FLUKE®

719Pro

Pressure Calibrator

Calibration Manual

November 2014 Rev. 1, 5/24

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 three years 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.

Fluke authorized resellers shall extend this warranty on new and unused products to end-user customers only but have no authority to extend a greater or different warranty on behalf of Fluke. Warranty support is available only if product is purchased through a Fluke authorized sales outlet or Buyer has paid the applicable international price. Fluke reserves the right to invoice Buyer for importation costs of repair/replacement parts when product purchased in one country is submitted for repair in another country.

Fluke's warranty obligation is limited, at Fluke's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to a Fluke authorized service center within the warranty period.

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).

THIS WARRANTY IS BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. FLUKE SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, ARISING FROM ANY CAUSE OR THEORY.

Since some countries or states do not allow limitation of the term of an implied warranty, or exclusion or limitation of incidental or consequential damages, the limitations and exclusions of this warranty may not apply to every buyer. If any provision of this Warranty is held invalid or unenforceable by a court or other decision-maker of competent jurisdiction, such holding will not affect the validity or enforceability of any other provision.

Fluke Corporation
6920 Seaway Blvd.
Everett, WA 98203
U.S.A.

Fluke Europe B.V.
P.O. Box 1186
5602 BD Eindhoven
The Netherlands

11/99

Table of Contents

Introduction

The 719PRO Pressure Calibrator (the Product) is a simple to use and versatile pressure calibrator. Its internal pressure sensor and innovative electrically-powered pump reach higher pressures (maximum 300 psi) and let the Product calibrate virtually any pressure device. The Product features inputs for mA, voltage, switch contacts, and an RTD probe. An external-pressure module option gives a wider range of pressure calibration options that include absolute and differential.

Contact Fluke

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.

Maintenance

See the Users Manual for maintenance items not detailed in this manual.

Clean the Valve Assembly

Occasionally, the Product may not work properly due to dirt or other contamination of the internal valve assembly. Use the subsequent procedure to clean the valve assembly. If this procedure does not correct the problem, order a repair kit. See the “User-Replaceable Parts” section.

1. With a small screwdriver, remove the two valve retention caps located in the battery compartment area.
2. After the caps have been removed, gently remove the spring and ring assembly.
3. Set aside the valve assemblies in a safe area and clean out the valve body with a cotton swab soaked in IPA (isopropyl alcohol).
4. Repeat the process several times with a new cotton swab each time until there is no evidence of contamination or dirt.
5. Operate the pump handles several times and recheck for contamination.
6. Clean the O-ring assembly and the O-ring on the retention caps with IPA and inspect the O-rings closely for any damage or excessive wear. Replacements are included in the repair kit, if necessary.
7. Inspect the springs for wear or loss of tension. They should be approximately 8.6 mm long in the relaxed state. If shorter, they may not provide sufficient seal tension. Replace if necessary.
8. Once all parts have been cleaned and inspected, reinstall the O-ring and spring assembly into the valve body.
9. Reinstall the retention caps and gently tighten each cap.
10. Seal the output port and operate the pump to at least 50 % of capacity.
11. Release the pressure and repeat several times to ensure that the rings seat properly.

Required Equipment

The equipment listed in Table 1 is necessary to do the performance verification tests and calibration adjustment.

Table 1. Required Equipment for Verification and Calibration

Equipment	Minimum Specifications	Recommended Model
Low thermal EMF banana to banana leads	-	Pomona 2948-36-2 (red) 2948-36-0 (black)
RTD Adapter	-	Fluke 720URTDA
Calibrator	0 V to 30 V Accuracy: 0.003 % + 0.5 mV 0 mA to 24 mA Accuracy: 0.006 % + 0.25 mA -40 °C to 150 °C RTD 0.1 °C	Fluke 5522A
DMM	0 to 30 Volts Accuracy: 0.5 V	Fluke 8846A
Pressure Controller/Calibrator	-14 PSI to 300 PSI 0.005 %	Ruska 7250xi
Metrology Well	-30 °C to 140 °C 0.06 °C	Fluke 9170

Verification Procedure

⚠⚠Warning

To prevent possible electrical shock, fire, or personal injury, do not perform the performance test or verification test procedures unless the Product is fully assembled.

The performance tests verify the complete operation of the Product and measure the accuracy of each function against Product specifications. If the Product fails a part of the test, calibration adjustment or repair is necessary. See “Calibration Adjustment Procedure”.

