



Infrared Thermometer 377BT
from **Test Products International, Inc.**



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A. INTRODUCTION

1. **Congratulations:** Thank you for purchasing TPI products. The 377BT is easy to use and built to last. It is backed by a 3 year limited warranty. Please remember to complete and return your product warranty registration card.
2. **Product Description:** The 377BT is a non-contact temperature testers with laser sighting to confirm you target. It has a built in K-type thermocouple input for optional contact temperature measurement and Bluetooth communication capability.

B. SAFETY CONSIDERATIONS

1. Never point the laser beam at someone's eyes.
2. Never look directly at the laser beam.
3. Use caution when measuring a shiny surface so the laser does not reflect back into your or someone else's eyes.
4. Do not touch the lens with any foreign object.
5. Do not expose the unit to damp environments for extended periods of time.

C. TECHNICAL DATA

Temperature Range: 0° to 1832°F (-18° to 1000°C)

Display Resolution: 0.1°F (°C) or 1°F (°C)

Accuracy @ 23°C and 0.95 emissivity: ± 2% of reading or ± 3.5°F (2°C) whichever is greater

Emissivity: 0.3 to 0.99 adjustable

Laser Sighting: Output <1mW, Wavelength 645-660nm, Class II Laser

Selectable Units of Measure: Yes, °C / °F

Distance to Target Ratio: 11.5 : 1

Display Hold: Yes, last reading held for 7 seconds after trigger release (70 second with BT active)

Response Time: 1 second

Spectral Response: 7 - 14 um

Operating Temperature: 32° to 120°F (0° to 50°C)

Storage Temperature: 14° to 140°F (-10 to 60°C)

Battery Type: 9 Volt

K-Type Range: -40° to 2192°F (-40° to 1200°C)

K-Type Accuracy: ± 0.5% of reading ±3°F (2°C)

Bluetooth Communication: Pass code (PIN number) is 1234

D. MEASUREMENT TECHNIQUES

Controls and Functions

1. **TRIGGER:** Squeeze the trigger to turn the instrument on. Release the trigger and the last reading is held on the display for approximately 7 seconds. If Bluetooth is on the 377BT will remain on for 70 seconds after the trigger is released. If the laser is activated it will only come on when the trigger is pressed.

2. **SEL:** Toggles on and off the laser, backlight and K-type thermocouple measurement functions of instrument.

Backlight and Laser control - With the trigger held down, press and hold the SEL button to turn the backlight or laser on and off. Three modes of operation are available, laser and backlight off, backlight only on, laser only on, backlight and laser on.

Infrared and K-type - With the 377BT on and the trigger pressed down or lock engaged press the SEL button to toggle between K-type thermocouple input and Infrared input. When K-type is selected a K-type probe must be inserted in the connector at the bottom front of the thermometer. If a probe is not connected the thermometer will display 'oPEn'.

3. **LOCK:** This locks the power on and is indicated by the word LOCK on the LCD. You can release the trigger and the instrument remains on. Pushing the LOCK button once more deactivates the lock feature and the unit will turn off after 7 seconds (70 seconds if Bluetooth is on).
4. **°F/°C:** This button allows you to view the reading in Fahrenheit of Celsius and is also used to activate Bluetooth.

F/C Selection - With the thermometer on and the trigger pressed or lock activated press the C/F button to toggle the display between C or F. The thermometer will power on in the unit of measurement last set when the thermometer automatically powered off.

Bluetooth Control - With the thermometer on and the trigger pressed or lock activated press and hold the C/F button until 'Bluetooth on' is displayed. This activates the Bluetooth feature. Press and hold the C/F button until 'Bluetooth oFF' is displayed and Bluetooth will be deactivated. When Bluetooth is activated 'Bluetooth' will flash in the display.

5. **ℰ:** This button allows the user to adjust the emissivity setting of the instrument and adjust the Hi and Low alarm levels.

Emissivity Control - With the thermometer on and the trigger pressed or lock activated press the ℰ button. ℰ= will flash and pressing the Lock button will raise the emissivity level and pressing the C/F button will lower the emissivity level. Once the required level is set press the ℰ button to return the thermometer to normal operation. Refer to the chart on page for the emissivity of common objects.

Alarm Control - With the thermometer on and the trigger pressed or lock activated press and hold the ℰ/ button until 'Alarm High' is flashing along with the main display. Use the Lock and C/F button to raise or lower the alarm point. Press the ℰ/ button and Alarm Low will flash along with the main display. Use the Lock and C/F buttons to raise or lower the alarm point. Press the ℰ button to return to normal operation. When an alarm point is reached the thermometer will emit a continuous beep.

6. **REC:** This button activates the record function to store minimum and maximum temperatures.

CAUTION: LASER RADIATION - DO NOT STARE INTO BEAM. OUTPUT <1Mw WAVELENGTH 645 - 660nm. CLASS II LASER PRODUCT.

