FLUKE®

5320A

Multifunction Electrical Tester Calibrator

Service Manual

October 2008

LIMITED WARRANTY AND LIMITATION OF LIABILITY

Each Fluke product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period is one year and begins on the date of shipment. Parts, product repairs, and services are warranted for 90 days. This warranty extends only to the original buyer or end-user customer of a Fluke authorized reseller, and does not apply to fuses, disposable batteries, or to any product which, in Fluke's opinion, has been misused, altered, neglected, contaminated, or damaged by accident or abnormal conditions of operation or handling. Fluke warrants that software will operate substantially in accordance with its functional specifications for 90 days and that it has been properly recorded on non-defective media. Fluke does not warrant that software will be error free or operate without interruption.

Fluke authorized resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of Fluke. Warranty support is available only if product is purchased through a Fluke authorized sales outlet or Buyer has paid the applicable international price. Fluke reserves the right to invoice Buyer for importation costs of repair/replacement parts when product purchased in one country is submitted for repair in another country.

Fluke's warranty obligation is limited, at Fluke's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to a Fluke authorized service center within the warranty period.

To obtain warranty service, contact your nearest Fluke authorized service center to obtain return authorization information, then send the product to that service center, with a description of the difficulty, postage and insurance prepaid (FOB Destination). Fluke assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If Fluke determines that failure was caused by neglect, misuse, contamination, alteration, accident, or abnormal condition of operation or handling, including overvoltage failures caused by use outside the product's specified rating, or normal wear and tear of mechanical components, Fluke will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB Shipping Point).

THIS WARRANTY IS BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. FLUKE SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE OR THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this Warranty is held invalid or unenforceable by a court or other decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

Fluke Corporation
P.O. Box 9090
Everett, WA 98206-9090
U.S.A.

Fluke Europe B.V.
P.O. Box 1186
5602 BD Eindhoven
The Netherlands

11/99

To register your product online, visit register.fluke.com

Claims

Immediately upon arrival, purchaser shall check the packing container against the enclosed packing list and shall, within thirty (30) days of arrival, give Fluke notice of shortages or any nonconformity with the terms of the order. If purchaser fails to give notice, the delivery shall be deemed to conform with the terms of the order.

The purchaser assumes all risk of loss or damage to instruments upon delivery by Fluke to the carrier. If an instrument is damaged in transit, PURCHASER MUST FILE ALL CLAIMS FOR DAMAGE WITH THE CARRIER to obtain compensation. Upon request by purchaser, Fluke will submit an estimate of the cost to repair shipment damage.

Fluke will be happy to answer all questions to enhance the use of this instrument. Please address your requests or correspondence to: Fluke Corporation, P.O. Box 9090, Everett, WA 98206-9090.

Declaration of the Manufacturer or Importer

We hereby certify that the Fluke Model 5320A is in compliance with Postal Regulation Vfg. 1046 and is RFI suppressed. The marketing and sale of the equipment was reported to the German Postal Service. The right to retest this equipment to verify compliance with the regulation was given to the German Postal Service.

Bescheinigung des Herstellers/Importeurs

Hiermit wird bescheinigt, daβ Fluke Models 5320A in Übereinstimung mit den Bestimmungen der Amtsblattverfügung Vfg. 1046 funk-entstört ist, Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprüfung der Seire auf Einhaltung der Bestimmungen eingeräumt.

Fluke Corporation

Interference Information

This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type-tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of more of the following measures:

- Reorient the receiving antenna
- Relocate the equipment with respect to the receiver
- Move the equipment away from the receiver
- Plug the equipment into a different outlet so that the computer and receiver are on different branch circuits

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: How to Identify and Resolve Radio-TV Interference Problems. This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402. Stock No. 004-000-00345-4.

OPERATOR SAFETY SUMMARY

WARNING

HIGH VOLTAGE

is used in the operation of this equipment

LETHAL VOLTAGE

may be present on the terminals, observe all safety precautions!

To avoid electrical shock hazard, the operator should not electrically contact the output HI, SENSE HI, or the Impedance and RCD binding posts. During operation, lethal voltages of up to 1100V ac or dc may be present on these terminals.

Whenever the nature of the operation permits, keep one hand away from equipment to reduce the hazard of current flowing thought vital organs of the body.

Terms in this Manual

This instrument has been designed and tested in accordance with the safety standards listed in the General Specifications. This manual contains information and warnings which have to be followed by the user to ensure safe operation and to retain the instrument in safe condition.

⚠ WARNING statements identify conditions or practices that could result in personal injury or loss of life.

⚠ CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

Symbols Marked on Equipment

DANGER — High Voltage, risk of electric shock

Protective ground (earth) terminal

Attention — refer to the manual. This symbol indicates that information about the usage of a feature is contained in the manual.

Power Source

The 5320A is intended to operate from a power source that will not apply more than 264 V ac rms between the supply conductors or between either supply conductor and ground. A protective ground connection, by way of the grounding conductor in the power cord, is essential for safe operation.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified on the line voltage selection switch label, which is identical in type voltage rating, and current rating.

Grounding the 5320A

The enclosure is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired, earth grounded receptacle before connecting anything to any of the 5320A terminals. A protective ground connection, by way of the grounding conductor in the power cord, is essential for safe operation.

Use the Proper Power Cord

Always use the line power cord and connector appropriate for the voltage and outlet of the country or location in which you are working.

Always match the line cord to the instrument.

- Use the AC line cord supplied with this instrument with this instrument only.
- Do not use this line cord with any other instruments.
- Do not use any other line cords with this instrument.

Use only the power cord and connector appropriate for proper operation of a 5320A in your country.

Use only a power cord that is in good condition.

For detailed information on power cords, refer to Figure 2-1.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate the 5320A in an atmosphere of explosive gas.

Do Not Remove Cover

To avoid personal injury, do not remove the cover from the 5320A. Do not operate the 5320A without the cover properly installed. There are no user-serviceable parts inside the 5320A, so there is never a need for the operator to remove the cover.

Table of Contents

List of Tables

List of Figures

Chapter 1
Introduction and Specifications

Title **Page**

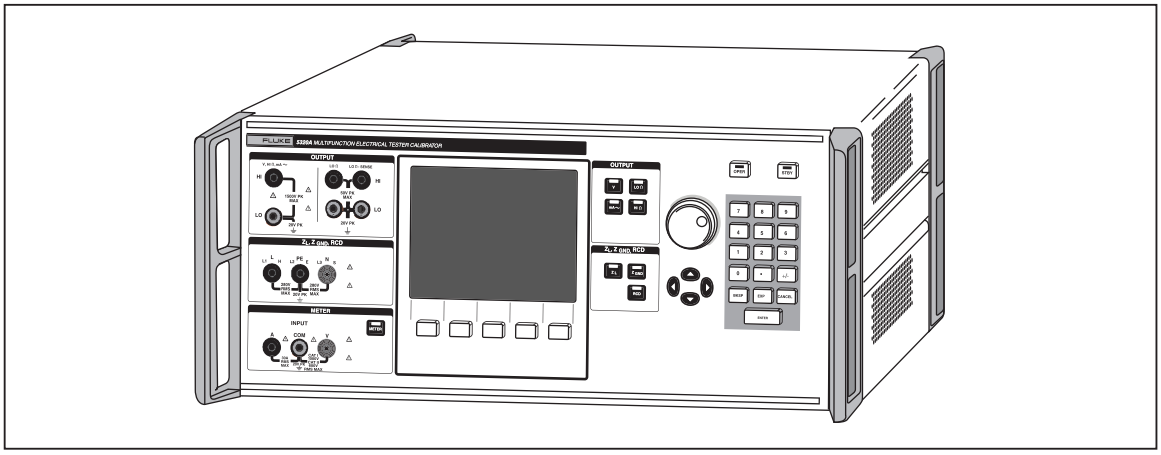
Introduction

The Fluke 5320A and 5320A/VLC (Figure 1-1) are Multifunction Electrical Tester Calibrators (hereafter referred to as the Calibrator), designed for full calibration and testing of electrical safety testers. Some examples of these testers are:

- Megohm meters
- Ground bond testers
- Loop testers
- RCD testers
- Appliance testers
- Electrical installation testers
- Earth resistance meters
- High voltage safety testers (Hipots)

⚠⚠ Warning

If the 5320A Calibrator is operated in any way not specified by this manual or other documentation provided by Fluke, the protection provided by the Calibrator may be impaired.



ewt002.eps

Figure 1-1. 5320A Multifunction Electrical Tester Calibrator

About This Manual

This manual provides information for verifying Calibrator operation, calibrating the Calibrator, and troubleshooting down to the module level. A list of replaceable parts with corresponding location diagrams, are also included.

Safety Information

This section addresses safety considerations and describes symbols that may appear in this manual or on the Calibrator.

A **Warning** statement identifies conditions or practices that could result in injury or death.

A **Caution** statement identifies conditions or practices that could result in damage to the Instrument or equipment to which it is connected.

⚠⚠Warning

To avoid electric shock, personal injury, or death, carefully read the information under "General Safety Summary" before attempting to install, use, or service the Instrument.

General Safety Summary

The instrument has been designed for according to EN 61010-1 (2nd Edition). The design reflects the requirements of A2 amendment of the standard.

Safety is ensured by the design and use of specific component types. The manufacturer is not liable for the damage caused by modification to the Calibrator or use of non-original replacement parts.

⚠⚠Warning

To avoid electric shock, personal injury, fire, or death, observe the following warnings before using the Calibrator:

- **Use the Calibrator only as specified in this manual, or the protection provided by the instrument might be impaired.**
- **Do not use the Calibrator in wet environments.**
- **Inspect the Calibrator before using it. Do not use the Calibrator if it appears damaged.**
- **Do not use the Calibrator if it operates abnormally. Protection may be impaired. If in doubt, have the Calibrator serviced.**
- **Have the Calibrator serviced only by qualified service personnel.**
- **Always use the power cord and connector appropriate for the voltage and outlet of the country or location in which you are working.**
- **Connect the Calibrator power cord to a power receptacle with an earth ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.**
- **Never remove the cover or open the case.**
- **Never operate the Calibrator with the cover removed or the case open.**
- **Use caution when working with voltages above 30 V ac rms, 42 V ac peak, or 60 V dc. These voltages pose a shock hazard.**
- **Use only the replacement fuse(s) specified by the manual.**
- **When servicing the Calibrator, use only specified replacement parts.**

⚠Warning

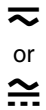
To prevent personal injury, use good lifting practices when lifting or moving the Calibrator. The Calibrator is an unbalanced load and weighs in excess of 18 kg (40 pounds).

⚠Caution

To prevent damage to the Calibrator, do not use aromatic hydrocarbons or chlorinated solvents for cleaning.

Symbols

The following safety and electrical symbols may be used on the Calibrator or in this manual.

Symbol	Description	Symbol	Description
	Risk of danger. Important information. See manual.	OI	Power ON / OFF
	Hazardous voltage. Voltage > 30 V dc or ac peak might be present.		Earth ground.
	AC (alternating current).		Capacitance.
	DC (direct current).		Diode.
	AC or DC (alternating or direct current).		Laser caution.
			Warning. Laser.
	Continuity test or continuity beeper tone.		Fuse.
	Digital signal.		Warning. Hot or burn hazard.
	Potentially hazardous voltage.	**CAT**	Overvoltage (installation or measurement) Category.
	Brightness / contrast adjustment		Display backlight
	Double insulated.		Recycle.
	Static awareness. Static discharge can damage part(s).		Do not dispose of this product as unsorted municipal waste. Contact Fluke or a qualified recycler for disposal.
	Do not connect to public network (e.g., telephone system.)		Maintenance or Service.
	Battery or battery compartment. Low battery when shown on display.		Tone or beep.

How to Contact Fluke

To order accessories, receive operating assistance, or get the location of the nearest Fluke distributor or Service Center, call:

USA:	1-800-44-FLUKE (1-800-443-5853)
Canada:	1-800-36-FLUKE (1-800-363-5853)
Europe:	+31 402-678-200
Japan:	+81-3-3434-0181
Singapore:	+65-738-5655
Anywhere in the world:	+1-425-446-5500
Service in USA:	1-888-99-FLUKE (1-888-993-5853)

Or, visit Fluke's Web site at www.fluke.com. To register your product, visit register.fluke.com.

Service Information

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

This service manual provides instructions for verification of performance, calibration, and maintenance. If you choose to repair a malfunction, information in this manual can help you to determine which module (printed circuit assembly) has a fault.

General Specifications

Warm-Up Time ..... 30 minutes
Specifications Confidence Level ..... 99 %
Specifications Interval ..... 1 year
Temperature Performance
- Operating Temperature ..... 18 to 28 °C
- Calibration Temperature (tcal) ..... 23 °C
- Temperature Coefficient ..... Temperature coefficient for temperature outside of Tcal ±5 °C between +5 °C to +40 °C is 0.1 x /°C
- Storage Temperature ..... -20 to +70 °C

Relative Humidity (operating) ..... <70 % to 28 °C
Altitude
- Operating ..... 3,050 m (10,000 ft.)
- Storage ..... 12,200 m (40,000 ft.)

Dimensions ..... 450 mm X 480 mm X 170 mm (17.7 in. X 18.9 in. X 6.7 in.)
Weight ..... 18 kg (39.7 lb)
Power Line ..... 115/230 V ac (50/60 Hz) ±10 %, with the maximum voltage difference between Neutral and Protective Earth not exceeding 20 V.
Power Consumption ..... 150 VA Maximum
Safety Class ..... Class I, Bonded Enclosure
Electrostatic Discharge ..... This instrument meets class I for ESD requirements per EN 61326 (Criteria A)
⚠ Fuse Protection
- AC mains input ..... 2 A, 250 V for 230 V, Time delay (T2L250 V – 5 x 20 mm)
4 A, 250 V for 115 V, Time delay (T4L250 V – 5 x 20 mm)
- RCD input ..... 3.15 A, 250 V, Fast (F3.15L250V – 5 x 20 mm)
- Meter amps (A) input ..... 20 A, 500 V, Time delay (T20L500V – 6.3 x 32 mm)
- Loop/Line impedance input ..... 4 A, 250 V, Time delay (T4L250V – 6.3 x 32 mm)
- Leakage current input ..... 100 mA, 150V, Fast (F100mL150V – 5 x 20 mm)

Electrical Specifications

Low Resistance Source

Total Range ..... 100 mΩ to 10 kΩ

Resolution ..... 3½ digits (continuously variable)

Uncertainty and Maximum Ratings

Range	Resolution	Maximum AC or DC Current[1]	2-Wire Uncertainty[2] (tcal ±5 °C)	4-Wire Uncertainty (tcal ±5 °C)
100 mΩ to 4.99 Ω	0.1 mΩ	400 mA	0.3 % + 25 mΩ	0.3 % + 10 mΩ
5 to 29.9 Ω	0.01 Ω	250 mA	0.2 % + 25 mΩ	0.2 % + 10 mΩ
30 to 199.9 Ω	0.1 Ω	100 mA	0.2 % + 25 mΩ	0.2 % + 10 mΩ
200 to 499 Ω	1 Ω	45 mA	0.2 %	0.2 %
500 Ω to 1.999 kΩ	1 Ω	25 mA	0.2 %	0.2 %
2 to 4.99 kΩ	10 Ω	10 mA	0.2 %	0.2 %
5 to 10 kΩ	10 Ω	5 mA	0.2 %	0.2 %

Notes:

[1] Test current can exceed 120 % of maximum current for up to 3 seconds. Terminals automatically disconnect if test current exceeds 120 % of specified maximum current.

[2] Uncertainty is valid to 200 mW. For higher power rating, add 0.1 % per each 300 mW above 200 mW.

Test Current Measurement

Range ..... 0 to 400 mA ac + dc rms

Resolution ..... 1 mA

Uncertainty ..... $\left(\left(\frac{20}{\sqrt{R}}\right)+0.1\right)mA$ R = set resistance between 0.5 Ω to 10 kΩ.

Short Mode

Nominal resistance ..... <50 mΩ

Maximum current ..... 400 mA ac + dc rms

Open Mode

Nominal resistance ..... 30 MΩ ±20 %

Maximum input voltage allowed ..... 50 V ac + dc rms

Test voltage reading ..... 0 to 50 V ac + dc rms

Resolution ..... 1 V

Uncertainty ..... 5 % + 2 V

High Resistance Source

Range ..... 10 kΩ to 10 GΩ plus 100 GΩ single value selection.

Resolution ..... 4½ Digit (continuously variable for 10 kΩ to 10 GΩ range)

Uncertainty and Maximum Ratings

Range	Resolution	Maximum Voltage (ac + dc) Peak	Uncertainty[1] (tcal ±5 °C)
10.000 to 39.99 kΩ	1 Ω	55 V	0.2 %
40.00 to 99.99 kΩ	10 Ω	400 V	0.2 %
100.00 to 199.99 kΩ	10 Ω	800 V	0.2 %
200.0 to 999.9 kΩ	100 Ω	1100 V	0.2 %
1.0000 to 9.999 MΩ	100 Ω	1150 V	0.3 %
10.000 to 999.9 MΩ	1 kΩ	1575 V[2]	0.5 %
1.0000 to 10.000 GΩ	100 kΩ	1575 V[2]	1.0 %
100 GΩ	NA	1575 V[2]	3.0 %[3]

Notes:

[1] Uncertainty is valid to 500 volts. For test voltages above 500 V, add 0.1% for each 200 V above 500 V.

[2] Maximum test voltage with the supplied banana leads is 1000 Vrms. For higher voltages, use leads rated at 1575 V or above.

[3] Calibration value uncertainty is specified in the table. Nominal value is ± 15 %.

Test Voltage Measurement

Range ..... 0 to 2000 V dc peak
Resolution ..... 1 V
Uncertainty ..... 1 % + 5 V for R above 1 MΩ
1 % + 2 V for R below 1 MΩ
Settling Time ..... 2 seconds for input deviations of <5 %

Test Current Measurement

Range ..... 0 to 9.9 mA dc
Uncertainty ..... 1.5 % + 5V/R A (where R is the selected resistance value)
Settling time ..... 2 seconds (for voltage reading deviations < 5 %)

Short Mode

Nominal resistance ..... <100 Ω
Maximum input current allowed ..... 50 mA ac + dc rms
Test current range ..... 0 to 50 mA ac + dc rms
Resolution ..... 0.1 mA
Uncertainty ..... 2 % + 0.5 mA

Resistance Multiplier Adapter (x1000 multiplier)

Resistance range ..... 350 MΩ to 10 TΩ

Uncertainty and Maximum Ratings

Range	Resolution	Maximum Voltage (ac + dc) Peak	Uncertainty (tcal ±5 °C)
350.0 MΩ to 99.99 GΩ	100 kΩ	10000 V	1.0 % + R[1]
100.00 GΩ to 999.9 GΩ	10 MΩ	10000 V	2.0 % + R[1]
1.0000 TΩ to 10.000 TΩ	100 MΩ	10000 V	3.0 % + R[1]

Notes:
[1] R is the uncertainty of resistor to be multiplied by 1000.

Ground Bond Resistance Source

Resistance Mode

Range ..... 25 mΩ to 1.8 kΩ
Resolution ..... 16 discrete values
Minimum test voltage/current ..... 10 V / 10 mA
Test Current Measurement Range ..... 0 to 40 A ac + dc rms
Test Current Measurement Resolution ..... 1 mA to 100 mA depending on resistance output and test current

Uncertainty and Maximum Ratings

Nominal Value	Deviation from Nominal Value	Absolute Uncertainty of Characterized Value (tcal ±5 °C)	Maximum Continuous Test Current ACrms or DC[1]	Maximum Short-term Test Current AC rms or DC[2]	Test Current Uncertainty
25 mΩ	±50 %	± 5 mΩ	30 A	40 A	1.5 % + 0.7 A
50 mΩ	±50 %	± 5 mΩ	28 A	40 A	1.5 % + 0.5 A
100 mΩ	±30 %	± 5 mΩ	25 A	40 A	1.5 % + 0.35 A
330 mΩ	±20 %	± 7 mΩ	14 A	40 A	1.5 % + 0.3 A
500 mΩ	±10 %	± 8 mΩ	10 A	40 A	1.5 % + 0.2 A
1 Ω	±10 %	± 10 mΩ	8 A	40 A	1.5 % + 150 mA
1.8 Ω	±10 %	± 18 mΩ	6 A	30 A	1.5 % + 100 mA
5 Ω	±10 %	± 30 mΩ	3.2 A	21 A	1.5 % + 70 mA
10 Ω	±10 %	± 60 mΩ	2.0 A	15 A	1.5 % + 50 mA
18 Ω	±10 %	± 100 mΩ	1.5 A	10 A	1.5 % + 30 mA
50 Ω	±10 %	± 300 mΩ	0.8 A	5.0 A	1.5 % + 20 mA
100 Ω	±10 %	± 500 mΩ	0.5 A	3.0 A	1.5 % + 10 mA
180 Ω	±10 %	± 1 Ω	0.25 A	1.35 A	1.5 % + 5 mA
500 Ω	±10 %	± 2.5 Ω	0.1 A	0.6 A	1.5 % + 3 mA
1 kΩ	±10 %	± 5 Ω	0.05 A	0.3 A	1.5 % + 2 mA
1.8 kΩ	±10 %	± 10 Ω	0.025 A	0.15 A	1.5 % + 2 mA

Notes:

[1] Test currents up to 30 % of maximum continuous test current can be applied to the Calibrator with no time limitation. Test current between 30 % and 100 % of the maximum continuous test current can be applied to the Calibrator for a limited time. Minimum period of full current load is 45 seconds. The Calibrator calculates the allowed time period and when exceeded, the output connectors are disconnected.

[2] Maximum short term test current is defined as the rms value of halfwave or fullwave test current flowing through the UUT. Maximum time of test is 200 ms. A time interval of 200 ms represents 10 full waves of power line voltage at 50 Hz and 12 full waves at 60 Hz.

Open Mode

Nominal resistance ..... >100 kΩ
Maximum voltage ..... 50 V ac + dc rms
Test voltage range ..... 0 to 50 V ac + dc rms
Resolution ..... 1 V
Uncertainty ..... 2 % + 2 V

Transfer Mode

Transfer Ground Bond Resistance Accuracy in mΩ

Transfer GBR (mΩ)	Marking on Display	UUT Test Current							
		30 A	28 A	25 A	20 A	14 A	10 A	8 A	3 A
50	0	±0.8 mΩ	±0.8 mΩ	±0.8 mΩ	±0.9 mΩ	±1.0 mΩ	±1.2 mΩ	±1.3 mΩ	±2.6 mΩ
80	R1	±0.9 mΩ	±1.0 mΩ	±1.0 mΩ	±1.0 mΩ	±1.2 mΩ	±1.4 mΩ	±1.5 mΩ	±2.9 mΩ
120	R2	-	±1.1 mΩ	±1.1 mΩ	±1.2 mΩ	±1.3 mΩ	±1.5 mΩ	±1.7 mΩ	±3.1 mΩ
170	R3	-	-	±1.4 mΩ	±1.4 mΩ	±1.6 mΩ	±1.8 mΩ	±2.0 mΩ	±3.6 mΩ
420	R4	-	-	-	-	±3.0 mΩ	±3.3 mΩ	±3.6 mΩ	±6.0 mΩ
550	R5	-	-	-	-	-	±4.1 mΩ	±4.4 mΩ	±7.2 mΩ

Maximum and Minimum Applicable Test Currents from the Ground Bond Resistance Meter

5320A Transfer GBR (mΩ)	UUT Minimum Test Current AC/DC (A)	UUT Maximum Test Current AC/DC (A)
50	3	30
80	3	30
120	3	28
170	3	25
420	3	14
550	3	10

Notes

- *The minimum value of the indicated test current is 0.05 A.*
- *The transfer GBR indication as the main value on the display is shown when the test current is 3 A or greater.*

Line/Loop Impedance Source

Range ..... 25 mΩ to 1.8 kΩ
Resolution ..... 16 discrete values
Minimum test voltage/current ..... 10 V/10 mA

Uncertainty and Maximum Ratings

Nominal Resistance Value	Deviation from Nominal Value	Absolute Uncertainty of Characterized Value (tcal ±5 °C)	Maximum Continuous Test Current AC rms or DC[1]	Maximum Short-term Test Current AC rms or DC[2]	Test Current Uncertainty
25 mΩ	±50 %	±5 mΩ	30 A	40 A	1.5 % + 0.7 A
50 mΩ	±50 %	±5 mΩ	28 A	40 A	1.5 % + 0.5 A
100 mΩ	±30 %	±5 mΩ	25 A	40 A	1.5 % + 0.35 A
330 mΩ	±20 %	±7 mΩ	14 A	40 A	1.5 % + 0.3 A
500 mΩ	±10 %	±8 mΩ	10 A	40 A	1.5 % + 0.2 A
1 Ω	±10 %	±10 mΩ	8 A	40 A	1.5 % + 150 mA
1.8 Ω	±10 %	±18 mΩ	6 A	30 A	1.5 % + 100 mA
5 Ω	±10 %	±30 mΩ	3.2 A	21 A	1.5 % + 70 mA
10 Ω	±10 %	±60 mΩ	2.0 A	15 A	1.5 % + 50 mA
18 Ω	±10 %	±100 mΩ	1.5 A	10 A	1.5 % + 30 mA
50 Ω	±10 %	± 300 mΩ	0.8 A	5.0 A	1.5 % + 20 mA
100 Ω	±10 %	± 500 mΩ	0.5 A	3.0 A	1.5 % + 10 mA
180 Ω	±10 %	± 1 Ω	0.25 A	1.35 A	1.5 % + 5 mA
500 Ω	±10 %	± 2.5 Ω	0.1 A	0.6 A	1.5 % + 3 mA
1 kΩ	±10 %	± 5 Ω	0.05 A	0.3 A	1.5 % + 2 mA
1.8 kΩ	±10 %	± 10 Ω	0.025 A	0.15 A	1.5 % + 2 mA

Notes:

[1] Test currents up to 30 % of maximum continuous test current can be applied to the Calibrator with no time limitation. Test current between 30 % and 100 % of the maximum continuous test current can be applied to the Calibrator for a limited time. Minimum period of full current load is 45 seconds. The Calibrator calculates the allowed time period and when exceeded, the output connectors are disconnected.

[2] Maximum short term test current is defined as the rms value of halfwave or fullwave test current flowing through the UUT. Maximum time of test is 200 ms. A time interval of 200 ms represents 10 full waves of power line voltage at 50 Hz and 12 full waves at 60 Hz.

Test Current Measurement

Type of recognized test current ..... Positive impulse (halfwave), negative impulse (halfwave), symmetrical (fullwave).
Range ..... 0 to 40 A ac + dc rms
Resolution ..... 1 to 100 mA depending on test current and resistance output

Prospective Fault Current

Range ..... 0 to 10 kA

Correction Manual Mode

Residual Impedance Range ..... 0 to 10 Ω
Resolution ..... 1 mΩ
Uncertainty ..... Uncertainty in manual (MAN) mode is the uncertainty of selected resistance value. See table above. Also, the uncertainty of the manually entered correction should be taken into consideration.

Correction Scan Mode

Residual Impedance Range ..... 0 to 10 Ω
Resolution ..... 1 mΩ
Uncertainty ..... (1 % +15 mΩ) + uncertainty of selected resistance value.

Correction COMP Mode (Active Loop Compensation) (5320A/VLC only)

Residual Impedance Range ..... 0 to 2 Ω
Maximum Test Current ..... <25/N A pk, where N equals number of UUT generated test current periods.
Uncertainty of compensation ..... (1 % + 15 mΩ) + uncertainty of selected resistance value. Uncertainty is valid at the point in time when the COMP function is initiated.

Leakage Current Source

Range ..... 0.1 to 30 mA
Resolution:
Passive Mode ..... 10 µA setting, 1 µA measurement
Differential Mode ..... 10 µA setting, 1 µA measurement
Substitute Mode ..... 10 µA
Active Mode (5320A/VLC only) ..... 10 µA
Test Voltage:
Passive Mode ..... 60 to 250 V ac + dc rms
Differential Mode ..... 60 to 250 V ac + dc rms
Substitute Mode ..... 10 to 250 V ac + dc rms
Active Mode (5320A/VLC only) ..... 50 to 100 V ac + dc rms
Uncertainty:
Passive Mode ..... 0.3 % + 2 µA ac + dc rms
Differential Mode ..... 0.3 % + 2 µA ac + dc rms
Test uncertainty can be influenced by power line voltage instability
Substitute Mode ..... 0.3 % + 2 µA ac + dc rms
Active Mode (5320A/VLC only) ..... 0.3 % + 1 µA ac + dc rms

RCD (Residual Current Device)

Trip Current Range:
0.5 X I and 1 X I Mode ..... 3 to 3000 mA in 1 mA steps
1.4 X I and 2 X I Mode ..... 3 to 1500 mA in 1 mA steps
5 X I Mode ..... 3 to 600 mA in 1 mA steps
Trip Current Measurement Resolution ..... 1 µA on 30 mA range
10 µA on 300 mA range
100 µA on 3A range
Uncertainty:
0.5 X I and 1 X I Mode ..... 1 % rms
1.4 X I and 2 X I Mode ..... 2 % rms
5 X I Mode ..... 5 % rms
Trip Time Range ..... 10 to 5000 ms
Trip Time Uncertainty ..... 0.02 % + 0.25 ms
Series Resistance ..... 0.025 Ω, 0.05 Ω, 0.1 Ω, 0.33 Ω, 0.5 Ω, 1 Ω, 1.8 Ω, 5 Ω, 10 Ω, 18 Ω, 50 Ω, 100 Ω, 180 Ω, 500 Ω, 1000 Ω, 1800 Ω
Line/Touch Voltage Range ..... 250 V
Line/Touch Voltage Uncertainty ..... 5 % + 3 V

AC/DC Voltage Calibrator (5320A/VLC only)

Range ..... 3 to 600 V, ac or dc
Resolution ..... 4 digits
Internal Ranges:
AC Mode ..... 30, 100, 300, and 600 V (Autoranging only)
DC Mode ..... 30, 150, and 600 V (Autoranging only)
Frequency:
Range ..... 40 to 400 Hz
Resolution ..... 3 digits
Uncertainty ..... 0.02 %
Settling Time ..... 300 ms to 3 s, depending on output value

AC Voltage

Uncertainty and Maximum Burden Current

Range	Resolution	Uncertainty ±(% of Output + mV)	Maximum Burden Current
3 – 29.99 V	0.001 V	0.1 % + 9	500 mA
30 – 99.99 V	0.01 V	0.1 % + 30	300 mA
100 – 299.9 V	0.1 V	0.1 % + 90	150 mA
300 – 600 V	0.1 V	0.1 % + 180	50 mA

DC Voltage

Uncertainty and Maximum Burden Current

Range	Resolution	Uncertainty ±(% of Output + mV)	Maximum Burden Current
3 – 29.99 V	0.001 V	0.1 % + 9	2 mA
30 – 149.9 V	0.01 V	0.1 % + 45	3 mA
150 – 600 V	0.1 V	0.1 % + 180	5 mA

AC Output Signal Distortion ..... 0.2 % ±10 mV (harmonic distortion and non-harmonic noise from 20 Hz to 500 kHz), for output power lower than 10 VA on each range.
Sensing Ammeter Current Range ..... 500 mA
Resolution ..... 1 mA
Uncertainty ..... ±5 mA

Multimeter

Voltage

Range ..... 0 to 1100 V ac rms or dc
Resolution ..... 4½ digits
Internal Ranges ..... 10, 100, and 1100 V (Autoranging only)
Frequency Range ..... DC, 20 Hz to 2 kHz
Input Resistance ..... 10 MΩ ±1 %
Time Constant ..... 1.5 s
Readings/Second 2
Measurement Category ..... 1000 V CAT I, 300 V CAT II

AC/DC Voltage Uncertainty

Range	Resolution	Uncertainty ±(% of Reading + mV)
10 V	0.001 V	0.15 % + 5
100 V	0.01 V	0.20 % + 50
1100 V	0.1 V	0.20 % + 550

Current

Range ..... 0 to 20 A continuous, 30 A for up to 30 minutes, ac rms or dc
Resolution ..... 4½ digits
Internal Ranges ..... 300 mA, 3 and 30 A (Autoranging only)
Frequency Range ..... DC, 20 to 400 Hz
Time Constant ..... 1.5 s
Readings/Second 2

AC/DC Current Uncertainty

Range	Resolution	Uncertainty ±(% of Reading + mA)
300 mA	0.1 mA	0.15 % + 0.15
3 A	1 mA	0.15 % + 1.5
30 A	10 mA	0.30 % + 15

Phantom Power

Range ..... 0 to 33 kVA
Resolution ..... 3 digits
Uncertainty ..... $\sqrt{(V_{unc})^2 + (I_{unc})^2}$ where V_{unc} is specified uncertainty of measured voltage and I_{unc} is specified uncertainty of measured current.

