

# 729/729 FC

Automatic Pressure Calibrator

## Users Manual

May 2017 Rev. 1, 8/20

© 2017-2020 Fluke Corporation. All rights reserved. Specifications are subject to change without notice.

All product names are trademarks of their respective companies.

### **LIMITED WARRANTY AND LIMITATION OF LIABILITY**

This Fluke product will be free from defects in material and workmanship for three years from the date of purchase. This warranty does not cover fuses, disposable batteries, or damage from accident, neglect, misuse, alteration, contamination, or abnormal conditions of operation or handling. Resellers are not authorized to extend any other warranty on Fluke's behalf. To obtain service during the warranty period, 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 problem.

THIS WARRANTY IS YOUR ONLY REMEDY. NO OTHER WARRANTIES, SUCH AS FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSED OR IMPLIED. FLUKE IS NOT LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, ARISING FROM ANY CAUSE OR THEORY. Since some states or countries do not allow the exclusion or limitation of an implied warranty or of incidental or consequential damages, this limitation of liability may not apply to you.

Fluke Corporation  
P.O. Box 9090  
Everett, WA 98206-9090  
U.S.A.

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

# ***Table of Contents***

| <b>Title</b>                          | <b>Page</b> |
|---------------------------------------|-------------|
| Introduction .....                    | 1           |
| Contact Fluke .....                   | 2           |
| Safety .....                          | 2           |
| Standard Equipment.....               | 3           |
| Buttons .....                         | 5           |
| The Display .....                     | 8           |
| Triple-Function Display .....         | 12          |
| RTD Connection .....                  | 13          |
| Pressure Module Connection .....      | 13          |
| Fluke Connect Device Connection ..... | 14          |
| Ports .....                           | 15          |
| Download the Fluke Connect™ App ..... | 17          |
| Enable the Fluke Connect™ App .....   | 18          |
| Setup Menu .....                      | 19          |

|                                       |    |
|---------------------------------------|----|
| Manage FC Devices (729 FC Only) ..... | 19 |
| Locator .....                         | 19 |
| 729 Information .....                 | 20 |
| 729 Setup .....                       | 21 |
| Manage Users .....                    | 22 |
| Manage Test Results .....             | 23 |
| Manage Screen Shots .....             | 23 |
| Manage Custom Tasks .....             | 24 |
| Maintenance Menu .....                | 24 |
| Drain Water (Condensation) .....      | 24 |
| Keypad Test .....                     | 26 |
| Exhaust .....                         | 26 |
| Tasks Menu .....                      | 26 |
| Pressure Transmitter (P/I) .....      | 27 |
| Pressure Switch (SW) .....            | 29 |
| Current to Pressure Test (I/P) .....  | 31 |
| Pressure Leak Test .....              | 34 |
| Pressure Transmitter (P/V) .....      | 35 |
| Pressure Transmitter (P/P) .....      | 35 |
| HART Functionality .....              | 37 |
| Loop Power +24V ON .....              | 38 |
| Enable HART 250Ω .....                | 40 |
| HART Menu .....                       | 40 |
| HART Data .....                       | 40 |
| HART Service .....                    | 41 |
| PV Zero Trim .....                    | 41 |
| mA Output Trim .....                  | 41 |
| Trim to Applied Values .....          | 41 |
| Set Fixed mA Output .....             | 42 |

|                                              |    |
|----------------------------------------------|----|
| Re-range Transmitter.....                    | 42 |
| Device Diagnostics .....                     | 42 |
| Calibrate (Ad hoc).....                      | 42 |
| Adjust.....                                  | 43 |
| PV Zero Trim .....                           | 43 |
| mA Output Trim .....                         | 43 |
| Trim to Applied Values.....                  | 44 |
| As Left .....                                | 44 |
| Find Task by Tag.....                        | 44 |
| Bus Polling .....                            | 44 |
| Measure Mode .....                           | 44 |
| Current Measurement.....                     | 45 |
| Volts Measurement.....                       | 45 |
| Pressure Measurement .....                   | 46 |
| Autostep and Auto Ramp the Output Value..... | 49 |
| Autostep .....                               | 49 |
| Auto Ramp the Output.....                    | 50 |
| Temperature Measurement .....                | 51 |
| Source mA Mode.....                          | 52 |
| 4 to 20 mA Simulation .....                  | 52 |
| Log .....                                    | 54 |
| Communication with a PC .....                | 54 |
| The Battery.....                             | 56 |
| Charge the Battery .....                     | 56 |
| Battery Life .....                           | 56 |
| Maintenance.....                             | 57 |
| Clean the Product.....                       | 57 |
| Clean the Pump Valve.....                    | 57 |
| In Case of Difficulty.....                   | 59 |

|                                              |    |
|----------------------------------------------|----|
| Battery Replacement .....                    | 60 |
| Update Product Firmware .....                | 61 |
| Calibration Data .....                       | 61 |
| Service Center Calibration or Repair .....   | 61 |
| Error Messages.....                          | 62 |
| HART Commands.....                           | 68 |
| Documenting Functionality.....               | 69 |
| Strap .....                                  | 69 |
| Hanger Accessory .....                       | 71 |
| User-Replaceable Parts and Accessories ..... | 72 |
| Specifications .....                         | 74 |
| Pressure Specification .....                 | 74 |
| Electrical Specification .....               | 74 |
| Product Models .....                         | 76 |
| Mechanical Specification .....               | 79 |
| Environmental Specification.....             | 79 |
| Safety.....                                  | 79 |

## ***Introduction***

The Fluke 729 and 729 FC Automatic Pressure Calibrators (the Product) are portable field pressure calibration tools for lab or field use. This battery-operated product performs automatic pressure calibration of transmitters, pressure switches, and gauges. The automatic functions are done by the Product or by downloaded tasks from calibration-management software (CMS). The Product also supplies basic HART® communicator functions when used with HART-capable transmitters. “FC” designates Fluke Connect® throughout this manual.

Product key features and benefits include:

- Automatic pressure calibration of transmitters, pressure switches and pressure gauges.
- Source and measure pressure to test and calibrate pressure sensors, transmitters, and other pressure instruments.
- Source and simulate milliamp signals while measuring pressure for testing current to pressure converters (I/P).
- HART (Highway Addressable Remote Transducer) communication to configure and perform trim on HART smart-pressure transmitters.
- Provides Loop Power and simultaneously measures mA output from a connected device.
- Measures pressure with any of 50 Fluke-750P Series pressure modules.

- Document automated as-found/as-left procedures to satisfy quality regulations or audits with DPCTrack2 software.
- Advanced features like auto step and auto ramp allow tests of devices automatically.
- The pressure switch test automatically ramps pressure up and down across expected switch trip setting to calibrate pressure switches.
- Fluke Connect (FC) built into FC models.

### **Contact Fluke**

Fluke Corporation operates worldwide. For local contact information, go to our website: [www.fluke.com](http://www.fluke.com)

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

Fluke Corporation  
P.O. Box 9090  
Everett, WA 98206-9090

+1-425-446-5500

[fluke-info@fluke.com](mailto:fluke-info@fluke.com)

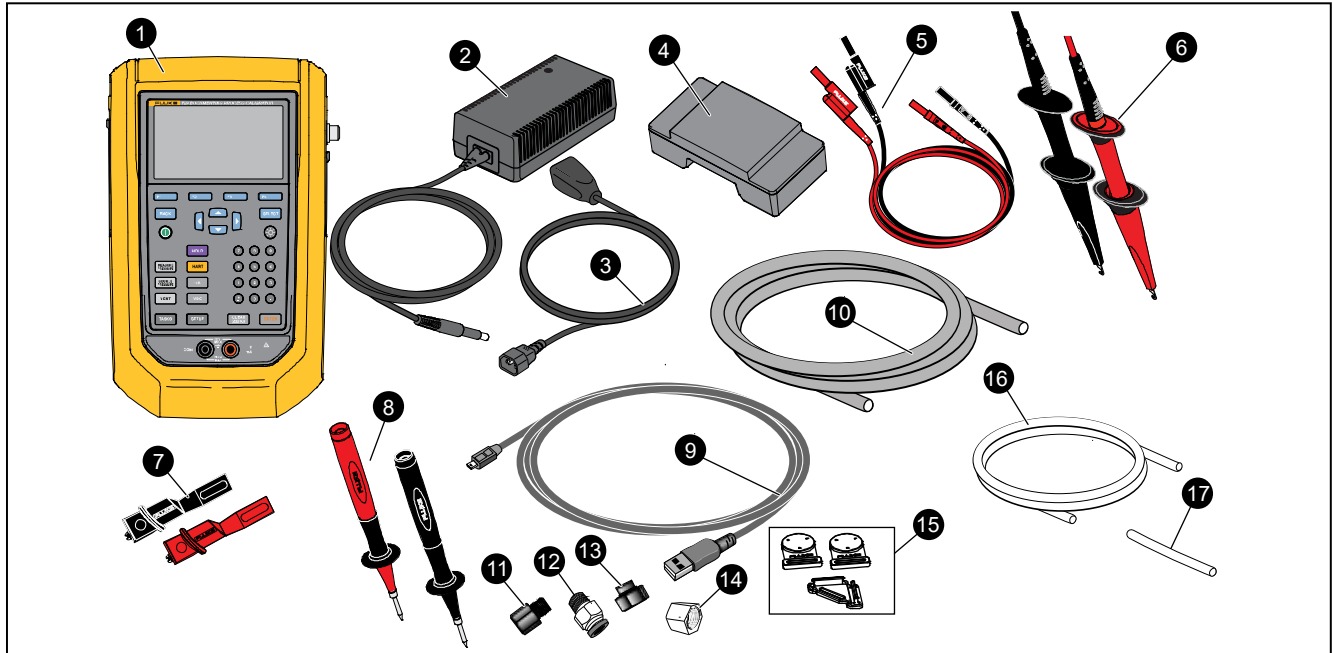
### **Safety**

General Safety Information is in the printed Safety Information document that ships with the Product and at [www.fluke.com](http://www.fluke.com). More specific safety information is listed where applicable.



## **Standard Equipment**

Figure 1 and Table 1 show standard equipment.



idj016.emf

**Figure 1. Standard Equipment**

**Table 1. Standard Equipment**

| <b>No.</b> | <b>Equipment</b>                                                                        | <b>No.</b> | <b>Equipment</b>                                                                       |
|------------|-----------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------|
| <b>1</b>   | 729 or 729 FC Automatic Pressure Calibrator                                             | <b>13</b>  | Fitting, 1/8 in NPT-Female X M20-Female                                                |
| <b>2</b>   | AC/DC converter                                                                         | <b>14</b>  | Fitting, 1/4 in BSP-Female X 1/8 in NPT-Female                                         |
| <b>3</b>   | Mains line cable                                                                        | <b>15</b>  | Hanger Kit                                                                             |
| <b>4</b>   | Rechargeable Li-ion Battery                                                             | <b>16</b>  | Hose to drain condensed water generated from the Product. 1/8 in diameter, 1 ft length |
| <b>5</b>   | Stackable test lead set                                                                 | <b>17</b>  | Hose for leakage test. 1/8 in diameter, 2 in length                                    |
| <b>6</b>   | AC280 Sure Grip hook set (red and black)                                                | Not Shown  | Adjustable quick-release strap for hanging the Product                                 |
| <b>7</b>   | Alligator clips (red and black)                                                         |            | Soft carrying case                                                                     |
| <b>8</b>   | One set of TP220 test probes (red and black)                                            |            | Printed multilingual Safety Information                                                |
| <b>9</b>   | USB communication cable: 3 ft (1 m) Type A plug for host (PC) to Mini-B plug for device |            | Traceable calibration report with data                                                 |
| <b>10</b>  | Nylon hose 1/8 in diameter, 3.5 ft length                                               |            | PTFE Tape                                                                              |
| <b>11</b>  | Fitting, 1/8 in NPT-Female x 1/4 in NPT-Female                                          |            | International AC Adapter Kit                                                           |
| <b>12</b>  | Tube fitting, male connector (qty 2), 1/8 in NPT male connector, 1/8 in hose            |            |                                                                                        |

**Buttons**

See Figure 2 and Table 2 for the Product buttons and the softkeys.

