pico®
Technology

TA467
Insulation tester

User's guide

www.picoauto.com

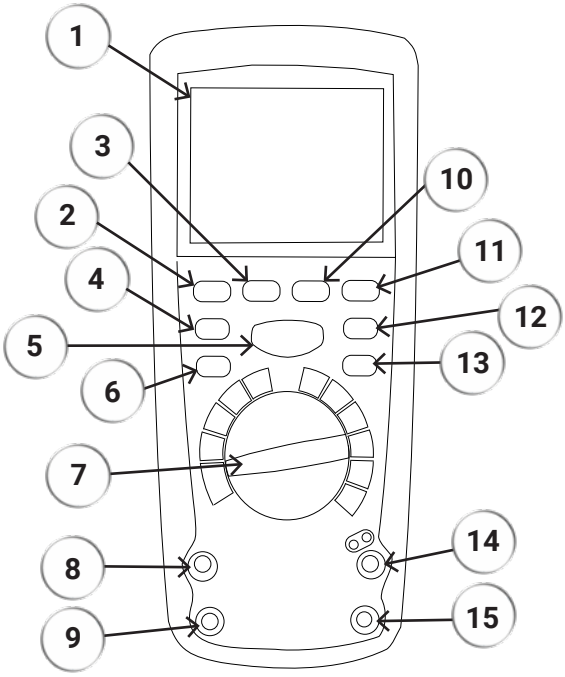
Contents

1. Description

The TA467 Insulation tester is specially designed for vehicles with on-board high voltagesand conforms to EN61010 CAT III (1000 volts) and CAT IV (600 volts). The insulation test function allows testing of the insulation of the high voltage wires found on high-voltage vehicles. It can be used as a stand-alone device or linked wirelessly with a USB interface to a PC or laptop so you can have the results graphed, saved or printed. In addition to the insulation test, it can be used to test diodes and to measure AC/DC voltage, AC/DC current, resistance, capacitance, frequency (electrical and electronic), duty cycle, continuity and thermocouple temperature. It can store and recall data and features a waterproof, rugged design for heavy duty use.

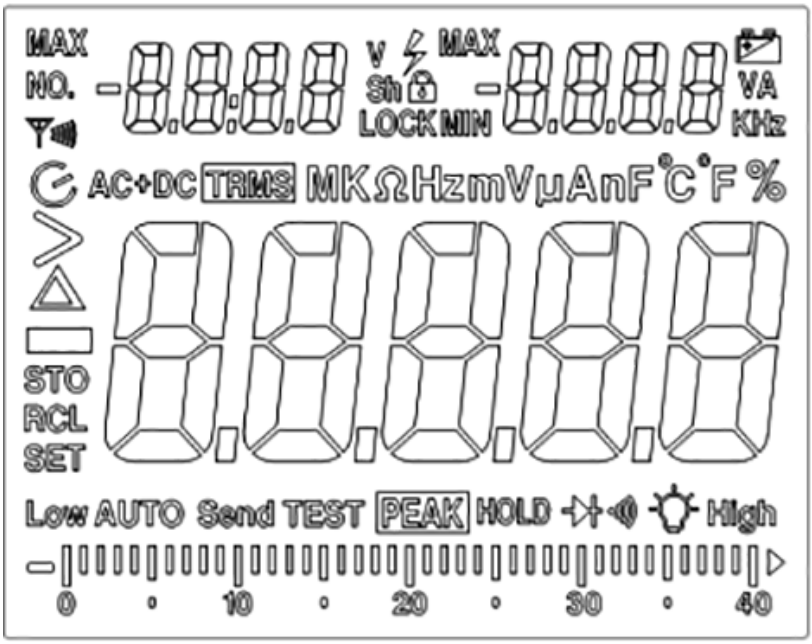
2. Appearance

Controls and jacks	
1. 40,000 count LCD display	9. mA, µA and Insulation - input jack
2. STORE, RECALL and < button	10. REL and + button
3. MAX/MIN and – button	11. HOLD, PeakHOLD and > button
4. RANGE and SETUP button	12. EXIT and AC+DC button
5. INSULATION TEST button	13. Backlight and USB button
6. MODE and LOCK button	14. V, Ω, ⏚, ⏚, ⏚ Hz%, Temp, and Insulation + input jack
7. Function switch	15. COM input jack
8. 10 A input jack	
Note: The tilt stand and battery compartment are on the rear of the unit.	



