# ADT760 Automatic Handheld Pressure Calibrator

# Additel 760 Automatic Handheld Pressure Calibrator

## ————User Manual

[Version: 2309V07]

**Additel Corporation**

## STATEMENT

This user manual provides operating and safety instructions for the ADT760 Automatic Handheld Pressure Calibrator. To ensure correct operation and safety, please follow the instructions in this manual. Additel Corporation reserves the right to change the contents and other information contained in this manual without notice.



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# Welcome

The Additel 760 Automatic Handheld Pressure Calibrator is a hand held controller, as well as a documenting process calibrator, all rolled into one with high precision and control stability. Each unit comes with an internal pressure module ranged to cover the full scale range of the unit. The internal module is located at the back of the calibrator and is removable allowing for the selection of lower range pressure to improve accuracy. In addition, the calibrator can work with two external pressure modules at the same time. With high precision electrical signal measurement function, this calibrator can be used for dial pressure gauges, digital pressure gauges, differential pressure gauges, pressure transmitters, I/P converters, or pressure switch calibration. For the most up-to-date manual, please visit www.additel.com.

# How to Contact Additel

**Additel Corporation**

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**Fax:+1-714-998-6999**

**E-mail: sales@additel.com or service@additel.com**

**Website: www.additel.com**



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# Safety Information

**WARNINGS** identify action or condition that may be hazards to the user;
**CAUTIONS** identify action or condition that may damage the calibrator or the equipment under test.

**WARNINGS:**

**To prevent personal injury, please follow this user manual.**

**To prevent possible electrical shock, fire, or personal injury, please:**

- Check product exterior before use
- Read and follow all instructions carefully
- Do NOT apply more than 30VAC or DC between any two electric jacks
- Correctly place and lock the battery before use
- Avoid close contact to the vent port when venting
- Charge the battery immediately with supplied power adapter when the low battery indication occurs. This will prevent potential pressure release due to a loss of electrical power
- Do NOT use the product if it is damaged or operates incorrectly
- Do NOT use in flammable, high humidity, or dusty environments
- Only use accessories, test leads, and probes that have the same measurement specification



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- The estimated End of Life (EOL) expectancy for all hoses and filters (pneumatic and hydraulic) is approximately 10 years and should be replaced at the first sign of wear or damage. These hoses and filters can be sold separately as kits or included in the accessories for various products, such as pressure controllers and calibrators. Failure to replace these hoses and filters beyond their EOL may result in poor performance of the product or potential physical harm to the operator.

**CAUTIONS:**

- Do NOT shake, drop, or bump the calibrator while in use
- If condensation occurs, thoroughly dry out the calibrator before startup
- Do NOT use any power adapter other than 9816-X
- Charge the battery immediately when low battery symbol indicates
- Do not remove the battery while it is in charging or when the calibrator is in use
- Release the system pressure before turning off the calibrator



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Product Symbols Table 1.

| Symbol | Meaning |
|---|---|
| | Important information<br>Danger<br>See user manual |
| | Risk of electrical shock<br>Hazardous voltage |
| | Conforms to European Union directives |
| | Please recycle |
| | Lithium-ion battery |

Table 1 Symbols



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# 1. Introduction

## 1.1 Model Information

| Model | Model No. | Pressure Range | Pressure Type |
|---|---|---|---|
| Low Differential Pressure | LLP | ±30 inH2O (±75 mbar) | D, G |
| Differential Pressure | D | -12.5 to 35 psi (-0.86 to 2.5 bar) | D, G |
| General Pressure | MA | -12.5 to 300 psi (-0.86 to 20 bar) | G, A |

Table 2 Model Information

NOTE: D - Differential; G - Gauge; A - Absolute.



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## 1.2 Basic Structure

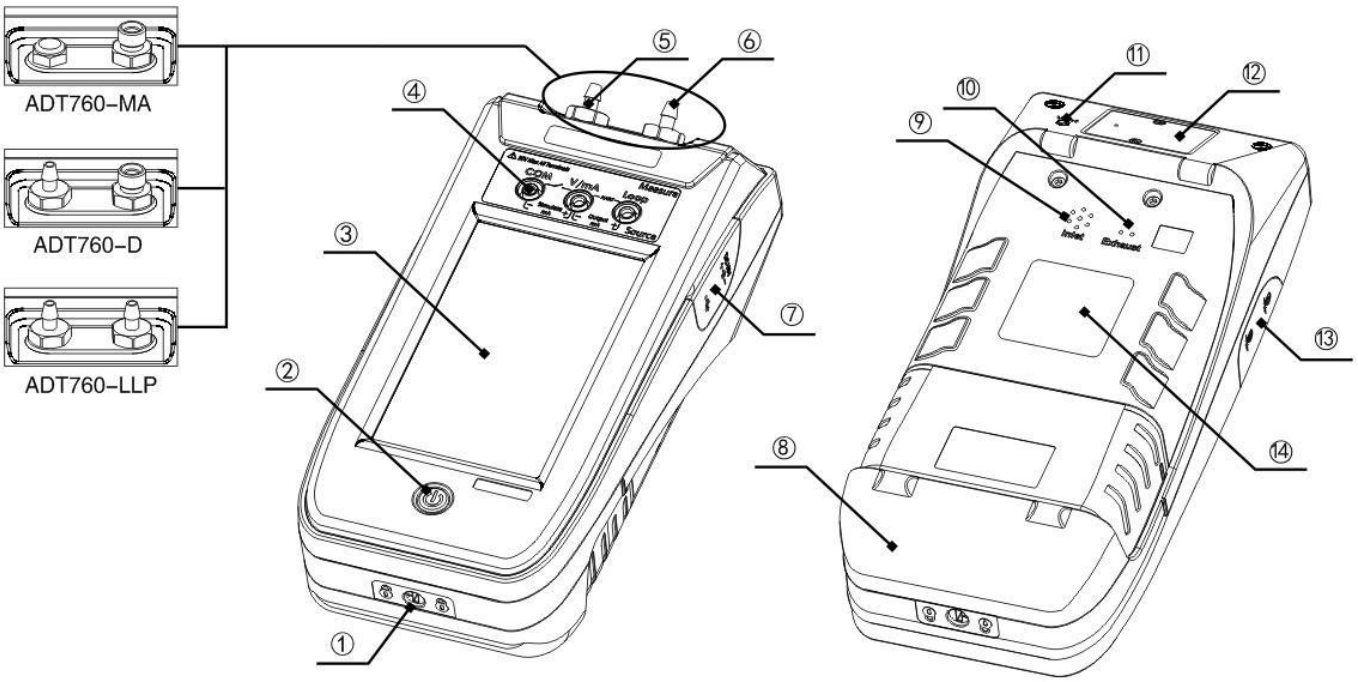


Figure 1 Basic Structure



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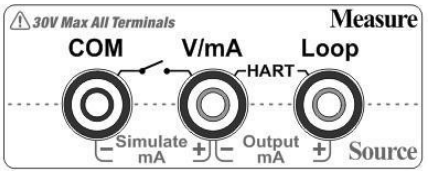
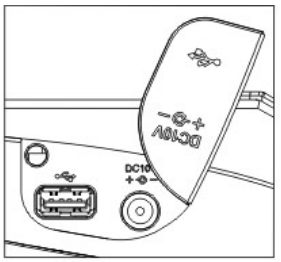
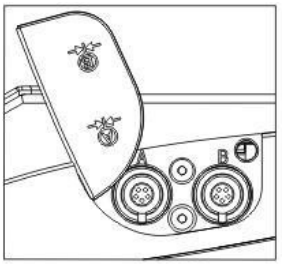
| No. | Name |
|---|---|
| (1) | Battery Lock |
| (2) | Power Switch |
| (3) | Touch Screen |
| (4) | Electrical Measurement Panel |
| (5) | REF Port (-MA: Barometer Sensor Calibration Port) |
| (6) | Pressure Outlet Port |
| (7) | Power Adapter and USB Port Panel |
| (8) | Battery |
| (9) | Inlet Port |
| (10) | Exhaust Port |
| (11) | VENT Port |
| (12) | Internal Pressure Module |
| (13) | External Pressure Module Connection Ports (A & B) |
| （14） | Product Nameplate |

Table 3 Basic Structure







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### 1.3 Features

- Fully automatic calibrator with built-in pump and controller
- Switchable internal pressure modules for expandable ranges
- Accuracy (1 year) of 0.02%FS
- External pressure modules available (measurement only)
- Less than 4 lbs. (1.8 kg) for handheld operation
- Source pressure, measure pressure and measure electrical
- 4 channels
- Optional HART communication
- Optional data logging and documentation
- USB, Wi-Fi, and Bluetooth communications



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## 1.4 Technical Specification

1.4.1 General Specification

◆Media：Clean Air
◆Internal module temperature compensation range：32 ~ 122℉ (0 ~ 50℃)
◆Stability：0.005%FS or 0.05 pa whichever is greater, based on FS of the switchable internal pressure module.
◆Display：5 inch 480 x 800 TFT color touch screen
◆Size：9.37" x 4.33" x 2.76" (238mm × 110mm × 70mm)
◆Weight：less than 4 lbs. (1.8 KG)
◆Connection：

1) -LLP：
Two Barb fittings

2) -D：
One Barb fitting
One Hose, 5 ft (1.5m), with built-in filter to 1/4 BSPF, 1/4 NPTF, and M20F adapters

3) -MA：
One Hose, 5 ft (1.5m), with built-in filter to 1/4 BSPF, 1/4 NPTF, and M20F adapters
One barometer sensor calibration port

**NOTE: Filters are installed in the pressure connection ports. By passing the filter will void the product warranty.**



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◆Inlet filter：Dedicated filter，50μm
◆Electrical Measuring Jacks：Φ4 mm electrical jacks
◆USB: Standard USB port, type A
◆External Pressure Module Port: Two 5-pin connections (A & B)

1.4.2 Environment Specification

◆Working Temperature： 32 ~ 122℉ (0 ~ 50℃)
◆Storage Temperature： -4 ~ 158℉ (-20 ~ 70℃)
◆Humidity：0 ~ 90% (32 ~ 122℉ or 0 ~ 50℃), Non condensation
◆Atmosphere Pressure：Less than 9,800 ft. (3,000 m)
◆Protect Level：IP54



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### 1.4.3 Electrical Specification

| Signal Type | Range | Resolution | Accuracy | Note |
|---|---|---|---|---|
| Current Measurement | ±30 mA | 0.0001 mA | ±(0.01%RD + 0.005%FS) | Input：<10 Ω |
| Voltage Measurement | ±30 V | 0.0001 V | ±(0.01%RD + 0.005%FS) | Input：>1M Ω |
| Current Output | 24 mA | 0.001 mA | ±(0.01%RD + 0.005%FS) | 20 mA @ 1K |
| Loop Power Source | 24 V | N/A | ±1 V | Max Load: 50 mA |
| Pressure Switch | Open, close. Support for mechanical switch and NPN / PNP digital switches. | | | |
| Temperature Compensation | 41℉ to 95 ℉ (5℃ to 35 ℃) | | | |
| Temperature Coefficient | <(±0.001%RD + 0.001%FS) / ℃ outside of 5℃ to 35 ℃ | | | |

Table 4 Electrical Specification

### 1.4.4 Internal Modules Specification



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| Selection Guide-Differential Pressure | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Module** | **Module Range[5]** | | **Media** | **Accuracy (%FS)[1]** | **Burst Pressure** | **760-LLP** | **760-D** | **760-MA** |
| | **inH2O** | **mbar** | | | | | | |
| DP025 | ±0.25 | ±0.62 | G | 0.2[2] | 100x | • | | |
| DP050 | ±0.5 | ±1.25 | G | 0.1[3] | 100x | • | | |
| DP1 | ±1 | ±2.5 | G | 0.05[4] | 100x | • | | |
| DP2 | ±2 | ±5 | G | 0.05[4] | 100x | • | | |
| DP5 | ±5 | ±10 | G | 0.05[4] | 50x | • | | |
| DP10 | ±10 | ±25 | G | 0.05[4] | 20x | • | • | |
| DP20 | ±20 | ±50 | G | 0.05 | 20x | • | • | |
| DP30 | ±30 | ±75 | G | 0.05 | 20x | • | • | |
| DP50 | ±50 | ±160 | G | 0.05 | 3x | | • | |
| DP100 | ±100 | ±250 | G | 0.02 | 3x | | • | |
| DP150 | ±150 | ±350 | G | 0.02 | 3x | | • | |
| DP300 | ±300 | ±700 | G | 0.02 | 3x | | • | |
| DP400 | -380 to 400 | -950 to 1K | G | 0.02 | 3x | | • | |
| DP800 | -380 to 800 | -950 to 2K | G | 0.02 | 3x | | • | |
| DP1K | -380 to 1K | -950 to 2.5K | G | 0.02 | 3x | | • | |

Table 5 Selection Guide-Differential Pressure



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[1] FS specification applies to the span of the module range. Accuracy includes one-year stability, except for DP025 to DP10 modules.

[2] Accuracy is a 6 months spec, 1-year long-term drift is 0.2%FS.

[3] Accuracy is a 6 months spec, 1-year long-term drift is 0.1%FS.

[4] Accuracy is a 6 months spec, 1-year long-term drift is 0.05%FS.

[5] The low module pressure range may be outside the pressure range of the calibrator

| Selection Guide-Gauge Pressure | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Module** | **Module Range[3]** | | **Media** | **Accuracy (%FS)[1]** | **Burst Pressure** | **760-LLP** | **760-D** | **760-MA** |
| | **psi** | **bar** | | | | | | |
| CP10 | ±10 | ±0.7 | G | 0.02[2] | 3x | | • | • |
| CP15 | -13.5 to 15 | -0.95 to 1 | G | 0.02[2] | 3x | | • | • |
| CP30 | -13.5 to 30 | -0.95 to 2 | G | 0.02[2] | 3x | | • | • |
| CP35 | -13.5 to 35 | -0.95 to 2.5 | G | 0.02[2] | 3x | | • | • |
| CP50 | -13.5 to 50 | -0.95 to 3.5 | G | 0.02[2] | 3x | | | • |
| CP100 | -13.5 to 100 | -0.95 to 7 | G | 0.02[2] | 3x | | | • |
| CP150 | -13.5 to 150 | -0.95 to 10 | G | 0.02[2] | 3x | | | • |
| CP200 | -13.5 to 200 | -0.95 to 14 | G | 0.02[2] | 3x | | | • |
| CP300 | -13.5 to 300 | -0.95 to 20 | G | 0.02[2] | 3x | | | • |

Table 6 Selection Guide-Gauge Pressure



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[1] FS specification applies to the span of the module range. Accuracy includes one-year stability, except for DP025 to DP10 modules.
[2] Specification based on gauge measurement. An additional 60 pa uncertainty will need to be included when measuring in absolute mode. Applicable only for use with the ADT760-MA
[3] The low module pressure range may be outside the pressure range of the calibrator

### 1.5 Power

- Power Supply：Power supplied by rechargeable Li-Ion battery or an external 10 V power adapter
- Li-Ion rechargeable battery is removable and can be charged directly using the external power adapter
- The battery should be removed from the calibrator and charged directly for the fastest charge time
- Charge Time：Full charge, less than 4 hours when removed from the calibrator and charged directly
- The charging time will be extended when battery is charged through calibrator
- Battery Working Time：More than 10 hours or 100 cycle of full scale pressure



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## 1.6 Standard Equipment

| Model | Quantity | -LLP | -D | -MA |
|---|---|---|---|---|
| 760 Calibrator | 1 | ● | ● | ● |
| 9724 Rechargeable Li-ion Battery | 1 | ● | ● | ● |
| 9816-X External Power Adapter | 1 pc | ● | ● | ● |
| 9025 Test Leads | 1 set (2 red, 1 black) | ● | ● | ● |
| Alligator Clip | 1 set (2 red, 1 black) | ● | ● | ● |
| Silicone Tube | Depends on 760 model | ● （2 pcs） | ● （1 pc） | |
| ADT100 Hose | 1 pc | | ● | ● |
| ADT100-760-KIT Adapter Set | 1 set (1/4BSPF, 1/4NPTF, and M20F) | | ● | ● |
| Barb Fitting Adapter | 1 pc | | ● | |
| O-ring | 1 pack | ● | ● | ● |
| Filter for Outlet Port | 2 pcs | ● | ● | ● |
| Filter for Inlet Port | 2 pcs | ● | ● | ● |
| CD Manual | 1 pc | ● | ● | ● |
| ISO17025 Accredited certificate | 1 pc | ● | ● | ● |

