Additel

Metrology Made Simple

ADT151
Calibration Manual

ADT151 Calibration Manual

1.0 – Scope

The Additel ADT151 series are pressure modules designed with flexibility and efficiency in mind. These modules are interchangeable within the ADT7X3 series of pressure controllers. With a wide variety of ranges and high accuracy, these modules meet the demanding needs of customers while also providing versatility in their applications. Please read this document carefully before attempting to perform any type of verification or adjustment. Also ensure that the operator has the metrological expertise and equipment to perform the work.

2.0 – References

- Additel 773, 783, and 793 User Manual
- Additel 151 Digital Pressure Module Datasheet
- Additel 161 Intelligent Digital Pressure Modules Datasheet

3.0 – Recommended Equipment and Specifications

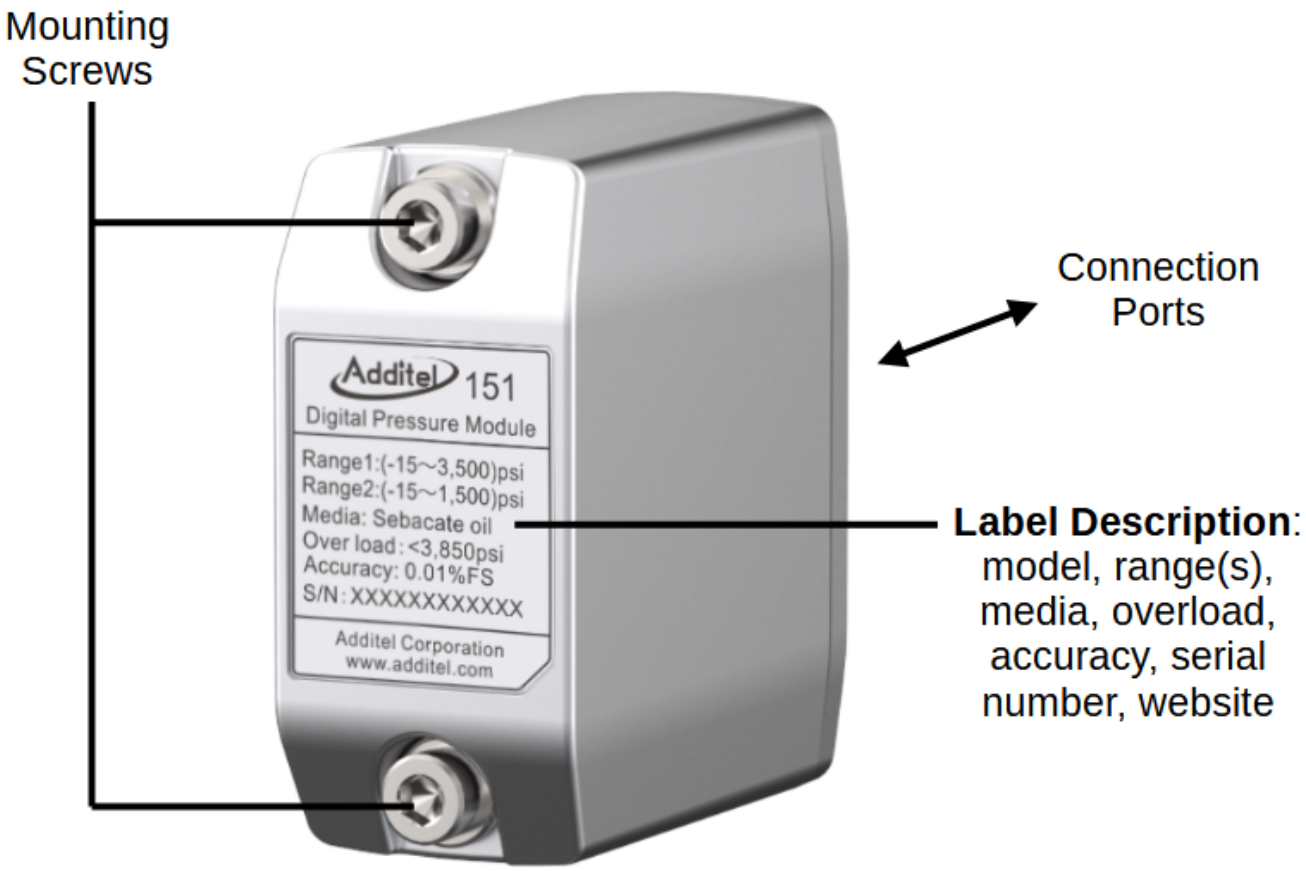
Equipment	Specifications	Recommended Model/ Item Number/Description
Pressure Controller	Applicable to the ADT151 pressure ranges	ADT773, ADT783, ADT793
Reference Standard Modules	Applicable to the ADT151 pressure ranges	ADT151, ADT161
Manifold	Applicable to the ADT151 pressure ranges	ADT121, ADT123
Hoses	Applicable to the ADT151 pressure ranges	silicone tubes, ADT100-HTK's
Fixtures and connections	Calibration fixture for ADT151 (includes adapter base w/ ¼ BSP male fitting, RS232/power supply cable, and 9V adapter)	9054
Software	Additel 9054 Module Adjustment Software	Additel Fit

