GENERAL®

50:1 ULTRA-WIDE RANGE IR THERMOMETER WITH "K" PORT

USER'S MANUAL

IRT850K

Test Equipment Depot
1-800-517-8431

99 Washington Street
Melrose, MA 02176
Phone 781-665-1400
Toll Free 1-800-517-8431

▶ Visit us at www.TestEquipmentDepot.com

Please read this manual carefully and thoroughly before using this product.

TABLE OF CONTENTS

INTRODUCTION

Thank you for purchasing General Tools & Instruments' IRT850K 50:1 Ultra-Wide Range IR Thermometer with "K" Port. Please read this user's manual carefully and thoroughly before using the instrument.

The IRT850K is a specialized instrument that can measure the temperature of a very hot or cold object or surface (the target) by using an IR sensor to measure its thermal radiation from a safe distance. Dual laser beams help define the size of the target. With a distance-to-spot (D:S) ratio of 50:1; the IR sensor can measure the temperature of a target (spot) 1 ft. in diameter from 50 ft. away with a basic accuracy of ±1.8°F near room temperature and an accuracy of ±(2% of the reading or 3.6°F) elsewhere in the measurement range. The IRT850K's IR measurement range is -76° to 2732°F (-60° to 1500°C).

The IRT also has a socket for an optional "K" type thermocouple probe with a measurement range as wide as -83.2° to 2552°F (-64° to 1400°C).

The IRT850K is designed for use in heavy industrial sectors such as steel and chemical manufacturing, petroleum refining, steam generation, and power generation and transmission.

SAFETY INSTRUCTIONS

CAUTION - Performing procedures other than those specified in this manual may result in dangerous radiation exposure.

The IRT850K is a Class 2 laser product that emits less than 1 mW of radiation at a wavelength between 635 and 660nm. Avoid looking directly at the laser pointers. U.S. law prohibits pointing a laser beam at aircraft; doing so is punishable by a fine of up to $10,000 and imprisonment.

The lasers may cause discomfort if viewed directly. Your eyes' natural aversion reflex will prevent you from looking at the beam long enough to cause harm. As a precaution, keep the IRT850K out of the hands of children, especially if you have pets.

Never stare at a laser beam through binoculars or a magnifying glass.

Do not operate the IRT in the presence of flammable or explosive gases or in environments full of dust or static electricity.

Do not operate the unit near a source of a strong electromagnetic field, such as an arc welder or an induction heater.

Be careful not to burn yourself when attaching a thermocouple probe to a hot surface.

KEY FEATURES

- Extremely wide measurement range
- Adjustable emissivity
- Dual targeting lasers
- Port for optional "K" type thermocouple for making contact temperature measurements
- Releasing trigger automatically holds measurement
- Measurement Lock mode eliminates need to keep squeezing trigger to make multiple measurements
- Stores/recalls 24 data sets (measured temperature + emissivity setting)
- Min/Max/Avg/Dif displays
- Adjustable Hi and Lo temperature alarm setpoints
- Large backlit dual readout LCD
- White LED flashlight
- Auto power off
- °C/°F, lasers and flashlight on/off, and backlight on/off buttons
- Battery charge indicator
- Tripod mount
- CE approved
- 1 year limited warranty

WHAT'S IN THE PACKAGE

The IRT850K comes in a hard plastic protective case along with this user's manual.

The only optional accessories for the IRT850K available from General are "K" type thermocouples.