Table 7 Standard Equipment



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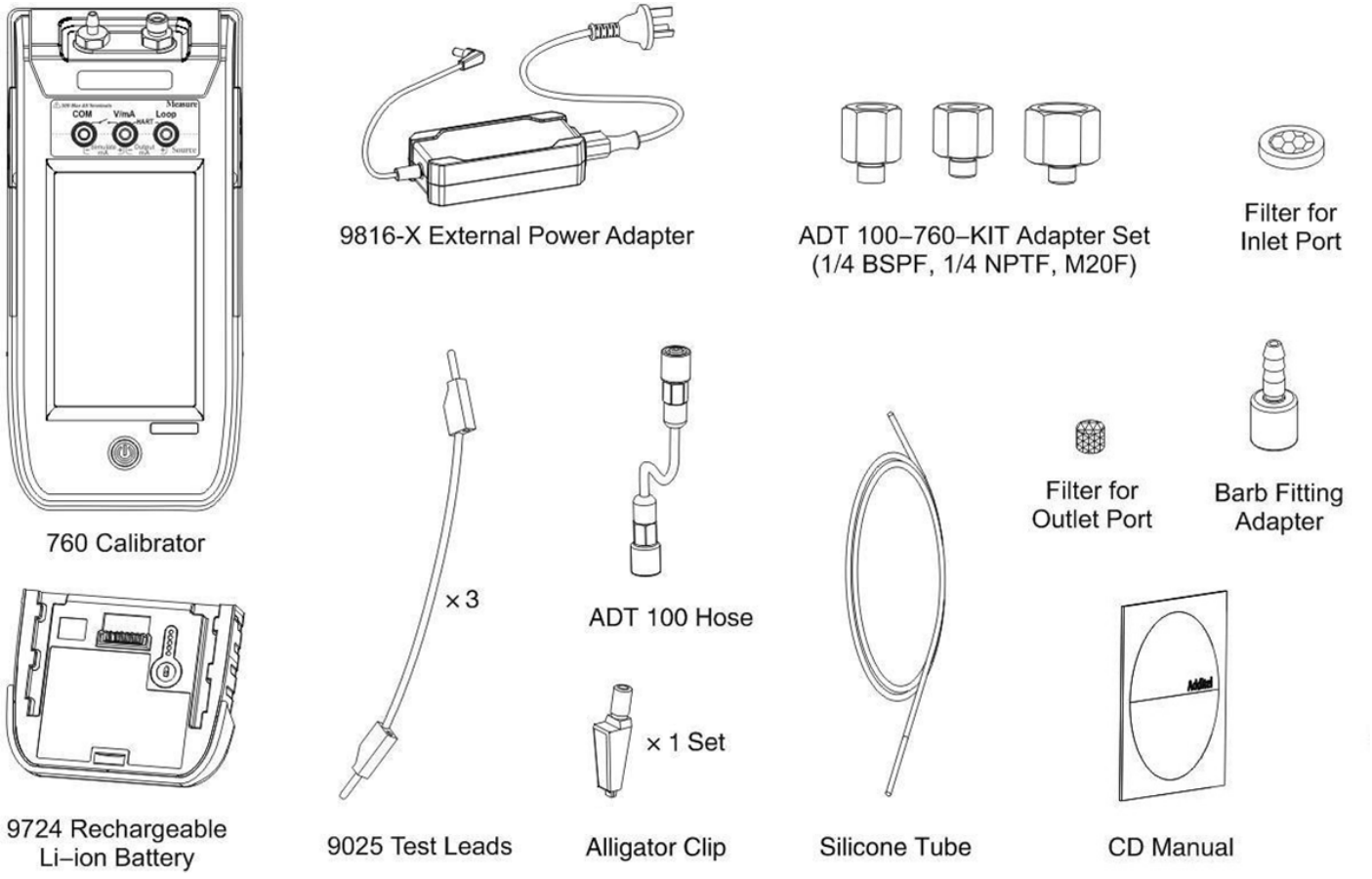


Figure 2 Standard Equipment



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# 2. Get Started

## 2.1 Battery

**WARNINGS:**

- Lithium-ion batteries may get hot or ignite and cause serious injury if not treated properly
- Do NOT incinerate or heat the battery
- Do NOT storage the battery in direct sunlight
- Do NOT try to disassemble the battery
- The battery contains dangerous chemical substances
- Please clean with water and look for medical treatment if exposure to chemicals occurs
- Continuously charging the battery of this unit will significantly reduce the life of the battery

**CAUTIONS:**

- Please remove the battery and store in a cool, dry, ventilated area if it will not be used for a long period
- Do not store batteries with hazardous or combustible materials
- Discontinue use and contact Additel or an authorized distributor immediately if the battery leaks
- Do not short circuit the battery
- Only use the dedicated power adapter (9816-X) to charge the battery
- Be sure to properly dispose of the battery if it is no longer usable



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The Additel 760 Automatic Handheld Pressure Calibrator uses a dedicated rechargeable, Li-Ion battery (model 9724). Each battery has a built-in protection circuit allowing the battery to be charged independent of being attached to the calibrator.

Each battery contains an illuminated charge indicator. Push ⓘ button to see the level of charge. The battery is fully charged when 5 blue LEDs are illuminated.

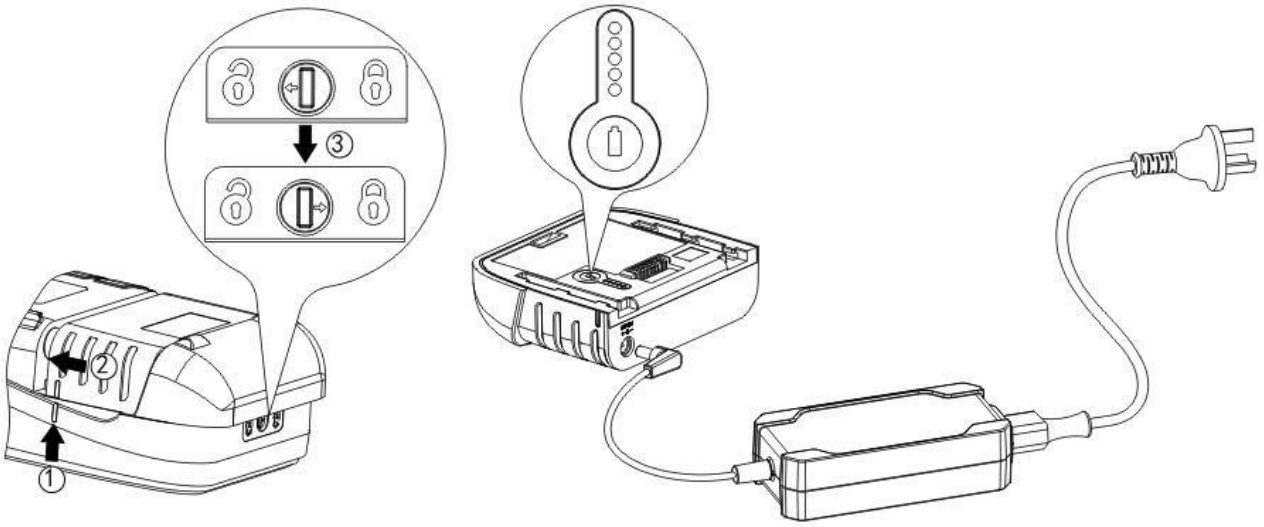


Figure 3 Battery Install and Charging

◆ To Install the battery:

1) Align to alignment markings of the calibrator and battery
2) Push the battery
3) Use a flat-head screwdriver to lock the battery



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◆ To Remove the battery:

1) Turn off the calibrator

2) Turn the battery lock to the unlock position with a flat-head screwdriver

3) Remove the battery

◆9816-X External Power Adapter:

1. Input: AC 85V ~ AC 265V, 50Hz / 60Hz
2. Output: DC 10V, 2A, 40W MAX



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## 2.2 Internal Pressure Module

The Additel 760 Calibrator comes with an internal pressure module which covers the full span of the unit. This pressure module is user-switchable and Additel offers a large variety of different range pressure modules.

◆To switch the internal pressure module:

1)VENT the system pressure (see section 5.5.3)

2)Turn off the calibrator, disconnect the power adapter if it is connected, and remove the battery

3)Unscrew both screws on the pressure module until the screw pin is loose and the screw pin can be extended out

4)Firmly pull the sensor out of the calibrator

5)Insert a new internal pressure module (please pay attention to module direction)

6)Tighten both screws on the pressure module until the screws reach the bottom

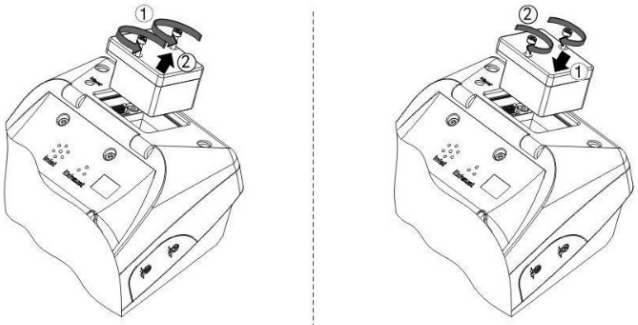


Figure 4 Internal Pressure Module Switching



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## 2.3 Starting the Calibrator

Push the power button to turn on the calibrator. The display will illuminate and the Additel logo will display. It will take a few seconds for the operating system to load after which the main screen will display.

◆Date and Time: To change date and time setting, please see section 5.7.1

◆Language: The default language is English. To change the language please refer to section 5.7.2

## 2.4 Electric Connections

Electric connection instruction:

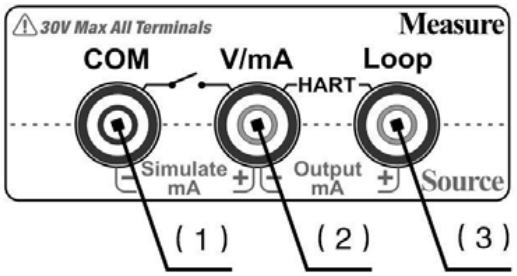


Figure 5 Electric Connection



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| Main Jacks | | | Power Supply Jack | |
|---|---|---|---|---|
| **Function** | **Black（1）** | **Red（2）** | **Red（3）** | **Function** |
| ±30 V Voltage | ● | O | | |
| ±30 mA Current | ● | O | | |
| 2-wire 4 ~ 20 mA Loop Transmitter | | O | O | |
| 3-wire Voltage/Current Transmitter | ● | O | O | Non-isolated 24 V power output |
| Mechanical Switch | ● | O | | |
| NPN/PNP Switch | ● | O | O | Non-isolated 24 V power output |
| HART Transmitter (Internal resistor, Internal power supply) | | O | O | |
| HART Device (External resistor, External power supply) | | O | O | |
| 0~20 mA Loop Current Output (Internal power supply) | | O | O | |
| 0~20 mA Loop Current Output (External power supply) | ● | O | | |

Table 8 Electric Connections



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## 2.5 Pressure Connection

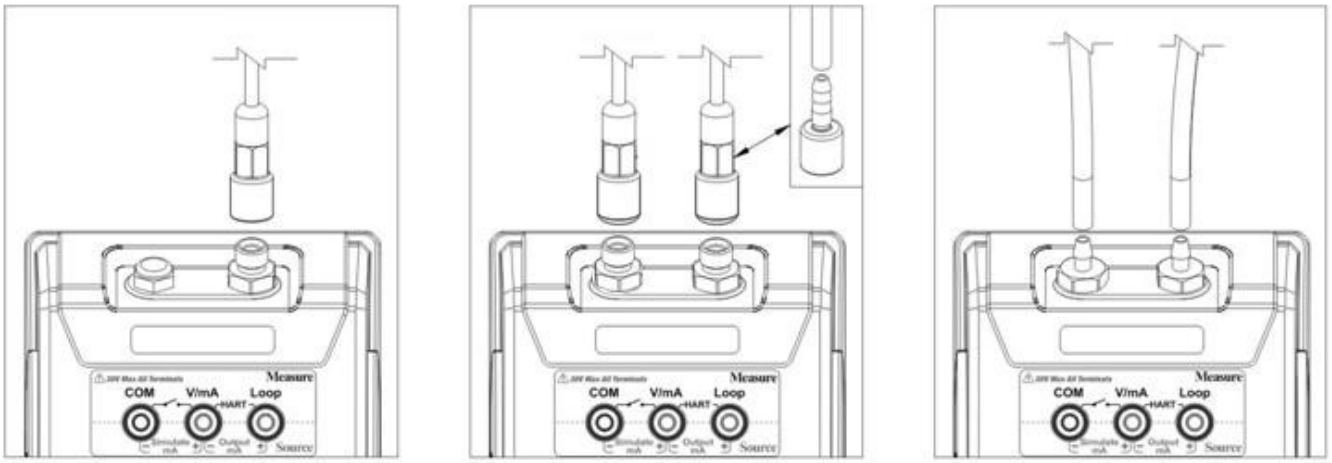


Figure 6 Pressure Connection



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# 3. Operation

### 3.1 Display and Operation

3.1.1 Main Screen

The main screen normally contains the Status Bar, Title Bar, Electrical Measurement Window, Pressure Window, and Control Bar.

①Status Bar：Includes date and time, external pressure module status, communication status, 24V internal power status, and battery status.

**NOTE: Information on Status Bar is read only. All other icons, pressure units, and output values can be selected for further operation.**

②Title Bar：Includes screen lock, abnormal notification,and system menu.

◆Abnormal notification sign can be cleared by rebooting the calibrator. Specific information about the abnormal condition can be reviewed in the system log, please see section 5.5.3.

③Electrical Measurement Window：Includes measurement value, data analysis (current/voltage measurement and transmitter test only), current output step (current output only), and loop current value (transmitter test only).

④Pressure Window：Includes pressure set point value, current pressure value, pressure unit, step control, and step size.

⑤Control Bar：Including Vent, Measure, and Control button.

◆Do not point the VENT port toward personal during venting



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◆When using one or two external pressure modules, the main screen will add additional windows to display the added module or modules

◆Every window can be collapsed

◆Press ⋯ on the top right corner of the window and select collapse

Press ⋯ on the top right corner of a collapsed window and select expand to open that window

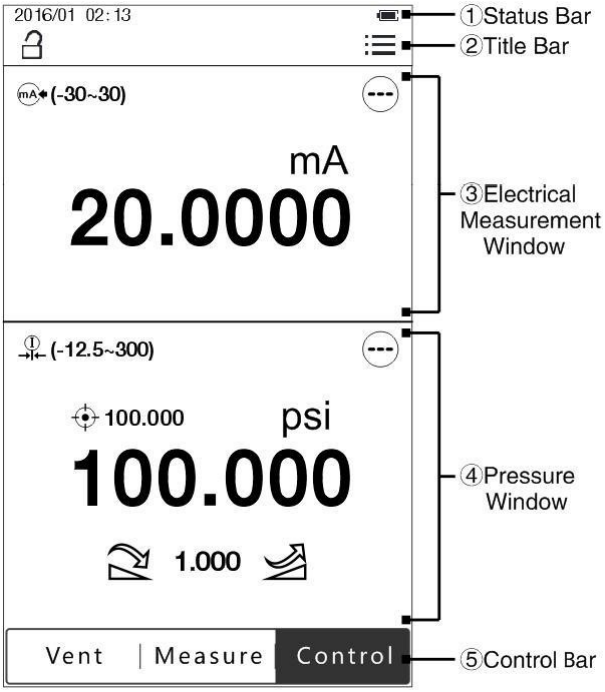


Figure 7 Main Screen



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3.1.2 Pressure Unit

Press the pressure unit on Pressure Window to change system unit. There are 25 default pressure units which can be selected: kPa, Pa, MPa, hPa, bar, mbar, torr, atm, psi, gf/cm$^2$, kgf/cm$^2$, in$H_2O$@4℃, in$H_2O$@68℉, mm$H_2O$@4℃ , mm$H_2O$@20℃ , ft$H_2O$@4℃, ft$H_2O$@68℉ , inHg@0℃ , mmHg@0℃, mtorr, lb/ft$^2$, tsi, psf, in$H_2O$@60℉, ft$H_2O$@60℉ .

In addition, there are 5 customizable pressure units which can be set up.

◆ To set up a custom pressure unit:

1) Press ⓤ in pressure unit selection screen and set up three parameters:

①Factor：This is the multiplier against the reference pressure unit.

②Unit Name：Custom unit name.

③Reference：Reference pressure unit, should be selected from one of the 25 default pressure units.

◆The calculation equation is: Factor * Unit Name = Reference

For example:

| Factor | Unit Name | Reference |
|---|---|---|
| 2 | USER1 | 1*kPa |

In this way, 1 USER1 pressure equals to 0.5 kPa.



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### 3.1.3 Pressure Output

1. Pressure Output Control Settings：

Press on the Pressure Window to enter the control settings menu:

| Subject | Valid Value | Comment |
|---|---|---|
| Pressure Type | Diff. / Gauge / Absolute | The pressure type displayed will depend on the ADT760 model |
| Resolution | 4 / 5 / 6 | Display digit |
| Slew Rate | 0~100% | Pressurization speed, depends on internal pressure module |
| Stability Limit | ±（0.003~1）% FS | Pressure control stability condition |
| Vent Limit | Depends on 760 model | Pressure at which the vent valves will open to atmosphere |
| Auto Zero | On / Off | Pressure measurement will auto zero every time the unit is vented (not available with all models) |
| Set Point Limits | On / Off | Limits the pressure output ranges |
| Set Point Limits (on) | Depends on internal pressure module | User editable for 0% and 100% of span ranges |
| Module Information | N/A | Information is read only and includes range, pressure type, accuracy, SN, version, and manufacture date |
| Running Information | N/A | Information is read only and includes supply pressure, vacuum pressure, and atmosphere |

Table 9 Pressure Output Control Settings



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2. Connection：

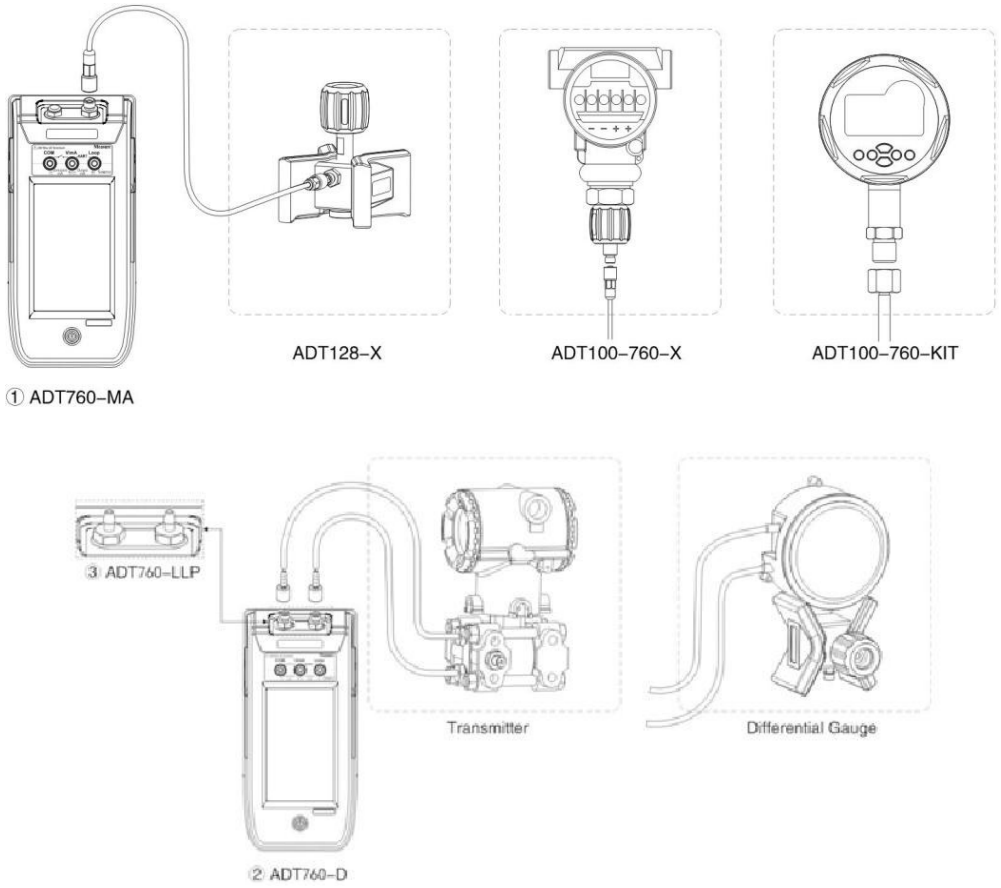


Figure 8 Output Connection



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3. Pressure Set Point：

①Manual Input：

1)Press pressure set point value or current pressure value on the Pressure Window and input the target pressure.

