

FLUKE®

1550B

MegOhmMeter

Calibration Manual

PN 2123247
March 2004

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MegOhmMeter

Introduction

⚠ ⚠ Warning

- **The information provided in this manual is for qualified personnel only.**
- **To avoid electrical shock or injury, do not perform the verification tests or calibration procedures described in this manual unless qualified to do so.**
- **Before using or servicing the MegOhmMeter, refer to Safety Information.**

The *Calibration Manual* for the 1550B MegOhmMeter (hereafter referred to as "the MegOhmMeter") provides the following information.

- Fluke Contact Information
- Precautions and Safety Information
- Performance Test Procedures
- Adjustment Procedure
- Battery Replacement Procedure
- Replaceable Parts/Accessories
- Specifications

For complete operating instructions and additional safety information, refer to the *1550B Users Manual* P/N 2102980.

Contacting Fluke

To contact Fluke for product information, operating assistance, service, or to get the location of the nearest Fluke distributor or Service Center, call:

USA: 1-888-99-FLUKE (1-888-993-5853)
 Canada: 1-800-36-FLUKE (1-800-363-5853)
 Europe: +31 402-675-200
 Japan: +81-3-3434-0181
 Singapore: +65-738-5655
 Anywhere in the world: +1-425-446-5500

Or, visit Fluke's Web site at www.fluke.com.

To register your product, visit register.fluke.com







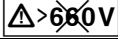





Address correspondence to:

Fluke Corporation P.O. Box 9090, Everett, WA 98206-9090 USA	Fluke Europe B.V. P.O. Box 1186, 5602 BD Eindhoven The Netherlands
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Symbols

Symbols on the MegOhmMeter and in the manual are explained in Table 1.

Table 1. Symbols

	Conforms to European Union standards.
	TUV GS
	This product complies with UL3111-1, CAN/CAS C22.2 No.1010.1 for Test and Measurement Equipment
	Risk of danger. Important information. See Manual.
	Potentially hazardous voltage
	Equipment protected by double or reinforced insulation.
	Do not use in distribution systems with voltages higher than 660 V.
	Interference is present. Displayed value might be outside of specified accuracy.
	Ramp mode indicator
	Electrical breakdown
	Volts AC
	Earth Ground

Safety Information

In this manual, a **Warning** identifies conditions and actions that pose hazard(s) to the user, a **Caution** identifies conditions and actions that may damage the MegOhmMeter or the test instruments.

⚠⚠ Warning

Before and after testing, confirm that the MegOhmMeter does not indicate the presence of a hazardous voltage. If the MegOhmMeter beeps continuously and a hazardous voltage is shown on the display, disconnect test leads and remove power from the circuit under test.

⚠⚠ Warning: Read Before Using the MegOhmMeter

To avoid possible electric shock or personal injury:

- Use the MegOhmMeter only as specified in this manual or the protection provided by the MegOhmMeter might be impaired.
- Do not disconnect the test leads before a test has been completed and the test voltage at the terminals has returned to zero. This ensures that any charged capacitance is fully discharged.
- Ensure there is no power to the circuit under test and that all circuit capacitances are fully discharged prior to testing with this instrument.
- Avoid working alone or around explosive gas, vapor or dust.
- Do not use the MegOhmMeter in a wet environment.
- Inspect the test leads for damaged insulation or exposed metal. Check test lead continuity. Replace damaged leads.
- Do not use the MegOhmMeter if it looks damaged.
- Take care when working above 30 V ac rms, 42 V ac peak and 60 V dc. Such voltages pose a shock hazard.
- When using the probes, keep fingers behind the finger guards.
- Measurements can be adversely affected by impedances of additional operating circuits connected in parallel.
- Place test leads in proper input terminals.
- Do not use the MegOhmMeter with any parts or cover removed.
- Disconnect the test leads from the circuit under test and from the MegOhmMeter before changing the fuse.
- Use only Fluke approved replacement fuses, parts, and accessories as specified in this manual.
- Do not use the MegOhmMeter if the safety shutter is impaired in any way. The safety shutter prevents access to the test terminals and charger terminals at the same time.
- There are no user replaceable parts inside the instrument.
- Use the guard terminal only as specified in the Users Manual. Do not allow other accessories or foreign objects to come into contact with the guard terminal as safety may be compromised.

Required Equipment

Equipment required to perform the procedures in this manual is listed in Table 2. If the recommended models are not available, equipment with equivalent specifications may be substituted.

⚠⚠ Warning

Repair or servicing should be performed only by qualified personnel.

⚠ Caution

Do not attempt to use the 5500A, 5520A, or other standard calibrator for insulation and continuity resistance tests. Calibrator damage will result.

