

729/729 FC

Automatic Pressure Calibrator

Calibration Manual

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Introduction

This manual contains information necessary to do performance verification tests and calibration adjustments on your 729 and 729 FC Automatic Pressure Calibrators (the Product).

Contact Fluke

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

- Technical Support USA: 1-800-44-FLUKE (1-800-443-5853)
- Calibration/Repair USA: 1-888-99-FLUKE (1-888-993-5853)
- Canada: 1-800-36-FLUKE (1-800-363-5853)
- Europe: +31 402-675-200
- Japan: +81-3-6714-3114
- China: +86-400-921-0835
- Singapore: +65-6799-5566
- Anywhere in the world: +1-425-446-5500

Or, visit Fluke's website at www.fluke.com.

To register your product, visit <http://register.fluke.com>.

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

The latest software trial version of *DPCTrack2* can be downloaded at www.fluke.com/productinfo. For more information, see *Update Product Firmware*.

Safety

Warnings and Cautions

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.

Warning

To prevent possible electrical shock, fire, or personal injury:














- Read all safety information before you use the Product.
- Carefully read all instructions.
- Do not use the Product around explosive gas, vapor, or in damp or wet environments.
- Use the Product only as specified, or the protection supplied by the Product can be compromised.
- Do not apply more than the rated voltage, between the terminals or between each terminal and earth ground.
- Do not touch voltages >30 V ac rms, 42 V ac peak, or 60 V dc.
- Do not use the Product if it is damaged.
- Disable the Product if it is damaged.
- Do not use the Product if it operates incorrectly.
- Use the correct terminals, function, and range for measurements.
- Remove all probes, test leads, and accessories before the battery door is opened.
- The battery door must be closed and locked before you operate the Product.
- Use only the mains power cord and connector approved for the voltage and plug configuration in your country and rated for the Product.
- Replace the mains power cord if the insulation is damaged or if the insulation shows signs of wear.
- Examine the case before you use the Product. Look for cracks or missing plastic. Carefully look at the insulation around the terminals.
- Do not use test leads if they are damaged. Examine the test leads for damaged insulation, exposed metal, or if the wear indicator shows. Check test lead continuity.
- Keep fingers behind the finger guards on the probes.

- **Only assemble and operate high-pressure systems if you know the correct safety procedures. High-pressure liquids and gases are hazardous and the energy from them can be released without warning.**
- **Remove the input signals before you clean the Product.**
- **Use only specified replacement parts.**
- **Have an approved technician repair the Product.**
- **Do not disassemble or crush battery cells and battery packs.**
- **Batteries contain hazardous chemicals that can cause burns or explode. If exposure to chemicals occurs, clean with water and get medical aid.**
- **Do not put battery cells and battery packs near heat or fire. Do not put in sunlight.**
- **Use only Fluke approved power adapters to charge the battery.**
- **Disconnect the battery charger and move the Product or battery to a cool, non-flammable location if the rechargeable battery becomes hot (>50 °C) during the charge period.**
- **Replace the rechargeable battery after 5 years of moderate use or 2 years of heavy use. Moderate use is defined as recharged twice a week. Heavy use is defined as discharged to cutoff and recharged daily.**
- **Do not disassemble the battery.**
- **Do not short the battery terminals together.**
- **Pressure sensors can be damaged and/or personnel injury can occur due to improper application of pressure. The Product shows “OL” when the pressure exceeds 110 % of the nominal range of the sensor. When “OL” is shown on any pressure, the pressure should be reduced or vented immediately to prevent Product damage or possible personnel injury. Push **CLEAR (ZERO)** to zero the pressure sensor when vented to atmospheric pressure.**
- **Do not point the vent port toward the operator during venting.**

Symbols

The symbols used in this manual and on the Product are in Table 1.

Table 1. Symbols

| Symbol | Description |
|---|--|
|  | WARNING. RISK OF DANGER. |
|  | WARNING. HAZARDOUS VOLTAGE. Risk of electric shock. |
|  | Pressure |
|  | Consult user documentation. |
|  | Conforms to relevant South Korean EMC Standards. |
|  | Conforms to European Union directives. |
|  | Certified by CSA Group to North American safety standards. |
|  | Certified by TÜV SÜD Product Service. |
|  | Conforms to the Appliance Efficiency Regulation (California Code of Regulations, Title 20, Sections 1601 through 1608), for small battery charging systems. |
|  | This product contains a Lithium-ion battery. Do not mix with solid waste stream. Spent batteries should be disposed of by a qualified recycler or hazardous materials handler per local regulations. Contact your authorized Fluke Service Center for recycling information. |
|  | China metrology certification mark for measuring instruments manufactured in the Peoples Republic of China (PRC). |
|  | Conforms to relevant Australian Safety and EMC standards. |
|  | This product complies with the WEEE Directive marking requirements. The affixed label 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 I, this product is classed as category 9 "Monitoring and Control Instrumentation" product. Do not dispose of this product as unsorted municipal waste. |

Specifications

Pressure Specification

| | |
|-------------------------------|---|
| 1-year Specification..... | 0.02 % of full scale |
| Control Specification | 0.005 % full scale minimum |
| Temperature Compensation..... | 15 °C to 35 °C (59 °F to 95 °F) to rated accuracy |
| | Note: For temperatures from -10 °C to +15 °C and 35 °C to 50 °C, add 0.04 % of full scale |

Electrical Specification

All specifications are valid to 110 % of range, except 24 mA source and simulate which are valid to 100 % of range.

Ranges

| | |
|-------------|-------------------|
| mA..... | 0 mA to 24 mA |
| Volts | 0 V dc to 30 V dc |

Resolution

| | |
|---|---|
| mA Ranges..... | 1 μ A |
| Voltage Range..... | 1 mV |
| Accuracy..... | 0.01 % \pm 2 LSD all ranges (at 23 °C \pm 5 °C) |
| Temperature Compensation..... | 20 ppm of full scale /°C from -10 °C to +18 °C and 28 °C to 50 °C |
| Loop Compliance Voltage | 24 V dc @ 20 mA |
| mA Simulate External Voltage Requirement..... | 12 V dc to 30 V dc |
| Temperature Measurement | |
| Only/100 Ω Pt(385) RTD | -50 °C to +150 °C (-58 °F to +302 °F) |
| Temperature Resolution..... | 0.01 °C (0.01 °F) |
| Temperature Accuracy | \pm 0.1 °C (0.2 °F) (\pm 0.25 °C \pm 0.45 °F) combined uncertainty when using 720 RTD probe (optional accessory) |
| Drive Capability | 1200 Ω without HART resistor, 950 Ω with internal HART resistor |

Product Models

| Model | psi Range, Resolution | bar Range, Resolution | kPa Range, Resolution | Comment |
|---------------|------------------------------|------------------------------|------------------------------|---|
| 729 30G | -12.0000 psi to +30.0000 psi | -0.82737 bar to +2.06842 bar | -82.737 kPa to +206.843 kPa | No wireless communication |
| 729 150G | -12.000 psi to +150.000 psi | -0.8273 bar to +10.3421 bar | -82.73 kPa to +1034.21 kPa | |
| 729 300G | -12.000 psi to +300.000 psi | -0.8273 bar to +20.6843 bar | -82.73 kPa to +2068.43 kPa | |
| 729 30G FC | -12.0000 psi to +30.0000 psi | -0.82737 bar to +2.06842 bar | -82.737 kPa to +206.843 kPa | Wireless communication for Fluke Connect |
| 729 150G FC | -12.000 psi to +150.000 psi | -0.8273 bar to +10.3421 bar | -82.73 kPa to +1034.21 kPa | |
| 729 300G FC | -12.000 psi to +300.000 psi | -0.8273 bar to +20.6843 bar | -82.73 kPa to +2068.43 kPa | |
| 729CN 200K | -12.0000 psi to +30.0000 psi | -0.82737 bar to +2.06842 bar | -82.737 kPa to +206.843 kPa | For China, no wireless communication |
| 729CN 1M | -12.000 psi to +150.000 psi | -0.8273 bar to +10.3421 bar | -82.73 kPa to +1034.21 kPa | |
| 729CN 2M | -12.000 psi to +300.000 psi | -0.8273 bar to +20.6843 bar | -82.73 kPa to +2068.43 kPa | |
| 729CN 200K FC | -12.0000 psi to +30.0000 psi | -0.82737 bar to +2.06842 bar | -82.737 kPa to +206.843 kPa | For China, wireless communication for Fluke Connect |
| 729CN 1M FC | -12.000 psi to +150.000 psi | -0.8273 bar to +10.3421 bar | -82.73 kPa to +1034.21 kPa | |
| 729CN 2M FC | -12.000 psi to +300.000 psi | -0.8273 bar to +20.6843 bar | -82.73 kPa to +2068.43 kPa | |
| 729JP 200K | N/A | N/A | -82.737 kPa to +206.843 kPa | For Japan, no wireless communication |
| 729JP 1M | N/A | N/A | -82.73 kPa to +1034.21 kPa | For Japan, 1 MPa range, no wireless communication |
| 729JP 2M | N/A | N/A | -82.73 kPa to +2068.43 kPa | For Japan, 2 MPa range, no wireless communication |
| 729JP 200K FC | N/A | N/A | -82.737 kPa to +206.843 kPa | For Japan, wireless communication for Fluke Connect |
| 729JP 1M FC | N/A | N/A | -82.73 kPa to +1034.21 kPa | |
| 729JP 2M FC | N/A | N/A | -82.73 kPa to +2068.43 kPa | |

