FLUKE ®

Calibration

5322A

Multifunction Electrical Tester Calibrator

Calibration Manual

March 2022 Rev. 1, 6/25

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Fluke Corporation	Fluke Europe B.V.
6920 Seaway Blvd.	P.O. Box 1186
Everett, WA 98203	5602 BD Eindhoven
U.S.A.	The Netherlands

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Table of Contents

Introduction

This manual documents adjustment instructions and other information for these four Products:

- 5322A Multifunction Electrical Tester Calibrator
- 5322A/5 Multifunction Electrical Tester Calibrator with 5 kV Insulation Resistance
- 5322A/VLC Multifunction Electrical Tester Calibrator with 600 V Source and Active Loop Compensation
- 5322A/5/VLC Electrical Tester Calibrator with 5 kV Insulation Resistance and 600 V Source and Active Loop Compensation

Where necessary, the text is specific to each of these Products. Otherwise, the manual applies to all of the Products. Throughout the manual, all varieties of the 5322A are referred to as the Product or Calibrator.

For Product use information, see the *5322A Operators Manual* available online 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 our website.

+1-425-446-5500

info@flukecal.com

Service Information

In case of difficulty within the 1-year Warranty period, return the Calibrator to a Fluke Calibration Service Center for warranty repair. For out of warranty repair, contact a Fluke Calibration Service Center.

Safety Information

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

A **Warning** identifies hazardous conditions and procedures that are dangerous to the user. A **Caution** identifies conditions and procedures that can cause damage to the Product or the equipment under test.

Specifications

Safety Specifications are in the Safety Specifications section of the *Safety Information* document.

Complete Product specifications are at www.fluke.com. See the *5322A Product Specifications*.

Theory of Operation

The Product is a Multifunction Electrical Tester Calibrator that covers a wide range of calibrations of devices under test (DUT). The Product produces calibrated outputs of these electrical quantities:

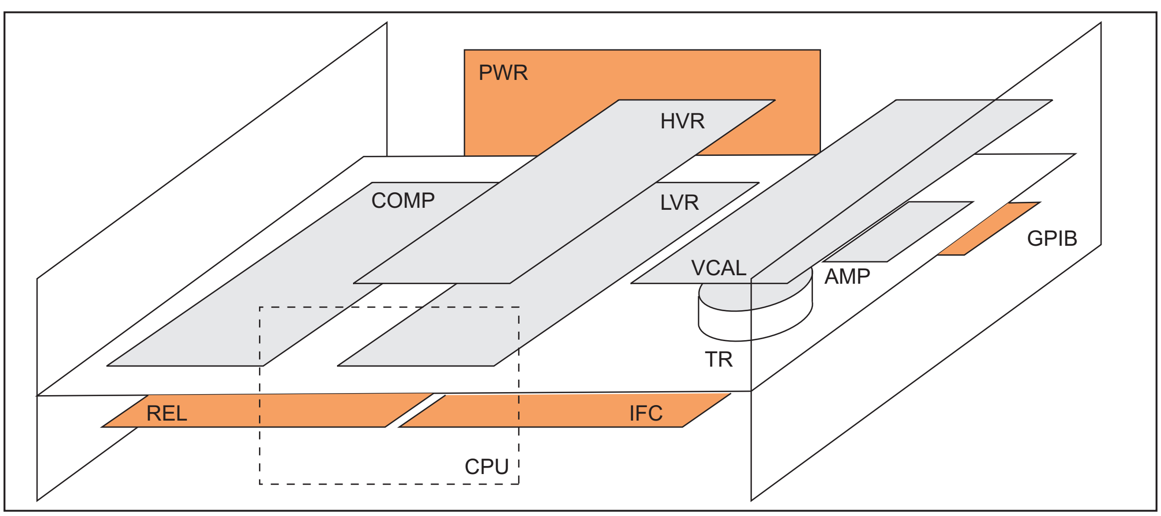
- Ground bond resistance source in fixed values from 25 mΩ to 1.8 kΩ
- Low-signal level, low-resistance source from 100 mΩ to 10 kΩ with 3 1/2-digit resolution
- High-resistance source in range from 10 kΩ to 10 GΩ with 4 1/2-digit resolution plus a single 100 GΩ value
- AC/DC voltage calibrator
- Loop/Line impedance calibrator that uses a ground bond resistance decade and residual impedance compensator (optional)
- RCD calibrator in a range from 3 mA to 3 A with trip time from 10 ms to 5 s
- Leakage current source, both passive and active (optional)
- AC/DC multimeter to 1100 V (10kV or 40 kV with an external probe) and 30 A

Electronic circuits located on the internal printed circuit boards (PCB) include:

- REL Ground bond resistance decade, RCD and Loop/Line impedance circuits
- IFC Multimeter block, RCD, Loop/Line impedance and Leakage current control processor.
- MER Floating voltmeter and ammeter
- COMP Loop/Line impedance compensator
- RCD RCD for PAT function
- LVR Low resistance decade
- HVR High resistance decade 1.5 kV or 5 kV
- VCAL AC/DC voltage calibrator
- AMP AC/DC voltage calibrator power amplifier
- TR AC/DC voltage calibrator transformer
- PWR Internal power sources
- GPIB GPIB, RS232, RJ45 interface circuits
- CPU Main processor

PCB location is illustrated in Figure 1. See the electrical connections between the PCAs shown in the block diagram in Figure 42 at the end of this manual.

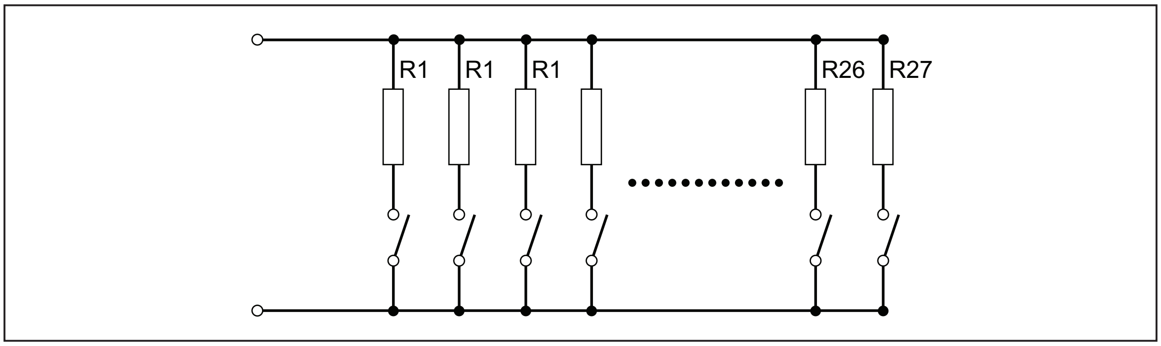
Figure 1. PCB Location



Low-Resistance Source (LVR Board)

A programmable, parallel-resistance decade with partial resistors values in nominal weight 1:2:4:4 forms a low-resistance source. Relays switch the resistors. The main CPU controls the switching process. The total range of partial resistors covers 100 mΩ to 16 MΩ. A one-range internal voltmeter senses the low-resistance decade applied test voltage. Use the **Mode** softkey to select 2-wire or 4-wire output. The low-resistance board is on the LVR board, the scanning voltmeter is on the IFC board. See Figure 2.

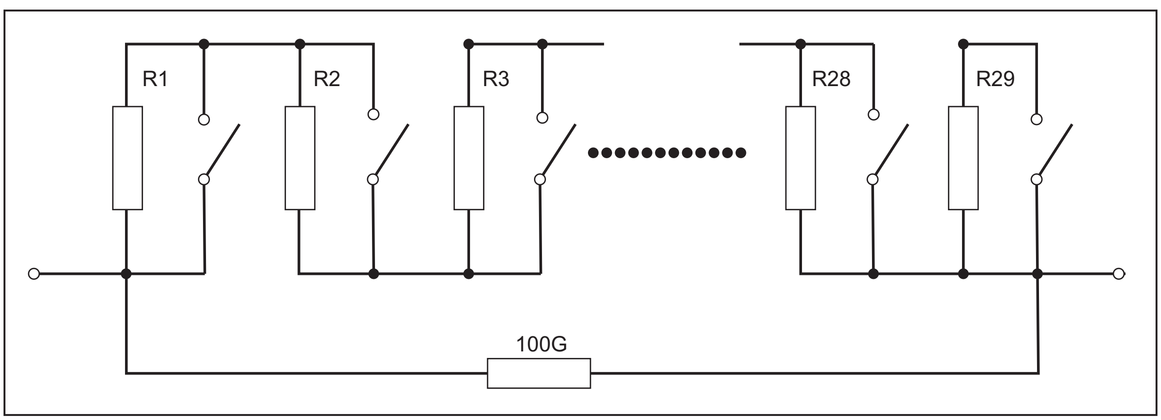
Figure 2. LVR Principle of Operation



High-Resistance Source (HVR/HVRB Board)

A programmable serial resistance decade with partial resistors values in approximate weight 1:2:4:4 forms a high-resistance source. Relays switch the resistors in series. The main CPU controls the switching process. The total range of partial resistors covers the range from 10 kΩ to 4 GΩ. A one-range internal voltmeter senses the high resistance applied test voltage. The 1.5 kV high-resistance board is on the HVRB board. The 5 kV high-resistance board is on the HVR board. The scanning voltmeter for both is on the IFC board. See Figure 3.

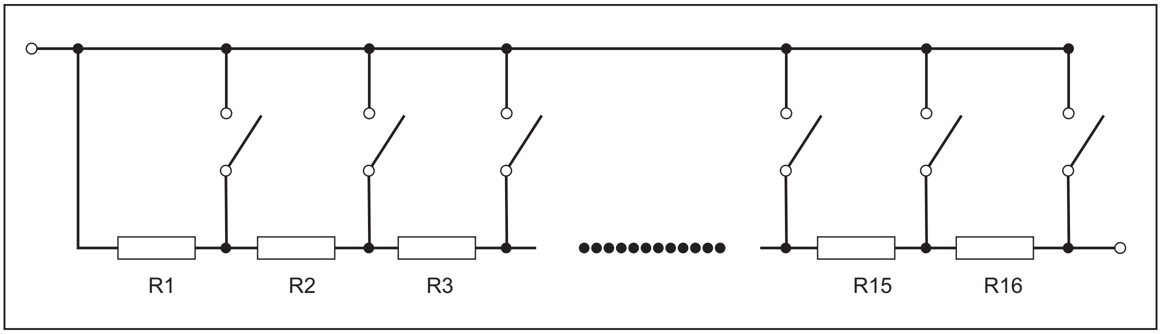
Figure 3. HVR Principle of Operation



Ground Bond Resistance Source (REL Board)

A programmable resistance box that contains 16 fix values in range 25 mΩ to 1.8 kΩ forms a ground bond resistance source. Relays switch the resistors. The main CPU controls the switching. An internal voltmeter senses the ground bond decade applied voltage. The main CPU also calculates the test current. Ground bond resistance board is on the REL board. The scanning voltmeter is on the IFC board. See Figure 4.

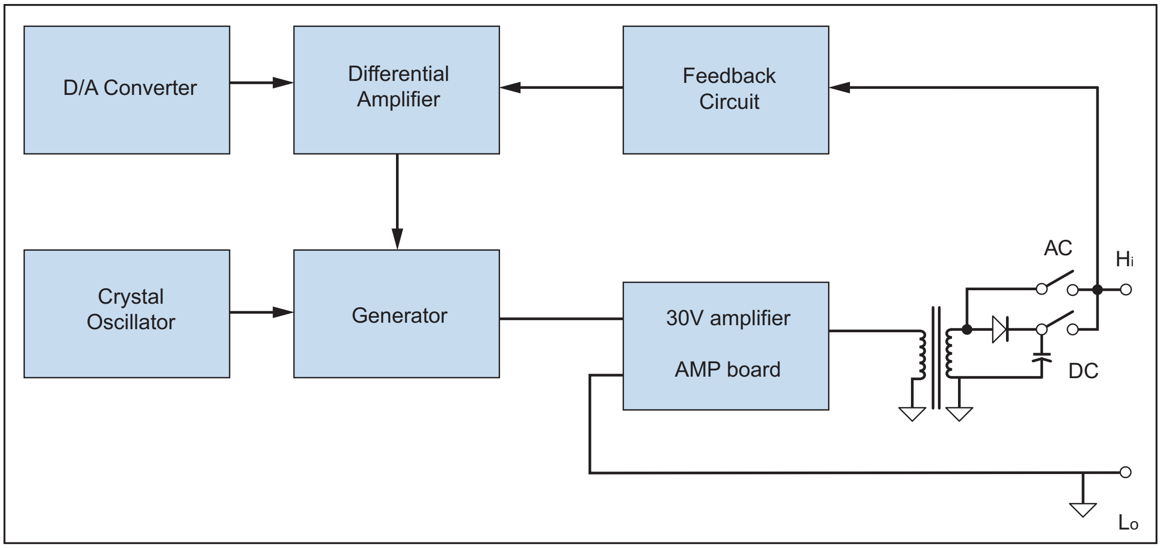
Figure 4. Ground Bond Resistance Principle of Operation



AC/DC Voltage Adjustment (VCAL + AMP Board)

In voltage calibrator mode, a built-in generator creates a sine wave with a voltage-controlled amplitude. The frequency comes from the crystal oscillator in the microprocessor control circuit. The signal is fed to a 30 V amplifier and then to output terminals from a transformer with range taps. Feedback circuits sense the voltage present at the output terminals, normalize its value, and compares it with precise a dc reference voltage. The error value controls the amplitude of the generator output. The voltage calibrator is in a separate box with control unit VCAL, power amplifier AMP, and a 5-range voltage transformer. See Figure 5.

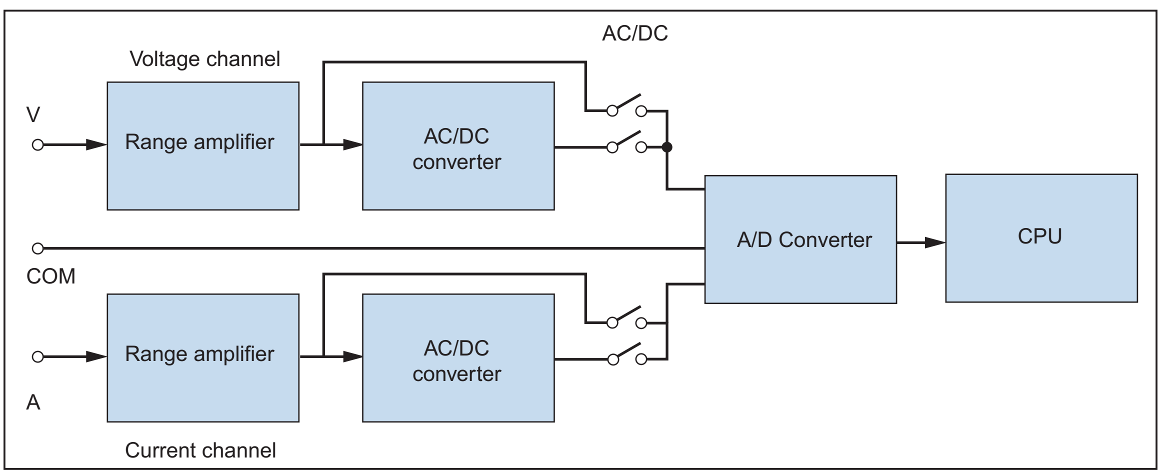
Figure 5. AC/DC Voltage Calibrator Principle



AC/DC Multimeter (MER Board)

The on-board ac/dc multimeter simultaneously measures any external voltage in range to 5000 Vrms and current to 30 Arms. Both voltage and current channels have a range amplifier and selectable ac/dc converter. A two-input 16-digit AD converter measures the output signal. See Figure 6.

Figure 6. AC/DC Multimeter Principle



The multimeter is on the MER board. The board floats up to 2000 V above PE potential.

The Meter function (M) has these sub-functions. Push the **Mode** softkey to select each sub-function:

- Voltmeter/ammeter
- AC/DC watt meter
- HIPOT leakage current meter
- Distortion and ripple coefficient meter
- Flash test CAT I and II meter

Loop/Line Impedance (REL+COMP Board)

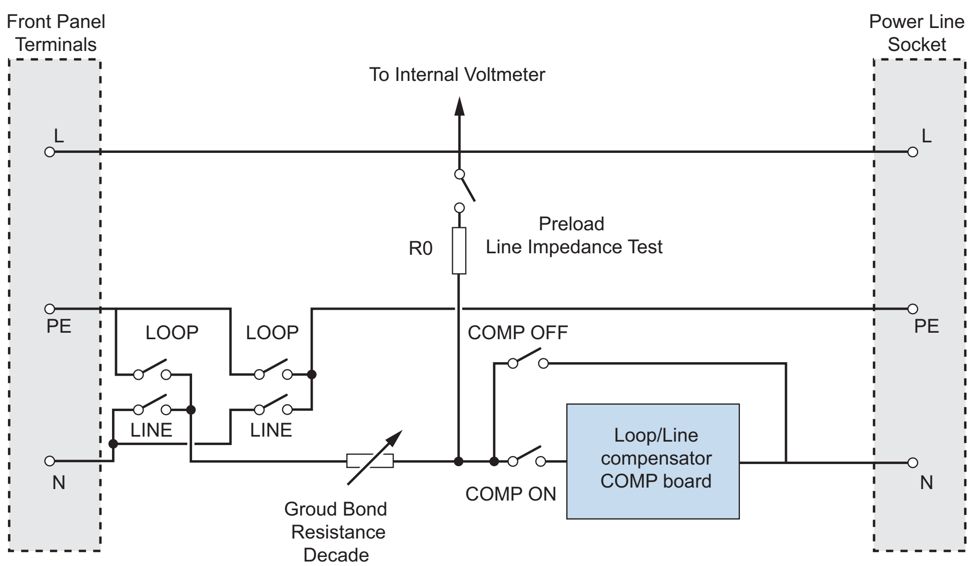
In the loop/line impedance function, the ground bond resistance decade is the calibrated resistance source. The selected resistance segment is inserted into the neutral wire. Loop/line impedance circuits connect to the power line mains and then come through the rear panel socket. The N power line wire connects to the PE or N terminal on the front panel and switches between loop and line impedance functions. The ground bond decade connects (as an option) in series with the block of loop/line residual compensation.

For residual impedance measurement, the Product has a built-in resistance load, R0. The R0 resistor connects between the L - N wires during residual impedance measurements, and creates a load for the mains voltage drop measurement. The internal voltmeter evaluates the voltage drop and calculates the residual line impedance at the place of installation. Loop/Line impedance circuits are on the REL board. The Compensator is on the COMP board. See Figure 7.

Note

Loop/line impedance circuits always work with L - N power line wires. Therefore, the Product cannot trip the RCD breaker at the place of installation.

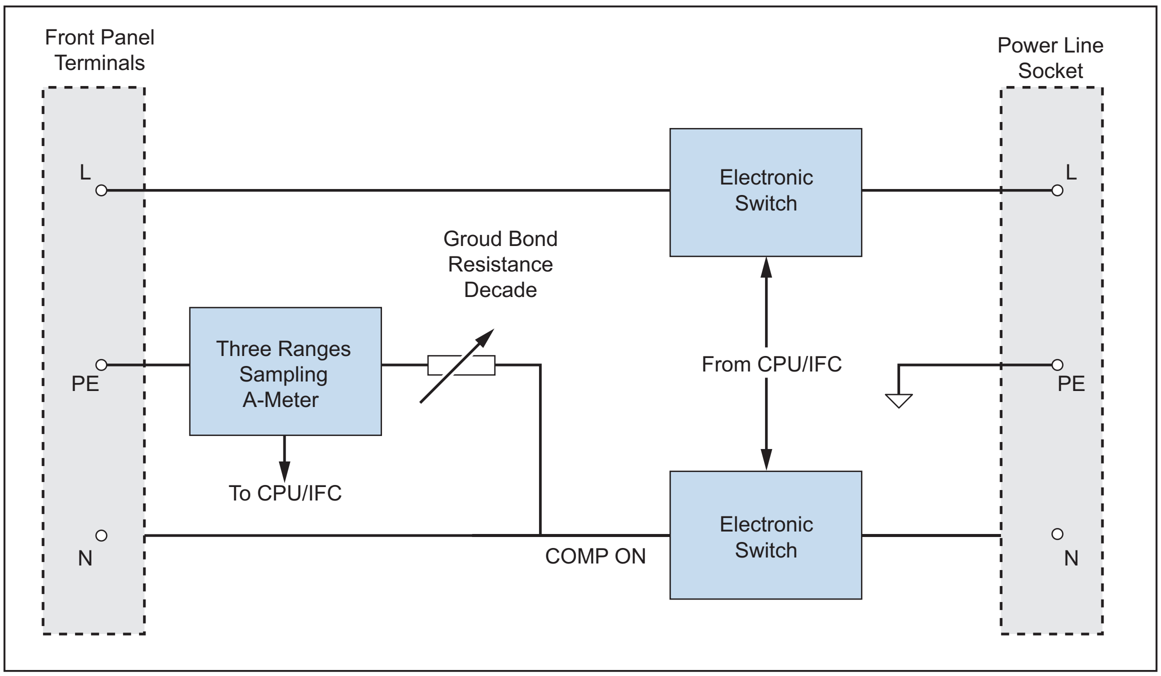
Figure 7. Loop/Line Impedance and Compensator



RCD function (REL+IFC board)

The RCD function contains two fast electronic switches, controlled from the CPU. Control of the switches comes from the sampling ammeter measurement. The ammeter is inserted at the PE wire and it senses the trip current caused by the DUT. When the fault current reaches a preset value, the CPU unit switches off both of the electronic switches after the preset trip time. The ground bond resistance block is applied to create a variable-touch voltage in an approximate range to 50 V.

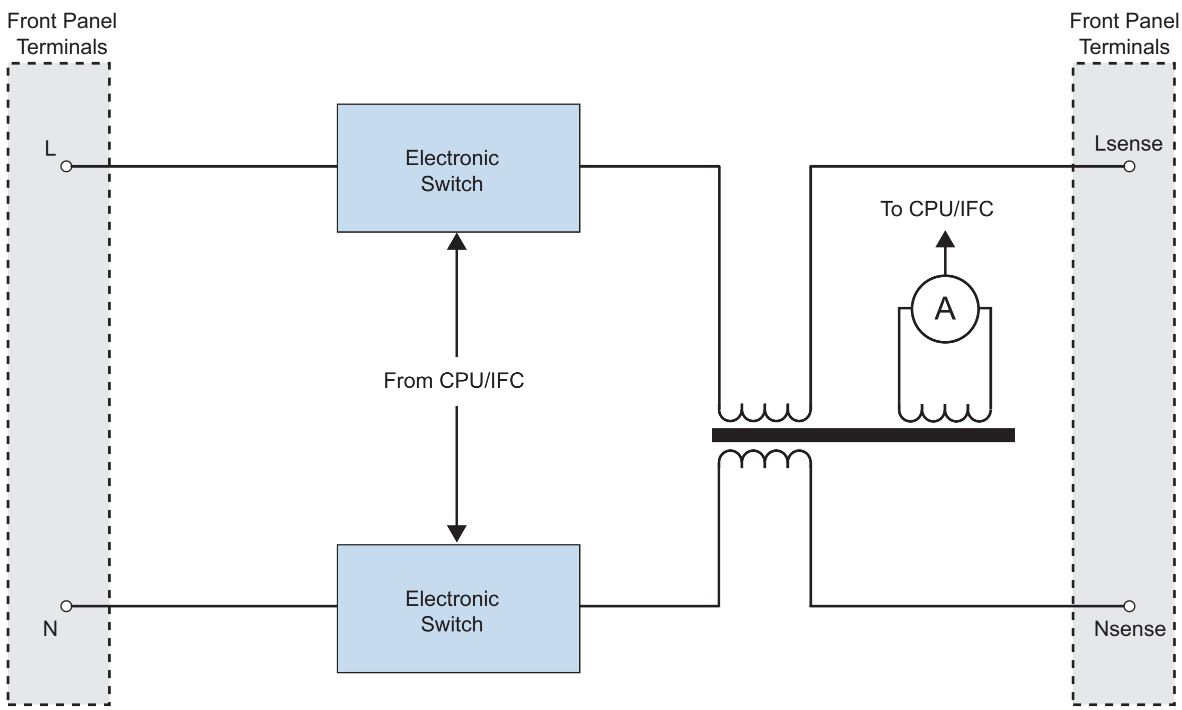
Figure 8. RCD Electronic Circuits on REL Board



RCD in PAT Function (RCD Board)

Use this function to adjust PAT testers that have an RCD function that measures trip time in portable RCD breakers such as extension cords. In this function, the Product does not supply power line voltage. The voltage comes from the DUT. The RCD board contains two FET switches and a current transformer that senses tripping current that comes from the PAT tester. This functionality is at the front terminals L - N - Lsense - N sense. A special cable adapter, RCD - PAT, comes with the Product to simplify the connection between the Product and a tested PAT. See Figure 9.

