FLUKE®

729 Pro

Automatic Pressure Controller

Calibration Manual

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Introduction

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

Contact Fluke

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

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

+1-425-446-5500 fluke-info@fluke.com

The latest software trial version of *DPCTrack2* can be downloaded at www.fluke.com/productinfo. For more information, see Update Product Firmware in the *729 Pro Users Manual* available at www.fluke.com .

Safety Information

General Safety Information is in the printed Safety Information document that ships with the Product and at www.fluke.com. More specific safety information is listed where applicable.

A **Warning** identifies hazardous 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

For product specifications, see the *729 Pro Users Manual* available at www.fluke.com.

Calibration and Verification of the Product

Verification is the process of measurement data evaluation collected during the process of calibration and evaluating whether the data is within the published specifications for the Product. Verification is recommended annually for the Product. Calibration and verification should also be done before and after normal periodic adjustment or repair of the Product. Verification also serves to check that internal adjustment processes are in control.

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 1. 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 1. Equipment Required for Verification and Calibration Adjustment

Equipment	Minimum Specifications	Recommended Model
DC Calibrator	DC Voltage: 0 V to 30 V Accuracy: ±0.002 % +0.5 mV DC Current 0 mA to 24 mA Accuracy: ±0.002 % +0.5 µA	Fluke 5530A Multi-Product Calibrator or equivalent
Digital Multimeter	DC Current: 0 mA to 26 mA Accuracy: ±0.002 % +0.5 µA	Fluke 8588A or equivalent
Pressure Controller/ Calibrator	-15 psi to 30 psi -14 psi to 300 psi -14 psi to 600 psi -14 psi to 1000 psi Accuracy: 0.005 %	Ruska 7252xi with Gauge/ Absolute Mode
RTD adapter		Fluke 720URTDA

Verification Process

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

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

Pressure Measurement 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 (1000 psi for the 1000 psi PMM, 600 psi for the 600 psi PMM, 300 psi for the 300 psi PMM, and 30 psi for 30 psi 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 is stable.
6. Test all positive pressure test points in ascending and descending order.
7. Source -14 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 is stable.
10. Test all pressure test points in Table 2 in ascending and descending order.

Table 2. Pressure Verification Points

Input Pressure (psi)	12 Month Lower Limit	12 Month Upper Limit
FLK-PMM-200K		
-14.0000	-14.0060	-13.9940
-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

Table 2. Pressure Verification Points (cont.)

Input Pressure (psi)	12 Month Lower Limit	12 Month Upper Limit
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
-14.0000	-14.0060	-13.9940
FLK-PMM-200KA		
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
Input Pressure (psi)	**12 Month Lower Limit**	**12 Month Upper Limit**
FLK-PMM-1000K		
-14.000	-14.030	-13.970
-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

Table 2. Pressure Verification Points (cont.)

Input Pressure (psi)	12 Month Lower Limit	12 Month Upper Limit
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
-14.000	-14.030	-13.970
Input Pressure (psi)	**12 Month Lower Limit**	**12 Month Upper Limit**
FLK-PMM-2000K		
-14.000	-14.060	-13.940
-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
60.000	59.940	60.060
120.000	119.940	120.060
180.000	179.940	180.060
240.000	239.940	240.060
300.000	299.940	300.060
240.000	239.940	240.060
180.000	179.940	180.060
120.000	119.940	120.060
60.000	59.940	60.060
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
-14.000	-14.060	-13.940

Table 2. Pressure Verification Points (cont.)

Input Pressure (psi)	12 Month Lower Limit	12 Month Upper Limit
FLK-PMM-4000K		
-14.00	-14.12	-13.88
-12.00	-12.12	-11.88
-9.00	-9.12	-8.88
-6.00	-6.12	-5.88
-3.00	-3.12	-2.88
0.00	-0.12	0.12
120.00	119.88	120.12
240.00	239.88	240.12
360.00	359.88	360.12
480.00	479.88	480.12
600.00	599.88	600.12
480.00	479.88	480.12
360.00	359.88	360.12
240.00	239.88	240.12
120.00	119.88	120.12
0.00	-0.12	0.12
-3.00	-3.12	-2.88
-6.00	-6.12	-5.88
-9.00	-9.12	-8.88
-12.00	-12.12	-11.88
-14.00	-14.12	-13.88
Input Pressure (psi)	**12 Month Lower Limit**	**12 Month Upper Limit**
FLK-PMM-7000K		
-14.00	-14.20	-13.80
-12.00	-12.20	-11.80
-9.00	-9.20	-8.80
-6.00	-6.20	-5.80
-3.00	-3.20	-2.80
0.00	-0.20	0.20
200.00	199.80	200.20
400.00	399.80	400.20

Table 2. Pressure Verification Points (cont.)