Mechanical Specification

| | |
|------------------------|--|
| Size (H x W x L) | 7.0 cm x 27.9 cm x 17.3 cm (2.75 in x 11.0 in x 6.8 in) |
| Weight | 2.95 kg (6.5 lb) |

Environmental Specification

| | |
|--|---|
| Operating Temperature | -10 °C to +50 °C for measurement, 0 °C to 50 °C for pressure control Battery will only charge from 0 °C to 40 °C |
| Operating Temperature with Battery | -10 °C to +40 °C |
| Storage Temperature | -20 °C to +60 °C |
| Operating Altitude..... | 3000 m |
| Storage Altitude..... | 13 000 m |
| Operating Humidity..... | Non condensing (<10 °C) ≤90 % RH (at 10 °C to 30 °C) ≤75 % RH (at 30 °C to 40 °C) ≤45 % RH (at 40 °C to 50 °C) |

Safety

| | |
|--------------------------|---|
| General..... | IEC 61010-1, Pollution Degree 2, IEC 61010-2-030: 30 V max |
| Ingress Protection | IEC 60529: IP54 (with all port seals properly fitted) |
| Lithium Battery | IEC 62133, UN 38.3; 14.4 V, 6.7Ah, 97Wh, 4ICR19/66-2 (4s2p) Charge input 19.5 V, 1.6 A. |

Electromagnetic Compatibility (EMC)

| | |
|--------------------|--|
| International..... | IEC 61326-1: Basic Electromagnetic Environment; CISPR 11: Group 1, Class A <i>Group 1: Equipment has intentionally generated and/or uses conductively-coupled radio frequency energy that is necessary for the internal function of the equipment itself.</i> <i>Class A: Equipment is suitable for use in all establishments other than domestic and those directly connected to a low-voltage power supply network that supplies buildings used for domestic purposes. There may be potential difficulties in ensuring electromagnetic compatibility in other environments due to conducted and radiated disturbances.</i> <i>Caution: This equipment is not intended for use in residential environments and may not provide adequate protection to radio reception in such environments.</i> |
|--------------------|--|

- Korea (KCC).....Class A Equipment (Industrial Broadcasting & Communication Equipment)
Class A: Equipment meets requirements for industrial electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and not to be used in homes.
- USA (FCC)47 CFR 15 subpart B. This product is considered an exempt device per clause 15.103 (non FC versions only)
- Radio Certification(Contains) FCC ID: T68-FBLE, IC: 6627A-FBLE
- Frequency2402 MHz to 2480 MHz
- Output Power<100 mW

Performance Verification Tests

Fluke recommends re-certification each year. To re-certify, do the verification procedure. If test points are out of tolerance, calibrate the Product and then re-verify.

Use the subsequent tests to make sure that the Product is inside its specification limits.

Verification Equipment

The equipment necessary for verification of the Product is shown in Table 2. If these instruments are not available, you can replace them with other source and measure instruments that have the same the minimum specification requirements.

Table 2. Equipment Required for Verification and Calibration Adjustment

| Equipment | Minimum Specifications | Recommended Model |
|--------------------------------|--|--------------------------------------|
| DC Calibrator | DC Voltage: 0 V to 30 V Accuracy: $\pm 0.002\%$ +0.5 mV DC Current 0 mA to 24 mA Accuracy: $\pm 0.002\%$ +0.5 μ A | Fluke 5522A Multi-Product Calibrator |
| Digital Multimeter | DC Current: 0 mA to 26 mA Accuracy: $\pm 0.002\%$ +0.5 μ A | Fluke 8508A |
| Pressure Controller/Calibrator | -14 psi to 300 psi Accuracy: 0.005 % | Ruska 7252xi |
| RTD adapter | | Fluke 720URTD |

How to Verify

For each procedure there is a table of test points and permitted readings. If the result of the test is not in the range shown, the Unit Under Test (UUT) is out of tolerance and must be re-calibrated or repaired if necessary. There are columns for 12-month specifications.

Follow these general instructions for all the tests:

- Operate the Unit Under Test (UUT) on battery power. Make sure the battery is fully charged.
- Let each piece of verification equipment have its specified warm-up time.

Verification Procedures

Allow the Product a 30-minute warm-up period before doing the verification procedures.

Pressure Verification

To verify the pressure function:

1. Carefully attach the pressure fitting of the Pressure Controller/Calibrator to the pressure port of the Product.
2. Put the Product in measure mode.
3. Source full scale pressure (300 psi for the 300 model, 150 psi for the 150 model, and 30 psi for 30 the model) from the calibrator (7252). Hold for at least 1 minute.
4. Source 0 psi from the calibrator.
5. ZERO the Product pressure reading when its reading has stabilized.
6. Test all positive pressure test points in ascending and descending order.
7. Source -12 psi from the calibrator. Hold for at least 1 minute.
8. Source 0 psi from the calibrator.
9. ZERO the Product pressure reading when its reading has stabilized.
10. Test all pressure test points in Table 3 for the 729 pressure range in ascending and descending order.

Table 3. Pressure Verification Points

| Input Pressure (psi) | 12 Month Lower Limit | 12 Month Upper Limit |
|---------------------------------|---------------------------------|---------------------------------|
| 729 30G/729FC 30G | | |
| -12.0000 | -12.0060 | -11.9940 |
| -9.0000 | -9.0060 | -8.9940 |
| -6.0000 | -6.0060 | -5.9940 |
| -3.0000 | -3.0060 | -2.9940 |
| 0.0000 | 0.0060 | -0.0060 |
| 6.0000 | 5.9940 | 6.0060 |
| 12.0000 | 11.9940 | 12.0060 |
| 18.0000 | 17.9940 | 18.0060 |
| 24.0000 | 23.9940 | 24.0060 |
| 30.0000 | 29.9940 | 30.0060 |
| 24.0000 | 23.9940 | 24.0060 |
| 18.0000 | 17.9940 | 18.0060 |
| 12.0000 | 11.9940 | 12.0060 |
| 6.0000 | 5.9940 | 6.0060 |
| 0.0000 | -0.0060 | 0.0060 |
| -3.0000 | -3.0060 | -2.9940 |
| -6.0000 | -6.0060 | -5.9940 |
| -9.0000 | -9.0060 | -8.9940 |
| -12.0000 | -12.0060 | -11.9940 |

Table 3. Pressure Verification Points (cont.)

| Input Pressure (psi) | 12 Month Lower Limit | 12 Month Upper Limit |
|----------------------------|-------------------------|-------------------------|
| 729 150G/729FC 150G | | |
| -12.000 | -12.030 | -11.970 |
| -9.000 | -9.030 | -8.970 |
| -6.000 | -6.030 | -5.970 |
| -3.000 | -3.030 | -2.970 |
| 0.000 | -0.030 | 0.030 |
| 30.000 | 29.970 | 30.030 |
| 60.000 | 59.970 | 60.030 |
| 90.000 | 89.970 | 90.030 |
| 120.000 | 119.970 | 120.030 |
| 150.000 | 149.970 | 150.030 |
| 120.000 | 119.970 | 120.030 |
| 90.000 | 89.970 | 90.030 |
| 60.000 | 59.970 | 60.030 |
| 30.000 | 29.970 | 30.030 |
| 0.000 | -0.030 | 0.030 |
| -3.000 | -3.030 | -2.970 |
| -6.000 | -6.030 | -5.970 |
| -9.000 | -9.030 | -8.970 |
| -12.000 | -12.030 | -11.970 |

Table 3. Pressure Verification Points (cont.)

| Input Pressure (psi) | 12 Month Lower Limit | 12 Month Upper Limit |
|---------------------------------|---------------------------------|---------------------------------|
| 729 300G/729FC 300G | | |
| -12.000 | -12.060 | -11.940 |
| -9.000 | -9.060 | -8.940 |
| -6.000 | -6.060 | -5.940 |
| -3.000 | -3.060 | -2.940 |
| 0.000 | -0.060 | 0.060 |
| 30.000 | 29.940 | 30.060 |
| 60.000 | 59.940 | 60.060 |
| 90.000 | 89.940 | 90.060 |
| 120.000 | 119.940 | 120.060 |
| 150.000 | 149.940 | 150.060 |
| 120.000 | 119.940 | 120.060 |
| 90.000 | 89.940 | 90.060 |
| 60.000 | 59.940 | 60.060 |
| 30.000 | 29.940 | 30.060 |
| 0.000 | -0.060 | 0.060 |
| -3.000 | -3.060 | -2.940 |
| -6.000 | -6.060 | -5.940 |
| -9.000 | -9.060 | -8.940 |
| -12.000 | -12.060 | -11.940 |

DC Voltage Measure Verification

To verify the dc voltage measure function, see Figure 1:

1. Push **VDC**, **Measure VDC** shows in the second row of the display.
2. Connect the Product red banana jack (V mA) to the 5522A HI VOLTS output.
3. Connect the Product black banana jack (COM) to the 5522A LO VOLTS output.
4. Set the 5522A for the voltage setting in Table 4 and verify the display reading on the Product.

