
DM34460 Series

6½ Digit TrueVolt Digital Multimeter

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Waste Electrical and Electronic Equipment (WEEE)

This product complies with the WEEE Directive) marketing requirement. The affixed product label (see below) indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category: With reference to the equipment types in the WEEE directive Annex 1, this product is classified as “Monitoring and Control instrumentation” product. Do not dispose in domestic household waste.

To return unwanted products, contact your local Keysight office, or see

about.keysight.com/en/companyinfo/environment/takeback.shtml for more information.



Declarations of Conformity

Declarations of Conformity for this product and for other Keysight products may be downloaded from the Web. Go to <https://regulations.about.keysight.com/DoC/default.htm>. You can then search by product number to find the latest Declaration of Conformity.

Safety Information

CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

1 Service and Maintenance

Specifications and Characteristics

General Information

Troubleshooting

Self-Test Procedures

Self-Test Error

Replacing the Power-Line Fuse

Replacing the Current Input Fuse

User Replaceable Parts

Battery Replacement

This chapter provides the specifications and service information on cleaning, troubleshooting, repair, and replaceable parts of the DM34460 Series 6½ Digit TrueVolt Digital Multimeter. This chapter also explains how to assemble and disassemble the DM34460 Series.

Specifications and Characteristics

NOTE

For the characteristics and specifications of the DM34460 Series 6½ Digit TrueVolt Digital Multimeter, refer to the datasheet www.keysight.com/find/dm34460a.

General Information

Types of service available

If your instrument fails during the warranty period, Keysight Technologies will repair or replace it under the terms of your warranty. After your warranty expires, Keysight offers repair services at competitive prices. You also have the option to purchase a service contract that extends the coverage after the standard warranty expires.

Obtaining repair service (worldwide)

To obtain service for your instrument, contact your nearest Keysight Technologies Service Center. They will arrange to have your unit repaired or replaced, and can provide warranty or repair-cost information where applicable. Ask the Keysight Technologies Service Center for shipping instructions, including what components to ship. Keysight recommends that you retain the original shipping carton for return shipments.

Repackaging for shipment

Ensure the following to ship the unit to Keysight for service or repair:

- Attach a tag to the unit identifying the owner and indicating the required service or repair. Include the model number and full serial number.
- Remove all accessories from the instrument. Do not include accessories unless they are associated with the failure symptoms.
- Place the unit in its original container with appropriate packaging material.
- Secure the container with strong tape or metal bands.
- If the original shipping container is unavailable, use a container that will ensure at least 10 cm (4 in.) of compressible packaging material around the entire instrument. Use static-free packaging materials.
- Remove all accessories from the instrument. Do not include accessories unless they are associated with the failure symptoms.

Keysight suggests that you always insure your shipments.

Cleaning and handling

Cleaning

To prevent electrical shock, disconnect the instrument from AC mains power and disconnect all test leads before cleaning. Clean the outside of the instrument using a soft, lint-free, cloth slightly dampened with water.

- Do not use detergent or solvents.
- Do not attempt to clean internally.

If required, contact a Keysight Technologies Sales and Service office to arrange for proper cleaning to ensure that safety features and performance are maintained.

Electrostatic Discharge (ESD) precautions

Almost all electrical components can be damaged by electrostatic discharge (ESD) during handling. Component damage can occur at electrostatic discharge voltages as low as 50 V.

The following guidelines will help prevent ESD damage during service operations:

- Disassemble instruments only in a static-free work area.
- Use a conductive work area to reduce static charges.
- Use a conductive wrist strap to reduce static charge accumulation.
- Minimize handling.
- Keep replacement parts in original static-free packaging.
- Remove all plastic, foam, vinyl, paper, and other static-generating materials from the immediate work area.

Troubleshooting

Before troubleshooting or repairing the instrument, make sure the failure is in the instrument rather than any external connections. Also make sure that the instrument was accurately calibrated within the last year (see [Calibration Adjustment Procedures > Calibration Interval](#) for details).

Perform the following verifications if the unit is inoperative:

- Verify that the ac power cord is connected to the multimeter and AC line power.
- Verify that the front-panel power switch is depressed.
- Verify that the correct power-line fuse is installed. Refer to *DM34460 Series User's Guide* for details.
- Verify the power-line voltage setting.

Perform the following verifications if the unit fail self test:

- Remove all test connections to the multimeter and run the self-test again.
NOTE: Errors may be induced by AC signals present on the multimeter input terminals during self-test. Long test leads can act as an antenna causing pick-up of AC signals.

Perform the following verifications if the unit's current input is inoperative:

- Verify the current input fuse. See [Checking the current input fuse](#).

Troubleshooting procedure

Malfunction	Identification
Failed current measurement	Verify the fuse condition and replace the fuse as necessary.
Failed to power on the instrument when power is supplied	– Verify the power line fuse condition and replace the power line fuse as necessary. – Ensure that correct voltage rating is selected on the instrument.
Failed to update firmware	– Verify that driver is installed correctly. – Verify that the I/O configuration and information entered in the Keysight Basic Firmware Update Utility is correct. – Ensure that no power or I/O connection lost during update. – Ensure instrument boot into bootloader mode when updating the firmware through recovery mode.
No beeper tone	Verify that the beeper is enabled in User Settings.
No keyclick tone	Verify that the key click is enabled in User Settings.
No display	Press any key to exit "display off" mode.

Checking the current input fuse

1. Press **[Ω2W]** to access 2W resistance measurement.
2. Connect a red test lead between **Ω** and 3 A input terminal.
3. Observe the resistance reading on the display. Replace the fuse if the resistance reading is $> 0.3 \Omega$.

NOTE: Refer to Current Input Fuse Replacement in *DM34460 Series User's Guide* for details.

Self-Test Procedures

A power-on self-test occurs automatically when you turn on the multimeter. It performs a self-test on its real-time clock, keyboard processor, power controller, measurement processor, calibration memory, FPGA, ADC, gain and offset circuitry, and voltage references. This self-test is equivalent to the *TST? SCPI query, and you do not need to remove inputs to the instrument to run the test.

Quick Self-test

The quick self test does not require you to remove the sources from the instrument's input terminals.

Press **[Shift]** > **[Single]** | **Utility** > **Test/Admin** > **Self Test** > **Quick Test** to perform the quick self-test of the multimeter.

Full Self-test

NOTE

Remove all test connections to the multimeter before performing self-test.

A complete self-test (TEST:ALL?) takes approximately two seconds. This tests all of the items tested by the power-on self-test and includes further tests for gain, current source, and shunt circuitry.

- When self-test completes, either "Self-test Passed" or "Self-test Failed" appears on front panel.
- If the self-test fails, " " is displayed on the front panel. Press [Shift] > [Single] | Utility > Help > Error View to record the error code and message, contact Keysight support if necessary.
- Execute the complete self-test before performing any verification or calibration procedures.

Front Panel

Press [Shift] > [Single] | Utility > Test/Admin > Self Test > Full Test to perform the complete self-test of the multimeter.

If the self-test is successful, this indicates a high confidence that the multimeter is operational.

Remote Interface

1. Connect to the instrument using the remote interface.
2. Send *TST? or TEST:ALL? and read the result: pass (+0) or fail (+1). Use SYSTem:ERRor? to view errors. See the list of self-test errors in the *DM34460 Series Programming Guide* for details.

Self-Test Error

The DM34460 Series self test (see the *TST? command) performs a series of tests on the instrument hardware. Any failure of these tests will generate a SCPI error number -330, with additional test failure information. Refer to the *Keysight DM34460 Series Programming Guide* for more information.

NOTE

On the remote interface, a self-test failure will generate SCPI error -330 and a supplemental message indicating one of the test numbers shown below. On the front panel, only the failing test is shown.

