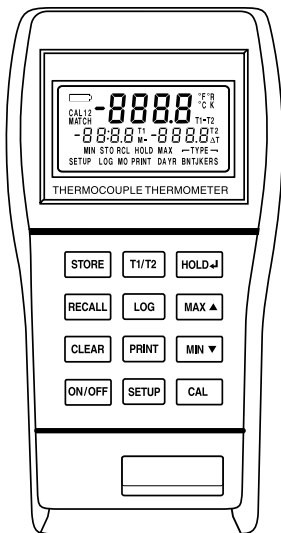


Digi-SENSE[®]

DualLogR[®]

THERMOCOUPLE THERMOMETER



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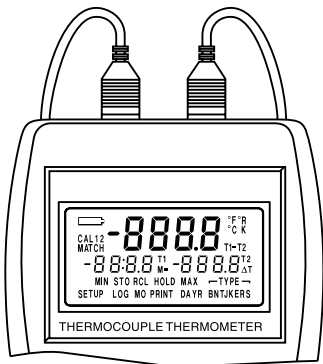
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ISO 9001
REGISTERED

INTRODUCTION




This versatile hand-held instrument provides highly accurate temperature measurements in Celsius, Fahrenheit, Rankine, or Kelvin using a wide range of thermocouple types. The temperature range for each type thermocouple is listed in the following chart.


| TYPE | °C | °F |
|------|--------------|--------------|
| J | -200 to 1000 | -328 to 1832 |
| K | -250 to 1372 | -418 to 2501 |
| T | -250 to 400 | -418 to 752 |
| E | -250 to 1000 | -418 to 1832 |
| N | -250 to 1300 | -418 to 2372 |
| B | 200 to 1800 | 392 to 3272 |
| R | 0 to 1768 | 32 to 3214 |
| S | 0 to 1768 | 32 to 3214 |


The instrument is designed for easy operation and includes the following features:


- Operator selection of temperature scale
- Resolution of 0.1° from –150°C to 999.9°C (–238°F to 999.9°F)
- LCD with three four-digit displays
- Two (2-blade female) ANSI mini-connector inputs
- Hold feature for temporarily retaining a reading
- Two-point field calibration capability
- Low battery warning
- Stores or logs up to 1000 readings with real-time markers
- Scrolls through all stored readings
- Displays MIN and MAX readings
- Scrolls between T1, T2, and T1-T2 readings
- Interfaces with optional HEWLETT PACKARD® infrared printer or optional RS-232-C adapter
- Prints temperature and time of reading
- Built-in tilt stand for easy hands-free operation


SAFETY PRECAUTIONS

 **WARNING** THIS INSTRUMENT IS DESIGNED TO ACCEPT LOW LEVEL SIGNALS SUPPLIED BY STANDARD THERMOCOUPLES. UNDER NO CIRCUMSTANCES SHOULD THE INPUT VOLTAGE EXCEED THE SPECIFIED 50V RMS.


 **CAUTION** DO NOT USE OR STORE THIS INSTRUMENT IN MICROWAVE OVENS OR ANY ABNORMALLY HOT OR COLD AREAS.

 **CAUTION** WEAK BATTERIES SHOULD NOT BE LEFT IN THE INSTRUMENT. DEAD BATTERIES CAN LEAK AND CAUSE DAMAGE TO UNIT.

 **DANGER** VOLTAGES PRESENT AT THE THERMOCOUPLE MAY ALSO BE PRESENT AT THE BATTERY TERMINALS. ALWAYS DISCONNECT THE THERMOCOUPLE WHEN CHANGING BATTERIES.

 **WARNING** TO PREVENT IGNITION OF A HAZARDOUS ATMOSPHERE, BATTERIES MUST ONLY BE CHANGED IN AN AREA KNOWN TO BE NON-HAZARDOUS.

 **AVERTISSEMENT** AFIN DE PREVENIR L'INFLAMMATION D'ATMOSPHERES DANGEREUSES, NE CHANGER LES BATTERIES QUE DANS DES EMPLACEMENTS DESIGNES NON DANGEREUX.

 **WARNING** TO PREVENT IGNITION OF A HAZARDOUS ATMOSPHERE BY ELECTROSTATIC DISCHARGE, CLEAN WITH DAMP CLOTH.

SPECIFICATIONS

THERMOCOUPLE PROBES

| Type | Temperature Range |
|------|-------------------|
|------|-------------------|

Type J: -200°C to 1000°C (-328°F to 1832°F)

Type K: -250°C to 1372°C (-418°F to 2501°F)

Type T: -250°C to 400°C (-418°F to 752°F)

Type E: -250°C to 1000°C (-418°F to 1832°F)

Type N: -250°C to 1300°C (-418°F to 2372°F)

Accuracy $> -150^{\circ}\text{C}$: $\pm 0.1\%$ of reading, $\pm 0.4^{\circ}\text{C}$
($\pm 0.7^{\circ}\text{F}$)

Accuracy $< -150^{\circ}\text{C}$: $\pm 0.25\%$ of reading, $\pm 1^{\circ}\text{C}$
($\pm 2^{\circ}\text{F}$)

Type B: 200°C to 1800°C (392°F to 3272°F)

Type R: 0°C to 1768°C (32°F to 3214°F)

Type S: 0°C to 1768°C (32°F to 3214°F)

Accuracy: $\pm 0.1\%$ of reading, $\pm 1^{\circ}\text{C}$ ($\pm 2^{\circ}\text{F}$)

Linearization: Conforms to NIST monograph 175 revised to ITS-90.

