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SouthwireTM

TOOLS & EQUIPMENT

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Contents Made in China

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One Southwire Drive, Carrollton, GA 30119

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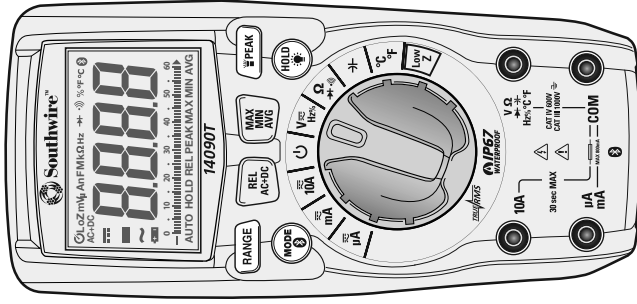
3/16 Rev. 0
14090T manual



SouthwireTM

TOOLS & EQUIPMENT

Operating Instructions
14090T True RMS Multimeter
with **MApp™ Mobile App**



Instrucciones completas de operación están disponibles en español en la página de exhibición del producto en SouthwireTools.com.

• actual manual size 4.25"W X 5.6875"H

Introduction

The Southwire 14090T wirelessly transmits data to the MApp™ mobile app via Bluetooth® technology allowing you to view, save, organize and share datalogs and take measurements from a safe distance. Visit nextgenmeters.southwiretools.com for mobile app download information. Functions include AC/DC voltage and current, resistance, continuity, capacitance, frequency, duty cycle, temperature, and diode test. True RMS readings provide accurate AC measurements and a Low Z setting eliminates false readings caused by "ghost" voltages. The 14090T also offers the added convenience of a built-in LED flashlight. This meter is fully tested and calibrated and, with proper use, will provide many years of reliable service.

⚠ WARNINGS

- Read, understand and follow Safety Rules and Operating Instructions in this manual before using this meter.
- The meter's safety features may not protect the user if not used in accordance with the manufacturer's instructions.
- Ensure that the test leads are fully seated in the input jacks and keep fingers away from the metal probe tips when taking measurements.
- Before changing functions using the selector switch, always disconnect the test leads from the circuit under test.
- Use only UL listed test leads with the proper safety category rating.
- Comply with all applicable safety codes. Use approved personal protective equipment when working near live electrical circuits - particularly with regard to arc-flash potential.
- Use caution on live circuits. Voltages above 30 V AC rms, 42 V AC peak, or 60 V DC pose a shock hazard.
- Do not use if the meter or test leads appear damaged.
- Verify operation before using meter by measuring a known live voltage.
- Do not use the meter in wet or damp environments or during electrical storms.
- Do not use the meter near explosive vapors, dust or gasses.
- Do not use the meter if it operates incorrectly. Protection may be compromised.
- Do not operate meter while Low Battery warning is on. Replace batteries immediately.
- Do not apply voltage or current that exceeds the meter's maximum rated input limits.
- When replacing the battery or fuses, be sure to secure the battery compartment door firmly to maintain the waterproof and dust proof integrity of the meter. Loose or overtightened screws, or an improperly seated o-ring may compromise the meter's water and dust ingress protection.

REGISTER YOUR PRODUCT

Register your product purchase at www.southwiretools.com. At Southwire, we are dedicated to providing you with the best customer experience. By following a few quick steps to register, you can experience quicker service, more efficient support, and receive information on our future products. Simply provide your model number, serial number, and just a few pieces of information about yourself – it is that quick and easy.

LIMITED WARRANTY AND LIMITATION OF LIABILITY ON SOUTHWIRE METERS & TESTERS

Southwire Company, LLC warrants this product to be free from defects in material and workmanship for two years from the date of purchase. This warranty does not cover uses, disposable batteries, or damage arising from an accident, neglect, misapplication, contamination, modification, improper maintenance or repair, operation outside of specifications, or abnormal handling of the product. Southwire's sole liability, and the purchaser's exclusive remedy, for any breach of this warranty is expressly limited to Southwire's repair or replacement of the product. Whether Southwire repairs or replaces the product will be a determination that Southwire makes at its sole discretion.

SOUTHWIRE MAKES NO WARRANTY THAT THE PRODUCT WILL BE MERCHANTABLE OR FIT FOR ANY PARTICULAR PURPOSE. SOUTHWIRE MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, OTHER THAN THE WARRANTY SPECIFICALLY SET FORTH HEREIN. SOUTHWIRE WILL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, INDIRECT, SPECIAL, OR PUNITIVE DAMAGES FOR ANY BREACH OF THIS WARRANTY.


