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Manual
Thermometer with data logger
PCE-T800
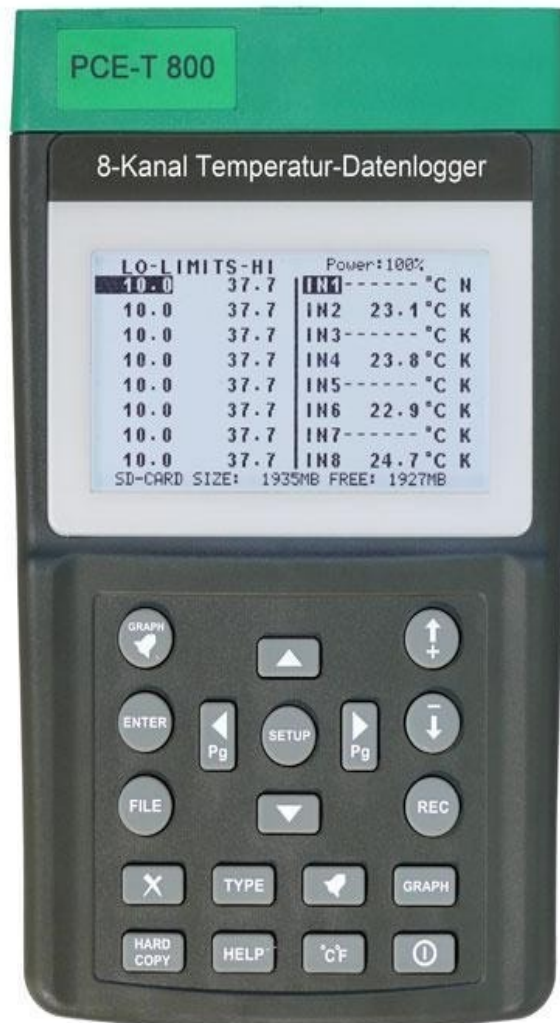
This unit passes the following tests

EN 61326-1:2006

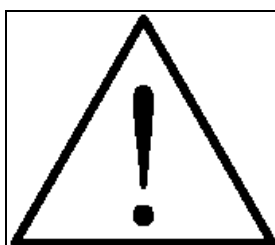**(CISPR11,IEC/EN 61000-3-2:2006,**

IEC/EN 61000-3-3: 1995+A1 :2001+A2:2005

IEC/EN 61000-4-2/-3/-5/-6/-11)

WARNING:

Do not use the thermometer/data logger before you read the users manual and the following instructions.

Do not turn the power off while data logging is in progress.   Always press the REC button to stop data logging.   Power interruption could cause loss of all data stored in SD or SDHC card.

Do not open the top cover.   If users open the top cover, calibration may be invalid.   Thermometer needs to be returned for re-calibration.

Table of Contents

I. Features

■ 8 input temperature measurement/data logging (℃/℉)

■ Graphic display of overall trend for each input

■ 4.5" STN LCD (240 x 128) with backlight

■ Timers for the durations out of HI and LO limits

■ Selection of 11 types of thermocouple (K, J, E, T, R, S, N,…)

■ Easy socket for thermocouple mini connector

■ Basic accuracy 0.1% ± 1 ℃ (K type)

■ Programmable Hi-Lo alarm for each input.

■ Display of max and min values for each input

■ Sampling Rate 8 Inputs / 1 second

■ 24 Hour Recording with Alkaline Batteries of 2400mAH

■ Standard 2G SD memory card (stores 3.8-year data)

■ Optional 8G SDHC memory card

■ SD card directly read by PC

■ Easy data file management (Read and Delete functions)

■ Built-in calendar clock

■ Independent Input Setup (type of thermocouple, Hi-Lo alarm values, name of Engineering Unit)

■ Isolated Input Protection of 350Vp-p between any two inputs

■ Programmable Engineering Unit (E.U.) to integrate Analog Output (-60 to 60 mV) from instruments (e.g. Sound level meter, Humidity meter, Current adaptor)

■ Screen hardcopy into files

■ Paperless Recorder

■ Ready to use package (Thermocouples, Memory Card, and Batteries etc.)

II. Panel Description

A. Front Panel

MULTI-INPUT THERMOMETER/DATALOGGER
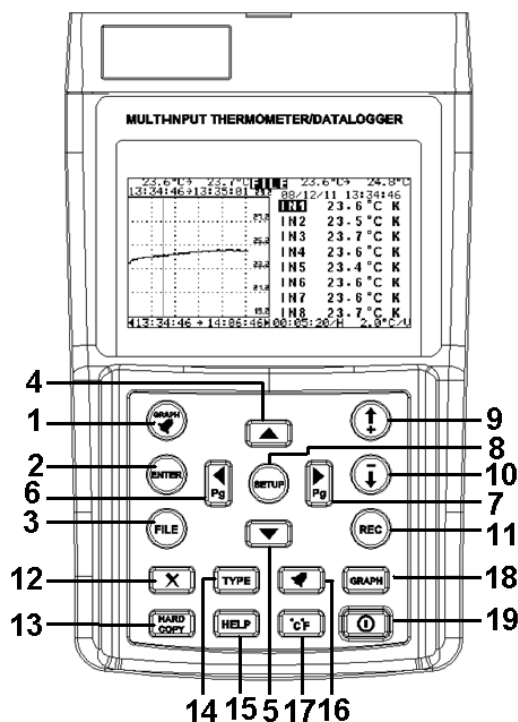
1.		Under FILE mode, press this button to select display of graph or alarm status stored in a file.	
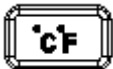
2.		Under FILE mode, press this button to display data after file is selected. Press this button to redraw curve when two cursor positions are marked by REC button.	

3.	FILE	Press this button to display a file list. When this button is pressed, the graph and alarm status are reset.	

4.	▲	Press this button to select from IN1 to IN8. Or press it to select a file in the file list. In the HELP function, press it to turn 10 pages up.	

5.	▼	Press this button to select from IN1 to IN8. Or press it to select a file in the file list. In the HELP function, press it to turn 10 pages down.	

6. Press this button to move the line cursor left.   Or press it to display previous page of a HELP file.

7. Press this button to move the line cursor right.   Or press it to display next page of a HELP file.

8. Press this button to display SETUP menu.   Press again to show internal reference temperature.   Press and hold this button for 2 seconds to turn the backlight on or off.

9. Press this button to increment value in the SETUP menu. Or press this button to increment the time stamp by 1 second in a file and the data are displayed below the time stamp.

10. Press this button to decrement value in the SETUP menu.   Or under FILE mode, press this button to decrement the time stamp by 1 second in a file and the data are displayed below time stamp.

11. Press this button to record data.   To stop recording data, press this button again.   In the zoom function, it is used to mark cursor position.

12. Delete button.   Press this button to delete a selected file in a file list.

13. Under GRAPH mode, press this button to hardcopy the content of LCD into a file.   Graph and alarm status are all stored.

14. Press this button select type of thermocouple or mV.

15. Under SETUP, press this button to display a help file. In the real time mode, press it to turn the label of Y-axis on or off.

16. Alarm button: press this button to display alarm status in real time.

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17.	Press this button to select ℃ or ℉ as temperature unit.
18.	Press this button to display curve of overall trend and data in real time.
19.	Press this button to turn the power on or off.

B. Data and Curve in the LCD

When the GRAPH button is pressed, following figure is shown.
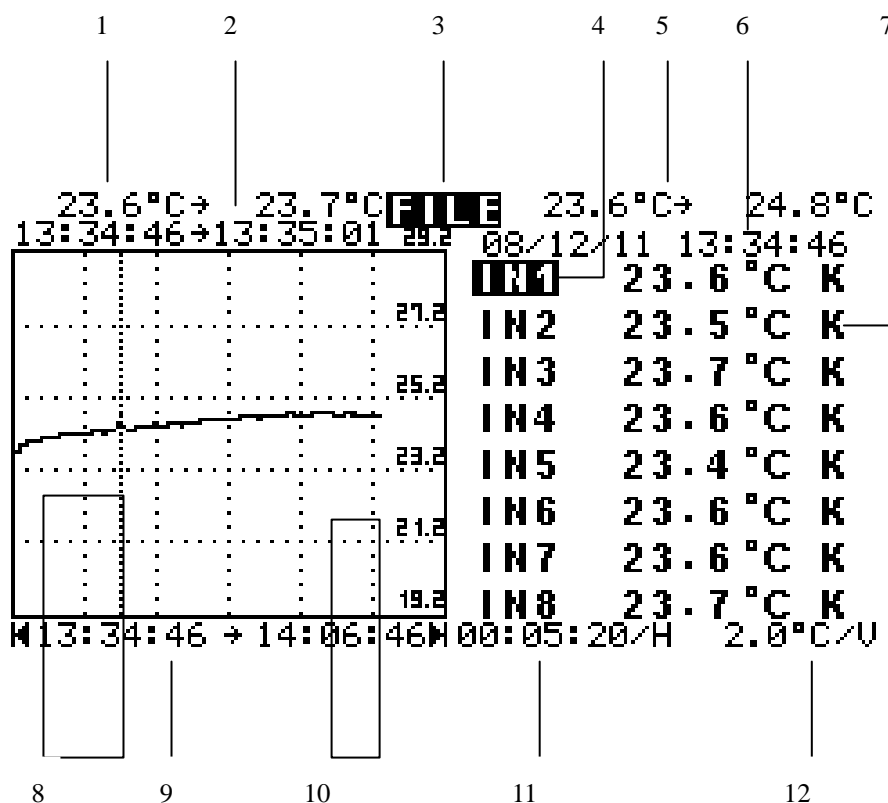
1. Minimum and Maximum Temperature Values during the time interval at the Current Cursor Position