Hipot Leakage Current Measurement Mode

Range ..... 0 to 300 mA ac rms or dc
Resolution ..... 4 1/2 digits
Frequency range ..... DC, 20 Hz to 400 Hz
Time constant ..... 1.5 s
Readings/second 2

Hipot Leakage Current Mode Uncertainty

Range	Resolution	Uncertainty ±(% of reading + µA)
300 uA	0.01 µA	0.3 % + 0.21
3 mA	0.1 µA	0.2 % + 1.5
30 mA	1 µA	0.2 % + 15
300 mA	10 µA	0.2 % + 150

Hipot Timer Measurement Mode

Range ..... 0.1 to 999 s
Resolution ..... 1 ms
Uncertainty ..... 0.02 % + 2 ms (dc)
0.02 % + 20 ms (ac)

10 kV Adapter (1000:1 voltage divider)

Range ..... 0 to 10 kV ac peak/dc
Resolution ..... 4½ digits
Uncertainty ..... 0.3 % of value + 5 V dc
0.5 % of value + 5 V ac at 50 or 60 Hz

80K-40 High Voltage Probe

Range ..... 0 to 40 kV ac peak/dc
Resolution ..... 4½ digits
Uncertainty ..... 0.5 % of value + 10 V dc
0.5 % of value + 10 V ac at 50 or 60 Hz

Chapter 2
Theory of Operation

Introduction

This chapter provides a block diagram discussion of the Calibrator's analog and digital sections. Figure 2-1 shows the arrangement of assemblies inside the 5320A and Table 2-1 identifies the circuits on each printed circuit assembly (PCA).

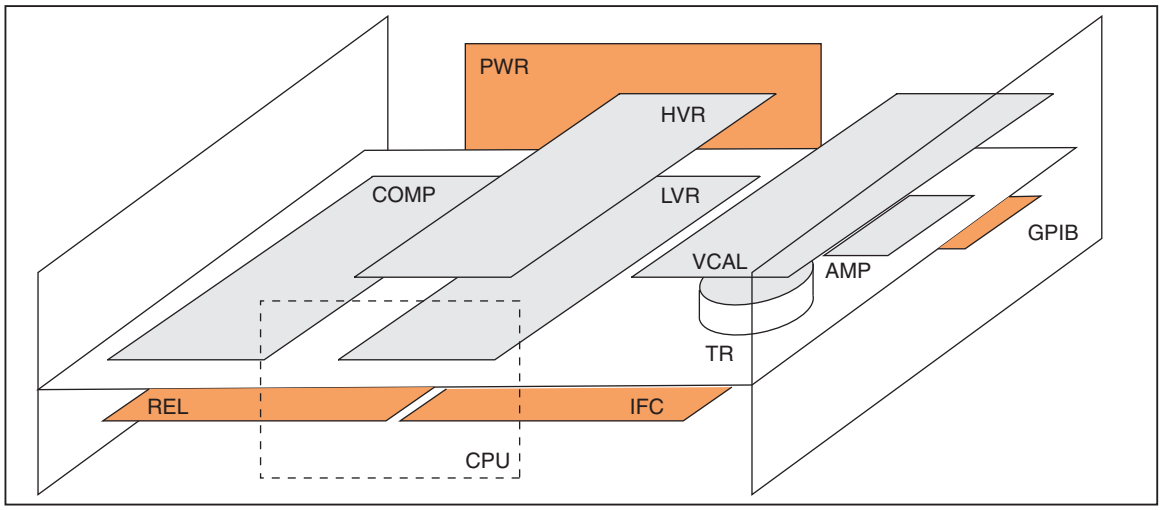


Figure 2-1. 5320A Internal Layout

Table 2-1. Electronic Circuits to PCA

PCA	Electronic Circuits
REL	Ground bond resistance decade, RCD and Loop/Line impedance circuits
IFC	Multimeter block, RCD, Loop/Line impedance and Leakage current control processor
COMP	Loop/Line impedance compensator
LVR	Low resistance decade
HVR	High resistance decade
VCAL	AC/DC voltage calibrator
AMP	AC/DC voltage calibrator power amplifier
TR	AC/DC voltage calibrator transformer
PWR	Internal power supply
GPIB	GPIB, RS232, RJ45 interface circuits
CPU	Main processor

The Calibrator produces a calibrated output with the following electrical characteristics:

- Ground bond resistance source in 16 different fixed values from 25 mΩ to 1.8 kΩ.
- Low resistance source from 100 mΩ to 10 kΩ with 3½ digit resolution.
- High resistance source from 10 kΩ to 10 GΩ with 4½ digit resolution.
- High resistance source fixed at 100 GΩ.

- AC and DC voltage from 3 to 600 Volts (5320A/VLC only).
- Loop and Line impedances from 25 mΩ to 1.8 kΩ and a residual impedance compensator (5320A/VLC only).
- RCD currents from 3 mA to 3 A with trip times from 10 ms to 5 seconds.
- Passive and active leakage current from 0.1 to 30 mA (5320A/VLC only).

In addition to the outputs listed above, the Calibrator has a built-in ac/dc multimeter for measuring up to 1100 volts and currents up to 30 Amps.

Low Resistance Source (LVR PCA)

The low resistance source is formed by 27 resistors connected as shown in Figure 2-2. Relays, controlled by the main CPU, switch the resistors in and out of the circuit. These resistors range in value from 100 mΩ to 16 MΩ. Voltage applied to the resistors is sensed with an internal voltmeter. The low resistance is sourced in either a 2-wire or 4-wire configuration based on the user selected mode. Test current is calculated based on the selected resistors and sensed voltage.

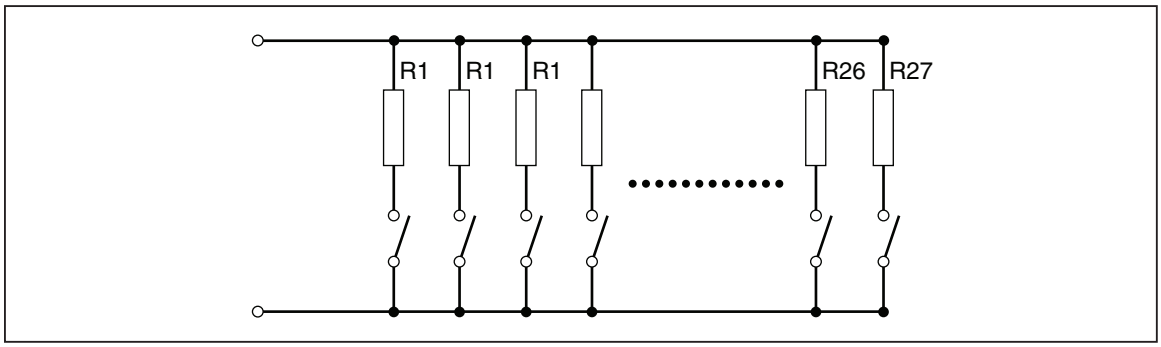


Figure 2-2. Low Resistance Source Resistor Connections

The low resistance circuit is on the LVR PCA and the internal voltmeter is on the IFC PCA.

High Resistance Source (HVR PCA)

The high resistance source is formed by 30 resistors connected as shown in Figure 2-3. Relays, controlled by the main CPU, switch the resistors in and out of the circuit. These resistors provide a range covering 10 kΩ to 10 GΩ and one fixed resistance of 100 GΩ. Voltage applied to the resistors is sensed by the internal voltmeter.

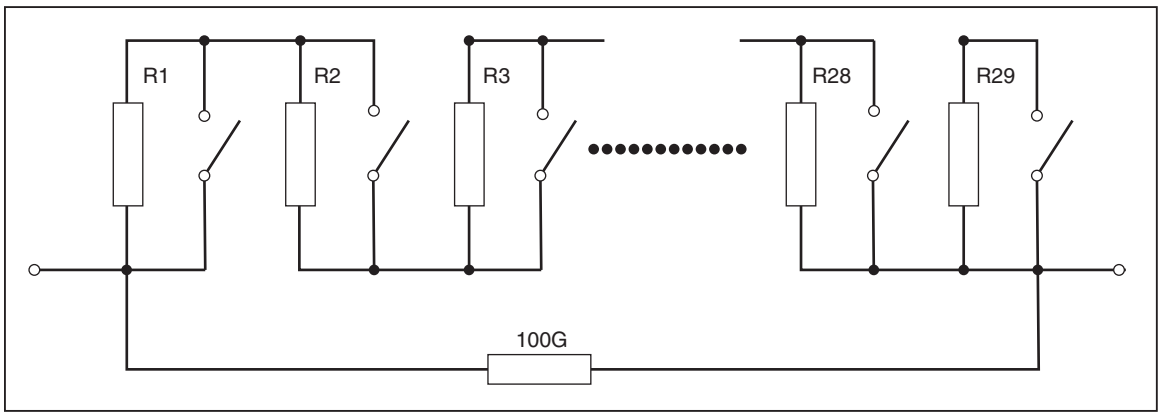


Figure 2-3. High Resistance Source Resistor Connections

The high resistance circuit is on the HVR PCA and the internal voltmeter is on the IFC PCA.

Ground Bond Resistance Source (REL PCA)

The ground bond resistance source is formed by 16 resistors connected as shown in Figure 2-4. Relays, controlled by the main CPU, switch the resistors in and out of the circuit. These resistors provide a range covering 25 mΩ to 1.8 kΩ. Voltage applied to the ground bond resistors is sensed by the internal voltmeter. Test current is calculated based on the selected resistors and sensed voltage.

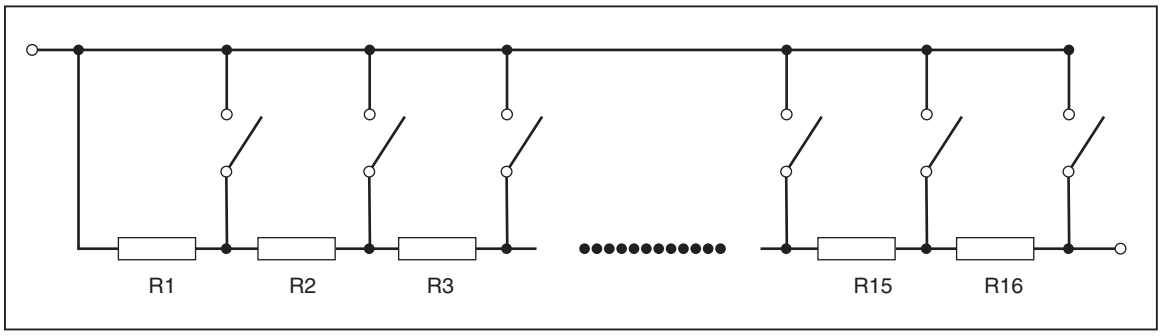


Figure 2-4. Ground Bond Resistance Source Resistor Connection

The Ground Bond resistance circuit is located on the REL PCA and the voltmeter is on the IFC PCA.

AC/DC Voltage Calibrator (VCAL and AMP PCAs)

A block diagram of the Voltage Calibrator circuit is shown in Figure 2-5. The voltage calibrator circuit generates a sine wave. The amplitude of the sine wave is regulated by controlling the input voltage to the sine wave generator. The frequency of the output is derived from the microprocessor's crystal oscillator. The signal is fed through a 30 V amplifier with its output connected to a transformer with range taps.

A feedback circuit senses the output voltage at the output terminals and produces a normalized value that is compared to a precise dc reference voltage. The difference between the feedback voltage and dc reference controls the amplitude of the generator's output.

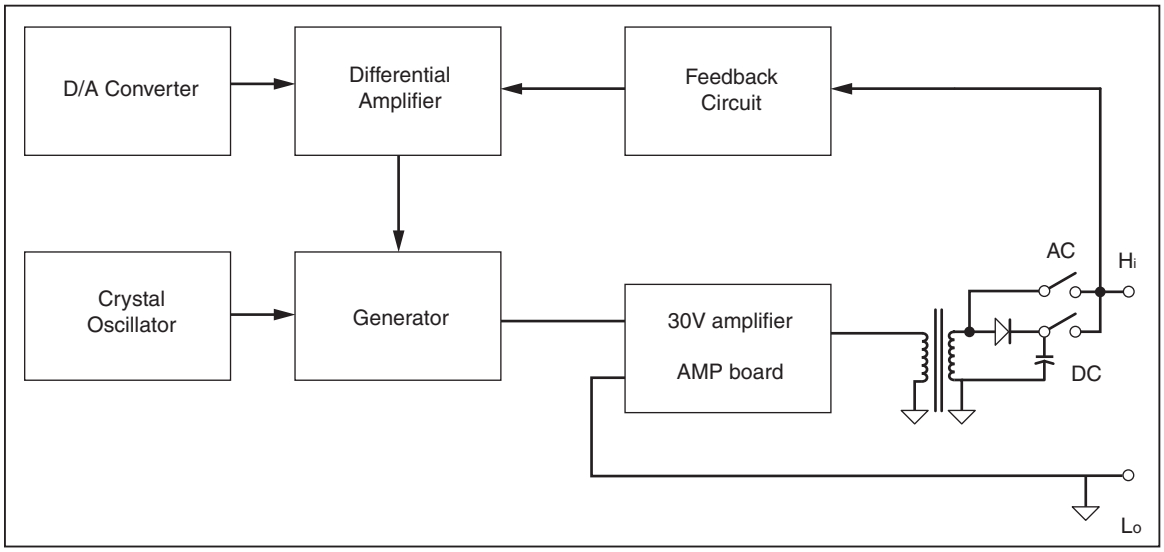


Figure 2-5. Voltage Calibrator Block Diagram

The voltage calibrator cirsuit is located in the VCAL and AMP PCAs.

AC/DC Multimeter (IFC PCA)

The ac/dc multimeter simultaneously measures voltage up to 1100 V and current up to 30 A. Both voltage and current channels consists of a range amplifier and a selectable ac/dc converter. See Figure 2-6. The output signal is measured with dual-input 16-digit A/D converter.

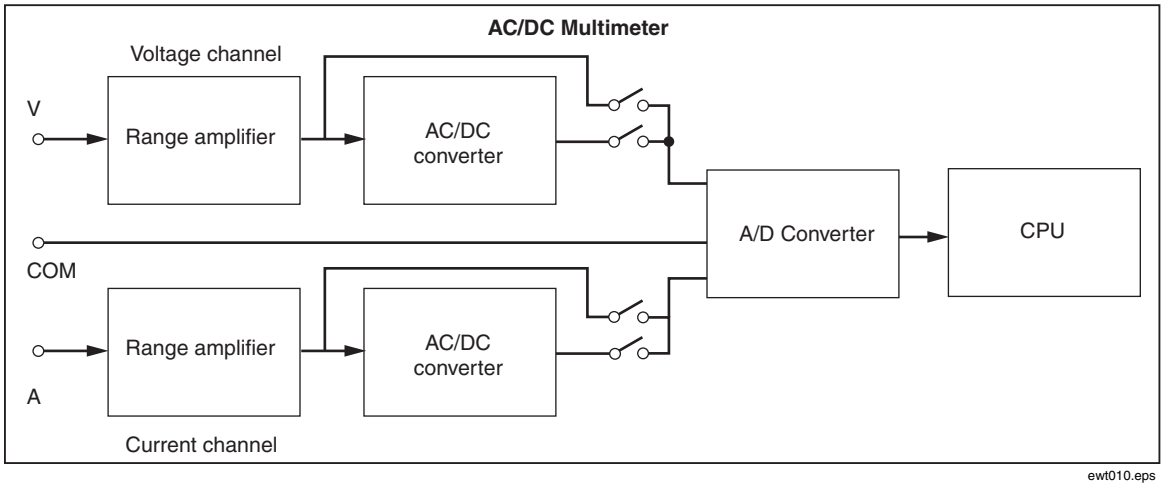


Figure 2-6. AC/DC Multimeter Block Diagram

The multimeter is located on the IFC PCA.

Loop/Line Impedance (REL and COMP PCAs)

The loop/line impedance circuit uses the same resistors the ground bond resistance circuit uses as a source of calibrated resistance. The loop/line impedance circuits are connected directly to the power line mains coming from the rear-panel mains socket. See Figure 2-7. The selected resistance is inserted in series with the neutral wire coming from the rear-panel mains socket. Switching between the loop and line impedance functions causes the

N and PE power line wires to be connected together and connected to either the PE or N terminal on the front panel. Optionally, a loop/line residual compensation circuit can be connected in series with the selected resistance.

For residual impedance measurements, the Calibrator is equipped with a built-in resistance load (R0). R0 is connected between the L and N wires to provide a load during a residual impedance measurement procedure. The internal voltmeter evaluates the voltage drop across R0 during the test and calculates the residual line impedance.

The loop/line impedance circuits work only with the L and N power line wires, which allows the Calibrator to be powered from both protected and unprotected networks. The Calibrator cannot trip RCD (current breakers).

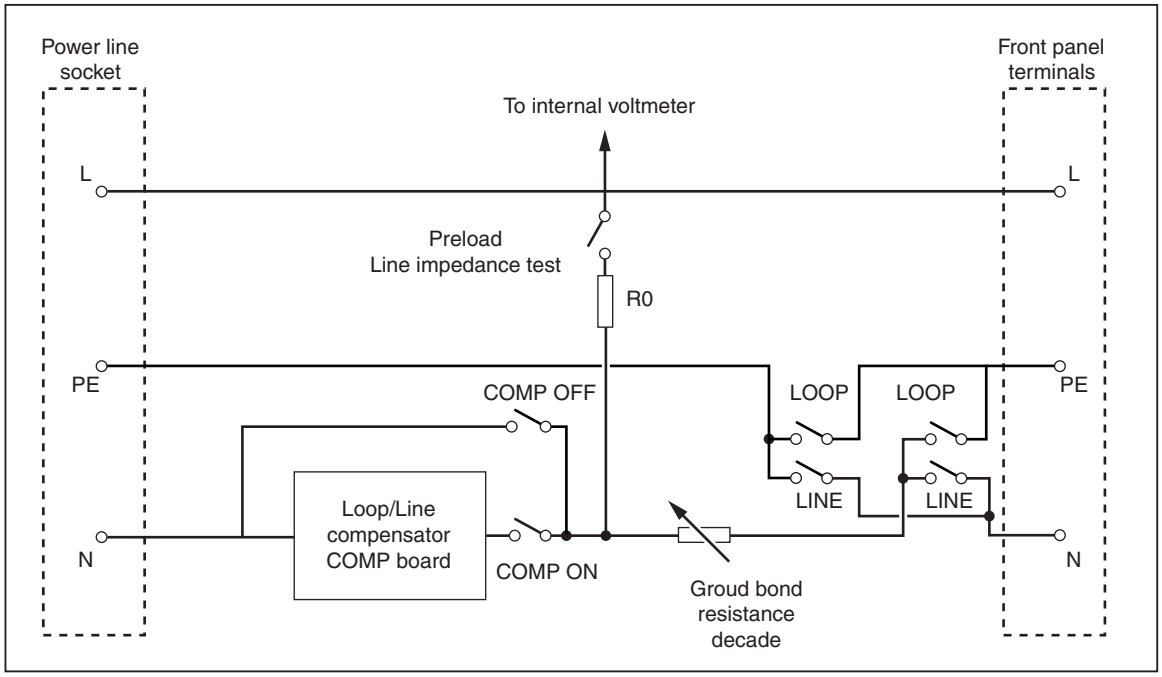


Figure 2-7. Loop/Line Impedance Block Diagram

The loop/line impedance circuits are located on the REL PCA. The compensator is located on the COMP PCA.

RCD Function (REL and IFC PCAs)

The RCD function uses two fast electronic switches controlled by the main CPU. See Figure 2-8. The main CPU monitors the UUT's trip current flowing through the Calibrator's PE terminal with a sampling ammeter. When the trip current in the PE wire reaches a preset value, the main CPU switches both electronic switches off after a preset trip time. A ground bond resistance block is applied to create a variable touch voltage of approximately 20 to 50 V, depending on the UUT.

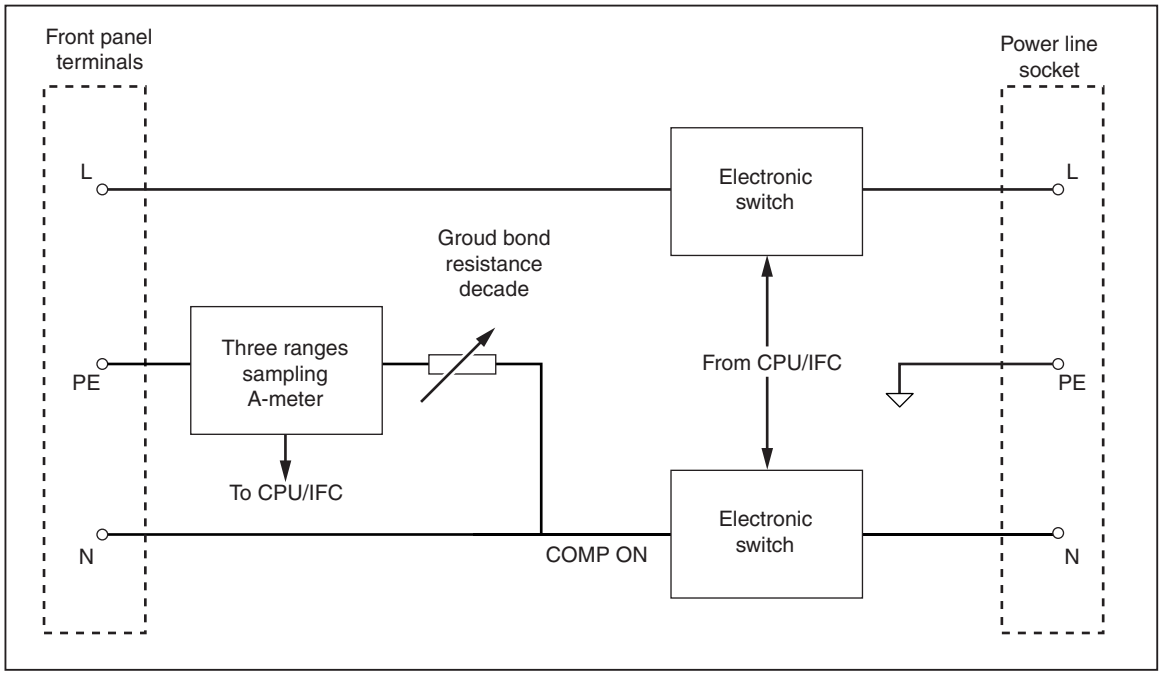


Figure 2-8. RCD Function Block Diagram

The RCD circuits are located on the REL PCA.

Passive and Differential Leakage Current (IFC and LVR PCAs)

The passive and differential leakage current functions use a sampling ammeter to sense leakage current coming from the UUT, flowing between the Calibrator's Hi and Lo terminals. As shown in Figure 2-9, the circuit adjusts the resistance value in series with the current so the current equals the preset leakage current value.

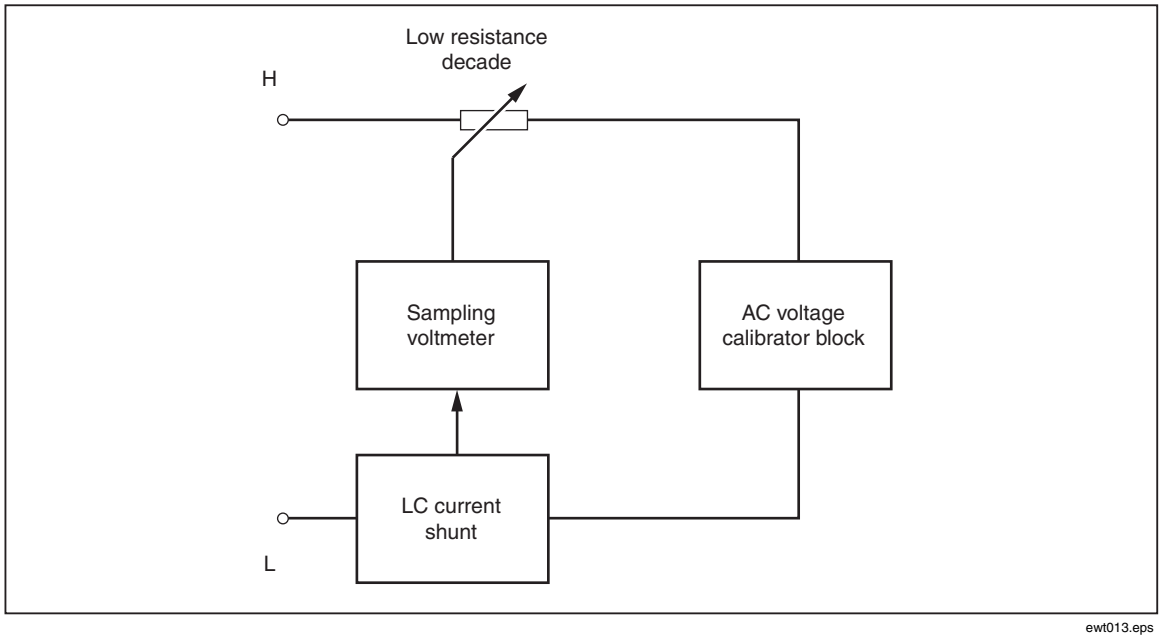


Figure 2-9. Passive and Differential Leakage Current Block Diagram

Leakage current circuits are located on the IFC PCB.

Active Leakage Current (IFC and LVR PCAs)

The active leakage current circuit generates AC current using the internal AC calibrator (active leakage current is available on 5320A/VLC models only). As shown in Figure 2-10, a sampling ammeter senses the current flowing between the Hi and Lo terminals. The circuit adjusts the resistance value in series with the current so the current equals the preset current value.

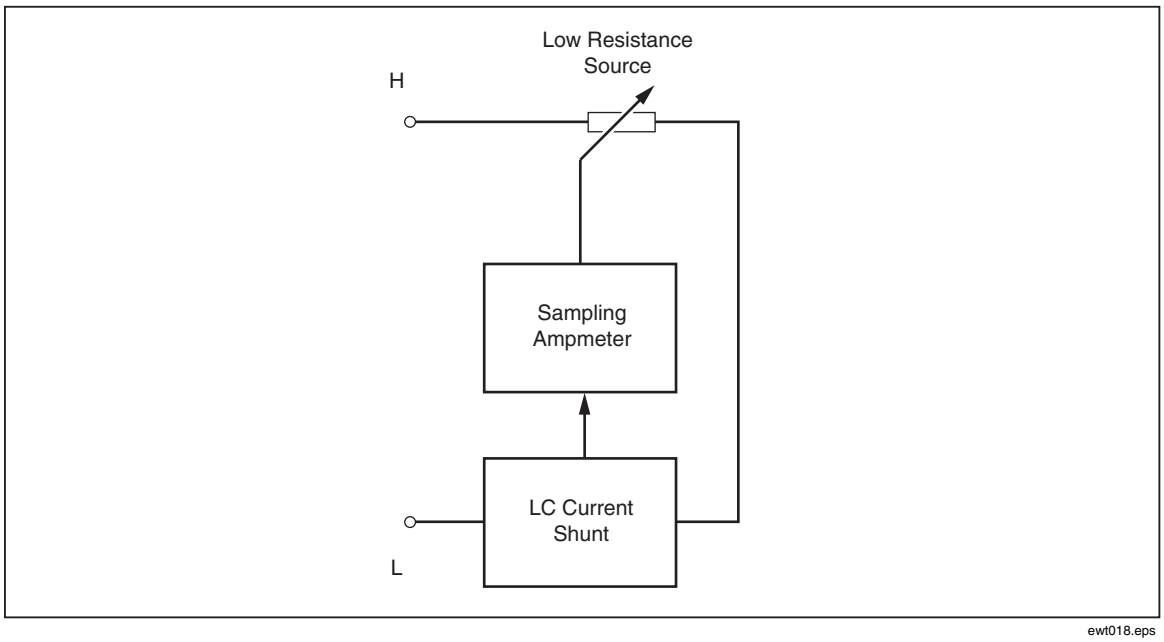


Figure 2-10. Active Leakage Current Block Diagram

The active leakage current circuits are located on the the IFC and LVR PCAs. The ac voltage calibrator is located on the VCAL and AMP PCAs.

Substitute Leakage Current (LVR PCA)

The substitute leakage current circuit uses a resistance value from the low resistance source in series between the Calibrator's Hi and Lo terminals, as shown in Figure 2-11. The main CPU sets the resistance to a value that produces a preset current value based on the nominal power line voltage.