PRODUCT OVERVIEW

Figure 1 shows all of the controls, indicators, connectors and other physical features of the IRT850K. Figure 2 shows a typical measurement display. Familiarize yourself with the positions and functions of all controls and key components and the meaning of all display indications before moving on to the Setup Instructions and Operating Instructions.
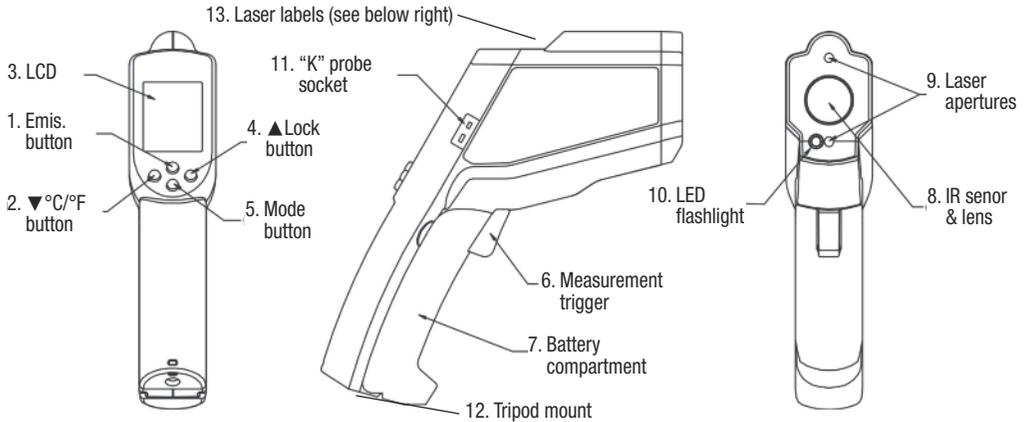

Fig. 1. The IRT850K's controls and indicators and other physical features

1. **Emis**. (Emissivity) button.

2. ▼ **°C/°F** multi-function button. Used to
   a) change measurement unit, b) turn targeting lasers and LED flashlight on and off,
   c) decrease Hi and Lo alarm setpoints and d) decrement memory location number of recalled data

3. LCD

4. ▲ **Lock** multi-function button. Used to a) enter/exit Measurement Lock mode, b) turn LCD backlight on and off, c) increase Hi and Lo alarm setpoints and d) increment memory location number of recalled data

5. **Mode** button. Selects display mode and operating mode

6. Measurement trigger   7. Battery compartment

8. IR sensor and lens   9. Laser apertures

10. LED flashlight   11. Socket for "K" type thermocouple probe with spade lugs

12. Tripod mount   13. Laser Identification/Certification/Warning/Safety labels

Fig. 2. A typical measurement screen. Note the main (upper) and secondary (lower) readouts.
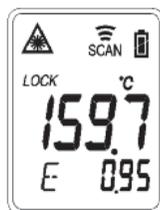
SETUP INSTRUCTIONS

INSTALL BATTERIES

The IRT850K is ready for use after you install two "AAA" batteries (not included) in the instrument's grip. To open the battery compartment (Fig. 1, Callout 7), pull the top of its hinged cover away from the grip. Then install the two batteries in the compartment, using the + and – marks inside it as a guide. Close the compartment by swinging the cover back to its original position and snapping it shut.

OPERATING INSTRUCTIONS

BASIC OPERATION IN SCAN MODE

The IRT850K's default operating mode is to scan a target object's surface and display its temperature.

To make a quick measurement, point the infrared lens on the front of the instrument (Fig. 1, Callout 8) at a target and squeeze and hold the measurement trigger (Callout 6). The temperature of the target will instantly appear on the main (upper) readout in the thermometer's default unit of degrees Fahrenheit (°F). Before releasing the trigger, note the **SCAN** icon on the top line of the display.

Now release the trigger and note that: 1) the main readout will hold the reading for 1 minute (as indicated by the **HOLD** indication at the upper left of the LCD); and 2) the IRT will briefly display the term **oFF** and then power off. This Auto Power Off (APO) function conserves battery life.