Table 4. DC Voltage Measure Verification Points

| Input Pressure (V) | 12 Month Lower Limit | 12 Month Upper Limit |
|--------------------|----------------------|----------------------|
| 0.000 | -0.002 | 0.002 |
| 11.000 | 10.997 | 11.003 |
| 20.000 | 19.996 | 20.004 |
| 29.900 | 29.895 | 29.905 |

5. Set the 5522A to Standby.

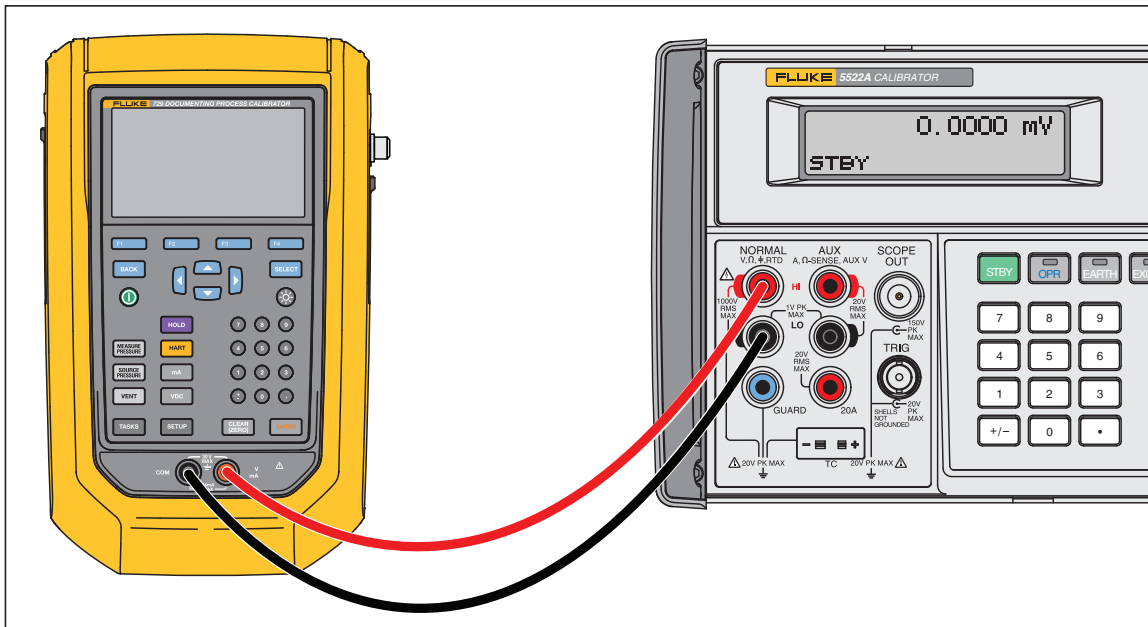


Figure 1. DC Voltage Measure Verification Connections

ien001.eps

DC Current Measure Verification

To verify the dc current measure function:

1. Push **mA**, **Measure Current** shows in the second row of the display.
2. Connect the Product as shown in Figure 2.
3. Set the 5522A to the first test point in Table 5, and edit its output so that the correct value shows on the 8508A.
4. Verify the display reading on the Product
5. Repeat for each applied value in Table 5.

Table 5. DC Current Measure Verification Points

| Input Current (mA) | 12 month Lower Limit | 12 month Upper Limit |
|-------------------------------|-----------------------------|-----------------------------|
| 0.100 | 0.0980 | 0.1020 |
| 4.000 | 3.9976 | 4.0024 |
| 11.000 | 10.9969 | 11.0031 |
| 20.000 | 19.9960 | 20.0040 |
| 23.990 | 23.9856 | 23.9944 |

6. Set the 5522A to Standby.

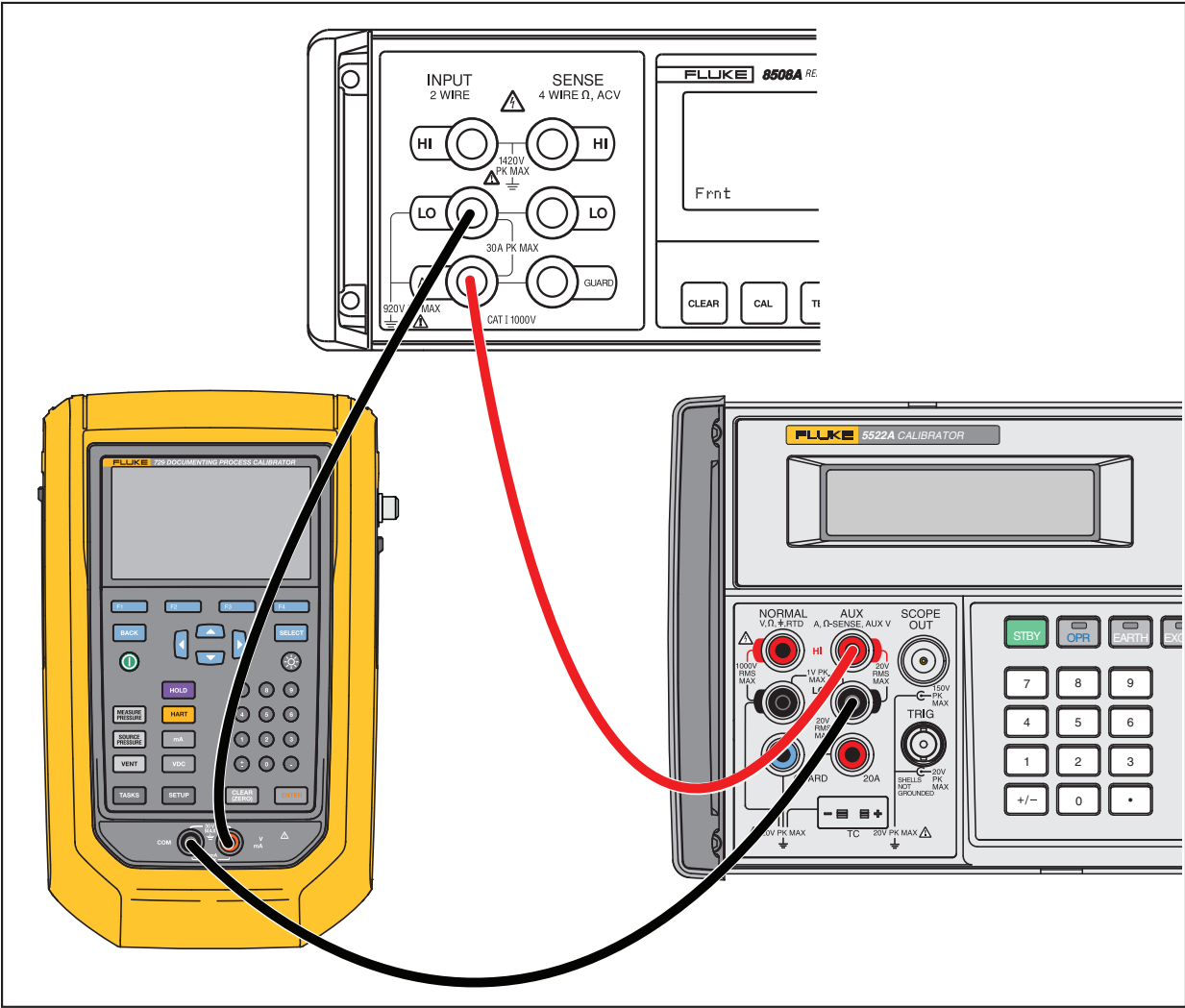


Figure 2. DC Current Measure Verification Connections

ien002.eps

DC Current Source Verification

To verify the dc current source function, see Figure 3:

1. Connect the Product red banana jack (V mA) to the 8508A HI mA INPUT.
2. Connect the Product black banana jack (COM) to the 8508A LO mA INPUT.
3. Set the 8508A for the Amp setting.
4. Use the arrow keys to move the cursor to second row of the display and highlight **Measure Current**.
5. Push **F3** to switch to the Source Current function.
6. Move the cursor to highlight the mA value.
7. Enter the current setting in Table 6, and push **ENTER**.
8. Verify the display reading on the Product.