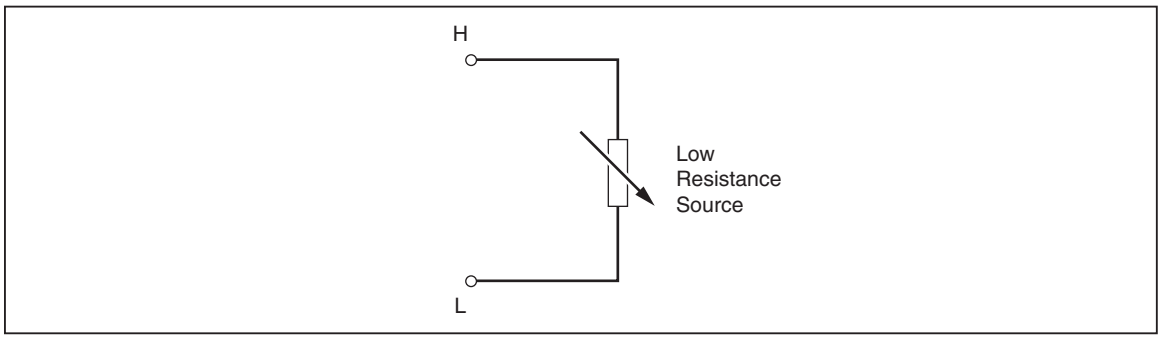


Figure 2-11. Substitute Leakage Current Circuit

Chapter 3
Calibration and Verification

Introduction

The recommended calibration interval for the Calibrator is one year. Use the verification procedure to verify the Calibrator is operating within specifications. If the Calibrator is not within specifications, use the calibration procedure to adjust the Calibrator as needed.

Fluke recommends that you return the Calibrator to Fluke for calibration and verification. The Fluke Service Center uses a software-controlled verification process and provides a detailed test report including traceability to national standards. If you plan to calibrate or verify the 5320A at your site, use this chapter as a guide. The procedures in this chapter are manual versions similar to the software-controlled process used at the Fluke Service Center.

Equipment Required for Calibration and Verification

The equipment listed in Table 3-1 is required to calibrate and verify the performance of the Calibrator. If a specified instrument is not available, you can substitute an instrument that has the same or better performance.

Table 3-1. Required Equipment for Calibration and Verification

Equipment	Manufacturer	Model
Standard Multimeter	Fluke	8508A or equivalent
Digital Multimeter	Fluke	289 or equivalent
Megohmeter	Quadtech	1865 or equivalent
Multifunction Calibrator	Fluke	5520A or equivalent
Frequency Counter	Fluke	PM 6690 or equivalent
Distortion Analyzer	HP/Agilent	8903B or equivalent
10 kV ac/dc source	As available	As available
40 kV ac/dc source	As available	As available

Calibration

The Calibrator can be either completely or partially calibrated. A complete calibration consists of all calibrations performed in the order defined by the calibration menu. For partial calibration, it is not necessary to calibrate all the ranges defined by the calibration algorithm for each item in the calibration menu. If new calibration of all ranges is not possible (the required standard is not available for example), the old calibration data can be used again.

Note

The calibration procedure can be interrupted at any point. However, this particular calibration procedure influences parameters of the Calibrator. Accuracy of the Calibrator is only guaranteed when a full calibration has been performed.

Table 3-2 lists the partial calibrations that make up the complete calibration procedure.

Table 3-2. Partial Calibrations of the Calibration Procedure.

Partial Procedure	Description
Ground Bond Resistance Source (ground bond & loop/line resistance source)	Calibrates 15 discrete resistors from 25 mΩ to 1.8 kΩ
Low Resistance Source	Calibrates 32 discrete resistances from 100 mΩ to 16 MΩ. Combinations of these resistors make up the complete resistance source range from 100 mΩ to 10 kΩ
High Resistance Source	Calibrates 32 discrete resistances from 10 kΩ to 100 GΩ. Combinations of these resistors make up the complete resistance source range from 10 kΩ to 100 GΩ
Ground Resistance Meters	Calibration of internal voltmeter and ammeter, used in the Ground Bond function for current measurements
Low Resistance Meters	Calibrates internal voltmeter used in Low Resistance mode for voltage and current measurements
High Resistance Meters	Calibrates internal voltmeter and ammeter used for sensing test voltage and current in High Resistance Source
DCV Calibrator	Calibrates dc voltage and current ranges in the calibrator function
ACV Calibrator	Calibrates ac voltage and current ranges in the calibrator function
DC Multimeter	Calibrates dc voltage and current ranges in the multimeter function
AC Multimeter	Calibrates ac voltage and current ranges in the multimeter function
RCD Trip Current	Calibrates line voltmeter and ammeter in the RCD function
Leakage Current	Calibrates internal leakage current ammeter
HV Probes	Sets calibration constants for the 10 kV and 40 kV external probes
High-Resistance Multiplier	Sets calibration constants for the High Resistance Multiplier adapter
Loop and Line Impedance	Performs an autocalibration
DC HIPOT Leakage Current	Calibrates DC hipot leakage current in the multimeter function
AC HIPOT Leakage Current	Calibrates AC hipot leakage current in the multimeter function
Trip Time Verification	Calibrates RCD trip time in the RCD function

Starting Calibration

A calibration password of “0235” is required when the Calibrator is shipped from the factory. Setting the password to “0” removes the need to enter a password when

accessing the calibration procedure. Refer to the "Setting the Calibration Password" section in Chapter 3 of the Users Manual.

To start the calibration procedure, perform the following:

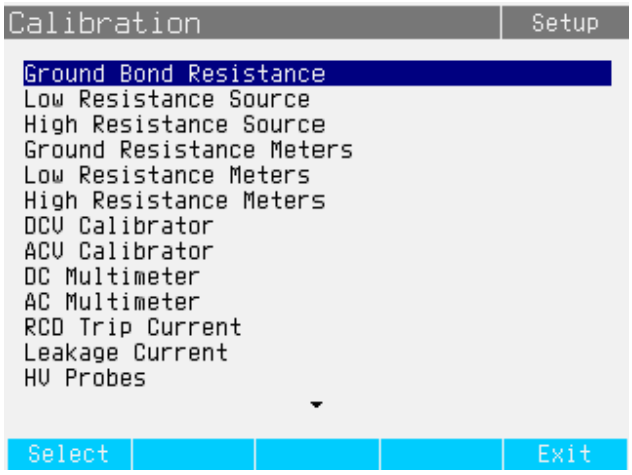
1. Press the softkey labeled **SETUP**.
2. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.

   If a password is required, a text box opens labeled Enter Password. If a password is not required, the next step is skipped.
3. Enter the required password using the numeric keyboard and then press the **ENTER** softkey.

Note

If an incorrect password is entered, the calibration menus cannot be selected.

The calibration selection menu shown in Figure 3-1 is displayed when the calibration mode has been entered successfully.

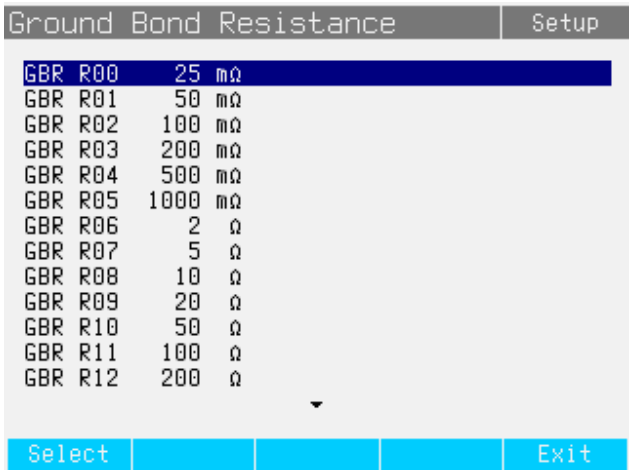


ewt003.bmp

Figure 3-1. Calibration Selection Menu

Use the cursor keys or rotary knob to highlight the desired function for calibration. With the Ground Bond Resistance function selected, press the softkey labeled **SELECT** or press in on the rotary knob to enter that function's calibration procedure.

A list of calibration points are displayed. Figure 3-2 shows the calibration points for the Ground Bond Resistance function.



ewt004.bmp

Figure 3-2. Ground Bond Resistance Function Calibration Points

Use the cursor keys or rotary knob to select a calibration point and either press the softkey labeled **SELECT** or press in on the rotary knob to start calibrating the selected point.

Terminating Calibration

Calibration can be canceled in one of the following ways:

- Complete the calibration procedures.
- Calibration of a selected function has been performed and new calibration data have been entered.
- Calibration of the selected range(s) of the selected function have been performed and new calibration data has been entered.
- The calibration has been started, but no calibration data has been entered.
- Press the softkey labeled Exit to go to a previous level of the calibration menu.

Note

Some calibration functions require "OPER" to be pressed to apply the signal to the Calibrator's terminals.

Calibration Procedures

The following sections describe each calibration function. Each lists the necessary equipment, the steps for the task, and the results each should meet.

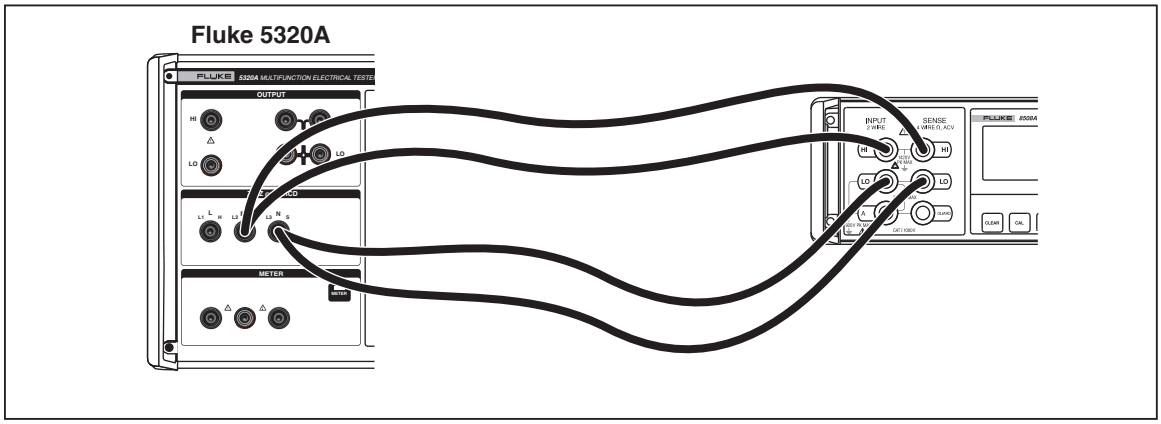
Ground Bond Resistance (and Loop/Line Impedance Resistance)

The Ground Bond Resistance Source can be calibrated through the front-panel controls. Calibration consists of taking a 4-wire DC measurement on each resistor in the Ground Bond Resistance Source. There are 16 test points requiring the application of a low-level signal.

Required instruments: Fluke 8508A Multimeter

To calibrated the Ground Bond Resistance function:

Connect the Fluke 8508A multimeter to the Calibrator's output terminals, as shown in Figure 3-3. Select the 4-wire ohms function on the standard multimeter.



ewt022.eps

Figure 3-3. Ground Bond Resistance Calibration Connections

1. Press the softkey labeled **SETUP**.
2. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
3. Enter the password using the keypad (0235 factory default).
4. Using the cursor keys or rotary knob, move the cursor to **Ground bond resistance** and either press the **SELECT** softkey or press in on the rotary knob.
5. Using the cursor keys or rotary knob, move the cursor to **GBR R00 25 mΩ** (or another resistor) and either press the **SELECT** softkey or press in on the rotary knob.

   GBR is the symbol of the function and Rxx is the original number of the resistor.
6. Measure the resistance value at the Calibrator's terminals. If the measured value differs from the existing calibration value, then the value should be updated with the new value.

   If the calibration value needs to be changed, enter the new value using the cursor keys or numeric keypad. Enter the new value by press the softkey labeled **WRITE**.

   If a new calibration is not needed, pressing the softkey labeled **EXIT** to leave the original value.

Go through all the calibration points shown in Table 3-3, repeating the steps 4 through 6 above.

When finished calibrating the Ground Bond Resistance Source function, press the softkey labeled **EXIT** repeatedly until the Calibrator display indicates the Ground Bond Resistance Source function.

Table 3-3. Ground Bond Resistance Calibration Points

Resistance Value	Position	Required Accuracy of Standard Multimeter	Uncertainty of Resistor	Lower Limit	Upper Limit
25 mΩ	R00	± 0.5 mΩ	± 5 mΩ	-50 %	+50 %
50 mΩ	R01	± 0.5 mΩ	± 5 mΩ	-50 %	+50 %
110 mΩ	R02	± 0.5 mΩ	± 5 mΩ	-30 %	+30 %
350 mΩ	R03	± 0.5 mΩ	± 7 mΩ	-20 %	+20 %
500 mΩ	R04	±0.5 mΩ	±8 mΩ	-15 %	+15 %
1 Ω	R05	±2 mΩ	±10 mΩ	-15 %	+15 %

Table 3-3. Ground Bond Resistance Calibration Points (cont.)

Resistance Value	Position	Required Accuracy of Standard Multimeter	Uncertainty of Resistor	Lower limit	Upper Limit
1.8 Ω	R06	±4 mΩ	±18 mΩ	-15 %	+15 %
5 Ω	R07	±8 mΩ	±30 mΩ	-15 %	+15 %
10 Ω	R08	±15 mΩ	±60 mΩ	-15 %	+15 %
18 mΩ	R09	±20 mΩ	±100 mΩ	-15 %	+15 %
50 Ω	R10	±80 mΩ	±300 mΩ	-15 %	+15 %
100 Ω	R11	±100 mΩ	±500 mΩ	-15 %	+15 %
180 Ω	R12	±200 mΩ	±1 Ω	-15 %	+15 %
500 Ω	R13	±500 mΩ	±2.5 Ω	-15 %	+15 %
1 kΩ	R14	±1 Ω	±5 Ω	-15 %	+15 %
1.8 kΩ	R15	±2 Ω	±10 Ω	-15 %	+15 %

Note

Depending on the firmware version installed in the Calibrator and its updates, the resistance accuracy displayed during calibration may differ from the values shown in Table 3-3.

The columns labeled “Lower limit” and “Upper limit” show the maximum acceptable deviation of the calibration value to the nominal value of each resistor. If resistors are out of specified limits, they must be replaced. Replacement should be performed by a Fluke authorized service center.

Low Resistance Source

The Low Resistance Source can be calibrated through the front-panel controls. Calibration consists of taking a 4-wire DC resistance measurement on each resistor in the Low Resistance Source function.

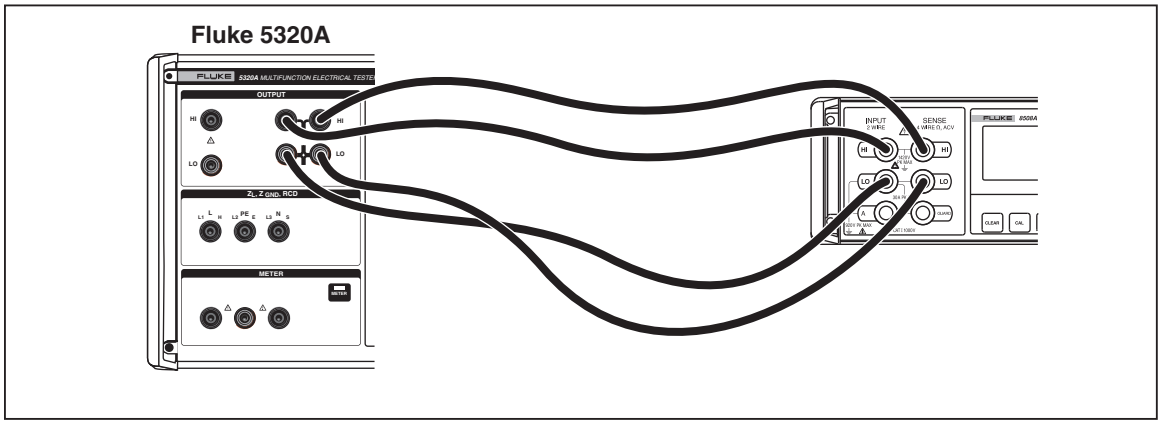
Note

Once the calibration is started, it is strongly recommended to perform calibration of all resistors to maintain the specified accuracy.

Required instruments: Fluke 8508A Multimeter

To calibrate the Low Resistance function:

1. Connect the Fluke 8508A multimeter to the Calibrator’s output terminals, as shown in Figure 3-4.



ewt023.eps

Figure 3-4. Low Resistance Source Calibration Connections

2. Select the 4-wire TRUE ohms function on the standard multimeter (8508A).
3. Press the softkey labeled **SETUP**.
4. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
5. Enter the password using the keypad (0235 factory default).
6. Using the cursor keys or rotary knob, move the cursor to **Low resistance source** and either press the **SELECT** softkey or press in on the rotary knob.
7. Using the cursor keys or rotary knob, move the cursor to **LVR R00 140 mΩ** (or another resistor) and either press the **SELECT** softkey or press in on the rotary knob.

   LVR is the symbol of the function and Rxx is the original number of the resistor.
8. Measure the resistance value at the Calibrator's terminals. If the measured value differs from the existing calibration value, then the value should be updated with the new value.

   If the calibration value needs to be changed, enter the new value using the cursor keys or numeric keypad. Enter the new value by press the softkey labeled **WRITE**.

   If a new calibration is not needed, press the softkey labeled **EXIT** to leave the original value.

Go through all the calibration points shown in Table 3-4, repeating the steps 7 through 9.

When finished calibrating the Low Resistance Source function, press the softkey labeled **EXIT** repeatedly until the Calibrator display indicates the Low Resistance Source function.

Table 3-4. Low Resistance Source Calibration Test Points

Resistance Value	Position	Required Accuracy of Standard Multimeter	Displayed Value	Lower Limit	Upper Limit
0.14 Ω	R00	1 %	±7.44 %	-50 %	+50 %
0.24 Ω	R01	0.5 %	±4.66 %	-20 %	+20 %
0.43 Ω	R02	0.3 %	±2.62 %	-10 %	+10 %
0.77 Ω	R03	0.1 %	±1.59 %	-10 %	+10 %
1 Ω	R04	0.05 %	±1.29 %	-10 %	+10 %
1.9 Ω	R05	0.02 %	±0.82 %	-10 %	+10 %
3.6 Ω	R06	0.02 %	±0.57 %	-10 %	+10 %
5.4 Ω	R07	0.02 %	±0.38 %	-10 %	+10 %

Table 3-4. Low Resistance Source Calibration Test Points (cont.)

Resistance Value	Position	Required Accuracy of Standard Multimeter	Displayed Value	Lower Limit	Upper Limit
10 Ω	R08	0.02 %	±0.29 %	-10 %	+10 %
18 Ω	R09	0.02 %	±0.25 %	-10 %	+10 %
36 Ω	R10	0.02 %	±0.22 %	-10 %	+10 %
55 Ω	R11	0.02 %	±0.21 %	-10 %	+10 %
100 Ω	R12	0.02 %	±0.2 %	-10 %	+10 %
190 Ω	R13	0.02 %	±0.2 %	-10 %	+10 %
360 Ω	R14	0.02 %	±0.2 %	-10 %	+10 %
600 Ω	R15	0.02 %	±0.2 %	-10 %	+10 %
1k Ω	R16	0.02 %	±0.2 %	-10 %	+10 %
1.9 kΩ	R17	0.02 %	±0.2 %	-10 %	+10 %
3.5 kΩ	R18	0.02 %	±0.2 %	-10 %	+10 %
7.1 kΩ	R19	0.02 %	±0.2 %	-10 %	+10 %
11 kΩ	R20	0.02 %	±0.2 %	-10 %	+10 %
20 kΩ	R21	0.05 %	±0.2 %	-10 %	+10 %
40 kΩ	R22	0.05 %	±0.2 %	-10 %	+10 %
65 kΩ	R23	0.05 %	±0.2 %	-10 %	+10 %
100 kΩ	R24	0.1 %	±0.2 %	-10 %	+10 %
200 kΩ	R25	0.1 %	±0.2 %	-10 %	+10 %
400 kΩ	R26	0.1 %	±0.2 %	-10 %	+10 %
760 kΩ	R27	0.2 %	±0.2 %	-10 %	+10 %
1000 kΩ	R28	0.2 %	±0.2 %	-10 %	+10 %
1.9 MΩ	R29	0.5 %	±0.2 %	-10 %	+10 %
3.3 MΩ	R30	0.5 %	±0.2 %	-10 %	+10 %
5.4 MΩ	R31	1.0 %	±0.2 %	-10 %	+10 %
8.2 MΩ	R32	1.0 %	±0.2 %	-10 %	+10 %
12 MΩ	R33	1.0%	±0.2 %	-20 %	+20 %

Note

Depending on the firmware version installed in the Calibrator and its updates, the resistance accuracy displayed during calibration may differ from the values shown in Table 3-4.

The columns labeled “Lower limit” and “Upper limit” show the maximum acceptable deviation of the calibration value to the nominal value of each resistor. If resistors are out of specified limits, they must be replaced. Replacement should be performed by a Fluke authorized service center.

High Resistance Source

The High Resistance Source can be calibrated through the front-panel controls. Calibration consists of taking a DC resistance measurement on each resistor in the High Resistance decade. There are 24 test points. This calibration consists of 3 parts. 1) Calibration of the resistance source, 2) Calibration of the test voltage meter, and 3) Calibration of the external resistance multiplier.

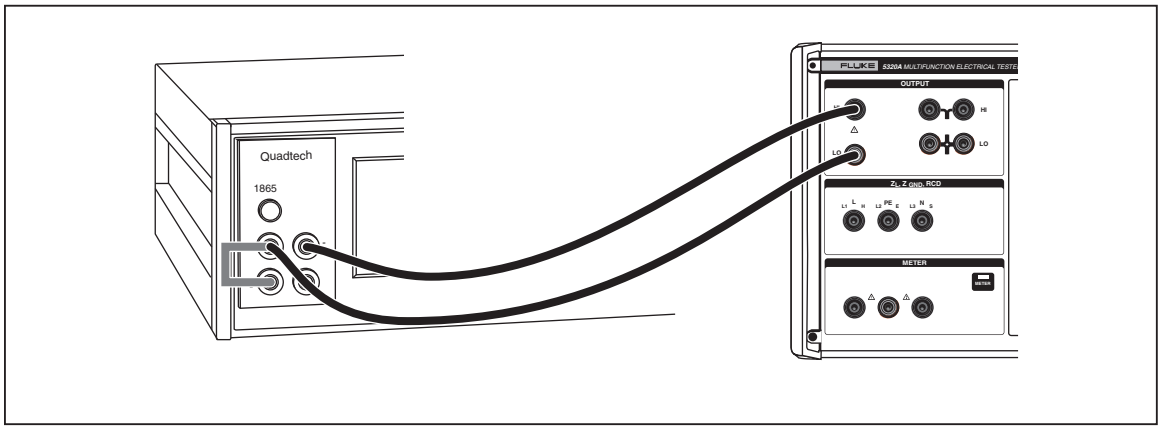
Note

Once the calibration is started it is strongly recommended to perform calibration of all resistors to maintain the specified accuracy.

Required instruments: Quadtech 1865 Megohmeter
Fluke 8508A Multimeter

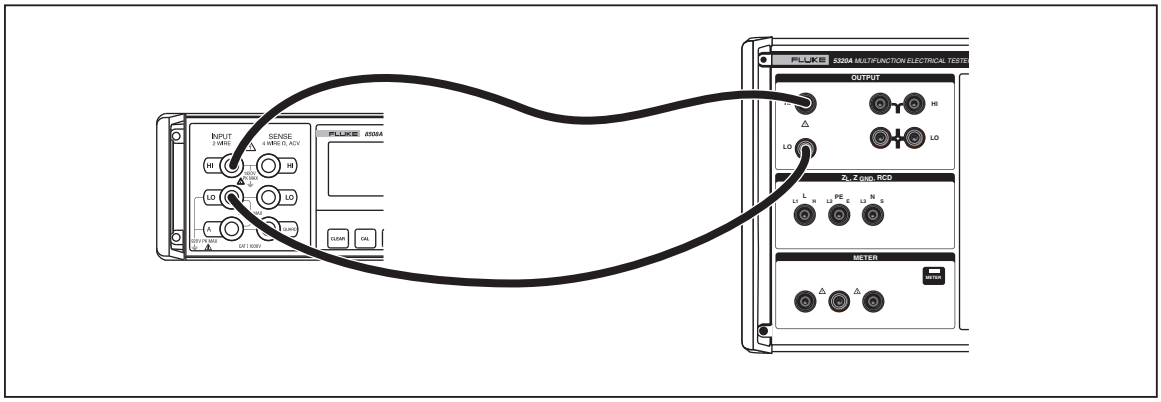
1. Connect the Calibrator directly to the Megohmeter (for values above 10 MΩ) as shown in Figure 3-5 or to the multimeter (for values less than 10 MΩ) as shown in Figure 3-6.
2. Setup the Megohmeter as follows:

   Voltage = 500
   Charge time = 5
   Dwell time = 5
   Measure time = 20
   Discharge time = 5
   Mode = Auto
   Number to average = 400



ewt071.eps

Figure 3-5. High Resistance Source (>10 MΩ) Calibration Connections



ewt070.eps

Figure 3-6. High Resistance Source (<10 MΩ) Calibration Connections

3. Press the softkey labeled **SETUP**.
4. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.

5. Enter the password using the keypad (0235 factory default).
6. Using the cursor keys or rotary knob, move the cursor to **High resistance source** and either press the **SELECT** softkey or press in on the rotary knob.
7. Using the cursor keys or rotary knob, move the cursor to **HVR R00 10 kΩ** (or another resistor) and either press the **SELECT** softkey or press in on the rotary knob.
8. Measure the resistance value with the reference meter. If the measured value differs from the existing calibration value, then the value should be updated with the new value.

   If the calibration value needs to be changed, enter the new value using the cursor keys or numeric keypad. Enter the new value by press the softkey labeled **WRITE**.

   If a new calibration is not needed, press the softkey labeled **EXIT** to leave the original value.

Go through all the calibration points shown in Table 3-5, repeating the steps 5 through 7 above.

When finished calibrating the High Resistance Source function, press the softkey labeled **EXIT** repeatedly until the Calibrator display indicates the High Resistance Source function.

Table 3-5. High Resistance Source Calibration Points

Resistance Value	Position	Required Accuracy of Standard Multimeter	Displayed Value	Lower Limit	Upper Limit
10 kΩ	R00	0.02 %	±0.2 %	-5 %	+5 %
18 kΩ	R01	0.02 %	±0.2 %	-5 %	+5 %
33 kΩ	R02	0.02 %	±0.2 %	-5 %	+5 %
44 kΩ	R03	0.02 %	±0.2 %	-5 %	+5 %
100 kΩ	R04	0.02 %	±0.2 %	-5 %	+5 %
180 kΩ	R05	0.02 %	±0.2 %	-5 %	+5 %
340 kΩ	R06	0.02 %	±0.2 %	-5 %	+5 %
480 kΩ	R07	0.02 %	±0.2 %	-5 %	+5 %
930 kΩ	R08	0.05 %	±0.2 %	-5 %	+5 %
1.9 MΩ	R09	0.05 %	±0.3 %	-5 %	+5 %
3.6 MΩ	R10	0.05 %	±0.3 %	-5 %	+5 %
3.5 MΩ	R11	0.05 %	±0.3 %	-5 %	+5 %
10.7 MΩ	R12	0.1 %	±0.5 %	-10 %	+10 %
20.8 MΩ	R13	0.1 %	±0.5 %	-10 %	+10 %
40.6 MΩ	R14	0.1 %	±0.5 %	-10 %	+10 %
40.6 MΩ	R15	0.1 %	±0.5 %	-10 %	+10 %
103 MΩ	R16	0.2 %	±0.5 %	-10 %	+10 %
206 MΩ	R17	0.2 %	±0.5 %	-10 %	+10 %
400 MΩ	R18	0.2 %	±0.5 %	-10 %	+10 %
390 MΩ	R19	0.2 %	±0.5 %	-10 %	+10 %
1000 MΩ	R20	0.5 %	±0.5 %	-10 %	+10 %
1.8 GΩ	R21	0.5 %	±1 %	-10 %	+10 %

Table 3-5. High Resistance Source Calibration Points (cont.)

Resistance Value	Position	Required Accuracy of Standard Multimeter	Displayed Value	Lower Limit	Upper Limit
2.7 GΩ	R22	0.5 %	±1 %	-10 %	+10 %
5.4 GΩ	R23	0.5 %	±1 %	-10 %	+10 %
100 GΩ	R24	1.0 %	±3 %	-10 %	+10 %

Note

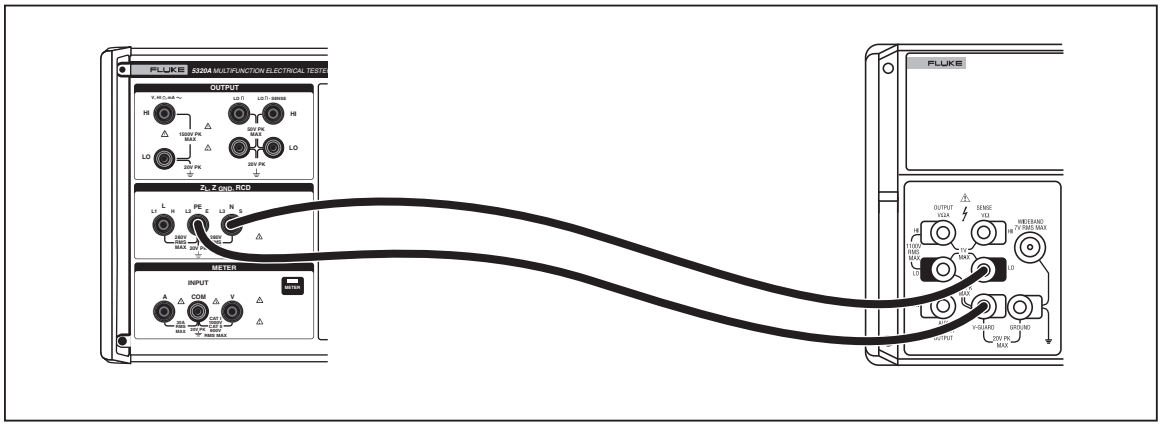
Depending on the firmware version installed in the Calibrator and its updates, the resistance accuracy displayed during calibration may differ from the values shown in Table 3-5.

The columns labeled “Lower limit” and “Upper limit” show the maximum acceptable deviation of the calibration value to the nominal value of each resistor. If resistors are out of specified limits, they must be replaced. Replacement should be performed by a Fluke authorized service center.

Ground Bond Resistance Meter

The internal voltmeter and ammeter are calibrated by an external calibrator.