Table 2. Required Equipment

Equipment	Minimum Required Characteristics	Recommended Model
HV Probe	6 kV, $\pm 1\%$ (1000:1 Divider)	Fluke 80K-6
Digital Multimeter	500 mVdc to 1V: $\pm 0.02\%$	Fluke 8508
¹Load with Guard Terminal	Resistances 200 k Ω , $\pm 1.25\%$, 500 V 500 k Ω , $\pm 1.25\%$, 500 V 1 M Ω , $\pm 1.25\%$, 1 kV 2.5 M Ω , $\pm 1.25\%$, 2.5 kV 5 M Ω , $\pm 1.25\%$, 5 kV 1 G Ω , $\pm 1.25\%$, 5 kV 100 G Ω , $\pm 5\%$, 500 V 200 G Ω , $\pm 5\%$, 1 kV 500 G Ω , $\pm 5\%$, 2.5 kV 1 T Ω , $\pm 5\%$, 5 kV	Combinations of: Welwyn F Series, Welwyn MFP2 Series And Vishay HTS-523
²Capacitors w/ Bleeder Resistors	0.1 μ F, $\pm 5\%$, 500 V, Polypropylene 1 μ F, $\pm 5\%$, 2.5 kV, Polypropylene	
Calibrator	DC current: 2 mA Accuracy: $\pm 1.25\%$ DC Voltage: 0 - 550 V Accuracy: $\pm 0.005\%$ AC Voltage: 0 - 240 V, 60 Hz Accuracy: $\pm 1.25\%$	Fluke 5520A
IR Cable Assembly		Fluke P/N 1578406
³Calibration Software		Baldric
Ammeter		Fluke 8508
Personal computer	IBM compatible, with Microsoft Windows	
1550B Users Manual CD ROM		Fluke P/N 2099928
<p>1. Resistors must have a voltage coefficient consistent with the test voltage used. 2. Can use (3) each, 0.033 μF, 2 kV capacitors in series and (8) each, 8 μF, 450 V capacitors in series to obtain required values. The 0.033 μF capacitors should have a 33 MΩ bleeder resistor across each capacitor. The 8 μF capacitors should have a 15 MΩ bleeder resistor across each capacitor. 3. Available from www.fluke.com under 1550B Product Information.</p>		

Performance Test Procedures

⚠⚠ Warning

To avoid electric shock hazard, do not contact the output terminals while performing the following procedures. There are potentially dangerous voltages at the MegOhmMeter output terminals when the MegOhmMeter is in the MΩ TEST function.

The following performance tests should be completed yearly to ensure that the MegOhmMeter, referred to as “the UUT” (Unit Under Test) in this section of the manual, is in proper operating condition and meets the published accuracy specifications. If the UUT fails any of the performance test steps, repair or adjustment is needed. Refer to Contacting Fluke for service information.

Fluke 1550B IR Port Verification Test

Verify operation of the 1550B IR Communications Port as follows:

1. Using an IBM compatible PC, install QuickLink Communications software from the 1550B Users Manual CD ROM, Fluke P/N 2099928.
2. Connect the IR adapter cable from the 1550B IR port to the computer Com port.
3. Complete an insulation test with the 1550B and store the result.
4. Using QuickLink Software, download the stored result from Step 3.

Button Test

Operate each of the front panel buttons in turn. All buttons should have a similar feel and tactile click when operated. Refer to Figure 1.

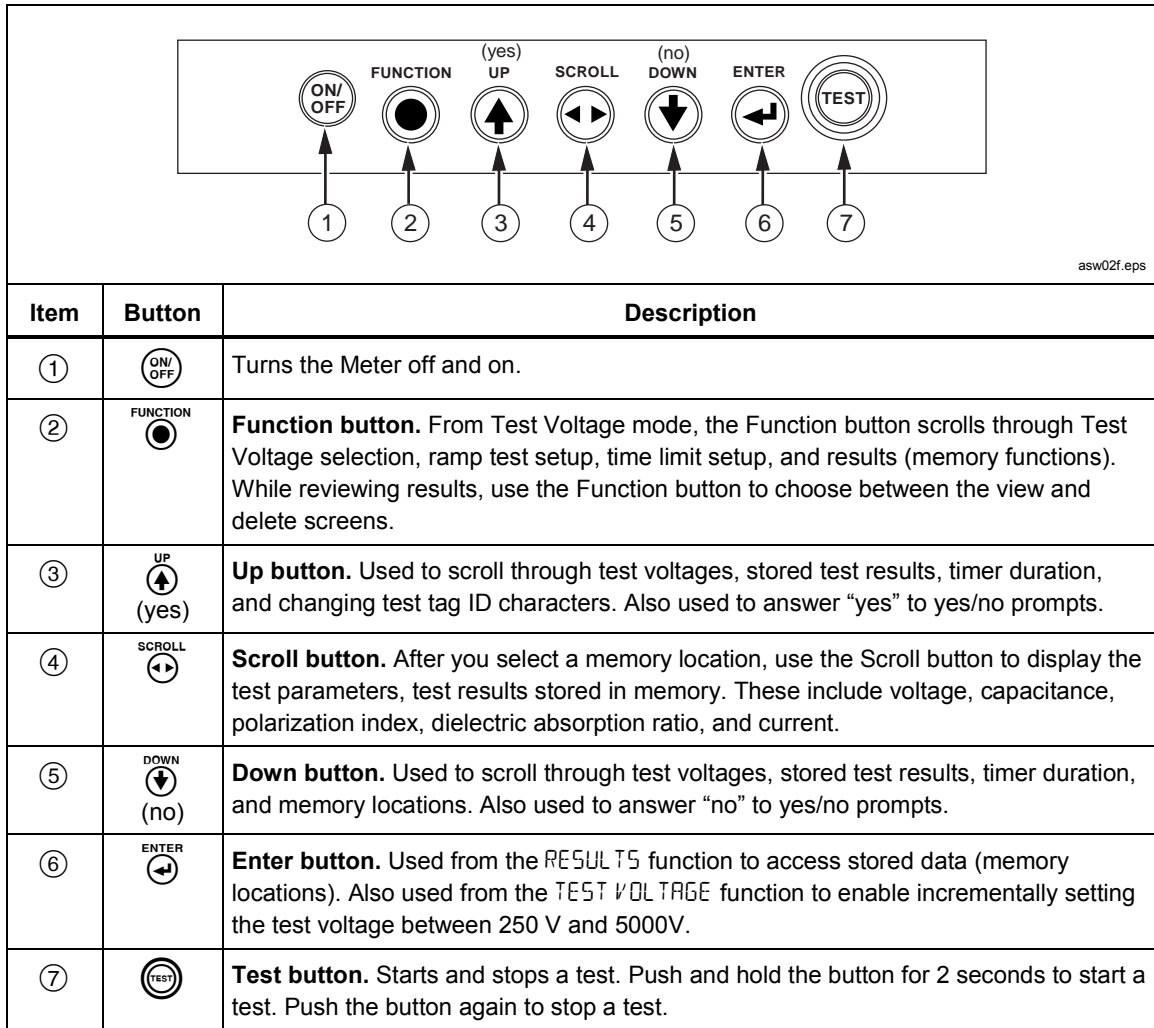
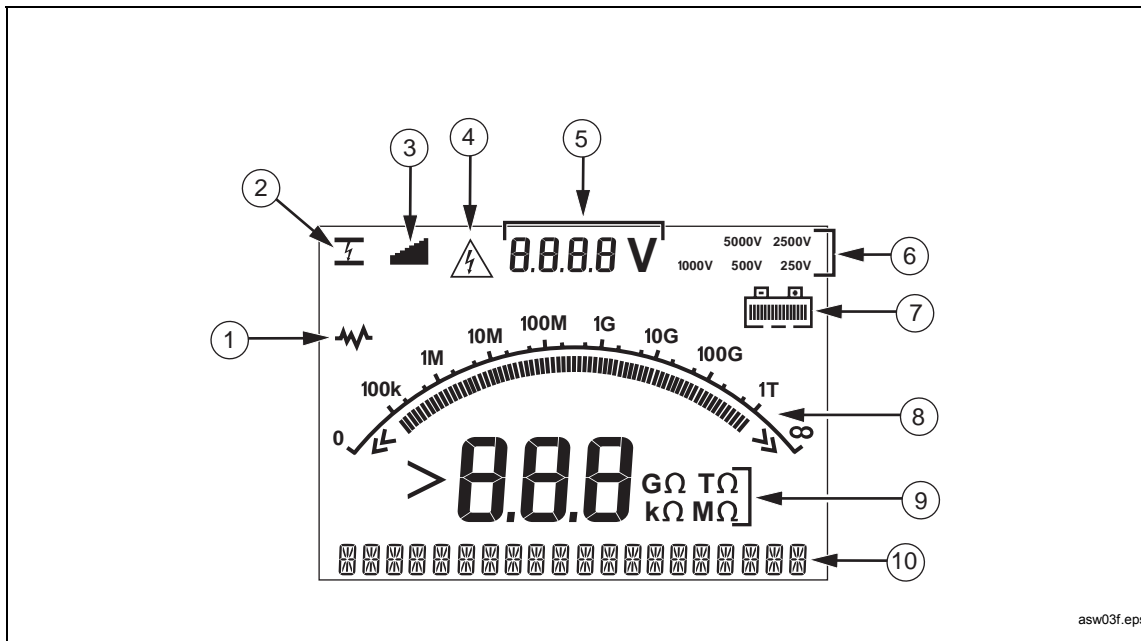