The form of this error message is as follows:

-330,"Self-test failed; <test# - testname>"

Where **test#** is the number of the test that failed (range +611 - 666) and **testname** describes the test. Here is an example of a test failure message:

-330,"Self-test failed; +617 - FPGA unconfigured"

The following is the list of test numbers and descriptions:

Error Code	Error Messages
+611	Self-test failed; Real Time Clock reset, check battery
+612	Self-test failed; keyboard processor not responding
+613	Self-test failed; unable to communicate with power controller
+614	Self-test failed; unable to sense line frequency
+615	Self-test failed; measurement processor not responding
+616	Self-test failed; calibration memory reading error
+617	Self-test failed; FPGA unconfigured
+618	Self-test failed; FPGA bus error
+619	Self-test failed; FPGA clock
+620	Self-test failed; shift register
+621	Self-test failed; overload sense stuck on
+622	Self-test failed; ADC generic error
+623	Self-test failed; ADC integrator saturated
+624	Self-test failed; Coarse ADC error
+625	Self-test failed; ADC offset
+626	Self-test failed; ADC noise
+627	Self-test failed; Fine ADC generic error
+628	Self-test failed; Fine ADC off-scale low
+629	Self-test failed; Fine ADC off-scale high
+630	Self-test failed; Fine ADC range
+631	Self-test failed; Fine ADC bits stuck
+632	Self-test failed; Fine ADC slope

+633	Self-test failed; Fine ADC linearity
+634	Self-test failed; low DC zero
+635	Self-test failed; high DC zero
+636	Self-test failed; +7V reference
+637	Self-test failed; -10V reference
+638	Self-test failed; x1 gain, zero input
+639	Self-test failed; x10 gain, zero input
+640	Self-test failed; x100 gain, zero input
+641	Self-test failed; precharge
+642	Self-test failed; x1 gain, non-zero input
+643	Self-test failed; x10 gain, non-zero input
+644	Self-test failed; x100 gain, non-zero input
+645	Self-test failed; 100uA current source
+646	Self-test failed; 10uA current source
+647	Self-test failed; 2 ohm shunt
+648	Self-test failed; AC offset
+649	Self-test failed; frequency input
+650	Self-test failed; input switch
+651	Self-test failed; autocal 10 V range full scale
+652	Self-test failed; autocal 10 V range tenth scale
+653	Self-test failed; autocal 1 V range full scale
+654	Self-test failed; autocal 1 V range tenth scale
+655	Self-test failed; autocal 100 mV range full scale
+656	Self-test failed; autocal 100 V range reference
+657	Self-test failed; autocal 10 kOhm range full scale
+658	Self-test failed; autocal 10 kOhm range tenth scale
+659	Self-test failed; autocal 1 kOhm range full scale
+660	Self-test failed; autocal 100 kOhm tenth scale
+661	Self-test failed; autocal 1 MOhm half scale
+662	Self-test failed; autocal 100 KOhm to 1 MOhm transfer
+663	Self-test failed; autocal 1 MOhm to 10 MOhm transfer
+664	Self-test failed; autocal 10 MOhm internal resistor
+665	Self-test aborted; high ac voltage present on input terminals
+666	Self-test aborted; high dc voltage present on input terminals

Replacing the Power-Line Fuse

Refer to Power Line Fuse Replacement in *DM34460 Series User's Guide* for details.

Replacing the Current Input Fuse

Refer to Current Input Fuse Replacement in *DM34460 Series User's Guide* for details.

User Replaceable Parts

You can find the instrument support part list at Keysight's Test & Measurement Parts Catalog

<http://www.keysight.com/find/parts>.

Battery Replacement

WARNING

SHOCK HAZARD

Only qualified, service-trained personnel who are aware of the hazards involved should remove instrument covers. Always disconnect the power cable and any external circuits before removing the instrument cover. Some circuits are remain powered for a short time even when the power switch is turned off.

The internal battery powers the real-time clock. The primary function of the clock is to provide a time stamp for the internal file system. If the battery fails, the clock and time stamp function will not be available. No other instrument functions are affected.

Under normal usage at room temperature, the lithium battery has a life expectancy between seven and ten years. Note that battery life will be reduced if the instrument is stored for a prolonged period at temperatures above 40 °C.

The battery type is CR 2032.

Replacing the Battery

Tools required

Items	Torque value
T10 Torx screwdriver	0.56 Nm
Flat plastic screwdriver	-

1. Remove four screws as shown below.

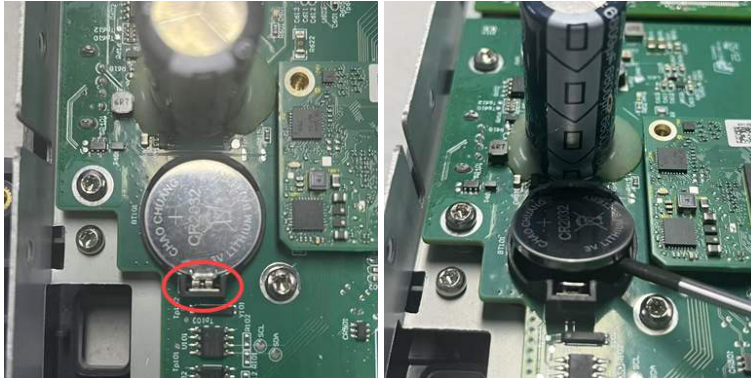


2. Remove the rear panel.

3. Remove nine screws from the chassis. Then, remove the chassis from the front panel.



4. The battery is located on the main board.
5. Unlatch the small spring clips (see red circle below). Use a flat-bladed plastic screwdriver and carefully pry up on the side of the battery.



6. Install the new battery. Make sure that the positive side (+) is facing up. Place the battery under the small spring clips (see red circle below), then push down on the opposite end of the battery to secure the battery (see red arrow below).



7. Assemble the rear panel when finished.
8. Reset the date and time.

NOTE

Properly dispose of the used battery in accordance with local laws and regulations.

2 Performance Verification

Performance Verification

Recommended Test Equipment

Test Considerations

Quick Performance Check

Performance Verification Tests

This chapter contains the performance verification procedures which verify that the DM34460 Series is operating within its published specifications.

Performance Verification

Performance verification ensures that the instrument performs within the specifications stated in the data sheet (www.keysight.com/find/dm34460a).

You can perform four different levels of performance verification tests:

- **Self test**(two types) A series of internal verification tests that give a high confidence that the instrument is operational.
- **Quick verification** A combination of the internal self tests and selected verification test.
- **Performance verification tests** An extensive set of tests that are recommended as an acceptance test when you first receive the instrument or after performing adjustments.
 - **Zero offset verification**
 - **DC voltage gain verification**
 - **DC current gain verification**
 - **Frequency gain verification**
 - **AC voltage verification**
 - **AC current verification**
- **Optional verification tests** Tests not performed with every calibration. Perform these tests to verify additional specifications or functions of the instrument.
 - **Capacitance verification**

Recommended Test Equipment

The test equipments recommended for the performance verification and adjustment procedures are listed below. If the exact instrument is not available, use the accuracy requirements shown to select substitute calibration standards.

An alternate method is to use the Keysight 3458A 8½-digit Digital Multimeter to measure less accurate, yet stable, sources. The output value measured from the source can be entered into the instrument as the target calibration value.

Application	Recommended equipment
Zero calibration	Keysight 34172B DMM calibration short
DC voltage	Fluke 5730A
DC current	Fluke 5730A
Resistance	Fluke 5730A
AC voltage	Fluke 5730A
AC current	Fluke 5730A
Frequency	Keysight 33500B Series Function/Arbitrary Waveform Generator
Capacitance	SCA-1uF Capacitance Standard

Test Considerations

Errors may be induced by AC signals present on the input leads during a self test. Long test leads can also act as an antenna causing pick-up of AC signals.

For optimum performance, all procedures should comply with the following recommendations:

- Ensure that the calibration ambient temperature is stable between 18 °C and 28 °C. Ideally the calibration should be performed at 23 °C $\pm$ 2 °C.
- Ensure ambient relative humidity is less than 80%.
- Allow a 90 minutes warm-up period with copper short connected.
- Use shielded twisted pair PTFE-insulated cables to reduce settling and noise errors. Keep the input cables as short as possible.
- Connect the input cable shields to earth ground. Except where noted in the procedures, connect the calibrator **LO** source to earth ground at the calibrator. It is important that the **LO** to earth ground connection be made at only one place in the circuit to avoid ground loops.

The instrument is capable of making highly accurate measurements, special care must be taken to ensure that the calibration standards and test procedures do not introduce additional errors. Ideally, the standards used to verify and adjust the instrument should be an order of magnitude more accurate than each instrument range full- scale error specification.

For 2-wire ohms measurements, remove lead resistance by doing a null measurement with the leads shorted or with a precision 4-terminal low thermal short. For offset calibration a 4-terminal low thermal short is required.

Input connections

Test connections to the instrument are best accomplished using a Keysight Technologies 34172B calibration short for low-thermal offset measurements and a 34171B DMM connector configured to interface to the calibrator output. Shielded, twisted-pair, PTFE interconnect cables of minimum length are recommended between the calibrator and the multimeter to reduce settling and noise errors. HI and HI Sense should be a twisted pair. LO and LO Sense should be a twisted pair. Cable shields should be earth ground referenced. This configuration is recommended for noise reduction and settling time performance during calibration.