Required instruments: Fluke 5520A Multifunction Calibrator

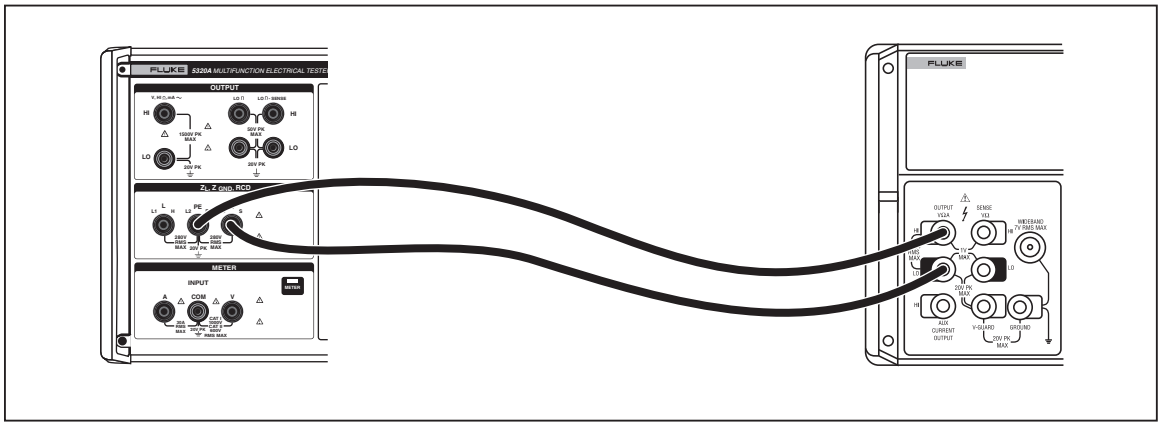


ewt025.eps

Figure 3-7. Ground Bond Resistance Meter Current Calibration Connections

1. Connect the current output of the multifunction calibrator to the PE and N terminals as shown in Figure 3-7.
2. Press the softkey labeled **SETUP**.
3. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
4. Enter the password using the keypad (0235 factory default).
5. Using the cursor keys or rotary knob, move the cursor to **Ground Resistance Meters** and either press the **SELECT** softkey or press in on the rotary knob.
6. Using the cursor keys or rotary knob, move the cursor to **GBR I01 Test Current 10 A dc (25 mΩ)** and either press the **SELECT** softkey or press in on the rotary knob.
7. Set the output current to 10 A dc on the multifunction calibrator and switch the output terminals on.

8. Use the cursor keys or the rotary knob to set the Calibrator's measured value to 10.0 A.
9. Confirm the new calibration value by pressing the softkey labeled **WRITE**.
10. Repeat steps 5 through 8 for the next two test points: GBR I02 Test Current 10 A dc (50 mΩ) and GBR Test Current 10 A dc (>50 mΩ).
11. Disconnect the multifunction calibrator.
12. Connect voltage output of the multifunction calibrator to the PE and N terminals as shown in Figure 3-8.



ewt026.eps

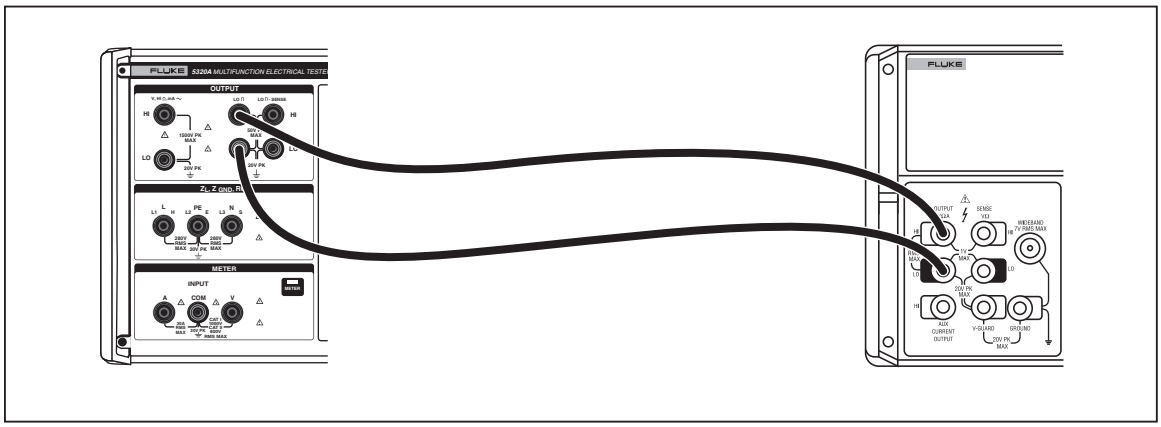
Figure 3-8. Ground Bond Resistance Meter Voltage Calibration Connections

13. Using the cursor keys or rotary knob, move the cursor to **GBR V01 Test Voltage 45 Vdc (Open)** and either press the **SELECT** softkey or press in on the rotary knob.
14. Set the multifunction calibrator's output to 45 Vdc and select **OPR**.
15. Select **OPER** and use the cursor keys or rotary knob to set the Calibrator's measured value to 45.0 V.
16. Confirm the new calibration value by pressing the softkey labeled **WRITE**.

Low Resistance Meter

The internal voltmeter is calibrated by an external multifunction calibrator. Calibration of the auxiliary voltmeter consists of setting two constants.

Required instruments: Fluke 5520A Multifunction Calibrator



ewt027.eps

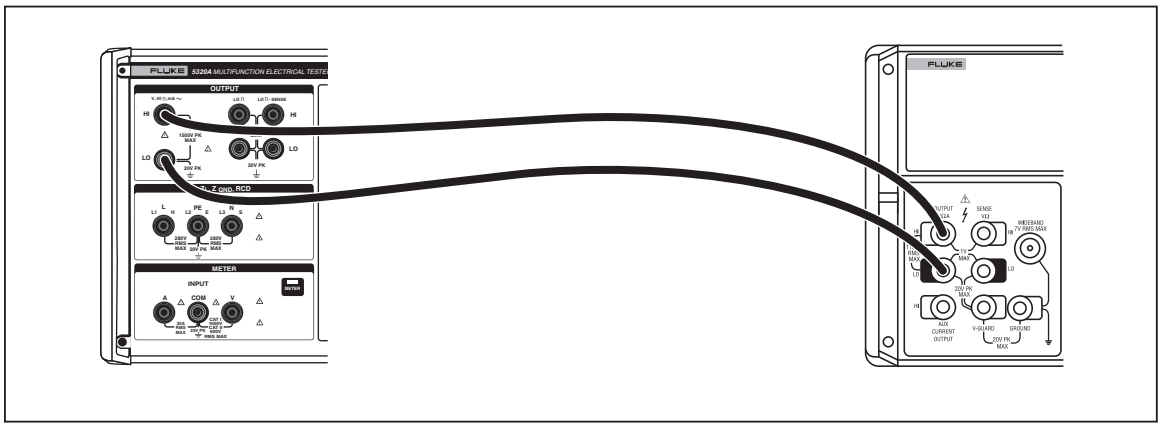
Figure 3-9. Low Resistance Meter Calibration Connections

1. Connect the multifunction calibrator to the Calibrator's OUTPUT LOΩ HI and LO terminals as shown in Figure 3-9.
2. Press the softkey labeled **SETUP**.
3. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
4. Enter the password using the keypad (0235 factory default).
5. Using the cursor keys or rotary knob, move the cursor to **Low Resistance Meters** and either press the **SELECT** softkey or press in on the rotary knob.
6. Using the cursor keys or rotary knob, move the cursor to **LVR V01 Test Voltage 45 Vdc (>50 Ω)** and either press the **SELECT** softkey or press in on the rotary knob.
7. Set the multifunction calibrator's output to 45 Vdc and select **OPR**.
8. Select **OPER** and use the cursor keys or the rotary knob to set the Calibrator's measured value to 45.0 V.
9. Confirm the new calibration value by pressing the softkey labeled **WRITE**.
10. Using the cursor keys or rotary knob, move the cursor to **LVR V01 Test Voltage 4.5 Vdc (>50 Ω)** and either press the **SELECT** softkey or press in on the rotary knob.
11. Set the multifunction calibrator's output to 4.5 Vdc and select **OPR**.
12. Select **OPER** and use the cursor keys or the rotary knob to set the Calibrator's measured value to 4.5 V.
13. Select **STBY** on the multifunction calibrator.
14. Confirm the new calibration value by pressing the softkey labeled **WRITE**.

High Resistance Meter

The internal voltmeter is calibrated by an external multifunction calibrator.

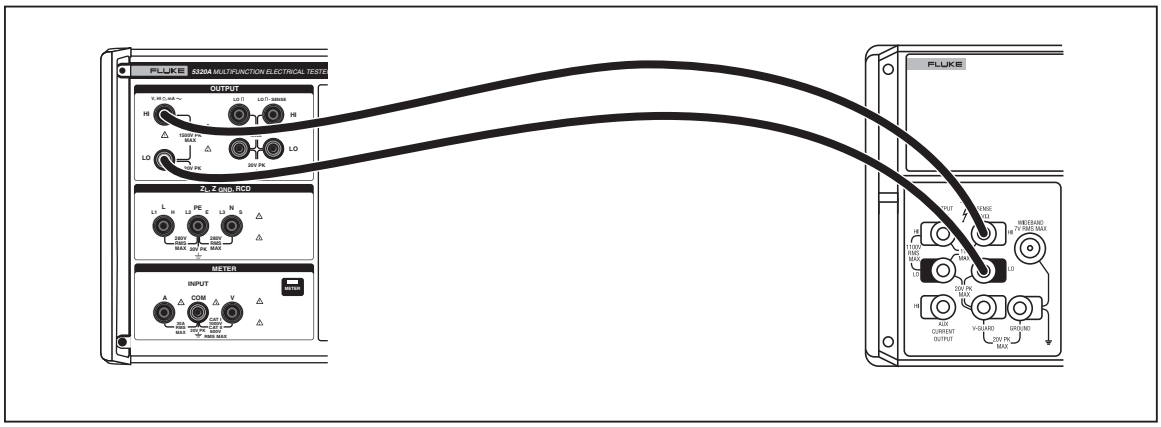
Required instruments: Fluke 5520A Multifunction Calibrator



ewt036.eps

Figure 3-10. High Resistance Meter Calibration Connections

1. Connect the multifunction calibrator to the Calibrator's OUTPUT HIΩ HI and LO terminals as shown in Figure 3-10.
2. Press the softkey labeled **SETUP**.
3. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
4. Enter the password using the keypad (0235 factory default).
5. Using the cursor keys or rotary knob, move the cursor to **High Resistance Meters** and either press the **SELECT** softkey or press in on the rotary knob.
6. Using the cursor keys or rotary knob, move the cursor to **HVR V01 Test Voltage 1000 Vdc (>1 MΩ)** and either press the **SELECT** softkey or press in on the rotary knob.
7. Set the multifunction calibrator's output to 1000 Vdc and select **OPR**.
8. Select **OPER** and use the cursor keys or the rotary knob to set the Calibrator's measured value to 1000 V.
9. Select **STBY** on the multifunction calibrator.
10. Confirm the new calibration value by pressing the softkey labeled **WRITE**.
11. Using the cursor keys or rotary knob, move the cursor to **HVR V02 Test Voltage 1000 Vdc (<1 MΩ)** and either press the **SELECT** softkey or press in on the rotary knob.
12. Set the multifunction calibrator's output to 1000 Vdc and switch on the output terminals.
13. Select **OPER** and use the cursor keys or the rotary knob to set the Calibrator's displayed voltage to 1000 V.
14. Select **STBY** on the multifunction calibrator.
15. Confirm the new calibration value by pressing the softkey labeled **WRITE**.



ewt017.eps

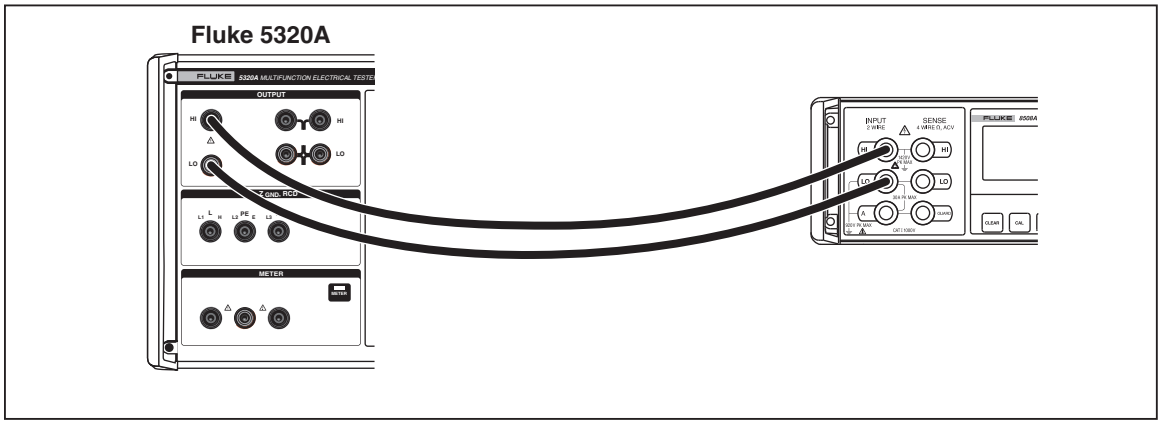
Figure 3-11. High Resistance Meter Calibration Connections – Part 2

16. Ensure the multifunction calibrator is in standby.
17. Connect the multifunction calibrator to the Calibrator's OUTPUT HIΩ HI and LO terminals as shown in Figure 3-11.
18. Using the cursor keys or rotary knob, move the cursor to **High Resistance Meters** and either press the **SELECT** softkey or press in on the rotary knob.
19. Using the cursor keys or rotary knob, move the cursor to **HVR I01 Test current 20 mAdc (Short)** and either press the **SELECT** softkey or press in on the rotary knob.
20. Select **OPER** on the Calibrator.
21. Set the multifunction calibrator's output current to 20 mAdc and switch on the output terminals.
22. Use the cursor keys or the rotary knob to set the Calibrator's measured value to 20 mA.
23. Select **STBY** on the multifunction calibrator.
24. Confirm the new calibration value by pressing the softkey labeled **WRITE.**

DC Voltage Calibrator

Calibration consists of adjustments made to three ranges: 30, 150, and 600 V. Each range has an upper and lower point to adjust.

Required instruments: Fluke 8508A Multimeter



ewt028.eps

Figure 3-12. DC Voltage Calibrator Calibration Connections

1. Connect the 8508A to the Calibrator's output terminals as shown in Figure 3-12.
2. Set grounding mode to ON through the Calibrator's SETUP menu.
3. Set the 8508A to the dc voltage mode, resolution of 6 digits, and filter off.
4. Press the softkey labeled **SETUP**.
5. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
6. Enter the password using the keypad (0235 factory default).
7. Using the cursor keys or rotary knob, move the cursor to **DCV Calibrator** and either press the **SELECT** softkey or press in on the rotary knob.
8. Using the cursor keys or rotary knob, move the cursor to **30 V low (+3V)** and either press the **SELECT** softkey or press in on the rotary knob.
9. Select **OPER** and use the cursor keys or the rotary knob to adjust the Calibrator's output to +3.000 V.
10. Confirm the new calibration value by pressing the softkey labeled **WRITE**.

Repeat steps 7 through 9 for all the calibration points listed in Table 3-6.

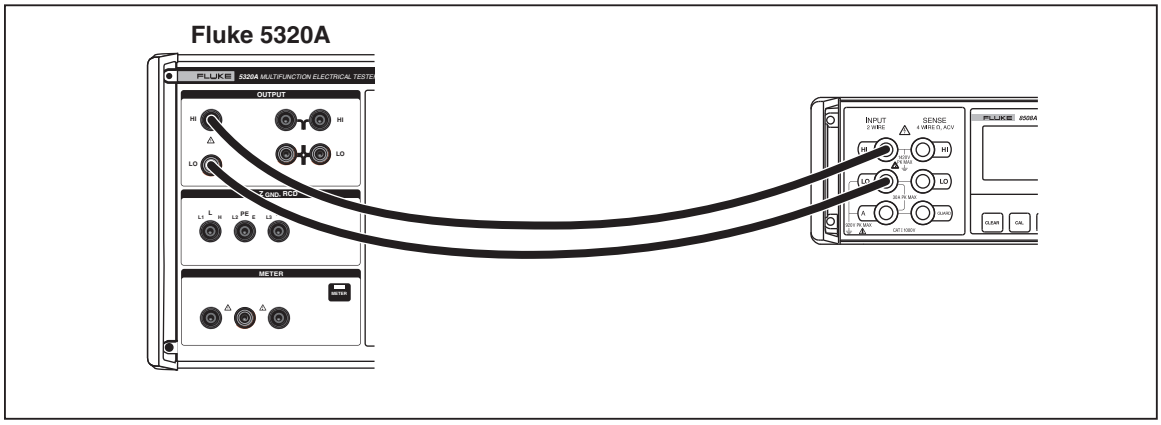
Table 3-6. DC Voltage Calibrator Calibration Points

Nominal Voltage Range	Calibration Point	Required Accuracy of Standard Multimeter
30 Vdc	3 Vdc	0.03 %
30 Vdc	30 Vdc	0.03 %
150 Vdc	30 Vdc	0.03 %
150 V dc	150 V dc	0.03 %
600 V dc	150 V dc	0.03 %
600 V dc	600 V dc	0.03 %

AC Voltage Calibrator

Calibration consists of adjustments made to four ranges: 30, 150, 300, and 600 V. Each range has an upper and lower point to adjust. Recommended frequency setting is 55 Hz.

Required instruments: Fluke 8508A Multimeter



ewt028.eps

Figure 3-13. AC Voltage Calibrator Calibration Connections

1. Connect the 8508A to the Calibrator's output terminals as shown in Figure 3-13.
2. Set grounding mode to ON through the Calibrator's setup menu.
3. Set the 8508A to the ac voltage mode, resolution of 6 digits, and filter on.
4. Press the softkey labeled **SETUP**.
5. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
6. Using the cursor keys or rotary knob, move the cursor to **ACV Calibrator** and either press the **SELECT** softkey or press in on the rotary knob.
7. Enter the password using the keypad (0235 factory default).
8. Using the cursor keys or rotary knob, move the cursor to **30 V 55 Hz low (3V)** and either press the **SELECT** softkey or press in on the rotary knob.
9. Select **OPER** and use the cursor keys or the rotary knob to adjust the Calibrator's output to +3.000 V.
10. Confirm the new calibration value by pressing the softkey labeled **WRITE**.
11. Repeat steps 8 through 10 for all the calibration points listed in Table 3-7.
12. Push the softkey labeled EXIT to go to a higher level menu.

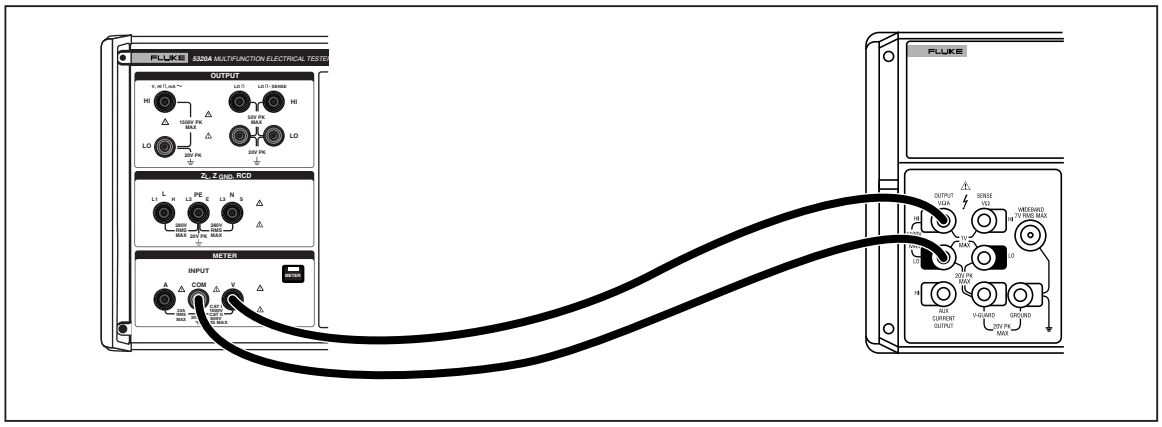
Table 3-7. AC Voltage Calibrator Calibration Points

Nominal Voltage Range	Calibration Point	Frequency	Required Accuracy of Standard Multimeter
30 V ac	3V ac	55 Hz	0.03 %
30 V ac	30V ac	55 Hz	0.03 %
150 V ac	30 V ac	55 Hz	0.03 %
150 V ac	150 V ac	55 Hz	0.03 %
300 V ac	150 V ac	55 Hz	0.03 %
300 V ac	300 V ac	55 Hz	0.03 %
600 V ac	300 V ac	55 Hz	0.03 %
600 V ac	600 V ac	55 Hz	0.03 %

DC Multimeter

Calibration of the DC Multimeter consists of adjustments to three voltmeter ranges and three ammeter ranges.

Required instruments: Fluke 5520A Multifunction Calibrator

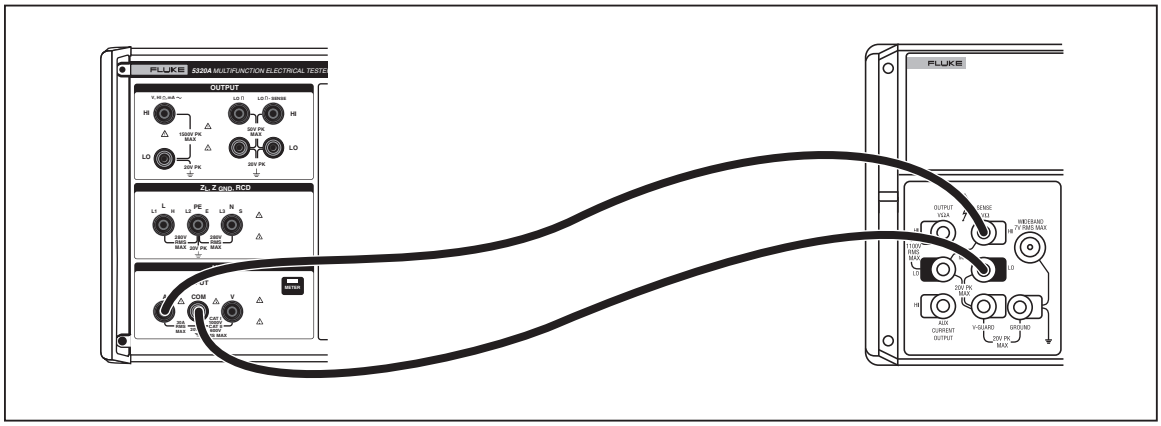


ewt029.eps

Figure 3-14. DC Multimeter Voltage Calibration Connections

1. Connect the multifunction calibrator to the Calibrator's output terminals as shown in Figure 3-14.
2. Press the softkey labeled **SETUP**.
3. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
4. Enter the password using the keypad (0235 factory default).
5. Using the cursor keys or rotary knob, move the cursor to **DC Multimeter** and either press the **SELECT** softkey or press in on the rotary knob.
6. Using the cursor keys or rotary knob, move the cursor to **10 VDC low (0V)** and either press the **SELECT** softkey or press in on the rotary knob.
7. Select **OPR** on the multifunction calibrator.

8. Observe the measured value on the Calibrator.
9. Confirm the new calibration value by pressing the softkey labeled **WRITE**.
10. Repeat steps 5 through 8 for all voltage calibration points listed in Table 3-8.



ewt030.eps

Figure 3-15. DC Multimeter Current Calibration Connections

11. Connect the multifunction calibrator to the Calibrator's output terminals as shown in Figure 3-15.
12. Using the cursor keys or rotary knob, move the cursor to **300 mA low (0mA)** and either press the **SELECT** softkey or press in on the rotary knob.
13. Select **OPR** on the multifunction calibrator.
14. Observe the measured value on the Calibrator. It should be close to the nominal value.
15. Confirm the new calibration value by pressing the softkey labeled **WRITE**.
16. Repeat steps 12 through 15 for all voltage calibration points listed in Table 3-8.
17. When all calibration points have been calibrated, press the softkey labeled **EXIT** to return to the calibration menu.

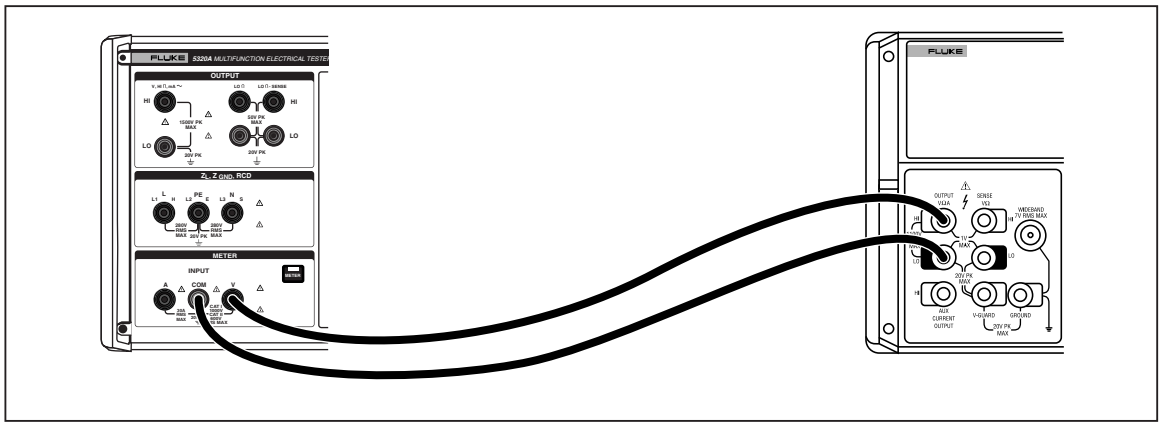
Table 3-8. DC Multimeter Calibration Points

Nominal Range	Calibration Point	Required Accuracy of Multifunction Calibrator
10 VDC low	0 V	1 mV
10 VDC high	+10 V	0.05 %
100 VDC low	0 V	10 mV
100 VDC high	+100 V	0.05 %
1000 VDC low	0 V	100 mV
1000 VDC high	+750 V	0.05 %
300 mADC low	0 mA	37.5 µA
300 mADC high	+300 mA	0.05 %
3 ADC low	0 mA	375 µA
3 ADC high	+3 A	0.05 %
30 ADC low	0 mA	37.5 mA
30 ADC high	+20 A	0.05 %

AC Multimeter

The AC Multimeter calibration consists of voltmeter adjustments to three ranges and ammeter adjustments to three ranges.

Required instruments: Fluke 5520A Multifunction Calibrator

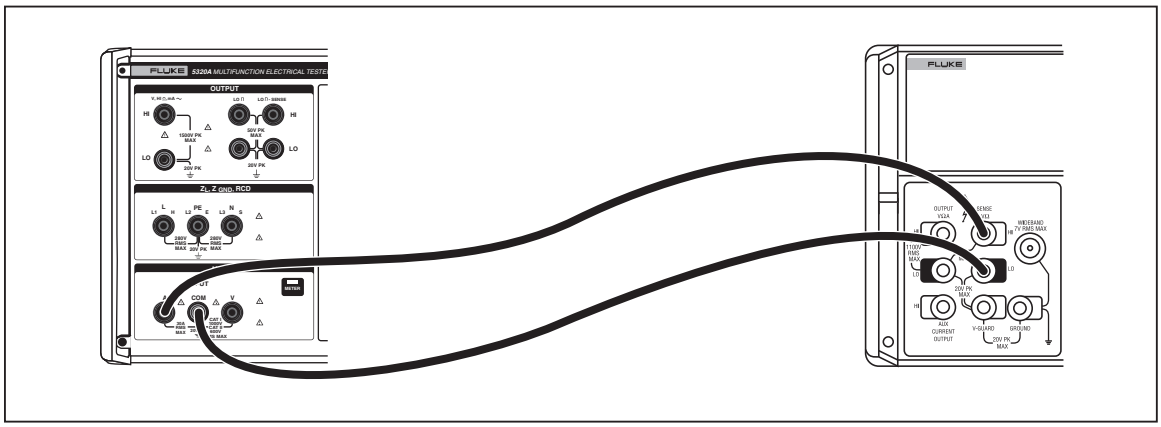


ewt029.eps

Figure 3-16. AC Multimeter Voltage Calibration Connections

1. Connect the Fluke 5220A to the Calibrator's output terminals as shown in Figure 3-16.
2. Press the softkey labeled **SETUP**.
3. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
4. Enter the password using the keypad (0235 factory default).

5. Using the cursor keys or rotary knob, move the cursor to **AC Multimeter** and either press the **SELECT** softkey or press in on the rotary knob.
6. Using the cursor keys or rotary knob, move the cursor to **10 V 55Hz low (1V)** and either press the **SELECT** softkey or press in on the rotary knob.
7. Select **OPR** on the multifunction calibrator.
8. Observe the measured value on the Calibrator.
9. Confirm the new calibration value by pressing the softkey labeled **WRITE**. If you want to leave the original calibration constant, press the softkey labeled **EXIT**. Then the Calibrator ignores measured current and returns to the list of current ranges.
10. Repeat steps 5 through 8 for all ac voltage calibration points listed in Table 3-9.



ewt030.eps

Figure 3-17. AC Multimeter Current Calibration Connections

11. Connect the multifunction calibrator to the Calibrator's output terminals as shown in Figure 3-17.
12. Using the cursor keys or rotary knob, move the cursor to **300 mA 55Hz low (30mA)** and either press the **SELECT** softkey or press in on the rotary knob.
13. Select **OPR** on the multifunction calibrator.
14. Observe the reading on the Calibrator. It should be close to the nominal value.
15. Confirm the new calibration value by pressing the softkey labeled **WRITE**. If you want to leave the original calibration constant, press the softkey labeled **EXIT**. Then the Calibrator ignores measured current and returns to the list of current ranges.
16. Repeat steps 12 through 16 for all ac current calibration points listed in Table 3-9.