2)Press the enter key or ✓.

**NOTE: Pressure set point should not exceed pressure range limit shown above the keyboard.**

②Manual Step：

1)Press step size on the Pressure Window and input the target step size.

2)Press / to decrease or increase pressure by the target step size.



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③Auto Step：Press ⋯ on Pressure Window, then select Auto Step：

1) Auto Step settings:

| Subject | Valid Value | Comment |
|---|---|---|
| Range | Depends on internal pressure module | The start and end points of auto step |
| Step Mode | By Points/ %Percent / Size | Calculation method for pressure change of each step |
| Points | Pressure change of each step = Range ÷ Points | Pressure change calculation |
| %Percent | Pressure change of each = Range × Percent ÷ 100 | |
| Step Size | Pressure change of each = Step Size | |
| Stroke | Round Trip / One Way | Auto Step stroke type |
| Dwell Time | 0~100,000,000（s） | Retention time after each step |
| Repeat | 1 / +∞ | Repeating criteria |

Table 10 Auto Step

2) Press ✓, then select Start.

4. Discontinue Control or Pressurization:

◆Manual Input and Manual Step:

Press Measure to pause and press Control to restart.



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Press Vent and the pressure will decrease and release.

◆Auto Step:

Press Pause to pause.

Press Exit to exit and the calibrator will release the pressure.

Press Vent to release the pressure then press Exit to stop the test or Continue to resume the test.

5. Pressure Stabilization：

If the difference between current output pressure value and set point is smaller than Stability Limit, the current pressure value on the Pressure Window will turn to green with a beep to indicate the output pressure has reached the set point stability criteria.



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3.1.4 Current/Voltage Measurement

1. Press on Electrical Measurement option ( (-30~30) ) on the top left corner of Electrical Measurement Window and select：(-30~30) mA or (-30~30) V.

◆Do not apply current / voltage that exceeds current / voltage measuring range

◆Apply a short circuit to zero

◆If the measurement value falls outside of the current/voltage measuring range, then it will turn red with an alarm

◆If measure value exceeds measure limit of the calibrator, it will display "--------" with alarm

2. Connection

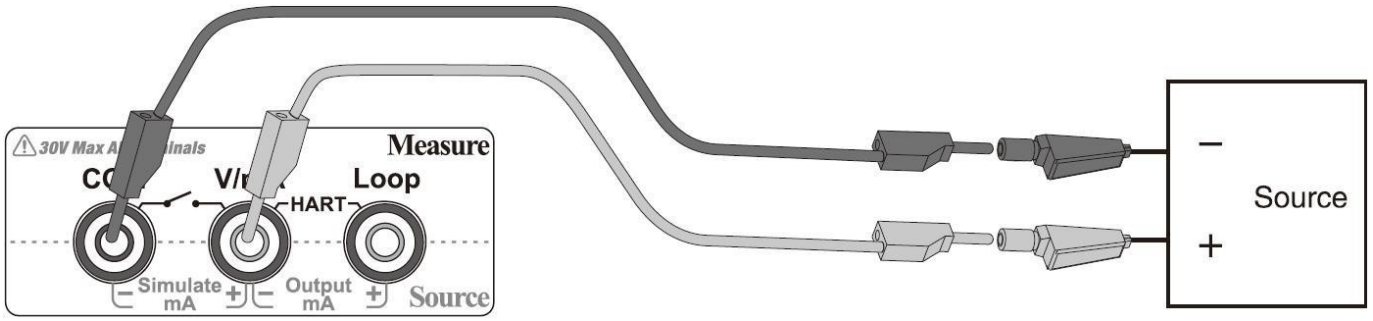


Figure 9 Current / Voltage Measurement



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3. Data Analysis：

Press ⋯ and select one of the functions below:

① $\bar{x}$ Min / Max / Avg：Shows the minimum, the maximum, and the average

| Subject | Valid Value | Comment |
|---|---|---|
| Samples | 1~100 | Sample collection quantity |

Table 11 Min / Max / Avg

② $\bar{x}_y$ Scale：

| Subject | Valid Value | Comment |
|---|---|---|
| Measuring Range | Depends on measurement type | Electrical measurement range |
| Scale Range | Number, letter, or pressure, temperature, electric unit | Scale unit |
| | -999999~999999 | Zero point value |
| | -999999~999999 | 100% point value |
| Resolution | 4, 5, 6 | Display digit |
| Transfer Function | Linear / Square Root | Transfer function type |

Table 12 Scale

◆To turn off data analysis function press ⋯ and select $\bar{x}$ or $\bar{x}_y$ .



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3.1.5 Mechanical Switch

1. Press the Electrical Measurement option ( mA (-30~30) ) on the top left corner of Electrical Measurement Window and select Switch.
2. Connection

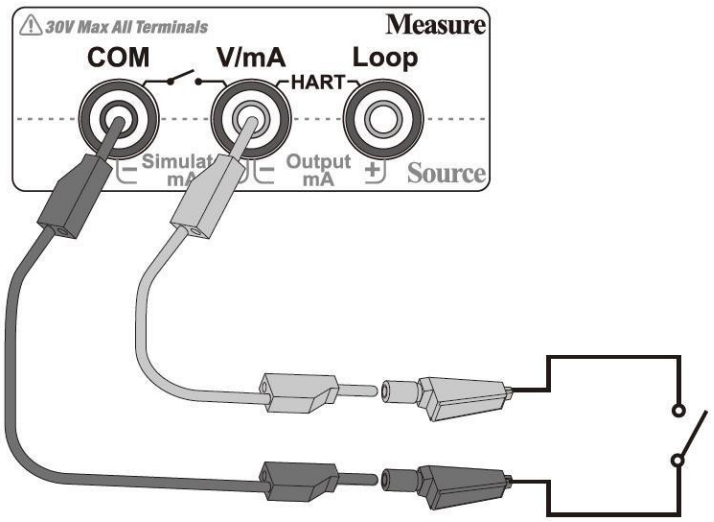


Figure 10 Mechanical Switch Measurement

3. Trip Values

◆The calibrator records the trip values and the state (open / close) of the switch.



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3.1.6 NPN /PNP Switch

1. Press the Electrical Measurement option ( mA (-30~30) ) on the top left corner of Electrical Measurement Window and select Switch NPN or Switch PNP.
2. Connection
3. Trip Values

◆The calibrator records the trip values and the state (open / close) of the switch.

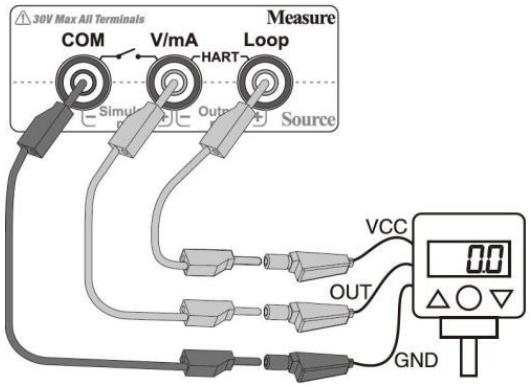


Figure 11 Electrical Switch Measurement



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3.1.7 Current Output

1. Press the Electrical Measurement option ( (-30~30) ) on the top left corner of Electrical Measurement Window and select Simulate mA or (0 ~ 24) mA.
2. Connection：

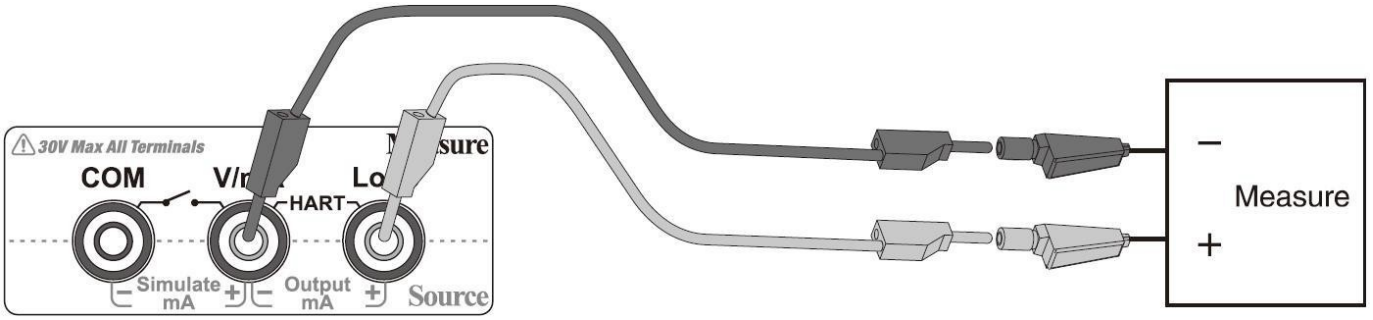


Figure 12 Current Output

3. 24V Internal Power:

◆Simulate mA:

Internal 24 V power should be turned off automatically, for more information please see section 5.2

◆(0~24) mA:

Internal 24 V power should be turned on automatically, for more information please see section 5.2



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4. Current Set Point：

①Manual Input：

1)Click Measure Value on the Electrical Measurement Window, and input the target value

2)Press ✓.

②Manual Step：

1)Press step size on the Electrical Measurement Window and input the current output range

2)Press 25%/ 25% each time to decrease or increase current output by 25% of range

**NOTE: Current output range shall not exceed 0~24 mA.**



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3.1.8 External Pressure Module

1. Connection:

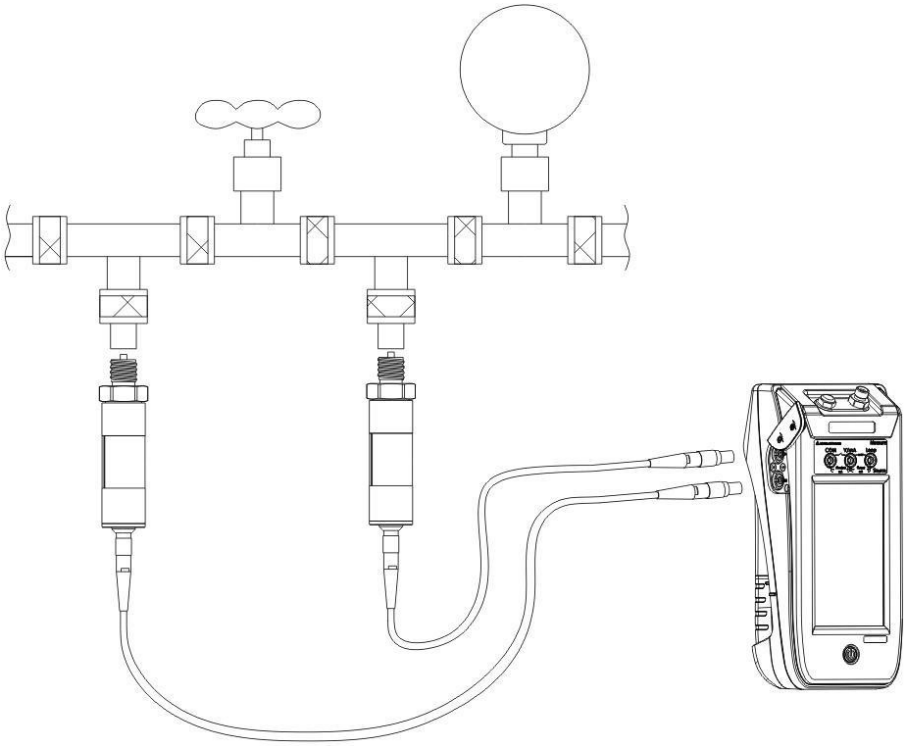

Figure 13 External Pressure ModuleConnection



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2. Display

◆Symbols Ⓐ / Ⓑ indicate the associated external pressure modules are connected.

The main screen will add one/two additional windows when connecting one/two external pressure module.

◆The external pressure module can only be used for pressure measurement, not for pressure control.

◆If the measurement value falls outside of the range then it will turn red with an alarm.

◆If measurement values exceed the limit of the calibrator then it will display "--------" with an alarm.

3. Settings:

Press Ⓐ / Ⓑ on the external pressure module window to enter external pressure module setting menu:

| Subject | Valid Value | Comment |
|---|---|---|
| Pressure Type | Gauge / Absolute / Diff. | External pressure module pressure type |
| Resolution | 4 / 5 / 6 | Display digit |
| Unit | Up to 25 default units or 5 custom units | External pressure module unit is independent of the system unit, see section 3.1.2 |
| Module Information | N/A | This information is read only: including range, pressure type, accuracy, SN, version, and manufacture date |

Table 13 External Pressure Module Information



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### 3.2 HART (Only available on 760-X-DL)

3.2.1 Poll

1. Connection

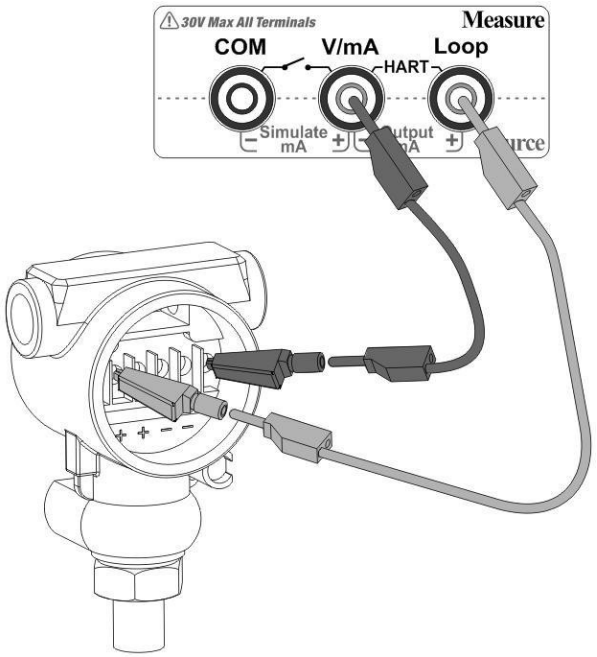


Figure 14 HART Device (Internal Power, Internal Resistor)



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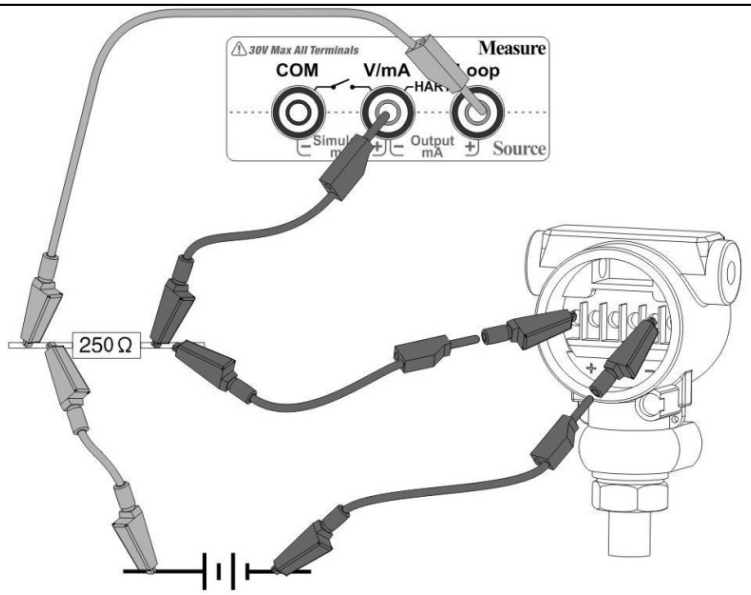


Figure 15 HART Device (External Power, External Resistor)

2. HART Device Type Selection:

On top of Electrical Measurement Window please press 250Ω (or 250Ω) and select:

1). 250Ω Internal Power and Resistor

2). 250Ω External Power and Resistor



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2. Search

1) Poll

Press on Electrical Measurement option ( mA (-30~30) ) on the top left corner of the Electrical Measurement Window and select HART. The calibrator will poll address 0 if no connection detected. Then it will scan addresses 1 to 15 automatically.

2) Manual Search

HART device manual search is available if necessary.

1）Press ⋯ on Electrical Measurement Window, then select 🔍 Search. The calibrator will list all HART device detected.

2）Select the device which needs to be tested. If still no required HART device are detected then press 🔍 to scan address from 1 to 15 automatically.

### 3.2.2 Operation Window

The HART measurement value will display on the Electrical Measurement Window. Other process variables can be displayed, see section 3.2.5. Loop current and HART device name are displayed on the bottom of the window.

◆Press the pressure unit to change HART device pressure measuring unit

◆Changing HART device pressure measure unit will not change the calibrator system unit



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### 3.2.3 Settings

Press and select Settings to enter HART device settings menu:

1.Device Information: HART device information

| Subject | Type | Comment |
|---|---|---|
| Manufacturer | Read Only | Manufacturer of HART device |
| Device Type | Read Only | HART device type |
| Device ID | Read Only | HART device ID number |
| Tag | Editable | Alphanumeric content (8 max length) |
| Date | Editable | HART device date setting |
| Write Protect | Read Only | Write protection for HART device |
| Message | Editable | Alphanumeric content (32 max length) |
| Descriptor | Editable | Alphanumeric content (12 max length) |
| Final Assembly Number | Editable | Numeric content (12 max length) |
| Preambles | Editable | Numeric content (12 max length) |
| Universal Revision | Read Only | Universal version number |
| Software Revision | Read Only | Software version number |
| Hardware Revision | Read Only | Hardware version number |
| Device Revision | Read Only | Device version number |

Table 14 HART Device Information



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2. Sensor: HART device sensor information

| Subject | Type | Comment |
|---|---|---|
| Sensor Serial Number | Read Only | HART device sensor SN |
| Sensor Unit | Read Only | HART device pressure measurement unit (user selectable, see section 3.2.2 |
| Sensor Lower Limit | Read Only | HART device sensor measurement range lower limit |
| Sensor Upper Limit | Read Only | HART device sensor measurement range upper limit |
| Sensor Min Span | Read Only | HART device sensor measurement resolution |

Table 15 ART device sensor information



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3. HART Device Output

| Subject | Type | Valid Value | Comment |
|---|---|---|---|
| PV / Range Unit | Editable | Select from 25 default units or from 5 custom units | HART device pressure measurement unit, see section 3.1.2 |
| PV LRV | Editable | Within HART device sensor range | Process variable lower range |
| PV URV | Editable | Within HART device sensor range | Process variable upper range |
| Transfer function | Editable | Linear / Square Root | Transfer function type |
| Alarm State | Read Only | N/A | Alarm State |
| Damping | Editable | 1~100 | Damping time, only support one digit after decimal point |
| Polling Address | Editable | 0~15 | HART device polling address |
| Burst Mode | Editable | On / Off | Burst mode status |
| Burst Command | Editable | 1 / 2 / 3 | Burst command, depends on HART device |

Table 16 HART Device Output



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3.2.4 Service

Press and select Service to enter HART device service menu:

1. Loop Test:

This test allows you to compare the HART device current output value with the ADT760 calibrator current measurement value.

