FLUKE®
Calibration

5080A
Calibrator

Calibration Manual

November 2011

Table of Contents

Title	Page
Introduction	1
Safety Information	1
Instruction Manuals	3
5080A Operators Manual	3
5080A Getting Started Manual	4
5080A Calibration Manual	4
Accessories and Options	4
How to Contact Fluke Calibration	5
General Maintenance	5
How to Replace the Line Fuse	5
How to Replace the Current Fuses	7
How to Clean the Air Filter	9
How to Clean Outside Surfaces	10
Performance Tests	11
Required Test Equipment	11
How to Verify the Main Calibrator	11
MEGOHM Option Verification Tests	17
Low Resistance Source (LVR) Verification	17
High Resistance Source (HVR) Verification	19
Scope Option Verification Tables	21
Mainframe Calibration	31
Required Calibration Test Equipment	31
Start Calibration	32
DC Volts Calibration (NORMAL Output)	32
AC Volts Calibration (NORMAL Output)	33
DC Current Calibration	35
AC Current Calibration	36
DC Volts Calibration (AUX Output)	40
AC Volts Calibration (AUX Output)	41
Resistance Calibration	41
SC200 Calibration	43
Required Test Equipment	43
Calibration Steps	46
SC200 Hardware Adjustments	51
MEGOHM Option Calibration	54
Required Test Equipment	54

Calibration Steps 54
How to Calibrate Through the Remote Interface 57
Remote Commands 58
Generating a Calibration Report 63
Replaceable Parts 63
How to Obtain Parts 63
Parts 64

List of Tables

Table	Title	Page
1.	Symbols	2
2.	Accessories and Options	4
3.	Replacement Fuses	6
4.	Current Fuses	8
5.	Test Equipment for Verification and Calibration	11
6.	Verification Tests for DC Voltage (Normal)	12
7.	Verification Tests for DC Voltage (AUX)	12
8.	Verification Tests for DC Current	13
9.	Verification Tests for 4-Wire Resistance	14
10.	Verification Tests for AC Voltage (Normal)	14
11.	Verification Tests for AC Voltage (AUX)	15
12.	Verification Tests for AC Current	15
13.	Verification Tests for Phase (Normal Voltage vs. AUX Current)	16
14.	Verification Tests for Phase (Normal Voltage vs. Aux Voltage)	17
15.	Verification Tests for Distortion	17
16.	Verification Tests for Frequency	17
17.	Megohm Option LVR Verification Points	18
18.	Megohm Option HVR Verification Points	19
19.	High Resistance Verification	21
20.	Voltage Function Verification: AC Voltage into a 1 MΩ Load	21
21.	Voltage Function Verification: AC Voltage into a 50 Ω Load	22
22.	Voltage Function Verification: DC Voltage into a 50 Ω Load	23
23.	Voltage Function Verification: DC Voltage into a 1 MΩ Load	24
24.	Edge Function Verification	25
25.	Wave Generator Function Verification: 1 MΩ Load	25
26.	Wave Generator Function Verification: 50 Ω Load	26
27.	Leveled Sine Wave Function Verification: Amplitude	27
28.	Leveled Sine Wave Function Verification: Flatness	27
29.	Leveled Sine Wave Function Verification: Frequency	30
30.	Marker Generator Function Verification	30
31.	Test Equipment Required for 5080A Calibration	31
32.	Test Equipment Required for DC Volts Calibration	32
33.	Calibration Steps for DC Volts	33
34.	Test Equipment Required for AC Volts Calibration	34
35.	Calibration Steps for AC Volts	34
36.	Test Equipment Required for DC Current Calibration	35

37. Calibration Steps for DC Current 35
38. Test Equipment Required for AC Current Calibration 38
39. Calibration Steps for AC Current 38
40. Calibration Steps for AUX DC Current 40
41. Calibration Steps for AUX AC Volts 41
42. Test Equipment Required for Resistance Calibration 41
43. Calibration Steps for Resistance 42
44. Required Test Equipment for SC200 Calibration 43
45. AC Square Wave Voltage and Edge Settings for HP3458A 47
46. Test Equipment for Hardware Adjustments 51
47. Spectrum Analyzer Parameters 51
48. Test Equipment for MEGOHM Option Calibration 54
49. MEGOHM Calibration Adjustment Points 55
50. QuadTech 1865 Parameter Values 57
51. MEGOHM Calibration Adjustments 57
52. Jumping to a Specific Calibration Step in Remote 58
53. Replaceable Parts 64

List of Figures

Figure	Title	Page
1.	Fuse Access	6
2.	Current Fuse Compartment	8
3.	Accessing the Air Filter	10
4.	Low Resistance Verifications Connections	18
5.	High Resistance Source Calibration Connections	19
6.	High Resistance Verification for 1 GΩ and higher	20
7.	DC Voltage Adjustment Setup	33
8.	AC Voltage Adjustment Setup	34
9.	DC Current Adjustment Setup	36
10.	Connections for Calibrating AC Current with a Fluke A40 Shunt	37
11.	Sample MET/CAL Program	39
12.	Connections for Calibrating 4-Wire Resistance	42
13.	Connections for Calibrating 2-Wire Resistance	43
14.	Connections for AC Square Wave Voltage and Edge Calibration	47
15.	Calibrator Mainframe to 5790A AC Measurement Standard Connections	49
16.	Leveled Sine Wave Harmonics Adjustment	52
17.	Edge Aberrations Adjustment	53
18.	MEGOHM Low Resistance Calibration Connections	55
19.	MEGOHM High Resistance Calibration Connections	57
20.	Final Assembly	68

Introduction

⚠⚠ Warning

If the 5080A Calibrator is operated in a manner not specified by this manual or other documentation provided by Fluke, the protection provided by the Calibrator may be impaired.

The 5080A Calibrator is a fully programmable precision source of the following:

- DC voltage from 0 V to ±1020 V.
- AC voltage from 1 mV to 1020 V, with output from 45 Hz to 1 kHz.
- AC current from 29 µA to 20.5 A, with variable frequency limits.
- DC current from 0 to ±20.5 A.
- Discrete resistance values from a short circuit to 190 MΩ.

Features of the 5080A Calibrator include the following:

- Automatic meter error calculation.
- [x 10] and [÷10] keys that change the output value to pre-determined cardinal values for various functions.
- Programmable entry limits that prevent entering invalid amounts.
- Simultaneous output of voltage and current, up to an equivalent of 20.9 kVA.
- Simultaneous output of two voltages.
- Variable phase signal output.
- EIA Standard RS-232 serial data interface to print, show, or transfer internally stored calibration constants, and for remote control of the 5080A.

Safety Information

This Calibrator complies with:

- ANSI/ISA-61010-1 (82.02.01)
- CAN/CSA C22.2 No. 61010-1-04
- ANSI/UL 61010-1:2004
- EN 61010-1:2001

In this manual, a **Warning** identifies conditions and procedures that are dangerous to the user. A **Caution** identifies conditions and procedures that can cause damage to the Product or the equipment under test.

Symbols used on the Calibrator and in this manual are explained in Table 1.

Table 1. Symbols

Symbol	Description	Symbol	Description
~	AC (Alternating Current)	⏚	Earth Ground
⚠	Important Information: refer to manual	⚠	Shock Hazard
CE	Complies with EU directives	c SP us	Complies with relevant North American Safety Standards.
CAT I	IEC Measurement Category I – CAT I is for measurements not directly connected to mains. Maximum transient Overvoltage is as specified by terminal markings.		Do not dispose of this product as unsorted municipal waste. Go to Fluke's website for recycling information.

This manual contains information, warnings, and cautions that must be followed to ensure safe operation and to maintain the Calibrator in a safe condition.

⚠⚠ Warning

To prevent possible electric shock or personal injury, follow these guidelines:

- **Use this Calibrator only as specified in this manual or the protection provided by the Calibrator might be impaired.**
- **Do not apply more than 264 V ac rms between the supply conductors or between either supply conductor and ground.**
- **Use caution when working with voltages above 30 V ac rms, 42 V peak, or 60 V dc. These voltages pose a shock hazard.**
- **Ensure the Calibrator is in STANDBY by pressing the RESET key before disconnecting test leads.**
- **Ensure the grounding conductor in the power cord is properly connected to a protective ground. The output terminals are clamped to the earth referenced chassis and rely on the protective earth bond to limit accessible voltage to the operator. Disruption of the protective earth could place lethal voltage onto the chassis of the Calibrator due to abnormal output terminal configuration or mains transient condition.**
- **Use only the replacement fuses specified by the manual.**
- **Do not position the Calibrator such that the power cord cannot be accessed in the event of an emergency. In the event that customer installation interferes with access to the power cord, a suitable power disconnection switch shall be provided by the customer.**
- **Use only the power cord and connector appropriate for the voltage and plug configuration in your country.**

- **Use only a power cord that is in good condition. Refer power cord and connector changes to qualified service personnel.**
- **Do not operate the Calibrator in an atmosphere of explosive gases.**
- **Verify the voltage applied to the unit under test does not exceed the insulation rating of the UUT and the interconnecting cables.**
- **Do not remove the Calibrator cover without first disconnecting the power cord.**
- **Do not operate the Calibrator without the cover properly installed. Access procedures and the warnings for such procedures are contained in the Service Manual. Service procedures are for qualified service personnel only.**
- **Do not use the Calibrator if it has damage or operates abnormally. Refer all questions of proper Calibrator operation to qualified service personnel.**

⚠ Caution

To avoid damage to the Calibrator, do not apply voltage in excess of the marked rating to any terminal.

Instruction Manuals

The 5080A Manual Set gives complete data for operators and service or maintenance technicians. The set includes:

- *5080A Operators Manual* (provided on CD-ROM)
- *5080A Getting Started Manual* (PN 3502934)
- *5080A Calibration Manual* (provided on CD-ROM)

The Operators and Getting Started manuals shown above are shipped with the Calibrator. To order replacements, refer to the Fluke Catalog, or speak to a Fluke sales representative (see “Service Information” in Chapter 2).

To view, print, or download the latest manual supplement, visit http://us.fluke.com/usen/support/manuals.

5080A Operators Manual

The *5080A Operators Manual* includes installation and operation instructions of the 5080A Calibrator from the front-panel keys and in remote configurations. This manual also has a glossary of calibration, specifications, and error code information. Operator Manual topics are:

- Installation
- Operating controls and features, including front-panel operation
- Remote operation (Ethernet or serial port remote control)
- Serial port operation (printing, displaying, or transferring data, and setting up for serial port remote control)
- Operator maintenance, including verification procedures and calibration approach for the 5080A
- Accessories and options

5080A Getting Started Manual

The *5080A Getting Started Manual* contains a brief introduction to the 5080A Manual Set, instructions on how to get your Calibrator prepared for operation and a complete set of specifications.

5080A Calibration Manual

This *5080A Calibration Manual* includes calibration and verification procedures to keep the Calibrator within specifications. Calibration Manual topics are:

- Specifications
- General Maintenance covers how to handle and clean the Calibrator as well as fuse replacement
- Performance Tests to verify Calibrator performance to specifications
- Calibration or adjustments to keep Calibrator operation within the specifications
- List of Replaceable Parts

Accessories and Options

Table 2 lists accessories and options available for the Calibrator.

Table 2. Accessories and Options

Accessory/Option	Fluke Model Part Number
5080A Service Manual	3790039
Oscilloscope Calibration Option [1]	5080A-SC
MegOhm Meter Calibration Option [1]	5080A-MEG
Transit Case with Wheels	5080A/CASE
Double Banana Plug Adapter	105825
5 A/250 V Time Delay Fuse (mains fuse for 100 V/120 V line voltage)	109215
2.5 A/250 V Time Delay Fuse (mains fuse for 200 V/240 V line voltage)	851931
4 A/500 V Fuse (AUX current output fuse)	3674001
25 A/250 V Fuse (20 A current output fuse)	3470596
RS-232 Interface Cable	RS43
Ethernet Internet Cable	884X-ETH
Calibration Software for Automated Calibration with 5080A	5080/CAL
License disk for MET/CAL. Automated Calibration software. MET/BASE-5 or later required.	MET/CAL-L
License disk upgrade. MET/BASE-7U and prior version of MET/CAL required.	MET/CAL-LU
Asset Management Software. MET/BASE-5 or later required	MET/TRACK

Table 2. Accessories and Options (cont.)

Accessory/Option	Fluke Model Part Number
System engine. Requires licenses for one or more client applications (MET/CAL-L, and/or MET/TRACK)	MET/BASE
Manual Calibration Software. MET/BASE and MET/TRACK required.	Manual MET/CAL
[1] Options can be ordered factory installed with a new calibrator (5080A/MEG, 5080A/SC, and 5080A/SC/MEG), or added later at a Fluke service center for an additional installation and calibration charge.	

How to Contact Fluke Calibration

To contact Fluke Calibration, call one of the telephone numbers shown below.

- Technical Support USA: 1-877-355-3225
- Calibration/Repair USA: 1-877-355-3225
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31-40-2675-200
- Japan: +81-3-6714-3114
- Singapore: +65-6799-5566
- China: +86-400-810-3435
- Brazil: +55-11-3759-7600
- Anywhere in the world: +1-425-446-6110

To see product information and download the latest manual supplements, visit Fluke Calibration's website at www.flukecal.com.

To register your product, visit http://flukecal.com/register-product.

General Maintenance

This section explains how to do routine maintenance on a 5080A Calibrator. These tasks include:

- How to Replace the fuses
- How to Clean the air filter
- How to Clean the External Surfaces

How to Replace the Line Fuse

⚠Caution

To prevent possible damage to the instrument, verify the correct fuse is installed for the selected line voltage setting 100 V and 120 V, use 5.0 A/250 V time delay (slow blow); 220 V and 240 V, use 2.5 A/250 V time delay (slow blow).

You can access the line power fuse on the rear panel. The fuse rating is 5 A/250 V slow blow fuse for 100 V/120 V line voltage; 2.5 A/250 V slow blow fuse for 220 V/240 V line voltage.

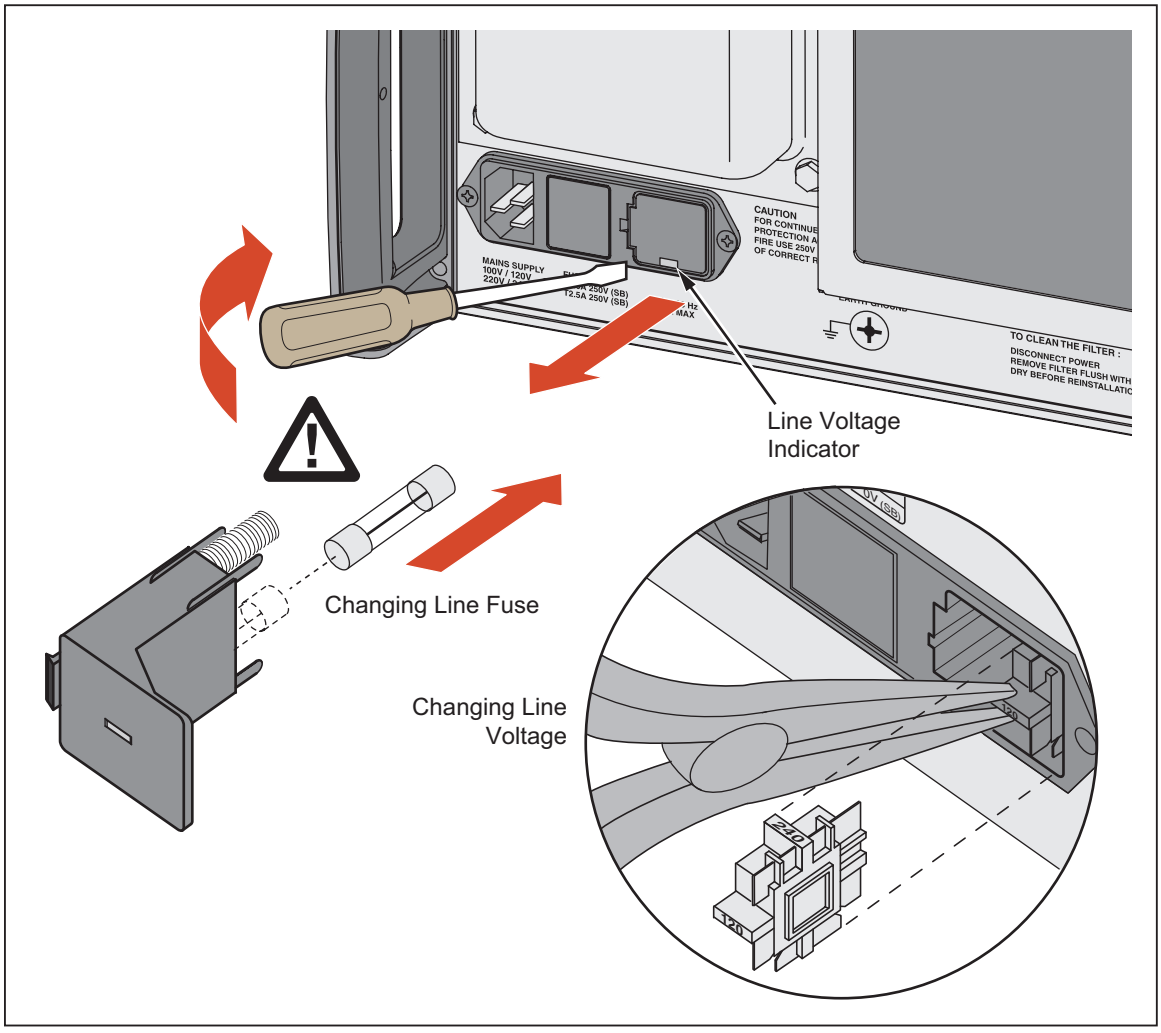
To examine or replace the fuse, refer to Figure 1 and continue as follows:

1. **Disconnect line power**.

2. Put a screwdriver blade in the tab at the left side of fuse holder and pry until it can be removed with the fingers.
3. Remove the fuse from the compartment for replacement or verification. Be sure the correct fuse is installed.
4. Install the fuse compartment and push it into the compartment until the tab locks.

Table 3. Replacement Fuses

Line Voltage Setting	Fuse Description	Fluke Part Number
100 V or 120 V	5.0A, 250V, Slow Blow, 0.25 x 1.25 ⚠	109215
220 V or 240 V	2.5A, 250V, Slow Blow, 0.25 x 1.25 ⚠	851931



gru004.eps

Figure 1. Fuse Access

How to Replace the Current Fuses

The two Calibrator current outputs have fuse protection. If the Calibrator cannot source current, one or both of the current fuses can be blown.

⚠⚠ Warning

To prevent electric shock, turn the Calibrator off and remove the mains power cord. Stop for two minutes to let the power assemblies discharge before you open the fuse door.

To replace the current output fuses:

1. Turn the Calibrator off and remove the power cord. Stop for two minutes to let the power assemblies discharge.
2. Turn the Calibrator over.
3. Remove the two screws that hold the fuse compartment cover in place and remove the cover as shown in Figure 2.

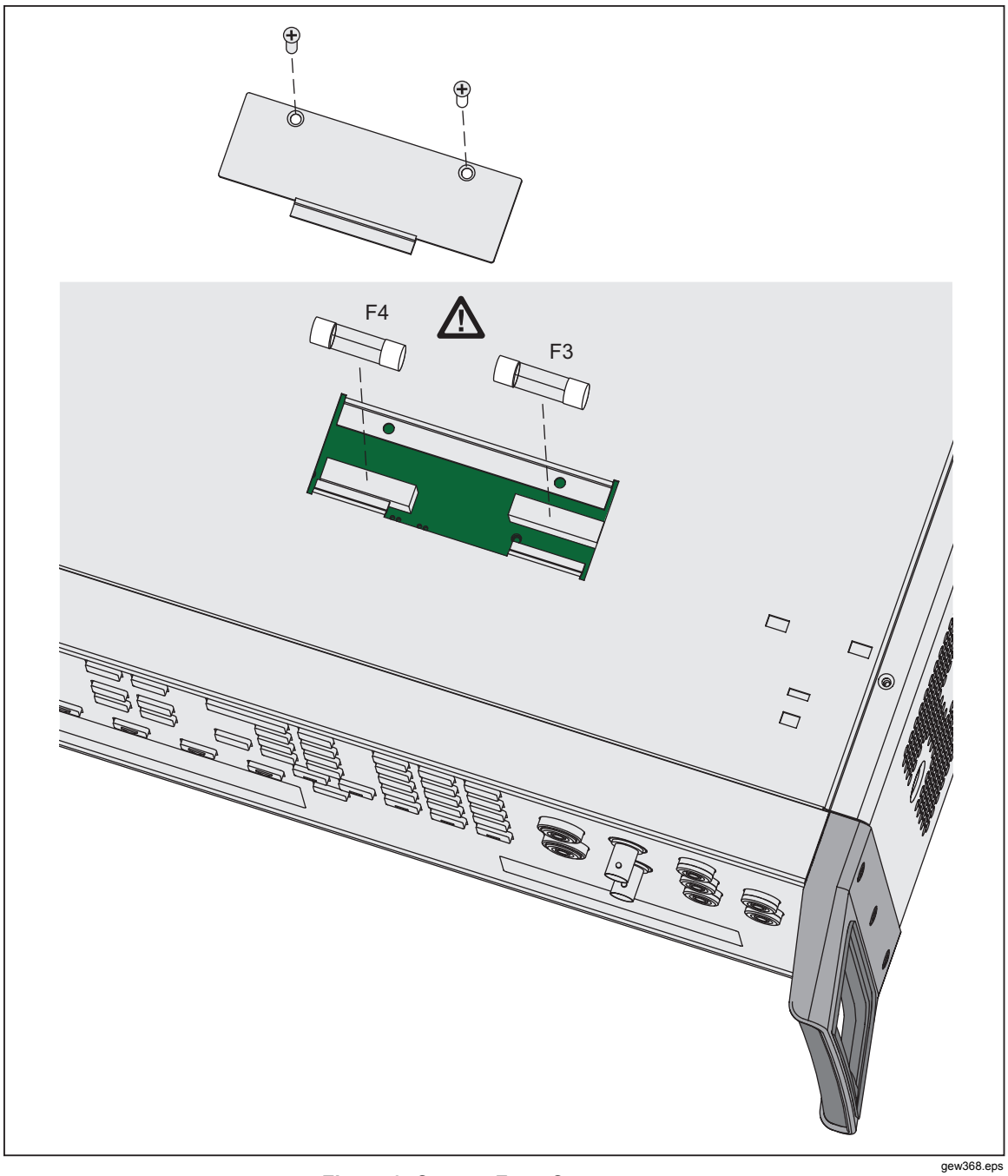


Figure 2. Current Fuse Compartment

4. Remove and examine the fuses as necessary. Table 4 shows the part number and rating of each fuse.

Table 4. Current Fuses

Current Output	Fuse Description	Fluke Part Number
AUX	4A/500V Ultra-Fast Blow (F3)	3674001
20A	25A/250V Fast Blow (F4)	3470596

5. Replace fuses as required.
6. Replace the fuse compartment door and attach the fuse compartment cover with the screws removed in step 3.