This warranty is void if this product is used for rental purposes. No product reseller is authorized to extend any other warranty on Southwire's behalf relating to this product, and no such reseller warranty will be binding on Southwire. If you have a warranty claim, or if the product needs to be serviced during or after the warranty period set forth above, please contact the Customer Service Department at 855-SWTOOLS (855-798-6657). The sender is responsible for all shipping, freight, insurance, and packaging costs associated with sending a product to Southwire. Southwire will not be responsible for lost or damaged products returned pursuant to this warranty. All products returned to Southwire under this warranty should be mailed to:

Southwire Company, LLC
 Attention: Tool Warranty Return
 840 Old Bremen Road
 Carrollton, GA 30117

Input Limits

Function	Maximum Input
Voltage AC or DC	1000V AC RMS/1000V DC
Low Z	600V AC RMS/600V DC
µA, mA Current AC/DC	800mA 1000V fast acting fuse
10A Current AC or DC	10A 1000V fast acting fuse (30 seconds max. every 15 minutes)
Resistance, Continuity, Diode Test, Capacitance, Frequency, Duty Cycle	600V AC RMS/600V DC
Temperature	600V AC RMS/600V DC

General Specifications

Insulation	Class 2, Double insulation
Enclosure	Double Molded, IP67 (waterproof and dust tight with plugs or test leads inserted into input jacks)
Diode Test	Test current 1.5mA max., open circuit voltage 3V typical
Continuity Test	Audible signal if the resistance is approx. 50Ω or less
Low Battery Indication	"  " is displayed
Display	6000 count LCD display
Over Range Indication	"OL" is displayed
Polarity	Minus symbol "-" is displayed for negative polarity
Measurement Rate	3 readings per second, nominal
Auto Power Off	After approx. 15 minutes of inactivity
Input Impedance	10MΩ AC/DC Voltage
Low Z	Approx. 3kΩ input impedance
AC Response	True RMS
AC Bandwidth	50 to 1kHz
Batteries	Four "AAA" 1.5V batteries
Fuses	800mA 1000V (6.3 x 32mm) fast blow/ 10A 1000V (10 x 38mm) fast blow
Operating Environment	32°F to 104°F (0°C to 40°C) at < 70% relative humidity
Storage Environment	-4°F to 140°F (-10°C to 60°C) at < 80% relative humidity
Operating Altitude	2000 meters maximum
Dimensions/ Weight	6.7" x 3.0" x 1.9"/0.85lb (170 x 75 x 48mm/386g)
Safety	Complies with UL 61010-1 v.3 for measurement Category IV 600V and Category III 1000V, Pollution Degree 2

International Safety Symbols

	Potential danger. Indicates the user must refer to the manual for important safety information
	Indicates hazardous voltages may be present
	Equipment is protected by double or reinforced insulation
	Indicates the terminal(s) so marked must not be connected to a circuit where the voltage with respect to earth ground exceeds the maximum safety rating of the meter

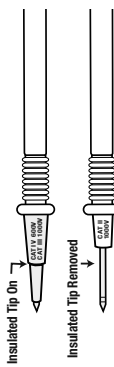
Safety Category Ratings

Category Rating	Brief Description	Typical Applications
CAT II	Single phase receptacles and connected loads	<ul style="list-style-type: none"> - Household appliances, power tools - Outlets more than 30ft (10m) from a CAT III source - Outlets more than 60ft (20m) from a CAT IV source
CAT III	Three phase circuits and single phase lighting circuits in commercial buildings	<ul style="list-style-type: none"> - Equipment in fixed installations such as 3-phase motors, switchgear and distribution panels - Lighting circuits in commercial buildings - Feeder lines in industrial plants - Any device or branch circuit that is close to a CAT III source
CAT IV	Connection point to utility power and outdoor conductors	<ul style="list-style-type: none"> - Primary distribution panels - Overhead or underground lines to detached buildings - Incoming service entrance from utility - Outdoor pumps

The measurement category (CAT) rating and voltage rating is determined by a combination of the meter, test probes, and any accessories connected to the meter and test probes. The combination rating is the LOWEST of any individual component.