◆The loop test function available only when HART device address is 0

1). Input a current value or select Fetch to capture the calibrator current measurement value and then press the enter key or select to apply.

2). After few seconds, the calibrator will send a signal to HART device comparing the HART device current output value (on the top left window) with the calibrator's current measurement value. If the difference is out of tolerance it is recommended to trim the HART device.

2. Pressure Zero Trim:

This test is designed to do a zero point trim on the HART device.

1). If using an external pressure module ensure the correct module is selected.

2). The calibrator will automatically vent the pressure. Wait until the measurement stabilizes and turns green.

3). Press Zero to trim HART device pressure zero point.



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3. D/A Trim:

This test is designed to trim the HART device current output value at zero and span.

◆D/A Trim function available only when HART device address is 0.

①D/A Zero:

1). Input a current value (4 mA is typical) or select Fetch to capture the calibrator measurement value (on the top right window). Then press the enter key or select to apply.

2). After few seconds, the calibrator will send a signal to HART device to trim the current value.

②D/A Gain:

1). Input a current value (20 mA is typical) or select Fetch to capture the calibrator measurement value (on the top right window). Then press the enter key or select to apply.

2). After few seconds, the calibrator will send a signal to HART device to trim the current value.

4. Sensor Trim:

This test is designed to trim the HART device sensor and the lowest and highest points of the range.

①Low trim:

1). Calibrator will control pressure to the lowest point of HART device range automatically.

2). Input calibrator pressure measuring value (on the top left window) through soft key board or select Fetch to catch 760 Calibrator current measuring value to trim HART device pressure measuring value.

3). Press the enter key or select to apply.

②High trim:

1). The calibrator will automatically control the pressure to the highest point of the HART device



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range.

2). Input the calibrator pressure measurement value (on the top left window) or select Fetch to capture the calibrator value to trim the HART device.

3). Press the enter key or select to apply.

③Trim Reset:

This feature will reset the HART device back to factory parameters.



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### 3.2.5 Process

Press ⋯ and select ☰ Process to enter the HART device process variable setting menu:

| Subject | Comment |
|---|---|
| PV | Process variable |
| PVAO | Digital current value |
| %range | Percentage of pressure range |
| SV | Secondary variable |
| TV | Tertiary variable |
| QV | Quaternary variable |
| Loop Current | Loop current value |

Table 17 HART Device Variable

◆Selected process variable will be displayed at the top left corner of Electrical Measurement Window, after the Ⓗ HART- icon



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### 3.3 Zeroing

The zeroing function is available for current/voltage measurement and pressure measurement either internal or external pressure modules.

◆To zero: Press and select

◆Apply a short circuit for current / voltage zeroing

◆Allowable zeroing range:

Pressure: within 1%FS;

Current / Voltage: within 0.1%FS.

### 3.4 Vent

Press Vent on Control Bar and the calibrator will run the vent process.

◆The vent process will end pressurization during a regular test, typical application, task, and leak test

◆The VENT port should not face the operator during venting process

◆Dust or contaminants may blow out through the VENT port

◆Any moisture or liquid may also blow out through the vent port



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# 4. Typical Applications

The Additel 760 Automatic Handheld Pressure Calibrator supports six typical applications.

To start, please select Calibrator under Main Menu, then select the desired application.

◆In the operation interface, press to re-select from the application list

◆In the operation interface, press to enter the new test set up

◆Zeroing：If current / voltage measurement or internal pressure module requires zeroing then press and select to zero the measurement, see section 3.3

◆Custom applications can be built with several simple selections



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### 4.1 Pressure Gauge (Includes dial and digital pressure gauges)

In pressure gauge mode, pressure is the only output function available.

1. Pressure Output

◆Ensure proper pressure connections

◆ For pressure output, please see section 3.1.3

◆Jog：Press and select Jog, which allows for a digit to be selected and numerically incremented, see Figure 16

Figure 16 Jog Function

◆Numeric Keyboard：Press and select to allow for quick entry of pressure values

2. New Test：

2.1 New Test Settings：

①UUT (Unit Under Test)：

| Subject | Valid Value | Comment |
|---|---|---|
| Range | Depends on UUT | UUT range |

Table 18 Pressure Gauge Test Settings

②Test Method：



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See section 3.1.3-3-③Auto Step.

2.2 Test Execution:

After test settings are complete, press ✓ to execute the test:

1). Press ⓪ to zero pressure module if necessary;

2). Press MP to start the test;

◆The calibrator will pressurize to the first set point (which may be zero)

◆Press / / to switch calibration interface

◆Press ⚙ to check or change test settings

3). Standard test steps:

(1). After the pressure shows it is stable, the gauge pressure value can be entered in the box on the right. Press / / to switch the calibration interface.

(2). Press the enter key or ▶| for next test point and the calibrator will start to pressurize again

(3). Wait for the pressure value to be generated and stabilize and then enter the UUT values and proceed to the next point.

(4). Repeat step (2) and (3) until all test points passed.

2.3 Report:

Once the test is complete, the test report interface will appear. For more information, please see section 4.6.



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### 4.2 Current / Voltage Transmitter

In the Current / Voltage Transmitter mode, only current, voltage, and pressure are available functions.

1. Current / Voltage Measurement：

◆Correct electrical connection please see Figure 9

◆Data Analysis：Please see section 3.1.4-3

2. Pressure Output

◆Correct output connection please see Figure 8

◆Pressure output: Please see section 3.1.3

3. New Test：

3.1 New Test Settings：

①UUT (Unit Under Test)：

| Subject | Valid Value | Comment |
|---|---|---|
| Input | Depends on UUT | UUT pressure measuring range |
| Output | Depends on UUT | UUT electrical signal output range |
| Transfer Function | Linear | Transfer function type |

Table 19 Current / Voltage Transmitter Test Settings

②Test Method：

See section 3.1.3-3-③Auto Step



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3.2 Test Execution:

After test settings are complete, press ✓ to execute the test:

1). Press ⟲0⟳ to zero the pressure if necessary.

2). Press MP to run a manual test, or press AP to run an automatic test.

(1).In manual mode, run next test point by pressing ▶|, and the calibrator will automatically record the electrical signal and pressure value.

(2).In automatic mode, the calibrator will run the test and record the electrical and pressure values automatically without the need to advance the calibrator to the next set point.

◆Press 📈 / ▦ / ▦ to switch calibration interface

◆Press ⚙ to check or change test settings

3.3 Report:

Once the test is complete the test report interface will appear. For more information, please see section 4.6.



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### 4.3 HART Transmitter

In HART Transmitter mode, only the Process Variable function and the Pressure function are available.

1. HART Function：

◆Correct electrical connection and HART function, please see section 3.2

2. Pressure Output：

◆Correct output connection please see Figure 8

◆Pressure output: Please see section 3.1.3

3. New Test：

3.1 New Test Settings：

①UUT (Unit Under Test)：

| Subject | Valid Value | Comment |
|---|---|---|
| Input | Depends on UUT | UUT pressure measuring range |
| Transfer Function | Linear / Square Root | Transfer function type |

Table 20 HART Device Test Settings

②Test Method：

See section 3.1.3-3-③Auto Step

3.2 Test Execution:

After test settings are complete, press ✓ to execute the test:



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1).Press to zero the pressure if necessary.

2).Press to run a manual test, or press to run a automatic test.

(1).In manual mode, run the next test point by press calibrator and the calibrator will automatically record the electrical signal and pressure value.

(2).In automatic mode, the calibrator will run the test and record the electrical and pressure values automatically without the need to advance the calibrator to the next set point.

◆Press / / to switch calibration interface

◆Press to check or change test settings

3.3 Report:

Once the test is complete the test report interface will appear. For more information, please see section 4.6.



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### 4.4 Pressure Switch

In the Pressure Switch mode only switch and pressure measurement functions are available.

◆Press on the top left corner of Switch Measurement window to select the switch type: Mechanical Switch, Switch NPN, or Switch PNP.

1. Switch Measurement：

◆Correct electrical connection please see Figure 9

2. Pressure Output

◆Correct output connection please see Figure 8

◆Pressure output: Please see section 3.1.3

3. New Test：

3.1 New Test Settings：

①UUT (Unit Under Test)：

| Subject | Valid Value | Comment |
|---|---|---|
| Range | Depends on UUT | UUT pressure range |
| Accuracy | 0.01 ~ 100 | UUT accuracy |
| Switch Type | NC (normal close) / NO (normal open) | Pressure switch type |
| Repeatability | On / Off | Pressure switch repeatability |

Table 21 Pressure Switch Test Settings



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3.2 Test Execution:

After test settings are complete, press ✓ to execute the test:

1). Press to run test automatically

◆Press to check or change test settings

3.3 Report:

Once the test is complete the test report interface will appear. For more information, please see section 4.6.



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### 4.5 I/P Converter

In the I/P Converter mode only pressure and current functions are available.

◆Press on the top left corner of Current Output window to select the switch type: (0~24) or Simulate mA.

1. Pressure Output

◆Correct output connection please see Figure 8

◆Do not exceed the pressure range of the calibrator

◆Please select Measure on Control Bar

2. Current Output：

◆Correct electrical connection and Current Output function, please see section 3.1.7

◆Jog：Press and select Jog, current output value could be adjusted by each digit in this mode, see Figure 16

◆Scale：Press and select Scale for scale function, more detail please see section 3.14-3-②

3. New Test：

3.1 New Test Settings：

①UUT (Unit Under Test)：



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| Subject | Valid Value | Comment |
|---|---|---|
| Input | Depends on UUT | UUT current measuring range |
| Output | Depends on UUT | UUT pressure output range |
| Transfer Function | Linear / Square Root | Transfer function type |

Table 22 I/P Converter Test Settings

②Test Method：

See section 3.1.3-3-③Auto Step

3.2 Test Execution:

After test settings are complete, press ✓ to execute the test:

1). Press ⊗ to zero the pressure if necessary.

2). Press to run a manual test, or press to run an automatic test.

(1).In manual mode, run the next test point by press ▶| and the calibrator will automatically record the electrical signal and pressure value.

(2).In automatic mode, the calibrator will run the test and record the electrical and pressure values automatically without the need to advance the calibrator to the next set point.

◆Press / / to switch calibration interface

◆Press ⚙ to check or change test settings

3.3 Report:

Once the test is complete the test report interface will appear. For more information, please see



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section 4.6.

### 4.6 Documenting

Once the test is complete the test report interface will appear.

◆Report interface can be switched between chart view and data view by pressing

◆The test results will be canceled and the test will restart by pressing

◆Report results are saved by pressing and entering the information below

1. Save to task:

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Alphanumeric content (16 max length) | Test ID |
| Serial Number | Alphanumeric content (16 max length) | Test serial number |
| Location | Alphanumeric content (16 max length) | Test location |
| Notes | Alphanumeric content (16 max length) | Note |
| Accuracy | 0.001~100 | Test accuracy requirement |
| Range | N/A | Under test pressure gauge range |

Table 23 Test Information



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2. Save Options:

| Subject | Valid Value | Comment |
|---|---|---|
| Operator | Alphanumeric content (16 max length) | Test operator ID |
| Execute Date | 2000/01/01 ~ 2099/12/31 | Execution date |
| Temperature | -20 ~ 100 | Environment temperature during test , unit: ℃ |
| Humidity | 0 ~ 100 | Environment humidity during test |

Table 24 Test Save Options

◆Results can be recorded as As Found, As Left or Both (As Found and As Left)



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# 5. Setup

To enter the setup menu, please select Setup under Main Menu.

◆Any changes made in the Setup will become the default values after the calibrator is rebooted.

### 5.1 Control Settings

See section 3.1.3-1

### 5.2 24V Power

To turn on 24V or turn off 24V internal 24V power supply.

◆For safety and operation convenience, 24V power will be turned on or off automatically depending on the calibration operation.



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### 5.3 Communication

Communication settings:

| Subject | Valid Value | Comment |
|---|---|---|
| WLAN Settings | | |
| WLAN | On / Off | Enable or disable Wi-Fi communication function |
| SSID | Depends on network environment (only available when WLAN is on) | Select Wi-Fi router |
| Network Port | N/A | 760 calibrator network port, read only |
| MAC | N/A | 760 calibrator MAC address, read only |
| Advanced | DHCP / Static | Network address acquisition mode |
| USB Settings | | |
| Host / Slave Mode | Host / Slave | USB communication mode:<br>Host: For firmware update<br>Slave (device)：For communication with computer |

Table 25 Communication Settings



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### 5.4 Head Correction

Head pressure correction can be enabled or disabled.

◆If head pressure correction is enabled:

| Subject | Valid Value | Comment |
|---|---|---|
| Correction Type | Auto / Fixed | Head pressure correction value calculation type |
| Correction Type: Fixed | | |
| Correction Value | Depends on internal pressure module | Fixed correction value |
| Correction Type: Auto | | |
| Correction Value | N/A | Calculated value, read only |
| Unit | SI / BS | Unit standard:<br>SI: Metric unit<br>BS: Imperial unit |
| Density | Air / Nitrogen / Custom | Density of gas in used |
| Height | -1000 ~ 1000 cm (4 digit after decimal point) | Altitude difference between UUT pressure inlet port and 760 calibrator pressure outlet port |
| Gravity | 9 ~ 10 $m/s^2$ (4 digit after decimal point) | The gravity acceleration at the location of 760 calibrator |
| Temperature | 0 ~ 100℃ (2 digit after decimal point) | Temperature at the location of 760 calibrator |

Table 26 Head Pressure Correction



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**NOTE: Default air and nitrogen density is 0°C @ 1 013,25 hPa. After inputting your height and temperature the ADT760 will calculate the correction value.**

## 5.5 Services

### 5.5.1 Calibration

To calibrate 760 calibrator system.

**CAUTIONS:**

- ◆The calibrator should be powered to warm up 30 minutes prior to starting the calibration
- ◆Current / voltage measurement, current output, and internal pressure module need to be calibrated periodically
- ◆Carefully read user manual and follow the instruction before 760 calibrator system calibration operation
- ◆Incorrect system calibration operation will decrease the accuracy of 760 calibrator, even shutting down
- ◆During system calibration operation, pressing ↻ will restore the factory calibration and change the calibration date to "----/--/--"
- ◆A higher accuracy standard should be used to calibrate the ADT760 calibrator
- ◆The calibration operation password is: 123456
- ◆Once the calibration is completed and saved the new data will be immediately loaded and used. A new calibration date will also be uploaded
- ◆Once a new calibration has been finished and saved any previous calibrations will be permanently deleted except for the factory calibration



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5.5.1.1 Current / Voltage Measurement Calibration

1. Connection:

◆Correct electrical connection please see Figure 9

2. Calibration point setup:

Select the calibration point which needs to be changed, then input value

◆3 points for current / voltage measurement calibration

◆Default current measurement calibration points are -30 mA, 0 mA, 30 mA

Default voltage measurement calibration points are -30 V, 0 V, 30 V

◆Additel does not recommend changing calibration points.

3. Calibration Execution:

1). Press ▷ to start calibration process

2). Output current / voltage from standard to 760 calibrator and the standard output value needs to be the same as the corresponding calibration set point

3). When Measured Value is stable, press ▶| to record data and move to the next calibration point

◆If the difference between Calibration Point and Measured Value is unacceptable, the Measured Value will display red.

5.5.1.2 Current Output Calibration

1. Connection:

◆Correct electrical connection please see Figure 3-3.

2. Calibration point setup:



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Select the calibration point which needs to be changed, then input value

◆3 points for current output calibration

◆Default current output calibration points are 1mA, 10mA, 20mA

◆Additel does not recommend changing calibration points.

3. Calibration Execution:

1). Press ▷ to start calibration process

2). Output current from 760 calibrator to standard

3). When standard measuring value is stable, press correspondent **Measured Value** and input measuring value displayed on the standard then select Enter button or ✓ to confirm and then press ▶| to record data and move to the next calibration point.

5.5.1.3 Internal Pressure Module Calibration

1. Output Connection:

Select Internal / External pressurizing;

◆For Internal pressurizing: Please connect 760 calibrator pressure outlet port to the standard ensuring the standard is in measurement mode

◆For External pressurizing: Please connect 760 calibrator pressure outlet port with the standard, ensuring the standard is in pressure generation mode

2. Calibration point setup:

Select the calibration point which needs to be changed, then input value

◆3 points for internal pressure module calibration

◆Default calibration points are the lower limit, zero point, and the upper limit of internal pressure



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module

◆Additel does not recommend changing calibration points

**NOTE: The lower limit of some internal pressure modules may exceed the lower limit of 760 calibrator pump, please use External pressurizing to calibrate these internal pressure modules.**

3. Calibration Execution:

1). Press ▷ to start calibration process

2). Pressurization:

①Internal pressurizing:

Generate pressure using the 760 internal pump. When the pressure is stable press Reference value and input the value and select the Enter key or ✓ to confirm, then press ▶| to record data and move to the next calibration point.

②External pressurizing:

Output pressure from standard to 760 calibrator, and not the standard output value shall be the same as correspondent calibration set point. When Measured Value is stable, press ▶| to record data and move to the next calibration point.

5.5.1.4 Auto Tune

This function is only used during when recommended by Additel Corporation to service the calibrator

5.5.1.5 Pressure Sensor

This function is for positive and negative pressure sensor check with atmosphere.



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5.5.1.6 Barometer (Only for -MA & -MA-DL)

This function is for barometer sensor calibration.