4.0 – Environmental Conditions

- Ideal Temperature and Humidity Conditions:
  - 23 ± 5°C with less than 80% relative humidity

5.0 – General Diagrams and Descriptions

Diagram 5.1
(Basic Structure)



6.0 – Calibration Procedure

6.1 – Exercise & Zero

6.1.1 – Exercise

1) Connect the module to the appropriate pressure system and ensure that all connections are sealed to prevent any pressure leakage. Refer to the following diagrams and tables for the different configurations of pressure connection (external or internal).

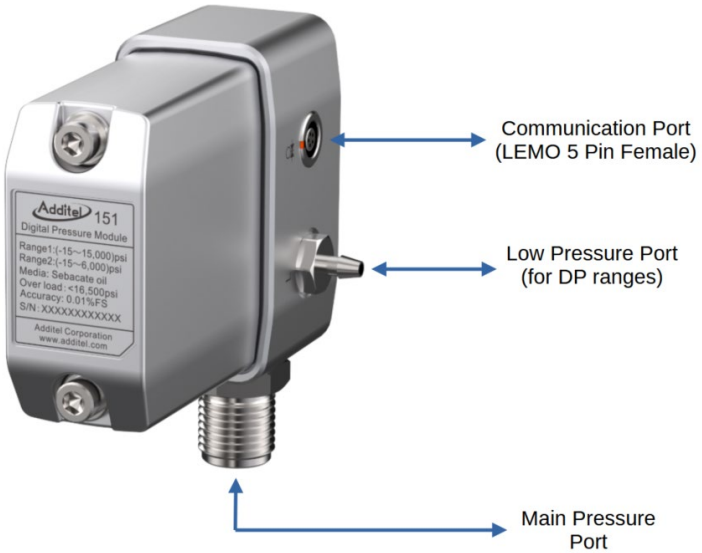


Diagram 6.1
(External Configuration - Using 9054 Fixture)

Diagram 6.2
(Internal Configuration - Using 7X3 Controllers)

Table 6.1
(Module Range Configuration - Using 773 Controller)

	ADT773-LLP	ADT773-D
High Module	DP30~DP400 (inH2O)	DP100~DP2.8K (inH2O)
Low Module	DP2~DP400 (inH2O)	DP100~DP2.8K (inH2O)
Barometer	60~110 (kPa.a)	

Table 6.2
(Module Range Configuration - Using 783 Controller)

	ADT783-D	ADT783-1K	ADT783-3.6K	ADT783-6K
High Module	DP40~DP1K (inH2O)	CP100~CP1K (PSI)	CP2K~CP3.6K (PSI)	CP2K~CP6K (PSI)
Low Module	DP20~DP1K (inH2O)	CP15~CP1K (PSI)	CP150~CP3.6K (PSI)	CP150~CP6K (PSI)
Barometer	60~110 (kPa.a)			

Table 6.3
(Module Range Configuration - Using 793 Controller)

	ADT793
Module Range	CP3K~GP15K (PSI)
Barometer	60~110 (kPa.a)

*ADT793 only has two pressure module bays:
Middle (for CP/GP ranges) and Right (for Barometer)

- NOTE: Please ensure that all equipment is rated to handle the maximum pressure of the unit under test.

2) Ensure that the device is set to measure pressure.
3) Pressurize the system to the lower limit range of the unit and allow it to stabilize for a sufficient amount of time. Additel typically allows 60 seconds of stabilization time.
4) Pressurize the system to the upper limit range of the unit and allow it to stabilize for a sufficient amount of time.
5) Repeat the lower and upper limit exercise for an additional two cycles then vent the system when done.