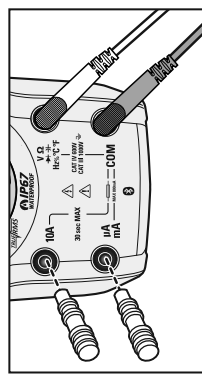
Test Leads

WARNING: Operation is limited to CAT II applications when the insulated tips are removed from one or both test probes. Refer to Input Limits section in this manual for maximum voltage ratings.



IP67 Rating

NOTE: Meter is waterproof and dust tight with supplied plugs or test leads inserted into input jacks.



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Specifications cont.

Function	Range	Resolution	Accuracy ± (% of reading + digits)
DC Current	600.0µA	0.1µA	±(1.0% +3 digits)
	6000µA	1µA	
	60.00mA	10µA	
	600.0mA	0.1mA	
	10.00A	10mA	±(1.5% +3 digits)

Overload Protection: µA, mA ranges: 800mA/1000V Fuse
10A range: 10A/1000V Fuse

Function	Range	Resolution	Accuracy ± (% of reading + digits)
Resistance	600.0Ω	0.1Ω	±(1.5% +5 digits)
	6.000kΩ	1Ω	
	60.00kΩ	10Ω	
	600.0kΩ	100Ω	
	6.000MΩ	1kΩ	
	60.00MΩ	10kΩ	±(2.0% +10 digits)

Input Protection: 600V AC RMS or 600V DC

Function	Range	Resolution	Accuracy ± (% of reading + digits)
Capacitance	60.00nF	10pF	±(5.0% +35 digits)
	600.0nF	100pF	
	6.000µF	0.001µF	
	60.00µF	0.01µF	
	600.0µF	0.1µF	
	6000µF	1µF	±(5.0% +5 digits)

Input Protection: 600V AC RMS or 600V DC
Accuracy is not stated below 6nF

Function	Range	Resolution	Accuracy ± (% of reading + digits)
Temperature	-4°F to 1400°F	0.1°F	±(1.5% +9°F)
	-20°C to 760°C	0.1°C	±(1.5% +5°C)

Input Protection: 600V AC RMS or 600V DC

Specifications cont.

Function	Range	Resolution	Accuracy ± (% of reading + digits)
AC+DC Voltage	6.000V	1mV	±(2.0% + 30 digits)
	60.00V	10mV	
	600.0V	0.1V	
	1000V	1V	

All AC + DC voltage ranges are specified from 5% to 100% of range.

Input Protection: 1000V AC RMS or 1000V DC

Input Impedance: 10M

AC voltage bandwidth: 50 to 400Hz

Function	Range	Resolution	Accuracy ± (% of reading + digits)
Frequency	9.999Hz	0.001Hz	±(1.0% +5 digits)
	99.99Hz	0.01Hz	
	999.9Hz	0.1Hz	
	9.999kHz	1Hz	

Input Protection: 600V AC RMS or 600V DC

Sensitivity: >8V RMS

Function	Range	Resolution	Accuracy ± (% of reading + digits)
Duty Cycle	20.0% to 80.0%	0.1%	±(1.2% + 2 digits)

Input Protection: 600V AC RMS or 600V DC
Pulse Width: 0.1 to 100ms
Frequency Range: 5Hz to 10kHz
Sensitivity: >8V RMS

Function	Range	Resolution	Accuracy ± (% of reading + digits)
AC Current	600.0µA	0.1µA	±(1.0% +3 digits)
	6000µA	1µA	
	60.00mA	10µA	
	600.0mA	0.1mA	
	10.00A	10mA	

All AC current ranges are specified from 5% to 100% of range.

Overload Protection: µA, mA ranges: 800mA/1000V Fuse

10A range: 10A/1000V Fuse

AC current bandwidth: 50 to 400Hz

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FCC ID: 2AENI-14090T / IC: 20144-14090T

FCC Statement

Warning: Changes or modifications to this unit not expressly approved by the Southwire Co. could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

IC Statement

This device complies with RSS247 of Industry Canada. This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Radiation Exposure Statement: This product complies with the Canadian portable RF exposure limit set forth for an uncontrolled environment and is safe for its intended operation as described in this manual.

Further RF exposure reduction can be achieved if the product is kept as far as possible from the user's body.

**Complies with
IDA Standards
DA107392**

Déclaration de conformité d'Industrie Canada

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Déclaration d'exposition aux radiations: Ce produit est conforme aux limites d'exposition pour les appareils portables RF pour le Canada établies pour un environnement non contrôlé. Le produit est sûr pour un fonctionnement comme décrit dans ce manuel. La réduction aux expositions RF peut être augmentée si l'appareil peut être conservé aussi loin que possible du corps de l'utilisateur.