3. Symbols and annunciators

•))	Continuity	**NO.**	Serial number
▶|	Diode test	**S**	Second
	Battery status	**SET**	Set up parameter
n	Nano (10^{-9}) (capacitance)	**AC + DC**	Alternating current + direct current
µ	Micro (10^{-6}) (amps, cap)	**TRMS**	True RMS
m	Milli (10^{-3}) (volts, amps)	**STO**	Store
A	Amps	**RCL**	Recall
k	Kilo (10^{3}) (ohms)	**AUTO**	Autorange
F	Farads (capacitance)		Backlight
M	Mega (10^{6}) (ohms)	**PEAK**	Peak hold
Ω	Ohms	**V**	Volts
Hz	Hertz (frequency)	**REL**	Relative
%	Percent (duty ratio)	**AUTO**	Autoranging
AC	Alternating current	**HOLD**	Display hold
DC	Direct current	**°C**	Degrees Celsius
°F	Degrees Fahrenheit	**MIN**	Minimum
MAX	Maximum		RF icon



4. Operating instructions

4.1. Safety instructions

⚠ WARNING
Risk of electrocution. High-voltage circuits, both AC and DC, are very dangerous and should be measured with great care.

- Always turn the function switch to the **OFF** position when you finish using the insulation tester.
- If **OL** appears in the display during a measurement, the value exceeds the range you have selected and you need to change to a higher range.

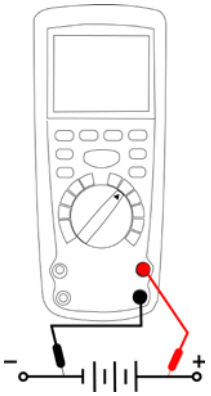
Please refer to the complete safety information for this product, in the PicoScope® 4225A and 4425A Automotive oscilloscope and accessories Safety Guide, before you use it.

4.2. Measurements and tests

4.2.1. DC voltage measurements

⚠ CAUTION
Do not measure DC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur which can damage the unit.

1. Set the function switch to the **V DC** position.
2. Insert the black test lead into the **COM** jack (negative). Insert the red test lead into the **V** jack (positive).
3. Touch the black test probe tip to the *negative* side of the circuit and touch the red test probe tip to the *positive* side of the circuit.
4. Read the voltage in the display.



4.2.2. AC voltage measurements (frequency, duty cycle)

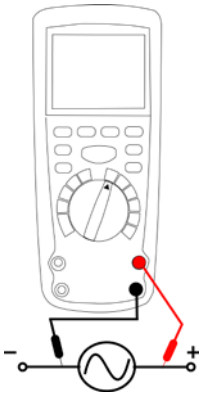
WARNING

Risk of electrocution! The probe tips may not be long enough to reach the live parts inside some 240 V outlets for appliances, because the contacts are recessed deep in the outlets. As a result, the reading may show 0 volts when the outlet actually has a voltage on it. Make sure that the probe tips are touching the metal contacts inside the outlet before you assume that there is no voltage present.

CAUTION

Do not measure AC voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur which can damage the unit.

1. Set the function switch to the **V AC** position
2. Insert the black test lead into the **COM** jack (negative). Insert the red test lead into the **V** jack (positive).
3. Touch the black test probe tip to the *neutral* side of the circuit and touch the red test probe tip to the *hot* side of the circuit.
4. Read the voltage in the main display and read the frequency in the right auxiliary display.
5. Press and hold the **MODE** button for two seconds to switch to **Hz**.
6. Read the frequency in the main display.
7. Press the **MODE** again to read the % of duty cycle in the main display.
8. Press **EXIT**
9. Press and hold the **AC + DC** button for two seconds to switch to **AC + DC**.
10. Test AC and DC TRUE RMS.

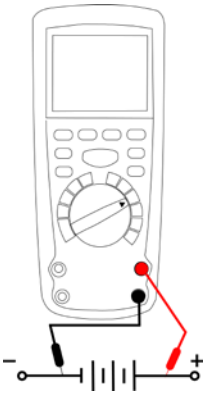


4.2.3. mV voltage measurements

CAUTION

Do not measure mV voltages if a motor on the circuit is being switched ON or OFF. Large voltage surges may occur which can damage the unit.

1. Set the function switch to the **mV** position.
2. Press the **MODE** button to indicate AC or DC OR while in AC range press and hold the **AC + DC** button for two seconds to switch to **AC + DC**.
3. Insert the black test lead into the **COM** jack (negative). Insert the red test lead into the **V** jack (positive).
4. Touch the black test probe tip to the *negative* side of the circuit and touch the red test probe tip to the *positive* side of the circuit.
5. Read the mV voltage in the display.

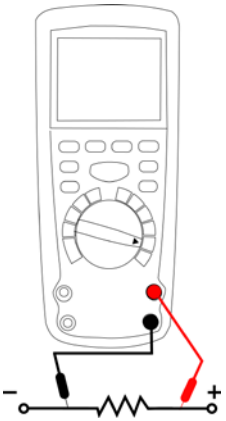


4.2.4. Resistance measurements

WARNING

To avoid electric shock, disconnect all power to the unit under test and discharge all capacitors before you take any resistance measurements.

1. Set the function switch to the **Ω** position.
2. Insert the black lead into the **COM** jack (negative). Insert the red lead into the **Ω** jack (positive).
3. Touch the test probe tips to the circuit or part you wish to check. It is best to disconnect one side of the part you are testing to avoid interference from both sides of the circuit.
4. Read the resistance in the display.