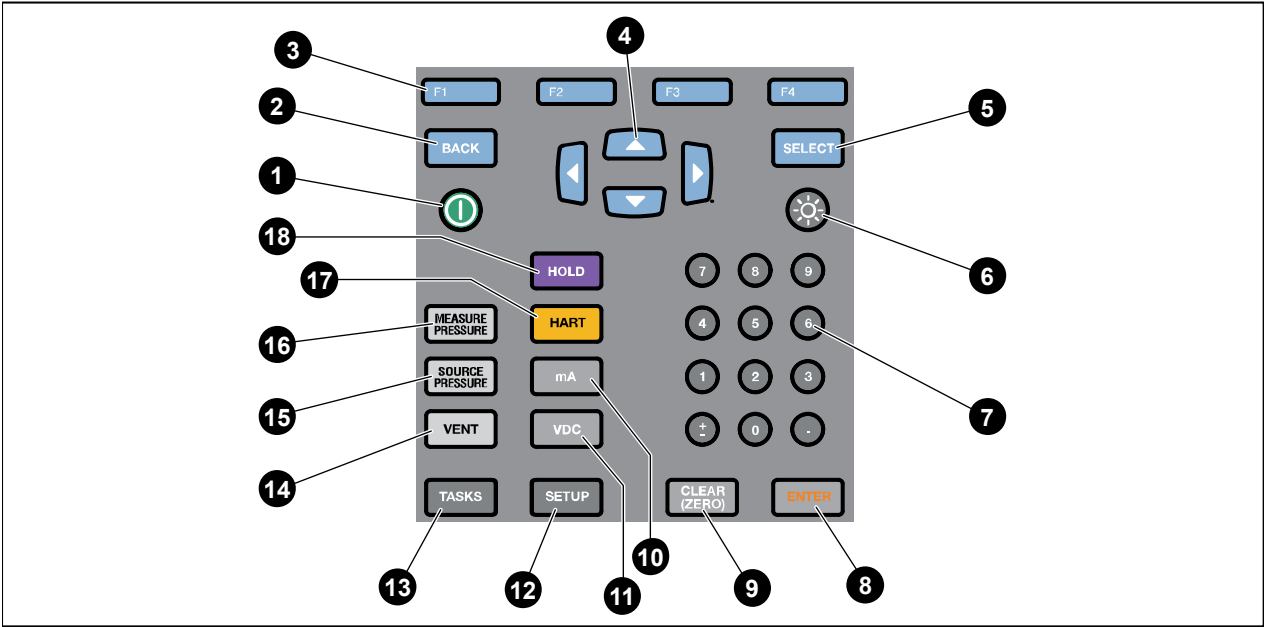


Figure 2. Buttons

idj001.emf

**Table 2. Buttons**

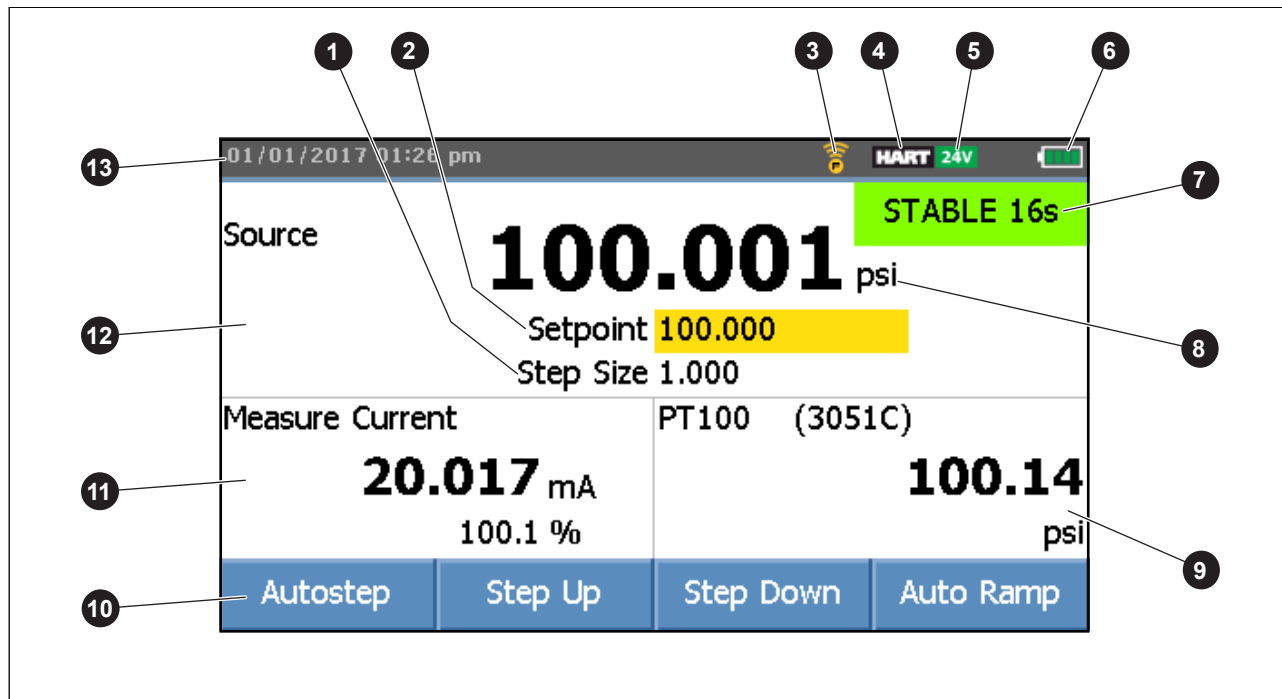
| <b>Number</b> | <b>Description</b>                                                                                                                                                                                                     | <b>Number</b> | <b>Description</b>                                                                                                                   |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b>      | Power button. Push to turn on or turn off the Product.                                                                                                                                                                 | <b>6</b>      | Display brightness button. Push to change the display brightness from dim to bright and back again.                                  |
| <b>2</b>      | BACK button. Push to move to the previous user interface (UI) screen. When navigating through the screens, BACK can move out of most screens and with repeated pushes, can take you all the way to the startup screen. | <b>7</b>      | Numeric keypad. Used when a numeric entry is necessary.                                                                              |
| <b>3</b>      | F1-F4 softkeys. Performs the specified function of the label above each softkey on the display. These labels change throughout the UI.                                                                                 | <b>8</b>      | ENTER button. Push to make a selection on the UI. Only ENTER confirms numbers and characters. Confirm all editable items with ENTER. |
| <b>4</b>      | Arrow buttons. Push to move the display cursor left, right, up, or down. Cursor highlights in yellow over the selection.                                                                                               | <b>9</b>      | CLEAR (ZERO) button. Push to clear highlighted entry. When PI/PV/IP/SWT starts, push to zero the pressure reading.                   |
| <b>5</b>      | SELECT button. Push to make a selection on the UI. This button cannot confirm number or character choices (push ENTER).                                                                                                | <b>10</b>     | mA button. Push to select the mA measure function.                                                                                   |

**Table 2. Buttons (cont.)**

| <b>Number</b> | <b>Description</b>                                                                                                                                              | <b>Number</b> | <b>Description</b>                                                                                                                                                                         |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>11</b>     | VDC button. Push to select the measure dc voltage function.                                                                                                     | <b>15</b>     | SOURCE PRESSURE button. Use this function to output (source) a target pressure from the Product. Use the arrows to select the Setpoint field and enter the values with the number buttons. |
| <b>12</b>     | SETUP button. Push to enter the Setup menu to change operating parameters. See <i>Setup Menu</i> .                                                              | <b>16</b>     | MEASURE PRESSURE button. Use this function for pressure measurement mode.                                                                                                                  |
| <b>13</b>     | TASKS button. Push to enter the Tasks menu. See <i>TASKS Menu</i> .                                                                                             | <b>17</b>     | HART button. Push to enter HART communication mode.                                                                                                                                        |
| <b>14</b>     | VENT button. Push to release pressure at the internal pressure port. VENTING shows on the display as the Product vents. VENTED shows after venting is complete. | <b>18</b>     | HOLD button. Push to freeze the reading on the display. Push it a second time to release the hold on the display. Push and hold to capture the screen and save into memory.                |

## The Display

Figure 3 and Table 3 explain the display.



idj014.emf

Figure 3. The Display

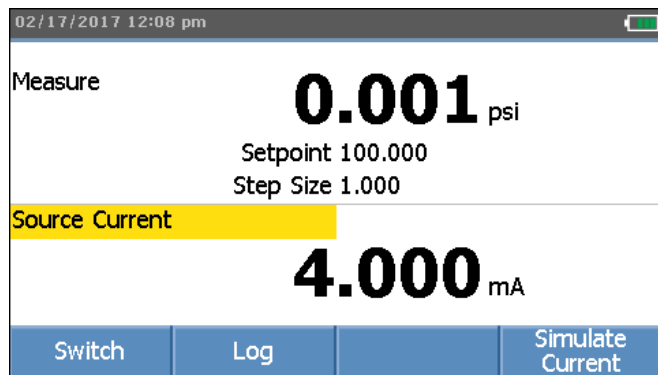
**Table 3. The Display**

| <b>Number</b> | <b>Description</b>                       | <b>Number</b> | <b>Description</b>                                                                                                                                                                                           |
|---------------|------------------------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b>      | Step size indicator                      | <b>8</b>      | Pressure units indicator                                                                                                                                                                                     |
| <b>2</b>      | Setpoint indicator                       | <b>9</b>      | External display shows selected device that is connected. The device can be a pressure module, temperature probe, process variable (PV) of connected HART device, or Fluke Connect secondary device reading. |
| <b>3</b>      | Fluke Connect on indicator (729 FC only) | <b>10</b>     | Softkey indicator                                                                                                                                                                                            |
| <b>4</b>      | HART on indicator                        | <b>11</b>     | Current, voltage, or pressure switch display                                                                                                                                                                 |
| <b>5</b>      | 24 volt loop power active indicator      | <b>12</b>     | Main display with measured or sourced value                                                                                                                                                                  |
| <b>6</b>      | Battery charge level                     | <b>13</b>     | Time and date display                                                                                                                                                                                        |
| <b>7</b>      | Pressure port status                     |               |                                                                                                                                                                                                              |

The display can also show different configurations:

Typically, the display does not show the third functions, see Figure 4. See *Triple-Function Display*.

- The upper display for the internal pressure has these different functions:
  - VENT
  - SOURCE
  - MEASURE
- The lower display shows these different functions:
  - Measure Current
  - Source Current
  - Simulate Current
  - Measure VDC
  - Switch



idj017.bmp

**Figure 4. Typical Dual-Function Display**



The screen has two sections:

The **upper display** shows the internal pressure controller status and includes:

- **Mode:** Measure, Source, and Vent
- **Pressure Value:** Current measured pressure and unit
- **Status:** Shows nothing in measure mode, NOT READY, STABLE in source mode, and VENTING, VENTED in vent mode.
- **Setpoint:** Current setpoint for source function.
- **Step Size:** The step size when **F2** (Step Up) and **F3** (Step Down) are pushed when sourcing pressure.

The **lower display** shows the electrical status and includes:

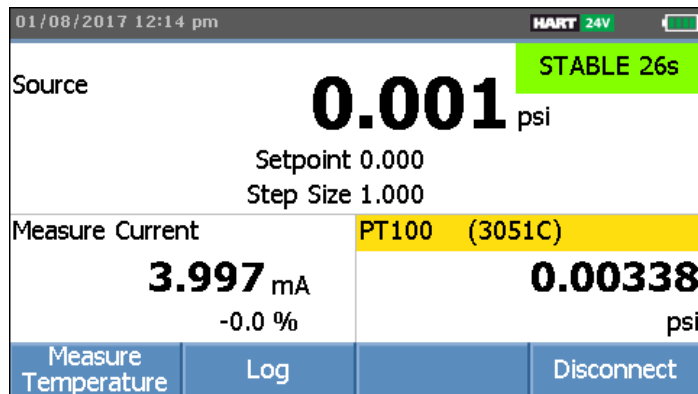
- **Mode:** Measure Current, Source Current, Simulate Current, Measure V dc, and Switch.
- **Reading:** Current reading from measure functions or setpoint for source functions.
- **Switch State:** Shows the pressure reading when the switch contacts open and close.
- **Percent:** Shows the percentage value of 4 mA to 20 mA or 1 V to 5 V in measure functions.
- **Status:** Shows Open circuit detected in mA source mode.

### Triple-Function Display

When the third function (RTD, External Pressure Module, HART Transmitter, or FC secondary device) is connected, the Product changes to triple-function display automatically. In the subsequent triple-function display, the original bottom half of the display is divided into two parts:

- The **left** display continues to show the electrical measurement display.
- The **right** display shows the model name, reading, and units from the selected third function. See Figure 5. The figure shows a transmitter device (3051C).

When more than one third function is available, use the arrow keys to highlight the device (in yellow) in the right display. Then use the softkeys to select the device to show.



idj022.bmp

Figure 5. Triple-Function Display

### RTD Connection

The display can show RTD temperature measurements in the selected unit (C/F) as the third-function. When the temperature unit field highlights, push the softkey to toggle the temperature setting. The ohms reading shows.

#### Note

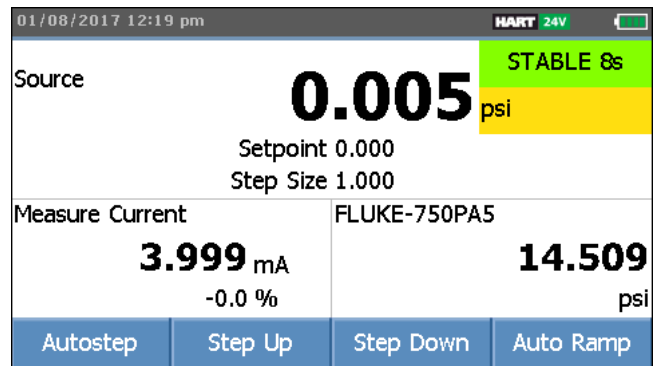
*The Product supports PT100-385 RTD only.*

### Pressure Module Connection

The Product automatically detects external pressure module installation or removal. Move the cursor to the unit type and push **ENTER** to configure the pressure-unit type (it can be different from the pressure unit of internal pressure). Change the unit type of the internal pressure to automatically change the unit type of the pressure module.

Figure 6 shows a pressure module as the third function.

- When you plug in an external pressure module, the pressure-unit type defaults to the internal pressure unit type.
- When you remove or install an external pressure module, the zero offset resets.



**Figure 6. Triple-Function Display with External Pressure Module Connected**

### ***Fluke Connect Device Connection***

The display shows connected FC device measurements as the third-function.

See *Setup Menu* for information to manage secondary FC devices.

## Ports

Figure 7 and Table 4 show the Product ports.

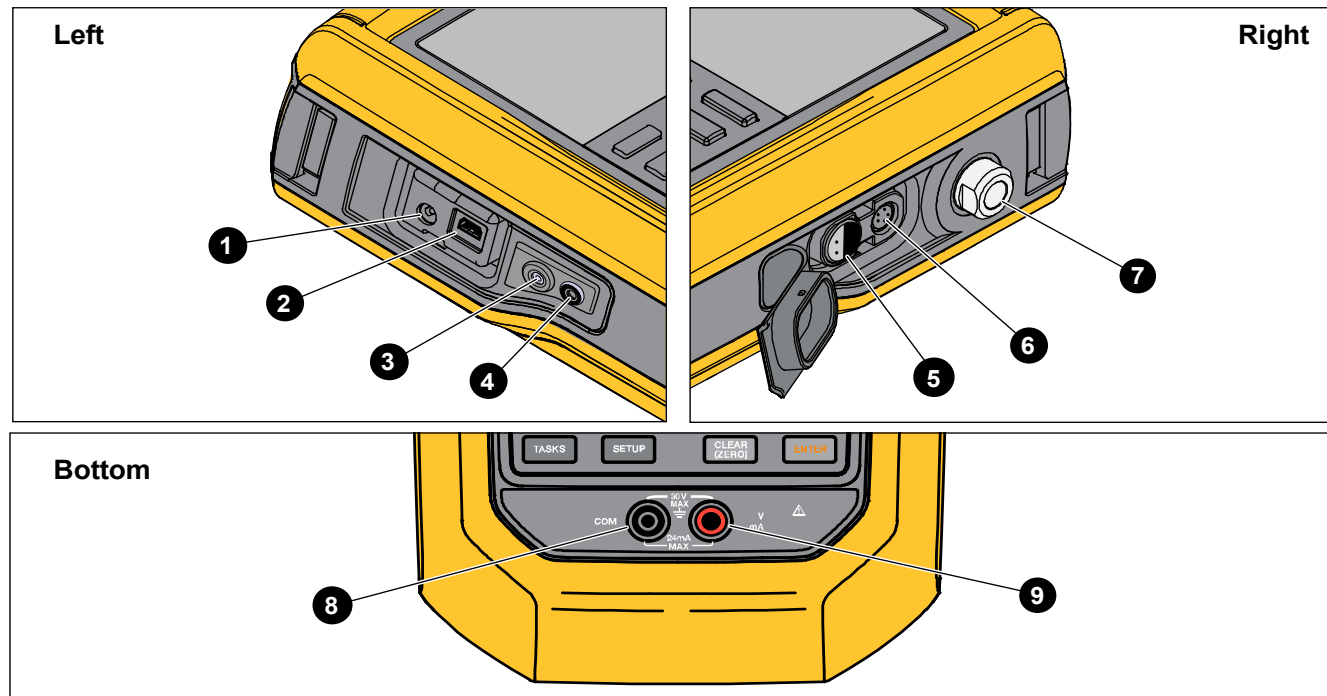


Figure 7. Product Ports

idj013.emf

**Table 4. Product Ports**

| <b>Number</b> | <b>Description</b>                                                                                                                                                                                               |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b>      | Battery charger/universal power supply port. Use the battery charger for bench-top applications that have ac line power available. Use the battery charger to charge the battery while installed in the Product. |
| <b>2</b>      | USB port – Used for communication between the Product and a PC.                                                                                                                                                  |
| <b>3</b>      | Push to drain condensation (see <i>Maintenance Menu</i> ).                                                                                                                                                       |
| <b>4</b>      | Drain port fitting connector.                                                                                                                                                                                    |
| <b>5</b>      | External temperature port for RTD Temperature Probe                                                                                                                                                              |
| <b>6</b>      | External pressure module port                                                                                                                                                                                    |
| <b>7</b>      | Pressure connection                                                                                                                                                                                              |
| <b>8</b>      | COM Port                                                                                                                                                                                                         |
| <b>9</b>      | Measure, source, and simulate mA; measure V dc and supply loop power.                                                                                                                                            |

Download the Fluke Connect™ App

To download the Fluke Connect™ App, see Figure 8.