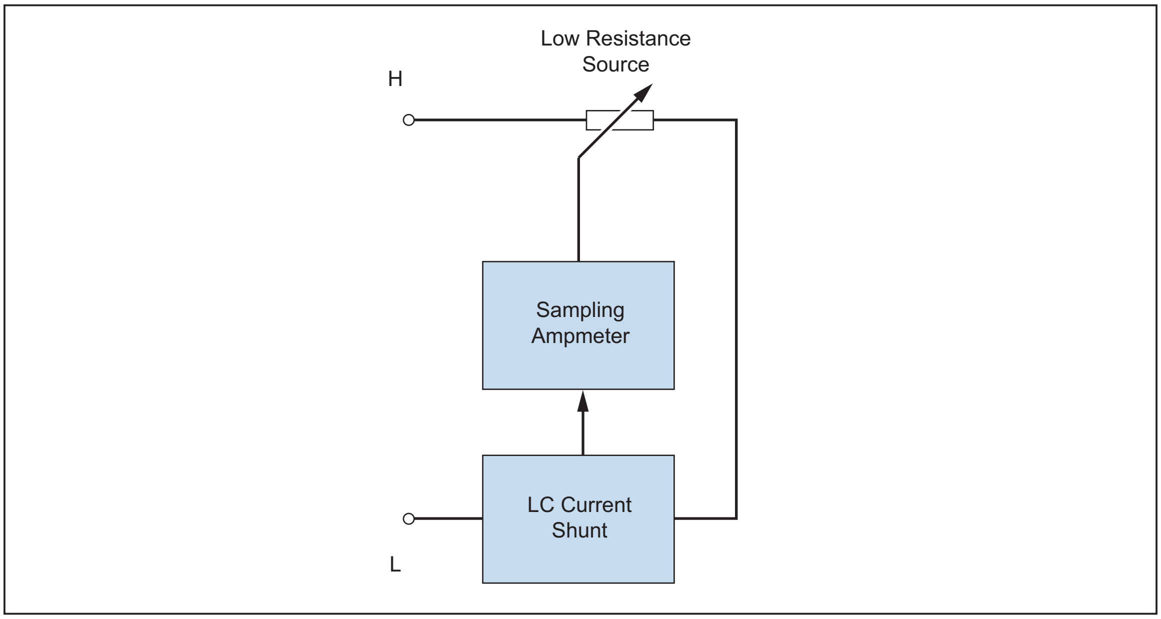
Figure 9. RCD Board



Passive and Differential Leakage Current (IFC+LVR Board)

In a passive and differential leakage current function, the sampling ammeter senses leakage current that comes from the DUT from the H terminal to L terminal. According to its value, the ammeter sets such a value on the resistance decade. The flow through current equals the preset leakage current. Leakage current circuits are on the IFC board. See Figure 10.

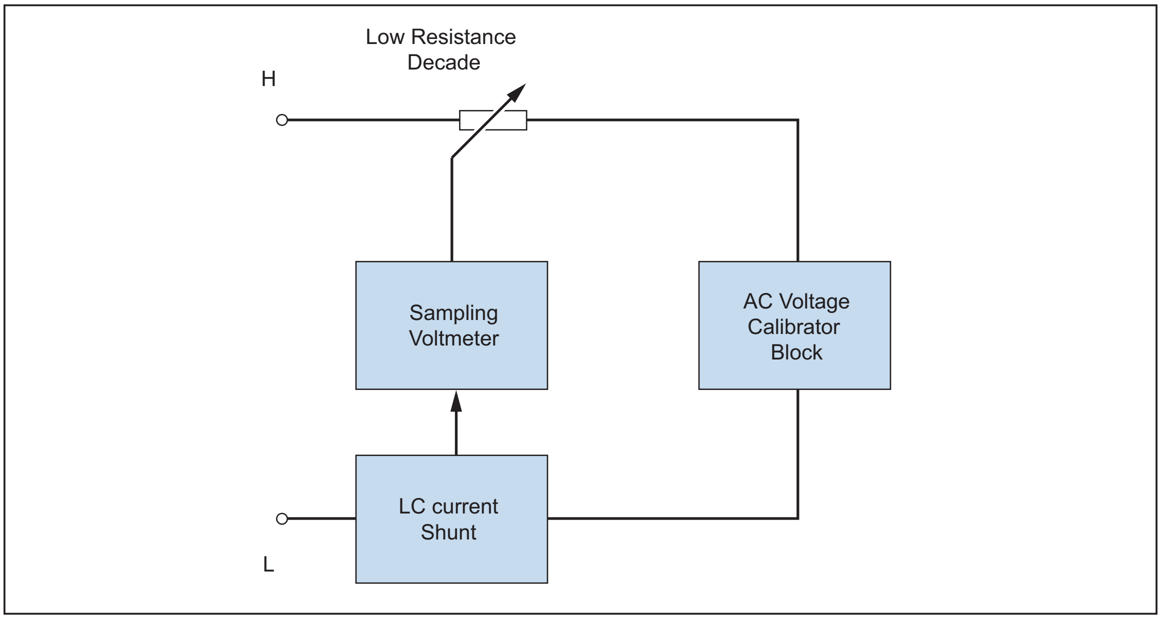
Figure 10. Leakage Current on the IFC Board



Active Leakage Current (IFC+LVR Board, Optional)

In active leakage current mode, the Product generates ac current with an internal ac calibrator as the source of current. A sampling ammeter sets this value in low-resistance decade, the output current equals the preset current value. Leakage current circuits are on the IFC board. The ac voltage calibrator is a separated block. See Figure 11.

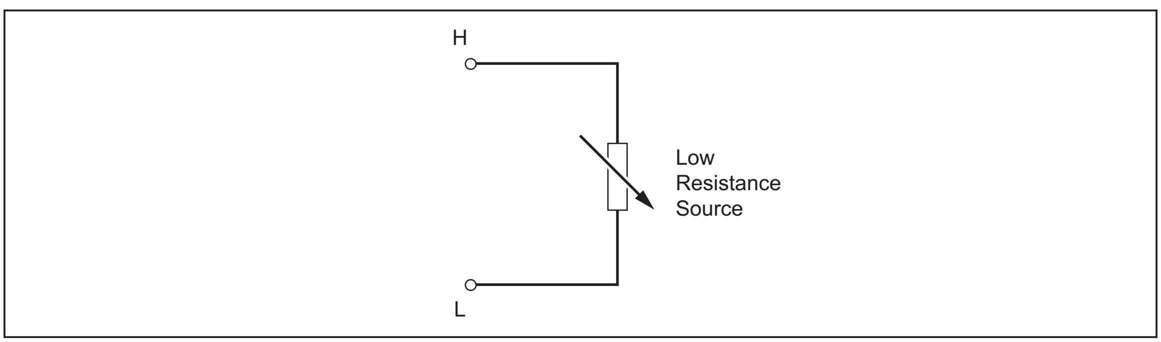
Figure 11. Active Leakage Current Circuits on the IFC Board



Substitute Leakage Current (LVR Board)

In substitute leakage current mode, the only low-resistance decade connects between the H and L terminals. The CPU sets a resistance value that lets current flow from the preset value according to the nominal power line voltage. See Figure 12.

Figure 12. Substitute Leakage Current from the LVR Board



Calibration

The Calibration process includes two procedures:

- Verification of the DUT to test that each function and range meets its specifications.
- Adjustment of the DUT to meet the performance test ranges. Use the next sections to verify and adjust the Product.

⚠Caution

To prevent Product damage:

- **Do not switch or use the Product outside its operating temperature range.**
- **Connect the DUT to the correct output terminals. There is no way to protect the Product from damage caused by incorrect connections.**
- **Do not plug in banana jacks that are thicker than the terminal inputs. This damages the output terminals.**
- **Whenever possible, use the setup menu to set the ground Lo output terminal (GND U ON setup function).**
- **If original cables are not used for DUT connections, ensure that cables used are suitable for the voltage and current under use. Maximum applied voltage can reach 1500 V and the maximum applied current can reach 30 A ac.**

Calibration Mode

The Product software includes a Product calibration procedure. Use the menus and the user interface to go through the procedure. For the necessary equipment for these procedures, see Table 1. Substitute equipment must meet the same minimum use specifications.

Table 1. Required Equipment

Item	Equipment
Fluke 8588A or equivalent with 4 test leads	Reference Multimeter
Quadtech MegaΩmeter 1653 or similar, with 3 test leads	Megohmeter
Fluke Calibration 5522A	Multi-product Calibrator

Adjustment Principles

Adjust all or only selected functions of the Product at each listed adjustment point.

Make adjustments in the order defined in the calibration menu. If the menu shows a selected item (for example **METER**) it is not necessary to adjust all ranges defined by the calibration algorithm. If new adjustment of all ranges is not possible (for example, the required standard is not available), confirm old calibration data and then skip that step in the menu.

Note

Interrupt this process at any point of the procedure if necessary. However, this particular process influences parameters of the Product.

Product accuracy is guaranteed when full calibration is done.

The Calibration Menu Summary

The individual sections of the calibration procedure are:

- Ground Bond Resistance (ground bond and loop/line resistance decade)

  Calibration values of 15 partial resistances from 25 mΩ to 2 kΩ.

- Low Resistance Decade

  Calibration values of 32 partial resistances from 100 mΩ to 13 MΩ.

- High Resistance Decade

  Calibration values of 32 partial resistances from 10 kΩ to 100 GΩ.

- Ground Resistance Meters

  Calibration data of the internal voltmeter and ammeter, used in the ground bond function for voltage and current measurements.

- Low Resistance Meters

  Calibration data of the internal voltmeter, used in low-resistance mode for voltage and current measurements.

- High Resistance Meters

  Calibration data of the internal voltmeter and ammeter, used to sense test voltage and current in the high-resistance decade.

- DCV Calibrator

  Calibration data for dc voltage and current ranges in the calibrator block.

- ACV Calibrator

  Calibration data for ac voltage and current ranges in the calibrator block.

- DC Multimeter

  Calibration data for dc voltage and current ranges in the multimeter block.

- AC Multimeter

  Calibration data for ac voltage and current ranges in multimeter block.

- RCD Trip Current

  Calibration data of ammeter and line voltage meter in the RCD function.
- Leakage Current

  Calibration data of internal leakage current ammeter.
- HV Probes

  Calibration constants for 10 kV and 40 kV external probes.
- High Resistance Multiplier

  Calibration constants external option high resistance multiplier.

Access the Calibration Procedure

Use the calibration code to access the Product calibration procedure. The default calibration password is **235**. In **General Setup**, if the calibration password is **0**, access to the calibration procedure unprotected with the password.

To enter the password:

1. Push the **Setup** softkey to open the setup menu.
2. Select **Calibration** and confirm with the **Select** softkey. The Product requests the calibration code.
3. Enter the calibration code with the numerical keypad and push ENTER. If you enter an incorrect calibration code, an error message shows: **Bad calibration code!**
4. When you enter the correct calibration code, the Product shows the calibration menu (see *The Calibration Menu Summary*).

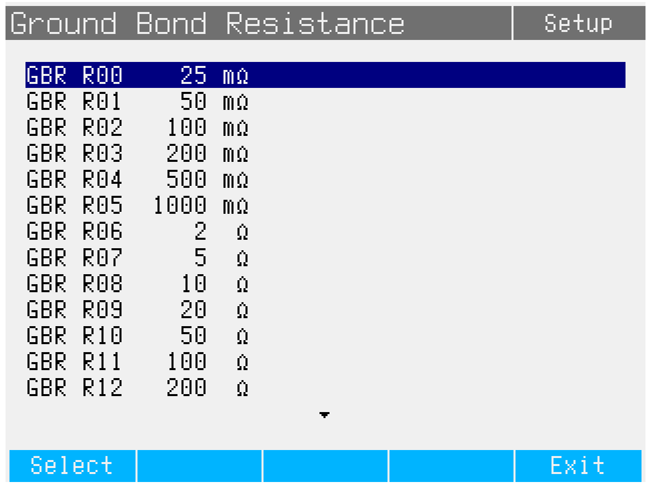
Select the Calibration Type

To select the calibration type:

From the calibration menu, use the cursor keys or the rotary knob to move the cursor through the listed items shown in *The Calibration Menu Summary*.

For example, if you select **Ground Bond Resistance** from the calibration menu, the Ground Bond Resistance screen shows the screen in Figure 13. The screen shows **GBR R00** highlighted. To choose this parameter, push the **Select** softkey.

Figure 13. Ground Bond Resistance Screen



Types of Adjustment Points

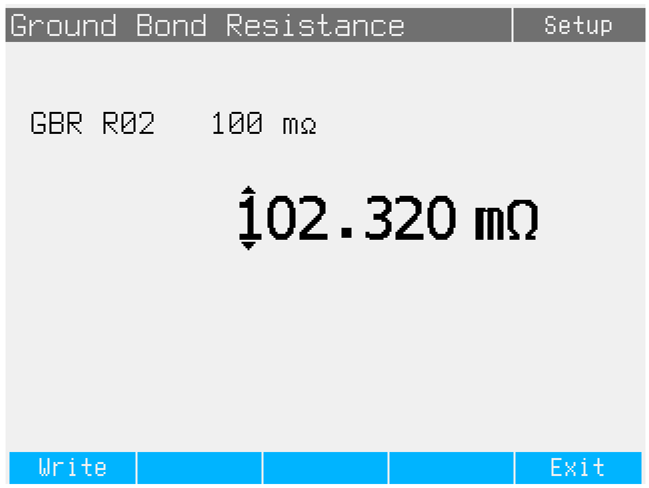
A calibration procedure contains these types of adjustment points:

1. Points where an external standard measures the internal resistance. The standard unit then manually writes and saves this value to the Product. These functions use this system:
   - Ground Bond Resistance
   - Low Resistance Decade
   - High Resistance Decade

For example, in Figure 14, the Ground Bond Resistance screen shows the resistance segment to adjust with this syntax:

- GBR ground bond resistance decade
- R02 ordinal number of the resistance segment
- 100 mΩ nominal value of calibrated resistance segment
- 102.320 mΩ adjustment value of R02 segment

Figure 14. Ground Bond Resistance Decade



2. The Product measures points where the external standard signal is applied to the Product input terminals. Use the cursor keys or the rotary knob to set the value on the display to the value shown on the external standard source. Although a preferred adjustment point is prescribed in the display, any suitable value within the range of the meter is applicable.

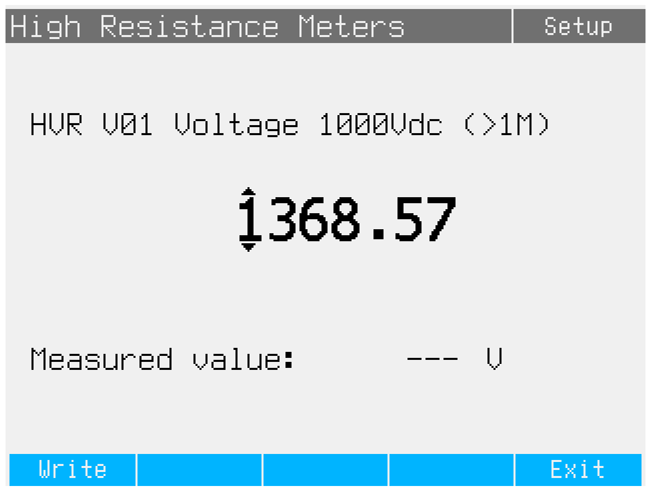
   These functions use this system:

   - High Resistance Meters
   - Low Resistance Meters
   - Ground Bond Resistance Meters
   - RCD Trip Current
   - Leakage Current

For example, in Figure 15, the display indicates the High Resistance Source Voltmeter segment to be adjusted in this syntax:

- HVR High voltage decade
- V01 Voltmeter senses voltage on the decade, range 01
- Measured value Life reading of the High Resistance Voltmeter
- 1368.57 Adjustable calibration value. Set such value to get reading which equals the set output voltage on the external standard.

Figure 15. High Resistance Voltage Screen



3. Points where the Product measures the external standard signal on the input terminals. Do not manually adjust this signal.

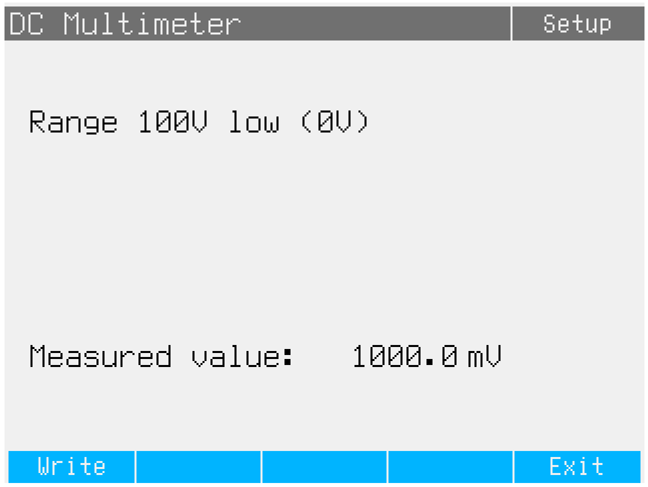
   These functions use this system:

   - DC Multimeter
   - AC Multimeter

For example, in Figure 16, the display shows the DC Multimeter range, 100V, adjustment of the zero point (dc offset) in this syntax:

- Range 100V low (0 V) DC range 100 V, nominal calibration point 1000 mV
- Measured value Internal voltmeter reads (1000.0 mV)

Figure 16. DC Multimeter Screen



4. Points where an external standard meter measures a Product-generated signal. Use the cursor keys or the rotary knob to set the value on the display to a nominal value.

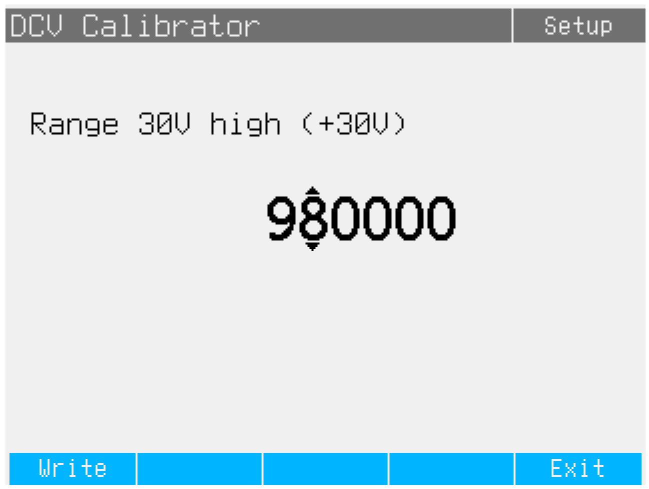
   These functions use this system:

   - DCV Calibrator
   - ACV Calibrator

For example, in Figure 17, the display identifies the active resistance segment in this syntax:

- Range 30V high (+30 V) — DC voltage range 30 V of internal voltage calibrator, nominal value +30 V dc
- 980000 — Adjustable calibration value. Set the value to get the exact output voltage +30.000 V on a standard voltmeter

Figure 17. DCV Screen



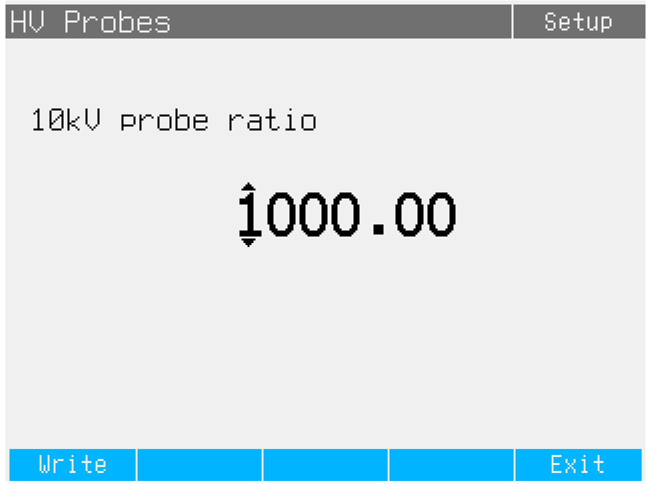
5. Points where the calibration procedure asks for no value. Find the calibration value by any suitable method or use the value from a calibration certificate. Use the cursor keys or the rotary knob to adjust the value to write down.

   These functions use this system:

   - HV Probes
   - High Resistance Multiplier

For example, Figure 18 shows a 10 kV HV Probes screen.

Figure 18. 10 kV Probe Screen



Identification of the active resistance segment shows in this syntax:

10kV probe ratio	Dividing constant K for 10 kV probe
1000.0	Adjustment value of dividing ratio in terms of 1/K

At the bottom of the screen are two softkeys:

Write	New value added into memory, the old value is irreversibly lost.
Exit	Current calibration process terminates. When pushed, the calibration memory holds the last value (old or new value entered) and the Product returns to the calibration menu. It is not necessary to adjust all ranges. Adjustment of only selected ranges is possible.

Terminate the Calibration Process

You can terminate the calibration process under any of these instances:

- Complete or partial adjustment (for example, specific steps in the calibration procedure) is complete after new calibration data was entered.
- Calibration is started but no calibration data is entered.

Push the **Exit** softkey to go to the previous level of the calibration menu.

Note

Some calibration functions require that the output terminals be switched on manually. Push OPER *to activate the output terminals. Description of this repeated step is omitted in the procedures listed in this manual.*

Adjustment Procedures

See the subsequent sections for adjustment procedures.

Note

Depending on the firmware version and Product updates, nominal accuracy shown on the display during the calibration procedures can differ from the values shown in the tables in these sections.

Ground Bond Resistance Adjustment

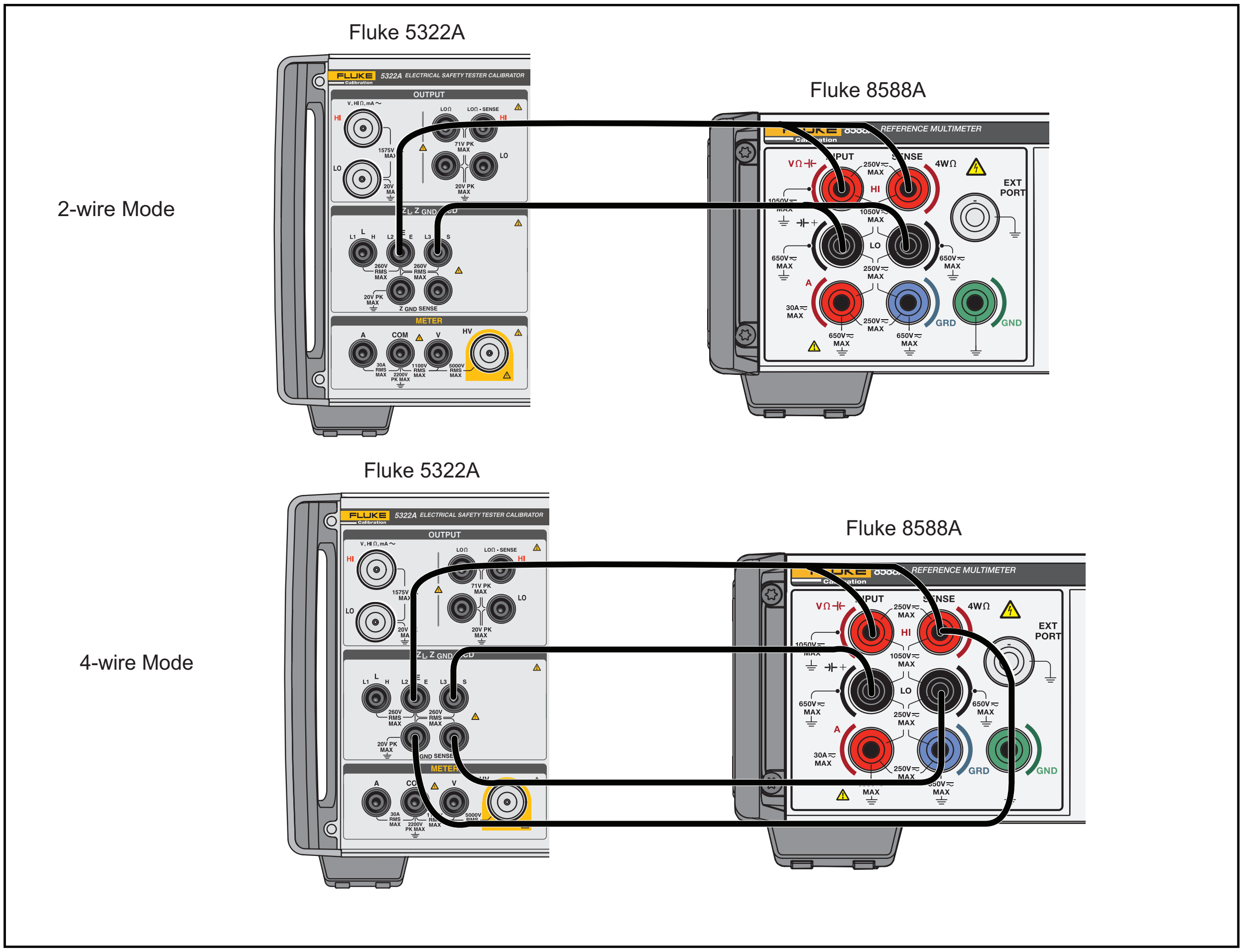
Adjust the ground bond resistance decade with the front-panel interface. Calibration is based on dc 4W measurements of resistance of all partial resistors in both four-wire (4W) and two-wire (2W) modes, separately. Adjustment uses low-level signals. The number of test points differs in two-wire mode and four-wire mode.

Use the 8588A or similar multimeter for these procedures.

To adjust the Product:

1. Make the connections shown in Figure 19.

Figure 19. Ground Bond Resistance Adjustment Connections



2. Push the Product **Setup** softkey.
3. Select **Calibration** and push the **Select** softkey.
4. From the calibration menu, select **Ground Bond Resistance 2W** or **Ground Bond Resistance 4W** and push the **Select** softkey.
5. The list of calibration points shows in this format:

   GBR2W(4W) Rxx nominal resistance value

   where GBR is symbol of the function

   Rxx is ordinal number of the point
6. Select and measure the first resistance position with a standard multimeter.
7. Write down the new adjustment value. Use the cursor keys and the numerical keypad to enter the new adjustment value.
8. Confirm the value with the **Write** softkey. To not change the adjustment value, push the **Exit** softkey to keep the original value.
9. Go through all steps (constants) in Table 2 and make a new adjustment for each of the resistors.
10. When finished with adjustment, push the **Exit** softkey repeatedly until the basic display shows.

This completes this part of the adjustment.