6.1.2 – Zero

1) Vent the system for a sufficient amount of time to allow any trapped gas to escape.
2) Using the calibration software or controller, manually zero the module before pressure verification.
   - NOTE: The 151 should not be zeroed when in absolute pressure mode because doing so will add an offset to the test values.

6.3 – Pressure Verification

- ADT151's can undergo pressure verification using the 9054 fixture (external) or within the ADT7X3 pressure controllers (internal). Navigate to the proper section based on the verification configuration.

6.3.1 - External Configuration (using the 9054 fixture)

1) Ensure the Unit Under Test - UUT (ADT151) is secured within the 9054 fixture and connected to the appropriate pressure system. Refer to Diagram 6.1.
2) Ensure that the correct reference standards are being used for an acceptable TUR and the system is sealed properly in order to prevent any leakage.
3) Ensure that the readout device being used is set to measure pressure.
4) Determine the test points for the appropriate range. Additel uses the following:
   - **Gauge Pressure – GP** typically has 9 test points:

   (0%, 25%, 50%, 75%, 100%, 75%, 50%, 25%, 0%) max range

   Example: GP100 test points are (0, 25, 50, 75, 100, 75, 50, 25, 0) psi.

   - **Compound Pressure – CP** typically has 11 test points:

   (-13psi, -7.25psi, 0%, 25%, 50%, 75%, 100%, 75%, 50%, 25%, 0%) max range

   Example: CP100 test points are (-13, -7.25, 0, 25, 50, 75, 100, 75, 50, 25, 0) psi.

   - **Differential Pressure – DP** typically has 9 test points:

   (-100%, -75%, -50%, -25%, 0%, 25%, 50%, 75%, 100%) max range

   Example: DP100 test points are (-100, -75, -50, -25, 0, 25, 50, 75, 100) inH20.

   - **Barometric Pressure – BP** typically has 4 test point:

   (60, 80, 100, 110) kPa.a.
5) Source the correct amount of pressure for each test point. Note: Each range should be verified independently of one another, even for dual ranged modules.

6) Allow appropriate time for each test point to stabilize and record each measured value.

7) Compare the reference and UUT test values for the pressure verification. Additel recommends maintaining less than 50% of the tolerance limit.

6.3.2 - Internal Configuration (within ADT7X3 controllers)

1) Ensure the Unit Under Test - UUT (ADT151) is secured within the correct module bay for the appropriate 7X3 controller. Refer to Diagram 6.2 and Tables 6.1-6.3.

2) Ensure that the correct reference standards are being used for an acceptable TUR and the system is sealed properly in order to prevent any leakage.

3) Ensure that the correct internal pressure module range is being tested. Press the internal module option (top-left) on the main display of the controller and select the appropriate range.

4) Ensure that the controller is set to measure. Press Measure from the row of actions (bottom) on the main display of the controller.

5) Determine the test points for the appropriate range. Additel uses the following:

- **Gauge Pressure – GP** typically has 9 test points:

(0%, 25%, 50%, 75%, 100%, 75%, 50%, 25%, 0%) max range

Example: GP100 test points are (0, 25, 50, 75, 100, 75, 50, 25, 0) psi.

- **Compound Pressure – CP** typically has 11 test points:

(-13psi, -7.25psi, 0%, 25%, 50%, 75%, 100%, 75%, 50%, 25%, 0%) max range

Example: CP100 test points are (-13, -7.25, 0, 25, 50, 75, 100, 75, 50, 25, 0) psi.

- Differential **Pressure – DP** typically has 9 test points:

(-100%, -75%, -50%, -25%, 0%, 25%, 50%, 75%, 100%) max range

Example: DP100 test points are (-100, -75, -50, -25, 0, 25, 50, 75, 100) inH20.

- **Barometric Pressure – BP** typically has 4 test point:

(60, 80, 100, 110) kPa.a.

6) Source the correct amount of pressure for each test point. Note: Each range should be verified independently of one another, even for dual ranged modules.
7) Allow appropriate time for each test point to stabilize and record each measured value.
8) Compare the reference and UUT test values for the pressure verification. Additel recommends maintaining less than 50% of the tolerance limit.

