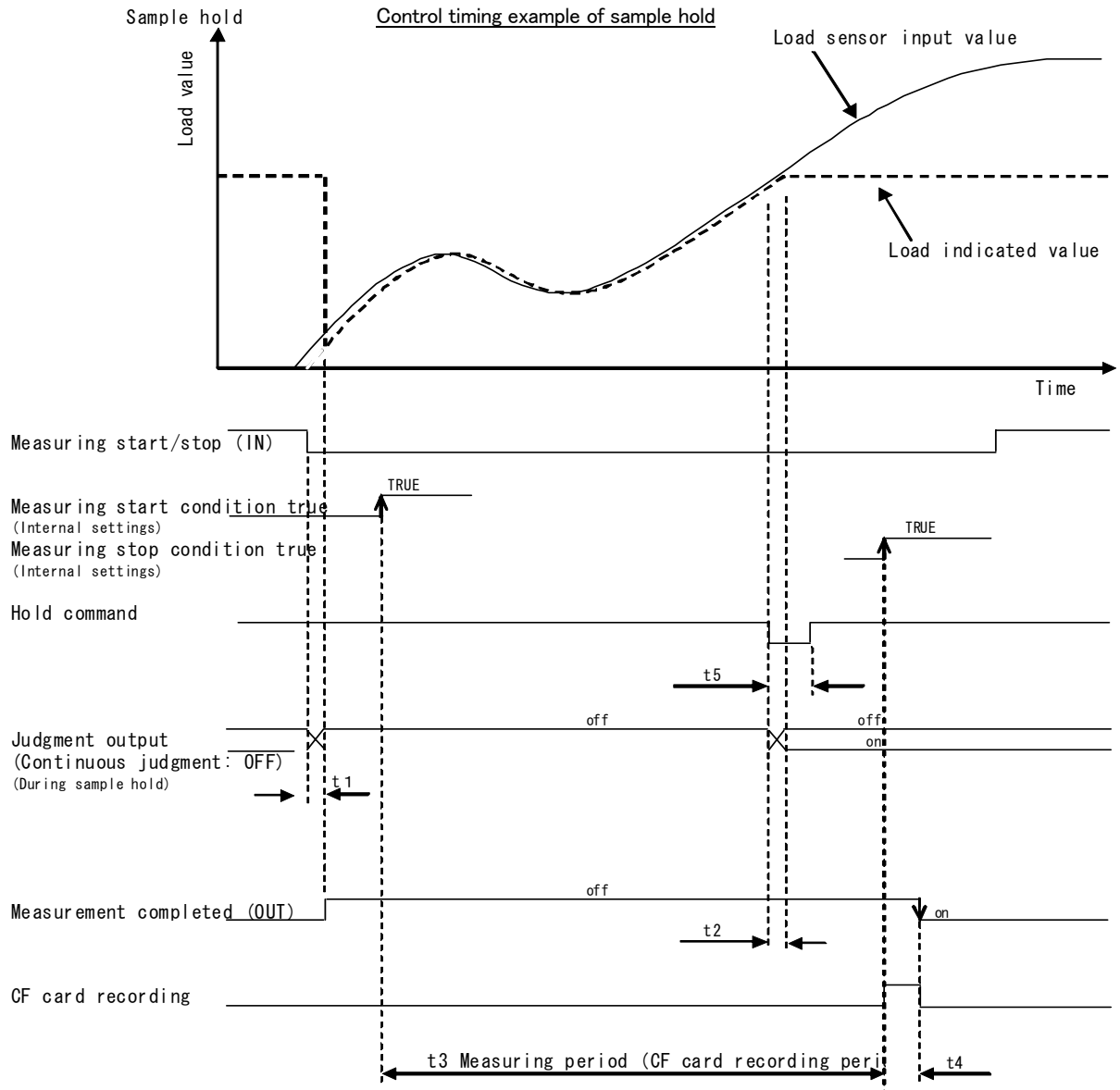
7-2-4-1 Sample Hold

Holds the load value at a certain point when the hold command signal (external A5 signal pin) is turned ON during a measuring period.

Compares the held load value against the HI LO limits and HI_HI LO_LO limits and outputs the judgment result.

The limits are set as discussed in "7-2-5-1 Setting the Load Limits."

From the TOP screen, select "SETTINGS" → "DETAIL SET" → "WORK" → "Work No." (1 to 16) → "HOLD SET." → "SAMPLE."



- t1: A delay time between the moment when the measuring start input is detected and the moment when the load indicated values and internal data hold are released and judgment output and measurement completed signal are turned OFF. 1ms (MAX)
- t2: A delay time between the moment when the hold command is entered and the moment when the indicated values and internal data are held, or between the moment when the measurement is completed and the moment when judgment output and judgment completed output are validated. 1ms (MAX)
- t3: Measuring period, up to a maximum of 30.0 seconds (depending on the measuring time settings)
- t4: CF card recording time, up to a maximum of 20 seconds (measuring time: 30.0 seconds)
- t5: External hold signal input time 10ms (MIN)

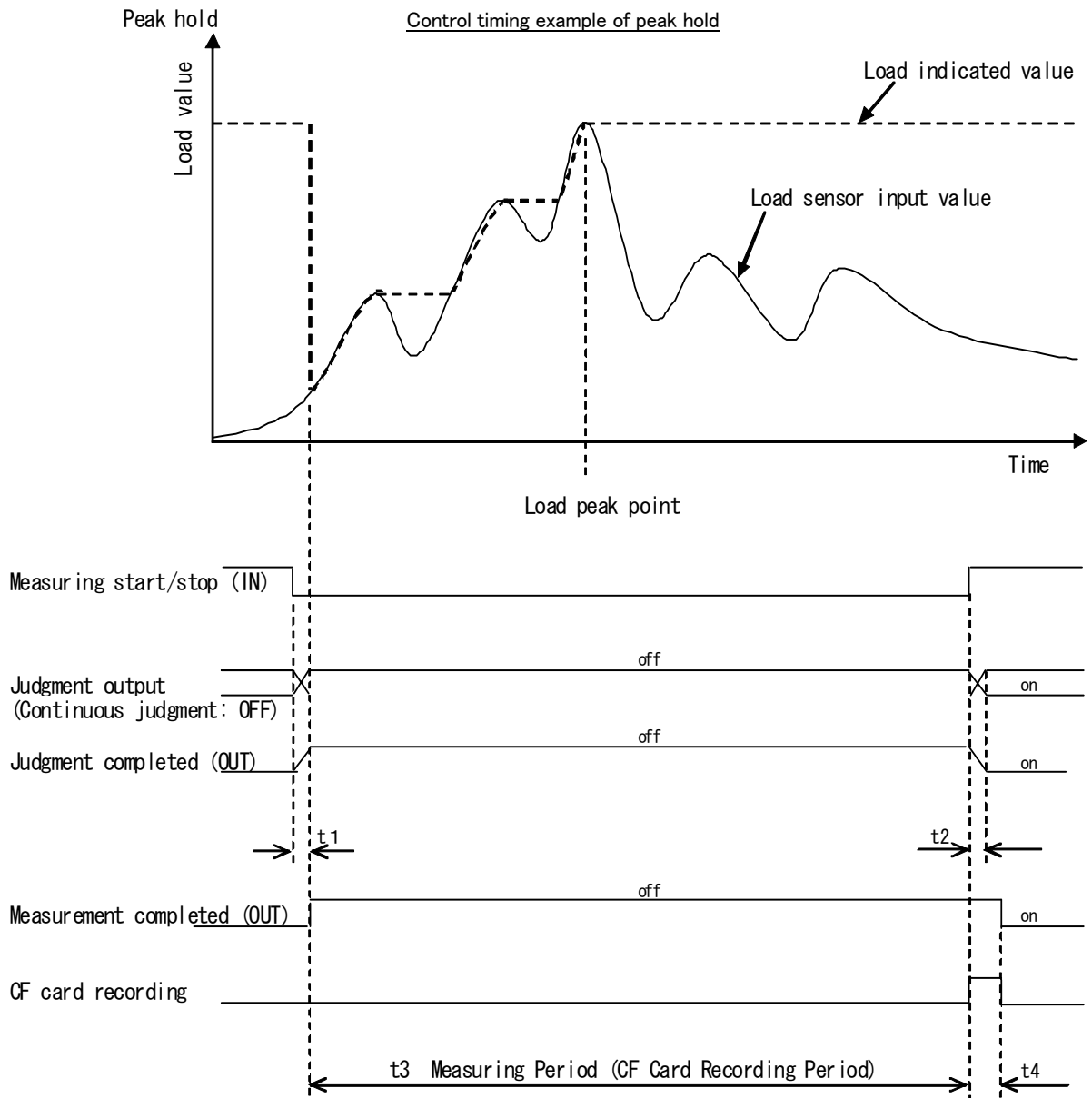
7-2-4-2 Peak Hold

Holds the maximum load value obtained during a measuring period.

Compares the peak held load value against the HI LO limits and HI_HI LO_LO limits and outputs the judgment result.

The limits are set as discussed in "7-2-5-1 Setting the Load Limits."

From the TOP screen, select "SETTINGS"→"DETAIL SET"→"WORK" →"Work No." (1 to 16)→"HOLD SET."→"PEAK."



t1: A delay time between the moment when the measuring start input is detected and the moment when the load indicated values and internal data hold are released and judgment output and measurement completed signal are turned OFF. 1 ms(MAX)

t2: A delay time between the moment when the measurement is completed and the moment when judgment output and judgment completed output are validated. 1 ms (AX)

t3: Measuring period, up to a maximum of 30.0 seconds (depending on the measuring time settings)

t4: CF card recording time, up to a maximum of 20 seconds (measuring time: 30.0 seconds)

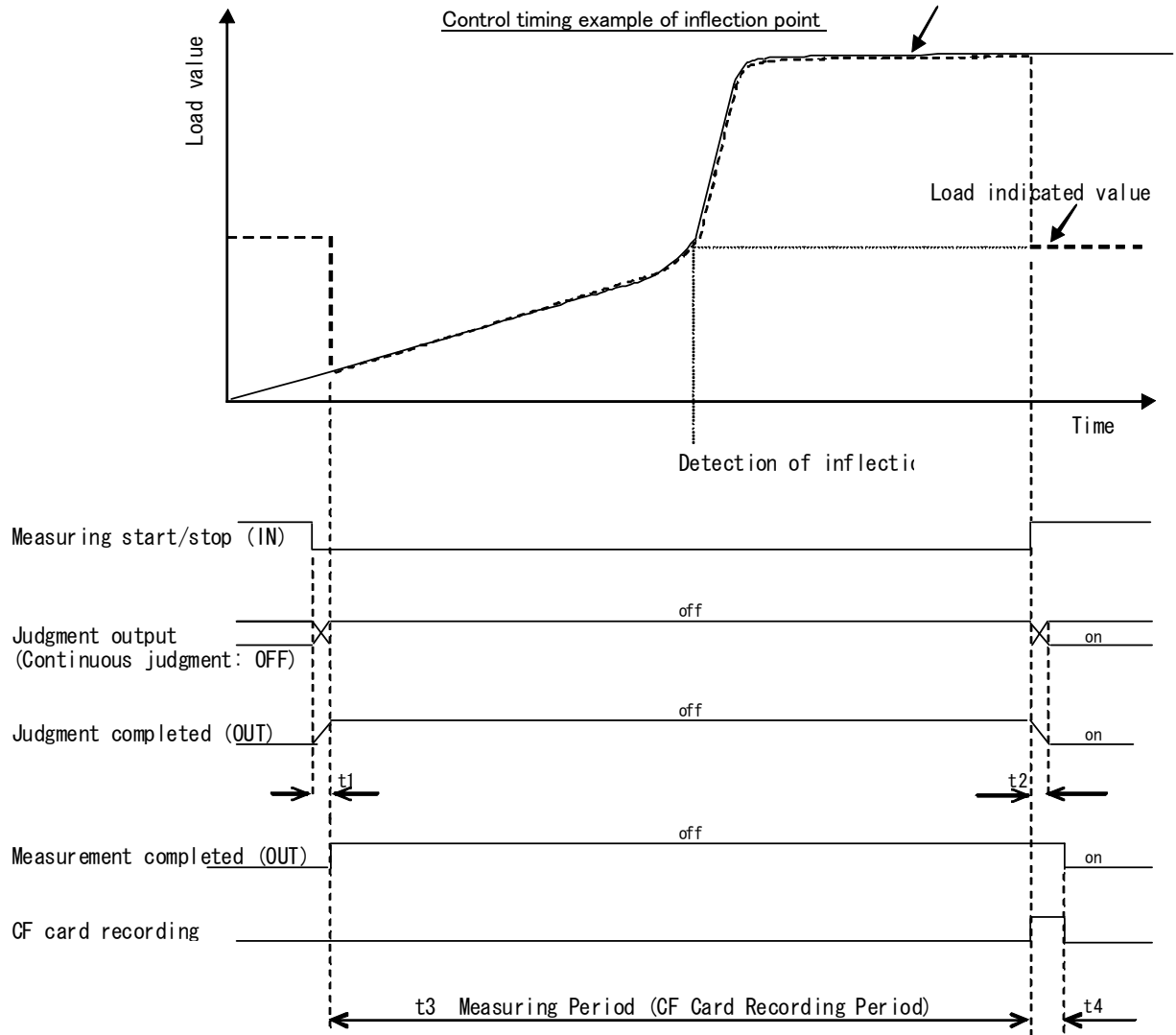
7-2-4-3 Inflection Point Hold

Captures the change of the slope of the load value during a measuring period and holds the value.

Compares the load value held at the inflection point against the HI LO limits and HI_HI LO_LO limits and outputs the judgment result.

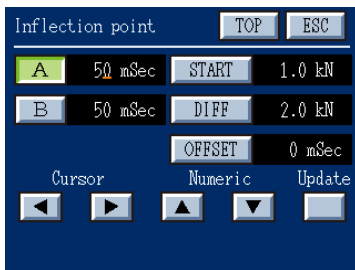
The limits are set as discussed in “7-2-5 Setting the Limits.”

From the TOP screen, select “**SETTINGS**” → “**DETAIL SET**” → “**WORK**” → “**Work No.**” (1 to 16) → “**HOLD SET.**” → “**INF.PNT.**”



- t1: A delay time between the moment when the measuring start input is detected and the moment when the load indicated values and internal data hold are released and judgment output and measurement completed signal are turned OFF. 1 ms (MAX)
- t2: A delay time between the moment when the measurement is completed and the moment when judgment output and judgment completed output are validated. 1 ms (MAX)
- t3: Measuring period, up to a maximum of 30.0 seconds (depending on the measuring time settings)
- t4: CF card recording time, up to a maximum of 20 seconds (measuring time: 30.0 seconds)

◇ Detection of Inflection Point



Inflection point screen

In the Inflection point screen, set the load difference E, detection time A, detection time B and detection start load value.

START : Set a start load value from which the inflection point detection is started.

When the measuring start conditions are met and the load value exceeds the detection start load value, the inflection point hold is started.





A : Set the detection time A, specified in hours.

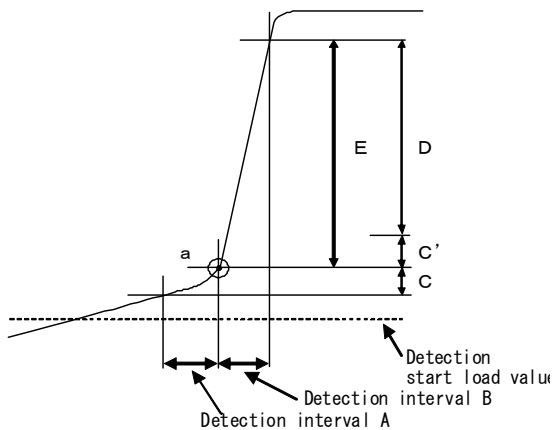
B : Set the detection time B.

DIFF : Set the difference (D) between the load changes.

OFFSET : The inflection point is moved back to a position offset by a specified time.

Set values by selecting an item ("A" is selected in the figure on the left), using

the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the "Update" button to confirm.



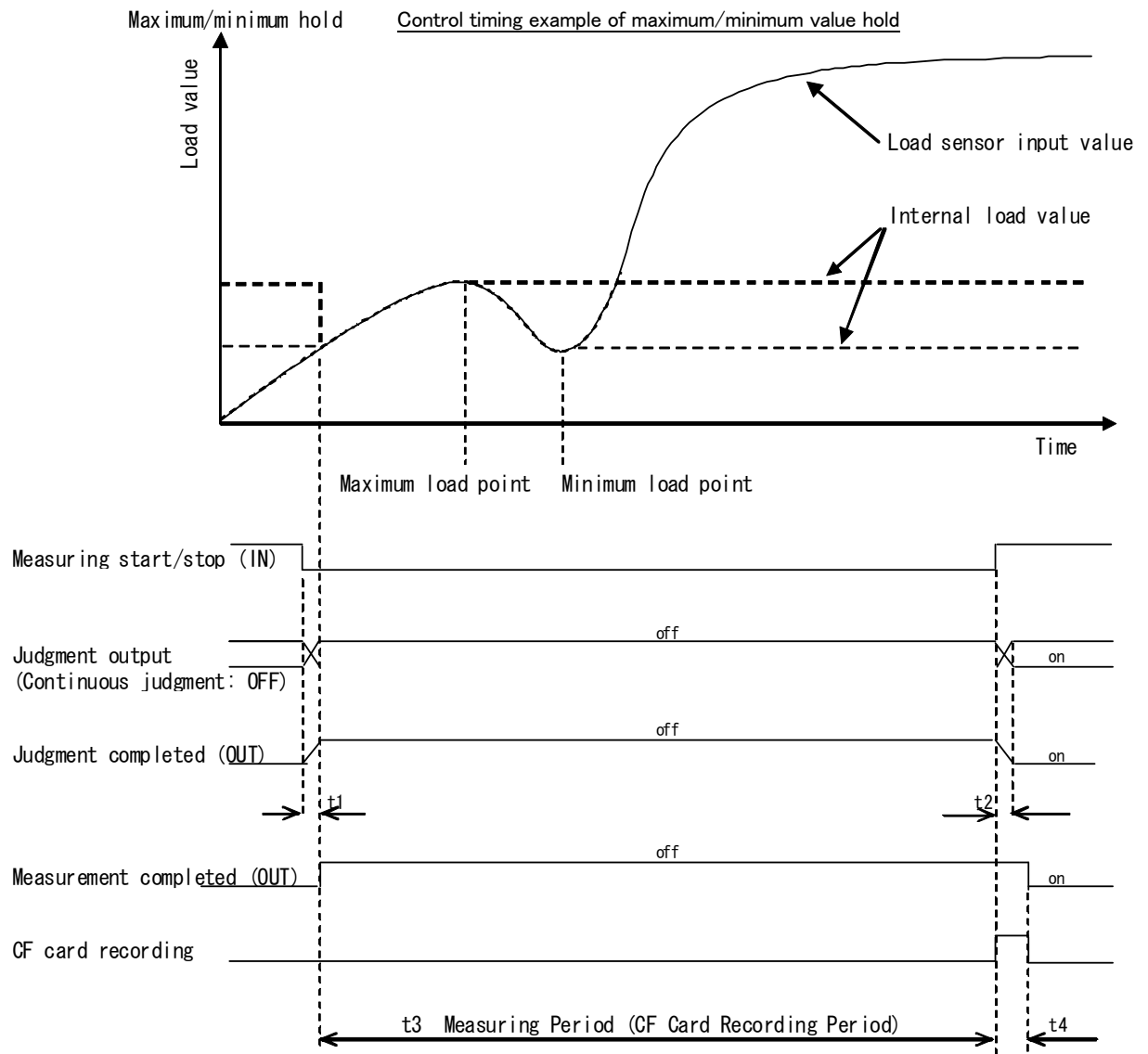
Let C be load change in detection time A and E be load change in detection time B. When subtracting C from E, if the difference (D) exceeds the value specified in "DIFF", point a is held as the inflection point.