Table 3-9. AC Multimeter Calibration Points

Nominal Range	Calibration Point	Frequency	Required Accuracy of Multifunction Calibrator
10 VAC low	1 V	55 Hz	0.05 %
10 VAC high	10 V	55 Hz	0.05 %
100 VAC low	10 V	55 Hz	0.05 %
100 VAC high	100 V	55 Hz	0.05 %
1000 VAC low	100 V	55 Hz	0.05 %

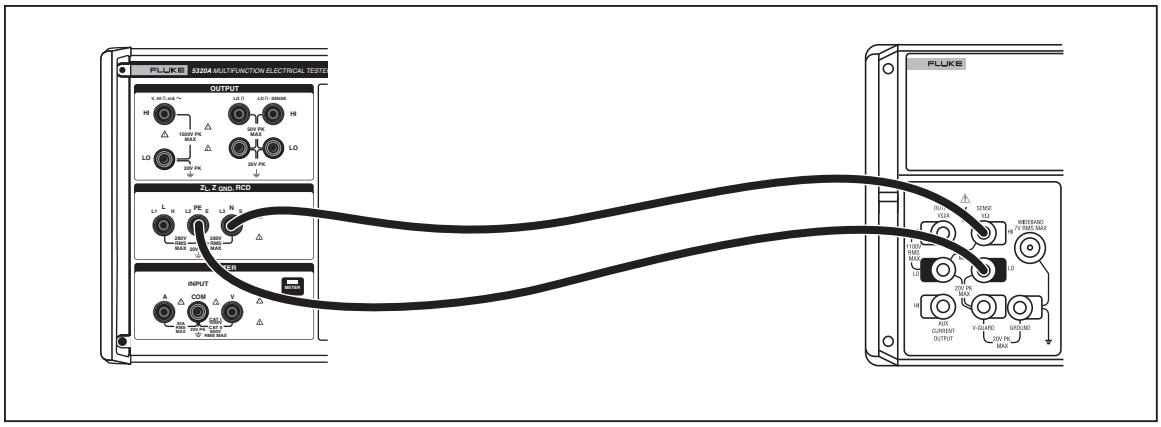
Table 3-9. AC Multimeter Calibration Points (cont.)

Nominal Range	Calibration Point	Frequency	Required Accuracy of Multifunction Calibrator
1000 VAC high	750 V	55 Hz	0.05 %
300 mAAC low	30 mA	55 Hz	0.05 %
300 mAAC high	300 mA	55 Hz	0.05 %
3 AAC low	300 mA	55 Hz	0.05 %
3 AAC high	3 A	55 Hz	0.05 %
30 AAC low	3 A	55 Hz	0.05 %
30 AAC high	20 A	55 Hz	0.05 %

RCD Trip Current

Calibration of the RCD Trip Current function consists of calibrating three ranges (30, 300, and 3000 mA) of the internal ammeter and one range of the internal voltmeter.

Required instruments: Fluke 5520A Multifunction Calibrator
Fluke 289 Digital Multimeter



ewt035.eps

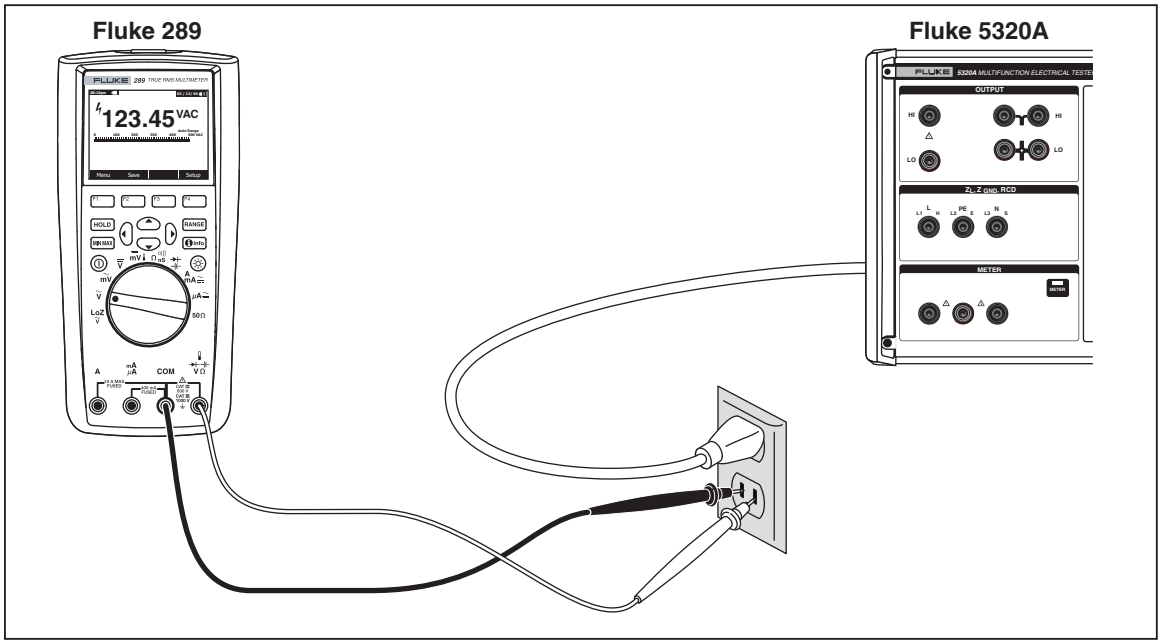
Figure 3-18. RCD Trip Current Calibration Connections

1. Connect the Fluke 5520A to the Calibrator's output terminals as shown in Figure 3-18.
2. Press the softkey labeled **SETUP**.
3. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
4. Enter the password using the keypad (0235 factory default).
5. Using the cursor keys or rotary knob, move the cursor to **RCD Trip Current** and either press the **SELECT** softkey or press in on the rotary knob.
6. Using the cursor keys or rotary knob, move the cursor to **RCD I00 Trip Current 30 mA** and either press the **SELECT** softkey or press in on the rotary knob.
7. Set the multifunction calibrator (Fluke 5520A) to the AC current function, 30 mA, and frequency of 55 Hz.

8. Select **OPER** on the Calibrator.
9. Select **OPR** on the multifunction calibrator.
10. Observe the measured value on the Calibrator. It should be approximately 30 mA.
11. Use the cursor keys or the rotary knob to set the Calibrator's displayed current to 30.000 mA.
12. Confirm the new calibration value by pressing the softkey labeled **WRITE**. If you want to leave the original calibration constant, press the softkey labeled **EXIT**. Then the Calibrator ignores measured current and returns to the list of current ranges.
13. Repeat steps 5 through 10 for the next two calibration points. Table 3-10 lists all three current calibration points.
14. Using the cursor keys or rotary knob, move the cursor to **Line Voltage** and either press the **SELECT** softkey or press in on the rotary knob.

Note

The frequency reading cannot be adjusted during the Line Voltage calibration step.



ewt032.eps

Figure 3-19. RCD Trip Current Line Voltage Calibration Connections

15. Connect the digital multimeter to the same mains outlet to which the Calbrator is connected. See Figure 3-19. Set the digital multimeter to measure ac volts.
16. Use the cursor keys or the rotary knob to set the Calibrator's displayed voltage to the same that is displayed on the standard multimeter.
17. Confirm the new calibration value by pressing the softkey labeled **WRITE**.
18. When calibration is finished, press the softkey labeled **EXIT** repeatedly until the basic calibration display appears.

⚠Caution

To avoid damaging the Calibrator, do not exceed maximum current value on any particular range while performing the RCD Trip Current calibration.

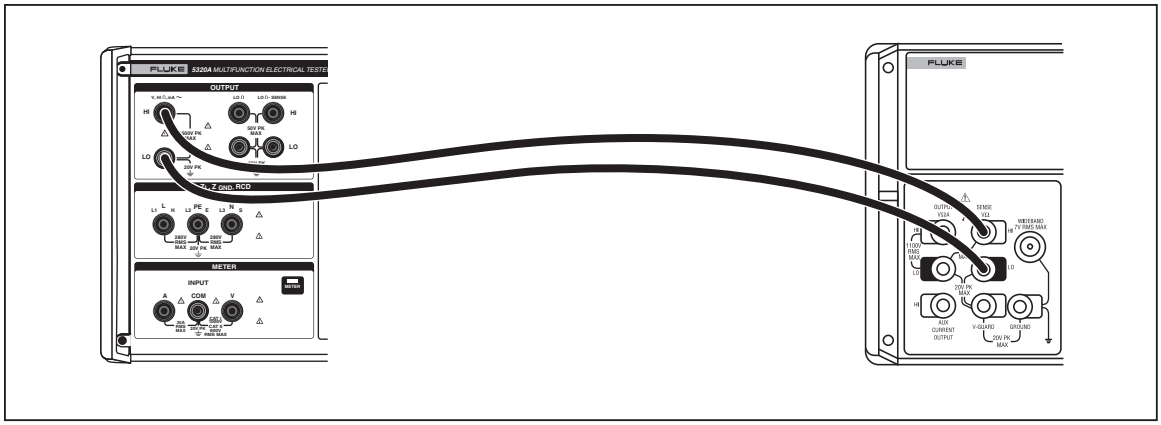
Table 3-10. RCD Trip Current Calibration Points

Nominal Current Range	Calibration Point	Frequency	Required Accuracy of Multifunction Calibrator
30 mA	30 mA	55 Hz	0.2 % + 50 µA
300 mA	300 mA	55 Hz	0.2 %
3 000 mA	3 A	55 Hz	0.2 %

Leakage Current

The leakage current ammeter is calibrated through the Calibrator's front panel. During calibration, the internal rms ammeter is checked. Calibration is performed using dc signals only.

Required instruments: Fluke 5520A Multifunction Calibrator



ewt033.eps

Figure 3-20. Leakage Current Calibration Connections

1. Connect the Fluke 5520A to the Calibrator's output terminals as shown in Figure 3-20.
2. Press the softkey labeled **SETUP**.
3. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
4. Enter the password using the keypad (0235 factory default).
5. Using the cursor keys or rotary knob, move the cursor to **Leakage Current** and either press the **SELECT** softkey or press in on the rotary knob.
6. Using the cursor keys or rotary knob, move the cursor to **I01 0.3 mA** and either press the **SELECT** softkey or press in on the rotary knob.
7. Set the multifunction calibrator (Fluke 5520A) to the DC current function and 0.30 mA.
8. Select **OPER** on the Calibrator.

9. Select **OPR** on the multifunction calibrator.
10. Use the cursor keys or the rotary knob to adjust the 5320A measured value to 0.3000 mA.
11. Select **STBY** on the multifunction calibrator.
12. Confirm the new calibration value by pressing the softkey labeled **WRITE**. If you want to leave the original calibration constant, press the softkey labeled **EXIT**. Then the Calibrator ignores measured current and returns to the list of current ranges.
13. Repeat steps 6 through 13 for the next two calibration points. Table 3-11 lists all three current calibration points.
14. When calibration is finished, press the softkey labeled **EXIT** repeatedly until the basic calibration display appears.

⚠Caution

To avoid damaging the Calibrator, do not exceed maximum current value on any particular range while performing the Leakage Current calibration.

Table 3-11. Leakage Current Calibration Points

Nominal Current Range	Position	Calibration Point	Required Accuracy of Multifunction Calibrator
0.3 mA DC	I01	0.3 mA	0.05 %
3 mA DC	I02	3 mA	0.05 %
30 mA DC	I03	30 mA	0.05 %

HV Probes

HV Probes calibration consists of writing and saving new calibration constants for each recommended high voltage probe. For both the 40 kV and 10 kV probes there are two independent contants. One constant is the DC divider coefficient, the other is the ac-dc difference ratio between dc and 55 Hz.

Required instruments: Fluke 5520A Multifunction Calibrator
Fluke 289 Digital Multimeter or multimeter with .0001 resolution at 1 V AC and DC, 0.1 % or better accuracy at 1 V dc, 0.1 % or better short-term stability on 1 V at 55 Hz, and 10 MΩ input impedance for ac and dc measurements at 1 V

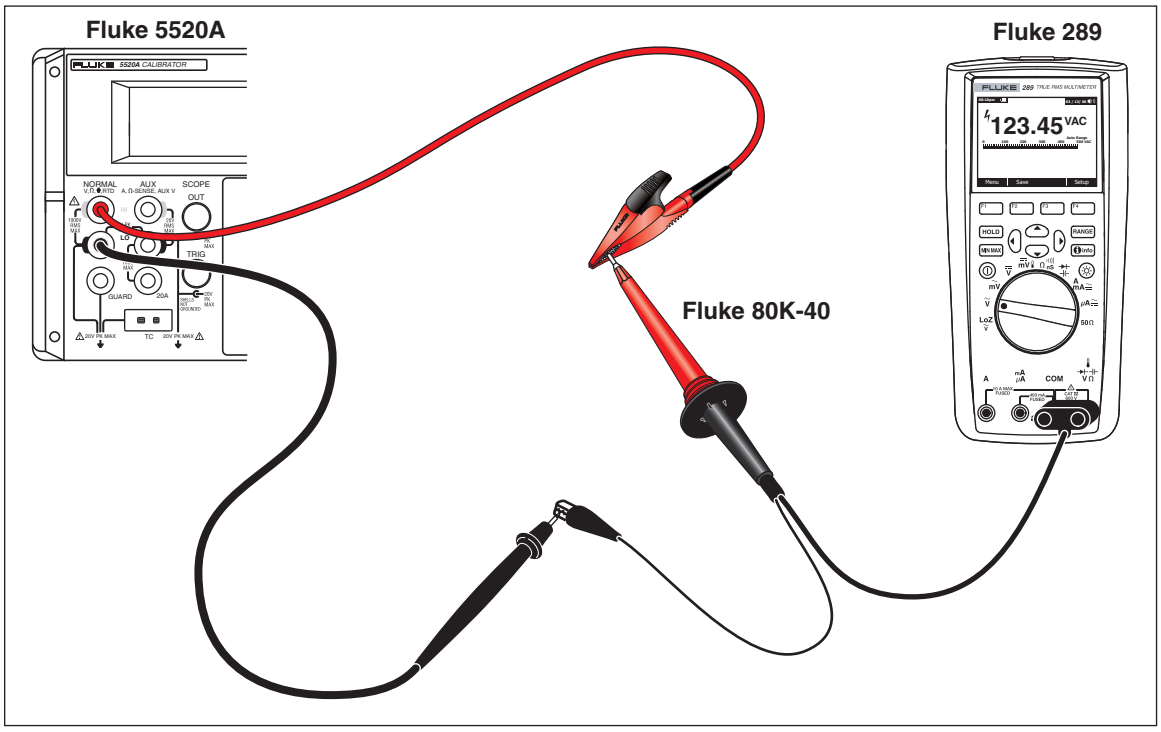
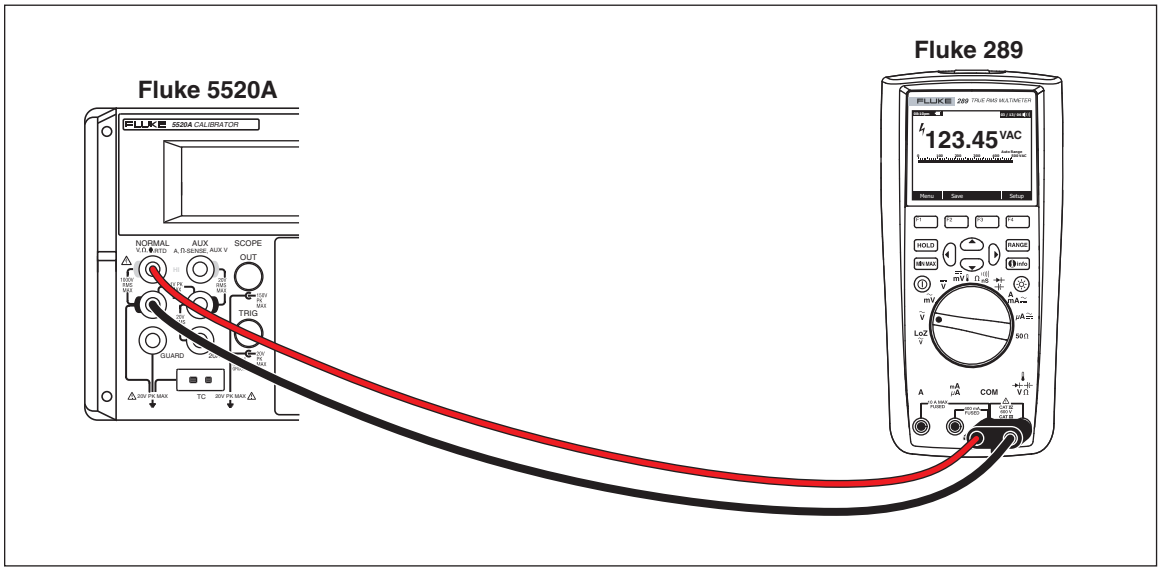


Figure 3-21. HV Probe Calibration Connections

1. Connect the HV Probe between the multifunction calibrator and a digital multimeter input as shown in Figure 3-21.
2. Set the multimeter to dc volts and the 5 V range.
3. Set the multifunction calibrator for 1000 V dc.
4. Select OPR on the multifunction calibrator.
5. Record the reading on the multimeter and note as V_{DC} for future calculations.
6. Select STBY on the multifunction calibrator.
7. Divide 1000 by the reading on the multimeter (V_{DC}) and record the value as the divider ratio.
8. Set the multimeter to ac volts and the 5 V range.
9. Set the multifunction calibrator to 1000 V at 55 Hz.
10. Select OPR on the multifunction calibrator.
11. Record the reading on the multimeter as V1, the value which is used later in this procedure.
12. Select STBY on the multifunction calibrator.
13. Remove all connections.



ewt080.eps

Figure 3-22. Digital Multimeter Characterization Connections

14. The digital multimeter must be characterized for its 1 volt 55 Hz ac response with the multifunction calibrator. Set the multifunction calibrator output to 1 volt at 55 Hz.
15. Write down the reading on the digital multimeter as V2.
16. Calculate the corrected V_{AC} reading as V_{AC} = V1/V2.
17. Calculate the ac-dc deviation by DEV=100*(V_{AC} – V_{DC})/ V_{DC}. DEV is the ac-dc deviation expressed as a percentage.
18. Connect the multifunction calibration to the digital multimeter terminals as shown in Figure 3-22.
19. On the Calibrator, press the softkey labeled **SETUP**.
20. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
21. Using the cursor keys or rotary knob, move the cursor to **HV Probes** and either press the **SELECT** softkey or press in on the rotary knob.
22. From the drop-down menu, select the appropriate probe “divider ratio.”
23. Edit the value displayed on the Calibrator to match the value obtained in step 7 above.
24. Press the softkey labeled **WRITE**.
25. From the drop-down menu select the appropriate probe “AC-DC deviaton.”
26. Edit the value displayed on the screen to match the value obtaine in step 17 above.
27. Press the softkey labeled **WRITE**.
28. Exit the calibration menu.
29. Confirm the new calibration value by pressing the softkey labeled **WRITE**.

Note

The AC/DC difference parameter is mostly created by mechanical design of the probes. It is recommended not to change the original constant, if the new constant is not known with uncertainty better than 10 %.

High Resistance Multiplier

Calibration consists of writing and saving two calibration constants:

- R multiplier R1 xxxx.x (MΩ) Input resistor value measured between adapter INPUT HI and COM/GUARD.
- R multiplier R2 xxx.x (kΩ) transfer resistor value measured between 10kV Divider and COM.

1. Set the standard multimeter to the 2 MΩ range.
2. Connect the standard multimeter 2W HI input to the HI jack (HI Ω Multiplier) on the back of the 5320A HV Adapter/R Multiplier.
3. Connect the standard multimeter 2W LO input to the Input HI jack on the front of the 5320A HV Adapter/R Multiplier.
4. Record the value as R1.
5. Move the lead coming from the 2W LO input of the standard multimeter from the Input HI jack to the COM/GUARD jack on the front of the 5320A HV Adapter/R Multiplier.
6. Record the value as R2.
7. Press the softkey labeled **SETUP**.
8. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
9. Enter the password using the keypad (0235 factory default).
10. Using the cursor keys or rotary knob, move the cursor to **High resistance multiplier** and either press the **SELECT** softkey or press in on the rotary knob.
11. Using the cursor keys or rotary knob, move the cursor to the required parameter which is to be changed (R1 or R2) and either press the **SELECT** softkey or press in on the rotary knob.
12. Using the cursor keys or rotary knob, move the cursor to **R1** and either press the **SELECT** softkey or press in on the rotary knob.
13. Enter the value of R1 from step 4 above.
14. Press the softkey labeled **WRITE** once.
15. Using the cursor keys or rotary knob, move the cursor to **R2** and either press the **SELECT** softkey or press in on the rotary knob.
16. Enter the value of R2 from step 7 above.
17. Confirm the new calibration value by pressing the softkey labeled **WRITE**.
18. Press the softkey labeled **EXIT**.

Loop and Line Impedance

Calibration consists of an autocalibration function only. This step adjusts for internal residual impedances.

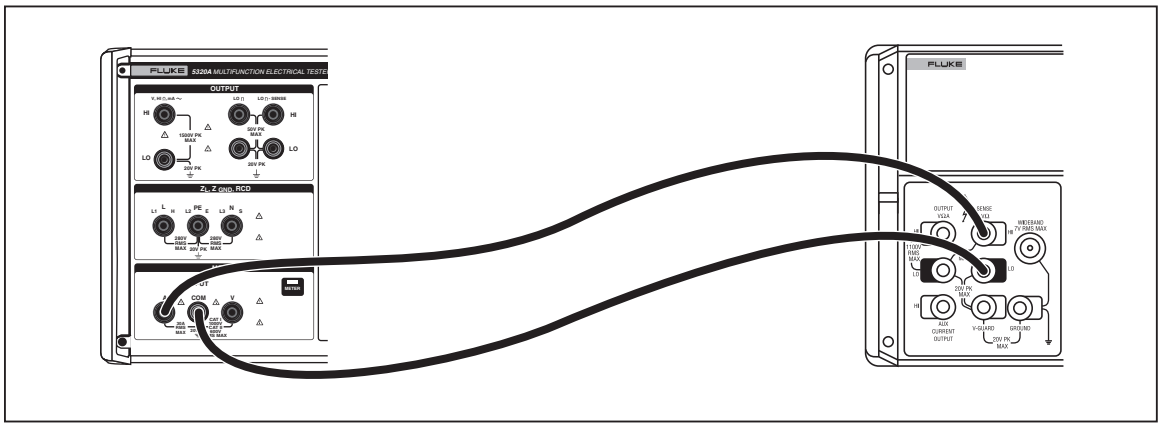
1. Press the softkey labeled **SETUP**.
2. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.

3. Using the cursor keys or rotary knob, move the cursor to **Loop & Line impedance** and either press the **SELECT** softkey or press in on the rotary knob.
4. Using the cursor keys or rotary knob, move the cursor to **Autocalibration** and either press the **SELECT** softkey or press in on the rotary knob.

DC HIPOT Leakage Current

DC hipot leakage current calibration consists of ammeter adjustments.

Required instruments: Fluke 5520A Multifunction Calibrator



ewt030.eps

Figure 3-23. DC HIPOT Leakage Calibration Connections

1. Connect the Fluke 5220A to the Calibrator's output terminals as shown in Figure 3-23.
2. Press the softkey labeled **SETUP**.
3. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
4. Enter the password using the keypad (0235 factory default).
5. Using the cursor keys or rotary knob, move the cursor to **DC HIPOT Leakage Current** and either press the **SELECT** softkey or press in on the rotary knob.
6. Using the cursor keys or rotary knob, move the cursor to **300 µA low (0µA)** and either press the **SELECT** softkey or press in on the rotary knob.
7. Select **OPR** on the multifunction calibrator.
8. Observe the measured value on the Calibrator.
9. Confirm the new calibration value by pressing the softkey labeled **WRITE**.
10. Repeat steps 5 through 8 for the calibration points listed in Table 3-12.
11. When calibration is finished, press the softkey labeled **EXIT** to return to the basic calibration menu.

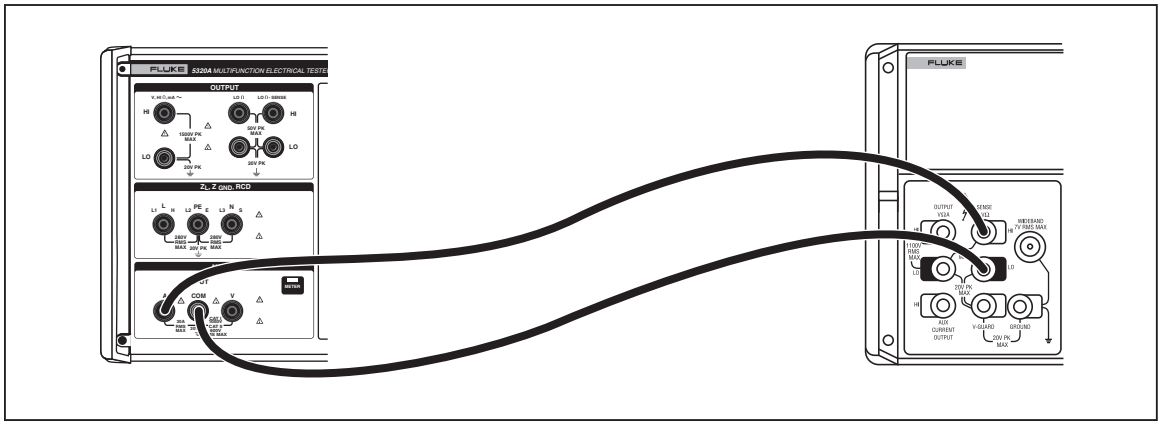
Table 3-12. DC HIPOT Leakage Current Calibration Points

Nominal Range	Calibration Point	Required Accuracy of Multifunction Calibrator
300 uADC low	0 µA	0.07 µA
300 uADC high	300 µA	0.05 %
3 mADC low	300 µA	0.5 µA
3 mADC high	3 mA	0.05 %
30 mADC low	3 mA	5 µA
30 mADC high	30 mA	0.05 %

AC HIPOT Leakage Current

AC hipot leakage current calibration consists of ammeter adjustments in three ranges.

Required instruments: Fluke 5520A Multifunction Calibrator



ewt030.eps

Figure 3-24. AC HIPOT Leakage Calibration Connections

1. Connect the Fluke 5520A to the Calibrator's output terminals as shown in Figure 3-24.
2. Press the softkey labeled **SETUP**.
3. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
4. Enter the password using the keypad (0235 factory default).
5. Using the cursor keys or rotary knob, move the cursor to **AC HIPOT Leakage Current** and either press the **SELECT** softkey or press in on the rotary knob.
6. Using the cursor keys or rotary knob, move the cursor to **300 mA 55Hz low (30mA)** and either press the **SELECT** softkey or press in on the rotary knob.
7. Select **OPR** on the multifunction calibrator.
8. Observe the measured value on the Calibrator.
9. Confirm the new calibration value by pressing the softkey labeled **WRITE**.
10. Repeat steps 5 through 8 for the calibration points listed in Table 3-13.

11. When calibration is finished, press the softkey labeled **EXIT** to return to the basic calibration menu.

Table 3-13. AC HIPOT Leakage Current Calibration Points

Nominal Range	Calibration Point	Frequency	Required Accuracy of Multifunction Calibrator
300 uAAC low	30 uA	55 Hz	0.05 %
300 uAAC high	300 uA	55 Hz	0.05 %
3 mAAC low	0.3 mA	55 Hz	0.05 %
3 mAAC high	3 mA	55 Hz	0.05 %
30 mAAC low	3 mA	55 Hz	0.05 %
30 mAAC high	30 mA	55 Hz	0.05 %

Verifying Calibrator Operation

The following sections describe the procedure used to verify the Calibrator is operating correctly and within specifications. Ensure the Calibrator has been in a temperature stable environment for at least 8 hours before starting the verification process.

Preparing for Calibrator Verification

Table 3-14 lists the equipment required to perform Calibrator verification.

Table 3-14. Required Verification Test Equipment

Test Equipment	Recommended Model
Multimeter with 4-wire ohms capability	Fluke 8508A or equivalent
Megohmmeter with 3 test leads	Quadtech 1865 or equivalent
Multifunction calibrator	Fluke 5520A or equivalent
Frequency counter	Fluke PM 6690 or equivalent
Distortion analyzer	HP/Agilent 8903B or equivalent
10 kV/40 kV High Voltage DC source [1]	Fluke 410B or equivalent
10 kV/40 kV High Voltage AC source [1]	Generic High Voltage AC Source
[1] Used to complete optional tests for the 10 kV and 40 kV probes.	

Power up the Calibrator and test equipment and ensure power has been applied for at least one hour before starting the verification process.

Performing Calibrator Verification

The Calibrator verification procedure consists of the following basic steps:

- Low resistance source
- High resistance source
- Ground bond (and loop/line impedance) resistance source
- Leakage current ac ranges 300 uA, 3 mA, 30 mA
- RCD trip current
- RCD trip time

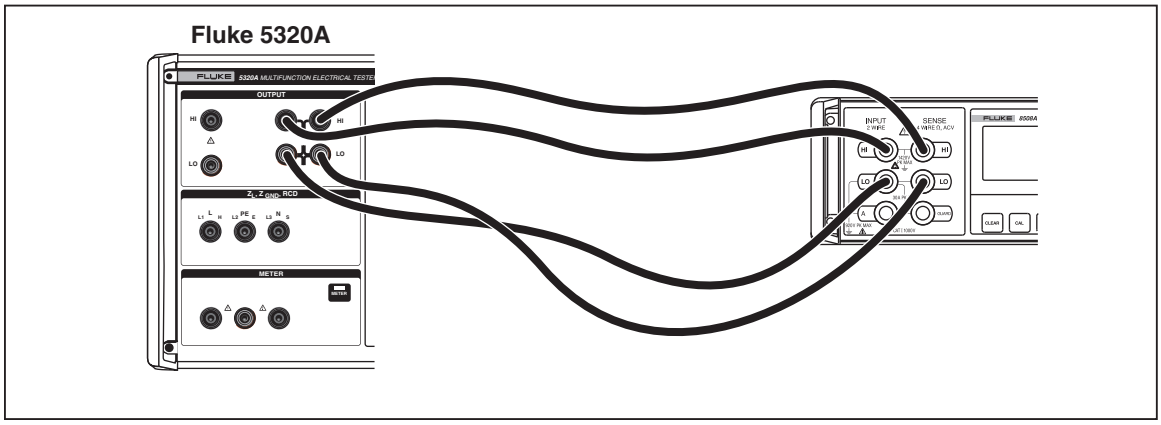
- Calibrator ac/dc voltage on ranges 30 V ac, 100 V ac, 300 V ac, 600 V ac, 100 V dc, 600 V dc (5320A/VLC models only)
- Multimeter voltage ranges 10 V, 100 V, 1000 V
- Multimeter current ranges 300 mA, 3 A, 30 A
- Frequency nominal value 400 Hz
- Hipot leakage current
- 10 kV ac/dc voltage divider verification
- 40 kV ac/dc voltage divider verification (5320A with 40 kV option)

After connecting the Calibrator to the power mains, turn power on and let the Calibrator warmup for at least one hour in a laboratory with a temperature of 23 ±5 ºC before proceeding with the verification.

The following steps use measuring points that are specified in Tables 3-15 to 3-27.

Low Resistance Source Verification

1. Connect the low resistance source output to a standard multimeter as shown in Figure 3-25. Use a 4-wire connection and setup the multimeter for a 4-wire ohms measurement.



ewt023.eps

Figure 3-25. Low Resistance Calibration Connections

2. Press [LOΩ] on the Calibrator.
3. Press the **Mode** softkey. Then, using the cursor keys or rotary knob, highlight **Resistance 4-Wire** and select it by pressing **Select** or pushing in on the rotary knob.
4. Set the multimeter for true ohms and auto range.
5. Verify the Calibrator's Low Resistance calibration performance at each resistance point listed in Table 3-15. Deviations should not exceed the specified limits.