Figure 8. Download the Fluke Connect App

idj025.emf

## Enable the Fluke Connect™ App

To enable the Fluke Connect App on your phone, see Figure 9.

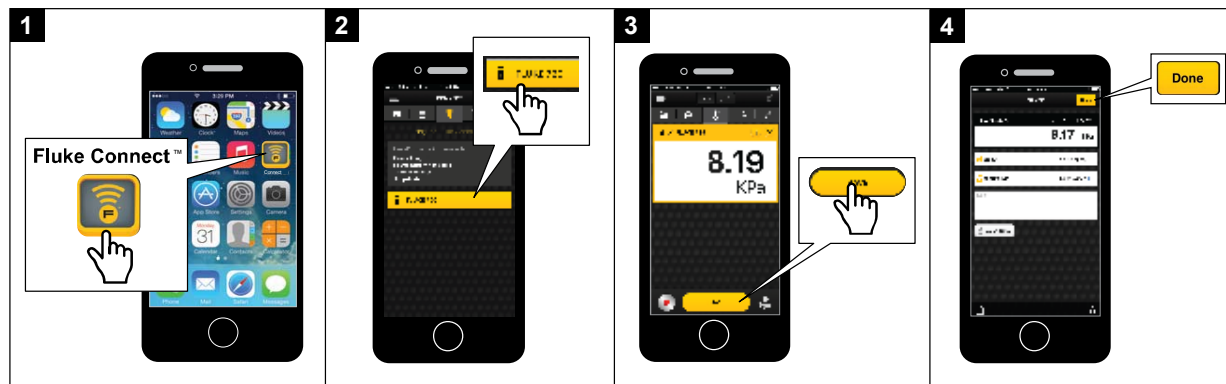


Figure 9. Enable the Fluke Connect App

idj027.emf



## Setup Menu

Use the multi-page Setup menu to configure the Product features.

### Note

*For some of the submenu functions, the Product password is required. The default password is 1234.*

To access the Setup menu, push **SETUP**.

The Setup menu includes submenus for Product configuration. The submenus are:

1. 729 Information
2. 729 Setup
3. Manage Users
4. Manage Test Results
5. Manage Screen Shots
6. Manage Custom Tasks
7. Maintenance

Push the arrow buttons, **SELECT**, or **ENTER** to access these submenus. Alternatively, push the corresponding number button for access. Push **BACK** to go to the previous menu.

To clear all stored files, push **F4** (Clear All Files). Enter the Product password to use this function. This action clears all stored test results, screen shots, and custom tasks.

The subsequent sections explain the Setup menu and submenus.

## Manage FC Devices (729 FC Only)

1. Enter the Setup menu.
2. Push **F2** (Manage FC Device) to set 729 FC as the primary device and discover other units that have Fluke Connect. The connected product shows on the display.

Push **F3** (Enable Fluke Connect) to set 729 FC as the secondary device so it can be discovered by the Fluke Connect App on smart phone.

## Locator

When the Product shows several FC devices on the Fluke Connect screen, highlight a product and push **F2** (Locator). This causes the Fluke Connect button on the listed product to flash repeatedly. The FC device exits locator mode automatically or when **F2** (Locator) is pushed again.

### **729 Information**

The 729 Information submenu is an information-only screen that shows information about the Product. The screen shows:

- The Product model (729 or 729 FC)
- Serial Number
- Firmware Revision
- The last calibration date of the Product pressure components.
- The last calibration date of the Product electrical components.

There are also softkeys at the bottom of this screen. These are:

- **F1** - **Calibrate Pressure** – Follow the prompts on the screen and the Product takes you through a procedure that calibrates the pressure components of the Product. Enter the Product password to use this function. **F4** (**Options**) lets you save the calibration, go back a step, skip a step, or move to the next section. See *Calibration Manual* for details.
- **F2** - **Calibrate Electrical** – Follow the prompts on the screen and the Product takes you through a procedure that calibrates the electrical components of the Product. Enter the Product password to use this function. **F4** (**Options**) lets you save the calibration, go back a step, skip a step, or move to the next section. See *Calibration Manual* for details.
- **F3** - **Battery Information** – An information-only screen that shows if the battery is present, the remaining battery charge level, battery temperature, and battery voltage.
- **F4** - **Change Password** – Use to change the password for advanced functions.

**729 Setup**

The 729 Setup submenu shows the information in Table 5.

**Table 5. 729 Setup Menu**

| Menu Parameter | Function                                                                                                                                                                                                                                                                                                                                                        |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Language       | Push <b>ENTER</b> and use the arrows to select the UI language: English, Simplified Chinese, Traditional Chinese, French, German, Italian, Portuguese, Spanish, Russian, Japanese, or Korean.                                                                                                                                                                   |
| Date and Time  | Push <b>ENTER</b> and use the arrows to access the Date and Time menu. Once inside the menu, use the arrows to select a parameter and use the number keys to make changes to these settings. For am or pm, push <b>SELECT</b> . Once you make changes, push <b>F4</b> ( <b>Done</b> ) to store the new parameters. The timestamp saves with any stored results. |

**Table 5. 729 Setup Menu (cont.)**

| Menu Parameter                  | Function                                                                                                                                                                |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Date Format                     | Set the format of the date. Use the softkeys to select <b>yyyy-mm-dd</b> , <b>mm/dd/yyyy</b> , or <b>dd/mm/yyyy</b> .                                                   |
| Time Format                     | Push the necessary softkey to select 12-hour or 24-hour time format. The format changes in the Date Format menu. <b>ENTER</b> or <b>SELECT</b> also changes the format. |
| Number Format                   | Push the necessary softkey to select a decimal point or comma for the numbering format. <b>ENTER</b> or <b>SELECT</b> also changes the format.                          |
| Temperature Unit <sup>[1]</sup> | Push the necessary softkey to select between °C or °F. <b>ENTER</b> or <b>SELECT</b> also changes the units.                                                            |

Table 5. 729 Setup Menu (cont.)

| Menu Parameter                   | Function                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Auto Battery Timeout             | <p>The Product has a programmable Auto Battery Timeout feature to save the battery charge. Push the arrow keys to highlight this line. Push <b>ENTER</b> or <b>SELECT</b> to reach the timeout menu. The choices are:</p> <ul style="list-style-type: none"> <li>• Never</li> <li>• 5 minutes</li> <li>• 10 minutes</li> <li>• 15 minutes</li> <li>• 30 minutes</li> <li>• 60 minutes</li> </ul> |
| PCM Resolution                   | <p>Choices are High and Low. High resolution is the normal state, and Low reduces the resolution one digit.</p>                                                                                                                                                                                                                                                                                  |
| HART Communication               | Enable/Disable                                                                                                                                                                                                                                                                                                                                                                                   |
| Fluke Connect                    | Enable/Disable                                                                                                                                                                                                                                                                                                                                                                                   |
| [1] Disabled in Japanese models. |                                                                                                                                                                                                                                                                                                                                                                                                  |

## Manage Users

The Manage Users submenu controls access to add or delete Product user names from this menu:

- **Add a new user:** push **F1** (**New**):  
 Use the onscreen keyboard to add a new user. Push the softkeys for **Capslock ON** (or **OFF**), **Backspace**, and to complete the entry (**Done**).
  1. Push the arrows to highlight each letter.
  2. Push **SELECT** or **ENTER** to choose the letter.
  3. When finished, push **F4** (**Done**) to return to the Manage Users screen.
- **Delete an existing user:** push the arrows to highlight a user and the push **F4** (**Delete**).

### **Manage Test Results**

The Product saves test results as found and as left and saves calibration results.

1. In the Setup menu, push the arrow buttons to highlight **Manage Test Results**.
2. Push **ENTER** to show a list of tests. The tests are designated by date and time, Tag ID, and serial number.
3. Push the arrow buttons and **ENTER** or **SELECT** to view the selected test results.
4. Push **F1** to select the As Found or As Left test result.
5. Push **F4** to redo the calibration and save a new test result.

To delete all test results:

1. Go to the **Manage Test Results** screen.
2. Push **F4** (**Delete All**).
3. Confirm to delete all records.
4. Push **F3** (**OK**) to delete all records or **F4** (**Cancel**) to escape the deletion process.

### **Manage Screen Shots**

The Product can take screen shots of any screen and store them.

To take a screen shot:

1. Bring up the screen to save.
2. Push and hold **HOLD**. The Product shows **File Saved**.

To view the screen shots:

1. From the Setup menu, push the arrows to highlight **Manage Screen Shots**.
2. Push **ENTER** or **SELECT**. The Product shows a list of screenshots and their time and date stamps.
3. Use the arrows to highlight a screen shot.
4. Push **ENTER** or **SELECT** and the screen shot is shown. The screen shows: **You are reviewing a screen copy!** over the saved screen.
5. Push **F4** to delete the individual screen.

### Manage Custom Tasks

Use this submenu to delete custom tasks (see *Tasks Menu*). To delete a single task, use the arrow to select a custom task and push **F1** (Delete). To delete all of the tasks, push **F4** (Delete All).

### Maintenance Menu

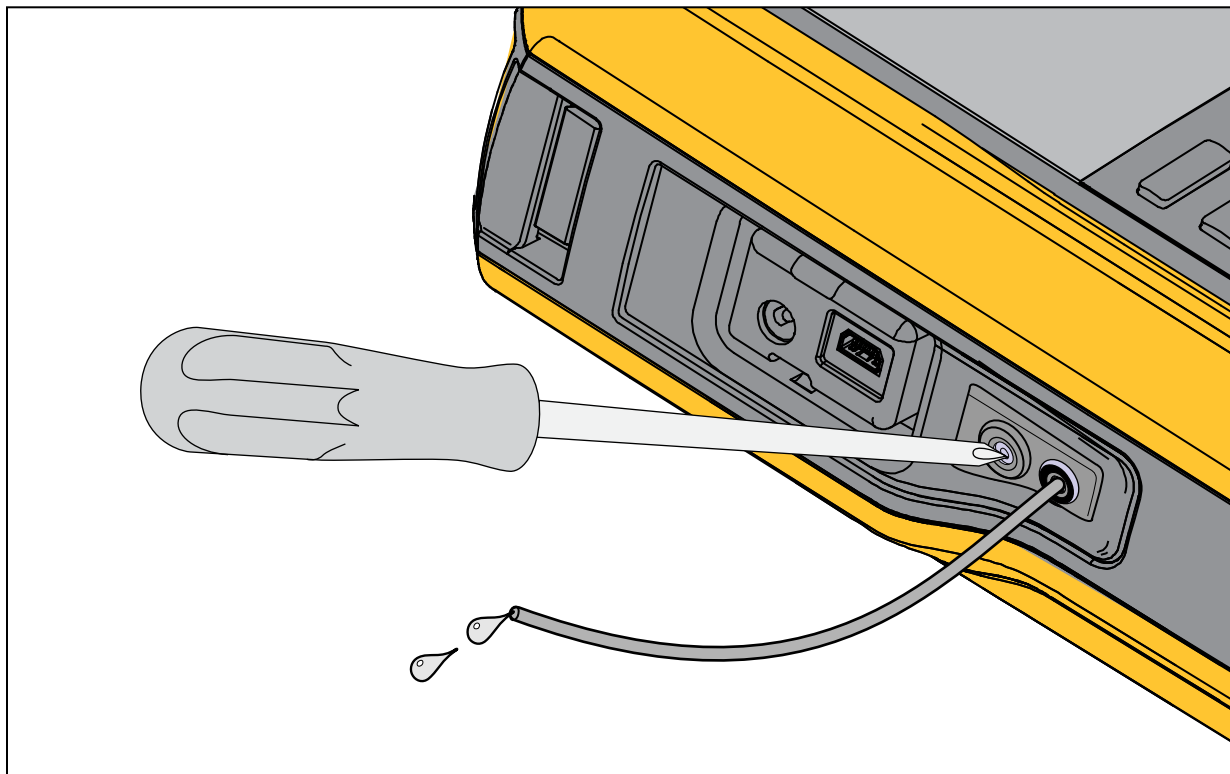
Maintenance has these sections:

- Drain Water (condensation)
- Keypad Test
- Pressure Sensor Characterize (see *Calibration Manual*)
- Supply Sensor Self Calibration (see *Calibration Manual*)
- Exhaust

### Drain Water (Condensation)

To drain condensation from the Product, see Figure 10:

1. Connect the hose to collect drained water.
2. Push **F4** (Continue).
3. The display shows **Creating pressure, please standby**. The pump works to establish a pressure.
4. To let the water out, use a small-tipped tool, such as a small Philips screwdriver, to push the **DRAIN** button on the side of the Product.
5. Push **F4** to repeat the drain operation.
6. When finished with water drain, push in on the fitting to release the hose.



idj030.emf

**Figure 10. Drain Water from Product**

### **Keypad Test**

Use this screen to check the Product buttons. Push any button and verify the onscreen response.

For the power button, push and hold for 2 seconds.

### **Exhaust**

The Exhaust function releases all pressure inside the Product including the pressure reservoir. This reservoir keeps the pressure stable and provides pressure if only small pressure steps are necessary. Push **F1** for Exhaust.

### **Tasks Menu**

Tasks let you set up calibration and measurement tasks to save and recall for later use.