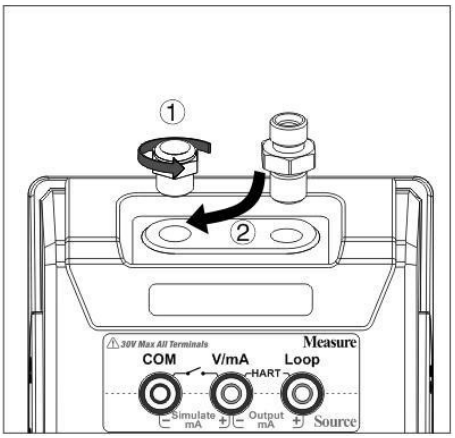


Figure 17 Barometer Sensor Calibration

1. Connection: Please connect 760 calibrator barometer sensor calibration port with standard pressure outlet port.

2. Calibration point setup:

Select the calibration point which needs to be changed, then input value

◆2 points for current output calibration

◆Default calibration points are 60kPa and 110kPa

◆Additel does not recommend changing calibration points

3. Pressure Outlet: The output pressure from the standard needs to be the same as the corresponding calibration set points. When the Measured Value is stable, enter the Reference



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value displayed on the standard and press the Enter key or ✓ to confirm, then press ▶| to record data and move to the next calibration point.

5.5.1.7 Touch Screen

To check the touch screen, please press the center of black cross displayed on the screen five times.

◆If pressed on the deviation from the center of black cross, the test will repeat until it is precisely pressed five times on the center of the black cross.

5.5.2 Diagnosis

This menu provides diagnostic information from the main board, control board, and electrical board which may help indicate if anything is working improperly.

◆If a problem is detected then please contact Additel for further assistance

◆More information:

1. Password: 123456

5.5.3 System Log

Lists all abnormal information. Powering off or rebooting will not clear the information. The information can be cleared by an update, please see section 5.5.4, or factory reset, please see section 5.5.5.



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### 5.5.4 Maintenance

This menu is used to depressurize the unit when switching internal pressure models.

◆Press ▷ to start.

### 5.5.5 Factory Reset

Resets all data to factory default settings.

◆Password：123456

### 5.5.6 Updates

To update 760 calibrator firmware, please:

1). Copy update file into an USB root directory

2). Insert USB into 760 calibrator USB port

3). Select Updates by USB on calibrator

4). Wait for the update to complete in which a notification will be given

◆Password：123456

◆The USB has to be in FAT16 or FAT32 type

◆The calibrator will switch USB port to Host type automatically



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## 5.6 Sound

To enable or disable **Touch Beep** and **Over range alarm beep**.

## 5.7 Personalization

### 5.7.1 Date and Time

| Subject | Valid Value | Comment |
|---|---|---|
| Time | 0:00 ~ 23:59 | Time |
| Date | 2000-1-1 ~ 2099-12-31 | Date |
| Date Format | YYYY-MM-DD / MM-DD-YYYY / DD-MM-YYYY | Date format |
| Date Separator | -, /, . | Date format separator |

Table 27 Date and Time Settings

### 5.7.2 Language

The calibrator is equipped with a multi-language user interface. Use this menu to change from the offered languages.



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5.7.3 Theme

Switch to **Light Theme** or **Dark Theme**.

5.7.4 Safety Data

Switch ON/OFF a warning before data deletion.

### 5.8 Power Management

| Subject | Valid Value | Comment |
|---|---|---|
| Brightness | 1~100% | Adjusting this setting may impact the battery life. |
| Battery Info | N/A | Battery Information: remaining capacity, full capacity, temperature, voltage, cell voltage I & II, Charging / Discharging Current |
| Auto Backlight Off | Never, 15 sec, 30 sec, 1 min, 5 min, 15 min, 30 min | Touch the screen to turn the backlight on |
| Auto Off | Never, 5 min, 15 min, 30 min, 1 hour, 2 hour | Auto power off after backlight is turned off. There will be a 30s countdown |

Table 28 Power Management



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### 5.9 System Information

1. Main:
Main information of 760 calibrator: including serial number, application, system version, Wi-Fi, BLE (Bluetooth), control board, electric board information

2. Battery:
Battery information: including serial number, version, manufacture date information.

3. Internal module:
Internal pressure module information: including range, pressure type, accuracy, serial number, version, manufacture date information.



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# 6. Task (Only available on 760-X-DL)

The Additel 760 calibrator provides task functionality for automated calibration while storing and archiving the calibration data. To use the task function, please select Task under Main Menu

### 6.1 New Task

Press + and select UUT (Unit Under Test) type to enter a New Task interface and add UUT information.



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### 6.1.1 Dial Pressure Gauge

UUT (Unit Under Test) information:

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Enter an alphanumeric content (16 max length) | UUT ID |
| Serial Number | Enter an alphanumeric content (16 max length) | UUT serial number |
| Location | Enter an alphanumeric content (16 max length) | Task location |
| Note | Enter an alphanumeric content (16 max length) | Task note |
| Pressure Type | Gauge / Absolute / Diff. | UUT pressure type |
| Range | Depends on UUT | UUT pressure measuring range |
| Accuracy | 0.06%, 0.1%, 0.16%, 0.25%, 0.4%, 0.6%, 1%, 1.6%, 2.5%, 4%,Custom | UUT accuracy |
| Resolution | 0.0001~999999999999 | The pressure difference represented by nearest two scale on UUT. |

Table 29 Dial Pressure Gauge Information Settings

Press ✓ to complete UUT information set up and the calibrator will switch back to the task list. For further instruction, please see section 6.2.1.



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### 6.1.2 Digital Pressure Gauge

Please see section 6.1.1.

Press ✓ to complete UUT information set up and the calibrator will switch back to the task list. For further instruction, please see section 6.2.2.



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### 6.1.3 Pressure Transmitter (Current, Voltage, HART)

UUT (Unit Under Test) information:

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Enter an alphanumeric content (16 max length) | UUT ID |
| Serial Number | Enter an alphanumeric content (16 max length) | UUT serial number |
| Location | Enter an alphanumeric content (16 max length) | Task location |
| Note | Enter an alphanumeric content (16 max length) | Task note |
| Pressure Type | Gauge / Absolute / Diff. | UUT pressure type |
| Input | Depends on UUT | UUT pressure measuring range |
| Output | Analog：<br>4~20 mA / 0~10 mA / 0~20 mA / 1~5 V / 0~5 V / 0~10 V / Custom | Current / voltage pressure transmitter output electrical signal type |
| | HART：<br>PV / % range / PVAO / Loop Current | HART transmitter output electrical signal display type |
| Transfer Function | Linear / Square Root | Transfer function type |
| Accuracy | 0.05%, 0.1%, 0.2%, 0.5%, 1%, 1.5%, 2%, 2.5%, Custom | UUT accuracy |

Table 30 Pressure Transmitter Information Settings

Press ✓ to complete UUT information set up and the calibrator will switch back to the task list. For further instruction, please see section 6.2.3.



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### 6.1.4 Pressure Switch

UUT (Unit Under Test) information:

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Enter an alphanumeric content (16 max length) | UUT ID |
| Serial Number | Enter an alphanumeric content (16 max length) | UUT serial number |
| Location | Enter an alphanumeric content (16 max length) | Task location |
| Note | Enter an alphanumeric content (16 max length) | Task note |
| Pressure Type | Gauge / Absolute / Diff. | UUT pressure type |
| Range | Depends on UUT | UUT pressure measuring range |
| Set point | Depends on UUT | Pressure switch activation set point |
| Accuracy | 0.06%, 0.1%, 0.16%, 0.25%, 0.4%, 0.6%, 1%, 1.6%, 2.5%, 4%, Custom | UUT accuracy |
| Switch Type | NC (normal close) / NO (normal open) | Pressure switch type |
| Deadband | Depends on UUT | Dead band range of pressure switch |

Table 31 Pressure Switch Information Settings

Press ✓ to complete UUT information set up and the calibrator will switch back to the task list. For further instruction, please see section 6.2.4.



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### 6.1.5 I/P Converter

UUT (Unit Under Test) information:

| Subject | Valid Value | Comment |
|---|---|---|
| Name | Enter an alphanumeric content (16 max length) | UUT ID |
| Serial Number | Enter an alphanumeric content (16 max length) | UUT serial number |
| Location | Enter an alphanumeric content (16 max length) | Task location |
| Note | Enter an alphanumeric content (16 max length) | Task note |
| Pressure Type | Gauge / Absolute / Diff. | UUT pressure type |
| Input | Depends on UUT | UUT electrical signal measuring range |
| Output | Depends on UUT | UUT pressure output range |
| Transfer Function | Linear / Square Root | Transfer function type |
| Accuracy | 0.025%, 0.05%, 0.1%, 0.16%, 0.25%, 0.4%, 1%, 1.6%, 2.5%, 4%, Custom | UUT accuracy |

Table 32 I/P Converter Information Settings

Press ✓ to complete UUT information set up and the calibrator will switch back to the task list. For further instruction, please see section 6.2.5.



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### 6.2 Task Execution

Please select UUT(Unit Under Test) from the task list, and check UUT information. Next select ▷to view and or edit the task information and execute the test.

◆To edit UUT information, please select UUT from the task list then select ✎.

6.2.1 Dial Pressure Gauge

1. Task Execution Setup (Run Information):

| Subject | Valid Value | Comment |
|---|---|---|
| Set Points | 2~17;<br>Set point values depend on UUT range | Set point values will be calculated automatically.<br>◆To edit the number of set points: press ⌃/ ⌄ or press on set point number at the bottom of the screen and input value through soft keyboard<br>◆To edit value: select and input value through soft keyboard |
| Repeat | 1 / 2 / 3 | Task cycle times |
| Stroke | Round Trip / One Way | Task stroke type |
| Readout format | Value / Scale | 1.Value：Input dial pressure gauge indicated value<br>2.Scale：Input scale number indicated on dial pressure gauge. For example, Resolution of UUT is 0.1 kPa, input 2 as scale number means UUT measurement value is 0.2 kPa |
| Tapping | On / Off | To enable or disable tapping after reach each set point during the test |

Table 33 Dial Pressure Gauge Task Settings



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2. Task Execution：

Press ✓ to execute the task：

1). ⊘ to zero pressure module if necessary

2). Press MP to start the test;

◆The calibrator start pressurizing to the first test point

◆Press / / to switch calibration interface

3). Standard test steps:

(1). After pressure is stable , enter the UUT pressure value on the top right UUT window or press / / to switch the calibration interface.

(2). Press the Enter key or ▶| for the next test point in which the calibrator will pressurize again.

**Note: if the tapping function is enabled, you should tap the dial gauge at each set point.**

(3). After the next pressure is stable then enter the UUT value in the UUT window or press / / to switch the calibration interface.

(4). Repeat step (2) and (3) until all test points are completed.

3. Report:

Once test is done, the reporting interface will appear. For more information please see section 6.4.



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6.2.2 Digital Pressure Gauge

1. Task Execution Setup (Run Information):

| Subject | Valid Value | Introduction |
|---|---|---|
| Set Points | 2~17;<br>Set point values depend on UUT range | Set point values will be calculated automatically.<br>◆To edit the number of set points press: press / or press on Set point number at the bottom of the screen and input value<br>◆To edit value: select and input value |
| Repeat | 1 / 2 / 3 | Task cycle times |
| Stroke | Round Trip / One Way | Task stroke type |

Table 34 Digital Pressure Gauge Task Settings

2. Task Execution：

Press to execute task：

1). Press to zero pressure module if necessary.

2). Press to start the test;

◆The calibrator start pressurization to the first test point

◆Press / / to switch calibration interface

3). Standard test steps:

(1). After the pressure is stable at the first test point then enter the UUT pressure value on the top right UUT window or press / / to switch the calibration interface.

(2). Press the Enter key or for the next test point in which the calibrator will begin pressurizing



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again.

(3). After the pressure is stable enter the UUT value.

(4). Repeat step 2 and 3 until all test points are completed.

3. Report:

Once a test is complete, the test report interface will appear. For more information please see section 6.4.



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6.2.3 Pressure Transmitter (Current, Voltage, HART)

1. Task Execution Setup (Run Information):

| Subject | Valid Value | Comment |
|---|---|---|
| Set Point | 2~17;<br>Set point values depend on UUT range | Set point values will be calculated automatically.<br>◆To edit the number of set points press: press ⊙ / ⊙ or press on set point number at the bottom of the screen and input value<br>◆To edit value: select and input value |
| Repeat | 1 / 2 / 3 | Task cycle times |
| Stroke | Round Trip / One Way | Task stroke type |
| Dwell Time | 1~36000 | Dwell time after pressure stabilized at each set point, unit: sec |

Table 35 Pressure Transmitter Task Settings

2. Task Execution：

Press ✓ to execute the task：

1).Press ⊗ to zero pressure module if necessary.

2).Press MP to run the test manually, or AP to run the test automatically.

(1).In manual mode, run the next test point by pressing ▶|, the calibrator will record electrical signal and pressure value automatically

(2). In automatic mode the calibrator will run the test and record the electrical and pressure values



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automatically.

◆Press / / to switch calibration interface

3. Report:

Once a test is complete, the test report interface will appear. For more information please see section 6.4.



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6.2.4 Pressure Switch

1. Task Execution Setup (Run Information):

| Subject | Valid Value | Comment |
|---|---|---|
| Repeat | 1 / 2 / 3 | Task cycle times |
| Select Current Source Channel | Switch(Mechanical Switch) / Switch PNP / Switch NPN | Pressure switch type |

Table 36 Pressure Switch Task Settings

2. Task Execution：

Press ✓ to execute task：

Press to run test automatically;

◆The calibrator will run the test and record electrical signal and pressure value automatically

3. Report:

Once a test is complete, the test report interface will appear. For more information please see section 6.4.



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6.2.5 I/P Converter

1. Task Execution Setup (Run Information):

| Subject | Valid Value | Comment |
|---|---|---|
| Set Points | 2~17;<br>Set point values depend on UUT range | Set point values will be calculated automatically.<br>◆To edit the number of set points press: press ⌃ / ⌄ or press on set point number at the bottom of the screen and input the value<br>◆To edit the value: select and input value |
| Repeat | 1 / 2 / 3 | Task cycle times |
| Stroke | Round Trip / One Way | Task stroke type |
| Dwell Time | 1~36000 | Dwell time after pressure stabilized at each set point, unit: sec |
| Select Current Source Channel | (0~24) mA / Simulate mA | Electrical signal type measured by I/P converter |

Table 37 I/P Converter Task Settings

2. Task Execution：

Press ✓ to execute task：

1).Press ⓪ to zero pressure module if necessary.

2).Press MP to run the test manually, or press AP to run the test automatically.



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(1).In manual mode, run the next test point by pressing ▶|, the calibrator will record electrical signal and pressure value automatically.

(2).In automatic mode, the calibrator will run the test and record electrical signal and pressure value automatically.

◆Press / / to switch calibration interface

3. Report:

Once a test is complete, the test report interface will appear. For more information please see section 6.4.

### 6.3 Task Delete

To delete a task: In task list, press and select **Clear All Tasks** or **Task delete management**.

◆In task delete management interface, select to select all tasks or select single or multiple tasks, then press to delete selected tasks.



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### 6.4 End of Task

Once a test is complete, the test report interface appears.

◆Report interface can be displayed in a chart or data format by pressing

◆The test data can be canceled and the test will restart by pressing

◆To save the report press and enter the information below:

Save Options:

| Subject | Valid Value | Comment |
|---|---|---|
| Operator | Alphanumeric content (16 max length) | Test operator ID |
| Execute Date | 2000/01/01~2099/12/31 | Execution date |
| Temperature | -20~100 | Environment temperature during test , unit: ℃ |
| Humidity | 0~100 | Environment humidity during test |

Table 38 Task Save Operation

◆ The report can be saved as As Found, As Left or Both (As Found and As Left)



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# 7. Data Logger (Only available on 760-X-DL)

To use data logger function, please select Data Logger under Main Menu☰.

1. The data logging functions available are listed below:

①Electrical Signal: Current / voltage measurement, pressure switch (mechanical, PNP, NPN) measurement, current output (0~24 mA, simulate mA), and HART device electrical signal are available for data logging.

②Pressure Measurement: Internal pressure module and external pressure module.

◆Data logging is available when the external pressure module is properly connected

◆At most, 4 channels can be logged independently or together: One electrical signal channel, one pressure measurement channel and two external pressure module channels;

2. Data Logger Channel Setup:

Press ⊕ or ⊖ to add or delete channels.

◆By selecting a channel from the channel list, you can view the channel number, change the logging content and change the units

◆Channel numbers will be rearranged once a channel has been deleted

3. Data logger setup:

Press the data logger details area which is on the bottom of the screen to change data logger setup:



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| Subject | Valid Value | Comment |
|---|---|---|
| Trigger | Periodic | Data logger activate type, read only |
| Interval | 0.1~999999 | Data logging internal, unit: sec |
| Samples | 1-999999 | Data logging sample number |
| Time | 0:00:00~999:59:59 | Data logging total time span |

Table 39 Data Logger Setup

**NOTE：Interval x Samples = Times**

4. To start data logging, press ▷:

1). Input data logging name, notes, and operator information, then select ✓.

2). The calibrator will start data logging automatically.

◆When the data logging process has started, data begins to record automatically

◆Press to see data logging chart

◆When in the chart view the different channels are represented by a different color:

| Theme | Channel 1 | Channel 2 | Channel 3 | Channel 4 |
|---|---|---|---|---|
| **White** | Blue | Orange | Aqua | Green |
| **Black** | Blue | Orange | Deep Pink | Green |

Table 40 Data Logger Chart

◆To stop logging press □

◆Press to enter Logger Results interface for data review



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◆In review interface, press to switch between chart and data view

# 8. Application

To use additional applications, please select Application under Main Menu .

### 8.1 Leak Test

Leak test is used to check the leak rate in the calibration system.

To start a test, press the > in the top right portion of the leak test screen. this will allow you to modify the following parameters.

| Subject | Valid Value | Comment |
|---|---|---|
| Pressure Module | Internal Pressure Module (INT.P) / External Pressure Module (PM) | Select pressure module |
| Pressure Type | Gauge / Absolute / Diff. | Pressure module pressure type, depends on 760 model |
| Unit | One from 25 default units or from 5 custom units | 760 Calibrator pressure unit, see section 3.1.2 |
| Test Time | 0:00:00~999:59:59 | Leak test total time span |
| Wait Time | 0:00:00~999:59:59 | Waiting time before leak test started |
| Set Point | Depends on internal pressure module | Leak test pressure set point |

Table 41 Leak Test

Press to start leak test.