Input Pressure (psi)	12 Month Lower Limit	12 Month Upper Limit
600.00	599.80	600.20
800.00	799.80	800.20
1000.00	999.80	1000.20
800.00	799.80	800.20
600.00	599.80	600.20
400.00	399.80	400.20
200.00	199.80	200.20
0.00	-0.20	0.20
-3.00	-3.20	-2.80
-6.00	-6.20	-5.80
-9.00	-9.20	-8.80
-12.00	-12.20	-11.80
-14.00	-14.20	-13.80
Input Pressure (psi)	**12 Month Lower Limit**	**12 Month Upper Limit**
FLK-PMM-7000KA		
0.00	-0.20	0.20
200.00	199.80	200.20
400.00	399.80	400.20
600.00	599.80	600.20
800.00	799.80	800.20
1000.00	999.80	1000.20
800.00	799.80	800.20
600.00	599.80	600.20
400.00	399.80	400.20
200.00	199.80	200.20
0.00	-0.20	0.20

750P Connection Verification

Connect Fluke-750P to the Product with the 5-pin LEMO port at the right of the Product. The Product shows the module of 750P and the pressure value at the lower right of the display. See Figure 1.

Pressure Control Verification

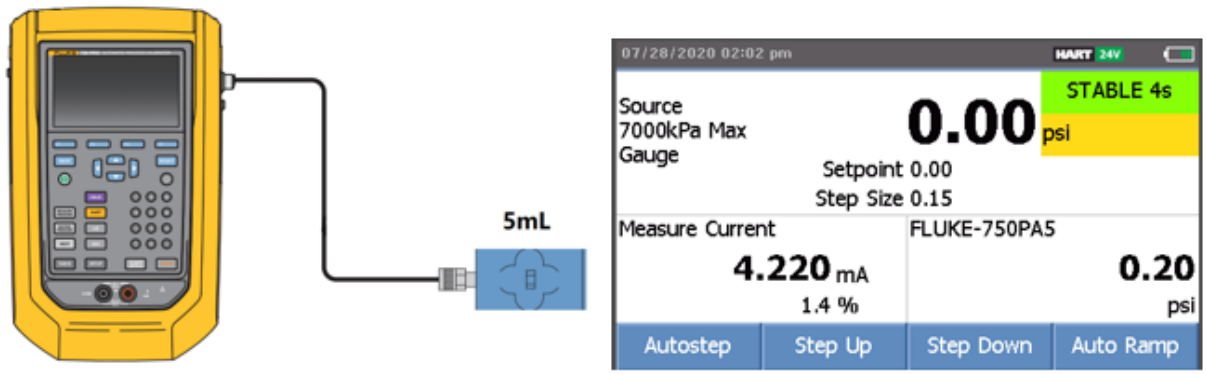
Connect the Product to the 5 mL Manifold and move the yellow cursor to **Setpoint** to input the target pressure to the Product. Push SOURCE PRESSURE for pressure control verification.

The Product needs approximately 2 minutes for pump to set pressure, and then stay stable. See Table 3.

Table 3. Pressure Control Verification

Supported PMM	Recommended Pressure Control Points(kPa)								
FLK-PMM-200K	-90	-60	-30	10	40	80	120	160	200
FLK-PMM-200KA				10	40	80	120	160	200
FLK-PMM-1000K	-90	-60	-30	10	200	400	600	800	1000
FLK-PMM-2000K	-90	-60	-30	10	400	800	1200	1600	2000
FLK-PMM-4000K	-90	-60	-30	10	800	1600	2400	3200	4000
FLK-PMM-7000K	-90	-60	-30	10	1400	2800	4200	5600	7000
FLK-PMM-7000KA	-	-	-	10	1400	2800	4200	5600	7000