Table 2. 2-Wire (2W) Adjustment Points

Nominal Resistance Value	Position		Required Accuracy of Adjustment	Lower Limit	Upper Limit
25 mΩ	R00	GBR2W	±3 mΩ	-50 %	+50 %
55 mΩ	R01	GBR2W	±3 mΩ	-50 %	+50 %
90 mΩ	R02	GBR2W	±3 mΩ	-30 %	+30 %
330 mΩ	R03	GBR2W	±5 mΩ	-20 %	+20 %
500 mΩ	R04	GBR2W	±5 mΩ	-10 %	+10 %
900 mΩ	R05	GBR2W	±5 mΩ	-10 %	+10 %
1.7 Ω	R06	GBR2W	±7 mΩ	-10 %	+10 %
4.7 Ω	R07	GBR2W	±10 mΩ	-10 %	+10 %
9 Ω	R08	GBR2W	±20 mΩ	-10 %	+10 %
17 Ω	R09	GBR2W	±30 mΩ	-10 %	+10 %
47 Ω	R10	GBR2W	±70 mΩ	-10 %	+10 %
90 Ω	R11	GBR2W	±100 mΩ	-10 %	+10 %

Table 2. 2-Wire (2W) Adjustment Points (cont.)

Nominal Resistance Value	Position		Required Accuracy of Adjustment	Lower Limit	Upper Limit
170 Ω	R12	GBR2W	±200 mΩ	-10 %	+10 %
470 Ω	R13	GBR2W	±500 mΩ	-10 %	+10 %
900 Ω	R14	GBR2W	±1 Ω	-10 %	+10 %
1700 Ω	R15	GBR2W	±2 Ω	-10 %	+10 %

Table 3. 4-wire (4W) Adjustment Points

Nominal Resistance Value	Position		Required Accuracy of Adjustment	Lower Limit	Upper Limit
15 mΩ	R00	GBR4W	±0.1 mΩ	-50 %	+50 %
45 mΩ	R01	GBR4W	±0.2 mΩ	-50 %	+50 %
90 mΩ	R02	GBR4W	±0.4 mΩ	-30 %	+30 %
330 mΩ	R03	GBR4W	±0.5 mΩ	-20 %	+20 %
500 mΩ	R04	GBR4W	±0.8 mΩ	-10 %	+10 %
900 mΩ	R05	GBR4W	±1 mΩ	-10 %	+10 %
1.7 Ω	R06	GBR4W	±2 mΩ	-10 %	+10 %
4.7 Ω	R07	GBR4W	±5 mΩ	-10 %	+10 %
9 Ω	R08	GBR4W	±15 mΩ	-10 %	+10 %
17 Ω	R09	GBR4W	±30 mΩ	-10 %	+10 %
47 Ω	R10	GBR4W	±70 mΩ	-10 %	+10 %
90 Ω	R11	GBR4W	±100 mΩ	-10 %	+10 %
170 Ω	R12	GBR4W	±200 mΩ	-10 %	+10 %
470 Ω	R13	GBR4W	±500 mΩ	-10 %	+10 %
900 Ω	R14	GBR4W	±1 Ω	-10 %	+10 %
1700 Ω	R15	GBR4W	±2 Ω	-10 %	+10 %
1 mΩ	R16	GBR4W	±0.05 mΩ	-20%	+20 %

The maximum acceptable deviation of the calibration value to the nominal value of each resistor is in the Lower Limit and Upper Limit columns. If any of the partial resistors is out of shown limits, it must be replaced. Replacement should be done only by an authorized service center.

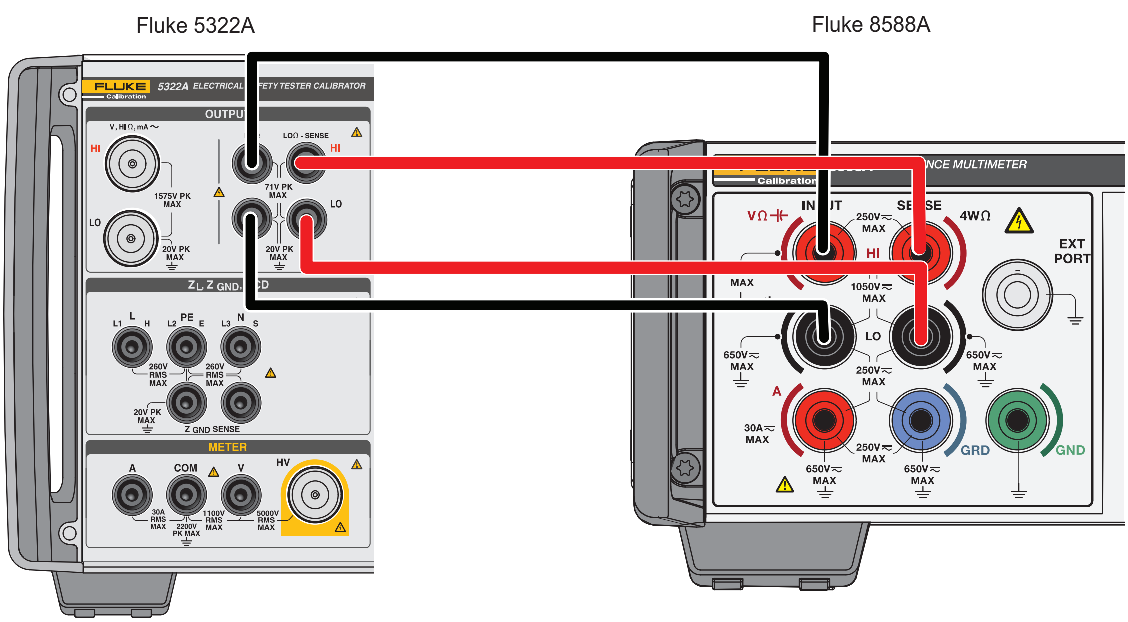
Low-Resistance Source Adjustment

Adjust the low-resistance source with the front-panel keyboard. Adjustment is based on the dc 4-wire measurements of resistance in recommended test points.

To adjust the Product, see Table 4:

1. Make the 4-wire connections shown in Figure 20.

Figure 20. Low-Resistance Source Adjustment Connections



2. Set the multimeter to the 4W or 4W TRUE function.
3. Push the **Setup** softkey on the Product.
4. Select **Calibration** and confirm with the **Select** softkey.
5. From the Calibration menu, select **Low resistance source** and push the **Select** softkey.

   The list of adjustment points shows in this format:

   LVR Rxx nominal resistance value

   where: LVR is symbol of the function

   Rxx is ordinal number of the point

6. Select the first position with the nominal value 0.01 Ω.
7. Measure the value with the multimeter.
8. Write down the new value. Use the cursor keys and the numerical keypad to enter the new value.

9. Confirm the value with the **Write** softkey. If there is no need to change value, push the **Exit** softkey to keep the original value.
10. Go through all positions in the list and make an adjustment for each resistor.
11. When you finish adjustment, push the **Exit** softkey repeatedly until the basic display with the Low resistance source function shows.

    This completes this part of the adjustment.

Table 4. Low Resistance Source Adjustment Points

Position	Adjustment Point	Nominal Calibration Value	Required Accuracy of Adjustment	Lower Limit	Upper Limit
LVR00	0.01 Ω	0.01 Ω	0.3 %	-30 %	+30 %
LVR01	0.14 Ω	0.1 Ω	1.0 %	-50 %	+50 %
LVR02	0.24 Ω	0.2 Ω	0.2 %	-20 %	+20 %
LVR03	0.43 Ω	0.4 Ω	0.1 %	-10 %	+10 %
LVR04	0.77 Ω	0.8 Ω	0.02 %	-10 %	+10 %
LVR05	1 Ω	1.0 Ω	0.02 %	-10 %	+10 %
LVR06	1.9 Ω	2.0 Ω	0.02 %	-10 %	+10 %
LVR07	3.6 Ω	3.4 Ω	0.02 %	-10 %	+10 %
LVR08	5.4 Ω	6.0 Ω	0.02 %	-10 %	+10 %
LVR09	10 Ω	10 Ω	0.02 %	-10 %	+10 %
LVR10	18 Ω	20 Ω	0.02 %	-10 %	+10 %
LVR11	36 Ω	33 Ω	0.02 %	-10 %	+10 %
LVR12	55 Ω	55 Ω	0.02 %	-10 %	+10 %
LVR13	100 Ω	100 Ω	0.02 %	-10 %	+10 %
LVR14	190 Ω	200 Ω	0.02 %	-10 %	+10 %
LVR15	360 Ω	400 Ω	0.02 %	-10 %	+10 %
LVR16	600 Ω	600 Ω	0.02 %	-10 %	+10 %
LVR17	1 kΩ	1 000 Ω	0.02 %	-10 %	+10 %
LVR18	1.9 kΩ	2 000 Ω	0.02 %	-10 %	+10 %
LVR19	3.5 kΩ	3 500 Ω	0.02 %	-10 %	+10 %
LVR20	7.1 kΩ	6 800 Ω	0.02 %	-10 %	+10 %
LVR21	11 kΩ	11 000 Ω	0.02 %	-10 %	+10 %
LVR22	20 kΩ	20 000 Ω	0.05 %	-10 %	+10 %
LVR23	40 kΩ	40 000 Ω	0.05 %	-10 %	+10 %

Table 4. Low Resistance Source Adjustment Points (cont.)

Position	Adjustment Point	Nominal Calibration Value	Required Accuracy of Adjustment	Lower Limit	Upper Limit
LVR24	65 kΩ	70 000 Ω	0.05 %	-10 %	+10 %
LVR25	100 kΩ	100 000 Ω	0.1 %	-10 %	+10 %
LVR26	200 kΩ	200 000 Ω	0.1 %	-10 %	+10 %
LVR27	400 kΩ	400 000 Ω	0.1 %	-10 %	+10 %
LVR28	760 kΩ	700 000 Ω	0.2 %	-10 %	+10 %
LVR29	1000 kΩ	1 000 000 Ω	0.2 %	-10 %	+10 %
LVR30	1.9 MΩ	1 900 000 Ω	0.5 %	-10 %	+10 %
LVR31	3.2 MΩ	3 200 000 Ω	0.5 %	-10 %	+10 %
LVR32	5.4 MΩ	5 400 000 Ω	1.0 %	-10 %	+10 %
LVR33	8.1 MΩ	8 100 000 Ω	1.0 %	-10 %	+10 %
LVR34	12 MΩ	12 000 000 Ω	1.0 %	-20 %	+20 %
LVR35	17 MΩ	17 000 000 Ω	1.0 %	-20 %	+20 %
LVR36	21 MΩ	21 000 000 Ω	1.0 %	-20 %	+20 %

Once you start the process, adjust all partial resistors to meet and keep specified accuracy.

The maximum acceptable deviation of the calibration value to the nominal value of each resistor is in the Lower Limit and Upper Limit columns. If any of the partial resistors is out of shown limits, it must be replaced. Replacement should be done only by an authorized service center.

High Resistance Source Adjustment 5 kV (Optional)

Fully adjust the high-resistance source with the front panel keyboard. Calibration is based on dc measurements of resistance in the listed test points, see Table 5. Part of the adjustment tests the voltmeter and adjusts an external option, Resistance multiplier, respectively.

To adjust the Product, see Figure 21 and Figure 22:

1. Connect the Product to the 1653 (for values above 10 MΩ) or to the 8588A (for values <10 MΩ):

Figure 21. High Resistance Source Adjustment for ≥10 ΩM Connections

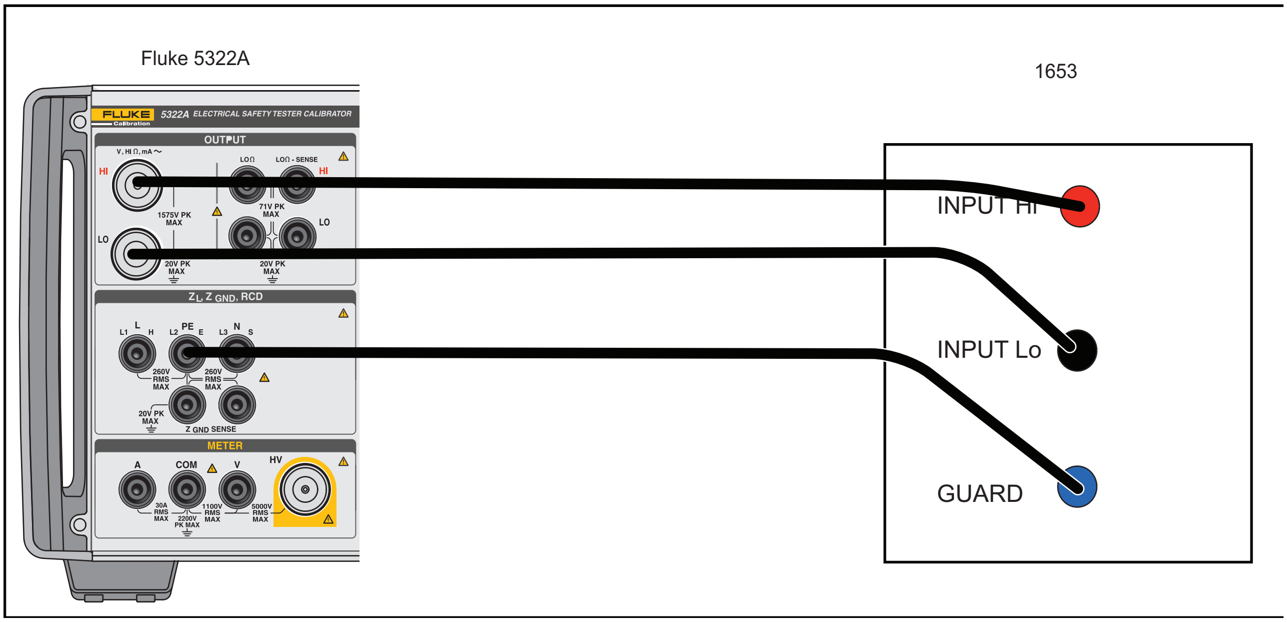
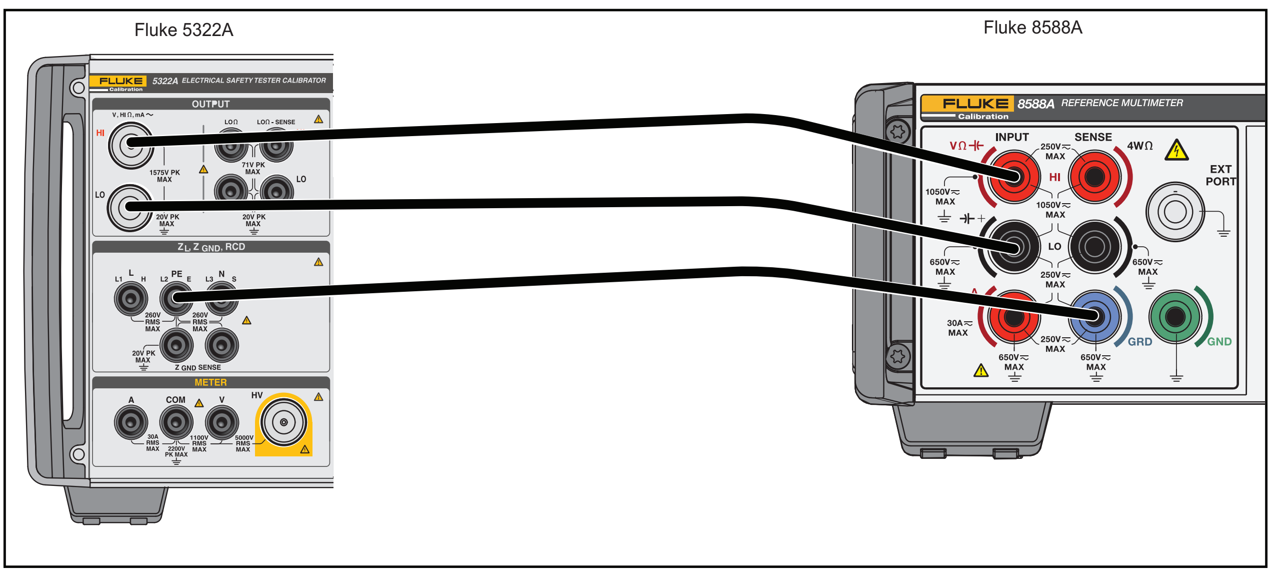


Figure 22. High Resistance Source Adjustment for <10 ΩM Connections



2. Push the **Setup** softkey on the Product.
3. Select **Calibration** and confirm with the **Select** softkey.
4. From the calibration menu, highlight **High Resistance Source** and push ENTER.

   The list of adjustment points appears in format:

   HVR Rxx nominal resistance value

   Where: HVR is a symbol of the function

   Rxx is an ordinal number of the point
5. Select the first position with a nominal value of 9.1 kΩ.
6. Measure its value with standard meter.
7. Write down the new value. Use the cursor keys and the numerical keypad to enter the new value.
8. Confirm the value with the **Write** softkey. If there is no need to change the value, push the **Exit** softkey to keep the original value.
9. Go through all of the constants in the table and make new adjustments for each resistor.
10. When finished with the adjustment, push the **Exit** softkey repeatedly until the basic display shows the Low resistance source function.

This completes this part of the adjustment.

Table 5. High Resistance Source Adjustment Points

Nominal Value	Position	Required Accuracy of Adjustment	Lower Limit	Upper Limit
9.1 kΩ	HVR00	0.02 %	-5 %	+5 %
18 kΩ	HVR01	0.02 %	-5 %	+5 %
36 kΩ	HVR02	0.02 %	-5 %	+5 %
53 kΩ	HVR03	0.02 %	-5 %	+5 %
100 kΩ	HVR04	0.02 %	-5 %	+5 %
195 kΩ	HVR05	0.02 %	-5 %	+5 %
380 kΩ	HVR06	0.02 %	-5 %	+5 %
730 kΩ	HVR07	0.02 %	-5 %	+5 %
1.4 MΩ	HVR08	0.05 %	-5 %	+5 %
2.8 MΩ	HVR09	0.05 %	-5 %	+5 %
5.4 MΩ	HVR10	0.05 %	-5 %	+5 %
10.0 MΩ	HVR11	0.05 %	-5 %	+5 %

Table 5. High Resistance Source Adjustment Points (cont.)

Nominal Value	Position	Required Accuracy of Adjustment	Lower Limit	Upper Limit
20.0 MΩ	HVR12	0.1 %	-10 %	+10 %
40.0 MΩ	HVR13	0.1 %	-10 %	+10 %
78.0 MΩ	HVR14	0.1 %	-10 %	+10 %
150 MΩ	HVR15	0.1 %	-10 %	+10 %
287 MΩ	HVR16	0.2 %	-10 %	+10 %
530 MΩ	HVR17	0.2 %	-10 %	+10 %
900 MΩ	HVR18	0.2 %	-10 %	+10 %
1.4 GΩ	HVR19	0.2 %	-10 %	+10 %
2.9 GΩ	HVR20	0.5 %	-10 %	+10 %
5.4 GΩ	HVR21	0.5 %	-10 %	+10 %
10 GΩ	HVR22	0.5 %	-10 %	+10 %
18 GΩ	HVR23	0.5 %	-10 %	+10 %
33 GΩ	HVR24	1.0 %	-10 %	+10 %
50 GΩ	HVR25	1.0 %	-10 %	+10 %

Once the process starts, adjust all partial resistors to keep the specified accuracy.

The maximum acceptable deviation of the calibration value to the nominal value of each resistor is in the Lower Limit and Upper Limit columns. If any of the partial resistors is out of the shown limits, it must be replaced. Replacement should be done only by an authorized service center.

High Resistance Source Adjustment 1.5 kV

Fully adjust the low resistance source with the front panel keyboard. Calibration is based on dc measurements of resistance in the test points in Table 6. Part of the adjustment sets the test voltage voltmeter and the adjustment of an external option, Resistance multiplier, respectively.

Use the 8588A and 1653 or similar for these procedures, see Table 6.

1. Connect the Product to the 1653 (for values >10 MΩ) or to 8588A (for values ≤10 MΩ), see Figure 21.
2. Push the **Setup** softkey on the Product.
3. Select **Calibration** and confirm with the **Select** softkey.
4. From the calibration menu, highlight **High Resistance Source** and push ENTER.

   The list of adjustment points shows in this format:

HVR Rxx nominal resistance value

where HVR is a symbol of the function,

Rxx is the ordinal number of the point

5. Select the first position with a nominal value of 10 kΩ.
6. Measure its value with a standard meter.
7. Write down the new value. Use the cursor keys and the numerical keypad to enter the new value.
8. Confirm the value with the **Write** softkey. If there is no need to change the value, push the **Exit** softkey to keep the original value.
9. Adjust each of the constants in the table.
10. When finished with the adjustment, push the **Exit** softkey repeatedly until the basic display with the Low resistance source function shows.

This completes this part of the adjustment.

Table 6. High Resistance Source Adjustment for 1.5 kV Adjustment Points

Nominal Value	Position	Required Accuracy of Adjustment	Lower Limit	Upper Limit
10 kΩ	HVR00	0.02 %	-5 %	+5 %
18 kΩ	HVR01	0.02 %	-5 %	+5 %
33 kΩ	HVR02	0.02 %	-5 %	+5 %
44 kΩ	HVR03	0.02 %	-5 %	+5 %
100 kΩ	HVR04	0.02 %	-5 %	+5 %
180 kΩ	HVR05	0.02 %	-5 %	+5 %
340 kΩ	HVR06	0.02 %	-5 %	+5 %
480 kΩ	HVR07	0.02 %	-5 %	+5 %
930 kΩ	HVR08	0.05 %	-5 %	+5 %
1.9 MΩ	HVR09	0.05 %	-5 %	+5 %
3.6 MΩ	HVR10	0.05 %	-5 %	+5 %
3.5 MΩ	HVR11	0.05 %	-5 %	+5 %
10.7 MΩ	HVR12	0.1 %	-10 %	+10 %
20.8 MΩ	HVR13	0.1 %	-10 %	+10 %
40.6 MΩ	HVR14	0.1 %	-10 %	+10 %
40.6 MΩ	HVR15	0.1 %	-10 %	+10 %
103 MΩ	HVR16	0.2 %	-10 %	+10 %
206 MΩ	HVR17	0.2 %	-10 %	+10 %
400 MΩ	HVR18	0.2 %	-10 %	+10 %
390 MΩ	HVR19	0.2 %	-10 %	+10 %
1.0 GΩ	HVR20	0.5 %	-10 %	+10 %
1.8 GΩ	HVR21	0.5 %	-10 %	+10 %
2.7 GΩ	HVR22	0.5 %	-10 %	+10 %
5.6 GΩ	HVR23	0.5 %	-10 %	+10 %
100 GΩ	HVR24	1.0 %	-10 %	+10 %

Once you start the process, adjust all partial resistors to meet and keep specified accuracy.

The maximum acceptable deviation of the calibration value to the nominal value of each resistor is in the Lower Limit and Upper Limit columns. If any of the partial resistors is out of shown limits, it must be replaced. Replacement should be done only by an authorized service center.

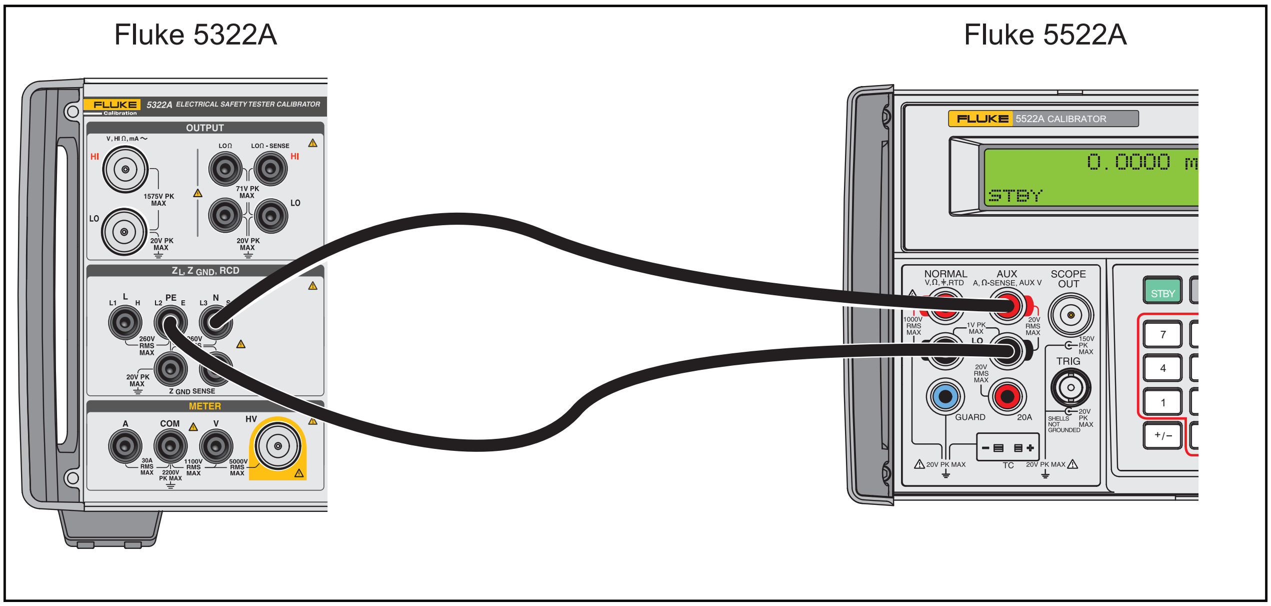
Ground Bond Resistance Meters Adjustment

Adjust the internal voltmeter and ammeter with an external multifunction calibrator. To set the two constants used to adjust the test voltage auxiliary voltmeter, use the subsequent procedure.

