

## Model 707 Loop Calibrator

### Calibration Information

#### ⚠ Warning

To avoid electrical shock, remove test leads and any input signals from the Model 707 Loop Calibrator before opening the case.

#### ⚠ Caution

The Model 707 Loop Calibrator contains parts that can be damaged by static discharge. Follow the standard practices for handling static sensitive devices.

### Introduction

The *Calibration Information* for the Model 707 Loop Calibrator (hereafter referred to as the Loop Calibrator) provides the information necessary to verify the performance and adjust the calibration of the Loop Calibrator.

This document includes the following:

- Contacting Fluke for service
- Specifications
- Cleaning
- Replacing the battery
- Disassembly and reassembly
- Recommended test equipment
- Performance verification procedures
- Calibration adjustments
- User-replaceable parts

The complete operating instructions and warranty statement for the Model 707 Loop Calibrator are provided in the *Instruction Sheet* that came with it.

### Contacting Fluke for Service

This Fluke product will be free from defects in material and workmanship for three years from the date of purchase.

To locate an authorized service center, visit us on the World Wide Web: [www.fluke.com](http://www.fluke.com) or call Fluke using the phone numbers listed below:


- 1-888-99-FLUKE (1-888-993-5853) in USA
- 1-800-36-FLUKE (1-800-363-5853) in Canada
- +1-425-356-5500 from other countries

## Specifications

Product specifications are provided in Tables 1 and 2. These specifications are based on a 1-year calibration cycle and apply from 18 °C to 28 °C (64 °F to 82 °F) unless stated otherwise. Accuracy specifications are given as follows:

$$\pm ( [ \% \text{ of reading } ] + [ \text{ number of least significant digits } ] ).$$

**Table 1. General Specifications**

|   |  |
|---|--|
| <b>Maximum voltage between any terminal and earth ground or between any two terminals</b> | 30 V   |
| <b>Display:</b>   | 0 to 28 V with 0.001 V resolution, 0 to 24 mA with 0.001 mA resolution   |
| <b>Operating Temperature:</b>   | -10 °C to 55 °C  |
| <b>Storage Temperature:</b>   | -30 °C to 60 °C  |
| <b>Temperature Coefficient:</b>   | ± 0.005 % of range per °C for -10 °C to 18 °C and 28 °C to 55 °C   |
| <b>Relative Humidity:</b>   | 95 % to 30 °C,<br>75 % to 40 °C,<br>45 % up to 50 °C,<br>35 % up to 55 °C  |
| <b>Operating Altitude:</b>  | 3000 meters maximum  |
| <b>Power Requirements:</b>  | Single 9 V battery (ANSI/NEDA 1604A or IEC 6LR61)  |
| <b>Battery Life (Typical):</b>  | Source Mode: 18 hours; 12 mA into 500 Ω<br>Measure / Simulate Mode: 50 hours   |
| <b>Shock, Vibration:</b>  | 1 meter drop test  |
| <b>Size (H x W x L):</b>  | 50.80 mm x 69.85 mm x 142.87 mm (2.00 in x 2.75 in x 5.625 in)   |
| <b>With Holster:</b>  | 54.61 mm x 76.20 mm x 158.75 (2.15 in x 3.00 in x 6.25 in)   |
| <b>Weight:</b>  | 349 g (12.3 oz). With Holster and flex-stand: 601 g (21.2 oz)  |
| <b>Safety</b>   | Certified as compliant to CAN/CSA C22.2 No. 1010.1:1992.<br>Complies with ANSI/ISA S82.01-1994<br>Complies with IEC 61010-1-95 CAT I, 30 V |
| <b>Certification</b>  | CE and    |

**Table 2. Accuracy Specifications**

| Function                       | Range  | Resolution | Accuracy<br>(% of reading + 250 counts) |
|--------------------------------|--|------------|---|
| <b>DC Volts Input</b>          | + 28 V (+30 V max)   | 0.001 V    | ± (0.015 % + 2 counts)                  |
| <b>DC mA Input</b>             | 20 mA (24 mA max)  | 0.001 mA   | ± (0.015 % + 2 counts)                  |
| <b>DC mA Output</b>            | 0 mA to 24 mA  | 0.001 mA   | ± (0.015 % + 2 counts)                  |
| <b>Source mode:</b>            | Compliance: ≥ 1200 Ω at 20 mA, ≥ 950 Ω at 20 mA in Hart™ Mode                |            |   |
| <b>Simulate mode:</b>          | External loop voltage requirements: 24 V nominal, 28 V maximum, 12 V minimum |            |   |
| <b>Loop Power</b>              | ≥ 24 V   |            |   |
| <b>Percent display</b>         | - 25 % to 125 % (4 to 20 mA mode)  |            |   |
| <b>Input/Output protection</b> | Fuseless protection.   |            |   |

## Cleaning

### ⚠ Warning


To avoid electrical shock, remove test leads and input signals before cleaning.