To go to the Tasks menu, push **TASKS**. The Tasks menu has these submenus:

- Pressure Transmitter (P/I)
- Pressure Switch (SW)
- Current to Pressure Test (I/P)
- Pressure Leak Test
- Pressure Transmitter (P/V)
- Pneumatic Pressure Transmitter (P/P)

#### *Note*

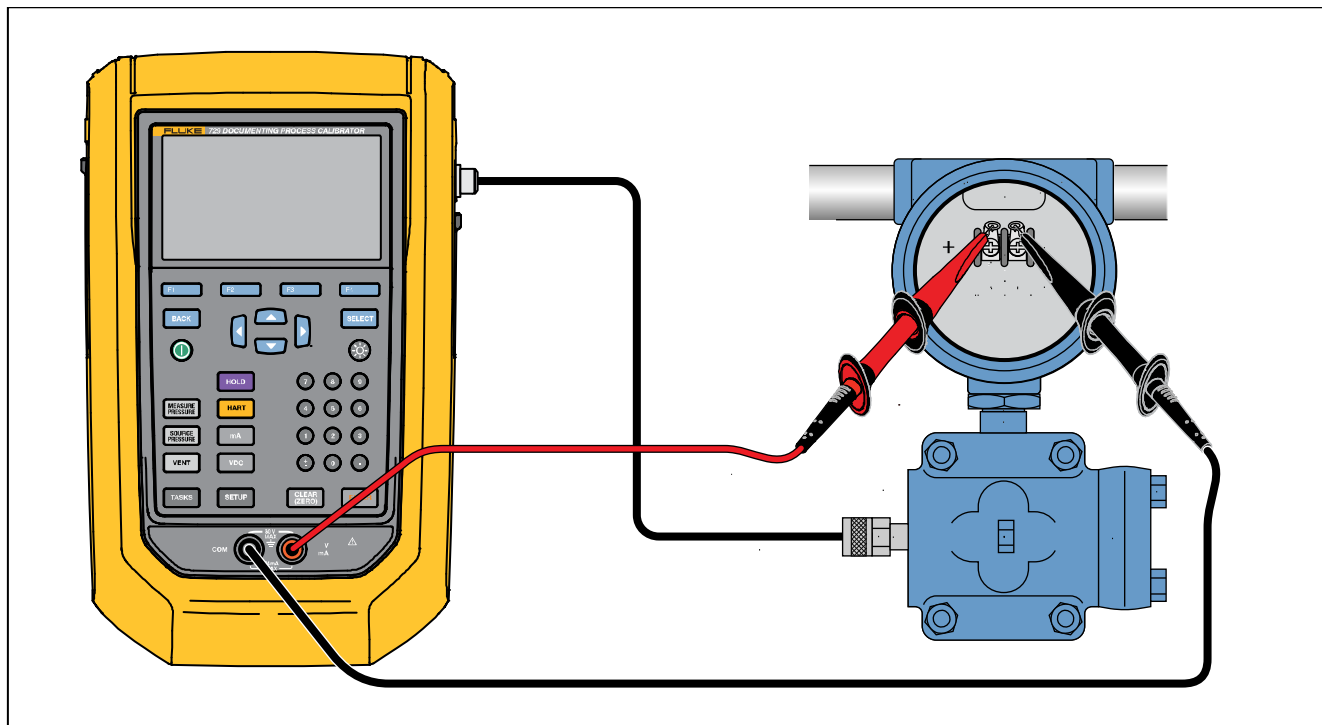
*P/P tasks require a pressure module connected to the Product.*



### **Pressure Transmitter (P/I)**

Use this function to calibrate a P/I transmitter (pressure to current) with current measurement. See Figure 11 for connections:

1. From page 1 of the Tasks menu, push the arrows to highlight **Pressure Transmitter (P/I)**.
2. Push **ENTER** or **SELECT**.
3. From this screen, use the arrows, numeric keypad, and **ENTER** to change the values of the Source Pressure and Measure Current.
4. Push **F2** (**PV Calibrate**) if HART is enabled and PV calibration is necessary.
5. Push **F3** to turn on (or off) 24 V loop power.
6. Once these values are specified, push **F4** (**Continue**).
7. From this second screen, use the arrows, numeric keypad, and **ENTER** to change the values of the Tolerance of Range, Test Strategy, Auto Settling Time, and Transfer Function.
8. Push **F1** to change the Transfer Function to Square Root or Linear.
9. To select the Test Strategy, highlight the parameter and push **SELECT**. Highlight the applicable listed test strategy and push **ENTER**.
10. Push **F2** (**Save as Customized**) to store this task for later use.
11. Once you enter the parameters, push **F4** (**Continue**).
12. Push **F2** (**Manual Test**) or **F4** (**Auto Test**).
13. Push **F3** to adjust. Go to 0%, 50%, and 100%.
14. Push **F1** (**As Left**) to do the As Left test.



idj005f.emf

**Figure 11. Pressure Transmitter (P/I) Task Connections**

### **Pressure Switch (SW)**

Use this feature to calibrate a pressure switch. See Figure 12 for connections:

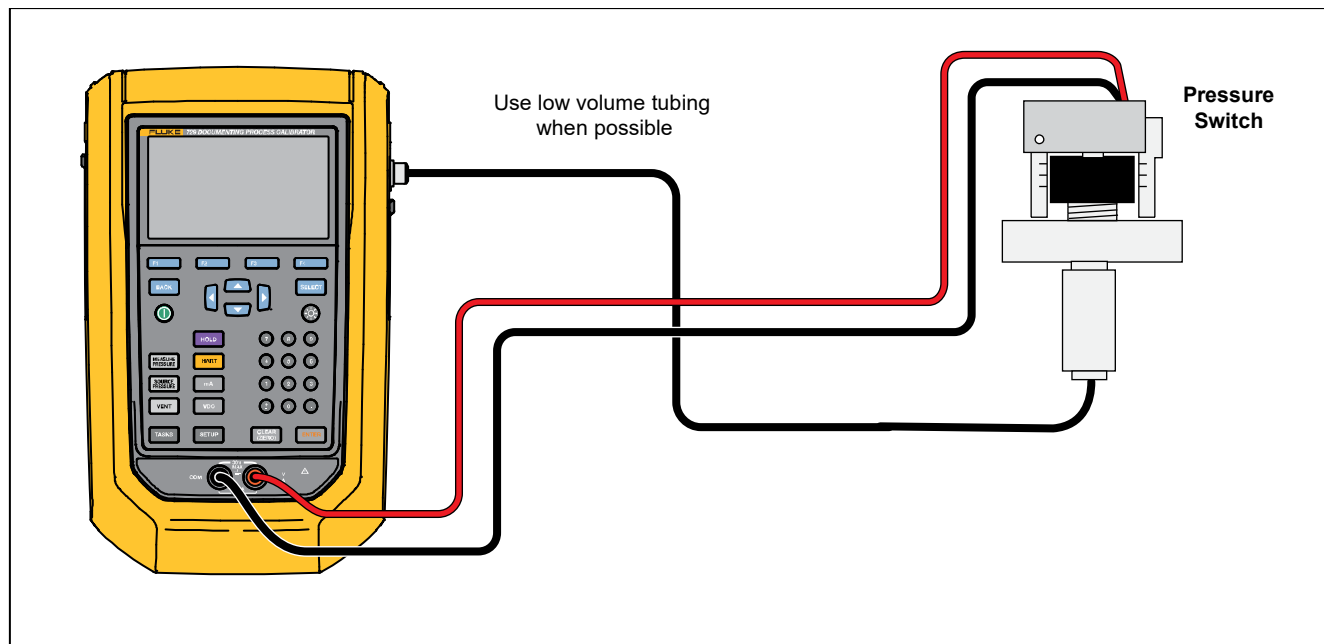
1. From page 1 of the Tasks menu, push the arrows to highlight **Pressure Switch (SW)**.
2. Push **ENTER** or **SELECT**.
3. From this screen, use the arrows, numeric keypad, and **ENTER** to change the values of these parameters:
  - Setpoint
  - Tolerance
  - Min Deadband
  - Max Deadband
  - Max Pressure
  - Switch Type

#### *Note*

*Make sure to push **ENTER** after EACH value change.*

You can save these settings as a customized task. Push **F2** (**Save as Customized**). Recall this customized task from the Tasks menu.

4. Once you enter the parameters, push **F4** (**Continue**).
5. Push **F4** (**Auto Test**) or **F2** (**Manual Test**) to do the As Found switch test. The test runs.  
After the test runs, the results show on the display.  
To save the test results:
  1. Push **F4** (**Done**).
  2. Push **ENTER** to edit the Tag information.
  3. Push **F4** (**Done**).
  4. Move the cursor to the S/N field (Serial Number).
  5. Push **ENTER** to edit the S/N information.
  6. Push **F4** (**Done**).
  7. Move the cursor to the User ID field.
  8. Push **F1** (**User List**) to select a user.
  9. Push **F4** (**Done**).
  10. Adjust the switch and push **F2** (**Step Up**) and **F3** (**Step Down**) to verify.
  11. Push **F1** (**As Left**) to do the As Left test.



idj008.emf

**Figure 12. Switch Test Connections**

### **Current to Pressure Test (I/P)**

Use this feature to calibrate a current to pressure (I/P) converter with current source and pressure measurements. See Figures 13 and 14:

1. From page 1 of the Tasks menu, push the arrows to highlight **Current to Pressure Test (I/P)**.
2. Push **ENTER** or **SELECT**.
3. From this screen, use the arrows, numeric keypad, and **ENTER** to change the values of the source current and measure pressure.

#### *Note*

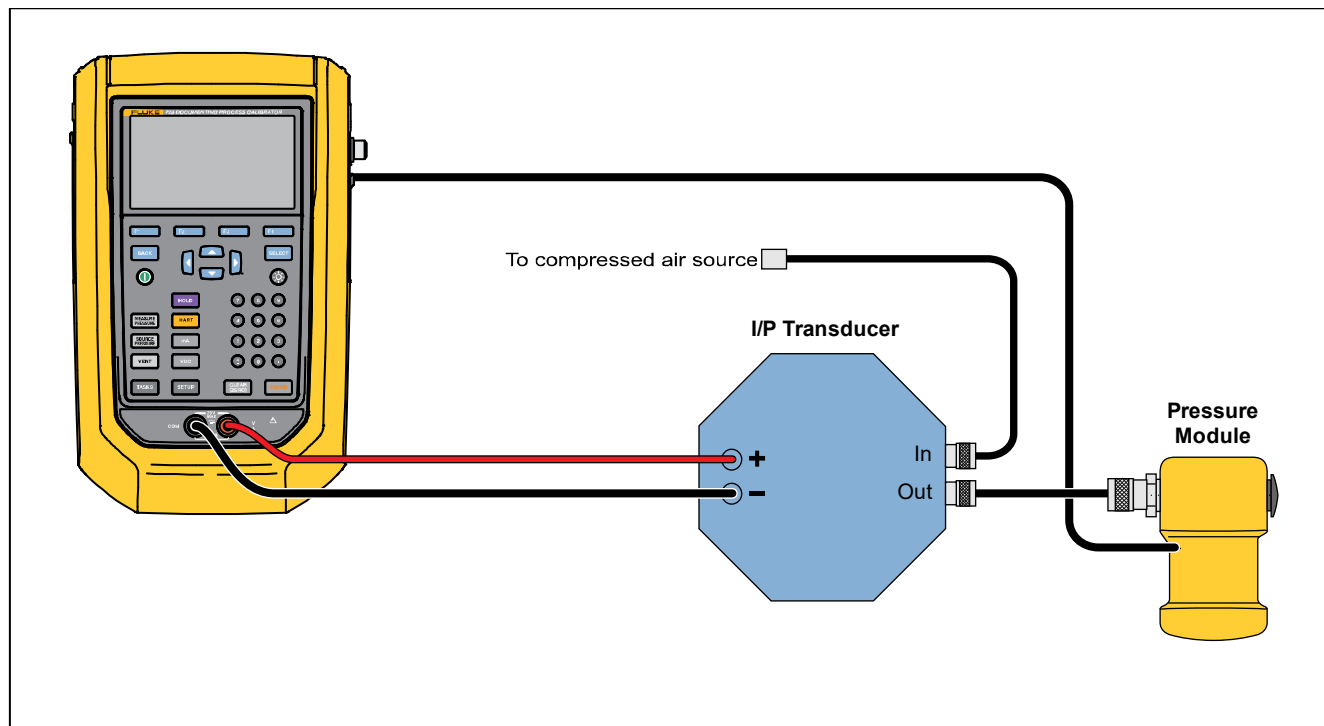
*Make sure to push **ENTER** after EACH value change.*

4. Once you enter the values, push **F4** (**Continue**).

Tolerance of Range, Test Strategy, and Auto Settling Time can be set from here.

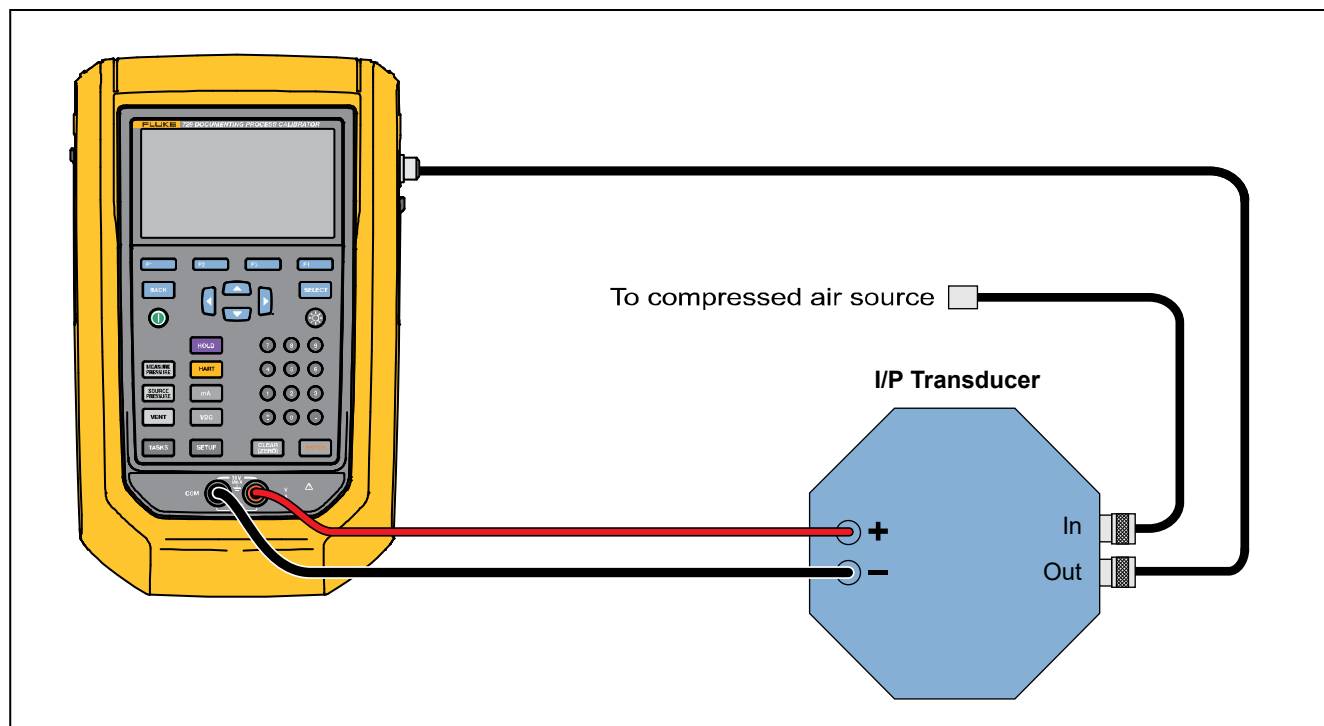
To save these settings as a customized task, push **F2** (**Save as Customized**). You can then recall the saved task from the Tasks menu.

5. Once you enter the parameters, push **F4** (**Continue**).
6. Push **F2** (**Manual Test**) or **F4** (**Auto Test**).
7. Adjust with **F3** to go to 0%, 50%, and 100%.
8. Push **F1** (**As Left**) to do the As Left test.



idj009.emf

Figure 13. Current to Pressure Test (I/P) with External Pressure Module



**Figure 14. Current to Pressure Test (I/P) with Internal Connections**

idj009a.emf

### **Pressure Leak Test**

Use this feature to test a pressure device for leaks. For connections, see Figure 15:

1. From this screen, use the arrows, numeric keypad, and **ENTER** to change the values of these parameters:
  - Setpoint (Pressure value)
  - Settling Time
  - Test Time

#### *Note*

*Make sure to push **ENTER** after EACH value change.*

2. Push **F4** (**Continue**). When the pressure leak test completes, the Product shows the results. Results include Start Pressure, End pressure, Test time, and Leak rate.