Table 3-15. Low Resistance Source Limits

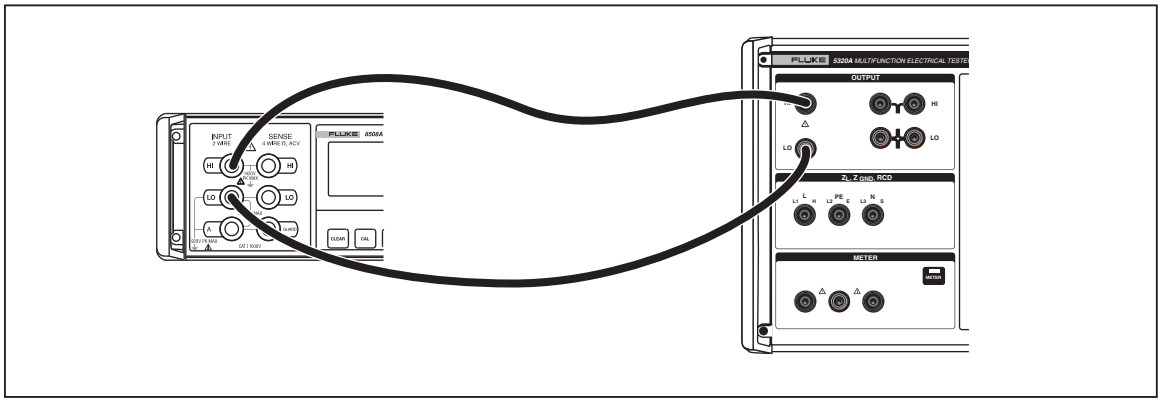
Nominal Value (Ohm)	Required Standard Ohmmeter Accuracy	Lower Limit (Ohm)	Upper Limit (Ohm)
0.100 Ω	0.02 %	89.7 mΩ	110.3 mΩ
0.200 Ω	0.02 %	189.6 mΩ	210.6 mΩ
0.400 Ω	0.02 %	388.8 mΩ	411.2 mΩ
1.000 Ω	0.02 %	987.0 mΩ	1013.0 mΩ

Table 3-15. Low Resistance Source Limits (cont.)

Nominal Value (Ohm)	Required Standard Ohmmeter Accuracy	Lower Limit (Ohm)	Upper Limit (Ohm)
2.000 Ω	0.02 %	1.984 Ω	2.016 Ω
4.000 Ω	0.02 %	3.978 Ω	4.022 Ω
8.000 Ω	0.02 %	7.974 Ω	8.026 Ω
10.00 Ω	0.02 %	9.970 Ω	10.030 Ω
20.00 Ω	0.02 %	19.95 Ω	20.05 Ω
40.00 Ω	0.02 %	39.92 Ω	40.08 Ω
80.00 Ω	0.02 %	79,84 Ω	80.16 Ω
100.0 Ω	0.02 %	99,80 Ω	100.20 Ω
200.0 Ω	0.02 %	199.6 Ω	200.4 Ω
400.0 Ω	0.02 %	399.2 Ω	400.8 Ω
800.0 Ω	0.02 %	798.4 Ω	801.6 Ω
1000 Ω	0.02 %	998.0 Ω	1002.0 Ω
2000 Ω	0.02 %	1996 Ω	2004 Ω
4000 Ω	0.02 %	3992 Ω	4008 Ω
8000 Ω	0.02 %	7984 Ω	8016 Ω
10000 Ω	0.02 %	9980 Ω	10020 Ω

High Resistance Source Verification

1. Connect the high resistance source output to a standard megaohmmeter's input terminals as shown in Figure 3-26. Setup the appropriate megaohmmeter parameters to meet its best accuracy. Do not exceed the maximum permitted test voltage.



ewt070.eps

Figure 3-26. High Resistance Source (<10 MΩ) Calibration Connections

2. Press [HI Ω] on the Calibrator.
3. Set the multimeter for normal 2-wire ohms measurement and auto range.
4. Verify the Calibrator's High Resistance calibration performance at each resistance point listed in Table 3-16. Deviations should not exceed the specified limits.

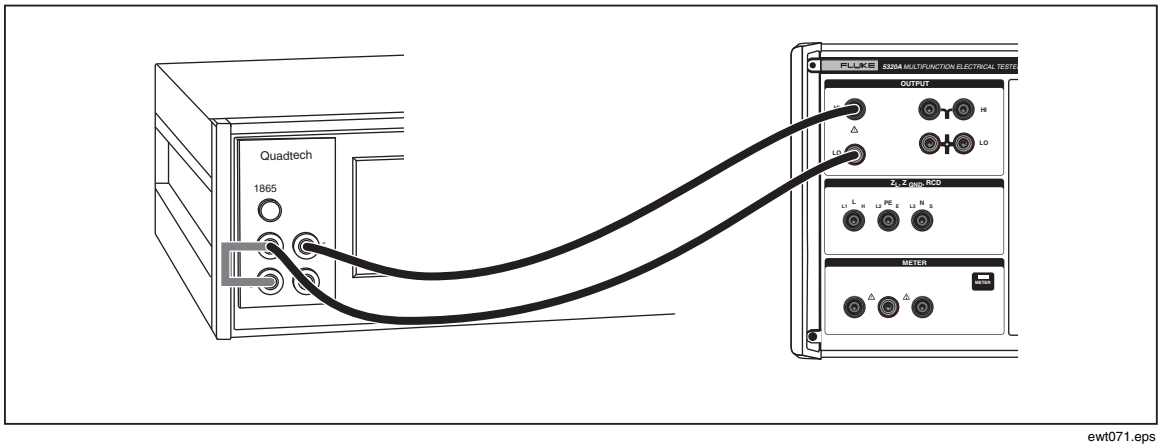
Note

For some megohmmeters, when using the Calibrator's 100 GΩ value or when using the resistance multiplier adapter, the leads must be swapped between the calibrator's HI and LO ohms resistance output. The ground must be turned on (Gnd On) when swapping HI and LO lead positions in the high ohms resistance function. For example, to make a proper measurement with the Quadtech 1865 megohmmeter, connect the HI terminal on the megohmmeter to the LO terminal on the Calibrator and connect the LO terminal on the megohmmeter to the HI terminal on the calibrator. Turn the ground on and proceed to make the measurement.

Table 3-16. High Resistance (<10 MΩ) Source Limits

Nominal Value (Ohm)	Required Standard Ohmmeter Accuracy	Lower Limit (Ohm)	Upper Limit (Ohm)
10 kΩ	0.02 %	9.98 kΩ	10.02 kΩ
20 kΩ	0.02 %	19.96 kΩ	20.04 kΩ
40 kΩ	0.02 %	39.92 kΩ	40.08 kΩ
80 kΩ	0.02 %	79.84 kΩ	80.16 kΩ
100 kΩ	0.02 %	99.80 kΩ	100.20 kΩ
200 kΩ	0.02 %	199.6 kΩ	200.4 kΩ
400 kΩ	0.02 %	399.2 kΩ	400.8 kΩ
800 kΩ	0.02 %	798.4 kΩ	801.6 kΩ
1.00 MΩ	0.05 %	997.0 kΩ	1003.0 kΩ
2.00 MΩ	0.05 %	1.994 MΩ	2.006 MΩ
4.00 MΩ	0.05 %	3.988 MΩ	4.012 MΩ
8.00 MΩ	0.05 %	7.976 MΩ	8.024 MΩ
10.0 MΩ	0.1 %	9.95 MΩ	10.05 MΩ

5. Connect the Calibrator directly to the megohmeter as shown in Figure 3-27.



ewt071.eps

Figure 3-27. High Resistance Source (>10 MΩ) Calibration Connections

6. Setup the Megohmeter as follows:

   Voltage = 500
   Charge time = 5
   Dwell time = 5
   Measure time = 20
   Discharge time = 5
   Mode = Auto
   Number to average = 400

7. Verify the Calibrator's High Resistance calibration performance at each resistance point listed in Table 3-17. Deviations should not exceed the specified limits.

Table 3-17. High Resistance (>10 MΩ) Source Limits

Nominal Value (Ohm)	Required Standard Ohmmeter Accuracy	Lower Limit (Ohm)	Upper Limit (Ohm)
20.0 MΩ	0.1 %	19.9 MΩ	20.1 MΩ
40.0 MΩ	0.1 %	39.8 MΩ	40.2 MΩ
80.0 MΩ	0.1 %	79.6 MΩ	80.4 MΩ
100 MΩ	0.2 %	99.5 MΩ	100.5 MΩ
200 MΩ	0.2 %	199 MΩ	201 MΩ
400 MΩ	0.2 %	398 MΩ	402 MΩ
800 MΩ	0.2 %	796 MΩ	804 MΩ
1.0 GΩ	0.5 %	990 MΩ	1.010 MΩ
2.0 GΩ	0.5 %	1.98 GΩ	2.02 GΩ
4.0 GΩ	0.5 %	3.96 GΩ	4.04 GΩ
8.0 GΩ	0.5 %	7.92 GΩ	8.08 GΩ
100 GΩ	1.0 %	Rdisplayed - 3.0 % [1]	Rdisplayed + 3.0 % [1]

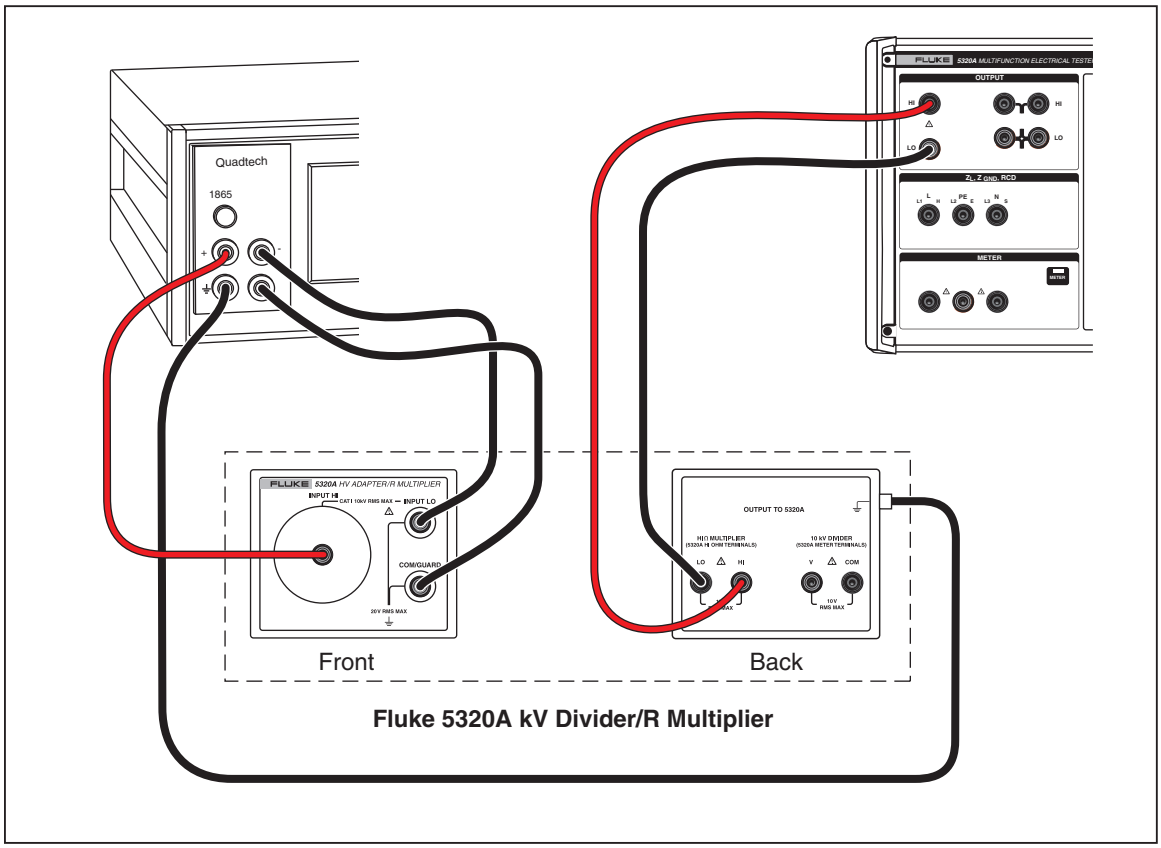
[1] Maximum deviation from calibration value.

Resistance Multiplier Verification

Note

To ensure low leakage, place the kV Divider/R Multiplier on an insulated surface (Teflon sheet or glass).

1. Connect the Calibrator to a megohmmeter through the HV Adapter using low-leakage, low-dielectric absorption test leads as shown in Figure 3-28. Note the polarity of the connections between the kV Divider/R Multiplier output to the Calibrator, HIΩ Multiplier to the Calibrator HIΩ, mA terminals are reversed.



ewt090.eps

Figure 3-28. Resistance Multiplier Verification Connections

Note

Minimize physical movement in the vicinity of the UUT and megohmmeter during the following measurement sequence.

2. Press the softkey labeled **R Mult.** on the Calibrator.

Table 3-18. Resistance Limits for Multiplier Verification

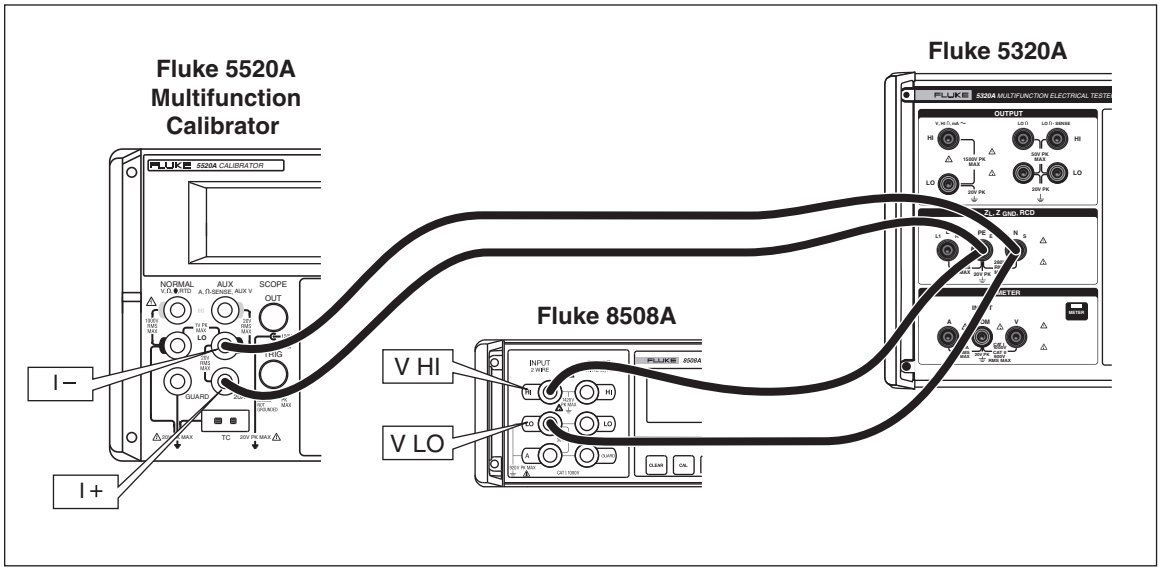
Nominal Value (Ohm)	Required Standard Ohmmeter Accuracy	Lower Limit (Ohm)	Upper Limit (Ohm)
1.0 GΩ [1]	0.2 %	0.987 GΩ	1.013 GΩ
10 GΩ [1]	0.2 %	9.85 GΩ	10.15 GΩ
100 GΩ [1]	0.5 %	97.5 GΩ	102.5 GΩ
1.0 TΩ [1]	1 %	0.97 TΩ	1.03 TΩ
9 TΩ [1]	1 %	8.64 TΩ	9.36 TΩ
[1] With resistance multiplier adapter.			

Ground Bond Resistance Source Verification

Verification using a standard ohmmeter with test current of 100 mA is adequate for ground bond decade verification for resistors greater than 1.8 ohms. Resistors less than or equal to 1.8 ohms use higher current stimulus which is more representative of the Calibrator's instrument workload.

Resistance < 5 Ohms

1. Connect the Calibrator to the multimeter and multifunction calibrator as shown in Figure 3-29.



ehq072.eps

Figure 3-29. High Current Bond Resistance Connections

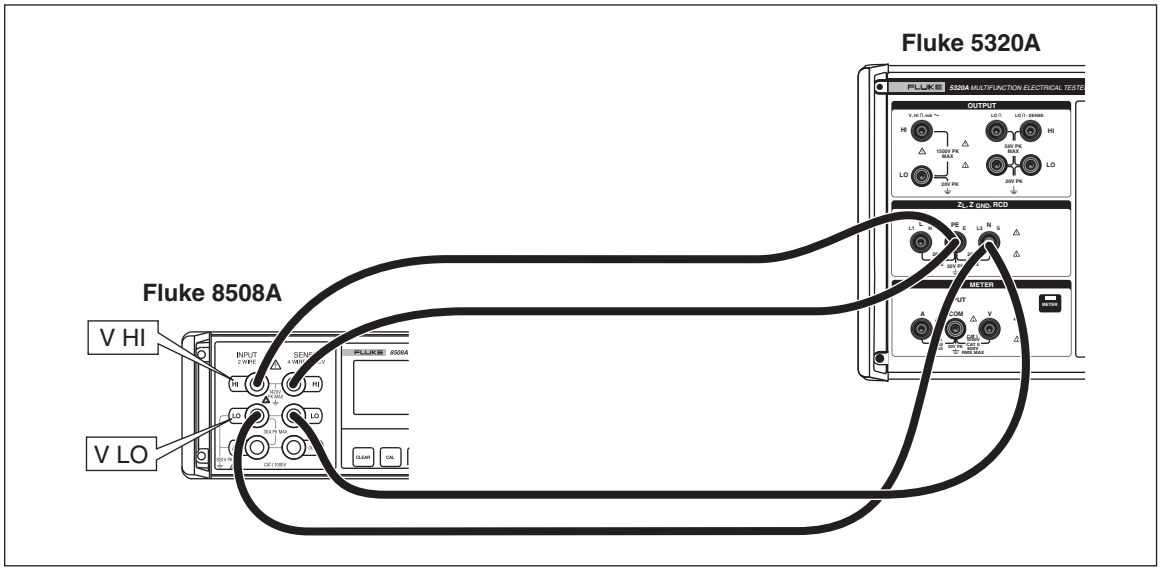
2. Set the test current on the multifunction calibrator to the DC test current in Table 3-19 and measure the voltage drop between the PE and N terminals on the Calibrator ($V_{multmeter}$).
3. Calculate ground bond resistance:
   $R_{gbr} = V_{multmeter}/I_{5520A}$
4. Compare the calculated Rgbr with the value displayed on the Calibrator. Both values should be within the lower and upper limt values in Table 3-19.

Table 3-19. High Test Current Ground Bond Source Limits

Nominal Value	Required Standard Calibrator/Multimeter Current/Voltage Uncertainty	DC Test Current	Lower Limit [1]	Upper Limit [1]
25 mΩ	± 0.5%	20 A	Rgbr - 5 mΩ	Rgbr + 5 mΩ
50 mΩ	± 0.2 %	10 A	Rgbr - 5 mΩ	Rgbr + 5 mΩ
100 mΩ	± 0.1 %	10 A	Rgbr - 5 mΩ	Rgbr + 5 mΩ
330 mΩ	± 0.1 %	5 A	Rgbr - 7 mΩ	Rgbr + 7 mΩ
500 mΩ	± 0.1 %	3 A	Rgbr - 8 mΩ	Rgbr + 8 mΩ
1 Ω	± 0.1 %	2 A	Rgbr - 10 mΩ	Rgbr + 10 mΩ
1.8 Ω	± 0.1 %	2 A	Rgbr - 18 mΩ	Rgbr + 18 mΩ
[1] Maximum deviation from calibration value.				

Resistance > 1.8 Ohms

1. Connect four test leads to the 4-wire terminals of a standard multimeter. Set the multimeter to make a 4-wire ohms measurement with the filter on.
2. Short the four leads together and zero the function on the multimeter.
3. Connect the multimeter to the calibrator as shown in Figure 3-30.



ehq090.eps

Figure 3-30. High Test Current Verification with Ohmmeter

4. Verify the Calibrator's Ground Bond Resistance calibration performance at each resistance point listed in Table 3-20. Deviations should not exceed the specified limits.

Table 3-20. Ground Bond Source Limits

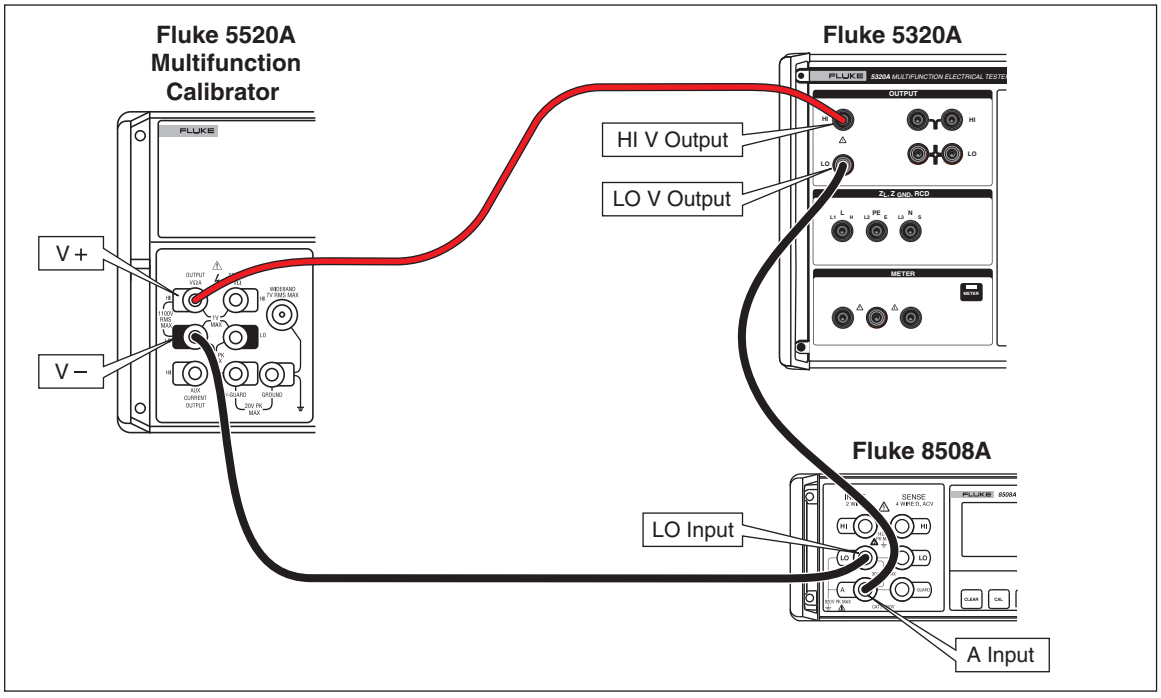
Nominal Value	Required Standard Ohmmeter Accuracy	Lower Limit [1]	Upper Limit [1]
5 Ω	±3 mΩ	Rcal - 30 mΩ	Rcal + 30 mΩ
10 Ω	±6 mΩ	Rcal - 60 mΩ	Rcal + 60 mΩ
18 Ω	±10 mΩ	Rcal - 100 mΩ	Rcal + 100 mΩ
50 Ω	±30 mΩ	Rcal - 300 mΩ	Rcal + 300 mΩ
100 Ω	±50 mΩ	Rcal - 500 mΩ	Rcal + 500 mΩ
180 Ω	±100 mΩ	Rcal - 1.0 Ω	Rcal + 1.0 Ω
500 Ω	±250 mΩ	Rcal - 2.5 Ω	Rcal + 2.5 Ω
1 kΩ	±500 mΩ	Rcal - 5.0 Ω	Rcal + 5.0 Ω
1.8 kΩ	±1 Ω	Rcal - 10.0 Ω	Rcal + 10.0 Ω
[1] Maximum deviation from displayed value.			

Leakage Current Verification

⚠⚠ Warning

To avoid electric shock and possible damage to the Calibrator and other test equipment, ensure all test leads are properly connected and equipment settings are correctly set before activating either calibrator's output with the operate switch.

1. Press [mA~] to select the passive leakage current function on the Calibrator. Connect the multifunction calibrator's output (Fluke 5520A in this example) to the HI and LO V~ terminals of the Calibrator as shown in Figure 3-31. On the 5520A calibrator, set its output to the nominal voltage of the power line voltage the Calibrator is powered from (115 V ac or 230 V ac), and set the frequency to 55 Hz.
2. Connect the standard multimeter's current terminals according to the connections shown in Figure 3-31. Select the ACI function with auto range on the standard multimeter (for example, Fluke 8508A).



ehq008.eps

Figure 3-31. Multimeter Current Verification Setup

3. Perform an ac current test on ranges 0.3, 3, and 30 mA according to the points listed in Table 3-21. Compare the readings on the standard multimeter with the Calibrator's measured Id. Deviations should not exceed the specified limits.
4. Set the multifunction calibrator to 40 Volts at 55 Hz in Standby.
5. Set the Calibrator Id nom for 250 µA and press [OPER].
6. Set the multimeter to the 1 mA range.
7. Press the OPER key on the multifunction calibrator and adjust the output voltage for a reading of approximately 250 µA on the standard multimeter. The reading is "Istd." See Table 3-21.
8. Compare the values with those found in Table 3-21.

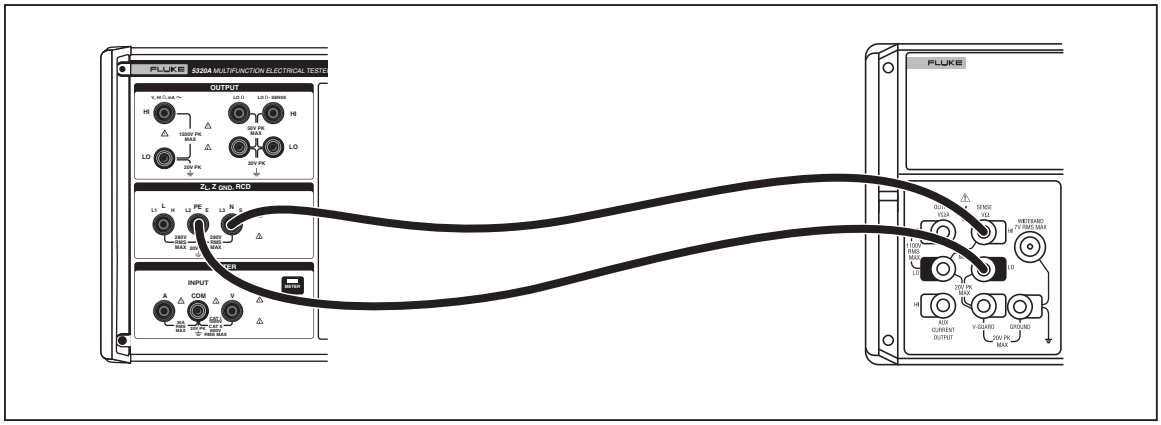
9. Set the multifunction calibrator, the Calibrator, and multimeter ranges for the remaining nominal currents found in Table 3-21.

Table 3-21. Leakage Current Limits

Nominal Current	Required Standard Ammeter Accuracy	Lower Limit (mA) [1]	Upper Limit (mA) [1]
0.25 mA ac	0.05 %	Istd -2.75 µA	Istd +2.75 µA
2.5 mA ac	0.05 %	Istd -9.5 µA	Istd +9.5 µA
25 mA ac	0.05 %	Istd -77 µA	Istd +77 µA
[1] Maximum deviation from calibration value.			

RCD Trip Current Verification

1. Connect the Calibrator to the multifunction calibrator as shown in Figure 3-32.



ewt035.eps

Figure 3-32. RCD Trip Current Calibration Connections

2. Press RCD.
3. Set 25 mA range on the Calibrator.
4. If RCD Trip Current is not already displayed, press the **Mode** softkey.
5. Using the cursor keys or rotary knob, highlight the **Trip Current** selection and either press the **Select** softkey or press in on the rotary knob.
6. Set the multifunction calibrator to the start current listed in Table 3-22.
7. Press OPER on the Calibrator.
8. Press **OPR** on the multifunction calibrator.
9. Slowly increment the current on the multifunction calibrator until the Calibrator trips to **STBY**.
10. Compare the output from the multifunction calibrator with the value listed in Table 3-22. Deviations should not exceed the specified limits.

Table 3-22. RCD Trip Current Limits

Nominal Current	Required Standard Ammeter Accuracy	Frequency	Start Current	Increment By	Lower Limit (mA)	Upper Limit (mA)
25 mA ac	0.2 %	Line Freq.	20 mA	0.1 mA	24.75 ma	25.25 ma
250 mA ac	0.2 %	Line Freq.	210 mA	1 mA	247.5 ma	252.5 ma
2.5 A ac	0.2 %	Line Freq.	2.1 A	10 mA	2475 ma	2525 ma

RCD Trip Current Meter Verification

This calibration verifies the trip current meter in the RCD function.