How to Clean the Air Filter

⚠ Warning

To prevent risk of injury, do not operate or power the 5080A calibrator without the fan filter in place.

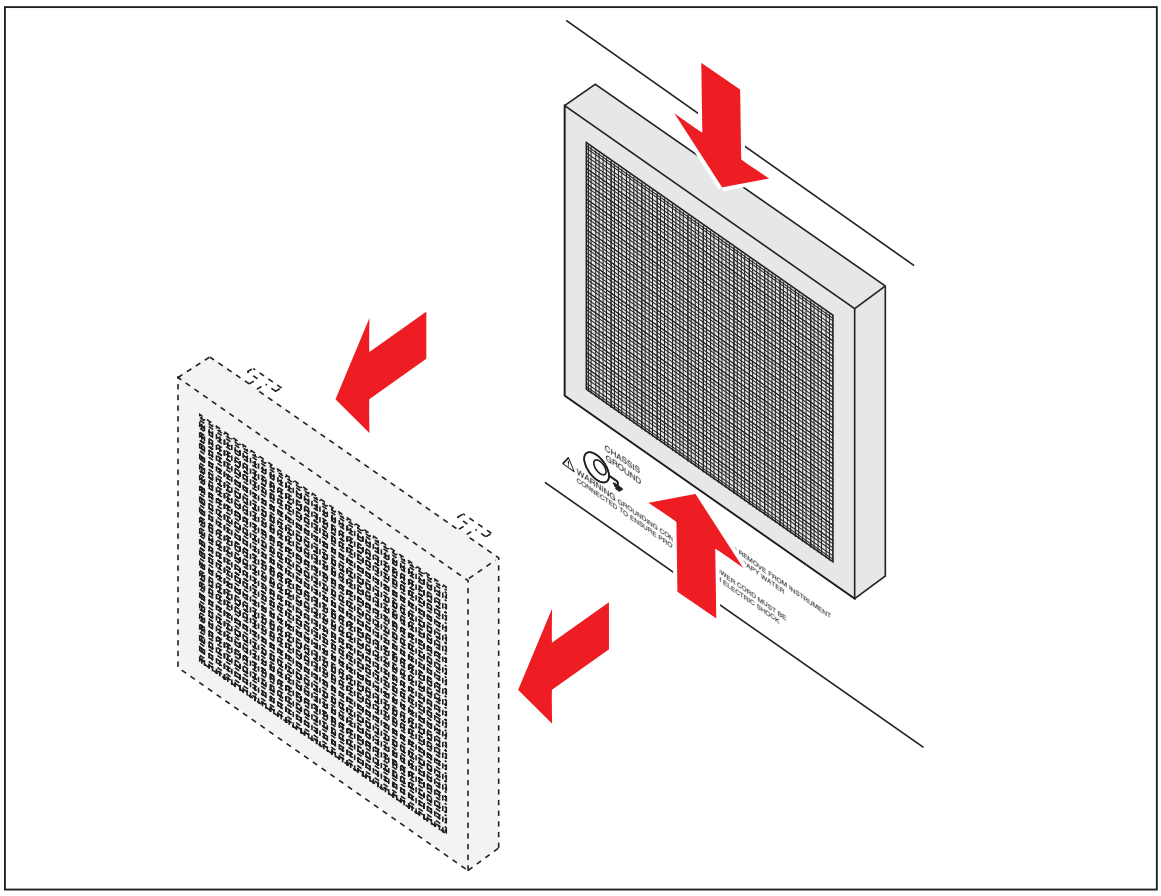
⚠ Caution

Damage can occur when the Calibrator becomes too hot if the area around the fan is restricted, the intake air is too warm, or the filter becomes clogged.

The air filter must be removed and cleaned at 30 day intervals, or more frequently if the calibrator is operated in a dusty environment. You access the air filter from the rear panel of the calibrator.

To clean the air filter, refer to Figure 3 and continue as follows:

1. Turn the power off and let the fan come to a stop.
2. Disconnect the ac line cord.
3. Remove the filter element.
   a. Hold the top and bottom of the air filter frame.
   b. Squeeze the edges of the frame towards each other to disengage the filter tabs from the slots in the Calibrator.
   c. Pull the filter frame straight out from the Calibrator.
4. Clean the filter element,
   a. Clean the filter element in soapy water.
   b. Flush the filter element.
   c. Shake out the water and let the filter element dry before you install it.
5. Do the filter removal steps in reverse order to install the filter element.



oq062f.eps

Figure 3. Accessing the Air Filter

How to Clean Outside Surfaces

To clean the outside surfaces, wipe the case, front-panel keys, and lens using a soft cloth slightly dampened with water or a non-abrasive mild cleaning solution that does not harm plastics.

⚠ Caution

To prevent damage to the plastic materials used in the Calibrator, do not use aromatic hydrocarbons or chlorinated solvents when you clean the Calibrator.

Performance Tests

The Performance Tests section contains the procedures used to make sure the Calibrator performs to specifications. There are sections for each of the two Calibrator options: 5080A/MEG and 5080A/SC.

Required Test Equipment

Table 5 is a list of the test equipment necessary to perform Verification and Calibration of the main Calibrator functions.

Table 5. Test Equipment for Verification and Calibration

Test Equipment	Recommended Model
Reference Multimeter	Fluke 8508A
AC Measurement Standard	Fluke 5790A or equivalent
Current shunts (10 mA, 50 mA, 20 A, 1 A, 2 A, and 200 mA)	Fluke A40B
Shunt, 0.01 Ω	Guildline 9230
Resistance Standard, 1 kΩ	Fluke 742A-1k
Resistance Standard, 100 Ω	Fluke 742A-100
Resistance Standard, 10 Ω	Fluke 742A-10
Resistance Standard, 1 Ω	Fluke 742A-1
Type-N Dual Banana Adapter	Fluke Part Number 900394
A40 Current Shunt	Fluke 792-7004
Distortion Analyzer	Krohn-Hite 6900B
Phasemeter	Clarke-Hess 6000
Timer/Counter	Fluke PM6680B

How to Verify the Main Calibrator

Use Tables 6 through 16 to make sure the 5080A operates to its specifications. The tables are for approved metrology personnel who have access to a standards laboratory that has equipment that can test calibration equipment of this level of accuracy. The tables show the recommended test points and the upper and lower limits for each point. The limits calculation is the 90-day specification added to or subtract from the output value. There is no built-in factor for measurement uncertainty.

Table 6. Verification Tests for DC Voltage (Normal)

Range	Output	Lower Limit	Upper Limit
329.999 mV	0.000 mV	-0.0100 mV	0.0100 mV
329.999 mV	329.000 mV	328.9538 mV	329.0462 mV
329.999 mV	-329.000 mV	-329.0462 mV	-328.9538 mV
3.29999 V	0.000000 V	-0.000015 V	0.000015 V
3.29999 V	1.00000 V	0. 999905 V	1.000095 V
3.29999 V	-1.00000 V	-1.000095 V	--0.999905 V
3.29999 V	3.29000 V	3.289722 V	3.290278 V
3.29999 V	-3.29000 V	-3.290278 V	-3.289722 V
32.9999 V	0.00000 V	-0.00015 V	0.00015 V
32.9999 V	10.0000 V	9.99905 V	10.00095 V
32.9999 V	-10.0000 V	-10.00095 V	-9.99905 V
32.9999 V	32.9000 V	32.89722 V	32.90278 V
32.9999 V	-32.9000 V	-32.90278 V	-32.89722 V
100.000 V	100.000 V	99.9885 V	100.0115 V
100.000 V	-100.000 V	-100.0115 V	-99.9885 V
329.999 V	329.000 V	328.9656 V	329.0344 V
329.999 V	-329.000 V	-329.0344 V	-328.9656 V
1000.00 V	330.000 V	329.962 V	328.9656 V
1000.00 V	-330.000 V	-330.039 V	-329.962 V
1000.00 V	1020.00 V	1019.893 V	1020.108 V
1000.00 V	-1020.00 V	-1020.108 V	-1019.893 V

Table 7. Verification Tests for DC Voltage (AUX)

Range	Output	Lower Limit	Upper Limit
329.999 mV	0.00 mV	-1.000 mV	1.000 mV
329.999 mV	329.00 mV	327.671 mV	330.329 mV
329.999 mV	-329.00 mV	-330.329 mV	-327.671 mV
3.29999 V	3.2900 V	3.28571 V	3.29429 V
3.29999 V	-3.2900 V	-3.29429 V	-3.28571 V
7.0000 V	7.000 V	6.9920 V	7.0080 V
7.0000 V	-7.000 V	-7.0080 V	-6.9920 V

Table 8. Verification Tests for DC Current

Range	Output	Lower Limit	Upper Limit
330 µA	0.00 µA	-0.100 µA	0.100 µA
330 µA	329.00 µA	328.670 µA	329.330 µA
330 µA	-329.00 µA	-329.330 µA	-328.670 µA
3.3 mA	0.00000 mA	-0.000250 mA	0.000250 mA
3.3 mA	3.2900 mA	3.28778 mA	3.29222 mA
3.3 mA	-3.00000 mA	-3.29222 mA	-3.28778 mA
33 mA	0.00000 mA	-0.001250 mA	0.001250 mA
33 mA	32.900 mA	32.8830 mA	32.9170 mA
33 mA	-32.900 mA	-32.9170 mA	-32.8830 mA
330 mA	0.00000 mA	-0.016500 mA	0.016500 mA
330 mA	329.00 mA	328.826 mA	329.174 mA
330 mA	-329.00 mA	-329.174 mA	-328.826 mA
1.1 A	0.00000 A	-0.000220 A	0.000220 A
1.1 A	1.0000 A	0.99838 A	1.00162 A
1.1 A	-1.0000 A	-1.00162 A	-0.99838 A
3 A	0.00000 A	-0.000220 A	0.000220 A
3 A	2.9900 A	2.98440 A	2.99560 A
3 A	-2.9900 A	-2.99560 A	-2.98440 A
11 A	0.00000 A	-0.002500 A	0.002500 A
11 A	10.900 A	10.8724 A	10.9276 A
11 A	-10.900 A	-10.9276 A	-10.8724 A
20.5 A	0.00000 A	-0.003750	0.003750 A
20.5 A	19.9900 A	19.8007 A	19.9993 A
20.5 A	-19.9900 A	-19.9993 A	-19.8007 A

Table 9. Verification Tests for 4-Wire Resistance

Range	Output	Tolerance
0.0000 Ω	0.0000 Ω	±0.01000 Ω
1.0000 Ω	1.0000 Ω	±0.00989 Ω
1.9000 Ω	1.9000 Ω	±0.00931 Ω
10.000 Ω	10.000 Ω	±0.014 Ω
19.000 Ω	19.000 Ω	±0.0171 Ω
100.000 Ω	100.000 Ω	±0.035 Ω
190.000 Ω	190.000 Ω	±0.0665 Ω
1.00000 kΩ	1.00000 kΩ	±0.00022 kΩ
1.90000 kΩ	1.90000 kΩ	±0.000418 kΩ
10.0000 kΩ	10.0000 kΩ	±0.0022 kΩ
19.0000 kΩ	19.0000 kΩ	±0.00494 kΩ
100.000 kΩ	100.000 kΩ	±0.035 kΩ
190.000 kΩ	190.000 kΩ	±0.0741 kΩ
1.00000 MΩ	1.00000 MΩ	±0.00035 MΩ
1.90000 MΩ	1.90000 MΩ	±0.000665 MΩ
10.000 MΩ	10.000 MΩ	±0.0092 MΩ
19.000 MΩ	19.000 MΩ	±0.0266 MΩ
100.00 MΩ	100.00 MΩ	±0.049 MΩ
190.00 MΩ	190.00 MΩ	±1.876 MΩ

Table 10. Verification Tests for AC Voltage (Normal)

Range	Output	Frequency	Lower Limit	Upper Limit
33 mV	10.00 mV	45 Hz	9.909 mV	10.091 mV
33 mV	10.00 mV	100 Hz	9.908 mV	10.092 mV
33 mV	10.00 mV	1 kHz	9.908 mV	10.092 mV
33 mV	32.90 mV	45 Hz	32.738 V	30.062 V
33 mV	32.90 mV	100 Hz	32.735 V	33.065 V
33 mV	32.90 mV	1 kHz	32.735 V	33.065 V
330 mV	329.00 mV	45 Hz	328.512 V	329.488 V
330 mV	329.00 mV	100 Hz	328.479 V	329.521 V
330 mV	329.00 mV	1 kHz	328.479 V	329.521 V
3.3 V	3.2900 V	45 Hz	3.28686 V	3.29314V
3.3 V	3.2900 V	100 Hz	3.28653 V	3.29347 V

Table 10. Verification Tests for AC Voltage (Normal) (cont.)

Range	Output	Frequency	Lower Limit	Upper Limit
3.3 V	3.2900 V	1 kHz	3.28653 V	3.29347 V
33 V	32.900 V	45 Hz	32.8686V	32.9314V
33 V	32.900 V	100 Hz	32.8620 V	32.9380 V
33 V	32.900 V	1 kHz	32.8620 V	32.9380 V
330 V	100.00 V	45 Hz	99.862 V	100.138 V
330 V	100.00 V	100 Hz	99.852 V	100.148 V
330 V	100.00 V	1 kHz	99.862V	100.138V
1000 V	1020.0 V	45 Hz	1018.60 V	1021.40 V
1000 V	1020.0 V	100 Hz	1018.49 V	1021.51 V
1000 V	1020.0 V	1 kHz	1018.49 V	1021.51 V

Table 11. Verification Tests for AC Voltage (AUX)

Range	Output, AUX	Frequency	Lower Limit	Upper Limit
330 mV	10.00 mV	45 Hz	8.982 mV	11.018 mV
330 mV	10.00 mV	100 Hz	8.980 mV	11.020 mV
330 mV	10.00 mV	1 kHz	8.980 mV	11.020 mV
330 mV	329.00 mV	45 Hz	327.408 mV	330.592 mV
330 mV	329.00 mV	100 Hz	327.342 mV	330.658 mV
330 mV	329.00 mV	1 kHz	327.342 mV	330.658 mV
3.3 V	3.29000 V	45 Hz	3.283078 V	3.296922 V
3.3 V	3.29000 V	100 Hz	3.282420 V	3.297580 V
3.3 V	3.29000 V	1 kHz	3.282420 V	3.297580 V
5 V	5.00000 V	45 Hz	4.990000 V	5.010000 V
5 V	5.00000 V	100 Hz	4.989000 V	5.011000 V
5 V	5.00000 V	1 kHz	4.989000 V	5.011000 V

Table 12. Verification Tests for AC Current

Range	Output	Frequency	Lower Limit	Upper Limit
330 µA	29.0 µA	45 Hz	28.18 µA	29.82 µA
330 µA	29.0 µA	100 Hz	28.18 µA	29.82 µA
330 µA	29.0 µA	1 kHz	28.18 µA	29.82 µA
330 µA	329.0 µA	45 Hz	327.46 µA	330.54 µA
330 µA	329.0 µA	100 Hz	327.43 µA	330.57 µA
330 µA	329.0 µA	1 kHz	327.43 µA	330.57 µA

Table 12. Verification Tests for AC Current (cont.)

Range	Output	Frequency	Lower Limit	Upper Limit
3.3 mA	3.2900 mA	45 Hz	3.28219 mA	3.29781 mA
3.3 mA	3.2900 mA	100 Hz	3.28186 mA	3.29814 mA
3.3 mA	3.2900 mA	1 kHz	3.28186 mA	3.29814 mA
33 mA	19.900 mA	45 Hz	19.8701 mA	19.9299 mA
33 mA	19.900 mA	100 Hz	19.8701 mA	19.9299 mA
33 mA	32.900 mA	1 kHz	32.8288 mA	32.9712 mA
330 mA	199.00 mA	45 Hz	198.701 mA	199.299 mA
330 mA	199.00 mA	100 Hz	198.701 mA	199.299 mA
330 mA	329.00 mA	1 kHz	328.288 mA	329.712 mA
1.1 A	1.0000 A	45 Hz	0.99790 A	1.00210 A
1.1 A	1.0000 A	100 Hz	0.99790 A	1.00210 A
1.1 A	1.0000 A	1 kHz	0.99660 A	1.00340 A
3 A	1.9900 A	45 Hz	1.98671 A	1.99329 A
3 A	1.9900 A	100 Hz	1.98671 A	1.99329 A
3 A	2.9900 A	1 kHz	2.98073 A	2.99927 A
11 A	10.000 A	45 Hz	9.9700 A	10.0300 A
11 A	10.000 A	100 Hz	9.9700 A	10.0300 A
11 A	10.000 A	1 kHz	9.9560 A	10.0440 A
20.5 A	19.900 A	45 Hz	19.7895 A	20.0105 A
20.5 A	19.900 A	100 Hz	19.7855 A	20.0145 A
20.5 A	19.900 A	1 kHz	19.7855 A	20.0145 A

Table 13. Verification Tests for Phase (Normal Voltage vs. AUX Current)

Range, Normal Output	Output, Normal V	Frequency	Range, AUX Output Current	Output AUX	Phase	Lower Limit	Upper Limit
3.3 V	3.00000 V	45 Hz	3.3 mA	300.00 mA	0 °	-0.25 °	0.25 °
3.3 V	3.00000 V	500 Hz	3.3 mA	300.00 mA	0 °	-1.5 °	1.5 °
3.3 V	3.00000 V	1 kHz	3.3 mA	300.00 mA	0 °	-5 °	5 °
3.3 V	3.00000 V	65 Hz	2.5 A	2.00000 A	0 °	-0.25 °	0.25 °
3.3 V	3.00000 V	65 Hz	2.5 A	5.0000 A	0 °	-0.25 °	0.25 °

Table 14. Verification Tests for Phase (Normal Voltage vs. Aux Voltage)

Range	Output	Frequency	Range, AUX Output Voltage	Output AUX	Phase	Lower Limit	Upper Limit
3.3 V	329 mV	65 Hz	3.29999 V	329 mV	0 °	-0.25 °	0.25 °
3.3 V	329 mV	65 Hz	3.29999 V	329 mV	60 °	-0.25 °	0.25 °
3.3 V	329 mV	65 Hz	3.29999 V	329 mV	90 °	-0.25 °	0.25 °
3.3 V	100 mV	500 Hz	3.29999 V	100 mV	0 °	-1.5 °	1.5 °
3.3 V	330 mV	1 kHz	3.29999 V	330 mV	0 °	-5.00 °	5.00 °

Table 15. Verification Tests for Distortion

Range, Normal Output	Output	Lower Limit	Upper Limit
0.000 % @ 3 V 45 Hz	0.00 %	0.00 %	0.22 %
0.000 % @ 3 V 100 Hz	0.00 %	0.00 %	0.22 %
0.000 % @ 30 V 45 Hz	0.00 %	0.00 %	0.52 %
0.000 % @ 30 V 1 kHz	0.00 %	0.00 %	0.52 %
0.000 % @ 100 V 100 Hz	0.00 %	0.00 %	0.53 %
0.000 % @ 100 V 1 kHz	0.00 %	0.00 %	0.53 %

Table 16. Verification Tests for Frequency

Range	Output	Nominal	Lower Limit	Upper Limit
3.29999 V	1.00000 V	100.0000 Hz	99.993 Hz	100.007 Hz

MEGOHM Option Verification Tests

The verification test points in Tables 17 through 19 are to be used as a guide when you re-verify the Calibrator. There is no built-in factor for measurement uncertainty. The tables are for approved metrology personnel who have access to a standards laboratory that has equipment that can test calibration equipment of this level of accuracy.