Input Protection: 50V rms

Display Update: 0.6 seconds per update

Connector: Two-blade female ANSI mini-connector inputs.

Battery

Size: Two AA, 1.5V alkaline ANSI-L40, IEC-LR6

Life: 750 hours continuous, typical.

Display: LCD with 0.4 in high characters main readout and 0.2 in high characters secondary displays, 4 digits each display plus various annunciators.

Temperature/Humidity Range

Operating:

| | |
|-------------------------|-----------------------------------|
| Stated Accuracy: | 18°C to 28°C (64°F to 82°F) |
| Useful Range: | 0°C to 40°C (32°F to 104°F) |
| Storage: | -40°C to 65°C (-40°F to 149°F) |
| Humidity: | 10% to 90% (non-condensing) |

Dimensions

3 cm D x 8.4 cm W x 15.8 cm H
(1.2 in x 3.3 in x 6.2 in)


Weight with batteries: 227 grams (8 ounces)


Ingress protection: Meets IEC-529 IP-54 for dust and water resistant enclosures.


Intrinsic safety

This product is energy limited for intrinsically safe operation in hydrogen atmospheres per Class I, Division 1, Groups A, B, C, and D hazardous (classified) locations for UL per UL913 and CSA per C22.2 No. 0-M1982 and No. 157-M1987. Maximum surface temperature: 135°C (T4); UL file No. E182612 (1997).

BATTERY INSTALLATION AND REPLACEMENT

 **CAUTION** WEAK BATTERIES SHOULD NOT BE LEFT IN THE INSTRUMENT. DEAD BATTERIES CAN LEAK AND CAUSE DAMAGE TO UNIT.

 **DANGER** VOLTAGES PRESENT AT THE THERMOCOUPLE MAY ALSO BE PRESENT AT THE BATTERY TERMINALS. ALWAYS DISCONNECT THE THERMOCOUPLE WHEN CHANGING BATTERIES.

 **WARNING** TO PREVENT IGNITION OF A HAZARDOUS ATMOSPHERE, BATTERIES MUST ONLY BE CHANGED IN AN AREA KNOWN TO BE NON-HAZARDOUS.

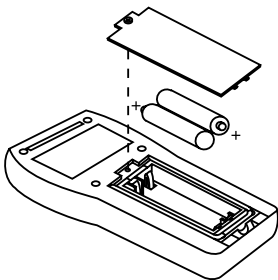
 **AVERTISSEMENT** AFIN DE PREVENIR L'INFLAMMATION D'ATMOSPHERES DANGEREUSES, NE CHANGER LES BATTERIES QUE DANS DES EMPLACEMENTS DESIGNES NON DANGEREUX.

If battery indicator turns on, battery life is approximately 8 to 10 hours. The battery indicator will start blinking with less than 1 hour of life remaining. Batteries must be changed.

AT THIS POINT, BATTERY MUST BE CHANGED. IF BATTERY VOLTAGE GOES TOO LOW, DISPLAY WILL GO BLANK.

See SPECIFICATIONS for battery type.

1. Before changing battery, turn instrument off and disconnect thermocouple(s).
2. Loosen screw and lift battery cover off back of case.
3. Remove the two AA batteries.
4. Insert two new batteries observing polarity.
5. Install cover and tighten screw.



AC ADAPTER

An optional AC adapter can be used for power to conserve batteries. The adapter is not a charger and will not charge batteries. The adapter connects to the bottom of the thermometer. When the adapter is connected, the batteries are disconnected. **This adapter is not intended for use in a hazardous area.**

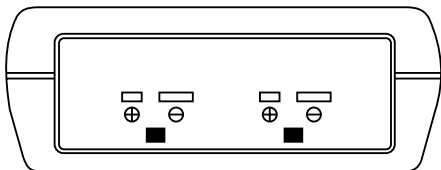
CONNECTING A THERMOCOUPLE

Note: Be sure your instrument setting (B, N, T, J, K, E, R or S) matches the thermocouple you are using.

Use the correct thermocouple type for your instrument. Using an incorrect thermocouple type will result in erroneous readings. Thermocouples are color coded by type using the North American ANSI Color Code as follows:

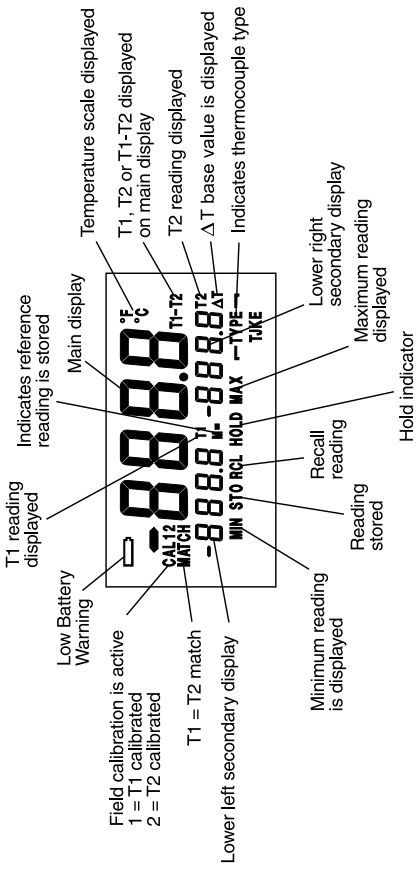
| TYPE | COLOR | TYPE | COLOR |
|------|--------|------|--------|
| J | Black | N | Orange |
| K | Yellow | B | Gray |
| T | Blue | R | Green |
| E | Purple | S | Green |