To clean the case, wipe it with a cloth lightly dampened with water and a mild detergent.

Do not use abrasives, solvents, or alcohol.

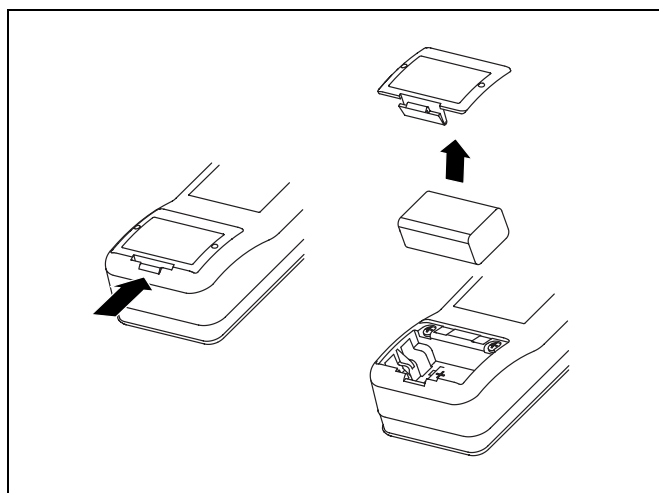
## Replacing the Battery

### ⚠ Warning

To avoid false readings, which could lead to possible electric shock or personal injury, replace the battery as soon as the low battery symbol (  ) appears on the Loop Calibrator's display.

To replace the battery:

1. Lift and remove the battery cover to gain access to the battery compartment. See Figure 1.
2. Lift the battery from the case bottom and insert a new 9 V battery.
3. Make sure the positive and negative battery posts are oriented correctly, as noted in the bottom of the battery compartment.



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Figure 1. Replacing the Battery

## Disassembling and Reassembling the Calibrator

### ⚠ Warning

To avoid electric shock or personal injury:

- Do not allow water into the case.
- Remove any input signals prior to removing test leads and opening case.
- When servicing the Loop Calibrator, use only specified replacement parts.

To disassemble and reassemble the Loop Calibrator, refer to Figures 2 and 3 as necessary and perform the following procedure.

### Note

Both a Phillips-head screwdriver and a flat-blade screwdriver are required.

### Removing the Printed Circuit Assembly (PCA)

1. Make sure the Loop Calibrator is off.
2. Remove all test leads from the terminals of the Loop Calibrator.
3. Gently pry the rotary knob off with a small flat-blade screwdriver.
4. Lift and remove the battery cover to gain access to the battery compartment and 2 case screws inside. Remove the battery.
5. Remove all Phillips-head screws from the case bottom.
6. Separate the case top from the case bottom.  
Verify that the battery terminals are being guided through the bottom case before completely removing the case bottom.
7. Referring to Figure 3, insert a small, flat-blade screwdriver between the edge of the case top and the PCA. Gently unsnap the case top from the PCA.
8. Repeat step 7 for each of the remaining snaps that secure the PCA to the case top.
9. Lift the PCA from the case top by its edges.
10. If the elastomeric strips for the keypad assembly and LCD are stuck to the PCA, remove them, but *do not touch the conductive edges*.