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### 8.2 Pressure Unit Converter

Each Additel 760 calibrator has a built-in pressure unit converter.

◆Press on any unit and input the value you would like to convert to



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# 9. Service

### 9.1 Inlet Port Filter

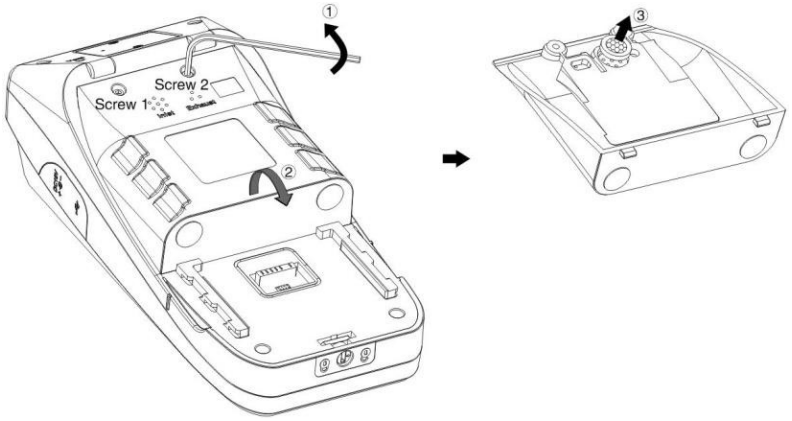


Figure 18 Inlet Port Filter

To change inlet port filter:

1). Remove battery and screw 1 and 2 by using Allen Key (2.5mm)

2). Remove back cover

3). Change the filter

Maintenance Cycle: 3 ~ 6 months depending on use.



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### 9.2 Pressure Outlet Port Filter and O-ring (Same as REF port)

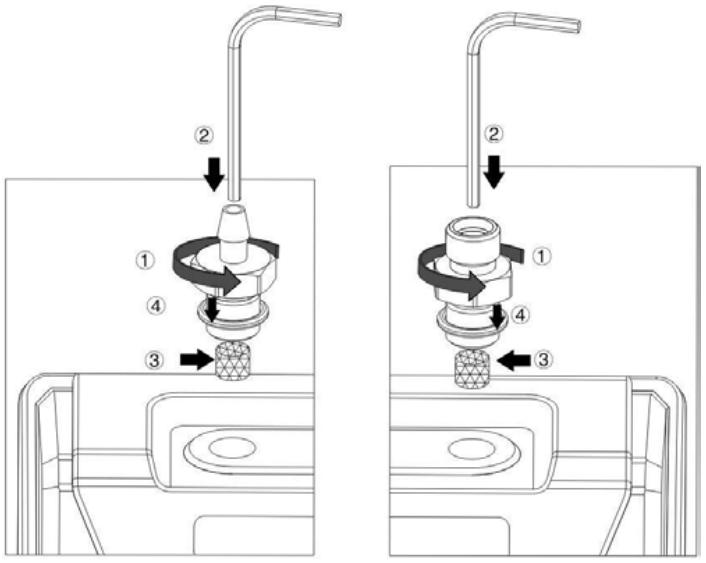


Figure 19 REF and Outlet PortFilter

To change pressure outlet port filter and o-ring:

1). Remove pressure outlet port by turning in counter-clockwise direction
2). Push out the filter by using Allen Key (≤2.5mm)
3). Clean by water or replace with a new one
4). Change o-ring if needed.

Maintenance Cycle: 3 ~ 6 months depending on use.



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# Appendix 1: SCPI List

**NOTE: In the system, pressure unit is an independent parameter. Current / voltage unit is used as a parameter along with its numerical value.**

### A1.1 IEEE488.2

| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | *CLS | The command removes the following register:<br>Standard event register;<br>Query event register;<br>Operational event register;<br>Status byte register;<br>Error queue. | - | - |
| 2 | *ESE <enable value> | Set the value of standard event enable register | <NRf>,0-255 | - |
| 3 | *ESE? | Read the value of standard event enable register | - | <NR1> |
| 4 | *ESR? | Read the value of standard event register. On execution of the order, the value of standard event register will be reset. | - | <NR1> |
| 5 | *IDN? | In inquiring the apparatus marking, the | - | Product series No. |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | return data shall be divided into 2 parts:<br>a.Product series No;<br>b.Software version No. | | and software Ver. No. |
| 6 | *OPC | After the equipment implements *OPC command, set the "operation complete" of standard event register at 1. | - | - |
| 7 | *OPC? | After *OPC? Order, return to 1. | - | 1 |
| 8 | *RST | Reset main program | - | - |
| 9 | *SRE <enable value> | Set the value of status byte enable register | <NRf>,0-255 | - |
| 10 | *SRE? | Read the value of status byte enable register | - | <NR1> |
| 11 | *STB? | Read the value of status byte register | - | <NR1> |
| 12 | *WAI | Wait for completion of operation. | - | - |



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## A1.2 Measurement and configuration

| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | MEASure[:SCALar][:PRESsure<n>]? | Pressure measurement. n valuing 1~6.<br>PRESsure1 means reading the pressure of pressure module under control (the value adjusted by air column under the currently set pressure type);<br>PRESsure2 means reading the pressure of internal module (as original value);<br>PRESsure3 means reading the pressure of external module (as original value);<br>PRESsure4 means reading the pressure of positive pressure module (as original value);<br>PRESsure5 means reading the pressure of negative pressure module (as original value);<br>PRESsure6 means reading atmospheric pressure | - | Measurement value: name of unit |
| 2 | MEASure[:SCALar]:CURRent? | Current measurement. For multi-channel measurement, n=1~4. | - | Measurement value |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | On receiving the command, the controller sets the measurement item as mA measurement, conduct measurement, and return to the measurement value. The current measurement has only one range (-30~30) mA, displaying the fixed bit width of 6. | | |
| 3 | MEASure[:SCALar]:VOLTage? | Voltage measurement | | Measurement value |
| 4 | MEASure[:SCALar]:SWITch:REGular? | Mechanical Switch status test | - | 1：Open；<br>0：Close. |
| 5 | MEASure[:SCALar]:SWITch:PNP? | PNP Switch status test | | 1：Open；<br>0：Close. |
| 6 | MEASure[:SCALar]:SWITch:NPN? | NPN Switch status test | | 1：Open；<br>0：Close. |
| 7 | MEASure[:SCALar]:ElECtricity? | Read current measurement value. | | Measurement value, unit. |
| 8 | SENSe:ElECtricity:FUNCtion “<function>” | Switch measurement type due to “<function>” | Measurement type:<br>“CURRent”：current | - |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | measurement; "CURRent:SOURce" :current output "VOLTage" : voltage measurement within (-300~300)mV range; "SWITch:REGular" : Switch tes; "SWITch:PNP" : PNP switch test; "SWITch:NPN" : NPN switch test. | |
| 9 | SENSe:ElECtricity:FUNCtion? | Read measurement type | - | |
| 10 | SENSe:PRESsure<n>:MODE ABSolute\|GAUGe | Pressure type switching, n=1~3<br>1. Internal pressure module<br>2. External pressure module A<br>3. External pressure module B | ABSolute: Absolute pressure; GAUGe : Gauge pressure; | - |
| 11 | SENSe:PRESsure<n>:MODE? | Read pressure type, n=1~3<br>1. Internal pressure module | - | Pressure type |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | 2. External pressure module A<br>3. External pressure module B | | |
| 12 | SENSe:PRESsure<n>:DIGit 4\|5\|6\|7\|MINimum\|MAXimum | Set pressure value display bit wide. 7 bit is only available for quartz pressure module.<br>n=1~3<br>1. Internal pressure module<br>2. External pressure module A<br>3. External pressure module B | Bit wide:<br>MIN stands for minimum bit wide;<br>MAX stands for maximum bit wide; | - |
| 13 | SENSe:PRESsure<n>:DIGit? [MINimum\|MAXimum] | Set pressure value display bit wide.<br>n=1~3<br>1. Internal pressure module<br>2. External pressure module A<br>3. External pressure module B | MINimum stands for minimum bit wide;<br>MAXimum stands for maximum bit wide;<br>Current set Ignore this parameter | Bit wide |
| 14 | SENSe:PRESsure<n>:RANGe:UPPer? | Read the upper limit of current pressure control module | - | Upper limit, unit |
| 15 | SENSe:PRESsure<n>:RANGe:LOWer? | Read the lower limit of current pressure control module | - | Lower limit, unit |
| 16 | SENSe:PRESsure<n>:ZER | Zero pressure measurement value of | - | - |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | O | current pressure control module.<br>n=1~3<br>1. Internal pressure module<br>2. External pressure module A<br>3. External pressure module B | | |
| 17 | SENSe:ElECtricity:ZERO | Zero current electrical measurement value | - | - |
| 18 | SENSe:VOLTage[:DC]:RANGe?<br>[MINimum\|MAXimum] | Read voltage measurement range | MINimum stands for minimum range;<br>MAXimum stands for maximum range;<br>All available ranges will be returned if ignore this parameter. | Lower limit, upper limit |
| 19 | SENSe:CURRent[:DC]:RANGe? | Read current measurement range | - | Lower limit, upper limit |
| 20 | SENSe<n>:ONLine? | Read pressure module status.<br>n=1~3<br>1. Internal pressure module<br>2. External pressure module A | | 1：Online<br>0：Offline |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | 3. External pressure module B | | |
| 21 | SENSe<n>:VERSionSW\|HW | Read pressure module version.<br>n=1~3<br>1. Internal pressure module<br>2. External pressure module A<br>3. External pressure module B | SW：Software Version<br>HW：Hardware Version | |



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## A1.3 Output

| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | [SOURce:]PRESsure<pressure_value> | Set targeted pressure value and output pressure. | Pressure value: <numeric_value>, unit is the current set unit of system | - |
| 2 | [SOURce:]PRESsure? | Read target pressure value | - | Target value, unit |
| 3 | [SOURce:]PRESsure:LIMit:UPPer? | Read pressure output upper limit | - | Upper limit, unit |
| 4 | [SOURce:]PRESsure:LIMit:LOWer? | Read pressure output lower limit | - | Lower limit, unit |
| 5 | [SOURce:]PRESsure:SLEW <value> | Set pressure control rate | Pressure control rate: <numeric_value>, unit is the current set unit of system | - |
| 6 | [SOURce:]PRESsure:SLEW? [LOWer\|UPPer] | Read pressure control rate | LOWer: Read lower limit<br>UPPer: Read upper limit<br>Read current | Pressure control rate, unit |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | pressure control rate if ignore this parameter | |
| 7 | [SOURce:]PRESsure:SLEW:TYPEMAX\|CUSTom | Set pressure control rate type | Max: Maximum rate<br>Custom: Custom rate | - |
| 8 | [SOURce:]PRESsure:SLEW:TYPE? | Read pressure control rate type | - | Pressure control rate type |
| 9 | [SOURce:]PRESsure:TOLerance<value> | Set pressure stability | Pressure stability: <numeric_value>, %FS | - |
| 10 | [SOURce:]PRESsure:TOLerance? | Read pressure stability | - | Pressure stability |
| 11 | OUTPut[:PRESsure]:MODE CONTrol\|MEASure\|VENT | Set controller working type | CONTrol; MEASure; VENT. | - |
| 12 | OUTPut[:PRESsure]:MODE? | Read controller working type | - | controller working type |
| 13 | OUTPut[:PRESsure]:STABl | Read pressure stability status | - | 1: Stable; 0: Unstable |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | e? | | | |
| 14 | OUTPut:GPIO<n>[:STATus]<br><Boolean>\|LOW\|HIGH | Set IO port status, n=1~30, stands for the IO port pin position. For example, GPIO2 stands for the second pin of IO port. | 1 or HITH: High electrical level;<br>0 or LOW: Low electrical level | - |
| 15 | OUTPut:GPIO<n>[:STATus]? | Read IO port status | - | 1: High electrical level;<br>0: low electrical level |
| 16 | OUTPut:24V[:STATe]<br>0\|1\|OFF\|ON | Set 24V power status | 1 or ON<br>0 or OFF | OK,<br>ERROR |
| 17 | OUTPut:24V[:STATe]? | Read 24V power status | - | 24V power status |
| 18 | [OUTPut:]CURRent:SOURce<Value>[,<Mode>] | Current output | Value: current output value<br>Mode: Output mode<br>0 : Original value<br>1 : End value<br>Default is 1 | |
| 19 | [OUTPut:]CURRent:SOURce? | Read current output value | | |



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## A1.4 Calculation

| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | CALCulate[:PRESsure]:LIMit:LOWer<low> | Set pressure lower limit | Pressure lower limit, unit is the current set unit of system | - |
| 2 | CALCulate[:PRESsure]:LIMit:LOWer? | Read pressure lower limit | - | Pressure lower limit, unit |
| 3 | CALCulate[:PRESsure]:LIMit:UPPer<high> | Set pressure upper limit | Pressure upper limit, unit is the current set unit of system | - |
| 4 | CALCulate[:PRESsure]:LIMit:UPPer? | Read pressure upper limit | - | Pressure upper limit, unit |
| 5 | CALCulate[:PRESsure]:LIMit:STATe<Boolean>\|ON\|OFF | Set whether the output range limit is enabled | 1 or ON: Enable<br>0 or OFF: Disable | - |
| 6 | CALCulate[:PRESsure]:LIMit:STATe? | Inquire whether the output range limit is enabled | - | 1: Enable<br>0: Disable |
| 7 | CALCulate[:PRESsure]:LIMit:VENT<value> | Set venting pressure | Venting pressure: <numeric_value>, | - |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | unit is the current set unit of system | |
| 8 | CALCulate[:PRESsure]:LIMit:VENT? | Read venting pressure | - | Venting pressure, unit |

### A1.5 System

| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | SYSTem:VERSion? [<module>] | Read module SCPI Ver No..<br>Default is the system SCPI version number | "APPLication": Main program version<br>"CONTroller:FIRMware": Controller firmware version<br>"CONTroller:HARDware": Controller hardware version<br>"ElECtricity:FIRM | Version number |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | ware" : Electrical measurement board firmware version "ElECtricity:HARDware" : Electrical measurement board hardware version | |
| 2 | SYSTem:ERRor[:NEXT]? | Check next error item in the error queue, and delete the item from the queue. The error queue can store 50 pieces of error information. The last piece will be replaced by -350 "Queue overflow" in the case of over 50 pieces. System power off or *CLS order can remove error queue. | - | Error information |
| 3 | SYSTem:DATE? | Read system date | - | Year, month, day |
| 4 | SYSTem:TIME? | Read system time | - | Hour, minute, second |
| 5 | SYSTem:KLOCk<Boolean>\|ON\|OFF | Set screen lock | 1 or ON: Lock screen; | - |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | 0 or OFF: Unlock screen | |
| 6 | SYSTem:KLOCk? | Read screen lock status | - | 1：Lock<br>0：Unlock |
| 7 | SYSTem:MAINtenance:MODE<Boolean>\|ON\|OFF | Set system maintenance status | 1 or ON: Maintenance start<br>0 or OFF: Maintenance stop | - |
| 8 | SYSTem:MAINtenance:STATe? | Read system maintenance status | - | Outlet pressure, positive, and negative pressure venting status InProgress: Being venting<br>Completed：Complete venting Failed: Venting failed |
| 9 | SYSTem:COMMunicate:SOCKet:WLAN[:STATe]<Boolean>\|ON\|OFF | Set WIFI status<br>NOTE： The serial port will be disabled if WiFi is on. During conversion time, | 1 or ON：Turn on WIFI;<br>0 or OFF：Turn off | - |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | communicate with controller through the Ethernet. | WIFI | |
| 10 | SYSTem:COMMunicate:SOCKet:WLAN[:STATe]? | Read WIFI Status | - | 1: WIFI is on;<br>0: WIFI is off |
| 11 | SYSTem:COMMunicate:SOCKet:WLAN:ADDRess<IP address> | Set WIFI IP address | IP address: Without quotation marks, the format is <NR1>.<NR1>.<NR1>.<NR1> | - |
| 12 | SYSTem:COMMunicate:SOCKet:WLAN:ADDRess? | Read WIFI IP address | - | IP address |
| 13 | SYSTem:COMMunicate:SOCKet:WLAN:MASK <IP address> | Set subnet mask | IP address: Without quotation marks, the format is <NR1>.<NR1>.<NR1>.<NR1> | - |
| 14 | SYSTem:COMMunicate:SOCKet:WLAN:MASK? | Read subnet mask | - | IP address |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 15 | SYSTem:COMMunicate:SOCKet:WLAN:GATeway <IPaddress> | Set WIFI gateway | IP address: Without quotation marks, the format is <NR1>.<NR1>.<NR1>.<NR1> | - |
| 16 | SYSTem:COMMunicate:SOCKet:WLAN: GATeway? | Read WIFI gateway | - | IP address |
| 17 | SYSTem:COMMunicate:SOCKet:WLAN:MAC? | Read WIFI MAC address | - | MAC address |
| 18 | SYSTem:COMMunicate:SOCKet:WLAN:DHCP[:STATe] <Boolean>\|OFF\|ON | Set WIFI DHCP status | 1 or ON: DHCP on; 0 or OFF: DHCP off | - |
| 19 | SYSTem:COMMunicate:SOCKet:WLAN:DHCP[:STATe]? | Read WIFI DHCP status | - | 1: DHCP on; 0: DHCP off |
| 20 | SYSTem:COMMunicate:SOCKet:WLAN:SSID? [ALL] | If this parameter is ALL, the search is performed, and returns all the search to the SSID name and encryption methods. If ignoring parameters, returns the current | - | {[ "ssid: encryption method" ]} |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | connection name and SSID encryption, no connection or not to return to the hot search"" | | |
| 21 | SYSTem:COMMunicate:SOCKet:WLAN:CONNect <ssid>,encryptionMode[,<password>] | Connect to specific hot spot | 1）ssid: Hot spot name, string with quotation marks; 2) encryptionMode: encryption method, OPEN\|WPA\|WPA2; 3) password: password, string with quotation marks | - |
| 22 | SYSTem:COMMunicate:SOCKet:WLAN:CONNect? | Read WIFI connection status | - | Successfully, Initialization, SSIDNotFound SSIDNotConfigured, JoinFaile |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | | ScaningConfiguredSSID<br>WaitingIPConfiguration<br>ModuleJoinedListeningSockets |
| 23 | SYSTem:COMMunicate:SOCKet:WLAN:DISConnect | Disconnect WIFI | - | - |
| 24 | SYSTem:COMMunicate:SOCKet:WLAN:DBM? | Read WIFI DBM value | - | DBM value，uint is dBm |