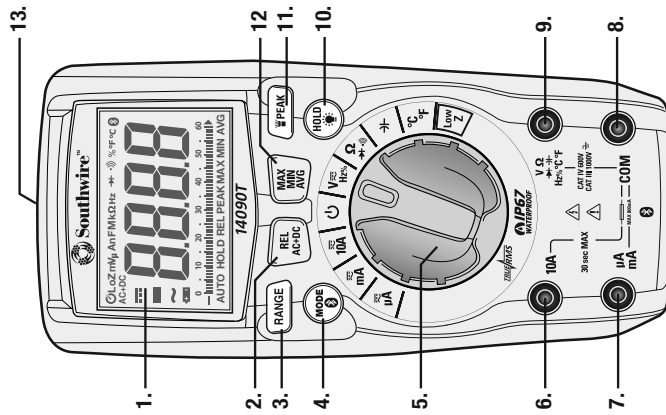
Maintenance

This Multimeter is designed to provide years of dependable service, if the following care instructions are performed:

1. KEEP THE METER DRY. If it gets wet, wipe it off.
2. USE AND STORE THE METER IN NORMAL TEMPERATURES. Temperature extremes can shorten the life of the electronic parts and distort or melt plastic parts.
3. HANDLE THE METER GENTLY AND CAREFULLY. Dropping it can damage the electronic parts or the case.
4. KEEP THE METER CLEAN. Wipe the case occasionally with a damp cloth. DO NOT use chemicals, cleaning solvents, or detergents.
5. USE ONLY FRESH BATTERIES OF THE RECOMMENDED SIZE AND TYPE. Remove old or weak batteries so they do not leak and damage the unit.
6. IF THE METER IS TO BE STORED FOR A LONG PERIOD OF TIME, the batteries should be removed to prevent damage to the unit.

Meter Description

1. LCD display
2. REL/AC + DC button
3. RANGE button
4. MODE/Bluetooth® button
5. Rotary function switch
6. 10A input jack
7. μ A, mA input jack
8. COM input jack
9. V/ Ω /+/–/–/Hz %/°C °F input jack
10. HOLD/Backlight button
11. Flashlight/PEAK button
12. MAX/MIN/Average button
13. Flashlight



Specifications

Accuracy is stated at 65°F (18°C to 83°F (18°C to 28°C), less than 70% relative humidity

Function	Range	Resolution	Accuracy \pm (% of reading + digits)
AC Voltage	6.000V	1mV	$\pm(1.0\% + 5 \text{ digits})$
	60.00V	10mV	
	600.0V	0.1V	
	1000V	1V	

All AC voltage ranges are specified from 5% to 100% of range

Input Protection: 1000V AC RMS or 1000V DC

Input Impedance: 10M Ω

AC voltage bandwidth: 50 to 1kHz

Function	Range	Resolution	Accuracy \pm (% of reading + digits)
Low Z AC Voltage	6.000V	1mV	$\pm(3.0\% + 40 \text{ digits})$
	60.00V	10mV	
	600.0V	0.1V	

All AC voltage ranges are specified from 5% to 100% of range

Input Protection: 600V AC RMS or 600V DC

Input Impedance: Approx. 3k Ω

AC voltage bandwidth: 50 to 1kHz

Function	Range	Resolution	Accuracy \pm (% of reading + digits)
DC Voltage	600.0mV	0.1mV	$\pm(0.9\% + 8 \text{ digits})$
	6.000V	1mV	
	60.00V	10mV	
	600.0V	0.1V	
	1000V	1V	$\pm(1.0\% + 3 \text{ digits})$

Input Protection: 1000V AC RMS or 1000V DC

Input Impedance: 10M Ω

Function	Range	Resolution	Accuracy \pm (% of reading + digits)
Low Z DC Voltage	600.0mV	0.1mV	$\pm(3.0\% + 40 \text{ digits})$
	6.000V	1mV	
	60.00V	10mV	
	600.0V	0.1V	

Input Protection: 600V AC RMS or 600V DC

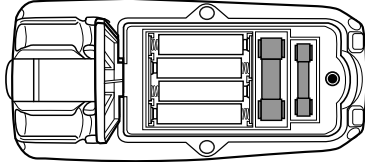
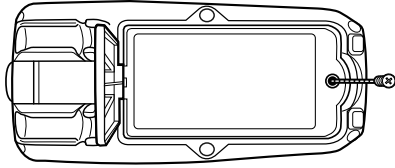
Input Impedance: Approx. 3k Ω

Operation cont.