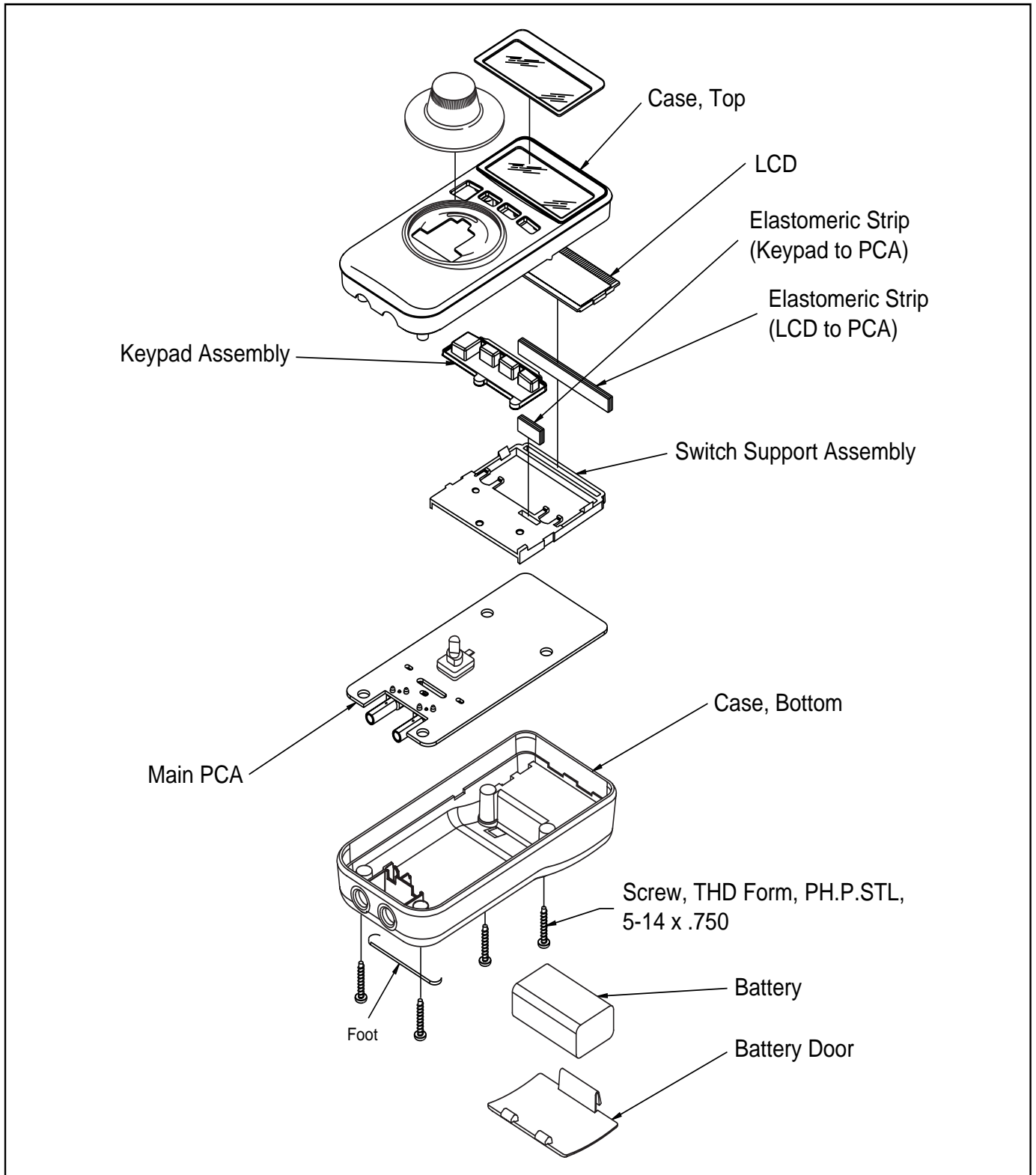


Figure 2. Disassembled Loop Calibrator

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### **Removing the Switch Support**

Lift the switch support out of the top case.

The LCD, keypad assembly, and elastomeric strips are now accessible and can be replaced as needed.

Do not allow the LCD to get wet.

Before installing a new LCD, make sure that all connector contact points are clean.

#### **⚠ Caution**

**Do not touch the conductive edges of the elastomeric strips or the contacts on the keypad assembly. If they are contaminated, clean them with isopropyl alcohol.**