Table 6. DC Current Source Verification Points

| Input Current (mA) | 12 Month Lower Limit | 12 Month Upper Limit |
|--------------------|----------------------|----------------------|
| 0.100 | 0.098 | 0.102 |
| 4.000 | 3.998 | 4.002 |
| 11.000 | 10.997 | 11.003 |
| 20.000 | 19.996 | 20.004 |
| 23.990 | 23.986 | 23.994 |

9. Push **mA** to switch to mA Measure mode to exit the current source function.

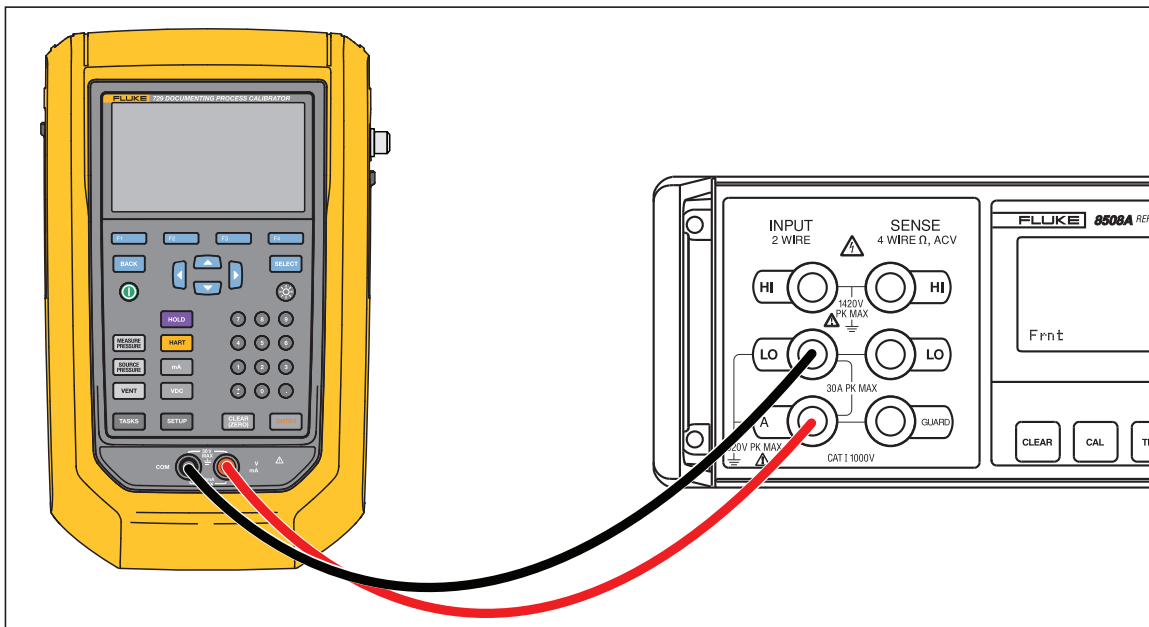


Figure 3. DC Current Source Verification Connections

ien003.eps

RTD Measure Verification

To verify the RTD measure function, see Figure 4.

When the Product detects temperature from the RTD connector, it turns on a temperature display.

1. Connect the 720URTD to the Product.
2. Connect the 720URTD Current HI to the 5522A HI RTD Output.
3. Connect the 720URTD Sense HI to the 5522A HI RTD Output.
4. Connect the 720URTD Current LO to the 5522A LO RTD Output.
5. Connect the 720URTD Sense LO to 5522A LO RTD Output.
6. Set the 5522A to PT385, RTD, 4-wire Comp temperature settings in Table 7.
7. Verify that the display reading on the Product is within the limits.

Table 7. RTD Measure Verification Points

| Applied Temperature from 5522A | Lower Limit | Upper Limit |
|--------------------------------|-------------|-------------|
| -40.00 °C (84.271 Ω) | -40.10 °C | -39.90 °C |
| 0.00 °C (100.000 Ω) | -0.10 °C | 0.10 °C |
| 150.00 °C (157.325 Ω) | 149.90 °C | 150.10 °C |

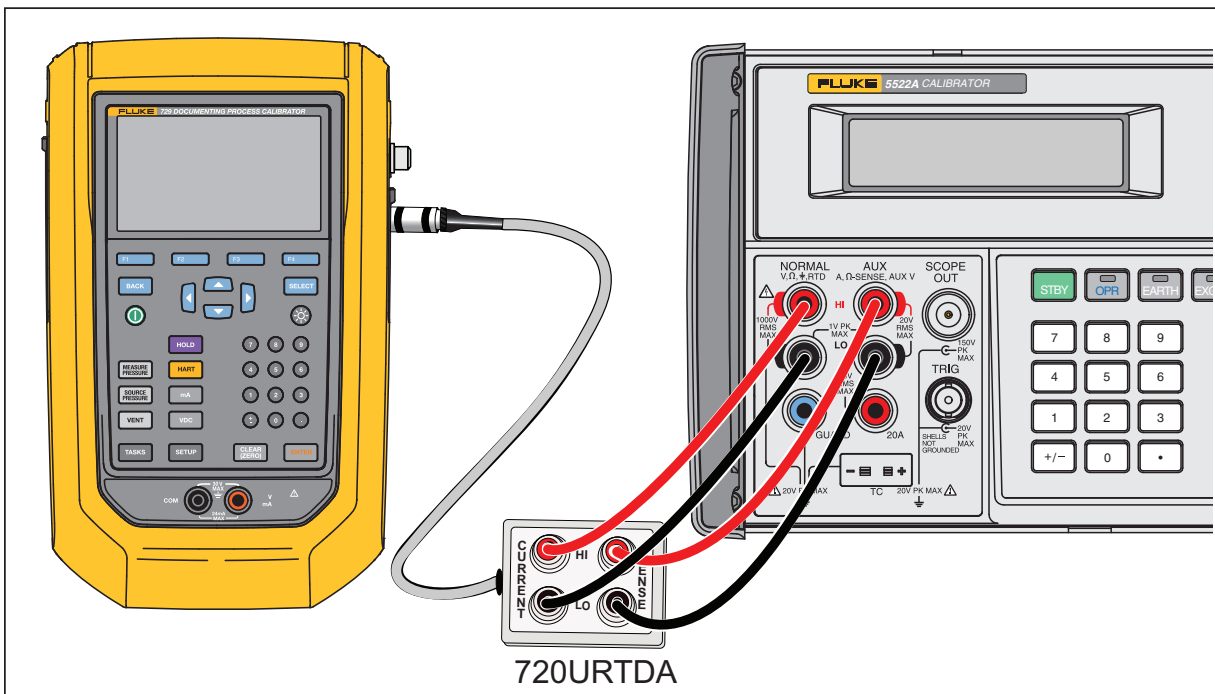


Figure 4. RTD Measure Verification Connections

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24V Loop Power Performance Check

To verify the 24V loop power function, see Figure 5:

1. Connect the Product red banana jack (V mA) to the 8508A HI VOLTS INPUT.
2. Connect the Product black banana jack (COM) to the 8508A LO VOLTS INPUT.
3. Push **mA** to get **Measure Current** in the lower display.
4. Move the cursor to second row of the display and highlight **Measure Current**.
5. Push **F1** to enable loop power.
6. The reading of 8508A should be between 26 V and 30 V. If it is not, repair may be necessary. See *Contact Fluke*.
7. Push **F1** to disable loop power.