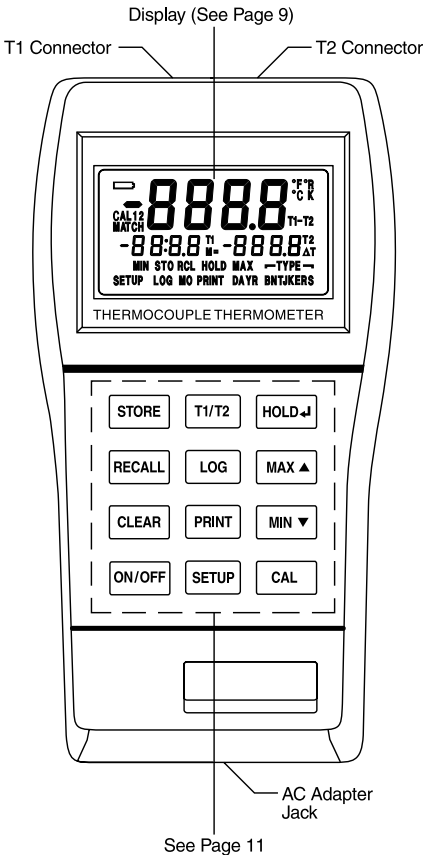
Thermocouple connectors have one wide blade and one narrow blade. *Do not force connector in backwards.* Connect thermocouple(s) to receptacle at top of instrument.









If only one thermocouple is being used, it can be connected to either T1 or T2. The thermometer will automatically determine which connector is being used. When two thermocouples are used, connect one to the T1 connector and one to the T2 connector.

Thermocouple wiring polarity must be correct. If readings decrease as the temperature increases, the thermocouple wires may be reversed. The red wire is negative for thermocouple wires manufactured in North America.



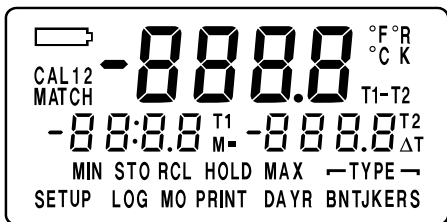


- STORE** — Press to store up to 1000 readings with time of occurrence.
- T1/T2** — Press to scroll main display between T1, T2, and T1-T2.
- HOLD**  — Press to freeze the current reading in display. (See field calibration section for  function.)
- RECALL** — Press to enter recall mode.
- LOG** — Press to activate and deactivate the log function.
- MAX**  — Press to briefly see the maximum reading. (See field calibration, setup, and recall sections for  function.)
- CLEAR** — Press to erase maximum, minimum, or stored readings.
- PRINT** — Press to activate and deactivate the infrared output.
- MIN**  — Press to briefly see the minimum reading. (See field calibration, setup and recall sections for  function.)
- ON/OFF** — Press to power up or turn off.
- SETUP** — Press to select desired thermocouple type, temperature, scale, resolution, filter or dampen rate, and set real-time clock.
- CAL** — For field calibration (See field calibration section.)

QUICK SETUP

Note: Review warnings on page 6.

1. Install batteries.
2. Connect thermocouple(s).
3. Press the **ON/OFF** key. The thermometer performs a self-test and all display digits and indicators, as shown below, should remain on for approximately one second. The clock will remain on for about three seconds.
4. Use **SETUP** to select the correct thermocouple and the desired scale. Use **▲** or **▼** to make selections, **↵** to enter selections and go to next step.



If a thermocouple has not yet been connected to one or more inputs on the instrument, you will see this display:



This message also appears if a thermocouple is broken. No measurements can be made while this warning is displayed.

COMPLETE SETUP PROCEDURE

The setup function scrolls through a series of steps for selecting thermocouple type, temperature scale, resolution, filter dampening rate, setting the real-time clock, and accessing the Log sub-menu and the Print sub-menu. Either the complete setup can be run as described below, or the setup can be initiated and terminated at any step. The Log sub-menu and the Print sub-menu can be accessed without going through the complete setup. These variations are covered in the following procedures.

NOTE

Settings selected in the Setup procedure are stored in memory and will remain even after power is turned off or while batteries are being replaced.

Press the **SETUP** key. The **SETUP** and **TYPE** annunciators will be on and the last selected thermocouple type will be flashing.

SELECTING THERMOCOUPLE TYPE

Press the **MAX ▲** key or **MIN ▼** key to step through the eight selections. When the correct thermocouple type is flashing, press the **HOLD ◀** key to advance to the next step in the setup sequence.

TEMPERATURE SCALE

1. The **SETUP** and one temperature scale annunciator (°C, °F, °R, or K) in the upper right hand corner of the display will be flashing.
2. Press the **MAX ▲** key or **MIN ▼** key to step through the four selections. When the correct temperature scale is flashing, press the **HOLD ◀** key to advance to the next step in the setup sequence.

TEMPERATURE RESOLUTION

When 0.1° resolution is selected, a decimal point will appear in the three numerical displays. When 1° resolution is selected, no decimal point will be present. When measuring temperature above 999.9° or below -150°C, the thermometer automatically autoranges to 1° resolution.

The SETUP annunciator will be on. If the instrument is set for 0.1° resolution the decimal point will appear in the display. Press either **MAX ▲** key or **MIN ▼** key to change resolution, then press the **HOLD ↵** to advance to the next step in the setup sequence.

FILTER DAMPENING

The filter dampening rate can be set to OFF or ON. This rate is changed to smooth out fluctuations in the readings. Normally this would be set to OFF. If readings are unstable, change to ON.

