FLUKE®

1550C/1555

Insulation Tester

Calibration Manual

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Introduction

⚠⚠ Warning

To prevent possible electrical shock, fire, or personal injury:

- **Do not perform the verification tests or calibration procedures described in this manual unless qualified to do so.**
- **Read all safety information before you use or service the product.**

The *Calibration Manual* for the 1550C/1555 Insulation Tester (the Product) 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, see the *1550C/1555 Users Manual* located at www.fluke.com.

Contact Fluke

Fluke Corporation operates worldwide. For local contact information, go to our website: www.fluke.com.

To register your product, view, print, or download the latest manual or manual supplement, go to www.fluke.com.

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Safety Information

General Safety Information is in the printed *Safety Information* document that ships with the Product and at www.fluke.com. More specific safety information is listed where applicable.

Required Equipment

Equipment required to perform the procedures in this manual is listed in Table 1. If the recommended models are not available, equipment with equivalent specifications may be substituted. Go to www.fluke.com to download the Users Manual for specific operating instructions.

⚠⚠ Warning

For safe operation and maintenance of the product, have an approved technician repair the product.

⚠ Caution

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

Table 1. Required Equipment

Equipment	Minimum Required Characteristics	Recommended Model
HV Probe	6 kV, ±1 % (1000:1 Divider) 11 kV, ±2 % for the 1555	Fluke 80K-6 80K-15
Digital Multimeter	500 mVdc to 1 V: ±0.02 %	Fluke 8508
Load with Guard Terminal[1]	Resistances 200 kΩ, ±1.25 %, 500 V 500 kΩ, ±1.25 %, 500 V 1 MΩ, ±1.25 %, 1 kV 2.5 MΩ, ±1.25 %, 2.5 kV 5 MΩ, ±1.25 %, 5 kV 10 MΩ, ±1.25 %, 10 kV 1 GΩ, ±1.25 %, 10 kV 100 GΩ, ±1.25 %, 10 kV 200 GΩ, ±1.25 %, 10 kV 500 GΩ, ±5 %, 10 kV 1 TΩ, ±5 %, 10 kV 2 TΩ, ±5 %, 10 kV	Combinations of: Welwyn F Series, Welwyn MFP2 Series And Vishay HTS-523
Capacitors with Bleeder Resistors[2]	0.1 µF, ±5 %, 500 V, Polypropylene 1 µF, ±5 %, 2.5 kV, Polypropylene	
Calibrator	DC current: 2 mA Accuracy: ±1.25 % DC Voltage: 0 - 550 V Accuracy: ±0.005 % AC Voltage: 0 - 240 V, 60 Hz Accuracy: ±1.25 %	Fluke 5080, Fluke 5520A
IR Cable Assembly		Fluke P/N 2166275
Calibration Software[3]		Snorre
Ammeter		Fluke 8508
Personal computer	IBM compatible, with Microsoft Windows XP SP2 or later + .NetFramework 2.0 or later	

[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 1550C/1555 Product Information.

Performance Test Procedures

⚠⚠ Warning

To prevent possible electrical shock, fire, or personal injury, do not contact the output terminals while performing the following procedures. There are potentially dangerous voltages at the output terminals when the product is in the MΩ TEST function.

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

IR Port Verification Test

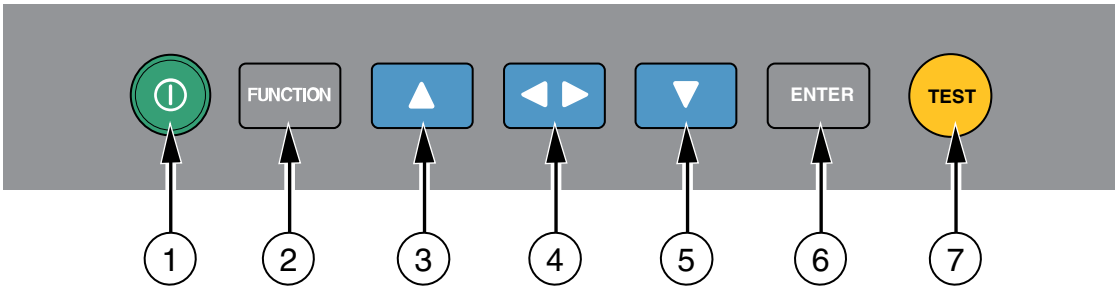
To verify operation of the IR Communications Port:

1. Using a Windows PC, connect the IR adapter cable from the product IR port to the computer COM port.
2. Activate the Snorre program from the Windows Start menu.
3. Select **Diagnostic**.
4. Select **Identification (ID)**. The PC sends out an ID command and the product responds to it.

