

High Temperature Infrared

THERMOMETER

Model : TM-949

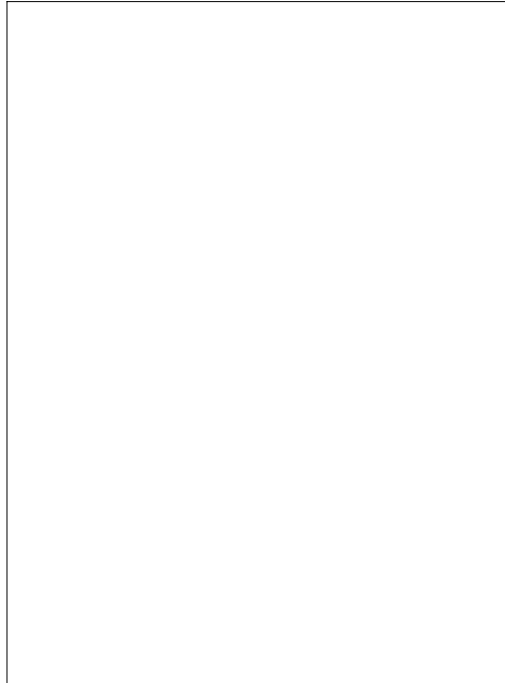


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1. FEATURES

- * Wide range Infrared thermometer, -20 蛭 to 650 蛭 (-4 蛭 to 1112 蛭), precision for none contact temperature measurement.
- * Emissivity adjustment for IR thermometer.
- * Laser guide for IR thermometer.
- * Red laser target guide easy for the target indentification.
- * Microcomputer circuit with high performance.
- * Build in 蛭 & 蛭 select button on the front panel.
- * Data hold function for stored the desired value on display.
- * Build the REL button, useful for relative measurement.
- * Memory function to record the maximum & minimum reading with recall.
- * RS 232 data output, easy cooperate with computer.
- * Optional data acquisition software for data record.
- * Auto power shut off saves battery life.
- * Built-in low battery indicator.
- * Heavy duty & compact housing case with stand.
- * Operates from 006P DC 9V battery.

2. SPECIFICATIONS

2-1 General Specifications

Display	51 mm x 32 mm supper large LCD display, 15 mm (0.6") digit size.
Measurement	Infrared thermometer (<i>Non contact temperature measurement</i>)
Functions	蛭, 蚌, Data hold, Memory (Max., Min.), Relative measurement, Emissivity adjustment (IR thermometer).
Circuit	Exclusive microcomputer circuit, the software build in linearity correction instead the traditional hardware circuit.
Emissivity Adjustment	Range : 0.20 to 1.00. Adj. by pushing button on front panel.
Laser Guide	Red laser light, less than 1 mW, Meet EN60825
Sampling Time	Approx. 1 second.
Hold Function	To freeze the display reading value.
Memory Recall	Memorize the Maximum, Minimum reading with recall.
IR Sensor	Thermocouple pie.
Measurement Wave Length Region	6 to 12 micro meter.
Distance Factor	D/S ratio : Approx. 7 : 1. * <i>D - Distance, S - Spot.</i>
Over Indication	Show " - - - - ".
Data Output	RS232 PC serial interface.
Power Supply	Alkaline or heavy duty type, DC 9V battery, 006P, MN1604 (PP3) or equivalent.

Power Consumption	Approx. DC 10 mA (laser guide off). Approx. DC 19 mA (laser guide on).
Operating Temperature	0 to 50 𠄎 (32 to 122 𠄎).
Operating Humidity	Less than 80% RH.
Weight	220 g/0.48 LB.
Dimension	HWD 215 x 68 x 30 mm . (8.5 x 2.7 x 1.2 inch).
Standard Accessory	Operational manual.....1 PC.
Optional Accessories	* Carrying case, Model : CA-06, CA-03. * RS232 cable, Model : UPCB-02. * Application software, windows version. Model : SW-U801-WIN

2-2 Electrical Specifications

Resolution/ ranges	1 𠄎	- 20 𠄎 to 650 𠄎
	1 𠄎	-4 𠄎 to 1202 𠄎
Accuracy	< 400 𠄎	3 % of reading or 3 𠄎 (5 𠄎), which ever is greater.
	400 𠄎	3 % of reading.
	* Accuracy test under the measurement range less than 300 𠄎 (572 𠄎). * Meter operating Temp. within 23 5 𠄎 & the emissivity value of measurement target set to 0.95. * Spec. tested with the 20 cm Dia. black body, the measuring distance from the probe sensing head is 30 cm. * Spec. tested under the environment RF Field Strength less than 3 V/M & frequency less than the 30 MHz only.	