To adjust the Product, see Figure 23:

1. Connect the current output of the 5322A to the ZGND PE and N terminals.

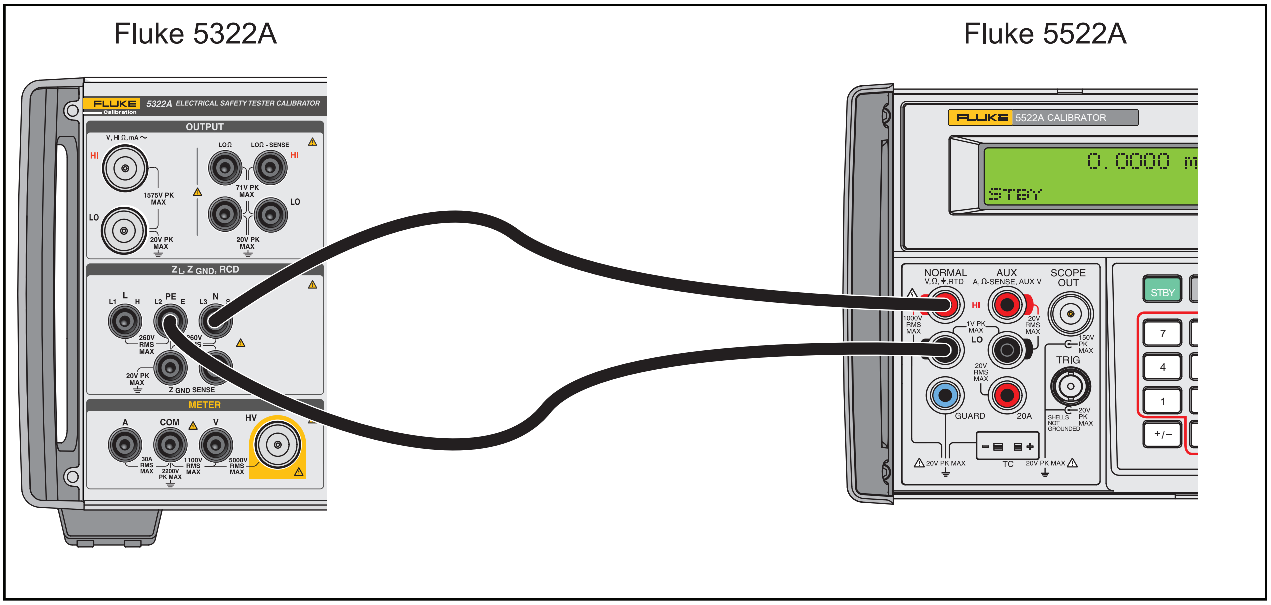
Figure 23. Ground Resistance Souce Meters Adjustment Connection 1



2. Select **Ground Resistance Meters** from the calibration menu and push the **Select** softkey.
3. Select **GBR I01 Test Current 2AacL** and push the **Select** softkey.
4. Set the output voltage to 2 AAC on the 5522A and switch the output terminals ON.
5. Use the rotary knob or cursor keys to set the Product to show 2.00 A. Push the **Write** softkey to confirm the new adjustment value.
6. Repeat the same procedure for the next items: GBR I03, I04, I05, I07, I08, I09, and I10.
7. Disconnect the circuit.

8. Connect the voltage output of the 5522A to the ZGND PE and N terminals. See Figure 24.

Figure 24. Ground Resistance Meters Adjustment Connection 2



9. Select **GBR V01 Test Voltage 23 VacL (Open)** and push the **Select** softkey.
10. Set the output voltage to 100 V dc on the 5522A and switch the output terminals ON.
11. Use the rotary knob or cursor keys to adjust the value to 23.0 V.
12. Repeat step 11 for the next position, **GBR V02 230A acH** with the requested voltage of 230.0 V.
13. Push the **Write** softkey to confirm new adjustment value.

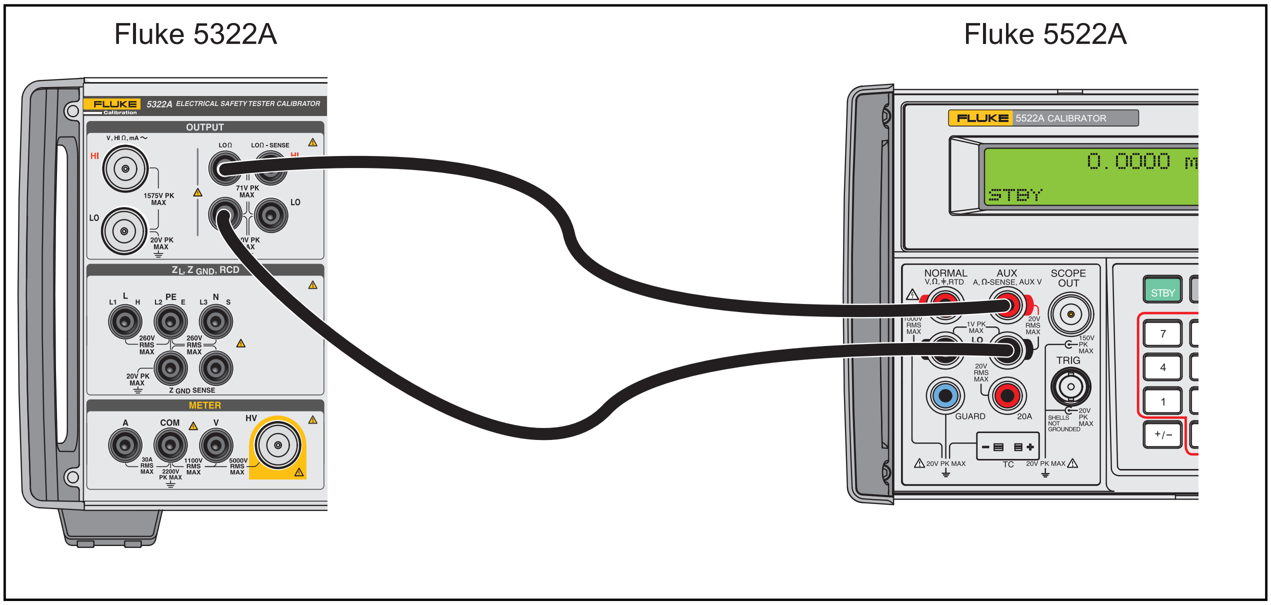
This completes this part of the adjustment.

Low Resistance Source Meters Adjustment

To adjust the low resistance meters, see Figure 25:

1. Connect the 5522A to the OUTPUT HIΩ HI and LO terminals.

Figure 25. Low Resistance Source Meters Adjustment Connections 1

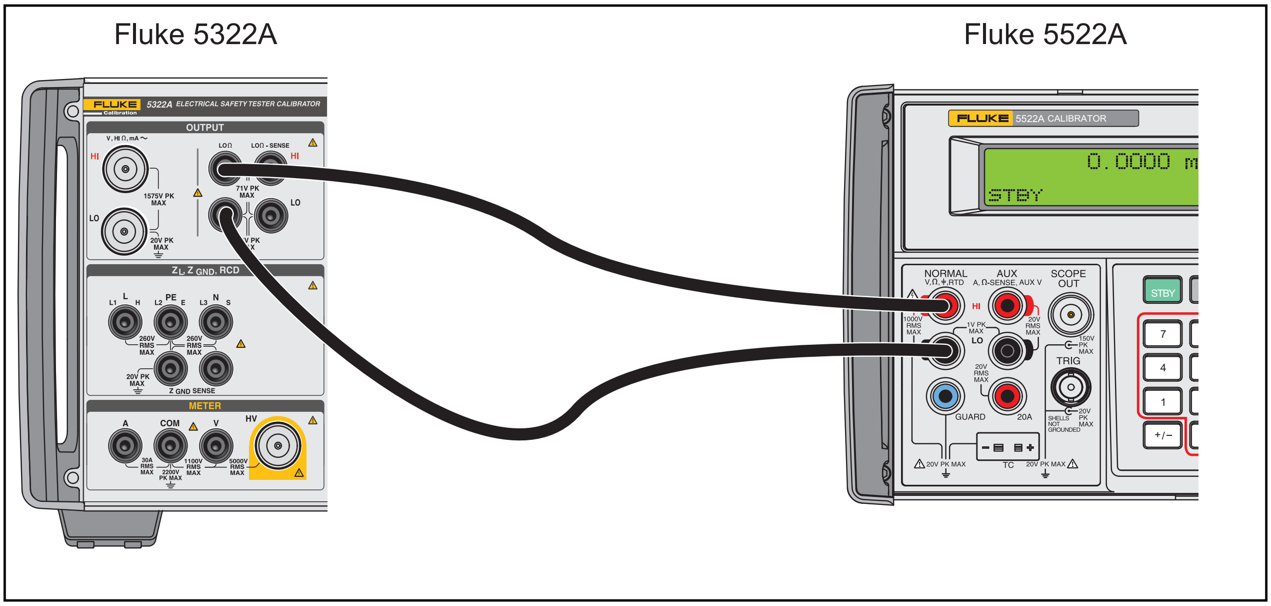


2. Select **Low Resistance Meters** from the calibration menu and push the **Select** softkey.
3. Select **LVR I01 Current 1Adc** and push the **Select** softkey.
4. Set the output current on the 5522A to 1 A dc and switch the output terminals ON.
5. Use the rotary knob or cursor keys to set the value of the Product to show 1.00 A.
6. Push the **Write** softkey to confirm the new adjustment value.

To set the required constants to adjust the test voltage auxiliary voltmeter:

1. Connect the 5522A to the OUTPUT HIΩ HI and LO terminals of the Product, see Figure 26.

Figure 26. Low Resistance Source Meters Adjustment Connections 2



2. On the Product, highlight **Low Resistance Meters** from calibration menu and push the **Select** softkey.
3. Select **LVR V01 Voltage 1Vdc** and push the **Select** softkey.
4. Set the output voltage to 1 V dc on the 5522A and switch the output terminals ON.
5. On the Product, use the rotary knob or cursor keys to set the value to 45.0 V.
6. Push the **Write** softkey to confirm the new adjustment value.
7. Repeat step 6 for the next three levels: V03 5 V dc, V04 15 V dc, and V05 50 V dc. Use the dc output voltage from the 5522A.

This completes this part of the adjustment.

High Resistance Source Meters 5 kV Adjustment (Optional)

Adjustment of High Resistance Source Meters 5 kV consists of these steps:

1. Voltmeter adjustment HVR V01-HVR V09
2. Ammeter adjustment HVR I01
3. 10 GΩ Input resistance calibration

Voltmeter adjustment HVR V01-HVR V09

Use an external high voltage dc source to adjust the internal voltmeter of the Product. This procedure adjusts the constants in the voltage range 1100 V to 6000 V.

To adjust the 5 kV high resistance meters with a high voltage source, see Figure 27:

1. Connect the high voltage source to the OUTPUT HIΩ HI and LO terminals of the Product.
2. Connect the high voltage probe input parallel to the high voltage source output terminals.
3. Set the multimeter to dc voltage and connect it to the high voltage probe output. Use the Hi Ω HI and HiΩ LO output terminals on the Product.
4. Select **High Resistance Meters** from the calibration menu and push the **Select** softkey.
5. Select **HVR 01 Offset 1100Vdc (1M)** and push the **Select** softkey.
6. On the high voltage source, set the output voltage to 0.0 V dc and switch the Product output terminals to ON.
7. Use the rotary knob or cursor keys to set the value to 1000 V.
8. Push **Write** to confirm the new adjustment value.
9. Select **HVR 02 Voltage 1100Vdc (1M)** and push the **Select** softkey.
10. Set the output voltage to 1100 V dc on the high voltage source and switch the output terminals ON.
11. Use the rotary button or cursor keys to set the Product value to 1000 V.
12. Push the **Write** softkey to confirm the new adjustment value.
13. Repeat this process with the other voltage ranges in combination with a different set resistances, see Table 7.

Figure 27. High Resistance Source Meters 5 kV Adjustment Connections

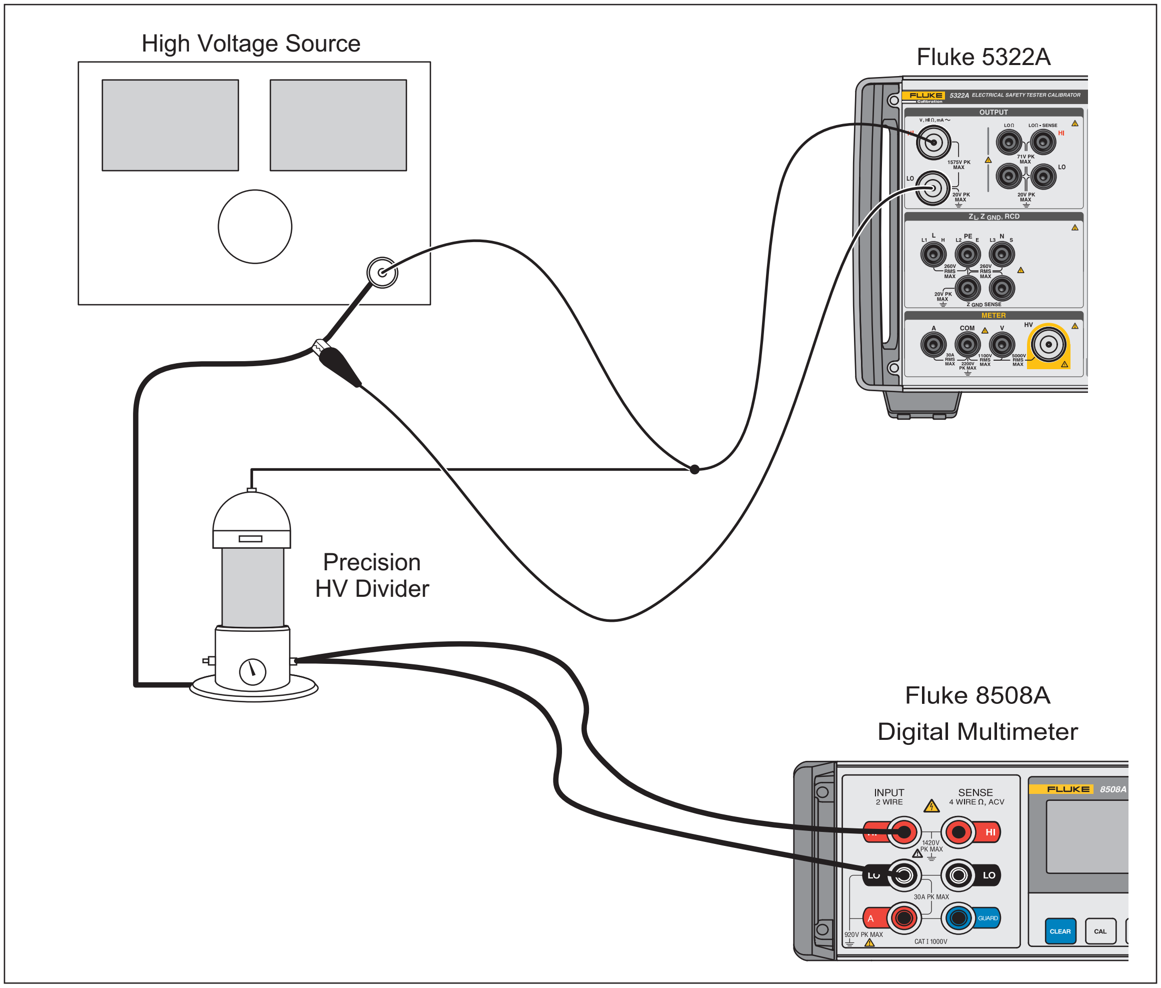


Table 7. Adjustment - High Resistance Meters 5 kV Adjustment

Adjustment Point	Output Voltage	Resistance Condition[1]	Calibration Constant
HVR V01	0.0 V dc	1 MΩ	Offset
HVR V01	1100 V dc	1 MΩ	Slope
HVR V02	0.0 V dc	10 MΩ	Offset
HVR V02	2500 V dc	10 MΩ	Slope
HVR V03	0.0 V dc	1.4 GΩ	Offset
HVR V03	6000 V dc	1.4 GΩ	Slope
HVR V04	0.0 V dc	2.5 GΩ	Offset
HVR V04	6000 V dc	2.5 GΩ	Slope
HVR V05	0.0 V dc	5 GΩ	Offset
HVR V05	6000 V dc	5 GΩ	Slope
HVR V06	0.0 V dc	10 GΩ	Offset
HVR V06	6000 V dc	10 GΩ	Slope
HVR V07	0.0 V dc	22 GΩ	Offset
HVR V07	6000 V dc	22 GΩ	Slope
HVR V08	0.0 V dc	50 GΩ	Offset
HVR V08	6000 V dc	50 GΩ	Slope
HVR V09	0.0 V dc	100 GΩ	Offset
HVR V09	6000 V dc	100 GΩ	Slope

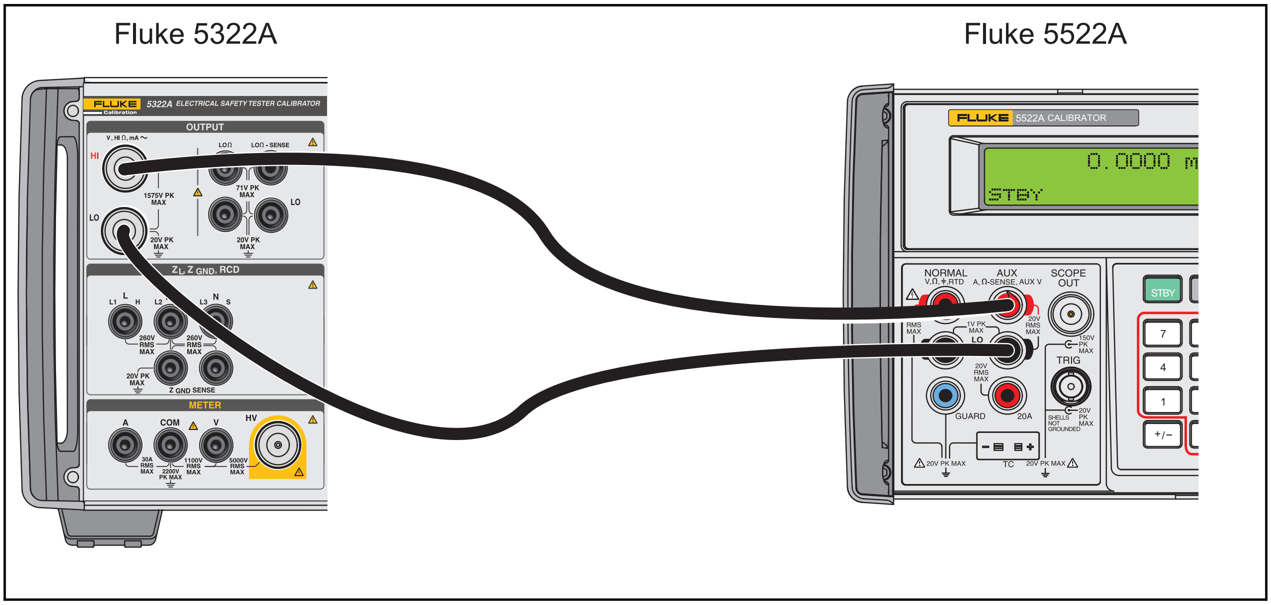
[1] The resistance condition in the table is for reference only.

Ammeter Adjustment HVR I01

One constant must be set to 20 mA dc for the current range. To adjust the Product:

1. Connect the 5522A to the OUTPUT HIΩ HI and LO terminals of the Product, see Figure 28.
2. Select **HVR I01 Current 20mAdc (Short)** from the calibration menu and push **Select**.
3. On the 5522A, set the output current to 20 mA dc and switch the output terminals ON.
4. Use the rotary knob or cursor keys to set the Product to 20.0 mA.
5. Push the **Write** softkey to confirm the new adjustment value.

Figure 28. High Resistance Meters 5 kV Adjustment Connections



10 GΩ Input Resistance Calibration

The internal voltmeter adjustment of the 5 kV high resistance source procedure requests a measurement of one 10 GΩ resistor.

To adjust the Product:

1. Connect the Product to the 1653, see Figure 21.
2. From the Product calibration menu, highlight **HVR Meter Input Resistance** and push ENTER.
3. Measure the value with a standard meter.
4. Write down the new value. Use the cursor keys and the numerical keypad to enter the new value.
5. Confirm the value with the **Write** softkey. If there is no need to change the value, push the **Exit** softkey to keep the original value.

This completes this part of the adjustment.

High Resistance Source Meters 1.5 kV Adjustment

Adjustment of High Resistance Source Meters 1.5 kV consists of two steps:

1. Voltmeter adjustment HVR V01-HVR V04
2. Ammeter adjustment HVR I01

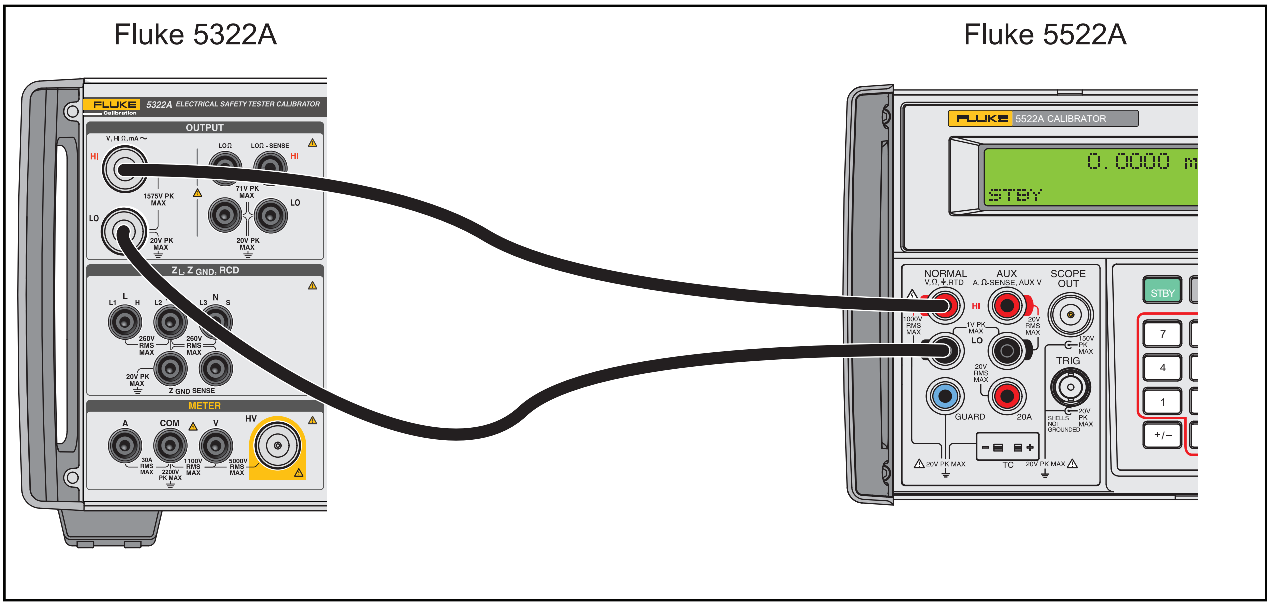
Voltmeter Adjustment HVR V01-HVR V04

Adjustment of the voltage auxiliary voltmeter requires that you set four constants in one voltage range of 1000 V dc.

To make this adjustment:

1. Connect the 5522A or similar to the OUTPUT HIΩ HI and LO terminals, see Figure 29.

Figure 29. High Resistance Source Meters 1.5 kV Adjustment Connections 1



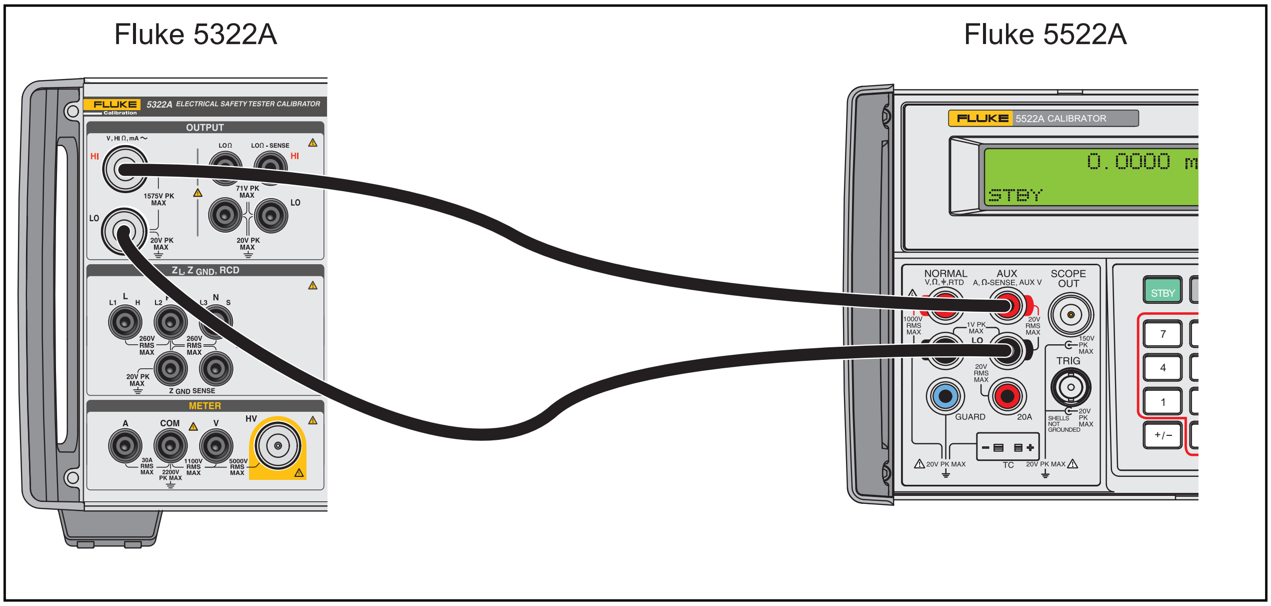
2. Select **High Resistance Meters** from calibration menu and push the **Select** softkey.
3. Select **HVR V01 Offset 1000Vdc (>1M)** and push the **Select** softkey.
4. Set the output voltage at 0.0 V dc on the 5322A and switch the output terminals ON.
5. Use the rotary knob or cursor keys to set the Product to 0.0 V.
6. Push the **Write** softkey.
7. Select **HVR V02 Voltage 1000Vdc (>1M)** and push the **Select** softkey.
8. On the 5522A, set the output voltage to 1000 V dc and switch the output terminals ON.
9. Use the rotary knob or the cursor keys to set the Product to1000.0 V.
10. Push the **Write** softkey.
11. Repeat this procedure similarly for the next two adjustment procedure positions (**HVR V03 Offset 1000Vdc (<1M)** and **HVR V04 Voltage 1000Vdc (<1M)**).