The performance verification tests check the accuracy of each Product function against its specifications. If the Product fails any of these tests, calibration adjustment or repair is necessary.

Pressure Verification

1. Carefully attach the pressure fitting of the Pressure Controller/Calibrator or Piston Gauge, called pressure source for the remainder of this procedure, to the first pressure port of the Product.

Note

Use a sufficient amount of PTFE tape when attaching pressure fitting.

The display should read 0.00 PSI with the deadweight tester opened up to ambient air. If not, push ZERO until both displays read 0.00 PSI.

2. Set up the deadweight tester for the sequence of PSI inputs from Table 2 to be injected into the pressure port of the Product.
3. Ensure the pressure has stabilized at each input before the display reading is verified.

4. Carefully vent all pressure and disconnect the first pressure port.

Table 2. Pressure Verification Tests

Input Pressure	6 Month Lower Limit	6 Month Upper Limit	12 Month Lower Limit	12 Month Upper Limit
719PRO-30G				
30.000	29.992	30.008	29.989	30.011
25.000	24.992	25.008	24.989	25.011
17.500	17.492	17.508	17.489	17.511
12.000	11.992	12.008	11.989	12.011
5.000	4.992	5.008	4.989	5.011
0.000	-0.008	0.008	-0.011	0.011
-3.000	-3.008	-2.992	-3.011	-2.989
-7.000	-7.008	-6.992	-7.011	-6.989
-12.000	-12.008	-11.992	-12.011	-11.989
719PRO-150G				
150.00	149.96	150.04	149.95	150.05
125.00	124.96	125.04	124.95	125.05
100.00	99.96	100.04	99.95	100.05
50.00	49.96	50.04	49.95	50.05
25.00	24.96	25.04	24.95	25.05
0.00	-0.04	0.04	-0.05	0.05
-3.00	-3.04	-2.96	-3.05	-2.95
-7.00	-7.04	-6.96	-7.05	-6.95
-12.00	-12.04	-11.96	-12.05	-11.95
719PRO-300G				
300.00	299.92	300.08	299.89	300.11
250.00	249.92	250.08	249.89	250.11
175.00	174.92	175.08	174.89	175.11
100.00	99.92	100.08	99.89	100.11
50.00	49.92	50.08	49.89	50.11
0.00	-0.08	0.08	-0.11	0.11
-3.00	-3.08	-2.92	-3.11	-2.89
-7.00	-7.08	-6.92	-7.11	-6.89
-12.00	-12.08	-11.92	-12.11	-11.89

5. Carefully vent all pressure and disconnect the second pressure port.

DC Voltage Measure Verification

1. Push F2 repeatedly until VOLTS is shown in the third 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 3 and verify the display reading on the Product.

Table 3. DC Voltage Measure Verification Tests

Applied Voltage from 5522A	Lower limit	Upper Limit
0.000 V	-0.002 V	0.002 V
15.000 V	14.996 V	15.004 V
30.000 V	29.994 V	30.007 V

5. Set the 5522A to Standby.

DC Current Measure Verification

1. Press F2 repeatedly until mA is shown in the third row of the display.
2. Connect the Product red banana jack (V mA) to the 5522A HI mA Output.
3. Connect the Product black banana jack (COM) to the 5522A LO mA Output.
4. Set the 5522A for the current setting in Table 4, and verify the display reading on the Product.

Table 4. DC Current Measure Verification Tests

Applied Current from 5522A	Lower limit	Upper Limit
4.000 mA	3.997 mA	4.003 mA
12.000 mA	11.996 mA	12.004 mA
24.000 mA	23.994 mA	24.006 mA

5. Set the 5522A to Standby.

RTD Measure Verification

1. Push F2 repeatedly until RTD is shown in the third row of the Product display.
2. Connect the 720URTDA to the Product.
3. Connect the 720URTDA Current HI to the 5522A HI RTD Output.
4. Connect the 720URTDA Sense HI to the 5522A HI RTD Output.
5. Connect the 720URTDA Current LO to the 5522A LO RTD Output.
6. Connect the 720URTDA Sense LO to 5522A LO RTD Output.
7. Set the 5522A to output the resistance setting in Table 5, and verify that the display readings on the Product are within the limits.

Table 5. RTD Measure Verification Tests

Applied Current from 5522A	Lower limit	Upper Limit
84.270 Ω	-40.10 °C	-39.90 °C
100.000 Ω	-0.10 °C	0.10 °C
157.325 Ω	149.90 °C	150.10 °C

8. Set 5522A to standby.

720RTD Probe Verification

Note

This is an optional test if the Product is paired with a 720RTD.