Quick Performance Check

The quick performance check is a combination of internal self test and an abbreviated performance test (specified by the letter Q in the performance verification tests). This test provides a simple method to achieve high confidence in the instrument's ability to functionally operate and meet specifications. These tests represent the absolute minimum set of performance checks recommended following any service activity. Auditing the instrument's performance for the quick check points (designated by a Q) verifies performance for "normal" accuracy drift mechanisms. This test does not check for abnormal component failures.

To perform the quick performance check, do the following:

- Perform a self test. Refer to **Self-Test Procedures**.
- Perform only the performance verification tests indicated in the following tables with the letter Q.

If the instrument fails the quick performance check, adjustment or repair is required.

The Quick Performance Check can be limited by the factors described in the following section (Performance Verification Test).

Performance Verification Tests

The performance verification tests are recommended as acceptance tests when you first receive the instrument. The acceptance test results should be compared against the 90-days test limits. After acceptance, you should repeat the performance verification tests at every calibration interval.

If the instrument fails performance verification, calibration adjustment or repair is required.

To reset the date used to determine the specifications versus time, a calibration with adjustment is required.

The allowable errors for verification are the published specifications (see the instrument data sheet at www.keysight.com/find/dm34460a). The periods in the published specifications are since the last full calibration adjustment.

NOTE

Ensure that you have read **Test Considerations** before running the performance verification tests.

Zero offset verification

This test checks the zero offset performance of the instrument. Verification checks are only performed for those functions and ranges with unique offset calibration constants. Measurements are checked for each function and range as described in the procedure below.

Review the **Test considerations** before proceeding with this procedure.

1. Connect 34172B Calibration Short (or equivalent) to the front panel input terminals. (see **Input connections**).
2. Configure each function and range in the order shown in the table below. Make a measurement and observe the result. Compare measurement results to the appropriate test limits shown below:

Step	Function ^[a]	Range	Quick check	Error from nominal		
				90 days	1 year	2 years
Open	DC Current	100 μ A	Q	$\pm 0.025 \mu$ A	$\pm 0.025 \mu$ A	$\pm 0.025 \mu$ A
		1 mA		$\pm 0.060 \mu$ A	$\pm 0.060 \mu$ A	$\pm 0.060 \mu$ A
		10 mA		$\pm 2 \mu$ A	$\pm 2 \mu$ A	$\pm 2 \mu$ A
		100 mA		$\pm 5 \mu$ A	$\pm 5 \mu$ A	$\pm 5 \mu$ A
		1 A		$\pm 100 \mu$ A	$\pm 100 \mu$ A	$\pm 100 \mu$ A
		3 A		$\pm 600 \mu$ A	$\pm 600 \mu$ A	$\pm 600 \mu$ A
Short	DC Volts	100 mV	Q	$\pm 6 \mu$ V	$\pm 7 \mu$ V	$\pm 7 \mu$ V
		1 V		$\pm 9 \mu$ V	$\pm 9 \mu$ V	$\pm 9 \mu$ V
		10 V		$\pm 50 \mu$ V	$\pm 50 \mu$ V	$\pm 50 \mu$ V
		100 V		$\pm 600 \mu$ V	$\pm 600 \mu$ V	$\pm 600 \mu$ V
		1000 V		± 10 mV	± 10 mV	± 10 mV
Short	4-wire Ohms	100 Ω	Q	± 7 m Ω	± 8 m Ω	± 9 m Ω
		1 k Ω		± 10 m Ω	± 10 m Ω	± 12 m Ω
		10 k Ω		± 100 m Ω	± 100 m Ω	± 100 m Ω
		100 k Ω		$\pm 1 \Omega$	$\pm 1 \Omega$	$\pm 1 \Omega$
		1 M Ω		$\pm 10 \Omega$	$\pm 10 \Omega$	$\pm 10 \Omega$
		10 M Ω		$\pm 100 \Omega$	$\pm 100 \Omega$	$\pm 100 \Omega$
		100 M Ω		± 10 k Ω	± 10 k Ω	± 10 k Ω

[a] Select 10 PLC.

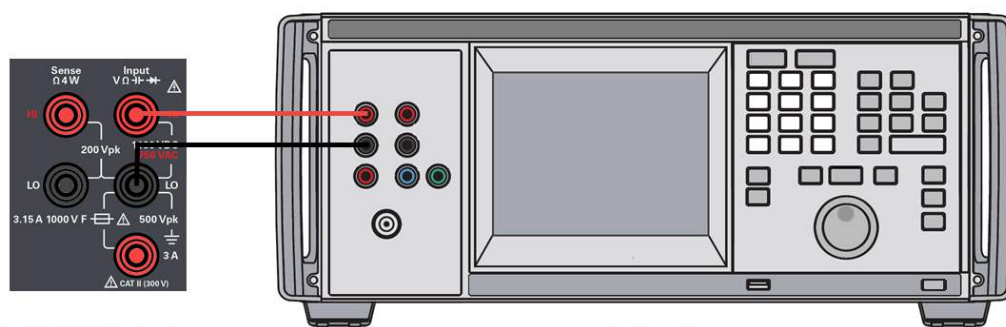
Q = Quick performance verification test points

Gain verification

This test checks the full-scale reading accuracy of the instrument. Verification checks are performed only for functions and ranges with unique gain calibration constants.

DC voltage gain verification test

Configuration: DC Voltage (CONFigure[:VOLTage][:DC])



DM34460 Series

Calibrator

1. Connect the calibrator to the front panel HI and LO input terminals as shown above.
2. Select each function and range in the order shown below. Provide the input voltage indicated below.
3. Make a measurement and observe the result. Compare measurement results to the appropriate test limits shown in the table. (Be certain to allow for appropriate source settling.)

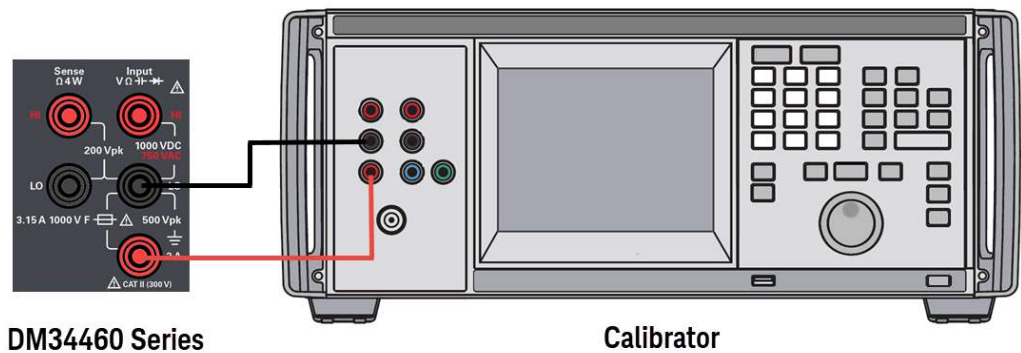
Input		Quick Check		Error from Nominal		
Voltage	Function ^[a]	Range		90 days	1 year	2 years
100 mV	DC Volts	100 mV		± 10 µV	± 12 µV	± 13.5 µV
-100 mV						
1 V		1 V		± 39 µV	± 49 µV	± 64 µV
-1 V						
4 V				± 210 µV	± 210 µV	± 250 µV
10 V		10 V	Q	± 450 µV	± 450 µV	± 550 µV
-10 V						
100 V		100 V		± 9.6 mV	± 13.1 mV	± 16.6 mV
-100 V			Q			
1000 V		1000 V		± 110 mV	± 140 mV	± 175 mV
-500 V				± 60 mV	± 75 mV	± 92.5 mV

[a] Select 5½ digit (slow mode) measurement resolution

Q = Quick performance verification test points

DC current gain verification test

Configuration: DC Current (CONFigure[:CURRENT][:DC])



1. Connect the calibrator to the front panel **3A** and **LO** input terminals as shown above.
2. Select each function and range in the order shown below. Provide the input current indicated below.
3. Make a measurement and observe the result. Compare measurement results to the appropriate test limits shown in the table. (Be certain to allow for appropriate source settling.)