Button Test

Use the pushbuttons to control the product, view test results, and scroll through chosen test results. Table 2 is a list of the pushbuttons and their functionality.

Table 2. Pushbuttons

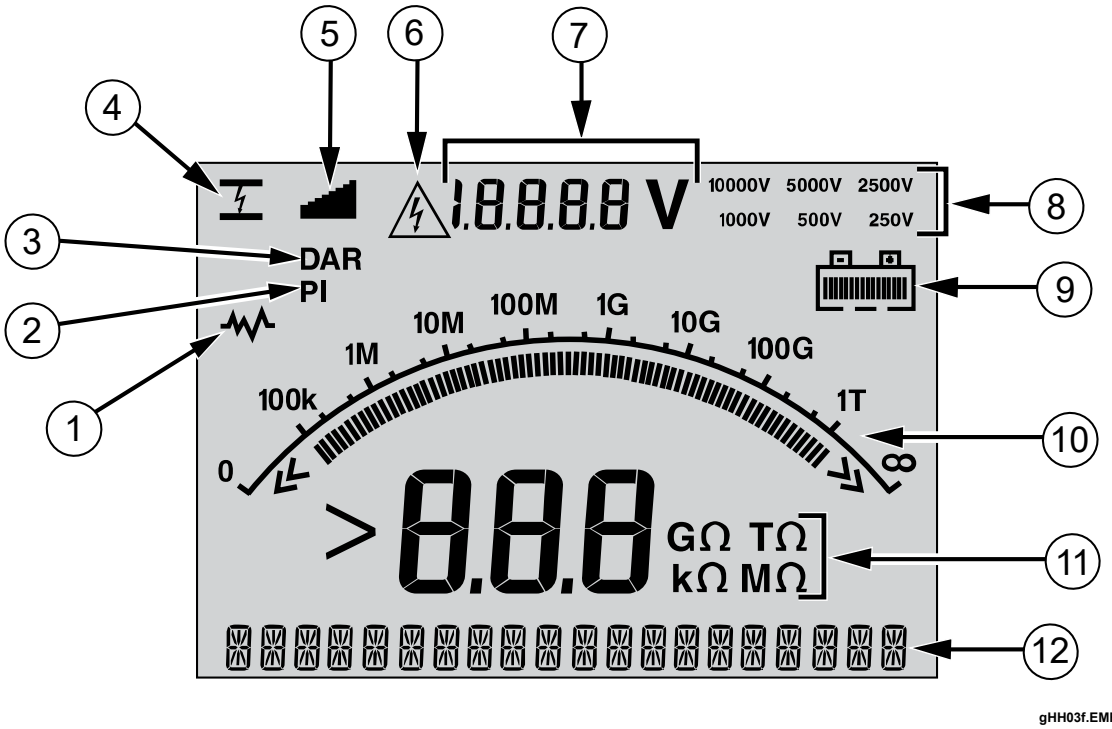


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Item	Description
①	Turn on and turn off the Product.
②	Push FUNCTION to go to the Function menu. Push again to exit the Function menu. To scroll within the Function menu, use the arrow pushbuttons.
③	Scrolls through test voltages, stored test results, timer duration, and changes test tag ID characters. Also used to answer “yes” to yes/no prompts.
④	After a memory location is set, ◀▶ displays the test parameters, test results stored in memory. These include voltage, capacitance, polarization index, dielectric absorption ratio, and current.
⑤	Use to scroll through test voltages, stored test results, timer duration, and memory locations. Also used to answer “no” to yes/no prompts.
⑥	Use for Test Voltage mode to start incrementally setting the test voltage between 250 V and 10 000 V.
⑦	Starts and stops a test. Push and hold for 1 second to start a test. Push again to stop a test.