Figure 1. Pushbuttons

Display Test

Turn the UUT on several times while observing the display during power up. Compare the display with the example in Figure 2. Check all segments for clarity and contrast.



Item	Description
①	Interference present. Displayed readings may be outside the specified accuracy range.
②	Electrical breakdown in Ramp mode.
③	Ramp mode indicator.
④	Potentially hazardous voltage is present at the test terminals. <p style="text-align: center;">⚠️⚠️Warning:</p> <p>Before and after testing, confirm that the Meter does not indicate the presence of a hazardous voltage. If the Meter beeps continuously and a hazardous voltage is present, disconnect test leads and remove power from the circuit under test.</p>
⑤	Voltage sourced by the Meter or from the circuit under test that is present at terminals of the Meter.
⑥	Test voltage selection (250 V, 500 V, 1000 V, 2500 V, or 5000 V)
⑦	Battery charge status.
⑧	Bar graph display of insulation resistance.
⑨	Digital display of insulation resistance.
⑩	Text display. Indicates voltage, test current, capacitance, programmable test voltages, and menu options.

Figure 2. Display Features

Charging Test

1. With the MegOhmMeter switched off, connect a mains supply to the AC supply receptacle and check that the UUT display shows **Charging**.
2. Disconnect the mains supply and check that the UUT turns off.
3. Turn the MegOhmMeter on and see that all the battery symbol segments display as shown in Figure 2.

Note

A fully charged battery is indicated when the battery symbol shows all segments. Recharge the battery as necessary to obtain all segments. A full charge requires 12 hours.

Insulation Accuracy Test

Using the various resistances shown in Table 3, perform the UUT insulation accuracy test. Push  for 2 seconds to start or discontinue a test.

Notes

- *For best results, allow for settling of up to 60 seconds when measuring high-value resistances (100 GΩ and above) and take care to avoid stray currents. Perform the test on a conductive work surface that is connected to the UUT's GUARD terminal and the load GUARD terminal.*
- *Motion/body capacitance can affect the stability of the reading at higher resistances. When taking the measurements above 1 GΩ, remain as motionless as possible.*


The capacitance reading is obtained by pressing  after a test has started.