Low Resistance Source (LVR) Verification

To verify the Low Resistance Source function:

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

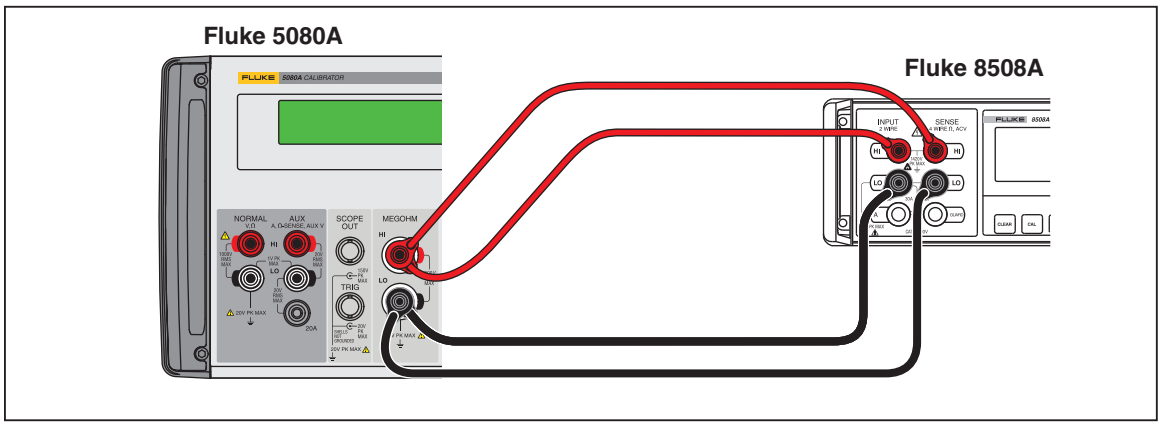


Figure 4. Low Resistance Verifications Connections

2. Push MEG Ω on the Calibrator.
3. Push the softkey labeled **MODE** until **lvr** shows above the right-most Calibrator softkey.
4. Set the multimeter for true ohms and auto range.
5. Measure the Low Resistance calibration performance at each resistance point in Table 17. Deviations must not be larger than the specified limits.

Table 17. Megohm Option LVR Verification Points

Range	Output	Tolerance
1.0000 Ω	1.0000 Ω	±0.0109 Ω
1.8000 Ω	1.8000 Ω	±0.0139 Ω
3.7000 Ω	3.7000 Ω	±0.0208 Ω
5.9000 Ω	5.9000 Ω	±0.0288 Ω
10.000 Ω	10.000 Ω	±0.045 Ω
18.000 Ω	18.000 Ω	±0.075 Ω
37.000 Ω	37.000 Ω	±0.154 Ω
59.000 Ω	59.000 Ω	±0.281 Ω
100.00 Ω	100.00 Ω	±0.45 Ω
180.00 Ω	180.00 Ω	±0.75 Ω
370.00 Ω	370.00 Ω	±1.5 Ω
590.00 Ω	590.00 Ω	±2.0 Ω
1.0000 kΩ	1.0000 kΩ	±0.003 kΩ
1.8000 kΩ	1.8000 kΩ	±0.004 kΩ
3.7000 kΩ	3.7000 kΩ	±0.005 kΩ
5.9000 kΩ	5.9000 kΩ	±0.006 kΩ

High Resistance Source (HVR) Verification

To verify the High Resistance Source function:

1. Connect the high resistance source output to the input terminals of a standard multimeter in 2-wire configuration as shown in Figure 5.

gru002.eps

Figure 5. High Resistance Source Calibration Connections

2. If not already on, push MEG Ω on the Calibrator.
3. Push the softkey labeled **MODE** until **hvr** shows above the right-most Calibrator softkey.
4. Set the multimeter for 2-wire ohms measurement and auto range.
5. Measure the High Resistance calibration performance at each resistance point shown in Table 18. Deviations should not be greater than the specified limits.

Table 18. Megohm Option HVR Verification Points

Range	Output	Tolerance
10.000 kΩ	10.000 kΩ	±0.0200 kΩ
11.550 kΩ	11.550 kΩ	±0.0231 kΩ
21.000 kΩ	21.000 kΩ	±0.042 kΩ
42.000 kΩ	42.000 kΩ	±0.0840 kΩ
80.850 kΩ	80.850 kΩ	±0.1617 kΩ
100.00 kΩ	100.00 kΩ	±0.0200 kΩ
150.20 kΩ	150.20 kΩ	±0.0300 kΩ
288.20 kΩ	288.20 kΩ	±0.576 kΩ
500.00 kΩ	500.00 kΩ	±1.000 kΩ
535.50 kΩ	535.50 kΩ	±1.071 kΩ
1.0000 MΩ	1.0000 MΩ	±0.00300 MΩ
1.0290 MΩ	1.0290 MΩ	±0.00309 MΩ
1.9200 MΩ	1.9200 MΩ	±0.00576 MΩ
3.6600 MΩ	3.6600 MΩ	±0.01098 MΩ

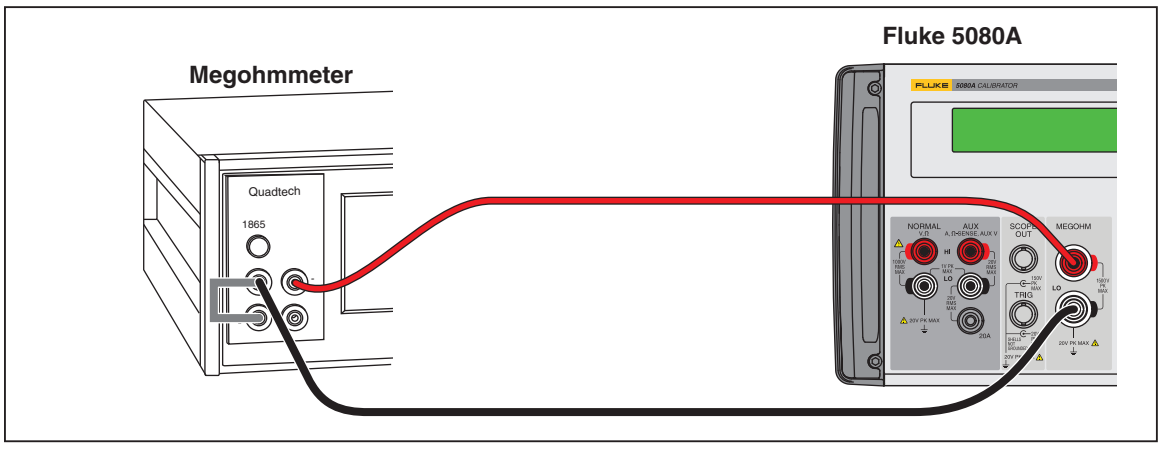
Table 18. Megohm Option HVR Verification Point (cont.)

Range	Output	Tolerance
6.9800 MΩ	6.9800 MΩ	±0.02094 MΩ
10.000 MΩ	10.000 MΩ	±0.0500 MΩ
10.240 MΩ	10.240 MΩ	±0.0512 MΩ
20.980 MΩ	20.980 MΩ	±0.1049 MΩ
39.190 MΩ	39.190 MΩ	±0.196 MΩ
76.550 MΩ	76.550 MΩ	±0.3827 MΩ
100.00 MΩ	100.00 MΩ	±0.500 MΩ
138.60 MΩ	138.60 MΩ	±0.693 MΩ
148.90 MΩ	148.90 MΩ	±0.744 MΩ
289.60 MΩ	289.60 MΩ	±1.448 MΩ
559.60 MΩ	559.60 MΩ	±2.798 MΩ

6. Connect the Calibrator directly to the megohmmeter as shown in Figure 6. Make sure you reverse the polarity.

Note

When you use the 100 GΩ value on the Calibrator for some megohmmeters, the leads must be swapped between the HI and LO ohms resistance output on the Calibrator. The ground must be turned on (Gnd On) when you swap HI and LO leads positions in the high ohms resistance function. For example, to make a correct 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 make the measurement.



gru003.eps

Figure 6. High Resistance Verification for 1 GΩ and higher

7. Setup the Quadtech 1865 as follows:

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

8. Verify the high resistance performance of the Calibrator at the test points in Table 19. Deviations should not exceed the specified limits. For 18.24 GΩ, push the **MODE** softkey until 18G shows in the display.

Table 19. High Resistance Verification

Range	Output	Tolerance
1.000 GΩ	1.000 GΩ	±0.010 GΩ
1.060 GΩ	1.060 GΩ	±0.011 GΩ
2.000 GΩ	2.000 GΩ	±0.020 GΩ
3.920 GΩ	3.920 GΩ	±0.039 GΩ
5.000 GΩ	5.000 GΩ	±0.050 GΩ
5.370 GΩ	5.370 GΩ	±0.054 GΩ
7.000 GΩ	7.000 GΩ	±0.070 GΩ
7.210 GΩ	7.210 GΩ	±0.072 GΩ
10.000 GΩ	10.000 GΩ	±0.100 GΩ
18.24 GΩ	18.24 GΩ	±0.55 GΩ

Scope Option Verification Tables

Before the 5080A/SC Option leaves the Fluke factory, it is verified to meet its specifications at the test points shown in Tables 20 through 30. The verification test points are provided here as a guide when re-verification is desired. Table 44 is a list of test equipment necessary for SC200 Scope option calibration.

Table 20. Voltage Function Verification: AC Voltage into a 1 MΩ Load

Nominal Value (p-p)	Frequency	Measured Value (p-p)	Deviation (mV)	1-Year Spec. (mV)
5.0 mV	10 Hz			0.11
5.0 mV	100 Hz			0.11
5.0 mV	1 kHz			0.11
5.0 mV	5 kHz			0.11
5.0 mV	10 kHz			0.11
10.0 mV	10 kHz			0.12
20.0 mV	100 Hz			0.15
20.0 mV	1 kHz			0.15

Table 20. Voltage Function Verification: AC Voltage into a 1 MΩ Load (cont.)

Nominal Value (p-p)	Frequency	Measured Value (p-p)	Deviation (mV)	1-Year Spec. (mV)
20.0 mV	10 kHz			0.15
50.0 mV	10 kHz			0.23
89.0 mV	10 Hz			0.32
89.0 mV	10 kHz			0.32
100.0 mV	10 kHz			0.55
200.0 mV	100 Hz			0.60
200.0 mV	1 kHz			0.60
500.0 mV	10 kHz			1.35
890.0 mV	10 Hz			2.32
890.0 mV	10 kHz			2.32
1.0 V	100 Hz			2.60
1.0 V	1 kHz			2.60
1.0 V	10 kHz			2.60
2.0 V	10 kHz			5.10
5.0 V	10 Hz			12.60
5.0 V	10 kHz			12.60
10.0 V	10 kHz			25.10
20.0 V	10 kHz			50.10
50.0 V	10 Hz			125.10
50.0 V	100 Hz			125.10
50.0 V	1 kHz			125.10
50.0 V	10 kHz			125.10
105.0 V	100 Hz			262.60
105.0 V	1 kHz			262.60

Table 21. Voltage Function Verification: AC Voltage into a 50 Ω Load

Nominal Value (p-p)	Frequency	Measured Value (p-p)	Deviation (mV)	1-Year Spec. (mV)
5.0 mV	10 Hz			0.11
5.0 mV	100 Hz			0.11
5.0 mV	1 kHz			0.11
5.0 mV	5 kHz			0.11
5.0 mV	10 kHz			0.11

Table 21. Voltage Function Verification: AC Voltage into a 50 Ω Load (cont.)

Nominal Value (p-p)	Frequency	Measured Value (p-p)	Deviation (mV)	1-Year Spec. (mV)
10.0 mV	100 Hz			0.12
10.0 mV	1 kHz			0.12
10.0 mV	10 kHz			0.12
20.0 mV	10 kHz			0.15
44.9 mV	10 Hz			0.15
44.9 mV	10 kHz			0.21
50.0 mV	10 kHz			0.23
100.0 mV	100 Hz			0.35
100.0 mV	1 kHz			0.35
100.0 mV	10 kHz			0.35
200.0 mV	10 kHz			0.60
449.0 mV	10 Hz			1.22
449.0 mV	10 kHz			1.22
500.0 mV	10 kHz			1.35
1.0 V	100 Hz			2.60
1.0 V	1 kHz			2.60
1.0 V	10 kHz			2.60
2.0 V	10 Hz			5.10
2.0 V	100 Hz			5.10
2.0 V	1 kHz			5.10
2.0 V	5 kHz			5.10
2.0 V	10 kHz			5.10

Table 22. Voltage Function Verification: DC Voltage into a 50 Ω Load

Nominal Value (dc)	Measured Value (dc)	Deviation (mV)	1-Year Spec. (mV)
0.0 mV			0.10
5.0 mV			0.11
-5.0 mV			0.11
10.0 mV			0.12
-10.0 mV			0.12
22.0 mV			0.15
-22.0 mV			0.15
25.0 mV			0.16

Table 22. Voltage Function Verification: DC Voltage into a 50 Ω Load (cont.)

Nominal Value (dc)	Measured Value (dc)	Deviation (mV)	1-Year Spec. (mV)
-25.0 mV			0.16
55.0 mV			0.24
-55.0 mV			0.24
100.0 mV			0.35
-100.0 mV			0.35
220.0 mV			0.65
-220.0 mV			0.65
250.0 mV			0.72
-250.0 mV			0.72
550.0 mV			1.47
-550.0 mV			1.47
700.0 mV			1.85
-700.0 mV			1.85
2.2 V			5.60
-2.2 V			5.60

Table 23. Voltage Function Verification: DC Voltage into a 1 MΩ Load

Nominal Value (dc)	Measured Value (dc)	Deviation (mV)	1-Year Spec. (mV)
0.0 mV			0.10
5.0 mV			0.11
-5.0 mV			0.11
22.0 mV			0.15
-22.0 mV			0.15
25.0 mV			0.16
-25.0 mV			0.16
45.0 mV			0.21
-45.0 mV			0.21
50.0 mV			0.23
-50.0 mV			0.23
220.0 mV			0.65
-220.0 mV			0.65
250.0 mV			0.72
-250.0 mV			0.72
450.0 mV			1.22

Table . Voltage Function Verification: DC Voltage into a 1 MΩ Load (cont.)

Nominal Value (dc)	Measured Value (dc)	Deviation (mV)	1-Year Spec. (mV)
-450.0 mV			1.22
500.0 mV			1.35
-500.0 mV			1.35
3.3 V			8.35
-3.3 V			8.35
4.0 V			10.10
-4.0 V			10.10
33.0 V			82.60
-33.0 V			82.60

Table 24. Edge Function Verification

Nominal Value (p-p)	Frequency	Pulse Response Time (nS)	1-Year Spec. (ps)
25.0 mV	1 MHz		400
250.0 mV	1 MHz		400
250.0 mV	10 kHz		400
250.0 mV	100 kHz		400
250.0 mV	1 MHz		400
2.5 V	1 MHz		400

Table 25. Wave Generator Function Verification: 1 MΩ Load

Waveform	Nominal Value (p-p)	Frequency	Measured Value (p-p)	Deviation (mV)	1-Year Spec.
Square	5.0 mV	10 kHz			0.25 mV
Square	20.0 mV	10 kHz			0.70 mV
Square	89.0 mV	10 kHz			2.77 mV
Square	219.0 mV	10 kHz			6.67 mV
Square	890.0 mV	10 kHz			26.80 mV
Square	6.5 V	10 kHz			195.10 mV
Square	55.0 V	10 kHz			1.65 V
Sine	5.0 mV	10 kHz			0.25 mV
Sine	20.0 mV	10 kHz			0.70 mV
Sine	89.0 mV	10 kHz			2.77 mV
Sine	219.0 mV	10 kHz			6.67 mV
Sine	890.0 mV	10 kHz			26.80 mV

Table 25. Wave Generator Function Verification: 1 MΩ Load (cont.)

Waveform	Nominal Value (p-p)	Frequency	Measured Value (p-p)	Deviation (mV)	1-Year Spec.
Sine	6.5 V	10 kHz			195.10 mV
Sine	55.0 V	10 kHz			1.65 V
Triangle	5.0 mV	10 kHz			0.25 mV
Triangle	20.0 mV	10 kHz			0.70 mV
Triangle	89.0 mV	10 kHz			2.77 mV
Triangle	219.0 mV	10 kHz			6.67 mV
Triangle	890.0 mV	10 kHz			26.80 mV
Triangle	6.5 V	10 kHz			195.10 mV

Table 26. Wave Generator Function Verification: 50 Ω Load

Waveform	Nominal Value (p-p)	Frequency	Measured Value (p-p)	Deviation (mV)	1-Year Spec.
Square	5.0 mV	10 kHz			0.25 mV
Square	10.9 mV	10 kHz			0.43 mV
Square	44.9 mV	10 kHz			1.45 mV
Square	109.0 mV	10 kHz			3.37 mV
Square	449.0 mV	10 kHz			13.57 mV
Square	1.1 V	10 kHz			32.50 mV
Square	2.2 V	10 kHz			66.10 V
Sine	5.0 mV	10 kHz			0.25 mV
Sine	10.9 mV	10 kHz			0.43 mV
Sine	44.9 mV	10 kHz			1.45 mV
Sine	109.0 mV	10 kHz			3.37 mV
Sine	449.0 mV	10 kHz			13.57 mV
Sine	1.1 V	10 kHz			32.50 mV
Sine	2.2 V	10 kHz			66.10 V
Triangle	5.0 mV	10 kHz			0.25 mV
Triangle	10.9 mV	10 kHz			0.43 mV
Triangle	44.9 mV	10 kHz			1.45 mV
Triangle	109.0 mV	10 kHz			3.37 mV
Triangle	449.0 mV	10 kHz			13.57 mV
Triangle	1.1 V	10 kHz			32.50 mV
Triangle	2.2 V	10 kHz			66.10 V

Table 27. Leveled Sine Wave Function Verification: Amplitude

Nominal Value (p-p)	Frequency	Measured Value (p-p)	Deviation (mV)	1-Year Spec. (mV)
5.0 mV	50 kHz			0.300
10.0 mV	50 kHz			0.400
20.0 mV	50 kHz			0.600
40.0 mV	50 kHz			1.000
50.0 mV	50 kHz			1.200
100.0 mV	50 kHz			2.200
200.0 mV	50 kHz			4.200
400.0 mV	50 kHz			8.200
500.0 mV	50 kHz			10.200
1.3 V	50 kHz			26.200
2.0 V	50 kHz			40.200
5.5 V	50 kHz			110.200

Table 28. Leveled Sine Wave Function Verification: Flatness

Nominal Value (p-p)	Frequency	Measured Value (p-p)	Deviation (mV)	1-Year Spec. (mV)
5.0 mV	500 kHz			0.17
5.0 mV	1 MHz			0.17
5.0 mV	1 MHz			0.17
5.0 mV	2 MHz			0.17
5.0 mV	5 MHz			0.17
5.0 mV	10 MHz			0.17
5.0 mV	20 MHz			0.17
5.0 mV	50 MHz			0.17
5.0 mV	100 MHz			0.17
5.0 mV	125 MHz			0.20
5.0 mV	160 MHz			0.20
5.0 mV	200 MHz			0.20
10.0 mV	500 kHz			0.25
10.0 mV	1 MHz			0.25
10.0 mV	1 MHz			0.25
10.0 mV	2 MHz			0.25
10.0 mV	5 MHz			0.25

Table 28. Leveled Sine Wave Function Verification: Flatness (cont.)

Nominal Value (p-p)	Frequency	Measured Value (p-p)	Deviation (mV)	1-Year Spec. (mV)
10.0 mV	10 MHz			0.25
10.0 mV	20 MHz			0.25
10.0 mV	50 MHz			0.25
10.0 mV	100 MHz			0.25
10.0 mV	125 MHz			0.30
10.0 mV	160 MHz			0.30
10.0 mV	200 MHz			0.30
40.0 mV	500 kHz			0.70
40.0 mV	1 MHz			0.70
40.0 mV	1 MHz			0.70
40.0 mV	2 MHz			0.70
40.0 mV	5 MHz			0.70
40.0 mV	10 MHz			0.70
40.0 mV	20 MHz			0.70
40.0 mV	50 MHz			0.70
40.0 mV	100 MHz			0.70
40.0 mV	125 MHz			0.90
40.0 mV	160 MHz			0.90
40.0 mV	200 MHz			0.90
100.0 mV	500 kHz			1.60
100.0 mV	1 MHz			1.60
100.0 mV	1 MHz			1.60
100.0 mV	2 MHz			1.60
100.0 mV	5 MHz			1.60
100.0 mV	10 MHz			1.60
100.0 mV	20 MHz			1.60
100.0 mV	50 MHz			1.60
100.0 mV	100 MHz			1.60
100.0 mV	125 MHz			2.10
100.0 mV	160 MHz			2.10
100.0 mV	200 MHz			2.10
400.0 mV	500 kHz			6.10

Table 28. Leveled Sine Wave Function Verification: Flatness (cont.)