MEASUREMENT TECHNIQUES continued

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Measuring Temperature:

1. Turn the thermometer on by either squeezing the trigger or squeezing the trigger and pushing the LOCK button.
2. Line up the laser with the target and hold the front of the thermometer eight inches from the target (spot size will be one inch at this distance).
3. Read the temperature on the LCD.

Turning the laser and Back Light ON and OFF:

1. Squeeze the trigger on the instrument (do not push the LOCK button) and hold it in.
2. Press and hold the SEL button until the laser  icon and / or  icon is either on the LCD or not on the LCD (when the icon is on the LCD, the laser and / or backlight is activated).

Each time the SEL button is pressed the mode will change. Available modes are:

Laser and Backlight Off = No icon in the display

Laser On =  icon in the display

Backlight On =  icon in the display

Laser and Backlight On =   icons in the display

Adjusting Emissivity

1. Squeeze the trigger on the instrument and hold it in or push the LOCK button to lock the instrument ON.
2. Push the ℰ button and the "ℰ=" will start flashing on the LCD.
3. Push the LOCK button to increase the emissivity or the C/F button to decrease the emissivity.
4. Push the ℰ button to save the setting.

Recording Minimum and Maximum Temperatures

1. Squeeze the trigger on the instrument and hold it in or push the LOCK button to lock the instrument ON.
2. Push the REC button to activate the Record function. You will see REC on the LCD.
3. Push the REC button to toggle between the recorded Max and Min temperatures during the measurement period.
4. Pushing in the REC button and holding it in for 3 seconds deactivates the REC mode (or turn the unit off).

MEASUREMENT TECHNIQUES continued

Changing from °C to °F (or °F to °C)

1. Squeeze the trigger on the instrument and hold it in or push the LOCK button to lock the instrument ON.
2. Push the °C/°F push button to select the desired measurement unit.

Measuring Temperature with K-type Thermocouple

1. Squeeze the trigger on the instrument and push the LOCK button (make sure the display says LOCK).
2. Press the SEL push button.
3. Make sure there is a K next to the word LOCK on the display.
4. Plug the temperature probe into the socket on the lower section of the thermometers handle.
5. Insert the probe tip into the air, liquid or surface to be measured.
6. Read the temperature on the LCD of the thermometer.

NOTE: You can select the mode of measurement (°F/°C) or the REC function for K-type temperature measurement.

Setting Emissivity using K-Type Contact Probe When Emissivity is not Known

1. Squeeze the trigger on the instrument and push the LOCK button (make sure the display says LOCK).
2. Press the SEL push button.
3. Make sure there is a K next to the word LOCK on the display.
4. Plug the contact temperature probe into the socket on the lower section of the thermometers handle.
5. Touch the end of the probe to the surface to be measured and record the temperature when the reading stabilizes.
6. Remove the temperature probe from the instrument.
7. Push the LOCK button and let the instrument turn off (Do not push in the trigger).
8. After the unit turns off, squeeze the trigger and point the instrument at the location the contact probe took the measurement.
9. Press the \mathcal{E} button and push the LOCK or °C/°F until the reading on the display matches the recorded reading in step 5 above.
10. Press the SEL button to save the setting.
11. Emissivity is now set for the surface being measured.

E. BLUETOOTH & ALARMS

CONNECTING BLUETOOTH:

- 1) **ACTIVATING BLUETOOTH:** With the thermometer on and the trigger pressed or lock activated press and hold the C/F button until 'Bluetooth on' is displayed. This activates the Bluetooth feature. The "Bluetooth" icon will flash in the display when this feature is active. Unless Bluetooth is deactivated the 377BT will turn on with Bluetooth active.
- 2) Using a Microsoft Windows PC search for Bluetooth devices. Add or "pair" the thermometer. It is listed as TPI377BTXXXXXXX. (X= last 8 digits of the serial number)
- 3) When prompted for a passkey or PIN code use 1234. Microsoft Windows XP will assign an incoming COM port and an outgoing COM port.
- 4) Start Microsoft Windows Hyper-terminal or similar program. Make sure the COM port setting is the same as the outgoing port number assigned in step 3.
- 5) Press the Hyper-Terminal connect button.
- 6) The 377BT will beep when the connection is made and data will begin streaming in ASCII format with one reading per second.
- 7) Data will stream as long as the LOCK function is in use or the trigger is being held. When the trigger is released and lock is disengaged data will not transmit. Approx. 70 seconds after lock is deactivated and the trigger is released "POWER OFF" will be displayed in Hyperterminal.

DEACTIVATING BLUETOOTH

Bluetooth can be deactivated to conserve battery life.

- 1) With the thermometer on and the trigger pressed or lock activated press and hold the C/F button until 'Bluetooth off' is displayed. This deactivates the Bluetooth feature.