Input		Quick Check		Error from Nominal		
Current	Function ^[a]	Range		90 days	1 year	2 years
2 A	DC Current	3 A		± 4.6 mA	± 4.6 mA	± 5.2 mA
1 A		1 A	Q	± 0.9 mA	± 1.1 mA	± 1.3 mA
100 mA		100 mA		± 35 µA	± 55 µA	± 65 µA
10 mA		10 mA	Q	± 5 µA	± 7 µA	± 8 µA
1 mA		1 mA		± 0.36 µA	± 0.56 µA	± 0.66 µA
100 µA		100 µA		± 0.065 µA	± 0.075 µA	± 0.085 µA

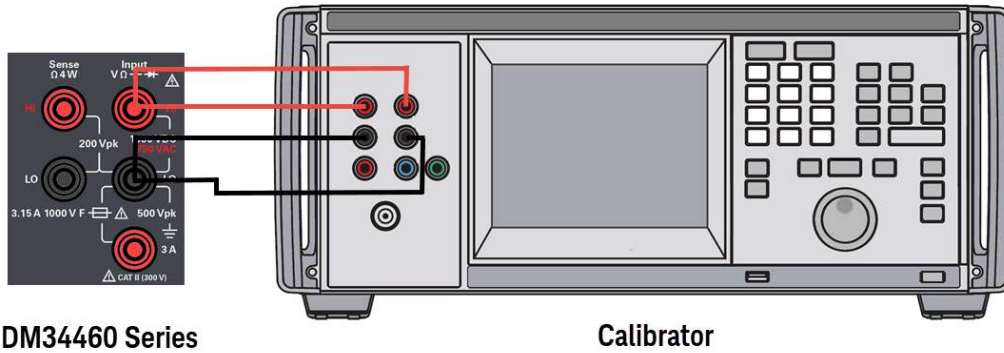
[a] Select 10 PLC

Q = Quick performance verification test points

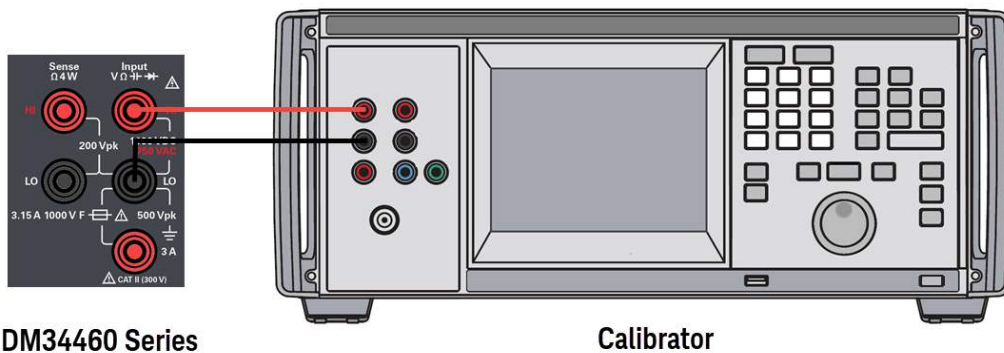
Ohms gain verification test

Configuration: 4W Resistance (CONFigure:FRESistance) or 2W Resistance (CONFigure:RESistance)

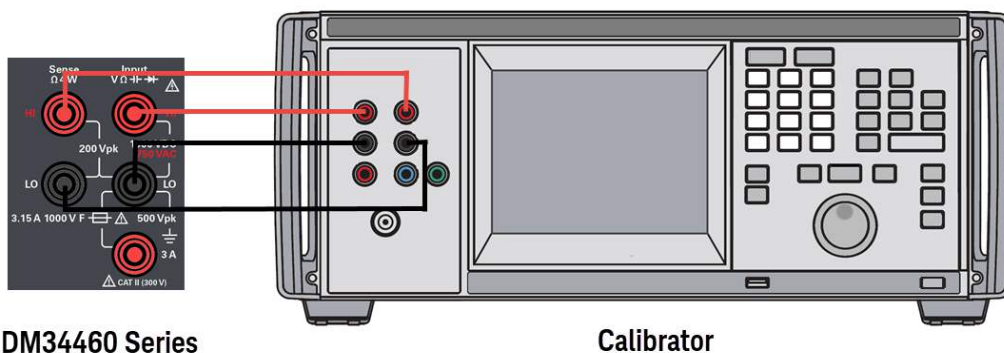
2W resistance with 2-wire compensation



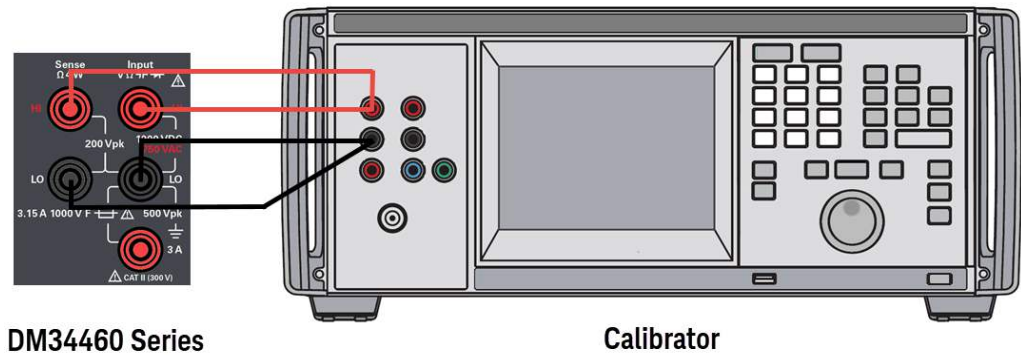
2W resistance without compensation



4W resistance with 4-wire compensation



4W resistance without compensation



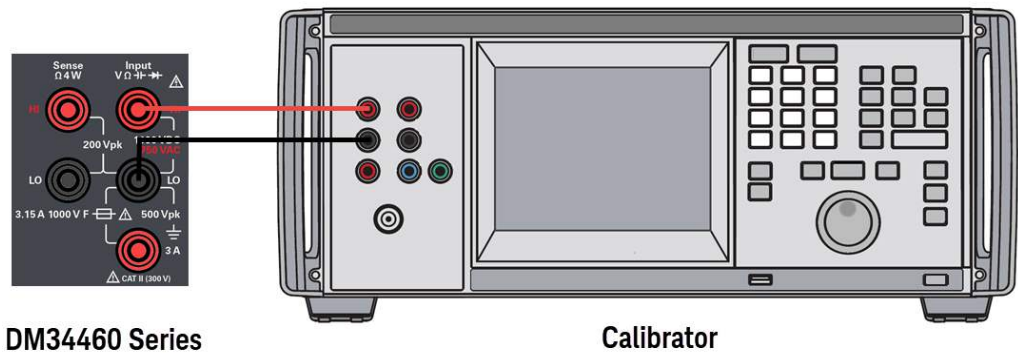
1. Connect the calibrator to the front panel **HI** and **LO** (2W/4W Resistance) and **Sense HI** and **Sense LO** (4W Resistance) input terminals as shown above.
2. Select the 4W Resistance or 2W Resistance function.
3. Select each range in the order shown below. Provide the input resistance value as indicated below.
4. Compare measurement results to the appropriate test limits shown in the table. (Be certain to allow for appropriate source settling)

Input		Quick Check		Error from Nominal		
Resistance	Function ^[a]	Range		90 days	1 year	2 years
100 Ω	4-wire Ohms	100 Ω		± 15 mΩ	± 18 mΩ	± 21 mΩ
1 kΩ		1 kΩ	Q	± 110 mΩ	± 140 mΩ	± 182 mΩ
10 kΩ		10 kΩ		± 1.1 Ω	± 1.4 Ω	± 1.8 Ω
100 kΩ		100 kΩ		± 11 Ω	± 14 Ω	± 20 Ω
1 MΩ		1 MΩ		± 190 Ω	± 230 Ω	± 290 Ω
10 MΩ	2-wire Ohms	10 MΩ	Q	± 2.8 kΩ	± 4.1 kΩ	± 6.1 kΩ
100 MΩ		100 MΩ			± 810 kΩ	

[a] Select 10 PLC
Q = Quick performance verification test points

Frequency gain verification test

Configuration: Frequency (CONFigure:FREQuency)



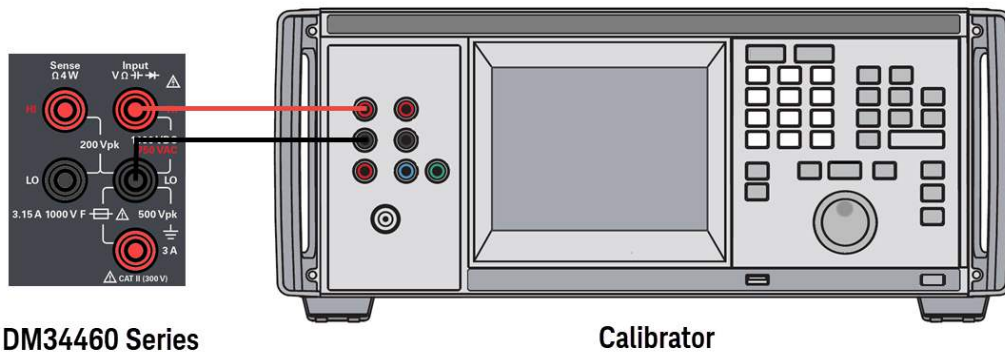
1. Connect the calibrator to the front panel HI and LO input terminals as shown above.
2. Select the frequency function.
3. Select each range in the order shown below. Provide the input voltage and frequency as indicated below.
4. Compare measurement results to the appropriate test limits shown in the table. (Be certain to allow for appropriate source settling)