Nominal Value (p-p)	Frequency	Measured Value (p-p)	Deviation (mV)	1-Year Spec. (mV)
400.0 mV	1 MHz			6.10
400.0 mV	1 MHz			6.10
400.0 mV	2 MHz			6.10
400.0 mV	5 MHz			6.10
400.0 mV	10 MHz			6.10
400.0 mV	20 MHz			6.10
400.0 mV	50 MHz			6.10
400.0 mV	100 MHz			6.10
400.0 mV	125 MHz			8.10
400.0 mV	160 MHz			8.10
400.0 mV	200 MHz			8.10
1.3 V	500 kHz			19.60
1.3 V	1 MHz			19.60
1.3 V	1 MHz			19.60
1.3 V	2 MHz			19.60
1.3 V	5 MHz			19.60
1.3 V	10 MHz			19.60
1.3 V	20 MHz			19.60
1.3 V	50 MHz			19.60
1.3 V	100 MHz			19.60
1.3 V	125 MHz			26.10
1.3 V	160 MHz			26.10
1.3 V	200 MHz			26.10
5.5 V	500 kHz			82.5
5.5 V	1 MHz			82.5
5.5 V	1 MHz			82.5
5.5 V	2 MHz			82.5
5.5 V	5 MHz			82.5
5.5 V	10 MHz			82.5
5.5 V	20 MHz			82.5
5.5 V	50 MHz			82.5
5.5 V	100 MHz			82.5

Table 28. Leveled Sine Wave Function Verification: Flatness (cont.)

Nominal Value (p-p)	Frequency	Measured Value (p-p)	Deviation (mV)	1-Year Spec. (mV)
5.5 V	125 MHz			110.00
5.5 V	160 MHz			110.00
5.5 V	200 MHz			110.00

Table 29. Leveled Sine Wave Function Verification: Frequency

Nominal Value (p-p)	Frequency	Measured Frequency	Deviation	1-Year Spec. (mV)
1.3 V	50 kHz			0.0013 kHz
1.3 V	10 MHz			0.0003 MHz
1.3 V	200 MHz			0.0063 MHz

Table 30. Marker Generator Function Verification

Nominal Interval	Measured Interval	Deviation	1-Year Spec.
4.98 s			25.12 ms
2.00 s			4.05 ms
1 s			1.03 ms
500.00 ms			262.50 ms
200.00 ms			45.00 ms
100.00 ms			12.50 ms
50.00 ms			3.75 ms
20.00 ms			900.000 ns
10.00 ms			350.00 ns
5.00 ms			150.00 ns
2.00 ms			54.00 ns
1.00 ms			26.00 ns
500.00 µs			12.750 ns
200.00 µs			5.040 ns
100.00 µs			2.510 ns
50.00 µs			1.287 ns
20.00 µs			0.506 ns
10.00 µs			0.252 ns
5.00 µs			0.125 ns
2.00 µs			0.050 ns
1.00 µs			0.025 ns

Table 30. Marker Generator Function Verification (cont.)

Nominal Interval	Measured Interval	Deviation	1-Year Spec.
500.000 ns			0.013 ns
200.000 ns			5.000 ps
100.000 ns			2.500 ps
50.000 ns			1.250 ps
20.000 ns			0.500 ps
10.000 ns			0.250 ps
5.000 ns			0.125 ps
2.000 ns			0.050 ps

Mainframe Calibration

The standard Calibrator has no internal hardware adjustments. Oscilloscope Options have hardware adjustments. The Control Display prompts you through the complete calibration procedure. Calibration occurs in the major steps below:

1. The Calibrator sources specified output values and you measure the outputs with traceable measurement instruments of higher accuracy. The 5080A automatically programs the outputs and prompts you to make external connections to applicable measurement instruments.
2. At each measure and enter step, you can push the **OPTIONS**, and **BACK UP STEP** softkeys to redo a step, or **SKIP STEP** to skip over a step.
3. You type in the measured results manually through the front panel keyboard or through the remote interface with an external terminal or computer.

Note

Mixed in with the "output and measure" procedures are internal 5080A calibration procedures that are done without operator aid.

4. The Calibrator computes a software correction factor and stores it in volatile memory.
5. When the calibration steps are complete, you are prompted to either store all the correction factors in nonvolatile memory or discard them and start over.

For usual calibration, all steps but frequency and phase are necessary. All the usual calibration steps are available from the front panel interface as well as the remote interface (IEEE-488 or serial). Frequency and phase calibration are recommended after instrument repair, and are available only through the remote interface (IEEE-488 or serial). Remote commands for calibration are given later in this chapter.

Required Calibration Test Equipment

Table 31 shows the test equipment necessary for 5080A calibration.

Table 31. Test Equipment Required for 5080A Calibration

Quantity	Manufacturer	Model	Equipment
1	Fluke	8508A	Reference Multimeter
1	Fluke	5790A	AC Measurement Standard

Table 31. Test Equipment Required for 5080A Calibration (cont.)

Quantity	Manufacturer	Model	Equipment
1	Fluke	A40B	10 mA, 50 mA, 20 A, 2 A, 1 A, and 200 mA current shunts
1	Fluke	742A-1k	Resistance Standard, 1 kΩ
1	Fluke	742A-100	Resistance Standard, 100 Ω
1	Fluke	742A-10	Resistance Standard, 10 Ω
1	Fluke	742A-1	Resistance Standard, 1 Ω
1	Guildline	9230	0.01 Ω shunt
1	Fluke	PN 900394	Type N Dual Banana Adapter
1	Fluke	792-7004	A40 Current Shunt, Adapter
1	Fluke	742A-1M	Resistance Standard, 1 MΩ
1	Fluke	742A-10M	Resistance Standard, 10 MΩ
1	Guildline	9334/100M	Resistance Standard, 100 MΩ

Start Calibration

To start a calibration:

1. Push SETUP.
2. Push the softkey labeled **CAL** twice.
3. Push the softkey labeled **5080A CAL**.

Note

The CALIBRATION SWITCH on the Calibrator rear panel can be in either position when you begin calibration. It must be set to ENABLE to store the correction factors into nonvolatile memory.

After you push the **5080A CAL** softkey, the procedure works as follows:

1. The Calibrator automatically programs the outputs and prompts you to make external connections to applicable measurement instruments.
2. The Calibrator then goes into Operate mode, or prompts you to place it into Operate mode.
3. You are then prompted to type in the value read on the measurement instrument.

Note

To redo a step, push the **OPTIONS**, *and* **BACK UP STEP** *softkey, or skip over a step by pressing the* **SKIP STEP** *softkey*

DC Volts Calibration (NORMAL Output)

The equipment shown in Table 32 is necessary for calibration of the dc volts function. (The equipment is also listed in the consolidated table, Table 31.)

Table 32. Test Equipment Required for DC Volts Calibration

Quantity	Manufacturer	Model	Equipment
1	Fluke	8508A	Reference Multimeter

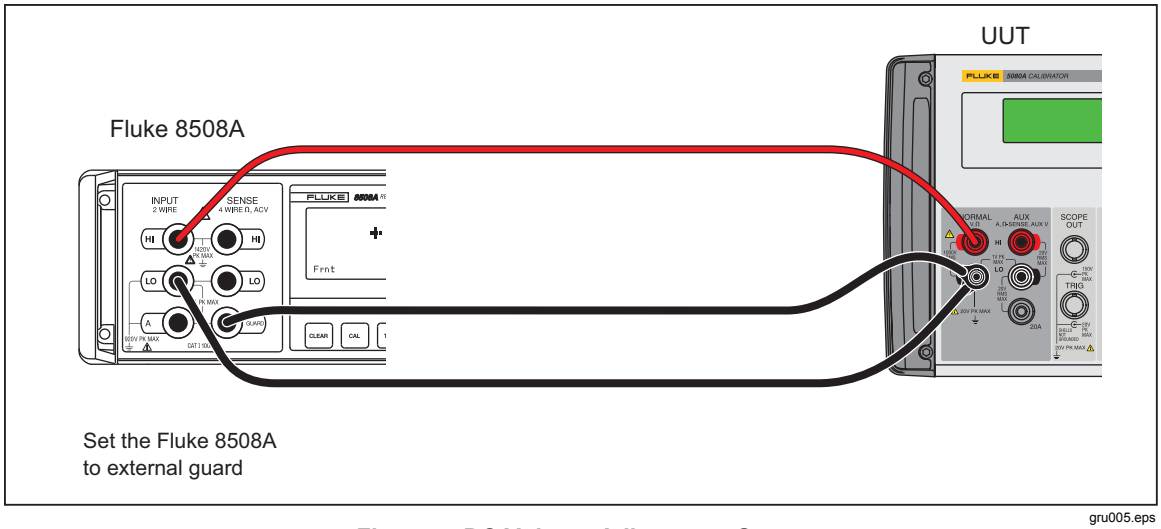
To calibrate the dc voltage function:

1. Check that the UUT (Unit Under Test) is in Standby.
2. Start calibration as instructed in the Start Calibration section.
3. Perform an internal DC Zeros Calibration as prompted.
4. Connect the test equipment as shown in Figure 7.
5. Measure and type in the values into the UUT for steps 1 through 9 in Table 33 as prompted. You Disconnect and reconnect the DMM as prompted during these steps.

DC Voltage adjust completed.

Table 33. Calibration Steps for DC Volts

Step	5080A Output (NORMAL)
1	1.000000 V
2	3.000000 V
3	-1.000000 V
4	-3.000000 V
5	0.0000 mV
6	300.0000 mV
7	30.00000 V
8	300.0000 V
9	1000.000 V



gru005.eps

Figure 7. DC Voltage Adjustment Setup

AC Volts Calibration (NORMAL Output)

The equipment shown in Table 34 is necessary for calibration of the ac volts function. (The equipment is also listed in the consolidated table, Table 31.)

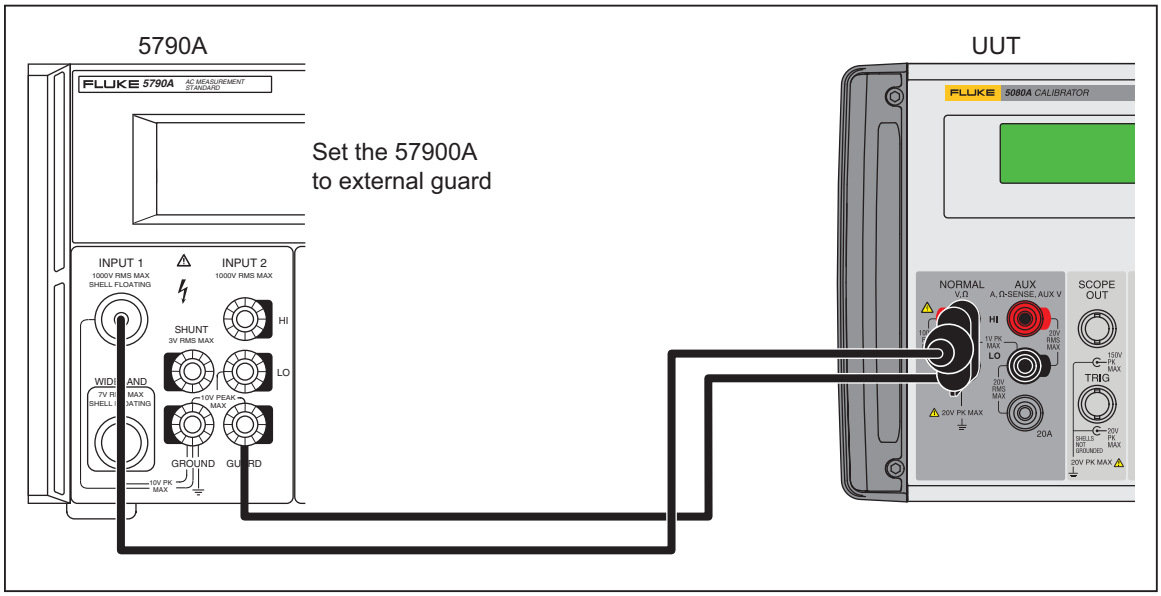
Table 34. Test Equipment Required for AC Volts Calibration

Quantity	Manufacturer	Model	Equipment
1	Fluke	PN 900394	Type N to dual banana adapter
1	Fluke	5790A	AC Measurement Standard

To calibrate the ac voltage function:

1. Measure the 5080A output through Input 1 of a Fluke 5790A AC Measurement Standard. Use a Type N to dual banana adapter as shown in Figure 8.
2. Type in the measured values into the Calibrator for each step in Table 35 as prompted.

AC Voltage adjust completed.



gru104.eps

Figure 8. AC Voltage Adjustment Setup

Table 35. Calibration Steps for AC Volts

Steps	5080A Output (NORMAL)	
	Amplitude	Frequency
1	3.2999 V	100.00 Hz
2	0.3300 V	100.00 Hz
3	30.000 mV	100.00 Hz
4	300.000 mV	100.00 Hz
5	30.0000 V	100.00 Hz
6	300.000 V	100.00 Hz
7	1000.00 V	100.00 Hz

DC Current Calibration

The equipment shown in Table 36 is necessary for calibration of the dc current function. (The equipment is also listed in the consolidated table, Table 31.)

You must use the calibrated dc current function of the Calibrator later to prepare for ac calibration. Because of this, you must save the dc current constants after dc current calibration and exit calibration, then resume calibration. The dc current calibration procedure shows how to save, exit, and resume calibration.

Table 36. Test Equipment Required for DC Current Calibration

Quantity	Manufacturer	Model	Equipment
1	Fluke	8508A	DMM
1	Fluke	742A-1k	Resistance Standard, 1 kΩ
1	Fluke	742A-100	Resistance Standard, 100 Ω
1	Fluke	742A-10	Resistance Standard, 10 Ω
1	Fluke	742A-1	Resistance Standard, 1 Ω
1	Guildline	9230	0.01 Ω shunt

To calibrate the dc current function:

1. Make sure you zero each range before each DMM measurement.
2. Make sure the UUT is in standby.
3. Set the DMM to the dc voltage function.
4. Connect the DMM and 742A-1k Resistance Standard to the UUT as shown in Figure 9.
5. On the first dc current calibration point in Table 37, wait for the output to settle, record the DMM voltage measurement, and compute the UUT current output with the certified resistance value of the 742A.
6. Type in the computed value into the UUT.
7. Go to the subsequent calibration point, make sure that the UUT is in standby, and disconnect the 742A.
8. Redo steps 3 through 6 above with the resistance standard or current shunt specified for each calibration point in Table 37.
9. Exit calibration and save the calibration constants changed so far through the front panel menus or the CAL_STORE remote command.

Table 37. Calibration Steps for DC Current

Step	5080A Output (AUX, HI, LO)	Shunt to Use
1	300.000 µA	Fluke 742A-1k 1 kΩ Resistance Standard
2	3.00000 mA	Fluke 742A-100 100 Ω Resistance Standard
3	30.000 mA	Fluke 742A-10 10 Ω Resistance Standard
4	300.000 mA	Fluke 742A-1 1 Ω Resistance Standard
5	1.9000 A	Guildline 9230 0.01 Ω shunt

Table 37. Calibration Steps for DC Current (cont.)

Step	5080A Output (AUX HI, LO)	Shunt to Use
	20A, LO	
6	10.0000 A	Guildline 9230 0.01 Ω shunt

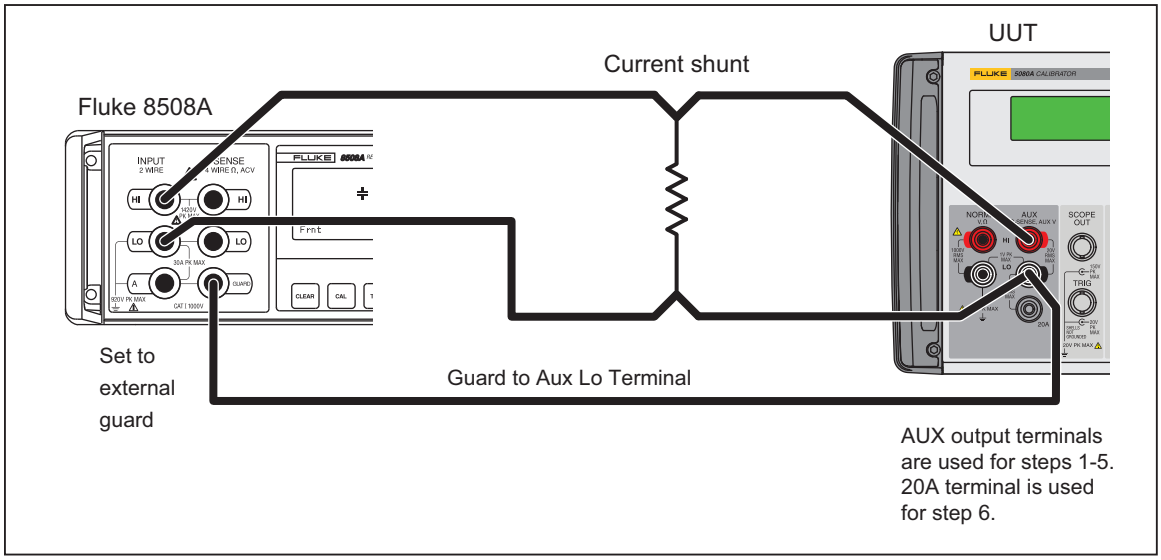


Figure 9. DC Current Adjustment Setup

AC Current Calibration

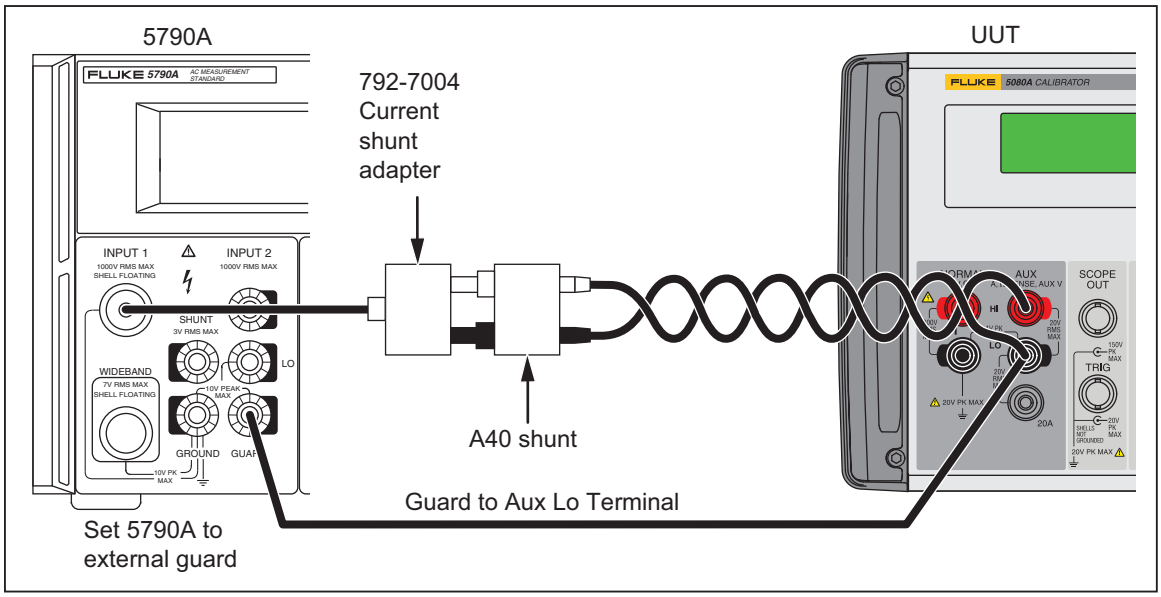
Note

DC Current must be calibrated before you continue with the ac current calibration.

The ac current calibration uses a number of current shunts that are necessary for dc characterization before they can be used. DC characterization can be done with the Calibrator, if you do the full 5080A dc current calibration first. When you do a dc characterization, data is obtained for each of the ac current levels needed by the ac current calibration procedure. For example, if a shunt is used for 0.33 mA ac and 3.3 mA ac calibrations, data must be obtained at 0.33 mA dc and 3.3 mA dc.

To characterize the shunt:

1. Connect the test equipment as shown in Figure 10.



gru007.eps

Figure 10. Connections for Calibrating AC Current with a Fluke A40 Shunt

2. For each amplitude shown in Table 38, apply the equivalent +(positive) and -(negative) dc current from the 5080A.
3. Calculate the actual dc characterization value with this formula:

$$\frac{((+\text{Value}) - (-\text{Value}))}{2}$$

The time between the dc characterization of a current shunt and the start calibration should be kept to a minimum. To decrease this time, each shunt is characterized as it is needed. As the ac current calibration procedure is done, it must be temporarily aborted each time a new shunt value is necessary. After the necessary shunt is characterized, the calibration procedure is continued at the previous point with the newly characterized shunt.

The example that follows demonstrates this procedure:

1. Do the dc current calibration procedure.
2. Select the first current shunt (A40-10 mA) shown in Table 38.
3. Do a dc characterization of the shunt at the amplitude specified in the table (as demonstrated above).
4. Start the ac current calibration procedure and push the softkey labeled **SKIP STEP** to go to the step(s) that use the newly characterized shunt.
5. Put the 5080A in OPERATE and measure the ac voltage across the shunt.
6. Calculate the ac current from the data derived from the dc characterization and the ac correction factors supplied by the shunt manufacturer.
7. Type in the ac current value in the Calibrator.
8. Continue the calibrator until Table 38 is complete.

There are five important remote commands used in this procedure.

- CAL_START MAIN, AI — Start the ac current calibration procedure.
- CAL_SKIP — Skip to the applicable calibration step.
- CAL_ABORT — Used to exit calibration between steps.

- CAL_NEXT Do the subsequent calibration step.
- CAL_STORE Store the new calibration constants

Because of the complexity of this procedure, it is recommended that the calibration steps be automated. See Figure 11 for a MET/CAL code fragment that demonstrates how the code can be written. Figure 11 is an example only to be used for a demonstration.

The equipment shown in Table 38 is necessary to do the calibration steps in Table 39 for the ac current function.