SETTING THE ALARM

- 1) With the thermometer on and LOCK activated, press and hold the \mathcal{E} button about 3 seconds. "Alarm" and "High" will flash in the display.
- 2) Use the LOCK and C/F buttons to adjust the high alarm value.
- 3) Press the \mathcal{E} button. "Alarm" and "Low" will flash in the display.
- 4) Use the LOCK and C/F buttons to adjust the low alarm value.
- 5) Press the \mathcal{E} button to return to normal operation.
- 6) When measuring temperature if the value is higher or lower than the alarm settings, "High Alarm" or "Low Alarm" will display and a continuous beep will be heard.

F. MAINTENANCE

1. Clean the surface of the instrument and optical lens with a damp cloth.
2. Replace the 9 Volt battery when the low battery indicator (BAT) appears on the LCD.
3. The battery door is located at the rear bottom of the instrument handle. The door is marked with an arrow and slides out to expose the battery.
4. There are no other user serviceable items.

G. TROUBLE SHOOTING

Symptom

Probable Cause

Temperature seems inaccurate.

- Dirty optical lens.
- Low battery.
- Instrument held too far away from target increasing desired target area.
- Target surface has poor emissivity qualities.

Does not turn on.

- Dead or low battery.
- Broken batter connector.

Laser does not turn on.

- Low battery.
- Broken connector to Laser.

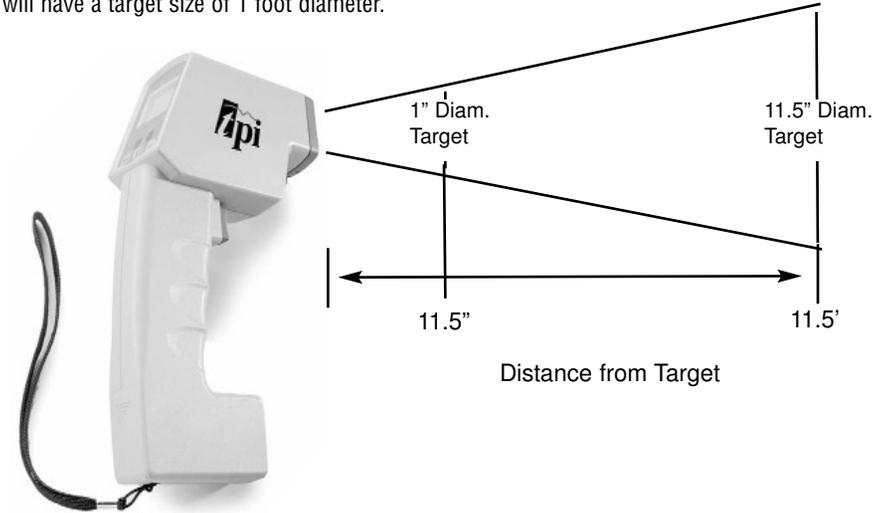
Will not communicate to PC

- Not paired properly.
- Make sure PIN code or passkey is set to 1234.
- Make sure Bluetooth is on.

H. DISTANCE TO TARGET RATIO & EMISSIVITY

DISTANCE TO TARGET

The 377BT has a distance to target ratio of 11.5 to 1. This means at a distance of 11.5 inches away the thermometer will have a target size of 1 inch diameter. At a distance of 11.5 feet the thermometer will have a target size of 1 foot diameter.



EMISSIVITY

The emissivity of a material (ϵ) is the relative ability of its surface to emit energy by radiation. It is the ratio of energy radiated by a particular material to energy radiated by a black body at the same temperature. A true black body would have an $\epsilon = 1$ while any real object would have $\epsilon < 1$.

In general, the duller and blacker a material is, the closer its emissivity is to 1. The more reflective a material is, the lower its emissivity.

Common Emissivity Values

Material	Emissivity	Material	Emissivity
Aluminum (oxidized)	0.25	Marble	0.9
Aluminum (polished)	0.1	Matte black paint	0.95
Asbestos	0.95	Nickel (pure)	0.1
Brass (oxidized)	0.6	Nickel plate (oxidized)	0.95
Brass (polished)	0.1	Paper	0.9
Carbon	0.75	Plaster	0.9
Carborundum	0.85	Plastics	0.8 to 0.95
Cardboard	0.9	Quartz	0.9
Cast Iron (polished)	0.2	Red Brick	0.75 to 0.9
Cast Iron (rusted)	0.95	Rubber (rough)	0.98
Chromium (polished)	0.1	Rubber (smooth)	0.9
Concrete	0.7	Silica	0.4
Copper (oxidized)	0.8	Silver (polished)	0.1
Copper (polished)	0.05	Stainless Steel (other)	0.2 to 0.6
Gold (polished)	0.1	Stainless Steel (polished)	0.1
Iron plate	0.7 to 0.85	Steel (ground sheet)	0.6
Lead (oxidized)	0.3	Steel (Mild)	0.3 to 0.5
Lead (pure)	0.1	Steel plate	0.9
		Timber	0.8 to 0.9
		Water	0.98
		Zinc (oxidized)	0.1

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