Display Test

Turn on the DUT several times while observing the display during power up. Compare the display with the example in Figure 1. Check all segments for clarity and contrast.



① Interference present. Readings could be out of specified accuracy range.

② Polarization Index

③ Dielectric Absorption Ratio

④ Electrical breakdown in Ramp mode

⑤ Ramp mode indicator

⑥ Possible hazardous voltage is at the test terminals.

⚠⚠ Warning

To prevent personal injury, before and after testing, confirm that the product does not indicate the presence of hazardous voltage. If the product beeps continuously and there is hazardous voltage, disconnect test leads and remove power from the circuit under test.

⑦ Voltage sourced by the product or from the circuit under test at terminals of the product.

⑧ Test voltage selection (250 V, 500 V, 1000 V, 2500 V, 5000 V, or 10,000 V)

⑨ Battery charge status

⑩ Bar graph display of insulation resistance

⑪ Digital display of insulation resistance

⑫ Text display. Shows voltage, test current, capacitance, programmable test voltages, and menu options.

Figure 1. Display Features

Charging Test

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

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 may require 12 hours.

Insulation Accuracy Test

Using the various resistances shown in Table 3, perform the DUT insulation accuracy test. Push TEST 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 DUT'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	DUT Display Limits	
			Minimum	Maximum
1	250 V	0.1 μF	0.055	0.145
2	500 V	250 kΩ	237 kΩ	263 kΩ
3	500 V	1 GΩ	0.95 GΩ	1.05 GΩ
4	500 V	100 GΩ	80 GΩ	120 GΩ
5	1 kV	1 GΩ	0.95 GΩ	1.05 GΩ
6[1]	2.1 kV	1 μF	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	100 GΩ	95 GΩ	105 GΩ
10	5 kV	1 TΩ	0.80 TΩ	1.20 TΩ
11	5 kV	5 MΩ	4.75 MΩ	5.25 MΩ
12[2]	10 kV	1 GΩ	0.95 GΩ	1.05 GΩ
13[2]	10 KV	200 GΩ	190 GΩ	210 GΩ
14[2]	10 KV	2 TΩ	1.6 TΩ	2.4 TΩ
15[2]	10 KV	10 MΩ	9.5 MΩ	10.5 MΩ

[1] Use “Programmable Test Voltage” mode by pushing ENTER.

[2] 1555 only

Output Voltage Test

In Table 4, the DUT 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 DUT output voltage. Use 15 80K-6 for voltages below 6 kV.

Table 4. Output Voltage Test

Step	Voltage Range	Load Resistor	Reading Limits	
			Minimum	Maximum
1	250 V	250 kΩ	250 V	275 V
2	250 V	No Load	250 V	275 V
3	500 V	500 kΩ	500 V	550 V
4	500 V	No Load	500 V	550 V
5	1 kV	1 MΩ	1000 V	1100 V
6	1 kV	No Load	1000 V	1100 V
7	2.5 kV	2.5 MΩ	2500 V	2750 V
8	2.5 kV	No Load	2500 V	2750 V
9	5 kV	5 MΩ	5000 V	5500 V
10	5 kV	No Load	5000 V	5500 V
11[1]	10 kV	No Load	10000 V	11000 V
12[1]	10 kV	10 MΩ	10000 V	11000 V
[1] 1555 only. Requires 80K-15 probe.				

Short Circuit Current Test

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

1. Connect an ammeter between the DUT + and - terminals.
2. Turn on the DUT 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 (TEST) and note that the ammeter reading is within the reading limits referred to in Table 5.
5. Push (TEST) to discontinue the test.

Table 5. Short Circuit Current Test

DUT	Voltage Range	Reading Limits	
		Minimum	Maximum
1550C	5000 V	1.20 mA	1.80 mA
1555	10000 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 DUT.