Ammeter Adjustment HVR I01

This procedure requires you to set one constant at 20 mA dc to adjust the test voltage auxiliary voltmeter.

1. Connect the Product to the OUTPUT HIΩ HI and LO terminals, see Figure 30.

Figure 30. High Resistance Meters 1.5 kV Adjustment Connections 2



2. Select **HVR I01 Test current 20mAdc (Short)** from the calibration menu and push the **Select** softkey.
3. Set the output current on the 5522A to 20 mA dc and switch the output terminals ON.
4. Use the rotary knob or cursor keys to set the value to 20.0 mA.
5. Push the **Write** softkey.

This completes this part of the adjustment.

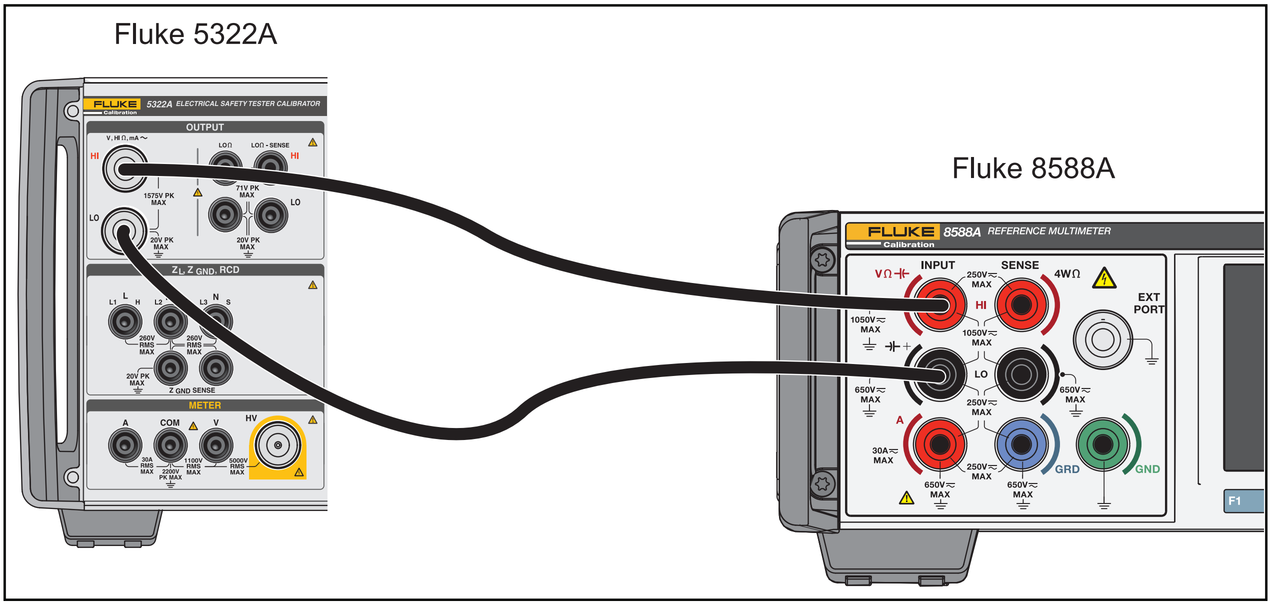
DC Voltage Calibrator Adjustment (Optional)

Calibration consists of adjustments of these ranges: 0.3 V, 3 V, 30 V, 150 V, and 600 V. Each of these has two adjustment points.

To adjust the dc voltage parameter, see Figure 31:

1. Connect a standard multimeter to the Product output terminals.

Figure 31. DC Voltage Adjustment Connections



2. On the Product, from the Setup menu, set the grounding mode to **GND ON**.
3. Set the standard multimeter to the most accurate dc voltage mode.
4. Push the **Setup** softkey on the Product.
5. Highlight **Calibration** and push the **Select** softkey.
6. From the calibration menu, highlight **DCV Calibrator** and push the **Select** softkey. A list of internal ranges shows.

Table 8. DC Voltage Adjustment Points

Nominal Voltage Range	Adjustment Point	Required Accuracy of Adjustment
0.3 V dc	+0.03 V dc low	0.03 %
0.3 V dc	+0.3 V dc high	0.03 %
3 V dc	+0.3 V dc low	0.03 %
3 V dc	+3 V dc high	0.03 %
30 V dc	+3 V dc low	0.03 %
30 V dc	+30 V dc high	0.03 %
150 V dc	+30 V dc low	0.03 %
150 V dc	+150 V dc high	0.03 %
600 V dc	+150 V dc low	0.03 %
600 V dc	+600 V dc high	0.03 %

7. Highlight item **0.03V low (+30 mV)** and push the **Select** softkey. The Product shows the value entered from the last adjustment.
8. Set the value on the standard multimeter to +30.00 mV. Push the **Write** softkey to save the new adjustment value.
9. Do the same procedure for all points in the table.
10. Push the **Exit** softkey to move to a higher level in the calibration menu.

This completes this part of the adjustment.

AC Voltage Calibrator Adjustment (Optional)

Adjustment of the ac voltage calibrator requires adjustment of these ranges: 0.3 V, 3 V, 30 V, 150 V, 300 V, and 600 V. Each range has two adjustment points. Fluke Calibration recommends
55 Hz.

Use the 8588A for this procedure, see Figure 31 and Table 9:

1. Connect a standard multimeter to the Product output terminals.
2. From the Setup menu on the Product, set the grounding mode to **GND ON**.
3. Select **AC Voltage Calibrator** and set the output frequency to 55 Hz.
4. Set the standard multimeter to the most accurate ac voltage mode.
5. Push the **Setup** softkey on the Product.
6. Highlight **Calibration** and push the **Select** softkey.
7. From the calibration menu, highlight **ACV Calibrator** and push the **Select** softkey. A list of internal ranges shows.

Table 9. AC Voltage Calibrator Adjustment Points

Nominal Voltage Range	Adjustment Point	Frequency	Required Accuracy of Adjustment
0.3 V ac	0.03 V ac low	55 Hz	0.03 %
0.3 V ac	0.3 V ac high	55 Hz	0.03 %
3V ac	0.3 V ac low	55 Hz	0.03 %
3V ac	3V ac high	55 Hz	0.03 %
30 V ac	3V ac low	55 Hz	0.03 %
30 V ac	30V ac high	55 Hz	0.03 %
150 V ac	30 V ac low	55 Hz	0.03 %
150 V ac	150 V ac high	55 Hz	0.03 %
300 V ac	150 V ac low	55 Hz	0.03 %
300 V ac	300 V ac high	55 Hz	0.03 %
600 V ac	300 V ac low	55 Hz	0.03 %
600 V ac	600 V ac high	55 Hz	0.03 %

8. Highlight the **0.03 V 55Hz low (30 mV)** adjustment point and push the **Select** softkey. The Product shows the value entered in the last adjustment.
9. Use the cursor keys to set the value to the value shown on the standard multimeter: 30.00 mV.
10. Push the **Write** softkey to save the new value.
11. Do the same procedure all adjustment points.
12. Push the **Exit** softkey to go to a higher level in menu.

This completes this part of the adjustment.

DC Multimeter Adjustment

DC multimeter adjustment consists of these steps:

1. 10 V, 100 V, and 1000 V range adjustment with the 5522A calibrator
2. 5000 V range with a high voltage source, standard divider, and more explained in the subsequent sections.

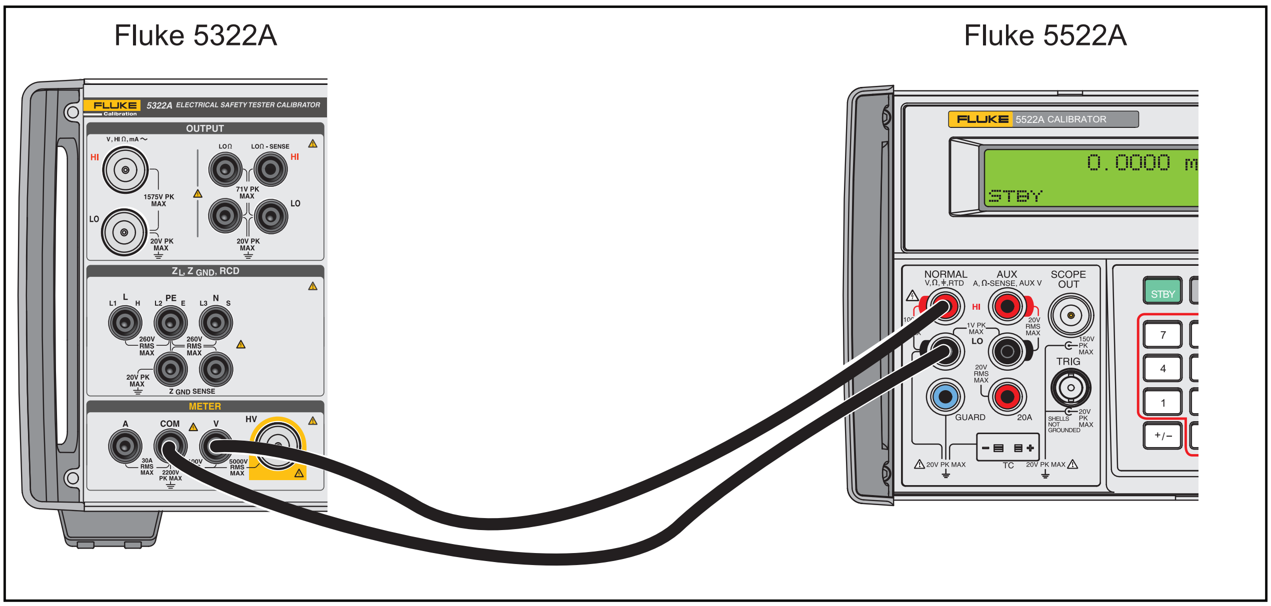
The dc multimeter adjustment procedure has a voltmeter adjustment in four ranges and an ammeter adjustment in 3 ranges.

DC Ranges for 10 V, 100 V, 1000 V Calibration

To adjust these dc ranges:

1. Connect 5522A to the Product output terminals, see Figure 32:

Figure 32. DC Calibration Connections



2. Set the 5522A to V dc mode.
3. Push the **Setup** softkey on the Product.
4. Highlight **Calibration** and push the **Select** softkey.
5. From the calibration menu, highlight **DC Multimeter** and push the **Select** softkey. The list of adjustment points shows.
6. Highlight **10V low (0V)** and push the **Select** softkey.
7. Set the 5522A to 1 V dc and switch the output terminals ON.
8. Make sure the Product reads approximately nominal value.
9. Push the **Write** softkey to save the new adjustment.

10. Go through all of the voltage adjustment points for ranges 10 V, 100 V, and 1000 V. Nominal adjustment voltage is noted in parenthesis.

This completes this part of the adjustment.

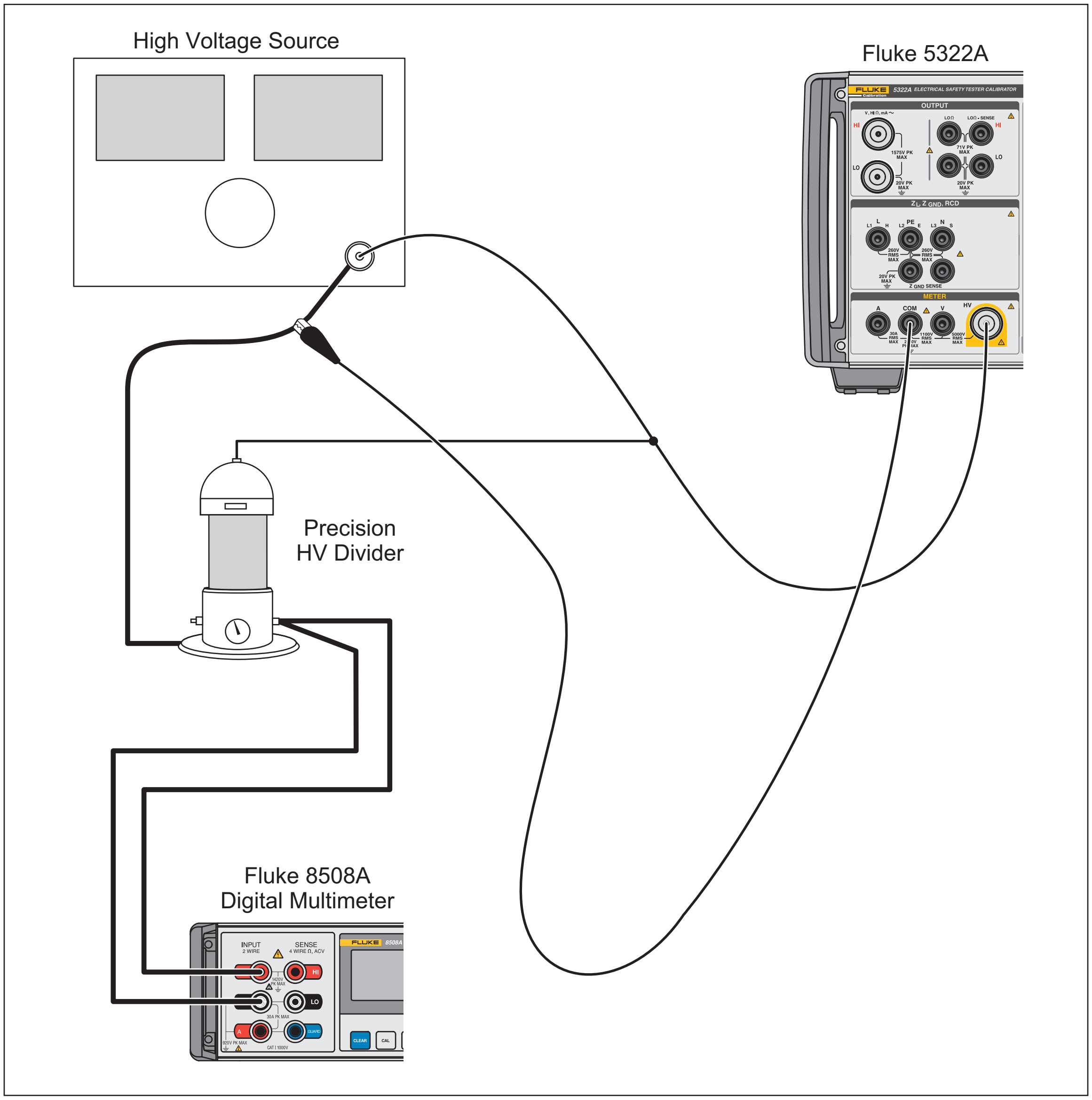
DC Range 5000 V Adjustment

To adjust this dc range, see Figure 33:

1. Connect the high voltage source to the HV and COM terminals of the Product.
2. Connect the high voltage probe input parallel to the high voltage source output terminals.
3. Connect the multimeter and set the dc voltage function to the high voltage probe output.
4. Select **Range 5000V low (0V)** from calibration menu. Push the **Select** softkey.
5. Set the output voltage 0.0 V dc on the high voltage source and switch the output terminals ON.
6. Push the **Write** softkey to confirm the new adjustment value.
7. Highlight **Range 5000V high (+5000 V)** and push the **Select** softkey.
8. Set the output voltage to 5000 V dc on the high voltage source and switch the output terminals ON. The Product reads approximately nominal value.
9. Push the **Write** softkey to save the new value.

This completes this part of the adjustment.

Figure 33. DC Multimeter Adjustment Connections

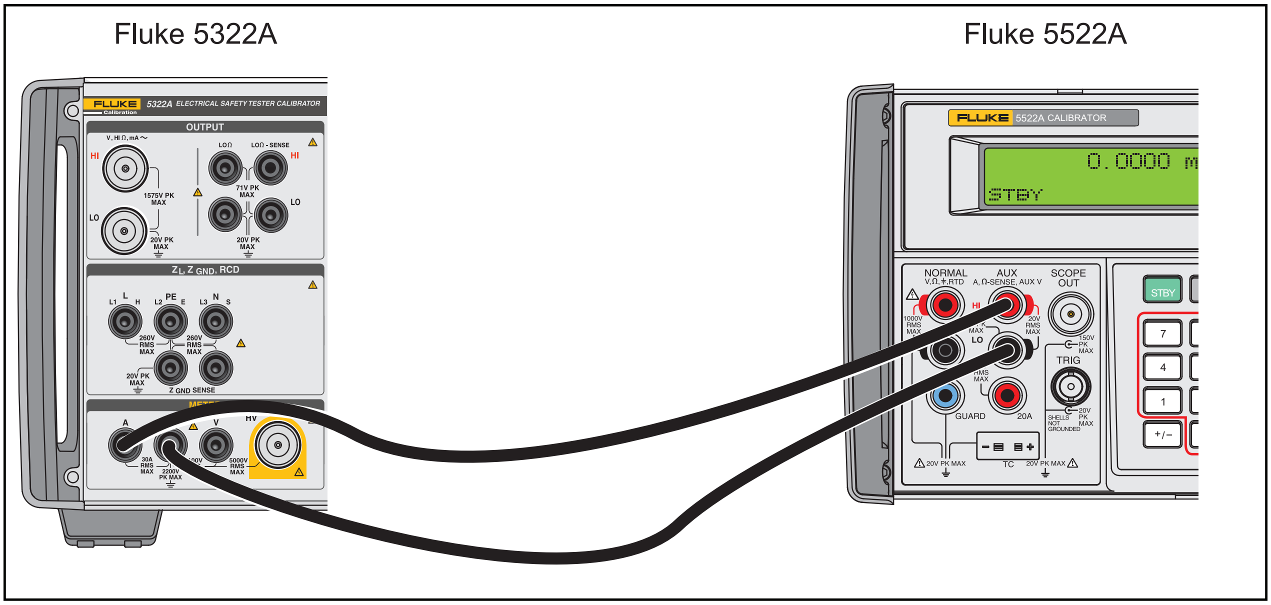


DC Current Ranges 0.3 A, 3 A, 30 A Adjustment

To adjust these dc current ranges:

1. Change the mode on the 5522A to DCI and connect it to the Product output terminals, see Figure 34:

Figure 34. DC Current 0.3A, 3 A, 30A Adjustment Connections



2. Set the first current adjustment point to 300 mA low (0 mA) and push the **Select** softkey.
3. Switch the output terminals ON. The Product reads approximately the nominal value.
4. Push the **Write** softkey to save new value.
5. Go through and adjust all points in the table.
6. When the process finishes, push the **Exit** softkey to go to the basic calibration menu.

This completes this part of the adjustment.

Table 10. DC Multimeter Adjustment Points

Nominal Range	Adjustment Points	Frequency	Required Accuracy of Adjustment (of Range)
10 V dc low	0 V	DC	0.05 %
10 V dc high	+10 V	DC	0.05 %
100 V dc low	0 V	DC	0.05 %
100 V dc high	+100 V	DC	0.05 %
1000 V dc low	0 V	DC	0.05 %
1000 V dc high	+750 V	DC	0.05 %
5000 V dc low	0 V	DC	0.05 %
5000 V dc high	+5000 V	DC	0.05 %
300 mA dc low	0 mA	DC	0.05 %
300 mA dc high	+300 mA	DC	0.05 %
3 A dc low	0 mA	DC	0.05 %
3 A dc high	+3 A	DC	0.05 %
30 A dc low	0 mA	DC	0.05 %
30 A dc high	+20 A	DC	0.05 %

AC Multimeter Adjustment

The adjustment procedure contains voltmeter adjustments in 3 ranges and ammeter adjustment in 3 ranges. Fluke Calibration recommends 55 Hz.

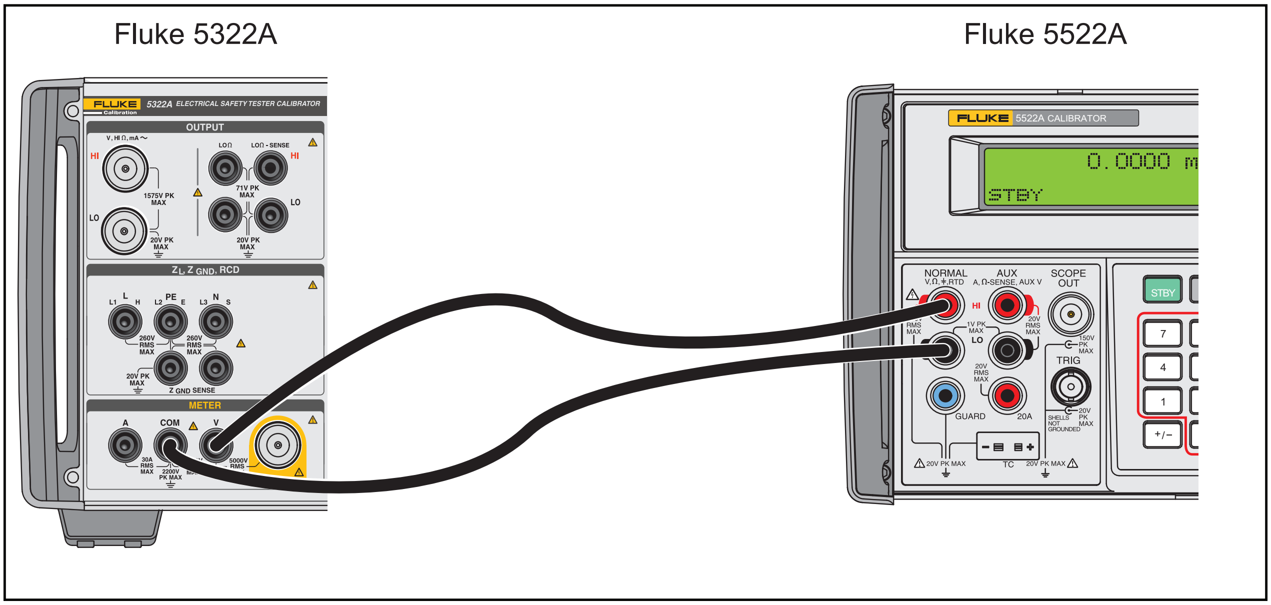
For these procedures and see Table 11 and Figure 34.

AC Ranges 10 V, 100 V, 1000 V Adjustment

To adjust these ac ranges:

1. Connect the 5522A or similar to the Product output terminals, see Figure 35.

Figure 35. AC Ranges 10 V, 100 V, and 1000 V Adjustment Connections



2. Push the **Setup** softkey on the Product.
3. Select **Calibration** and push the **Select** softkey.
4. From the calibration menu, highlight **AC Multimeter** and push the **Select** softkey. The list of adjustment points shows.
5. Highlight the first range with the nominal value, **10 V 55Hz low (1V)** and push the **Select** softkey.
6. Set 1 V ac 55 Hz on the 5522A. Switch the output terminals ON. The Product reads approximately the nominal value.
7. Push the **Write** softkey to save new value for the 10 V range. To leave the original value, push the **Exit** softkey. The Product ignores the measured current and returns to list of current ranges.
8. Do the same adjustment for all ac voltage ranges, 10 V, 100 V, and 1000 V.

This completes this part of the adjustment.

AC Range 5000 V Adjustment

To make this adjustment, see Figure 33:

1. Connect the high voltage source to the HV and COM terminals of the Product.
2. Connect the high voltage probe input parallel to the high voltage source output terminals.
3. Set the multimeter to the dc voltage function and connect the it to the high voltage probe output.
4. Select **Range 5000V 55 Hz low (100V)** from the calibration menu and push the **Select** softkey.
5. Set the output voltage to 100.0 V dc on the high voltage source and switch the output terminals ON.
6. Use the rotary knob or cursor keys to set the value the Product to show 100.0 V.
7. Push the **Write** softkey to confirm the new value.
8. Select **Range 5000V high (+5000 V)** and push the **Select** softkey.
9. Set the output voltage to 5000 V dc on the high voltage source and switch the output terminals ON. The Product shows the approximate nominal value.
10. Push the **Write** softkey to save the new value.

This completes this part of the adjustment.

AC Current Ranges 0.3 A, 3 A, 30 A Adjustment

Change the mode on the 5522A to ACI.

To adjust these ranges, see Figure 34:

1. Connect the 5522A to the Product output terminals.
2. Set the first current point to **300 mA 55 Hz low (30mA)** and push the **Select** softkey.
3. Switch the output terminals ON. Set 30 mA ac 55 Hz on the 5522A. The Product reads the approximate nominal value.
4. Push the **Write** softkey to save the new value.
5. Go through each of the current adjustment points in Table 11. When finished, push the **Exit** softkey to go to the basic calibration menu.

This completes this part of the adjustment.