### **Pressure Transmitter (P/V)**

Use this feature to calibrate a pressure to voltage transmitter with voltage measurement. For connections, see Figure 11.

1. From page 1 of the Tasks menu, push the arrows to highlight **Pressure Transmitter (P/V)**.
2. Push **ENTER** or **SELECT**.
3. From this screen, use the arrows, numeric keypad, and **ENTER** to change the values of the source pressure and measure voltage.

Push **F4** (**Continue**) to edit these other parameters:

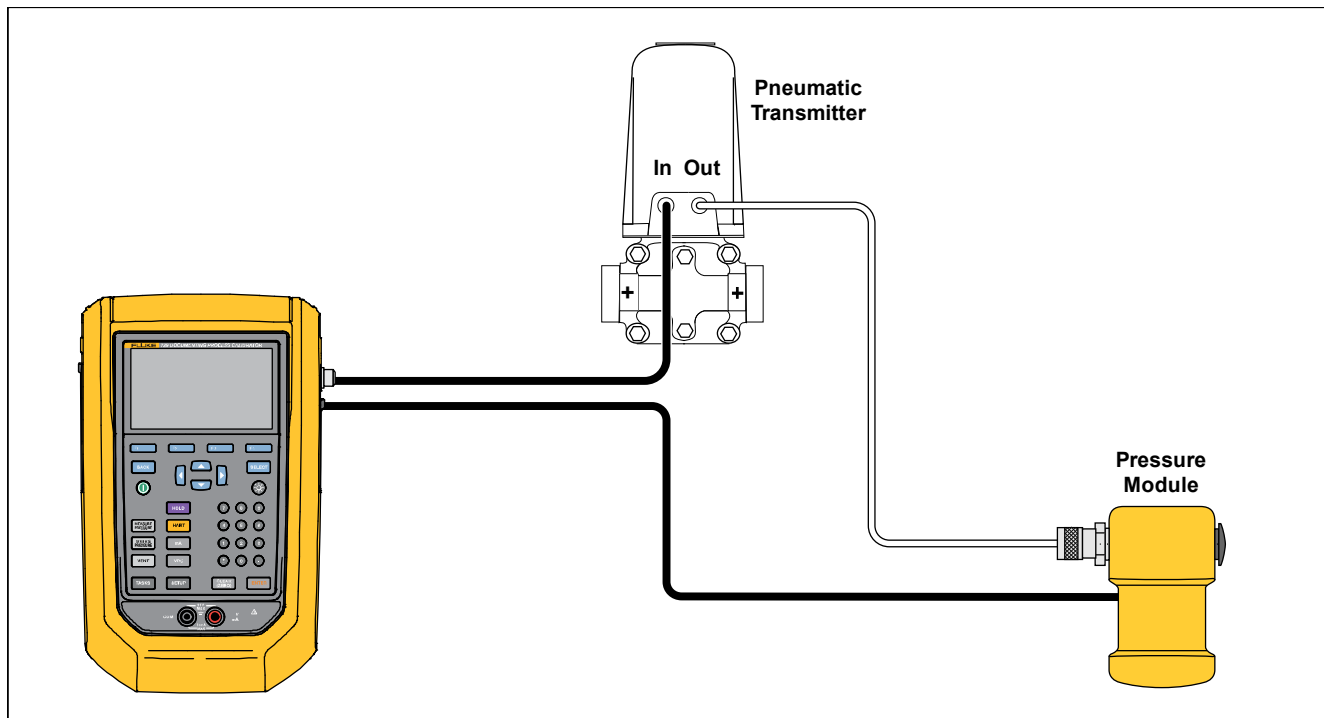
- Tolerance of Range
- Test Strategy
- Auto Settling Time
- Transfer Function **F1** (**Linear or Square Root**).

Push **F2** (**Save as Customized**) to save these settings as a customized task. Recall these customized tasks from the Tasks menu at any time.

### **Pressure Transmitter (P/P)**

To calibrate a pressure-to-pressure transmitter, use this feature. This feature requires a pressure module to measure pressure output from a connected transmitter. To use the function, see Figure 15:

1. From page 1 of the Tasks menu, push the arrows to highlight **Pressure Transmitter (P/P)**.
2. Push **ENTER** or **SELECT**.
3. From this screen, use the arrows, numeric keypad, and **ENTER** to change the values of the source pressure and measure pressure.
4. Push **F4** (**Continue**) and these parameters can be edited:
  - Tolerance of Range
  - Test Strategy
  - Auto Settling Time
5. Push **F2** (**Save as Customized**) to save these settings as a customized task. Recall this customized task from the Tasks menu at any time.



idj026.emf

**Figure 15. Pressure Transmitter (P/P) Connections**

## ***HART Functionality***

The Product interfaces with HART devices. It can:

- View and modify transmitter setup and data that includes:
  - Write Lower Range Value (LRV)
  - Write Upper Range Value (URV)
  - Write PV Unit
  - Write Message and Descriptor
  - Write Damping Value
  - Write Date
- Perform service features including:
  - PV Zero Trim
  - mA Output Trim
  - Trim to Applied Values
  - Set Fixed mA Output
  - Re-range Transmitter
  - Device Diagnostics
- Perform HART calibration without using a Task (Ad hoc)
- Perform HART calibration from a downloaded Task

Push **HART** and the Product searches (polls) the bus to find any connected HART devices. From this screen, there are these softkeys:

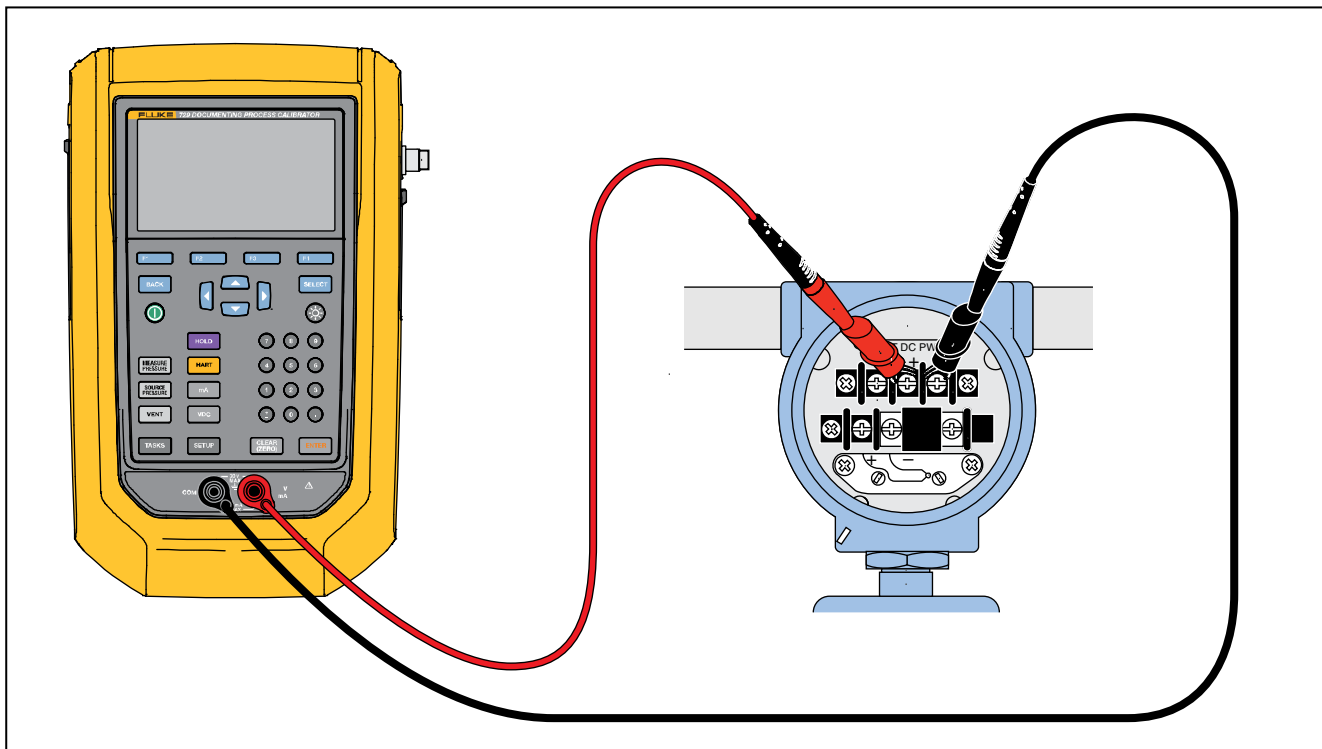
- F1** - Communicator Only
- F2** - Loop Power +24V ON
- F3** - Enable HART 250Ω
- F4** - Restart BUS Polling

Once Polling finds the transmitter(s), move the cursor to the desired tag number and select **F4** (**Continue**) to select.

### **Loop Power +24V ON**

The Product supplies loop power at 24 V dc to a current transmitter disconnected from the system. To supply 24 V loop power:

1. From the HART menu, push **F2** (**Loop Power +24V ON**). The Product polls the bus to see if a transmitter is connected.
2. With the transmitter disconnected from normal loop power, connect the Product test leads in series with the instrument current loop as shown in Figure 16.
3. The mA display shows measure loop current.



**Figure 16. Connection with Loop Power Enabled**

idj029.emf

### **Enable HART 250Ω**

The Product has a selectable 250 Ω HART resistor to facilitate use with HART devices. Enable the HART resistor when you connect the Product to a HART device. The HART resistor defaults to OFF.

To turn on or off the HART resistor, push **F3** (Enable HART 250Ω) or (Disable HART 250Ω).

### **HART Menu**

The HART menu has these functions that configure and calibrate a HART device:

- HART Data
- HART Service
- Calibrate (Ad Hoc)
- Find Task by Tag
- Bus Polling

From the HART menu, push **F1** (Disconnect) to disconnect from HART communication, or push **F4** (Continue) to continue to the highlighted entry.

### **HART Data**

The HART data screen shows information about the connected HART device. Push **F2** (Page Up) or **F3** (Page Down) where necessary.

You can modify certain fields that include:

- Tag ID
- PV Unit Type
- Lower Range Value (LRV)
- Upper Range Value (URV)
- Damping
- Message
- Descriptor
- Date

### **HART Service**

HART Service includes these submenus:

- PV Zero Trim
- mA Output Trim
- Trim to Applied Values
- Set Fixed mA Output
- Re-range Transmitter
- Device Diagnostics

Highlight the HART Service menu selection and push **F4** (Continue). When you enter some of the submenus, a warning tells you to remove the loop from AUTOMATIC control. Push **F4** (Continue).

#### **PV Zero Trim**

This function sets the digital pressure value of the transmitter to zero.

1. Push **F3** (Trim Zero) to trim the PV output value to zero.
2. Push **F4** (Done) when completed.

#### **mA Output Trim**

In the mA output trim screen, you can adjust the transmitter output.

1. Start with the 4 mA range. Push **F1** (Fetch) to get the current measured mA value.
2. Push **F2** (Trim 4 mA) to send the measured value for correction. Push **F3** (Next Point). The Product moves to the 20 mA range.
3. Repeat steps 1 and 2.
4. When complete, push **F3** to return to the previous point or **F4** (Done).

#### **Trim to Applied Values**

1. Enter the LRV pressure value necessary in the Setpoint entry and then push **ENTER** and let the pressure settle.
2. Push **F2** (Trim LRV) to trim the lower range of pressure applied.
3. Enter the necessary URV pressure value in the Setpoint entry and push **ENTER** and let the pressure settle.
4. Push **F3** (Trim URV) to trim the upper range of pressure applied.

### **Set Fixed mA Output**

Enter the necessary mA value to output from the connected transmitter.

- Push **F2** (**Step Up 4mA**) to increase mA output in 4 mA steps.
- Push **F3** (**Step Down 4mA**) to decrease mA output in 4 mA steps.

### **Re-range Transmitter**

Change the Upper Range Value (URV) and the Lower Range Value (LRV) of the connected transmitter from this screen.

1. Enter the Upper Range Value (PV URV) necessary.
2. Push **ENTER** to select.
3. Push **F3** (**Send**) to change the URV.
4. Enter the Lower Range Value (PV LRV) necessary.
5. Push **ENTER** to select.
6. Push **F3** (**Send**) to change the LRV.

### **Device Diagnostics**

Select Device Diagnostics to send the self-diagnostics command to the connected transmitter and view the transmitter Self Test result.

### **Calibrate (Ad hoc)**

Calibrate (Ad Hoc) calibrates a connected HART device without a downloaded task.

The opening screen shows the task type and source/measure configuration for the device. The transmitter HART configuration is copied into this configuration screen. Correct as needed for your test.

1. Push **F2** (**PV Calibrate**) to change the measure from mA to the PV source value of the transmitter.
2. Push **F3** (**Disable/Enable Loop Power**).
3. Push **F4** (**Continue**) to continue to second configuration screen. These choices are shown:
  - Tolerance of Range
  - Test Strategy
  - Auto Settling Time
  - Transfer Function



These softkeys are active:

**F1** – Linear/Square Root Selection

**F2** – Save as Customized

**F3** – Leak Test

**F4** – Continue

The next screen starts the As Found Calibration. These softkeys are active:

**F1** – Abort

**F2** – Manual Test

**F4** – Auto Test

Test results show after all strategy points have recorded the measurements. Measurements in specification show as black. Measurements out of specification show as red.

1. Push **F4** (**Done**) or **F1** (**Abort**).
2. Enter the Tag ID, serial number of the device, and the User ID.
3. Push **F4** (**Done**)

### **Adjust**

Push **F2** (**HART Adjust**). These choices are shown:

- PV Zero Trim
- mA Output Trim
- Trim to Applied Values

### **PV Zero Trim**

To set the digital pressure value of the Product to zero:

1. Push **F3** (**Trim Zero**).
2. Push **F4** (**Done**).

### **mA Output Trim**

From the mA output trim screen, you can fetch the current PV value and send this value to the transmitter to adjust the PV to the correct mA output.

1. Starting with the 4 mA range, push **F1** (**Fetch**) to get the current measured mA value.
2. Push **F2** (**Trim 4mA**) to send the measured value for correction.
3. Push **F3** (**Next Point**). The Product moves to the 20 mA range.
4. Repeat steps 1, 2, and 3.
5. When complete, push **F3** to return to the previous point or **F4** (**Done**).

### **Trim to Applied Values**

1. Enter the LRV pressure value necessary in the Setpoint entry and let the pressure settle.
2. Push **F2** (Trim LRV) to trim to the lower range of pressure applied.
3. Enter the URV pressure value necessary in the Setpoint entry and let the pressure settle.
4. Push **F3** (Trim URV) to trim to the upper range of pressure applied.

### **As Left**

Push **F4** (As Left). Repeat the procedure from As Found.

Calibration results save to the Test Results menu.