Figure 1. Pressure Control Verification Connections and Source Pressure



DC Voltage Measure Verification

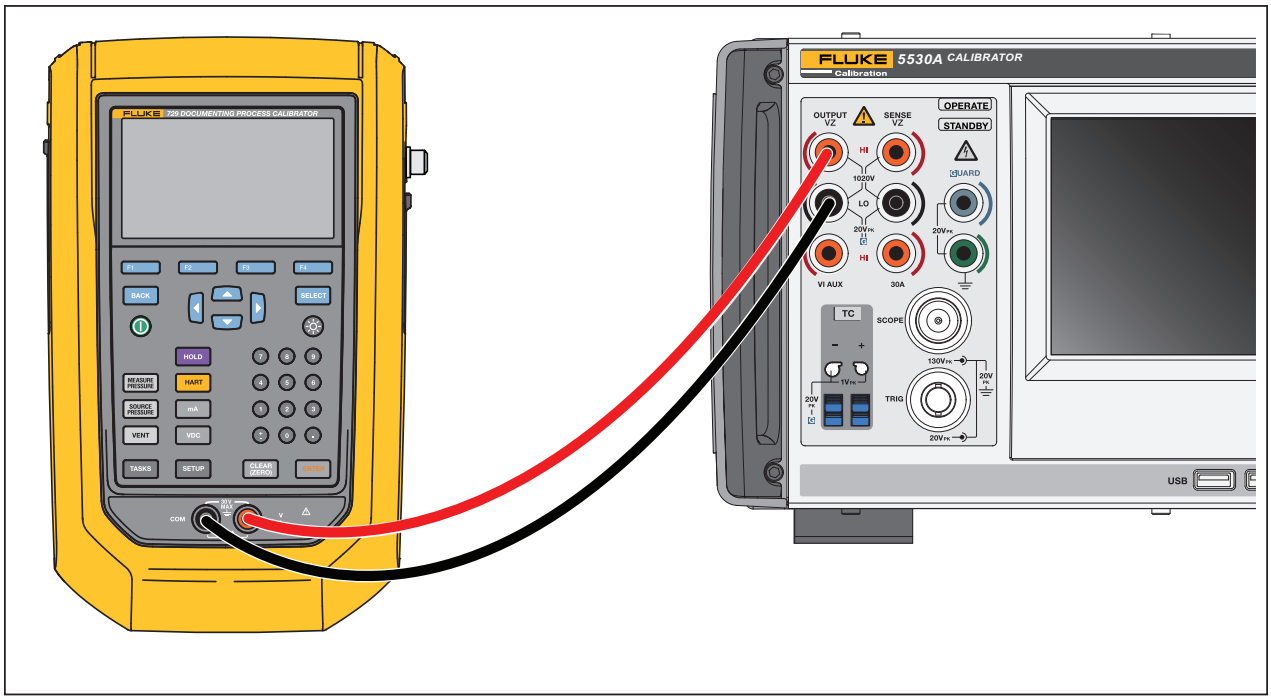
To verify the dc voltage measure function, see Figure 2:

1. Push VDC, **Measure VDC** shows in the second row of the display.
2. Connect the Product red banana jack (**V mA**) to the 5530A **HI VOLTS** output.
3. Connect the Product black banana jack (**COM**) to the 5530A **LO VOLTS** output.
4. Set the 5530A for the voltage setting in Table 4 and check the display reading on the Product.
5. Set the 5530A to Standby.