4.2.5. DC current measurements

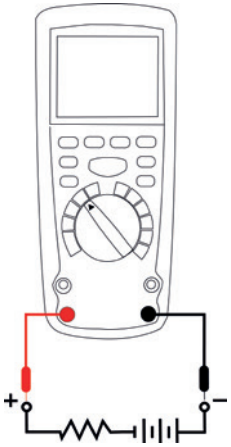
WARNING

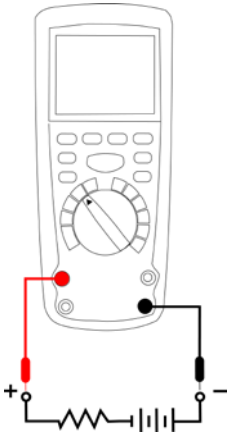
Risk of electrocution! The probe tips may not be long enough to reach the live parts inside some 240 V outlets for appliances, because the contacts are recessed deep in the outlets. As a result, the reading may show 0 volts when the outlet actually has a voltage on it. Make sure that the probe tips are touching the metal contacts inside the outlet before you assume that there is no voltage present.

CAUTION

Do not capture 20 A current measurements for more than 30 seconds. Exceeding 30 seconds may cause damage to the unit and/or to the test leads.

1. Insert the black test lead into the **COM** jack (negative).
2. Set the function switch to the required position and connect the red test lead:
   a. For current measurements up to 4000 µA DC: Set the function switch to the **µA** position and insert the red test lead into the **µA mA** jack.
   b. For current measurements up to 400 mA DC: Set the function switch to the **mA** position and insert the red test lead into the **µA mA** jack.
   c. For current measurements up to 20 A DC: Set the function switch to the **10A** position and insert the red test lead into the **10A** jack.
3. Press the **MODE** button to switch to **DC** on the display.
4. Remove power from the circuit under test.
5. Open up the circuit at the point where you want to measure the current.
6. Touch the black test probe tip to the *negative* side of the circuit and touch the red test probe tip to the *positive* side of the circuit.
7. Apply power to the circuit.
8. Read the current in the display.



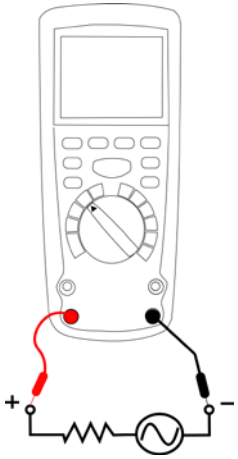


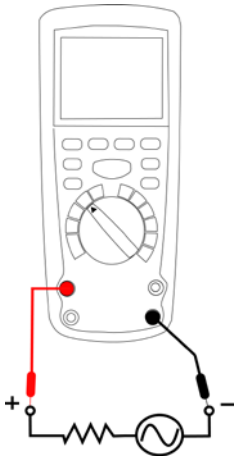
4.2.6. AC current measurements (frequency, duty cycle)

⚠ CAUTION

Do not capture 20 A current measurements for more than 30 seconds. Exceeding 30 seconds may cause damage to the unit and/or to the test leads.

1. Insert the black test lead into the **COM** jack (negative).
2. Set the function switch to the required position and connect the red test lead:
   a. For current measurements up to 4000 µA AC: Set the function switch to the **µA** position and insert the red test lead into the **µA mA** jack.
   b. For current measurements up to 400 mA AC: Set the function switch to the **mA** position and insert the red test lead into the **µA mA** jack.
   c. For current measurements up to 20 A AC: Set the function switch to the **10A** position and insert the red test lead into the **10A** jack.
3. Press the **MODE** button to switch to **AC** on the display.
4. Remove power from the circuit under test.
5. Open up the circuit at the point where you want to measure the current.
6. Touch the black test probe tip to the *neutral* side of the circuit and touch the red test probe tip to the *hot* side of the circuit.
7. Apply power to the circuit.
8. Read the current in the display. In the 10 A AC range, the right auxiliary display will show the frequency.
9. Press and hold the **MODE** button to switch to **Hz**.
10. Read the frequency in the display.
11. Press the **MODE** button again to indicate **%**.
12. Read the % duty cycle in the display.
13. Press the EXIT button to return to current measurement
14. Press the **MODE** button to select AC.
15. Press and hold the **AC + DC** button for two seconds to switch to **AC + DC**.
16. Test AC and DC TRUE RMS.



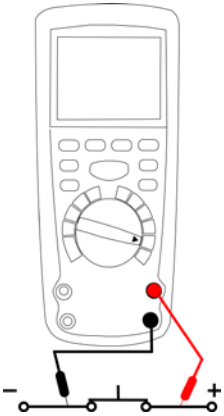


4.2.7. Continuity check

WARNING

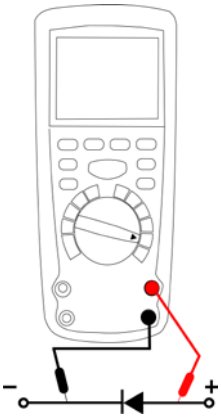
To avoid electric shock, never measure continuity on circuits or wires that have voltage on them.

