

APPLICATION NOTE

Automating the calibration of analog output pressure transmitters using the 2271A Industrial Pressure Calibrator

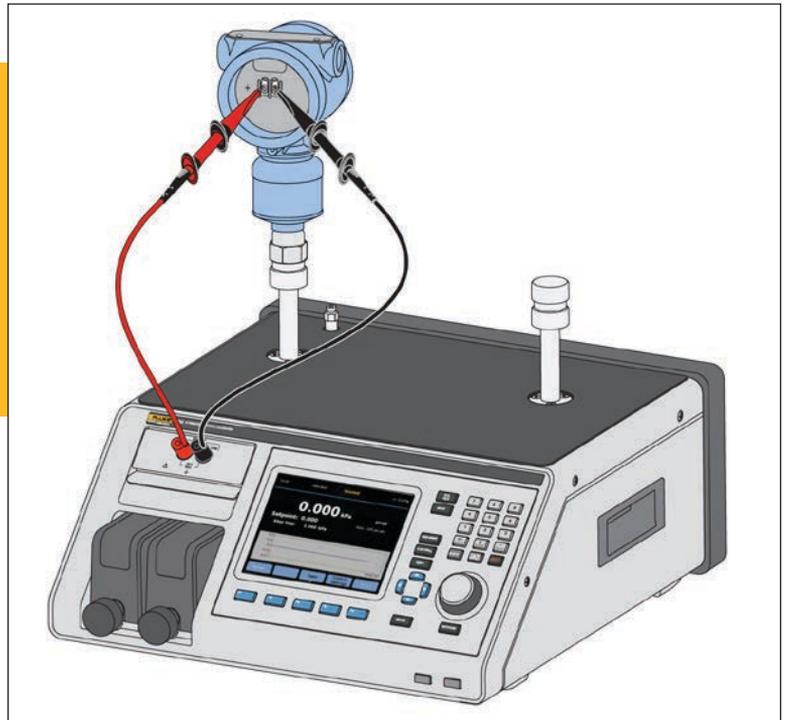
Pressure transmitters are used in a variety of different applications, many of them mission critical, such as determining the flow of fluids through a pipeline or ensuring process integrity in a process plant. Therefore, process professionals must test and calibrate these pressure transmitters regularly.

This application note explains how to automate that testing and calibration with the Fluke Calibration 2271A Automated Pressure Calibrator. The 2271A includes everything you need to calibrate and test pressure transmitters from 10 in of water to 3000 psi, all in one simple-to-automate box.

Setting up the equipment

The 2271A has two identical vertical test ports on top of the unit. Connecting bottom-mount pressure transmitters using the provided hand-tight adapters is easy and straightforward. If the transmitter's pressure port is located on its side, then you can run a pressure line from the 2271A test port to the device under test (DUT).

The 2271A includes test leads to make electrical connections easy and convenient. The specifications for connecting any specific transmitter may vary depending upon the manufacturer, so consult the documentation provided with the transmitter for detailed directions.



Confirming electrical connections



Figure 1. Showing 4.000 mA measurement

It is best to validate that you have made the proper electrical connections before you start the automated test. To validate the connections, press the **mA/VDC** button on the 2271A front panel. The bottom half of the display shows the mA measurement. It reads 0 mA at this point, assuming that you are not using an external device to power the transmitter. Press **F5** to turn the 24 V loop power on. Depending on the transmitter's range, the transmitter should now be reading approximately 4 mA with the pressure vented to atmosphere.

Setting up the program

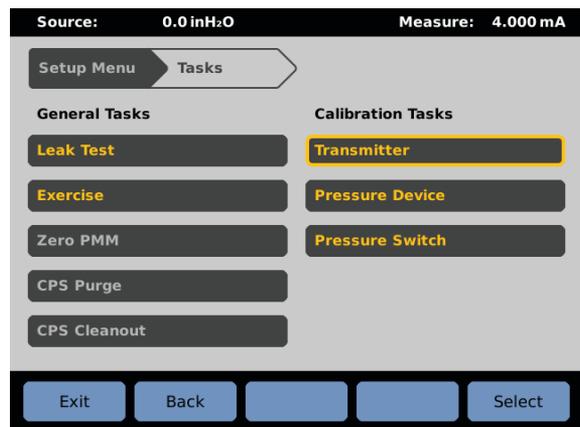


Figure 2. Task menu

To access the programmable tasks, press the **F3** key. The right hand column lists the **Calibration Tasks**. Use the jog wheel or arrow keys to highlight **Transmitter** and press **Enter**. This takes you to the **Transmitter Task** screen, where you can choose an already generated program or create a new one.

Creating a new program

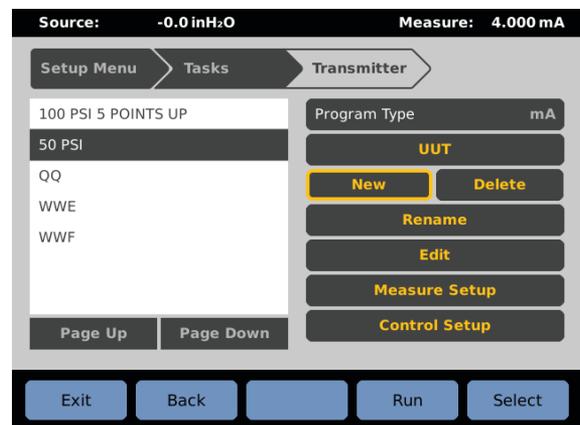


Figure 3. Transmitter Task Screen with New highlighted

Select **New** using the jog wheel (when you first enter the **Transmitter Task** screen, **New** is selected) and press **Enter**. This takes you to the keyboard screen, where you can enter a name for the procedure. Once you have keyed in the name of the procedure, press **F3** to save the name.



Figure 4. Keypad

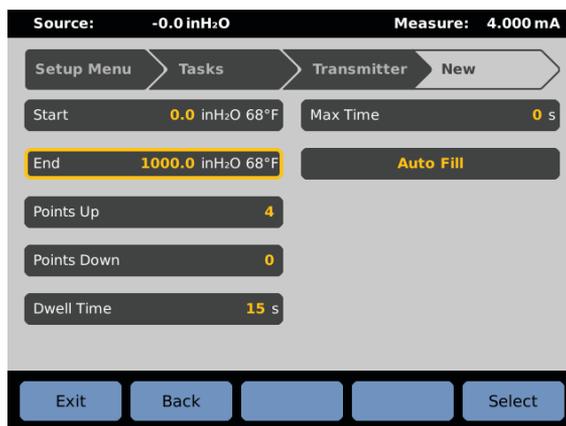


Figure 5. Analog transmitter block diagram

You now see a screen that allows you to auto fill the procedure with a set of pressure points. Enter the starting and ending procedure and the number of points in each direction. When determining the number of points, the first point doesn't count. For example, if you want to do 25 psi increments to 100 psi (0, 25, 50, 75, 100) then you enter 4 points up. You can also specify a dwell time (the amount of time after the controller is ready at a set point before it records the reading) and max time. Max time is the maximum amount of time it will take to get to a set point before the controller reports an error. This is useful if the procedure is going to run unsupervised, because it ensures that it doesn't try to endlessly control into a very large leak. A max time setting of 0 turns off this feature. After selecting **Auto Fill**, the 2271A asks if you want the first point set to **ATM**. If a point is set to **ATM**, the controller vents at that point instead of trying to control

O. This is preferable in most applications. You now see the **Edit** screen for the newly created procedure.

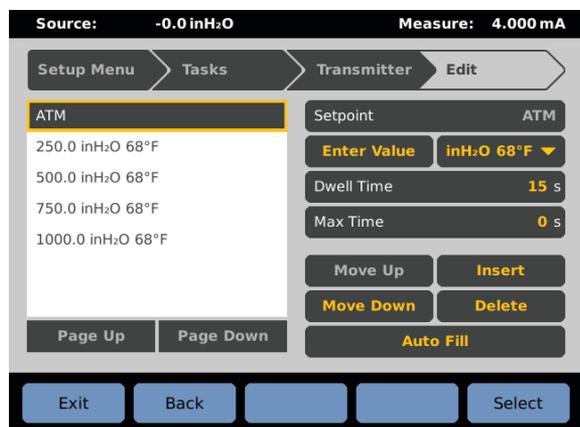


Figure 6. Edit screen

Editing a program

To reach the **Edit** screen, create a new procedure (as described above) or edit a previously generated procedure from the **Transmitter Task** screen. While in the **Transmitter Task** screen, use the jog wheel to highlight the list of procedures in the white box on the left. Use the **up** and **down arrow** keys to highlight the desired procedure in the list and press enter. Then use the jog wheel to select Edit on the right side of the screen.

In the **Edit** screen you can modify the settings for each pressure point. First, use the jog wheel to highlight the list of points in the white box on the left. Then use the **up** and **down arrows** to scroll through the list and press Enter once you have selected the desired setpoint. Then you can use the jog wheel to highlight the setting you wish to change. You can change the setpoint pressure value (or change it to an ATM point) as well as the dwell time and max time for each point.

In addition to editing an individual point, you can change the order of points or add additional points by using the **Move Up**, **Move Down**, **Insert**, and **Delete** functions.

Once you have completed editing the procedure, press **F2** to go back to the **Transmitter Task** screen.

Setting up the device under test

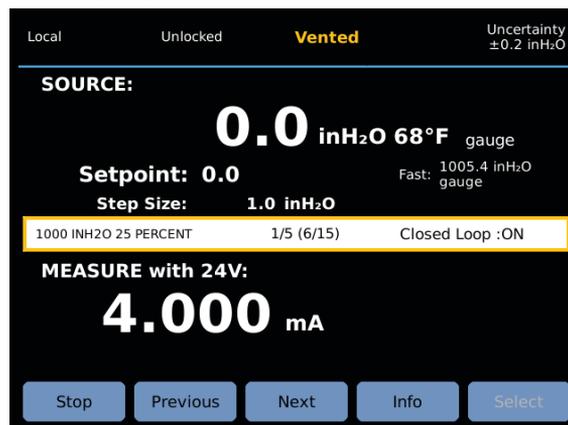


Figure 7. Analog transmitter block diagram

Once the program has been configured, you can configure the DUT so that the DUT output will be collected and analyzed automatically. Use the jog wheel to highlight **DUT** on the **Transmitter Task** screen (make sure that the correct program is selected in the list on the left). Enter the zero and full scale values for the transmitter. You can then specify a pass/fail tolerance. The tolerance can be specified as a percentage of reading, percentage of span, or in the selected pressure units. The 2271A will use this calculating method and the specified allowable error to determine if each set point is in or out of tolerance.

For a fully automated test, set **Closed Loop** to **On**. This setting enables the 2271A to control to each setpoint, wait for the defined dwell time, and then take and record the pressure and current measurement. If **Closed Loop** is set to **Off**, the 2271A waits at each pressure point for the user to press **OK** before proceeding. Press **F2** to go back to the **Transmitter Task** menu.

Running the procedure

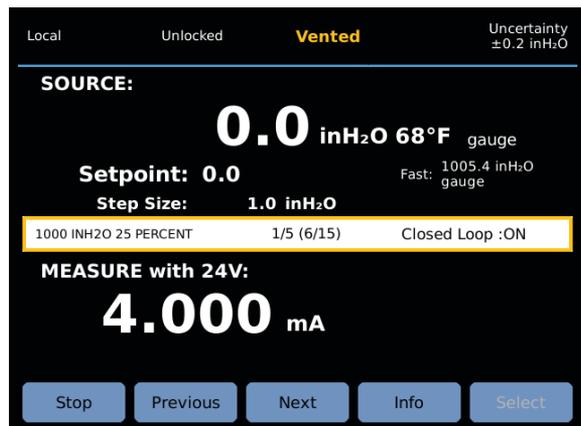


Figure 8. Analog transmitter block diagram

To run the procedure from the **Transmitter Task** screen, select the correct procedure in the list on the left, then press **F4** to run the procedure. This brings up the keyboard screen, where you can type in the ID for the DUT. This can be the serial number or ID tag, depending upon what is required by your quality policy. To enter in numbers, select the **& 123** button in the bottom right or use the physical keypad on the 2271A front panel. Once you have entered the ID, press **F3** to continue. This starts the actual calibration process. It goes to each requested setpoint, dwells for the specified time, and then collects data.

Viewing the results

Results files can be copied to a computer using the USB port. Connect the 2271A to a computer using a USB-A-to-USB-B cable. The USB port on the 2271A can be set to emulate an RS-232 port. This needs to be turned off to allow the copying of results files. The RS-232 emulation mode can be toggled on and off in the **SETUP|Instrument Setup|Remote Port|USB** setup menu. With the RS-232 emulation mode turned off, the 2271A appears as a drive on the computer. The results files can then be copied from the 2271A onto the computer.

Summary

Automation is a useful tool to improve the reproducibility and efficiency of your calibrations. By using the built-in tools available with the 2271A Industrial Pressure Calibrator, you can automate your pressure calibrations quickly and easily without needing specialized support software on a PC.



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