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

Figure 2. DC Voltage Measure Verification Connections



DC Current Measure Verification

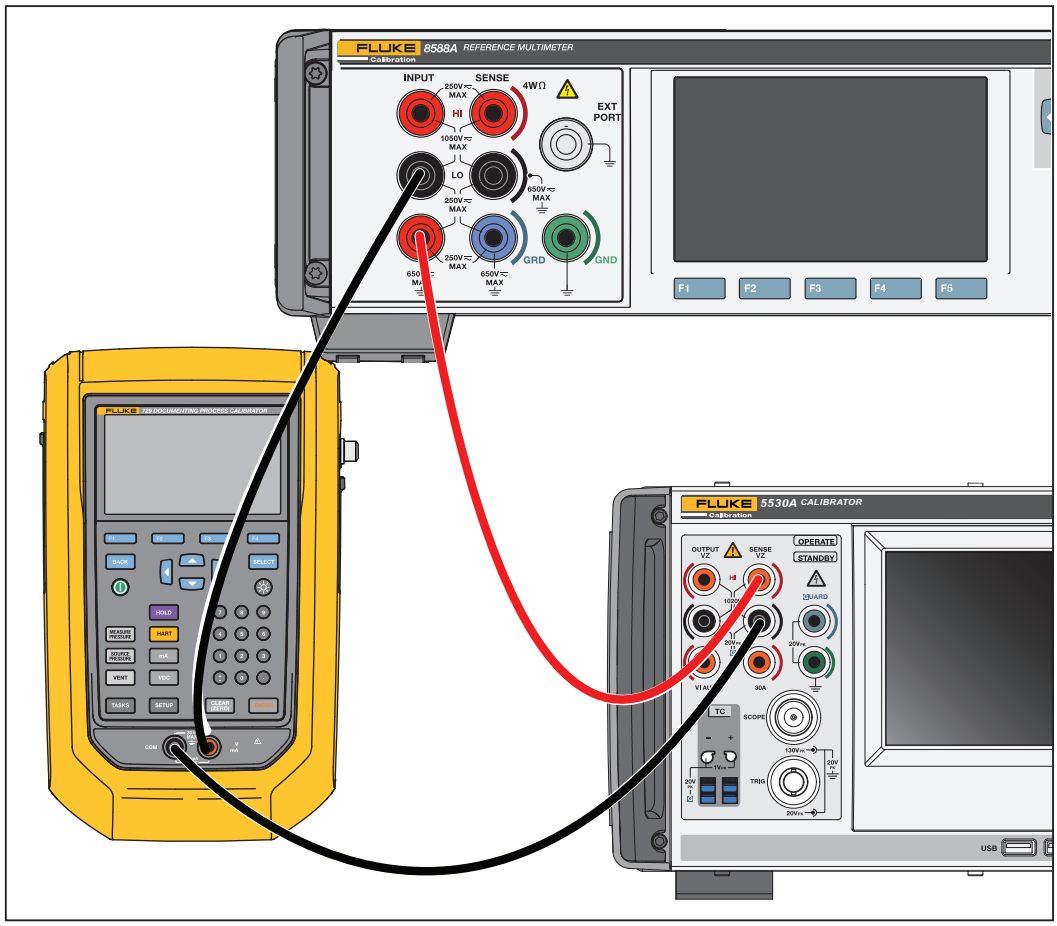
To verify the dc current measure function:

1. Push **mA**, **Measure Current** shows in the second row of the display.
2. Connect the Product as shown in Figure 3.
3. Set the 5530A to the first test point in Table 5 and edit its output so that the correct value shows on the 8588A.
4. Check the display reading on the Product
5. Repeat for each applied value in Table 5.
6. Set the 5530A to Standby.

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

Figure 3. DC Current Measure Verification



DC Current Source Verification

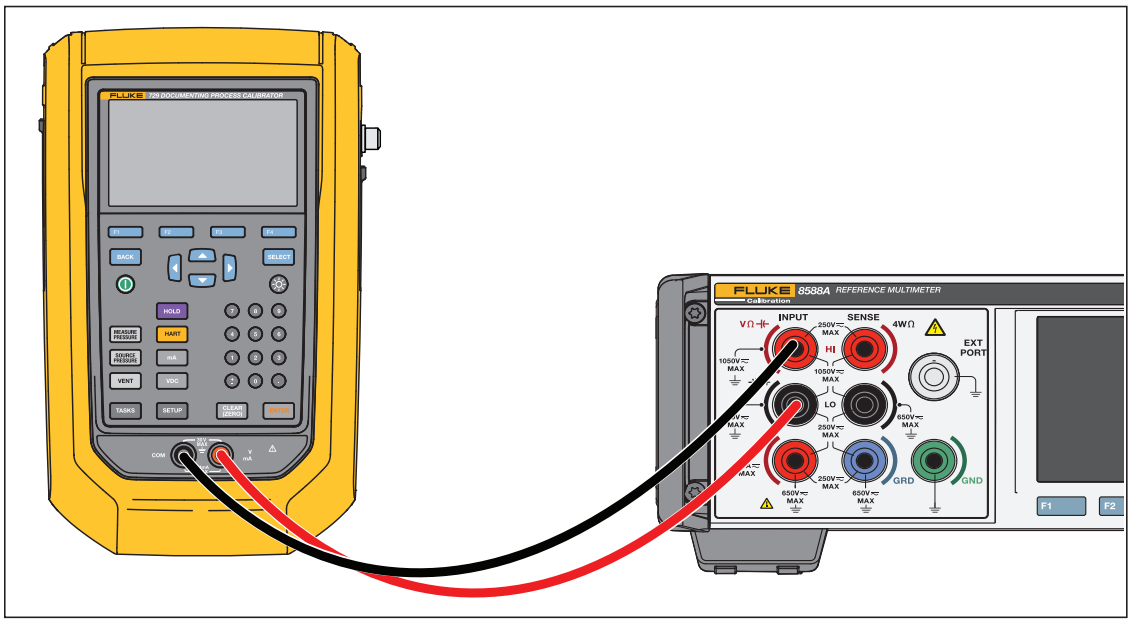
To verify the dc current source function, see Figure 4:

1. Connect the Product red banana jack (**V mA**) to the 8588A **HI mA INPUT**.
2. Connect the Product black banana jack (**COM**) to the 8588A **LO mA INPUT**.
3. Set the 8588A to 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 change 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. Check the display reading on the Product.
9. Push **mA** to switch to **mA Measure** mode to exit the current source function.