Table 3. Insulation Accuracy Test

Step	Voltage Range	Resistance	UUT Display Limits	
			Minimum	Maximum
1	250 V	0.1 uF	0.055	0.145
2	500 V	200 kΩ	190 kΩ	210 kΩ
3	500 V	1 GΩ	0.95 GΩ	1.05 GΩ
4	500 V	100 GΩ	80 GΩ	120 GΩ
5	1kV	1 GΩ	0.95 GΩ	1.05 GΩ
*6	2.1 kV	1 uF	0.82	1.18
7	2.5 kV	1 GΩ	0.95 GΩ	1.05 GΩ
8	5 kV	1 GΩ	0.95 GΩ	1.05 GΩ
9	5 kV	1 TΩ	0.80 TΩ	1.20 TΩ
10	5 kV	5 MΩ	4.75 MΩ	5.25 MΩ
*Use "Programmable Test Voltage" mode by pressing ENTER				

Output Voltage Test

In Table 4, the UUT output voltage is checked with various loads applied. In this test a voltmeter with a high-voltage probe must be connected to the load resistor to measure the UUT output voltage.

Table 4. Output Voltage Test

Step	1550B Voltage Range	Load Resistor	Reading Limits	
			Minimum	Maximum
1	250V	200 k Ω	250V	275V
2	250V	No Load	250V	275V
3	500 V	500 k Ω	500 V	550 V
4	500 V	No Load	500 V	550 V
5	1 kV	1 M Ω	1000 V	1100 V
6	1 kV	No Load	1000 V	1100 V
7	2.5 kV	2.5 M Ω	2500 V	2750 V
8	2.5 kV	No Load	2500 V	2750 V
9	5 kV	5 M Ω	5000 V	5500 V
10	5 kV	No Load	5000 V	5500 V

Short Circuit Current Test

To verify the UUT short circuit current, use the following procedure:




1. Connect an ammeter between the UUT + and - terminals.
2. Turn the UUT on and allow to startup.
3. Wait for **Test Voltage** to appear on the display and set the test voltage to 5000 V by pushing .
4. Push  and note that the ammeter reading is within the reading limits referred to in Table 5.
5. Push  to discontinue the test.

Table 5. Short Circuit Current Test

Step	1550B Voltage Range	Reading Limits	
		Minimum	Maximum
1	5000 V	1.20 mA	1.80 mA

Voltage Measurement Accuracy

To verify voltage measurement accuracy of the Live Circuit Warning function, apply the voltages listed in Table 6 to the + and - terminals of the UUT. Verify that:

- The UUT reading is within the display limits of Table 6.
- The UUT is beeping at a 1-second interval.
- ⚠ is flashing on the display.

Table 6. Voltage Measurement Test

Step	Voltage Source Output	UUT Display	UUT Tone	UUT Display Limits	
				Minimum	Maximum
1	-34 Vdc	Flashing Hazard	Beeps	30 V	38 V
2	240 Vac, 60 Hz	Flashing Hazard	Beeps	226 V	254 V

Adjustment Procedure

The MegOhmMeter should be performance tested yearly to ensure compliance with its specifications. When required, use the following adjustment procedure to bring the UUT within its nominal accuracy specifications.

Interface Connection

Perform adjustment with software using a computer and IR (infrared) adapter.

Connect the Infrared Cable Assembly to the UUT IR Port and COM port of the computer. Refer to Figure 3.

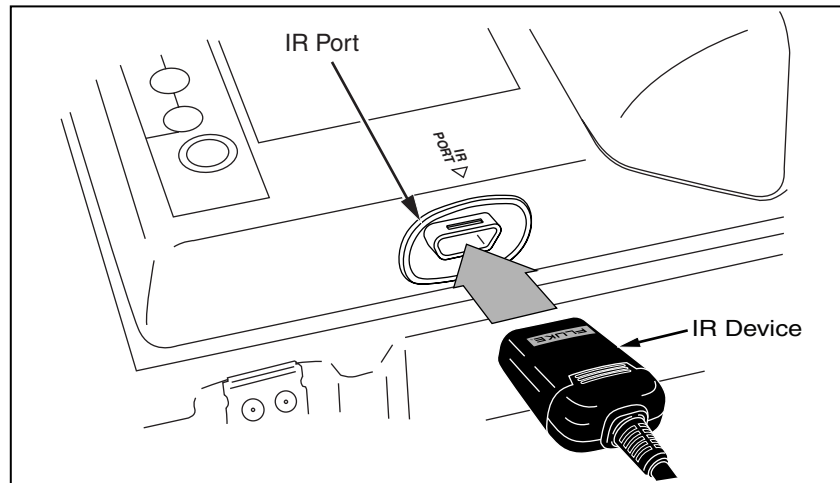


Figure 3. IR Port on the MegOhmMeter

ath04.eps

Instrument Setup

Turn the MegOhmMeter on and wait for **Test Voltage** to appear on the display. From the computer terminal, activate the Baldric program from the Windows Start menu. On the Setup tab, confirm the selected COM port settings.

⚠⚠ Warning

To avoid electric shock hazard, do not contact the output terminals or test equipment terminals while performing the following procedures. There are potentially dangerous voltages when the UUT is in the "Calibrate HV Output and Measurement" mode.

Normalizing the HV Probe and Digital Multimeter

1. Connect the HV probe and digital multimeter to the 5520A **NORMAL** output terminals, observing polarity. Manually set the multimeter for a range that has a 10 M Ω input impedance (e.g., 100 V) and provides a maximum resolution for a 500 mV and 5000 mV input.
2. Set the 5520A output to 506 V and note the digital multimeter reading. Record this value.
3. Set the 5520A output to 1000 V and note the voltmeter reading. If the error is > 0.025 % from the nominal value, convert the error from nominal to percentage. Multiply 5005 V by this percentage and algebraically add to 5005 V. Record this value.
4. Set the 5520A to standby and disconnect the HV probe and digital multimeter.

HV Adjustment

1. Select the **CAL HV** tab.
2. Connect the HV probe and digital multimeter to the output terminals of the UUT, as shown in the connection diagram.
3. Press the **START** button to begin adjustment . The UUT briefly displays **HV OFFSET** then flashes Δ with PWM 600, while emitting a beep at 1-second intervals.
4. Use the \uparrow and \downarrow keys on the terminal to modify the UUT output value to as close as possible to the value recorded in step 2 of “Normalizing the HV Probe and Digital Multimeter”. The nominal value for this adjustment is between 502 and 510 V.
5. Press the **Cal 500** button. The UUT now increases its output to nominally 5000 V.
6. Use the \uparrow and \downarrow keys on the terminal to modify the UUT output value to as close as possible to the value obtained in step 3 of “Normalizing the HV Probe and Digital Multimeter”. The nominal value for this adjustment is between 5000 V and 5010 V.
7. Press the **Cal 500** button. The HV generation and measurement functions are now calibrated.
8. Disconnect the HV probe and digital multimeter from the UUT.

Current Adjustment

1. Select the **Cal Current** tab.
2. Attach a 2 mA current source to the LO and GUARD terminals of the UUT, connecting the current source LO to UUT GUARD terminal, as shown in the connection diagram.
3. Apply 2 mAdc to the UUT.
4. Press the **START** button and wait until the adjustment is complete.
5. The current measurement is now adjusted. Disconnect the current source.

Charge Adjustment

1. Select the **Cal Charge** tab.
2. Attach a 2 mA current source to the LO and GUARD terminals of the UUT, connecting the current source LO to UUT Guard.
3. Apply 2 mAdc to the UUT.
4. Press the **Start** button and wait until the adjustment is complete; progress is displayed.
5. The charge measurement is now adjusted. Set the current source to **STANDBY** and disconnect it from the UUT.

This completes the Adjustment Procedure.

Additional Procedures

Note

*The following additional procedures are used during factory calibration and repair but should **not** be performed in the field. They are included for information only.*

Various diagnostics are available from the **Diagnostic** tab as follows:

Identification (Id)

This button installs the default opvars in the UUT; the present calibration is lost as the opvars are overwritten with the defaults. The user is presented with a YES/NO dialog box, to prevent accidental selection of this option.

Restart UUT

This button first sets the UUT to CAL_DIAGS mode then sends out the restart hardware command. The UUT is then restarted.

Set Current Range _ Connect

(CR_1K,CR_8K,CR_32K,CR_256K,CR_1024K,CR_8192K) shown in the Enable listbox window puts the UUT into **CAL_DIAGS** then sets the current range to that selected and connects, the raw ADC count boxes (v_counts, i_counts, q_counts) are updated. Left clicking a current range in the Disable listbox disconnects a current range providing it was previously connected.

Shutdown UUT

This button puts the UUT into **CAL_DIAGS** mode and sends out the powerdown command.

Get Diagnostics

Pressing this button continually gets Raw ADC values from the UUT and updates the Raw ADC Counts boxes (v_counts, i_counts, q_counts), pressing the button again turns this feature off.

Query Constants

Pressing this button provides an html screen dump of the present opvars obtained from the UUT.

Save / Print html Page

The Save button brings up a Windows Save Dialog Box so that the html document being displayed can be saved to file.

The Print button brings up a Windows Print Dialog Box so that the rendered html document may be printed.

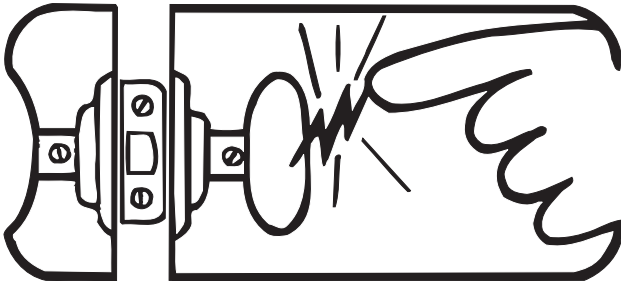
The window at the bottom of the page is a scrollable log of the baldrick methods issuing commands to the UUT and the corresponding responses received back from the UUT.



static awareness



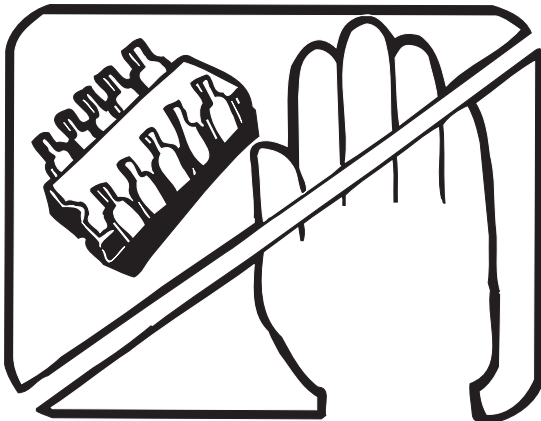
A Message From
Fluke Corporation



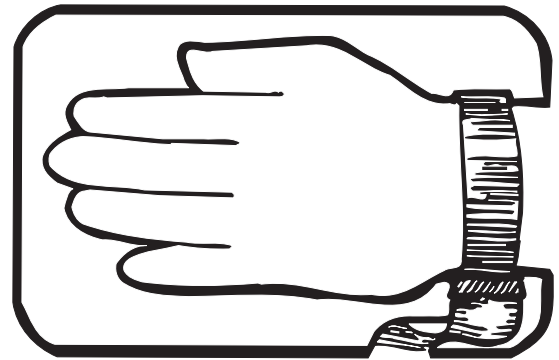
Some semiconductors and custom IC's can be damaged by electrostatic discharge during handling. This notice explains how you can minimize the chances of destroying such devices by:

1. Knowing that there is a problem.
2. Learning the guidelines for handling them.
3. Using the procedures, packaging, and bench techniques that are recommended.

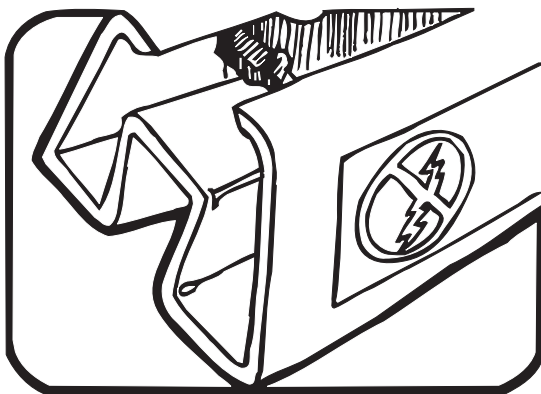
The following practices should be followed to minimize damage to S.S. (static sensitive) devices.



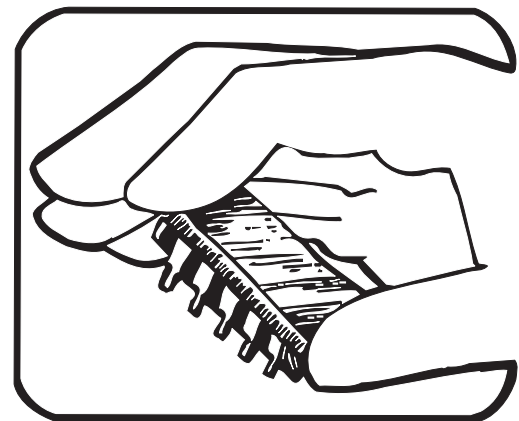
1. MINIMIZE HANDLING



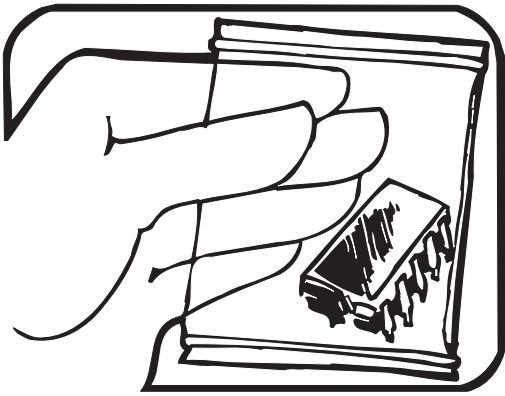
3. DISCHARGE PERSONAL STATIC BEFORE HANDLING DEVICES. USE A HIGH RESISTANCE GROUNDING WRIST STRAP.



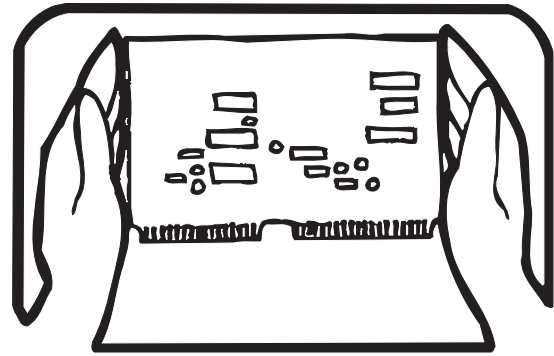
2. KEEP PARTS IN ORIGINAL CONTAINERS UNTIL READY FOR USE.



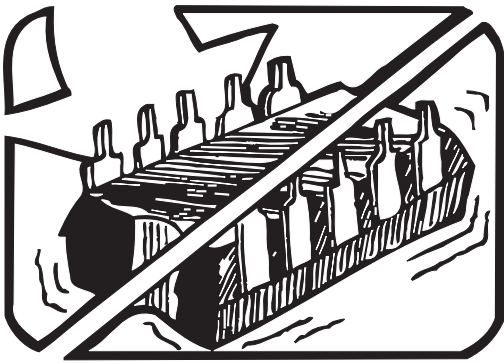
4. HANDLE S.S. DEVICES BY THE BODY.



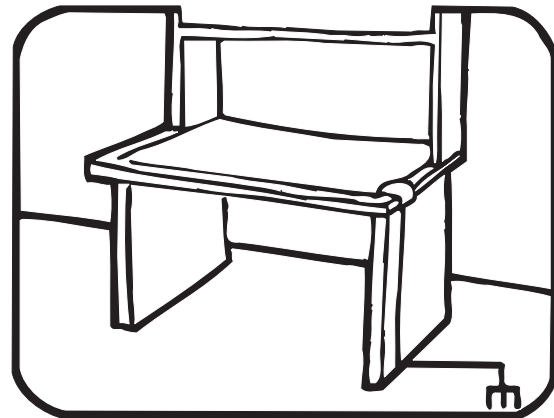
5. USE STATIC SHIELDING CONTAINERS FOR HANDLING AND TRANSPORT.



8. WHEN REMOVING PLUG-IN ASSEMBLIES HANDLE ONLY BY NON-CONDUCTIVE EDGES AND NEVER TOUCH OPEN EDGE CONNECTOR EXCEPT AT STATIC-FREE WORK STATION. PLACING SHORTING STRIPS ON EDGE CONNECTOR HELPS PROTECT INSTALLED S.S. DEVICES.



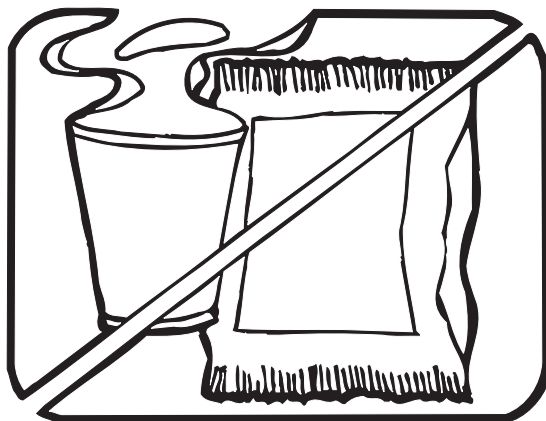
6. DO NOT SLIDE S.S. DEVICES OVER ANY SURFACE.



9. HANDLE S.S. DEVICES ONLY AT A STATIC-FREE WORK STATION.

10. ONLY ANTI-STATIC TYPE SOLDER-SUCKERS SHOULD BE USED.

11. ONLY GROUNDED-TIP SOLDERING IRONS SHOULD BE USED.



7. AVOID PLASTIC, VINYL AND STYROFOAM® IN WORK AREA.

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Battery Replacement Procedure

Warning

To avoid electrical shock or personal injury, remove the test leads and any input signals before opening the case or replacing the battery or fuse. To prevent damage or injury, install **ONLY** batteries or fuses specified for the product.

Caution

Do not attempt to repair or service the MegOhmMeter unless qualified to do so and you have the relevant calibration, performance test, and service information.

Note

This instrument contains a lead-acid battery. Do not mix with the solid waste stream. Spent batteries should be disposed of by a qualified recycler or hazardous materials handler. Contact your authorized Fluke Service Center for disposal and recycling information.

Storing rechargeable lead-acid batteries in a low-charged state could lead to reduced life and/or damage. Fully charge the battery before storing for extended periods and check, the charge at regular intervals.

The MegOhmMeter is powered by 12 V lead acid battery, Fluke P/N 2142662. The battery can be recharged using the AC power cord.

Fully charging the battery typically takes 12 hours. Avoid charging in extremes of temperature. Recharge the battery if the MegOhmMeter has been stored for extended periods.

If the battery needs to be replaced, refer to Figure 4 and use the following procedure to replace the battery.

Disassembly

Caution

Disassembly must be performed using proper ESD handling techniques. Place the unit on an anti-static mat and use a grounded wrist strap during the following procedure.

1. Disconnect the test leads from any live source and power off the MegOhmMeter. Remove the mains supply cable leads from the instrument.
2. With the case latched, turn the unit over and place the instrument on a level surface with feet up.
3. Remove the 4 screws and feet from the Rotomould case. This frees the entire electronic chassis from the case and cover.
4. Set the unit upright, unsnap the case latches and open the cover. Remove the instrument chassis from the case and set it on the anti-static mat so that the instrument panel and LCD are face down.
5. Unscrew and remove the two chassis standoffs that protrude from the battery-mounting bracket.
6. Remove the two screws at each end of the battery bracket assembly.
7. To gain access to the battery connections, rotate the battery as shown in Figure 4.

8. Remove the positive and negative sleeved connectors from the battery. Take note of how the battery and the unit are assembled. It will be necessary for reassembly.

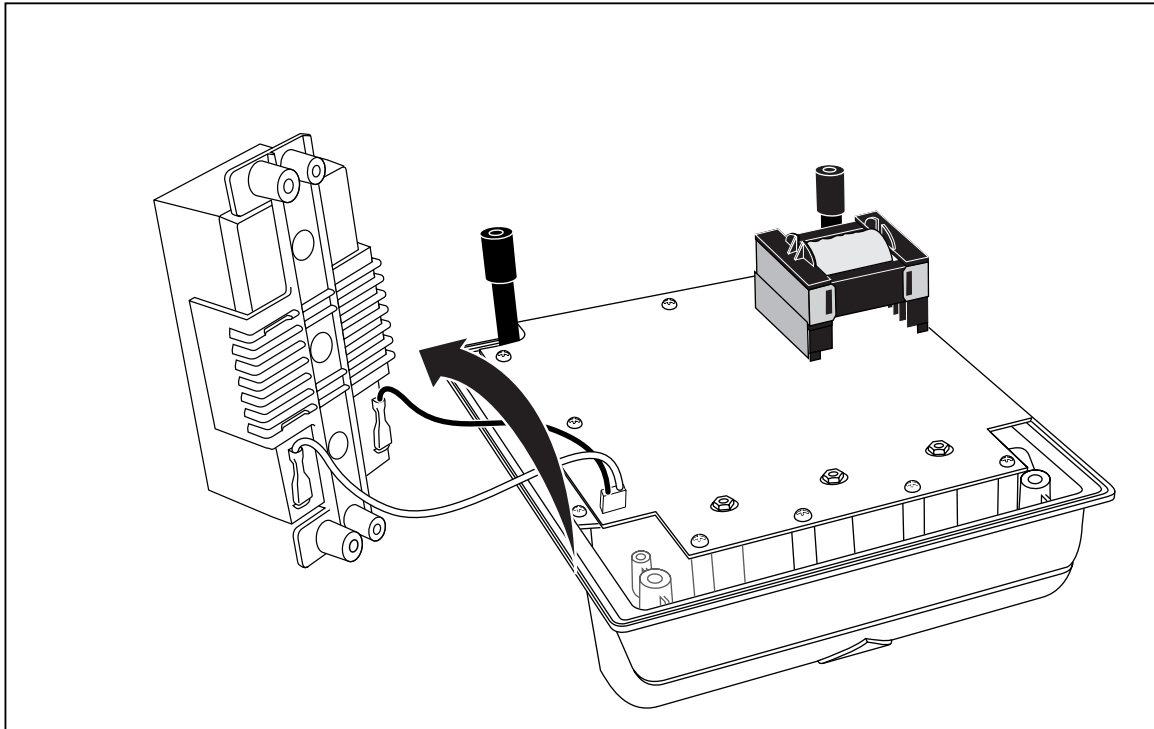


Figure 4. 1550B Disassembly

ath1.eps

Re-assembly

1. Place the new battery assembly in position, and attach sleeved connectors to the battery, observing correct polarity.
2. Reverse steps 2 through 6 of the disassembly procedure to re-assemble the MegOhmMeter.

Cleaning

Warning


To avoid possible electric shock or personal injury, remove excess water from the cloth before cleaning the MegOhmMeter to ensure that water does not enter any terminal.

Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents to clean the MegOhmMeter.

Replacement Parts/Accessories



Replacement parts are listed in Table 7.

Table 7. Replacement Parts

Parts	Part Number
Test Cable Red	1642584
Test Cable Black	1642591
Test Cable Green	1642600
Test Clip Red	1642617
Test Clip Black	1642621
Test Clip Green	1642639
Carry Case	1642656
IR Cable Assembly	1578406
Rotomould Base & Cover	1642859
Living Hinge for Rotomould Case	1670893
Battery Replacement Kit	2142662
Latch for Rotomould Case	1670887
AC Power Cord (S. Africa)	1552363
AC Power Cord (Australia)	658641
AC Power Cord (UK)	769455
AC Power Cord (Continental Europe)	789422
AC Power Cord (North America)	284174
Soft Carrying Case	1642658
 Charger Fuse, 5 A, 1.5-in X 0.25-inch, Quick Blow (Fast) Fuse	1643479
Extended Lead Set	2032761
1550B Quick Reference Card	2099943
CD ROM (Includes QuickLink HVT Communication Software and Users Manuals [English, French, German, Spanish])	2099928

Specifications

General Specifications

Display	75 mm x 105 mm	
Power	12 V lead-acid rechargeable battery. Yuasa NP2.8-12	
Charger Input (AC)	85 V to 250 V ac 50/60 Hz 20 VA This Class II (double insulated) instrument is supplied with a Class 1 (grounded) power cord. The protective earth terminal (ground pin) is not connected internally. <u>The extra pin is for added plug retention only.</u>	
Dimensions (H x W x L)	170 mm x 242 mm x 330 mm (6.7 in. x 9.5 in. x 13.0 in.)	
Weight	3.6 kg (7.94 lbs.)	
Temperature (operating)	-20 °C to 50 °C (-4 °F to 122 °F)	
Temperature (storage)	-20 °C to 65 °C (-4 °F to 149 °F)	
Humidity	80 % to 31 °C decreasing linearly to 50 % at 50 °C	
Altitude	2000 m	
Enclosure Sealing	IP40	
Input Overload Protection	600 V AC	
Electromagnetic Compatibility	EN 61326	
Certifications	CE  	
Safety Compliance	EN 61010, EN 61557 Parts 1 and 2 IEC 61010-1, CAT III V 600, Pollution Degree 2	
Typical Battery Charge Capability Note At temperature extremes, the battery needs to be charged more frequently.	Test Voltages	Number of Tests
	250 V	4138
	500 V	3913
	1 kV	3462
	2.5 kV	2043
	5 kV	1000

Electrical Specifications

The meter's accuracy is specified for 1 year after calibration at operating temperatures of 0 °C to 35 °C. For operating temperatures outside the range (-20 °C to 0 °C and 35 °C to 50 °C), add $\pm .25$ % per °C, except on the 20 % bands add ± 1 % per °C.

Insulation		
Test Voltage (DC)	Insulation Resistance Range	Accuracy (+/- reading)
250 V	<200 k Ω	unspecified
	200 k Ω to 5 G Ω	5 %
	5 G Ω to 50 G Ω	20 %
	>50 G Ω	unspecified
500 V	<200 k Ω	unspecified
	200 k Ω to 10 G Ω	5 %
	10 G Ω to 100 G Ω	20 %
	>100 G Ω	unspecified
1000 V	<200 k Ω	unspecified
	200 k Ω to 20 G Ω	5 %
	20 G Ω to 200 G Ω	20 %
	>200 G Ω	unspecified
2500 V	<200 k Ω	unspecified
	200 k Ω to 50 G Ω	5 %
	50 G Ω to 500 G Ω	20 %
	>500 G Ω	unspecified
5000 V	<200 k Ω	unspecified
	200 k Ω to 100 G Ω	5 %
	100 G Ω to 1 T Ω	20 %
	>1 T Ω	unspecified
Bar graph range:		0 to 1 T Ω
Insulation test voltage accuracy:		-0 %, +10 % at 1 mA load current
Induced ac mains current rejection:		2 mA maximum
Charging rate for capacitive load:		5 seconds per μ F
Discharge rate for capacitive load		1.5 s/ μ F
Leakage current measurement		
Range	Accuracy	
1 nA to 2 mA	+/- (5 % + 2 nA)	
Capacitive measurement		
Range	Accuracy	
0.01 μ F to 15.00 μ F	+/- (15 % of reading + 0.03 μ F)	
Timer		
Range	Resolution	
0 to 99 minutes	Setting: 1 minute Indication: 1 second	
Live circuit warning	Warning range: 30 V to 660 V ac/dc, 50/60 Hz Voltage accuracy: +/- (5 % + 2 V)	