Fuse Replacement

⚠ WARNING: To avoid electric shock, remove the test leads from the meter before removing the battery/fuse cover.

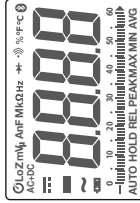
1. Lift up the tilt stand.
2. Loosen the Phillips screw(s) on the battery/fuse cover.
3. Remove the battery/fuse cover.
4. Gently remove fuse and install new fuse into the holder.
5. Always use a UL recognized fuse of the proper size and value: 800mA/1000V (6.3 x 32mm) fast blow for the μ A/mA ranges and 10A/1000V (10 x 38mm) fast blow for the 10A range.
6. Install the battery/fuse cover and tighten the screw(s).



⚠ WARNING: To avoid electric shock, do not operate meter until the battery/fuse cover is securely fastened to the meter.

⚠ WARNING: When replacing the battery or fuses, be sure to secure the battery compartment door firmly to maintain the waterproof and dust proof integrity of the meter. Loose or overtightened screws, or an improperly seated o-ring may compromise the meter's water and dust ingress protection.

Symbols Used on LCD Display



V	Volts
A	Amperes
~	Alternating current
—	Direct current
-	Minus sign
Hz	Hertz (frequency)
%	Percent (duty cycle)
Ω	Ohms
∞	Continuity
\rightarrow	Diode test
F	Farads (capacitance)
$^{\circ}$ F	Degrees Fahrenheit
$^{\circ}$ C	Degrees Celsius
n	nano (10^{-9})
μ	micro (10^{-6})
m	milli (10^{-3})
k	kilo (10^3)
M	mega (10^6)
OL	Overload
⌚	Auto Power Off
⚡	Low battery
AUTO	Autorange
HOLD	Display hold
LOZ	Low Z (impedance)
MAX/MIN/AVG	Maximum/Minimum/Average
Peak	Peak hold
REL	Relative
BT	Bluetooth®

Operation

RANGE Button

The Autorange mode automatically selects the proper range for the measurement being made and is generally the best mode for most applications. For measurement situations requiring that a range be manually selected, perform the following:

1. Momentarily press the **RANGE** button. The "AUTO" indicator will no longer be shown on the LCD display.
2. Momentarily press the **RANGE** button to step through the available ranges until the desired range is selected.
3. To exit the Manual Ranging mode, press and hold the **RANGE** button until the "AUTO" indicator reappears.

NOTE: The range button does not work on Frequency, Duty Cycle, Capacitance or Temperature.

MODE/Bluetooth® Button

Momentarily press the **MODE** button to select AC or DC, Frequency or Duty Cycle, Resistance, Continuity or Diode Test and °C or °F.

Bluetooth® technology allows readings to be displayed and stored on mobile devices. To activate Bluetooth®, press and hold the **MODE** button until the "B" symbol appears on the LCD display. The Bluetooth® function should be disabled when not connected to a mobile device in order to conserve battery power. To turn off the Bluetooth® function, press and hold the **MODE** button until the "B" symbol no longer appears on the display.

Visit nextgenmeters.southwiretools.com for mobile app download information.

REL/AC + DC button

The RELATIVE function zeros out the reading on the display and stores it as a reference. Subsequent readings will be displayed as the relative difference between the actual measurement and the stored reference value. To activate, momentarily press the **REL/AC + DC** button. The "REL" indicator will appear on the LCD display along with the relative reading. Momentarily press the **REL/HZ** button again to return to normal operation.

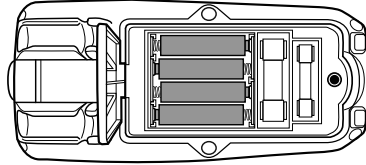
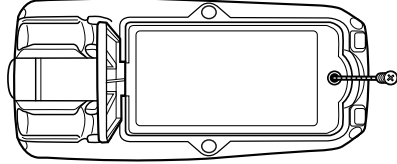
NOTE: The meter does not Autorange when the Relative mode is active. The display will read OL if the difference exceeds the range. When this occurs, exit REL and use the RANGE button to select a higher range. REL does not work on Frequency, Duty Cycle, Continuity, Diode Test or Temperature.

Operation cont.

Battery Replacement

⚠ WARNING: To avoid electric shock, remove the test leads from the meter before removing the battery/fuse cover.

1. Lift up the tilt stand.
2. Loosen the Phillips screw(s) on the battery/fuse cover.
3. Remove the battery/fuse cover.
4. Replace the batteries with four AAA batteries.
5. Observe polarity as shown inside battery compartment.
6. Install the battery/fuse cover and tighten the screw(s).



⚠ WARNING: To avoid electric shock, do not operate the meter until the battery/fuse cover is securely fastened to the meter.

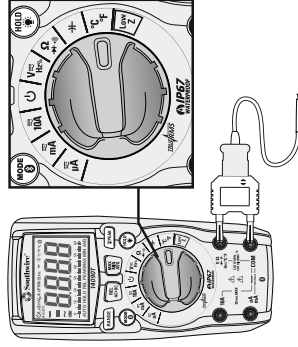
⚠ WARNING: When replacing the battery or fuses, be sure to secure the battery compartment door firmly to maintain the waterproof and dust proof integrity of the meter. Loose or overtightened screws, or an improperly seated o-ring may compromise the meter's water and dust ingress protection.

Operation cont.

Temperature Measurements

⚠ WARNINGS: Do not touch the temperature probe to live circuits.

1. Set the rotary function switch to the °F °C position.
2. Press the **MODE** button to select readings in °F or °C.
3. Connect the Temperature Probe to the Banana Plug Adapter. Note the – and + markings on the adapter. Connect the adapter to the meter, making sure the – side goes into the **COM** input jack and the + side goes into the **°C/F** input jack.
4. Touch the tip of the Temperature Probe to the object being measured. Keep the probe touching the object until the reading stabilizes (about 30 sec).
5. Read the temperature on the LCD display.



Operation cont.

REL/AC + DC button cont.

The AC + DC function measures both the AC and DC components to derive the effective RMS (AC + DC) value. The AC + DC mode is typically used when measuring voltage on unfiltered rectifier circuits. To activate, press and hold the **REL/AC + DC** button until “AC + DC” appears on the LCD display. Press and hold the **REL/AC + DC** button to exit AC + DC. The meter will return to AC voltage.

NOTE: AC + DC can only be accessed when the rotary function switch is set to voltage.

MAX/MIN/AVG Button

1. Momentarily press the **MAX/MIN/AVG** button to activate the MAX/MIN/Average mode. “MAX” will appear on the LCD display and the meter will display and hold the highest reading. The meter will update the reading when a higher “max” occurs.
2. Momentarily press the **MAX/MIN/AVG** button again to view the lowest reading. “MIN” will appear on the LCD display and the meter will display and hold the lowest reading. The meter will update the reading when a lower “min” occurs.
3. Momentarily press the **MAX/MIN/AVG** button once more to view the average reading. “AVG” will appear on the LCD display and the meter will display the running average. The meter will update the reading when the average value changes.
4. Press and hold the **MAX/MIN/AVG** button to end MAX/MIN/Average and return to normal operation.

NOTE: The meter does not Autorange when the MAX/MIN/AVG mode is active. The display will read OL if the range is exceeded. When this occurs, exit MAX/MIN/AVG and use the RANGE button to select a higher range. MAX/MIN/AVG does not work on Frequency, Duty Cycle or Capacitance.

HOLD/Backlight Button

To freeze the reading on the LCD display, momentarily press the **HOLD** button. The “HOLD” indicator will be displayed while the reading is being held. Momentarily press the **HOLD** button again to exit HOLD and return to normal operation.

To turn the backlight on, press and hold the **HOLD** button until the backlight turns on. To turn the backlight off, press and hold the **HOLD** button until the backlight turns off.

Operation

Flashlight/PEAK Button

Momentarily press and the **PEAK** button to turn the flashlight on and off.

The PEAK function is accessible when measuring AC Voltage or Current. It captures and displays the highest positive peak and the highest negative peak of the AC waveform.

1. Press and hold the **PEAK** button until "**Peak MAX**" appears on the LCD display. The meter will display the highest reading and will update the reading when a higher positive peak occurs.
2. To view highest negative peak, press the **PEAK** button for approximately one second. "**Peak MIN**" will appear on the LCD display and the meter will display and hold the highest reading. The meter will update the reading when a higher negative peak occurs.
3. Press the **PEAK** button for approximately one second to switch between Peak MAX and Peak MIN readings.
4. Press and hold the **PEAK** button to exit PEAK and return to normal operation.

