GENERAL®

12:1 WIDE-RANGE INFRARED THERMOMETER WITH STAR BURST LASER TARGETING

USER'S MANUAL

Star Burst Laser Targeting

IRT657

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INTRODUCTION

Thank you for purchasing General Tools & Instruments' IRT657 12:1 Wide Range Infrared Thermometer with Star Burst Laser Targeting. Please read this user's manual carefully and thoroughly before using the thermometer.

The IRT657 is a compact, non-contact (infrared) thermometer with a 12:1 distance-to-spot (D:S) ratio and a wide measurement range of -40° to 1076°F (-40° to 580°C). These two key specifications make the IRT657 ideal for various applications, a few of which are listed below.

Using this IR thermometer, the temperature of a target can easily be measured from a distance. This makes it possible to safely measure the temperature of very hot or cold surfaces, hard-to-reach objects and toxic substances.

The IRT657 is especially suitable for the following four classes of applications:

ELECTRICAL

- Checking the temperature of high-voltage equipment and transformers from a safe distance
- Detecting excessive heating of motors, fuses, wires, insulators, connectors, and switches
- Pinpointing hot spots in electrical connections and bearings
- Verifying temperatures of induction-heated parts

HVAC/R

- Monitoring food processing and storage temperatures
- Checking heating, AC and refrigeration system components
- Taking the temperature of forced hot air supply and return vents
- Testing chillers, steam traps and heat exchangers

INDUSTRIAL/MRO

- Making temperature measurements on equipment during maintenance, repair and operations (MRO)
- Performance testing of motors, turbomachinery and boilers, including identifying overheated bearings, couplings and conveyor belts
- Simplifying jobs such as laying asphalt or concrete and checking fire protection systems

AUTOMOTIVE

- Detecting overheated electrical components, connectors and wiring harnesses
- Pinpointing radiator core restrictions
- Testing temperature sensors, catalytic converters and exhaust systems
- Measuring the temperature of oil, batteries, A/C systems and tire treads

The IRT657 has a backlit LCD and is powered by a single 9V battery. Thanks to the instrument's auto power off feature, the battery may last up to 50 hours when the backlight and laser pointer are turned off.

CAUTION!

The IRT657 is a Class 3R laser product that emits less than 3mW of radiation. Avoid looking directly at the laser pointer. U.S. law prohibits pointing a laser beam at aircraft; doing so is punishable by a fine of up to $10,000 and imprisonment.

KEY FEATURES

- Measurement range of -40° to 1076°F (-40° to 580°C)

- 12:1 distance-to-spot (D:S) ratio

- Emissivity fixed at 0.95

- Measurements accurate within ±3°F (2°C) or ±2% of reading (whichever is greater) for readings above 32°F (0°C); within ±5°F (3°C) or ±2% of reading (whichever is greater) for readings below 32°F (0°C)

- °F or °C unit selectable on front panel

- Large (1.6 in. diagonal) backlit LCD

- Low (<30mA) power consumption when laser and backlight are off; extends battery life

- Meets CE, RoHS and U.S. FDA standards

CAUTION: Use of controls or adjustments or performance of procedures other than those specified herein may result in dangerous radiation exposure.

WHAT'S IN THE BOX

The IRT657 comes in a blister pack along with a soft carrying case, a 9V battery and this user's manual.

PRODUCT OVERVIEW

Figure 1 shows all of the controls, indicators and physical features of the IRT657. Figure 2 shows most of the icons and text that may appear on the display. Familiarize yourself with the locations and functions of these controls and the meanings of these display icons before moving on to the setup and operating instructions.

Fig 1. The IRT657's controls, indicators and physical features

A. Laser Pointer

B. Infrared Sensor/Lens

C. Measurement Trigger
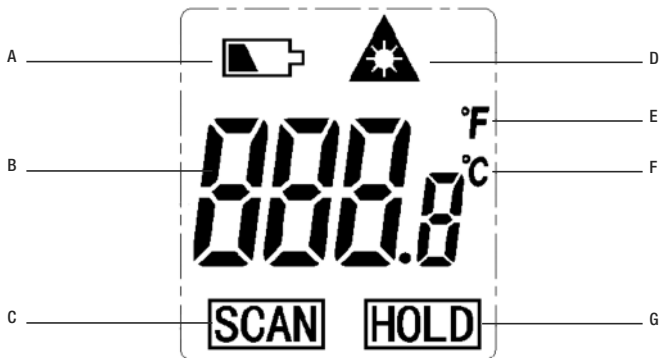
D. Battery Compartment

E. Backlit Liquid-Crystal Display

F. ☀ Button (laser on or off)

G. ☀ Button (backlight on or off)

H. **°C/°F** Button (temperature unit selection)

I. Laser Identification/ Certification/Warning/Safety Labels (on left side); see below

General Tools & Instruments
75 Seaview Drive, Secaucus, NJ 07094
Made in China Manufactured MM/YYYY

Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

⚠ CE 🚫

Laser radiation!
Avoid direct eye exposure!
Pmax<3mW, λ=655nm
Class 3R Laser Product
IEC60825-1 ed2 2007

Fig. 2. All possible display indications

A. Low battery

B. Measured temperature

C. Measurement in progress

D. Laser on

E. Fahrenheit units selected

F. Celsius units selected

G. Data being held (for 7 seconds, max, after trigger is released)

SETUP INSTRUCTIONS
INSTALLING THE BATTERY

Open the battery compartment (callout D of Fig. 1) by pulling its cover away from the grip. Then plug the 9V battery that comes with the IRT657 into the wired socket inside the compartment. The terminals of the battery and the socket mate in only one way, with the smaller male terminal plugging into the larger female terminal. Close the battery compartment by snapping it shut.

OPERATING INSTRUCTIONS

To make a quick temperature measurement, squeeze the **measurement** trigger on the front of the grip and hold it for at least one second while pointing the laser at the target. Note that the **SCAN** icon appears along with the measured temperature while you are squeezing the trigger. When you release the trigger, the **SCAN** icon disappears and is replaced by the **HOLD** icon for no more than seven seconds. After seven seconds, the IRT657's auto power off function kicks in and shuts off the thermometer to prevent battery discharge.
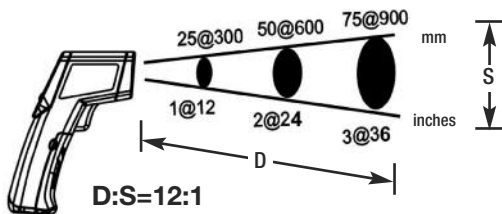
The IRT657 will not make accurate measurements if there is glass or plastic between the thermometer and the target.

To change the IRT657's default measurement unit from degrees Celsius (°C) to degrees Fahrenheit (°F), press the **°C/°F** button below the display at right to make the icon **°F** appear on the right side of the display. To return to Celsius units, press the **°C/°F** button again.

To turn off the backlight, press the ☼ button (callout G of Fig. 1) below the display at left.

To turn off the laser pointer, press the ⚠ button (callout F of Fig. 1) below the center of the display.

Fig. 3. The IRT657's thermometer's field of view

HOW TO MAKE ACCURATE IR MEASUREMENTS

The IRT657 has a distance-to-spot (D:S) ratio of 12:1. This means that the target area (spot) whose infrared radiation (temperature) is being measured increases in diameter by 1 inch for every 12 inches you move *away* from the target. Conversely, the diameter of the target area measured *decreases* by 1 inch for every 12 inches you move *closer* to the target.

All IR thermometers (IRTs), including the IRT657, take the *average* temperature of all objects within a circular *target area (spot)*. Although the distance "D" in the D:S ratio is defined as a linear value and the "S" defines the diameter of the spot (see Fig. 3), the critical parameter is the *target area*. Depending on the distance to the target (the object whose temperature you want to measure), the target area may include both the target and background objects near or behind the thermometer's field of view, which defines the target area or spot.

To explain the relationship between D:S ratio and measurement accuracy, consider how the IRT657 would be used to measure the temperature of a small AC motor suspected of overheating. The motor measures approximately 1 ft x 1 ft, so it has an area of 1 ft^2. If the IRT657 is used to make the measurement from 24 ft. away, the reading will have a large error. At this distance, the target area is 2 ft^2. Therefore, the IRT657 will measure not just the temperature of the motor, but also the temperature of the physical surroundings in its field of view, and average the two readings.

How inaccurate would the measurement be? If the motor's operating temperature is 200°F and the background temperature is 75°F, and the motor's area is half the target area at the measurement distance, the following equation gives the average temperature of the target area:

$$Tavg = (Tmotor + Tbackground) \div 2$$

Solving for Tavg, we get (200 + 75) ÷ 2 or 137.5°F., which is what the IRT657 would display. In other words, trying to measure the temperature of the motor from 24 ft. away introduced an error of (200-137.5) ÷ 200, or 31% into the measurement. In this case, the measured temperature was 31% below the motor's actual temperature because the background is cooler than the motor.

To eliminate measurement error, the IRT must be moved close enough so the motor is the only object in the target area (see Fig. 4). For a motor with an area of 1 ft^2 and using an IRT with a D:S ratio of 12:1, the optimum measurement distance would be 12 ft.