### **Find Task by Tag**

Downloaded tasks from DPCTrack2 or other supported software are shown. Use the up and down arrows to scroll through the tasks. Push **F2** (Page Up) or **F3** (Page Down) where necessary. Push **F4** (Recall) to recall the highlighted task.

### **Bus Polling**

Bus Polling goes back into the bus polling screen and scans for connected HART devices.

If no HART device is found after Polling has completed, push **F4** (Restart Bus Polling) to restart bus polling to search of the Product BUS for HART devices. The Product locates the device.

### **Measure Mode**

The measure mode has these functions:

- mA dc measure
- mA dc source
- mA dc simulate
- V dc measure
- Switch (continuity)

The lower left of the display shows the operation mode.

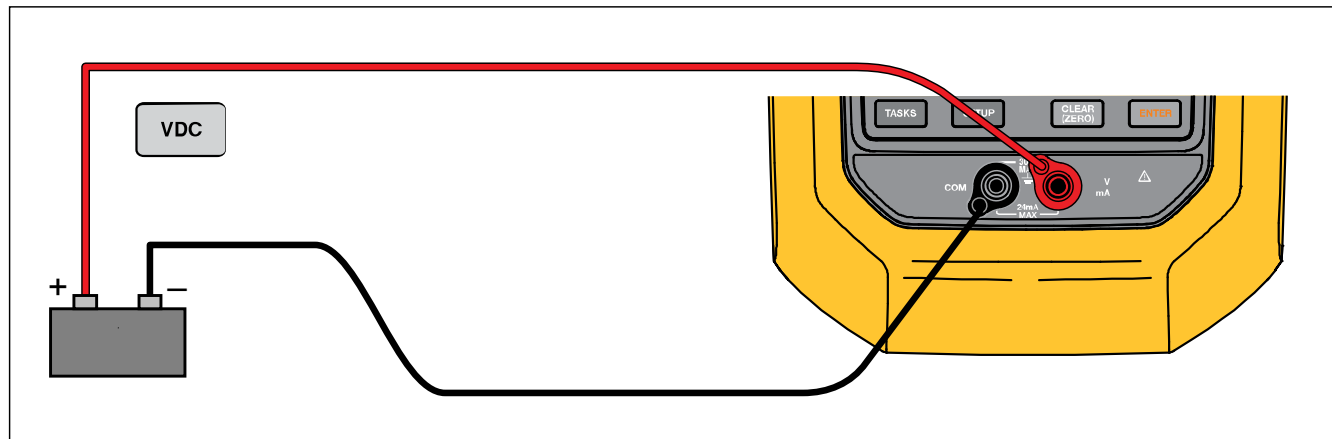
### Current Measurement

The Product measures 0 mA to 24 mA.

Move the cursor to highlight **Measure Current**. Push **F3** to **Source Current**. Push **F4** to **Simulate Current**.

### Volts Measurement

The Product measures 0 V dc to 30 V dc. Figure 17 shows measurement connections for voltage measurements.



**Figure 17. VDC Measurement Connections**

idj004f.emf

## Pressure Measurement

The Product supports the 700P and 750P series pressure modules. See *Accessories*. Before you use a pressure module, read its instruction sheet. The modules are different in how they are used, zeroed, what types of process pressure media are allowed, and accuracy specifications.

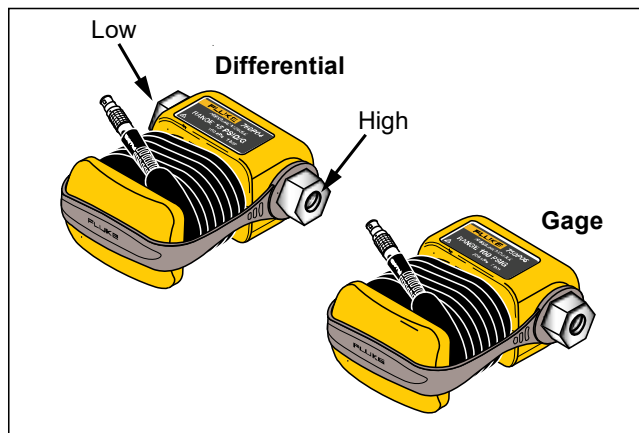
Figure 18 shows gage and differential modules. Differential modules also operate in gage mode when you leave the low fitting open to atmosphere.

To measure pressure, attach the applicable pressure module for the process pressure you will test as described in the module's instruction sheet.

To measure pressure:

### Warning

**To prevent personal injury, shut off the valve and slowly bleed off the pressure before attaching the pressure module to the pressure line to avoid a violent release of pressure in a pressurized system.**



hbb001.emf

Figure 18. Gage and Differential Pressure Modules

**⚠ Caution**

**To prevent possible damage to the Product or to equipment under test:**

- **Never apply more than 10 lb-ft. of torque between the pressure module fittings, or between the fittings and the body of the module.**
- **Always apply correct torque between the pressure module fitting and connecting fittings or adapters.**
- **Never apply pressure above the rated maximum printed on the pressure module.**
- **Use the pressure module only with specified materials. See the printing on the pressure module or the pressure module instruction sheet for the acceptable material compatibility.**

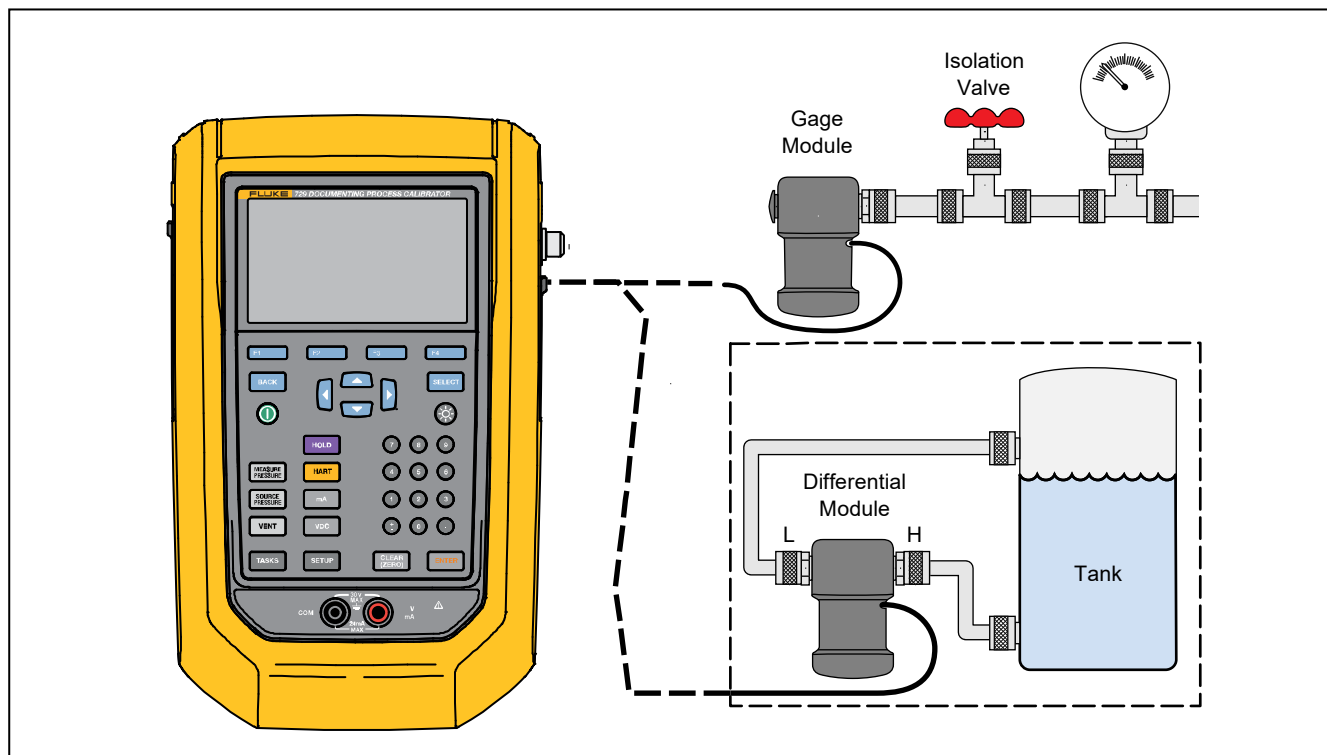
Connect a pressure module to the Product as shown in Figure 19. The pressure module shows on the display after several seconds once installed.

The Product automatically senses the pressure module attached and sets its range accordingly.

*Note*

*Before doing a task that sources or measures pressure, zero the Product.*

1. With the pressure module highlighted in the third screen, push **F4** (**Zero External**) to zero the pressure. When zeroing absolute pressure modules, enter the current barometric pressure when the displayed value turns to yellow highlight
2. Zero the pressure. See the module's Instruction Sheet. Modules can have different zeroing procedures that depend on module type.



ldj010.emf

Figure 19. Pressure Module Connections

### **Autostep and Auto Ramp the Output Value**

Autostep and Auto Ramp can automatically adjust the value of source functions for pressure or current.

#### **Autostep**

To configure the Product to make a sequence of steps that run automatically:

1. Connect the Product to the test circuit.
2. From the main screen, push **F1** (**Autostep**).
3. Set the Product for the necessary source function:
  - **F2** (**Pressure**)
  - **F3** (**Current**)
4. From this screen, use the arrows, numeric keypad, and **ENTER** to change the values of Start and End Values, and Number of Steps and time per step.
5. Select the Repeat Mode:
  - **F2** (**One Time**)
  - **F3** (**Repetitive**)
6. Select the Step Style:
  - **F2** (**Sawtooth**)
  - **F3** (**Triangle**)
7. Push **F4** (**Start**).
8. The Product automatically starts the step function. The softkey label changes to **Stop Step**.
9. To Push the **Stop Step** softkey to stop the automatic step function.
10. Push the **Done** softkey to continue normal operation.

### **Auto Ramp the Output**

When ramped, the source sweeps up or down in value. Use the Auto Ramp feature to verify a switch or alarm, or when a smooth increase or decrease of the output function is necessary. Set the Product to ramp up Pressure or Current.

1. From the main screen, push **F4** (Auto Ramp).
2. Set the Product for the necessary source function:
  - **F2** (Pressure)
  - **F3** (Current)
3. Use the arrows, numeric keypad, and **ENTER** to change the Start Values, End Values, and Slew Rate (Ramp Time).
4. Select the Repeat Mode:
  - **F2** (One Time)
  - **F3** (Repetitive)
5. Select the Step Style:
  - **F2** (Sawtooth)
  - **F3** (Triangle)
6. Push **F4** (Start).

While the signal ramps, the output adjusts to the value. The selection of endpoints and ramp time determines the size of steps. For example, if you set the Product to ramp from 1 mV to 1 V over 10 seconds, the output adjusts in approximately 25 mV steps. The Ramp function continues until you get the selected limit.



### **Temperature Measurement**

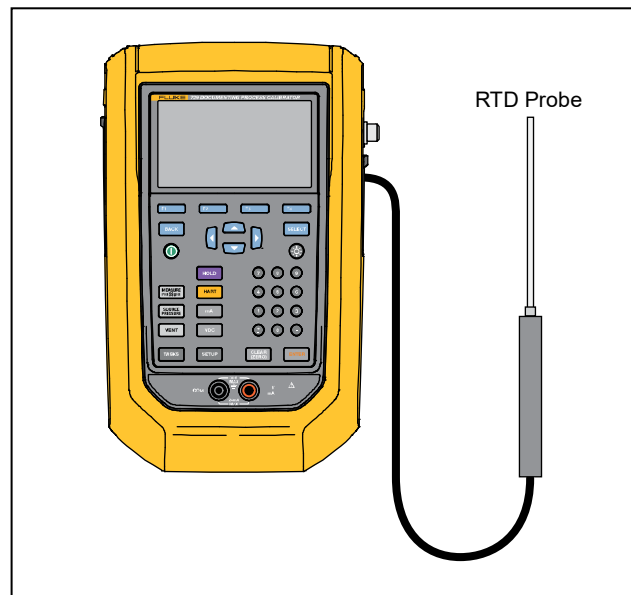
To measure temperature with an RTD probe accessory, connect the probe into the RTD port on the right of the Product. Make sure the correct probe type is used. Use Fluke-720RTD, PN 4366669 or the Fluke-720URTD, PN 4382695.

The standard probe has a 10-inch insertion depth with a 1/4-inch diameter stainless steel sheath. See Figure 20.

#### *Note*

*The factory default type is PT100-385 so if the Product is used with the Fluke 720 RTD Probe (PN 4366669), it is not necessary to set the probe type. Connect the probe to the Product and configure the display to read temperature.*

*The display shows “OL” when the measured temperature is outside the nominal measurement range of the RTD function (below -40 °C or above 150 °C).*



idj015.emf

**Figure 20. Temperature Probe Connection**

### Source mA Mode

The operation mode (for example, measure or source) shows on the display. If the Product is not in mA source mode, push **mA**.

To source mA:

1. Connect the test leads as necessary.
2. Key in the necessary output value (for example, to source 5.5 mA, push **5** **.** **5** **ENTER**).
3. Push **ENTER**.
4. To change the output value, record a new value and then push **ENTER**.
4. To set the output value in the present source function, push **CLEAR (ZERO)** then enter the desired value and push **ENTER**.