2. Time Interval at the Current Cursor Position

3. Current Operating Status (FILE, REC, and NONE)

4. Label of Each Input (Can be programmed). Label of Selected Input is Reverse Video.

5. Minimum and Maximum Values of Selected Input

6. Current Date and Time

7. Type of Thermocouple, mV or Engineering Unit

8. Line Cursor

9. Time Interval of the Whole Graph

10. Label of Y-axis

11. Time per Horizontal Division

12. Temperature per Vertical Division.

C. Alarm Status in the LCD

When ALARM button is pressed, alarm status is shown in LCD.

```
        1           2            3           4
        |           |            |           |
  MIN  UL-Duration  MAX  OL-Duration
  23.6                 24.8◊00:27:15
  23.5◊00:27:15        24.8◊00:27:15
  23.7                 24.7
  23.6                 25.1
  23.4                 24.7
  23.6                 24.9
  23.6◊00:27:15        25.0
  23.7                 24.9
08/12/11 13:34:46  →  08/12/11 14:01:45
        |                     |
        5                     6
```
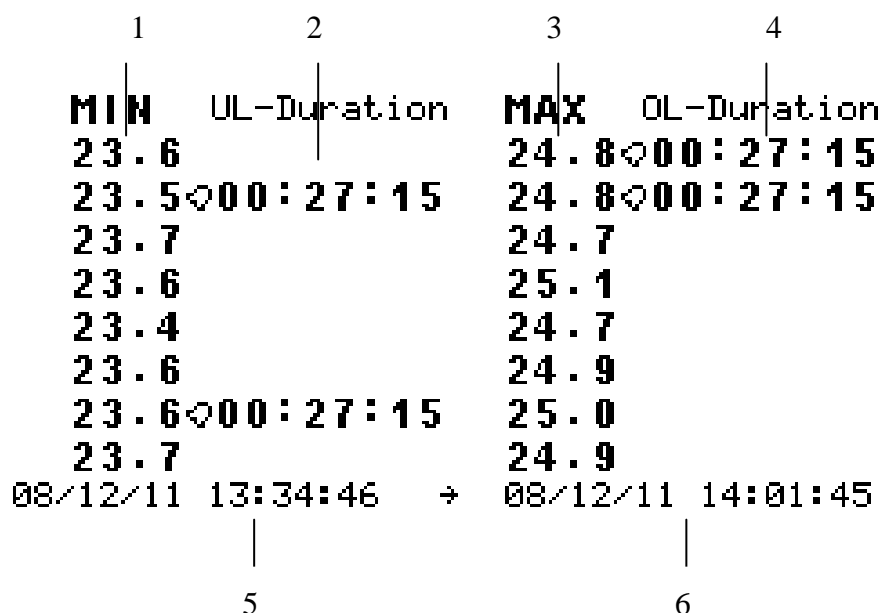
1. Minimum Value of Each Input

2. Duration under LO Limit

3. Maximum Value of Each Input

4. Duration over HI Limit

5. Beginning Date and Time of Recording Period

6. Ending Date and Time of Recording Period

D. File List in the LCD

When FILE button is pressed, a file list is shown in LCD.

```
  FILE        SIZE       DATE        TIME
T0000023     4176 B    08/12/11    13:12:04
T0000024   X --- B     08/12/11    13:19:22
T0000025      29KB     08/12/11    13:35:24
T0000026      85KB     08/12/11    15:24:32
T0000027   X --- B     08/12/11    17:25:14
T0000028    1023KB     08/12/11    17:29:22
```

Note: File name marked by "X" is a damaged file which is caused by power interruption. Data of a damaged file can not be recovered.

E. Setup Menu in the LCD

When users press the SETUP button, a setup menu is shown in LCD.

```
        1              2              3       4    5
                                      │       │    │

        LO-LIMITS-HI         Power:100%
            0.0       10.0   IN1   24.2°C  K
          25.0  X   20.0     IN2   24.2°C  K
        - 10.0       50.0    IN3   24.2°C  K
        - 50.0      100.0    IN4   24.2°C  K
        -100.0      250.0    IN5   24.0°C  K
        -500.0      500.0    IN6   24.2°C  K
         700.0      1000     IN7   24.1°C  K
        - 1000      1250     IN8   24.1°C  K
        SD-CARD SIZE:    974MB FREE:   968MB

              6            7            8
```

1. LO Limit

2. HI Limit

3. % of Available Battery Power

4. Temperature Unit in ℃ or ℉

5. Type of Thermocouple

6. SD-CARD or SDHC CARD

7. Used Bytes of SD or SDHC card

8. Free Bytes not Used of SD or SDHC card

F. Rear Panel

1. **AC to DC Adaptor Input**

2. **USB Interface for PC Communication**

3. **Optical RS-232 Interface for Thermal Printer (Optional)**

4. **Stand**

5. **Battery Cover**

6. **Screw of Battery Cover**

G. Top Panel

1.   **Input for Thermocouple Mini Connector**
2.   **Plastic Screw of Top Cover (Do not open)**

Warning: Do not open the top cover. If users open the top cover, calibration may be invalid. Re-calibration is necessary.

III. Operation

A. Thermocouple Temperature Measurement
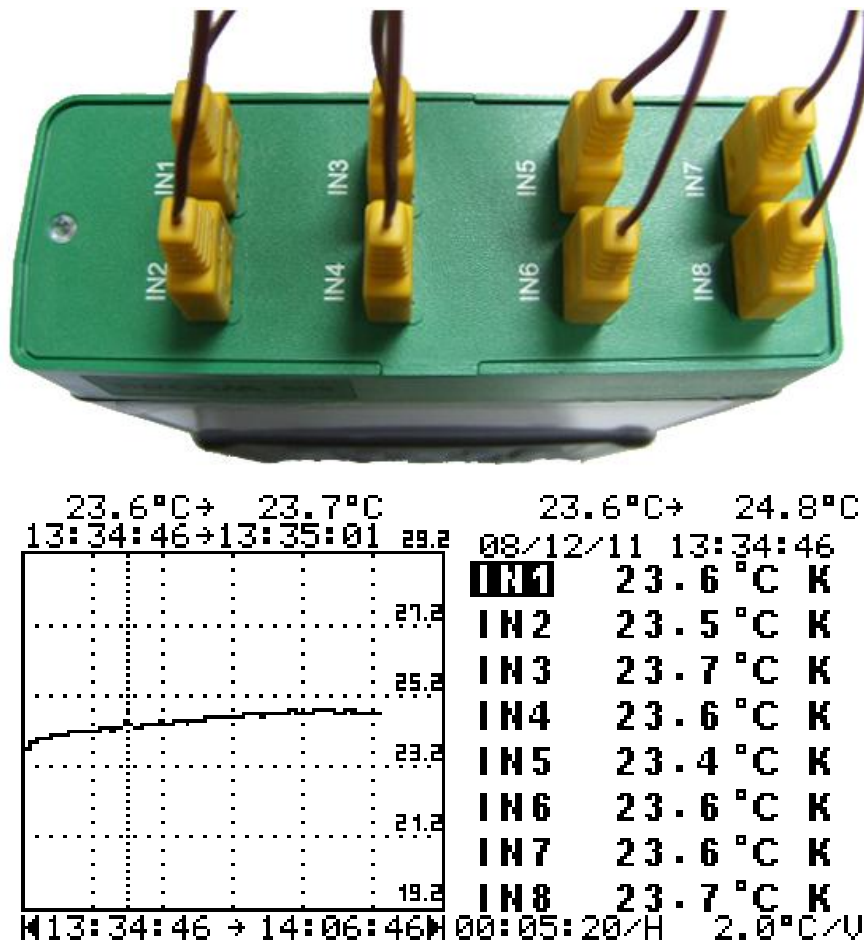
1. Connect the thermocouples to the top panel of the thermometer.