To make an accurate measurement, use the IRT850K's dual laser beams to define the diameter of the target. Unlike convergent lasers used to identify the spot distance, the IR850K's dual lasers are designed to highlight the spot diameter beyond the focal point (see figure below)—and therefore the target area—at any distance beyond the spot. This capability is not just convenient, but also critical in making accurate temperature measurements.
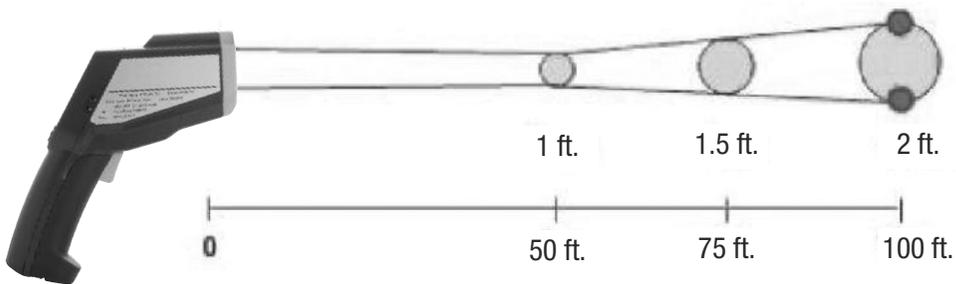

	1 ft.	1.5 ft.	2 ft.
0	50 ft.	75 ft.	100 ft.

Fig. 3. The IRT850K's field of view, created by dual diverging laser beams

All IR thermometers, including the IRT850K, take the *average* temperature of all objects within a circular target area. Depending on the distance to the target, the target area may include both the target and background objects in the thermometer's field of view. If background objects in the field of view are cooler than the target, the measured temperature will be lower than the target's

actual temperature. If background objects are hotter than the target, the measured temperature will be higher than the target's actual temperature. The IRT850K's very large D:S ratio of 50:1 enables measurement of very high- or –low temperature objects from a safe distance.

To eliminate measurement error, move the IRT850K close enough to the target so it is the only object in the field of view. (See Appendix I for an illustrative example.)

ACCOUNTING FOR EMISSIVITY

Emissivity is the ability of an object to reflect or absorb IR radiation (energy). Because the IRT850K measures the amount of infrared energy emitted by a surface, its measurements are most accurate when they take into account the characteristic emissivity of the target material.

A perfectly absorbent surface (called a black body) has an emissivity (represented by the Greek letter ε) of 1; it absorbs 100% of the thermal energy hitting it. An object with an emissivity of 0.8 absorbs 80% of IR energy and reflects 20% of it. All emissivity values fall between 0 and 1; as a rule, the shinier the surface, the lower its emissivity. The default emissivity setting of the IRT850K is 0.95.

To maximize the accuracy of IRT850K measurements, you should enter the actual emissivity of the target surface using the front-panel buttons. To do so, first **determine the emissivity of the surface** whose temperature you wish to measure from the list in Appendix II. Compensating for emissivity will particularly improve the accuracy of measurements of surfaces with emissivities nearer to zero than to the IRT850K's default setting of 0.95.

To enter an emissivity value, begin by pressing the **Emis**. button (Fig. 1, Callout 1). Then enter the emissivity of your target by using the ▼**°C/°F** and ▲**Lock** buttons to change the reading on the secondary (lower) readout from the default 0.95. The IRT850K's emissivity setting can be adjusted from 0.10 to 1.0 in steps of 0.01. Once you have reached the correct value, press the **Mode** button (Fig. 1, Callout 5) to store the setting as the new default.

If your target's material is not listed in the table in Appendix II, you can determine its emissivity by using the IRT850K to do the following:

1. Measure the temperature of the target with an optional "K" type thermocouple probe. This requires switching to operation in PRB ("K" port) mode. Instructions for entering and operating in this mode can be found on p. 7.

2. Return to operating in Scan mode. Use the **Emis**., ▼**°C/°F** and ▲**Lock** buttons to change the emissivity setting until the temperature reading in Scan mode matches the one obtained in PRB mode. When both readings are the same, the displayed emissivity value is the correct one for your object or surface at that temperature.