For best results, the targeted area (spot) should fall within the target's boundaries, as in Fig. 3
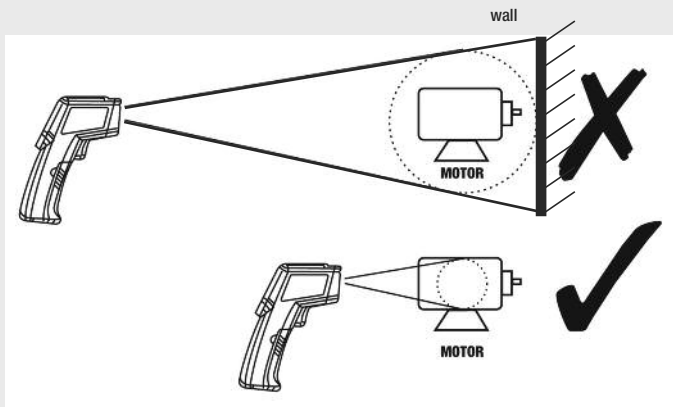
Fig. 4. Measuring a motor's temperature from the wrong (top) and right (bottom) distance

SPECIFICATIONS

Measurement Range	-40° to 1076°F (-40° to 580°C)
Distance-To-Spot (D:S) Ratio	12:1
Measurement Accuracy	±3°F (2°C) or ±2% of reading (whichever is greater) for readings above 32°F (0°C); within ±5°F (3°C) or ±2% of reading (whichever is greater) for readings below 32°F (0°C)
Measurement Repeatability	1% of reading or 1°
Response Time	250 msec for 95% response
Emissivity	Fixed at 0.95
Laser Class/Power/Wavelength	Class 3R<3mW/655nm
Functions Controllable from Front Panel	°F/°C temperature unit, backlight on/off, laser pointer on/off
Auto Power Off Trigger	Inactivity for 7 seconds
Current Consumption	<30mA, max
Battery Life	50 hours (typical), w/backlight and laser pointer off
Operating Temperature	32° to 104°F (0° to 40°C) @ <75% relative humidity (RH)
Storage Temperature	-4° to 140°F (-20° to 60°C) @<85% RH
Power Source	One 9V battery
Dimensions	6.9 x 3.6 x 1.5 in. (175.3 x 92.1 x 38.1mm)
Weight	5.93 oz. (168g)

MAINTENANCE AND TROUBLESHOOTING TIPS

After subjecting the thermometer to a sudden change in ambient temperature, you must wait 30 minutes before measurements are within specifications.

The infrared lens on the front of the unit is the IRT657's most sensitive component. To clean the lens, first use compressed air to blow off loose particles and then brush any remaining debris away with a camel's hair brush. If necessary, carefully wipe the lens with a cotton swab moistened with water. NEVER use a solvent, such as alcohol, to clean the lens.

To clean the thermometer's housing, use soap and water and a sponge or soft cloth.

When the ▭ icon appears in the upper left corner of the display, it's time to change the thermometer's 9V battery. To do so, refer to the Setup Instructions on p. 7.

If the text "OH—" or "OL" appears on the display, the target's temperature is outside the measurement range of the IRT657.

If a temperature reading is far different than the known temperature of a target, the likely reason is either:

- The thermometer is at the wrong distance from the target (see "HOW TO MAKE ACCURATE IR MEASUREMENTS" on p. 9).

- The target's emissivity is well below the IRT657's fixed setting of 0.95.

WARRANTY INFORMATION

General Tools & Instruments' (General's) IRT657 12:1 Wide-Range Infrared Thermometer with Star Burst Laser Targeting is warranted to the original purchaser to be free from defects in material and workmanship for a period of one year. Subject to certain restrictions, General will repair or replace this instrument if, after examination, the company determines it to be defective in material or workmanship. The warranty period begins on the date of purchase. You are encouraged to register your product online. General will extend your warranty an additional 60 days if you register at www.generaltools.com/Product Registry.

This warranty does not apply to damages that General determines to be from an attempted repair by non-authorized personnel or misuse, alterations, normal wear and tear, or accidental damage. The defective unit must be returned to General Tools & Instruments or to a General-authorized service center, freight prepaid and insured.

Acceptance of the exclusive repair and replacement remedies described herein is a condition of the contract for purchase of this product. In no event shall General be liable for any incidental, special, consequential or punitive damages, or for any cost, attorneys' fees, expenses, or losses alleged to be a consequence of any damage due to failure of, or defect in any product including, but not limited to, any claims for loss of profits.

Register now at www.generaltools.com/ProductRegistry to receive a 60-day extension to your warranty.

RETURN FOR REPAIR POLICY

Every effort has been made to provide you with a reliable product of superior quality. However, in the event your instrument requires repair, please contact our Customer Service to obtain an RGA (Return Goods Authorization) number before forwarding the unit via prepaid freight to the attention of our Service Center at this address:

Remember to include a copy of your proof of purchase, your return address, and your phone number and/or e-mail address.

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