2. Turn the power on, and a SETUP menu is shown.

3. Select proper type of thermocouple for each input.

4. Press the GRAPH button to start temperature measurement.

5. The right hand side of LCD shows the temperature readings of all inputs. The left hand side of LCD shows the curve of overall trend of current selected input.

6. Press the ▲ button or ▼ button to select next temperature input.

Note: The label of selected input is reverse video.

Note: "00:05:20/H" means that each horizontal division is 5 minutes and 20 seconds. It is shown at the right bottom corner in LCD.

"2.0 ℃ / V" means that each vertical division is $2℃$. It is shown at the right bottom corner in LCD.

Note: The maximum value and minimum value are shown at the top of the right hand side of LCD. The current date and time is shown in the next line. If an input is not connected with any type of thermocouple or input, the maximum value and minimum value are replaced by dash line (------).

Note: If an input is not connected with any type of thermocouple or input, dash line (------) will be shown. Alarm is set for both LO and HI limits. A vertical line is shown in the graph at the location of the time when it is not connected.

Note: When users press SETUP or FILE button, the previous LCD display is cleared. When users press GRAPH button or ALARM button, a new curve will be plotted. And new maximum value and minimum value are recorded.

B. Select Type of Thermocouple

```
LO-LIMITS-HI        Power:100%
    0.0      10.0  |IN1   24.2°C K
   25.0 X   20.0  |IN2   24.2°C K
-  10.0      50.0  |IN3   24.2°C K
-  50.0     100.0  |IN4   24.2°C K
- 100.0     250.0  |IN5   24.0°C K
- 500.0     500.0  |IN6   24.2°C K
  700.0     1000   |IN7   24.1°C K
-  1000     1250   |IN8   24.1°C K
SD-CARD SIZE:   974MB FREE:   968MB
```

1. Press the SETUP button, and a SETUP menu is shown.
2. Press ▲ button or ▼ button to select individual temperature input from IN1 to IN8.
3. Press the TYPE button to select type of thermocouple or mV input. There are 11 types of thermocouples (K, J, E, T, R, S, N, L, U, B, and C).

Warning: Whenever users press the SETUP button, the curve of overall trend and alarm function will be reset. Previous curve and alarm status are cleared. To save the curve or alarm status, record the data in a file.

Note: To save new selection, press the SETUP button, GRAPH button, or ALARM button.

C. Select ℃ or ℉

Press the [℃℉] button to change the unit directly.

D. Review Data and Curve of Overall Trend

1. When users press the GRAPH button, the current readings of all inputs are shown in the right hand side of LCD. Curve of overall trend will be shown in the left hand side of LCD.

2. Press ▲ button or ▼ button to select individual input from IN1 to IN8.

3. Press ► button or ◄ button to move the line cursor.

4. The minimum value and maximum value in the time interval at the cursor position are shown at the top of the graph.

5. The time interval at the cursor position is shown in the next line.

Note: When users press SETUP button, the previous LCD display is cleared. When users press GRAPH button or ALARM button, a new curve will be plotted. And new maximum value and minimum value are recorded.

Note: The starting time and the ending time of the whole graph is shown at the bottom of the graph. The ending time is not the current time.

Note: If an input is not connected with any type of thermocouple or input, a vertical line is drawn at the location of the time when it is not connected.

E. Setup of HI Limit and LO Limit

```
LO-LIMITS-HI        Power:100%
      0.0        10.0  IN1   24.2°C  K
     25.0  X    20.0  IN2   24.2°C  K
  -  10.0        50.0  IN3   24.2°C  K
  -  50.0       100.0  IN4   24.2°C  K
  -100.0       250.0  IN5   24.0°C  K
  -500.0       500.0  IN6   24.2°C  K
   700.0       1000  IN7   24.1°C  K
  - 1000       1250  IN8   24.1°C  K
SD-CARD SIZE:    974MB FREE:   968MB
```

1. Press the SETUP button. A SETUP menu is shown.

2. Press ▲ button or ▼ button to select individual temperature input from IN1 to IN8.

3. Press ► button or ◄ button to select LO limit or HI limit.

4. Press ↑ + or ↓ - button to increment or decrement value. To increment or decrement value faster, press and hold the ↑ + or ↓ - button for over 2 seconds.

Note: The range of LO and HI limits is from -1684 to 1684. The number will roll over from -1684℃ to 1684℃ (or 1684℃ to -1684℃). Or the number will roll over from -3000℉ to 3000℉ (or 3000℉ to -3000℉).

Warning: If LO limit > HI limit, a symbol of "X" will be shown to the next of the value of LO limit. Alarm still functions as long as the reading is less than the LO limit, or is higher than HI limit.

Note: To save new limits, press the SETUP button, GRAPH button, or ALARM button.

F. Alarm Function

Timer

```
MIN    UL-Duration    MAX    OL-Duration
23.6                  24.8♡00:27:15
23.5♡00:27:15         24.8♡00:27:15
23.7                  24.7
23.6                  25.1
23.4                  24.7
23.6                  24.9
23.6♡00:27:15         25.0
23.7                  24.9
08/12/11 13:34:46   →  08/12/11 14:01:45
```

The alarm function operates all the time. Press the [button] button to see the minimum and maximum values of all inputs. If a reading is ever greater than HI limit or smaller than LO limit, the status will be recorded.

A symbol of [symbol] is shown to right of the MIN or MAX value. And timers are used for each input to show the duration under LO limit (UL-Duration) and over HI limit in the format of "hh:mm:ss" and timing.

Note: The starting time and ending time of recording period is shown at the bottom of the alarm status.

Note: If an input is ever not connected with any type of thermocouple or input, dash line (------) will be shown. Alarm is set for both LO and HI limits. The timer for OL-Duration is still timing for the disconnected condition. **But the UL-Duration** (under limit duration) **and OL-Duration (**over limit duration) **are no longer valid.**

Note: Maximum duration is 18:03:02 (65000 seconds). If timer exceeds 18:03:20 (65000 seconds), dash lines are shown (--------).

G. Reset LCD Display by Pressing SETUP or FILE Button

When users press the SETUP button, a setup menu is displayed. And the previous curve and parameters in the LCD display is clear. When users press the GRAPH button or ALARM button again, a new curve is plotted. Previous minimum value and maximum value are cleared. Timers for the over limit duration (OL_DURATION) and under limit duration (UL_DURATION) are reset to 0. New minimum value and maximum value will be recorded.

When users press the FILE button, a file list is shown. Similarly, the LCD display is reset at the same time.

H. Record Data

Recording _____   Record Counter _____

```
 23.5°C→  23.5°C REC      23.5°C→  24.2°C
16:04:54→16:05:01 28.8   RECORDS:      842
                         IN1    24.0 °C  K
                  26.8   IN2    23.7 °C  K
                  24.8   IN3    23.7 °C  K
                         IN4    23.7 °C  K
                  22.8   IN5    24.4 °C  K
                  20.8   IN6    23.4 °C  K
                         IN7    24.2 °C  K
                  18.8   IN8    24.2 °C  K
◄16:04:54 → 16:20:54► 00:02:40/H   2.0°C/U
```
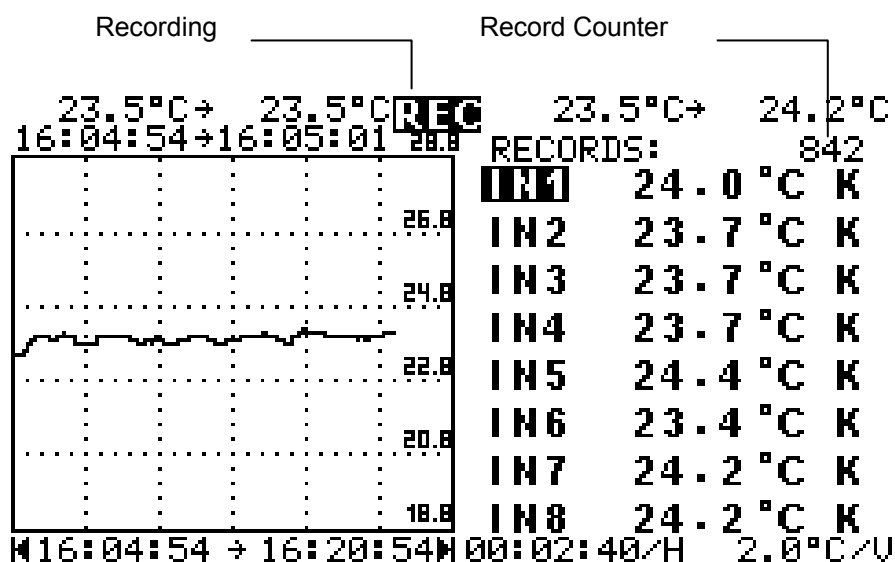
1. Press the REC button to record data. A symbol of "REC" is shown at the top center of LCD.