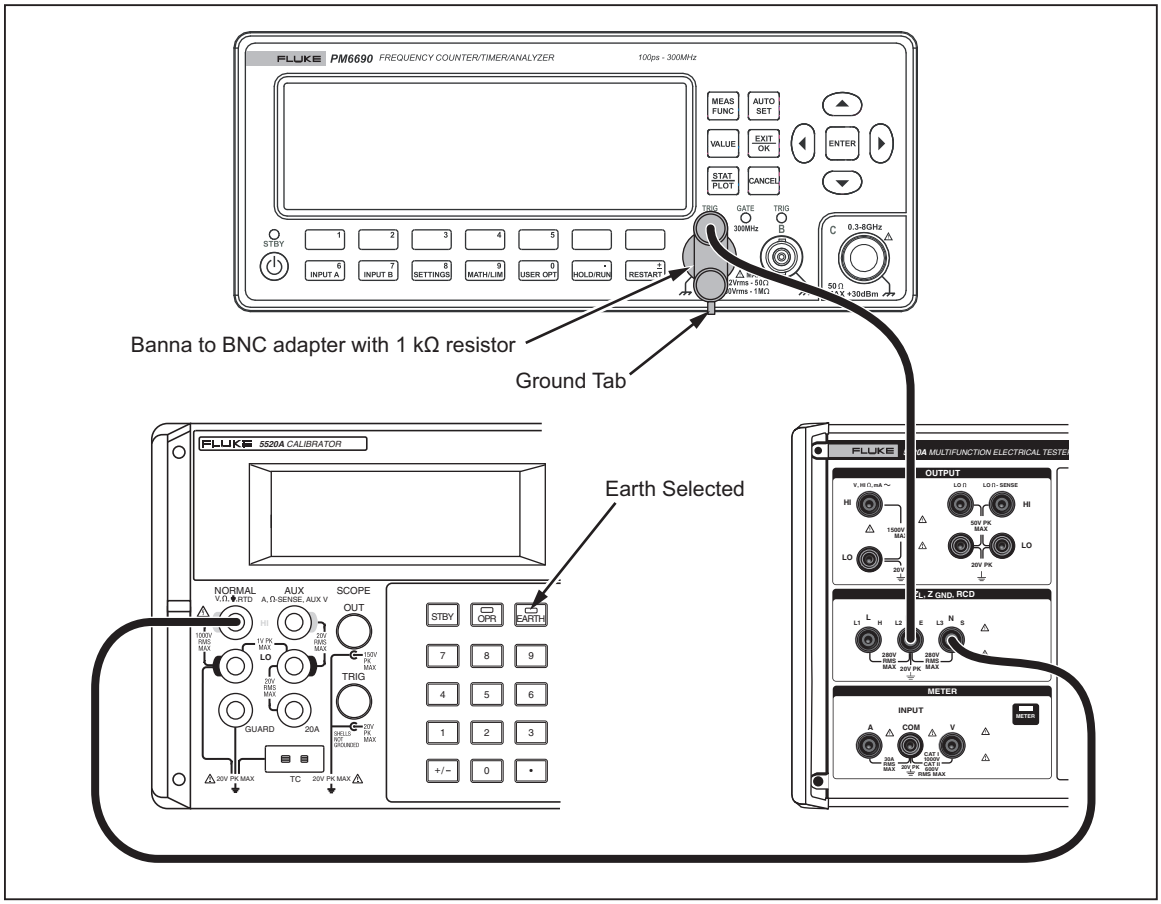
1. Connect the Calibrator to the multifunction calibrator as shown in Figure 3-32.
2. Press the softkey labeled **SETUP**.
3. Using the cursor keys or rotary knob, highlight the **Calibration** selection and either press the **Select** softkey or press in on the rotary knob.
4. Enter the password using the keypad (0235 factory default).
5. Using the cursor keys or rotary knob, move the cursor to **RCD Trip Current** and either press the **SELECT** softkey or press in on the rotary knob.
6. Using the cursor keys or rotary knob, move the cursor to **RCD I01 Trip Current 30mAac** and either press the **SELECT** softkey or press in on the rotary knob.
7. Set the multifunction calibrator to 25 mA ac at 55 Hz.
8. Press OPER on the Calibrator.
9. Press **OPR** on the multifunction calibrator.
10. The readout at the bottom of the display should indicate a value between 24.75 mA and 25.25 mA.
11. Put the multifunction calibrator in to standby.
12. Press the **Exit** softkey on the Calibrator.
13. Using the cursor keys or rotary knob, move the cursor to **RCD I02 Trip Current 300mAac** and either press the **SELECT** softkey or press in on the rotary knob.
14. Set the multifunction calibrator to 250 mA ac at 55 Hz.
15. Press OPER on the Calibrator.
16. Press **OPR** on the multifunction calibrator.
17. The readout at the bottom of the display should indicate a value between 247.5 mA and 252.5 A.
18. Put the multifunction calibrator in to standby.
19. Press the **Exit** softkey on the Calibrator.
20. Using the cursor keys or rotary knob, move the cursor to **RCD I03 Trip Current 3Aac** and either press the **SELECT** softkey or press in on the rotary knob.
21. Set the multifunction calibrator to 2.50 A ac at 55 Hz.
22. Press OPER on the Calibrator.
23. Press **OPR** on the multifunction calibrator.

24. The readout at the bottom of the display should indicate a value between 2.475 A and 2.525 A.
25. Put the multifunction calibrator in to standby.
26. Press the **Exit** softkey on the Calibrator.
27. Press the **Exit** softkey four times to exit the calibration menu.

RCD Trip Time Verification

This calibration verifies the trip time in the RCD function. During the procedure, the Calibrator generates passive pulses at a frequency of 1/T with a 1:1 duty cycle. The range is 50 ms to 5 s.

Required instruments: Fluke 5520A Multifunction Calibrator
Fluke PM6690 Frequency Counter/Time/Analyzer



ewt034.eps

Figure 3-33. Trip Time Verification Connections

12. Connect the Calibrator, Fluke 5520A multifunction calibrator and Fluke counter/timer as shown in Figure 3-33.
13. Set 5 Vdc on the multifunction calibrator and turn on the output by pressing **OPR**.
14. Set the pulse width function on the counter, start on rising edge, stop falling edge. Set TRIG to 2.5 V. Set input coupling to dc.
15. Press the softkey labeled **SETUP**.

16. Using the cursor keys or rotary knob, move the cursor to **CALIBRATION** and either press the **SELECT** softkey or press in on the rotary knob.
17. Enter the password using the keypad (0235 factory default).
18. Using the cursor keys or rotary knob, move the cursor to **Trip Time Verification** and either press the **SELECT** softkey or press in on the rotary knob.

Note

If the trip time verification does not appear on the main menu, this revision of IFC and REL boards does not support RCD trip time verification.

19. Set the Calibrator trip time to the value listed under Nominal Trip Time in Table 3-23.
20. The counter should indicate a value between the lower and upper limit in Table 3-23.

Table 3-23. RCD Trip Time Limits

Nominal Trip Time	Required Standard Time Uncertainty	Lower Limit (ms)	Upper Limit (ms)
100 ms	0.05 %	99.75 ms	100.25 ms
1000 ms	0.005 %	999.75 ms	1000.25 ms

AC Voltage Calibrator Verification

Note

This verification procedure can only be performed when the VLC option is installed in the Calibrator.

1. Select the ac voltage calibration function on the Calibrator. Set the output frequency to 55 Hz.
2. Connect a standard multimeter to the appropriate output terminals of the Calibrator and select the ac voltage function. Set the appropriate parameters on the standard multimeter to meet its best accuracy.
3. Verify the Calibrator's ac voltage calibration performance at each voltage point listed in Table 3-24. Deviations should not exceed the specified limits.
4. Set the Calibrator's output voltage to 10 V ac with a frequency of 400 Hz and press STBY.
5. Connect a standard counter to the voltage output terminals of the Calibrator.
6. Set the standard counter to measure frequency using auto trigger.
7. Press OPER on the Calibrator.
8. Verify the Calibrator's output frequency is within the specifications listed in Table 3-24. Deviations should not exceed specified limits.
9. Press STBY on the Calibrator and set the output to 20 V ac at 120 Hz.
10. Connect the Calibrator's output to the distortion analyzer.
11. Set the distortion analyzer to measure distortion with the 30 kHz low pass filter turned on.
12. Compare the distortion anaylyzer's reading with the value in the distortion section of Table 3-24.

13. Press [STBY] on the Calibrator.

Table 3-24. AC Voltage, Frequency Test and Distortion Test Limits

AC Voltage Limits				
Nominal Output Voltage	**Required Standard Voltmeter Accuracy**	**Frequency (Hz)**	**Lower Limit (V AC)**	**Upper Limit (V AC)**
20 V ac	0.02 %	55	19.971 V	20.029 V
90 V ac	0.02 %	55	89.880 V	90.120 V
250 V ac	0.02 %	55	249.66 V	250.34 V
500 V ac	0.02 %	55	499.32 V	500.68 V
Frequency Test Limits				
Nominal Output Voltage	**Required Standard Counter Accuracy**	**Frequency (Hz)**	**Lower Limit (Hz)**	**Upper Limit (Hz)**
10 V ac	0.005 %	400 Hz	399.96 Hz	400.04 Hz
Distortion Test Limits				
Nominal Output Voltage	**Required Standard Distortion Meter Accuracy**	**Frequency (Hz)**	**Limit (%)**	
20 V ac	0.005 %	120 Hz	0.25 %	

DC Voltage Calibrator Verification

Note

This verification procedure can only be performed when the VLC option is installed in the Calibrator.

1. Select the dc voltage calibration function on the Calibrator.
2. Connect a standard multimeter to the appropriate output terminals of the Calibrator and select the dc voltage function. Set the appropriate parameters on the standard multimeter to meet its best accuracy.
3. Verify the Calibrator's dc voltage calibration performance at each voltage point listed in Table 3-25. Deviations should not exceed the specified limits.

Table 3-25. DC Voltage Limits

Nominal Output Voltage	**Required Standard Voltmeter Accuracy**	**Lower Limit (V DC)**	**Upper Limit (V DC)**
90 V dc	0.02 %	89.880 V	90.120 V
500 V dc	0.02 %	499.32 V	500.68 V

Meter Verification

1. Select the meter function on the Calibrator. Connect the voltage output terminals of the multifunction calibrator to the Calibrator's Meter V and COM input terminals.

2. Verify the Calibrator's Meter function measures ac and dc voltages within the specifications listed in Table 3-26. Deviations should not exceed specified limits.
3. Select the Meter function on the Calibrator. Connect the current output terminals of the multifunction calibrator to the Calibrator's Meter A and COM terminals.
4. Verify the Calibrator's Meter function measures ac and dc currents within the specifications listed in Table 3-27. Deviations should not exceed specified limits.

At any point in the verification, if a Calibrator function does not fall within the lower and upper limits, the appropriate function and range should be recalibrated. It is not necessary to recalibrate all the functions, just the one that does not meet the specification. Refer to the *5320A Service Manual* or contact Fluke for calibration.

Note

AC voltage frequency and distortion cannot be adjusted in the Calibrator.

Table 3-26. AC/DC Voltage Multimeter Limits

Nominal Output Voltage	Required Standard Voltmeter Accuracy	Frequency (Hz)	Lower Limit (V)	Upper Limit (V)
9 V ac	0.02 %	55	8.9815 V	9.0185 V
90 V ac	0.02 %	55	89.77 V	90.23 V
1000 V ac	0.02 %	55	997.45 V	1002.55 V
9 V dc	0.02 %	-	8.9815 V	9.0185 V
90 V dc	0.02 %	-	89.77 V	90.23 V
1000 V dc	0.02 %	-	997.45 V	1002.55 V

Table 3-27. AC/DC Current Meter Limits

Nominal Output Voltage	Required Standard Voltmeter Accuracy	Frequency (Hz)	Lower Limit (A)	Upper Limit (A)
250 mA ac	0.02 %	55	0. 249475 A	0.250525 A
2.5 A ac	0.02 %	55	2.49475 A	2.50525 A
18 A ac	0.02 %	55	17.931 A	18.069 A
250 mA dc	0.02 %	-	0. 249475 A	0.250525 A
2.5 A dc	0.02 %	-	2.49475 A	2.50525 A
20 A dc	0.02 %	-	19.925 A	20.075 A

HV Probe Verification

Note

This procedure will use lab test equipment to calibrate the probe to 1 kV dc and 1 kV ac at 50 or 60 Hz. Measurements above 1 kV are considered optional tests. If the HV source does not meet the accuracy requirement, setting the source will require characterizing the source with the voltmeter and precision HV divider.

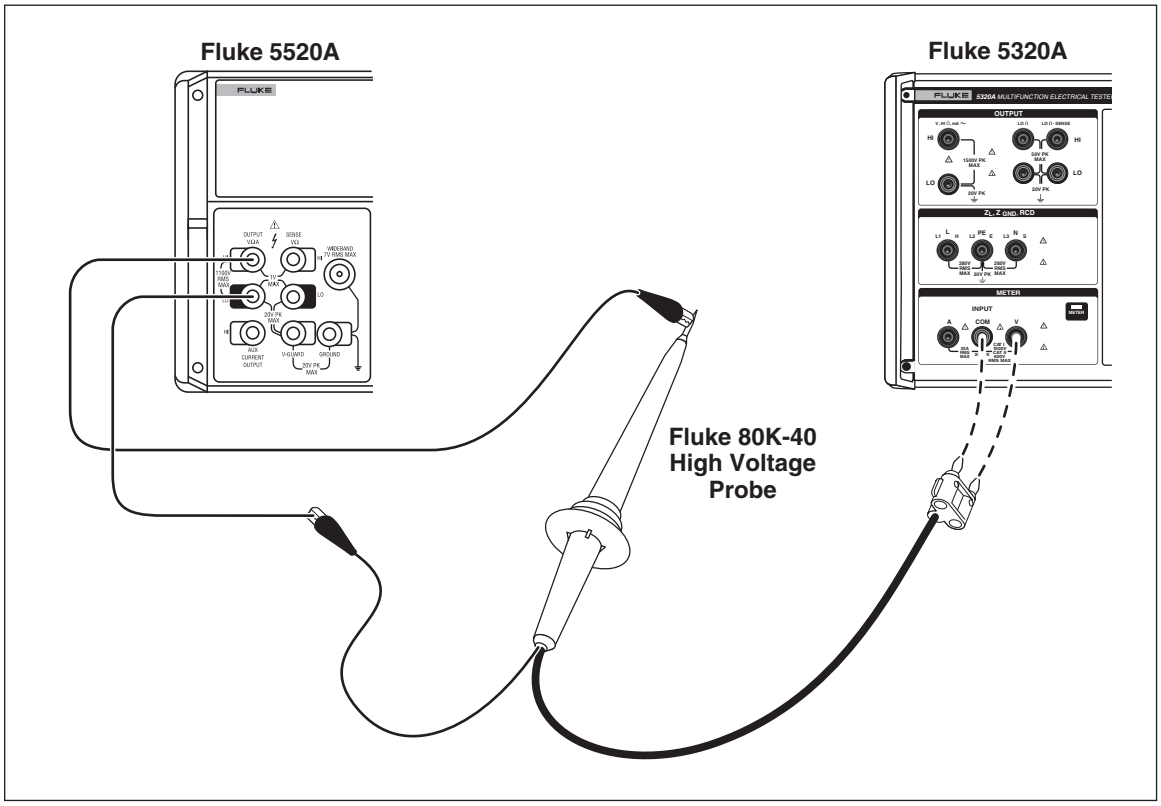


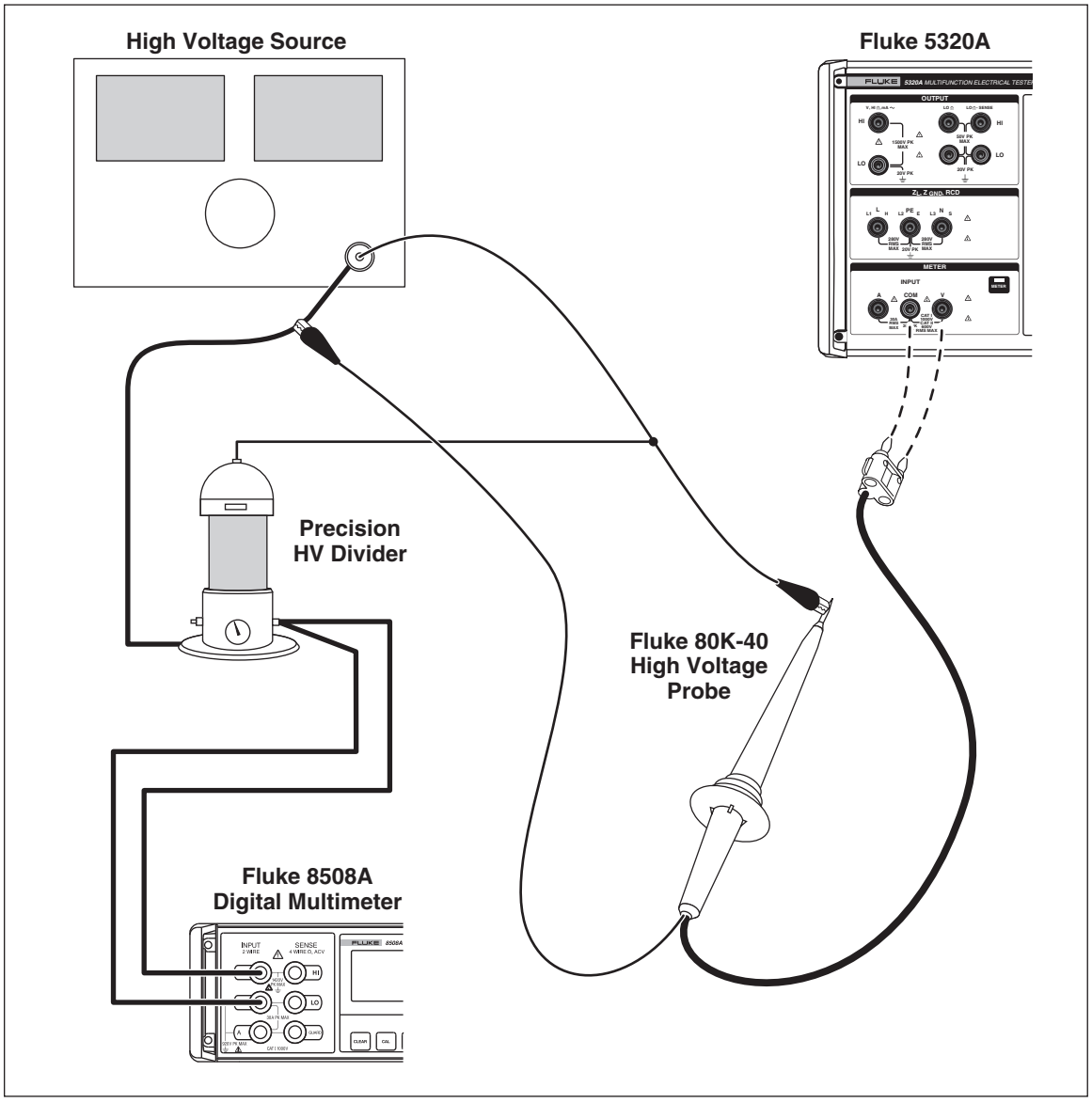
Figure 3-34. High Voltage Probe Calibration Connection

1. Connect the multifunction calibrator (5520A in this case) to the High Voltage probe as shown in Figure 3-34.
2. Connect the HV probe output to the V and COM meter inputs of the Calibrator.
3. Select the proper probe (40KV or 10KV) on the Calibrator.
4. Set the multifunction calibrator output to 1000V dc and press the operate key.
5. The Calibrator should read between 992 V and 1008 V (For 40K probe: 985 V and 1015 V).
6. Set the 5520A to standby and 0 V dc.

Note

Steps 7 through 12 are optional verification steps for the 10 kV and 40 kV probes.

7. Connect the HV source to the high voltage divider as shown in Figure 3-35.



ewt082.eps

Figure 3-35. High Voltage Divider Calibration Connection

8. Set the HV source to 5 kV dc and press the operate key.
9. The Calibrator should read between 4980 V and 5020 V (For 40K probe: 4965 V and 5035 V).
10. Set the HV source to 10 kV dc and press the operate key.
11. The Calibrator should read between 9965 V and 10035 V (For 40K probe: 9940 V and 10060 V).
12. Set the HV source to standby.

Note

Steps 13 through 18 are optional verification steps for the 40 kV probe.

13. Set the HV source to 20 kV 50 or 60 Hz ac and press the operate key.
14. The Calibrator should read between 19890 V and 20110 V.

15. Set the HV source to 30 kV ac and press the operate key.
16. The Calibrator should read between 29840 V and 30160 V.
17. Set the HV source to 40 kV ac and press the operate key.
18. The Calibrator should read between 39790 V and 40210 V.
19. Set the HV source to standby.
20. Remove all connections

This completes the HV probe verification.

Chapter 4
List of Replaceable Parts

Introduction

This chapter contains an illustrated list of replaceable parts for Fluke 5320A Multifunction Electrical Tester Calibrator. Parts are listed by assembly; alphabetized by reference designator. Each assembly is accompanied by an illustration showing the location of each part and its reference designator.

The parts lists give the following information:

- Reference designator (for example, "R52")
- An indication if the part is subject to damage by static discharge (* near the part description)
- Description
- Fluke stock number
- Total quantity
- Any special notes (i.e., factory-selected part)

⚠Caution

A * symbol indicates a device that may be damaged by static discharge.

How to Obtain Parts

Electronic components may be ordered directly from the Fluke Corporation and its authorized representatives by using the part number under the heading Fluke Stock No. Parts price information is available from the Fluke Corporation or its representatives.

To contact Fluke, call one of the following telephone numbers:

- 1-888-99FLUKE (1-888-993-5853) in U.S.A.
- 1-800-36-FLUKE (1-800-363-5853) in Canada
- +31-402-678-200 in Europe
- +81-3-3434-0181 Japan
- +65-738-5655 Singapore
- +1-425-446-5500 from other countries

Or, visit the Fluke web site at **www.fluke.com**. A list of service centers is available on the Fluke web site.

In the event that the part ordered has been replaced by a new or improved part, the replacement will be accompanied by an explanatory note and installation instructions, if necessary.

To ensure prompt delivery of the correct part, include the following information when you place an order:

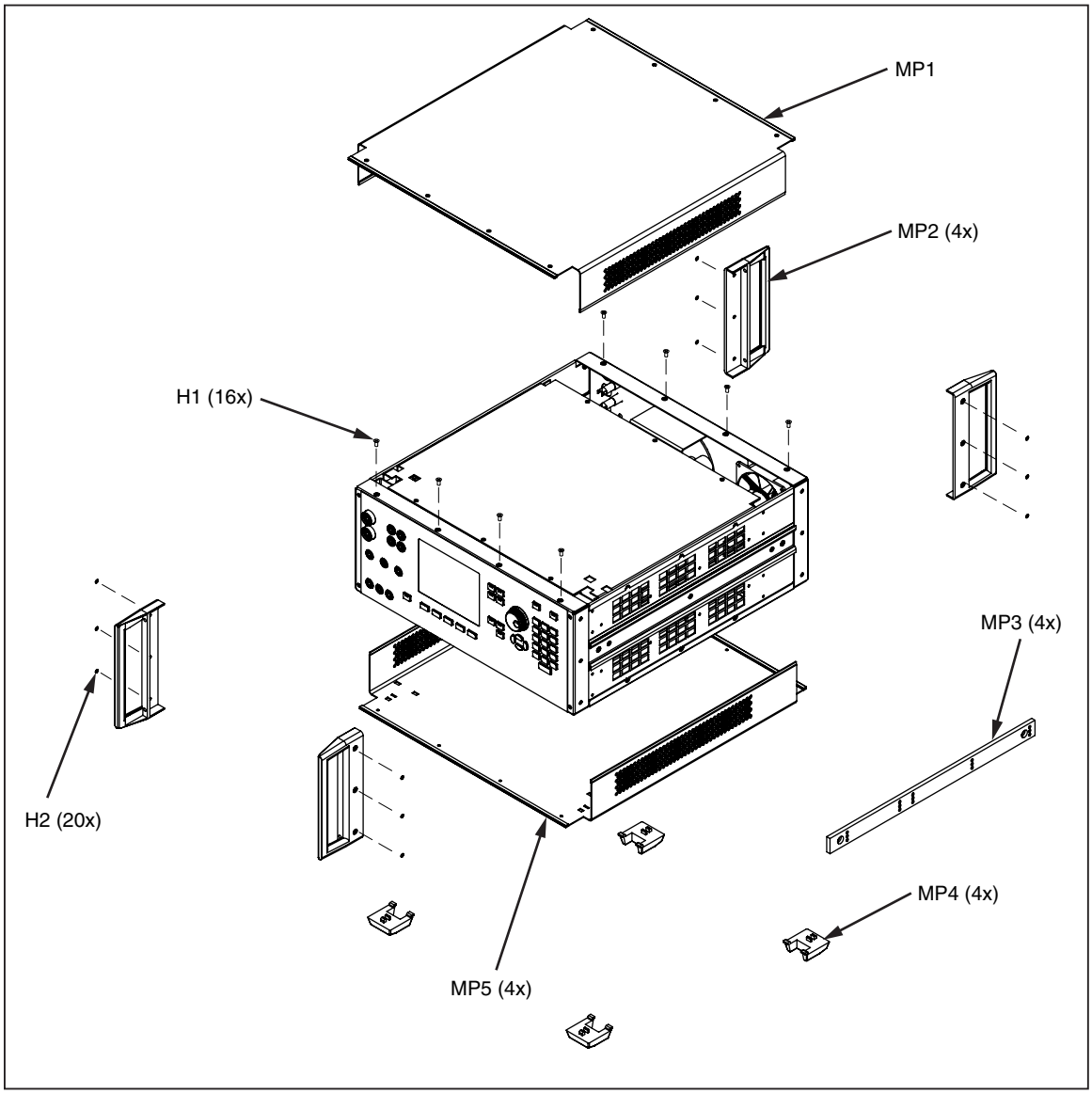
- Instrument model and serial number
- Part number and revision level of the pca (printed circuit assembly) containing the part.
- Reference designator
- Fluke stock number
- Description (as given under the Description heading)
- Quantity

Parts Lists

Figures 4-1 through 4-2 and Tables 4-1 through 4-4 list the parts for the Calibrator,

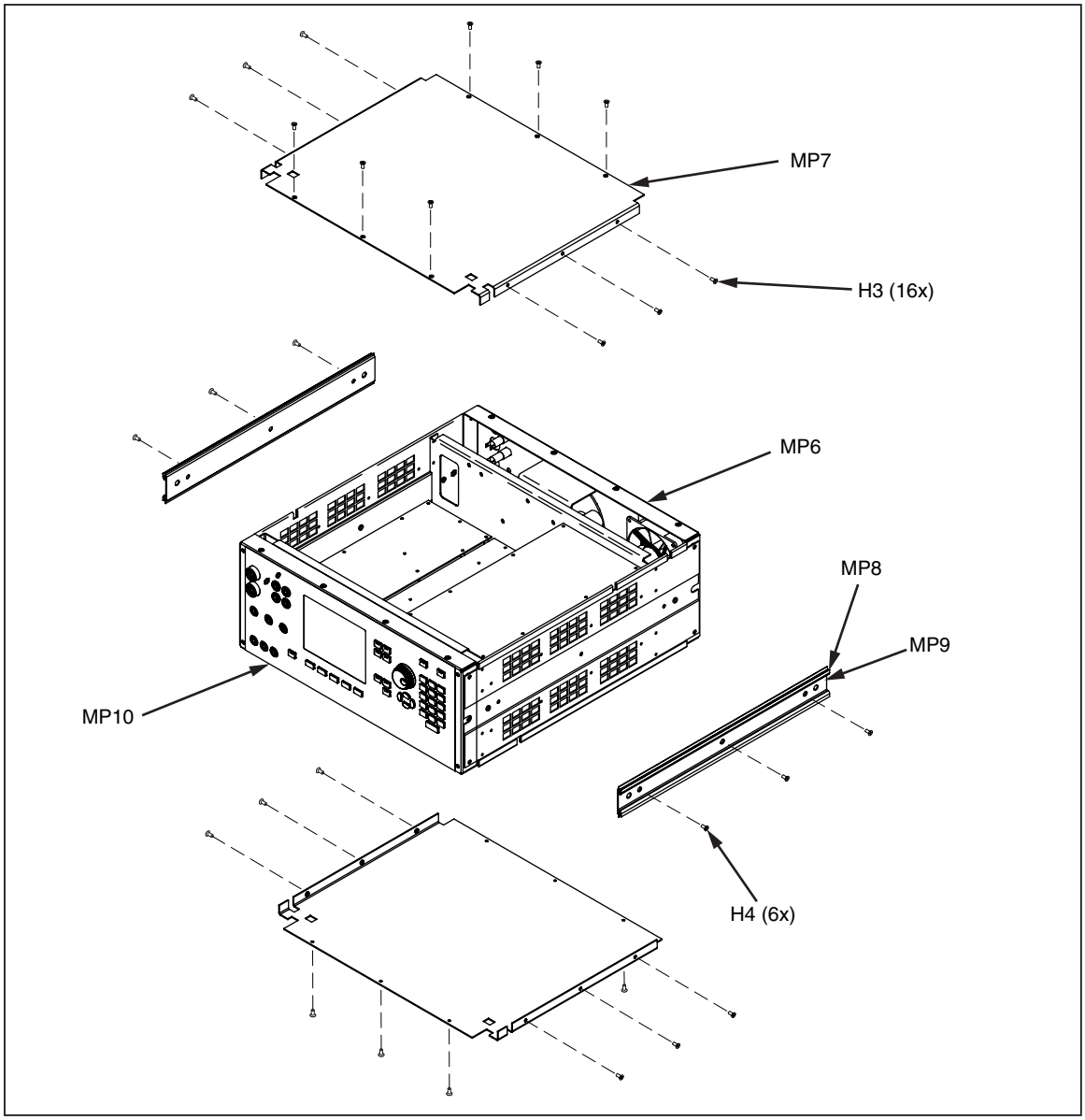
Table 4-1. Chassis Assembly

Ref. Desig.	Description	Part Number
A1	PCB, COMP - ASSEMBLY	3027698
A2	PCB, LVR DECADE - ASSEMBLY,(5320A)	3027710
A3	PCB, HVR DECADE - ASSEMBLY,(5320A)	3027722
A4	VCAL - ASSEMBLY	3027731
A5	PCB, REL – ASSEMBLY	3027779
A6	PCB, PWR – ASSEMBLY	3027841
H1	SCREW PH, M3 X 6	3027596
H2	SCREW	295105
H3	SCREW M3 X 6	3027644
H4	SCREW M4 X 6	3027659
H5	SCREW M5X 8	3027680
H6	SCREW M3 X 8	3027746
H7	SCREW PH, M4 X 12	3027787
H8	SCREW PH, M4 X 8	3027829
MP1	COVER, INSTRUMENT TOP	3027562
MP2	HANDLE	886333
MP3	INSERT, PLASTIC SIDE	3027570
MP4	FOOT	868786
MP5	COVER, INSTRUMENT BOTTOM	3027581
MP6	REAR PANEL	3027603
MP7	INNER COVER TOP-BOTTOM	3027615
MP8	METAL STRIP	3027626
MP9	SIDE EXTRUSION	3027632
MP10	FRONT PANEL	3027667
MP11	VCAL HOUSING	3027671
MP12	WASHER, FLAT	3027705
MP13	BRASS SPACER M3, 20MM	3027754
MP14	WASHER, FLAT, M4	3027793
MP15	WASHER, SPRING LOCK, M4	3027807
MP16	NUT, M4	3027818
MP17	FAN, 12V, 80 X 25	3027834