Input			Quick Check		Error from Nominal	
Vrms	Frequency	Range		90 days	1 year	2 years
0.1 Vrms	10 Hz	1 Vrms			± 3 mHz	
0.01 Vrms	300 kHz	0.1 Vrms	Q	± 180 Hz	± 300 Hz	± 450 Hz

Q = Quick performance verification test points

AC voltage verification test

Configuration: AC Voltage (CONFigure[:VOLTage]:AC)



1. Connect the calibrator to the front panel **HI** and **LO** input terminals as shown above.
2. Select the AC voltage function.
3. Select each range in the order shown below. Provide the input voltage and frequency as indicated below.
4. Compare measurement results to the appropriate test limits shown in the table. (Be certain to allow for appropriate source settling)

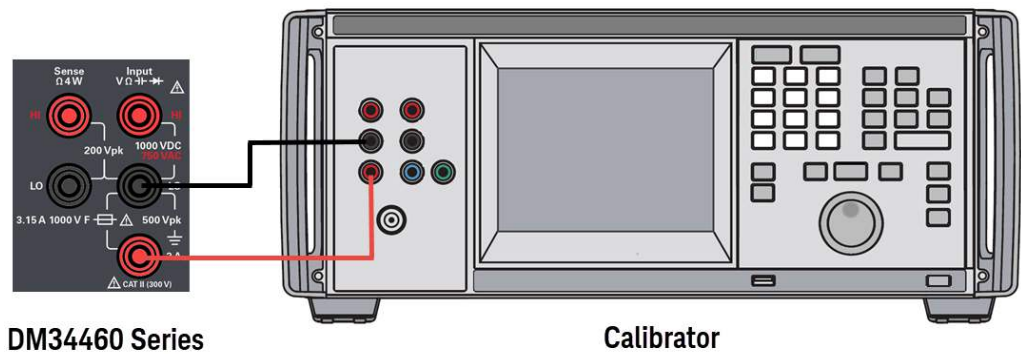
Input				Quick Check	Error from Nominal		
Vrms	Frequency	Range	Filter		90 days	1 year	2 years
100 mV	1 kHz	100 mV	200 Hz		± 0.080 mV	± 0.090 mV	± 0.160 mV
	50 kHz				± 0.340 mV	± 0.360 mV	± 0.370 mV
	300 kHz			Q		± 4.50 mV	
1 V	1 kHz	1 V	200 Hz		± 0.80 mV	± 0.90 mV	± 1.60 mV
	50 kHz				± 3.40 mV	± 3.60 mV	± 3.70 mV
	300 kHz					± 45.00 mV	
0.03 V	1 kHz	10 V	200 Hz		± 3.015 mV	± 3.018 mV	± 3.039 mV
1 V	1 kHz		200 Hz		± 3.5 mV	± 3.6 mV	± 4.3 mV
10 V	10 Hz		3 Hz		± 8 mV	± 9 mV	± 16 mV
	100 Hz		20 Hz		± 8 mV	± 9 mV	± 16 mV
	20 kHz		200 Hz		± 8 mV	± 9 mV	± 16 mV
	50 kHz		200 Hz	Q	± 34 mV	± 36 mV	± 37 mV
	100 kHz				± 68 mV		± 78 mV
	300 kHz				± 450 mV		
100 V	1 kHz		100 V	Q	± 80 mV	± 90 mV	± 160 mV
	50 kHz				± 340 mV	± 360 mV	± 370 mV
70 V	300 kHz					± 3.300 V	

Input				Quick Check	Error from Nominal		
Vrms	Frequency	Range	Filter		90 days	1 year	2 years
750 V	1 kHz	750 V	200 Hz		± 0.600 V	± 0.675 V	± 1.200 V
210 V	50 kHz				± 0.984 V	± 1.026 V	± 1.047 V
70 V	300 kHz					± 6.550 V	

Q = Quick performance verification test points

AC current verification test

Configuration: AC Current (CONFigure:CURRent:AC)



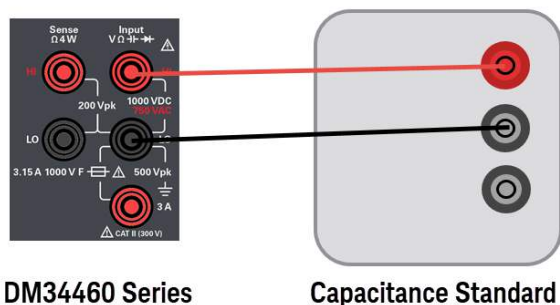
1. Connect the calibrator to the front panel **3A** and **LO** input terminals as shown above.
2. Select the AC current function.
3. Select each range in the order shown below. Provide the input current and frequency as indicated below.
4. Compare measurement results to the appropriate test limits shown in the table. (Be certain to allow for appropriate source settling)

Input				Quick Check	Error from Nominal		
Current, rms	Frequency	Range	Filter		90 days	1 year	2 years
2 A	1 kHz	3 A	200 Hz			± 5.8 mA	
	5 kHz						
1 A	1 kHz	1 A	200 Hz			± 1.4 mA	
	5 kHz						
	10 Hz		3 Hz				
100 mA	1 kHz	100 mA	200 Hz			± 140 µA	
	5 kHz		200 Hz				
100 µA	1 kHz					4.1 µA	
1 mA	1 kHz	10 mA	200 Hz			5 µA	
10 mA	1 kHz					14 µA	
	5 kHz						
1 mA	1 kHz	1 mA	200 Hz			1.4 µA	
	5 kHz						
100 µA	1 kHz	100 µA	200 Hz			0.14 µA	
	5 kHz			Q			

Q = Quick performance verification test points

Capacitance verification test (Optional)

Configuration: Capacitance (CONFigure:CAPacitance)



1. Connect the capacitance standard to the front panel **HI** and **LO** input terminals as shown above. The cable capacitance between DM34460 Series and capacitance standard must be impedance controlled with less than 100 pF of cable capacitance. For best accuracy, use only coaxial cable or shielded twisted-pair cable.
2. Select the Capacitance function.
3. Select each range in the order shown below. Provide the input capacitance value as indicated below.
4. Compare measurement results to the appropriate test limits shown in the table. (Be certain to allow for appropriate source settling)

Input capacitance	Range	Function	Error from nominal one year
1 μ F	1 μ F	Capacitance	$\pm 0.005 \mu$ F
1 μ F	10 μ F		$\pm 0.014 \mu$ F

3 Calibration Adjustments

Calibration Adjustment

Calibration Adjustment Process

Gain Calibration Adjustment Overview

Gain and Flatness Calibration Adjustment Overview

Calibration Security

Calibration Count

Calibration Message

Abort a Calibration in Progress

Calibration Adjustment Procedure

This chapter contains information on adjustments performed after a performance verification fails.

Calibration Adjustment

This chapter includes calibration adjustment procedures for Keysight DM34460 Series multimeter. Instructions are applicable for performing the procedures from either the front panel or a controller over the LAN or USB.

NOTE

Perform the verification tests before calibrating your instrument. If the instrument passes the verification tests, the unit is operating within its calibration limits and does not need to be re-calibrated.

Closed-case electronic calibration

The instrument uses closed-case electronic calibration; no internal mechanical adjustments are required. The instrument calculates correction factors based on reference signals that you apply and stores the correction factors in non-volatile memory. This data is not changed by cycling power, *RST, or SYSTem:PRESet.

Keysight Technologies calibration services

When your instrument is due for calibration, contact your local Keysight Service Center for a low-cost re-calibration. The DM34460 Series is supported on automated calibration systems, which allow Keysight to provide this service at competitive prices.

Calibration interval

The instrument should be calibrated on a regular interval determined by the accuracy requirements of your application. A 1-year interval is adequate for most applications. Accuracy specifications are warranted only if calibration is made at regular calibration intervals. Keysight Technologies never recommends calibration adjustment intervals beyond two years.