The inflection point is normally detected with $A = B$, but it may easily be detected with $A < B$ where the slope is gradual.

7-2-4-4 Maximum/Minimum Value Hold

Holds the load value at the moment when the maximum or minimum value is attained during a measuring period.
 Compares the held load value against the HI LO limits and HI_HI LO_LO limits and outputs the judgment result.
 The limits are set as discussed in "7-2-5 Setting the Limits."

From the TOP screen, select "SETTINGS"→"DETAIL SET"→"WORK" →"Work No." (1 to 16)→"HOLD SET."→"MAX, MIN."



t1: A delay time between the moment when the measuring start input is detected and the moment when the load indicated values and internal data hold are released and judgment output and measurement completed signal are turned OFF. 1 ms (MAX)

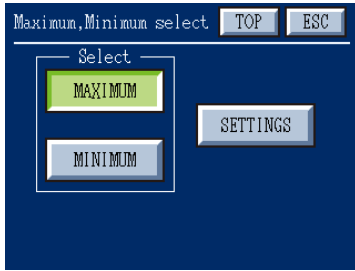
t2: A delay time between the moment when the measurement is completed and the moment when judgment output and judgment completed output are validated. 1 ms (MAX)

t3: Measuring period, up to a maximum of 30.0 seconds

t4: CF card recording time, up to a maximum of 20 seconds (measuring time: 30.0 seconds)

◇ Maximum and Minimum Settings

When you select the “**Max, Min**” button on the Hold settings screen, the Maximum, Minimum select screen is displayed.



Maximum, Minimum select screen

Select “**MAXIMUM**” to set the maximum hold mode, or “**MINIMUM**” to set the minimum hold mode.





Then, determine the following settings.

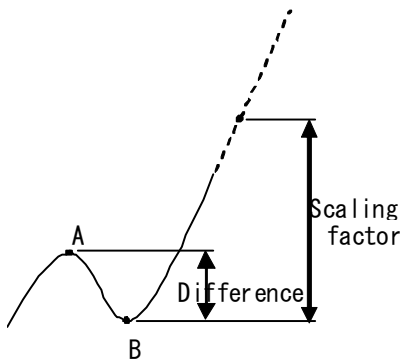


Maximum, Minimum screen

DIFF : Set the difference between the maximum and minimum load values.

x : Enter the detection condition for the maximum and minimum values, specified as a scaling factor.

Set values by selecting “DIFF” or “X” (“DIFF” is selected in the figure on the left), using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “**Update**” button to confirm.



Detection of the Maximum and Minimum Values

When the maximum and minimum values are detected and the difference exceeds the product of “Diff” and “x”, point A is held in the maximum value hold and point B is held in the minimum value hold.

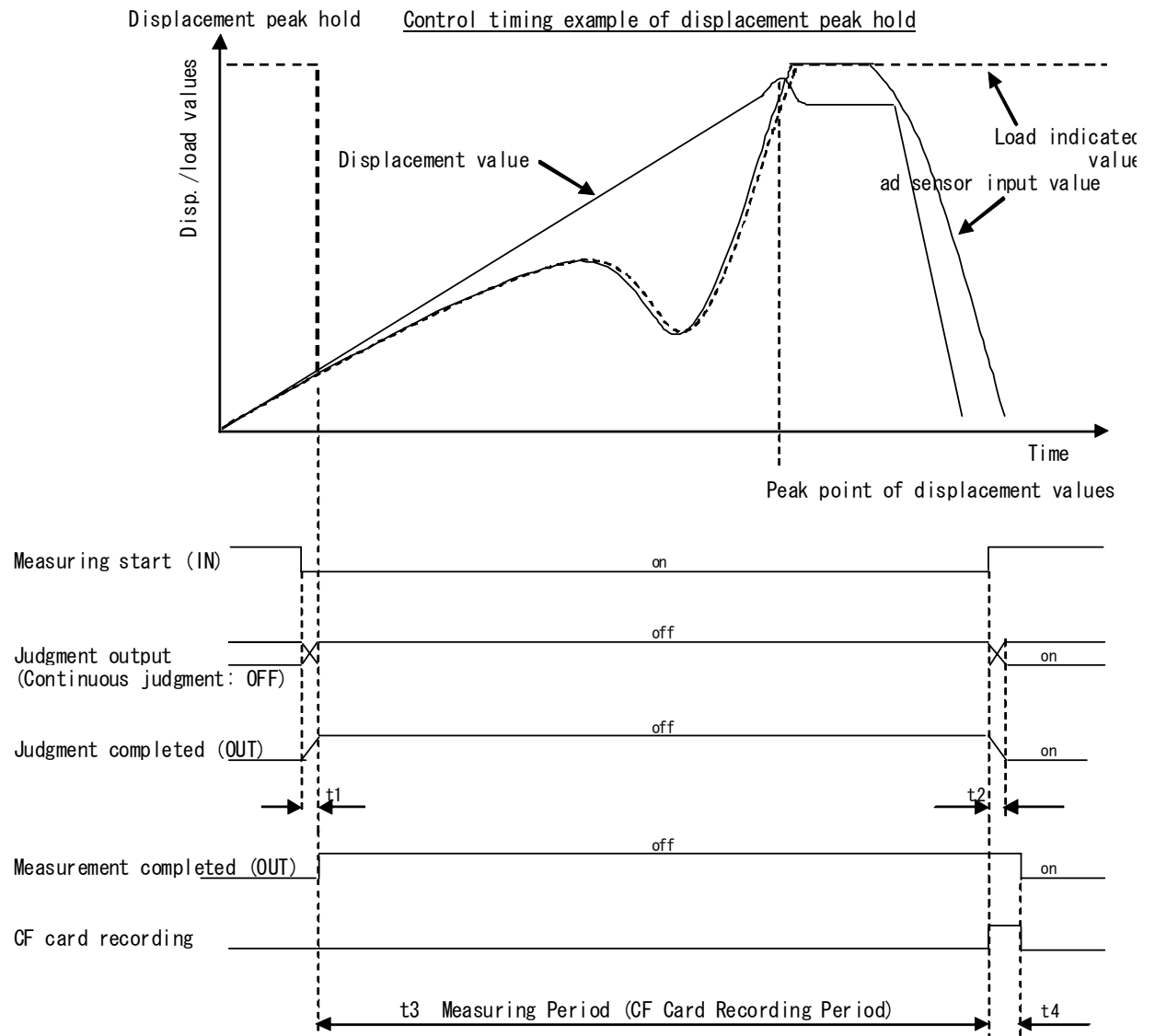
7-2-4-5 Displacement Peak Hold

Holds the maximum displacement value obtained during a measuring period.

Compares the load value peak held at the displacement value against the HI LO limits and HI_HI LO_LO limits and outputs the judgment result. The limits are set as discussed in "7-2-5 Setting the Limits."

To use the displacement peak hold mode, it is necessary to select "DISP.VOLT" or "DISP. PULSE" on the Displacement sensor screen (accessible from the Sensor calibration screen).

From the TOP screen, select "SETTINGS" → "DETAIL SET" → "WORK" → "Work No." (1 to 16) → "HOLD SET." → "DISP.PK."



- t1: A delay time between the moment when the measuring start input is detected and the moment when the load indicated values and internal data hold are released and judgment output and measurement completed signal are turned OFF. 1 ms (MAX)
- t2: A delay time between the moment when the measurement is completed and the moment when judgment output and judgment completed output are validated. 1 ms (MAX)
- t3: Measuring period, up to a maximum of 30.0 seconds (depending on the measuring time settings)
- t4: CF card recording time, up to a maximum of 20 seconds (horizontal axis: disp., measuring time: 30.0 seconds)

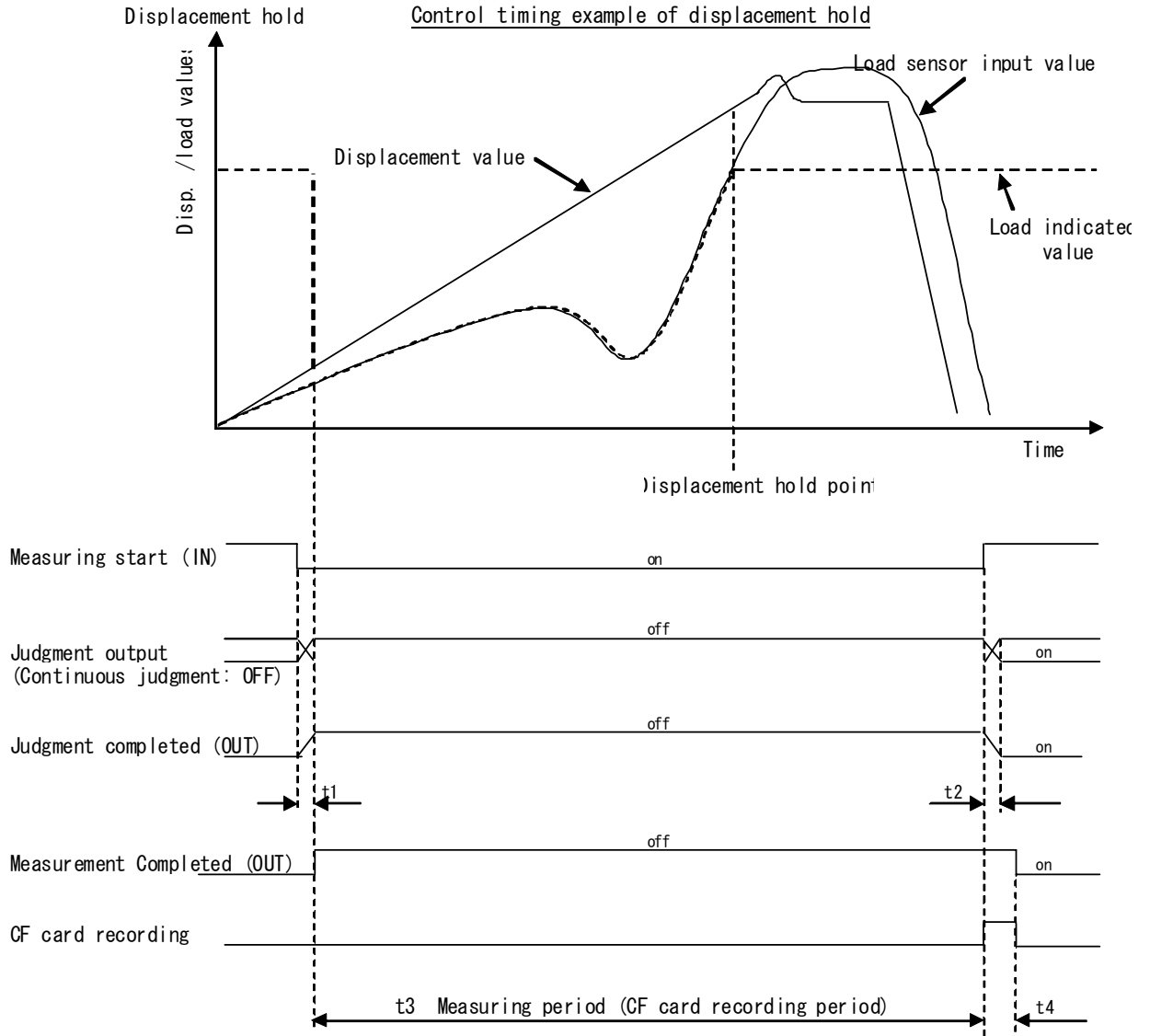
7-2-4-6 Displacement Hold

Holds the load value at the moment when the displacement value set is attained during a measuring period.

Compares the load value held at the displacement value against the HI LO limits and HI_HI LO_LO limits and outputs the judgment result. The limits are set as discussed in "7-2-5 Setting the Limits."

To use the displacement hold mode, it is necessary to select "DISP.VOLT" or "DISP. PULSE" on the Displacement sensor screen (accessible from the Sensor calibration screen).

From the TOP screen, select "SETTINGS" → "DETAIL SET" → "WORK" → "Work No." (1 to 16) → "HOLD SET." → "DISP."



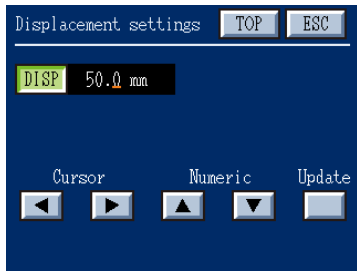
t1: A delay time between the moment when the measuring start input is detected and the moment when the load indicated values and internal data hold are released and judgment output and measurement completed signal are turned OFF. 1 ms (MAX)

t2: A delay time between the moment when the measurement is completed and the moment when judgment output and judgment completed output are validated. 1 ms (MAX)

t3: Measuring period, up to a maximum of 30.0 seconds (depending on the measuring time settings)





t4: CF card recording time, up to a maximum of 20 seconds

(horizontal axis: disp., measuring time: 30.0 seconds)



Displacement settings screen

Enter a displacement comparison value, specified in millimeters (mm).

Set values by using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “**Update**” button to confirm.

Note:

7-2-4-7 Displacement Sample Hold

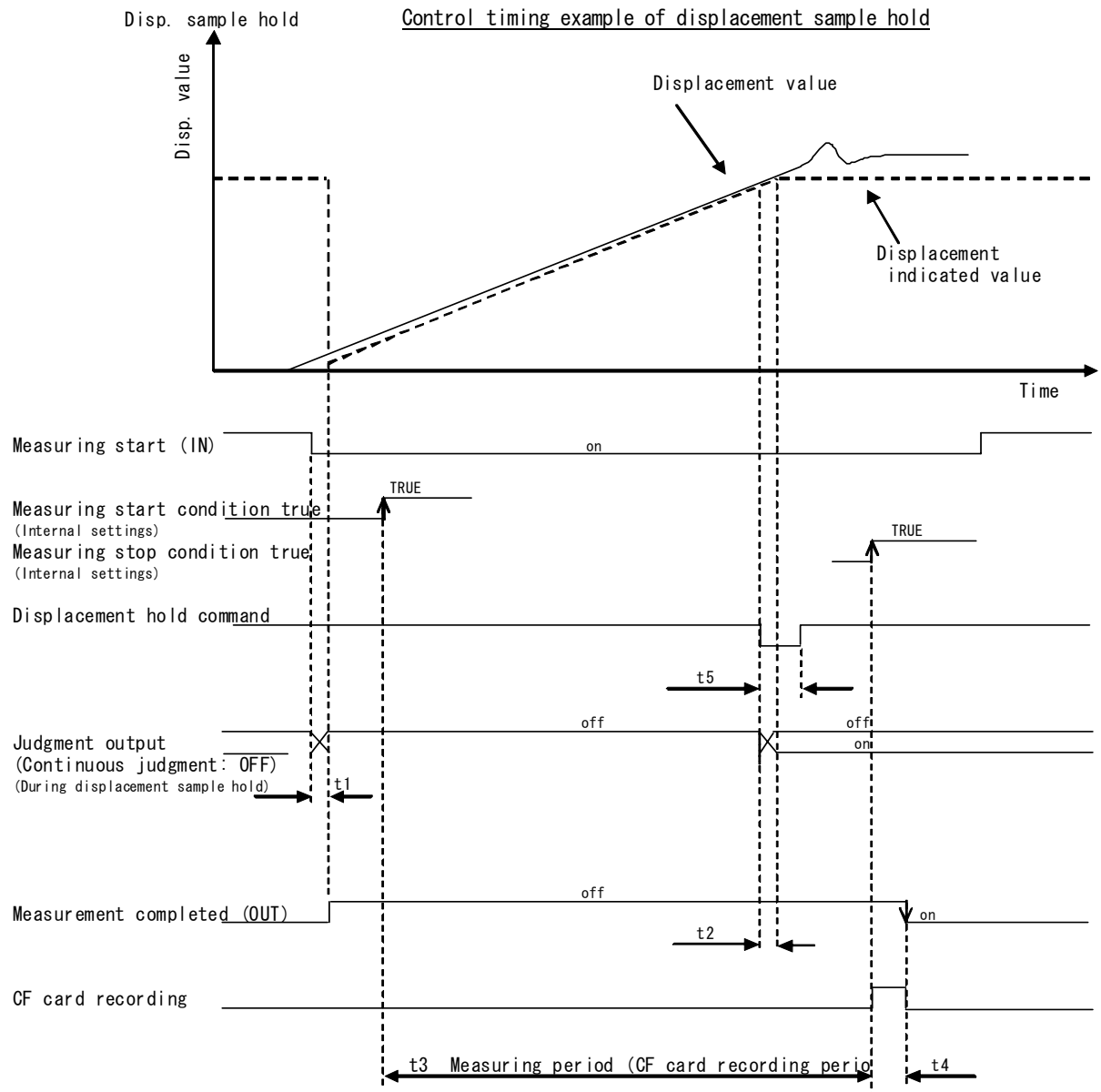
Holds the load value at a certain point when the hold (displacement) signal (pin 10 of STROKE connector) is turned ON during a measuring period.

Compares the held displacement value against the HI LO limits and HI_HI LO_LO limits and outputs the judgment result.

The limits are set as discussed in "7-2-5 Setting the Limits."

To use the displacement sample hold mode, it is necessary to select "DISP.VOLT" or "DISP. PULSE" on the Displacement sensor screen (accessible from the Sensor calibration screen).