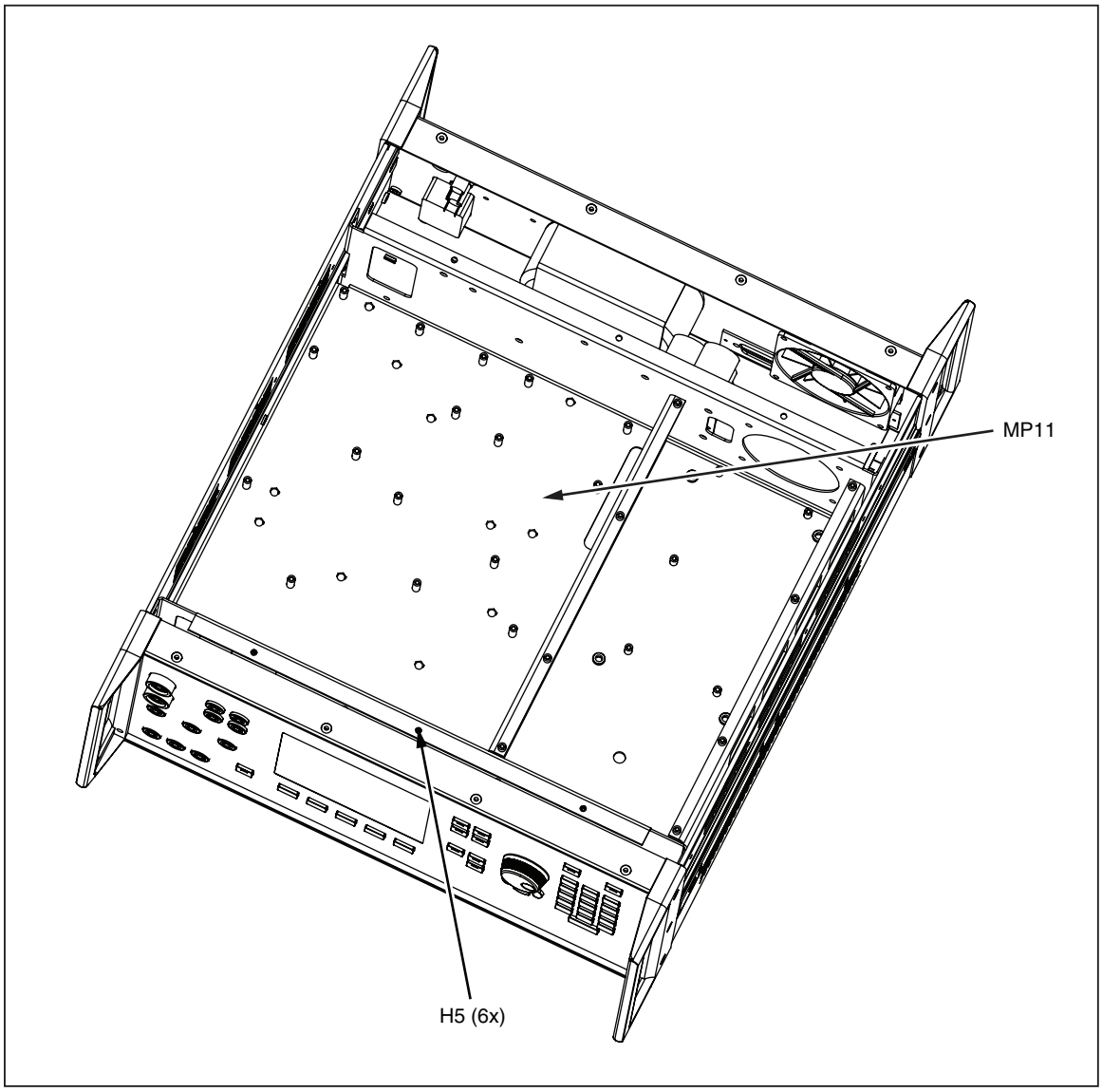
ewt053.eps

Figure 4-1. Chassis Assembly



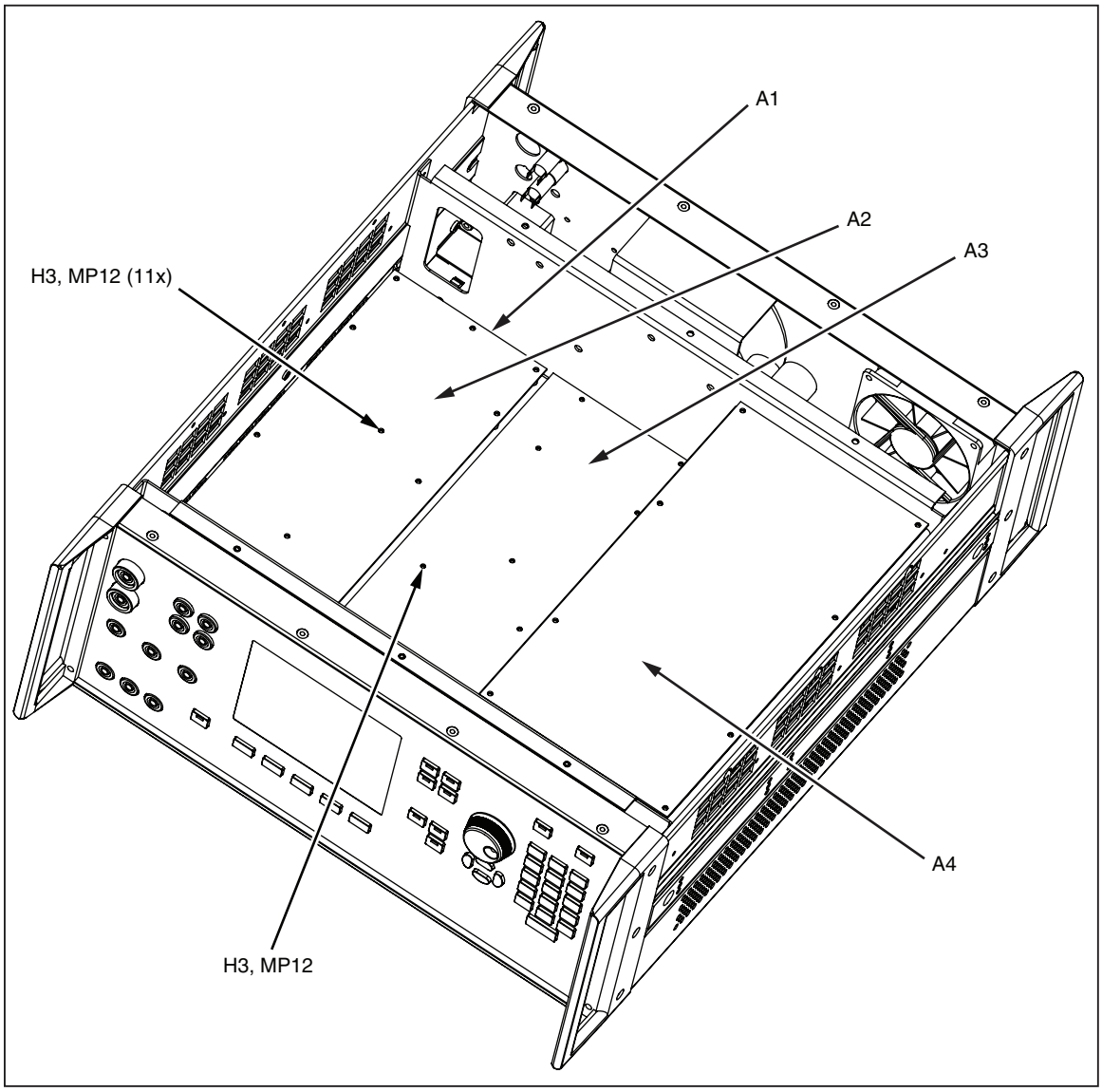
ewt054.eps

Figure 4-1. Chassis Assembly (cont.)



ewt055.eps

Figure 4-1. Chassis Assembly (cont.)



ewt056.eps

Figure 4-1. Chassis Assembly (cont.)

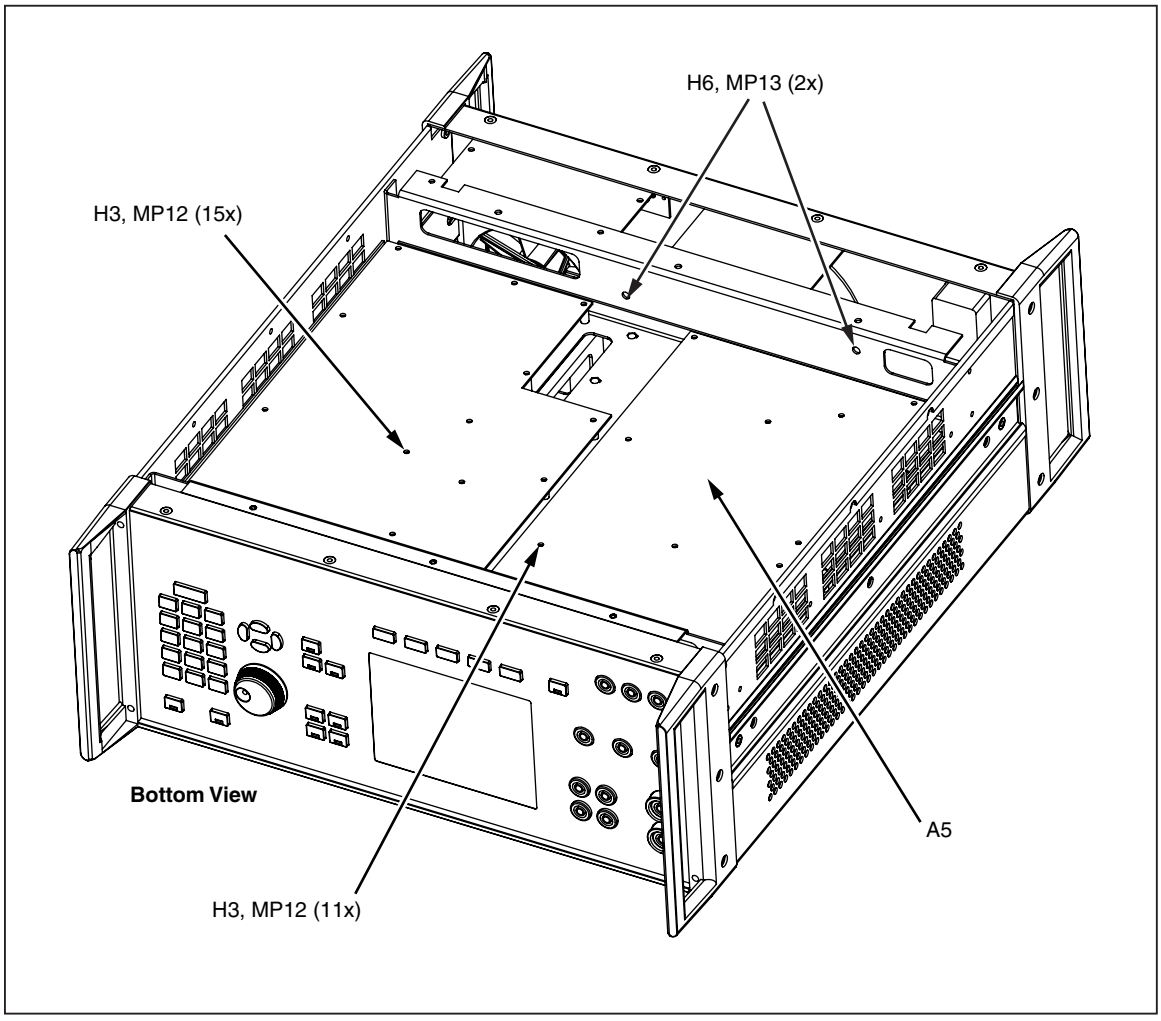


Figure 4-1. Chassis Assembly (cont.)

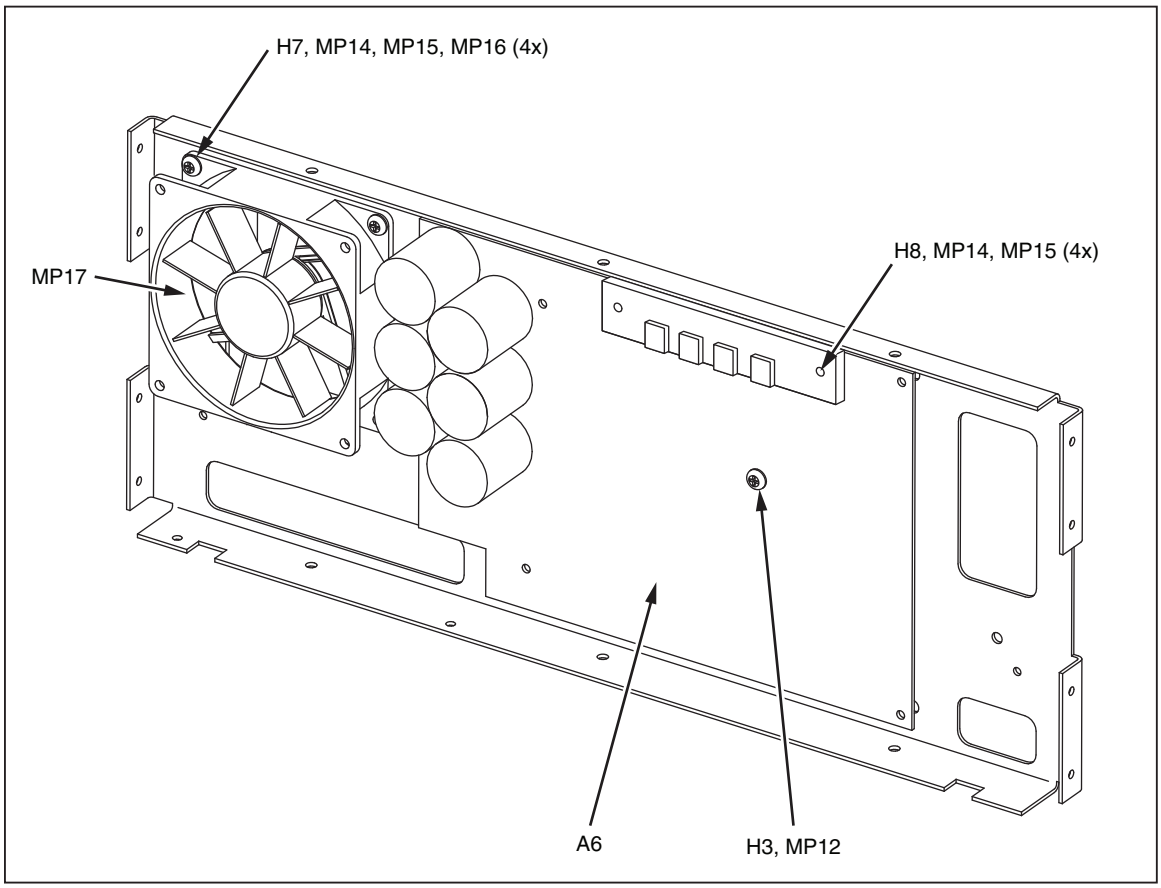


Figure 4-1. Chassis Assembly (cont.)

Table 4-2. Front-Panel Assembly

Ref. Desig.	Description	Part Number
A7	PCB, KEY – ASSEMBLY	3028077
A8	PCB, MICROPROCESSOR – ASSEMBLY	3028092
H6	SCREW M3 X 8	3027746
MP12	WASHER, FLAT	3027705
MP18	TERMINAL, RED	3027994
MP19	TERMINAL, BLACK	3028006
MP20	WASHER, VN, ERTALYTE	3028014
MP21	KNOB, ENCODER, GREY	3028023
MP22	TERMINAL, BLUE	3028038
MP23	TERMINAL, GREEN	3028045
MP24	DECAL	3028050
MP25	KEY-BOARD, RUBBER	3028061
MP26	NUT M3 X 6	3028089
W1	VN CABLE, WHITE, 450 MM	3028108
W2	VN CABLE, WHITE, 320 MM	3028113
W3	CABLE, BLUE, 290 MM	3028124
W4	CABLE, RED, 330 MM	3028136
W5	CABLE, BLACK, 290 MM	3028149
W6	CABLE, BLACK, 520-50-480 MM	3028151
W7	CABLE, RED, 700 MM	3028160
W8	CABLE, RED, 210 MM	3028172
W9	CABLE, RED, 270 MM	3028185
W10	CABLE, BLACK, 270 MM	3028197
W11	CABLE, BLACK, 210 MM	3028201
W12	CABLE, BLUE, 230 MM	3028212
W13	VN CABLE, WHITE, 300 MM	3028220
W14	CABLE, BROWN, 240 MM	3028235
W15	CABLE, BLACK, 250 MM	3028247

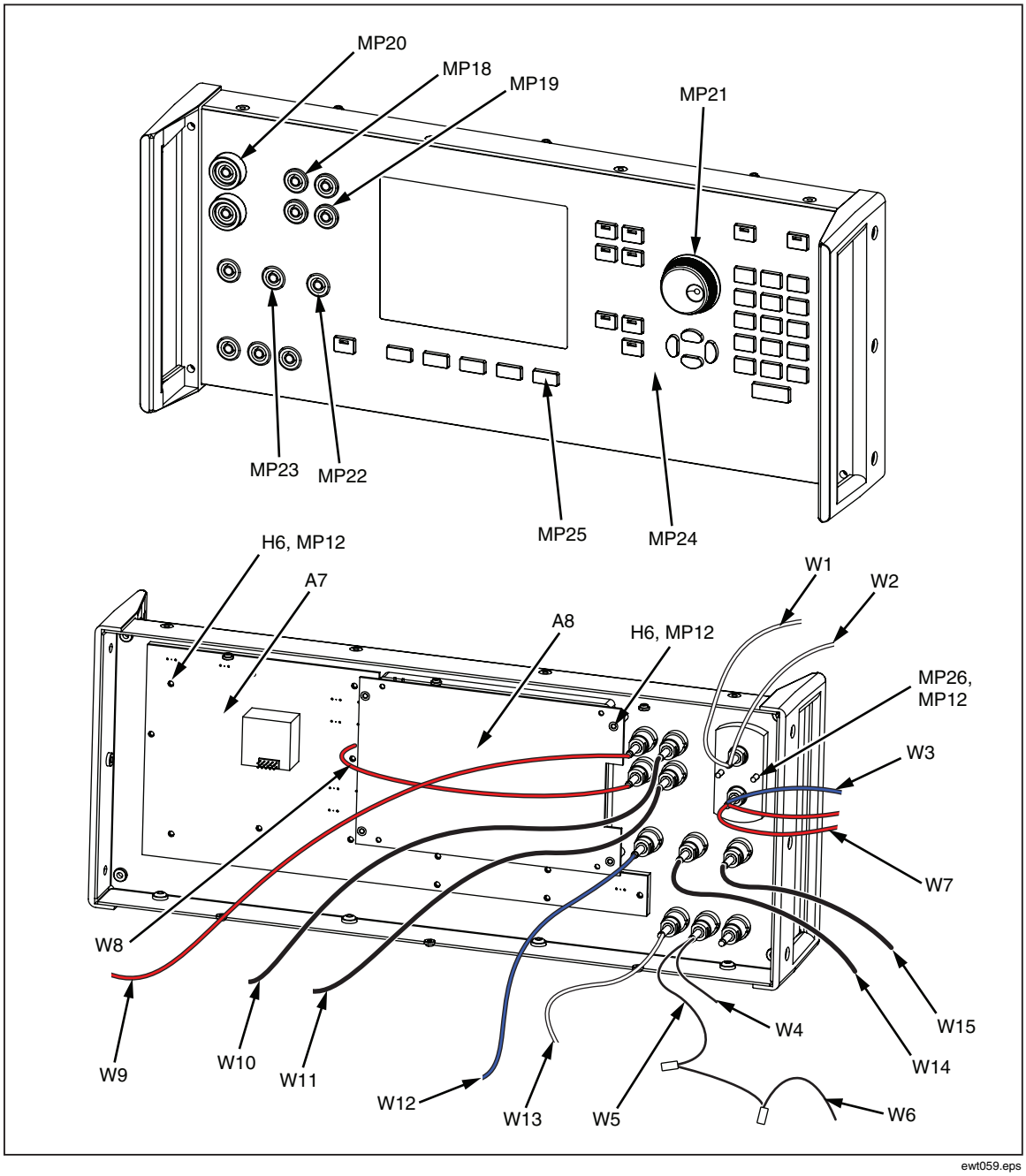


Figure 4-2. Front-Panel Assembly

Table 4-3. Rear-Panel Assembly

Ref. Desig.	Description	Part Number
A9	PCB, GPIB-ASSEMBLY	3028476
H6	SCREW M3 X 8	3027746
H8	SCREW PH, M4 X 8	3027829
MP14	WASHER, FLAT, M4	3027793
MP15	WASHER, SPRING LOCK, M4	3027807
MP16	NUT, M4	3027818
MP26	NUT M3 X 6	3028089
MP27	PLASTIC FAN FILTER	3028258
MP28	FUSE HOLDER IP40	3028264
MP29	FUSE HOLDER	3028273
MP30	POWER SWITCH 115/230V	3028286
MP31	GROUNDING POST SET	3028299
MP32	WASHER, FLAT, M6	3028300
MP33	WASHER, SPRING LOCK, M6	3028317
MP34	POWER ENTRY MODULE	3028321
MP35	WASHER, FLAT, M3	3027705
MP35	WASHER, FLAT, M3	3027705
MP36	SCREW M3 X 10, BLACK	3028339
MP37	SCREW M2.5 X 10	3028342
MP38	WASHER, SPRING LOCK, M3	3028356
MP39	GPIB-RS PANEL	3028363
MP40	SCREW, GPIB	3028374
MP41	WASHER, PLASTIC, M8	3028388
MP42	PLASTIC SCREW COVER, M8	3028395
MP43	TRANSFORMER SUPPORT	3028407
MP44	LINE TRANSFORMER	3028418
MP45	SCREW PH, M4 X 16	3028429
MP46	SCREW PH, M8 X 70	3028434
MP47	WASHER FLAT, M8	3028441
MP48	WASHER, SPRING LOCK, M8	3028452
MP49	NUT M8	3028465
W16	CABLE, #1 BLACK, 870 MM	3028483

Table 4-3. Rear-Panel Assembly (cont.)

Ref. Desig.	Description	Part Number
W17	CABLE, #2 BLACK, 870 MM	3028490
W18	CABLE, BLACK, 380 MM	3028503
W19	CABLE, RED, 240 MM	3028515
W20	CABLE, RED, 430-50-530 MM	3028526
W21	CABLE, BLUE, 500-200 MM	3028532
W22	CABLE, YELOW-GREEN, 440-200 MM	3028544
W23	CABLE, BLACK, 450 MM	3028559
W24	CABLE, BLACK, 470 MM	3028567
W25	CABLE, YELOW-GREEN, 220 MM	3028571
W26	CABLE, YELOW-GREEN, 240-240 MM	3028580
W27	FILTER, LINE, 250V	3028598

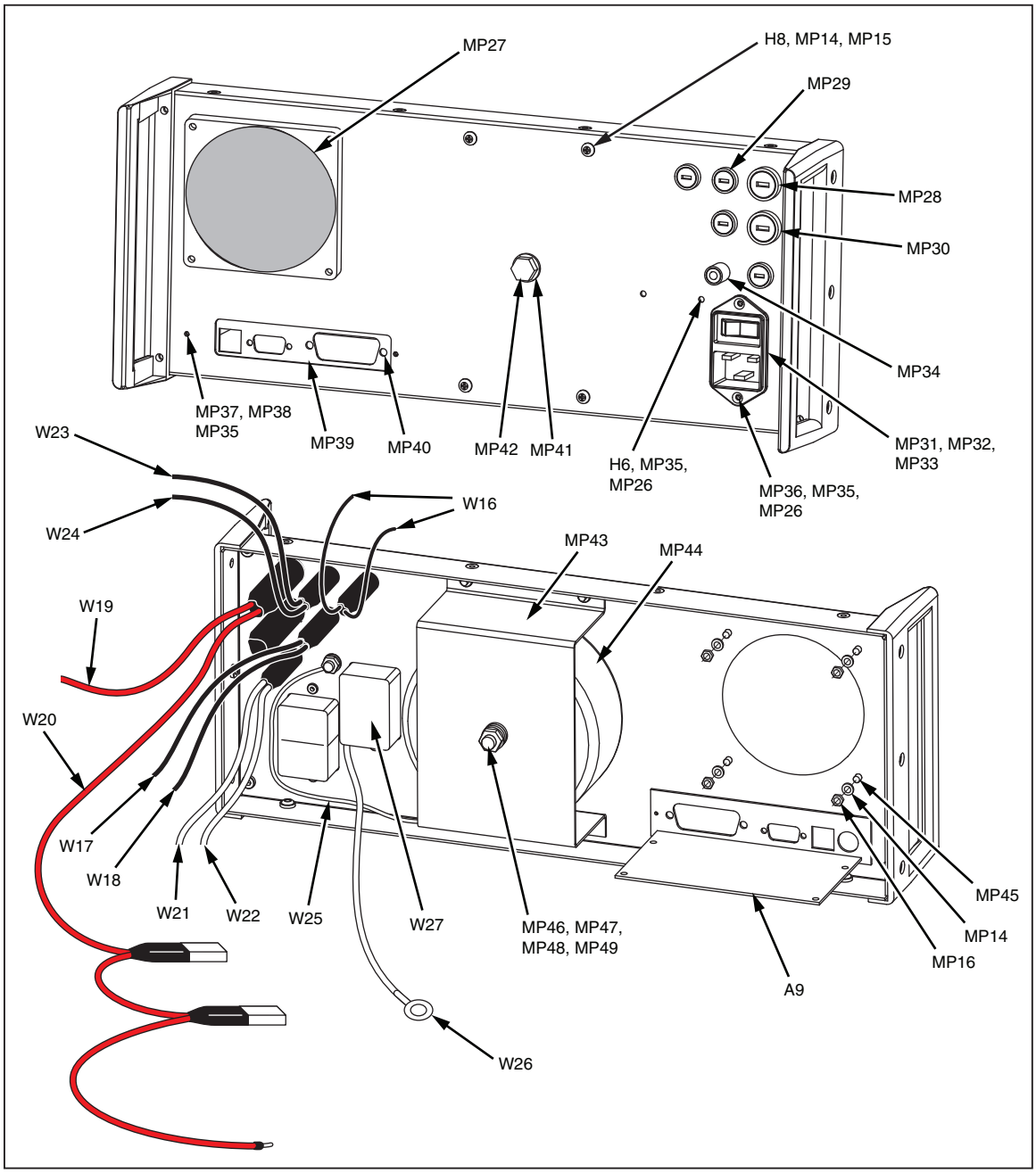


Figure 4-3. Rear-Panel Assembly

Table 4-4. VCAL Assembly

Ref. Desig.	Description	Part Number
A10	PCB, AMP - ASSEMBLY	3028637
A11	PCB, VCAL - ASSEMBLY	3028655
H3	SCREW M3 X 6	3027644
MP35	WASHER, FLAT, M3	3027705
MP38	WASHER, SPRING LOCK, M3	3028356
MP45	SCREW PH, M8 X 70,(5320A)	3028604
MP48	WASHER, SPRING LOCK, M8	3028452
MP49	NUT M8	3028465
MP50	WASHER, FLAT, M8 X 38	3028619
MP51	TRANSFORMER VN	3028628
MP52	SCREW PH, M3 X 12	3028643

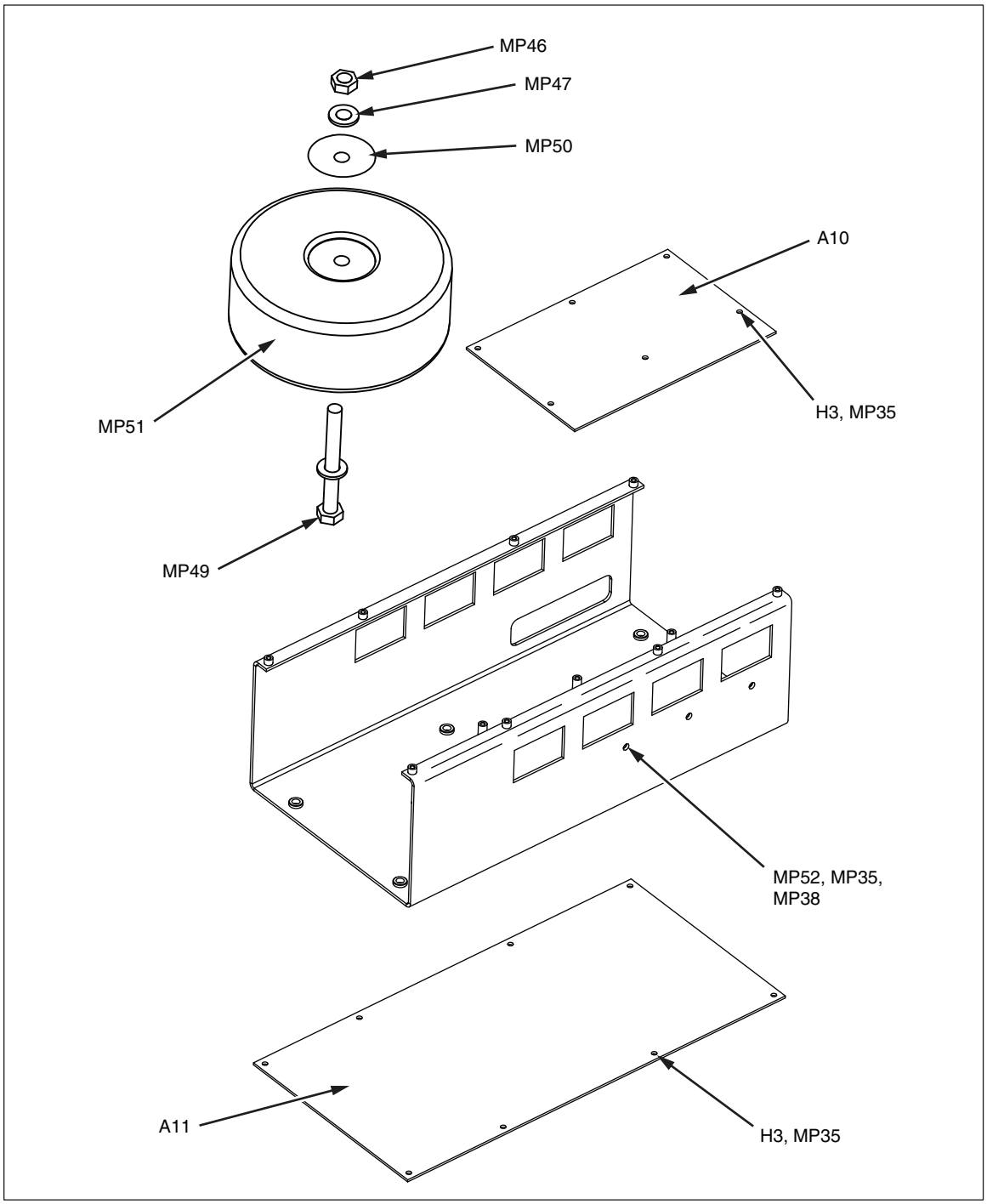


Figure 4-2. VCAL Assembly