Calibration is Recommended

Whatever calibration interval you select, Keysight Technologies recommends that complete recalibration should always be performed at the calibration interval. This ensures that the instrument will remain within specifications for the next calibration interval and provides the best long-term stability. Performance data measured during performance verification tests does not mean that the instrument will remain within these limits unless the calibration adjustments are performed. Use the calibration count to verify that all calibration adjustments have been performed.

Time required for calibration

The instrument can be automatically calibrated under computer control. With computer control, you can perform the complete calibration procedure and performance verification tests in less than 60 minutes once the instrument is warmed-up (see **Test Considerations**). Refer to the *DM34460 Series Programming Guide* for more information.

Automating calibration procedures

The adjustment procedures provided in this Service Guide demonstrate front panel adjustment. You can automate the complete verification and adjustment procedures outlined in this manual. You can program the instrument configurations specified for each test over the remote interface. You can then enter read back verification data into a test program and compare the results to the appropriate test limit values. The instrument calibration must be unsecured to perform a calibration. See **Calibration Security** for details. Refer to the CALibration Subsystem for information on SCPI programming.

Input Connections

Test connections to the instrument are best accomplished using a Keysight Technologies 34172B calibration short for low-thermal offset measurements and a 34171B DMM connector configured to interface to the calibrator output. Shielded, twisted-pair, PTFE interconnect cables of minimum length are recommended between the calibrator and the multimeter to reduce settling and noise errors. HI and HI Sense should be a twisted pair. LO and LO Sense should be a twisted pair. Cable shields should be earth ground referenced. This configuration is recommended for noise reduction and settling time performance during calibration.

Calibration Adjustment Process

The following general procedure is recommended to complete a full calibration adjustment.

1. Adhere to the test considerations. See [Performance Verification > Test considerations](#) for details.
2. Perform the performance verification tests to characterize the instrument. See [Performance Verification](#) for details.
3. Unsecure the instrument for calibration adjustment. See [Calibration Security](#) for details.
4. Perform the calibration adjustment procedures. See [Calibration Adjustment Procedure](#) for details.
5. Secure the instrument against the calibration adjustment. See [Calibration Security](#) for details.
6. Take note of the security code and calibration count in the instrument's maintenance records.
7. Perform the [performance verification tests](#) to verify the calibration.

Gain Calibration Adjustment Overview

The ADC and zero calibration adjustment procedure must have been recently performed before beginning gain calibration.

CAUTION

Never turn off the instrument during a gain or flatness calibration adjustment. This may cause calibration memory for the present function to be lost.

Valid gain and frequency compensation input values.

Gain calibration adjustment can be accomplished using the following input values.

Function	Range	Valid Amplitude Input Values
DC Volts	100 mV to 100 V	0.9 to 1.1 x Full Scale
	1000 V	450 to 1000 V
	100 μ A to 1 A	0.9 to 1.1 x Full Scale
DC Current	3 A	1.5 A to 2.5 A
Ohms (2W and 4W)	100 Ω to 100 M Ω	0.9 to 1.1 x Full Scale
Frequency	Auto	Input > 100 mV rms, 9.9 kHz to 110 kHz
AC Current (rms) ^[a]	100 μ A to 1 A	0.9 to 1.1 x Full Scale
	3 A	0.9 A to 2 A
	100 mV to 10 V	0.9 to 1.1 x Full Scale
AC Volts (rms) ^[a]	100 V	40 V to 110 V
	750 V	400 to 750 V

[a] Valid frequencies are nominal frequencies $\pm 1\%$.

Gain and Flatness Calibration Adjustment Overview

The instrument stores new flatness correction constants each time this procedure is followed. Flatness constants adjust the DMM for AC Volts and AC current measurements across the usable input frequency band. The flatness constant is computed from the calibration value entered for the calibration command and from measurements made automatically during the calibration adjustment procedure.

Calibration adjustment for each range and frequency should be performed in the order shown.

Flatness calibration adjustment considerations

The ADC and zero calibration adjustment procedure must have been recently performed before beginning gain calibration adjustment.

CAUTION

Never turn off the instrument during a gain or flatness calibration adjustment. This may cause calibration memory for the present function to be lost.

Gain Calibration Adjustment

The instrument calculates and stores gain corrections for each input value. The gain constant is computed from the calibration value entered for the calibration command and from measurements made automatically during the calibration adjustment procedure.

Most measurement functions and ranges have gain calibration adjustment procedures, and calibration for each function should be performed in the order shown.

Entering Calibration Values and Storing Calibration Constants

Selecting the calibration mode

Use the CALibration:ADC? query to begin ADC calibration adjustment. The response to this query indicates a successful calibration (0) or a failure (1). Following the ADC calibration adjustment, use the measurement commands to set the DMM measurement parameters and functions for the mode being calibration adjusted.

From the front panel:

Press **[Shift]** > **[Single]** | **Utility** > **Test/Admin** > **Calibrate** > **Perform Cal** > **Cal Value** > **Perform ADC Cal**.

Entering calibration values

From the front panel:

Press **[Shift]** > **[Single]** | **Utility** > **Test/Admin** > **Calibrate** > **Perform Cal** > **Cal Value**. Use the navigation keys to enter a value followed by **Perform Cal Step**

Storing the calibration constants

To store calibration values in non-volatile memory, use CALibration:STORe.

From the front panel:

Press [Shift] > [Single] | Utility > Test/Admin > Calibrate > Save Cal Values

NOTE

You must have performed a successful calibration adjustment immediately before pressing **Save Cal Values**.

Calibration Security

The instrument has a calibration passcode to prevent accidental or unauthorized calibration adjustment. When you receive your multimeter, it is secured by a default passcode.

The default security passcode is DM3446XA. The security code cannot be changed by a power cycle, *RST, or SYSTem:PRESet.

You can change the passcode from both front panel and remote interface. You can enter a passcode of up to 12 characters. The first character must be a letter (A-Z), remaining may contains letters, numbers (0-9), or underscore "_". Blank spaces are not allowed.

From the front panel:

To unsecure the instrument:

1. Press [Shift] > [Single] | Utility > Test/Admin > Calibrate > Perform Cal > Secure Code.
2. Use the keyboard to enter the security passcode and press **Done**.
3. Then, press **UNLOCK**.

You can also unsecure the instrument from the Security menu: Press [Shift] > [Single] | Utility > Test/Admin > Security > Secure Code.

To change passcode:

NOTE

Make sure you have unsecured the instrument prior proceeding with this step.

1. Press [Shift] > [Store/Recall] | Utility > Test/Admin > Security > New Code.
2. Use the keyboard to enter the current passcode and your desired passcode.
3. Press **Done**.

From the remote interface:

To unsecure the instrument:

CAL:SEC:STAT 0, DM34460A

To change a new passcode to K_DM34460A:

CAL:SEC:CODE K_DM34460A

NOTE

To change a forgotten passcode to a new passcode, you can turn on the instrument after shorting CAL SECURE jumper J505 on the front panel board as shown below and send CAL:SEC:CODE <code> to change the passcode.



Calibration Count

You can query the instrument to determine how many calibrations have been performed. Note that your instrument was calibrated before it left the factory. When you receive your instrument, read the count to determine its initial value.

The count value increments by one for each calibration adjustment point, and a complete calibration adjustment will increase the value by many counts. The calibration count increments up to a maximum of $2^{32}-1$ after which it rolls over to 0. The calibration count can be read either remotely or from the front panel.

From the front panel:

Press **[Shift]** > **[Single]** | **Utility** > **Test/Admin** > **Calibrate**. The display will show the calibration count.

From the remote interface:

CAL:COUN?

You can read the calibration count regardless of whether the instrument is secured.

Calibration Message

You can use the CALibration:STRing command to store a message of up to 40 characters in calibration memory. For example, you could store the last calibration date, the calibration due date, or contact information for the person responsible for calibration. The calibration message is not affected by a power cycle or *RST.

You can only store the calibration message when the instrument is unsecured, but you can execute the CALibration:STRing? query regardless of whether the instrument is secured. A new calibration message overwrites the previous message, and messages over 40 characters are truncated.

To read the calibration message, press **[Shift]** > **[Single]** | **Utility** > **Test/Admin** > **Calibrate** or send CALibration:STRing? from the remote interface.

To change the calibration message, unsecure the instrument and press **[Shift]** > **[Single]** | **Utility** > **Test/Admin** > **Calibrate** > **Edit Cal String** or send CALibration:STRing "<string>" from the remote interface.

Calibration Error

The following errors indicate failures that may occur during a calibration.