Verify:

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

Table 6. Voltage Measurement Test

Step	Voltage Source Output	DUT Display	DUT Tone	DUT Display Limits	
				Minimum	Maximum
1	-38 V dc	Flashing Hazard	Beeps	30 V	46 V
2	240 V ac, 60 Hz	Flashing Hazard	Beeps	202 V	278 V

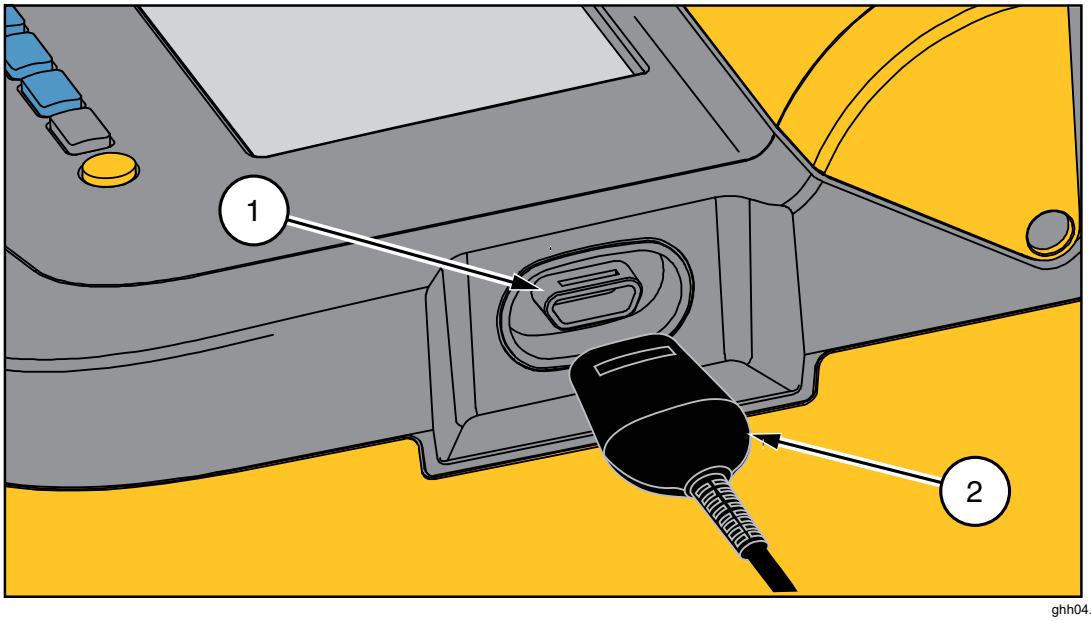
Adjustment Procedure

The product should be performance tested yearly to ensure compliance with its specifications. When required, use the following adjustment procedure to bring the DUT 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 DUT IR Port and COM port of the computer. Refer to Figure 2.



① IR Port

② IR Device

Figure 2. IR Port

Instrument Setup

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

⚠⚠ Warning

To prevent possible electrical shock, fire, or personal injury, do not contact the output terminals or test equipment terminals while performing the following procedures. Potentially dangerous voltages can occur when the DUT 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 MΩ input impedance, for example, 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 DUT, as shown in the connection diagram.
3. Press the **START** button to begin adjustment. The DUT briefly displays **HV OFFSET** then flashes ⚠ with PWM 600, while emitting a beep at 1-second intervals.
4. Use ▲ and ▼ on the terminal to modify the DUT 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 DUT now increases its output of the 1550C to nominally 5000 V, the output of the 1555 goes to a nominal 10,000 V.
6. Use ▲ and ▼ on the terminal to modify the DUT 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 the 1550C adjustment is between 5000 V and 5010 V, the target range for the 1555 adjustment is 10 000 V and 10 020 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 DUT.

Current Adjustment

1. Select the **Cal Current** tab.
2. Attach a 2 mA current source to the LO and GUARD terminals of the DUT, connecting the current source LO to DUT GUARD terminal, as shown in the connection diagram.
3. Apply 2 mAdc to the DUT.
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 DUT, connecting the current source LO to DUT Guard.
3. Apply 2 mAdc to the DUT.
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 DUT.

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 returns the model number and firmware version of the unit.

Clear Non-volatile Memory

To delete all saved test results:

1. Push FUNCTION to call the Function menu.
2. Push ▲ or ▼ to select the menu item DELETE RESULT.
3. Push ENTER to call the menu item.
4. Push ▲. REALLY DEL? shows on the display.
5. Push ▼ to confirm the deletion.

Note

The Delete function deletes all stored test results. Individual test locations cannot be deleted but are overwritten.