1. Set the function switch to the **Ω** position.
2. Insert the black lead into the **COM** jack (negative). Insert the red lead into the **Ω** jack (positive).
3. Press the **MODE** button to switch to ·)) and **Ω** on the display.
4. Touch the test probe tips to the circuit or wire you wish to check.
5. If the resistance is less than 35 Ω, the audible signal will sound. If the circuit is open, OL will display.



4.2.8. Diode test

1. Set the function switch to the **Ω CAP** ▶| ·)) position.
2. Insert the black test lead into the **COM** jack (negative) and the red test lead into the **V** jack (positive).
3. Press the **MODE** button to switch to ▶| and **V** on the display.
4. Touch the test probes to the circuit on either side of the diode under test. Forward voltage will typically indicate 0.400 to 0.700 V. Reverse voltage will indicate **OL**. Shorted devices will indicate near 0 V and open devices will indicate **OL** in both polarities.

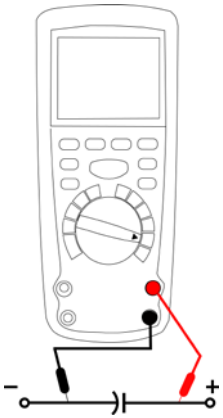


4.2.9. Capacitance measurements

WARNING

To avoid electric shock, disconnect all power to the unit under test and discharge all capacitors before you take any capacitance measurements.

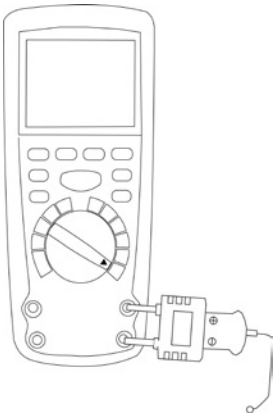
1. Set the function switch to the **CAP** position.
2. Insert the black test lead into the **COM** jack (negative) and the red test lead into the **V** jack (positive).
3. Press the **MODE** button to switch to **nF**.
4. Touch the test probes to the circuit on either side of the the capacitor you are testing.
5. Read the capacitance value in the display.



4.2.10. Temperature measurements

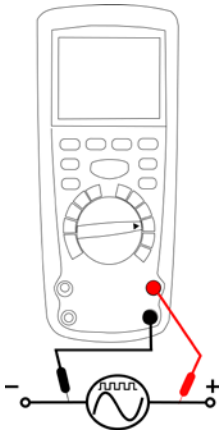
1. Set the function switch to the **Temp** position
2. Connect the temperature probe to the input jacks on the unit (make sure that you observe the correct polarity).
3. Press the **MODE** button to switch to **°F** or **°C**.
4. Touch the temperature probe tip to the part that you wish to measure the temperature of. Keep the probe touching the part under test until the reading stabilizes (about 30 seconds).
5. Read the temperature in the display.

Note: The temperature probe is fitted with a K-Type mini connector. The tool is supplied with a mini to banana adaptor to connect to the input jacks on the unit.



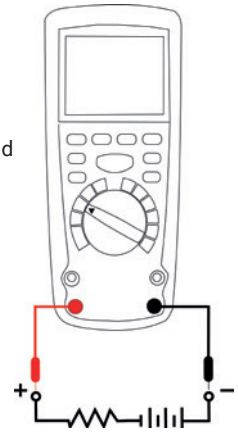
4.2.11. Frequency (duty cycle) measurements (electronic)

1. Set the function switch to the **Hz%** position.
2. Insert the black test lead into the **COM** jack (negative) and the red test lead into the **Hz%** jack (positive).
3. Touch the test probes to the circuit under test.
4. Read the frequency on the display.
5. Press the **MODE** button to switch to **%**.
6. Read the % duty cycle in the display.



4.2.12. % 4 - 20 mA measurements

1. Insert the black test lead into the **COM** jack (negative).
2. Insert the red test lead into the **µA mA** jack.
3. Set the function switch to the **4-20mA%** position.
4. Remove power from the circuit under test.
5. Open up the circuit at the point where you want to measure the current.
6. Touch the black test probe tip to the *negative* side of the circuit and touch the red test probe tip to the *positive* side of the circuit.
7. Apply power to the circuit.
8. The loop current will be displayed as a % with 0 mA=-25%, 4 mA=0%, 20 mA=100% and 24 mA=125%.



4.2.13. Insulation resistance measurements

WARNING

Risk of electric shock during testing. The Insulation tester applies a potential difference (1000 V DC maximum) across its probe tips during an insulation resistance test. If the LOCK function is active, this voltage will be present at all times.

WARNING

Insulation testing a powered-up high-voltage system may cause death and damage to equipment. Safely power down the high-voltage system according to the manufacturer's instructions and check for the absence of high-voltage prior to insulation resistance testing.