The SETUP annunciator will be on and the lower left display will read "FILt" and the upper display will flash either OFF or ON. Use the **MAX ▲** key or **MIN ▼** keys to switch the dampening rate, the press **HOLD ↵** key to store the rate and continue setup by setting the real-time clock.

SETTING REAL-TIME CLOCK

1. When setting the real-time clock, the SETUP annunciator will be on and the right two digits in the lower left display will be flashing. Use the **MAX ▲** key or **MIN ▼** key to adjust the flashing digits to the desired minute setting.
2. Press **HOLD ↵** key to lock in the minutes and advance to the hours setting.

Hours are set in the 24 hour time system. Therefore, time after 12:59 pm requires 12 to be added to the time. For example, 3:00 PM is (3+12) = 15:00 hours.

3. The SETUP annunciator will be on and the left two digits in the lower left display will be flashing. Use the **MAX ▲** key or **MIN ▼** key to adjust the flashing digits to the desired hour setting.
4. Press the **HOLD ↵** key to store the hours and advance to the month setting.
5. The SETUP and MO annunciators will be on and the right two digits in the lower left display will be flashing. Use the **MAX ▲** key or **MIN ▼** key to adjust the flashing digits to the desired month setting (1 to 12).
6. Press the **HOLD ↵** key to store the months and advance to the day setting.
7. The SETUP and DA annunciators will be on and the right two digits in the lower right display will be flashing. Use the **MAX ▲** key or **MIN ▼** key to adjust the flashing digits to the desired day setting (1 to 31).
8. Press **HOLD ↵** key to store the day and advance to the year setting.
9. The SETUP and YR annunciators will be on and the four digits in the lower right display will be flashing. Use the **MAX ▲** key or **MIN ▼** key to adjust the flashing digits to the desired year setting (1996 to 2059).
10. Press **HOLD ↵** key to lock in the year. This completes the basic operation setup and returns to normal operation. To set up the log or print functions proceed to the following paragraphs.

LOG SETUP

The Log sub-menu is used to set the time intervals between the logged readings. The time can be set from 1 second to 60 minutes. Once the log sub-menu is setup, logging can be toggled ON or OFF by pressing the **LOG** key. When logging is turned ON it will continue until turned OFF or 1000 logs have occurred at the entered rate. The first 1000 logs are retained.

1. Any time while in SETUP, press the **LOG** key. The SETUP and LOG annunciators will be on and the presently set time interval (default is one second) will be displayed in the lower left display. The two right digits represent seconds and will be blinking.
2. Use the **MAX ▲** key or **MIN ▼** keys to adjust the “seconds” as desired. Press **HOLD ↵** key to store setting and advance to “minutes” setting.
3. Use the **MAX ▲** key or **MIN ▼** keys to adjust the “minutes” as desired. Press **HOLD ↵** key to store setting. This completes the Logging setup.

PRINT SETUP

The Print sub-menu is used to set the time intervals between the readings being sent to the printer. The default rate is once every three seconds. The time can be set from 3 seconds to 60 minutes. Once the print sub-menu is setup, printing can be toggled ON or OFF by pressing the **PRINT** key. In addition the data rate for the infrared RS-232-C output can also be set.

1. Any time the **PRINT** key is pressed while in SETUP the SETUP and PRINT annunciators will be on and the presently set time interval (default is three seconds) will be displayed in the lower left display. The two right digits represent seconds and will be blinking.

2. Use the **MAX ▲** key and/or **MIN ▼** keys to adjust the “seconds” as desired. Press **HOLD ↵** key to store setting and advance to the “minutes” setting.
3. Use the **MAX ▲** key and/or **MIN ▼** keys to adjust the “minutes” as desired. Press **HOLD ↵** key to store setting and proceed to the data output rate.
4. Use the **MAX ▲** key and/or **MIN ▼** keys to scroll through the available data output rates of HP, 300, or 600, (Use HP for the HEWLETT-PACKARD infrared printer). Press **HOLD ↵** key to store setting and end the setup. The data output rates of 300 and 600 are for use with the optional infrared to RS-232-C adapter.

SELECTING INDIVIDUAL PARAMETERS

The thermocouple type, temperature scale, resolution, filter update rate, and real-time clock can be set individually without performing the complete setup. First press the **SETUP** key, then repeatedly press the **HOLD ↵** key until the desired function is displayed. Use the **▲ ▼** keys to change the function and press **HOLD ↵** key to store setting.

OPERATING PROCEDURES

The unit will always power up with the upper display showing T1 unless T1 is not connected. If only T2 is connected at power up, the upper display shows T2 and the lower left display indicates T1 is open. If thermocouples are not connected to T1 or T2 at power up, the upper display indicates an open T1 and the lower right display indicates an open T2.

If you are in single probe mode and the probe is moved to the other connector or to restore the dual probe mode, turn power OFF then back ON.

For optimum operation, allow about one minute for ambient temperature stabilization. If the unit has been stored at an extreme ambient condition, more time may be needed.

BASIC TEMPERATURE MEASUREMENTS

Check that the thermometer is turned on, the probe(s) connected, the desired resolution 0.1° or 1° is selected, and the desired scale °F, °C, °R, or K is selected.

Single Probe Measurements

The thermometer will automatically determine if the T1 or T2 connection is being used.

Initially the upper display will indicate the measured temperature and the annunciator will indicate which probe is making the measurement. One of the lower displays will indicate open and the annunciator will indicate which probe is open. Pressing the **T1/T2** key will cause the thermometer to go into the single probe differential mode described later.

Temperatures > 999.9° have a resolution of 1° and therefore no decimal will be present.