Table 38. Test Equipment Required for AC Current Calibration

Quantity	Manufacturer	Model	Equipment
1	Fluke	PN 900394	Type N to dual banana adapter
1	Fluke	5790A	AC Measurement Standard
1	Fluke	A40-10 mA	Current Shunt, 10 mA
1	Fluke	A40-200 mA	Current Shunt, 200 mA
1	Fluke	A40-2A	Current Shunt, 2 A
1	Fluke	A40A-20A	Current Shunt, 20 A
1	Fluke	792-7004	A40 Current Shunt, Adapter

Table 39. Calibration Steps for AC Current

Steps	5080A Output (AUX HI, LO)		
	Amplitude	Frequency	Shunt to Use
1	3.2999 mA	55.00 Hz	Fluke A40 10 mA
2	0.3300 mA	55.00 Hz	Fluke A40 10 mA
3	3.0000 mA	55.00Hz	Fluke A40 10 mA
4	3.00000 mA	1.000 kHz	Fluke A40 10 mA
5	300.0uA	55.00 Hz	Fluke A40 10 mA
6	300.0uA	1.000 kHz	Fluke A40 10 mA
7	30.000 mA	55.00 Hz	Fluke A40 200 mA
8	30.000 mA	1.000 kHz	Fluke A40 200 mA
9	300.000 mA	55.00 Hz	Fluke A40 2 A
12	300.000 mA	1.000 kHz	Fluke A40 2 A
13	1.9000 A	55.00 Hz	Fluke A40 2 A
15	1.9000 A	1.000 kHz	Fluke A40 2 A
	AUX 20A, LO		
16	10.0000 A	55.00 Hz	Fluke A40A 20 A
17	10.0000 A	1.000 kHz	Fluke A40A 20 A

```
Fluke Corporation - Worldwide Support Center MET/CAL Procedure
================================================================================
INSTRUMENT:            Sub Fluke 5080A ACI ADJ
DATE:                  03-Oct-2011
AUTHOR:                Gary Bennett, Metrology Specialist
REVISION:              0.6
ADJUSTMENT THRESHOLD:  70%
NUMBER OF TESTS:       1
NUMBER OF LINES:       487
CONFIGURATION:         Fluke 5790A
================================================================================
 STEP    FSC    RANGE NOMINAL        TOLERANCE     MOD1        MOD2  3  4 CON
# 10 Sep 98 changed Cal_Info? commands to Out? and checked for 10A -
# needs cal_next to get past display; check for 0 out when ACI is done.
#
  1.001  ASK-   R   Q N                   U         C           F        W

  1.002  HEAD         AC CURRENT ADJUSTMENT
# Set M[10] to 3mA initially
  1.003  MATH         M[10] = 0.003
# Reset UUT - get it out of calibration mode.
  1.004  IEEE         *CLS;*RST; *OPC?[I]
  1.005  IEEE         ERR?[I$][GTL]
  1.006  MATH         MEM1 = FLD(MEM2,1,",")
  1.007  JMPT
  1.008  IEEE         CAL_SW?[I][GTL]
  1.009  MEME
  1.010  JMPZ         1.012
  1.011  JMP          1.015
  1.012  HEAD         WARNING! CALIBRATION SWITCH IS NOT ENABLED.
  1.013  DISP         The UUT CALIBRATION  switch is in NORMAL.
  1.013  DISP
  1.013  DISP         The switch MUST be in ENABLE to store the
  1.013  DISP         new calibration constants.
  1.013  DISP
  1.013  DISP         Select ENABLE, then press "Advance" to
  1.013  DISP         continue with the calibration process.
  1.014  JMP          1.008

# Reset 5790A standard.
  1.015  ACMS         *
  1.016  5790         *                                              S
  1.017  HEAD         DCI References
  1.018  PIC          552A410m
  1.019  IEEE         OUT 3.2999mA, 0HZ; OPER; *OPC?[I][GTL]
  1.020  IEEE         [D30000][GTL]

  1.021  ACMS                                                 G

  1.022  5790         A                                      SH    N  2W
  1.023  MATH         M[17] = MEM
# Apply nominal -DC Current to A40
  1.024  IEEE         OUT -3.2999mA, 0HZ; OPER; *OPC?[I][GTL]
  1.025  IEEE         [D5000][GTL]
  1.026  ACMS                                                 G
  1.027  5790         A                                      SH    N  2W
  1.028  MATH         M[17] = (ABS(MEM) + M[17]) / 2

  1.029  IEEE         OUT .33mA, 0HZ; OPER; *OPC?[I][GTL]
  1.030  IEEE         [D15000][GTL]
  1.031  ACMS                                                 G
  1.032  5790         A                                      SH    N  2W
  1.033  MATH         M[18] = MEM
```

Figure 11. Sample MET/CAL Program

```
# Apply nominal -DC Current to A40
  1.034  IEEE         OUT -.33mA, 0HZ; OPER; *OPC?[I][GTL]
  1.035  IEEE         [D5000][GTL]
  1.036  ACMS                                                  G
  1.037  5790         A
  1.038  MATH         M[18] = (ABS(MEM) + M[18]) / 2
  1.039  IEEE         OUT 3mA, 0HZ; OPER; *OPC?[I][GTL]
  1.040  IEEE         [D15000][GTL]
  1.041  ACMS                                                  G
  1.042  5790         A                                       SH    N  2W
  1.043  MATH         M[19] = MEM
# Apply nominal -DC Current to A40
  1.044  IEEE         OUT -3mA, 0HZ; OPER; *OPC?[I][GTL]
  1.045  IEEE         [D5000][GTL]
  1.046  ACMS                                                  G
  1.047  5790         A                                       SH    N  2W
  1.048  MATH         M[19] = (ABS(MEM) + M[19]) / 2
  1.049  IEEE         CAL_START MAIN,AI; *OPC?[I][GTL]
  1.050  IEEE         CAL_NEXT; *OPC?[I][GTL]
  1.051  HEAD         Calibrating 3.2999mA @ 100Hz
# cal_next is required for initial start.
# after sending AIG330U if you send cal_next 5520A tries to
# start the cal at that time.

# 3.2999mA @ 100Hz
  1.052  IEEE         *CLS;OPER; *OPC?[I][GTL]
  1.053  IEEE         [D5000][GTL]
  1.054  ACMS                                                  G
  1.055  5790         A                                       SH    N  2W


# Calculate difference between the average value of both polarities of DC
# Current and the applied AC Current.
  1.056  MATH         M[21] = 0.0032999 - (.0032999 * (1 - (MEM / M[17])))
# Determine measurement frequency to retrieve correct AC-DC difference value.
  1.057  IEEE         OUT?[I$][GTL]
  1.058  MATH         M[2] = FLD(MEM2,5,",")
# Retrieve AC-DC difference from data file named "A40-10mA"
  1.059  DOS          get_acdc A40-10mA
  1.060  JMPT         1.064
  1.061  OPBR         An error occurred during get_acdc
  1.061  OPBR         Press YES to try again or NO to terminate.
  1.062  JMPT         1.059
  1.063  JMP          1.231


# Correct the calculated value of AC Current by adding the AC-DC difference
# of the A40-series shunt used at the frequency under test
  1.064  MATH         MEM = (M[21] * MEM) + M[21]
# Store corrected value into the UUT
  1.065  IEEE         CAL_NEXT [MEM]; *OPC?[I][GTL]
  1.066  IEEE         ERR?[I$][GTL]
  1.067  MATH         MEM1 = FLD(MEM2,1,",")
  1.068  JMPT         1.231
# 'Ask' UUT for next value to calibrate
  1.069  IEEE         CAL_REF?[I][GTL]
```

Figure 11. Sample MET/CAL Program (cont)

DC Volts Calibration (AUX Output)

To calibrate the auxiliary dc voltage function, use the same procedure as shown for the normal dc voltage output, but use the AUX HI and LO terminals on the UUT. Table 40 shows the calibration steps for AUX dc volts.

Table 40. Calibration Steps for AUX DC Current

Steps	5080A Output (Aux)
1	300.00 mV
2	3.0000 V
3	7.000 V

AC Volts Calibration (AUX Output)

To calibrate the auxiliary ac voltage function, use the same procedure as shown for the normal ac voltage output, but use the AUX HI and LO terminals instead on the UUT. Table 41 shows the calibration steps for AUX ac volts.

Table 41. Calibration Steps for AUX AC Volts

Steps	5080A Output (AUX)	
	Amplitude	Frequency
1	300.00 mV	55 Hz
2	300.00 mV	1 kHz
3	3.0000 V	55 Hz
4	3.0000 V	1 kHz
5	5.0000 V	55 Hz
6	5.000 V	1 kHz

Resistance Calibration

The equipment shown in Table 42 is necessary for calibration of the resistance function.

Table 42. Test Equipment Required for Resistance Calibration

Quantity	Manufacturer	Model	Equipment
1	Fluke	8508A	DMM

To calibrate the resistance function:

1. Use the Fluke 8508A DMM for each measurement.
2. Make sure the UUT (Unit Under Test) is in Standby.
3. Follow the prompt on the Control Display to connect the DMM to the UUT for 4-wire ohms measurement as shown in Figure 12.
4. Push the **GO ON** softkey and wait for the internal calibration steps to complete.
5. When the internal calibration steps are done, measure and type in the values into the UUT for calibration steps 1 through 12 in Table 43 as prompted.
6. Connect the UUT to the DMM in a 2-wire ohms configuration as shown in Figure 13.
7. Measure and type in the values into the UUT for calibration steps 13 through 18 in Table 43 as prompted.
8. Make sure the UUT is in Standby and disconnect the test equipment.

Table 43. Calibration Steps for Resistance

Step	5080A Output (4-Wire Ohms, NORMAL and AUX)
1	1.0000 Ω
2	1.9000 Ω
3	10.000 Ω
4	19.000 Ω
5	100.000 Ω
6	190.000 Ω
7	1.00000 kΩ
8	1.90000 kΩ
9	10.0000 kΩ
10	19.0000 kΩ
11	100.000 kΩ
12	190.000 kΩ
	2-Wire Ohms, NORMAL
13	1.00000 MΩ
14	1.90000 MΩ
15	10.0000 MΩ
16	19.000 MΩ
17	100.00 MΩ
18	190.00 MΩ

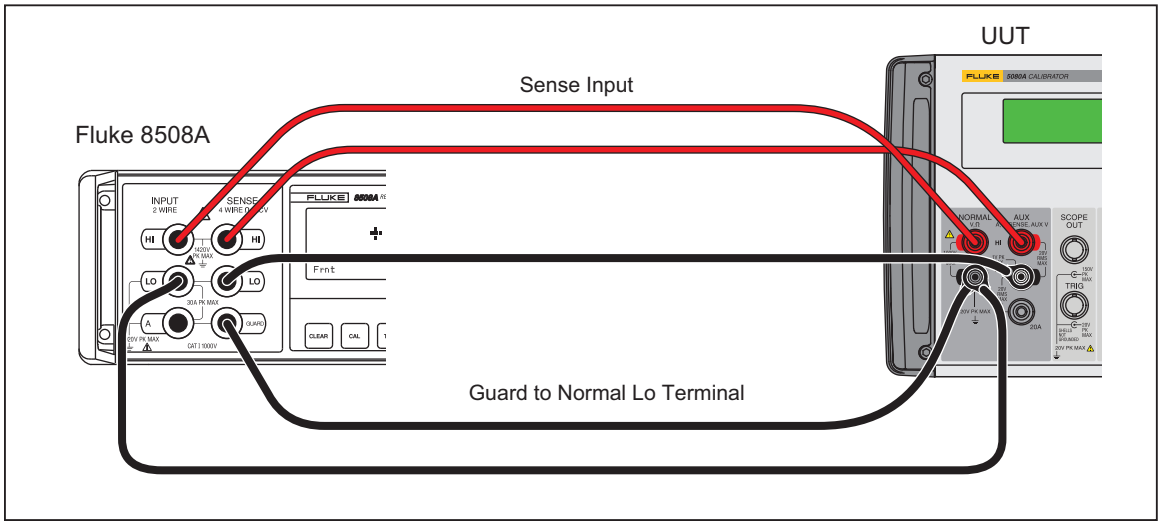


Figure 12. Connections for Calibrating 4-Wire Resistance

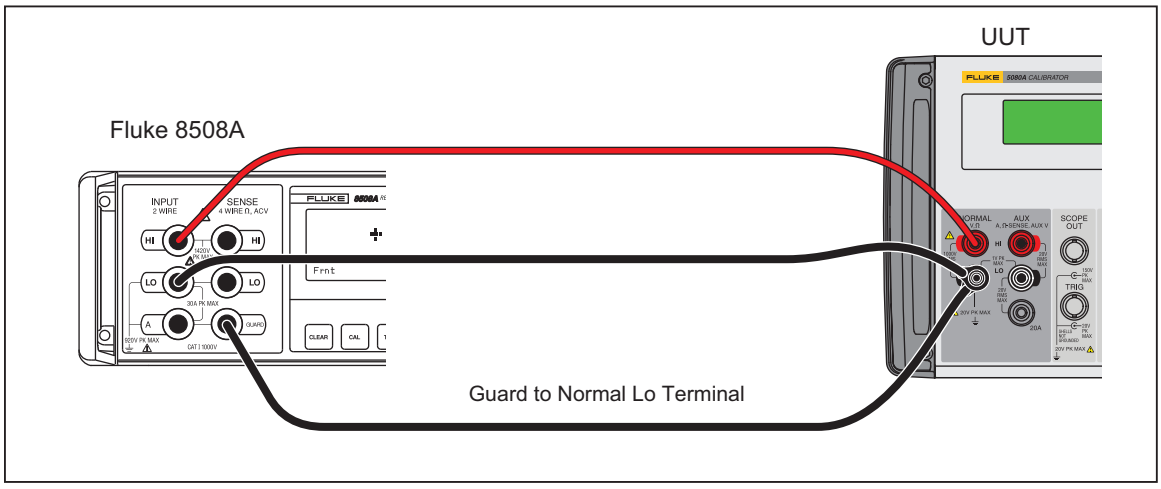


Figure 13. Connections for Calibrating 2-Wire Resistance

SC200 Calibration

The SC200 is an oscilloscope calibration option for the 5080A. The sections that follow explain how to calibrate the SC200 Oscilloscope Option.

Note

Although this procedure will calibrate the SC200 option in the field, it is recommended the calibrator be sent to Fluke for calibration and verification.

It is recommended that you review all of the procedures in this section to make sure you have the resources to complete the calibration before you start.

Required Test Equipment

All test equipment used to calibrate the SC200 option must be calibrated and in their specified environment. To keep traceability, all equipment must be certified traceable. Refer to the operators manual of each piece of test equipment for operation instructions.

Table 44 shows the test equipment required to verify and calibrate the SC200 option.

Table 44. Required Test Equipment for SC200 Calibration

Test Equipment	Recommended Model	Minimum Specifications	
Wave Generator, Edge Amplitude Calibration, AC Voltage Verification			
Digital Multimeter	Hewlett Packard 3458A	Voltage	1.8 mv to ±105 V p-p uncertainty: 0.06 %
		Edge	4.5 mV to 2.75 V p-p uncertainty: 0.06 %
Adapter	Pomona #1269	BNC(f) to Double Banana Plug	
Termination		Feedthrough 50 Ω, +1 % (used with Edge Amplitude Calibration and AC Voltage Verification)	
BNC Cable	(supplied with SC200)		

Table 44. Required Test Equipment for SC200 Calibration (cont.)

Test Equipment	Recommended Model	Minimum Specifications	
Edge Rise Time and Aberrations Verification			
High Frequency Digital Storage Oscilloscope	Tektronix 11801 with SC-22/26 sampling head, or Tektronix TDX 820 with 8 GHz bandwidth	Frequency	2 GHz
		Resolution	4.5 mV to 2.75 V
Attenuator	Weinschel 9-10 (SMA) or Weinschel 18W-10 or equivalent	10 dB, 3.5 mm(m/f)	
Adapter		BNC(f) to 3.5 mm(m)	
BNC Cable	(supplied with SC200)		
Leveled Sine Wave Amplitude Calibration and Verification			
AC Measurement Standard	Fluke 5790A	Range	5 mV p-p to 5.5 V p-p
		Frequency	50 kHz
Adapter	Pomona #1269	BNC(f) to Double Banana Plug	
Termination		Feedthrough 50 Ω, +1 %	
BNC Cable	(supplied with SC200)		
DC and AC Voltage Calibration and Verification, DC Voltage Verification			
Digital Multimeter	Hewlett Packard 3458A		
Adapter	Pomona #1269	BNC(f) to Double Banana Plug	
Termination		Feedthrough 50 Ω, +1 %	
BNC Cable	(supplied with SC200)		
Leveled Sine Wave Frequency Verification			
Frequency Counter	PM 6680 with Option (PM 9621, PM 9624, or PM 9625) and (PM 9678)	50 kHz to 350 MHz, <1.6 ppm uncertainty	
Adapter	Pomona #3288	BNC(f) to Type N(m)	
BNC Cable	(supplied with SC200)		
Leveled Sine Wave Flatness (Low Frequency) Calibration and Verification			
AC Measurement Standard	Fluke 5790A with 03 option	Range	5 mV p-p to 5.5 V p-p
		Frequency	50 kHz to 10 MHz
Adapter	Pomona #3288	BNC(f) to Type N(m)	
BNC Cable	(supplied with SC200)		
Leveled Sine Wave Harmonics Verification			
Spectrum Analyzer	Hewlett Packard 8590A		
Adapter	Pomona #3288	BNC(f) to Type N(m)	
BNC Cable	(supplied with SC200)		

Table 44. Required Test Equipment for SC200 Calibration (cont.)

Test Equipment	Recommended Model	Minimum Specifications	
Edge Frequency, AC Voltage Frequency Verification			
Frequency Counter	PM 6680 with PM 9678 option	20 ms to 150 ns, 10 Hz to 10 MHz: <1.6 ppm uncertainty	
BNC Cable	(supplied with SC200)		
Edge Duty Cycle			
Frequency Counter	PM 6680		
BNC Cable	(supplied with SC200)		
Leveled Sine Wave Flatness (High Frequency) Calibration and Verification			
Power Meter	Hewlett Packard 437B	Range	-42 to +5.6 dBm
		Frequency	10 – 300 MHz
Power Sensor	Hewlett Packard 8482A	Range	-20 to +19 dBm
		Frequency	10 – 300 MHz
Power Sensor	Hewlett Packard 8481A	Range	-42 to -20 dBm
		Frequency	10 – 300 MHz
30 dB Reference Attenuator	Hewlett Packard 11708A (supplied with HP 8481D)	Range	30 dB
		Frequency	50 MHz
Adapter	Hewlett Packard PN 1250-1474	BNC(f) to Type N(f)	
BNC Cable	(supplied with SC200)		
Leveled Sine Wave Frequency, Time Marker Verification			
Frequency Counter	PM 6680 with Option (PM 9621, PM 9624, or PM 9625) and (PM 9678)	2 ns to 5 s, 50 kHz to 500 MHz: <1.6 ppm uncertainty	
Adapter	Pomona #3288	BNC(f) to Type N(m)	
BNC Cable	(supplied with SC200)		
Wave Generator Verification			
AC Measurement Standard	Fluke 5790A with 03 option	Range	1.8 mV p-p to 55 V p-p
		Frequency	10 Hz to 100 kHz
Adapter	Pomona #1269	BNC(f) to Double Banana Plug	
Termination		Feedthrough 50 Ω, +1 %	
BNC Cable	(supplied with SC200)		

Calibration Steps

Note

The Calibrator mainframe must be calibrated before you start to calibrate the SC200 option.

Adjustments can be necessary after repair of the SC200. Hardware adjustments must be done before calibration. You must calibrate the option after hardware adjustments. See the Hardware Adjustment section.

Note

The Calibrator mainframe must complete its warm-up period and the SC200 must be turned on (SCOPE button green LED on) for a minimum of five minutes before you start the calibration. The mainframe warm-up period must be a minimum of two times the Calibrator off time or a maximum of 30 minutes.

To calibrate the SC200 through the front panel:

1. Push SETUP.
2. Push the CAL softkey.
3. Push the SCOPE CAL softkey.

Note

If you start the SCOPE CAL mode before the five minutes after you push SCOPE*, an error message will show in the display.*

The Calibrator first prompts to calibrate the dc voltage function. Push the **OPTIONS** and **NEXT SECTION** softkeys until the function to calibrate shows in the display.

Calibration and Verification of the Square Wave Functions

The SC200 ac voltage and edge functions have square wave voltages that must be calibrated and made sure they equal specifications.

The Hewlett Packard 3458A is setup as a digitizer to measure the peak-to-peak value of the signal. Set the meter to the dcv function and the different analog-to-digital integration times and trigger commands to measure the topline and baseline of the square wave signal.

Note

You can set the different meter set ups into the HP3458A user defined keys to quickly change the meter setup. For example, to make topline measurements at 1 kHz, you can set the meter to NPLC .01, LEVEL 1, DELAY<SL> .0002, TRIG LEVEL. To find the average of multiple measurements, you can program one of the user keys to MATH OFF, MATH STAT<SL> and then use the RMATH MEAN function to recall the average or mean value of the readings.

Table 45 is a list of parameters you set in to the HP3458A for the square wave and edge calibration and verification.