6.4 – Pressure Calibration

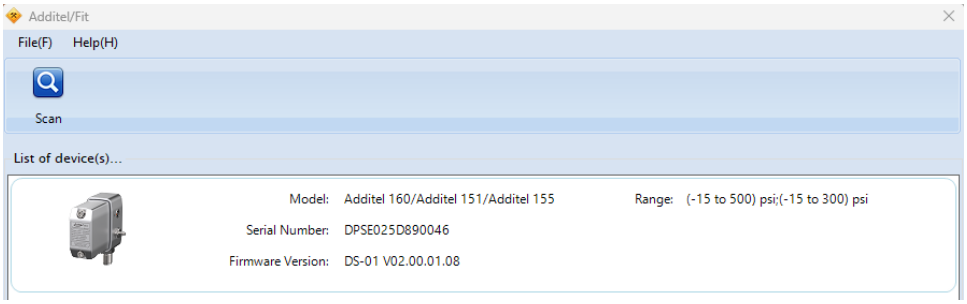
- ADT151's can undergo pressure calibration using the 9054 fixture (external) or within the ADT7X3 pressure controllers (internal). Navigate to the proper section based on the calibration configuration.

6.4.1 – External Configuration (using the 9054 fixture)

1) Ensure that the ADT151 is connected to a computer that has Additel Fit installed.

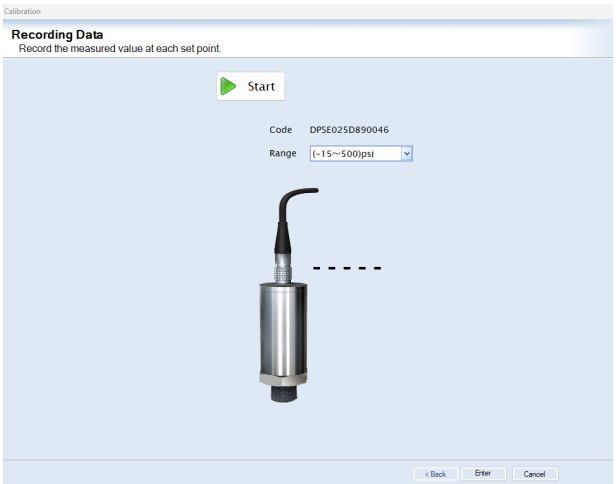
   Note: This software can be downloaded from the Additel website.

2) Open up the Additel Fit software. Click **Scan** (top-left) to search for the connected devices. Select the module that needs calibration from the List of device(s).



3) Ensure that the Code depicts the correct serial number of the unit. Select the proper range from the drop down options and click **Enter** (bottom-right) to continue.

   Note: For dual range modules, select the higher range to adjust.



4) Ensure that the Number of calibration points (top-right) is correct.

- **DP (dual range)** typically has 5 calibration points: lower limit range 1, lower limit range 2, zero, upper limit range 2, and upper limit range 1.

  Example: DP100 has (-100, -50, 0, 50, 100) inH2O calibration points.

- **CP (dual range)** typically has 4 calibration points: lower limit, zero, upper limit range 2, and upper limit range 1.

  Example: CP100 has (-13, 0, 50, 100) psi calibration points.

- **CP…M (single range, high accuracy)** typically has 3 calibration points: lower limit, zero, and upper limit.

  Example: CP100M has (-13, 0, 100) psi calibration points.

- **GP (dual range)** typically has 3 calibration points: zero, upper limit range 2, and upper limit range 1.

  Example: GP10K has (0, 5K, 10K) psi calibration points.

- **GP…M (single range, high accuracy)** typically has 2 calibration points: zero and upper range.

  Example: GP10KM has (0, 10K) psi calibration points.

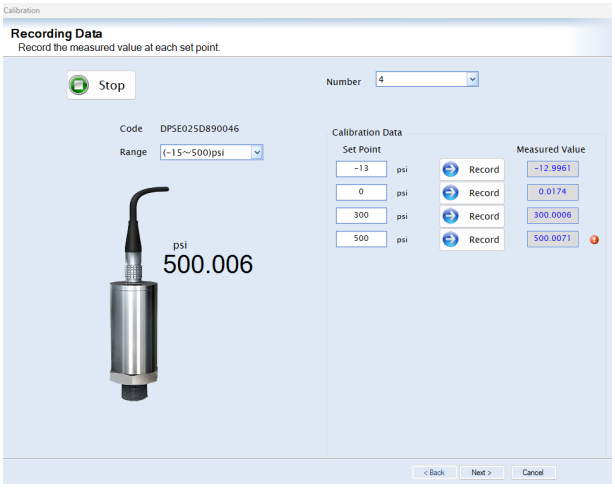
- **BP and BPH** typically have 2 calibration points: lower limit and upper limit.

