*Pt-100 calibrator,Pt 100 thermometer,Type K,J,T,R,E,S thermocouple*
*400 ohm resistance calibrator, measurement*
*DC mV calibrator(source) , measurement*

# THERMOMETER CALIBRATOR

## Model : TC-424

Your purchase of this 4 in 1 THERMOMETER CALIBRATOR with Source & Measurement marks a step forward for you into the field of precision measurement. Although this meter a complex and delicate instrument, its durable structure will allow many years of use if proper operating techniques are developed. Please read the following instructions carefully and always keep this manual within easy reach.

# OPERATION MANUAL

# TABLE OF CONTENTS

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## 1. FEATURES

* Four kinds Source output :
  1. Pt-100 source, 2. Voltage( DC mV) source.
  3. 400 ohm source , 4. Type KJRETS Temp. source .

* Four kinds measurement inputer :
  1. Pt-100 measure, 2. Voltage( DC mV) measure,
  3. 400 ohm measure , 4. Type K/J/R/E/T/S Temp. measure .

* Portable instrument for calibrating process devices.

* Four kinds Source Adjustable output.


# 2. SPECIFICATIONS

## 2-1 General Specifications

| Circuit | Custom one-chip of microprocessor LSI circuit. |
|---|---|
| Display | LCD size : 52 mm x 30 mm. LCD with white backlight ( ON/OFF ). |
| Measurement | 1.Type k/J/R/E/T/S Temp. , 2. Voltage (DC mV). 3. Pt-100 ohm, 4. 400 ohm . |
| Source | *Type k/J/R/E/T/S Temp.,* Voltage (DC mV： - 10.00 to + 110.00 mV), Pt-100 ohm , 400 ohm . |
| Sampling Time of Display | Approx. 1 second. |
| Advanced setting | * Auto power OFF management. * Set unit ℃ or ℉ . |

| Operating Temperature and Humidity | 0 to 50 ℃.<br>Less than 85% R.H. |
|---|---|
| Power Supply | * Alkaline or heavy duty DC 1.5 V battery ( UM3, AA ) x 6 PCs, or equivalent.<br>* DC 9V adapter input. ( AC/DC power adapter is optional ). |
| Power Current | Normal operation ( w/o current source ) :<br>Approx. DC 18 mA.<br>LCD Backlight is ON) : Approx. + DC 2 mA. |
| Weight | *Meter :* 282 g/ 0.61 LB. (with cable) |
| Dimension | *Meter :* 198 x 68 x 45 mm |
| Accessories Included | * Instruction manual.............................................. 1 PC<br>* Hard carrying case( CA-06 )............................. 1 PC<br>* ( Type K source output line ), AC-DUK02........ 1 PC<br>* MTL-CP424........................................................ 1 PC |
| Optional Accessories | AC to DC 9V adapter.<br>TP-01,TP-02A, TP-03, TP-04, TP-05 |

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## 2-2 Electrical Specifications ( 23.0 $\pm 5$℃ )

**Thermocouple**

| Type | Range of source / measure | Accuracy | | Resolution |
|------|---------------------------|----------|--------|-----------|
| | | source | measure | |
| K | -200.0to 1370.0 ℃ | >-100℃: | >-100℃: | |
| | -328 to 2498 ℉ | ±(0.05 %+ 1 ℃) | ±(0.07%+1.5℃) | 0.1 ℃ or 1 ℉ |
| J | -200.0 to 1200.0 ℃ | <-100℃: | <-100℃: | |
| | -328 to 2192 ℉ | ±(0.05 %+ 2 ℃) | ±(0.07%+ 2 ℃) | |
| T | -200.0 to 400.0℃ | | | |
| | -328 to 752 ℉ | | | |
| E | -200.0 to 1000.0 ℃ | | | |
| | -328 to 1832 ℉ | | | |
| R | 0 to 1768 ℃ | <100℃: | >100℃: | |
| | | ±(0.05 %+ 3 ℃) | ±(0.07 %+ 3 ℃) | 1 ℃ or 1 ℉ |
| S | 32 to 3214 ℉ | ≧100℃: | ≧100℃: | |
| | | ±(0.05 %+ 2 ℃) | ±(0.07 %+ 2 ℃) | |