From the TOP screen, select "SETTINGS" → "DETAIL SET" → "WORK" → "Work No." (1 to 16) → "HOLD SET." → "DISP.SMP."



t1: A delay time between the moment when the measuring start input is detected and the moment when the load indicated values and internal data hold are released and judgment output and measurement completed signal are turned OFF. 1 ms (MAX)

t2: A delay time between the moment when the displacement hold command is entered and the moment when the indicated values and internal data are held, or between the moment when the measurement is completed and the moment when judgment output and judgment completed output are validated. 1 ms (MAX)

t3: Measuring period, up to a maximum of 30.0 seconds (depending on the measuring time settings)

t4: CF card recording time, up to a maximum of 20 seconds (horizontal axis: disp., measuring time: 30.0 seconds)

t5: External displacement hold signal input time 10 ms (MIN)

7-2-4-8 Multiple Hold

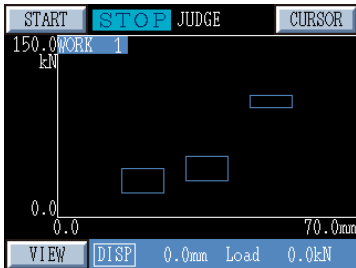
This hold is set when using multiple-zone judgment.

In multiple-zone judgment, judgment ranges (zones) of either load and time or load and displacement are set and judgment about whether a hold value falls within the zones is made.

Up to 3 zones can be set, and each can contain different hold conditions.

However, more than one zone are not allowed to have the same hold condition.

The limits are set as discussed in “7-2-5-3 Multiple-zone Limit Value Settings.”



Example of multiple-zone judgment screen

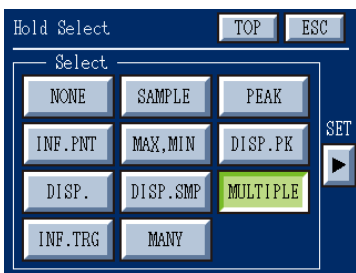
The figure on the left shows an example of multiple-zone judgment.

Set the hold condition for each zone.

About multiple-zone judgment, refer to the “Multiple-zone Limit Value Settings” section in “Setting the Limits.”

From the TOP screen, select “**SETTINGS**”→“**DETAIL SET**”→“**WORK**” →“**Work No.**” (1 to 16)→“**HOLD SET.**”→“**Multiple.**”

When multiple hold is set as a hold condition, judgment condition is set to multiple-zone judgment.



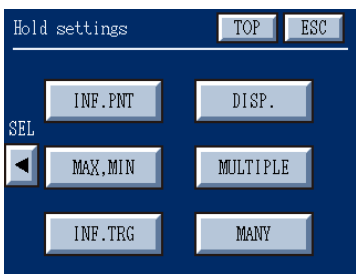
Hold Select screen

Select either “**NONE**” or “**MULTIPLE**” in the Hold Select screen.



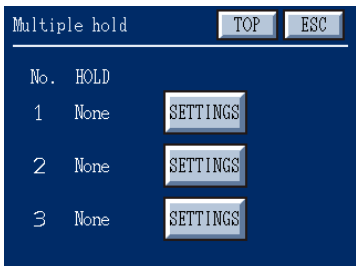
Caution

If “**NONE**” is selected in the Hold Select screen and “**ZONE TIME**” or “**ZONE DISP.**” is selected in the Criterion settings screen (accessible from the Criterion select screen), judgment as to whether the measured values passed through the zone is made.



Hold settings screen

Select “**MULTIPLE**” in the Hold settings screen to set the hold conditions of zones.



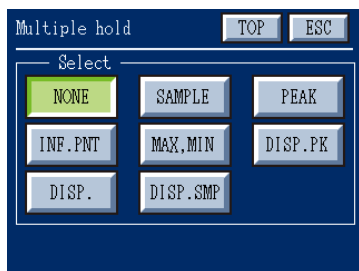
Multiple hold screen

In this screen, set the multiple hold.

Set the hold condition for a judgment value of each zone.

The numbers (No. 1 to 3) displayed in the screen correspond to zone numbers in multiple-zone judgment.

To set the hold condition, select “**SETTINGS**” next to each No. and select hold condition in the Multiple hold screen.



Multiple hold screen

In the Multiple hold screen, select the hold condition for zone judgment.
Available settings: "**NONE**", "**SAMPLE**", "**PEAK**", "**INF.PNT**", "**MAX, MIN**", "**DISP.PK**", "**DISP.**", or "**DISP.SMP**".



Caution

If "**NONE**" is set in the Multiple hold screen, the zone is not subject to the judgment.
For the zone which is set to "**NONE**", leave unselected in the Criterion settings ("ZONE TIME" or "ZONE DISP.".)

Note:

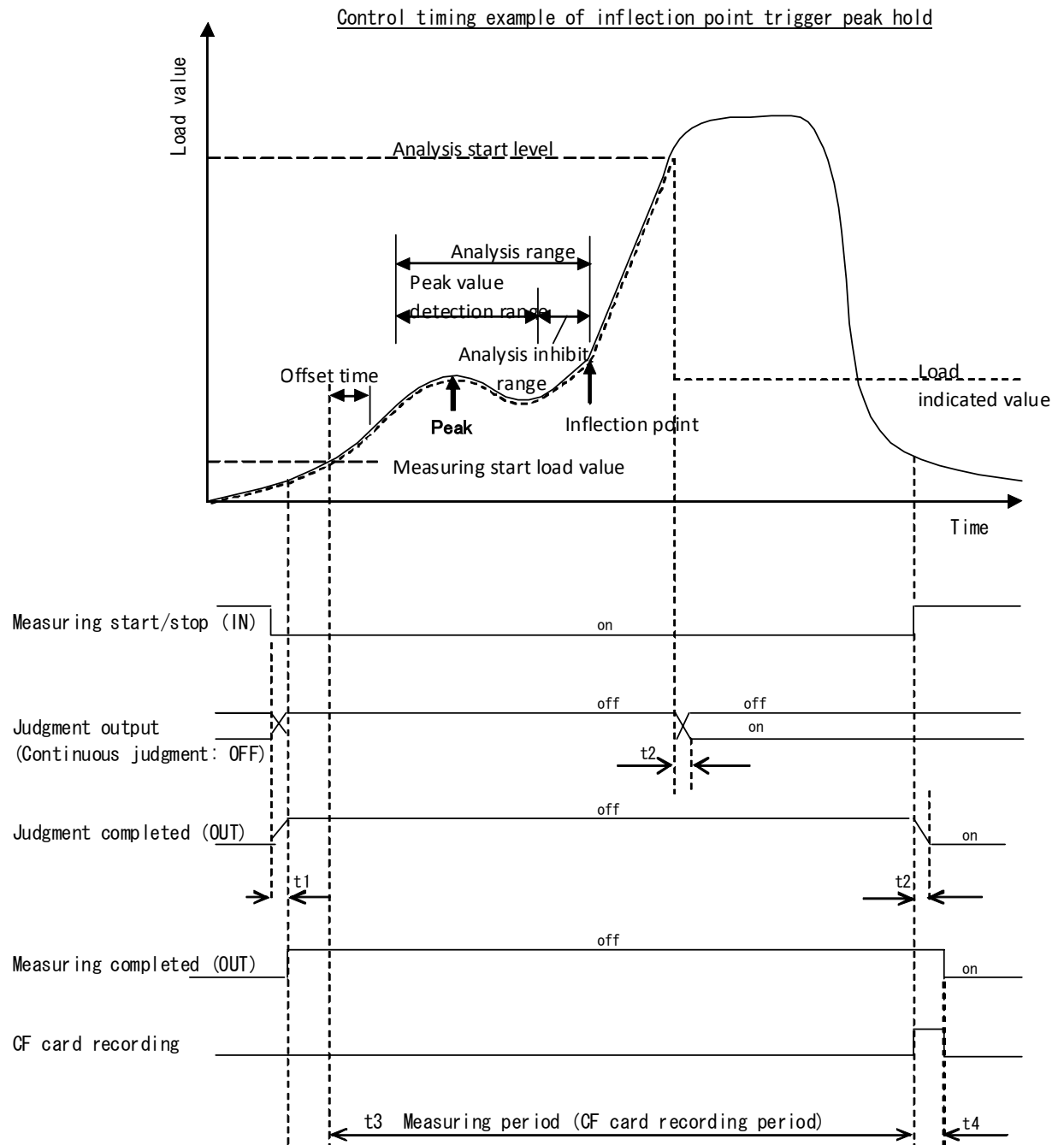
7-2-4-9 Inflection Point Trigger Peak Hold

Captures the change of the slope of the load value during a measuring period, detect the inflection point and holds the preceding peak hold value.

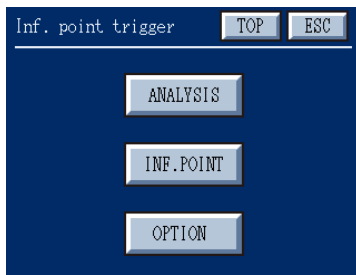
Compares the peak load value held against the load HI LO limits and outputs the judgment result.

The limits are set as discussed in "7-2-5-1 Setting the Load Limits."

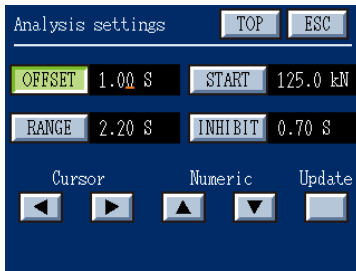
From the TOP screen, select "SETTINGS" → "DETAIL SET" → "WORK" → "Work No." (1 to 16) → "HOLD SET." → "INF. TRG."



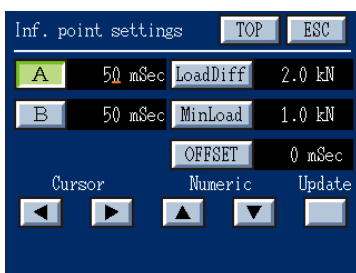
- t1: A delay time between the moment when the measuring start input is detected and the moment when the load indicated values and internal data hold are released and judgment output and measurement completed signal are turned OFF. 1 ms (MAX)
- t2: A delay time between the moment when the measurement is completed and the moment when judgment output and judgment completed output are validated. 1 ms (MAX)
- t3: Measuring period, up to a maximum of 30.0 seconds (depending on the measuring time settings)
- t4: CF card recording time, up to a maximum of 20 seconds (measuring time: 30.0 seconds)



Inf.point trigger screen



Analysis settings screen



Inf. point settings screen

◇ Hold settings for inflection point trigger peak

From the Hold settings screen, select “**INF. TRG**” to display the Inf. Point trigger screen, in which you determine settings for “**ANALYSIS**”, “**INF. POINT**” and “**OPTION.**”

◇ Analysis settings





Set the conditions for detecting a peak load value preceding the inflection point.

OFFSET : Starts detecting an inflection point when an offset time elapses after measurement is started (0 to 9.9 seconds).

RANGE : A range of time when a peak value is detected (0 to 9.9 seconds).

START : An inflection point is determined after the analysis start load is exceeded.
(Use the decimal point position as specified in the equivalent input mode)

INHIBIT : A range of time when the detection of a peak is inhibited (0 to 9.9 seconds).

Set values by selecting an item (“**OFFSET**” is selected in the figure on the left), using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the “**Update**” button to confirm.

◇ Inf. point settings





In the Inf. Point settings screen, set the detection conditions and offset for the inflection point.

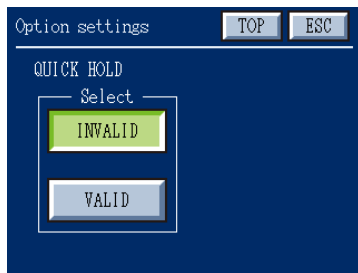
For details about the settings of “**A**”, “**B**”, and “**LoadDiff**”, refer to the “7-2-4-3 Inflection Point Hold” section.

(Detection starts when a time specified in “**OFFSET**” of the Analysis settings screen is elapsed).

MinLoad : Judgment HL is output when the load value at an inflection point is less than a MinLoad value.

OFFSET : The inflection point is moved back to a position offset by a specified time.
Analysis settings are computed from the position of the inflection point which offset is applied to.

Set values by selecting an item ("A" is selected in the figure on the left), using the   key to place the cursor over a digit you want to change, and using the   key to set a desired value, and then push the "Update" button to confirm.



Option settings screen

◇ Option settings

This hold mode utilizes a unique algorithm to determine judgment of the inflection point based on the peak value of load difference. It is possible to detect an inflection point quickly and output the judgment result.

INVALID: Judge at the analysis start level.

VALID : Determine and judge based on the peak value of load difference.

Note:

7-2-4-10 Many-Point Hold

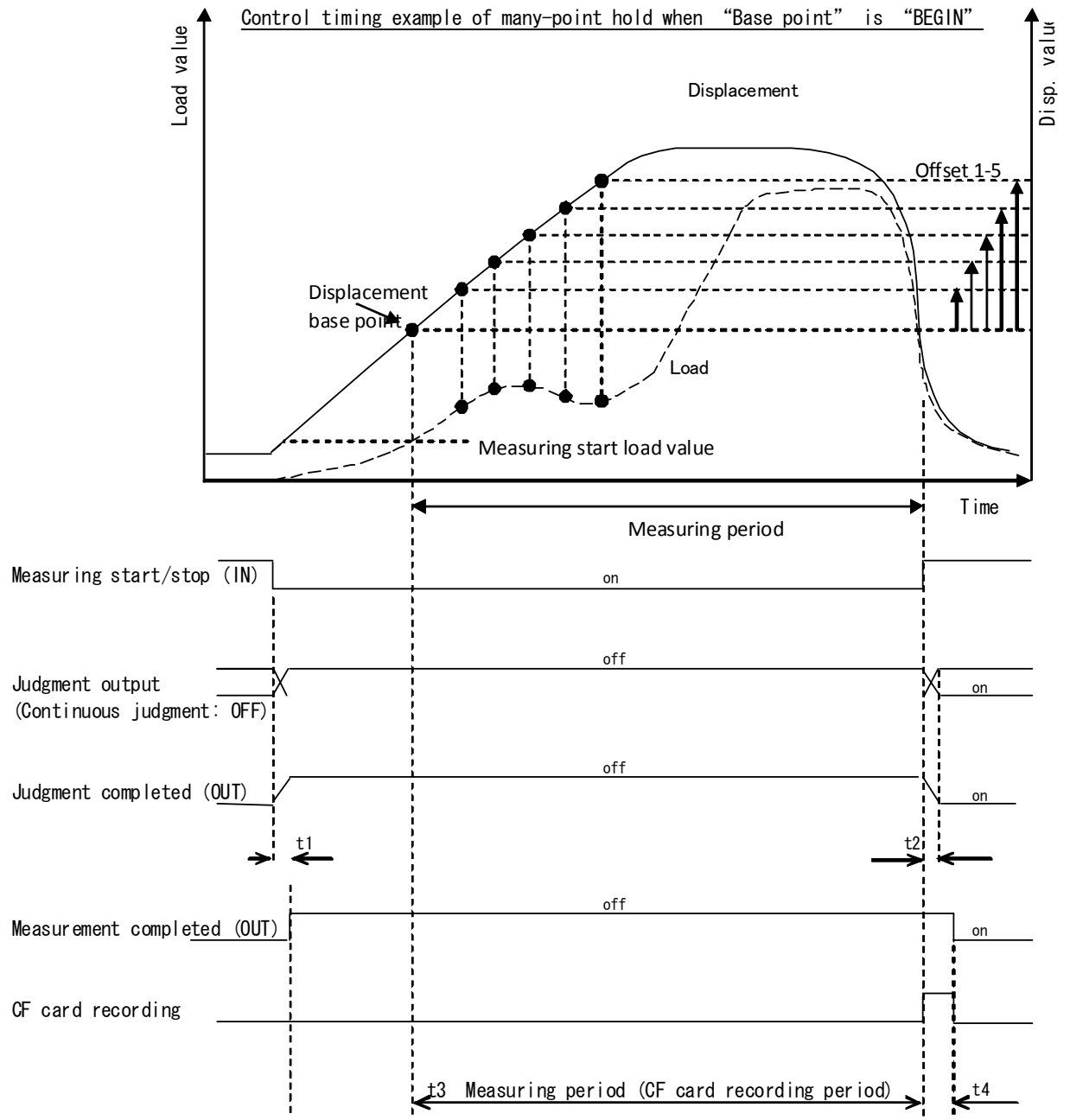
Captures the change of displacement during a measuring period, based on the base point and offset values defined for displacement, and holds the hold value at the defined offset position (up to a maximum of 5 points for offset values).

For each offset, compares the held load value against the load HI LO limits and outputs the judgment result.

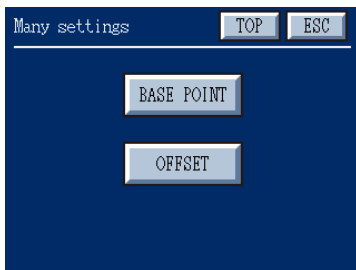
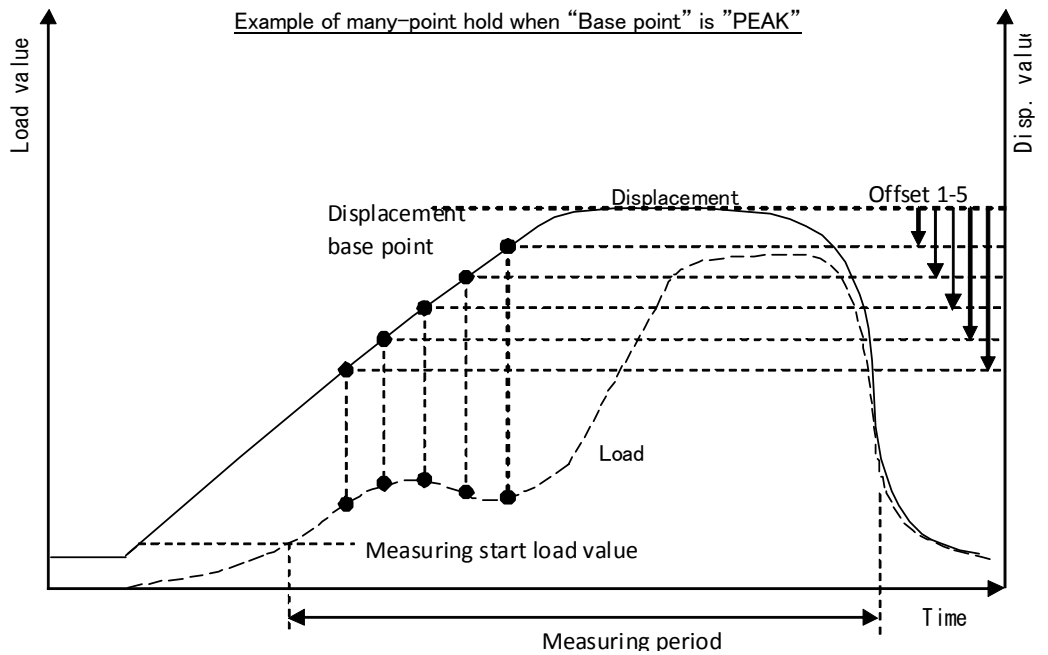
The limits are set as discussed in "7-2-5-1 Setting the Load Limits."