5. To turn off sourcing completely, select another function.

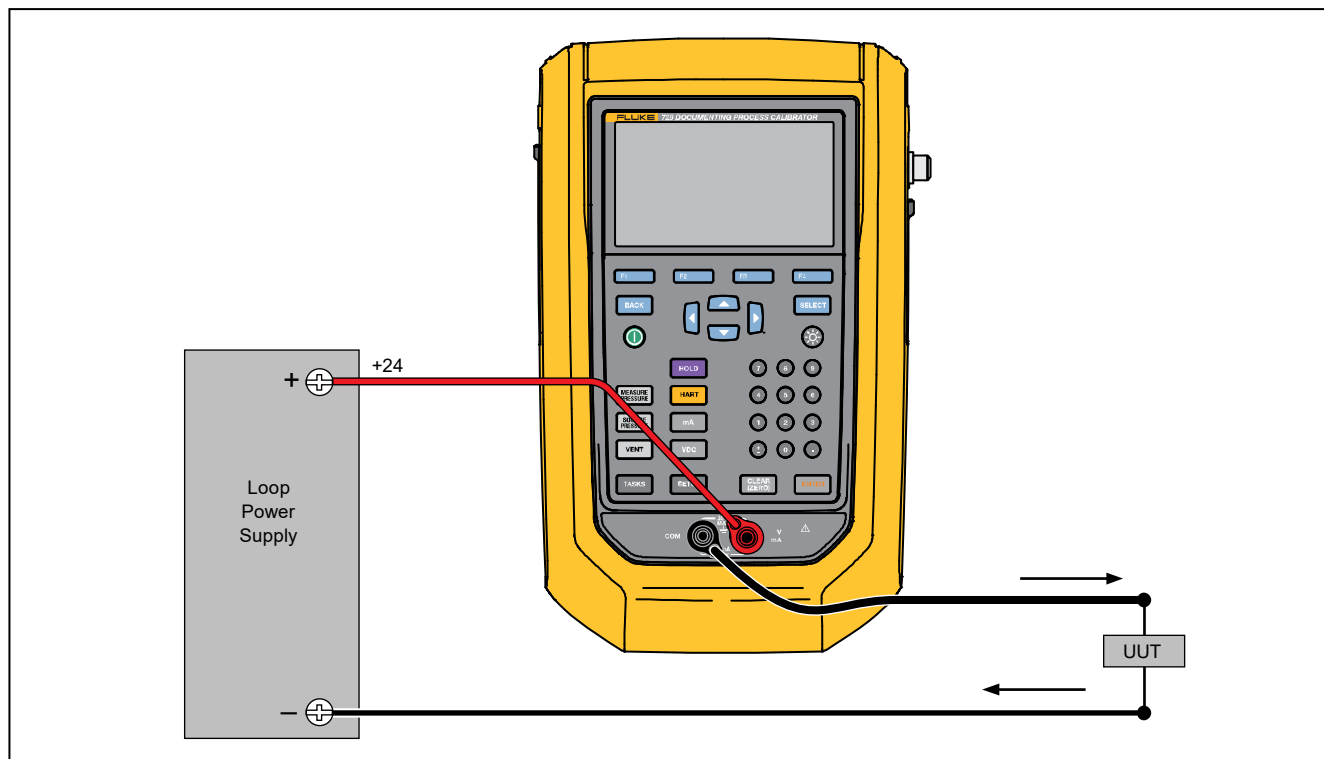
#### Note

*Use the source current function to drive a current input device. This is different from the loop power function in which the Product is powering a process instrument.*

### 4 to 20 mA Simulation

To configure the Product as a load on a current loop:

1. Move the cursor to the analog function indicator and push **F4** (**Simulate Current**).
2. Enter the necessary value.
3. Connect an external loop supply to the mA port as shown in Figure 21.



idj011.emf

**Figure 21. Connections to Simulate a 4 to 20 mA Transmitter**

## Log

Users can record a series of pressure or mA measurements for later upload to a host computer. The Product records a maximum of 8000 readings, depending on the reading rate, duration, and how much memory is in use for other functions such as tasks or stored results. Record the reading rate and duration in minutes.

To log data:

1. From the main screen, push **F2** (**Log**). Adjust the Reading Rate and Duration with the arrow buttons and then push **ENTER** to select parameters from the Log screen.
2. Choose the Log Source from any of the available measured values with **F1**, **F2**, or **F3**. The log source can be internal pressure, external pressure, mA, V dc, HART PV, or temperature.
3. For **Reading Rate**: push **ENTER** to adjust the reading rate from 1 /m to 60 /m.
4. For **Duration**: use the numeric keypad to record the duration in minutes, followed by **ENTER**. The maximum depends on the reading rate and how much memory is available to log data.

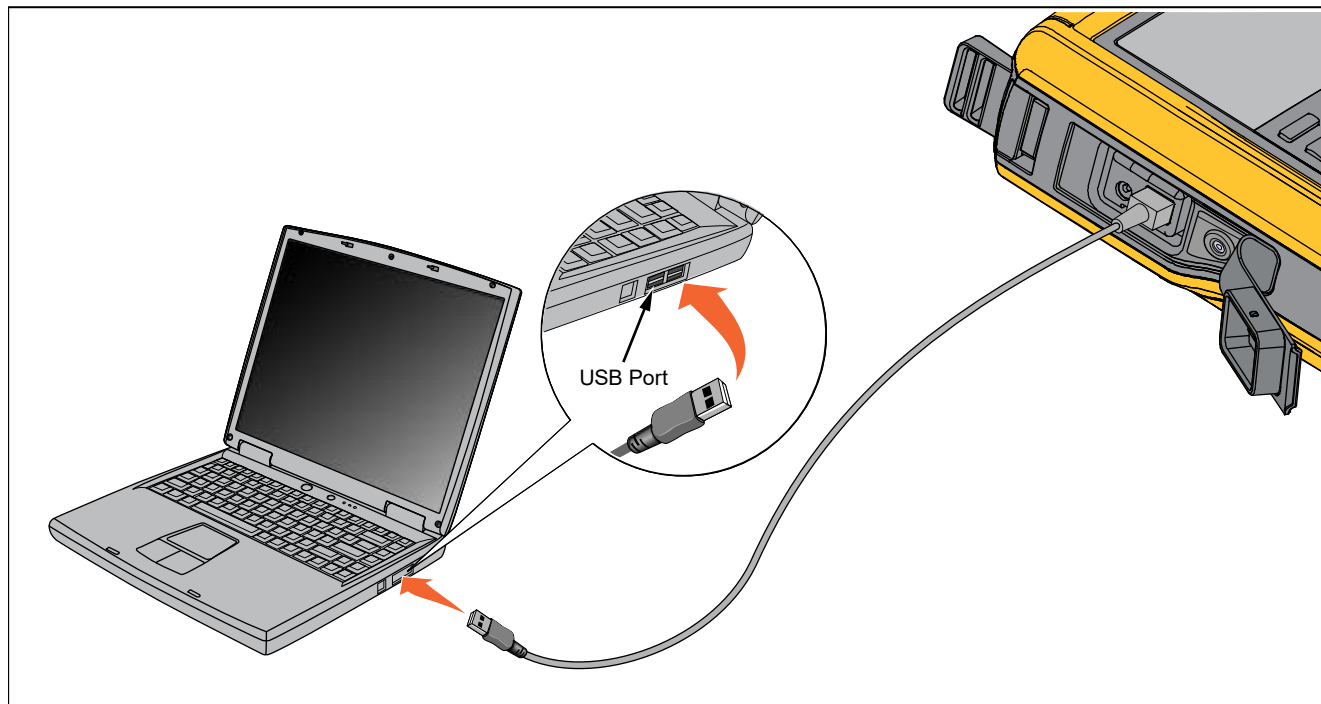
5. Push **F4** (**Start**) to begin. The Product logs the measured values of the selected source for the pre-selected duration. Push **F1** (**Abort**) to stop logging.

Results show after the Product logs the data. Push **F1** (**Abort**) or **F4** (**Done**). If you push **F4** (**Done**), enter Tag, S/N, and a User ID. The Product saves the results and are recalled under the Setup>Manage Test Results menu. Upload the logged Product data to DPCTrack2 for review in a graphical report.

## Communication with a PC

Download procedures from a PC to the Product and upload test results to a PC from the Product. A PC, Microsoft Windows, USB cable (supplied), and Fluke DPCTrack2™ application software, or a qualified Fluke partner's software are required. See the DPCTrack2 Users Manual for further instructions. See Figure 22 for the connection.

Download DPCTrack2 Trial Version Software and the DPCTrack2 Users Manual from [www.fluke.com/productinfo](http://www.fluke.com/productinfo).



idj006f.emf

**Figure 22. Connection to a PC**

## **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 24 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 charge to the input on the battery.

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

**Table 6. Typical Battery Life**

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

## **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**

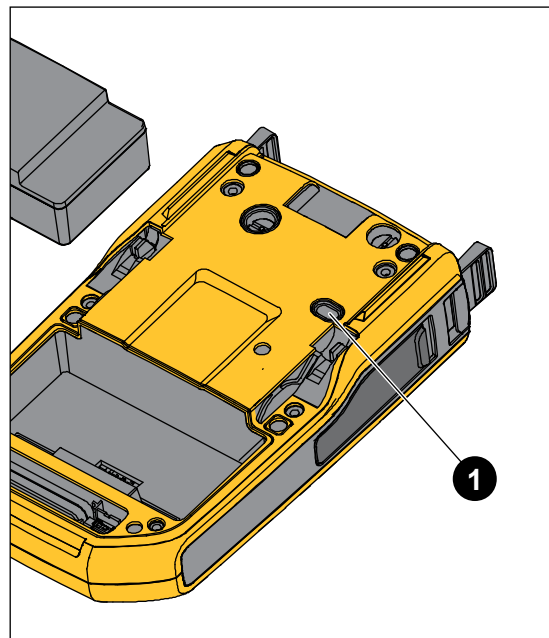
To prevent possible damage to the Product, do not use solvents or abrasive cleansers.

### **Clean the Pump Valve**

1. Remove the battery door (see *Battery Replacement*) and locate the pump valve caps, see Figure 23 (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.

The Product is now ready for use.



idj031.emf

**Figure 23. Pump Valve**



***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*.

## **Battery Replacement**

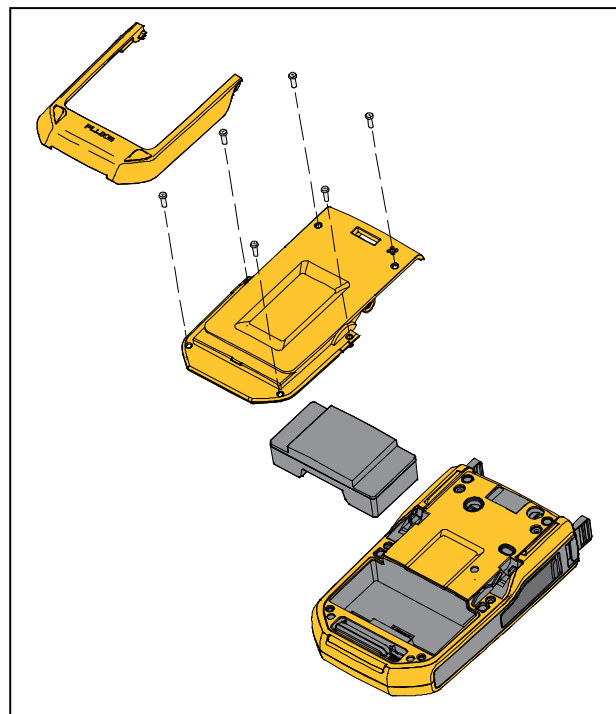
Replace the battery when it no longer holds a charge for the rated interval. The battery normally lasts for up to 300 charge/discharge cycles. To order a replacement battery, see *Contact Fluke* and *User-Replaceable Parts*.

### *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 24:

1. Push **SETUP** and select Maintenance.
2. Push **F1** (**Exhaust**) to release Product internal pressure.
3. Turn the Product Off.
4. Remove test leads.
5. Make sure the Product is unplugged from its charger.
6. Turn the Product over.
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.



idj007.emf

**Figure 24. Replace the Battery**

### **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 23).
3. Go to [www.fluke.com/productinfo](http://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.

### **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 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.

### Error Messages

The Product display shows error messages when the Product fails to meet certain conditions or there is a

problem with the configuration of the Product or test. See Table 7 to troubleshoot these issue.

**Table 7. Error Messages**

| Error Message           | Explanation                                | Potential Root Cause and Solution                                                                                                                                       |
|-------------------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Too many errors         | Too many errors, the error queue overflow. | Clear the errors with the Product user interface                                                                                                                        |
| Cannot read file        | Failed to read file from file system.      | <ol style="list-style-type: none"><li>1. File corrupted, delete the file and try again.</li><li>2. Data flash memory failure, the main PCA needs service.</li></ol>     |
| Cannot recall procedure | Failed to recall downloaded procedure.     | <ol style="list-style-type: none"><li>1. The downloaded procedure contains an illegal configuration.</li><li>2. File corrupted, download the procedure again.</li></ol> |
| Cannot store results    | Failed to store task results.              | <ol style="list-style-type: none"><li>1. Not enough space, delete some files and run the task again.</li><li>2. Delete all results and run the task again.</li></ol>    |

**Table 7. Error Messages (cont.)**

| <b>Error Message</b>                                   | <b>Explanation</b>                                        | <b>Potential Root Cause</b>                                                 |
|--------------------------------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------------|
| Filesystem fatal error                                 | Failed to load filesystem from flash memory when startup. | Data flash memory failure, the main PCA needs service.                      |
| Cannot save screen                                     | Failed to save screen into filesystem.                    | Not enough space, delete some files and try again.                          |
| Calibration error when<br>(name of step)               | Calibration failed at current step.                       | Make sure connection and reference are correct and try again.               |
| HART command failed (command<br>dependent explanation) | Error returned from HART device of<br>previous command.   | Device-dependent error, please refer to<br>user manual of HART transmitter. |
| Lost connection to PCM                                 | The link to the PCM is broken.                            | Cycle power, if error persists, the unit<br>needs service.                  |
| Lost connection to EMM                                 | The link to EMM is broken.                                |                                                                             |
| PCM temperature too high                               | The temperature of PCM reaches its high<br>limit.         | In measure mode, let the PCM cool<br>down and try the task again.           |

**Table 7. Error Messages (cont.)**

| <b>Error Message</b>                                      | <b>Explanation</b>                                                               | <b>Potential Root Cause</b>                                                                                                                                                                                                        |
|-----------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PCM pressure exceeds limit                                | The pressure of PCM exceeds its limit.                                           | Vent pressure and do the task again.                                                                                                                                                                                               |
| Failed to initial DPC memory                              | Failed to initial memory lists for documenting.                                  | <ol style="list-style-type: none"> <li>1. Clear all files and try again.</li> <li>2. Data flash memory failure, the main PCA needs service.</li> </ol>                                                                             |
| Invalid Instrument Setup, Default loaded                  | Checksum of instrument setup failed. All settings reset to their default values. |                                                                                                                                                                                                                                    |
| Zero offset too large, please vent                        | Pressure is higher than limit for zeroing.                                       | Vent pressure and zero the Product again.                                                                                                                                                                                          |
| Flash memory error                                        | Failed to initial data flash memory.                                             | Cycle power, if error persists, the main PCA needs service.                                                                                                                                                                        |
| Lost connection to external pressure module, Task aborted | Running task aborted, due to lost connection to external pressure module.        | <ol style="list-style-type: none"> <li>1. Make sure the external pressure module is connected and run the task again.</li> <li>2. Replace the external pressure module. If still undetected, the Product needs service.</li> </ol> |

**Table 7. Error Messages (cont.)**

| <b>Error Message</b>                              | <b>Explanation</b>                                                            | <b>Potential Root Cause</b>                                                                                                  |
|---------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Lost connection to HART transmitter, Task aborted | Running task aborted, due to lost connection to HART transmitter.             | Make sure the transmitter is connected and powered. Try HART polling again. After connected, rerun the task.                 |
| Lost connection to FC devices, Task aborted       | Running task aborted, due to lost connection to Fluke Connect secondary unit. | Turn on the FC secondary device and make sure FC is active. Redo the discovery process. After connected, run the task again. |
| Lost connection to RTD, Task aborted              | Running task aborted because RTD was removed.                                 | Make sure the RTD probe is connected and run the task again.                                                                 |
| Open circuit detected                             | Open circuit detected while sourcing mA.                                      | Connect the circuit properly and try again.                                                                                  |
| Invalid Task Setting                              | Task setting contains invalid items.                                          | Verify zero/full-scale value defined in the task are in the range of the selected pressure source and try again.             |

**Table 7. Error Messages (cont.)**

| <b>Error Message</b>                               | <b>Explanation</b>                                                              | <b>Potential Root Cause</b>                                                            |
|----------------------------------------------------|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Input Out Of Range                                 | Invalid input signal when calibrating.                                          | Make sure input signal is in the range of the current calibration point and try again. |
| Invalid EMM/PCM CAL constant, Factory value loaded | Checksum failed for calibration constant and factory values are loaded.         | The unit needs service for recalibration.                                              |
| Invalid EMM/PCM CAL constant, Default value loaded | Checksum failed for factory calibration constant and default values are loaded. | The unit needs service for recalibration.                                              |



**Table 7. Error Messages (cont.)**

| <b>Error Message</b>    | <b>Explanation</b>                                         | <b>Potential Root Cause</b>                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supply Pressure Too Low | Failed to create supply pressure for the current setpoint. | <ol style="list-style-type: none"><li>1. The pressure volume is too large, reduce the volume and try again.</li><li>2. The leakage of pressure volume is too large. Test the leakage and try again.</li><li>3. Ambient pressure is lower than the negative gauge setpoint. Change the negative gauge setpoint to a reasonable value at current ambient pressure.</li><li>4. The unit needs service.</li></ol> |
| Value out of range      | Value input is out of range.                               | Try to configure a valid value.                                                                                                                                                                                                                                                                                                                                                                               |
| Function not available  | Selected function is not available for the current state.  |                                                                                                                                                                                                                                                                                                                                                                                                               |
| Illegal Operation       | Illegal operation for the current state.                   |                                                                                                                                                                                                                                                                                                                                                                                                               |

### **HART Commands**

See Table 8 for Product HART commands.