NOTE: The meter does not Autorange when the PEAK mode is active. The display will read OL if the reading exceeds the range. When this occurs, exit PEAK and use the RANGE button to select a higher range.

Auto Power Off

To conserve battery power, the meter automatically turns off after approximately 15 minutes. To disable Auto Power Off, set the rotary function switch to the Off position. Press and hold the **MODE** button while setting the rotary function switch to the desired function.

Release the **MODE** button when the **OFF** symbol no longer appears on the LCD display. Auto Power Off can be restored by turning the meter off. As soon as the meter is turned back on, the **OFF** symbol will reappear indicating Auto Power Off is active.

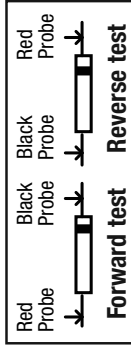
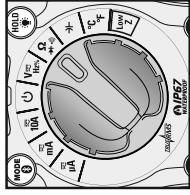
Operation cont.

Diode Test

WARNING: Never test diodes in a live circuit.

1. Set the rotary function switch to the $\Omega \rightarrow \rightarrow \rightarrow$ position.
2. Press the **MODE** button until the "**+**" symbol appears on the LCD display.
3. Insert the black test lead into the **COM** input jack and the red test lead into the Ω input jack.
4. Touch the test lead probes to the diode under test.
5. Forward voltage will indicate

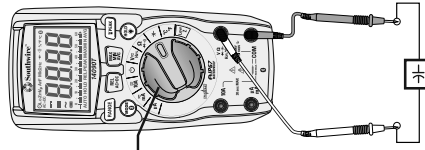
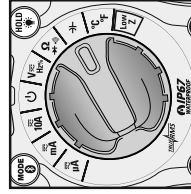
0.4 to 0.7 on the display. Reverse voltage will indicate "**OL**". Shorted devices will indicate near 0 and an open device will indicate "**OL**" in both polarities.



Capacitance Measurements

WARNING: Safely discharge capacitors before taking capacitance measurements.

1. Set the rotary function switch to the \rightarrow position
2. Insert the black test lead into the **COM** input jack and the red test lead into the \rightarrow input jack.
3. Touch the test lead probes to the capacitor under test.
4. Read the capacitance value on the LCD display. It may take up to a minute to get a stable reading on large capacitors.

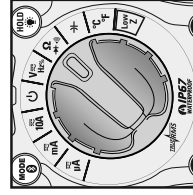
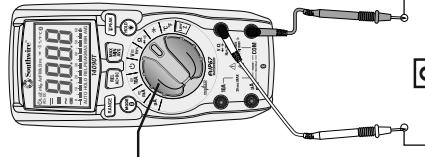


Operation cont.

Resistance Measurements

⚠ WARNING: Never test resistance on a live circuit.

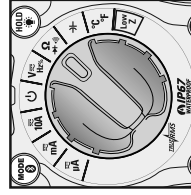
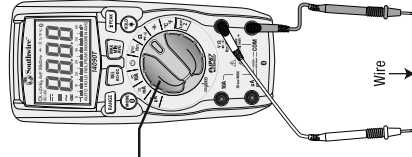
1. Set the rotary function switch to the Ω position.
2. Press the **MODE** button until the “ Ω ” symbol appears on the LCD display.
3. Insert the black test lead into the **COM** input jack and the red test lead into the Ω input jack.
4. Touch the test lead probes to the component under test. If the component is installed in a circuit, it is best to disconnect one side before testing to eliminate interference with other devices.
5. Read the resistance in on the LCD display.



Continuity

⚠ WARNING: Never test continuity on a live circuit.

1. Set the rotary function switch to the Ω position.
2. Press the **MODE** button until the “ Ω ” symbol appears on the LCD display.
3. Insert the black test lead into the **COM** input jack and the red test lead into the Ω input jack.
4. Touch the test lead probes to the device or wire under test.
5. A beeper will sound if the resistance is approximately 50Ω or less and the resistance value will be shown on the LCD display.

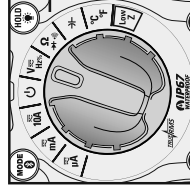
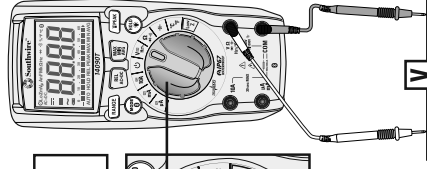


Operation cont.

AC/DC Voltage Measurements

⚠ WARNING: Observe all safety precautions when working on live voltages.

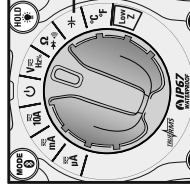
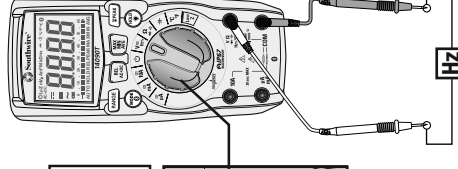
1. Set the rotary function switch to the V position.
2. To select AC or DC, press the **MODE** button until the AC “ \sim ” or DC “—” symbol appears on the LCD display.
3. Insert the black test lead into the **COM** input jack and the red test lead into the V input jack.
4. Touch the test lead probes to the circuit under test. If measuring DC voltage, touch the red test lead to the positive side of the circuit and the black test lead to the negative side of the circuit.
5. Read the voltage on the LCD display.



Frequency and % Duty Cycle Measurements

⚠ WARNING: Observe all safety precautions when working on live voltages. Do not measure frequency or duty cycle on circuits that exceed 600V.

1. Set the rotary function switch to the V position.
2. To select Frequency or % Duty Cycle, press the **MODE** button until the “HZ” or “%” symbol appears on the LCD display.
3. Insert the black test lead into the **COM** input jack and the red test lead into the V input jack.
4. Touch the test lead probes to the circuit under test.
5. Read the frequency or % duty cycle on the LCD display.



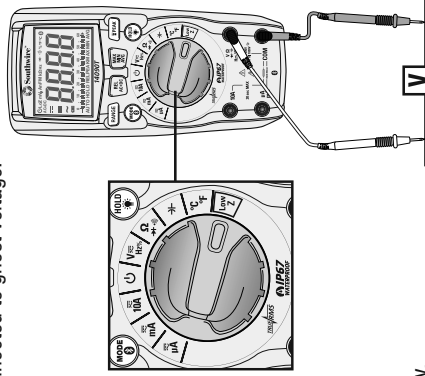
Operation cont.

Low Z AC/DC Voltage

⚠ WARNING: Observe all safety precautions when working on live voltages. Do not connect to circuits that exceed 600V when the meter is set to Low Z. Do not use Low Z when testing circuits that could be harmed by this function's low input impedance.

Low Z is used to check for "ghost" voltage. Ghost voltages are present when non-powered wires are in close proximity to powered wires. Capacitive coupling between wires make it appear that non-powered wires are connected to a real source of voltage. The Low Z setting places a load on the circuit, which greatly reduces the voltage reading when connected to ghost voltage.

1. Set the rotary function switch to the **Low Z** position.
2. Press the **MODE** button to select AC or DC voltage. The AC " \sim " or DC " --- " symbol will appear on the LCD display.
3. Insert the black test lead into the **COM** input jack and the red test lead into the **V** input jack.
4. Touch the test leads to the circuit under test. If measuring DC voltage, touch the red test lead to the positive side of the circuit and the black test lead to the negative side of the circuit.
5. Read the voltage on the LCD display.



Operation cont.

AC/DC Current Measurements

⚠ WARNING: Observe all safety precautions when working on live circuits. Do not measure current on circuits that exceed 1000V. Measurements in the 10A range should be limited to 30 seconds maximum every 15 minutes.

1. Insert the black test lead into the negative **COM** input jack.
2. For current measurements up to 10A, set the rotary function switch to the **10A** position and insert the red test lead into the **10A** input jack.
3. For current measurements up to 600mA, set the rotary function switch to the **mA** position and insert the red test lead into the **mA mA** input jack.
4. For current measurements up to 6000 μA , set the rotary function switch to the **μA** position and insert the red test lead into the **$\mu\text{A mA}$** input jack.
5. Press the **MODE** button to select AC or DC current. The AC " \sim " or DC " --- " symbol will appear on the LCD display.
6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
7. Touch the test lead probes in series with the circuit being measured. For DC current, touch the red probe to the positive side of the circuit and touch the black probe to the negative side of the circuit.
8. Apply power to the circuit.
9. Read the current on the LCD display.

