

Multifunction calibration using the 7526A Precision Process Calibrator

The flexibility and precision measurement capabilities of the 7526A Precision Process Calibrator make it the ideal tool to handle multifunction calibration (voltage, current, thermocouple, RTD and pressure). This application note provides examples of how to calibrate a Rosemount 3144 Temperature Transmitter and Rosemount 3051 Pressure Transmitter. These two transmitters are widely used in the process control industry and provide an excellent starting point to become familiar with the 7526A features and interface (Figure 1). Please take time to review the 7526A user's manual and device specifications before beginning.

Calibrating a Rosemount 3144 Temperature Transmitter

The transmitters covered in this application note are HART smart two-wire devices that require loop power. The 7526A features a fully isolated measurement channel which can be used to power the 24 V dc loop, monitor current, and provide the 250 Ω HART resistor; enabling direct connection to a HART communicator.

This example calibrates a Rosemount 3144 Temperature Transmitter that is set up to measure a single Type J thermocouple. To calibrate the Rosemount 3144, an A/D trim or two-point sensor trim is performed. A sensor trim allows for alteration of the transmitter's input to a known NIST traceable source. In this case, the temperature is simulated from the

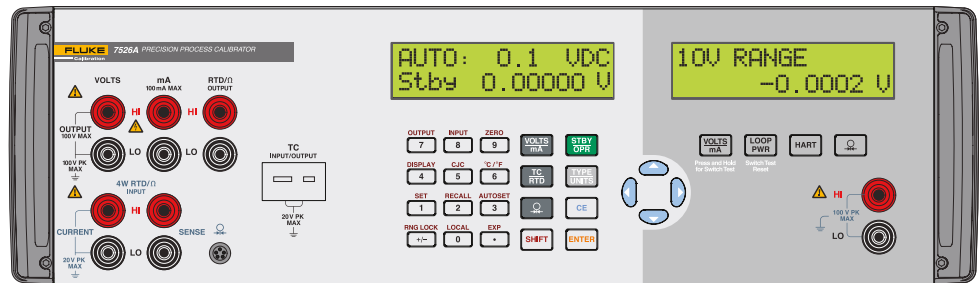


Figure 1. Fluke Calibration 7526A interface.

7526A to the transmitter. This process adjusts both the slope and offset of the original factory curve fit. To perform the sensor trim, an external HART communicator is needed to execute the digital commands. In addition, the 4–20 mA output on the isolated measurement channel is monitored and used to determine if a D/A trim is required.

Follow these steps:

1. Power on the 7526A and allow it to warm up.
2. Disconnect any test leads on the device under test.
3. Connect a Type J mini connector into the TC input/output jack as shown in Figure 2. Make sure to use a Type J thermocouple (typically black).
4. Connect the bare ends of the thermocouple wire to terminals 2 (+) and 3 (–) of the transmitter and run power as shown in Figure 2, ensuring that the polarity of the circuit is connected correctly.
5. Select the TC/RTD button and toggle to TC.

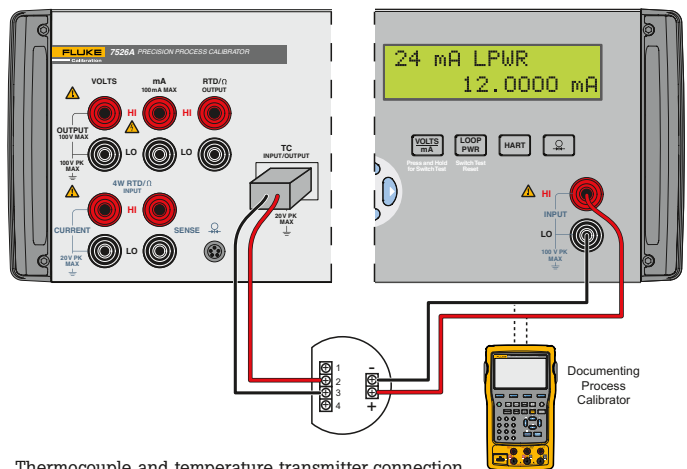


Figure 2. Thermocouple and temperature transmitter connection.

6. Once in TC mode, cycle through the thermocouple types to Type J by using the Type/Units key.
7. Select Shift and Output (#7) to source temperature. Key in 0.0 °C and press Enter.
8. Select the mA, loop power, and the HART option on the isolated side. The mA reading will be displayed if all selections are made correctly.
9. Connect a HART communicator or equivalent across the 24 V dc power connections. Power on the device and verify communication. Save the transmitter configuration and perform an "As Found" measurement before making any changes to the transmitter. This documents the current state of the transmitter.
10. Navigate to the Rosemount Sensor calibration, lower and upper trim methods. A complete Menu Tree for the Rosemount 3144 can be found in the product reference manual.
11. Verify that the temperature unit of measure on the 7526A matches that of the HART communicator.
12. Apply the Lower Trim point or Offset by entering the value requested by the HART communicator. This is typically a negative value. Follow screen prompts and proceed to the Upper Trim point or Slope.
13. Apply the Upper Trim point and follow screen prompts to complete the A/D calibration.
14. Verify the 4-20 mA output meets published transmitter specifications by performing a D/A trim. Since the connections are already made, simply follow the prompts from the communicator and verify the analog output on the 7526A.

Get it done faster-quick tip


Save time when testing several transmitters that have the same range by using the available nine preset output setpoints. They may be recalled on an individual basis, or as an automatic up and down cycle with configurable dwell time between each setpoint.