3. FRONT PANEL DESCRIPTION

Fig. 1

3-1 Display	3-7 蛭/蚌 Button
3-2 Power On/Off Button	(Up Button)
3-3 Left Button	3-8 Emissivity Button
3-4 REL Button	(Laser Button)
(Down Button)	3-9 RS232 Output Socket
3-5 Hold Button	3-10 Battery Compartment/Cover
3-6 FREC Button	3-11 IR Sensing Head
	3-12 Laser Guide

4. IR MEASURING PROCEDURE

4-1 General IR Measurement

Measuring consideration of the " Emissivity "

All objects emit invisible energy. The amount of energy is emitted proportional to the object's temperature & its ability to emit energy. This ability is called emissivity based upon the material that object is made of and its surface roughness. Emissivity values range from 0.1 for a very reflective object to 1.00 for a black body.

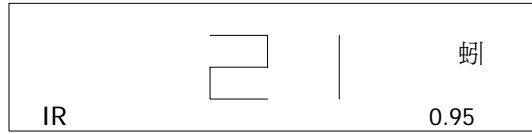
The probe of this IR THERMOMETER senses energy and calculates the temperature based on the amount of IR energy it receives and a factory set emissivity value is 0.95, which will cover 90% of the typical applications. However if the emissivity value of the measured material is not 0.95, then should adjust the " Emissivity Value ".

The procedure of the emissivity adjustment, please refer to page 8 " 4-5 How to Calculate & adjust the Emissivity ".

1) Power On :

Power on the meter by pressing the " Power Off/On Button " (3-2, Fig. 1).

The display will count down from " 99999 ", " 88888 ", to " 00000 ", then show the IR temperature value (approx. room temperature value) & the emissivity value on the right bottom corner of the LCD.



Remark : Suppose the approx. room temperature is 21 ℃

- 2) Select the " ℃ " " ℉ " display unit by pressing " ℃/℉ Button " (3- 7, Fig. 1).
- 3) Hold the meter, point the " IR Sensing Head " (3-11, Fig. 1) to the measured object. The meter will display the spot's temperature values.

Consideration :

- a) The displayed value may fluctuate if the meter is shaken or suddenly stretched etc. during measurement.*
- b) The device automatically compensates with temperature of the sensor influenced by the ambient temperature. When carry out the standard measurement, the device can be measured quickly for normal environment Temp. changes with 23 ℃. For more accurate measurement, keep it approx. 30 min. in the new temperature.*
- c) When low temperature objects are measured directly after high temperature objects, some time is required for the display to stabilize.*

4-2 Laser Target Guide

Press the " Laser Button " (3-8, Fig. 1) once will activate the laser light from the " Laser Guide " (3-12, Fig. 1). The Laser Target Guide is a useful tool to approximately locate the measured target of IR thermometer.

4-3 Measurement Field Distance/Spot (D/S) value

The object must be larger than spot size calculated by the measurement Distance/Spot ratio (Distance Factor, refer to page 2). For accurate measurement, a 1.5 times distance/spot size is recommended.

Careful collimating is required when the object is not large enough, if the temperature of the object or a part of it is higher (or lower) than the ambient temperature. After the direction of the probe (little move the probe), the ideal collimating is obtained the display registers the maximum (or minimum) reading. However the emissivity of the object and its ambient must be roughly the same.

4-4 Disturbance

Objects with low emissivity or objects with a low temperature but high emissivity, emit little infrared energy.

Fig. 2

For this reason, measurement of these objects is effected by powerful infrared energy radiated from nearby objects with high emissivity or high temperature.

For example, when such objects are measured in sunlight, erratic measurement happened because of powerful radiated energy from the sun and reflected by the surface of the object and received by the sensor.

4-5 Emissivity Adjustment

A factory set emissivity value is 0.95, which will cover 90% of the typical applications. However to match the correct emissivity with the specific value of the object is important in order to obtain the true temperature. When the emissivity of the object is known & its value is not 0.95. It is necessary to adjust the emissivity value again. The adjustment procedures are listed as following :

- a) Press the " Emissivity Button " (3-8, Fig. 1) continuously for at least 2 seconds. The emissivity value will flash, then release the button.
- b) Use the " Down Button " (3-4, Fig. 1), " Up Button " (3-7, Fig. 1) or the " Left Button " (3-3, Fig. 1) to adjust the required emissivity value.
Press the " Emissivity Button " continuously for at least 2 seconds again. The emissivity value will stop flashing. Release the button, the adjustment procedures are completely finished.

4-6 Offset Value adjustment

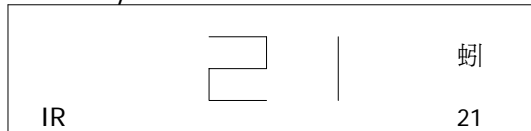
Caused by the environment temperature change or other reasons.... the measuring value may drift few degrees (1, 2 or 3 degrees).

If you found the measuring values exist little deviation especially when measuring the low temperature, then offset value adjustment will make the compensation & let the measurement more precise.

The offset value adjustment procedures are as following :

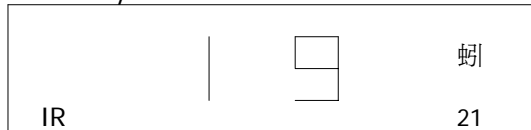
- a) Use two fingers to press the " Hold Button " (3-5, Fig. 1) & " REC Button " (3-6, Fig. 1) together & not release. The small digit (right bottom corner of LCD) will show the same value of main LCD (big digit).