OTHER OPERATING MODES

The **Mode** button also serves as the gateway for entering the IRT850K's other operating modes. Pressing the button repeatedly steps through those modes in the sequence shown in Fig. 3.
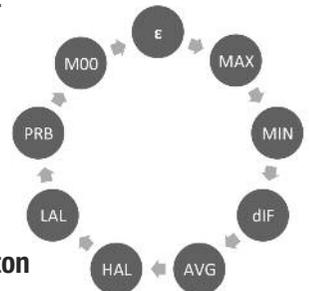

Fig. 3. The functions available through the IRT850K's Mode button

ε   Emissivity entering mode

MAX   Secondary readout displays the maximum temperature sensed during a single measurement session (In Scan mode, a measurement session begins when the trigger is squeezed and ends when the APO function powers off the instrument.)

MIN   Secondary readout displays the minimum temperature during the current measurement session

dIF   Secondary readout displays the largest temperature difference during the current session

AVG   Secondary readout displays the average temperature sensed during the current session

HAL   Secondary readout displays the high alarm setpoint. To change the setpoint, use the ▼**°C/°F** and ▲**Lock** buttons to enter a new temperature threshold and then squeeze the trigger to save the setting.

LAL   Secondary readout displays the low alarm setpoint. To change the setpoint, use the ▼**°C/°F** and ▲**Lock** buttons to enter a new temperature threshold and then squeeze the trigger to save the setting.

PRB   Secondary readout displays the temperature sensed by an optional "K" type thermocouple plugged into the socket on the right side of the grip (Fig. 1, Callout 11). **To make a contact measurement using a thermocouple**, place its bead or stem on or in the target. To view the minimum and maximum temperature sensed during a measurement session with an external probe, press and hold the ▼**°C/°F** and ▲**Lock** buttons, respectively.

M00   Memory mode. **To save a measurement**, press the **Mode** button after making the measurement. **To recall a measurement or set of measurements**, use the ▼**°C/°F** and ▲**Lock** buttons to scroll through the data sets stored in memory.

Fig 4 shows a typical IRT850K memory screen. It shows that a measurement of 1854°F on an object with an emissivity of 0.95 was made and stored in memory location 02. In addition, the "LOW" icon on the screen reveals that when the reading was stored it was below the instrument's low alarm setpoint (LAL). The IRT850K can store up to 24 pairs of temperature measurements/emissivity values.
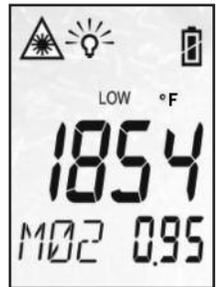

Fig. 4. A typical IRT850K memory screen

Two other functions are available whenever the IRT850K is operating in MAX, MIN, dIF or AVG mode.

    1. Pressing the ▲**Lock** button puts the instrument into LOCK mode. In this mode, the thermometer makes and displays measurements continuously for up to one hour without pulling the measurement trigger. In LOCK mode, the "wave" portion of the SCAN icon on the top line of the LCD blinks continuously and the time over which MAX, MIN, dIF and AVG readings are calculated is extended to 1 hour from the APO interval of 1 minute.

    To unlock the trigger, press the ▲**Lock** button again.

2. Pressing the ▼**°C/°F** button changes the instrument's default temperature unit from °C to °F. To return to using °C units, press the ▼**°C/°F** button again.

Another two functions are available whenever the IRT850K is operating in *any* mode:

1. To toggle the LCD backlight on and off, press the ▲**Lock** button while squeezing and holding the measurement trigger.
2. To shut off the twin lasers and LED flashlight, press the ▼**°C/°F** button while squeezing and holding the trigger. To turn on the lasers and flashlight, press the ▼**°C/°F** button again. Turning off the lasers and flashlight extends battery life.

OTHER DISPLAY INDICATIONS

Battery messages. Fig. 4 shows three of several other possible icons and alerts that could appear on the IRT850K's display. They are the ⚠ and ☼ icons (the symbols for the "Lasers and flashlight on" and "Backlight on" states discussed in the last section) and the 🔋 icon.