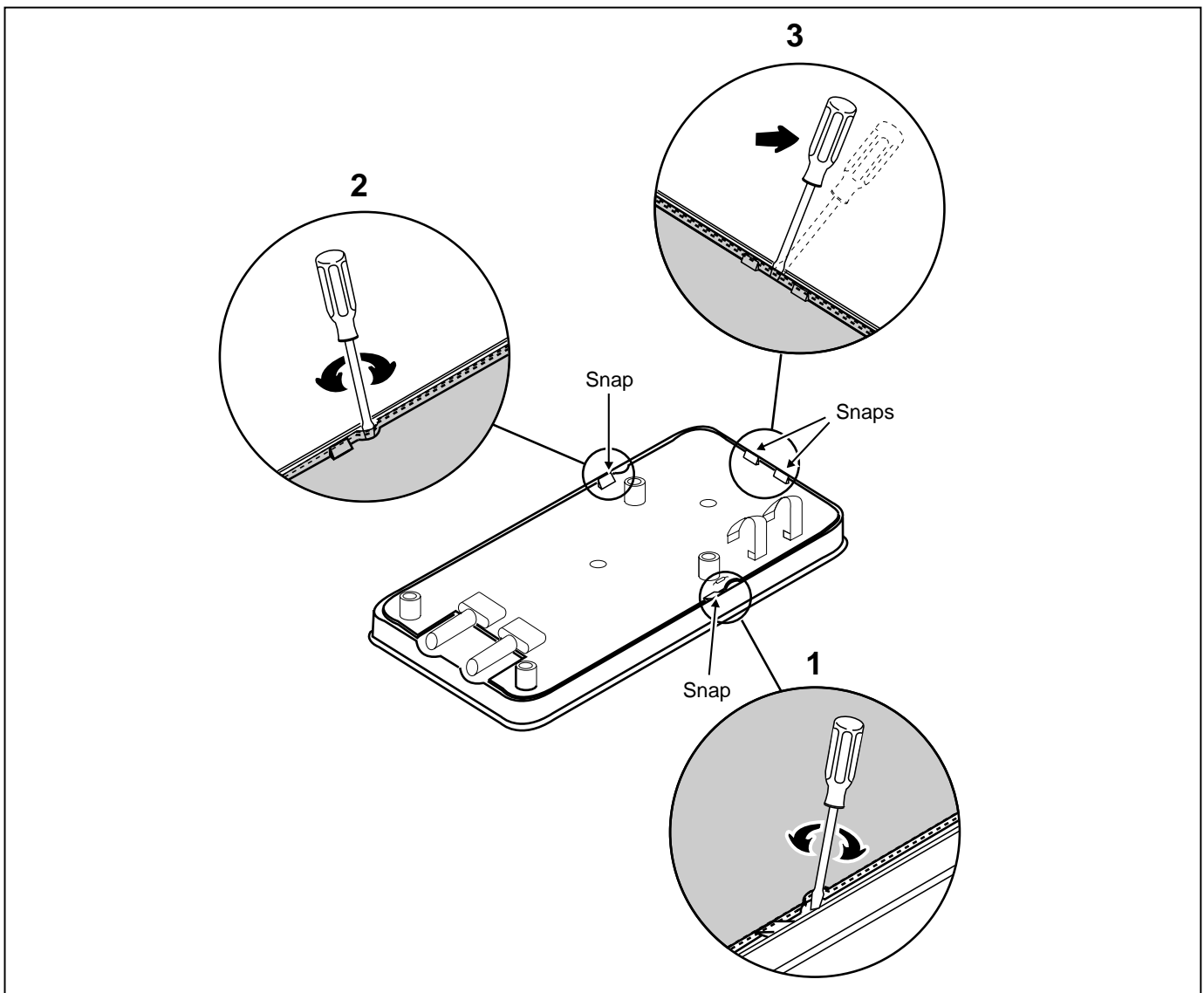
### **Reinserting the PCA**

1. Place the PCA over the four screw posts in the case top.
2. Gently press on the center of the PCA while using the small flat-edge screwdriver to insert the PCA under the snap on a side of the case top. Repeat on the other side and the top.

### **Reassembling the Loop Calibrator**

Reassembling the Calibrator is the reverse of disassembling it.

After the Calibrator is reassembled, perform the verification test to confirm that the Loop Calibrator is working properly.



**Figure 3. Removing and Reinserting the Printed Circuit Assembly (PCA)**

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### Recommended Test Equipment

A list of recommended equipment for the performance verification tests and calibration adjustment procedure is shown in Table 3.

### Performance Verification

#### ⚠ Warning

**To avoid electric shock, do not perform the verification tests unless the Loop Calibrator is fully assembled.**



Perform the following tests to check the accuracy of each of the Loop Calibrator’s functions against its specifications.

If the Loop Calibrator fails any of these tests, calibration adjustment or repair is required.