1. Push F2 repeatedly until RTD is shown in the third row of the Product display.
2. Plug the 720RTD probe into the Product.
3. Insert the probe into the Metrology Well.
4. Set the 9170 to the temperatures in Table 6.
5. After the well stabilizes, verify that the display readings are within tolerance.

Table 6. 720RTD Probe Verification Tests

Applied Temperature	Lower Limit	Upper Limit
-30.00 °C	-30.25 °C	-29.75 °C
0.00 °C	-0.25 °C	0.25 °C
70.00 °C	69.75 °C	70.25 °C
130.00 °C	129.75 °C	130.25 °C

6. Set 9170 to standby.

mA Loop Performance Check

Loop voltage does not have traceable specifications, this is a functional check only.

1. Push F2 to get LOWER in the display above F2.
2. Push F1 to show CONFIG and then push again to show SELECT on the display.

   Type of measurement should be flashing in the lower display.
3. Push F1 until mA flashes.
4. Push F2.
5. The type of measurement/source flashes. Push F1 until MEAS/24V flashes.
6. Push F3 to begin supplying loop power.
7. Connect the Product red banana jack (V mA) to the 8846A HI Input.
8. Connect the Product black banana jack (COM) to the 8846A LO Input.
9. Set the 8846A to dc volts range. The voltage measured should be between 22 V and 30 V.
10. When a Product fails any verification step, adjustment or repair is recommended by Fluke.

Calibration Adjustment

The Product has an electronic calibration process. There are no mechanical adjustments and the calibration is done with the case closed. A serial communications port is used for the calibration process to send commands and receive readings. The normal RS232 interface is used. Calibration can be done with a terminal program or an automated-calibration program can be written with programs like MetCal. In this manual, only the serial terminal mode is described.

Table 1 lists the required equipment.

Initiate Communication

Terminal communications can be set up with terminal communication software on a PC such as HyperTerminal or Ucon. Connect the RS232 cable to the 5-pin Lemo on the side of the Product. The other end of the cable connects to the terminal/PC serial port.

Terminal Settings:

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

All calibration commands are performed on the functions selected on the lower display. Use this command sequence to turn off all but the lower display:

DISPLAY UPPER, OFF DISPLAY MIDDLE, OFF DISPLAY LOWER, ON

As long as the Product has been at a stable temperature, within the range of 20 °C to 26 °C for an hour or more, the Product only needs 5 minutes to warm up. If temperature conditions were previously <10 °C or >40 °C, then the Product must be allowed to stabilize for a minimum of 3 hours prior to calibration.

Adjust Voltage Input

The test equipment to adjust the voltage input is listed in Table 7.

Table 7. List of Test Equipment to Calibrate Voltage Input

Quantity	Manufacturer	Model	Equipment
1	Pomona	2948-36-2 (red) 2948-36-0 (black)	Low-thermal EMF banana to banana leads
1	Fluke	5522A	Calibrator

1. Use the test lead set to attach the voltage output of the 5522A to the input of the product.
2. Send this command to put the Product into Voltage mode:

   FUNC LOWER,DCV
3. Use the 5522A to input 0 V.
4. When the reading is stable, send the command:

   CAL_POINT[0][0]
5. Use the 5520A to input 15 V.
6. When the reading is stable, send the command:

   CAL_POINT[0][1]
7. Use the 5520A to input 30 V.
8. When the reading is stable, send the command:

   CAL_POINT[0][2]

The voltage range is now calibrated.

Adjust mA Input

The test equipment to adjust the mA input is listed in Table 8.

Table 8. List of Test Equipment to Calibrate mA Input

Quantity	Manufacturer	Model	Equipment
1	Pomona	2948-36-2 (red) 2948-36-0 (black)	Low-thermal EMF banana to banana leads
1	Fluke	5522A	Calibrator

1. Use the test lead set to attach the voltage output of the 5522A to the input of the Product.
2. Send this command to put the Product into Current mode:

   FUNC LOWER,DCI
3. Use the 5522A to input 0 mA.
4. When the reading is stable, send the command:

   CAL_POINT[0][0]
5. Use the 5520A to input 12 mA.
6. When the reading is stable, send the command:

   CAL_POINT[0][1]
7. Use the 5520A to input 24 mA.
8. When the reading is stable, send the command:

   CAL_POINT[0][2]
9. The milliamp measure range is now calibrated. Use the 5522A to verify the calibration.