1. Set the function switch to the **Insulation** position. Note the voltages in the top left corner on the display. Press the **RANGE** button to switch between the available test voltages and select a suitable voltage range for your application.
2. Connect the black test lead to the **Insulation -** jack (negative) and connect the red test lead to the **Insulation +** jack (positive).
3. Connect the two test leads to the circuit you want to test.
4. You can now continue the test in two different ways:

   a. Without the LOCK function
      i. Push down and hold the **INSULATION TEST** button
      ii. If the insulation detects a potential difference between the probe tips of less than 30 V (AC or DC), it will:
         1. Display the lightning symbol while the test voltage is applied
         2. Display the insulation resistance (in megaohms)
         3. Display the achieved test voltage (in VDC) in the top right ocorner of the display
         4. Indicate the insulation resistance using the analog bar graph
         5. Sound a frequent buzzer warning

      Otherwise, the insulation tester will not apply a test voltage and will display both > 30 V and a flashing lightning symbol and sound a buzzer warning.

      iii. Release the **INSULATION TEST** button

      iv. The insulation resistance and achieved test voltage will continue to be displayed for approximately 20 seconds, although you can push and release the **EXIT** button within this period to clear the display and discharge any residual test voltage from the tester.

b. With the LOCK function:

i. Push down and hold the **LOCK** button for two seconds. A buzzer will sound twice to confirm it has been activated.

ii. Push and release the **INSULATION TEST** button

iii. If the insulation detects a potential difference between the probe tips of less than 30 V (AC or DC), it will:

1. Display the lightning symbol whilst the test voltage is applied.
2. Display the insulation resistance (in megaohms).
3. Display the achieved test voltage (in VDC) in the display top right corner.
4. Indicate insulation resistance using the analog bar graph.
5. Sound a frequent buzzer warning.

Otherwise, the Insulation tester will not apply a test voltage and will display both > 30 V and a flashing lightning symbol and sound a buzzer warning.

iv. Push the **EXIT** button to stop applying the test voltage, discharge any residual test voltage from the tester, and clear the insulation resistance and the achieved test voltage from the display.

5. Rotate the function switch to **OFF** to exit the test. This discharges any remaining insulation test voltage through an internal switch, which will take approximately two seconds.

Object of the insulation test	Note
Power tools and small appliances (equipment with a line cord)	The main power must be disconnected and the power switch on the tool/appliance must be in the ON position. For double insulated power tools, the negative (black) test lead must be connected to a metal part of the tool (e.g. the chuck or blade).
Motors AC	If the motor is disconnected at the motor terminals, connect one test lead to the grounded motor housing and the other lead to one of the motor leads. If the main switch disconnects the motor, and the motor also has a starter, you must find a way to hold the starter in the ON position. In measurements of motors with a starter, the measured resistance will include the resistance of the motor, wire and all other components between the motor and the main switch.
Motors DC	To test the brush assembly, field coils and armature, connect one test lead to the grounded motor housing and the other test lead to the brush on the commutator. The above also applies to DC Generators.
Cables	Disconnect the cable from the circuit. Also disconnect the opposite end to avoid errors due to leakage from other equipment. Check each conductor to ground and/or cable sheath by connecting one test lead to a ground and/or cable sheath and the other test lead to each of the conductors in turn Check the insulation resistance between conductors by connecting the test leads to conductors in pairs.

4.3. Auto-ranging/manual range selection

When the insulation tester is first turned on, it automatically goes into Autoranging. This selects the best range for the measurements being made, which is generally the best mode for most measurements. For measurement situations requiring a manual range selection, perform the following:

1. Press the **RANGE** button once. The **AUTO** display indicator will turn off.
2. Press the **RANGE** button again to go through the available ranges until you find the range you want to select.
3. To exit the manual ranging mode and return to Autoranging, press **EXIT.**

Note: Manual ranging does not apply for the temperature functions.

4.4. MAX/MIN

Press the **MAX/MIN** button to activate the MAX/MIN recording mode. The **MAX** icon will appear in the display. The left auxiliary display will hold the maximum reading and will update only when a new max occurs. The **MIN** icon will appear in the display. The right auxiliary display will hold the minimum reading and will update only when a new min occurs.
To exit **MAX/MIN** mode press **EXIT.**

4.5. Relative mode

The relative measurement feature allows you to make measurements relative to a stored reference value. A reference voltage, current, etc. can be stored and you can make measurements comparison to that value. The displayed value is the difference between the reference value and the measured value.

Note: Relative mode does not operate in the 4-20 mA function.

1. Perform the required measurement as described in the appropriate operating instructions.
2. Press the **REL** button to store the reading in the display and the **REL** indicator will appear on the display.
   a. The left auxiliary display will show the margin of the initial value and the current value. The right auxiliary display will show the initial reading. The main display will show the reading after **REL TEST**.
3. Press the **EXIT** button to exit the relative mode.