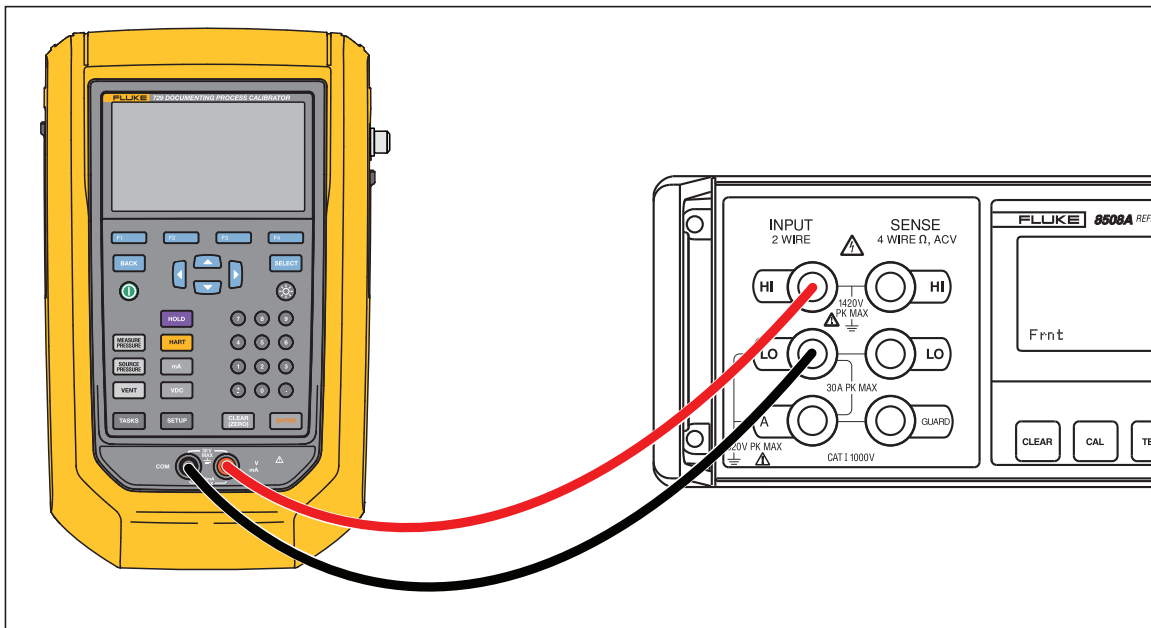


Figure 5. 24V Loop Power Verification Connections

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Calibration Adjustment

Calibrate the Product manually or with an electronic calibration process. These processes are explained below.

Calibration Data

The date of the last calibration and verification shows on the sticker on the calibration certificate and on the Instrument Information screen in the Setup menu. The CAL. STATUS number on the sticker should always match the Calibration Status number in the calibration screen. Only qualified personnel should calibrate the Product.

Service Center Calibration or Repair

Only qualified service personnel must do calibration, repairs, or service not included in this manual. If the Product fails, examine the battery pack first, and replace it if necessary.

Make sure to operate the Product in accordance with the instructions in this manual. If the Product is faulty, send a description of the failure with the Product. Pressure modules do not need to accompany the Product unless the module is faulty also. Be sure to pack the Product securely, in the original shipping container if it is available. See *Contact Fluke* and the Warranty Statement.

Manual Process (Front Panel)

Pressure Adjustment - 2-point adjustment (Zero and Full scale)

1. Push **SETUP** and select **729 information**.
2. Push **F1** (**Calibrate Pressure**).
3. Enter the password **1234** and push **ENTER**.
4. Follow the display prompts to finish the adjustment.

Pressure adjustment - 11-point adjustment (Vacuum to Full scale)

1. Push **SETUP** select **Maintenance** to enter maintenance mode.
2. Select **Pressure Sensor Characterize**.
3. Enter the password **1234** and push **ENTER**.
4. Follow the display prompts to finish the adjustment.

Supply Sensor Self Calibration

1. Push **SETUP** select **Maintenance** to enter maintenance mode.
2. Select **Supply Sensor Self Calibration**.
3. Follow the display prompts to finish the adjustment.

Electrical Adjustment

1. Push **SETUP** and select **729 information**.
2. Push **F2** (**Calibrate Electrical**).
3. Enter the password **1234** and push **ENTER**.
4. Follow the display prompts to finish the adjustment.

Electronic Calibration Process (Remote)

The USB port sends calibration process commands and receive readings. Do the calibration with a terminal program or you can write an automated-calibration program with programs like MetCal. This manual describes only the serial terminal mode.

Table 8 lists the required equipment.

Initiate Communication

Set up terminal communications with terminal communication software on a PC such as Hyperterminal or Ucon. Connect the Product's mini USB port to the PC. At first connection, a FTDI virtual serial port is installed on the PC.

The terminal settings are:

- Bits per second: 9600
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: none
- Local echo: on

Adjust Pressure

Use the equipment and procedures in this section to adjust pressure. The test equipment required for this adjustment is in Table 8.

Table 8. Test Equipment to Calibrate Pressure

| Equipment | Minimum Specifications | Recommended Model |
|--------------------------------|---|--------------------------|
| Pressure Controller/Calibrator | -14 psi to 300 psi Accuracy: 0.005 % | Ruska 7252xi |

Note

The Product uses a 1/8" NPT female connection in the pressure input port. Various adapters may be needed to connect to the pressure standard. Make sure the hose, tubing, and fittings have a rated working pressure at or above the pressure of the Product. It is also important that there be no leaks. To achieve accurate calibration, use PTFE tape where appropriate.

To adjust the pressure function, follow the procedures in Tables 9, 10, and 11.

Table 9. Ambient Pressure Sensor Characterize Steps for 30 psi Model

| Expected Manual Process (Front Panel) | Expected Electronic Calibration Process (Remote) |
|--|---|
| Connect the Product pressure input to the 7252xi output | Message prompts the operator Connect pressure input with the 7252xi test output |
| Output -12 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output -12 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output -9 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output -9 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure > to proceed |
| Output -6 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output -6 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure > to proceed |
| Output -3 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output -3 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure > to proceed |

Table 9. Ambient Pressure Sensor Characterize Steps for 30 psi Model (cont.)

| Expected Manual Process (Front Panel) | Expected Electronic Calibration Process (Remote) |
|---|--|
| Output 0 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 0 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 5 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 5 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 10 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 10 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 15 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 15 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 20 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 20 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 25 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 25 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 30 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 30 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Calibration is completed, push F3 (Go On) to exit the calibration | Continue Send command CAL_NEXT until <i>NOT</i> is returned from the Product by CAL_STEPTYPE? query |

Table 10. Ambient Pressure Sensor Characterize Steps for 150 psi Model

| Expected Manual Process (Front Panel) | Expected Electronic Calibration Process (Remote) |
|--|--|
| Connect the Product pressure input to 7252xi output | Message prompts the operator Connect pressure input with 7252xi's test output |
| Output -12 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output -12 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output -9 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output -9 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output -6 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output -6 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output -3 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output -3 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 0 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 0 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 25 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 25 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 50 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 50 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |

Table 10. Ambient Pressure Sensor Characterize Steps for 150 psi Model (cont.)

| Expected Manual Process (Front Panel) | Expected Electronic Calibration Process (Remote) |
|--|---|
| Output 75 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 75 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 100 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 100 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 125 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 125 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 150 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 150 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Calibration is completed, push F3 (Go On) to exit the calibration | Continue Send command CAL_NEXT until <i>NOT</i> is returned from the Product by CAL_STEPTYPE? query |

Table 11. Ambient Pressure Sensor Characterize Steps for 300 psi Model

| Expected Manual Process (Front Panel) | Expected Electronic Calibration Process (Remote) |
|--|--|
| Connect the Product pressure input to 7252xi's output | Message prompts the operator Connect pressure input with 7252xi's test output |
| Output -12 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output -12 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output -9 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output -9 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output -6 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output -6 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output -3 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output -3 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure>> to proceed |
| Output 0 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 0 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 50 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 50 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 100 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 100 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |

Table 11. Ambient Pressure Sensor Characterize Steps for 300 psi Model

| Expected Manual Process (Front Panel) | Expected Electronic Calibration Process (Remote) |
|--|---|
| Output 150 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 150 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 200 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 200 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 250 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 250 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Output 300 psi from 7252xi, input actual value and push F3 (Go On) to proceed | Output 300 psi from 7252xi Wait for 7252xi output ready Send command CAL_NEXT <actual_pressure> to proceed |
| Calibration is completed, push F3 (Go On) to exit the calibration | Continue send Send command CAL_NEXT until <i>NOT</i> is returned from the Product by CAL_STEPTYPE? query |

Adjust Voltage Input

The test equipment to adjust the voltage input is listed in Table 12.

Table 12. Required Test Equipment for Voltage Input Adjustment

| Equipment | Minimum Specifications | Recommended Model |
|---------------|--|--------------------------------------|
| DC Calibrator | DC Voltage: 0 V to 30 V Accuracy: $\pm 0.002\%$ +0.5 mV DC Current 0 mA to 24 mA Accuracy: $\pm 0.002\%$ +0.5 μ A | Fluke 5522A Multi-Product Calibrator |

Use the test procedure in Table 13 to adjust the voltage input.