Table 11. AC Current Ranges 0.3 A, 3 A, 30 A Adjustment Points

Nominal Range	Adjustment Point	Frequency	Required Accuracy of Adjustment (of Range)
10 V ac low	0 V	55 Hz	0.05 %
10 V ac high	10 V	55 Hz	0.05 %
100 V ac low	0 V	55 Hz	0.05 %
100 V ac high	100 V	55 Hz	0.05 %
1000 V ac low	0 V	55 Hz	0.05 %
1000 V ac high	750 V	55 Hz	0.05 %
5000 V ac low	100 V	55 Hz	0.1 %
5000 V ac low	4500 V	55 Hz	0.1 %
300 mA ac low	0 mA	55 Hz	0.05 %
300 mA ac high	300 mA	55 Hz	0.05 %
3 A ac low	0 mA	55 Hz	0.05 %
3 A ac high	3 A	55 Hz	0.05 %
30 A ac low	0 mA	55 Hz	0.05 %
30 A ac high	20 A	55 Hz	0.05 %

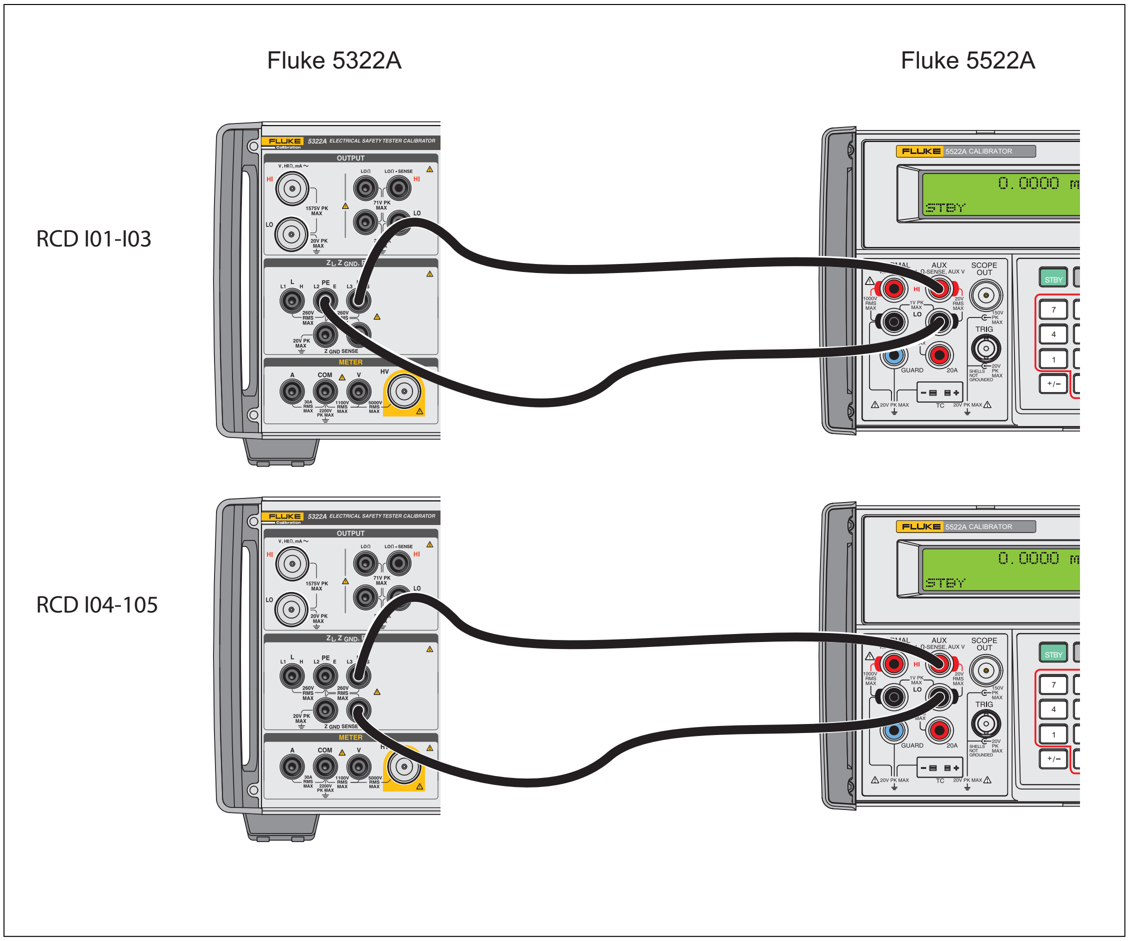
RCD Trip Current Adjustment

The RCD adjustment procedure includes adjustment of the internal ammeter and line voltage meter. The ammeter has three ranges (30 mA, 300 mA, and 3000 mA) for RCD function, and two ranges (30 mA and 150 mA) for RCD in PAT function. The line voltage meter is one range.

To adjust the RCD trip current, see Figure 36:

1. Connect the 5522A to the Product.

Figure 36. RCD Trip Current Adjustment Connections



2. Push the **Setup** softkey on the Product.
3. Highlight **Calibration** in the menu and push the **Select** softkey.
4. From the calibration menu, highlight **RCD Trip Current** and push the **Select** softkey. The list of ranges shows, see Table 12.
5. For these Positions, see Figure 36. Highlight **RCD I01 Trip Current 30 mA** and push the **Select** softkey.

   For Position **I01-I03**, 5522A **Aux Hi**, connect to 5322A **N**.

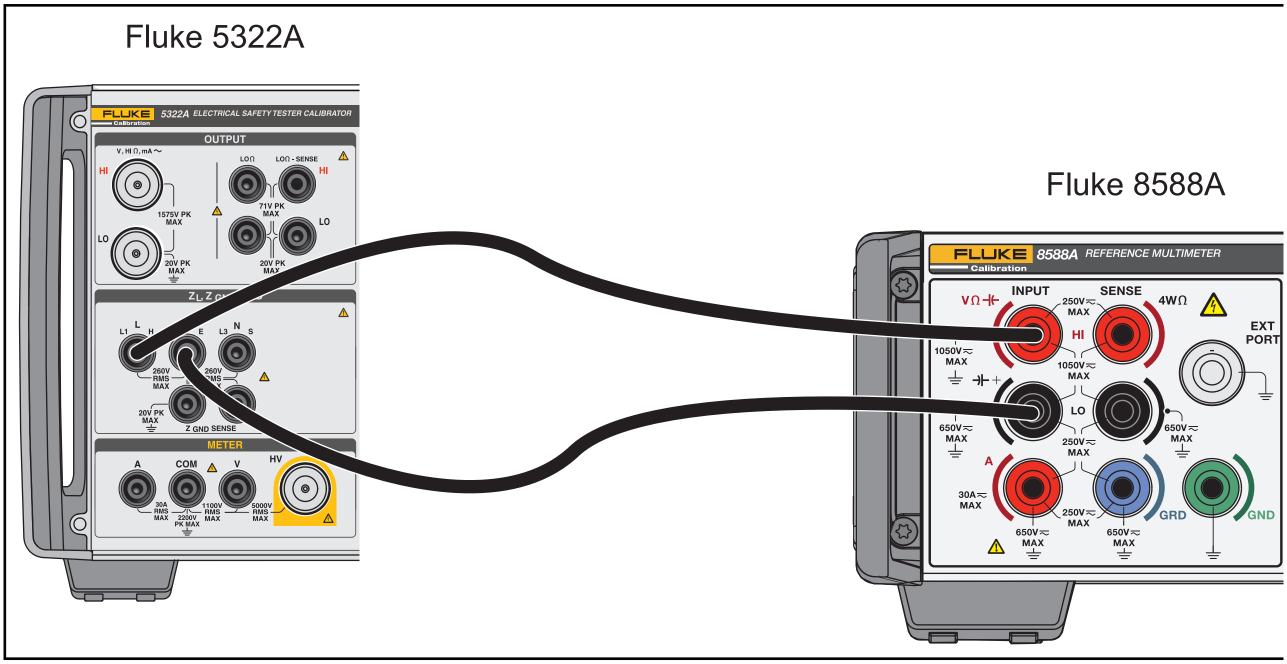
   For Position **I04-I05**, 5522A **Aux Hi** connect to 5322A **N** and 5522A **Aux Lo** connect to 5322A **Z GND SENSE HI**.

Table 12. RCD Trip Current Adjustment Points

Nominal Current Range	Position	Adjustment Point	Frequency	Required Accuracy of Adjustment
30 mA	I01	25 mA	55 Hz	0.2 % + 50 µA
300 mA	I02	250 mA	55 Hz	0.2 %
3 000 mA	I03	2 500 mA	55 Hz	0.2 %
30 mA	I04	25 mA	55 Hz	0.2 % + 50 µA
150 mA	I05	125 mA	55 Hz	0.2 %

6. The Product shows the value entered in the last adjustment.
7. From the 5522A AUX output, set the value to 30 mA at 55 Hz. Push the ON button on the 5522A.
8. The Product reads approximately 30 mA. Use the cursor buttons or rotary knob to set the measured value to 30.000 mA.
9. Push the **Write** softkey to save the new value for the 30 mA current range. To leave the original value, push the **Exit** softkey. The Product ignores the measured current and returns to list of current ranges.
10. Repeat these steps for the next two ranges.
11. Highlight **Line Voltage** and push the **Select** softkey. The Product shows line voltage and frequency.
12. Connect the 8588A to the L and N mains terminals, see Figure 37.
13. Set the range to 1000 V ac. The 8588A measures the power line voltage.

Figure 37. RCD Trip Current Line Voltage Adjustment Connections 2



14. Set the Product to show the same value as on the standard 8588A.
15. Push the **Select** softkey to save the new adjustment data.
16. When the Product finishes, push the **Exit** softkey until the basic calibration display shows.

This completes this part of the adjustment.

Note

During the calibration process, the internal ammeter (without any series resistor) connects to the RCD L - PE *terminals. The ammeter is not protected against voltage overloads. Do not exceed the maximum current values on particular ranges.*

Note

Frequency cannot be adjusted during the line voltage step.

Leakage Current Adjustment

This process checks the internal rms ammeter. Adjustment is only for the dc signal.

To make this adjustment, see Figure 30:

1. Connect the 5522A to the Product.
2. Push the **Setup** softkey on the Product.
3. Highlight **Calibration** and push the **Select** softkey.
4. From the calibration menu, highlight **Leakage Current** and push the **Select** softkey. The list of the adjustment points shows in this format, see Table 13:

   ID Ixx nominal ammeter range

   where ID is the symbol of the function

   Ixx is the ordinal number of the range

Table 13. Leakage Current Adjustment Points

Nominal Current Range	Position	Adjustment Point	Required Accuracy of Adjustment
0.3 mA dc	I01	0.25 mA	0.05 %
3 mA dc	I02	2.5 mA	0.05 %
30 mA dc	I03	25 mA	0.05 %

5. Select the first position with the nominal value of 0.25 mA. The Product shows the actual measured current.
6. Set the dc current on the Product to 0.25 mA. Push the ON button on the 5522A. The Product reads approximately 0.25 mA.
7. Use the cursor buttons or rotary knob to adjust the value to 250.00 µA.
8. Push the **Write** softkey to save the new value for the 0.3 mA current range. To leave the original value, push the **Exit** softkey. The Product ignores the measured current and returns to list of current ranges.
9. Go through and adjust all ranges in the table.
10. Push the **Exit** softkey until the Low resistance source function shows.

This completes this part of the adjustment.

Note

During adjustment, the internal ammeter connects to the OUTPUT HI-LO terminals. The ammeter is not protected against voltage overloads. Do not exceed the maximum current values on particular ranges.

HV Probes Adjustment

The adjustment process writes and saves the new calibration constants. For each recommended high voltage probe, the calibration menu contains two independent constants.

For 40 kV probe 80k-40:

40 kV probe ratio	xxxx.x (-)	DC divider coefficient with connected load 10 MΩ/0.1%
40 kV probe ac-dc deviation	x.xx (-)	AC/DC difference of divider ratio between dc and 55 Hz

For 10 kV probe 190-06:

10 kV probe ratio	xxxx.x (-)	DC divider coefficient with connected load 10 MΩ/0.1%
10 kV probe ac-dc deviation	x.xx (-)	AC/DC difference of divider ratio between dc and 55 Hz

To make this adjustment:

1. Select **HV Probes** from calibration menu.
2. Select the required parameter to change.
3. Use the cursor buttons or rotary knob to adjust the value.
4. Push the **Write** softkey to save the value.

Note

The ac/dc difference parameter is mostly created by the mechanical design of the probes. Fluke Calibration recommends to not change the original constant, if a new constant is not known with uncertainty better than 0.1 %.

Note

The dc divider coefficient is created by a number that represents 1/p, where p is probe dividing ratio. The coefficient nominal value is 1000.0.

High Resistance Multiplier Adjustment

The calibration process writes and saves these new constants.

R multiplier R1	xxxx.x (MΩ)	Input resistor value measured between adapter INPUT HI terminal front panel – LO terminal rear panel
R multiplier R2	xxx.x (kΩ)	Transfer resistor value measured between COM terminal front panel - LO terminal rear panel

To make this adjustment:

1. Highlight **High Resistance Multiplier** from the calibration menu and push the **Select** softkey.
2. Select the required parameter to change.
3. Use the cursor buttons or rotary knob to adjust the value.
4. Push the **Write** softkey to save the value.

Loop & Line Impedance Adjustment

The adjustment procedure contains only the Autocalibration function. Use this function to adjust the internal residual impedance meter.

To make this adjustment:

1. Select **Loop & Line Impedance** from the calibration menu.
2. Select **Autocalibration** item, and push the **Select** softkey. The autocalibration process starts. This adjusts the internal meter sampling voltmeter calibration constant.
3. During adjustment, **Measuring** shows on the display.

DC HIPOT Leakage Current Adjustment

Adjust the HIPOT Leakage Current ammeter with the front panel keyboard. Adjustment is done on the dc signal.

To make this adjustment, see Figure 34:

1. Connect the 5522A to the Product output terminals.
2. Push the **Setup** softkey on the Product.
3. Highlight **Calibration** and push the **Select** softkey.
4. From the calibration menu, highlight **DC HIPOT Leakage Current** and push the **Select** softkey. A list of adjustment points shows, see Table 14.

Table 14. DC HIPOT Leakage Current Adjustment Points

Nominal Current Range	Position	Adjustment Point	Required Accuracy of Adjustment
0.3 mA dc	Range 300 µA low (0 µA)	0.0 mA	0.05 %
	Range 300 µA high (+300 µA)	0.25 mA	0.05 %
3 mA dc	Range 3 mA low (0 mA)	0.0 mA	0.05 %
	Range 3 mA high (+3 mA)	2.5 mA	0.05 %
30 mA dc	Range 30 mA low (0 mA)	0.0 mA	0.05 %
	Range 30 mA high (+30 mA)	25 mA	0.05 %

5. Select the first position with the nominal value **Range 300µA low (0µA)**. The Product shows the actual measured current.
6. Set the function on the Product to dc current and set the value to 0.0 mA.
7. On the 5522A, push the ON button. The Product reads approximately 0.0 mA.
8. Push the **Write** softkey to save the new value for the 0.3 mA current range, point 0.0 mA. To leave the original value, push the **Exit** softkey. The Product ignores the measured current and returns to the list of current ranges.
9. Select the second position of the 300 µA range, **Range 300µA high (+300µA)**.
10. Set the 5522A to 0.25 mA. The Product reads approximately 0.25 mA.
11. Use the cursor buttons or rotary knob to get a measured value of 0.025 00 µA.
12. Push the **Write** softkey to save the new value for the 0.3 mA current range. To leave the original calibration constant, push the **Exit** softkey. The Product ignores the measured current and returns to list of current ranges.
13. Use the same process to go through next two ranges.
14. At the end of the adjustment process, push the **Exit** softkey until the display shows the Low resistance source function.

This completes this part of the adjustment.

AC HIPOT Leakage Current Adjustment

Adjust the HIPOT Leakage Current ammeter with the front panel keyboard. Adjustment is done on the ac signal.

To make this adjustment, see Figure 34:

1. Connect the 5522A to the Product output terminals.
2. Push the **Setup** softkey on the Product.
3. Highlight **Calibration** and push the **Select** softkey.
4. From the calibration menu, highlight **AC HIPOT Leakage Current** and push the **Select** softkey. The list of adjustment points shows, see Table 15.

Table 15. AC HIPOT Leakage Current Calibration Points

Nominal Current Range	Position	Adjustment Point	Frequency	Required Accuracy of Adjustment
0.3 mA ac	Range 300 µA 55 Hz low	0.025 mA	55 Hz	0.05 %
0.3 mA ac	Range 300 µA 55 Hz high	0.250 mA	55 Hz	0.05 %
3 mA ac	Range 3 mA 55 Hz low	0.250 mA	55 Hz	0.05 %
3 mA ac	Range 3 mA 55 Hz high	2.5 mA	55 Hz	0.05%
30 mA dc	Range 30 mA 55 Hz low	2.5 mA	55 Hz	0.05 %
30 mA dc	Range 30 mA 55 Hz high	25 mA	55 Hz	0.05 %

5. Select the first position with the nominal value of 0.025 mA. The Product shows the actual measured current.
6. Set the Product function to ac current and set the value to 0.025 mA at 55 Hz.
7. On the 5522A, push the ON button. The Product reads approximately 0.025 mA.
8. Use the cursor buttons or rotary knob to set the measured value of 0.025 00 µA.
9. Push the **Write** button to save the new value for the 0.3 mA current range. To leave the original value, push the **Exit** softkey. The Product ignores the measured current and returns to list of current ranges.
10. Go through all ranges in the list and adjust each of them.
11. When the calibration process concludes, push the **Exit** softkey until the display shows the Low resistance source function.

This completes this part of the adjustment.

HIPOT Ripple Adjustment

HIPOT Ripple adjustment enables adjustment of the meters used for the ripple coefficient measurement. Adjustment is done on the ac signal.

To make this adjustment, see Figure 35:

1. Connect the 5522A to the Product output terminals.
2. Push the **Setup** softkey on the Product.
3. Highlight **Calibration** and push the **Select** softkey.
4. Highlight **HIPOT Ripple** and push the **Select** softkey. The list of adjustment points shows, see Table 16.

Table 16. HIPOT Ripple Calibration Points

Nominal Current Range	Position	Adjustment Point	Frequency	Required Accuracy of Adjustment
10 V ac	Range 10 V 55 Hz high (10 V)	10 V	55 Hz	0.1 %
100 V ac	Range 100 V 55 Hz high (100 V)	100 V	55 Hz	0.1 %
1000 V ac	Range 1000 V 55 Hz high (950 V)	950 V	55 Hz	0.1 %

5. Select the first position with nominal value, 10 V. The Product shows the actual measured voltage.
6. Set the Product function to ac voltage, 10 V at 55 Hz.
7. On the 5522A, push the ON button and the Product reads approximately 10 V.
8. Push the **Write** softkey to save the new value for the 10 V voltage range. To leave the original value, push the **Exit** softkey. The Product ignores the measured current and returns to list of current ranges.
9. Go through and make new adjustments for each of the ranges in the list.
10. When the calibration process concludes, push the **Exit** softkey until the Low resistance source function shows.

This completes this part of the adjustment.

Verification

This section describes the procedure to verify the Product parameters.

The required verification equipment is in Table 17.

Table 17. Required Verification Equipment

Required Instrument	Recommended Model
Digital Multimeter	Fluke Calibration 8588A or similar model
Teraohmmeter	Quadratech 1865
Multi-product Calibrator	Fluke Calibration 5502A, 5522A or similar model
HIPOT Tester	Chroma 19052
Counter	Keysight 53131A or equivalent
10 kV Divider	5320A/5322A Accessory

Product Configuration

Test the Product from the front panel terminals. Let the Product warm up for 1 hour before you do the performance verification. Keep the temperature around the Product stable for a minimum of 4 hours prior to the test.

Basic Verification Step

The basic, top-level steps of the performance verification test are:

Ground Bond Resistance Decade

- Two wire resistance
- Four wire resistance
- Open resistance

Low resistance source

- Two-wire, low-resistance source
- Four-wire, low-resistance source
- SHORT two-wire resistance
- SHORT four-wire resistance

5 kV and 1.5 kV High Resistance Source

- Resistance
- 100 GΩ value
- OPEN resistance
- SHORT resistance
- 10 mΩ value
- Test voltage
- Resistance multiplier

Voltage Calibrator

- AC/DC voltage
- Frequency

Leakage Current AC and DC

- Passive leakage current internal ranges
- OPEN substitute leakage current voltage
- Active leakage current

RCD Function

- RCD Trip current ammeter test
- RCD Trip time test

Multimeter Function

- DC/AC voltage ranges
- DC/AC current ranges
- Phase
- HIPOT leakage current
- Flash V test
- Flash LC test

High Voltage Tests

- 5 kV dc voltage input test
- 5 kV ac voltage input test
- 10 kV divider dc voltage test
- 10 kV divider ac voltage test

Conditions

The Fluke Calibration recommended measure points are in *Verification Tables*.

1. Connect the Product to the mains and leave it switched on for at least 1 hour in a laboratory at 23±1 °C.
2. Push the **Setup** softkey on the Product.
3. Select **Calibration**. Enter the calibration code if requested.

Ground Bond Resistance and Loop/Line Resistance Verification Procedure

Follow these steps to verify the ground bond resistance and loop/line resistance functions, see Figure 38:

1. Two-wire ground bond resistance test:
   a. Connect the ground bond/loop/line resistance decade output terminals PE and N to a standard multimeter (8588A). Use a four-wire connection and set the 8588A for four-wire measurement.
   b. Set the series resistance parameter in the ground bond resistance setup to zero.
   c. Select the **Z GND** function on the Product.
   d. Push the **Mode** softkey and select **Resistance 2W**.
   e. Push OPER.
   f. Select each available nominal value from 25 mΩ to 1.7 kΩ with the rotary knob, cursor keys, or numerical keypad. Measure their resistance and compare that measurement with the value shown on the Product. Compare the measurement on the Product to the limits in Table 20.
2. Four-wire ground bond resistance test:
   a. Connect the ground bond/loop/line resistance decade output terminals PE and N to the 8588A +I and -I terminals. Connect the ground bond/loop/line resistance decade output terminals Z GND SENSE to the 8588A +Ω SENSE and -Ω SENSE terminals. Use a four-wire connection and set the 8588A for four-wire measurement.
   b. Set the series resistance parameter in the ground bond resistance setup to zero.
   c. Select the **Z GND** function in the Product. Push the **Mode** softkey and select **Resistance 4W**.
   d. Push OPER.
   e. Select each available nominal value from 25 mΩ to 1.7 kΩ with the rotary knob, cursor keys, or numerical keypad. Measure their resistance and compare that measurement with the value shown on the Product. Compare the measurement on the Product to the limits in Table 21.
3. OPEN ground bond resistance test:

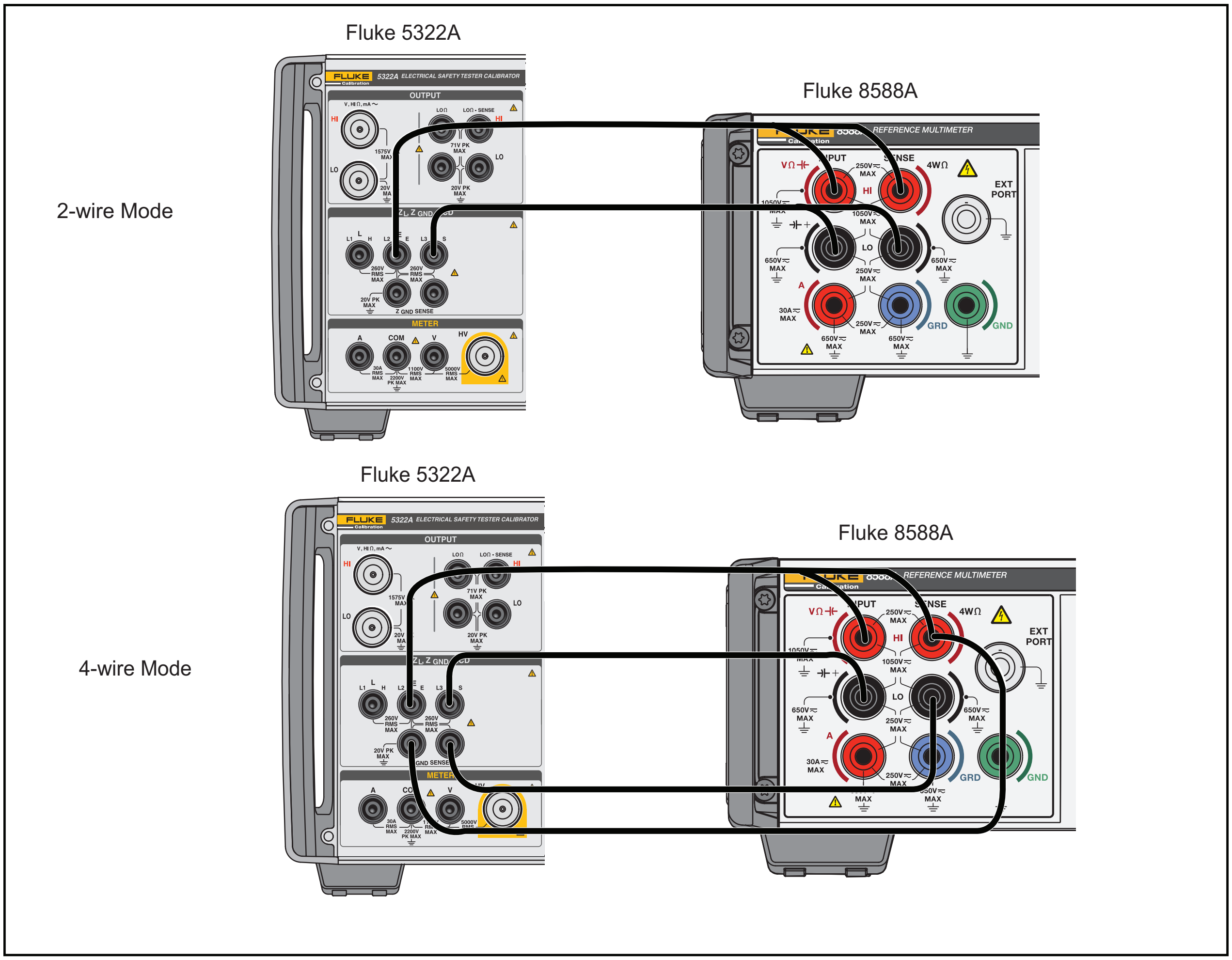
a. Connect the ground bond/loop/line resistance decade output terminals PE and N to the 8588A. Use a four-wire connection and set the 8588A for four-wire measurement.

b. Select the **Z GND** function on the Product. Push the **Mode** softkey and select **OPEN**.

c. Push OPER.

d. The measured resistance reads >100 kΩ.

Figure 38. Ground Bond Resistance and Loop/Line Resistance Value Connections



Low Resistance Source Verification

Follow the subsequent steps to verify the low resistance source functions.