*\* input impedence  : 10 ^12  ohms.*
*\* measure protection : DC 60 V , AC 24 V.*
*\* source protection : Reference CAUTION.*

**DC Voltage**

### DC Voltage

| Range of source / measure | Display Resolution | Accuracy source / measure |
|---------------------------|--------------------|---------------------------|
| -10.00mV to +110.00 mV | 0.01 mV | ± ( 0.05 %  + 30 μV ) |

*\* input impedence  : 10 ^12  ohms.*
*\* measure protection : DC 60 V , AC 24 V.*
*\* source protection : Reference CAUTION.*

**Pt100**

### Pt100

| Range of source / measure | Display Resolution | Accuracy | |
|---------------------------|--------------------|----------|--------|
| | | source | measure |
| -200.0 to 850.0 ℃ | 0.1 degree | ±(0.05%+0.6℃) | ±(0.05%+ 1℃) |
| -328.0 to 1562.0 ℉ | 0.1 degree | | |

*\* input impedence  : 10 ^12  ohms.*
*\*  protection : Reference CAUTION.*

*Remark :*
*The above specification are tested under the environment*
*RF Field Strength less than 3 V/M & frequency less than the*
*30 MHz only.*

**400 Ω**

| 400 Ω | | | |
|---|---|---|---|
| Range of source / measure | Display | Accuracy: | |
| | Resolution | source | measure |
| 400.0 Ω | 0.1 Ω | ±(0.1%+ 0.4 Ω) | ±(0.1%+ 0.6Ω) |
| * input impedence  : 10 ^12  ohms. | | | |
| * protection :  Reference CAUTION. | | | |
| * FS : full scale | | | |

Remark :

　　The above specification are tested under the environment

　　RF Field Strength less than 3 V/M & frequency less than the

　　30 MHz only.

⚠ CAUTION

*  Do not apply a voltage exceeding the maximum input voltage.
　 otherwise the input part may be damaged.

* Do not short_circuit or apply an external voltage to output terminals of the
　 instrument or standard equipment, or else their internal circuitry may be damaged.

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# 3. FRONT PANEL DESCRIPTION

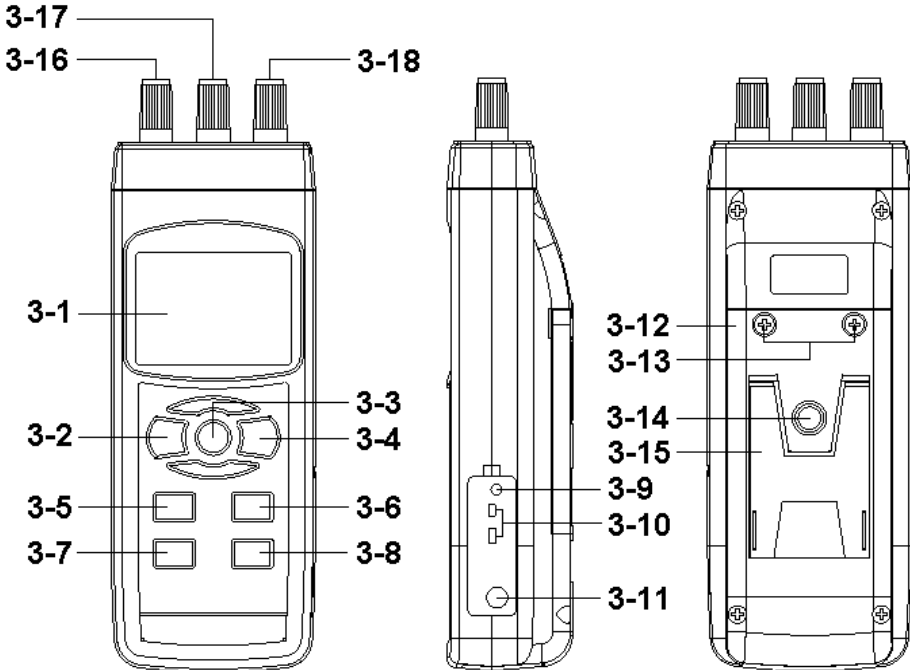

Fig. 1

3-1 Display
3-2 ◄ Button( Backlight Button )
3-3 Power Button
3-4 ► Button
3-5 ▲ Button
3-6 ▼ Button
3-7 FUNCTION Button/SET Button
3-8 Source/Measure Button / Type Button
3-9 Reset Button
3-10 Thermocouple Temp.Input Socket