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

Figure 4. DC Current Source Verification Point



RTD Measure Verification

To verify the RTD measure function, see Figure 5.

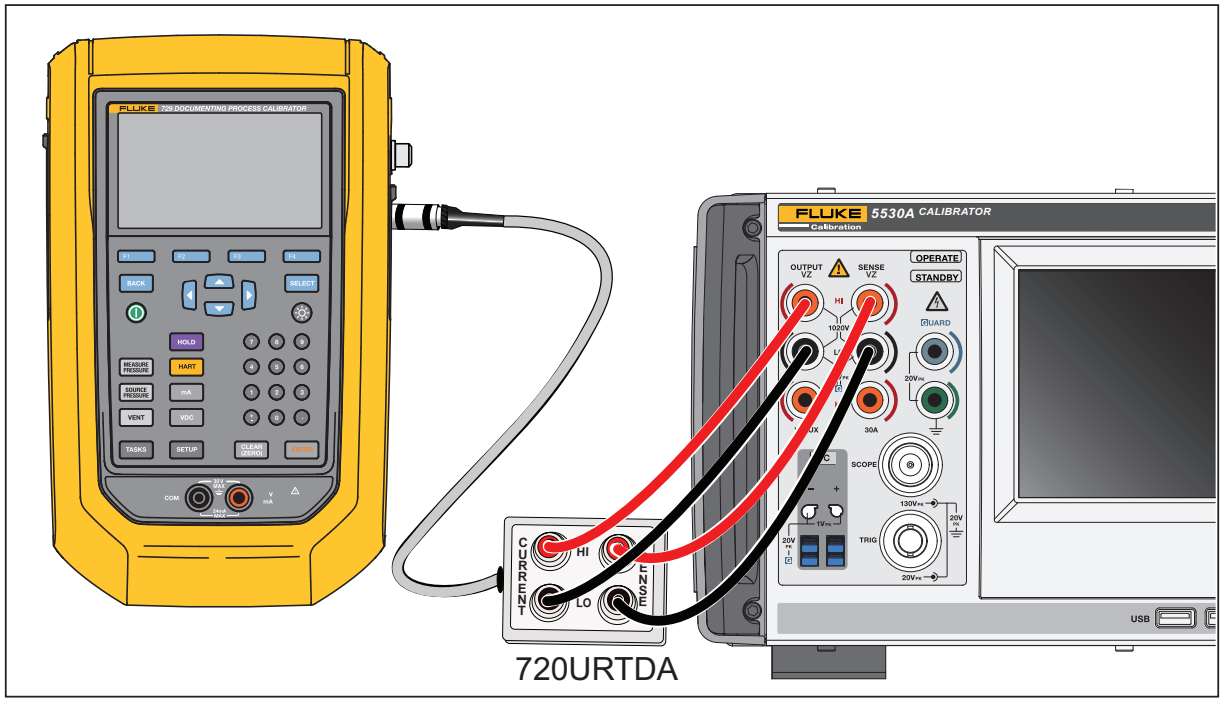
When the Product detects temperature from the RTD connector, the Product turns on a temperature display.

1. Connect the 720URTDA to the Product.
2. Connect the 720URTDA **Current HI** to the 5530A **HI RTD Output**.
3. Connect the 720URTDA **Sense HI** to the 5530A **HI RTD Output**.
4. Connect the 720URTDA **Current LO** to the 5530A **LO RTD Output**.
5. Connect the 720URTDA **Sense LO** to 5530A **LO RTD Output**.
6. Set the 5530A to **PT385**, **RTD**, **4-wire Comp** temperature settings in Table 7.
7. Check that the display reading on the Product is within the limits.