Dual Probe Measurements

The thermometer will automatically determine if one or two thermocouples are connected. When two thermocouples are connected, the upper main display will initially show T1 and the lower right display will show T2. Pressing the **T1/T2** key once will cause the upper display to show T2 and the lower left display to show T1. Pressing the **T1/T2** key again will cause the upper display to show T1–T2, the lower left display to show T1 and the lower right display to show T2.

MAXIMUM READINGS

The maximum reading function displays the maximum reading since power up or since the last time the clear function was used. The maximum reading function is ideal for monitoring unattended operations while continually displaying every temperature change that occurs. The maximum and minimum values are sensed and automatically stored until you are ready to observe the reading.

Do not turn the instrument OFF when a maximum or minimum temperature value may be needed; MAX/MIN memory contents will be lost. Factory Calibration will be maintained.

Single Probe Measurements

The displayed information depends on whether you are using a single probe in the dual probe mode or have changed to the single probe differential mode by pressing the **T1/T2** key.

If you are using a single probe and in the dual probe mode, momentarily press the **MAX ▲** key. The MAX annunciator turns on. If the probe is connected to T1 the maximum reading will be shown in the lower left display. If the probe is connected to T2 the maximum reading will be shown in the lower right display. If a higher maximum occurs while in the MAX mode, the higher reading will be displayed. To turn off the maximum reading, press the **MAX ▲** key again.

If you are in the single probe differential mode, momentarily press the **MAX ▲** key. The MAX and MIN annunciators turn on and both the maximum and minimum readings appear in the lower displays. The minimum will be on the left display and the maximum on the right display. If a higher maximum or lower minimum occurs while in the MAX mode, the higher reading will be displayed. To turn off the maximum reading, press the **MAX ▲** key again.

Dual Probe Measurements

Momentarily press the **MAX ▲** key. The MAX annunciator turns on, and both maximum T1 and T2 readings appear in the lower display. The T1 reading is on the left display and the T2 reading is on the right display.

Clearing a Maximum Reading

Press the **CLEAR** key then press the **MAX ▲** key. The maximum memory will be cleared.

MINIMUM READINGS

The minimum reading function displays the minimum reading since power up or since the last time the clear function was used. While continually displaying every temperature change that occurs, the maximum and minimum values are sensed and automatically stored until you are ready to observe the reading.

Do not turn the instrument OFF when a maximum or minimum temperature value may be needed; MAX/MIN memory contents will be lost.

Single Probe Measurements

The displayed information depends on whether you are using a single probe in the dual probe mode or have changed to the single probe differential mode by pressing the **T1/T2** key.

If you are using a single probe and in the dual probe mode, momentarily press the **MIN ▼** key. The MIN annunciator turns on. If the probe is connected to T1 the minimum reading will be shown in the lower left display. If the probe is connected to T2 the minimum reading will be shown in the lower right display. If a lower minimum occurs while in the MIN mode, the lower reading will be displayed. To turn off the minimum reading, press the **MIN ▼** key again.

If you are in the single probe differential mode, momentarily press the **MIN ▼** key. The MAX and MIN annunciators turn on and both the maximum and minimum readings appear in the lower displays. The minimum will be on the left display and the maximum on the right display. If a lower minimum or higher maximum occurs while in the MIN mode, the new readings will be displayed. To turn off the minimum reading, press the **MIN ▼** key again.

Dual Probe Measurements

Momentarily press the **MIN ▼** key. The MIN annunciator turns on, and both minimum T1 and T2 readings appear in the lower display. The T1 reading is on the left display and the T2 reading is on the right display. Press the **MIN ▼** key again to cancel.

Clearing a Minimum Reading

Press the **CLEAR** key then the **MIN ▼** key. The minimum memory will be cleared.

DIFFERENTIAL READINGS (T1-T2)

The differential function is used to compare two different measurements and display the difference between them. Differential measurements can be made using either one probe or two probes.

Single Probe Measurements

For single probe measurements, one measurement is stored as the reference measurement, then each following measurement is compared to the reference. The reference measurement is viewed on the lower left display, the differential value is shown in the lower right display and the main display shows the present T1 or T2 reading.



1. Place probe at first measurement point.
2. Press the **T1/T2** key to store this reference temperature. The ΔT and M= annunciators will be on and the reference temperature will be displayed on the lower left display. The ΔT indicates that the differential mode is selected and the M= indicates that a reference temperature has been stored. Any time after this that the **T1/T2** key is pressed, the M=value will be updated to the present value shown in the main display.
3. Place the probe at the second measurement point. The main display will immediately show the new measured temperature and the lower

right display will immediately show the difference between the reference temperature and the present temperature point.




Dual Probe Measurement


1. Connect the two probes to the two points of measurement. The lower left display will indicate the T1 temperature, the lower right display will indicate the T2 temperature.
2. The main display can be scrolled between displaying T1, T2 or the differential temperature T1-T2 by repeatedly pressing the **T1/T2** key. To display the differential temperature press the **T1/T2** key until the T1-T2 annunciator to the right of the main display is on.

HOLD FUNCTION




Press the **HOLD**  key to retain the reading on the display. Press **HOLD**  key again for normal operation.


Maximum Hold

Press the **MAX**  key, then press the **HOLD**  key. To turn off the HOLD function and return to normal operation, press the **HOLD**  key again.

To clear the maximum readings, press the **CLEAR** key, then the **MAX**  key.

Minimum Hold

Press the **MIN**  key, then press the **HOLD**  key. To turn off the HOLD function and return to normal operation press the **HOLD**  key again.

To clear the minimum readings, press the **CLEAR** key, then the **MIN**  key.

STORED READINGS

The store function allows you to store up to 1000 readings. Each reading is logged with a storage location number and the time of occurrence. Both T1 and T2 readings are stored. To store readings proceed as follows:

1. Momentarily press the **STORE** key. Both T1 and T2 are stored. The upper main display will momentarily show the storage location number and the STO annunciator will be on.

After three seconds the storage number will be replaced with a temperature reading but the STO annunciator remains on to indicate a temperature reading has been stored. The **STORE** key may be pressed as fast as once per second.

2. Repeat step 1 for all the points to be recorded up to a maximum of 1000. Each time the **STORE** key is pressed the new reading will be stored and the upper main display will show the storage location number for about 3 seconds. After 1000 stored readings, the next time the **STORE** key is pressed the main display will indicate FULL.

RECALL READINGS

This function allows the stored readings and the Time/Date of the readings to be recalled. RECALL shows each stored reading individually. When individual readings are recalled you can toggle between the reading and the time/date of the reading. To recall readings proceed as follows:

1. Momentarily press the **RECALL** key, the first stored reading will be displayed on the lower display and the stored sequence number will be displayed on the upper main display. The STO and RCL annunciators will be on.

2. To step through the readings, press the **MAX ▲** key or the **MIN ▼** key. Each press of the key will advance to the next reading in sequence. Hold the **MAX ▲** key or **MIN ▼** key down to continuously advance through the readings at an increasing rate. To increment or decrement by 100 proceed as follows:

To increment hold down the **MAX ▲** key then press the **MIN ▼** key.

To decrement hold down the **MIN ▼** key then press the **MAX ▲** key.

3. To toggle between the readings and the time of the readings press the **RECALL** key again.
4. To return to normal operation press any other key except **ON/OFF**, **MAX ▲**, **MIN ▼** or **RECALL**.

CLEARING STORED OR LOGGED READINGS

Press the **CLEAR** key, then the **STORE** key or **LOG** key. Regardless of which key is pressed, **STORE** or **LOG**, the stored and logged readings in memory will be cleared.

LOGGING READINGS

The Logging function is controlled by the **LOG** key. Prior to logging readings it is necessary to set up the time interval between readings (see *LOG Setup*) in **COMPLETE SETUP PROCEDURE** section. The time between readings can be set to any value from 1 second to 60 minutes. Logging is initiated by pressing the **LOG** key. Logging will continue at the programmed rate until either the **LOG** key is pressed again or 1000 logs have occurred. The display will then show "FULL".

The **STORE** function can be used during logging to insert additional measurements by pressing the **STORE** key.

PRINTING

Printing can output real-time readings or stored readings. The output is sent to the infrared (IR) printer output located at the top of the thermometer. The printer output default time period is once every 3 seconds. This time can be set to any value between 3 seconds and 60 minutes (see *PRINT Setup*) in the COMPLETE SETUP PROCEDURE section. The following sample printouts show the RS-232-C format and the HEWLETT-PACKARD infrared printer in normal and log dump print modes. Note that in log dump print mode the first line specifies the total number of readings.

HP Printer Format for Normal Printing

New heading will appear when date changes or new print is started.

---- = over range

| | | |
|----------|--------|--------|
| 05/21/96 | T1 °F | T2 °F |
| 10:33:25 | 902.3 | 904.4 |
| 10:33:30 | 902.3 | 904.4 |
| 10:33:35 | 2504 | 2504 |
| 10:33:40 | "----" | 2504 |
| 10:33:45 | 100.0 | - 17.8 |
| 10:33:50 | 100.0 | - 17.8 |
| 10:33:55 | 100.0 | OPEN |

HP Printer Format for Log Dump

New heading will appear when date changes.

---- = over range

```
TOTAL READINGS:      7
05/21/96  T1 °F  T2 °F
10:33:25  902.3  904.4
10:33:30  902.3  904.4
10:33:35   2504   2504
10:33:40  "----"   2504
10:33:45  100.0 - 17.8
10:33:50  100.0 - 17.8
10:33:55  100.0  OPEN
```

Note that printing 1000 stored sets of readings could take nearly one hour as limited by the printer.

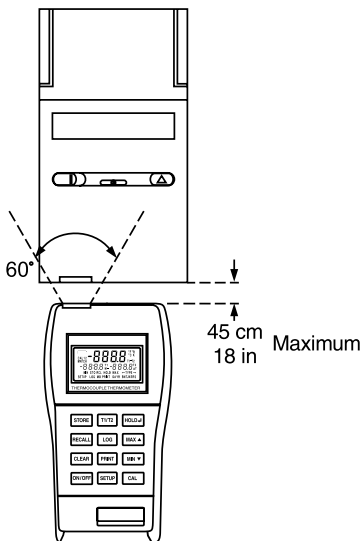
RS-232-C Format for Normal Printing and Log Dump

---- = over range

```
, , "T1 F" , "T2 F"
05/21/96,10:31:25, 164.4, 165.8
,10:31:30, 164.2, 165.1
,10:31:35,"OPEN", 165.1
,10:31:40,"OPEN", "OPEN"
,10:31:45,- 65.7, 165.1
,10:31:50, 2507, 165.1
,10:31:55, 2507, 165.2
,10:32:00,"----", 165.2
,10:32:05,"----", 165.2
```

The print function is controlled by the **PRINT** key. Proceed as follows:

1. Perform the PRINT Setup procedure to set the desired print rate.
2. Check that the IR printer input is properly aligned with the infrared output at the top of the thermometer.



Printer output will occur in real-time when the thermometer is operating in the normal mode. When the thermometer is in the RECALL mode, printing of the stored information will occur.

3. Press the **PRINT** key to start printing. Printing will continue at the programmed print rate until the **PRINT** key is pressed again, or if stored data is being printed, all data has been transferred to the printer. When printing stored data, the temperatures and times of occurrence will be output.

CALIBRATION

The calibration function allows both single point and dual point calibration of the thermometer. Single point calibrates the offset only. Dual point calibrates the offset first then calibrates the slope. The thermometer can be calibrated at any temperature. When two probes are used, a match calibration matches the T1 and T2 offsets.

It is not necessary to perform a field calibration to obtain specified accuracies. Use the field calibration feature to improve thermometer/probe accuracy or to compensate for thermocouple probe calibration drift.

The thermometer has a memory retention capability to hold calibration values even while power is off or the battery is removed.

When you restart, there is no need to recalibrate. Each of the eight thermocouple types may be individually calibrated and stored.

NOTE

The temperature at which water boils ($100^{\circ}\text{C}/212^{\circ}\text{F}$) is at sea level and standard atmospheric pressure using distilled water. Changes in altitude and barometric pressure will cause the boiling temperature to change.

As a rule of thumb, the boiling temperature of water will decrease 1°C (1.8°F) for every 1000 feet above sea level. For example, at an elevation of 5300 feet (1600 meters), water will boil at approximately 94.7°C (202.5°F).

Other liquids may also be used as calibration standards. Consult a chemical handbook for their freezing (melting) point and boiling point properties.

When calibrating at freezing (0°C or 32°F) it is recommended to use crushed ice made of distilled water in a dewar flask. Add crushed ice to top of flask. Top off flask with distilled water. Continue to add crushed ice to maintain tightly packed crushed ice/water in flask.

CALIBRATION PROCEDURES

Calibration Procedure (One Probe Detected)

This calibration function provides for both an offset and slope field calibration of either T1 or T2. If only one probe is detected, the procedure applies to that probe, and the main display will indicate T1 or T2 as applicable. For proper calibration the following conditions must be observed:

- The slope point must be a higher temperature than the offset point.
- The difference must be at least 20°C.
- Use two points based on the expected high and low temperatures. Temperatures measured outside of these limits may no longer meet specifications.

Proceed as follows to calibrate the probes.

1. Place the probe at the lower known reference temperature.
2. **Offset Calibration:** Momentarily press the **CAL** key to enter the calibration mode, the CAL annunciator will flash. The temperature is displayed on the main display and Lo is displayed on the lower left display. "Lo" signifies that this is the offset point.

3. Allow the reading to stabilize. If the displayed temperature is higher or lower than the reference temperature, use the **MAX ▲** key to increase the displayed reading or the **MIN ▼** key to decrease the displayed reading until the reference temperature is displayed. **The MIN ▼ or MAX ▲ must be pressed at least once.** The CAL annunciator should be blinking during this procedure.
4. Press the **HOLD ↵** key to lock the offset calibration in and advance to the slope calibration. To return to normal operation press any key except **CAL** or **HOLD ↵**.
5. **Slope Calibration:** Place the probe at the higher reference temperature.
6. Allow the reading to stabilize. If the displayed temperature is higher or lower than the reference temperature, use the **MAX ▲** key to increase the displayed reading or the **MIN ▼** key to decrease the displayed reading until the reference temperature is displayed. **The MIN ▼ or MAX ▲ key must be pressed at least once.** The CAL annunciator should be blinking during this procedure.
7. Press the **HOLD ↵** key to lock the calibration in.

Calibration Procedure (Two Probes Detected)

This calibration function provides for both an offset and slope field calibration of either or both T1 and T2. For proper calibration the following conditions must be observed:

- The slope point must be a higher temperature than the offset point.
- The difference must be at least 20°C.
- Use two points based on the expected high and low temperatures. Temperatures measured outside of these limits may no longer meet accuracy specifications.



Proceed as follows to calibrate the probes.

1. Place the probe at the lower known reference temperature.
2. **Offset Calibration:** Momentarily press the **CAL** key to enter the calibration mode, the CAL annunciator will flash. The temperature is displayed on the main display and Lo is displayed on the lower left display. “Lo” signifies that this is the offset point.
3. Allow the reading to stabilize. If the displayed temperature is higher or lower than the reference temperature, use the **MAX ▲** key to increase the displayed reading or the **MIN ▼** key to decrease the displayed reading until the reference temperature is displayed. **The MIN ▼ or MAX ▲ key must be pressed at least once.** The CAL annunciator should be blinking during this procedure.
4. Press the **HOLD ◀** key to lock the T1 calibration in and advance to T2 offset calibration, or press the **CAL** key to skip T1 calibration. In either case you will now be in T2 offset calibration.


5. Allow the reading to stabilize. If the displayed temperature is higher or lower than the reference temperature, use the **MAX ▲** key to increase the displayed reading or the **MIN ▼** key to decrease the displayed reading until the reference temperature is displayed. **The MIN ▼ or MAX ▲ key must be pressed at least once.** The CAL annunciator should remain blinking during this procedure.
6. Press the **HOLD ↵** key to lock the T2 offset calibration in, or press the **CAL** key to skip T2 offset calibration and proceed with T1 slope.

If T1 or T2 offset calibration is skipped, then the slope calibration for that input will also be skipped.

7. **Slope Calibration:** Place the probe(s) at the higher reference temperature.
8. The temperature is displayed on the main display and “Hi” is displayed on the lower left display.
9. Allow the reading to stabilize. If the displayed temperature is higher or lower than the reference temperature, use the **MAX ▲** key to increase the displayed reading or the **MIN ▼** key to decrease the displayed reading until the reference temperature is displayed. **The MIN ▼ or MAX ▲ key must be pressed at least once.** The CAL annunciator should remain blinking during this procedure.
10. Press the **HOLD ↵** key to lock the T1 slope calibration in and advance to T2 slope calibration, or press the **CAL** key to skip T1 slope calibration. In either case you will now be in T2 slope calibration.

11. Press the **HOLD**  key to lock the T2 slope calibration in, or press the **CAL** key to skip T2 slope calibration. In either case you will now be in T1 = T2 offset calibration. To return to normal operation press any key except **CAL** or **HOLD** .

If either T1 or T2 offset or slope were modified, CAL 1 or 2 will be lit.


12. The MATCH annunciator should be blinking. When both readings (T1 and T2) are stable, press the **HOLD**  key to lock the T1 = T2 offset calibration in. The MATCH annunciator will remain lit.

13. This completes the two-point calibration.

14. To return to normal operation press any key except **ON/OFF** key or the **CAL** key.

Matching T1 and T2 Procedure

This procedure requires both probes to be at the same temperature.

1. Place both probes at the same temperature and let stabilize.
2. Momentarily press the **CAL** key until the MATCH annunciator is blinking. When both readings (T1 and T2) are stable, press the **HOLD**  key to lock in the calibration.

Clearing an Individual Cal Point: Press **CAL** until the desired point is displayed, then press **CLEAR**.

Clearing all Cal Points: Press **CLEAR**, then **CAL**. Unit reverts to factory calibration with no offset or slope compensation.



FIELD CALIBRATION LOCKOUT AND RE-ENABLE

The calibration lockout feature, prevents any field calibration changes. The lockout remains in effect until a lockout re-enable has been performed. Use the following procedures to lockout or re-enable the field calibration operation.

Lockout Procedure


1. Turn the thermometer off.
2. Simultaneously press and hold the **CAL** and the **CLEAR** keys down and momentarily press the **ON/OFF** key. Continue to hold the **CAL** and **CLEAR** keys for at least 5 seconds.

Re-Enable Procedure

1. Turn the thermometer off.
2. Simultaneously press and hold the **HOLD**  and the **CAL** keys down and momentarily press the **ON/OFF** key. Continue to hold the **HOLD**  and **CAL** keys until the display blanks.

MAINTENANCE AND TROUBLESHOOTING

Properly used, the thermometer should maintain calibration indefinitely and not require service other than occasional cleaning of the housing and changing of the batteries.

 **WARNING** *TO PREVENT IGNITION OF A HAZARDOUS ATMOSPHERE BY ELECTROSTATIC DISCHARGE, CLEAN WITH DAMP CLOTH.*

Do not clean with abrasives or solvents. Use mild detergents, never immerse nor use excessive fluid.

BATTERIES

If there is no display when the thermometer is turned on, check condition of the two AA batteries. Also check that the battery terminals are clean and batteries are properly installed. If replacement is necessary refer to the BATTERY INSTALLATION AND REPLACEMENT section for replacement procedure.

The real-time clock will keep time for up to 1 minute with the batteries removed. To minimize the need for resetting the clock, either remove and replace one battery at a time, or connect the AC adapter while changing the batteries. All stored/logged readings are retained until cleared, even if the batteries are removed for long periods.

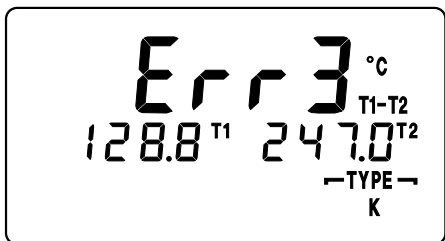
SERVICE

⚠ WARNING *SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.*

⚠ AVERTISSEMENT *LA SUBSTITUTION DE COMPOSANTS PEUT COMPROMETTRE LA SECURITE INTRINSEQUE.*

There are no internal adjustments or user replaceable parts.

If “Err” followed by the numbers 1 through 9 is displayed (see example below) return unit for service. Note that “Err” alone may be displayed during improper field calibration.



Note: Serial number label is located inside battery compartment.

TROUBLESHOOTING

The following chart lists the most probable faults. There are no internal adjustments or user-replaceable parts. If this does not solve the problem refer service to your dealer.

| FAULT | ACTION |
|----------------------------|---|
| No display when turned on. | Check condition of batteries. Check that batteries are inserted properly. Check operation using AC adapter. |
| Display shows - - - - | Out of range indication. |
| Display shows OPEN | Open thermocouple connection. |
| Display shows Err | If displayed at any time other than during field calibration, return instrument for service. |

If "Err 1" through "Err 9" remains on the display, return instrument for service.

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WARRANTY

The Manufacturer warrants this product to be free from significant deviations from published specifications. If repair or adjustment is necessary within the warranty period, the problem will be corrected at no charge if it is not due to misuse or abuse on your part as determined by the Manufacturer. Repair costs outside the warranty period, or those resulting from product misuse or abuse, may be invoiced to you.

This product comes with a warranty of 3 years.

PRODUCT RETURN

To limit charges and delays, contact the seller or Manufacturer for authorization and shipping instructions before returning the product, either within or outside of the warranty period. When returning the product, please state the reason for the return. For your protection, pack the product carefully and insure it against possible damage or loss. Any damages resulting from improper packaging are your responsibility.

TECHNICAL ASSISTANCE

If you have any questions about the use of this product, contact the Manufacturer or authorized seller.

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