For example :



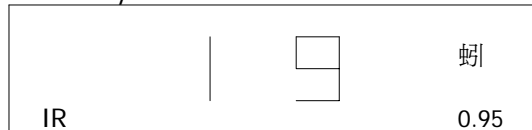
- b) Still hold on the " Hold Button " & the " REC Button ", use the " Down Button " (3-4, Fig. 1), " Up Button " (3-7, Fig. 1) to adjust the big display until the required exact environment Temp. value appears.

For example :



Then release all buttons, the small digit display (right bottom corner of LCD) will disappear, the offset adjustment procedures are completely finished.

For example :



4-7 Others

- a) If the meter seems to be giving incorrect reading. Then the object may exist the not correct emissivity value (0.95), then it is necessary to make the right emissivity correction. procedures (refer 4-5).
- b) If the surface for measuring is covered by frost or other material, clean it expose the surface.
- c) If the surface for measuring is highly reflective, apply masking tape or apply the known " block body paint " (such as emissivity 0.95).

5. DATA HOLD, RECORD, RELATIVE, and AUTO POWER OFF DISABLE

5-1 Data Hold

- 1) During the measurement, pressing the " Hold Button " (3-5, Fig. 1) will hold the measured value & the LCD will show " HOLD " symbol.
- 2) Press the " Hold Button " again to exit the data hold function

5-2 Data Record (Maximum, Minimum reading)

- 1) The DATA RECORD function displays the maximum and minimum readings. To start the DATA RECORD function by pressing the " REC Button " (3-6, Fig. 1) once. " REC " symbol will appear on the LCD display.
- 2) With the " REC " symbol on the display :
 - (a) Press the " REC Button " (3-6, Fig. 1) once, the " Max " symbol along with the maximum value will appear on the display.
 - (b) Press the " REC Button " again, the " Min " symbol along with the minimum value will appear on the display.
 - (c) To exit the memory record function, press the " REC Button " for at least 2 seconds and then the display will revert to the current reading.

5-3 Relative measurement

- 1) During the measurement, the circuit will memorize the last measured value when press the " REL Button " (3-4, Fig. 1) once, and display will show zero value & a " REL " symbol appears on the LCD.
- 2) The new measured temperature values will deduct above memorized " Last measured values " automatically.
- 3) It will cancel the relative measurement function if the " REL Button " be pressed again and at same time the " REL " marker will disappear.

Considering :


When meter in the " Data Hold " & " Data Record " condition, the relative function can't be activated.

5-4 Auto Power Off disable

The instrument build-in " Auto Power Off " function in order to prolong battery life. The meter will switch off automatically if none of the buttons are pressed for approx. 10 minutes.

To disable this feature, Select the memory record function during measurement, by pressing the " REC Button " (3-6, Fig. 1).

6. BATTERY REPLACEMENT

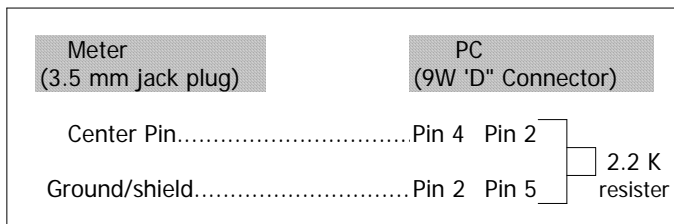
- 1) When the left top corner of LCD display show "  ", it is necessary to replace the battery.
However within specification measurement may still be made for several hours after low battery indicator appears
- 2) Open the " Battery Cover " (3-10, Fig. 1) away from the instrument and remove the battery.
- 3) Install a 9 V battery (Alkaline or Heavy duty type) and reinstate the cover.

7. RS232 PC SERIAL INTERFACE

The instrument features an RS232 output via 3.5 mm terminal (3-9, Fig. 1).

The connector output is a 16 digit data stream which can be utilized by the user for specific application.

A RS232 lead with the following connection will be required to link the instrument with the PC serial input.



The 16 digit data stream will be displayed in the following format :

D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5 D4 D3 D2 D1 D0

Each digit indicate the following status :

D0	End Word
D1 & D8	Display reading, D1 = LSD, D8 = MSD For example : <i>If the display reading is 1234, then D8 to D1 is : 00001234</i>
D9	Decimal Point(DP), position from right to the left 0 = No DP, 1= 1 DP, 2 = 2 DP, 3 = 3 DP
D10	Polarity 0 = Positive 1 = Negative
D11 & D12	Annunciator for Display 蚌 = 01 蚌 = 02
D13	1
D14	4
D15	Start Word

RS232 FORMAT : 9600, N, 8, 1

8. OPTIONAL ACCESSORIES & PROBES

Software	Model : SW-U801-WIN, Windows version. * Software apply as the performance of data logging system & data recorder...
Carrying Case	Model : CA-03, Vinyl soft carrying case.
Carrying Case	Model : CA-06, Hard carrying case.