Error Code	Error Messages
+701	Calibration error; security defeated
+702	Calibration error; calibration memory is secured
+703	Calibration error; secure code provided was invalid
+704	Calibration error: secure code too long
+705	Calibration error; calibration aborted
+706	Calibration error: provided value out of range
+707	Calibration error: computed correction factor out of range
+708	Calibration error: signal measurement out of range
+708	Calibration error; signal frequency out of range
+709	Calibration error: no calibration for this function/range
+710	Calibration error: full scale correction out of range
+711	Calibration error: calibration string too long
+712	Calibration failed
+713	Calibration error; ADC calibration failed; ADC configuration 'ACI' did not converge
+713	Calibration error; ADC calibration failed; ADC configuration 'ACV' did not converge
+713	Calibration error; ADC calibration failed; ADC configuration 'DCV' did not converge
+713	Calibration error; ADC calibration failed; DC offset for setup 'ACI'
+713	Calibration error; ADC calibration failed; DC offset for setup 'ACV'
+713	Calibration error; ADC calibration failed; DC offset for setup 'DCV'
+713	Calibration error; ADC calibration failed; feedbackLutGainTune unsupported LUT goal
+713	Calibration error; ADC calibration failed; feedbackLutTune search did not converge
+713	Calibration error; ADC calibration failed; feedbackPiCancel did not converge for setup 'ACI'

+713	Calibration error; ADC calibration failed; feedbackPiCancel did not converge for setup 'ACV'
+713	Calibration error; ADC calibration failed; feedbackPiCancel did not converge for setup 'DCV'
+713	Calibration error; ADC calibration failed; fine merge for setup 'ACI'
+713	Calibration error; ADC calibration failed; fine merge for setup 'ACV'
+713	Calibration error; ADC calibration failed; fine merge for setup 'DCV'
+713	Calibration error; ADC calibration failed; fine offset for setup 'ACI'
+713	Calibration error; ADC calibration failed; fine offset for setup 'ACV'
+713	Calibration error; ADC calibration failed; fine offset for setup 'DCV'
+713	Calibration error; ADC calibration failed; fineDcCancel found non-monotonic value in setup 'ACI'
+713	Calibration error; ADC calibration failed; fineDcCancel found non-monotonic value in setup 'ACV'
+713	Calibration error; ADC calibration failed; fineDcCancel found non-monotonic value in setup 'DCV'
+713	Calibration error; ADC calibration failed; LUT gain for setup 'ACI'
+713	Calibration error; ADC calibration failed; LUT gain for setup 'ACV'
+713	Calibration error; ADC calibration failed; LUT gain for setup 'DCV'
+713	Calibration error; ADC calibration failed; LUT goal incompatible with ACV
+713	Calibration error; ADC calibration failed; PI offset for setup 'ACI'
+713	Calibration error; ADC calibration failed; PI offset for setup 'ACV'
+713	Calibration error; ADC calibration failed; PI offset for setup 'DCV'
+713	Calibration error; DCV 10M input impedance gain adjustment out of range
+715	Calibration error; must perform +100mV DCV calibration before -100mV
+715	Calibration error; must perform +100uA DCI calibration before -100uA
+715	Calibration error; must perform +10V DCV calibration before -10V
+715	Calibration error; must perform 10MOhm calibration before 100MOhm
+720	Calibration error; DCV offset out of range
+721	Calibration error; DCI offset out of range
+722	Calibration error; RES offset out of range
+723	Calibration error; FRES offset out of range
+724	Calibration error; extended resistance self cal failed
+725	Calibration error; 1000V DC correction out of range
+726	Calibration error; ACV offset out of range
+727	Calibration error; ACI offset out of range
+730	Calibration error; precharge DAC convergence failed
+731	Calibration error; A/D turnover correction out of range
+732	Calibration error; AC flatness calibration failed
+733	Calibration error; AC low frequency correction out of range
+734	Calibration error; AC flatness calibration restarted by function/range change
+735	Calibration error; 1 kHz AC flatness frequency point must be last frequency point in sequence

+736	Calibration error; DCI 100uA range self-cal failed
+740	Calibration data lost: secure state
+740	Calibration information lost; count, security state, security code, string
+741	Calibration data lost: string data
+742	Calibration data lost: corrections
+746	System information write failure
+747	System information read failure
+748	Calibration memory write failure
+749	Calibration memory read failure
+750	Autocalibration corrections lost lost; due to firmware revision change
+750	Autocalibration corrections lost
+751	Autocalibration memory write failure
+752	Autocalibration memory read failure
+753	Autocalibration measurement out of range
+760	Operation aborted; high voltage present on input terminals

Aborting a Calibration Adjustment in Progress

Sometimes it may be necessary to abort a calibration adjustment. You can abort a calibration adjustment at any time by turning off the power or issuing a remote interface device clear message.

CAUTION

If you abort a calibration adjustment in progress, all calibration constants for the selected function range are lost. If power is turned off when the instrument is attempting to write new calibration constants to EEPROM, all calibration constants for the selected function range may also be lost. Typically, upon re-applying power, the instrument will report error 705 Cal:Aborted. It may also generate errors 740 through 742. If this occurs, you should not use the instrument until a complete re-calibration adjustment has been performed. See the [list of calibration errors](#) for more information

Calibration Adjustment Procedure

Perform the calibration adjustment procedures in the order listed in this document.

1. **ADC and Zero Calibration Adjustment**
2. **AC Voltage Low Freq Gain and Flatness Calibration Adjustment**
3. **AC Voltage Gain and Flatness Calibration Adjustment**
4. **AC Current Gain and Flatness Calibration Adjustment**
5. **AC Zero Calibration Adjustment**
6. **Frequency Accuracy Calibration Adjustment**
7. **DC Voltage Gain Calibration Adjustment**
8. **Ohms Gain Calibration Adjustment**
9. **DC Current Gain Calibration Adjustment**
10. **Capacitance Offset Calibration Adjustment(Optional)**
11. **Finishing Calibration Adjustment**

ADC and Zero Calibration Adjustment

Each time you perform a zero calibration adjustment; the instrument stores a new set of offset correction constants for every measurement function and range. The instrument sequences through all required functions and ranges automatically and stores new zero offset calibration constants. All offset corrections are determined automatically. You may not correct a single range or function without re-entering ALL zero offset correction constants automatically. This feature is intended to save calibration time and improve zero calibration consistency.

CAUTION

Never turn off the instrument during Zero Calibration. This may cause ALL calibration memory to be lost.

ADC and DC zero calibration adjustment procedure

This procedure uses a low-thermal shorting block installed on the input connectors. Be sure to allow the instrument to warm up and stabilize for 90 minutes before performing the calibration adjustment.

Review the **Test considerations** before proceeding with this procedure.

1. Install a shorting block on the front panel input terminals.
2. Select the ADC calibration mode ([**Shift**] > [**Single**] | **Utility** > Test/Admin > Calibrate > Perform Cal > Perform ADC Cal).
3. The display will show a message indicating that ADC calibration adjustment is in process. It will then display the results of the ADC calibration adjustment. A Calibration Step Succeeded message indicates success; if the display shows Calibration Step Failed, check the input value, range, function, and entered calibration value and repeat the calibration step. Press **Save Cal Values**.
4. Select the DCV measurement function. Enter a calibration value of +0.
Press [**Shift**] > [**Single**] | **Utility** > Test/Admin > Calibrate > Perform Cal > Perform Cal Step.

5. The Zero Calibration Adjustment lasts approximately two minutes. A Calibration Step Succeeded message indicates success; if the display shows Calibration Step Failed, check the input value, range, function, and entered calibration value and repeat the calibration step.
6. Press **Save Cal Values**.

AC voltage low frequency gain and flatness calibration adjustment procedure

Review the **Test considerations** and **Gain adjustment considerations** before proceeding with this procedure.

Configuration: AC Voltage

1. Configure each function and range in the order as shown in the table below.
2. Apply the input signal as indicated in the Input column.
3. Enter the actual applied input voltage amplitude (see **Entering calibration values**). A Calibration Step Succeeded message indicates success; if the display shows Calibration Step Failed, check the input value, range, function, and entered calibration value and repeat the calibration adjustment step.
4. Repeat steps 1 through 3 for each flatness calibration adjustment point shown in the table.
5. Store the new calibration constants (see **Storing the calibration constants**).

NOTE

Each voltage and frequency takes approximately 2.5 seconds to complete.

Input		Instrument Settings	
Vrms	Frequency	Function	Range
7 V	10 Hz	AC Voltage	10 V
7 V	40 Hz		10 V

AC voltage gain and flatness calibration adjustment procedure

Review the **Test considerations** and **Gain adjustment considerations** before proceeding with this procedure.