4.6. Display backlight

Press the key to turn the backlight on. The backlight will automatically turn off after the set time (see page 19 to learn how to change this setting). Press the button to exit the backlight-on mode.

4.7. Hold

The hold function freezes the reading in the display. Press the **HOLD** key to activate or to exit the **HOLD** function.

4.8. Peak hold

The peak hold function captures the peak AC voltage or peak AC and DC current. The unit can capture negative or positive peaks as fast as 1 millisecond in duration. Press the **PEAK** button, **PEAK** and **MAX** will display in the left auxiliary display. **MIN** will display in right auxiliary display. The unit will update the display each time a lower negative peak occurs. Press the **EXIT** button to exit the **PEAK HOLD** mode.

Note: The auto power-off feature is automatically disabled in this mode.

4.9. Data storage

STORE function:
While being in your chosen testing mode, press the **STORE** button one time to enter the **STORE** function and the setup for the recording interval time function.

The upper left corner shows **0000 S**, the recording interval time. Use the **+** and **-** buttons to select. The range is 0 to 255 seconds.

When the recording interval time is set to 0000 S, press the **STORE** button to change into manual recording. Press the **STORE** button again to record. When the recording interval time is set to 1 to 255 S, press the **STORE** button to start recording automatically from 0000. Recording time is shown in the upper left corner, data is shown in the upper right corner. Note: The time display is limited to four digits. To exit the **STORE** function, press the **EXIT** button.

For storing insulation measurements:
When the recording interval time is set to 0000 S, press the **STORE** button to change into manual recording. While you perform the insultation test press the **STORE** button to record the displayed value.

When the recording interval time is set to 1 to 255 S, press the **STORE** button to automatically start recording the displayed value at the selected interval while you perform the test. The number of stored recordings is shown in the upper left corner, data is shown in the upper right corner. Note: The time display is limited to four digits. To exit the **STORE** function, press the **EXIT** button.

4.10. Data storage recall

1. Switch on the meter.
2. Press and hold the **STORE** button for two seconds to enter into the **RECALL** function. The upper left corner will show **XXXX**, which is the serial number for the current storage. The upper right corner will show **XXXX**, which is how much of the storage that is currently in use.
3. Use the **+** and **-** buttons to select the required serial number **XXXX** in the upper left corner and record the data in the upper right corner.
4. To exit the **RECALL** function, press the **EXIT** button.

4.11. Clear all data

1. From the **OFF** position, press and hold the **RANGE** button while turning the function switch to any position.
2. Release the **RANGE** button. The memory has been cleared.

4.12. PC wireless communication

1. Install and launch the PC software.
2. Switch on the meter.
3. Press and hold the **USB** button for two seconds to enter **RF wireless transmit mode**. The **RF icon** will appear on the display.
4. When communication is established, the RF icon on the display will blink and the LED indicator on the receiver will blink.
5. The data will be displayed on the PC screen (plotted on the graph and inserted in the data list) once every second.
6. Press and hold the USB button for two seconds to exit the RF wireless transmit mode.
7. Refer to the HELP file in the software for more details.

4.13. Sending stored data to the PC

1. Launch the PC software.
2. Switch on the meter.
3. Press and hold the STORE button for two seconds to enter data RECALL function.
4. Press and hold the HOLD button for two seconds. The RF transmit icon will flash while the stored data is sent to the PC.

Note: The time stamp for the transferred data is the time it was transferred, not captured.
Note: Refer to the HELP file included in the software for in-depth software instructions.

4.14. SETUP (SET)

This function allows you to configure the meter and decide on the following settings:

The settings includes (in sequence):

a. upper limit buzzer alarm, the unit will sound the alarm ("beep") if the measured value is greater than the high limit.
b. lower limit buzzer alarm, the unit will sound the alarm ("beep") if the measured value is lower than the low limit.
c. auto power-off time
d. turn off sound
e. backlight time

Press and hold the **SETUP** button for two seconds to enter the **settings menu**. The screen will display SET on the left display, OFF on the main display and High on the right display. This is the first available setting, the upper limit buzzer alarm.

To change this setting, press the **>** button to cycle through the digit placement. Use the **+** and **-** buttons to select a value. Please note that this setting does not use decimals.

Press the **<** button to cancel the upper limit buzzer (OFF in the primary display).

Press the **SETUP** button to save this setting and move to the next setting in the menu.

Note: In the last three settings you can only use the **+** and **<** button to alter the settings.

Note: If you press the **EXIT** button to cancel while in the settings, you will exit from the menu without saving any updated settings.

4.15. AC + DC

In any of the following measuring modes, V AC, mV (AC), 10 A (AC), mA (AC), µA (AC), you can press and hold the **EXIT** button for two seconds to enter **AC + DC** testing. The procedure is the same as with AC measurement. The display will show the **AC+DC** icon. Press the **EXIT** button to exit the mode.

4.16. Low battery indication

When the  icon appears alone in the display, you need to replace the battery.