Table 45. AC Square Wave Voltage and Edge Settings for HP3458A

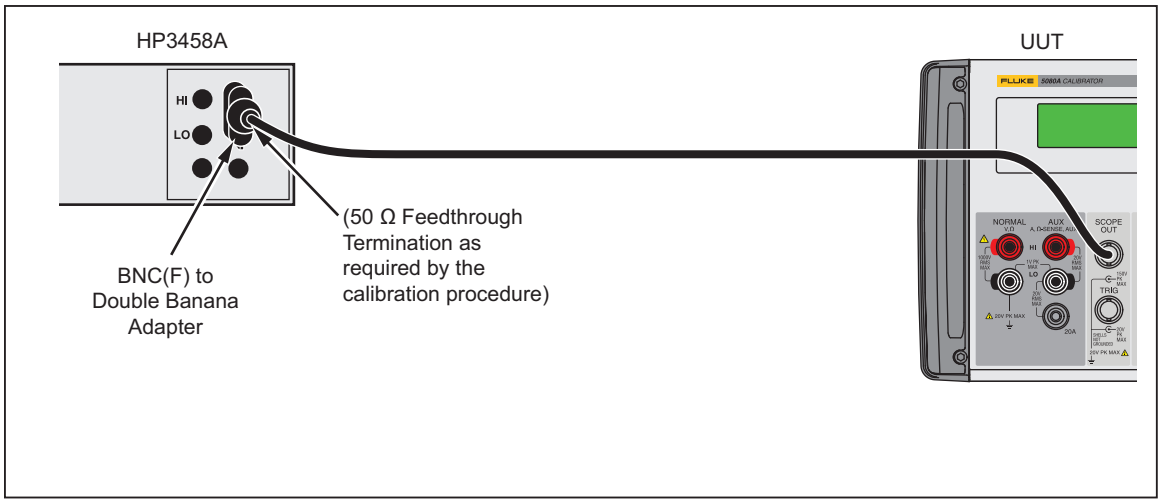
Voltage Input Frequency	HP 3458A Settings		
	NPLC	Delay (topline)	DELAY (baseline)
10 Hz	1	0.02 s	0.07 s
100 Hz	0.1	0.002 s	0.007 s
1 kHz	0.01	0.0002 s	0.0007 s
5 kHz	0.002	0.00004 s	0.00014 s
10 kHz	0.001	0.00002 s	0.00007 s

Note

When you measure a signal that is >1 kHz, lock the HP3458A to the 1 V range. The meter can have 0.05 % to 0.1 % peaking on the 100 mV range.

DC Voltage Calibration

1. Connect the Calibrator to the HP3458A as shown in Figure 14.



gru110.eps

Figure 14. Connections for AC Square Wave Voltage and Edge Calibration

2. Set the Calibrator mainframe in Scope Cal mode, dc voltage section.
3. Set the HP3458A to DCV, AutoRange, NPLC=10, FIXEDZ=on.
4. Push the **GO ON** softkey.
5. Make sure the HP3458A measurement is 0.0 Vdc + 100 LiV.
6. Push the **GO ON** softkey.

Note

The Calibrator output goes to standby when the output is more than 33 volts. Push OPR *to turn on the output.*

7. After the HP3458A measurement becomes stable, type the measurement into the Calibrator and push ENTER.

Note

The Calibrator shows a warning message if the typed in measurement is out of limit. Look at the measurement again and re-enter the value carefully, with the correct multiplier (m, k, n, p, etc.). If the warning continues to show in the display, Calibrator repair can be necessary.

8. Do steps 6 and 7 again until **The next steps calibrate SC200ACV** shows in the display.
9. Push the **OPTIONS**, then **STORE CONSTS** softkeys to keep the calibration constants.

AC Square Wave Voltage Calibration

The equipment and setup is the same for ac voltage calibration as the dc voltage calibration. There are different parameters for the HP3458A multimeter.

If "The next steps calibrates SC200 ACV" is not already shown in the Calibrator display, push the **OPTIONS** and then **NEXT SECTION** softkeys until it does show.

- Push the **GO ON** softkey.
- Connect the Calibrator to the HP3458A as shown in Figure 14.
- Set the HP3458A to DCV, NPLC=.01, LEVEL 1, TRIG LEVEL, and the DELAY to .0002 to measure the top part of the waveform (topline). Change the DELAY to .0007 to measure the lower part of the waveform (baseline). Set the meter range to a range that shows the maximum resolution for the topline measurements. Use this same range for the related baseline measurements at each step.
- At each calibration step, read measurements for a minimum of two seconds, with the HP 3458A MATH function to get the average or mean value.

  The "true amplitude" of the waveform is the difference between the topline and baseline measurements, with a correction for the load resistance error. To make this correction, multiply the measurements by (0.5 * (50 + Rload)/Rload), where Rload = actual feedthrough termination resistance.

Note

The Calibration mainframe will warn when the typed in value is out of limits. If this warning occurs, inspect the setup and carefully type in the measurement again with the correct multiplier (m, u, n, p, etc.). If the warning continue to show in the display, repair can be necessary.

- Do step 4 again until the Calibrator mainframe display shows **WAVEGEN CAL** as the subsequent step. Push the **OPTIONS**, then the **STORE CONSTS** softkeys to keep the new calibration constants.

Edge Amplitude Calibration

To do an Edge Amplitude calibration:

1. Push the **OPTIONS** and **NEXT SECTION** softkeys until the display shows **Set up to measure fast edge amplitude**.
2. Use the BNC cable and BNC to double-banana adapter to connect the scope out connector of the Calibrator to the HP 3458A as shown in Figure 14.
3. Set the HP 3485A to DCV, NPLC = .01, LEVEL 1, TRIG LEVEL, and the DELAY to 0.0002 to measure the top part (topline) of the waveform. Set the DELAY to 0.0007 to measure the lower part (baseline) of the waveform. Set the meter range to a range that shows the maximum resolution for the topline measurements. Use this same range for the related baseline measurements at each step.

Note

The topline is near 0 V, and the baseline is a negative voltage in the EDGE function.

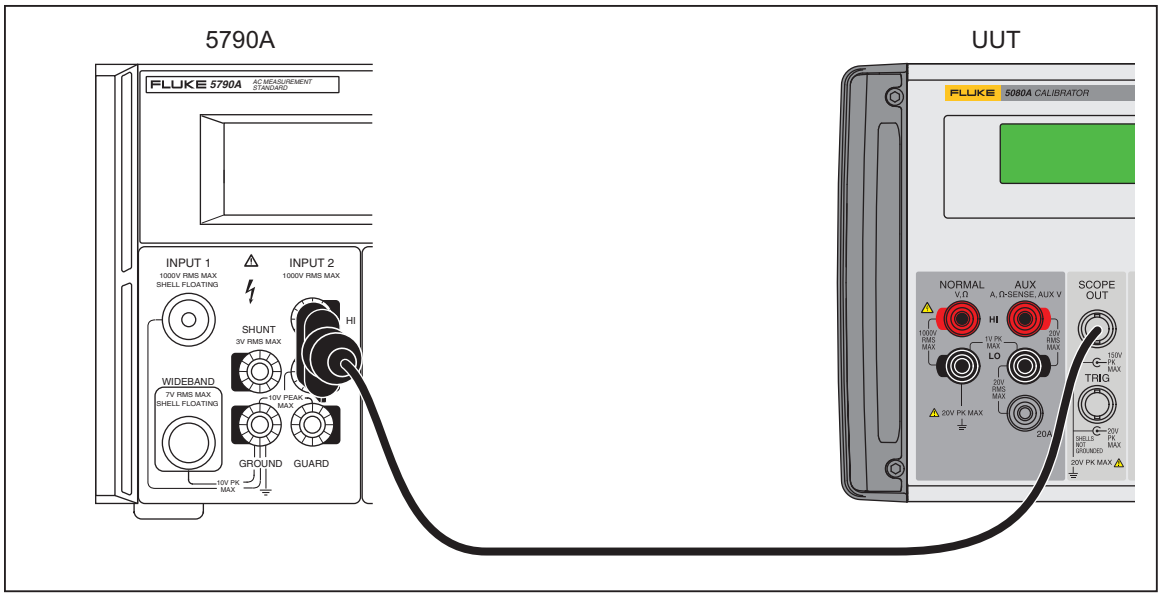
4. At each calibration step, read measurements for a minimum of two seconds, with the HP 3458A MATH function to get the average or mean value.

   The "true amplitude" of the waveform is the difference between the topline and baseline measurements, with a correction for the load resistance error. To make this correction, multiply the measurements by (0.5 * (50 + Rload)/Rload), where Rload = actual feedthrough termination resistance.

Leveled Sine Wave Amplitude Calibration

To do a leveled sine wave amplitude calibration:

1. Push the **OPTIONS** and **NEXT SECTION** softkeys until the display shows **Set up to measure leveled sine amplitude**.
2. Use the BNC cable, double-banana adapter, and the 50 Ω feed-through termination to connect the scope out connector of the Calibrator to the HP 3458A as shown in Figure 15.



gru109.eps

Figure 15. Calibrator Mainframe to 5790A AC Measurement Standard Connections

3. Set the 5790A to autorange, digital filter mode to fast, restart fine, and Hi Res on.
4. Push the **GO ON** softkey.
5. Push [OPR].
6. When you see stable measurements on the 5790A, multiply the measurement by (0.5 * (50 + Rload)/Rload), to correct for the resistance error. Rload is the actual feed-through resistance. Type in the calculated rms measurement through the Calibrator keypad.
7. Push [ENTER].

Note

The Calibration mainframe will warn when the typed in value is out of limits. If this warning occurs, inspect the setup and carefully type in the measurement again with the correct multiplier (m, u, n, p, etc.). If the warning continue to show in the display, repair can be necessary.

8. Do steps 6 and 7 again until the Calibrator mainframe display shows **CALIBRATE LEVELED SINE FLATNESS** as the subsequent step. Push the **OPTIONS**, then the **STORE CONSTS** softkeys to keep the new calibration constants.

Leveled Sine Wave Flatness Calibration

Leveled sine wave flatness calibration is divided into two frequency bands. 50 kHz to 10 MHz (low frequency) and >10 MHz to 200 MHz (high frequency). Test equipment setup is different for each frequency band. Flatness of the low frequency band is made relative to 50 kHz. The high frequency band is relative to 10 MHz.

Leveled sine wave flatness is calibrated at multiple amplitudes. Low and high frequency bands are calibrated at each amplitude. Calibration starts with the low frequency bands, then the high frequency band for the first amplitude, followed by the low frequency band, then the high frequency band for the second amplitude, and so on, until the flatness calibration is complete.

To start the leveled sine wave flatness calibration:

1. Push the **OPTIONS** and **NEXT SECTION** softkeys until **Set up to measure leveled sine flatness** shows in the display.

   For the low frequency band:

2. Connect the Calibrator SCOPE connector to the 5790A Wideband input.
3. Push the **GO ON** softkey.
4. When you see a stable 5790 measurement, push the **Set Ref** softkey on the 5790A to set the 50 kHz reference. If necessary, push the **Clear Ref** softkey on the 5790A before you set a new reference.
5. Push the **GO ON** softkey.
6. Use the knob on the Calibrator to change the amplitude until the 5790A reference deviation is less than 1000 ppm of the 50 kHz reference.
7. Do steps 3 to 6 until the Calibrator display shows a reference frequency of 10 MHz.

   To continue with the high frequency band:

8. Connect the Calibrator SCOPE connector to a power meter and power sensor.
9. Push the **GO ON** softkey.
10. Push the **SHIFT** key on the power meter, then the **FREQ** key, and use the arrow keys to set the cal factor of the power sensor for the frequency shown on the Calibrator display. Make sure the cal factor is correct.
11. Push the **ENTER** key on the power meter.
12. Use the knob on the Calibrator to change the amplitude until the power sensor measurement is less than 0.1 % of the 10 MHz reference.
13. Do steps 9 to 12 until the Calibrator display shows a reference frequency of 50 kHz or the subsequent step is **calibrate pulse width**.
14. Do the low frequency calibration procedure again unless the Calibrator shows the subsequent step is **calibrate pulse width**.

15. Push the **OPTIONS**, then the **STORE CONSTS** softkeys to keep the new calibration constants.

SC200 Hardware Adjustments

You must make hardware adjustments to the leveled sine and edge functions each time the SC200 is repaired. This section contains a list of equipment and recommended models necessary for these procedures. You can use equivalent models if necessary.

Equipment Required

Table 46 is a list of the equipment necessary to make hardware adjustments to the Calibrator.

Table 46. Test Equipment for Hardware Adjustments

Test Equipment	Recommended Model
Extender card	Fluke PN 661865 (5800A-7006K Extender kit)
Oscilloscope and Sampling head	Tektronix 11801 with SD-22/26 or Tektronix TDS 820 with 8 GHz bandwidth
10 dB Attenuator	Weinschel 9-10 (SMA) or Weinschel 18W-10
Spectrum Analyzer	HP 8590A
Cable supplied with SC200	Fluke

You will also need a standard adjustment tool for adjusting the pots and trimmer capacitors.

How to Adjust the Leveled Sine Wave Function

This is one adjustment procedure for the leveled sine wave function that adjusts the harmonics. To adjust the level sine wave function:

1. Set the Calibrator into leveled sine wave mode.
2. Set the Calibrator output to 5.5 V p-p at 50 MHz.
3. Push OPR.
4. Connect the Calibrator to the Spectrum Analyzer.
5. Set the spectrum analyzer so it shows one peak across the horizontal centerline. The far right of the peak is fixed at the far right of the centerline, as shown in Figure 16.
6. Set the spectrum analyzer to the parameters in Table 47.

Table 47. Spectrum Analyzer Parameters

Parameter	Value
Start Frequency	50 MHz
Stop Frequency	500 MHz
Resolution Bandwidth	3 MHz
Video Bandwidth	3 kHz
Reference Level	20 dBm

7. Use the search function on the spectrum analyzer to find the reference signal. The spectrum analyzer display will show the fundamental with the second and third harmonics. This adjustment will set the second harmonic to -34 dBc. The third harmonic can be at -39 dBc or more as shown in Figure 16.

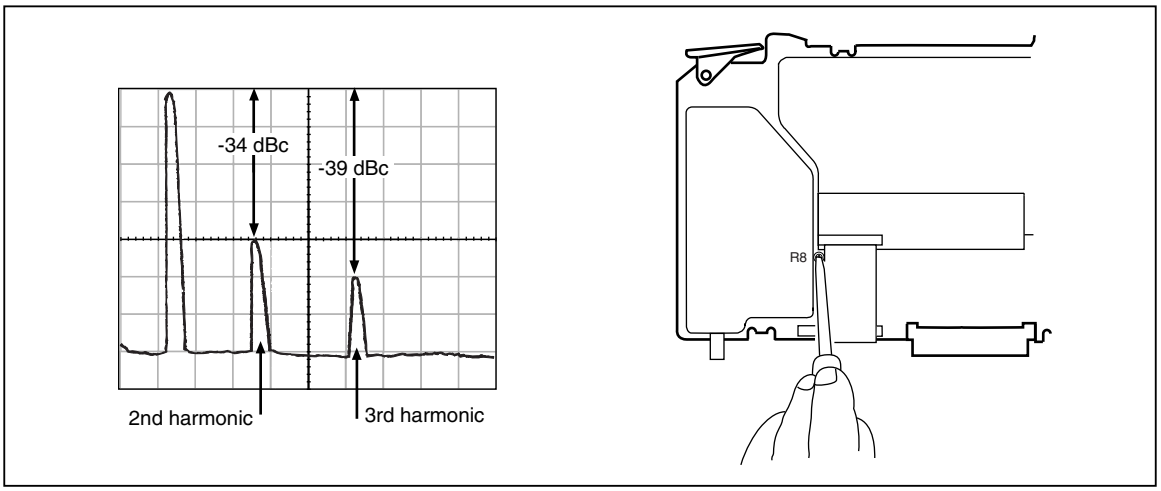


Figure 16. Leveled Sine Wave Harmonics Adjustment

8. If the second and third harmonics are not at the correct dB level, adjust R8 until they are. You can find that you can have the second harmonic at -34 dBc but the third harmonic is less than -39 dBc. Continue to adjust R8 until the third harmonic is at -39 dBc and the second harmonic is ≥ -34 dBc. The second harmonic will change, but there is a point at which both harmonics will be at the correct decibel level.

How to Adjust the Aberrations for the Edge Function

You must adjust the edge aberrations after you repair the edge function.

1. Set the Calibrator into edge mode.
2. Set the Calibrator output to 1 V p-p at 1 MHz.
3. Push OPR.
4. Connect the Calibrator to the oscilloscope.
5. Set the oscilloscope to 1 mV/div vertical scale and 1 ns/div horizontal scale.
6. Set the oscilloscope to show the 90 % point of the edge signal. See Figure 17. Record this voltage (or set to the center of the display) as it will be used as a reference for future adjustments.
7. Set the oscilloscope to show the first 10 ns of the edge signal with the rising edge at the left edge of the oscilloscope display.

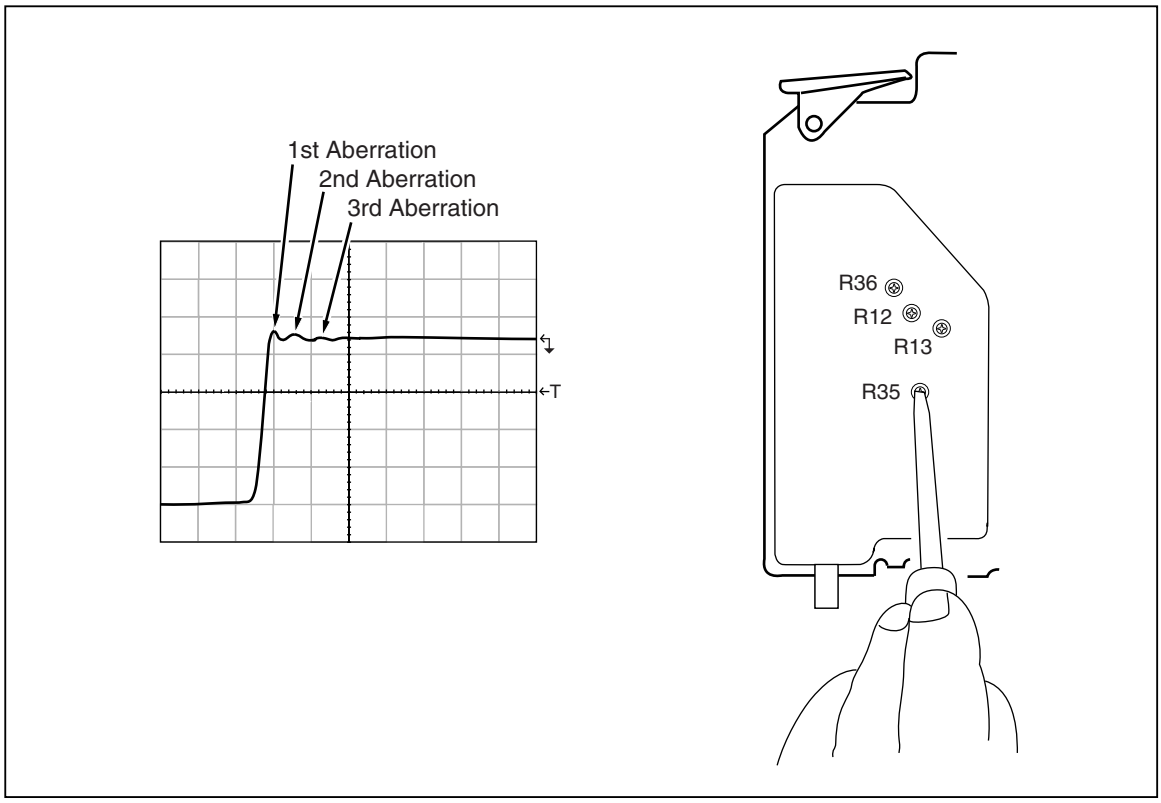


Figure 17. Edge Aberrations Adjustment

8. Adjust R13 to set the edge signal at the 10 ns point to the reference level.
9. Adjust R12 for a flat edge signal. If necessary, adjust R13 again to keep the edge signal at the reference level.
10. Adjust R35 so the first overshoot is the same amplitude as the second aberration.
11. Adjust R36 to center the first two aberrations about the reference level.
12. If necessary, adjust R13 again to keep the edge signal at 10 ns to be at the reference level.
13. Adjust R36, R35, or R12 again to set the same amplitude of the aberrations shown in the display in the first 10 ns to be equally above and below the reference level. Compare the aberrations with the specifications. You can slow the rise time (R35) to decrease the amplitude of the aberrations if necessary.
14. Set the Calibrator output to 2.5 V and the oscilloscope to 2 mV/div vertical scale and examine the aberrations.
15. Remove the 20 dB attenuator from the oscilloscope input. Connect the Calibrator to the oscilloscope input and set the Calibrator to output 250 mV.
16. Set the oscilloscope to 5 mV/div vertical scale and examine the aberrations.
17. Examine the rise time and make sure it is <950 ps ±250 ps at 250 mV, 1 V, and 2.5 V outputs.

MEGOHM Option Calibration

The sections that follow explain how to calibrate the MEGOHM Option.

Note

Although this procedure will calibrate the SC200 option in the field, it is recommended the calibrator be sent to Fluke for calibration and verification.

It is recommended that you review all of the procedures in this section to make sure you have the resources to complete the calibration before you start.