Whenever the 🔋 icon is on-screen, the IRT850K's batteries are still sufficiently charged to enable accurate measurements. By contrast, the 🔋 icon indicates that the batteries have discharged enough to warrant replacing them immediately, although they still have enough charge to support accurate measurements. Once the 🔋 icon appears, however, the thermometer's batteries have been fully discharged, making accurate measurements impossible.

To replace the batteries, follow the Setup Instructions on p. 5.

Alarm messages. The following four types of alarm messages could appear on the IRT850K's display.

(((HI LOW))) "Hi" or "Low" is displayed when the measured temperature is higher than the HAL setpoint or lower than the LAL setpoint.

Er2, Er3 "Er2" is displayed when the thermometer is exposed to rapid changes in ambient temperature. When this message appears, try giving the thermometer some time (30 minutes or more) to adjust to the new working temperature after it has stabilized."Er3" appears when the ambient temperature falls below 32°F (0°C) or rises above 122°F (50°C).

Er If this error message (or an "Error 5~9" message) appears, the IRT850K must be reset. To do so, wait up to 1 minute for the APO function to engage and then remove the batteries. Then wait at least one minute more, reinsert the batteries, and attempt to make a measurement in Scan mode. If the error message remains, contact General's Customer Service department for help.

Hi, Lo "Hi" or "Lo" is the message displayed if the target's temperature is outside the IRT850K's measurement range of -76° to 2732°F (-60° to 1500°C).

SPECIFICATIONS

IRT Distance to Spot (D:S) Ratio:	50:1
IRT Measurement Range:	-76° to 2732°F (-60° to 1500°C)
IRT Measurement Accuracy:	±1.8°F (1.0°C) from 59° to 95°F (15° to 35°C) @ Tamb of 77°F (25°C); ±(2% of reading or 3.6°F (2°C)), whichever is greater, from -27° to 59°F (-33° to 15°C) and from 95° to 2732°F (35° to 1500°C) @ Tamb of 73.4° ± 5.4°F (23° ±3°C)
IRT Emissivity:	Adjustable from 0.1 to 1.0 in 0.01 steps with default of 0.95
"K" Port Measurement Range:	-83° to 2552°F (-64° to 1400°C)
"K" Port Measurement Accuracy:	±(2% of reading +3.6°F/2°C) or ±5.4°F (3°C), whichever is greater, @ Tamb of 73.4° ± 10.8°F (23° ±6°C)
IRT/"K" Port Measurement Resolution:	0.1° (F or C) below 1000°; 1° at and above 1000°
Display Type, Size:	2 in. (51mm) diagonal backlit LCD with 0.5 in. (13mm) high digits on main readout
Response Time:	< 1 second
Laser Power:	<1mW (Class 2) @ wavelength of 635 to 660nm
Auto Power Off Trigger:	1 minute of front-panel inactivity in Scan (IRT) mode; 12 minutes of front-panel inactivity in PRB ("K" port) mode
Operating Temperature:	32° to 122°F (0° to 50°C)
Dimensions:	7.99 x 7.76 x 1.85 in. (203 x 197 x 47mm)
Weight (including batteries):	13.6 oz. (386g)
Power Source:	(2) "AAA" batteries (not included)
Battery Life:	180 hours (typical) of continuous use with lasers and backlight off

MAINTENANCE TIPS

The IRT850K cannot make accurate measurements if there is glass or plastic between it and the target.

Clean the lens of the IR sensor lens (Fig. 1, Callout 8) often—but never use a solvent.

Abrupt temperature changes will cause condensation and possible vapor penetration. Clean the LCD after the vapor evaporates. Blow off loose particles with clean, compressed air. Gently brush remaining debris away with a lens hair brush.

To clean the housing, use a moist cotton swab or wet sponge. Avoid excessive amounts of water and corrosive gas or liquids.