To use the many hold mode, it is necessary to select "DISP.VOLT" or "DISP. PULSE" on the Displacement sensor screen (accessible from the Sensor calibration screen).

From the TOP screen, select "SETTINGS" → "DETAIL SET" → "WORK" → "Work No." (1 to 16) → "HOLD SET." → "MANY."



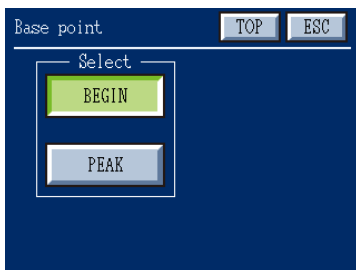
- t1: A delay time between the moment when the measuring start input is detected and the moment when the load indicated values and internal data hold are released and judgment output and measurement completed signal are turned OFF. 1 ms (MAX)
- t2: A delay time between the moment when the measurement is completed and the moment when judgment output and judgment completed output are validated. 1 ms (MAX)
- t3: Measuring period, up to a maximum of 30.0 seconds (depending on the measuring time settings)
- t4: CF card recording time, up to a maximum of 20 seconds (measuring time: 30.0 seconds)



Many setting screen

◇ Many-Point Hold Settings

From the Hold settings screen, select "MANY" to display the Many settings screen, in which you determine settings for "BASE POINT" and "OFFSET."



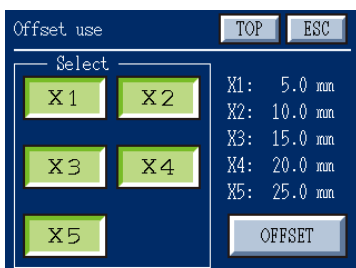
Base point screen

◇ Base point

The Base point screen allows you to set a base point.

BEGIN: Set the displacement position at the start of measurement as a base point.

PEAK: Set the peak displacement position as a base point.



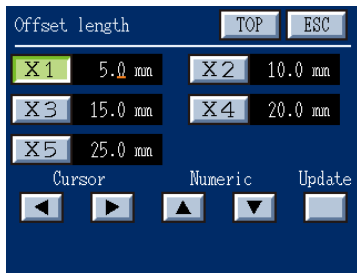
Offset use screen

◇ Offset use

The Offset use screen allows you to select offsets ("X1" to "X5") you want to use and set their offset length ("OFFSET.")

In the figure on the left, all the offsets are selected.

For the load hold values at the offset position specified here, load HI/LO limits can be set for each offset in the "Criterion settings" screen.



Offset length screen

In the Offset length screen, set the length of displacement offsets (X1 to X5) from the base point.

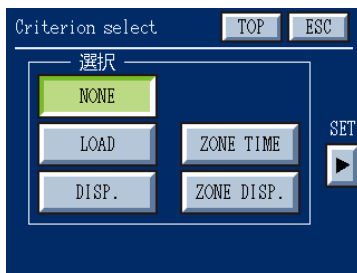
Set values by selecting an item (“X1” is selected in the figure on the left), using the key to place the cursor over a digit you want to change, and using the key to set a desired value, and then push the “Update” button to confirm.

7-2-5 Setting the Limits

Criteria for comparison and judgment can be set for load values (HI/LO and HI_HI/LO_LO limits) and displacement values (HI/LO limits) on a work-by-work basis. Comparison and judgment are performed against values held under each hold condition.

From the TOP screen, select “**SETTINGS**”→“**DETAIL SET**”→“**WORK**” →”**Work No.**” (1 to 16)→“**CRITERION**” to set a criterion for comparison and judgment and limits for judgment.

Pushing on the Criterion Select screen advances to the Criterion Settings screen and pushing on the Criterion Settings screen returns to the Criterion Select screen.



Criterion Select screen

In the Criterion select screen, select the type of comparison and judgment.

NONE : No comparison and judgment are performed.

LOAD : Comparison and judgment are performed for a load value at the moment of being held.

DISP. : Comparison and judgment are performed for a displacement value at the moment of being held.

ZONE TIME : This mode sets time along the horizontal axis and judges whether a load value is within a zone defined by load values and time (up to three blocks can be set). When the three blocks are all judged OK, a GO signal is output. Up to three blocks can be selected.

ZONE DISP.: This mode sets displacement along the horizontal axis and judges whether a load value is within a zone defined by load values and displacement values (up to three blocks can be set). When the three blocks are all judged OK, a GO signal is output. Up to three blocks can be selected.



Criterion Settings screen

In the Criterion settings screen, set limits and conditions for judgment.

LOAD : Set HI/LO limits, HI_HI/LO_LO limits, and a hysteresis value.
When “**MANY**” hold is selected, set HI/LO limits for a hold value.

DISP. : Set limits for judging displacement values.

ZONE TIME : Set three time zones.

ZONE DISP.: Set three displacement zones.

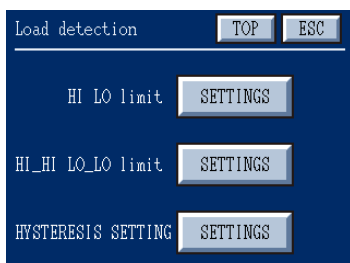
7-2-5-1 Setting the Load Limits

Load limits settings are different, depending on whether “MANY” hold is set or not.

◇ When a hold other than “MANY” is set

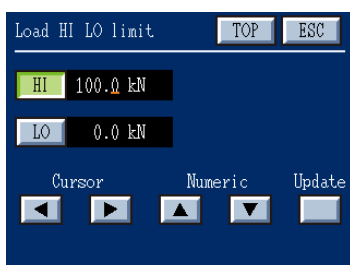
Load detection function allows you to specify HI/LO limits and HI_HI/LO_LO limits.

In the HYSTERESIS SETTING screen, you can set the width of hysteresis.



Load detection screen

In the **Criterion settings** screen, select “LOAD”→“SETTINGS” to set the HI LO limit, HI_HI LO_LO limit, and HYSTERESIS SETTING.

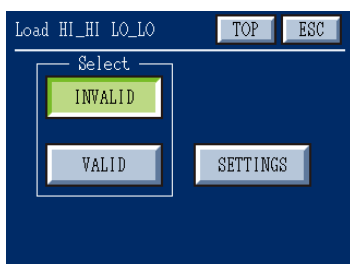


Load HI LO limit screen

Load HI LO limit screen

Set values by selecting “HI” or “LO” (“HI” is selected in the figure on the left), using the key to place the cursor over a digit you want to change, and using the key to set a desired value, and then push the “Update” button to confirm.

- Comparison and judgment conditions
 - HI or HH ON condition: indicated value > HI or HH limit value
 - LO or LL ON condition: indicated value < LO or LL limit value
- Setting conditions for each limit value
 - LL limit value ≤ LO limit value ≤ HI limit value ≤ HH limit value



Load HI_HI LO_LO screen

Load HI_HI LO_LO screen

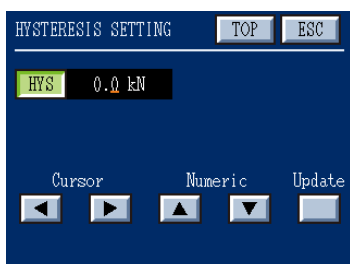
HH and LL limit values can be disabled when not used.

Select “SETTINGS” to set HH and LL limit values in the same manner as HI and LO limit values.



Caution

For inflection point trigger peak hold, judgment against the load HH and LL limit values is not performed. Load HH and LL limit values are ignored.



Load HI LO limit screen

HYSTERESIS SETTING screen

When constant judgment is enabled, the hysteresis function for judging against HI and LO limit values and HH and LL limit values becomes effective.

Set a hysteresis value by using the key to place the cursor over a digit you want to change, and using the key to set a desired value, and then push the “Update” button to confirm.



Caution

When constant judgment is enabled in the Load sensor screen, the hysteresis function becomes effective.

When you set a value other than 0.0 in “HYS”, the hysteresis function becomes effective.

- Once the HI judgment output becomes ON, the state continues until a measured load value falls below a value obtained by subtracting the hysteresis value from the HI limit value.
- Once the LO judgment output becomes ON, the state continues until a measured load value exceeds a value obtained by adding the hysteresis value to the LO limit value.

HH judgment and LL judgment function similarly.

A hysteresis setting value is common to all load limit values.

If a hysteresis value is large, for example, so that a value obtained by subtracting the hysteresis value from the HI limit value overlaps the LO limit value, a judgment result based on the HI and LO limit values takes precedence over a judgment result in which a hysteresis value is considered.

Once a value is held, the held value is compared against the HI and LO limit values and the comparison result is judged and output.

◇ When “MANY” hold is set

When “MANY” hold is set, load is be judged against HI and LO limit values.

Set load HI and LO limit values for each set displacement offset (up to 5 points).



Many HI LO limit screen

>> Selecting HI and LO limit values for many-point hold

Set HI and LO limit values for load values held during many-point hold.

X1 SET, X2 SET, X3 SET, X4 SET

: Set HI and LO limit values for many-point hold values.

PEAK SET : Set HI and LO limit values for a displacement peak value of measurement data and HI and LO limit values for a load value at the displacement peak (zone judgment).

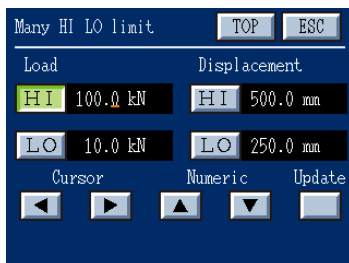


Many HI LO limit screen

>> HI and LO limits value setting for many-point hold values

Set HI and LO limit values for many-point hold values.

Set values by selecting an item (“HI” is selected in the figure on the left), using the key to place the cursor over a digit you want to change, and using the key to set a desired value, and then push the “Update” button to confirm.



Many HI LO limit (peak) screen

>> HI and LO limits value settings for peak values (zone judgment)

Set HI and LO limit values for a displacement peak value of measurement data and HI and LO limit values for a load value at the displacement peak.

Set values by selecting an item (“HI” is selected in the figure on the left), using the key to place the cursor over a digit you want to change, and using the key to set a desired value, and then push the “Update” button to confirm.

◇ Judgment output for many-point hold values

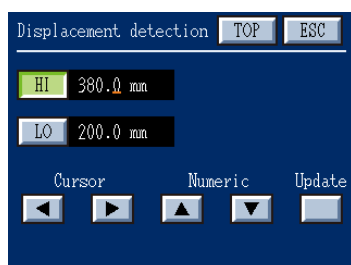
Many-point hold values are judged against the set load HI and LO limit values and displacement HI and LO limit values and the result is output as follows.

Judging condition	Displacement judgment output	Load judgment output
for selected offset, load hold value, displacement peak value and load value at the displacement peak are all within the HI and LO limit values	—	GO is ON
for selected offset, load hold value, displacement peak value and load value at the displacement peak exceed the HI or LO limit value (load hold values are judged each time the offset position is passed. Once the HI or LO limit value is exceeded, the HI and LO signals are held)	—	HI and LO are ON
displacement peak value exceeds the displacement HI and LO limit values	HI or LO is ON	—
hold position is outside displacement measurement data	—	LL is ON

For many-point hold, HI and LO can both be ON. In this case, HL is judged and displayed in the screen (refer to judgment results described in “1-1-1 Digital Display Screen (TOP Screen)”).

7-2-5-2 Setting Displacement Limits

Holds the load value when the set displacement value is reached during a measuring period.



Displacement detection screen

This function is enabled when displacement is plotted along the horizontal axis and HI and LO limit values are specified in millimeters (mm).

Set values by selecting “HI” or “LO” (“HI” is selected in the figure on the left), using the key to place the cursor over a digit you want to change, and using the key to set a desired value, and then push the “Update” button to confirm.

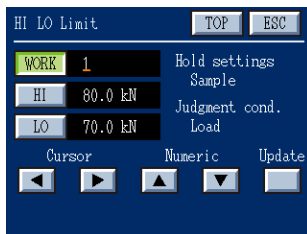
- Comparison and judgment conditions
 - HI ON condition: indicated value > HI limit value
 - LO ON condition: indicated value < LO limit value
- Setting conditions for each limit value
 - LO limit value ≤ HI limit value

◇ Shortcut to HI and LO limit value setting

To set load and displacement HI and LO limit values, usually access the TOP screen → “SETTINGS” → “DETAIL SET” → “WORK” → “Work No.” (1 to 16) → “CRITERION” → “LOAD” or “DISP.” - “SET”.

Alternatively, you can use “SETTINGS” → “HI LO LIMIT” as a shortcut.

The settings can be changed only when load or displacement is judged.



Example of HI LO Limit for load

The HI and LO limit values set in this screen apply to the settings made on a work-by-work basis.

Set values by selecting an item (“WORK” is selected in the figure on the left), using the key to place the cursor over a digit you want to change, and using the key to set a desired value, and then push the “Update” button to confirm.

7-2-5-3 Multiple-zone Limit Value Settings

Multiple-zone judgment covers ranges (zones) defined by coordinates and two modes are available. One mode compares against load values and time and the other compares against load values and displacement values.

When comparing with displacement values, you need to select “DISP.” in the Sensor calibration screen.

- Comparison against load value and time:

From the TOP screen, select “SETTINGS” → “DETAIL SET” → “WORK” → “Work No.” (1 to 16) → “CRITERION” → “ZONE TIME.”

- Comparison against load value and displacement value:

From the TOP screen, select “SETTINGS” → “DETAIL SET” → “WORK” → “Work No.” (1 to 16) → “CRITERION” → “ZONE DISP.”



Zone time settings screen

For multiple-zone judgment, up to 3 blocks can set. The block, highlighted in light green, with the “SETTINGS” button pushed is enabled and the corresponding zone is displayed on the graph screen. In the figure on the left, all zones (1 to 3) are selected.



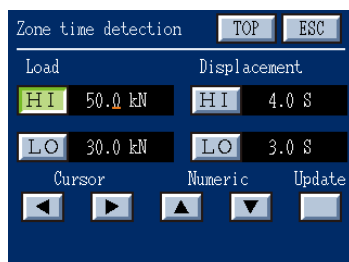
Caution

When “MULTIPLE” hold is set, zone which is set to “NONE” must be left unselected.

For multiple-zone judgment, “NONE” or “MULTIPLE” hold can be set.

When “NONE” is set in the Hold Select screen, judgment as to whether measured values fall within each zone is made.

When “MULTIPLE” is set in the Hold Select screen, judgment as to whether hold values fall within each zone is made.

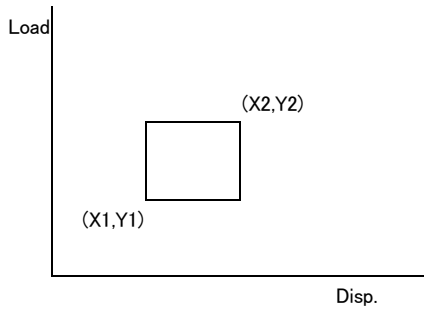


Zone time settings screen

Set a zone which you want to use using the axis of coordinates (load HI and LO limit values and displacement or time HI and LO limit values).

Set values by selecting an axis (“HI” for “LOAD” is selected in the figure on the left), using the key to place the cursor over a digit you want to change, and using the key to set a desired value, and then push the “Update” button to confirm.

(The figure on the left shows a comparison of displacement and load values).



Setting conditions

Load LO:Y1, Load HI:Y2

Displacement LO:X1, Displacement HI:X2

In this case,

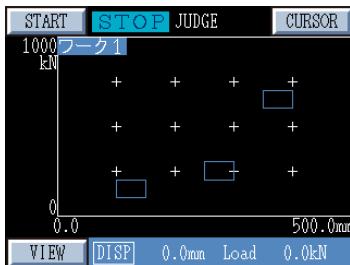
The settings are independent between the zones, but $X1 \leq X2$ and $Y1 \leq Y2$ are required within the zones.



Caution

For multiple-zone judgment, “**NONE**” or “**MULTIPLE**” hold can be set.

- When “**NONE**” is set in the Hold Select screen, judgment as to whether measured values fall within each zone is made.
- When “**MULTIPLE**” is set in the Hold Select screen, judgment as to whether hold values fall within each zone is made.



Example of graph display for multiple-zone judgment

The figure on the left shows a comparison of load and displacement values with zones 1, 2, and 3 set.

The limit values (zones) are displayed on the graph display measurement screen.

Example of setting three zone judgment

• Zone 1 settings

Displacement LO limit value (X1) : 100.0 mm

Displacement HI limit value (X2) : 150.0 mm

Load LO limit value (Y1) : 100 kN

Load HI limit value (Y2) : 200 kN

• Zone 2 settings

Displacement LO limit value (X1) : 250.0 mm

Displacement HI limit value (X2) : 300.0 mm

Load LO limit value (Y1) : 200 kN

Load HI limit value (Y2) : 300 kN

• Zone 3 settings

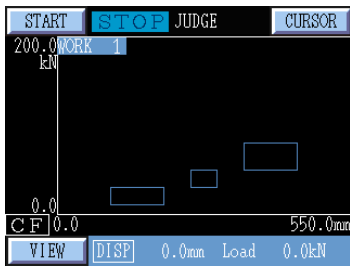
Displacement LO limit value (X1) : 350.0 mm

Displacement HI limit value (X2) : 400.0 mm

Load LO limit value (Y1) : 600 kN

Load HI limit value (Y2) : 700 kN

◇ Example of Multiple-zone Judgment (Hold Condition: MULTIPLE)

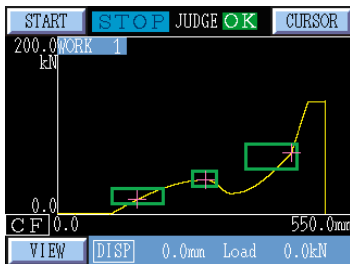


Example of a graph before measurement is performed

The figure on the left shows an example of a multiple-zone judgment graph before measurement is performed.

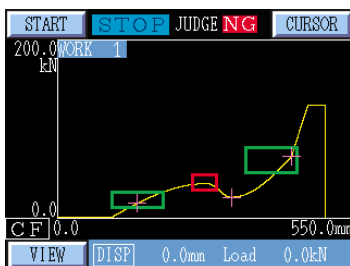
In this case, three zones are set.

Multiple-zone judgment checks whether hold values falls within the determined zones.



Example of a graph when judgment result is OK

When measurement is performed, if all the hold values fall within the zones, judgment result is OK.



Example of a graph when judgment result is NG

If at least one of the hold values falls outside of the zones, judgment result is NG.

Note:

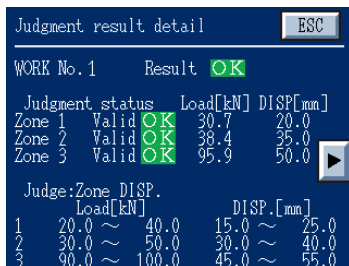
◇ Details of Multiple-zone judgment result

Details of multiple-zone judgment result and settings can be checked by pushing the DETAIL button on the digital display screen (TOP screen).



Digital Display screen

Push the “DETAIL” button on the digital display (TOP screen) to display the Judgment result detail screen.



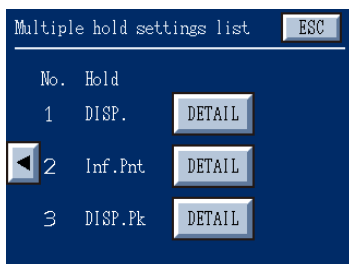
Example of Judgment result detail

The figure on the left shows an example of multiple-zone judgment result detail.


Before measurement is performed, the settings can be checked.

The followings are displayed.

- Work number, judgment result
- Judgment result and hold values (load and displacement values) for each zone
- Criterion for judgment and the set ranges (zones)

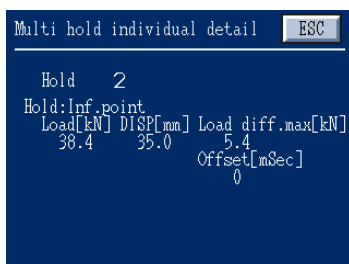


Multiple hold settings list screen

Push the  key to display the Multiple hold settings list screen.

In the Multiple hold settings list screen, you can check the hold conditions and hold values for each zone.

Push the DETAIL button to display the hold value for each zone.



Example of Multi hold individual detail

The figure on the left shows the load value, displacement value, and maximum load difference for Inf.point hold.

(the maximum load difference indicates a maximum of load difference during detecting an inflection point).

7-2-5-4 Special Judgment Output

◇ Judgment NG output

When comparing and judging hold values, comparison output (HH, HI, GO, LO, LL) may not be applied. This case is called “judgment NG,” and can be output by assigning to the HI and LO signals for comparison outputs.

Usually, for judgment NG, comparison output (HH, HI, GO, LO, LL) is not changed, and therefore judgment NG can not be detected from comparison output. In such a case, the judgment NG output function detects judgment NG by assigning judgment NG to the HI and LO signals for comparison output.

Hold settings	Causes for judgment NG
Sample	Sample signal for external input signal was not turned ON
Inflection point	Failed to detect an inflection point
Maximum, minimum	Failed to detect maximum and minimum
Displacement	Predetermined displacement position was not passed
Displacement sample	Displacement sample signal for external input signal was not turned ON
Multiple	Hold values were outside the zones
—	DZ (Digital Zero) was not accepted prior to measurement (DZ errors occurred)

About judgment NG output settings, refer to “9-9 Judgment NG Output.”

◇ Special judgment NG output for inflection point trigger peak hold and many-point hold

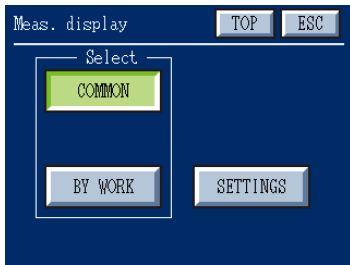
When inflection point trigger peak hold or many-point hold is set, HH and LL judgment outputs are used instead of HI and LO judgment outputs in the causes shown below.

Hold settings	Causes for judgment NG	Load judgment output
Inflection point trigger	Failed to detect an inflection point.	HI and LO is ON
	The load value of the point of inflection is less than minimum load value.	HI and LO is ON
	Analysis range is outside measurement data.	LL is ON
	The load value satisfied a condition of the measurement end without surpassing an analysis start level.	LL is ON
Many	Both HI and LO were formed.	HI and LO is ON
	Hold position is outside measurement data.	LL is ON

7-2-6 Measuring Display Settings

Set the measuring display conditions.

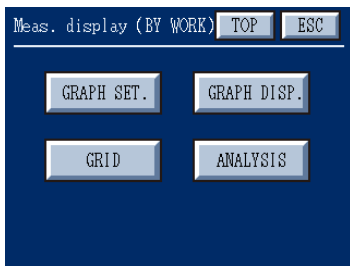
From the TOP screen, select **“SETTINGS”**→**“DETAIL SET”**→**“WORK”** →**“Work No.”(1 to 16)**→**“MEAS. DISP.”**



Meas. display screen

COMMON : The settings defined by choosing **“SETTINGS”**→**“DETAIL SET”**→**“VIEW”** from TOP screen is applied.

BY WORK : The measuring display set by using the **“SETTINGS”** button in the Meas. display screen is applied. Select when you want to set the measuring display conditions on a work-by-work basis.



Meas.display (BY WORK) screen

From the “Meas. display” screen, select **“SETTINGS.”**

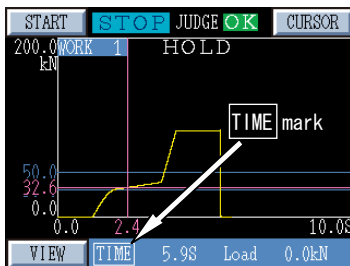
In the “Meas.display (BY WORK)” screen, set the measuring display conditions (**“GRAPH SET.”**, **“GRID”**, **“GRAPH DISP.”**, **“ANALYSIS”**) for this work.

For details about settings, refer to “6. Measurement Display Settings.”

7-2-6-1 Measuring Display Settings from the Graph Screen

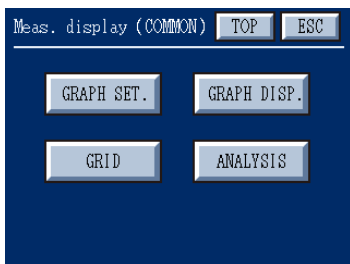
When you push the **TIME** mark or **DISP** mark on the Graph screen, a shortcut to the Meas. Display screen is provided.

This shortcut allows you to change the display range or grids directly from the Graph screen.



Graph screen

When you push the **TIME** mark (or **DISP** mark) on the Graph screen, a shortcut to the Meas. Display screen is provided.



Meas. display (COMMON) screen

Even when the settings are changed from this screen, the measurement data is not discarded.

When “COMMON” is selected, the common settings are changed.

When “BY WORK” is selected, settings by work are changed.

The figure on the left is displayed when “COMMON” is selected.

8. CF (Compact Flash) Settings



CF screen

The CF screen allows you to determine settings for storing onto a compact flash card.

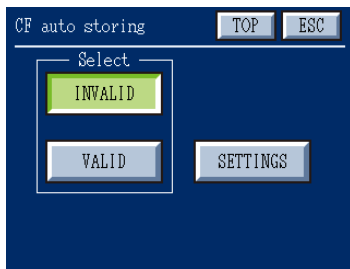
From the TOP screen, select “**SETTINGS**”→”**DETAIL SET**”→”**CF.**”



Caution

When recorded data is stored, the filename (if date is set) and timestamp are generated based on the system clock. Make sure that the system clock is accurate.

8-1 Auto Store and Capture Settings



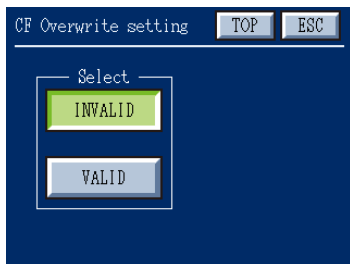
CF auto storing screen

From the CF screen, select “**AUTO STORE.**”

Specify whether recorded data is automatically stored (“**VALID**”) on a CF card or not (“**INVALID.**”)

INVALID : Recorded data is manually stored.

VALID : Data recorded from measuring start to stop is automatically stored onto a CF card once the measurement is stopped.



CF Overwrite setting screen

When you select “**VALID**”, select “**SETTINGS**” next to “**VALID**” and specify whether previous data is overwritten (“**VALID**”) or not (“**INVALID.**”)

INVALID : Previous data is not overwritten.

VALID : Previous data is deleted so that approx. 10 MB of free capacity is available when new data is stored or a CF card is inserted. Data to be deleted is files which are of the same file format in the recording working folder.



Caution

- When the overwrite function is enabled, previous data is deleted and then new data is written on completion of measurement. Wait awhile before starting the subsequent measurement.
- Repeated write and deletion of data may cause slower access. In this case, format the CF card.

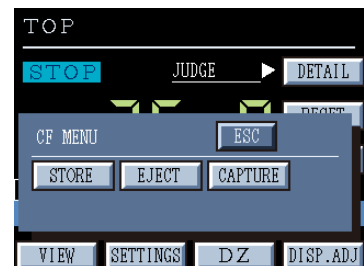
◇ Manually storing recorded data

When a CF card is inserted, a CF mark is displayed.

To store on the CF card, push the CF



TOP screen for manual storing




CF menu displayed

To manually store data recorded from measuring start to stop, begin by pushing the **CF** mark on the screen to display the CF screen.

When you select “**STORE**”, the recorded data is stored on the CF card. Once the store has been finished, the filename is displayed. Push “**OK**” to confirm.

Caution) The CF mark is displayed to indicate that a CF card is inserted.



During the CF card is being accessed, the CF mark is shown in yellow.
Do not remove the CF card while accessing the card. Doing so may cause the CF card or files stored in the card to be damaged.

Caution

◇ Capture

To store a digital display screen or a graph display screen, begin by pushing the CF mark * on the screen to display the CF menu.

When you select “**CAPTURE**”, the menu image is stored in the bitmap format on the CF card. Once the store has been finished, the filename is displayed. Push “**OK**” to confirm.

The file is saved in the BMP format in a folder as follows:

Target directory: ¥BMP

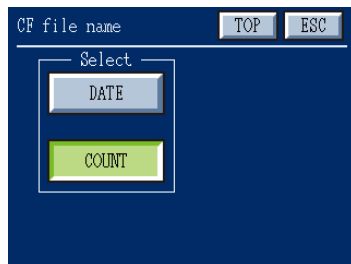
Filename: MMDDnnnn.BMP

MM : Month

DD : Day

nnnn : serial number, starting at 0001

8-2 Filename Settings



CF file name screen

From the CF screen, select “**FILE NAME.**”

Select the format of files you want to store on a CF card.

DATE : Files are given a name of hhmmss (where hh, mm, and ss represent the hour, minute, and second when the measurement was started, respectively) and saved under a folder with a name of YYYYMMDD (where YYYY, MM, and DD represent the year, month, and day when the measurement was started, respectively).

Example: Under Work No. 1, measurement started on January 03, 2008 at 12:54:16

¥WORK1¥20080103¥125416.CSV

COUNT : Files are named sequentially beginning with TD0001 and saved under a folder which is named sequentially beginning with TD001.


Example: Under Work No. 2, the first file to be recorded

¥WORK2¥TD001¥TD0001.CSV

When you select “**COUNT**”, one folder can contain a maximum of 5,000 files. Subsequent files are saved under a specific folder with the number incremented by one every 5000 files and again are named sequentially beginning with TD0001.

Example: If 6000 files are recorded under Work No. 2, the files are saved under two different folders as follows:

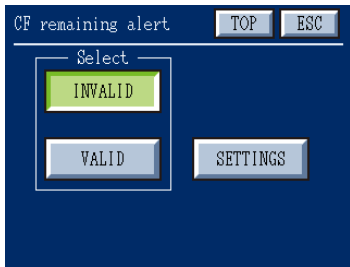
- 1st to 5000th files ¥WORK2¥TD001¥TD0001.CSV to TD5000.CSV
- 5001st to 6000th files ¥WORK2¥TD002¥TD0001.CSV to TD1000.CSV



Caution If more than one measurement was performed in one second or less, select **“COUNT.”** If you select **“DATE”**, files with the same date and time are not saved.

8-3 Remaining Alert and Limit Settings

From the CF screen, select **“REMAIN ALERT.”**

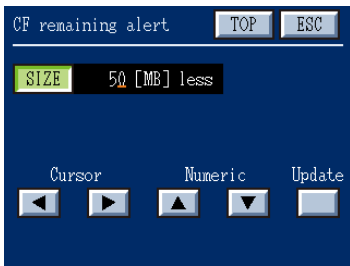


CF remaining alert screen

The CF remaining alert screen allows you to select whether or not an alert is issued before the CF card is full and, if you select that such an alert is issued, to define when the alert is issued.





INVALID: Alert is not issued.

VALID : Alert is issued.



CF remaining alert screen

When you select **“VALID”**, select **“SETTINGS”** next to **“VALID”** and then define the minimum remaining capacity below which an alert is issued.


Set values by using the   key to place the cursor over a digit you want to change, and using the   key to set a desired size (MB), and then push the **“Update”** button to confirm.

◇ Remaining capacity alert



CF remaining alert displayed

When the remaining capacity of your CF card falls below the specified size, an indication of how much capacity remains on the card is given.



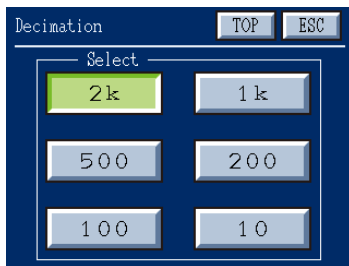
Caution Even after the capacity of your CF card falls below the predefined size, you can save additional files. However, if your CF card is full, you can no longer save files and an alert is issued to indicate that there is no capacity left on the CF card.

Files are saved until the CF card is full. Even after the CF card is full, measurement can be still performed. However, files can be no longer saved.

In this case, use another new CF card or erase the files stored on the CF card or format the card (refer to Section 8-8).

8-4 Decimation

From the CF screen, select “**Decimation.**”



Decimation screen

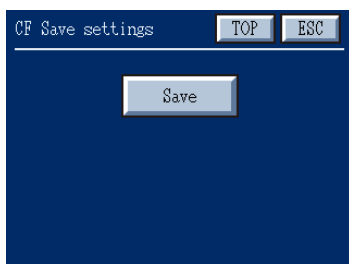
This function allows you to decimate measurement data and then store the reduced data on a CF card.

Before performing measurements, set 2 k, 1 k, 500 Hz, 200 Hz, 100Hz, or 10 Hz. Data with a specified sampling rate will be written.

The actual sampling rate is 2 k. When you specify not to decimate data, select “2 k.”

8-5 Saving a Setup File

From the CF screen, select “**SAVE SETTING.**”

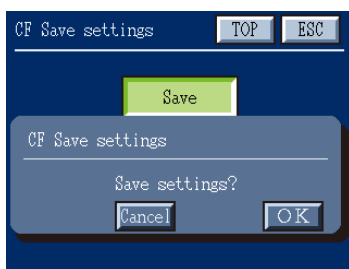


CF Save settings screen

Various setting information of TD-280T is saved in a setup file (TD_CNF.PRM) on a CF card.

Filename: TD_CNF.PRM

Target directory: ¥ (root directory)

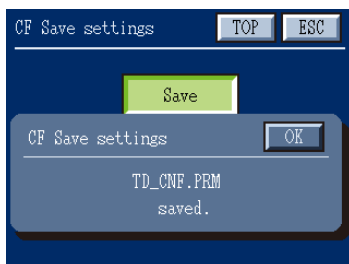


Save confirmation

When you push “**Save**” button on the CF Save settings screen, a confirmation dialog is displayed asking whether to continue. Push the “**OK**” button to save the setup file.

If the setup file already exists, a confirmation dialog is displayed asking whether to overwrite the file. Push the “**OK**” button to overwrite the file.

Any existing setup file is renamed to TD_CNF.BAK. If the TD_CNF.BAK file already exists, the existing file is deleted.

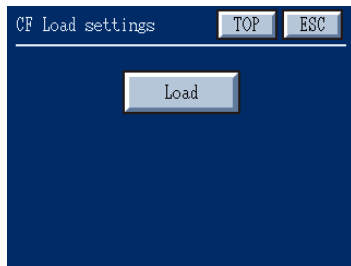


Settings saved

Once the setup file has been saved, the filename (TD_CNF.PRM) is displayed. Push “**OK**” to confirm.

8-6 Loading a Setup File

From the CF screen, select "LOAD SETTING."

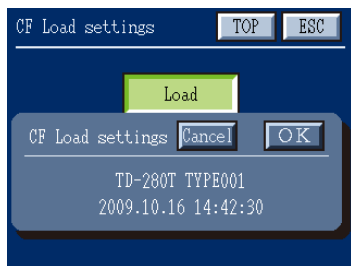


CF Load settings screen

You can load the setup file from the CF card and change the settings.

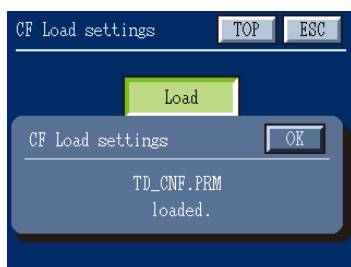
Filename: TD_CNF.PRM

Target directory: ¥ (root directory)



Load confirmation

When you push the "Load" button on the CF Load settings screen, the information about the setup file is displayed. Push the "OK" button to read the setup file.



Settings loaded

Once the setup file has been read, the filename (TD_CNF.PRM) is displayed. Push "OK" to confirm.

◇ Cautions when loading settings



Caution

- The sensor calibration values in TD-280T are not changed. After determining the settings for sensor calibration, load the settings.
- It is recommended to use a setup file with the same version of firmware currently installed in TD-280T. Using firmware with a different version can lead to errors because of the difference in specifications.
- If the number of digits after the decimal point used to display load values is different from that used in the setup file, errors will occur.
- After the setup file is loaded, check the settings of TD-280T.
- If the setup file fails to be loaded, the settings are not changed.
- Do not edit the setup file.

8-7 Installing and Removing a CF Card

◇ Installing a CF card

- Open the CF card slot cover on the front panel.
- Insert a CF card into the CF card slot.
- Make sure that the LED indicator, located to the right of the CF card slot, goes up.
- Close the CF card slot cover on the front panel.

When a CF card is recognized by TD-280T, a CF mark is displayed on the screen.

When a CF card is inserted, a CF mark is displayed.



CF mark displayed



Caution

When you insert a CF card, 16 folders (WORK1 to WORK16) are created under the root directory of the CF card.

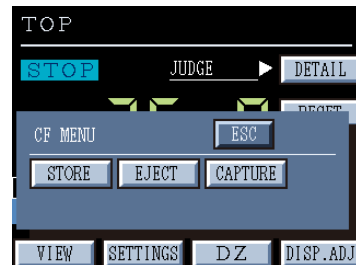
◇ Removing a CF Card

- Push the CF mark to display the CF MENU.

Touch the CF mark to display the CF MENU.



CF mark displayed



CF MENU displayed

- Select "**EJECT**" on the CF MENU.
- Open the CF card slot cover on the front panel.
- Make sure that the LED indicator, located to the right of the CF card slot, is off.
- Push the eject button, located to the left of the CF card slot, gently to remove the CF card.
- Close the CF card slot cover on the front panel.



Caution

During the CF card is being accessed, the CF mark is shown in yellow.

Do not remove the CF card while accessing the card.

Doing so may cause the CF card or files stored in the card to be damaged.

8-8 File Erase and Format

TD-280T supports a CF card formatted with FAT16 and FAT32.

FAT32 is recommended.

Before using a CF card with TD-280T, format it on your PC.

To erase files stored on the CF card or format the CF card, use your PC.

You can not erase files stored on the CF or format the CF card directly from TD-280T.

If the CF card is full, use another new CF card or erase the files stored on the CF card or format the card.

8-9 Recorded Data Format

Files are stored on a CF card in CSV format.

A file consists of header and data sections.

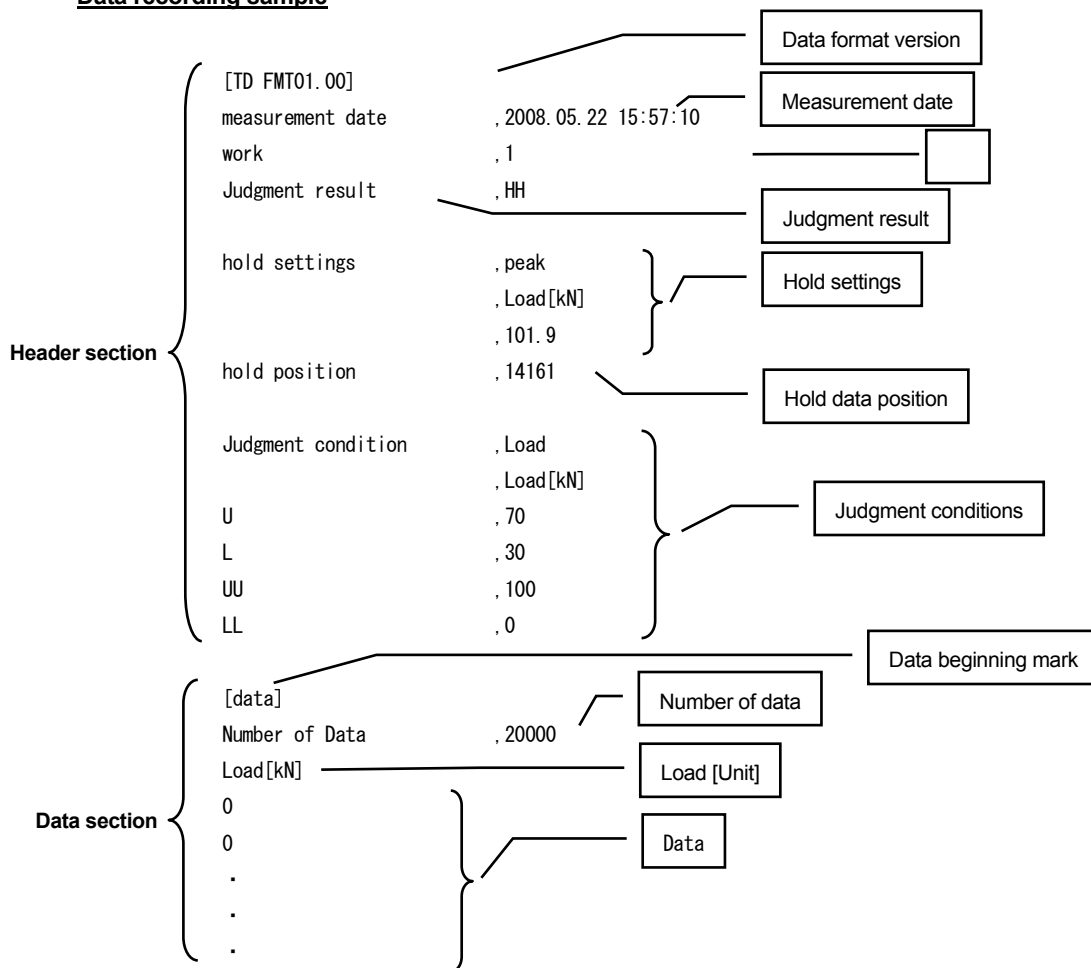
◇ Header section

The header section contains measurement date, work No., judgment result, hold settings, judgment status, and other configuration information.

◇ Data section

The data section contains load data.



Data recording sample

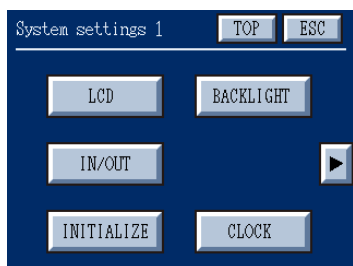


9. System Settings

The System settings screen allows you to determine settings for the backlight and contrast of the LCD, the backlight timer, check of external IN/OUT signals, the clock, the system information, the buzzer, key lock, judgment NG output, system reboot, and optional board (if installed).

From the TOP screen, select “**SETTINGS**”→”**DETAIL SET**”→”**SYSTEM.**”

Pushing  on the System settings 1 screen advances to the System settings 2 screen and pushing  on the System settings 2 screen returns to the System settings 1 screen.

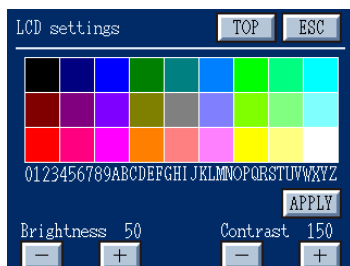


System settings 1 screen



System settings 2 screen

9-1 LCD Settings



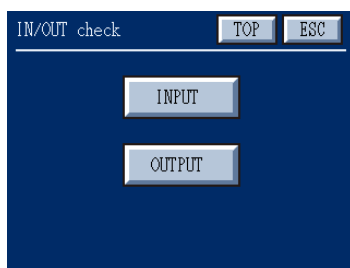
LCD screen

From the System settings 1 screen, select “**LCD.**”

Adjust the brightness and contrast of the LCD.

The optimal values are factory pre-set, however you may need to change the values according to the ambient temperature. In this case, set the brightness and contrast as appropriate, and then push the “**APPLY**” button to confirm.

9-2 IN/OUT (IN/OUT check)

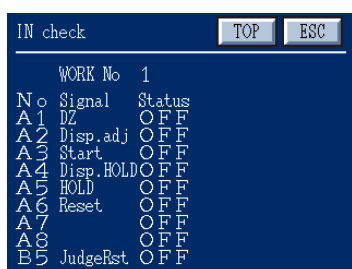


IN/OUT check screen

From the System settings 1 screen, select “**IN/OUT.**”

The IN/OUT check screen allows you to check whether the externally connected input signals are ON or OFF, and to turn the output signals ON or OFF, regardless of the status given from the indicator, and check the connections easily.

◇ IN (Input check)



IN check screen

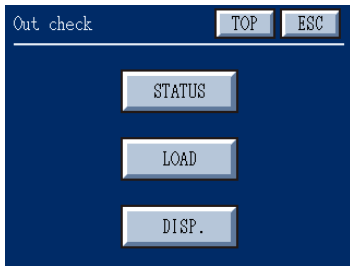
From the IN/OUT check screen, select “**INPUT.**”

You can check the status of the externally connected input signals.

When an input signal is turned on, the signal will have a status of “**ON.**”

◇ OUT (Output check)

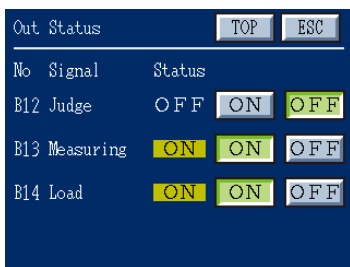
The Out check screen allows you to turn the contact outputs ON or OFF, regardless of the status given from the indicator, and check the connections easily.



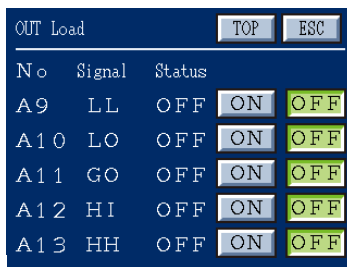
OUT check screen

From the IN/OUT check screen, select **“OUTPUT.”**

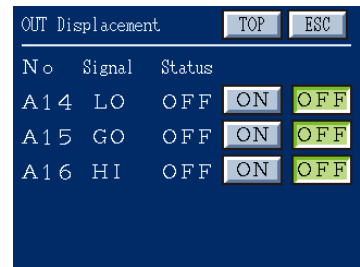
The Out check screen allows you to turn each contact output of status signals, load comparison, and displacement comparison ON/OFF. Therefore, TD-280T in combination with the connected system can be checked.



Status (Contact) check screen



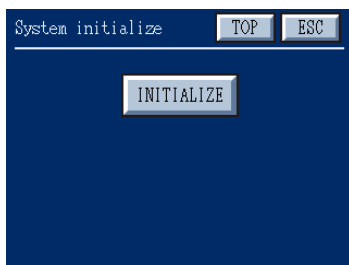
Load (Contact) check screen



Displacement (Contact) check screen

You can turn a signal output ON or OFF by pushing the ON or OFF button next to the output.

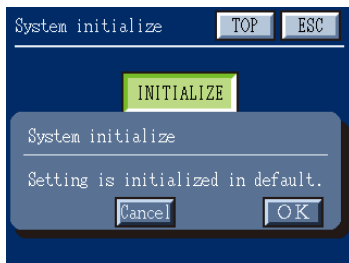
9-3 Initializing Settings



System initialize screen

From the System settings 1 screen, select **“INITIALIZE.”**

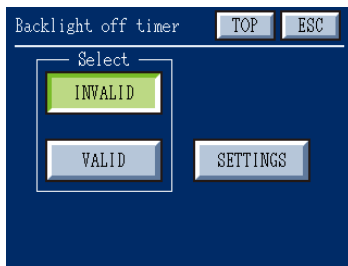
This function is used to reset various settings of TD-280T to their defaults.



System initialize screen

Push the **“INITIALIZE”** button on the System initialize screen and then push the **“OK”** button to initialize the system.

9-4 Backlight Off Timer Settings



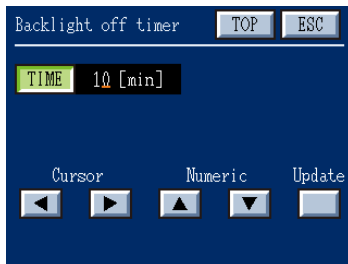
Backlight off timer screen

From the System settings 1 screen, select “**BACKLIGHT.**”

Specify whether or not you should set a timer for your screen backlight so that your LCD screen becomes dark when a specified time is elapsed after no operation takes place on the touch panel.

INVALID: Disable the backlight off timer.





VALID : Enable the backlight off timer.



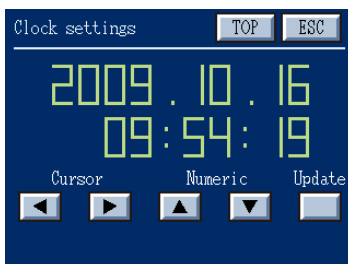
Backlight off timer screen

Select “**SETTINGS**” next to “**VALID**” to set time.

You can set, in steps of one minute, to a maximum of 999 minutes.

Set values by using the   key to place the cursor over a digit you want to change, and using the   key to set a desired time, and then push the “**Update**” button to confirm.

9-5 Clock Settings







Clock settings screen

From the System settings 1 screen, select “**CLOCK.**”

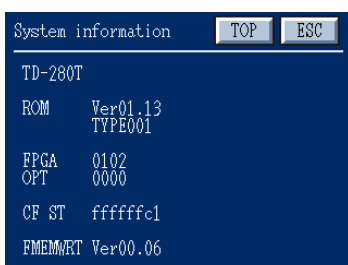
Set the system clock. This clock function is used to indicate the name (date) and timestamp of files, which are stored on a CF card.

If necessary, use the function to adjust the system time.

When the “**Update**” button is pushed, a cursor should appear. Set values by using the   key to place the cursor over a digit you want to change, and using the   key to set the present date (year.month.day) and time values, and then push the “**Update**” button to confirm.

- The clock is backup with an embedded battery. When you need to replace the battery, contact your local office or service representative.

9-6 System Information



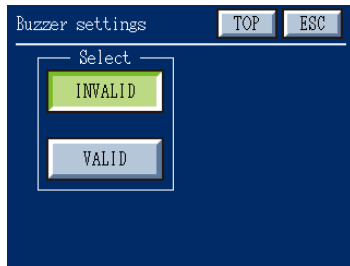
System information screen

From the System settings 2 screen, select “**SYSTEM INFO.**”

This should display various version and configuration information for your TD-280T.

When you contact us for help, you may need to provide the system information.

9-7 Buzzer Settings



Buzzer settings screen

From the System settings 2 screen, select “**BUZZER.**”

Specify whether or not the buzzer sounds when pushing on the touch panel.

INVALID: The buzzer does not sound.

VALID : The buzzer sounds.

9-8 LANG (言語)



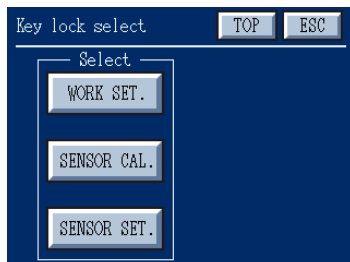
Language select screen

Select which language you want to use: Japanese or English.

日本語 : Screen text is displayed in Japanese.

ENGLISH : Screen text is displayed in English.

9-9 Key Lock Select



Key lock select screen

The Key lock select screen allows you to prevent changes in the settings on the Work settings screen, the Sensor calibration screen, and the Sensor settings screen.

WORK SET. : Prevents changes in the settings on the Work settings screen.

SENSOR CAL. : Prevents changes in the settings on the Sensor calibration screen.

SENSOR SET. : Prevents changes in the settings on the Sensor settings screen.

Caution) Key locked settings are prevented from being modified, but are allowed to be displayed.

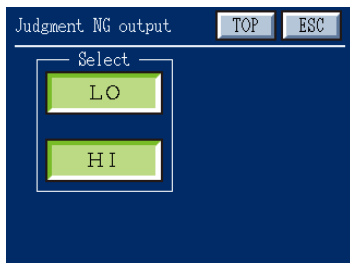
9-10 Judgment NG Output

When comparing and judging hold values, comparison output (HH, HI, GO, LO, LL) may not be applied. This case is called "judgment NG," and can be output by assigning to the HI and LO signals for comparison outputs.

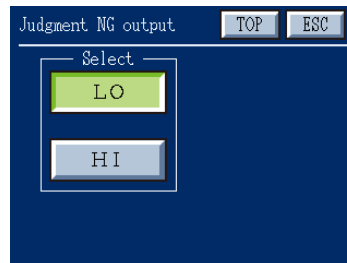
Usually, for judgment NG, comparison output (HH, HI, GO, LO, LL) is not changed, and therefore judgment NG can not be detected from comparison output. The judgment NG output function detects judgment NG by assigning judgment NG to HI and LO signals of judgment output.

Hold settings	Causes for judgment NG
Sample	Displacement sample signal for external input signal was not turned ON
Inflection point Inflection point trigger	Failed to detect an inflection point
Maximum, minimum	Failed to detect maximum and minimum
Displacement	Predetermined displacement position was not passed
Displacement sample	Displacement sample signal for external input signal was not turned ON
Multiple	Hold values were outside the zones
—	Errors occurred during DZ (Digital Zero) prior to measurement

In the Judgment NG output screen, set so that judgment NG will turn HI and LO signals of comparison output ON.



Judgment NG will turn LO and HI ON



Judgment NG will turn LO ON

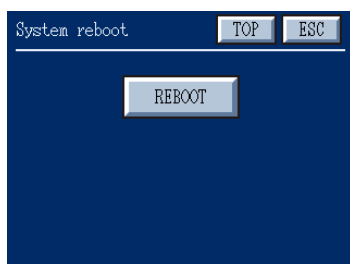
9-11 Reboot

When this button is pushed, the system is rebooted.

When you select "REBOOT" on the System settings 2 screen, a confirmation dialog is displayed asking whether to reboot the system.

Select "OK" to reboot the system or "Cancel" to cancel the operation.

A few seconds after you select "OK", a system reboot will start and the reboot screen will open.



System reboot screen



System reboot confirmation

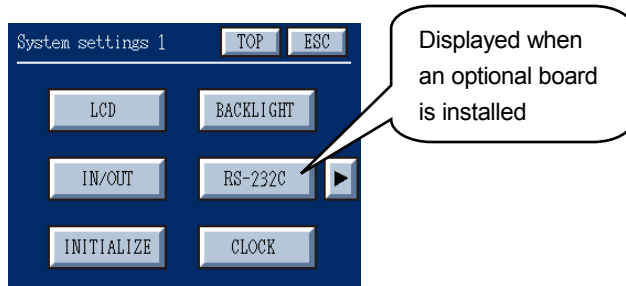
10. Settings When an Optional Board Is Installed

◇ Option settings

The option settings are enabled only when an optional board is installed in the option slot provided on the back of TD-280T.

Select **“SETTINGS”**→**“DETAIL SET”**→**“SYSTEM.”** When an optional board is installed, a button for setting the option appears.

Example: when a D/A converter is installed



System screen

10-1 Setting D/A Converter

This function applies to a device with an optional D/A converter installed.

This D/A converter is provided to obtain an analog output which is linked with indicated values from the indicator.

The analog output has a range of 0 to ± 10 V for voltage output or from 4 to 20 mA for current output.

For any digital value you have set with the D/A zero setting and the D/A full scale setting functions, you can obtain an analog output of zero (0 V, 4 mA) to full scale (± 10 V, 20 mA).

The D/A output circuit and the main circuit are isolated. The resolution is $1/\pm 10000$ for 0 to ± 10 V and the conversion rate is 500 times per second. The output has an over range of about +10%.

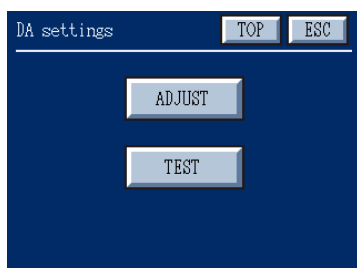
A current output of 4 mA corresponds to a voltage output of 0 V, and a current output of 20 mA corresponds to a voltage output of 10 V.

Use a current output of 4 mA (0 V) to 20 mA (+10 V).

Current output and voltage output are not set independently to zero or full scale.

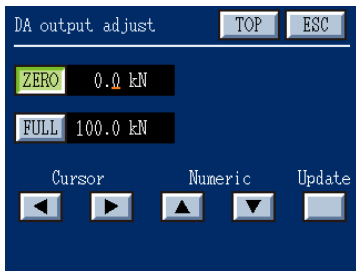
◇ DA Settings

From the TOP screen, select **“SETTINGS”**→**“DETAIL SET”**→**“SYSTEM”**→**“DA.”**



DA settings screen

10-1-1 DA Output Adjustment




DA settings screen

From the DA settings screen, select “**ADJUST**” to adjust DA output.

The DA output adjust screen allows you to set load values at DA zero and at DA full scale.

Set values by selecting an item (“ZERO” is selected in the figure on the left), using the key to place the cursor over a digit you want to change, and using the key to set a desired load value, and then push the “Update” button to confirm.

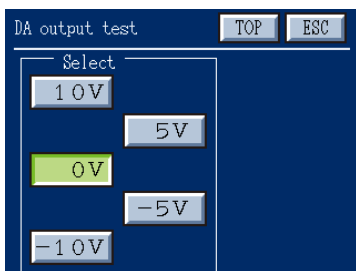


Current output and voltage output are not set independently to zero or full scale.
Caution Use a current output of 4 mA (0 V) to 20 mA (+10 V).

Setting Examples

Example 1		Example 2		Example 3		Example 4	
DA zero	000.00	DA zero	020.00	DA zero	020.00	DA zero	-10.00
DA full scale	100.00	DA full scale	100.00	DA full scale	-100.00	DA full scale	20.00
Indicated value	DA output	Indicated value	DA output	Indicated value	DA output	Indicated value	DA output
100.00	10V	120.00	10V	120.00	-10V	10.00	10V (20mA)
:	:	:	:	:	:	:	:
000.00	0V	020.00	0V	020.00	0V	0.00	5V (12mA)
:	:	:	:	:	:	:	:
-100.00	-10V	-80.00	-10V	-80.00	10V	-10.00	0V (4mA)

10-1-2 Output Test



DA output test screen

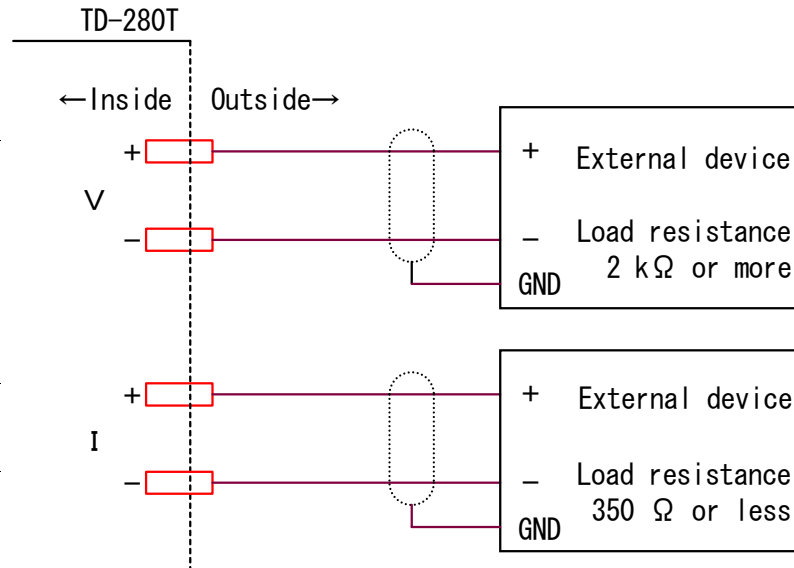
From the DA settings screen, select “**TEST**” to allow a DA output test.

A DA output test is performed by outputting any specified voltage (± 10 V, ± 5 V, or 0 V) from the D/A converter.

Select the button representing the voltage you want to be output from the D/A converter (in this case, 0 V).

10-1-3 Voltage and Current Output Connections

- Connect an external device (with a load resistance of 2 kΩ or more) to the "V"+ (plus) and the "V"- (minus) for voltage output.
- Connect an external device to the "I"+ (plus) and the "I"- (minus) for current output.



10-1-4 Resolution

The D/A converter provides a frequency of $1/\pm 10000$ for 0 to ± 10 V and $1/10000$ for 4 to 20 mA.

10-1-5 D/A Output Error

This is an overflow alert which is output only when a D/A option is provided.



DA alert display

The alert is issued when the DA output is +10 V higher and -10 V lower than the linear limits.

"RESET" will clear the alert.

Overflow alert display

10-2 Setting RS-232C Interface

This function applies to TD-280T with an optional RS-232C interface installed.

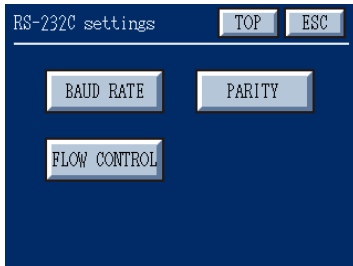
RS-232C interface is used to read out the indicated values or recorded data from TD-280T.

It is useful when connecting TD-280T with a computer, a process controller or a sequencer, etc. to perform tasks such as control, aggregation, recording, etc.

The internal and external circuits are electrically isolated via a photocoupler.

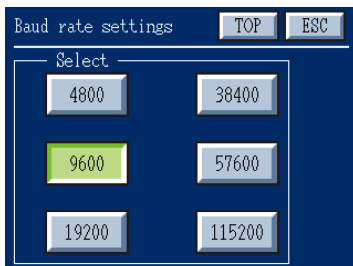
◇ RS-232C Settings

From the TOP screen, select “**SETTINGS**”→”**DETAIL SET**”→”**SYSTEM**”→”**RS-232C settings.**”



RS-232C settings screen

10-2-1 Baud Rate Settings

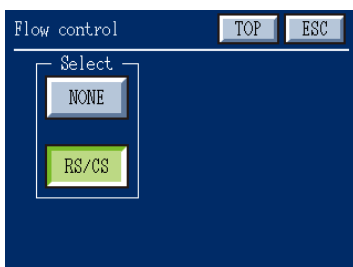


Baud Rate Settings screen

From the RS-232 settings screen, select “**Baud Rate**” and set a communication speed.

Available settings: 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps, or 115200 bps.

10-2-2 Flow Control Setting

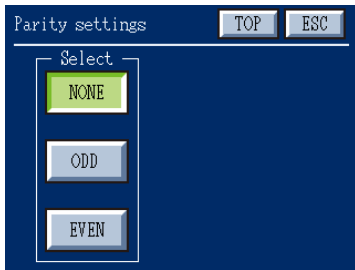


Flow Control Screen

From the RS-232C settings screen, select “**FLOW CONTROL**” to set whether or not hardware flow control is enabled.

Available settings: “NONE” or “RS/CS.”

10-2-3 Parity Settings



Parity setting Screen

From the RS-232C settings screen, select “**PARITY**” to set a communication error detection code.

Available settings: None, Odd, or Even.

10-2-4 Communication Specifications

◇ Standard

- Signal level : Based on RS-232C
- Transmitting distance : Approx. 10 m
- Transmitting method : Asynchronous, Full duplex
- Transmitting speed : 4800, 9600, 19200, 38400, 57600, 115200 bps
- Bit configuration : Start bit 1
Character length 8 bit
Stop bit 1 bit
Parity none, odd, or even
- Code : ASCII
- Flow control : none or RS/CS

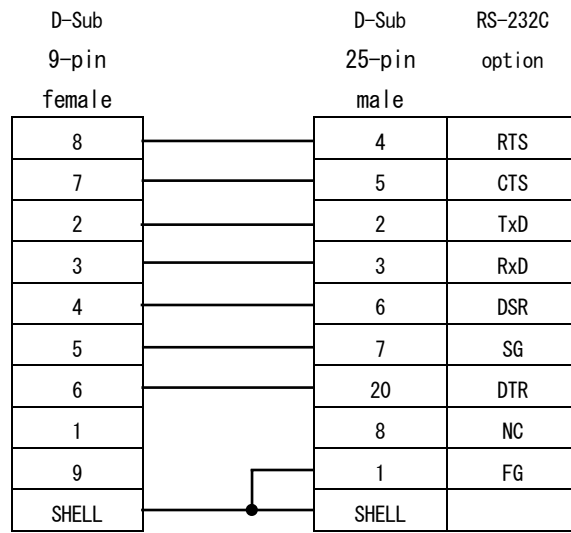
◇ Connector Pin Assignment

Adaptable plug: 25-pin D-sub connector (ex. JAE DB-25P-NR)

No.			No.		
1		FG	14		
2	Output	TxD	15		
3	Input	RxD	16		
4	Output	RTS	17		
5	Input	CTS	18		
6	Input	DSR	19		
7		SG	20	Output	DTR
8			21		
9			22		
10			23		
11			24		
12			25		
13					

◇ Cable connection sample

Cross cable connection sample

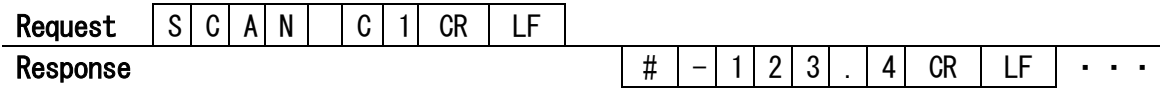


Note:

10-2-5 Communication Format

Request is a command sent from a host computer to TD-280T and Response is data sent from TD-280T to a host computer. All characters are ASCII, except [CR] and [LF].

([CR]:Carriage Return (0x0D), [LF]:LineFeed (0x0A))



10-2-6 Control Commands

Communication conditions are set in the RS-232C settings screen (accessible from the System settings screen).

Caution: Control commands are entered, using uppercase or lowercase single-byte characters.

◇ HD command

Function : To acquire the model number, hardware version, and ROM version

Argument : none

Description

The command sends the model number, hardware version, and ROM version.

◇ SCAN command

Function : To acquire the current value

Argument : frequency or STOP

Description

The command returns the current values at the specified frequency.

When you set the horizontal axis to “displacement”, load and displacement are returned.

When the settings screen is being displayed and when DZ (Digital Zero) or displacement adjustment is being performed, no data is transmitted.

During the current value is transmitted, any commands other than HD and SCAN STOP are ignored.

Arguments	Transmission Frequency [Hz]	Remarks
C1 to C9	1 to 9	1 pitch (C1, C2, C3, ...)
C10 to C100	10 to 100	10 pitches (C10, C20, C30, ...)
STOP	—	Stop the transmission

If no argument is taken, the current value is returned only once.

If STOP is taken as an argument, the transmission is stopped and * is returned.

Command examples

Example 1 SCAN C1

Example 2 SCAN STOP

Data examples

Load only (7 letters + CR +LF)

12.3

#-123.4

Load and displacement (14 letters + CR +LF)

#-123.4, - 12.3

0.0, 123.4

Communication speed

On a transmission of load and displacement, C54 or beyond requires a communication speed of 19200 bps or more.

Processings when the transmission is stopped by flow control

When the transmit buffer has enough free space, the current value is written into the transmit buffer.

After the transmit buffer is full, the current value is not written into the transmit buffer.

Therefore, the number of data and the measuring time may be inconsistent.

About data transmission

The RS-232C controller has its built-in FIFO transmit/receive buffers and transmits data collectively for efficient data transmission.

Transmission frequency [Hz]	Data to be transmitted [Sampling]	
	Load only	Load and displacement
1 to 10	1	
20	2	
30	3	
40	4	2
50	5	3
60 to 100	6	3

In case of load only, 9 bytes/sampling

In case of load and displacement, 16 bytes/sampling

If the transmission is stopped by flow control, a maximum of 2 K byte of consecutive data will be transmitted on a restart of transmission.

◇ TR_ACQ_DAT command

Function : To acquire the recorded data

Argument : none Data is transmitted as characters (ASCII)

BIN Data is transmitted as binary (float)

BIN_S Data is transmitted as binary (short)

Description

- When no argument is specified, the recorded data is transmitted as characters.

Order in which data is transmitted

the number of data per line, the number of lines transmitted

Measurement data

•
•
•

*

When the number of data per line is 1, load is transmitted.
When the number of data per line is 2, load, followed by displacement, are transmitted.
When no measurement data is available, the number of lines transmitted is 0.

Command examples

TR_ACQ_DAT

Data examples

2, 20000

-123. 4, - 12. 3

•
•
•

200. 1, - 50. 3

*

• When BIN is taken as argument, the measurement data is transmitted as float (4 bytes).

Order in which data is transmitted

the number of data per line, the number of lines transmitted (character)

Measurement data (float)

•
•
•

* (character)

- When BIN_S is taken as argument, the measurement data is transmitted as short (2 bytes).

Order in which data is transmitted

the number of data per line, the number of lines transmitted, n, n (character; when the number of data per line is 1, a single "n" appears)

Measurement data (short)

•
•
•

* (character)

Caution: Measured value = Measurement data × 10ⁿ

◇ **VERBOSE command**

Function : To set how the status is transmitted

Argument : Mode 0 or 1

Description

When Mode 0 is specified, !ACQ_START and !ACQ_END messages are not returned.

When Mode 1 is specified, !ACQ_START and !ACQ_END messages are returned.

When no argument is specified, the VERBOSE mode setting (0 or 1) and OK are returned.

Messages

!ACQ_START: a message when the measurement is started.

!ACQ_END: a message when the measurement is ended.

The messages are transmitted each time the measurements are started or ended.

Command examples: When Mode 1 is specified

VERBOSE 1 (Request)

OK (Response)

◇ **HOLD_POS command**

Function : To acquire the hold position

Argument : none

Description

The command returns the position of data which is held in the specified hold mode (i.e. the number of data from the beginning).

When no data is held, -1 is returned.

Get the measurement data using the TR_ACQ_DAT command.

The command has no effect during measurement is being performed.

◇ **ACQ_START command**

Function : To start the measurement

Argument : none

Description

The command is effective only when the measurement screen is displayed.

When measurement is being performed, ERR-48 is returned.

Command examples

ACQ_START (Request)

OK (Response)

◇ **ACQ_END**

Function : To end the measurement

Argument : none

Description

The command is effective only when the measurement screen is displayed.

When no measurement is being performed, ERR -48 is returned.

Command examples

ACQ_END (Request)

OK (Response)

◇ **ACQ_RESET command**

Function : To reset the measurement status

Argument : none

Description

The command is effective only when the measurement screen is displayed.

The command is equivalent to pushing the RESET button on the screen where the measured values are displayed.

Command examples

ACQ_RESET	(Request)
OK	(Response)

◇ **SET_DATE command**

Function : To set the date and time

Argument : Date and Time

Description

The command sets a specified date and time.

YYYY. MM. DD hh:mm:ss

- YYYY : Year
- MM : Month
- DD : Day
- hh : Hour
- mm : Minute
- ss : Second

Command examples

SET_DATE 2008. 10. 01 01:30:00	(Request)
OK	(Response)

Caution: Do not attempt to set an irrelevant date and time, such as 15 month.

◇ **GET_DATE command**

Function : To acquire the date and time

Argument : none

Description

The command returns the current date and time.

For the format of argument, refer to the SET_DATE command.

Command examples

GET_DATE	(Request)
2008. 10. 01 01:30:00	(Response)
OK	(Response)

11. Overscale/Error Displays

This section describes overscales and errors which may be displayed on each screen.

11-1 Errors Related to Load Sensor



LOAD:

This error indicates that an input signal from the load sensor exceeds +3.0 mV. It also indicates that a sensor signal exceeds 3.0 mV/V. The sensor and the cables require to be checked.

If you encounter this error during use of the system, possible causes include an overload on the sensor, etc.

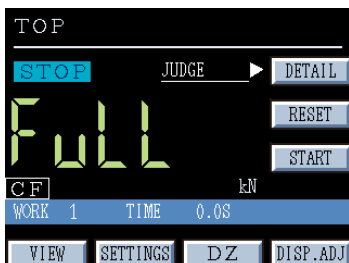
From the TOP screen, select “**SETTINGS**”→“**DETAIL SET**”→“**VIEW**”→“**STRAIN**” and then check an indicated value. If the indicated value is larger than a rated output (4000 to 6000) of the connected sensor, a failure may occur in the sensor.



-LOAD:

This error indicates that an output from the load sensor goes beyond the negative limit value. The sensor and the cables require to be checked.

As in the LOAD error, select “STRAIN” so as to check an indicated value. For possible causes, refer to the description of the LOAD error.



FuLL:

This alarm indicates that an overflow of a positive indicated value occurs.

For example, suppose that a sensor rated-output of 1.234 mV/V is set to an indicated value of 5000. If an input from the sensor goes beyond 2.468 mV/V, the indicated value exceeds 9999, which causes the indicated value error “FuLL.”

This error relates to an indicated value. However, note that when “FuLL” occurs, the sensor also is overloaded (i.e. an output from the sensor exceeds the rated output).



-FuLL:

This alarm indicates that an overflow of a negative indicated value occurs.

11-2 Errors Related to Displacement Sensor



FULL:

This error appears when a displacement value is positive and is too large to fit within the number of digits allowed available on the display.

For example, suppose that a value is displayed to one decimal place. In this case, a larger value than 999.9 causes this error.



-FULL:

This error appears when a displacement value is negative and is too small to fit within the number of digits allowed available on the display.

For example, suppose that a value is displayed to one decimal place. In this case, a smaller value than -999.9 causes this error.

◇ Errors related to displacement sensor (pulse output)

You can clear these errors by performing the displacement adjustment.



OVER:

This error appears at the lower right on the screen when the pulse count goes beyond 65535, thereby causing the overflow of the pulse counter.



UNDER:

This error appears at the lower right on the screen when the pulse count is negative, thereby causing the underflow of the pulse counter.



OVER UNDER:

“OVER UNDER” is displayed when the pulse count recovers to a value within the correct range after the pulse counter overflows or underflows.



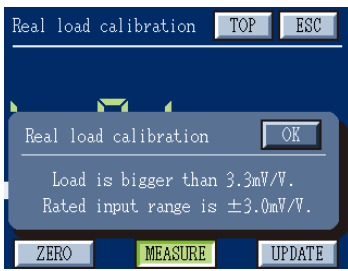
Error notification on the graph display screen

If the pulse counter encounters any error, the background of the letters “Displacement” located at the lower left on the screen is shown in red.

Contents of errors can be shown by pressing the “VIEW” button to switch to the numeric display screen.

11-3 Errors During Load Sensor Calibration

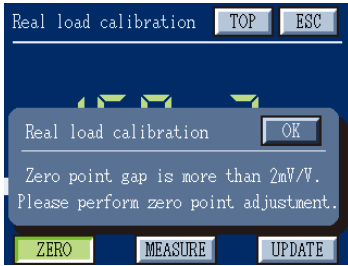
◇ Errors during real load calibration



Input-range over error screen

Input-range over error

This error shows that the signal from the sensor exceeds the input range (3 mV/V) of the indicator. This 3 mV/V includes the zero point of the sensor.

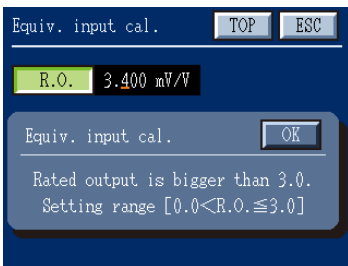


Zero balance error screen

Zero balance error

This error shows that during zero point measurement, the signal from the sensor is larger than ± 2 mV/V. Check a zero balance value, and then adjust it to 2 mV/V or less.

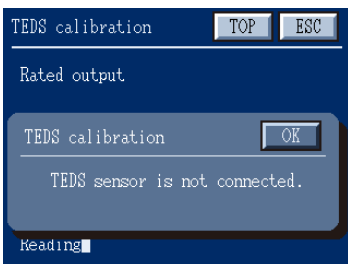
◇ Error during equivalent input calibration



Input over error screen

Refer to the sensor data to enter the correct rated output. A rated output larger than 3 mV/V is an input over and therefore cannot be set.

◇ Error during TEDS calibration



TEDS unconnected error screen

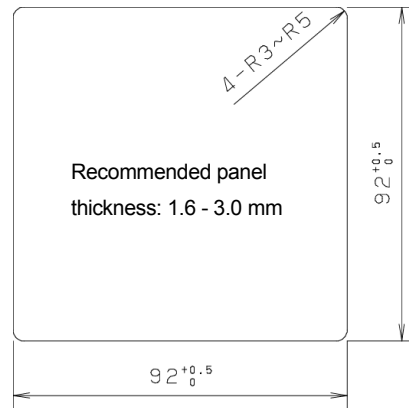
This error shows that a TEDS sensor is not connected to the indicator.

Check the connection between the sensor and the indicator. Further, make sure that a TEDS-capable sensor is used.

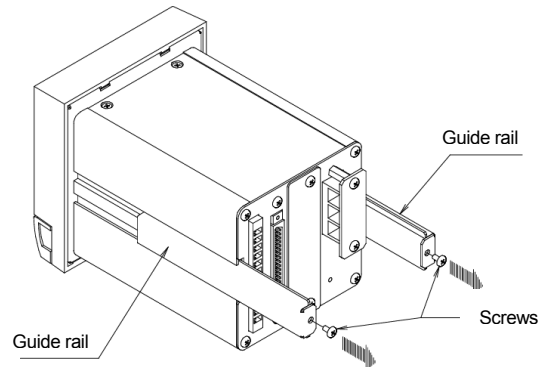
12. Hardware Installation

Follow these steps to install the TD-280T inside a control panel.

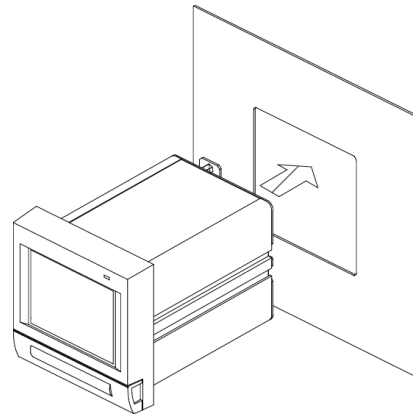
1. Cut out the panel according to the dimensions in the panel cut-out drawing.



2. Remove the two screws, and then remove the guide rails on the right and left sides.

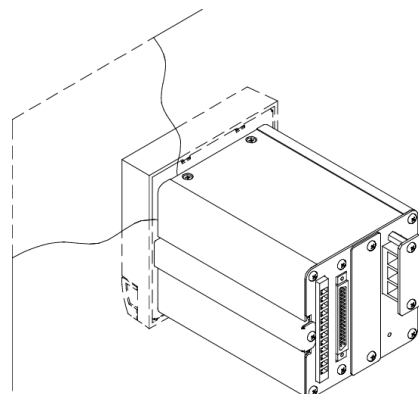


3. Push the TD-280T into the panel cut-out area from the front side of the panel.



4. Put the guide rails that were removed in Step 2, back in place from the rear side, and then secure them with the two screws.

(Recommended tightening torque: $0.6 \pm 0.1 \text{ N} \cdot \text{m}$ [$6 \pm 1 \text{ kgf} \cdot \text{cm}$])



13. Specifications

Load Sensor Input

- 1) Input/Range : Strain gauge sensor ± 3.0 mV/V
Input connector : Screw connection-type terminal (pitch 5.08 mm, 12P)
- 2) Excitation Voltage : 2.5 V DC ($\pm 10\%$)/10 V DC ($\pm 10\%$) Current: 30 mA
- 3) Calibration method : Equivalent Input/TEDS/Real Load
Calibration range : 0.5 to 3.0 mV/V
Calibration Accuracy : $\leq 0.1\%$ F.S (excitation voltage = 10 V)
- 4) Zero balancing : 0 to ± 2.0 mV/V
- 5) Accuracy Nonlinearity : $\leq 0.02\%$ F.S ± 1 digit (excitation voltage = 10 V, Input ≥ 1.0 mV/V)
Zero drift : $\leq 0.5\mu\text{V}/^\circ\text{C}$ (Input conversion value)
Gain drift : $\leq 0.01\%$ F.S/ $^\circ\text{C}$ (excitation voltage = 10 V, Input ≥ 1.0 mV/V)
- 6) Analog filter : Selectable from 10, 30, 100 (default), 300 Hz
Low pass filter Attenuation -6 dB/OCT
- 7) A/D converting rate : 2000 times per second Quantization 16 bits
- 8) TEDS function : IEEE 1451.4 Class 2 mix mode interface
- 9) Peak-hold function : Digital hold
- 10) Analog output : Approx. 1.0 V (per sensor input 1.0 mV/V)

Displacement Sensor Input (Analog)

- 1) Sensor input voltage range : 0 to ± 10 V
- 2) Sensor drive power supply : 12 V DC ($\pm 10\%$) Current: 250 mA
Input connector : Assigned to 12 pin connector (pitch 5.08 mm load sensor terminal)
- 3) Calibration method
Real load calibration : Original point and specified point are set 0 to 9999.
Equivalent input calibration : Rated output can be set 0 to 9999.
Calibration range : 5 to 10 V
Calibration accuracy : $\leq 0.1\%$ F.S
- 4) Zero tracking : Force a current value to 0.
- 5) Accuracy Nonlinearity : $\leq 0.02\%$ F.S. ± 1 digit (≥ 5 V)
Zero drift : 0.005% F.S/ $^\circ\text{C}$
Gain drift : $\leq 0.02\%$ / $^\circ\text{C}$ /F.S
- 6) A/D converting rate : 2000 times/sec. Quantization 16 bits
- 7) Analog filter : Selectable from 10, 30, 100 (default), 300 Hz
Low pass filter Attenuation -6 dB/OCT

Note) F.S in this specification is about ± 32768 (16 bit).

Displacement Sensor Input (Pulse)

- 1) Maximum input frequency : 2 MHz
- 2) Inside count range : 16 bits (Approx. 65000)
Input connector : Assigned to 32 pin connector (control I/O signal connector)
- 3) Sensor drive power supply : 5 V DC ($\pm 10\%$) Current: 500 mA
- 4) Adaptable displacement sensor
Output : Two-phase (A and B)
Also support one-phase output (phase A; always count as a plus)
Output specifications : EIA-422 differential output
- 5) Calibration method
Real load calibration : Original point and specified point are set 0 to 9999.
Equivalent Input calibration : Rated output can be set 0 to 9999.
Calibration range : Number of the pulses 65,535 maximum
- 6) Zero tracking
Pre-set function : Force a current value to 0 or a pre-set value.

Common Section

- 1) Display/Operation : 3.5 inch STN color LCD model (320×240 dot)
 - Operation : Touch panel
 - Load display range : 0 to ±9999
 - Decimal point : Selectable display position
 - Display timing : 3 times/sec.
 - Time axis setting : 0.1 to 30.0 sec.
- 2) Indication items : Digital load value, Waveform, Setting, Distortion, etc.
- 3) Setting items
 - Comparison judgment value setting
 - Load : HI/LO/HI-HI/LO-LO limit
 - Hold function : Inflection point, Sample, Peak, Maximum value, Minimum value, Displacement, Displacement sample, Displacement peak, Multiple, Inflection point trigger peak, Many
 - Other function settings : Analog/Digital filter, Digital zero, Measurement start/end conditions, Graph setting, CF card setting, Minimum scale, etc.
 - Measurement work setting memory : Selectable 16 kinds (Comparison value judgment, Hold setting, Measurement start/end conditions)
 - Clock function : Management and storage of data by a real-time clock
- 4) Judgment output signal
 - Load : HI/LO/HI-HI/LO-LO limit, GO output, each “a” contact
 - Point of contact : Rating voltage: 30 V Current: 50 mA Insulation: Photocoupler
- 5) Control input/output signal : Measurement Start/End, Sample Hold, Reset, Load Digital Zero, Work Select inputs; Measurement Completed, Judgment Completed outputs
 - Connector : Multi-electrode connector (FCN-365P032-AU)
 - Rated input signal : Dry contact input (Contact, Transistor opening collector, etc.)
 - Outflow current: Approx. 10 mA
 - Output signal : Rated Voltage: 30 V Current: 50 mA
 - Insulation : Photocoupler
- 6) CF card : Saving data to CF card on CSV format.
 - Saving load data, stroke data, their settings, judgment results, etc. from start to stop, or from automatic start level to judgment output.
 - Supporting CF cards with capacities of 256 MB to 16 GB.
- 7) Options : Only one option can be installed (except CF card)
 - RS-232C : Signal level RS-232C Conformity
 - Electrical transmission distance Approx. 10m
 - Transfer method Start/Stop synchronization, Full duplex
 - Transfer speed 4800/9600/19200/38400/57600/115200 bps
 - Bit pattern
 - Start bit 1 bit
 - Character length 8 bits
 - Stop bit 1 bit
 - Parity bit Selectable from Nothing/Odd number/Even number
 - Code ASCII
 - D/A converter : D/A Zero setting (For a digital value by full scale setting)
 - Voltage output 0 to ±10 V (Load ≥ 2 kohms)
 - Current output 4 to 20 mA (Load ≤ 350 ohms)
- 8) Power supply : 100 to 240 V ±10% 50 / 60Hz AC, Approx. 13 W

9) Ambient Temperature/Humidity

Temperature : Operation 0 to +40°C
Storage -20 to +60°C

Humidity : ≤85%RH (Non-condensing)

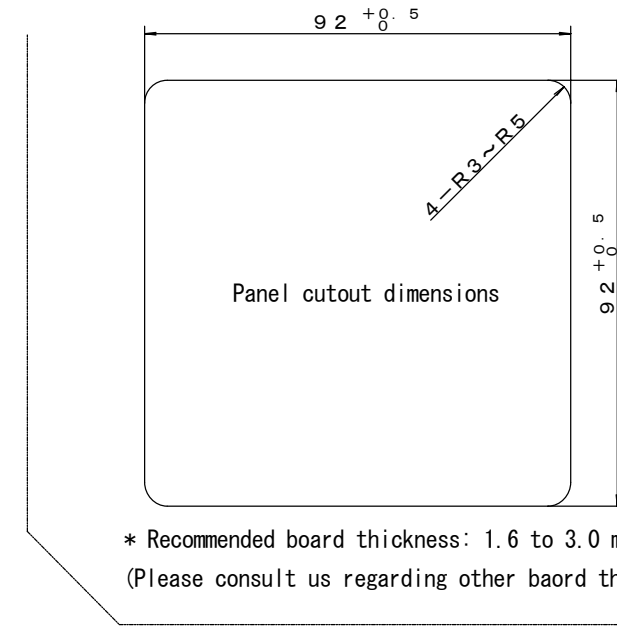
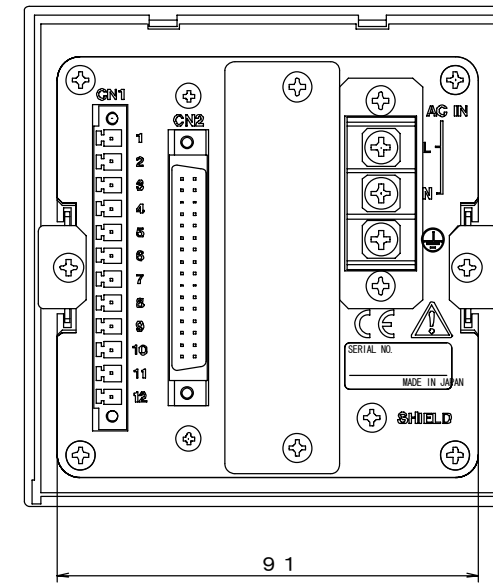
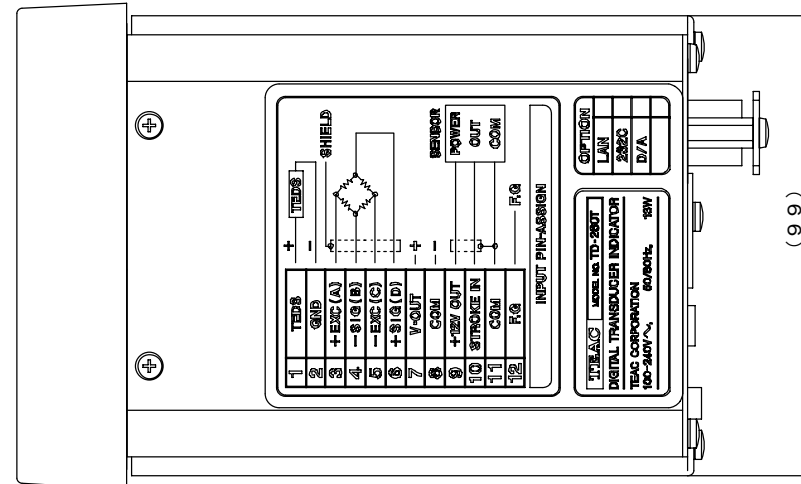
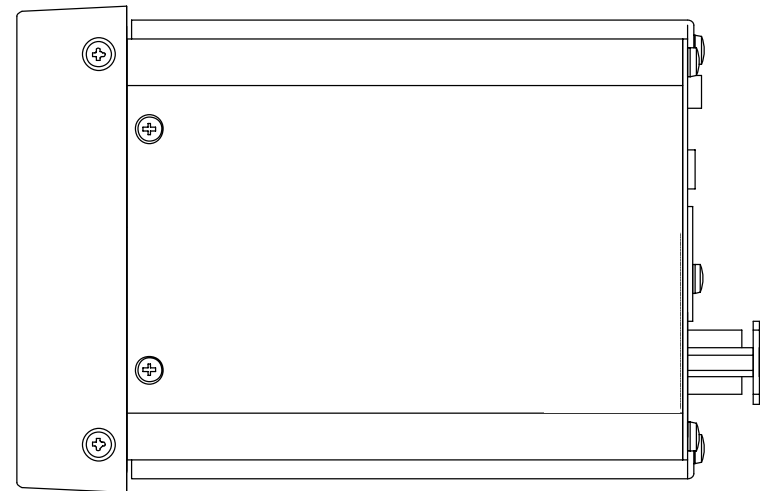
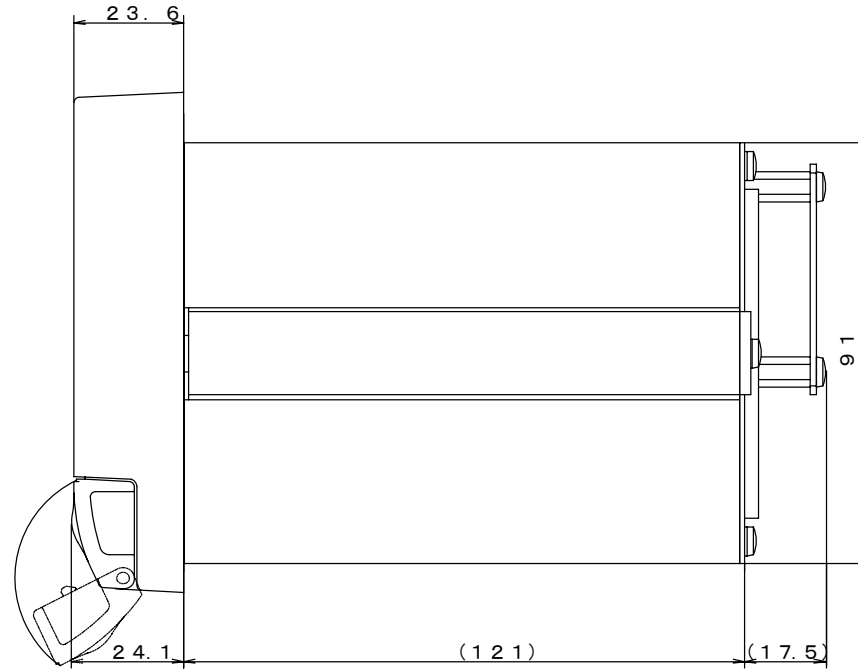
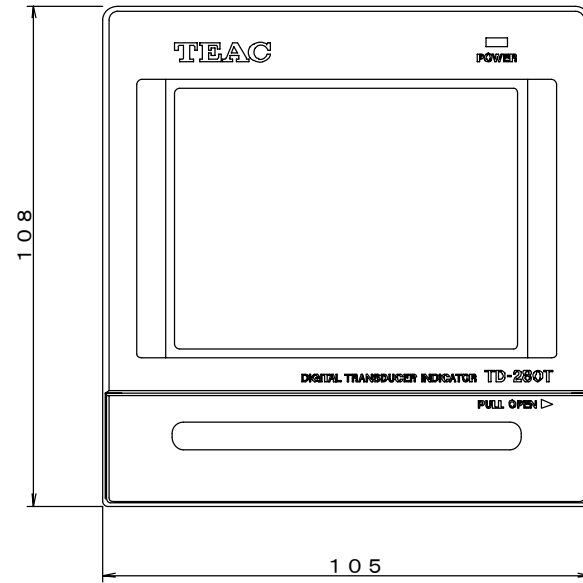
10) Dimension (W×H×D) : Approx. 105 mm×108 mm×145.1 mm

11) Weight : Approx. 1.05 kg

12) Accessories	: Instruction Manual (CD-ROM)	1
	Brief Instruction Manual	1
	Sensor input connector	1
	Phoenix Contact MC1.5/12-STF-5.08	
	Control input/output connector/plug (FUJITSU)	
	Connector FCN-361J032-AU	1
	Cover FCN-360C032-B	1
	AC power cord	1

Safety standard Installation class I, EN61010-1 Pollution degree 2 Overvoltage category II, CE marking
EMC VCCI (Class A), EN61326 (Class A), EN61000-3-2, EN61000-3-3

14. Dimensions



* Recommended board thickness: 1.6 to 3.0 mm
(Please consult us regarding other board thicknesses.)