4.17. Maintenance

WARNING

To avoid electric shock, disconnect the test leads from any source of voltage before you remove the battery cover, the batteries and the rear cover.

WARNING

To avoid electric shock, do not operate your insulation tester until the rear cover and battery cover are in place and fastened securely.

This insulation tester is designed to provide years of dependable service if the following care instructions are performed.

1. Keep the unit dry. If it gets wet, dry it immediately.
2. Use and store the unit in normal temperatures. Temperature extremes can shorten the life of the electronic parts and distort or melt plastic parts.
3. Handle the unit gently and carefully. Dropping it can damage the electronic parts or the case.
4. Keep the unit 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 unit is to be stored for a long period of time, the batteries should be removed to prevent damage to it.

4.17.1. Battery installation

1. Turn the power off and disconnect the test leads from the unit.
2. Lift the stand to access the battery cover.
3. Remove the battery cover by removing four screws (requiring a Phillips head screwdriver).
4. Insert six AA batteries into the battery holder. Observe the correct polarity.
5. Put the battery cover back in place and secure with the screws.

Note: If your insulation tester does not work properly, check the fuses and batteries to make sure that they are still good and that they are properly installed.

Replacing the fuses

1. Turn the power off and disconnect the test leads from the unit.
2. Lift the stand to access the battery cover.
3. Remove the battery cover by removing four screws (requiring a Phillips head screwdriver).
4. Remove the six AA batteries.
5. Remove the rear cover by removing six screws (requiring a Phillips screwdriver) and carefully separating it from the front cover. Be aware of the supply wires, you do not want to pull them too hard. Both fuses should now be easily accessible.
6. Carefully remove the old fuses and install the new fuses.
   a. Always use a fuse of the proper size and value (0.5 A/1000 V fast blow for the 400 mA range [SIBA 70-172-40], 10 A/1000 V fast blow for the 20 A range [SIBA 50-199-06]).
7. Put the rear cover, batteries and battery cover back in place and secure with the designated screws. Make sure you do not trap the supply wires when you put the rear cover back on.

4.18. Technical specifications

Note: Accuracy specifications consist of two elements:

- (% reading) - This is the accuracy of the measurement circuit.
- (+ digits) - This is the accuracy of the analog to digital converter.

Function	Range	Resolution	Accuracy
DC voltage	400 mV	0.01 mV	± (0.06% reading + 4 digits)
	4 V	0.0001 V	
	40 V	0.001 V	
	400 V	0.01 V	
	1000 V	0.1 V	± (0.1% reading + 5 digits)
AC voltage	50 to 1000 Hz		
	400 mV	0.1 mV	± (1.0% reading + 7 digits)
	4 V	0.001 V	
	40 V	0.01 V	± (1.0% reading + 5 digits)
	400 V	0.1 V	
	1000 V	1 V	
AC + DC voltage	400 mV	0.1 mV	± (1.0% reading + 7 digits) (50/60 Hz)
	4 V	0.001 V	
	40 V	0.01 V	
	400 V	0.1 V	
	1000 V	1 V	
	All AC voltage ranges are specified from 5% of range to 100% of range.		
DC current	400 µA	0.01 µA	± (1.0% reading + 3 digits)
	4000 µA	0.1 µA	
	40 mA	0.001 mA	
	400 mA	0.01 mA	
	10 A	0.001 A	
	(20 A: 30 seconds max with reduced accuracy)		
AC current (AC+DC)	50 to 1000 Hz		
	400 µA	0.1 µA	± (1.5% reading + 7 digits)
	4000 µA	1 µA	
	40 mA	0.01 mA	
	400 mA	0.1 mA	
	10 A	0.01 A	
AC+DC current	400 µA	0.1 µA	± (1.5% reading + 7 digits)
	4000 µA	1 µA	
	40 mA	0.01 mA	
	400 mA	0.1 mA	
	10 A	0.01 A	
	(20 A: 30 seconds max with reduced accuracy)		
	All AC current ranges are specified from 5% of range to 100% of range.		

Note: Accuracy is stated at 65°F to 83°F (18°C to 28°C) and less than 75% RH.

AC accuracy depends on the purity of the sine wave. The error generally increases ±(2% reading + 2% full scale) for other waveforms with a crest factor of less than 3.0.