Table 13. Voltage Input Adjustment Procedure

| Expected Manual Process (Front Panel) | Expected Electronic Calibration Process (Remote) |
|---|--|
| Connect the Product VDC input with Fluke 5522A NORMAL output | Message prompts the operator Connect VDC input to 5522A NORMAL output |
| Output 0 V from Fluke 5522A, input actual value and push Go On to proceed | Output 0 V dc from 5522A Wait for at least 3 seconds for signal stable Send command CAL_NEXT <actual_volts> to proceed |
| Output 30 V from Fluke 5522A, input actual value and push Go On to proceed | Output 30 V dc from 5522A Wait for at least 3 seconds for signal stable Send command CAL_NEXT <actual_volts> to proceed |

Adjust mA Input

The test equipment to adjust the mA input is listed in Table 14.

Table 14. Required Test Equipment for mA Input Adjustment

| Equipment | Minimum Specifications | Recommended Model |
|--------------------|--|--------------------------------------|
| DC Calibrator | DC Voltage: 0 V to 30 V Accuracy: $\pm 0.002\%$ +0.5 mV DC Current 0 mA to 24 mA Accuracy: $\pm 0.002\%$ +0.5 μ A | Fluke 5522A Multi-Product Calibrator |
| Digital Multimeter | DC Current: 0 mA to 26 mA Accuracy: $\pm 0.002\%$ +0.5 μ A | Fluke 8508A |

Note

All reference (actual) values that you input during the calibration procedure should be the reading from 8508A.

Use the test procedure in Table 15 to adjust the mA input.

Table 15. mA Input Adjustment Procedure

| Expected Manual Process (Front Panel) | Expected Electronic Calibration Process (Remote) |
|---|--|
| Connect the Product mA input with Fluke 5522A AUX output | Message prompts the operator Connect mA input with 5522A AUX output |
| Output 0 mA from Fluke 5522A, input actual value and push F3 (Go On) to proceed | Output 0mA dc from 5522A Wait for at least 3 seconds for signal stable Send command CAL_NEXT <actual_mA> to proceed |
| Output 22 mA from Fluke 5522A, input actual value and push F3 (Go On) to proceed | Output 22 mA dc from 5522A Wait for at least 3 seconds for signal stable Send command CAL_NEXT <actual_mA> to proceed |

Adjust mA Source

Table 16 is a list of the the test equipment to adjust the mA source.

Table 16. Required Test Equipment for mA Source Adjustment

| Equipment | Minimum Specifications | Recommended Model |
|--------------------|---|-------------------|
| Digital Multimeter | DC Current: 0 mA to 26 mA Accuracy: $\pm 0.002\%$ +0.5 μ A | Fluke 8508A |

Use the test procedure in Table 17 to adjust the mA source.

Table 17. mA Source Adjustment Procedure

| Expected Manual Process (Front Panel) | Expected Electronic Calibration Process (Remote) |
|--|--|
| Connect the Product mA output to Fluke 8508A's Amps input, and set Fluke 8508A to DCA function | Message prompts the operator Connect the Product mA output to 8508A's Amps input |
| Input measured mA value from Fluke 8508A, and push F3 (Go On) to proceed | Wait for at least 3 seconds for signal stable Send command CAL_NEXT <actual_mA> to proceed |
| Input measured mA value from Fluke 8508A, and push F3 (Go On) to proceed | Wait for at least 3 seconds for signal stable Send command CAL_NEXT <actual_mA> to proceed |
| Input measured mA value from Fluke 8508A, and push F3 (Go On) to proceed | Wait for at least 3 seconds for signal stable Send command CAL_NEXT <actual_mA> to proceed |

Adjust RTD

Table 18 is a list of the test equipment to adjust the RTD.

Table 18. Required Test Equipment for RTD Adjustment

| Equipment | Minimum Specifications | Recommended Model |
|---------------|--|--------------------------------------|
| DC Calibrator | DC Voltage: 0 V to 30 V Accuracy: $\pm 0.002\%$ +0.5 mV DC Current 0 mA to 24 mA Accuracy: $\pm 0.002\%$ +0.5 μ A | Fluke 5522A Multi-Product Calibrator |
| RTD adapter | | Fluke 720URTD |

Use the test procedure in Table 19 for RTD adjustment.

Table 19. RTD Adjustment Procedure

| Expected Manual Process (Front Panel) | Expected Electronic Calibration Process (Remote) |
|---|--|
| Connect FLUKE 720URTD A to the Product RTD input, and connect it to Fluke 5522A (in 4-wire ohms mode) | Message prompts the operator Connect 720URTD A to the Product RTD lemo jack, and connect the adapter with 5522A in 4-wire connection |
| Output 80 Ω from Fluke 5522A, input actual value and push F3 (Go On) to proceed | Output 80 Ω from 5522A in 4-wire mode Wait for at least 3 seconds for a stable signal Send command CAL_NEXT <actual_ohms> to proceed |
| Output 160 Ω from Fluke 5522A, input actual value and push F3 (Go On) to proceed | Output 160 Ω from 5522A in 4-wire mode Wait for at least 3 seconds for a stable signal Send command CAL_NEXT <actual_ohms> to proceed |
| Calibration is completed, push F3 (Go On) to exit the calibration | Continue Send command CAL_NEXT until NOT is returned from the Product by CAL_STEPTYPE? query |

Adjust Continuity

Table 20 lists the test equipment to test continuity.

Table 20. Required Test Equipment for Continuity Adjustment

| Equipment | Minimum Specifications | Recommended Model |
|--------------------|---|-------------------|
| Resistor | 0 Ω Accuracy: ±1 % 1 kΩ Accuracy: ±1 % | |
| Digital Multimeter | DC Current: 0 mA to 26 mA Accuracy: ±0.002 % +0.5 μA | Fluke 8508A |

Note

All reference (actual) values the you input during the calibration procedure should be the reading from 8508A.

Use the test procedure in Table 21 for continuity adjustment.

Table 21. Continuity Adjustment Procedure

| Expected Manual Process (Front Panel) | Expected Electronic Calibration Process (Remote) |
|---|--|
| Connect 0 Ω resistor to the Product switch input | Message prompts the operator Connect a 0 Ω resistor to the Product switch input |
| Input actual resistance value and push F3 (Go On) to proceed | Wait for at least 3 seconds for signal stable Send command CAL_NEXT <actual_ohms> to proceed |
| Connect 1 k Ω resistor to the Product switch input | Message prompts the operator Connect a 1 k Ω resistor to the Product switch input |
| Input actual resistance value and push F3 (Go On) to proceed | Wait for at least 3 seconds for signal stable Send command CAL_NEXT <actual_ohms> to proceed |

Calibration Remote Commands

1. Get last calibrated date

- Syntax

CAL_DATE? [{EMM|PCM}]

2. Return PCM cal date if no argument provided.

3. CAL_START - Start a calibration

- Syntax

CAL_START {EMM|PCM|PCHAR}, <password>

EMM

Run calibration procedure for electrical functions

PCM

Run 2-point pressure calibration for internal pressure module

PCHAR

Run ambient pressure sensor characterization

<password>

Default value 1234, or super password calculated by Product serial number

4. Get type of current calibration step

- Syntax

CAL_STEPTYPE?

- Response

NOT

No calibration procedure is running

INS

Displays message for next step

REF

Expects reference value for current step

RUN

Busy

5. Get name of current calibration step

- Syntax

CAL_STEPNAME?

6. Get nominal calibration reference

- Syntax

CAL_REF?

- Response

<ref_value>, <unit>

7. Proceed to next step with optional reference

- Syntax

CAL_NEXT [<ref>[,<unit>]]

For *REF* step, a reference value must be sent with this command to proceed.

8. Skip to next step

- Syntax

CAL_SKIP

9. Backup a step

- Syntax

CAL_BACKUP

10. Skip to next section

- Syntax

CAL_SECTION

Use this command to skip some function do not need to be recalibrated.

11. Save CAL constants

- Syntax

CAL_SAVE

12. Abort calibration

- Syntax

CAL_ABORT

Example:

```
=>CAL_START EMM 1234      # Start electrical function calibration

=>CAL_STEPTYPE?          # Get current step type
INS                      # Instruction

=>CAL_STEPNAME?         # Get current step name
DC20MA_INS              # Need to connect 729 to 5522A AUX

=>CAL_NEXT              # Proceed to next step

=>CAL_STEPTYPE?         # Get current step type
REF                     # Reference value is expected to proceed

=>CAL_STEPNAME?        # Get current step name
DC20MA_1                # The 1st calibration point of MADC measure function

=>CAL_REF?              # Get nominal reference value
0.000000e+00,mA        # 0.000 mA

=>CAL_NEXT              # Proceed with default reference value

=>CAL_STEPTYPE?         # Get current step type
REF                     # Reference value is expected to proceed

=>CAL_STEPNAME?        # Get current step name
DC20MA_2                # The 2nd calibration point of MADC measure function

=>CAL_REF?              # Get nominal reference value
2.200000e+01,mA        # 22.000 mA

=>CAL_ABORT             # Abort calibration

=>CAL_STEPTYPE?         # Get current step name
NOT                     # No calibration is running
```

The Battery

The Product features a rechargeable battery. Charge the battery while it is inside or outside of the Product. This allows you to have more than one fully-charged battery on hand.

Charge the Battery

Before the Product is used, charge the battery. To charge the battery while in the Product, connect the battery charger to the Product.

The battery fully charges in 8 hours.

To charge the battery outside of the Product, see Figure 6 for battery access:

1. Place the Product face down.
2. Lift the Product stand to expose all screws.
3. Remove the six screws with a Phillips screwdriver.
4. Pull off the back.
5. Remove the battery.
6. Connect the battery charger to the input on the battery.
7. The battery charge indicator (top-right of display) shows while the battery is outside of the Product. Solid green bars show the level of charge on the battery. When all bars are illuminated and solid, the battery is fully charged. The bars progressively illuminate to show that the battery is currently charging.

Battery Life

The battery charge indicator shows on the upper right of the display.

Table 22 shows the typical operation time for a new, fully charged battery. Product performance meets its specification until the battery charge indicator reads empty.

Table 22. Typical Battery Life

| Operation Modes | Battery Life |
|--|--------------|
| Measure, continuous | 20 Hours |
| Measure and source, with loop power on, continuous | 10 Hours |
| Typical intermittent operation | >16 Hours |

Battery Replacement

Replace the battery when it no longer holds a charge for the rated interval. The battery normally lasts for up to 300 charge/discharge cycles. To order a replacement battery, see *Contact Fluke* and *User-Replaceable Parts*.

Note

Take spent batteries to a qualified recycler or hazardous materials handler for disposal. Contact an authorized Fluke Service Center for recycling information.

To replace the battery, see Figure 6:

1. Push **SETUP** and select Maintenance.
2. Push **F1** (**Exhaust**) to release Product internal pressure.
3. Turn Off the Product.
4. Remove test leads.
5. Make sure the Product is unplugged from its charger.
6. Turn over the Product.
7. Lift up the bail and remove the six screws with a Phillips screwdriver.
8. Lift off the back battery cover.
9. Replace the battery.
10. Replace the back cover and screws.

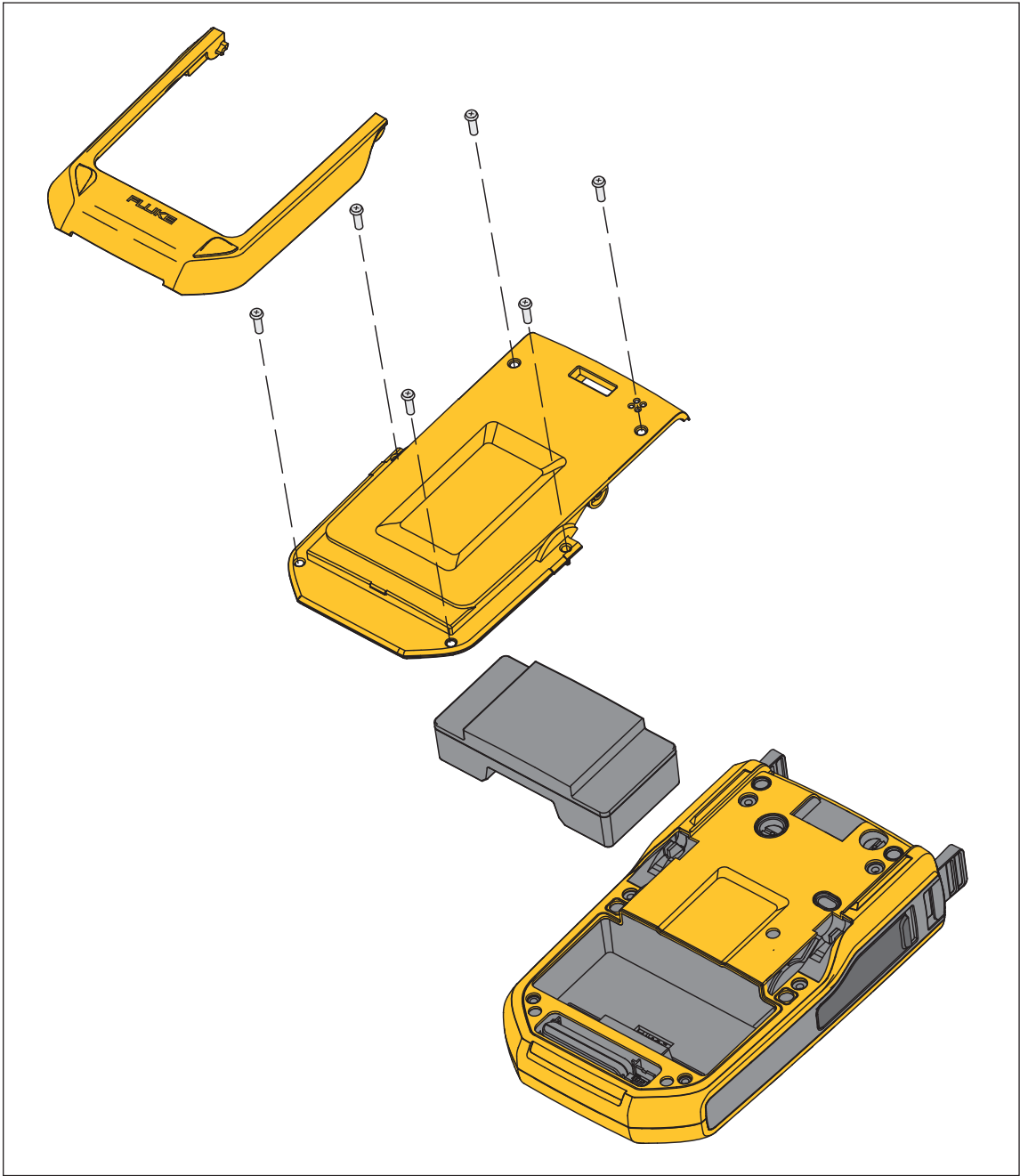


Figure 6. Replace the Battery

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Maintenance

Warning

To prevent possible electrical shock, fire, or personal injury:

- Have an approved technician repair the Product.
- Do not operate the Product with covers removed or the case open. Hazardous voltage exposure is possible.
- Remove the input signals before you clean the Product.
- Use only specified replacement parts.
- Run “Exhaust” before you open the battery door.

Clean the Product

Clean the Product and pressure modules with a soft cloth dampened with water or water and mild detergent.

Caution

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

Clean the Pump Valve

1. Remove the battery door (see *Battery Replacement*) and locate the pump valve caps, see Figure 7 (1).
2. Use a small screwdriver to remove the two valve retention caps located in the oval shaped opening on the underside of the Product.
3. Gently remove the spring and O-ring assembly.
4. Set aside the valve assemblies and clean out the valve body with a cotton swab soaked in isopropyl alcohol (IPA).
5. Repeat this process several times with a new cotton swab until there is no sign of residue.
6. Run the pump for a few seconds.
7. Clean the O-ring assembly and O-ring on the retention caps with IPA and inspect the O-rings closely for any cuts, nicks, or wear. Replace if necessary.
8. Inspect the springs for wear or loss of tension. They should be approximately 3.8 mm (0.15 in) long in the relaxed state. If they are shorter, the O-ring will not seat properly. Replace if necessary.
9. Clean and inspect all parts and then reinstall the O-ring and spring assemblies into the valve body.
10. Reinstall the retention caps and gently tighten the cap.
11. Seal the output of the Product and pump up the unit to at least 50 % of its rated pressure.
12. Release the pressure and repeat several times to ensure that the O-rings seat properly.
13. The Product is now ready for use.

Replace the Pump Filters

1. Remove the battery door (see *Battery Replacement*) and locate the two filter caps, see Figure 7 (2).
2. Use a screwdriver to push the pressure release pin on the screws before removing.
3. Unscrew the two filter caps.
4. Remove the filters and replace if necessary.
5. Clean the O-rings on the filter caps with IPA and inspect the O-rings closely for any cuts, nicks, or wear. Replace if necessary.
6. Reinstall the filter caps.
7. Gently tighten the caps.