Required Test Equipment

All test equipment used to calibrate the SC200 option must be calibrated and in their specified environment. To keep traceability, all equipment must be certified traceable. Refer to the operators manual of each piece of test equipment for operation instructions.

Table 48 shows the test equipment required to calibrate the MEGOHM option.

Table 48. Test Equipment for MEGOHM Option Calibration

Test Equipment	Recommended Model
Standard Multimeter	Fluke 8508A
Megohmmeter	QuadTech 1865
Calibrator	Fluke 5500A/5520A

Calibration Steps

You can do all the calibration steps or only the steps to some of the functions. For a complete calibration, you must do all the calibration steps in the sequence set in the calibration menu. When you calibrate a function, it is not necessary to calibrate all the ranges specified 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 calibration data that is in the Calibrator can be used again.

Note

You can stop the calibration in the middle of the procedure, but this calibration procedure influences parameters of the Calibrator. Accuracy of the Calibrator is only guaranteed when you do a full calibration.

Low Resistance Source Calibration

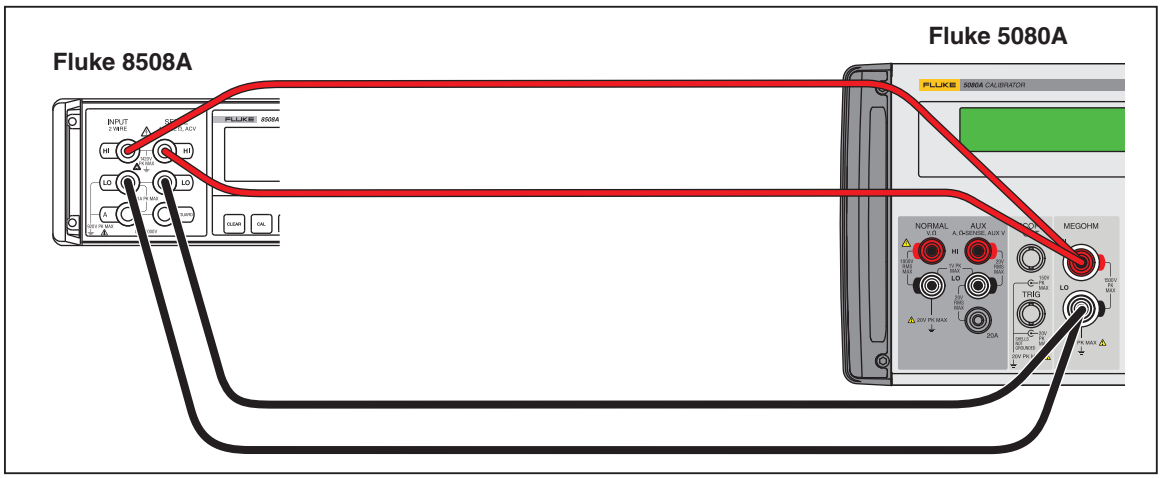
You can calibrate the Low Resistance Source through the front-panel controls. This Calibration does a 4-wire DC resistance measurement on each resistor in the Low Resistance Source function.

Note

Fluke recommends you do a calibration of all resistors to make sure the low resistance source function operates to the specified accuracy.

To calibrate the Low Resistance function:

1. Connect the Fluke 8508A multimeter to the output terminals of the Calibrator, as shown in Figure 18.



gru112.eps

Figure 18. MEGOHM Low Resistance Calibration Connections

2. Select the 4-wire TRUE ohms function on the multimeter.
3. Set the cal enable switch on the rear of the 5080A to the enable position.
4. Push SETUP, then **Cal**, **Cal**, **Option Cal**, and **Megohm Cal**.
5. Do the instructions on Calibrator display and cal points in Table 49. Type in the measured values through the Calibrator keypad.

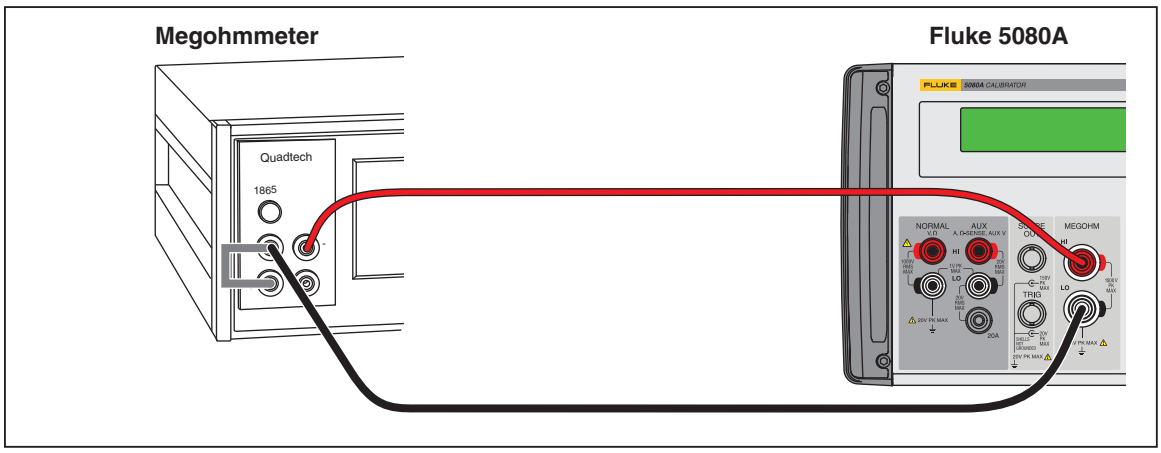
Table 49. MEGOHM Calibration Adjustment Points

Step	MEGOHM Output
1	1.0000 Ω
2	1.8000 Ω
3	3.7000 Ω
4	5.9000 Ω
5	10.000 Ω
6	18.000 Ω
7	37.000 Ω
8	59.000 Ω
9	100.00 Ω
10	180.00 Ω
11	370.00 Ω
12	590.00 Ω
13	1.0000 kΩ
14	1.8000 kΩ
15	3.7000 kΩ
16	5.9000 kΩ
17	35.00 Ω

Table 49. MEGOHM Calibration Adjustment Points (cont.)

Step	MEGOHM Output
18	1.620 kΩ
19	6.810 kΩ
20	11.00 kΩ
21	20.00 kΩ
22	40.00 kΩ
23	77.00 kΩ
24	143.0 kΩ
25	274.5 kΩ
26	510.0 kΩ
27	980.0 kΩ
28	1.825 MΩ
29	3.490 MΩ
30	6.650 MΩ
31	9.760 MΩ
32	20.000 MΩ
33	37.40 MΩ
34	73.20 MΩ
35	133.0 MΩ
36	143.0 MΩ
37	280.0 MΩ
38	549.0 MΩ

6. Disconnect all connections from the Calibrator and the multimeter.
7. Connect the Calibrator to the Quadtech 1865 Megohmeter as shown in Figure 19. Make sure that you REVERSE POLARITY on this setup.



gru111.eps

Figure 19. MEGOHM High Resistance Calibration Connections

8. Set the parameters of the QuadTech 1865 to the values shown in Table 50 and then do the adjustment steps in Table 51.

Table 50. QuadTech 1865 Parameter Values

Parameter	Value
Voltage	500
Charge Time	5
Dwell Time	5
Measure Time	20
Discharge Time	5
Mode	Auto
Number to Average	400

Table 51. MEGOHM Calibration Adjustments

Steps	MEGOHM Output
1	1.070 GΩ
2	2.1 GΩ
3	3.9 GΩ
4	7.1 GΩ
5	11.02 GΩ
6	18.24 GΩ

9. Connect the 5500A/5520A to the MEGOHM terminals and follow the instructions on the Calibrator display until the calibration is completed.

How to Calibrate Through the Remote Interface

To access the standard calibration steps through the remote interface, send the command:

```
CAL_START MAIN
```

To jump to a specified calibration step, add a comma followed by a modifier to specify

an entry point. Table 52 shows the applicable entry points and the modifier to use for each point.

Table 52. Jumping to a Specific Calibration Step in Remote

Entry points for CAL_START MAIN	Modifier
AC Volts	AV
Thermocouple Measuring	TEMPX
DC Current	ICAL
AC Current	AI
AUX DC Volts	V2
AUX AC Volts	AVS
Resistance	R
Capacitance	C
Entry Points for CAL_START FACTORY	**Modifier**
NORMAL Volts and AUX Volts Phase	PHASE
Volts and Current Phase	IPHASE

For example, to jump directly to ac volts calibration, send the command:

```
CAL_START MAIN,AV
```

To go directly to Resistance calibration, send the command:

```
CAL_START MAIN,R
```

These calibration commands can be sent through the IEEE-488 or serial interface. To type in commands through the serial interface:

1. Use a Fluke PM8914 cable to connect the applicable COM port on a PC to the 5080A Serial 1 connector.
2. In Microsoft Windows, start the Terminal program. Set the communications parameters to agree that of the 5080A.
3. Push ENTER. At the prompt, type the calibration command, e.g., CAL_START MAIN.

Remote Commands

The IEEE-488/RS-232 remote calibration commands for the Calibrator are shown in this section alphabetically. This list ignores the * character that is used as the first character in the common commands. The remote commands duplicate works that can be done from the front panel in local operation.

Note

For remote commands pertaining to normal operation of the Calibrator, see the 5080A Operators Manual.

IEEE-488 (GPIB) and **RS-232 Applicability** Each command title shown in this section shares the same remote interface applicability, IEEE-488 (general purpose interface bus, or GPIB) and RS-232 remote operations, and command group: Sequential, Overlapped, and Coupled.

Sequential Commands – Commands executed immediately as they are found in the data

stream are sequential commands. All commands that is not overlapped or coupled are sequential.

Overlapped Commands – Commands that take added time to execute are overlapped commands. The execution time of these commands can overlap the subsequent command.

Coupled Commands – Commands that "couple" in a compound command sequence are coupled commands. Some examples are CUR_POST and OUT. You must take precautions to be sure one command does not disable a second command and cause a fault.

CAL_ABORT

Description Instructs the Calibrator to abort a calibration procedure after current step.

Examples `CAL_ABORT`

CAL_BACKUP

Description Skip to a previous entry point in the current calibration procedure.

Examples `CAL_BACKUP`

CAL_DATE?

Description Returns a calibration date related to stored calibration constants. The date is returned with the same format as the CLOCK command.

Parameters

MAIN	Returns the cal date of the main unit calibration.
ZERO	Returns the cal date of the ZERO calibration.
OHMSZERO	Returns the cal date of the Ohms zero calibration.
SCOPE	Returns the cal date of the scope option calibration.

Example `CAL_DATE? MAIN`

Response The date.

CAL_DAYS?

Description Gets the number of days and hours since the last calibration constant. The data output for date is in the same format as the CLOCK command.

Parameters

MAIN	Returns the days since the main unit calibration.
ZERO	Returns the days since the ZERO calibration.
OHMSZERO	Returns the days since the Ohms zero calibration.
SCOPE	Returns the days since the scope option calibration.

Example `CAL_DAYS? ZERO`

Response (Integer) Days.
(Integer) Hours.

CAL_FACT

Description Set the procedure "fault action" flag. Procedures refer to calibration and diagnostic procedures. This command is more useful for diagnostics that calibration.

Parameters

CONT	To continue on faults.
ABORT	To abort on faults.

Example `CAL_FACT ABORT`

CAL_FACT?

Description Get the procedure "fault action" flag.

Example `CAL_FACT?`

Response ABORT.

CAL_FAULT?

Description Get information about calibration error, if one occurred).

Example `CAL_FAULT?`

Response 1. Error number (use EXPLAIN? command to interpret).
2. Name of step where error occured.

CAL_INFO?

Description Return message or instructions related to the running step.

Example `CAL_INFO?`

Response (String) the message string.

CAL_NEXT

Description Continue a calibration procedure if it is waiting for a CAL_NEXT command.

Parameters (Optional) reference value (used if it's waiting for a reference). If the reference value has no unit, the unit is assumed to be that returned by the CAL_REF? command.

Example `CAL_NEXT`

CAL_REF?

Description Return normal value expected for reference entry.

Response 1. The nominal value.

2. The accepted or implied unit.

Example `3.000000e+00,V`

CAL_SKIP

Description Skip to subsequent entry point in calibration procedure.

Examples `CAL_SKIP`

CAL_SECT

Description Skip to next section of the calibration procedure.

Example `CAL_SECT`

CAL_START

Description Start a calibration procedure.

Parameters

MAIN	Procedure for the 5080A minus the scope cal option.
ZERO	Internal procedure to touch up zero offsets.
OHMSZERO	Internal procedure to touch up resistance offsets.
SCOPE	Procedure for the 5080A-SC200 scope cal option.
DIAG	Diagnostic pseudo-cal procedure.
NOT	Aborts a procedure after the step underway.

A second optional parameter that shows the name of the step at which to start can be used. If this parameter is not supplied, calibration starts at the first calibration step.

Examples

`CAL_START MAIN`	Start the MAIN calibration procedure.
`CAL_START MAIN,DVG3_3`	Start the MAIN calibration procedure at DVG3_3 point.

CAL_STATE?

Description Gets the state of calibration.

Response

RUN	A calibration step is in progress.
REF	Waiting for a CAL_NEXT with reference (measurement) value.
INS	Instruction available, waiting for a CAL_NEXT.
NOT	Not in a calibration procedure (or at end of one)

CAL_STEP?

Description Gets the name of the calibration step in progress.

Response (Char) the step name.

Examples `IDAC_RATIO` (running IDAC ratio calibration)

`NOT` (not running a calibration procedure now)

CAL_STORE

Description Store new calibration constants (CAL switch must be ENABLED).

Example
```
CAL_STORE
```

CAL_STORE?

Description Gets if a CAL_STORE is necessary.

Response

1	Yes.
0	No

Example
```
CAL_STORE?
```

CAL_SW?

Description Gets the position of the calibration switch.

Response

1	Enabled.
0	Normal

Example
```
CAL_SW?
```

EOFSTR

Description Sets the End-Of-File character string used for calibration reports. The maximum length is two characters. The EOF parameter is kept in nonvolatile memory.

Parameters The EOF string (two characters maximum).

EOFSTR?

Description Gets the End-Of-File character string used for calibration reports.

Parameters None

Response (String) The End-Of-File character string.

PR_RPT

Description Prints a self-calibration report out the selected serial port.

Parameters

1. Type of report to print: STORED, ACTIVE, or CONSTS
2. Format of report: PRINT (designed to be read) SPREAD (designed to be loaded into a spreadsheet)
3. Calibration interval to be used for instrument specifications in the report: I90D (90 day specifications) or I1Y (1 year specifications)
4. Serial port out which to print report: HOST or UUT

Example
```
PR_RPT STORED,PRINT,I90D,HOST
```

RPT?

Description Gets a self-calibration report.

Parameters
1. Type of report to print: STORED, ACTIVE, or CONSTS
2. Format of report: PRINT (designed to be read) SPREAD (designed to be loaded into a spreadsheet)
3. Calibration interval to be used for instrument specifications in the report: I90D (90 day specifications) or I1Y (1 year specifications)

Example
```
PR_RPT? STORED,PRINT,I90D
```

RPT_PLEN

Description Sets the page length used for calibration reports. This parameter is kept in nonvolatile memory.

Parameters Page length.

RPT_PLEN?

Description Gets the page length used for calibration reports.

Parameters None.

Response (Integer) Page length.

RPT_STR

Description Sets the user report string used for calibration reports. The string is stored in nonvolatile memory. The CALIBRATION switch must be set to ENABLE.

Parameters String of up to 40 characters.

RPT_STR?

Description Returns the user report string used for calibration reports.

Parameters None.

Response (String) Up to 40 characters.

STOP_PR

Description Terminates printing a calibration report if one was being printed.

Parameters None.

UNCERT?

Description Returns specified uncertainties for the present output. If there is no specification for an output, the uncertainty returned is zero.

Parameters
1. (Optional) The preferred unit in which to express the primary output uncertainty (default is PCT).
2. (Optional) The preferred unit in which to express the secondary output uncertainty (default is same as primary unit)

Response
1. (Float) 90 day specified uncertainty of primary output.
2. (Float) 1 year specified uncertainty of primary output.
3. (Character) unit of primary output uncertainty.
4. (Float) 90 day specified uncertainty of secondary output.
5. (Float) 1 year specified uncertainty of primary output.
6. (Character) unit of secondary output uncertainty.

Example `UNCERT?`

Returns `2.00E-02,2.10E-02,PCT,4.60E-02,6.00E-02,PCT`

Generating a Calibration Report

Three different calibration reports are available from the Calibrator: stored, active, or consts. Each report can be formatted for printing or comma-separated for importation into a different application. Push the **REPORT SETUP** softkey under **CAL** menu to set lines per page, calibration interval, type of report, format, and the serial port to output through. The specification shown in these reports is dependent on the interval selected in the **REPORT SETUP** menu.

The three types of report are:

- "**stored**," shows output shifts as a result of the most recent stored calibration constants.
- "**active**," shows output shifts as a result of a calibration just performed but whose calibration constants are not yet stored.
- "**consts**," which is a listing of the active set of raw calibration constant values.

Replaceable Parts

This section contains an illustrated list of replaceable parts for the Fluke 5080A Calibrator. Parts are in the list by assembly and alphabetized by reference designator. Each assembly is accompanied by an illustration that shows the location of each part and its reference designator. The replaceable parts list shows:

- Reference designator
- An indication if the part is subject to static discharge damage
- Description
- Fluke stock number
- Total quantity
- Special notes (i.e., factory-selected part)

⚠Caution

An asterisk (*) indicates a part that may be damaged by static discharge.

How to Obtain Parts

Part prices are available from the Fluke Corporation or its representatives. Prices are also available in a Fluke Replacement Parts Catalog, which you can get from Fluke. See the How To Contact Fluke section to get parts.

If a part is replaced by a new or better part, the replacement will be accompanied by an explanatory note and if necessary, installation instructions.

To make sure you get the correct part, you must include:

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

Parts

Table 53 shows the replaceable parts for the 5080A Calibrator. Figure 20 shows the parts within the Calibrator.

Table 53. Replaceable Parts

Ref. Desig.	Description	Part Number	Qty
A3	5080A-7603, MOTHER BOARD, A3 - TESTED	4018029	1
A5	5080A-7605, OHMS, A5 - TESTED	4018034	1
A6	5080A-7606, INGUARD/CPU, DDS, A6 - TESTED	4018041	1
A7	5080A-7607, CURRENT, A7 - TESTED	4018052	1
A8	5080A-7608, VOLTAGE, A8 - TESTED	4018065	1
A9	5080A-7609, OUT-GUARD, CPU, A9 - TESTED	4018076	1
A12	5080A-7612, POWER SUPPLY, A12 - TESTED	4018083	1
F1	FUSE, FUSE, .25X1.25,5A,250V,SLOW	109215	1
H1-16	HEX NUT, M3-0.5,2.4MM THICK,DIN 934,STEEL,Z CL8,COARSE THREAD FINISHED	3472020	16
H17-H37	SCREW, HK M4-0.7X8MM,STEEL,PLAIN,LOW HEAD SOCKET CAP SCREW,W/SELF LOCKING PATCH	3472154	20
H38-H60	SCREW,M3X0.5,6MM,PAN HEAD,PHILLIPS,STEEL,ZINC-CHROMATE,S-L NYLON PATCH	3783203	22
H61-H77	WASHER,M3,6MM OD,3.38MM ID,0.4MM THK,DIN 6797,STEEL,ZINC,EXT TOOTH LOCK WASHER	3472012	16
H78,H79	WASHER, WASHER,FLAT,SS,.378,.563,.016	245811	2
H80-H83	INSULATOR,BNC BULKHEAD,POLYCARBONATE	3533990	4
H84,H85	WASHER,3 WAVE,SPRING,0.39 ID,0.50 OD,0.007 THICK	3591326	2
H86-H89	LOCK NUT,NYLON INSERT,M5-0.8,5MM THICK,DIN 985,STEEL,ZINC PLATED	3472047	4
H90-H93	SCREW,M5-0.8X80MM,8.8 DIN 931,COARSE PARTIAL THD,STEEL,ZINC,HEX CAP SCREW	3471961	4
H94-H97	WASHER, FLAT,.219 ID,.506 OD,.061 THK,STEEL,ZINC-CHROMATE	2565513	4
H98-H101	WASHER, WASHER,FLAT,STL,.160,.281,.010	111005	4
H102,H103	CONNECTOR ACCESSORY,D-SUB JACK SCREW,4-40,.250 L,W/FLAT WASHER	1777348	2
H104,H105	SCREW,M3X0.5,6MM,FLAT,PHILLIPS,STEEL,ZINC-CLEAR	2064911	2
H106	WASHER, WASHER,LOCK,INTRNL,STL,.267ID	110817	1
H107	NUT, NUT, HEX, BR, 1/4-28	110619	1

Table 53. Replaceable Parts (cont.)