3-11 DC 9V Power Adapter Input Socket
3-12 Battery Compartment/Cover
3-13 Battery Cover Screws
3-14 Tripod Fix Nut
3-15 Stand
3-16 Red(Hi) bananaTerminal
3-17 Black(Lo) bananaTerminal
3-18 Green(Lo) bananaTerminal

# 4. SOURCE PROVIDE PROCEDURE

## 4-1. Thermocouple  SOURCE PROVIDE PROCEDURE

1) Power on the meter by press  the " Power button " ( 3-3,Fig. 1 ) > 2 sec.
2) Press  the " Source/Measure button "  ( 3-8, Fig. 1 )  select to SOURCE Model .
3) Press  the " FUNCTION button "  ( 3-7, Fig. 1 )  select to Thermocouple Function.
4) Press and hold  the " Source/Measure button "  ( 3-7, Fig. 1 )  select to Thermocouple Type .
5) Press the " ► button "( 3-4, Fig. 1 )or " ◄ button"( 3-2, Fig. 1 ) select a digit for adjustment. The blinking digit identifies the digit selected.
6) Press the " ▼button "( 3-6, Fig. 1 ) or " ▲button "( 3-5, Fig. 1 ) to adjust the value of the digit. Press and Hold the  ▼ or  ▲  button to rapidly adjust the value. And will generate the Temp. output same as the display value.
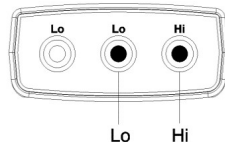
*Remark :*

It is recommended to use  the Thermocouple Temp.Input Socket (3-10 Fig 1 *output  better , or Use The " Red banana Terminal " ( 3-16, Fig. 1 ) is for the positive Temp. output. The " Black banana Terminal " ( 3-17, Fig. 1 ) is the " ground " for negtive Temp. output.*

## 4-2. VOLTAGE SOURCE PROVIDE PROCEDURE

1) Power on the meter by press  the " Power button " ( 3-3,Fig. 1 ) > 2 sec.
2) Press  the " Source/Measure button "  ( 3-8, Fig. 1 )  select to SOURCE Model .
3) Press  the " FUNCTION button "  ( 3-7, Fig. 1 )  select to Votage Function.
4) Press the " ► button "( 3-4, Fig. 1 )or " ◄ button"( 3-2, Fig. 1 ) select a digit for adjustment. The blinking digit identifies the digit selected.
5) Press the " ▼button "( 3-6, Fig. 1 ) or " ▲button "( 3-5, Fig. 1 ) to adjust the value of the digit. Press and Hold the  ▼ or  ▲  button to rapidly adjust the value.  And will generate the voltage output same as the display value.

*Remark :*
*Use The " Red banana Terminal" ( 3-16, Fig. 1 ) is for the positive Votage output. The " Black banana Terminal " ( 3-17, Fig. 1 ) the " ground " for negtive Votage output.*

## 4-3. RTD Pt100 ohm  SOURCE PROVIDE PROCEDURE

1)  Power on the meter by press  the " Power button " ( 3-3,Fig. 1 ) > 2 sec.
2)  Press  the " Source/Measure button "  ( 3-8, Fig. 1 )  select to SOURCE Model .
3)  Press  the " FUNCTION button "  ( 3-7, Fig. 1 )  select to Pt100 Function.
4)  Press the " ► button "( 3-4, Fig. 1 )or " ◄ button"( 3-2, Fig. 1 ) select
    a digit for adjustment. The blinking digit identifies the digit selected.
5)  Press the " ▼button "( 3-6, Fig. 1 ) or " ▲button "( 3-5, Fig. 1 ) to adjust the
    value of the digit. Press and Hold the  ▼ or  ▲  button to rapidly adjust the
    value. And will generate the Pt100 ohm Temp. output same as the display value.
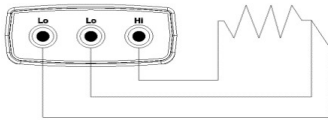