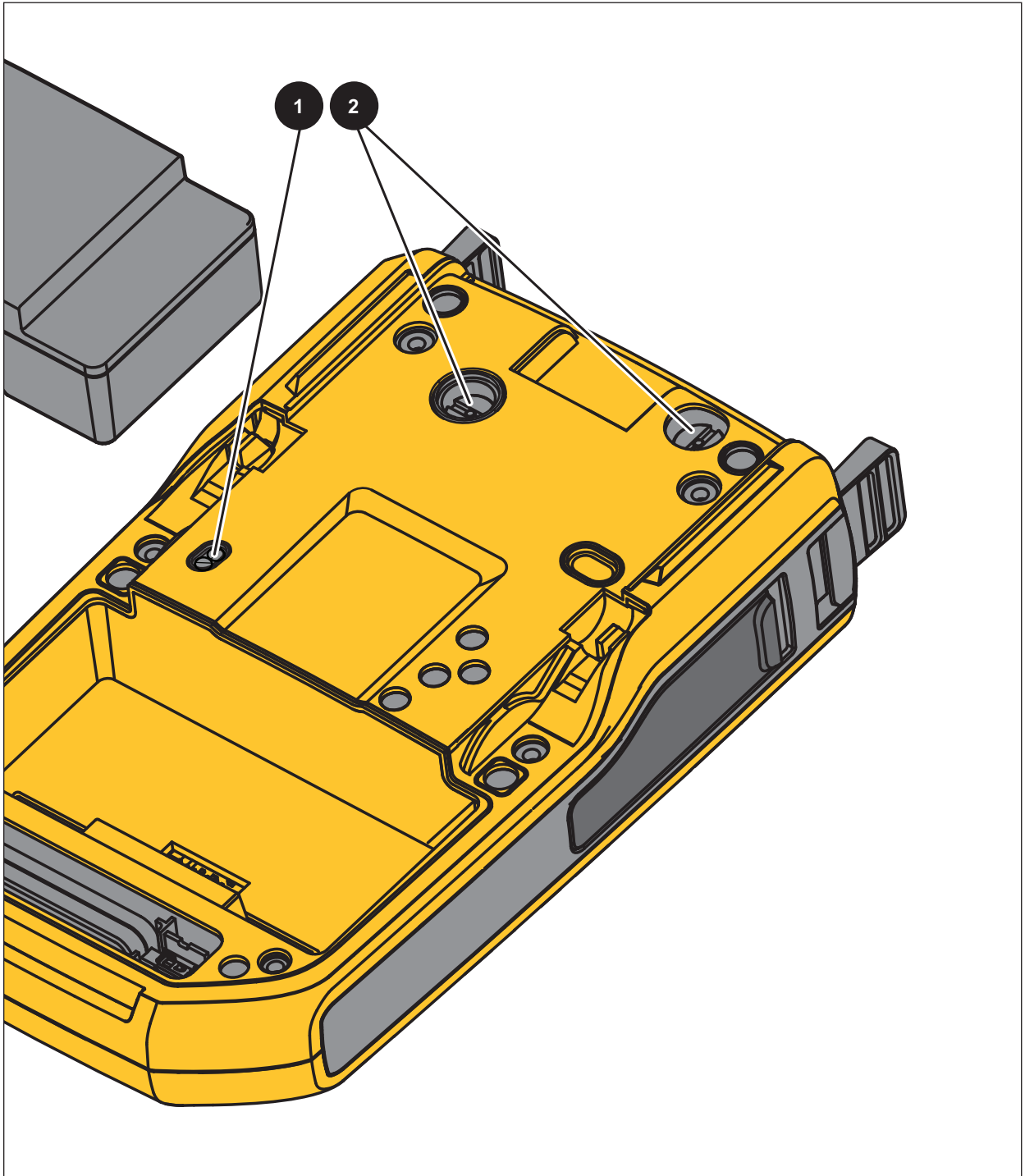


Figure 7. Pump Valve

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In Case of Difficulty

⚠⚠ Warning

To prevent possible electrical shock, fire, or personal injury, do not use the Product if it operates abnormally. Protection may be impaired. When in doubt, have the Product serviced.

If the Product does not turn on, check the battery charge. Disconnect the battery charger. If the Product receives power, the power button is illuminated. If the button is illuminated, but the Product does not turn on, have the Product serviced. See *Contact Fluke*.

Update Product Firmware

To update the Product firmware version:

1. Turn on the Product.
2. Connect the USB cable (provided) to a PC (see Figure 8).
3. Go to www.fluke.com/productinfo.
4. Click on “Find your software”.
5. Search for “729”.
6. On the results page, select the **Software Downloads** tab.
7. Click on the necessary software link.
8. Read the instructions on this page.
9. Download the Firmware file.
10. Click on the Firmware **exe** file.

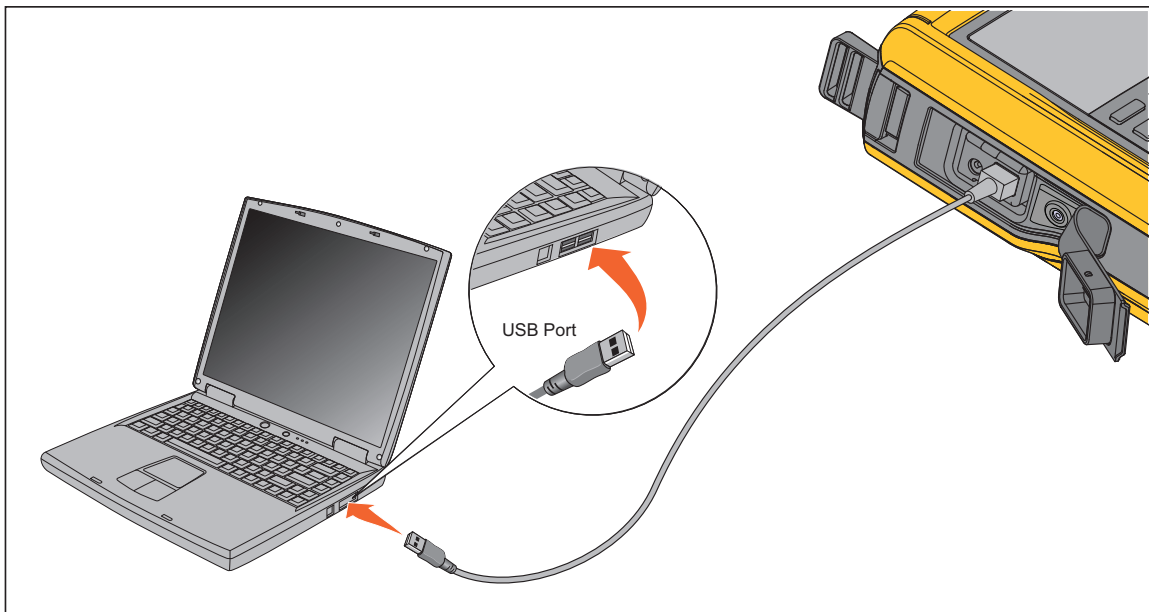


Figure 8. Connect the USB Cable

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User-Replaceable Parts and Accessories

Table 23 is a list of replacement parts and accessories.

Table 23. User-Replaceable Parts and Accessories

| Description | Quantity | Fluke P/N |
|---|----------|-----------|
| BP729, Rechargeable Li-ion Battery | 1 | 4817068 |
| Power Charger, AC/DC | 1 | 4878453 |
| Mains Adapters International (Except For China) | 1 | 2441372 |
| Line Cord, Jumper (Except China) | 1 | 4542113 |
| Power Cable (China Only) | 1 | 2716592 |
| USB Cable Assembly | 1 | 4499448 |
| AC280, Suregrip Hook Clips | 1 | 1610115 |
| Alligator Clip Set | 1 | 3765923 |
| Cable Assembly, Stackable Test Leads Set | 1 | 3669716 |
| TP220, Test Probes | 1 | 3971276 |
| Hose, Nylon | 3.3 ft | 4366602 |
| Fitting, 1/8" NPT-Female X 1/4" NPT-Female | 1 | 4366616 |
| Fitting, 1/8" Tube x 1/8" NPT-Male | 2 | 4551693 |
| Fitting, 1/8" NPT-Female x M20-Female | 1 | 4366633 |
| Fitting, 1/4" BSP-Female x 1/8" NPT-Female | 1 | 4366640 |
| PTFE Tape | 1 | 3714052 |
| Filter | 2 | 4883735 |
| Softcase | 1 | 4860790 |
| Softcase Accessory | 1 | 4821227 |
| Shoulder Strap | 1 | 4850059 |
| Hanger, Dual Magnet | 1 | 4357287 |
| Magnet Strap | 2 | 4329190 |
| Strap - 9 in | 1 | 669960 |
| Liquid Contaminant Trap (optional) | 1 | 4380747 |
| Calibration Certificate | 1 | - |
| Printed Multilingual Safety Information | 1 | 4864397 |
| Warranty Card | 1 | - |