Configuration: AC Voltage

NOTE

All AC calibration adjustment procedures use the 3 Hz bandwidth measurement filter.

1. Configure each function and range in the order as shown in the table below.
2. Apply the input signal as indicated in the Input column.
3. Enter the actual applied input voltage amplitude (see **Entering calibration values**). A Calibration Step Succeeded message indicates success; if the display shows Calibration Step Failed, check the input value, range, function, and entered calibration value and repeat the calibration adjustment step.
4. Repeat steps 1 through 3 for each flatness calibration adjustment point shown in the table.
5. Store the new calibration constants (see **Storing the calibration constants**).

NOTE

Each voltage and frequency takes approximately 2.5 seconds to complete.

Input		Instrument Settings	
Vrms	Frequency	Function	Range
100 m V	5 kHz, 10 kHz, 20 kHz, 35 kHz, 50 kHz, 75 kHz, 100 kHz, 200 kHz, 300 kHz, 390 kHz, 400 kHz, 220 Hz, 1 kHz	AC Voltage	100 mV
1 V	5 kHz, 10 kHz, 20 kHz, 35 kHz, 50 kHz, 75 kHz, 100 kHz, 200 kHz, 300 kHz, 390 kHz, 400 kHz, 220 Hz, 1 kHz		1 V
10 V	5 kHz, 10 kHz, 20 kHz, 35 kHz, 50 kHz, 75 kHz, 100 kHz, 200 kHz, 300 kHz, 390 kHz, 400 kHz, 220 Hz, 1 kHz		10 V
50 V	5 kHz, 10 kHz, 20 kHz, 35 kHz, 50 kHz, 75 kHz, 100 kHz, 200 kHz, 300 kHz, 390 kHz, 400 kHz, 220 Hz, 1 kHz		100 V
500 V	1 kHz		750 V

AC current gain and flatness calibration adjustment procedure

Review the **Test considerations** and **Gain adjustment considerations** before proceeding with this procedure.

Configuration: AC Current

NOTE

All AC calibration adjustment procedures use the 3 Hz bandwidth measurement filter.

1. Configure each function and range in the order as shown in the table below.
2. Apply the input signal as indicated in the Input column.
3. Enter the actual applied input current as the Cal Value (see **Entering calibration values**). A Calibration Step Succeeded message indicates success; if the display shows Calibration Step Failed, check the input value, range, function, and entered calibration value and repeat the calibration adjustment step.
4. Repeat steps 1 through 3 for each gain calibration adjustment point shown in the table.
5. Store the new calibration constants (see **Storing the calibration constants**).

NOTE

Each range takes approximately 4 seconds to complete.

Input		Instrument Settings	
Vrms	Frequency	Function	Range
1 A	5 kHz, 7.5 kHz, 9.7 kHz, 10 kHz, 220 Hz, 1 kHz	AC Current	1 A
100 mA	5 kHz, 7.5 kHz, 9.7 kHz, 10 kHz, 220 Hz, 1 kHz		100 mA
10 mA	5 kHz, 7.5 kHz, 9.7 kHz, 10 kHz, 220 Hz, 1 kHz		10 mA
1 mA	1 kHz		1 mA
100 μ A	1 kHz		100 μ A

AC zero calibration adjustment procedure

Review the **Test considerations** before proceeding with this procedure.

Configuration: AC Voltage

1. Set the calibrator to 0.00 Ω .
2. Enter a calibration value of +0 (see **Entering calibration values**). A Calibration Step Succeeded message indicates success; if the display shows Calibration Step Failed, check the input value, range, function, and entered calibration value and repeat the calibration adjustment step.
3. Store the new calibration constants (see **Storing the calibration constants**).

NOTE

This calibration adjustment takes approximately 10 seconds to complete.

Frequency accuracy calibration adjustment procedure

Review the **Test considerations** and **Gain adjustment considerations** before proceeding with this procedure.

Configuration: Frequency, 10 V range

NOTE

The frequency accuracy of the Fluke 5730A is insufficient to calibrate the DMM. Its frequency output needs to be calibrated against a more accurate reference. The Keysight 33500B Series Function/Arbitrary Waveform Generator is recommended for this calibration adjustment procedure.

1. Configure the instrument for frequency measurements at 10 V and 10 kHz, with 1 second gate time.
2. Apply a 10 kHz sine wave, amplitude 20 Vpp.
3. Enter a the actual applied input frequency (see **Entering calibration values**). A Calibration Step Succeeded message indicates success; if the display shows Calibration Step Failed, check the input value, range, function, and entered calibration value and repeat the calibration adjustment step.
4. Store the new calibration constants (see **Storing the calibration constants**).

NOTE

This calibration adjustment takes approximately 1 seconds to complete.

DC voltage gain calibration adjustment procedure

Review the **Test considerations** and **Gain adjustment considerations** before proceeding with this procedure.

Configuration: DC Voltage

1. Configure each function and range in the order as shown in the table below.
2. Apply the input signal as indicated in the Input column.
3. Enter the actual applied input voltage amplitude (see **Entering calibration values**). A Calibration Step Succeeded message indicates success; if the display shows Calibration Step Failed, check the input value, range, function, and entered calibration value and repeat the calibration adjustment step.
4. Repeat steps 1 through 3 for each gain calibration adjustment point shown in the table.
5. Store the new calibration constants (see **Storing the calibration constants**).

NOTE

Each range takes less than 4 seconds to complete.

Input	Instrument Settings	
	Function	Range
10 V	DC Voltage	10 V
-10 V		10 V
0.1 V		100 mV
-0.1 V		100 mV
1 V		1 V
100 V		100 V
500 V		1000 V

Ohm gain calibration adjustment procedure

Review the **Test considerations** and **Gain adjustment considerations** before proceeding with this procedure.

Configuration: 4-wire Ohms

This procedure adjusts the gain for the 2-wire and 4-wire Ohms functions, and the offset compensated Ohms function.

1. Configure each function and range in the order as shown in the table below.
2. Apply the input signal as indicated in the Input column.
3. Enter the actual applied input voltage amplitude (see **Entering calibration values**). A Calibration Step Succeeded message indicates success; if the display shows Calibration Step Failed, check the input value, range, function, and entered calibration value and repeat the calibration adjustment step.
4. Repeat steps 1 through 4 for each gain calibration adjustment point shown in the table.
5. Store the new calibration constants (see **Storing the calibration constants**).

NOTE Each range takes less than 4 seconds to complete.

Input	Instrument Settings	
	Function	Range
100 Ω	4-wire Ohms	100 Ω
1 k Ω		1 k Ω
10 k Ω		10 k Ω
100 k Ω		100 k Ω
1 M Ω		1 M Ω
10 M Ω	2-wire Ohms	10 M Ω
100 M Ω		100 M Ω

DC current gain calibration adjustment procedure

Review the **Test considerations** and **Gain adjustment considerations** before proceeding with this procedure.

Configuration: DC Current

1. Configure each function and range in the order as shown in the table below.
2. Apply the input signal as indicated in the Input column.
3. Enter the actual applied input current as the Cal Value (see **Entering calibration values**). A Calibration Step Succeeded message indicates success; if the display shows Calibration Step Failed, check the input value, range, function, and entered calibration value and repeat the calibration adjustment step.
4. Repeat steps 1 through 3 for each gain calibration adjustment point shown in the table.
5. Store the new calibration constants (see **Storing the calibration constants**).

NOTE

Each range takes less than 4 seconds to complete.

Input	Instrument Settings	
	Function	Range
100 μ A	DC Current	100 μ A
1 mA		1 mA
10 mA		10 mA
100 mA		100 mA
1 A		1 A

Capacitance offset calibration adjustment procedure (Optional)

This calibration adjustment is normally not required. It compensates for residual capacitance offset which is typically less than a few pF. In normal use, any residual offset will be overridden by the null function (null also corrects for cable capacitance), and the null function is required to achieve the multimeter's capacitance specification.

Configuration: Capacitance

1. Remove all connections from the instrument's front terminals.
2. Enter a calibration value of +0 (see **Entering calibration values**). A Calibration Step Succeeded message indicates success; if the display shows Calibration Step Failed, check the input value, range, function, and entered calibration value and repeat the calibration adjustment step.
3. Store the new calibration constants (see **Storing the calibration constants**).

Finishing the calibration adjustment

1. Remove all shorting plugs and connections from the instrument.
2. Reset the Calibration Message (see **Calibration Message**).

3. Record the new Calibration Count (see **Calibration Count**).
4. Performs the performance verification to verify the calibration (see **Performance verification tests**)