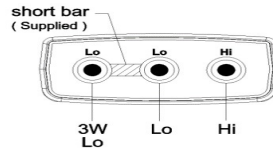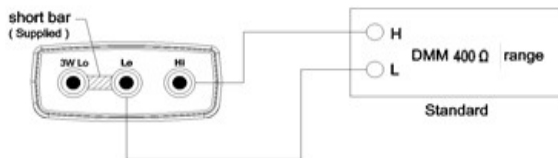Fig. 1-A                                        Fig. 1-B

Remark :
when carrying out calibration on a resistance temperature detector or a resistance
measurement unit in three-wire connection, the supplide terminal adapter can be used
to achieve a three-wire configuration (Fig. 1-A).2W Lo and LO terminals can
be shorted (Fig. 1-B) Otherwise connect as Fig.1-A

## 4-4. 400 ohm  SOURCE PROVIDE PROCEDURE

1)  Power on the meter by press  the " Power button " ( 3-3,Fig. 1 ) > 2 sec.
2)  Press  the " Source/Measure button "  ( 3-8, Fig. 1 )  select to SOURCE
    Model .
3)  Press  the " FUNCTION button "  ( 3-7, Fig. 1 )  select to 400 ohm Function.
4)  Press the " ► button "( 3-4, Fig. 1 )or " ◄ button"( 3-2, Fig. 1 ) select
    a digit for adjustment. The blinking digit identifies the digit selected.
5)  Press the " ▼button "( 3-6, Fig. 1 ) or " ▲button "( 3-5, Fig. 1 ) to adjust the
    value of the digit. Press and Hold the  ▼ or  ▲  button to rapidly adjust the
    value. And will generate the 400 ohm. output same as the display value.

# 5. MEASUREMENT PROCEDURE

## 5-1. Thermocouple Type MEASURE PROCEDURE

1) Power on the meter by press the " Power button " ( 3-3,Fig. 1 ) > 2 sec.
2) Press the " Source/Measure button " ( 3-8, Fig. 1 ) select to MEASURE Model .
3) Press the " FUNCTION button " ( 3-7, Fig. 1 ) select to Thermocouple Type Measure Function.
4) Press and hold the " SOURCE/MESURE button " ( 3-8, Fig. 1 ) to select Thermocouple Type .
5) Thermocouple Type Temp. probe into the "Thermocouple Type Temp. socket " ( 3-10, Fig. 1 ) .
6) The meter LCD display will show the measure value same as the input Type k temp. value.

## 5-2. VOLTAGE MEASURE PROCEDURE

1) Power on the meter by press the " Power button " ( 3-3,Fig. 1 ) > 2 sec.
2) Press the " Source/Measure button " ( 3-8, Fig. 1 ) select to MEASURE Model .
3) Press the " FUNCTION button " ( 3-7, Fig. 1 ) select to Voltage Measure Function.
4) Voltage (mV) input to the "RED banana Terminal " (3-16 ,Fig.1 ) and "BLACK banana Terminal " (3-17 ,Fig.1) .
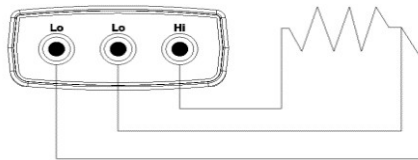5) The meter LCD display will show the measure value same as the input Voltage (mV), value.

*Remark :*
*Use The " Red banana Terminal " ( 3-16, Fig. 1 ) is for the positive Votage input. The " Black banana Terminal" ( 3-17, Fig. 1 ) is the " ground " for negtive Votage input.*
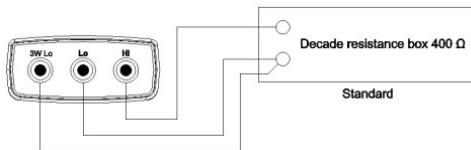
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## 5-3. RTD Pt100 ohm  MEASURE PROCEDURE

1) Power on the meter by press  the " Power button " ( 3-3,Fig. 1 ) > 2 sec.
2) Press the " Source/Measure button "  ( 3-8, Fig. 1 )  select to MEASURE Model .
3) Press  the " FUNCTION button "  ( 3-7, Fig. 1 )  select to RTD Pt100 ohm Measure Function.
4) Pt100 ohm Temp. probe into the Red (HI) banana Terminal(3-16,Fig1) and Black (LO) banana Terminal(3-17,Fig1) .
5) The meter LCD display will show the measure value same as the input Pt 100 temp. value.