Function	Range	Resolution	Accuracy
Resistance	400 Ω	0.01 Ω	± (0.3% reading + 9 digits)
	4 kΩ	0.0001 kΩ	± (0.3% reading + 4 digits)
	40 kΩ	0.001 kΩ	
	400 kΩ	0.01 kΩ	
	4 MΩ	0.001 MΩ	
	40 MΩ	0.001 MΩ	± (2.0% reading + 10 digits)
Capacitance	40 nF	0.001 nF	± (3.5% reading + 40 digits)
	400 nF	0.01 nF	
	4 µF	0.0001 µF	± (3.5% reading + 10 digits)
	40 µF	0.001 µF	
	400 µF	0.01 µF	
	4000 µF	0.1 µF	± (5.0% reading + 10 digits)
	40 mF	0.001 mF	
Frequency (electronic)	40 Hz	0.001 Hz	± (0.1% reading + 1 digits)
	400 Hz	0.01 Hz	
	4 kHz	0.0001 kHz	
	40 kHz	0.001 kHz	
	400 kHz	0.01 kHz	
	4 MHz	0.0001 MHz	
	40 MHz	0.001 MHz	
	100 MHz	0.01 MHz	Not specified
	Sensitivity: 0.8 V RMS min. @ 20% to 80% duty cycle and <100 kHz; 5 V RMS min @ 20% to 80% duty cycle and >100 kHz.		
Frequency (electrical)	40.00 Hz - 10 kHz	0.01 Hz - 0.001 kHz	± (0.5% reading)
	Sensitivity: 1 V RMS		
Duty cycle	0.1 to 99.90%	0.01%	± (1.2% reading + 2 digits)
	Pulse width: 100 µs - 100 ms, Frequency: 5 Hz to 150 kHz		
Temp (type-K)	-50 to 1000 °C - 58 to 1832 °F	0.1 °C 0.1 °F	± (1.0% reading + 2.5 °C) ± (1.0% reading + 4.5 °F)
4-20 mA%	-25 to 125%	0.1 °F	± 50 digits
	0 mA = -25%, 4 mA = 0%, 20 mA = 100%, 24 mA = 125%		

Megohms table

Terminal voltage	Range	Resolution	Accuracy	Test current	Short circuit current
125 V (0% ~ +10%)	0.125 ~ 4.000 MΩ	0.001 MΩ	±(2% + 10)	1 mA @ load 125 kΩ	≤ 1 mA
	4.001 ~ 40.00 MΩ	0.01 MΩ	±(2% + 10)		
	40.01 ~ 400.0 MΩ	0.1 MΩ	±(4% + 5)		
	400.1 ~ 4000 MΩ	1 MΩ	±(5% + 5)		
250 V (0% ~ +0%)	0.250 ~ 4.000 MΩ	0.001 MΩ	±(2% + 10)	1 mA @ load 250 kΩ	≤ 1 mA
	4.001 ~ 40.00 MΩ	0.01 MΩ	±(2% + 10)		
	40.01 ~ 400.0 MΩ	0.1 MΩ	±(3% + 5)		
	400.1 ~ 4.000 MΩ	1 MΩ	±(4% + 5)		
500 V (0% ~ +10%)	0.500 ~ 4.000 MΩ	0.001 MΩ	±(2% + 10)	1 mA @ load 500 kΩ	≤ 1 mA
	4.001 ~ 40.00 MΩ	0.01 MΩ	±(2% + 10)		
	40.01 ~ 400.0 MΩ	0.1 MΩ	±(2% + 5)		
	400.1 ~ 4000 MΩ	1 MΩ	±(4% + 5)		
1000 V (0% ~ +10%)	1.000 ~ 4.000 MΩ	0.001 MΩ	±(3% + 10)	1 mA @ load 1 MΩ	≤ 1 mA
	4.001 ~ 40.00 MΩ	0.01 MΩ	±(2% + 10)		
	40.01 ~ 400.0 MΩ	0.1 MΩ	±(2% + 5)		
	400.1 ~ 4000 MΩ	1 MΩ	±(4% + 5)		

Specifications	
Storage capacity	2000 measurements
Enclosure	Double-molded, IP67 waterproof
Shock (drop test)	6.5 feet (2 meters)
Diode test	Test current of 0.9 mA maximum, open circuit voltage 2.8 V DC typical
Continuity check	Audible signal will sound if the resistance is less than 35 Ω (approximately), test current < 0.35 mA.
PEAK	Captures peaks > 1 ms
Temperature sensor	Requires type K thermocouple
Input impedance	>10 MΩ VDC and >9 MΩ V AC
AC response	True RMS
AC True RMS	The term stands for "Root-Mean-Square", which represents the method of calculation of the voltage or current value. Average responding multimeters are calibrated to read correctly only on sine waves and they will read inaccurately on non-sine wave or distorted signals. True RMS meters read accurately on either type of signal.
AC V bandwidth	50 Hz to 1000 Hz
Crest factor	≤ 3 at full scale up to 500 V, decreasing linearly to ≤ 1.5 at 1000 V.
Display	40,000 count backlit liquid crystal with bargraph
Overrange indication	"OL" is displayed
Auto power off	15 minutes (approximately) with disable feature
Polarity	Automatic (no indication for positive); minus (-) sign for negative
Measurement rate	2 times per second, nominal
Low battery indication	is displayed if the battery voltage drops below operating voltage.
Battery	6 x AA batteries
Fuses	mA, µA ranges; 0.5 A/1000 V ceramic fast
Safety	See the PicoScope® 4225A and 4425A automotive oscilloscope and accessories Safety Guide for the complete safety information.

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