### Performance Verification Procedures

#### DC Current Source Mode


##### Test 1:

- Turn the Loop Calibrator on.  
After the P.S. power timeout displays, the Loop Calibrator should display 4.000 mA. If it is displaying 0.000 mA, turn the Loop Calibrator off. Hold down  while turning the Loop Calibrator on. Continue to hold  for 2 seconds. When the timeout display ends, the Loop Calibrator should display 4.000 mA.
- Connect the Loop Calibrator’s [+] terminal to the HP 3458A I input, and the COM terminal to the HP 3458A LO input.
- Verify that the Loop Calibrator's display shows **SOURCE** in the upper-left corner.
- Set the HP 3458A to measure DC Amps (DCI).
- Refer to Table 4 to verify the readings on the HP 3458A for the following tests. (No adjustment is necessary for test 1.)

##### Test 2:


- Press  twice to select 12.000 mA.
- Verify the readings.

##### Test 3:

- Press  twice to select 20.000 mA.
- Press and rotate the knob until 24.000 mA is displayed.
- Verify the readings.

### DC Current Measurement Mode

##### Test 4:

- Press the  key twice to put the Loop Calibrator into the mA measurement mode.  
The Loop Calibrator’s display should show **MEASURE** in the top right corner.
- Disconnect the HP 3458A from the Loop Calibrator.
- Connect the test leads from the **red AUX** terminal of the Fluke 5520A to the HP 3458A I input.
- Connect a test lead from the **black AUX** terminal of the Fluke 5520A to the **COM** terminal on the Loop Calibrator.
- Connect a test lead from the HP 3458A **LO** input to the Loop Calibrator's + terminal.
- Adjust the Fluke 5520A to output the value of test 4 in Table 2 as measured by the HP 3458A.
- Adjust the Fluke 5520A if necessary to cause the HP 3458A to show the desired value.
- Verify the display readings on the Loop Calibrator.


**Table 3. Recommended Equipment**

| Equipment           | Minimum Specification  | Recommended Model or Equivalent      |
|---------------------|--|--------------------------------------|
| DC Calibrator       | DC Voltage: 0 to 30 V<br>Accuracy: ± 0.004 % +0.5 mV<br>DC Current: 0 to 24 mA<br>Accuracy: ± 0.004% +0.5 µA | Fluke 5520A Multi-Product Calibrator |
| Digital Multimeter  | DC Current: 0 to 26 mA<br>Accuracy: ± 0.004% +0.5 µA   | HP 3458A                             |
| Flexible Test Leads |  | Fluke TL24                           |

**Table 4. DC Current Source / Current Measure / Voltage Measure Mode Tests**

| Test No. | 707 Loop Calibrator Output | Mode         | HP 3458A Minimum  | HP 3458A Maximum  |
|----------|----------------------------|--------------|-------------------|-------------------|
| 1        | 4.000 mA                   | mA Source    | 3.9974 mA         | 4.0026 mA         |
| 2        | 12.000 mA                  | mA Source    | 11.9962 mA        | 12.0038 mA        |
| 3        | 24.000 mA                  | mA Source    | 23.9944 mA        | 24.0056 mA        |
| Test No. | 5520A Calibrator Output    | Mode         | Fluke 707 Minimum | Fluke 707 Maximum |
| 4        | 4.000 mA                   | mA Measure   | 3.997 mA          | 4.003 mA          |
| 5        | 12.000 mA                  | mA Measure   | 11.996 mA         | 12.004 mA         |
| 6        | 24.000 mA                  | mA Measure   | 23.994 mA         | 24.006 mA         |
| Test No. | 5500A Calibrator Output    | Mode         | Fluke 707 Minimum | Fluke 707 Maximum |
| 7        | 0.000 V                    | Volt Measure | -0.002 V          | 0.002 V           |
| 8        | 14.000 V                   | Volt Measure | 13.995 V          | 14.005 V          |
| 9        | 28.000 V                   | Volt Measure | 27.993 V          | 28.007 V          |

### DC Voltage Measurement Mode

- Press  twice to get the Loop Calibrator to **V MEASURE**. The Loop Calibrator's display should read "V".
- Connect the test leads from the **NORMAL** output terminals of the Fluke 5520A to the input terminals on the Loop Calibrator (black to **COM** and red to [+]).
- Set the Fluke 5520A to test 7 in Table 4 and verify the display reading on the Loop Calibrator.
- Repeat for tests 8 and 9.

The reading on the display should be within the minimum and maximum values shown in Table 4.

- Set the 5520A output to 0 V (zero), and set output to **STANDBY**.
- Turn the Loop Calibrator **OFF** and disconnect the Loop Calibrator from the 5520A.