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## A1.6 Status

| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | STATus:OPERation:ENABle<enable value> | Set operation status enable register | Enable value: <numeric_value>, 0-65535 | - |
| 2 | STATus:OPERation:ENABle? | Read operation status enable register | - | <enable value>:NR1 |
| 3 | STATus:OPERation[:EVENt]? | Read the value of operation status register. On execution of the command, the value of operation status register shall be reset. | - | <value>:NR1 |
| 4 | STATus:QUEStionable:ENABle<enable value> | Set problem data enable register | Enable value: <numeric_value>, 0-65535 | - |
| 5 | STATus:QUEStionable:ENABle? | Read problem data enable register | - | <enable value>:NR1 |
| 6 | STATus:QUEStionable[:EVENt]? | Read the value of problem data incident Register. The value of the problem data enable register will be cleared after the command is executed. | - | <value>:NR1 |
| 7 | STATus:PRESet | Remove the value operation status enable register and problem data enable register | - | - |



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### A1.7 Unit

| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | UNIT:PRESsure<n><unit_name>\|<unit_ID> | Set pressure unit | Unit: Can be a unit name or unit ID, unit name is a string with quotes, unit ID is number. | - |
| 2 | UNIT:PRESsure<n>? | Read pressure unit | - | Unit name |
| 3 | UNIT:PRESsure<n>:ID? | Read system unit ID<br>n= 1~3<br>1. Internal pressure module<br>2. External pressure module A<br>3. External pressure module B | | Unit ID |



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### A1.8 Data Record

| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1 | DATALOGGER:COUNt? | | Read the total number of data records | Result quantity |
| 2 | DATALOGGER:CATalog? <Index>,<count> | Index: Starting position count: Qty. (0-5) | Read data record brief information (GUID, record name, operator, notes, record time, sampling number, sampling interval) | ClassName，Base64 character data，CRC16 check code (Data obtained by anti serialization) |
| 3 | DATALOGGER:LOGGerinfo ? <guid> | guid: Unique identifier for data records | Read a record information (the number of channels, channel information, etc.) | ClassName，Base64 character data，CRC16 check code (Data obtained by anti serialization) |
| 4 | DATALOGGER:DATA? <guid>,<start>,<length> | guid: Unique identifier for data records start: Relative starting position length: Length of information reading in one | Read log data | data，Base64 character data，CRC16 check code (Data need to |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | time (less than 750 bytes) | | be converted into an array of byte, and then converted to float values for presentation) |
| 5 | DATALOGGER:DELete<guid> | guid: Unique identifier for data records | Delete record | |
| 6 | DATALOGGER:CLEar | | Clear all records | |
| 7 | DATALOGGER:SEARchcount ?<br><Condition> | Condition: Condition, strings with quotation marks<br>Format: "Type,Param"<br>Type: Searching method<br>0: Result name<br>1: operator<br>2: Note<br>3: Start and stop time<br>Param: The parameters of the search method, separated by a comma.<br>Muilt-condition searching are available.<br>eg: | Number of searching result which meets the condition | Result quantity |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | DATALOGGER:SEARchcount?<br>"0,test;1,sun;2,heihei;3,2000/01/28,2016/10/28" | | |
| 8 | "DATALOGGER:SEARchinfo [:ECHO]?<br>< Condition>,< Index>,< count>" | Conditon: Same as above<br>Index: Starting position count: Qty. (0-5) | Read the brief information that satisfies the condition data record | ClassName，Base64 character data，CRC16 check code (Data obtained by anti serialization) |



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## A1.9 HART

| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 1. | HART:SUPPLYMODE? | | Read power supply type | 0: Internal; 1: External; |
| 2. | HART:SUPPLYMODE Int\|Ext\|0\|1 | 0 or Int: Internal;<br>1 or Ext: External; | Set power supply type (the electrical measurement will switch to HART measurement if power supply type is changed) | |
| 3. | HART:SEARCHStart\|Stop\|Zero[,<Numeric>][,<Numeric>] | Start: Start searching;<br>Stop: Stop searching;<br>Zero: Only search where address is 0<br>NOTE: address range parameter can be added follow "Start" and "Stop", such as ",0,15" | HART search ; | |
| 4. | HART:DEVICES? | | Return to the searched device list (address and | |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | | | type) | |
| 5. | HART:CONnect<address> | Address: | Connect to searched device | |
| 6. | HART:ONLDEVice:PROCess? | | | PV or 0: Process variable;<br>AO or 1: Digital current value;<br>% or 2: Percentage of pressure range;<br>SV or 3: Secondary variable;<br>TV or 4: Tertiary variable;<br>FV or 5: Quatemary variable; |
| 7. | HART:ONLDEVice:PROCess PV\|AO\|%\|SV\|TV\|FV\|0\|1\|2\|3\|4\|5 | PV\|AO\|%\|SV\|TV\|FV\|0\|1\|2\|3\|4\|5 | Switching process variable | |
| 8. | HART:ONLDEVice:PARame | name: parameter name | Read parameter | |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| | ter? <name> | | | |
| 9. | HART:ONLDEVice:PARameter[:ECHO] <name>,< "value" >\|<value> | name: parameter name<br>value: Value (with a quoted string, or number) | Set parameter | |
| 10. | HART:ONLDEVice:INFO? | No or < parameter name > parameter name listed below:<br>Tag<br>Manufacturer<br>Devicetype<br>Deviceid<br>writeprotect<br>date<br>message<br>descriptor<br>finalassemble<br>preambles<br>universalrev<br>hardwarerev<br>softwarerev<br>devicerev | Return HART device information | Returns all device information values when no parameters are entered; Corresponding parameter values returns when the parameter name is specified; |



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| S/N | Command | Description | Parameter | Return Value |
|---|---|---|---|---|
| 11. | HART:ONLDEVice:SENSor? | No or < parameter name > parameter name listed below:<br>sn<br>unit<br>lrl<br>url<br>minspan | Return sensor information | Returns all device information values when no parameters are entered; Corresponding parameter values returns when the parameter name is specified; |
| 12. | HART:ONLDEVice:OUTput? | No or < parameter name > parameter name listed below:<br>unit<br>lrv<br>urv<br>damping<br>transferFunction | Return HART device output parameter value | Returns all device information values when no parameters are entered; Corresponding parameter values returns when the parameter name is specified; |



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# Appendix 2: Unit

| S/N | Unit Name | Unit Name in System | Unit ID in System |
|---|---|---|---|
| 1 | Pa | Pa | 1130 |
| 2 | kPa | kPa | 1133 |
| 3 | MPa | MPa | 1132 |
| 4 | hPa | hPa | 1136 |
| 5 | bar | bar | 1137 |
| 6 | mbar | mbar | 1138 |
| 7 | torr | torr | 1139 |
| 8 | atm | atm | 1140 |
| 9 | psi | psi | 1141 |
| 10 | $gf/cm^2$ | GF | 1144 |
| 11 | $kgf/cm^2$ | KGF | 1145 |
| 12 | $inH_2O$@4°C | INH2O | 1147 |
| 13 | $inH_2O$@68°F | | 1148 |
| 14 | $mmH_2O$@4°C | H2O | 1150 |
| 15 | $mmH_2O$@20°C | mmH2O@20C | 1151 |
| 16 | $ftH_2O$@4°C | ftH2O@4°C | 1153 |
| 17 | $ftH_2O$@68°F | ftH2O@68°F | 1154 |
| 18 | inHg@0°C | inHg | 1156 |



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| S/N | Unit Name | Unit Name in System | Unit ID in System |
|---|---|---|---|
| 19 | mmHg@0°C | Hg | 1158 |
| 20 | mtorr | mtorr | 2001 |
| 21 | lb/ft$^2$ | lb/ft2 | 2002 |
| 22 | tsi | tsi | 2003 |
| 23 | psf | psf | 2004 |
| 24 | in$H_2O$@60°F | inH20@60°F | 2005 |
| 25 | ft$H_2O$@60°F | ftH20@60°F | 2006 |



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# Appendix 3: Software

The Additel 760 calibrator can work with 4 Additelsoftware:

| | Calibration Program | Data Logging | | Task Management | | Control |
|---|---|---|---|---|---|---|
| | | Export | Recording | Uploading *(760 → Computer)* | Downloading *(Computer → 760)* | |
| ACal | √ | | | √ | √ | √ |
| PCal | √ | | | | | |
| Land | | √ | | √ | | |
| Log II | | √ | √ | | | |



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The ADT760 communicates with Additel software via a standard USB cable. Additel offers a cable below.

Order Info:

| Model Number | Description | Picture |
|---|---|---|
| 1311000019 | USB to USB cable, 1 meter | |

- Please connect ADT760 to computer by a USB to USB cable
- Please follow section A3.1, A3.2, A3.3, A3.4 for ADT760 driver installation
- Driver installation is only required once.



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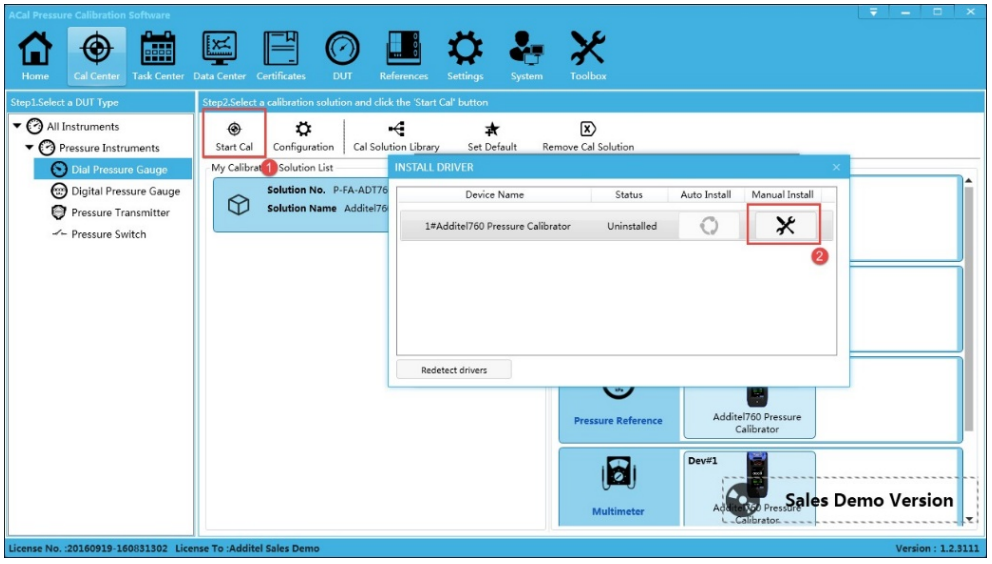
### A3.1 Additel ACal

Step 1. Additel/ACal must be updated to version 1.1.2980 or later

Step 2. Follow ACal user manual and select ADT760 as reference

Step 3. Click on "Start Cal", then click on the Manual Install icon



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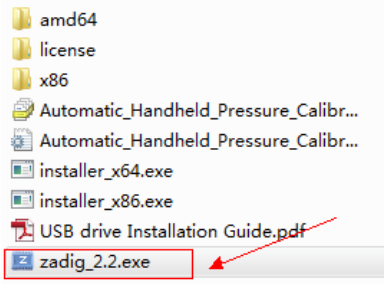
Step 4. Double click on "zadig.exe"




Step 5. Follow section A3.5 to install ADT760 driver



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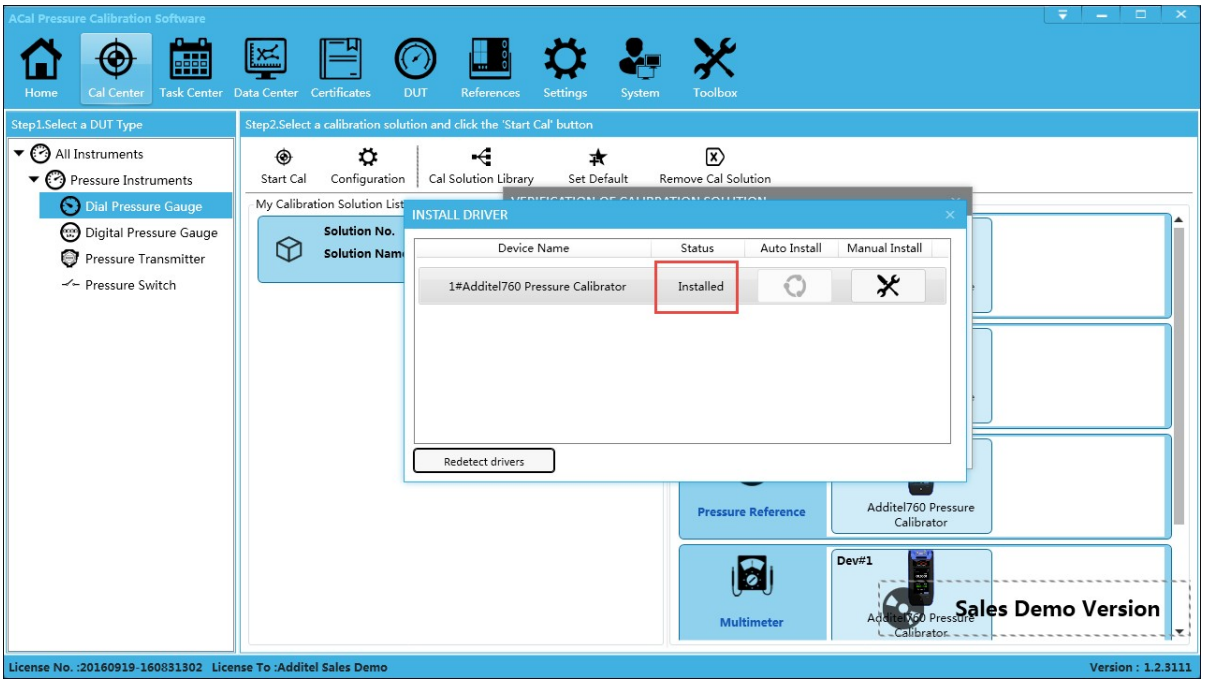
Step 6. Close the "zadig" program and the folder and check the driver status in ACal




Step 7. After the ADT760 driver has been successfully installed, please follow ACal user manual for further operation.



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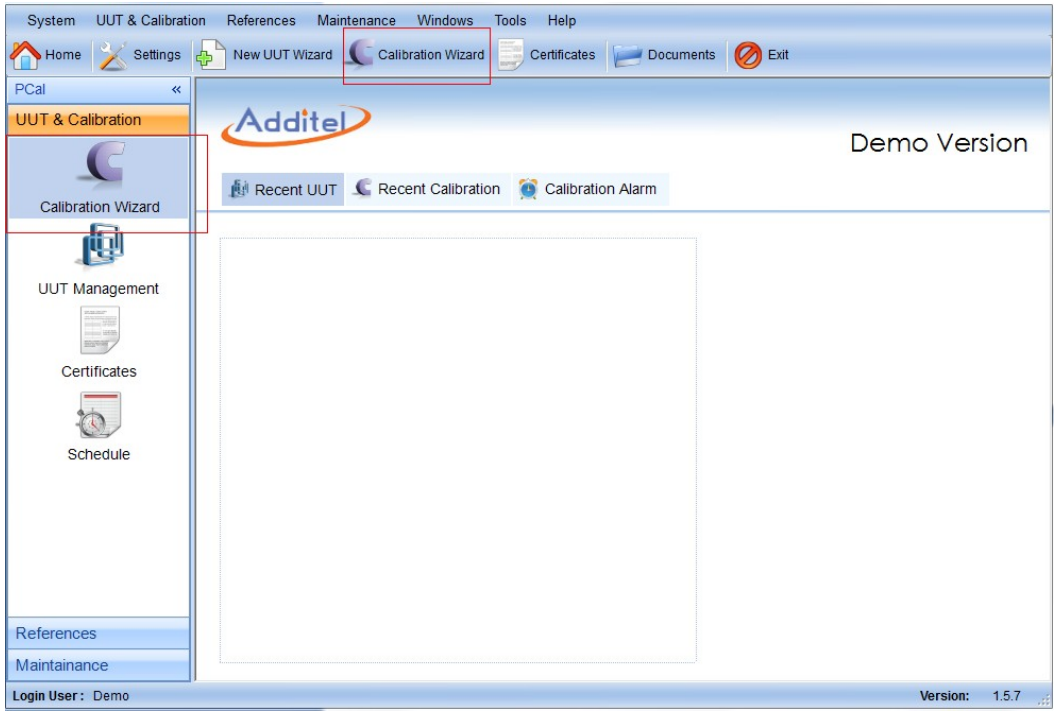
### A3.2 Additel PCal

Step 1. Additel/PCal must be updated to version 1.5.7 or later

Step 2. Click on Calibration Wizard



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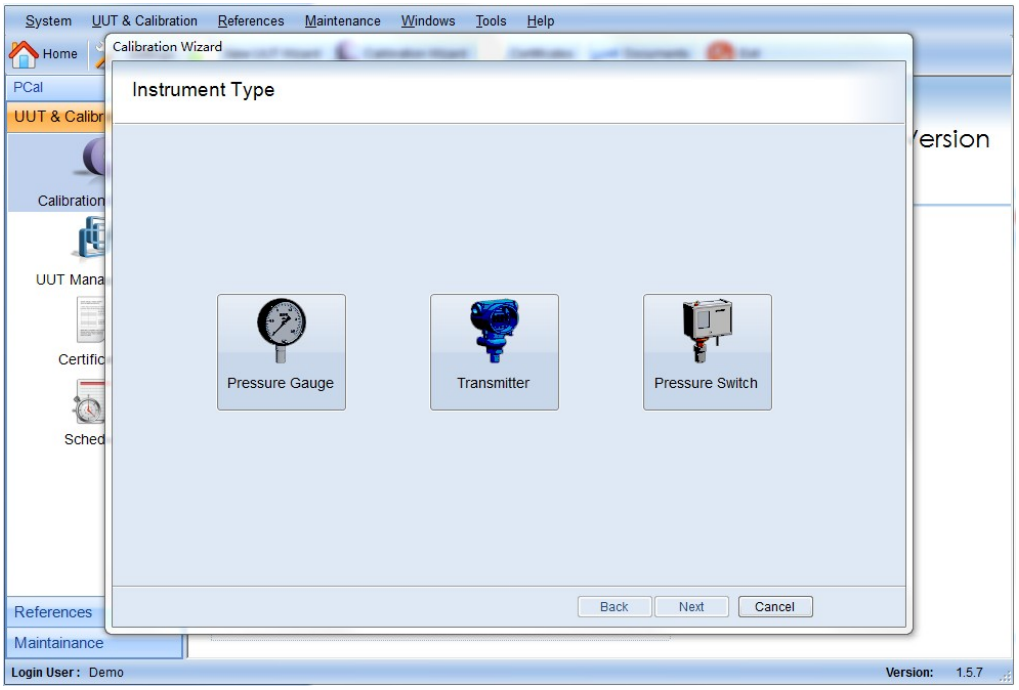
Step 3. Select UUT (Unit Under Test) type, then wait few seconds for the auto calibration reference detection