Calibrate mA Source

1. Place a short from V/mA to the COM input of the Product.
2. Send this command to put the Product into Current Source mode:

   FUNC LOWER,DCI

   IO_STATE SOURCE
3. Once the Product is in the Current Source mode, send the command:

   CAL_MA_SRC
4. The Product will then internally calibrate mA source based on the 5522A mA read calibration.

   The milliamp source range is now calibrated.

Adjust RTD

The test equipment to adjust RTD is listed in Table 9.

Table 9. List of Test Equipment to Calibrate RTD

Quantity	Manufacturer	Model	Equipment
4	Pomona	2948-36-2 (red) 2948-36-0 (black)	Low-thermal EMF banana to banana leads
1	Fluke	720URTDA	RTD Adapter
1	Fluke	5522A	Resistance Standard (w/ a 4:1 TUR)

1. Connect the Product to the Resistance Standard:
   a) Plug the 720URTDA into the Product.
   b) Connect the HI side of the current output (ohms measure) jacks of the 720URTDA to the NORMAL HI of the 5522A.
   c) Connect the LO side of the current output (ohms measure) of the 720URTDA to the NORMAL LO of the 5522A.
   d) Connect the HI side of sense jacks of the 720URTDA to the AUX HI of the 5522A.
   e) Connect the LO side of the sense jacks of the 720URTDA sense input to the AUX LO of the 5522A.
   f) Set the 5522A to 4 WIRE COMP.
2. After you have made the connections, send this command to put the Product into RTD mode:

   FUNC LOWER,RTD
3. Use the Resistance Standard to input 90 Ω.
4. When the reading is stable send the command:

   CAL_POINT[0][0]
5. Use the Resistance Standard to input 140 Ω.
6. When the reading is stable, send the command:

   CAL_POINT[0][1]

The RTD range is now calibrated.

Adjust Pressure

The test equipment to adjust RTD is listed in Table 10.

Table 10. List of Test Equipment to Calibrate Pressure Input

Quantity	Manufacturer	Model	Equipment
1	Ruska	Ruska 7250xi	Pressure Controller/Calibrator

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. Always make sure the hose, tubing, and fittings have a rated working pressure at or above the pressure of the Product. Also it is important that there be no leaks. To achieve accurate calibration, use PTFE tape where appropriate.

1. Once connected, send this command to put the unit in pressure mode:

   FUNC LOWER,P1
2. Send the command:

   OFFSET_ADJ?
3. Note the value returned.
4. Use the pressure standard to input a value equal or close to the noted value.
5. When the pressure is stable, send the command:

   OFFSET_ADJ n

   where n is the entered pressure.
6. Send the command:

   GAIN_ADJ? command.
7. Note the value returned.
8. Use the pressure standard to input a value equal or close to the noted value.
9. When the pressure is stable send the command:

   GAIN_ADJ n

   where n is the applied pressure.

Pressure has now been adjusted.

Case and Pump Assembly Replaceable Parts and Accessories

⚠⚠ Warning

To prevent possible electrical shock, fire, or personal injury, use only specified replacement parts.

Case and pump assembly replaceable parts are listed in Table 11. For more information about these items, contact a Fluke representative. See the “Contact Fluke” section of this manual.

Table 11. User-Replaceable Parts and Accessories

Description	Part Number
Fluke-719Pro, Battery Door	4364820
Fluke-719Pro, Beltline Gasket, Black	4364835
Fluke-719Pro, 30P,REPLACEMENT CASE TOP ASSEMBLY	4443706
FLUKE 719PRO, 150P,REPLACEMENT CASE TOP ASSEMBLY	4443714
FLUKE 719PRO, 300P,REPLACEMENT CASE TOP ASSEMBLY	4443723
Fluke-719Pro, Decal, Battery Door	4364762
Fluke-719Pro, Case Bottom Pro 300 Psig	4443691
Fluke-719Pro, Case Bottom Pro 30, 150 Psig	4443678
Pump assembly, 30 Psig and 150 Psig	4450976
Pump assembly, 300 Psig	4451006
FLK719PRO 300PRK, Pump Rebuild Kit, 719PRO-300G	4443669
FLK719PRO 30 150PR, Pump Rebuild Kit, 719PRO30 AND 150G	4443500
Note: See the Users Manual for other replaceable parts not listed here.	