Automatic setpoint cycle setup:

1. Select the output mode desired. Example: TC OUT
2. Press the Shift Key and Autoset (#3 Key) to select the AUTOSET function.
3. At the selection prompt for the sequence ending setpoint number (AUTO SET POINT#), press the numeric key, 1-9, corresponding to the final setpoint number of the sequence.
4. At the prompt "DWELL TIME", "5-500?", enter the number of seconds (5 to 500) for the dwell time at each setpoint value, followed by the Enter key.
5. Press any other key to terminate the cycle.

Adding a Fluke 700 Series Pressure Module

To calibrate a pressure transmitter, the pressure measurement capability needs to first be configured for the 7526A. Follow these steps:

1. Connect the Fluke 700 Series Pressure Module as shown in Figure 3.
2. Press the  pressure key. The 7526A will sense the pressure module automatically.

3. Press the Type/Units key to select desired units.

It is important to review the recommended calibration procedure and tolerances required by the manufacturer to ensure the proper pressure module is selected. The pressure transmitter used in this application note is a simple gage unit that is referenced to atmospheric pressure.

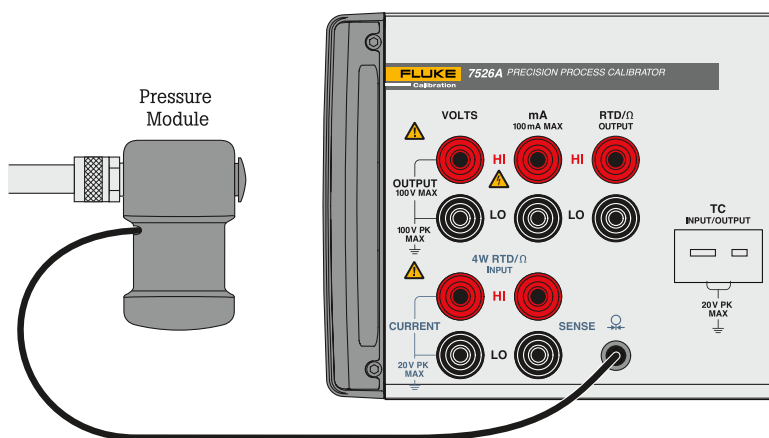


Figure 3. Pressure module connection.

Calibrating a Rosemount 3051 Pressure Transmitter

Follow these steps to calibrate the Rosemount pressure transmitter:

1. Make the necessary connections to the pressure module, pressure source, and pressure transmitter as shown in Figure 4. Connections must be leak free for proper calibration. Connect to the High Side (H) and make sure the Low Side (L) is vented to atmosphere.
2. Connect the test leads from the transmitter to the HI (+) and LO (-) terminals, ensuring that the polarity of the circuit is connected properly as illustrated.
3. Select loop power and the HART option on the isolated side. The mA reading will be displayed if all connections are made correctly.
4. Vent the pressure source to atmosphere and press the Shift key and Zero (#9 key) to establish a good zero. Close the valve on the pressure source to begin calibration. The 7526A should be reading close to 4.0000 mA.
5. Connect the HART communicator or equivalent across the 24 V dc power connections. Power on the device and verify communication.
6. Navigate to the Rosemount sensor calibration, lower and upper trim methods. A complete menu tree for the Rosemount 3051 can be found in the product reference manual.
7. Verify that the pressure units of measure on the 7526A match those of the HART communicator.
8. Apply the Lower Trim point requested by the HART communicator by adjusting the pressure source. This is typically zero for pressure. Follow screen prompts and proceed to the Upper Trim point.
9. Apply the Upper Trim point and follow screen points to complete the A/D calibration.
10. Verify the 4-20 mA output meets published transmitter specifications by performing a D/A trim. Since the connections are already made, simply follow prompts from the communicator and verify the analog output on the 7526A.

Save the transmitter configuration and perform an "As Found" measurement before making any changes to the transmitter. This documents the current state of the transmitter.

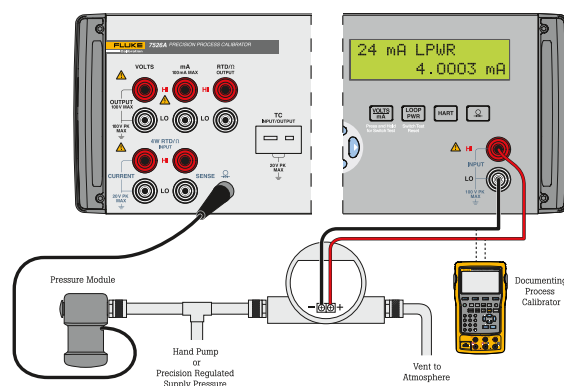


Figure 4. Pressure module, source, and transmitter connection.

Summary

The 7526A Precision Process Calibrator is a versatile benchtop instrument for multifunction calibration. This application note has illustrated how the 7526A is used to calibrate two transmitters that are popular in the process control industry—the Rosemount 3144 Temperature Transmitter and Rosemount 3051 Pressure Transmitter. Since the 7526A can simultaneously source and measure voltage, current or resistance, it can calibrate a range of other process tools beyond temperature and pressure transmitters. These tools include RTD and thermocouple readouts, pressure gauges, digital process simulators, data loggers, multi-meters, and more.



Thermocouple transmitter calibration

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