1. Two-wire low resistance source test:
   a. Connect the 8588A to the low resistance source output terminals LOΩ HI and LO. Use a four-wire connection and set the 8588A to four-wire measurement.
   b. Set the **Low resistance source GND** item in low resistance source setup to GND On.
   c. Select the LOΩ function on the Product. Push the **Mode** softkey and select **Resistance-2W**.
   d. Push OPER.
   e. Use the rotary knob, cursor keys, or numerical keypad to set the output nominal range value from 100 mΩ to 10 kΩ, see Table 22.
   f. Measure the Product resistance. Compare the measurement on the Product to the limits in Table 22.
2. Four-wire low resistance source:
   a. Connect the 8588A +I and -I terminals to the low resistance source output terminals LOΩ HI and LO. Connect the 8588A +Ω SENSE and -Ω SENSE terminals to the low resistance source output terminals, LOΩ-SENSE HI and LO. Use a four-wire connection, and set the 8588A to four-wire measurement.
   b. Set **Low resistance source GND** in the Low resistance source setup to **GND On**.
   c. Push OPER.
   d. Measure the Product resistance. Compare the measurement on the Product with the limits in Table 23.
   e. Select the LOΩ function on the Product. Push the **Mode** softkey and select **Resistance-4W**.
   f. Push OPER.
   g. Use the rotary knob, cursor keys, or numerical keypad to set the output nominal range value from 100 mΩ to 10 kΩ, see Table 23.
   h. Measure the Product resistance. Compare the measurement on the Product with the limits in Table 23.
3. SHORT Two-wire low resistance source test:
   a. Connect the 8588A to the low resistance source output terminals LOΩ HI and LO. Use a four-wire connection and set the 8588A to four wire measurement.
   b. Set **Low resistance source GND** in the Low resistance source setup to **GND On**.
   c. Select LOΩ function on the Product. Push the **Mode** softkey and select **SHORT 2-Wire**.
   d. Push OPER.

e. Measure the Product resistance. The value reads ≤100 mΩ.

4. SHORT Four-wire Low resistance source test:

   a. Connect the 8588A +I and -I terminals to the Low resistance source output terminals LOΩ HI and LO. Connect the 8588A +Ω SENSE and -Ω SENSE terminals to the Low resistance source output terminals LOΩ-SENSE HI and LO. Use a four-wire connection, and set the 8588A to four-wire measurement.

   b. Set the **Low resistance source GND** in the Low resistance source setup to **GND On**.

   c. Select the LOΩ function on the Product. Push the **Mode** softkey and select **SHORT 4-Wire**.

   d. Push OPER.

   e. Measure the Product resistance. The value reads ≤1 mΩ.

5. OPEN Low resistance source test:

   a. Connect the 8588A to the low resistance source output terminals LOΩ HI and LO. Use a two-wire connection and set the 8588A to two-wire measurement.

   b. Set the **Low resistance source GND** item in the Low resistance source setup to **GND On**.

   c. Select **LO**Ω on the Product. Push the **Mode** softkey and select **Open**.

   d. Push OPER.

   e. Measure the Product resistance. The value reads ≥10 MΩ.

5 kV and 1.5 kV High Resistance Source

Follow these steps to verify the low resistance source functions, see Table 24 for 5 kV and 1.5 kV.

1. Resistance test:

   a. Connect the 8588A HI and LO terminals to high resistance source output terminals HI and LO. Use two-wire High Voltage mode.

   b. Set **High resistance source GND** in High resistance source setup to **GND On**.

   c. Select the HIΩ function on the Product. Push the **Mode** softkey and select **Resistance**.

   d. Push OPER

   e. Use the rotary knob, cursor keys, or numerical keypad to set the output nominal value to that of to the tables.

   f. Measure the Product resistance in points below 2 GΩ. Compare the measurement on the Product with the limits in Table 24.

   g. Connect the standard teraohmmeter Quadtech 1865 to the High resistance source output terminals HI and LO. Set the test voltage 950 V.

   h. Push OPER.

   i. Use the rotary knob, cursor keys, or numerical keypad to set the output nominal value, see Table 24.

   j. Measure the Product resistance in points 2 GΩ and higher. Compare the measurement on the Product with the limits in Table 24.

2. 100 GΩ test:

   a. Select the HIΩ function on the Product. Push the **Mode** softkey and select **100 GΩ**.

   b. Push OPER.

   c. Measure the Product resistance. Compare the measurement on the Product with the limits in Table 24.

3. OPEN High resistance source test:

   a. Connect the 8588A to the low resistance source output terminals LOΩ HI and LO. Use a two-wire connection.

   b. Select HIΩ function in the Product. Push the **Mode** softkey and select **OPEN**.

   c. Push OPER.

   d. Measure the Product resistance. The value reads >90 MΩ.

4. SHORT high resistance source test:

   a. Connect the 8588A to the low resistance source output terminals LOΩ HI and LO. Use a two-wire connection.

   b. Select the HIΩ function on the Product. Push the **Mode** softkey and select **SHORT**.

   c. Push OPER.

   d. Measure the Product resistance. The value reads ≤250 Ω.

5. Test voltage High resistance source test:

   a. Connect the 5522A voltage output terminals to the high resistance source output terminals HIΩ HI and LO. Select the 5522A dc voltage function.

   b. Select HIΩ function on the Product. Push the **Mode** softkey and select **Resistance**.

   c. Push OPER.

   d. Set the resistance value for the 5 kV and 1.5 kV option with Table 18 and Table 19.

   e. Set the appropriate voltage on the 8588A.

   f. Measure the test voltage on the Product. Do not exceed the limits in Table 18 and Table 19 for the 5 kV and 1.5 kV option.

6. Short current High resistance source test:

   a. Connect the 5522A current output terminals to the high resistance source output HIΩ HI and LO terminals. Select the dc current function in the 5522A. Set output current to 10 mA.

   b. On the Product, select the HIΩ function. Push the **Mode** softkey and select **SHORT**.

c. Push OPER and switch 5522A output terminals on.

d. Measure the test current on the Product. The test current reads within the limits of 9.3 mA to 10.7 mA.

7. Resistance multiplier test:

a. Connect the Resistance multiplier to the Product HI – LO output terminals.

b. Connect the1865 to the resistance multiplier input terminals.

c. Connect the grounding post on the resistance multiplier to the Product rear-panel grounding post.

d. Select the HIΩ function on the Product and set the **R Mult** parameter to **Yes**.

e. On the 1865, set the test voltage, see Table 24.

f. Set the resistance value on the Product, see Table 24.

g. Push OPER on the Product.

h. Push **START** on the 1865.

i. Compare the1865 with the limits in Table 24.

Note

Fluke Calibration recommends shielded test leads to avoid the influence of noise. The indication settles depending on the set resistance value and ambient conditions. It can last several minutes under poor conditions.

Table 18. 5 kV High Resistance Source Voltmeter

Set Resistance	Test Voltage	Lower Limit	Upper Limit
10 kΩ	50 V	47.75 V	52.25 V
50 kΩ	200 V	197 V	203 V
100 kΩ	500 V	487.5 V	512.5 V
500 kΩ	500 V	487.5 V	512.5 V
1.5 MΩ	1 000 V	985 V	1015 V
5 MΩ	1 000 V	985 V	1015 V
100 MΩ	1 000 V	985 V	1015 V

Table 19. 1.5 kV High Resistance Source Voltmeter

Set Resistance	Test Voltage	Lower Limit	Upper Limit
10 kΩ	50 V	47.85 V	52.15 V
50 kΩ	200 V	197.4 V	202.6 V
100 kΩ	500 V	496.5 V	503.5 V

Table 19. 1.5 kV High Resistance Source Voltmeter

Set Resistance	Test Voltage	Lower Limit	Upper Limit
500 kΩ	500 V	496.5 V	503.5 V
1.5 MΩ	1 000 V	994.5 V	1005.5 V
5 MΩ	1 000 V	994.5 V	1005.5 V
100 MΩ	1 000 V	994.5 V	1005.5 V

Voltage Calibrator

Follow these steps to verify the voltage calibrator functions.

1. Voltage calibrator test:
   a. On the Product, select the dc voltage calibrator function.
   b. Connect the 5522A to the appropriate output terminals of the Product and select the dc voltage function.
   c. Do the dc voltage test in Table 25. Do not exceed the specified limits.
   d. Select the ac voltage calibrator function and set the output frequency 55 Hz.
   e. Connect the standard multimeter to the appropriate output terminals of the Product and select the ac voltage function.
   f. Do the ac voltage test, see Table 25. Do not exceed the specified limits.
2. Frequency calibrator test:
   a. Select ac voltage calibrator function on the Product.
   b. Set the value to 10 V at 400 Hz.
   c. Connect the standard counter (Keysight 53131A) to the HI – LO output terminals of the Product and select **Frequency** measurement**.**
   d. Push OPER on the Product.
   e. The 53131A starts to measure the voltage calibrator frequency. Do not exceed the limits of 399.92 Hz to 400.08 Hz.

Leakage Current

Follow these steps to verify leakage current functions.

1. Passive leakage current test:
   a. Select **Calibration**>**Leakage current**.
   b. Connect the 5522A current output terminals to the HI, LO input terminals of the Product. Select the ac current function on the 5522A and set the frequency to 55 Hz.
   c. Set the first test current on the 5522A from Table 26.
   d. Select **IC1 Leakage current 0.3mA** and push OPER. The Product ammeter starts to measure.
   e. Switch the 5522A output on.
   f. Compare the measurement on the Product with the limits in Table 26.
   g. Do the tests for next two ranges, **IC2 3 mA** and **IC3 30 mA**.
2. OPEN substitute leakage current test:
   a. Connect the 5522A current output terminals to the HI, LO input terminals on the Product. Select the dc voltage function in on the 5522A and set the output value to 45 V.
   b. Select **Leakage current**>**Substitute Open** mode.
   c. Switch the output terminals on the Product and the 5522A.
   d. Compare the test voltage on the Product with the set voltage on the 5522A.
3. Active leakage current test:
   a. Connect the standard multimeter current input terminals to the HI, LO terminals on the Product. Select the ac current function on the multimeter.
   b. Select **Leakage current**, item **Active** on the Product. Set the output current to 20 mA and push OPER on the Product.
   c. Compare the standard multimeter reading with the set output current value. The value reads within 19.94 mA to 20.06 mA.

RCD Function

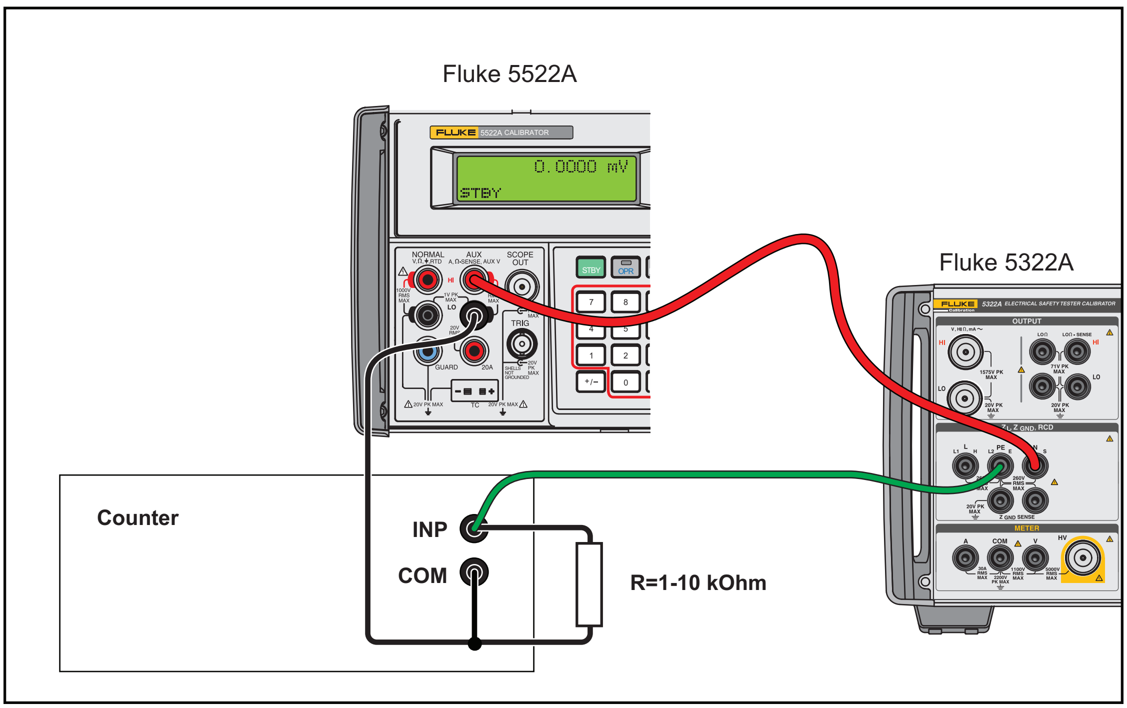
Follow these steps to verify the RCD function.

1. RCD Trip current ammeter test:
    a. Connect the current output terminals of the 5522A to the Product PE-N terminals. Set the frequency to 55 Hz on the 5522A
    b. Select **Setup**>**Calibration**>**RCD Trip Current**. Select the first current range RCD I01.
    c. Set the nominal output current on the 5522A, see Table 27.
    d. Compare the measurement on the Product with the limits in Table 27.
2. RCD Trip time test:

    The calibration function enables trip time verification in the RCD function. In the verification procedure Product generates passive pulses with frequency 2/T with duty cycle 1:1 in the range of T 10 ms to 5 s.

    a. To perform Trip time verification test connect the instruments as shown in Figure 39.
    b. Select **Setup**>**Calibration**>**Trip time** position. Set the trip time to value 1000 ms.

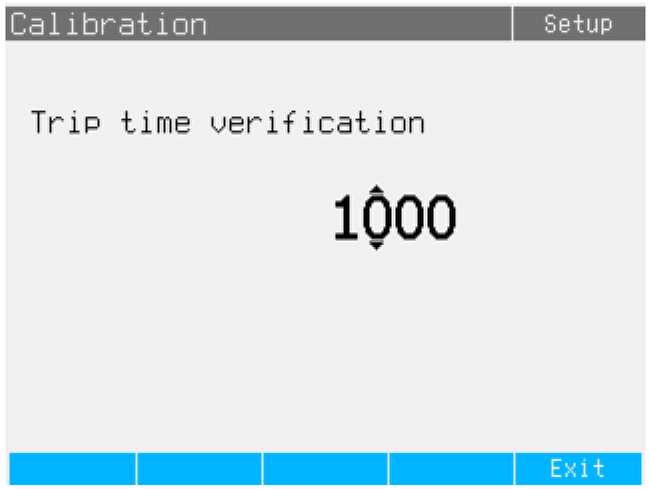
Figure 39. RCD Verification Connections



    c. Set 5 V dc on the 5522A and turn the output ON.
    d. Set the time interval function on the counter to start rise edge, stop fall edge. Set 50 Ω or 100 kΩ input impedance on the counter. If the counter does not have this function, use a single resistor with a 1 Ω to 10 kΩ / 0.1W value connected in parallel to the counter input.

e. Use the numerical keypad, cursor keys, or rotary knob to set the time interval on Product display in ms.

Figure 40. Trip Time Verification Screen



f. If the counter does not indicate 0 ms, reset the counter display.

g. Push OPER on the Product. The Product generates passive square wave with a frequency of 2/T.

h. Compare the counter with the Product preset time value with the limits in Table 28.

METER

Follow these steps to verify the METER functions.

1. DC/AC multimeter voltage test:
   a. Connect the 5522A voltage output terminals to V and COM terminals of the Product.
   b. Set the frequency and output voltage as in Table 29.
   c. Select the **METER** function, and the **Multimeter** mode on the Product.
   d. Select the appropriate **AC** or **DC** mode.
   e. Switch the 5522A output to ON.
   f. Compare the measurement on the Product with the limits in Table 29.
2. DC/AC multimeter current test:
   a. Connect the 5522A current output terminals to the A and COM terminals on the Product. Set the frequency and output voltage as in Table .
   b. Select the **METER** function, and the **Multimeter** mode on the Product.
   c. Select the appropriate **AC** or **DC** mode.
   d. Switch the 5522A output to ON.
   e. Compare the measurement on the Product with the limits in Table .

3. DC/AC multimeter phase test:
   a. Connect the 5522A current output terminals to A and COM terminals on the Product.
   b. Connect the 5522A voltage output terminals to V and COM terminals on the Product.
   c. Set frequency and output voltage as in Table .
   d. Select the **METER** function, and the **Multimeter** mode on the Product.
   e. Select **AC** mode.
   f. Switch the 5522A output to ON.
   g. Compare the measurement on the Product with the limits in Table .
4. DC/AC HIPOT leakage current test:
   a. Connect the 5522A current output terminals to A and COM terminals on the Product.
   b. Set the frequency and output voltage, see Table .
   c. Select the **METER** function and the **HIPOT LC** mode on the Product.
   d. Select appropriate **AC** or **DC** mode.
   e. Switch the 5522A output to ON.
   f. Compare the measurement on the Product with the limits in Table .
5. Flash V test:
   a. Connect the 5522A voltage output terminals to V and COM terminals on the Product.
   b. Select **AC** mode and an output of 1000 V at 55 Hz.
   c. Select the **METER** function and the **Flash V** mode on the Product.
   d. Switch the 5522A output to ON.
   e. The measured voltage on the Product should be within the limits of 991 V to 1009 V.
6. Flash LC test:
   a. Connect the 5522A voltage output terminals to the A and COM terminals on the Product.
   b. Select **AC** mode and an output of 2 mA at 55 Hz.
   c. Select the **METER** function and the **Flash LC** on the Product.
   d. Switch the 5522A output to ON.
   e. The measured current on the Product should be within the limits of 1.9945 mA to 2.0055 mA.

High Voltage Tests

The subsequent functions or ranges request verification with a high voltage source. Use a Chroma 19052 HIPOT Tester as the source for ac and dc voltage and check the actual output value with a 10 kV standard divider and a Fluke Calibration 8588A multimeter. Use Table 32 for these tests.

Follow these steps to verify the high voltage functions.

1. 5 kV dc voltage input test:
    a. Connect the 19052 output terminals to the HV and COM input terminals of the Product.
    b. Use a 5 kV test lead from the 5322A accessory on the high voltage side.
    c. Connect the grounding post on the Resistance multiplier to the Product rear panel grounding post.
    d. Select the **METER** function on the Product. Push the **Input** softkey to activate the HV input terminal.
    e. Select **HV (Max 5kV).**
    f. Push the **AC/DC** softkey to set the mode to **DC**.
    g. Set 4 500 V dc on the 19052. Switch the 19052 output terminals ON.
    h. The Product should read within the limits of 4 481 V to 4 519 V.
2. 5 kV ac voltage input test:
    a. Connect the 19052 output terminals to the Product HV and COM input terminals.
    b. Use a 5 kV test lead from the 5322A accessory on the high voltage side.
    c. Connect the grounding post on the Resistance multiplier to the Product rear panel grounding post.
    d. Select the **METER** function on the Product.
    e. Push the **Input** softkey to activate the HV input terminal.
    f. Select **HV (Max 5kV).**
    g. Push the **AC/DC** softkey to set the mode to **AC**.
    h. Set 4 500 V ac on the 19052. Switch the 19052 output terminals ON.
    i. The Product should read within the limits of 4 481 V to 4 519 V.

3. 10 kV divider dc voltage test:
    a. Connect the 10 kV divider rear panel output terminals to the V and COM input terminals on the Product. Use the 5 kV test lead from 5322A accessory on the high voltage side. Connect the grounding post on the Resistance multiplier to Product rear panel grounding post.
    b. Select the **METER** function on the Product.
    c. Push the **Input** softkey to activate the HV input terminal.
    d. Select **With 10 kV probe**.
    e. Push the **AC/DC** softkey to set the mode to **DC**.
    f. Set 4500 V dc on the 19052. Switch the 19052 output terminals ON.
    g. The Product should read within the limits of 4481.5V to 4518.5 V.
4. 10 kV divider ac voltage test:
    a. Select the **METER** function on the Product.
    b. Push the **Input** softkey to activate the HV input terminal.
    c. Select **With 10 kV probe.**
    d. Push the **AC/DC** softkey to set the mode to **AC**.
    e. Set 4500 V ac on the 19052. Switch the 19052 output terminals ON.
    f. The Product should read within the limits of 4472.5V to 4527.5 V.

Verification Tables

Use the tables in this section and the previous procedures to verify the Product meets its specifications.

Table 20. Two-wire Ground Bond Decade and Loop/Line Decade Test

Nominal Value	Lower Limit [1]	Upper Limit [1]
20 mΩ	Rcal -12 mΩ	Rcal +12 mΩ
50 mΩ	Rcal -12 mΩ	Rcal +12 mΩ
100 mΩ	Rcal -12 mΩ	Rcal +12 mΩ
350 mΩ	Rcal -14 mΩ	Rcal +14 mΩ
500 mΩ	Rcal -15 mΩ	Rcal +15 mΩ
960 mΩ	Rcal -20 mΩ	Rcal +20 mΩ
1.7 Ω	Rcal -25 mΩ	Rcal +25 mΩ
4.7 Ω	Rcal -37 mΩ	Rcal +37 mΩ
9.0 Ω	Rcal -60 mΩ	Rcal +60 mΩ
17 Ω	Rcal -100 mΩ	Rcal +100 mΩ
47 Ω	Rcal -300 mΩ	Rcal +300 mΩ
90 Ω	Rcal -500 mΩ	Rcal +500 mΩ
170 Ω	Rcal -1.0 Ω	Rcal +1.0 Ω
470 Ω	Rcal -2.5 Ω	Rcal +2.5 Ω
900 Ω	Rcal -5 Ω	Rcal +5 Ω
1700 Ω	Rcal -10 Ω	Rcal +10 Ω
[1] Rcal is a calibration value of a selected standard.		

Table 21. Four-wire Ground Bond Decade and Loop/Line Decade Test

Nominal value	Lower limit [1]	Upper limit [1]
1 mΩ	Rcal -0.2 mΩ	Rcal +0.2 mΩ
14 mΩ	Rcal -0.4 mΩ	Rcal +0.4 mΩ
39 mΩ	Rcal -0.7 mΩ	Rcal +0.7 mΩ
94 mΩ	Rcal -1.2 mΩ	Rcal +1.2 mΩ
340 mΩ	Rcal -2.0 mΩ	Rcal +2.0 mΩ
490 mΩ	Rcal -2.7 mΩ	Rcal +2.7 mΩ
960 mΩ	Rcal -4.8 mΩ	Rcal +4.8 mΩ
1.7 Ω	Rcal -8.5 mΩ	Rcal +8.5 mΩ
4.7 Ω	Rcal -24 mΩ	Rcal +24 mΩ
9 Ω	Rcal -45 mΩ	Rcal +45 mΩ

Table 21. Four-wire Ground Bond Decade and Loop/Line Decade Test (cont.)

Nominal value	Lower limit [1]	Upper limit [1]
17 Ω	Rcal -45 mΩ	Rcal +45 mΩ
47 Ω	Rcal -300 mΩ	Rcal +300 mΩ
90 Ω	Rcal -500 mΩ	Rcal +500 mΩ
170 Ω	Rcal -1 Ω	Rcal +1 Ω
470 Ω	Rcal -2.5 Ω	Rcal +2.5 Ω
900 Ω	Rcal -5 Ω	Rcal +5 Ω
1700 Ω	Rcal -10 Ω	Rcal +10 Ω
[1] Rcal is a calibration value of a selected standard.		

Table 22. Two-wire Low Resistance Source

Nominal value	Lower limit	Upper limit
100 mΩ	.49 mΩ	0.15 mΩ
200 mΩ	149.4 mΩ	250.6 mΩ
400 mΩ	348.8 mΩ	451.2 mΩ
800 mΩ	747.6 mΩ	852.4 mΩ
1 Ω	0.947 Ω	1.053 Ω
2 Ω	1.944 Ω	2.056 Ω
4 Ω	3.938 Ω	4.062 Ω
8 Ω	7.926 Ω	8.074 Ω
10 Ω	9.92 Ω	10.08 Ω
20 Ω	19.89 Ω	20.11 Ω
40 Ω	39.87 Ω	40.13 Ω
80 Ω	79.79 Ω	80.21 Ω
100 Ω	99.75 Ω	100.25 Ω
200 Ω	199.6 Ω	200.4 Ω
400 Ω	399.2 Ω	400.8 Ω
800 Ω	798.4 Ω	801.6 Ω
1 kΩ	998 Ω	1002 Ω
2 kΩ	1996 Ω	2004 Ω
4 kΩ	3992 Ω	4008 Ω
8 kΩ	7984 Ω	8016 Ω
10 kΩ	9980 Ω	10020 Ω

Table 23. Four-wire Low Resistance Source

Nominal value	Lower limit	Upper limit
9.47 mΩ	09.38 mΩ	9.56 mΩ
100 mΩ	89.7 mΩ	110. 3 mΩ
200 mΩ	189.4 mΩ	210.6 mΩ
400 mΩ	388.8 mΩ	411. 2 mΩ
800 mΩ	787. 6 mΩ	812.4 mΩ
1.00 Ω	0.987 Ω	1.013 Ω
2.00 Ω	1.984 Ω	2.016 Ω
4.00 Ω	3.978 Ω	4.022 Ω
8.00 Ω	7.974 Ω	8.026 Ω
10.00 Ω	9.97 Ω	10.03 Ω
20.00 Ω	19.95 Ω	20.05 Ω
40.00 Ω	39.91 Ω	40.09 Ω
80.00 Ω	79.83 Ω	80.17 Ω
100.00 Ω	99.79 Ω	100.21 Ω
200.00 Ω	199.6 Ω	200.4 Ω
400.00 Ω	399.2 Ω	400.8 Ω
800.00 Ω	798.4 Ω	801.6 Ω
1000.00 Ω	998 Ω	1002 Ω
2000.00 Ω	1996 Ω	2004 Ω
4000.00 Ω	3992 Ω	4008 Ω
8000.00 Ω	7984 Ω	8016 Ω
10000.00 Ω	9980 Ω	10020 Ω

Table 24. High Resistance Source

Output Terminals	Nominal Value	Standard Multimeter Test Method	Test Voltage	Lower Limit 5 kV & 1.5 kV Version	Upper Limit 5 kV & 1.5 kV Version
HI - LO	10 kΩ	8588A	--	9.98 kΩ	10.02 kΩ
HI - LO	20 kΩ	8588A	--	19.96 kΩ	20.04 kΩ
HI - LO	40 kΩ	8588A	--	39.92 kΩ	40.08 kΩ
HI - LO	80 kΩ	8588A	--	79.84 kΩ	80.16 kΩ
HI - LO	100 kΩ	8588A	--	99.80 kΩ	100.20 kΩ
HI - LO	200 kΩ	8588A	--	199.6 kΩ	200.4 kΩ
HI - LO	400 kΩ	8588A	--	399.2 kΩ	400.8 kΩ
HI - LO	800 kΩ	8588A	--	798.4 kΩ	801.6 kΩ
HI - LO	1.00 MΩ	8588A	--	997.0 kΩ	1003.0 kΩ
HI - LO	2.00 MΩ	8588A	--	1.994 MΩ	2.006 MΩ
HI - LO	4.00 MΩ	8588A	--	3.988 MΩ	4.012 MΩ
HI - LO	8.00 MΩ	8588A	--	7.976 MΩ	8.024 MΩ
HI - LO	10.0 MΩ	8588A	--	9.95 MΩ	10.05 MΩ
HI - LO	20.0 MΩ	8588A	--	19.9 MΩ	20.1 MΩ
HI - LO	40.0 MΩ	8588A	--	39.8 MΩ	40.2 MΩ
HI - LO	80.0 MΩ	8588A	--	79.6 MΩ	80.4 MΩ
HI - LO	100 MΩ	8588A	--	99.5 MΩ	100.5 MΩ
HI - LO	200 MΩ	8588A	--	199 MΩ	201 MΩ
HI - LO	400 MΩ	8588A	--	398 MΩ	402 MΩ
HI - LO	800 MΩ	8588A	--	796 MΩ	804 MΩ
HI - LO	1.0 GΩ	8588A	--	990 MΩ	1.010 GΩ
HI - LO	2.0 GΩ	Quadtech 1865	200 V	1.98 GΩ	2.02 GΩ
HI - LO	4.0 GΩ	Quadtech 1865	200 V	3.96 GΩ	4.04 GΩ
HI - LO	8.0 GΩ	Quadtech 1865	200 V	7.92 GΩ	8.08 GΩ
HI - LO	10 GΩ	Quadtech 1865	200 V	9.70 GΩ	10.3 GΩ
HI - LO	20 GΩ [1]	Quadtech 1865	200 V	19.4 GΩ	20.6 GΩ

Table 24. High Resistance Source (cont.)

Output Terminals	Nominal Value	Standard Multimeter Test Method	Test Voltage	Lower Limit 5 kV & 1.5 kV Version	Upper Limit 5 kV & 1.5 kV Version
HI - LO	40 GΩ [1]	Quadtech 1865	200 V	38.8 GΩ	41.2 GΩ
HI - LO	100 GΩ [1]	Quadtech 1865	200 V	97 GΩ	103 GΩ
Resistance multiplier	1 GΩ [2]	Quadtech 1865	500 V	990 MΩ - Rcal	1.010 GΩ + Rcal
Resistance multiplier	10 GΩ [2]	Quadtech 1865	500 V	9.9 GΩ - Rcal	10.1 GΩ + Rcal
Resistance multiplier	100 GΩ [2]	Quadtech 1865	500 V	98 GΩ - Rcal	102 GΩ + Rcal
Resistance multiplier	1 TΩ [2]	Quadtech 1865	500 V	997 GΩ - Rcal	1.03 TΩ + Rcal
Resistance multiplier	2 TΩ [2]	Quadtech 1865	500 V	1.94 TΩ - Rcal	2.06 TΩ + Rcal
Resistance multiplier	5 TΩ [2]	Quadtech 1865	500 V	4.85 TΩ - Rcal	5.15 TΩ + Rcal
Resistance multiplier	9 TΩ [2]	Quadtech 1865	500 V	8.73 TΩ - Rcal	9.27 TΩ + Rcal

[1] Use these points only for model 5322A/5 with 5 kV version high resistance source.
[2] Use this point only for model 5322A with 1.5 kV version high resistance source.

Table 25. DC/AC Voltage Calibrator

Test Voltage	Frequency (Hz)	Lower Limit	Upper Limit
60 mV	-	58.7 mV	61.3 mV
200 mV	-	198 mV	202 mV
270 mV	-	267.65 mV	272.35 mV
600 mV	-	595.2 mV	604.8 mV
2.0 V	-	1.991 V	2.009 V
2.7 V	-	2.689 V	2.711 V
6 V	-	5.985 V	6.015 V
20 V	-	19.971 V	20.029 V
27 V	-	26.964 V	27.036 V
100 V	-	99.855 V	100.145 V

Table 25. DC/AC Voltage Calibrator (cont.)

Test Voltage	Frequency (Hz)	Lower Limit	Upper Limit
200 V	-	199.62 V	200.38 V
300 V	-	299.52 V	300.48 V
400 V	-	399.42 V	400.58 V
500 V	-	499.32 V	500.68 V
600 V	-	599.22 V	600.78 V
60 mV	50	58.7 mV	61.3 mV
200 mV	50	198 mV	202 mV
200 mV	60	198 mV	202 mV
200 mV	400	198 mV	202 mV
270 mV	50	267.65 mV	272.35 mV
600 mV	50	595.2 mV	604.8 mV
2 V	50	1.991 V	2.009 V
2 V	60	1.991 V	2.009 V
2 V	400	1.991 V	2.009 V
2.7 V	50	2.689 V	2.711 V
6 V	50	5.985 V	6.015 V
20 V	50	19.971 V	20.029 V
20 V	60	19.971 V	20.029 V
20 V	400	19.971 V	20.029 V
80 V	50	19.971 V	20.029 V
80 V	60	79.89 V	80.11 V
80 V	400	79.89 V	80.11 V
110 V	50	109.80 V	110.2 V
150 V	50	149.76 V	150.24 V
200 V	50	199.71 V	200.29 V
250 V	50	249.66 V	250.34 V
280 V	50	279.63 V	280.37 V
280 V	60	279.63 V	280.37 V
280 V	400	279.63 V	280.37 V
500 V	50	499.32 V	500.68 V
500 V	60	499.32 V	500.68 V
500.00	400	499.32 V	500.68 V

Table 26. Passive Leakage Current

Set Resistance	Test Voltage	Lower Limit	Upper Limit
100 µA	55	97.7 µA	102.3 µA
250 µA	55	247.25 µA	252.75 µA
280 µA	0	277.16 µA	282.84 µA
1 mA	55	9.995 mA	1.005 mA
2.5 mA	55	2.4905 mA	2.5095 mA
2.8 mA	0	2.7896 mA	2.8104 mA
10 mA	55	9.968 mA	10.032 mA
25 mA	55	24.923 mA	25.077 mA
28 mA	0	27.914 mA	28.086 mA

Table 27. RCD Trip Current Test

Nominal Current	5322A Range	Frequency	Lower Limit	Higher Limit
10 mA	RCD I01	55	9.9 mA	10.1 mA
20 mA	RCD I01	55	19.8 mA	20.2 mA
30 mA	RCD I01	55	29.7 mA	30.3 mA
100 mA	RCD I02	55 Hz	99 mA	101 mA
200 mA	RCD I02	55 Hz	198 mA	202 mA
300 mA	RCD I02	55 Hz	297 mA	303 mA
1 A	RCD I03	55 Hz	0.99 A	1.01 A
2.5 A	RCD I03	55 Hz	2.475 A	2.525 A

Table 28. RCD Trip Time Test

Nominal Current	Test Voltage	Lower Limit	Upper Limit
50 ms	5 V	49.74 ms	50.26 ms
110 ms	5 V	109.73 ms	110.27 ms
510 ms	5 V	509.65 ms	510.35 ms
4.1 s	5 V	4.09893 s	4.10107 s

Table 29. DC/AC Voltage Multimeter Test

Nominal Output Voltage	Frequency (Hz)	Lower Limit (V)	Upper Limit (V)
4 V	-	3.989	4.011
-4 V	-	-4.011	-3.989
9 V	-	8.982	9.019
40 V	-	39.870	40.130
-40 V	-	-40.130	-39.870
90 V	-	89.770	90.230
200 V	-	199.050	200.950
-200 V	-	-200.950	-199.050
400 V	-	398.650	401.350
600 V	-	598.250	601.750
800 V	-	797.850	802.150
1000 V	-	997.450	1002.550
9 V	50	8.982	9.019
9 V	60	8.982	9.019
9 V	400	8.982	9.019
90 V	50	89.770	90.230
90 V	60	89.770	90.230
90 V	400	89.770	90.230
200 V	50	199.050	200.950
200 V	60	199.050	200.950
200 V	400	199.050	200.950
400 V	60	398.650	401.350
600 V	60	598.250	601.750
800 V	60	797.850	802.150
1000 V	60	997.450	1002.550

Table 30. DC/AC Current Multimeter Test

Nominal Output Voltage	Frequency (Hz)	Lower Limit (A)	Upper Limit (A)
0.100 A	-	0.0997	0.1003
-0.100 A	-	-0.1003	-0.0997
0.200 A	-	0.19955	0.20045
-0.200 A	-	-0.20045	-0.19955
0.500 A	-	0.49775	0.50225
1 A	-	0.997	1.003
-1 A	-	-1.003	-0.997
2.5 A	-	2.49475	2.50525
5 A	-	4.97	5.03
-5 A	-	-5.03	-4.97
10 A	-	9.955	10.045
15 A	-	14.94	15.06
20 A	-	19.925	20.075
0.100 A	50	0.0997	0.1003
0.200 A	50	0.19955	0.20045
0.250 A	50	0.24948	0.25053
0.250 A	60	0.24948	0.25053
0.250 A	400	0.24948	0.25053
0.500 A	50	0.49775	0.50225
0.500 A	60	0.49775	0.50225
1 A	60	0.997	1.003
2.5 A	50	2.49475	2.50525
2.5 A	60	2.49475	2.50525
2.5 A	400	2.49475	2.50525
5 A	50	4.97	5.03
5 A	60	4.97	5.03
5 A	400	4.97	5.03
10 A	60	9.955	10.045
15 A	60	14.94	15.06
20 A	60	19.925	20.075

Table 31. AC/DC Phase Multimeter Test

Nominal Output Voltage	Nominal Output Current	Nominal Phase Shift	Frequency (Hz)	Lower Limit	Upper Limit
250 mA AC	100 V	0 °	55	- 0. 1 °	+0.1 °
2.5 A AC	100 V	0 °	55	- 0. 1 °	+0.1 °
20 A AC	100 V	0 °	55	- 0. 1 °	+0.1 °
250 mA AC	100 V	45 °	55	44.9 °	45.1 °
2.5 A AC	100 V	45 °	55	44.9 °	45.1 °
20 A AC	100 V	45 °	55	44.9 °	45.1 °

Table 32. DC/AC HIPOT Leakage Current Test

Nominal Output Voltage	Frequency (Hz)	Lower Limit (A)	Upper Limit (A)
100 µA	-	99.50 µA	100.50 µA
200 µA	-	199.20 µA	200.80 µA
250 µA	-	249.05 µA	250.95 µA
1 mA	-	0.9965 mA	1.0035 mA
2 mA	-	1.99450 mA	2.00550 mA
2.5 mA	-	2.4935 mA	2.5065 mA
10 mA	-	9.965 mA	10.035 mA
20 mA	-	19.945 mA	20.055 mA
25 mA	-	24.935 mA	25.065 mA
100 mA	-	99.65 mA	100.35 mA
200 mA	-	199.45 mA	200.55 mA
250 mA	-	249.35 mA	250.65 mA
100 µA	50	99.50 µA	100.50 µA
200 µA	50	199.20 µA	200.80 µA
250 µA	50	249.05 µA	250.95 µA
250 µA	60	249.05 µA	250.95 µA
250 µA	400	249.05 µA	250.95 µA
1 mA	50	0.9965 mA	1.0035 mA
2 mA	50	1.99450 mA	2.00550 mA
2.5 mA	50	2.4935 mA	2.5065 mA
2.5 mA	60	2.4935 mA	2.5065 mA

Table 32. DC/AC HIPOT Leakage Current Test (cont.)

Nominal Output Voltage	Frequency (Hz)	Lower Limit (A)	Upper Limit (A)
2.5 mA	400	2.4935 mA	2.5065 mA
10 mA	50	9.965 mA	10.035 mA
20 mA	50	19.945 mA	20.055 mA
25 mA	50	24.935 mA	25.065 mA
25 mA	60	24.935 mA	25.065 mA
25 mA	400	24.935 mA	25.065 mA
100 mA	50	99.65 mA	100.35 mA
200 mA	50	199.45 mA	200.55 mA
250 mA	50	249.35 mA	250.65 mA
250 mA	60	249.35 mA	250.65 mA
250 mA	400	249.35 mA	250.65 mA

Table 33. DC/AC Voltage Multimeter Test 5 kV Option

Nominal Output Voltage	Frequency (Hz)	Lower Limit (V)	Upper Limit (V)
1000 V	-	991.5	1008.5
2000 V	-	1988.5	2011.5
3000 V	-	2985.5	3014.5
4000 V	-	3982.5	4017.5
5000 V	-	4979.5	5020.5
1000 V	50	991.5	1008.5
2000 V	50	1988.5	2011.5
3000 V	50	2985.5	3014.5
4000 V	50	3982.5	4017.5
5000 V	50	4979.5	5020.5
1000 V	60	991.5	1008.5
2000 V	60	1988.5	2011.5
3000 V	60	2985.5	3014.5
4000 V	60	3982.5	4017.5
5000 V	60	4979.5	5020.5
1000 V	0	991.5	1008.5

List of Error Messages

See Table 34 for a list of error messages shown by the Product.

Table 34. Error Messages

ID	Error message	Description
-430	Deadlocked.	Remote interface error. A received command generates too much data to fit in the output buffer and the output buffer is full. Command execution continues but all data as lost.
-420	Unterminated.	Remote interface error. The Product was addressed to talk but a command was not received which sends data to the output buffer.
-410	Interrupted.	Remote interface error. A received command sends data to the output buffer, but the output buffer contained data from a previous command. The output buffer is cleared when power turns off, or after you execute a reset command.
-363	Input buffer overrun	Remote interface error.
-220	Invalid parameter	Remote interface error. An invalid character string was received. Check to see if the character string was enclosed in single or double quotes and that the string contains valid ASCII character.
-140	Character data	Remote interface error.
-120	Numeric data	Remote interface error.
-110	Command header	Remote interface error. A command was received that is not valid for the Product. The command could be misspelled.
-103	Invalid separator	Remote interface error. An invalid separator was found in command string. It might contain a comma instead of a colon, semicolon, or blank space – or there could be a blank space instead of comma.
501	Eeprom write.	Eeprom write failed.
502	Eeprom read.	Eeprom read failed.
503	Eeprom error.	Eeprom data lost.
651	Impedance too high.	Residual impedance is too high (SCAN, COMP). Do not use SCAN and COMP mode in the Loop/Line impedance function or connect the Product to the socket with lower residual impedance.
652	Compensator overload	Compensator cannot be set. Hardware failure.

Table 34. Error Messages (cont.)

ID	Error message	Description
653	Compensator overload	Overloaded compensator (high residual impedance, measurement current or long measurement time).
654	Compensator disabled	Cannot select compensator because residual impedance is >10 Ω.
655	Cont. current too high	Continuous current is too high.
656	Short-t. current too high	Short-term current is too high.
661	Test voltage too high.	External test voltage is too high. Use lower test voltage on DUT.
662	Test voltage unstable.	Unstable external test voltage.
701	Output/Input overloaded	Input or output signal is over specified limits. Decrease signal level.
701	Output/Input overloaded	Input or output signal over specified limits. Decrease signal level.
703	Temperature too high.	Product power stage overheated. Disconnect external load.
704	Output/Input overloaded	Input or output signal over specified limits. Decrease signal level.
705	Output/Input overloaded	Input or output signal over specified limits. Decrease signal level.
706	Output/Input overloaded	Input or output signal over specified limits. Decrease signal level.
711	Value too large.	Set up value is too large. Set value in specified limits.
712	Value too small.	Set up value is too low. Set value in specified limits.
713	Negative value.	Negative value is not permitted. Do not set a negative value.
715	Rescan is not ready	Temperature overheating of scan circuit.
716	Rescan required	Required impedance correction mode cannot be selected without Rescan. Do Rescan first.
721	Unknown function.	Error in internal communication.
722	Unexpected crossing.	Error in internal communication.
731	Calibrator not ready	Error in internal communication.
732	Internal cpu RESET	Product will be restarted.

Table 34. Error Messages (cont.)

ID	Error message	Description
742	Interface data	Internal communication error.
743	Interface receive	Internal communication error.
744	Measurement not available	Internal communication error.
745	Ifc ready timeout.	Internal communication error.
750	GBR sense overloaded	Sense terminal current is too high.
801	Option not installed.	Unavailable selected function. Option not installed.
-	Current timeout.	Maximal thermal load in ground bond, loop/line resistance is reached. The Product disconnected the output terminals. Leave the Product in STANDBY mode for 5 minutes.

Maintenance

⚠⚠ Warning

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

- **For safe operation and maintenance of the Product, turn the Product off and remove the mains power cord. Stop for 2 minutes to let the power assemblies discharge before you open the fuse door.**
- **Do not operate the Product with covers removed or the case open. Hazardous voltage exposure is possible.**
- **Remove the input signals before you clean the Product.**
- **Use only specified replacement parts.**
- **Use only specified replacement fuses.**
- **Have an approved technician repair the Product.**

This section explains the routine maintenance and tasks required to keep the Product in optimum condition. The tasks covered in this section include:

- Clean the internal relays used in Ground Bond Resistance and Loop/Line functions.
- Fuse replacement.
- Clean the air filter and external surfaces.
- There are no user-serviceable items within the Product. Do not remove the Product covers. For intensive maintenance, tasks such as repair, contact the Fluke Calibration service center.
- Calibrate the Product annually.

Clean the Ground Bond Resistance and Loop/Line Impedance Relays

The power relays used in the Ground Bond Resistance and Loop/Line Impedance functions must be periodically cleaned to minimize their contact resistance. The Ground Bond Resistance and Loop/Line Impedance specifications are based on how often the relays are cleaned. See the *5322A Specifications*.

If the relay cleaning procedure has not been done within the past 90 days, the Product prompts you to run the procedure at startup with the displayed message: **Start the cleaning procedure**. The message shows after the Product is turned on and allows you to run the cleaning procedure immediately or to continue without cleaning the relays. If you do not run the cleaning procedure, the same message shows during the next startup operation until you run the relay cleaning procedure.

Besides the reminder function, start relay cleaning manually from the Setup menu. The cleaning procedure exercises the relays on the REL board a number of times with current that flows through them. To perform the relay cleaning procedure, disconnect all external connections to the Product front panel.

To clean the relays:

1. Push the **Setup** softkey.
2. Use the cursor keys or rotary knob to highlight **Maintenance** and either push the **Select** softkey or push in the rotary knob.
3. Use the cursor keys or rotary knob to highlight **Relay cleaning procedure** and either push the **Select** softkey or push in the rotary knob.
4. Push the **Select** softkey to start the procedure. The message **Please wait** shows. When the relay cleaning procedure concludes, the Product automatically returns to the main menu.

Access the Fuses

The Product fuses protect both the line-power input and various front-panel terminals. The subsequent sections describe the replacement procedures and list the appropriate fuses used in the Product.

Line-Power Fuse

The Product has a line-power fuse in series with the power supply. Table 35 indicates the proper fuse for each line voltage selection.

To replace the line power fuse:

1. Unplug the power cord from the Product.
2. On the rear panel, locate the fuse holder labeled **Power Fuse**.
3. Use a flat-blade screwdriver in the slot on the end of the fuse holder to unscrew the fuse holder.
4. Replace the fuse with one rated for the selected line voltage.
5. Reinsert the fuse holder and screw it into the socket.

Table 35. Line Power Fuses

Line Voltage Selection	Fuse	Fluke Part No.
115 V	⚠ T4L250V (5 x 20 mm)	2743488
230 V	⚠ T2L250V (5 x 20 mm)	2743495

Measurement Input Fuses

The Amps (A) terminal of the METER input, the HI terminal of the OUPUT terminals, and the L terminal or the RCD terminals are protected by fuses at the rear of the Product.

To replace these fuses:

1. Unplug all connections to the front panel of the Product.
2. Unplug the power cord from the Product.
3. Locate the fuse holder for the function on the rear panel of the Product.
4. Place a flat-blade screwdriver into the slot on the end of the fuse holder and unscrew the fuse holder.
5. Replace the fuse with one rated for the selected function. See Table 36.
6. Reinsert the fuse holder and screw it into the socket.

⚠ Caution

To avoid Product damage, use only the fuse specified for each of the measurement inputs as listed in Table 36.

Table 36. Measurement Input Fuse

Input	Fuse	Fluke Part No.
RCD	⚠ F3.15H250 V (5 mm x 20 mm)	2743508
Leakage Current	⚠ F100mL250 V (5 mm x 20 mm)	2743513
Meter	⚠ T20H500 V (6.3 mm x 32 mm)	4778086
Loop/Line Impedance	⚠ T4H500V (6.3 mm x 32 mm)	2743524

Clean the Air Filter

⚠ Caution

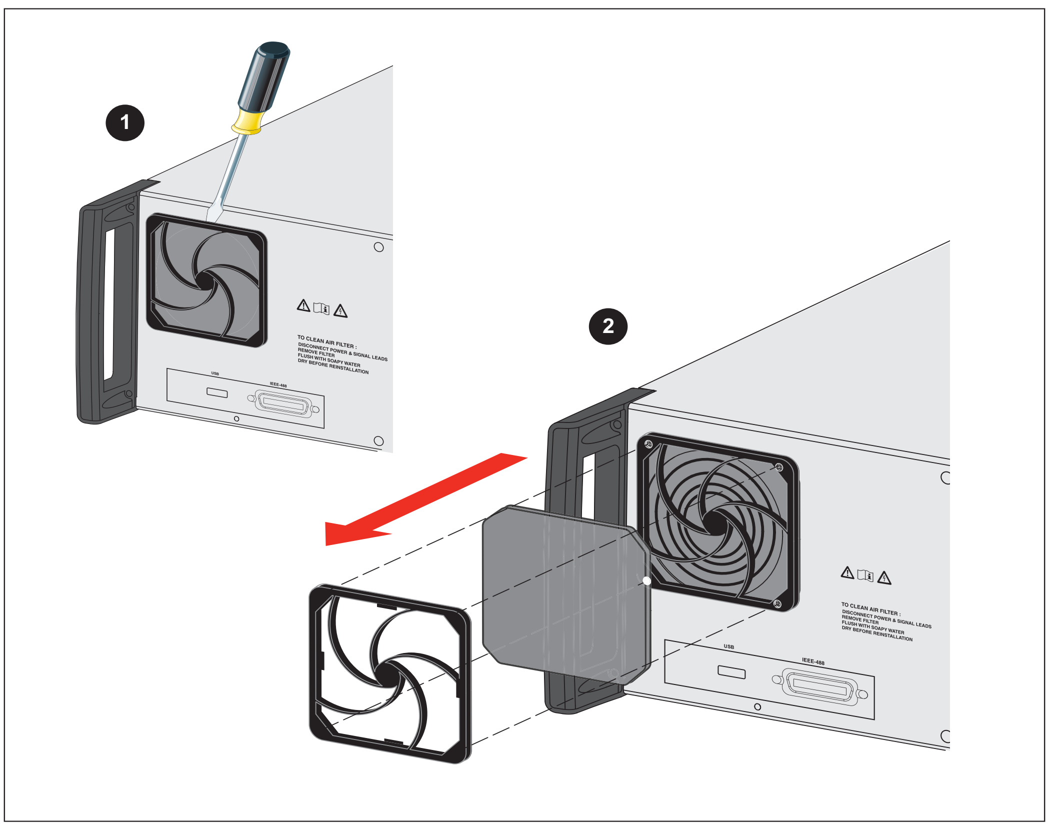
Damage from overheating can occur if the area around the fan is restricted, the intake air is too warm, or there is a clogged air filter.

Clean the air filter at least every 30 days, or more frequently if the Product is in a dusty environment. Access the air filter from the rear panel of the Product.

To clean the air filter, see Figure 41:

1. Unplug all connections to the front panel of the Product.
2. Unplug the power cord from the Product.
3. Grasp the outside edges of the filter and pull it straight out to remove the filter.
4. Remove the filter element from the filter frame.
5. To clean the filter, wash it in soapy water. Rinse and dry the filter element thoroughly before you reinstall it.
6. Reinstall the filter element into the filter frame.
7. Snap the filter frame back onto the fan housing.

Figure 41. Remove the Air Filter



Clean the Exterior

Clean the case, front-panel keys, and lens with a soft cloth, slightly dampened with water or a non-abrasive mild cleaning solution that is not harmful to plastics.

⚠ **Caution**

Do not use aromatic hydrocarbons or chlorinated solvents to clean the Product. They can damage the plastic materials used in the Product.

Electrical Parts

The Product contain the PCAs shown in Table 37.

Table 37. Electrical Parts

PCA Name	Description	Fluke Part Number
5322AMP	Voltage calibrator amplifier	4991626
5322COMP	Loop/Line compensator	4991632
5322CPU	Processor board	4991644
5322HVR	5 kV High resistance decade	4991659
5322HVRB	1.5 kV High resistance decade	4991667
5322IFC	Internal meters for individual functions (LVR, RCD, Leakage current, residual Line impedance)	4991671
5322KBD	Keyboard	4991680
5322LVR	Low resistance decade	4991698
5322MER	Floating multimeter	4991705
5322PWR	Power supply unit	4991710
5322RCD	RCD PAT board	4991722
5322REL	Ground bond resistance decade	4991731
5322VCAL	Voltage calibrator	4991746
6003GPIB	IEEE488 and USB interfaces	4596348
5322VCAL.ASS	Voltage calibrator with cables for upgrades	4991953
5322COMP.ASS	Loop/Line compensator with cables for upgrades	4991966

Figure 42. Block Diagram