The performance verification tests are now complete.


If the Loop Calibrator failed any of these tests, calibration adjustment or repair is required.

### Calibration Adjustment


Perform the following calibration adjustment procedures if the Loop Calibrator fails the performance verification test.

#### Calibration Adjustment Counter

The Loop Calibrator contains a calibration adjustment counter. The value in the calibration adjustment counter can be recorded and used to show that no adjustments have been made during a calibration cycle. When Fluke performs the calibration, the value of the calibration adjustment counter will be recorded on the calibration label.

To find the value in the calibration adjustment counter, hold down  while turning the unit on. The software revision will display for 2 seconds followed by the calibration counter for another 2 seconds.

#### Note

*Make sure that the Loop Calibrator has a new battery before starting the calibration procedure. Calibration will not function properly if the low battery indicator (  ) is on.*

Because the Loop Calibrator incorporates several key hold start up features, entering the Adjust mode through the keypad requires an exact key hold sequence:

- With the Loop Calibrator off, hold down  and  and turn the Loop Calibrator on.

"CAL" appears on the main display and the calibration adjustment counter is displayed on the secondary display. If the knob is not turned



within 2 seconds, the unit returns to the normal operation mode.





2. The Loop Calibrator adjustment procedure is password protected. At this point, a password is needed to go forward. "**PAS**" is displayed on the main display and "**000**" on the secondary display.

Enter the password "**626**" as follows:


1. Rotate the knob to add a 6 in the LCD of the secondary display, push and release the knob.
2. Rotate the knob to get 2 into the LCD, push and release.
3. Rotate the knob to get a 6, push and release.

If the password is correct, you'll be led through all the adjust modes (source, mA read, V read), otherwise the unit returns to normal operation. In the adjust mode, the main display will show "**1.000 mA**".

3. Connect the Loop Calibrator [+] terminal to the HP 3458A I input, and the **COM** terminal to the HP 3458A LO input. The Loop Calibrator will be in mA source cal and "**1.000 mA**" is displayed. On the secondary LCD, the last 3 digits from the knob value are shown. Adjust the mA output by tuning the knob until "**1.000 mA**" shows on the HP 3458A.
4. Press , "**22.000 mA**" is displayed. Adjust the mA output by turning the knob until "**22.000 mA**" is shown on the HP 3458A.
5. Press  to go to mA measure adjust.
6. Disconnect the HP 3458A from the Loop Calibrator.
7. Connect the test leads from the **AUX** terminals of the Fluke 5520A to the terminals on the Loop Calibrator (black to **COM** and red to [+]).

8. The Loop Calibrator will display "**MEASURE**" and 0.000 mA is displayed. On the secondary display, the last 3 digits of the A/D reading are shown. Set the 5520A to output 0.000 mA into the Loop Calibrator. Press .
9. After a moment, the Loop Calibrator will display 24.000 mA. Set the 5520A to output 24.000 mA into the Loop Calibrator.
10. Press  to go to V measure adjust.
11. Connect the test leads from the output NORMAL terminals of the Fluke 5520A to the input terminals on the Loop Calibrator.
12. The Loop Calibrator will display "**MEASURE**" and 0.000 V. The Secondary display will show the last 3 digits of the A/D reading. Set the 5520A to output 0.000 V into the Loop Calibrator.
13. Press . After a moment, 25.000 V will display on the Loop Calibrator. Set the 5520A to output 25.000 V into the Loop Calibrator.
14. Press  to complete the adjustment. The calibration counter is incremented and the calibration data is stored. The calibration count will be on the main display and "**CAL**" on the secondary display for 2 seconds.

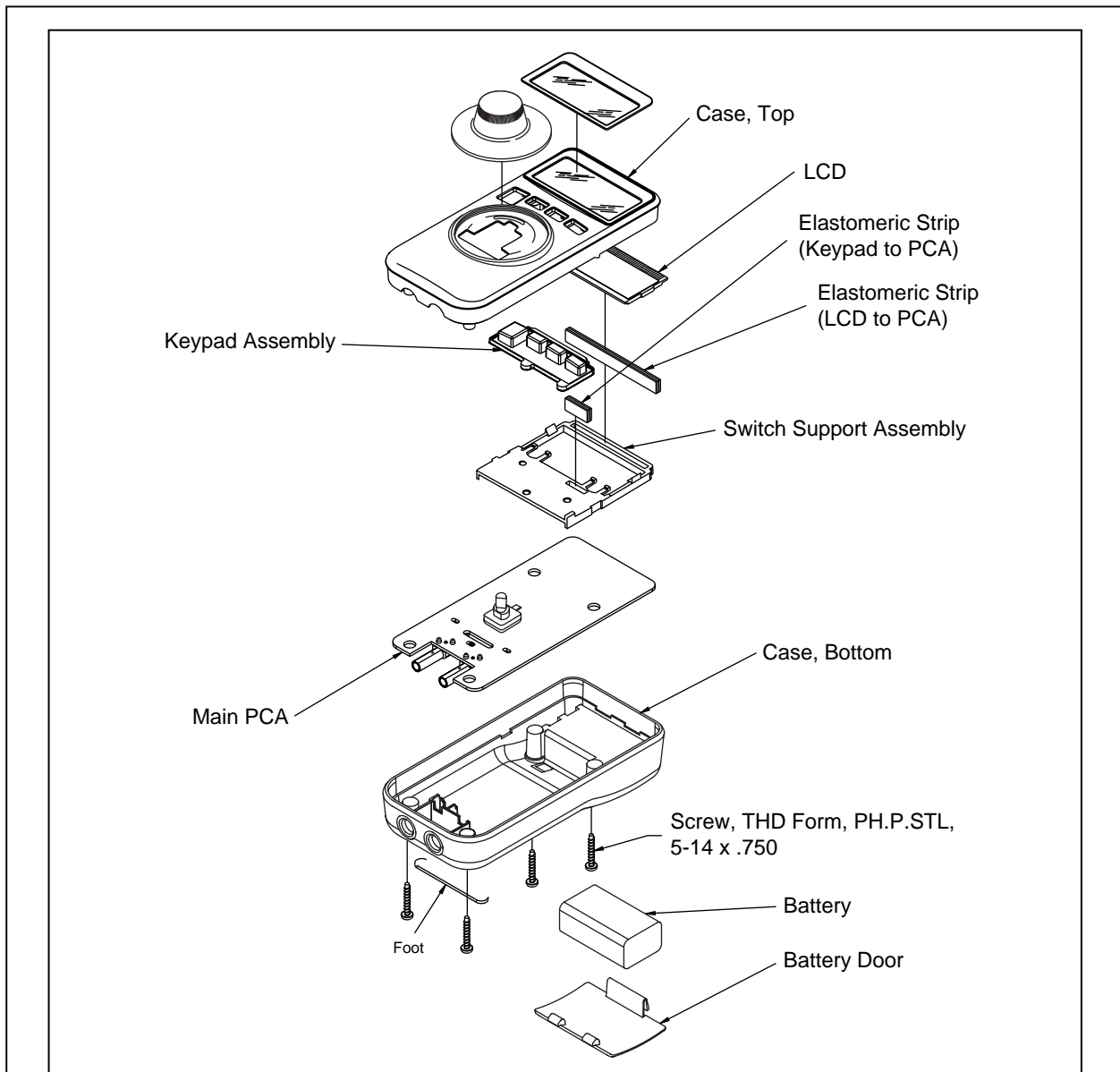
The calibration adjustment procedure is complete.

To see the value of the calibration counter without calibrating the unit, hold down  at power up. The software revision number is displayed for 2 seconds followed by the calibration counter for 2 seconds.

### **User-Replaceable Parts**

User-replaceable parts, are listed in and shown in Figure 4.





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| Item | Description  | Part No. | Qty. |
|------|--|----------|------|
| 1.   | Rotary knob  | 1618022  | 1    |
| 2.   | Case top   | 1618355  | 1    |
| 3.   | HART Jumper  | 530253   | 1    |
| 4.   | Keypad   | 1612222  | 1    |
| 5.   | Case bottom  | 1618005  | 1    |
| 6.   | Non-skid foot  | 885884   | 1    |
| 7.   | Battery, 9 V, Alkaline, ANSI / NEDA 1604A or IEC 6LR61 | 614487   | 1    |
| 8.   | Case screws  | 665098   | 4    |
| 9.   | Battery door   | 665106   | 1    |
| 10.  | Instruction sheet pack                                 | 1611701  | 1    |
| 11.  | Test lead set  | TL75     | 1    |
| 12.  | Alligator clips  | AC70A    | 1    |
| 13.  | Holster, yellow  | C10      | 1    |

**Figure 4. User-Replaceable Parts**