Restart DUT

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

Shutdown DUT

This button puts the DUT into **CAL_DIAGS** mode and sends out the power down command.

Get Diagnostics

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

Query Constants

Pressing this button provides an html screen dump of the present opvars obtained from the DUT. You will need to check that numerical values are reported for all nine variables. See Figure 3.



snorre 3.bmp

Figure 3. Query Constant Result

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 Snorre methods issuing commands to the DUT and the corresponding responses received back from the DUT.

Battery Replacement Procedure

⚠⚠ Warning

For safe operation and maintenance of the product:

- **Batteries contain hazardous chemicals that can cause burns or explode. If exposure to chemicals occurs, clean with water and get medical aid.**
- **Remove all probes, test leads, and accessories before the battery door is opened.**
- **Remove all probes, test leads, and accessories before the case is opened.**
- **The battery door must be closed and locked before you operate the product.**
- **Use only specified replacement fuses and batteries.**
- **Do not disassemble the battery.**

⚠ Caution

To prevent possible damage to the product or to equipment under test:

- **Do not attempt to repair or service the product unless qualified to do so and you have the relevant calibration, performance test, and service information.**
- **Remove batteries to prevent battery leakage and damage to the product if it is not used for an extended period.**
- **Be sure that the battery polarity is correct to prevent battery leakage.**
- **Repair the product before use if the battery leaks.**
- **Do not disassemble the battery.**
- **Do not short the battery terminals together.**
- **Keep cells and battery packs clean and dry. Clean dirty connectors with a dry, clean cloth.**
- **Do not disassemble or crush battery cells and battery packs.**
- **Do not keep cells or batteries in a container where the terminals can be shorted.**
- **Do not put battery cells and battery packs near heat or fire. Do not put in sunlight.**

This Product uses a rechargeable 12 V lead-acid battery for power. Storing rechargeable lead-acid batteries in a low-charged state could decrease their life and cause damage. Fully charge the battery before storing it for extended periods and examine the charge at regular intervals.

Charge the 12 V lead-acid battery with the ac power cord. Expect up to 12 hours to fully charge the battery. Do not charge in very high or low temperatures.

Charge the battery if the Tester is not used for extended periods.

If the battery needs to be replaced, use the following procedure to replace the battery. 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.

Disassembly

⚠ Caution

To prevent possible damage to the product or to equipment under test, disassembly must be performed using proper ESD handling techniques. Place the product 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 product.
2. Remove the mains supply cable leads from the instrument.
3. Turn over the product and place it on a level surface with feet up.
4. Remove the 4 screws from the case. This frees the top assembly from the base. The battery is attached to the base.
5. Lift the base from the top assembly and set it on its side next to the top assembly.
6. Disconnect the red and black leads for the battery.
7. Set the base on its feet and remove the 4 screws from the battery bracket.
8. Remove the bracket.
9. The battery (PN 2803592) can now be removed.

Re-assembly

1. Place the new battery assembly in position and then reinstall the battery bracket.
2. Reverse steps 2 through 9 of the disassembly procedure to re-assemble. When reconnecting the red and black battery leads, the red wire must be connected to the + terminal of the battery. Connect the black wire to the – terminal.

Cleaning

⚠⚠ Warning

For safe operation and maintenance of the product, remove excess water from the cloth before cleaning the product 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 product.

Replacement Parts/Accessories

Table 7 is a list of replacement parts.

Table 7. Replacement Parts

Parts	Part Number
Test Lead Set Fluke 1550	3477137
10 kV Clip	3611951
1550C 1555 Safety Input Cover	3529198
1550C Top Case	3622602
1555 Top Case	3624655
Input Jacks Decal	3624643
Case Screws	3552926
IR Cable Assembly	2166275
Battery Hold Bracket	3540654
Case Bottom	3524293
Battery	2803592
Rubber Foot	3777953
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	3592805
Extended Lead Set (5 kV rating)	2032761
1550C/1555 Quick Reference Card	3592822
ir3000 FC 1550 BLE-IR Adapter (FC kits only)	4460451