## 5-4. 400 ohm  MEASURE PROCEDURE

1) Power on the meter by press  the " Power button " ( 3-3,Fig. 1 ) > 2 sec.
2) Press the " Source/Measure button "  ( 3-8, Fig. 1 )  select to MEASURE Model .
3) Press  the " FUNCTION button "  ( 3-7, Fig. 1 )  select to 400 ohm Measure Function.
4) Measured resistance  into the Red (HI) banana Terminal (3-16,Fig1) and Black (LO) banana Terminal(3-17,Fig1) .
5) The meter LCD display will show the measure value same as the input Measured resistance, value.



### 5-5.  LCD Backlight Operation
During the meter Power on
*long press The" ◄ button"( 3-2, Fig. 1 ) > 2 sec. the LCD Backlight will be on ,and*
*long press The" ◄ button"( 3-2, Fig. 1 ) > 2 sec. the LCD Backlight will be off.*

# 6. ADVANCED SETTING

Under do not execute the Datalogger function,
press the " Function Button " ( 3-7, Fig. 1 ) continuously at
least 3 seconds will enter the " Advanced  Setting " mode.
Then  press the " Function Button " (3-7, Fig. 1 ) once a while
in sequence to select the two main function, the lower
display will show :

**POFF.......**   Auto power OFF management
**t-CF.......**   Select the Temp. unit to ℃ or ℉

*Remark :*
*During execute the " Advanced Setting " function,  if*
*press " Power Button " ( 3-3, Fig. 1 )  once will exit*
*the " Advanced Setting "  function, the LCD will  return to*
*normal screen.*

### 6-1 Auto power OFF management

When the lower display show " PoFF "

1) Use the " ▲ Button " ( 3-5, Fig. 1 ) or  " ▼ Button "
   ( 3-6, Fig. 1 ) to select the upper value to " yES " or
   " no ".

   **yES - Auto Power Off management will enable.**
   **no - Auto Power Off management will disable.**

2) After select the upper text to " yES " or " no ",  press the
   " Source/Measure Button " ( 3-8, Fig. 1 ) will  save the setting
   function with default.

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### *6-2 Select the Temp. unit to* ℃ *or* ℉

> When the lower display show " t-CF "

1) Use the " ▲ Button " ( 3-5, Fig. 1 ) or  " ▼ Button "
   ( 3-6, Fig. 1 ) to select the upper Display text to " C " or
   " F ".

   **C - Temperature unit is ℃**
   **F - Temperature unit is ℉**

2) After Display unit is selected to " C " or " F ",  press the
   "  Source/Measure " ( 3-8, Fig. 1 ) will  save the setting
   function with default.


# 7. POWER SUPPLY from DC ADAPTER

The meter also can supply the power supply from the
DC 9V Power Adapter ( optional ). Insert the plug of
Power Adapter into  " DC 9V Power Adapter Input Socket
" ( 3-11, Fig. 1 ). The meter will auto select to DC 9V Power Adapter.

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# 8. BATTERY REPLACEMENT

1) When the left corner of LCD display show "  ⌧  ", it is necessary to replace the battery. However, in-spec. measurement may still be made for several hours after low battery indicator appears before the instrument become inaccurate.
2) Loose the screws of the " Battery Cover Screws " ( 3-13, Fig. 1 ) and take away the " Battery Cover " ( 3-12, Fig. 1 ) from the instrument and remove the battery.
3) Replace with  DC 1.5 V battery ( UM3, AA, Alkaline/heavy duty ) x 6 PCs,  and reinstate the cover.
4) Make sure the battery cover is secured after changing the battery.

# 9. SYSTEM RESET

If the meter happen the troubles such as :
*CPU system is hold ( for example, the key button can not be operated... ).*
Then make the system  RESET will fix the problem.
The system RESET procedures will be either following method :
During the power on, use a pin to press the  " Reset Button " ( 3-9, Fig. 1 ) once a while will reset the circuit system.

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