  Example: BP has (60, 110) kPa.a calibration points.

5) A column of Set Points (calibration points) are located under the Calibration Data section. These points can be edited, if needed.

6) Click **Start** (top-left) to begin recording the data.

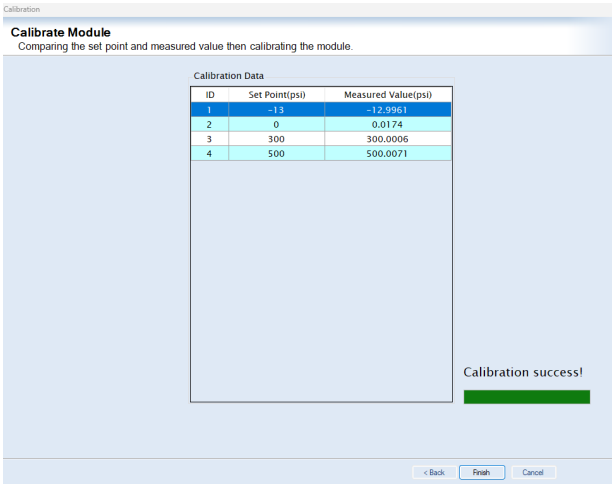
7) Source the first set point and allow enough time for the pressure to stabilize. Click **Record** at the right of the set point. The Measured Value for that set point should be recorded. Repeat this step for each of the individual set points.



8) Click **Next** (bottom-right) after all the set points have been recorded with their measured values.

9) The Calibration Data will be displayed in the next window. Ensure that these values are correct.

10) Click **Calibrate** (bottom-right) to save the calibration data. Click **Finish** (bottom-right) after the loading bar is full and it states “Calibration success!”



11) Close the Additel Fit software. Repeat the Zero procedure (6.1.2) and Pressure Verification (6.3).

6.4.2 – Internal Configuration (within ADT7X3 controllers)

1) Ensure that the ADT151 is connected to the correct pressure port (high, low, or barometric) inside the appropriate ADT7X3 controller.
2) Press the **Icon** on the controller's main display to view the system settings.
3) Press **Service** to view the service options.
4) Press **System Calibration** to view the calibration options.
5) Input the Password as **123456** and press the **Enter Icon** to confirm.
6) Press **Pressure Module Calibration** to calibrate the modules inside the controller.
7) Select the appropriate pressure module range to calibrate.
8) Press **Multi Points Calibration** for calibrations with more than one point.
9) Press **Calibration** (bottom-right) to continue.
10) Press **Pressure Source** and select **External Pressure**.
11) Determine the calibration points depending on the range and accuracy.
    - **DP (dual range)** typically has 5 calibration points: lower limit range 1, lower limit range 2, zero, upper limit range 2, and upper limit range 1.

      Example: DP100 has (-100, -50, 0, 50, 100) inH2O calibration points.
    - **CP (dual range)** typically has 4 calibration points: lower limit, zero, upper limit range 2, and upper limit range 1.

      Example: CP100 has (-13, 0, 50, 100) psi calibration points.
    - **CP…M (single range, high accuracy)** typically has 3 calibration points: lower limit, zero, and upper limit.

      Example: CP100M has (-13, 0, 100) psi calibration points.

- **GP (dual range)** typically has 3 calibration points: zero, upper limit range 2, and upper limit range 1.

  Example: GP10K has (0, 5K, 10K) psi calibration points.

- **GP…M (single range, high accuracy)** typically has 2 calibration points: zero and upper range.

  Example: GP10KM has (0, 10K) psi calibration points.

- **BP and BPH** typically have 2 calibration points: lower limit and upper limit.

  Example: BP has (60, 110) kPa.a calibration points.

12) Adjust the calibration points, if necessary.

13) Press **Next** to begin the calibration.

14) The display will show three columns: Calibration Point, Standard Value, and Indicating Value.

15) The lower limit row will be highlighted. Source the lower limit pressure and allow enough time to stabilize. If necessary, adjust the Standard Value for the lower limit using the touch screen display. Press **Next Point** to confirm the lower limit calibration. Repeat this step for each of the other calibration points.

16) Press the **Save Icon** to save and confirm the calibration data.

17) Press the **Home Icon** to return to the main display.

18) Repeat the Zero Procedure (6.1.2) and Pressure Verification (6.3) for the 151.