Specifications

General Specifications

Display	475 mm x 105 mm
Power	12 V lead-acid rechargeable battery 2.6 Ahr
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. **The extra pin is for added plug retention only**.
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 lb)
Tamper Protection	Kensington lock
Temperature (operating)	-20 ˚C to 50 ˚C (-4 ˚F to 122 ˚F)
Temperature (storage)	-20 ˚C to 65 ˚C (-4 ˚F to 149 ˚F)
Relative Humidity	80 % to 31 ˚C decreasing linearly to 50 % at 50 ˚C
Altitude	2000 m
IP Rating	IEC 60529: IP40
Input Overload Protection	1000 V ac
Safety	IEC 61010-1: 600 V CAT IV / 1000 V CAT III, Pollution Degree 2
Electromagnetic Compatibility (EMC)	
International	IEC 61326-1: Portable CISPR 11: Group 1, Class A *Group 1: Equipment has intentionally generated and/or uses conductively-coupled radio frequency energy that is necessary for the internal function of the equipment itself.* *Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances.* *Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.* *Emissions that exceed the levels required by CISPR 11 can occur when the equipment is connected to a test object.*
Korea (KCC)	Class A Equipment (Industrial Broadcasting & Communication Equipment) *Class A: Equipment meets requirements for industrial electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.*
USA (FCC)	47 CFR 15 subpart B. This product is considered an exempt device per clause 15.103.
Wireless Radio with Adapter	Frequency Range: 2412 MHz to 2462 MHz Output Power: <100 mW

Typical Battery Charge Capacity

Note

At temperature extremes, the battery needs to be charged more frequently.

Test Voltages	**Number of Tests**
250 V	4100
500 V	3600
1 kV	3200
2.5 kV	2500
5 kV	1000
10 kV	500

Electrical Specifications

Product 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 ±0.25 % per °C, except on the 20 % bands add ±1 % per °C.

Insulation		
Test Voltage (DC)	Insulation Resistance Range	Accuracy (±reading)
250 V	<250 kΩ 250 kΩ to 5 GΩ 5 GΩ to 50 GΩ >50 GΩ	unspecified 5 % 20 % unspecified
500 V	<500 kΩ 500 kΩ to 10 GΩ 10 GΩ to 100 GΩ >100 GΩ	unspecified 5 % 20 % unspecified
1000 V	<1 MΩ 1 MΩ to 20 GΩ 20 GΩ to 200 GΩ >200 GΩ	unspecified 5 % 20 % unspecified
2500 V	<2.5 MΩ 2.5 MΩ to 50 GΩ 50 GΩ to 500 GΩ >500 GΩ	unspecified 5 % 20 % unspecified
5000 V	<5 MΩ 5 MΩ to 100 GΩ 100 GΩ to 1 TΩ >1 TΩ	unspecified 5 % 20 % unspecified
10 000 V	10 MΩ 10 MΩ to 200 GΩ 200 GΩ to 2 TΩ >2 TΩ	unspecified 5 % 20 % unspecified
Bar graph range:	0 to 2 TΩ	
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 s/µF	
Discharge rate for capacitive load:	1.5 s/µF	

Leakage Current Measurement	**Range**	**Accuracy**
	1 nA to 2 mA	±(20 % + 2 nA)
Capacitive Measurement	0.01 µF to 20.00 µF	±(15 % of reading + 0.03 µF)

Timer	**Range**	**Resolution**
	0 to 99 minutes	Setting: 1 minute Indication: 1 second

Live circuit warning	**Warning Range**	**Voltage Accuracy**
	30 V to 1100 V ac/dc, 50/60 Hz	±(15 % + 2 V)

Short circuit current >1 mA and <2 mA

Principle of Measurement and Resistance

The product measures insulation parameters and displays the results with the following formulas.

Ohm's Law	**Capacitance (charge)**	**PI (Polarization Index)**	**DAR (Dielectric absorption ratio)**	**DAR [CN] (Dielectric absorption ratio)**
$R = \frac{V}{I}$	$C = \frac{Q}{V}$	$PI = \frac{R\ @\ 10\ min}{R\ @\ 1\ min}$	$DAR = \frac{R\ @\ 1\ min}{R\ @\ 30\ sec}$	$DAR\ [CN] = \frac{R\ @\ 1\ min}{R\ @\ 15\ sec}$