Remove the batteries if you do not expect to use the IRT for an extended period of time (months or years).

Do not drop or disassemble the instrument or immerse it in water.

WARRANTY INFORMATION

General Tools & Instruments' (General's) IRT850K 50:1 Ultra-Wide Range IR Thermometer with "K" Port 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/ProductRegistry.

This limited 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.

APPENDIX I
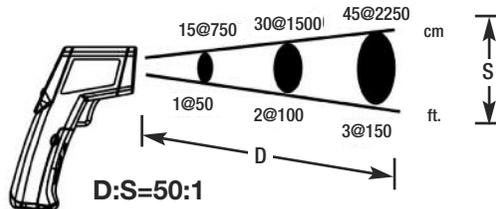
The IRT850K's field of view

HOW TO MAKE ACCURATE IR MEASUREMENTS

The IRT850K has a distance-to-spot (D:S) ratio of 50:1. That means that the target area (spot) whose infrared radiation (temperature) is being measured increases in diameter by 1 inch for every 50 inches you move away from the target. Conversely, the diameter of the target area measured decreases by 1 inch for every 50 inches you move closer to the target.

All IR thermometers (IRTs), including the IRT850K, 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 figure on previous page), 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 IRT850K 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 IRT850K is used to make the measurement from 100 ft. away, the reading will have a large error. At this distance, the target area is 2 ft^2. Therefore, the IRT850K 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 IRT850K would display. In other words, trying to measure the temperature of the motor from 100 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 figure below). For a motor with an area of 1 ft^2 and using an IRT with a D:S ratio of 50:1, the optimum measurement distance would be 50 ft.

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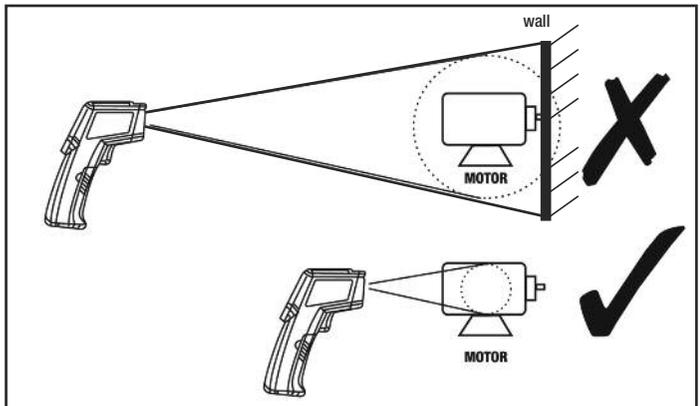
Measuring a motor's temperature from the wrong (top) and right (bottom) distance

APPENDIX II
EMISSIVITIES OF COMMON MATERIALS

Material	Emissivity	Material	Emissivity
Aluminum	0.30	Glass	0.90 to 0.95
Asphalt	0.95	Iron Oxides	0.78 to 0.82
Concrete	0.95	Paint	0.80 to 0.95
Asbestos	0.95	Plastic	0.85 to 0.95
Ceramics	0.95	Paper	0.70 to 0.94
Brass	0.50	Plaster	0.80 to 0.90
Brick	0.90	Rubber	0.95
Carbon	0.85	Wood	0.90
Sludge	0.94	Textile	0.94
Frozen Food	0.90	Lead	0.50
Hot Food	0.93	Marble	0.94
Ice	0.98	Cloth (black)	0.98
Snow	0.90	Sand	0.90
Human Skin	0.98	Water	0.93

GENERAL®

Specialty Tools & Instruments

NOTES

GENERAL®

Specialty Tools & Instruments

Test Equipment Depot
1-800-517-8431

99 Washington Street
Melrose, MA 02176
Phone 781-665-1400
Toll Free 1-800-517-8431

Visit us at www.TestEquipmentDepot.com

General Tools & Instruments   GeneralToolsNYC