Ref. Desig.	Description	Part Number	Qty
H108	SCREW,M3-0.5X18MM,PHILLIPS PAN HEAD,STEEL,ZINC,MACHINE SCREW W/SELF LOCK PATCH	3472243	4
H109,H110	250400030,NUT #M4 X 0.7 HEX STEEL S	3168025	2
H111-H120	SCREW,M4-0.7X8MM,PHILLIPS,PAN HEAD,STEEL,ZINC PLATED,W/SELF LOCKING NYLON PATCH	3566379	10
H121-131	SCREW,M3-0.5 X 8MM,PHILLIPS FLAT HEAD,DIN 965,STEEL,ZINC PL,W/SELF LOCKING PATCH	3472058	11
H132-H168	140102,SCREW,M3X0.5,8MM,PAN,PHILLIP,STEEL,ZN-CHROMATE	2803610	36
J1-J6	CABLE ACCESSORY ,CABLE ACCESS,TIE,4.00L,.10W,.75 DIA	172080	6
J7,J8	CONNECTOR ,CONN,COAX,BNC(F),CABLE	412858	2
J9	5080A-4403,CABLE, FRONT PANEL TO MOTHER BOARD	3474794	1
J10	5080A-4402,CABLE, 20AMP OUTPUT	3473928	1
J11	5800A-4409 ,WIRE, 6 GROUND"	626116	1
J12	CABLE TIE RETAINER,CABLE TIE,FLAT RETAINER,ADHESIVE BACK	564625	1
J13	CABLE,ADAPTER,USB STANDARD A TO RS232 DB-9 FEMALE,1.65M LENGTH,W/USB DRIVER CD	3525836	1
MP1	5080A-2001,FRONT PANEL SHEET METAL	3387819	1
MP2	5080A-8002,DECAL FRONT PANEL 5080A	3391354	1
MP3	5080A-2002,FRONT PANEL ALUMINUM TRIM EXTRUSION (PAINTED)	3391331	2
MP4	5080A-2010,FRONT TRIM FIXING STRIP	3435237	2
MP5	5080A-8006,HANDLE, 4U	3468705	4
MP6	5080A-8001,KEYPAD RUBBER 5080A	3391346	1
MP7	5080A-4002,PCA, KEYPAD / ENCODER A1 / A2	3439674	1
MP8	CONTRACT MFG ITEM, JACK BAN SAFE BLK	2079863	3
MP9	CONTRACT MFG ITEM, JACK BAN SAFE RED	2079874	4
MP10	5080A-2019,HIGH VOLTAGE TERMINAL BLOCK	3564380	1
MP11	5080A-4016,PCA, ESD CLAMP, A16	3541713	1
MP12	5080A-8004,KNOB ENCODER GREY#3 6MM SHAFT	3441850	1
MP13	5080A-2007,REAR PANEL	3409081	1
MP14	5080A-8003,REAR PANEL DECAL	3409096	1

Table 53. Replaceable Parts (cont.)

Ref. Desig.	Description	Part Number	Qty
MP15	5520A-2026 ,TRANSFORMER COVER, PAINTED	647138	1
MP16	FILTER ,FILTER,LINE,250VAC,4A,W/ENTRY MODULE	944269	1
MP17	FILTER PART ,FILTER,LINE,PART,VOLTAGE SELECTOR	944272	1
MP18	FILTER PART ,FILTER,LINE,PART,FUSE DRWR W/SHRT BAR	944277	1
MP19	5440A-8197-01 ,BINDING HEAD, PLATED	102889	1
MP20	FAN,TUBEAXIAL,110CFM,115VAC,15W,BALL BRG,37DBA,0.28 IN H2O,120X120X38MM,BULK	3473622	1
MP21	LABEL ,LABEL,MYLAR,GROUND SYMBOL	911388	1
MP22	TAPE ,TAPE,FOAM,POLYUR,W/LINER,.3125,.250	603134	1
MP23	5080A-2008,CHASSIS RIVETED	3409118	1
MP24	INSULATOR,NYLON,MOLDED,5/16 (M8),0.093 IN. LONG,BULK	3533983	10
MP25	CABLE TIE,50LB,14.2 IN. LIGHT GREEN HIGH-TEMP NYLON WITH S-S LOCKING DEVICE,BULK	3534000	8
MP26	5080A-8007,MAINS SWITCH PUSH ROD 5080A	3525824	1
MP27	5700A-2046 ,POWER BUTTON, ON/OFF	775338	1
MP28	5500A-8011 ,AIR FILTER	945287	1
MP29	5500A-2012 ,HOUSING, AIR FILTER	937107	1
MP30	5080A-2017,SHIELD OHMS	3474905	1
MP31	5080A-2018,SHIELD ANALOG FRONT DDS PANGU	3474910	1
MP32	5080A-2014,SHIELD COVER A7	3439961	1
MP33	5080A-2004,ANALOG TOP COVER	3409055	1
MP34	WT-630564, TILT STAND	2650711	2
MP35	5700A-2043-01 ,BOTTOM FOOT, MOLDED, GRAY #7	868786	4
MP36	5080A-2005,BOTTOM INSTRUMENT COVER	3409062	1
MP37	5080A-2006,TOP INSTRUMENT COVER	3409070	1
MP38	5080A-2016,FUSE ACCESS PLATE	3473610	1
MP39	6070A-2063 ,AIDE,PCB PULL	541730	1
MP40	5080A-2015,SHIELD COVER A8	3449027	1
MP41	FTCL-8001-01 ,LABEL,CALIB, CERTIFICATION SEAL	802306	2
MP42	TAPE ,TAPE,FOAM,VINYL,.500,.125	330449	1
MP43	TEST LEAD SET ,TEST LEAD SET,SI,STACKING,100CM,4 PC	601721	1

Table 53. Replaceable Parts (cont.)

Ref. Desig.	Description	Part Number	Qty
MP44	GUIDE,GETTING STARTED GUIDE, 5080A	3502941	1
MP45	SHIPPING BOX,REGULAR SLOTTED CARTON,KRAFT,48LB B-C FLUTE,28.375,25.00,13.25	3753014	1
MP46	DVD,GNU LESSER GENERAL PUBLIC LICENSE - 5080A	3779181	1
MP47	LABEL,SERVICE ONLY LABEL- 5080A	3779509	1
MP48	5080A-2020,SHIELD, A9	3669601	1
MP49	5440A-8198-01 ,BINDING POST, STUD, PLATED	102707	1
T1	TRANSFORMER,POWER,100/120/220/240V,50/60HZ,7:1:8:2:1:2,PANGU,286VA,EI175	3471249	1
T2	TRANSFORMER,POWER,45V,50-400HZ,1:3,PANGU,TOROIDAL,105X35MM,BULK	3451576	1
T3	TRANSFORMER,POWER,45V,50-400HZ,1:10:10:10,PANGU,TOROIDAL,105X35MM,BULK	3451583	1

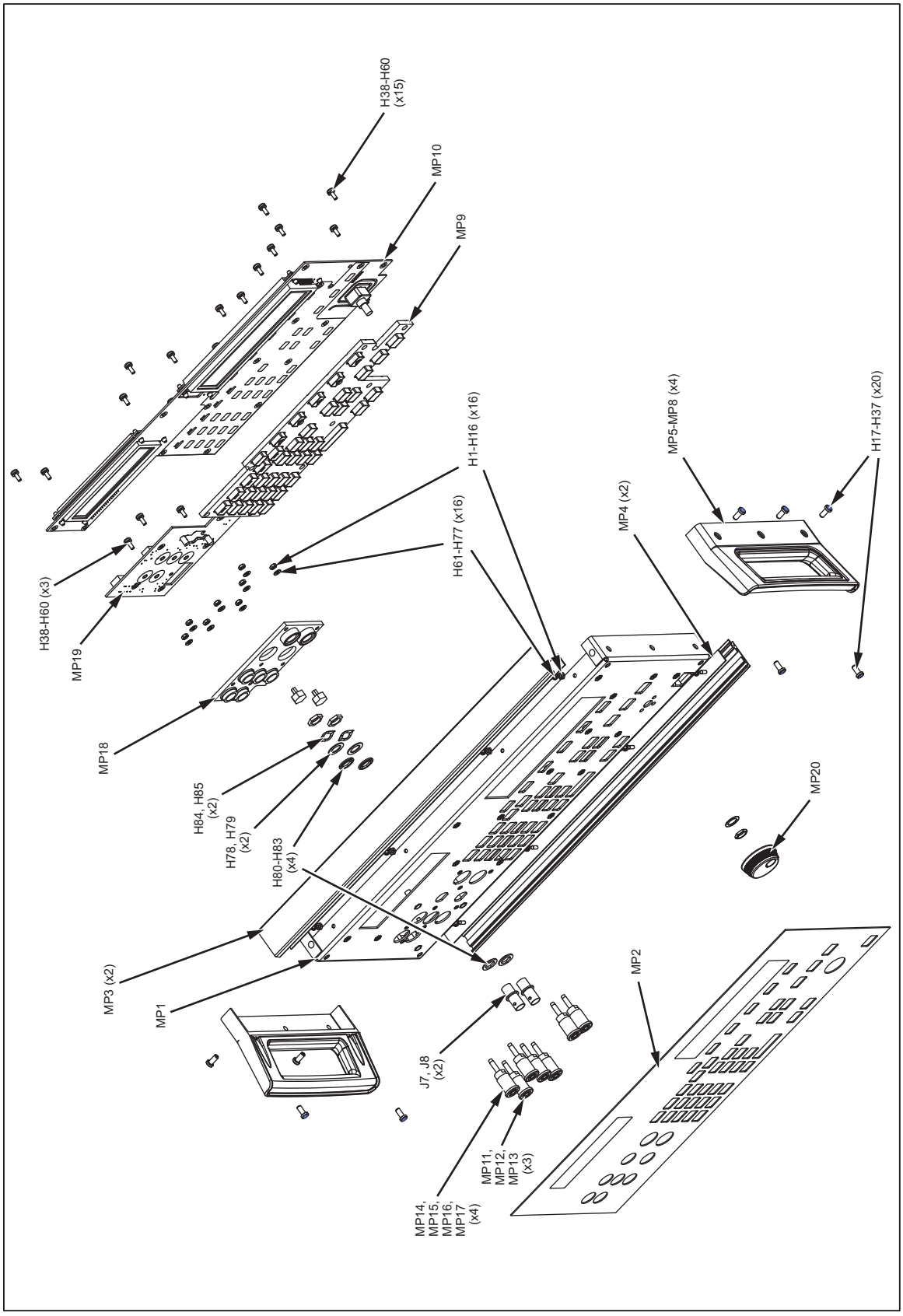


Figure 20. Final Assembly

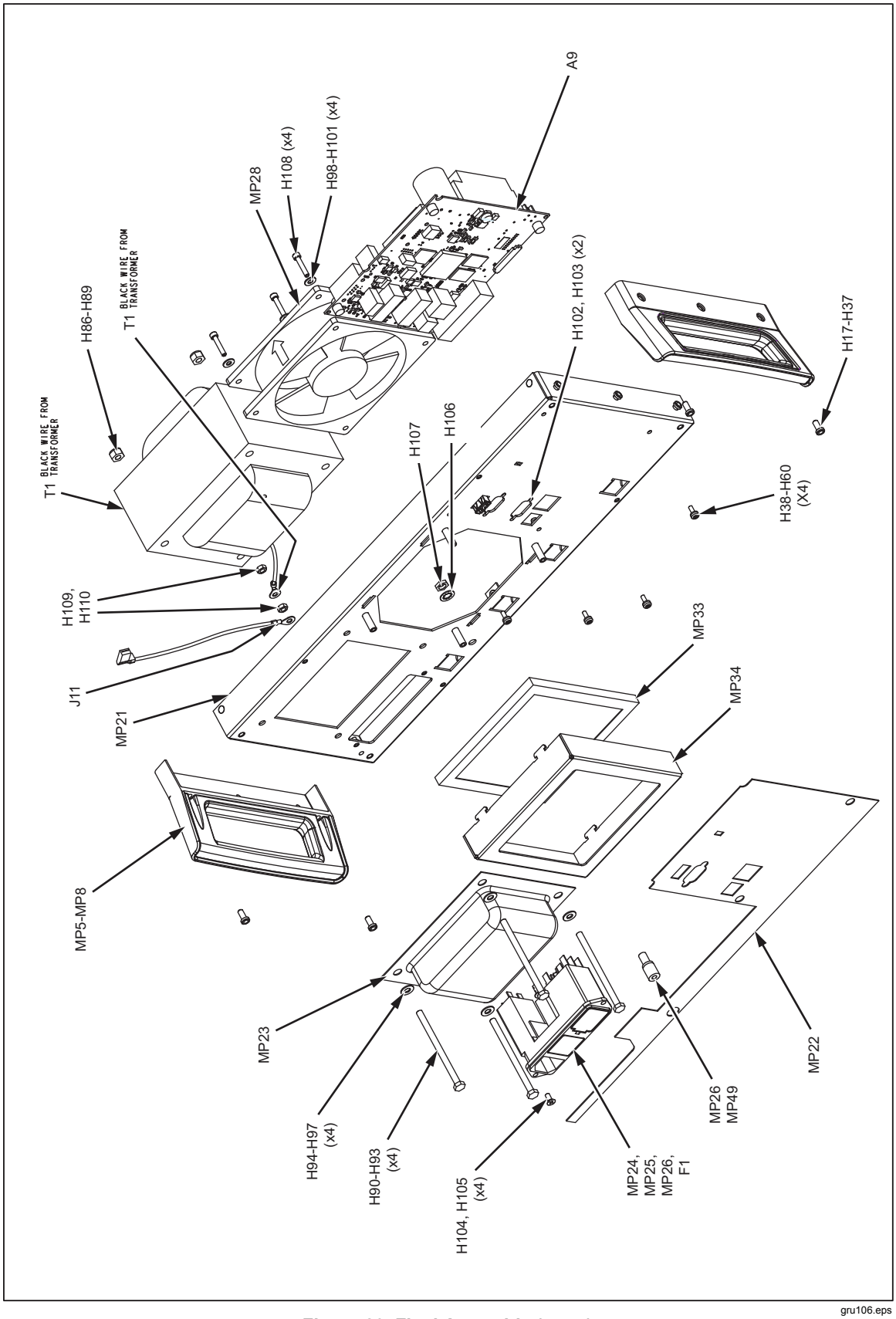


Figure 20. Final Assembly (cont.)

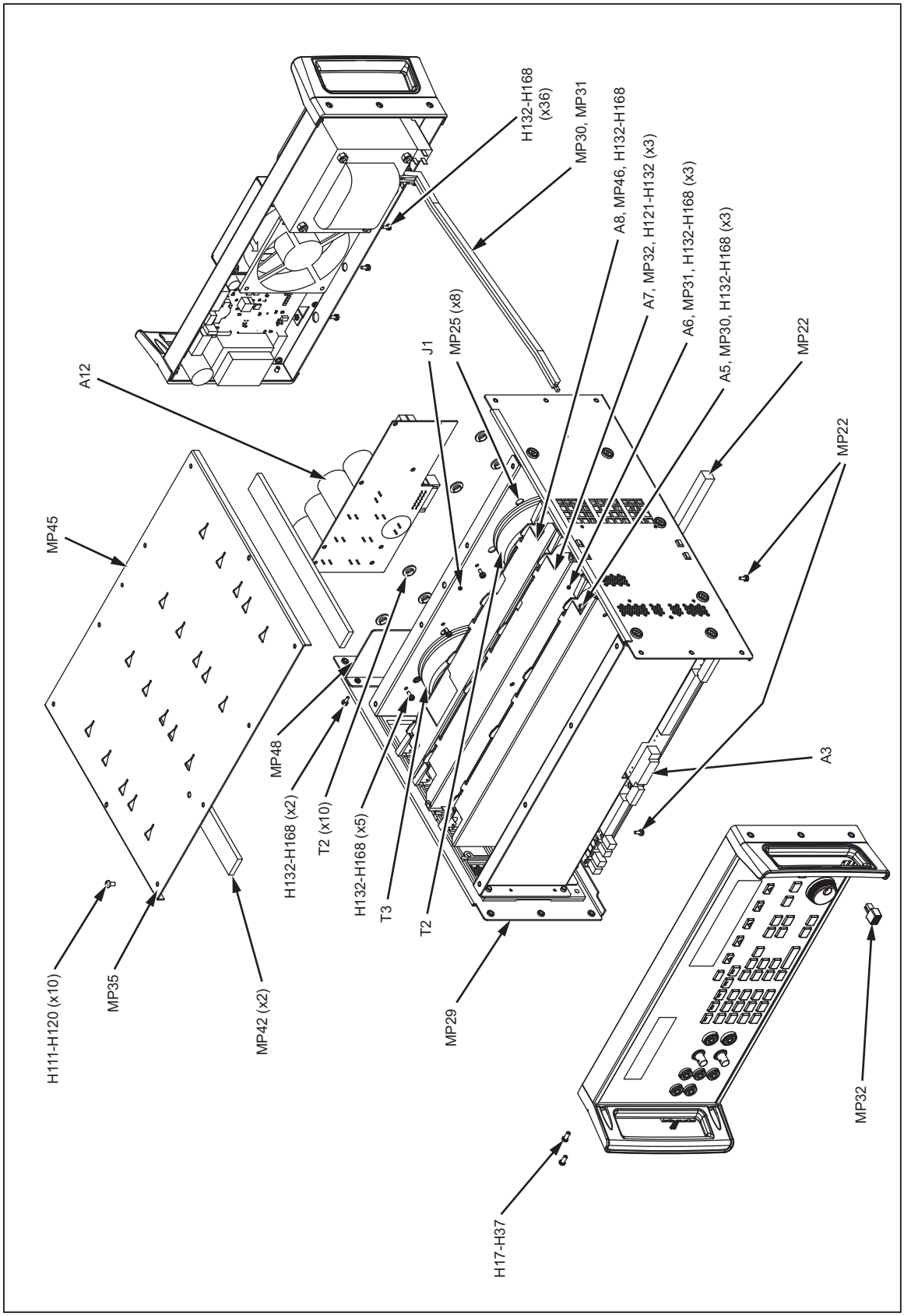


Figure 20. Final Assembly (cont.)

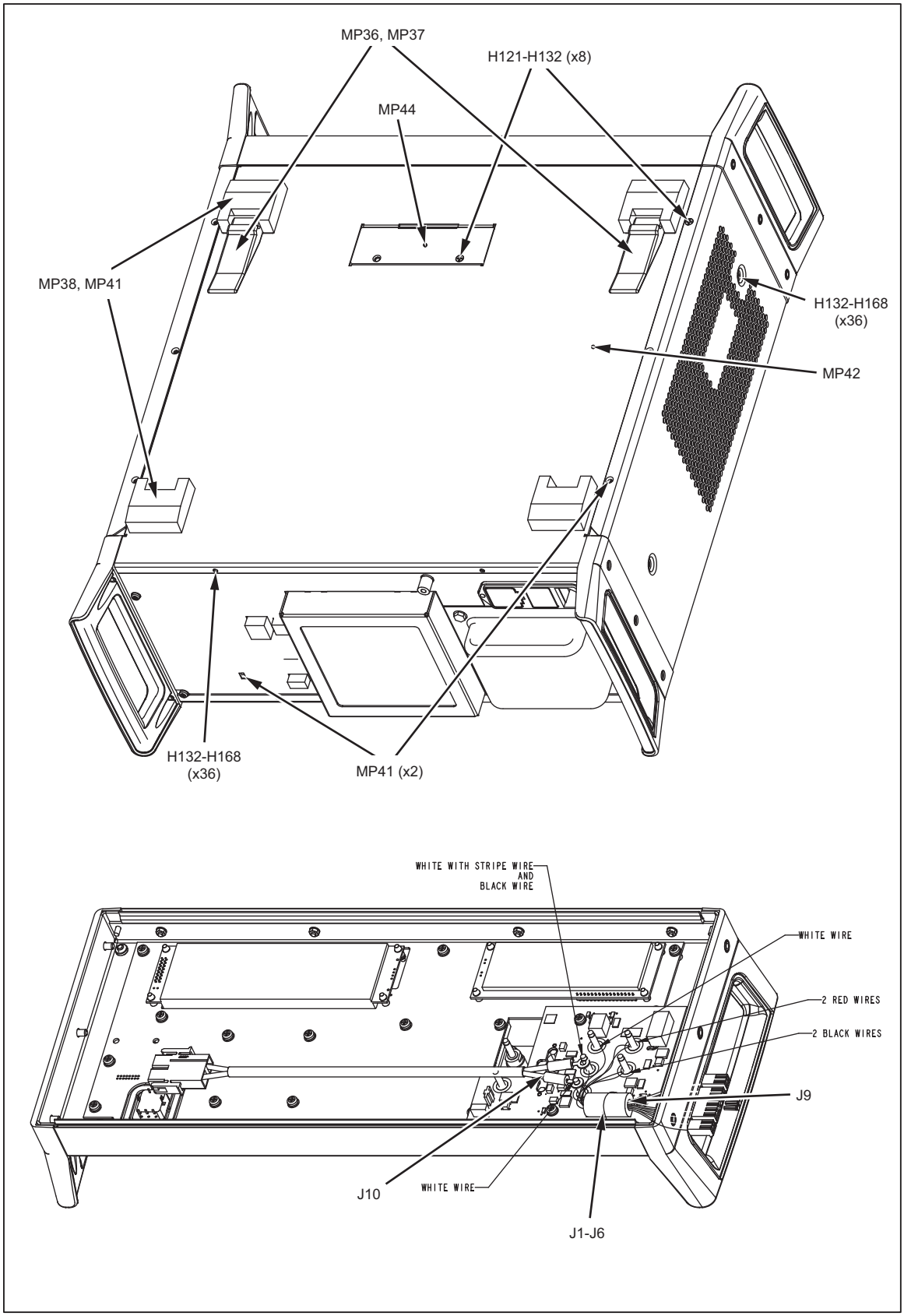


Figure 20. Final Assembly (cont.)