**Table 8. Supported HART Commands**

| <b>Number</b> | <b>Command Description</b>                   | <b>Type</b> |
|---------------|----------------------------------------------|-------------|
| 1             | Read Primary Variable                        | Universal   |
| 2             | Read Loop Current and Percent of Range       | Universal   |
| 3             | Read Dynamic Range and Loop Current          | Universal   |
| 8             | Read Dynamic Variable Classification         | Universal   |
| 12            | Read Message                                 | Universal   |
| 13            | Read Tag, Descriptor, Date                   | Universal   |
| 14            | Read Primary Variable Transducer Information | Universal   |
| 15            | Read Device Information                      | Universal   |
| 17            | Write Message                                | Universal   |
| 18            | Write Tag, Descriptor, Date                  | Universal   |

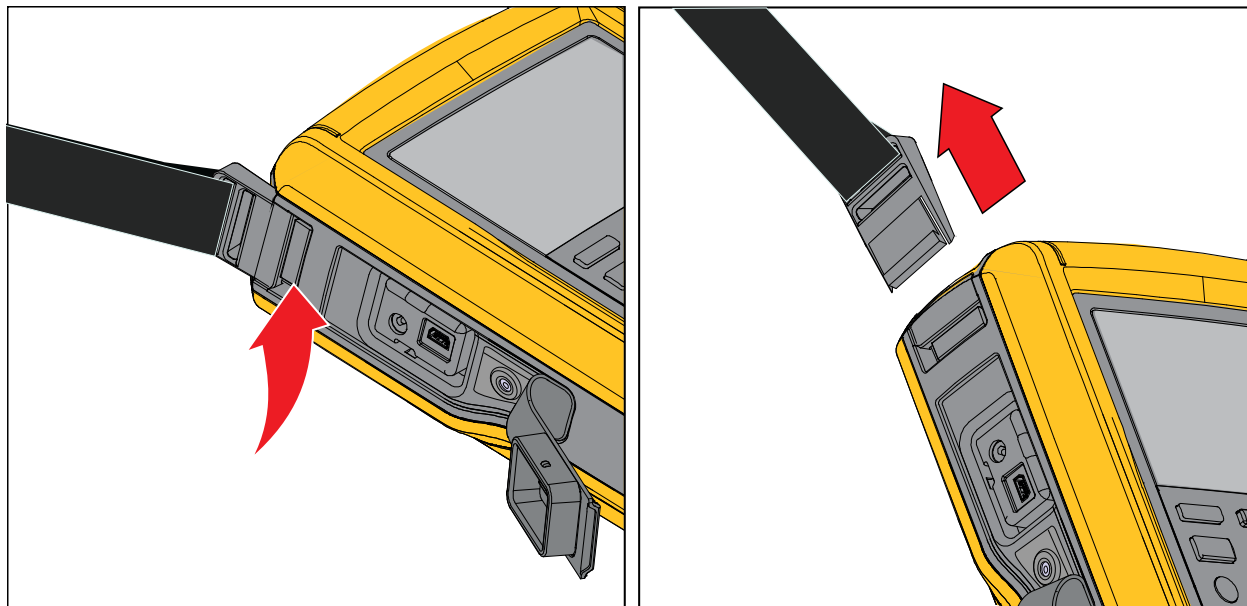
| <b>Number</b> | <b>Command Description</b>         | <b>Type</b>     |
|---------------|------------------------------------|-----------------|
| 20            | Read Long Tag                      | Universal       |
| 21            | Read Unique Identifier             | Universal       |
| 35            | Write Primary Variable Range Value | Common Practice |
| 40            | Enter/Exit Fixed Current Mode      | Common Practice |
| 41            | Perform Self Test                  | Common Practice |
| 43            | Set Primary Variable Zero          | Common Practice |
| 44            | Write Primary Variable Units       | Common Practice |
| 45            | Trim Loop Current Zero             | Common Practice |
| 46            | Trim Loop Current Gain             | Common Practice |
| 48            | Read Additional Device Status      | Common Practice |

### **Documenting Functionality**

The Product uses calibration management software to communicate with documenting software. The Product documents As Found, As Left, and single-reading results. Download tasks by pre-defined tag numbers and save the results to Product memory. Review or delete these results when necessary.

### **Strap**

Attach the Product carrying strap as shown in Figure 25. Adjust the straps as necessary to hang the Product on any sturdy support.

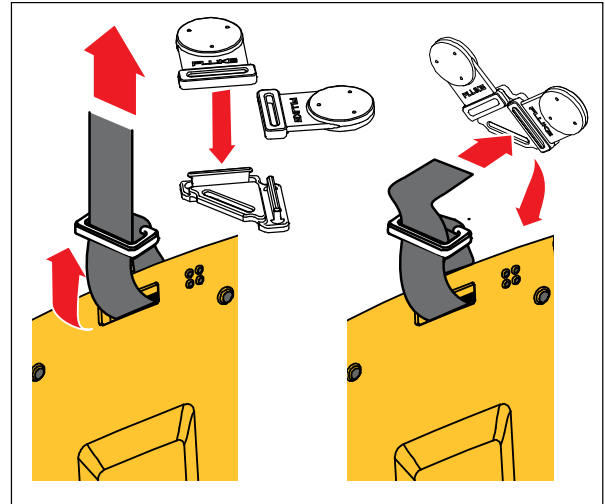


idj012.emf

**Figure 25. Product Strap**

### **Hanger Accessory**

Figure 26 shows the provided magnetic hanger accessory.



idj018.emf

**Figure 26. Hanger Accessory**

## ***User-Replaceable Parts and Accessories***

Table 9 lists replacement parts and accessories.

**Table 9. User-Replaceable Parts and Accessories**

| <b>Item No.</b> | <b>Description</b>                              | <b>Quantity</b> | <b>Fluke P/N</b> |
|-----------------|-------------------------------------------------|-----------------|------------------|
| 1               | BP729, Rechargeable Li-ion Battery              | 1               | 4817068          |
| 2               | Power Charger, AC/DC                            | 1               | 4878453          |
| 3               | Mains Adapters International (Except For China) | 1               | 2441372          |
| 4               | Line Cord, Jumper (Except China)                | 1               | 4542113          |
| 5               | Power Cable (China Only)                        | 1               | 2716592          |
| 6               | USB Cable Assembly                              | 1               | 4499448          |
| 7               | AC280, Suregrip Hook Clips                      | 1               | 1610115          |
| 8               | Alligator Clip Set                              | 1               | 3765923          |
| 9               | Cable Assembly, Stackable Test Leads Set        | 1               | 3669716          |
| 10              | TP220-1, Test Probes                            | 1               | 3971276          |

**Table 9. User-Replaceable Parts and Accessories (cont.)**

| <b>Item No.</b> | <b>Description</b>                         | <b>Quantity</b> | <b>Fluke P/N</b> |
|-----------------|--------------------------------------------|-----------------|------------------|
| 11              | Hose, Nylon                                | 3.3 Ft          | 4366602          |
| 12              | Fitting, 1/8" NPT-Female X 1/4" NPT-Female | 1               | 4366616          |
| 13              | Fitting, 1/8" Tube x 1/8" NPT-Male         | 2               | 4551693          |
| 14              | Fitting, 1/8" NPT-Female x M20-Female      | 1               | 4366633          |
| 15              | Fitting, 1/4" BSP-Female x 1/8" NPT-Female | 1               | 4366640          |
| 16              | PTFE Tape                                  | 1               | 3714052          |
| 17              | Filter                                     | 2               | 4883735          |
| 18              | Softcase                                   | 1               | 4860790          |
| 19              | Softcase Accessory                         | 1               | 4821227          |
| 20              | Shoulder Strap                             | 1               | 4850059          |
| 21              | Hanger, Dual Magnet                        | 1               | 4357287          |
| 22              | Magnet Strap                               | 2               | 4329190          |
| 23              | Strap - 9 in                               | 1               | 669960           |
| 24              | Liquid Contaminant Trap (optional)         | 1               | 4380747          |
| -               | Calibration Certificate                    | 1               | Not Shown        |
| -               | Printed Multilingual Safety Information    | 1               | Not Shown        |
| -               | Warranty Card                              | 1               | Not Shown        |

## 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<br>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 $\mu$ 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 |



**Automatic Pressure Calibrator**  
**Specifications**

---

|                                                             |                                                                                                                            |
|-------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Loop Compliance Voltage .....                               | 24 V dc @ 20 mA                                                                                                            |
| mA Simulate External Voltage Requirement .....              | 12 V dc to 30 V dc                                                                                                         |
| Temperature Measurement Only/100 $\Omega$ 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<br>when using 720 RTD probe (optional accessory) |
| Drive Capability .....                                      | 1200 $\Omega$ without HART resistor, 950 $\Omega$ with internal HART<br>resistor                                           |

**Product Models**

| Model       | Psi Range,<br>Resolution        | Bar Range,<br>Resolution        | kPa Range,<br>Resolution       | Comment                                                                              |
|-------------|---------------------------------|---------------------------------|--------------------------------|--------------------------------------------------------------------------------------|
| 729 30G     | -12.0000 psi to<br>+30.0000 psi | -0.82737 bar to<br>+2.06842 bar | -82.737 kPa to<br>+206.843 kPa | No wireless communication<br>Dry air and non-corrosive gas<br>only                   |
| 729 150G    | -12.000 psi to<br>+150.000 psi  | -0.8273 bar to<br>+10.3421 bar  | -82.73 kPa to<br>+1034.21 kPa  |                                                                                      |
| 729 300G    | -12.000 psi to<br>+300.000 psi  | -0.8273 bar to<br>+20.6843 bar  | -82.73 kPa to<br>+2068.43 kPa  |                                                                                      |
| 729 30G FC  | -12.0000 psi to<br>+30.0000 psi | -0.82737 bar to<br>+2.06842 bar | -82.737 kPa to<br>+206.843 kPa | Wireless communication for<br>Fluke Connect<br>Dry air and non-corrosive gas<br>only |
| 729 150G FC | -12.000 psi to<br>+150.000 psi  | -0.8273 bar to<br>+10.3421 bar  | -82.73 kPa to<br>+1034.21 kPa  |                                                                                      |
| 729 300G FC | -12.000 psi to<br>+300.000 psi  | -0.8273 bar to<br>+20.6843 bar  | -82.73 kPa to<br>+2068.43 kPa  |                                                                                      |

| <b>Model</b>  | <b>Psi Range,<br/>Resolution</b> | <b>Bar Range,<br/>Resolution</b> | <b>kPa Range,<br/>Resolution</b> | <b>Comment</b>                                                                                     |
|---------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------|
| 729CN 200K    | -12.0000 psi to<br>+30.0000 psi  | -0.82737 bar to<br>+2.06842 bar  | -82.737 kPa to<br>+206.843 kPa   | For China, no wireless<br>communication<br>Dry air and non-corrosive<br>gas only                   |
| 729CN 1M      | -12.000 psi to<br>+150.000 psi   | -0.8273 bar to<br>+10.3421 bar   | -82.73 kPa to<br>+1034.21 kPa    |                                                                                                    |
| 729CN 2M      | -12.000 psi to<br>+300.000 psi   | -0.8273 bar to<br>+20.6843 bar   | -82.73 kPa to<br>+2068.43 kPa    |                                                                                                    |
| 729CN 200K FC | -12.0000 psi to<br>+30.0000 psi  | -0.82737 bar to<br>+2.06842 bar  | -82.737 kPa to<br>+206.843 kPa   | For China, wireless<br>communication for Fluke<br>Connect<br>Dry air and non-corrosive<br>gas only |
| 729CN 1M FC   | -12.000 psi to<br>+150.000 psi   | -0.8273 bar to<br>+10.3421 bar   | -82.73 kPa to<br>+1034.21 kPa    |                                                                                                    |
| 729CN 2M FC   | -12.000 psi to<br>+300.000 psi   | -0.8273 bar to<br>+20.6843 bar   | -82.73 kPa to<br>+2068.43 kPa    |                                                                                                    |
| 729JP 200K    | N/A                              | N/A                              | -82.737 kPa to<br>+206.843 kPa   | For Japan, no wireless<br>communication<br>Dry air and non-corrosive<br>gas only                   |

| <b>Model</b>  | <b>Psi Range,<br/>Resolution</b> | <b>Bar Range,<br/>Resolution</b> | <b>kPa Range,<br/>Resolution</b> | <b>Comment</b>                                                                                     |
|---------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------|
| 729JP 1M      | N/A                              | N/A                              | -82.73 kPa to<br>+1034.21 kPa    | For Japan, 1 MPa range, no<br>wireless communication<br>Dry air and non-corrosive<br>gas only      |
| 729JP 2M      | N/A                              | N/A                              | -82.73 kPa to<br>+2068.43 kPa    | For Japan, 2 MPa range, no<br>wireless communication<br>Dry air and non-corrosive<br>gas only      |
| 729JP 200K FC | N/A                              | N/A                              | -82.737 kPa to<br>+206.843 kPa   | For Japan, wireless<br>communication for Fluke<br>Connect<br>Dry air and non-corrosive<br>gas only |
| 729JP 1M FC   | N/A                              | N/A                              | -82.73 kPa to<br>+1034.21 kPa    |                                                                                                    |
| 729JP 2M FC   | N/A                              | N/A                              | -82.73 kPa to<br>+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<br>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)<br>≤90 % RH (at 10 °C to 30 °C)<br>≤75 % RH (at 30 °C to 40 °C)<br>≤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)<br>Charge input 19.5 V, 1.6 A. |

## Electromagnetic Compatibility (EMC)

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| International.....        | IEC 61326-1: Basic Electromagnetic Environment;<br>CISPR 11: Group 1, Class A<br><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><br><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><br><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)<br><i>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.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Frequency.....            | 2402 MHz to 2480 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Output Power.....         | <100 mW                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |