FLUKE
Calibration

1586A

SUPER-DAQ Precision Temperature Scanner

Calibration Manual

July 2014 Rev. 2, 2/26

LIMITED WARRANTY AND LIMITATION OF LIABILITY

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

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

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Introduction

The Fluke Calibration 1586A SUPER-DAQ Precision Temperature Scanner (the Product or Instrument) is a 45 analog channel bench-top measurement instrument that measures and records temperature, resistance, dc volts, and dc current. See the *Specifications* section for information on the types and ranges of the measurement inputs the Product can accept.

⚠⚠ Warning

Read *Safety Information* before you use the Product.

Contact Fluke Calibration

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

To register your product, view, print, or download the latest manual or manual supplement, go to our website.

+1-425-446-5500

fluke-info@fluke.com.

Safety Information

General Safety Information is in the Fluke Safety Information that shipped with the Product or at www.fluke.com. More specific safety information is listed where applicable.

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.

Specifications

Complete Product specifications are available at www.fluke.com. Safety specifications are in the *Safety Information* that shipped with the Product.

General Maintenance

The subsequent sections describe how to maintain the Product.

Clean the Product

To clean the Product, wipe the instrument with a cloth that is lightly dampened with water or mild detergent. Do not use aromatic hydrocarbons, chlorinated solvents, or methanol-based fluids.

⚠Caution

To prevent possible damage to the Product, do not use solvents or abrasive cleansers.

⚠Caution

For safe operation and maintenance of the Product:

- **Have an approved technician repair the Product.**
- **Do not allow water to get inside the Product.**

If the Product Does Not Turn On

To help solve problems encountered when turning on the Product:

1. Make sure that the power switch is in the “On” position.
2. Make sure that the mains power cord is firmly plugged into the power module on the rear of the Product.
3. Make sure the power source that the Product is plugged into is energized.
4. Make sure that the line power fuse is good. See *Replace the Line Power Fuse*.

If these steps do not solve the problem, then contact Fluke Calibration. See *Contact Fluke Calibration*.

Replace the Line Power Fuse

To replace the fuse, see the *Users Manual*.

Battery Replacement

The battery in the Product is used for Product memory.

To replace the battery, see Figure 1:

1. Disassemble the Product as described in the *Disassembly* section.
2. Remove the battery and replace with one rated appropriately for the selected voltage.
3. Reassemble the Product.

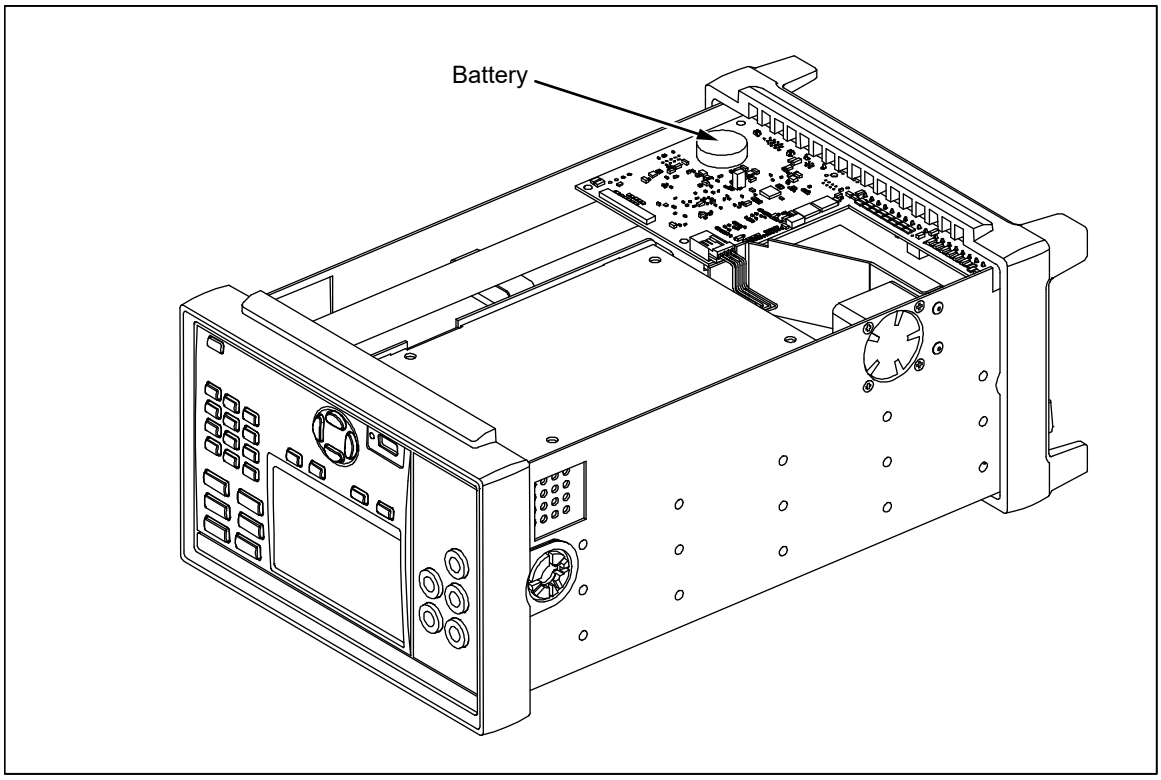

Figure 1. Battery Location

Memory and Factory Reset

The Product has two memory reset functions:

- Clear all Files
- Factory Reset

See Table for a comparison of these functions.

Note

All memory reset functions require the Admin password.

Table 1. Memory Clear Functions

Task	Clear All Files	Factory Reset
Deletes test setup files, DMM data files, and scan data files from the internal memory.[1]	•	
Clears the configuration of the channel setup, test setup, and instrument setup[2]		•
[1] Does not remove data from the USB drive.		
[2] Does not reset the MAC address, the serial number, calibration, clock time, or the Admin or User passwords.		

To clear all files:

1. Push MEMORY.
2. Push F1 twice.
3. Enter the Admin password.
4. Push F4.
5. Push F3 to confirm.

To reset the Product to factory settings:

1. Push INSTRUMENT SETUP.
2. Push F2.
3. Enter the Admin password, then push F4.

Product Disposal

Dispose of the Product in a professional and environmentally sound manner:

- Delete personal data on the Product before disposal.
- Remove batteries that are not integrated into the electrical system before disposal and dispose of batteries separately.
- If this Product has an integral battery, put the entire Product in the electrical waste.

Required Equipment

Table 2 lists the equipment required for performance tests and calibration of the Product.

Table 2. Required Test Equipment

Function	Instrument Type	Model	Comments
Volts DC	Standard	Fluke 5720A	
	8½ digit meter	Fluke 8508A	Used to characterize the 5522A
	4-wire short	Fluke 884X-SHORT, low thermal 4-wire short or equivalent	Fluke PN 2653346
	Alternate standard[1]	Fluke 5522A	Must be characterized with 8508A
Ohms	Standard	Fluke 5720A	
	4-wire short	Fluke 884X-SHORT, low thermal 4-wire short or equivalent	Fluke PN 2653346
	Alternate standard	The standard resistors which have equivalent spec with Fluke 5720A.	
PRT	Standard	Fluke 5522A (for 1 kΩ value) Standard resistors of 25 Ω, 100 Ω, 200 Ω and 400 Ω	Resistance accuracy specification (k = 2) should be equal to or better than: 6 ppm (for 25 Ω) 4 ppm (for 100 Ω, 200 Ω and 400 Ω)
	4-wire short	Fluke 884X-SHORT, low thermal 4-wire short or equivalent	Fluke PN 2653346
	Alternate standard	The standard resistors which have equivalent specification	
Thermistor	Standard	Fluke 5522A	Must be characterized with 8508A
	8½ digit meter	Fluke 8508A	Used to characterize the 5522A
	4-wire short	Fluke 884X-SHORT, low thermal 4-wire short or equivalent	Fluke PN 2653346
	Alternate standard[1]	Fluke 5720A	

Table 2. Required Test Equipment (cont.)

Function	Instrument Type	Model	Comments
Current DC	Standard	Fluke 5522A	Must be characterized with 8508A
	8½ digit meter	Fluke 8508A	Used to characterize the 5522A
	Alternate standard[1]	Fluke 5720A	
1586-2586 Input Module CJC	Metrology Drywell	Fluke 9171 with insert block	
	Reference thermistor probe	Fluke 5610-9	Accuracy 0.013 °C or better at 25 °C
	Reference thermometer	Fluke 1586A	Only for CJC verification
	E-type thermocouples	Omega TT-E-24-SLE	Must be calibrated. Accuracy 0.026 °C or better at 25 °C.
1586-2588 DAQ-STAQ CJC	Metrology Drywell	Fluke 9171 with insert block	
	Reference thermistor probe	Fluke 5610-9	Accuracy 0.013 °C or better at 25 °C.
	Reference thermometer	Fluke 1586A	Only for CJC verification
	E-type thermocouples	Omega TT-E-24-SLE with NMP-E-M TC adaptor	Must be calibrated. Accuracy 0.026 °C or better at 25 °C.
Cables	To reduce the possibility of inducing errors with ac signals picked up by the test leads, use short, shielded twisted-pair PTFE-insulated test cables between the test equipment and the Meter. Fluke makes a 2 foot (PN 738716) and 4 foot (PN 738724) PTFE insulated test cable for this purpose		

[1] Other alternate standards beside those listed can be used as long as they provide sufficient traceable [Test uncertainty Ratios (TURs)] at each calibration and verification point.

Test Considerations

For optimum performance, all test procedures should comply with these recommendations:

- Assure the calibration ambient temperature (T_{cal}) is stable and between 18 °C and 28 °C. Ideally, the calibration should be done at 23 °C ±2 °C.
- Assure ambient relative humidity is <80 %.
- Allow a 60-minute warm-up period.
- Use shielded twisted-pair PTFE-insulated cables to reduce settling and noise errors.
- Keep all input cables as short as possible.
- Ensure that the calibration standards and test procedures used do not introduce additional errors.

Note

Ideally, the standards used to verify and adjust the Product should be four times more accurate than each full-scale error specification of the Product.

- User the Fluke low-thermal 4-Wire short for all voltages and Ohm shorts. See Table 2 for Fluke part number.

Performance Tests

This section provides performance tests to verify that the Product operates within published specifications as well as a complete calibration adjustment procedure. The performance test and, if necessary, the calibration procedure can be done both periodically and after service or repair.

The performance tests can be used as an acceptance test upon receipt of the Product. Use the 90-day specifications when an acceptance test is done after the Product is calibrated.

These performance tests are provided to ensure that the Product is in proper operating condition. If the Product fails any of the performance tests, calibration adjustment and/or repair is needed. The performance test works best if done in the sequence shown in Table 3.

Each of the measurements listed in the following tests assumes the Product is being tested after a one-hour warmup in an environment with an ambient temperature of 18 °C to 28 °C and a relative humidity of <80 %.

Note

All instrument settings for verification use power up conditions except as noted by the verification step.

Front Panel Test

To test the keypad and LEDs on the front panel:

1. Turn on the Product.
2. Push **Instrument Setup**.
3. Push and hold [5] for 3 seconds to enter keypad diagnostic.
4. Push every key, the key name should be shown correctly on the screen.
5. Push [SCAN MONITOR], [MEASURE DMM], [CHANNEL SETUP], [RECORD] and [⏻] again, to check the LED.
6. Push [F5] to exit the keypad diagnostic program.

DC Volts Verification

Connect the Product to the test equipment as shown in Figure 2 and apply the voltages listed in Table 3.

Note

For the 0 V tests, use the 4-wire short to short the Hi/Lo and Sense inputs.

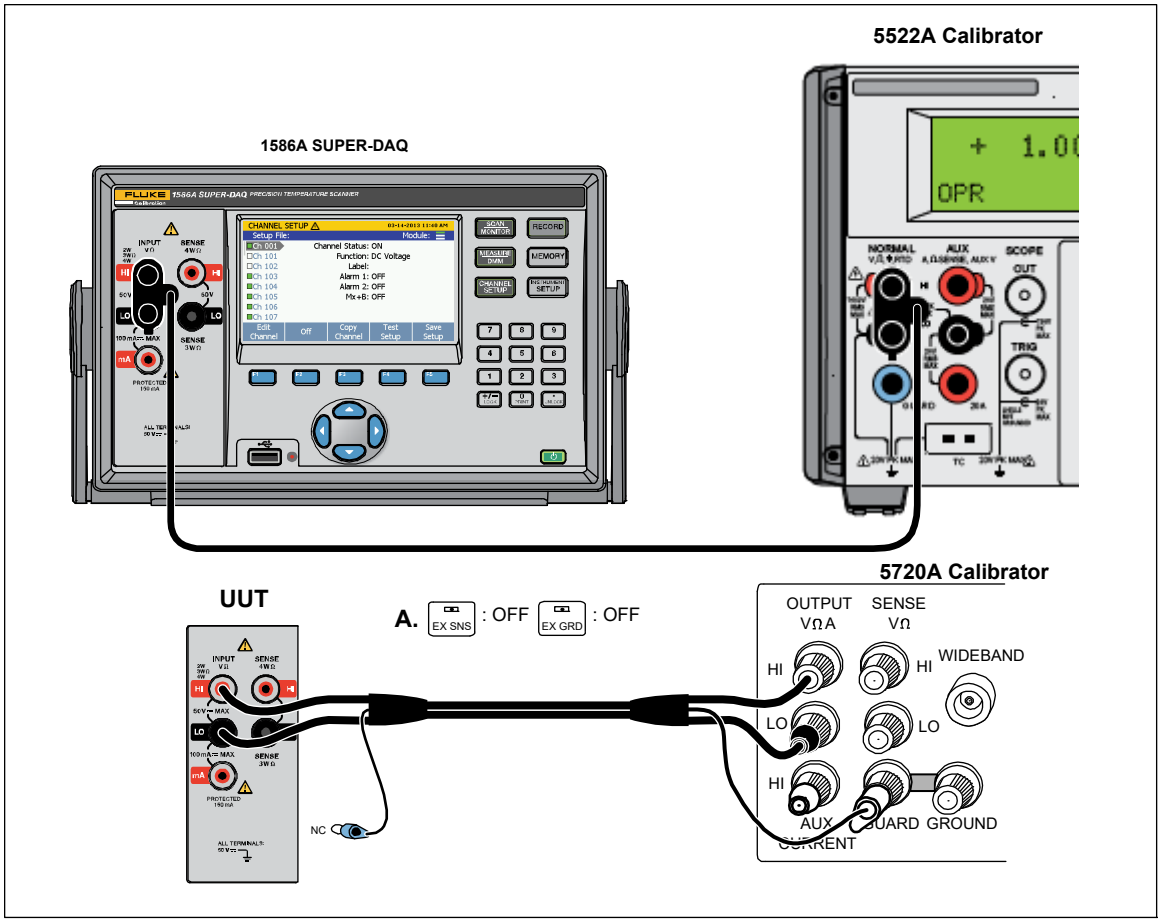

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Figure 2. DC Voltage Test Connections

Table 3. DC Volts Verification Steps

Nominal Input(V)	Range	1-Year Test Limits	
		High	Low
0	0.1	3.5 μV	-3.5 μV
0.04[1]	0.1	40.005 mV	39.995 mV
0.1[1]	0.1	100.0072 mV	99.9928 mV
-0.04[1]	0.1	-39.995 mV	-40.005 mV
-0.1[1]	0.1	-99.9928 mV	-100.0072 mV
0	1	7.0 μV	-7.0 μV
1[1]	1	1.000032 V	0.999968 V
-1[1]	1	-0.999968 V	-1.000032 V
0	10	50.0 μV	-50.0 μV
10[1]	10	10.00029 V	9.99971 V
-10[1]	10	-9.99971 V	-10.00029 V
0	50	600.0 μV	-600.0 μV
50[1]	50	50.0025 V	49.9975 V
-50[1]	50	-49.9975 V	-50.0025 V
[1] 5522A must be used with 8508A to obtain suitable test uncertainty ratio.			

4-Wire Ohms Verification

Connect the Product to the test equipment as shown in Figure 3 and apply the resistance listed in Table 4.

Note

For the 0 Ω tests, use the 4-wire short to short the Hi/Lo and Sense inputs.

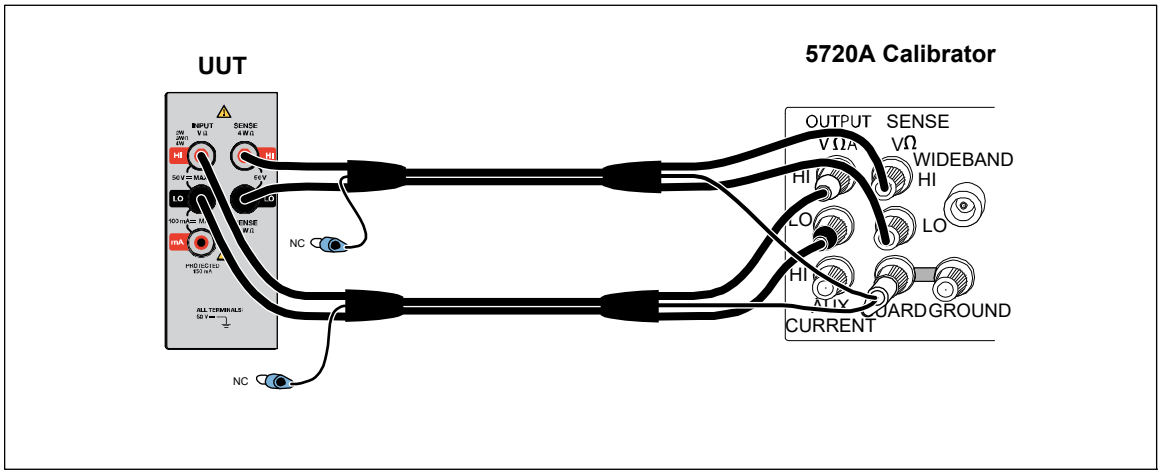

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Figure 3. 4-Wire Ohms Test Equipment Setup

Table 4. 4-Wire Ohms Verification Steps

Nominal Input	Range	1-Year Test Limits	
		High	Low
0 Ω	100	0.0035 Ω	-0.0035 Ω
100 Ω	100	100.0075 Ω	99.9925 Ω
0 Ω	1 K	0.00001 kΩ	-0.00001 kΩ
1 k Ω	1 K	1.000031 kΩ	0.999969 kΩ
0 Ω	10 K	0.0001 kΩ	-0.0001 kΩ
10 kΩ	10 K	10.00041 kΩ	9.99959 kΩ
0 Ω	100 k	0.001 kΩ	-0.001 kΩ
100 kΩ	100 k	100.0041 kΩ	99.9959 kΩ
0 Ω	1 M	0.00001 MΩ	-0.00001 MΩ
1 MΩ	1 M	1.000041 MΩ	0.999959 MΩ
0 Ω	10 M	0.0001 MΩ	-0.0001 MΩ
10 MΩ	10 M	10.0016 MΩ	9.9984 MΩ
0 Ω[1]	100 M	0.01 MΩ	-0.01 MΩ
100 M Ω[1]	100 M	100.81 MΩ	99.19 MΩ
[1] 2-Wire			

PRT Verification

Connect the Product as in Figure 4 for the 1 kΩ value listed in Table 5. For all other values in the table, use standard resistors. Configure Ch001 as a 4-wire PRT function with resistance display.

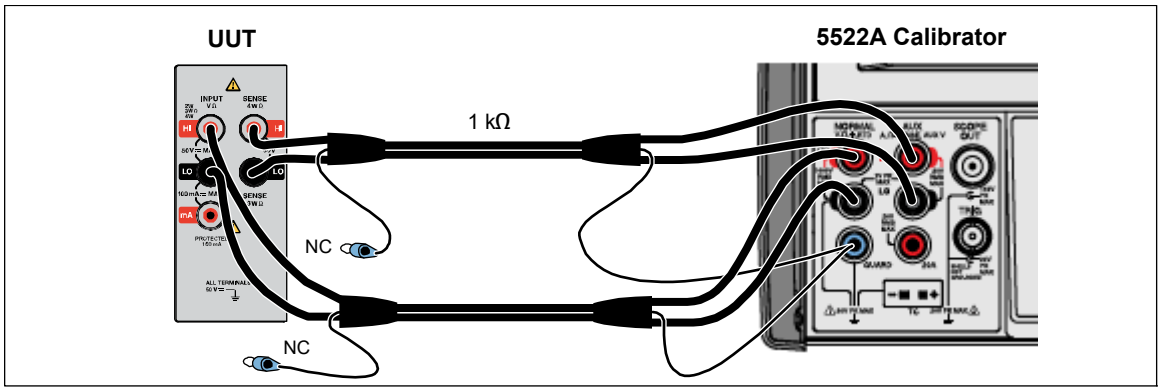

Figure 4. PRT Test Equipment Setup

Table 5. PRT Verification Steps

Nominal Input	Range	1-Year Test Limits	
		High	Low
0 Ω	100	0.0008 Ω	-0.0008 Ω
25 Ω	100	25.0008 Ω	24.9992 Ω
100 Ω	100	100.002 Ω	99.998 Ω
1 kΩ	1k	1.00006 kΩ	0.99994 kΩ

Thermistor Verification Steps

Connect the Product to the test equipment as shown in Figure 5 and apply the resistance listed in Table 6. Configure Ch001 as a 4-wire thermistor function with resistance display.

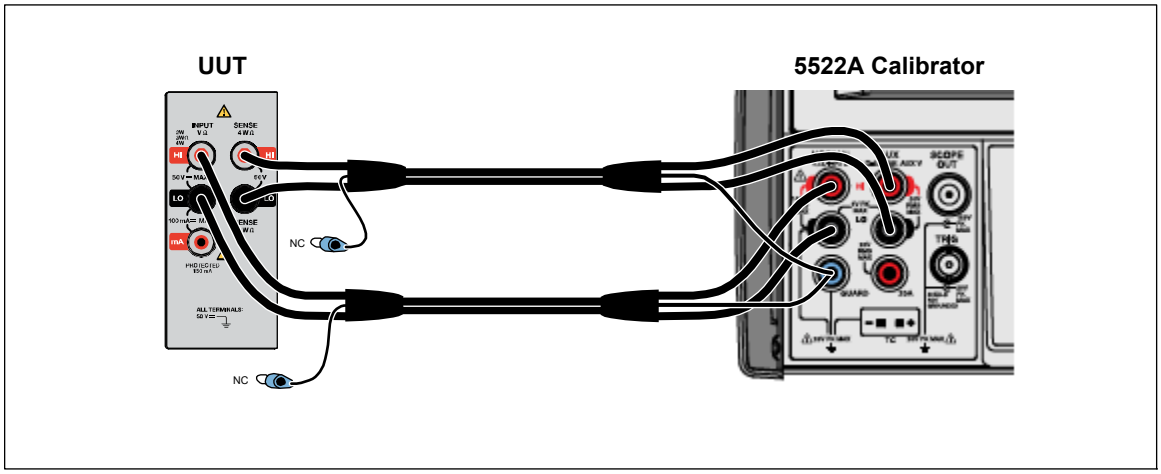

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Figure 5. Thermistor Test Equipment Setup

Table 6. Thermistor Verification Steps

Nominal Input	Range	1-Year Test Limits	
		High	Low
0 Ω	2.2 k	0.2 Ω	-0.2 Ω
2 kΩ	2.2 k	2000.28 Ω	1999.72 Ω
90 kΩ	98 k	90004.1 Ω	89995.9 Ω
900 kΩ	1 M	900140 Ω	899860 Ω

DC Current Verification

Connect the Product to the test equipment as shown in Figure 6 and apply the values listed in Table 7.

Note

When you use 5720A/5522A as source, connect Hi (source) to Lo (Product) and Lo (source) to mA (Product). For the 0 A tests, open Lo inputs.

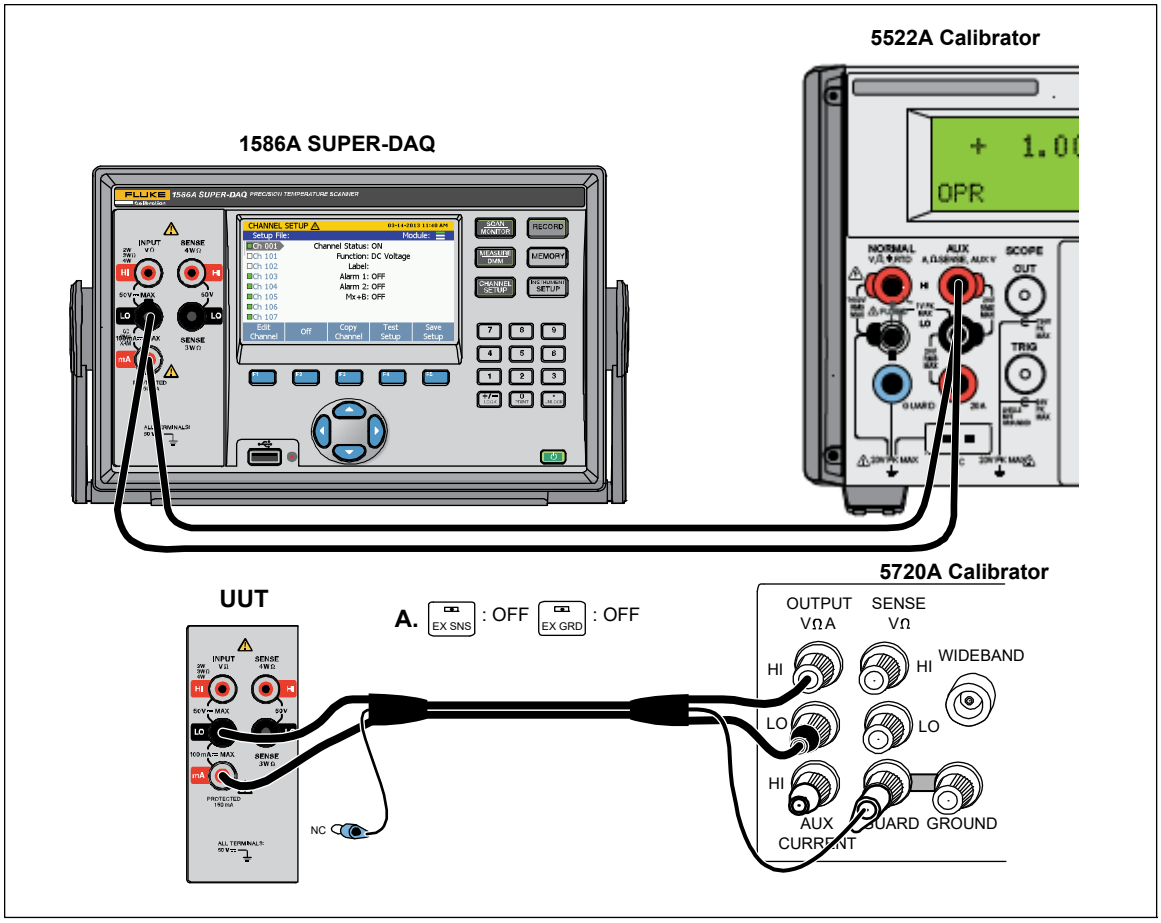

Figure 6. mA DC Current Equipment Setup

Table 7. DC Current Verification Steps

Nominal Input (mA)	Range	1-Year Test Limits	
		High	Low
0	0.1	3.5 nA	-3.5 nA
0.1[1]	0.1	100.0185 µA	99.9815 µA
-0.1[1]	0.1	-99.9815 µA	-100.0185 µA
0	1	11.0 nA	-11.0 nA
1[1]	1	1.000161 mA	0.999839 mA
-1[1]	1	-0.999839 mA	-1.000161 mA
0	10	0.35 µA	-0.35 µA
10[1]	10	10.00185 mA	9.99815 mA
-10[1]	10	-9.99815 mA	-10.00185 mA
0	100	3.5 µA	-3.5 µA
100[1]	100	100.0185 mA	99.9815 mA
-100[1]	100	-99.9815 mA	-100.0185 mA
[1] 5720A or 5522A must be used with 8508A to obtain suitable test uncertainty ratio.			

1586-2586 CJC Module Accuracy Verification

1. Connect the calibrated E-type thermocouples to channel 10 on the Unit Under Test (UUT).
2. Insert the thermocouples into a drywell calibrator which is set and stabilized at 25 °C.
3. Configure the channels of the Product for an E-thermocouple.
4. Insert the reference thermistor probe into the drywell to measure the actual temperature.
5. Use the reference thermometer with the reference thermistor probe and the thermocouples with the Product to measure the drywell temperature until all readings are stable.
6. Compare the thermocouple readings and reference thermometer reading.
7. The difference should be <0.6 °C.

1586-2588 Module CJC Accuracy Verification

1. Connect 10 calibrated E-type thermocouples with TC adaptors to channels 1 through 10 on the Module TC input connectors.
2. Insert all thermocouples into a drywell calibrator which is set and stabilized at 25 °C.
3. Configure the channels of the Product for E-type thermocouples.
4. Insert the reference thermistor probe into the drywell to measure the actual temperature.
5. Use the reference thermometer with reference thermistor probe and the thermocouples with the Product (UUT) to measure the drywell temperature until all readings are stable.
6. Compare the 10 thermocouple readings and the reference thermometer reading. The maximal difference should be <0.25 °C.

Calibration Adjustment

Calibration adjustment should be done at the desired time interval, or whenever a verification test indicates that a Product function is out of tolerance. Product accuracy stays within specifications only if the adjustment procedure is done at regular intervals. A one-year interval is adequate for most applications. Product accuracy specifications are not valid beyond the one-year interval.

Adjustments are accessed through both the remote interface and front panel with a series of adjustment steps. The remote program directs the test equipment to apply a series of shorts, opens, voltages, currents, and resistances to the Product. At each step, the Product internally makes the necessary adjustment to bring the Product into specification. No internal mechanical adjustments are necessary.

With an automated, computer-controlled procedure, the calibration and verification procedures can be done in under an hour. A MetCal program is available at www.fluke.com to adjust the Product.

Adjustments are password protected to prevent accidental or unauthorized adjustments. The admin password must be entered through the front panel or remote interface.

Unlock the Product

To unlock the Product for adjustments from the front panel:

1. Push **Instrument Setup**.
2. Push **Calibrate**.
3. Use the numeric keypad to enter the 4-digit admin password. The Product is shipped from the factory with the password set to **1586**.
4. Push **OK** to enter the password and continue the adjustments procedure.

Unlock the Product with a Remote Interface

To unlock the Product with a remote interface, send the command:

```
CAL:SEC:STAT OFF,"1586"
```

To relock the Product, send the command:

```
CAL:SEC:STAT ON
```

Reset the Admin Password

If the admin password is lost or forgotten, the password can be reset to 1586 with these steps:

Note

Before doing these steps, try to use the factory default password: ***1586****.*

1. Do the general disassembly steps in the *Disassembly* section.
2. Connect a jumper across J8, as shown in Figure 7.
3. Reconnect the mains power cable between the Product and a power outlet.
4. Turn the on the Product.
5. When the Product is started, the password will automatically be reset to **1586**.
6. Turn the Product off and disconnect the mains power cable.
7. Remove the jumper connected in step 2.
8. Reassemble the Product by doing the reverse procedure in *Disassembly*.

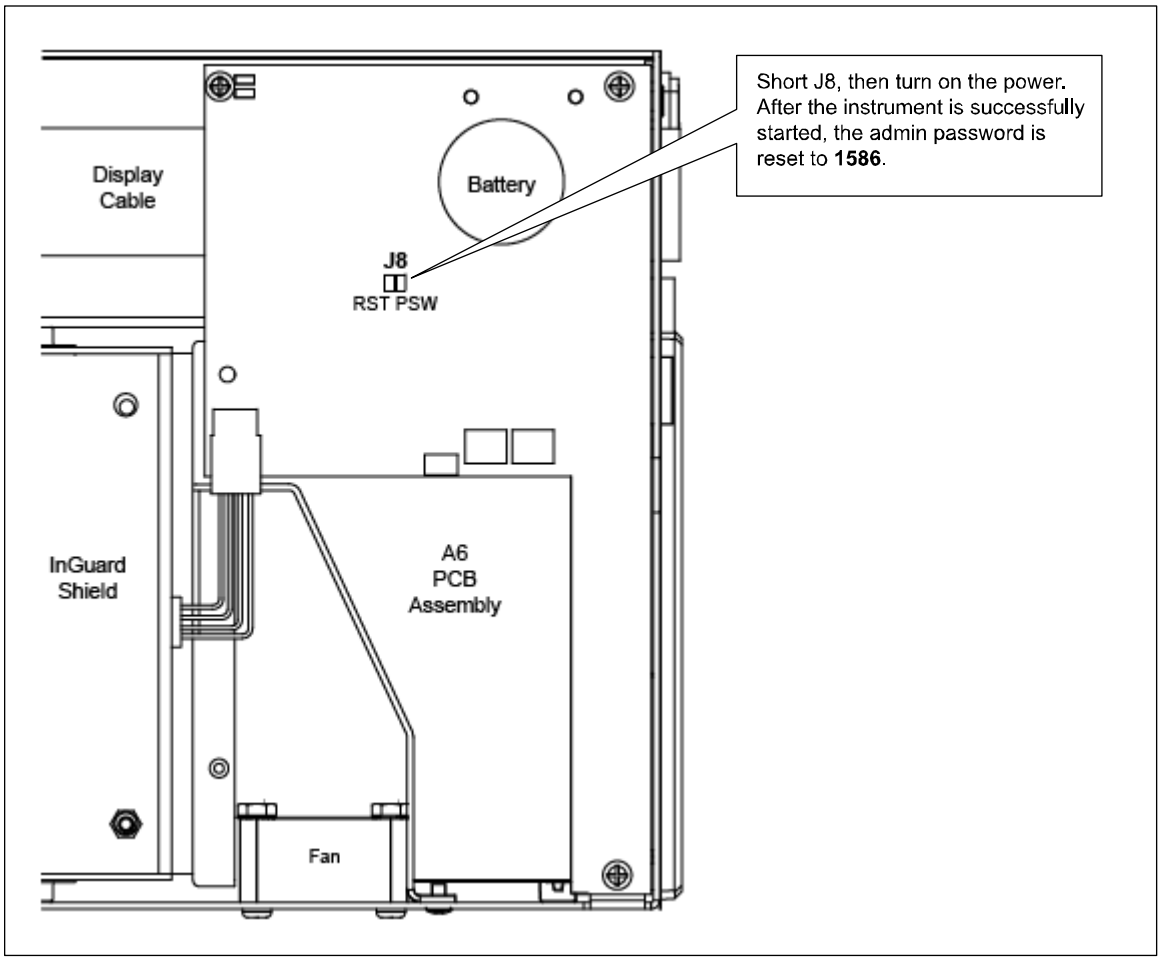

Figure 7. Password Reset Jumper

Update the Firmware

For Products with a firmware version 1.03 or higher, firmware can be updated by the product administrator with the front-panel USB port. Download new firmware versions from the Fluke web page for the Product under the Knowledge and Information tab. For Products that have firmware versions below 1.03, contact Fluke Calibration Service to schedule a firmware update as these versions do not support the USB firmware update process. See *Contact Fluke Calibration.*

Update instructions for Products that currently use version 1.03 and above:

⚠Caution

- **Do not cycle Product power or remove the USB device while the firmware update is in process. These actions will cause an instrument failure during the update process and require a return to a Fluke Service center to correct.**
- **The Product automatically re-boots once the update process completes. Updates can take several minutes to complete, and the display is not illuminated until the re-boot occurs.**

Note

Fluke Calibration recommends you move all internal data files and setup files from the Product to a USB device prior to updating the Product firmware.

Before the update process starts, push INSTRUMENT SETUP, then **Firmware** to make sure the current firmware version is 1.03 or above.

- If your firmware version is 1.03 or above, continue.
- If your firmware version is below 1.03, do not continue the update process. You must return the Product to Fluke Calibration Service to update it.

To update the firmware:

1. Download and extract the firmware update files (AuxInfo.txt and mtv.flt) to your computer from the Fluke website
2. Create a new folder named “firmware” on the USB flash drive (1 GB or greater) and then copy these files to this folder. To prevent file corruption, use the Windows utility to safely eject your flash drive from your computer.
3. Plug the flash drive into the Product and wait for the red light next to the USB port to illuminate to show that the drive is recognized.

Note

The Product may not recognize some USB flash drives. Test the flash drive that you intend to use prior to starting this update process to ensure it is recognized.

4. Push INSTRUMENT SETUP to enter the Setup menu.
5. Push ▲ or ▼ and select “Firmware” then push F3 to enter the firmware menu.
6. Push F1 and enter the administrator password, then push F3 to start the update process.
7. WAIT until the Product automatically re-boots. The screen is blank for several

minutes during this time. Do not cycle the power or remove the USB device while the firmware update is in process.

8. After the automatic re-boot, push INSTRUMENT SETUP to make sure that the update was successful. Make sure the firmware version installed shows on the screen.

Disassembly

⚠⚠Warning

To prevent possible electrical shock or personal injury, disconnect the mains power cord before you remove the Product covers.

Only disassemble the Product to reset the password or replace the battery. See Figure 8.

A 2# Phillips screwdriver and small crescent wrench are required for disassembly.

1. Remove all High-Capacity Modules and test leads from the Product.
2. Turn off the mains power at the rear of the Product and remove the mains power cord. The front panel power key only puts the Product into a power-save mode and does not remove mains power.
3. Remove the bail by pulling from a corner and stretching the boot off the Product.
4. Remove the bail by rotating the handle upright to a 90 ° angle from the top of the Product and pull the bail out from the sides.
5. Remove the top cover by removing the two screws on the sides of the chassis and slide the cover towards the back of the Product.

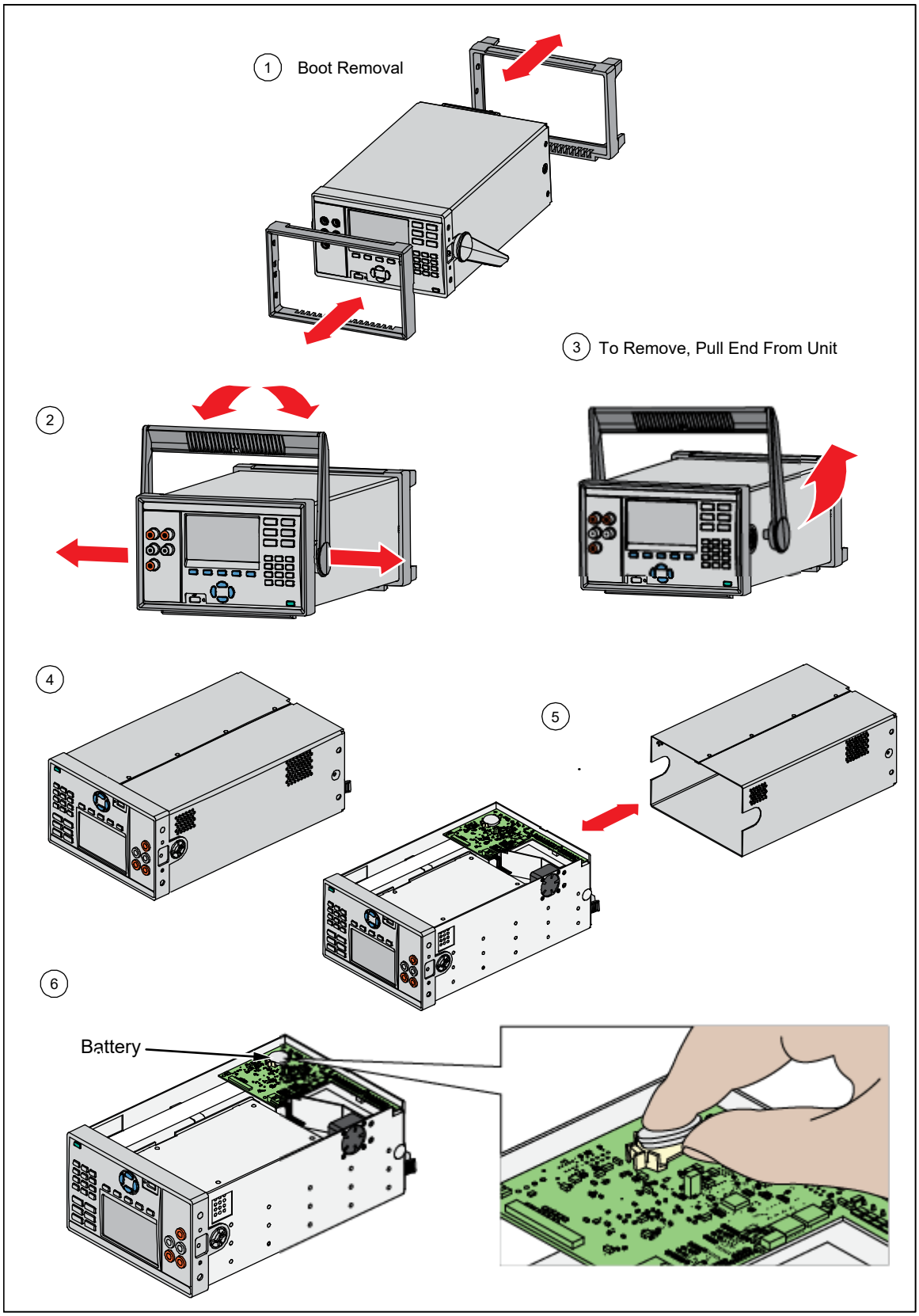

Figure 8. Disassembly

Change the Calibration Date Remotely

The calibration date is automatically updated when the "`CALibrate:STORe`" command is sent.

Equipment for "Mainframe" Calibration

The required equipment for calibration is listed in Table 2.

"Mainframe" Adjustment Process

Table 8 lists the steps to adjust the *mainframe*. The table shows:

- Step numbers
- Description of the adjustment
- Measurement adjustment type (open, zero, or gain adjustment)
- Product value or range to adjust
- Amplitude of the adjustment signal
- The frequency of the adjustment signal (if necessary)

Table 8. Adjustment Steps

Step	Value Range	Input Signal	Description	Entry Point
MAIN				
A2D		open	ADC self-calibration	Y
DCV				
DC100MV	0.1		Start calibration of dc 100 mV range	Y
DC_P100MV_1		100.0 mV		N
DC_0V_1		0.0 V		N
DC_N100MV_1		-100.0 mV		N
DC1V	1.0		Start calibration of dc 1 V range	Y
DC_P1V_2		1.0 V		N
DC_0V_2		0.0 V		N
DC_N1V_2		-1.0 V		N
DC10V	10.0		Start calibration of dc 10 V range	Y
DC_P10V_3		10.0 V		N
DC_0V_3		0.0 V		N
DC_N10V_3		-10.0 V		N
DC50V	50.0		Start calibration of dc 50 V range	Y
DC_P50V_4		50.0 V		N
DC_0V_4		0.0 V		N
DC_N50V_4		-50.0 V		N

Table 8. Adjustment Steps (cont.)

Step	Value Range	Input Signal	Description	Entry Point
OHM				
R100	100.0		Start calibration of FRES 100 Ω range	Y
R_100_1		100.0 Ω		N
R_19_1		19.0 Ω		N
R_0_1		0.0 Ω		N
R1K	1.0E+3		Start calibration of FRES 1 kΩ range	Y
R_1K_2		1.0 kΩ		N
R_190_2		190.0 Ω		N
R_0_2		0.0 Ω		N
R10K	10.0E+3		Start calibration of FRES 10 kΩ range	Y
R_10K_3		10.0 kΩ		N
R_1_9K_3		1.9 kΩ		N
R_0_3		0.0 Ω		N
R100K	100.0E+3		Start calibration of FRES 100 kΩ range	Y
R_100K_4		100.0 kΩ		N
R_19K_4		19.0 kΩ		N
R_0_4		0.0 Ω		N
R1M	1.0E+6		Start calibration of FRES 1 MΩ range	Y
R_1M_5		1.0 MΩ		N
R_190K_5		190.0 MΩ		N
R_100K_5		100.0 kΩ		N
R_0_5		0.0 Ω		N
R10M	10.0E+6		Start calibration of RES 10 MΩ range	Y
R_10M_6		10.0 MΩ		N
R_1_9M_6		1.9 MΩ		N
R_1_0M_6		1.0 MΩ		N
R_0_6		0.0 Ω		N

Table 8. Adjustment Steps (cont.)

Step	Value Range	Input Signal	Description	Entry Point
R100M	100.0E+6		Start calibration of RES 100 MΩ range	Y
R_100M_7		100.0 MΩ		N
R_19M_7		19.0 MΩ		N
R_0_7		0.0 Ω		N
PRT				
P400FR	400.0		Start calibration of PRT 400 Ω range	Y
P_400_FR		400.0 Ω		N
P_200_FR		200.0 Ω		N
P_0_FR		0.0 Ω		N
THERM				
T2K	2.2E+3		Start calibration of FTH 2 kΩ range	Y
T_1_9K_1		1.9 kΩ		N
T_1_0K_1		1.0 kΩ		N
T_190_1		190.0 Ω		N
T_0_1		0.0 Ω		N
T90K	90.0E+3		Start calibration of FTH 90 kΩ range	Y
T_100K_2		100.0 kΩ		N
T_19K_2		19.0 kΩ		N
T_10K_2		10.0 kΩ		N
T_0_2		0.0 Ω		N
T1M	90.0E+3		Start calibration of FTH 1 MΩ range	Y
T_1M_3		1.0 MΩ		N
T_190K_3		190.0 kΩ		N
T_100K_3		100.0 kΩ		N
T_0_3		0.0 Ω		N

Table 8. Adjustment Steps (cont.)

Step	Value Range	Input Signal	Description	Entry Point
DCI				
DC100UA	100.0E-6		Start calibration of dc 100 μA range	Y
DC_P100UA_1		100.0 μA		N
DC_0A_1		Open		N
DC_N100UA_1		-100.0 μA		N
DC1MA	1.0E-3		Start calibration of dc 1 mA range	Y
DC_P1_0MA_2		1.0 mA		N
DC_0A_2		Open		N
DC_N1_0MA_2		-1.0 mA		N
DC10MA	10.0E-3		Start calibration of dc 10 mA range	Y
DC_P10MA_3		10.0 mA		N
DC_0A_3		Open		N
DC_N10MA_3		-10.0 mA		N
DC100MA	100.0E-3		Start calibration of dc 100 mA range	Y
DC_P100MA_4		100.0 mA		N
DC_0A_4		Open		N
DC_N100MA_4		-100.0 mA		N

Remote Commands for Calibration

Table 9 alphabetically lists the command set for calibration.

Table 9. List of Commands

Remote Command	Meaning
CALibrate:ABORt	Instruct Product to abort calibration procedure after present step.
CALibrate:BACKup	Backup to previous entry point in calibration procedure.
CALibrate:CONSt?	Retrieve the value in use of the given calibration constant.
CALibrate:DATE?	Return a CAL date associated with stored calibration constants.
CALibrate:INFO?	Return message or instructions associated with running step.
CALibrate:MOD:DATE <slot>,<year>,<month>,<day>	Set CAL date of module in specified slot.
CALibrate:NEXT [<reference>]	Continue a calibration procedure if it is waiting.
CALibrate:REF?	Return nominal value expected for reference entry.
CALibrate:SECure:STATe <boolean>,<admin_password>	Instruct unit to enable calibration.
CALibrate:SECTion	Skip to next section of calibration procedure.
CALibrate:SKIP	Skip to next entry point in calibration procedure.
CALibrate:STARt <procedure>[,<step>]	Start a calibration procedure.
CALibrate:STATe?	Return state of calibration.
CALibrate:STEP?	Return name of step currently running.
CALibrate:STORe	Store new calibration constants.
CALibrate:MODule:DATE <slot>,<year>,<month>,<day>	Set module CAL date.

Remote Programming Examples

This section gives examples of command sequences for several likely scenarios.

Start a Full Calibration

Table 10 shows an example for how to run a full calibration.

Table 10. Full Calibration Example

Command	Action
`CAL:SEC:STAT OFF,"1586"`	Disable the security for calibration.
`CAL:STAR MAIN`	Start MAIN calibration procedure, and show instruction of MAIN calibration procedure.
`CAL:NEXT`	Continue to show instruction of VDC calibration.
`CAL:NEXT`	Continue to perform VDC calibration. After it is completed, show instruction to connect the calibrator to the instrument for DCV calibration.
`CAL:NEXT`	Show instruction to ask for +100 mV signal input, and the reference value.
`CAL:NEXT 0.1`	Continue to perform measurements for this point, after it is completed, show instruction to ask for 0 V signal input and the reference value.
`CAL:NEXT 0`	Continue to perform measurements for this point, after it is completed, show instruction to ask for -100 mV signal input and the reference value.
`CAL:NEXT -0.1`	Continue to perform measurements for this point, after it is completed, calculate the calibration constants for dc 100 mV range, then show instructions to ask for +1 V input signal and the reference value (the first calibration point of next dc 1 V range).
…	…
`CAL:STOR`	Store the calibration constants.
`CAL:ABOR`	Abort the calibration procedure.

Calibrate 1 V DC Range only

Table 11 shows an example to run a calibration for 1 V dc.

Table 11. 1 V DC Calibration Example

Command	Action
`CAL:SEC:STAT OFF,"1586"`	Disable the security for calibration.
`CAL:STAR MAIN,DC1V`	Start MAIN calibration procedure, and jump to 1 V dc range directly, it will show ask for 1 V signal input, and the reference value.
`CAL:NEXT 1`	Continue to perform measurements for this point, after it is completed, show instruction to ask for 0 V signal input and the reference value.
`CAL:NEXT 0`	Continue to perform measurements for this point, after it is completed, show instruction to ask for -1 V signal input and the reference value.
`CAL:NEXT -1`	Continue to perform measurements for this point, after it is completed, calculate the calibration constants for DC 1V range, then show instruction to ask for 10 V signal input and the reference value (the first calibration point of next 10 V dc range.
`CAL:STOR`	Store the calibration constants.
`CAL:ABOR`	Abort the calibration procedure.

Write Calibration Date to a Module

Table 12 shows an example to write the calibration date into a module after the CJC accuracy is validated.

Table 12. Write Calibration Date to a Module Example

Command	Action
`CAL:SEC:STAT OFF,"1586"`	Disable the security for calibration.
`CAL:MOD:DATE 1,2014,11,1`	Write "2014/11/1" as new calibration date into module in slot 1.

Command References

CALibrate:ABORt

Description: Instruct unit to abort calibration procedure after present step.

Example: `CAL:ABOR`

Related Commands:

`CALibrate:STATe?`

CALibrate:BACKup

Description: Backup to previous entry point in calibration procedure.

Example: `CAL:BACK`

Related Commands:

`CALibrate:SKIP`

`CALibrate:SECTion`

CALibrate:CONSt? "<cco_name>"

Description: Retrieves the value in use of the given calibration constant.

Example: `CAL:CONS? "DC100MV_A1"`

Response: -1.401686110719e-04

Related Commands:

`CALibrate:SECure:STATe`

`CALibrate:STORe`

CALibrate:DATE?

Description: Return a CAL date associated with stored calibration constants.

Example: `CAL:DATE?`

Response: 2013,11,1

Related Commands:

`CALibrate:MODule:DATE?`

CALibrate:INFOrmation?

Description: Return message or instructions associated with running step

Example: `CAL:INFO?`

Response: “Connect calibrator to Volt terminals”

Related Commands:

`CALibrate:STATe?`

`CALibrate:STEP?`

CALibrate:MODule:DATE <slot>,<year>,<month>,<day>

CALibrate:MODule:DATE? <slot>

Description: Set and query module calibration date.

Example: `CAL:MOD:DATE 1,2013,11,1`

`CAL:MOD:DATE? 1`

Response: 2013,11,1

Related Commands:

`CALibrate:SECure:STATe`

CALibrate:NEXT [<reference>]

Description: Continue a calibration procedure if it is waiting. An optional parameter 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_NEXT 2.999987`

`CAL_NEXT 100 mV`

Related Commands:

`CALibrate:REFerence?`

`CALibrate:BACKup`

`CALibrate:SKIP`

CALibrate:REFerence?

Description: Return nominal value expected for reference entry

Example: `CAL:REF?`

Response: 3.000000e+00

Related Commands:

`CALibrate:NEXT`

`CALibrate:STATe?`

`CALibrate:INFOrmation?`

`CALibrate:STEP?`

CALibrate:SECure:STATe <boolean>, <admin_password>

Description: Instruct Product to enable calibration

Example: `CAL:SEC:STATE OFF,"1586"`

Related Commands:

`CALibrate:SECure:STATe?`

CALibrate:SECure:STATe?

Description: Query calibration enable state

Example: `CAL:SEC:STAT?`

Response: 1

Related Commands:

`CALibrate:SECure:STATe`

CALibrate:SECTion

Description: Skip to next section of calibration procedure.

Example: `CAL:SECT`

Related Commands:

`CALibrate:BACKup`

`CALibrate:SKIP`

CALibrate:SKIP

Description: Skip to next entry point in calibration procedure.

Example: `CAL:SKIP`

Related Commands:

`CALibrate:BACKup`

`CALibrate:SECTion`

CALibrate:STARt <procedure>[,<step>]

Description: Start a calibration procedure. As parameter, the name of procedure should be provided (MAIN is the procedure for full instrument calibration), an optional parameter <step> can be provided to start from, if it is omitted, it starts at the beginning. Before any calibration procedure can be started, the calibration secure state should be disabled.

Example: `CAL_START MAIN`

`CAL_START MAIN,DC1V`

Related Commands:

`CALibrate:SECure:STATe`

CALibrate:STATe?

Description: Return state of calibration

Example: `CAL:STAT?`

Response: `RUN` - running a calibration step

`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)

Related Commands:

`CALibrate:STEP?`

`CALibrate:REFerence?`

`CALibrate:INFOrmation?`

CALibrate:STEP?

Description: Return name of step currently running

Example: `CAL:STEP?`

Response: `DC1V`

Related Commands:

`CALibrate:STATe?`

`CALibrate:REFerence?`

`CALibrate:INFOrmation?`

CALibrate:STORe

CALibrate:STORe?

Description: Store new calibration constants or query whether a cal store is needed.

Example: `CAL:STOR`

`CAL:STOR?`

Response: 1 is yes, 0 if no

Related Commands:

`CALibrate:SECure:STATe`

User-Replaceable Parts and Accessories

Table lists the part numbers of each user-replaceable part or accessory for the Product, see Figure 9.

Table 13. User-Replaceable Parts and Accessories

Item	Fluke Part Number	Quantity	Description
(1)	4281998	1	FLUKE-1586A-2010, 1586A HANDLE
(2)	4281980	1	FLUKE-1586A-2009, 1586A FRONT PANEL BOOT
(3)	4281971	1	FLUKE-1586A-2008, 1586A REAR PANEL BOOT
(4)	4396173	1	FLUKE 1586A-2586 RELAY CARD
(5)	4374710	1	FLUKE-1586A-2586, 1586A, PROTECTIVE SLOT COVER
(6)	4338362	1	FLUKE-1586A, REAR SLOT FRAME
(7)	4357143	6	SCREW,4-40 X 0.375 IN.,FLAT,PHILLIPS,SS,PASSIVATED,LOCK PATCH,ROHS COMPLIANT
(8)	Contact Fluke	1	FLUKE 1586A-2586 HI-CAPACITY MODULE
Not Shown	1588940	1	BATTERY,PRIMARY,LI-MNO2,3V,560MAH,COIN,CR2450,24X5MM,BULK
Not Shown	4348094	1	DIO/ALARM connectors for 1586A
Not Shown	4121552	1	884X-4GB,USB MEMORY, 4GB
Not Shown	4298499	1	CABLE, USB MALE A TO MALE B, 2M
Not Shown	4396147	1	884X-ETH,ETHERNET INTERFACE CABLE, 1m
Not Shown	4396147	1	1586A-ETH,ETHERNET INTERFACE CABLE, 2m
Not Shown	3980562	1	TEST LEAD Set [3]
Not Shown	166306	1	⚠ Fuse 0.25A, 250V (slow blow) [2]
Not Shown	4396147		884X-ETH Ethernet Interface Cable, 1 Meter
Not Shown	4298486	1	RS-232 Cable
Contact Fluke	OPC Server software for 1586A	1	Contact Fluke
Not Shown	Transit Case	1	

[1] Quantity of items listed can vary based on kit or model ordered.
[2] Only use exact replacements.
[3] See www.fluke.com for more information about the test leads for your region.

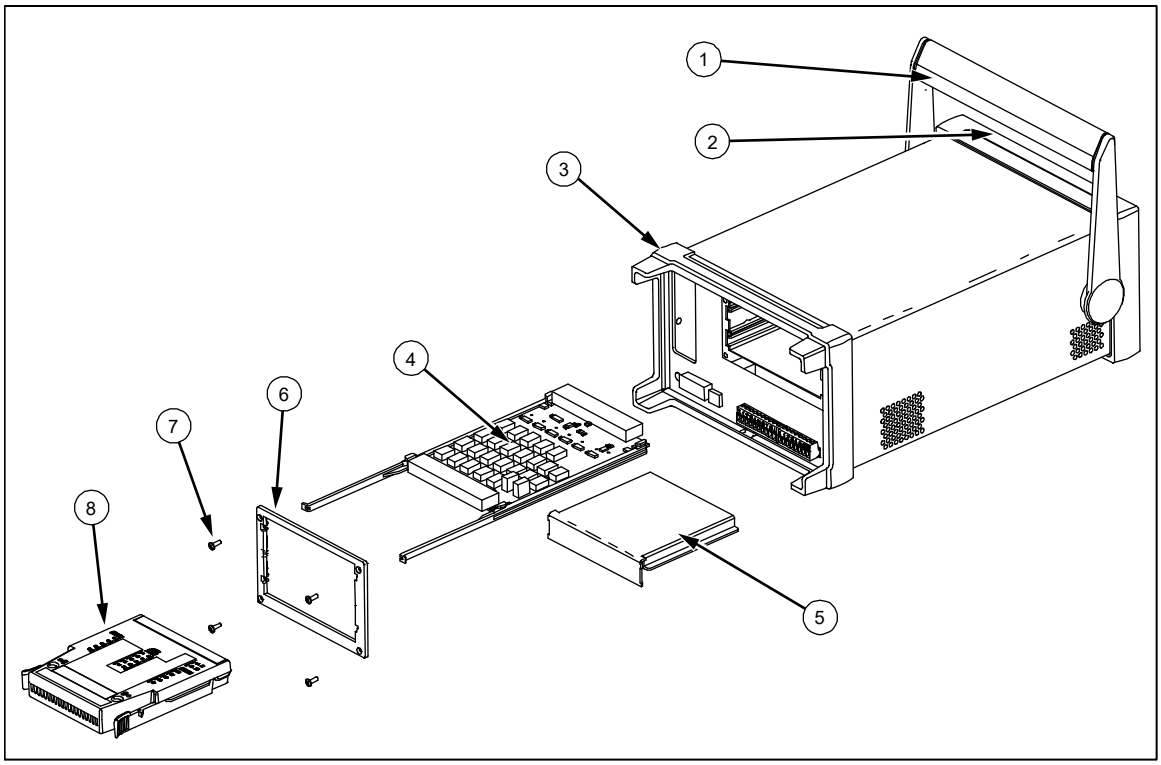

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Figure 9. Replaceable Parts