Table 7. RTD Measure Verification Points

Applied Temperature from 5530A	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 5. RTD Measure Verification Connections

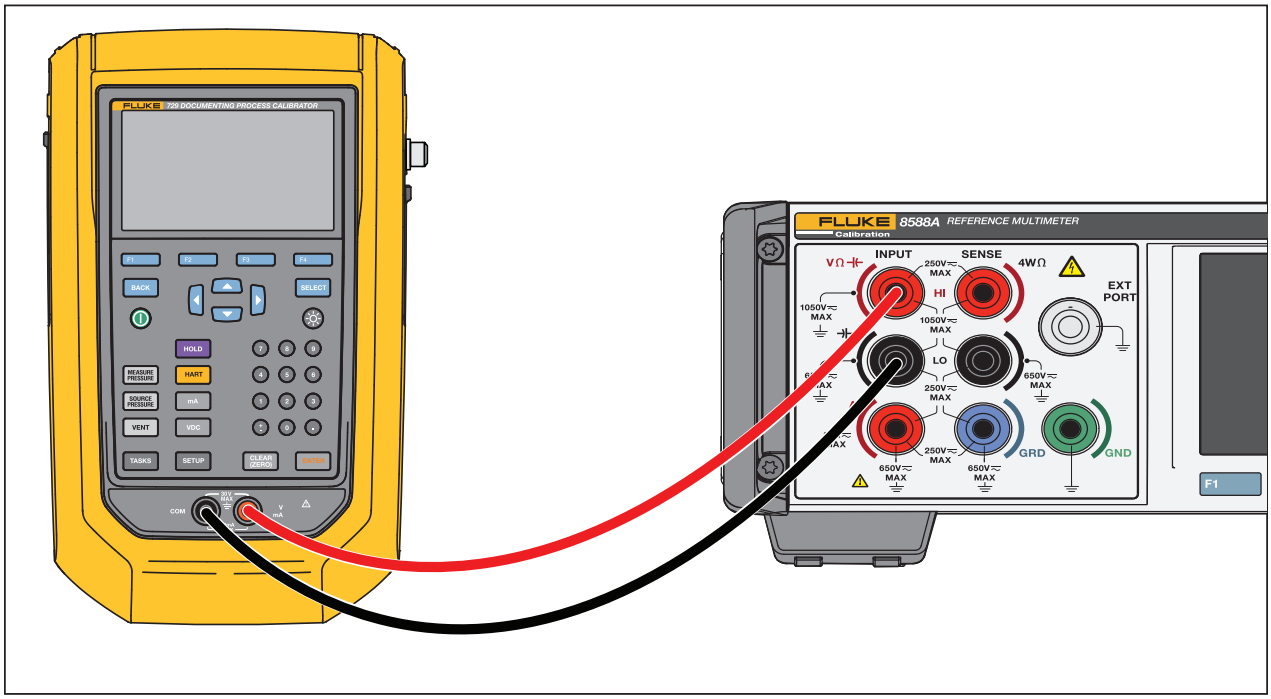


24V Loop Power Performance Check

To verify the 24V loop power function, see Figure 6:

1. Connect the Product red banana jack (**V mA**) to the 8588A **HI VOLTS INPUT**.
2. Connect the Product black banana jack (**COM**) to the 8588A **LO VOLTS INPUT**.
3. Push **mA** until **Measure Current** shows 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 8588A should be between 24 V and 28 V. If not, repair may be necessary. See *Contact Fluke*.
7. Push **F1** to disable loop power.

Figure 6. 24V Loop Power Verification Connections



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 on the calibration screen. Do not calibrate the Product unless you are qualified.

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, and replace if necessary.

Make sure to operate the Product in accordance with the instructions in this manual or the Users 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 also faulty. Make sure to pack the Product securely, in the original shipping container if available. See *Contact Fluke* and the Warranty Statement.

Manual Calibration (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.

Supply Sensor Self Calibration

1. Push SETUP and 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.

Maintenance

See the *729 Pro Users Manual* for maintenance procedures not listed in this manual that include:

- Battery Replacement
- PMM Replacement
- Update Product Firmware
- Calibration Data
- Service Center Calibration or Repair

⚠⚠ 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.**
- **Run *Exhaust* before you open the battery door.**

Clean the Product

Periodically wipe the case with a damp cloth and mild detergent. Do not use abrasives or solvents. Dirt or moisture in the terminals can affect readings.

⚠ Caution

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

Replace the Filter

To replace the filter:

1. Turn the Product, see Figure 7.
2. Use a screwdriver to unscrew the filter cap, part number 5118083.
3. Remove the filter (part number 4883735) and replace if necessary.
4. Reinstall the filter caps.
5. Gently tighten the caps.

Figure 7. Replace Filter