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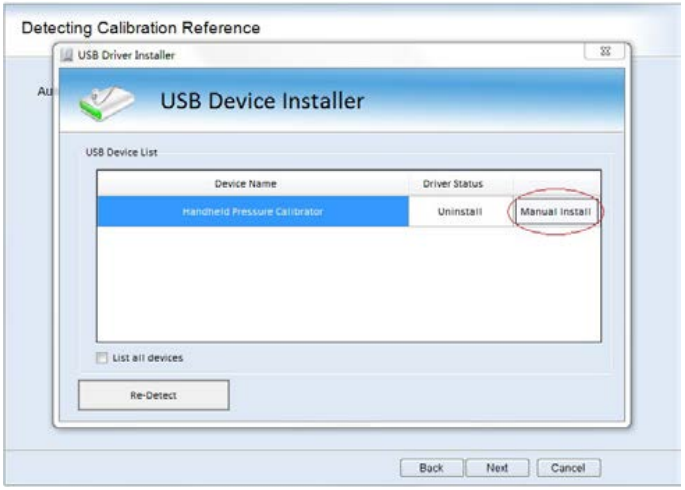
Step 4. Click on "Manual Install"



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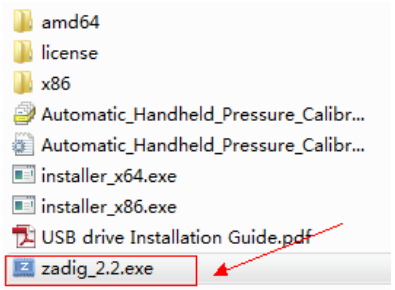
Step 5. Double click on "zadig.exe"




Step 6. Follow section A3.5 to install ADT760 driver

Step 7. Close the "zadig" program and the folder, then click on "Re-Detect" and wait for few seconds



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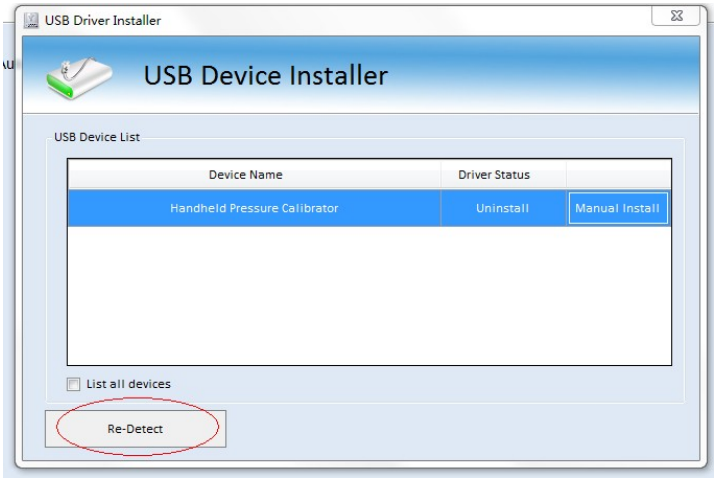


Step 8. Close the window and wait few seconds for re-detection

Step 9. When the ADT760 driver has been installed successfully, please follow PCal user manual for further operation.



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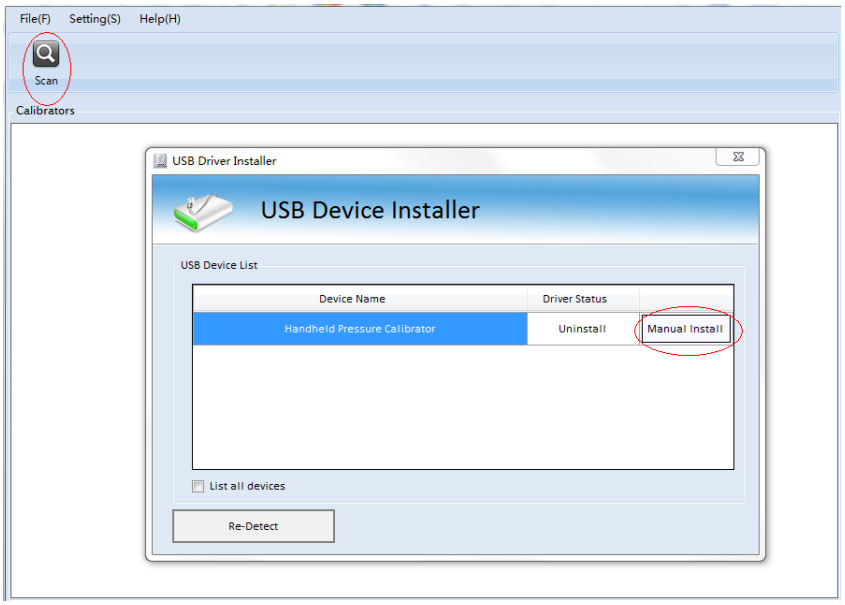
### A3.3 Additel Land

Step 1. Additel Land must be updated to version 3.5.8 or later

Step 2. Click on "Scan", then click on "Manual Install"



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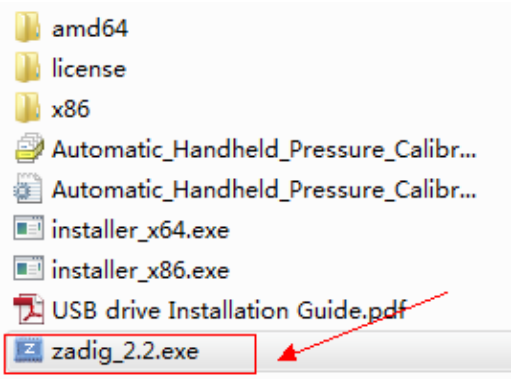
Step 3. Double click on "zadig.exe"




Step 4. Follow section A3.5 to install the ADT760 driver

Step 5. Close the "zadig" program and the folder, then click on "Re-Detect" and wait for few seconds



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Step 6. Close the window and wait few seconds for re-detection

Step 7. When the ADT760 driver has been installed successfully, please follow Land user manual for further operation.



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### A3.4 Additel Log II

Step 1. Additel Log II must be updated to version 2.4.1 or later

Step 2. Wait for few seconds, then click on "Manual Install"

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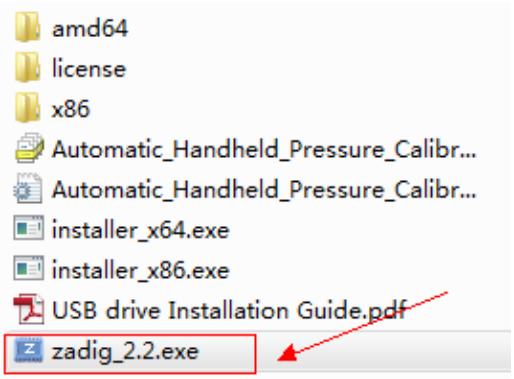
Step 3. Double click on "zadig.exe"




Step 4. Follow section A3.5 to install the ADT760 driver

Step 5. Close the "zadig" program and the folder, then click on "Re-Detect" and wait for few seconds



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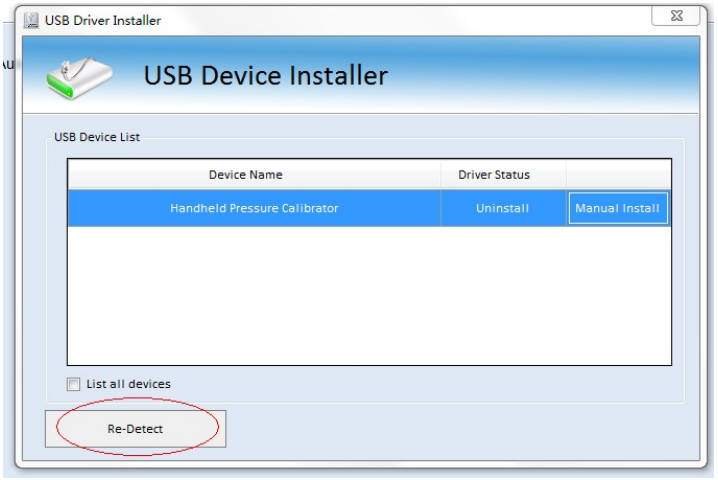


Step 6. Close the window and wait few seconds for re-detection

Step 7. Please follow Log II user manual for further operation.



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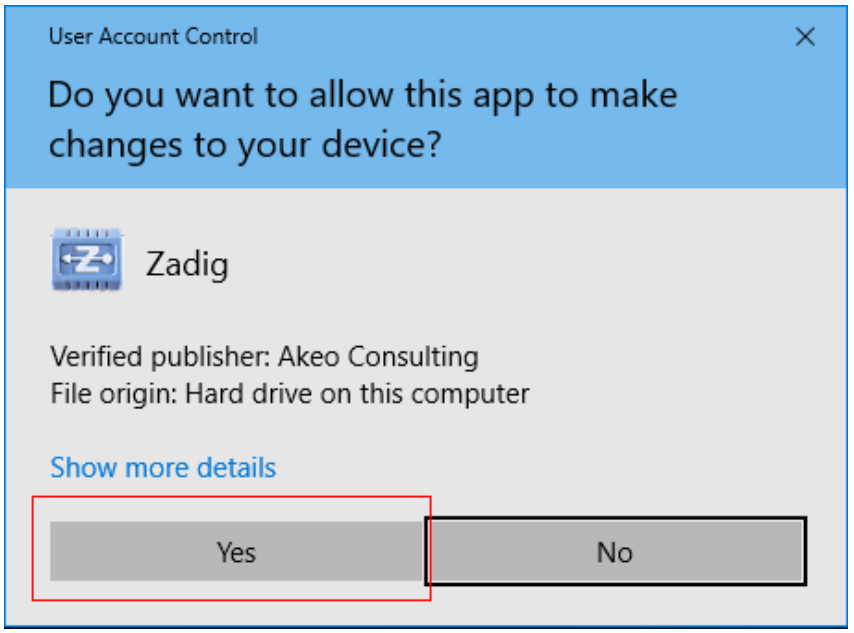
### A3.5 How to install ADT760 Driver by using Zadig

We suggest a third party software which is called Zadig to simplified ADT760 driver installation. This software is packed into all Additel software, no additional download required after initial installation.

Step 1. Right click "Zadig.exe", Choose “Run as administrator”, then Select “Yes”.



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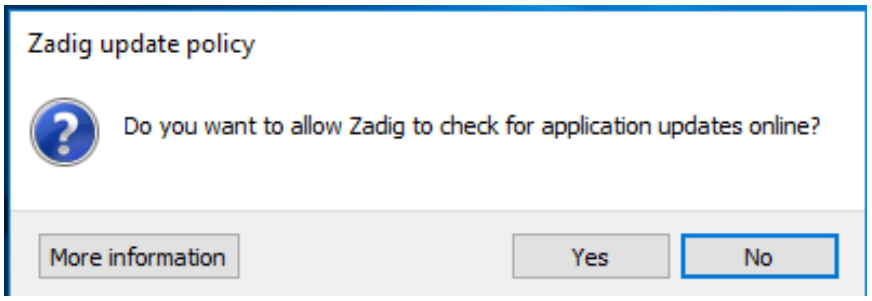
Step 2. Select "No" to skip update process.



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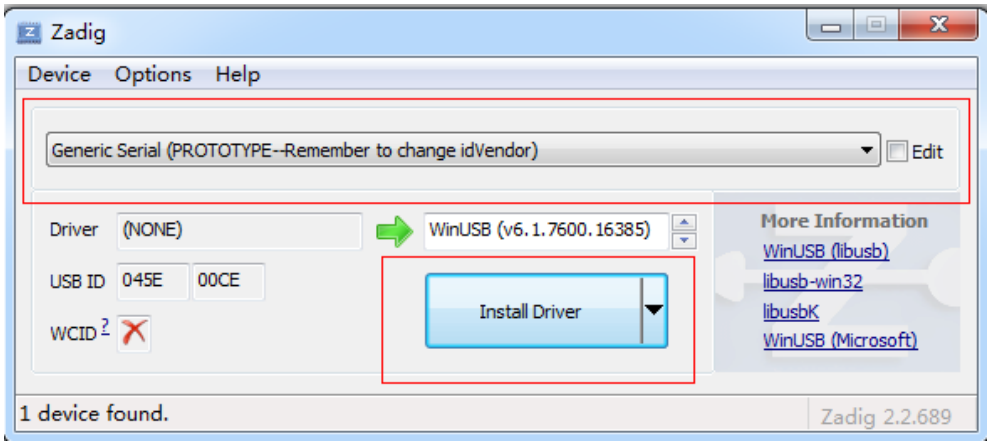
Step 3. In the first red Frame ,select “Generic Serial（PROTOTYPE—Remember to change idVendor ）”, In the second red Frame, select “Install Driver”.



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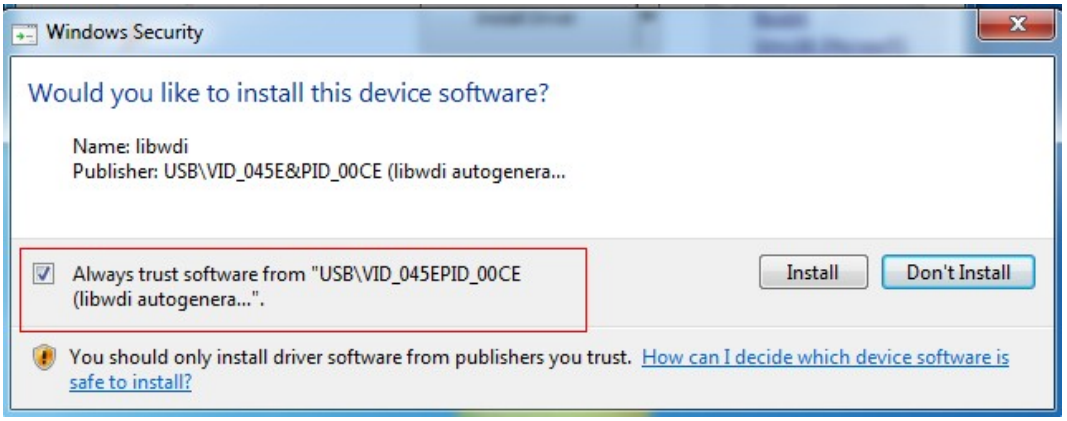
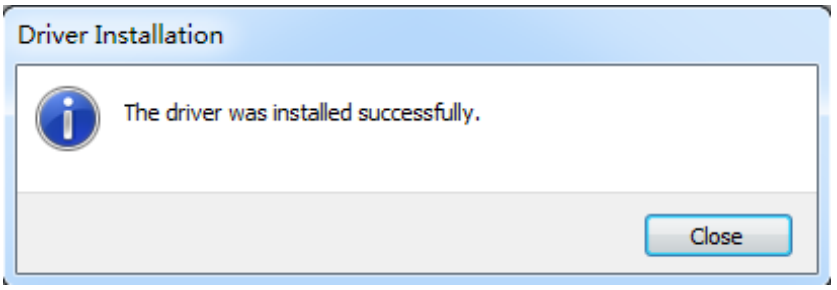
Step 4. Select “Always trust software”, and Click “Install” button. Wait for a few seconds for the driver installation.



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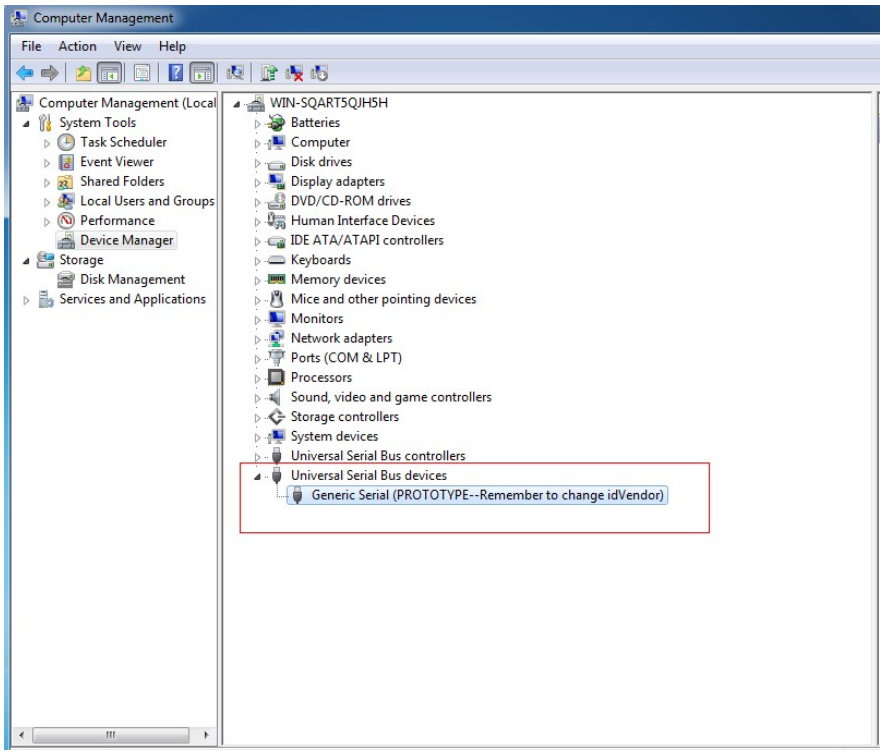
Check: In "**Device manager**" panel, there is a new option which means the Device drive has been installed successfully.



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