2. Data of all inputs, alarm status and curve of overall trend are recorded. A record counter shows the number of records at the right top corner of LCD.

3. Press the REC button again to stop recording. The data is saved in a file. The file is named automatically by the thermometer.

Warning: Do not turn the power off while data logging is in progress. Always press the REC button to stop data logging. Power interruption could cause loss of data stored in SD or SDHC card.

Note: The file is named sequentially with a leading T (T0000xxx). The file name could be duplicated if the SD or SDHC card is used in different thermometers.

I. Review Data and Curve of Overall Trend in a File

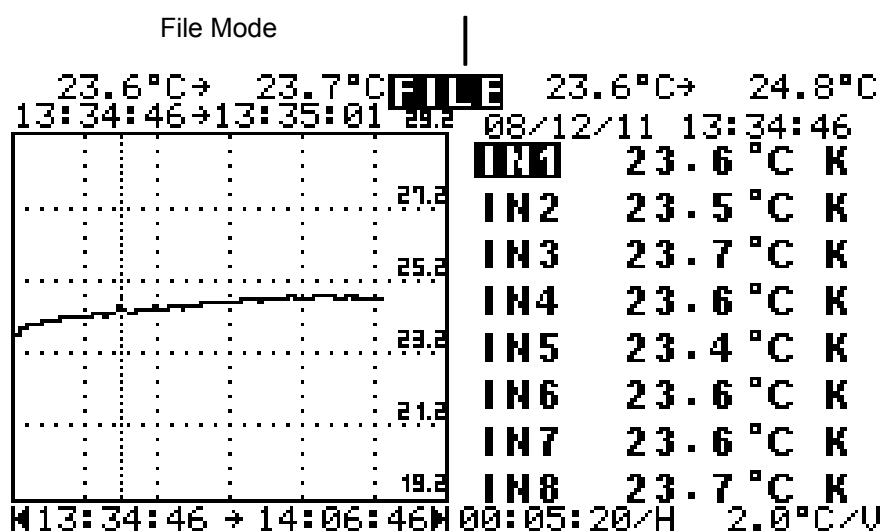| FILE	SIZE	DATE	TIME
T0000023	4176 B	08/12/11	13:12:04
T0000024	X --- B	08/12/11	13:19:22
T0000025	29KB	08/12/11	13:35:24
T0000026	85KB	08/12/11	15:24:32
T0000027	X --- B	08/12/11	17:25:14
T0000028	1023KB	08/12/11	17:29:22

1. Press the FILE button to show a list of files.

2. Press ▲ button or ▼ button to select a file. The name of selected file is reverse video.

3. Press ENTER button to review data in the file.

File Mode

23.6°C→ 23.7°C **FILE** 23.6°C→ 24.8°C		
13:34:46→13:35:01 **29.2** 08/12/11 13:34:46		

IN1	23.6	°C	K
IN2	23.5	°C	K
IN3	23.7	°C	K
IN4	23.6	°C	K
IN5	23.4	°C	K
IN6	23.6	°C	K
IN7	23.6	°C	K
IN8	23.7	°C	K

◄13:34:46 → 14:06:46► 00:05:20/H 2.0°C/V

4. Curve of overall trend of all data is shown in the left hand side of LCD.

5. Press ► button or ◄ button to move the line cursor.

6. The minimum value and maximum value in the time interval at the cursor position are shown at the top of the graph.

7. The time interval at the cursor position is shown in the next line.

8. Press ↑ + or ↓ - button to list each temperature reading in the time interval at the current cursor position.

Note: A file name marked by "X" is a damaged file. It is caused by power interruption during data logging. Data in a damaged file can not be recovered.

J. Zoom into Details of a Curve in a File
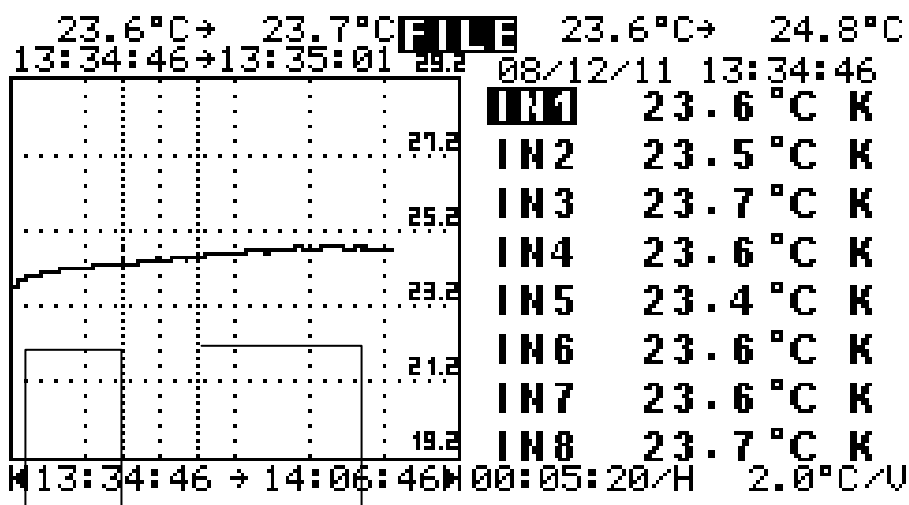
First Cursor Position   Second Cursor Position

Users can always review a specific portion of a curve by marking two cursor positions.

1. Press ► button or ◄ button to move the line cursor.

2. Press the REC button to mark the first cursor position. The time stamp above the 8 input readings is used as the first one.

3. Press ► button or ◄ button to move the line cursor again.

4. Press the REC button to mark the second cursor position. The time stamp above the 8 input readings is used as the second one.

5. Press the ENTER to plot curve between the two time stamps.

6. Press ↑ + or ↓ - button to list each temperature reading in the time interval at the current cursor position.

7. Press the ✦ button to display the alarm status in that period of time.

8. Users can iterate the process for the current curve plotted.

Note: When the unit is processing data between two time stamps, message of "Processing Data" will be shown. Bytes of data processed and total Kbytes of data to be processed will follow the message.
It takes about 1 second to process 3K bytes of data.

Note: Users can always zoom in, but can not zoom out. To zoom out, users can press the FILE button and re-plot the whole curve again.

Note: The unit always zooms into the curve of the last two marked cursor position.

Note: If no cursor position is marked by REC button, a curve of 119 data from the current cursor position is plotted.

K. Delete Data File in the SD or SDHC card

```
  FILE         SIZE        DATE        TIME
T0000023     4176 B     08/12/11    13:12:04
T0000024   ▧ --- B     08/12/11    13:19:22
T0000025       29KB     08/12/11    13:35:24
T0000026       85KB     08/12/11    15:24:32
T0000027   ▧ --- B     08/12/11    17:25:14
T0000028     1023KB     08/12/11    17:29:22
```

1. Press the FILE button, and the above file list will be shown.

2. Press ▲ button or ▼ button to select a file. The name of selected file is reverse video.

3. Press the "X" button to delete a selected file. Users will be asked for confirmation.

Note: Users can also place the SD or SDHC card in a PC and delete the files.

L. Review Alarm Status in a File

```
                   FILE
MIN   UL-Duration  MAX   OL-Duration
23.6               24.8♡00:27:15
23.5♡00:27:15      24.8♡00:27:15
23.7               24.7
23.6               25.1
23.4               24.7
23.6               24.9
23.6♡00:27:15      25.0
23.7               24.9
08/12/11 13:34:46   →  08/12/11 14:01:45
```

1. Press the FILE button to show a list of files.

2. Press ▲ button or ▼ button to select a file. The name of selected file is reverse video.

3. Press ENTER button, then press the "GRAPH / 🔔 " button. The minimum and maximum values of all inputs will be shown in the left hand side of LCD.

4. If a reading is ever greater than HI limit or smaller than LO limit, the status will be recorded. A symbol of 🔔 is shown to right of the MIN or MAX value. And a timer is shown for that input and timing.

Note: The date and time interval of recording period is shown at the bottom of the data.

M. Hardcopy of the LCD content

Press the HARDCOPY button to copy the content of LCD into a file.   The graph and alarm status are both stored.

Users can review the hardcopy file, and press the button to toggle between graph and alarm status.

> **Note:** The size of a hardcopy file is 4096B, and only the hardcopy file is of this size.   So, if users see a file of size 4096B in the file list, then they can be sure this is a hardcopy file.   The file is named by the thermometer automatically.

N. Turn the Label of Y-axis On or Off

In the display of data and graph, users can turn the label of Y-axis on or off by pressing the HELP button. This also control the label on or off in the FILE mode.
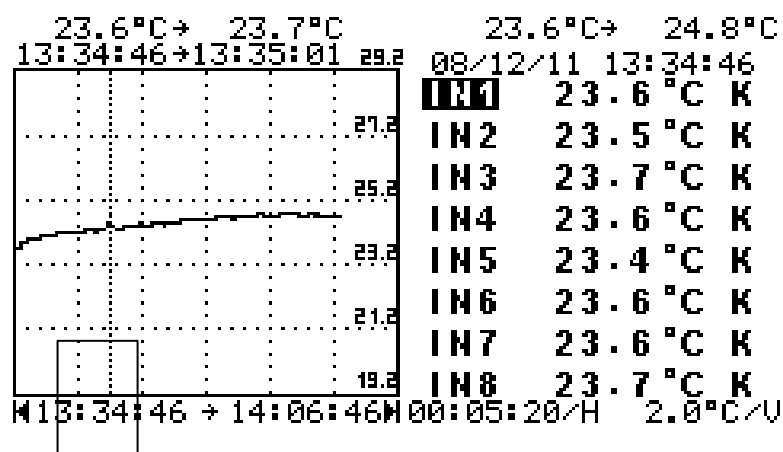
Label is on
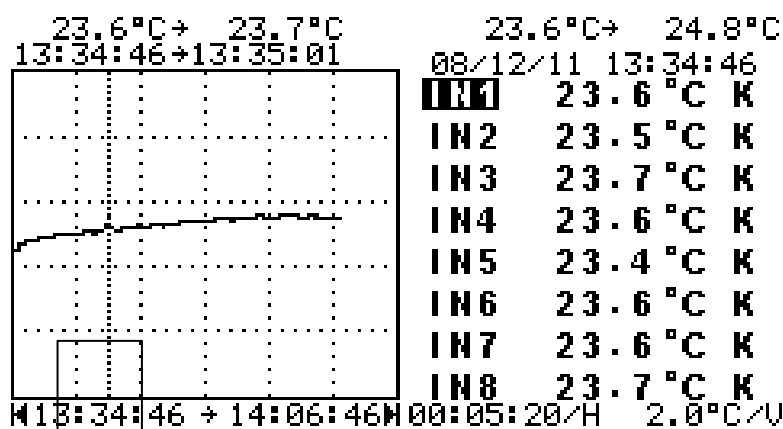
Label is off

Note: There is no label of Y-axis if mV is selected as type of input.

Note: When input is not connected or out of range, there is also no label of Y-axis.

O. Turn the Backlight On or Off

Press and hold the SETUP button for 2 seconds to turn the backlight on or off.

P. Program Engineering Unit

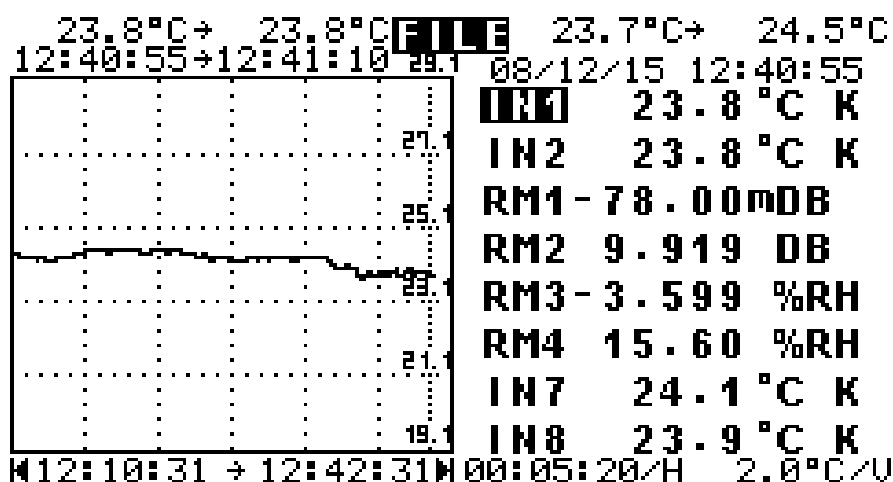| Label		Coefficient A		Coefficient B		Unit	
CH 1	IN1	A1	0.001	B1	0	Unit 1	VCH1
CH 2	IN2	A2	0.001	B2	0	Unit 2	VCH2
CH 3	RM1	A3	1	B3	0	Unit 3	DB
CH 4	RM2	A4	1	B4	10	Unit 4	DB
CH 5	RM3	A5	50	B5	0	Unit 5	%RH
CH 6	RM4	A6	50	B6	20	Unit 6	%RH
CH 7	IN7	A7	0.001	B7	0	Unit 7	VCH7
CH 8	IN8	A8	0.001	B8	0	Unit 8	VCH8

As long as the voltage range is within ±60mV, Instruments with analog output can be connected to the input, and program the coefficients A and B of a specific input.

Through a PC application program, users can program the Label, Coefficient A, Coefficient B, and Unit. Programmed labels are displayed all the time. Units are displayed only when mV is selected as type of input.

In the above table, contents of IN3 to IN6 are programmed. Labels are programmed as RM1 to RM4. The values of coefficient A are programmed from 0.001 to 1, 1, 50, and 50. The values of coefficient B are programmed from 0 to 0, 10, 0, and 20. The units are programmed as DB, DB, %RH, and %RH.

After completion of programming, turn the power off and turn the power on. The following display will be shown.

```
23.8°C→  23.8°C FILE  23.7°C→  24.5°C
12:40:55→12:41:10 29.1  08/12/15 12:40:55
                   IN1    23.8°C K
               27.1  IN2    23.8°C K
               25.1  RM1-78.00mDB
                   RM2  9.919  DB
               23.1  RM3-3.599 %RH
               21.1  RM4 15.60  %RH
                   IN7   24.1°C K
               19.1  IN8   23.9°C K
M12:10:31 → 12:42:31M 00:05:20/H  2.0°C/V
```

> **Note:** The engineering unit with coefficient A and B are effective only under the selection of mV as type of input.

> **Note:** If the voltage range is out of -60mV and 60mV, users can adopt two resistors to lower the input voltage to the range of ±60mV. Please refer to the section Lower the Analog Input to +/- 60mV.

> **Note:** 4 to 20mA signal can also be converted to mV input. Please refer to the section Connect the 4-20mA Signal.

> **Note:** For details of software, please refer to the separated software user manual.

> **Note:** Defaults are IN1 to IN8, A=0.001, B=0, and Unit=VCH1 to VCH8.

Q. Calculate Coefficents for the Engineering Unit (E.U.)

Coefficient A is the gain (E.U. / mV) of the analog output.

Coefficient B is the offset value.

E. U. = "Coefficient A" x "Input (in mV)" + "Coefficient B"

Equivalent mathematic equation:

Y = A * X + B

Example 1:

Program IN3 for a sound level meter with analog output of 1mV per 1DB without any offset.

1. Convert "1mV / 1DB" to "1 DB /mV". Then, Coefficient A = 1. B = 0.

2. If input is 1 mV, then the reading becomes 1DB.

Example 2:

Program IN4 for a sound level meter with analog output of 1mV per 1DB with a 10DB offset at 0mV.

1. Convert "1mV / 1DB" to "1 DB /mV". Then, Coefficient A = 1. B =10.

2. If input is 1 mV, then the reading becomes 11DB.

Example 3:

Program IN5 for a humidity meter with analog output of 0.02mV per 1%RH without any offset.

1. Convert "0.02mV / 1DB" to "50 DB /mV". Then, Coefficient A = 50. B = 0.

2. If input is 1 mV, then the reading becomes 50 %RH.

Example 4:

Program IN6 for a humidity meter with analog output of 0.02mV per 1%RH with a 20%RH offset at 0 mV.

1. Convert "0.02mV / 1DB" to "50 DB /mV". Then, Coefficient A = 50. B = 20.

2. If input is 1 mV, then the reading becomes 70 %RH.

Note: The reading of the thermometer is displayed with scientific notation m (10^{-3}), u (10^{-6}), n(10^{-9}), K(10^3), M(10^6), and G(10^9). Users should avoid using those letters of scientific notation (m, u, n, K, M, and G) as part of unit name.

## R. Connect Analog Input with a Mini Connector (Optional)
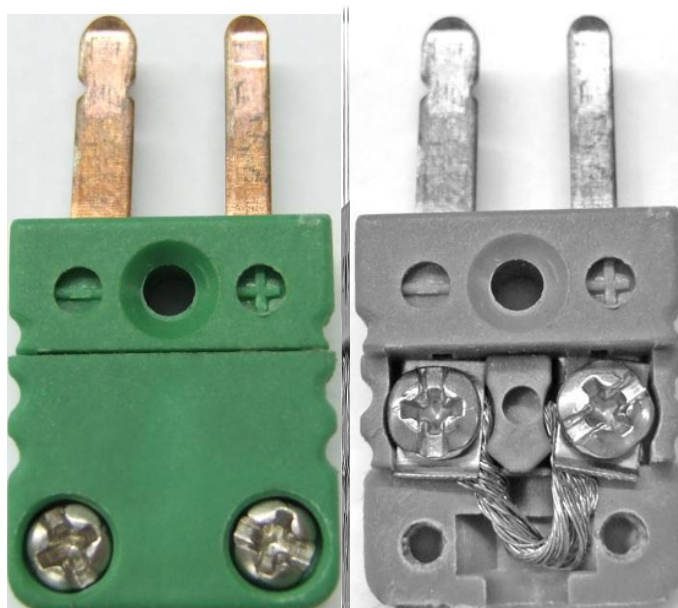
Use the optional mini connector to connect analog input from an analog signal of any instrument.

1. Loose the screws of the cover and open the cover.

2. Loose the 2 screw posts and then connect the copper wires from the instrument to the posts.   Fasten the 2 screw posts.

3. Close the cover and fasten the screws.

Warning: Do not use any solder in the connection with the two posts in the mini connector. Only copper wire is allowed. If any metal other than copper is used in the connection, users must take the inaccuracy caused by the thermal effect into consideration.

S. Lower the Analog Input to Less Than ±60mV (3 examples)
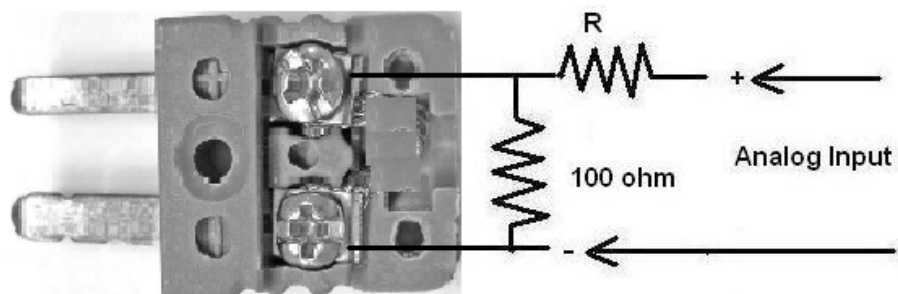
1. If the analog input from an instrument is greater than +/- 60mV, users can add two resistors to lower the voltage to less than +/- 60mV.
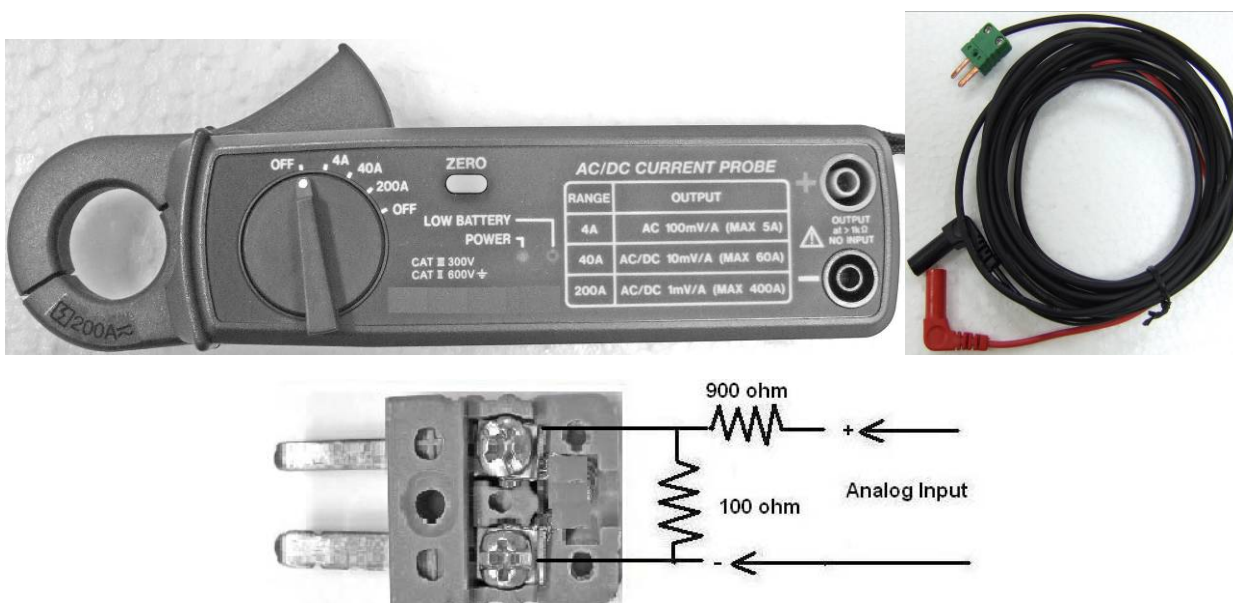
Scale Factor = 100 / (R +100)

Input = Analog Input x Scale Factor

2. Properly select value of R so that input voltage is less than +/- 60mV.

3. Program the coefficient A and B as instructed in previous sections.

> **Note:** 100 ohm resistor is connected in parallel with two posts of mini connector.   R and 100 ohm resistor are connected at the posts of positive input.

**Example 1: Connect a current adaptor to the thermometer**

1. Set the rotary switch at 40A range.   The full scale output is 400mV per 40 A.

2. To lower the voltage from 400 mV to 40 mV, the scale factor is 1/10.

3. Select R = 900 ohm. Scale Factor = 100 / (100 + 900) = 1 / 10 = 0.1

4. Full Scale becomes 40mV / 40A = 1mV / A.

5. Convert 1mV / A to 1 A / mV. So A = 1, B=0.

Example 2: connect a sound level meter to the thermometer
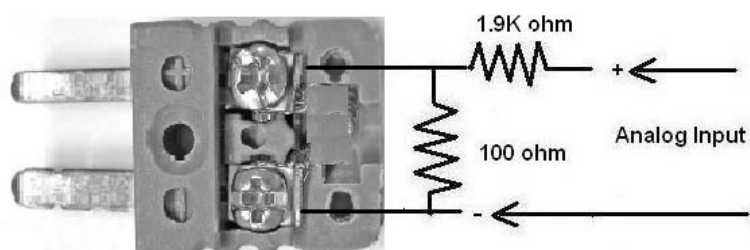
1. The full scale output is 1000 mV per 100 DB.

2. To lower the voltage from 1000 mV to 50 mV, the scale factor is 1 / 20.

3. Select R = 1.9K ohm. Scale Factor = 100 / (100 + 1900) = 1 / 20 = 0.05

4. Full Scale becomes 50mV / 100 DB = 0.5 mV / DB.

5. Convert 0.5 mV / DB to 2 DB / mV. So A = 2, B=0.

Example 3: connect a humidity meter to the thermometer
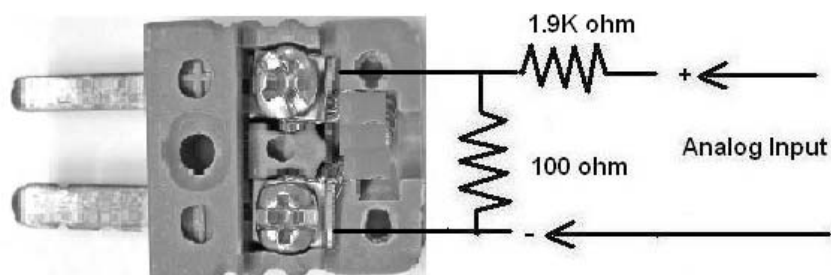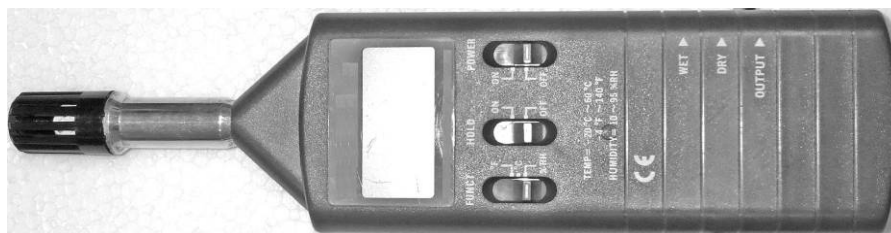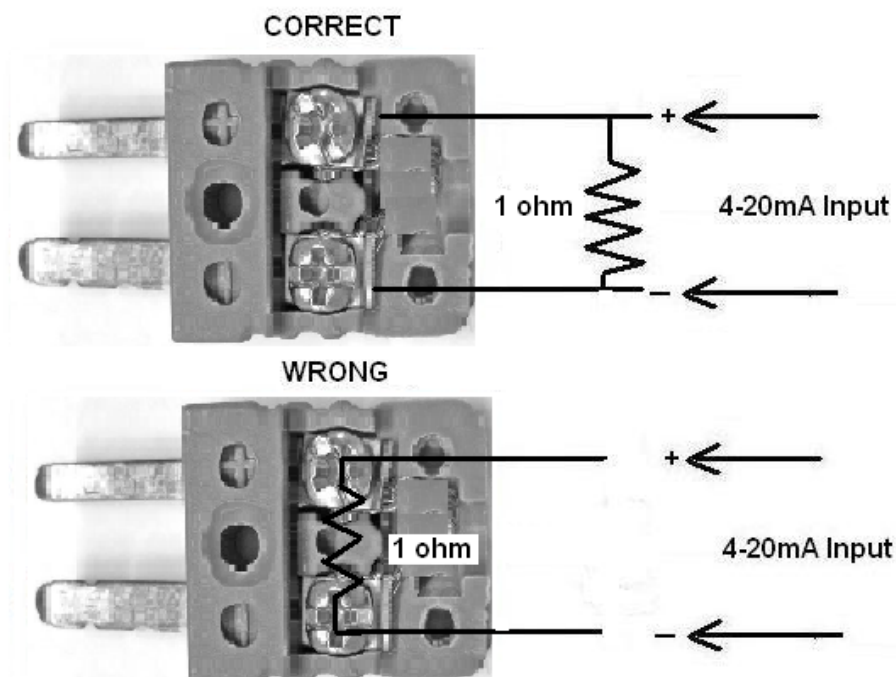

1. The full scale output is 1000 mV per 100 %RH.

2. To lower the voltage from 1000 mV to 50 mV, the scale factor is 1 / 20.

3. Select R = 1.9K ohm. Scale Factor = 100 / (100 + 1900) = 1 / 20 = 0.05

4. Full Scale becomes 50mV / 100 %RH = 0.5 mV / %RH

5. Convert 0.5 mV / %RH to 2 %RH / mV. So A = 2, B=0.

T. Connect the 4 to 20mA Signal (1 example)

If the input is a 4 to 20mA signal, users can convert the mA signal to mV signal by placing a 1 ohm resistor between two terminals.   Then 4mA becomes 4mV and 20mA becomes 20mV.

Warning: Do not connect the 1 ohm resistor with the two posts directly.
Solder the 1 ohm resistor to the wire, and then connect the wire with posts without any solder.

Example 1: Voltage transmitting 0 to 240V by a 4-20mA transmitter

1. First convert 4 to 20 mA to 4 to 20mV using the above circuitry.

2. Using $Y = A * X + B$, find the coefficients A and B.

$$0 \text{ V} = A * 4 \text{ mV} + B$$

$$240 \text{ V} = A * 20 \text{ mV} + B$$

3. Solve the equation, we have A = 15, B = -60,

4. Program A = 15, B = -60 and unit = V.

U. Remove the SD or SDHC Card

If users need to retrieve data stored in the SD or SDHC card, users need to remove the SD or SDHC card from the unit.

1. Users turn the power off of the unit and, remove the screw of battery cover.

2. Users will find the SD or SDHC card when the battery cover is removed.

3. Push the SD or SDHC card with users finger nail, and the card will eject from the socket.

4. Pull the SD or SDHC card with users finger nail.

5. Plug the SD or SDHC card into the socket of a PC or a Note Book. The card is ready to be read by a PC or a Note Book.

6. Replace the screw and battery cover.

> **Note:** If the message of "SD or SDHC CARD WRITE PROTECT" is shown, move the sliding lever of SD or SDHC card in the opposite direction. If the message is still shown, then replace with a new SD or SDHC card.

> **Note:** The maximum size of SD or SDHC card used by the thermometer is 8 G bytes.

V. Format the SD or SDHC Card by the Thermometer

1. Hold the REC button, and turn the power on.

2. Users will be asked to "RELEASE REC BUTTON". Then release REC button as instructed.

3. Users will be asked to confirm the format of SD card.

4. Select "YES" to format SD or SDHC card.

> **Warning:** All data files are deleted after re-format. So before re-format the SD or SDHC card, users should store needed files in a PC.

> **Note:** To restore HELP files and DEMO files, copy the directory of METER in the software CD-ROM to the SD card after re-format.

W. Format the SD or SDHC Card with a PC

1. Insert the SD or SDHC card into the slot for SD card in a PC.

2. Select the device of SD card, and click on the right button of mouse.

3. The following table is shown, please enter parameters as shown.
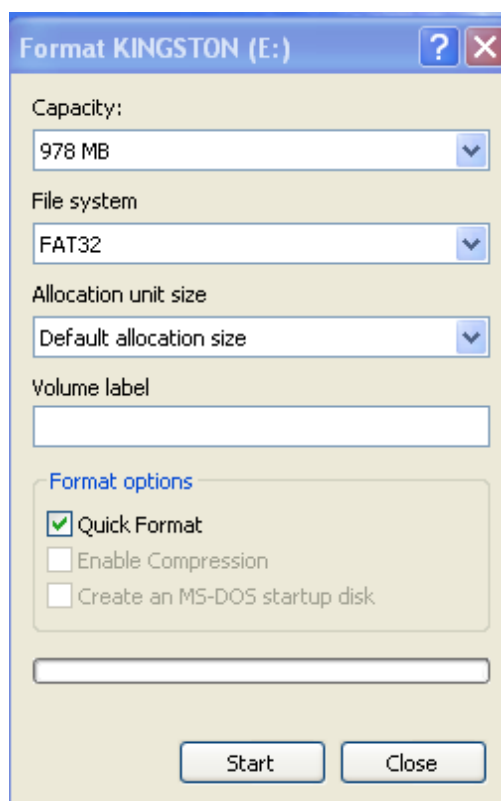
Warning: All data files are deleted after re-format. So before re-format the SD or SDHC card, users should store needed files in a PC.

Note: To restore HELP files and DEMO files, copy the directory of METER in the software CD-ROM to the SD card after re-format.

X. On-line HELP Function

1. Press SETUP button. A setup menu is displayed.

2. Press HELP button. A HELP file is displayed.

3. Press ►pg or ◄pg to page up or down.

4. Press ▲ or ▼ to turn 10 pages up or down.
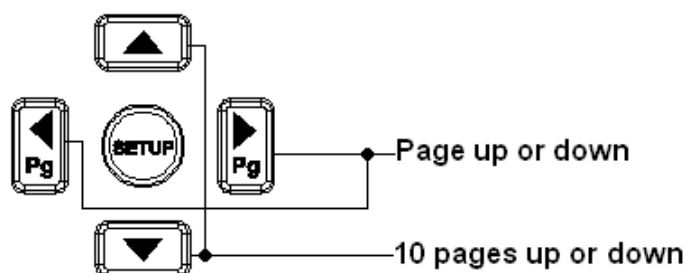
5. Press the following buttons to turn to corresponding page directly.
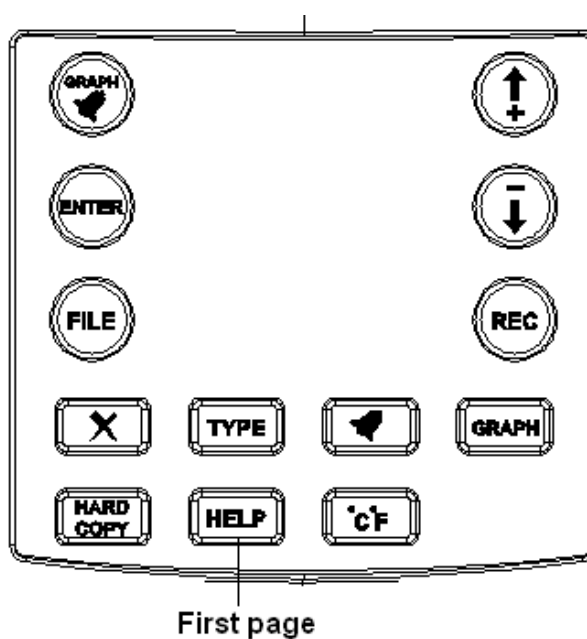
6. To exit HELP function, press the SETUP button.

Y. Internal Temperature Reference

```
LO-LIMITS-HI        Power:100%
  10.0      37.7  | IN1  26.6°C int
  10.0      37.7  | IN2  26.8°C int
  10.0      37.7  | IN3  26.9°C int
  10.0      37.7  | IN4  26.7°C int
  10.0      37.7  | IN5  26.8°C int
  10.0      37.7  | IN6  26.8°C int
  10.0      37.7  | IN7  26.3°C int
  10.0      37.7  | IN8  26.4°C int
```

Press SETUP button to toggle the display of setup menu and the display the internal temperature for each input (when thermocouple is connected).

These temperature readings are used for cold junction temperature compensation for the thermometer itself.

IV. Specifications

Electrical Specifications:

1. 23℃ ± 5℃, 10 minutes after power is on, 0.1/1 ℃, 0.1/1℉ Resolution, Accuracy is of reading, input overload protection is 10V, input impedance is 100KΩ, and thermocouple accuracy is not included.

2. The range of temperature does not include the room temperature.

So the actual range is the range listed less the room temperature.

3. Cold junction temperature compensation accuracy is not included.

4. When engineering unit is programmed, the accuracy of mV is for coefficient A = 1 and B = 0

Type	℃		℉	
	Range	**Accuracy**	**Range**	**Accuracy**
K	-200 ~ -150	±3.0℃	-328 ~ -238	±5.4℉
	-150 ~ -100	±2.0℃	-238 ~ -148	±3.6℉
	-100 ~ 999.9	±0.1% ±1.0℃	-148 ~ 999.9	±0.1% ±1.8℉
	1000 ~ 1370	±0.2% ±1.0℃	1000 ~ 2498	±0.2% ±1.8℉
J	-200 ~ -100	±2.5℃	-328 ~ -148	±4.5℉
	-100 ~ 100	±1.5℃	-148 ~ 212	±2.7℉
	100 ~ 999.9	±0.1% ±1.0℃	212 ~ 999.9	±0.1% ±1.8℉
			1000 ~ 1832	±0.2% ±1℉
E	-150 ~ -100	±2.0℃	-238 ~ -148	±3.6℉
	-100 ~ 760	±0.1% ±1.0℃	-148 ~ 999.9	±0.1% ±1.8℉
			1000 ~ 1400	±0.2% ±1℉
T	-200 ~ -150	±3.0℃	-328 ~ -238	±5.4℉
	-150 ~ -100	±0.1% ±1.5℃	-238 ~ -148	±0.1%±2.7℉
	-100 ~ 400	±0.1% ±0.5℃	-148 ~ 752	±0.1% ±0.9℉
R/S	0 ~ 100	±5.0℃	32 ~ 212	±9.0℉
	100 ~ 300	±3.0℃	212 ~ 572	±5.4℉
	300 ~ 999.9	±0.1% ±2.0℃	572 ~ 999.9	±0.1% ±3.6℉
	1000 ~ 1600	±0.1% ±2.0℃	1000 ~ 2912	±0.1% ±3.6℉
N	0 ~ 999.9	±0.1% ±1.0℃	32 ~ 999.9	±0.1% ±1.8℉
	1000 ~ 1300	±0.2% ±1.0℃	1000 ~ 2372	±0.2% ±1.8℉
L	-200 ~ 900	±0.1% ±1.0℃	-328 ~ 999.9	±0.1 % ±1.8℉
			1000 ~ 1652	±0.2 % ±1℉
U	0 ~ 600	±0.1% ±1.0℃	32 ~ 999.9	±0.1% ±1.8℉
			1000 ~ 1112	±0.2% ±1℉
B	600 ~ 999.9	±0.1% ±2.0℃	1112 ~ 1831	±0.1% ±3.6℉
	1000 ~ 1760	±0.1% ±2.0℃	1832 ~ 3200	±0.1% ±3.6℉
C	0 ~ 999.9	±0.1% ±1.5℃	32 ~ 999.9	±0.1% ±2.7℉
	1000 ~ 1760		1000 ~ 3200	

		±0.2% ±1.5℃		±0.2% ±2.7℉
mV	-60 ~ 60	±60 µV	-60 ~ 60	±60 µV

General Specifications

LCD	4.5" STN LCD (240 x 128)
Battery Type:	1.5V AA alkaline batteries x 8
AC Adaptor:	DC Regulated 12V / 300mA output AC 110V or 220V Input
Power Consumption:	100mA (with backlight) 70mA (without backlight)
Cold Junction Compensation Accuracy:	±0.5℃ / ±0.9℉
Temperature Coefficient:	0.01% of F.S. / ℃
Isolated Input Protection between any two inputs:	350Vp-p
Dimension:	257(L) x 155(W) x 57(H) mm 10.1" (L) x 6.1" (W) x 2.2" (H)
Weight:	1160g / 40.9oz (Batteries included)
Operation Environment:	0℃ ~ 50℃, 85% RH
Storage Environment:	-20℃ ~ 60℃, 75% RH
Accessories:	User manual x 1 1.5V AA alkaline batteries x 8 USB cable x 1 Software CD x 1 Software manual x 1 SD card (2GB) x 1 K-type thermocouples (-50~200℃ / -58 ~392℉±0.75%): 1-meterx7pcs.; 3-meterx1pc. Carrying bag x 1
Option:	Thermal Printer SDHC card (8GB, Maximum) Mini connector for analog Input Optical RS-232 to USB bridge

V. Battery Replacement

Battery Power

```
LO-LIMITS-HI      Power:   1%
     0.0      10.0  IN1   24.2°C  K
    25.0  X   20.0  IN2   24.2°C  K
-   10.0      50.0  IN3   24.2°C  K
-   50.0     100.0  IN4   24.2°C  K
- 100.0      250.0  IN5   24.0°C  K
- 500.0      500.0  IN6   24.2°C  K
   700.0      1000  IN7   24.1°C  K
-  1000       1250  IN8   24.1°C  K
  SD-CARD SIZE:    974MB FREE:   968MB
```

1. When power is turned on, the % (percentage) of battery power is displayed at the right top corner of LCD.

    If the % is less than or equal to 1%, please replace the batteries with new ones.

2. Turn off the power and remove all the thermocouples connected.

3. Remove the screw of the battery cover.

4. Lift and remove the battery cover.

5. Remove the old batteries and insert eight new 1.5V SUM-3 alkaline batteries.

6. Install the battery cover and secure the screw.
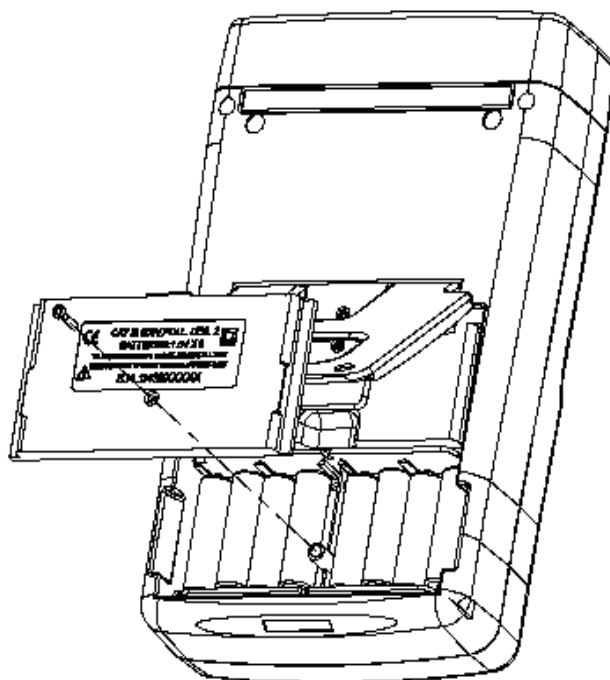
VI. Maintenance & Cleaning

1. Servicing not covered in this manual should only be performed by qualified personnel.   Repairs should only be performed by qualified personnel.

2. Periodically wipe the case and cable with a damp cloth and detergent; do not use abrasives or solvents.

3. Please remove all the batteries if users won't use the thermometer for a long time.

Address of Agent, Distributor, Importer, or Manufacturer

In this direction will find a vision of the measurement technique:
http://www.industrial-needs.com/measuring-instruments.htm

NOTE: "This instrument doesn't have ATEX protection, so it should not be used in potentially explosive atmospheres (powder, flammable gases)."