ADT761 Automated Pressure Calibartor

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User Manual

(Revision：20111114V0101)

CE

Additel Corporation.

STATEMENT

This technical manual provides the operating and safety instructions for the ADT761 Portable Automated Pressure Calibrator. The instructions of this publication must be followed to ensure safe operation and to maintain the equipment in safe conditions. We rserve the right to change the contents and other information contained in this manual without notice.

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Warnings and caution notes

- The calibrator cannot pressurize one target with other pressure sources at the same time. We are not liable for this misapplication.
- Do not apply pressures greater than the maximum working pressure to the equipment. We are not liable for this misapplication.
- Avoid the influences of flammable atmospheres, steam and dust.
- Dispose of spent batteries using a safe, approved method.
- Charge battery with the SA27V3.37A–W Battery Charger and make sure that the battery is not short circuited.

General safety notices

- Do not shake, drop or bump the calibrator while in use.
- Solve the condensing before startup if needed.
- Connect the REF port to the reference ports of UUTs with a small differential pressure range which might result in control problems.
- Please gather and properly dispose of all pollutions during venting.
- The VENT port cannot face to the operator during venting.
- Do not apply excessive voltage or current to the electrical terminals.
- Do not use any adapter other than the Additel model SA27V3.37A–W. Charge as soon as the battery symbol flickers.
- If the calibrator is faulty, then turn it off, remove the battery and contact Additel.
- Do not remove the battery when it is charged or when the calibrator is being used.
- Before turn off the calibrator, make sure the system pressure is reduced to the atmospheric pressure.

1. Introduction

1.1 Overview

The ADT761 Portable Automated Pressure Calibrator can generate pneumatic pressure rapidly with high precision and stability. The precise measurement and digital control technique are used for it. The calibrator provides many different ways to calibrate multifarious units (dial pressure gauges, digital pressure gauges, pressure transmitters, pressure switches, I/P converters, differential pressure devices and so on) with dual range, precise electrical measurement and output.

1.2 Characteristics

- ◆ Generates pressure with high precision automatically.
- ◆ Responds rapidly.
- ◆ HART commuFigure 3–26 rejected current source.
- ◆ Loop power supply at 24V.
- ◆ Strong task management which stores and archives your recorded data.
- ◆ 800x480 TFT LCD with friendly HMI.
- ◆ Multi–languge.
- ◆ Rechargeable Li battery.
- ◆ Light weight and portable.
- ◆ Leak tested.
- ◆ Firmware updated.

1.3 Specifications

Shortened Form	Specifications	Range 1	Range 2
Low Pressure Calibrator	ADT761 (–95~100) kPa	(–100~100) kPa	(–2.5~2.5) kPa
Pneumatic Pressure Calibrator	ADT761 (–0.09~2.5) MPa	(0~2.5) MPa	(0.1~0.16) MPa

Table 1–1 specifications of ADT761

◆ The range can be customized within the limits as follows, please contact Additel about your custom requirements.

1) Low pressure calibrator: ± (600Pa~100kPa).

2) Pneumatic pressure calibrator: (0.095~2.50)MPa.

◆ Since product improvement is a continuous process at Additel, we reserve the right to change specifications and other information contained in this manual without notice.

1.4 Standard equipment and options

1.4.1 Standard equipment

No	Equipment and Quantity	No	Equipment and Quantity
1	ADT761 mainframe X 1	8	QSC–6H plugs X 2
2	SA27V3.37A–W adapter X 1	9	Φ6 tubes X 2 (1 meter)
3	BP2235 rechargeable battery X 1	10	3mm inner hexagonal wrench X 1
4	Red test leads X 2	11	Connectors (Φ6 quick connector to crow's–feet) X 2
5	Black test leads X 2	12	Gauge rack (for differential pressure gauge only) X 1
6	Red short circuit lead X 1	13	User manual X 1
7	Black short circuit lead X 1	14	Test report X 1

Table 1–2 standard equipment of low pressure calibrator

No	Equipment and Quantity	No	Equipment and Quantity
1	ADT761 mainframe X 1	7	Black short circuit lead X 1
2	SA27V3.37A–W adapter X 1	8	QSC–4H plugs X 1
3	BP2235 rechargeable battery X 1	9	Φ4 tubes X 1 meter
4	Red test leads X 2	10	3mm inner hexagonal wrench X 1
5	Black test leads X 2	11	User manual X 1
6	Red short circuit lead X 1	12	Test report X 1

Table 1–3 standard equipment of the pneumatic pressure calibrator

1.4.2 Options

◆ Connectors (Φ6 quick connector to NPT1/4 male).

◆ USB/RS–232 interface cable.

2. Installation

2.1 Packaging

◆ Pack the instrument as detailed in Table 2–1 for transportation. Remove the unit from the packing and ensure everything is good.

Mainframe Packaging	Tools Packaging
ADT761 mainframe	TC150S–4PA test lead × 4 (2 red and 2 black)
SA27V3.37A–W adapter	Short circuit lead × 2 (1 red and 1 black)
BP2235 rechargeable battery	Φ4 tubes X 1 (1 meter) Φ6 tubes X 2 (1 meter)
3mm inner hexagonal wrench	Gauge rack (for Low Pressure Calibrator only)
QSC–6H plugs X 2 or QSC–4H plugs X 1	USB/RS–232 interface cable (options)
Belt	
Users manual	
Special Calibration Software	
Test report	
Guarantee and Certificate	

Table 2–1 packaging

2.2 Feature

2.2.1 Basic structure

Figure 2–1 basic structure

2.2.2 Electrical jack and signal interface

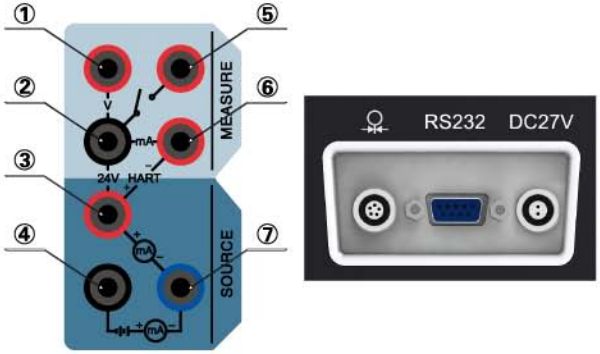

Figure 2–2 electrical jacks and signal interfaces

Jack and Interface	Introduction
6 and 2	Current measure.Red is positive and black is negative.
1 and 2	Voltage measure.Red is positive and black is negative.
5 and 2	Switch test. Red is positive if the power supply needed.
3 and 6	HART communication.
7 and 4	Current output (external power).
3 and 7	Current output (internal power).
3 and 2	Loop power supply at 24V. Red is positive.
Pressure module connector interface	Connect to CDP pressure module.
RS–232 interface	Connect to the computer for communication.
DC27V recharging interface	Connect to the adapter for power supply and charge.

Table 2–2 introductions of electrical jacks and signal interfaces

2.2.3 RS–232 interface

◆ The RS–232 interface is designed as a 9 pole SUB–D–socket, Pin–configuration see Figure table 2–3.

Pin	1	2	3	4	5	6	7	8	9
Configuration	N.C	TX	RX	N.C	GND	N.C	N.C	N.C	N.C

Table 2–3 Pin configurations

2.2.4 Keyboard

Key	Introduction
⏻	Turns the power on and off.
HART	Enters HART communication mode.
TASK	Enters task management to calibrate a device automatically.
SETUP	Enters setup mode to modify operating parameters.
SAVE	Stores up snapshots.
VENT	Vents.
STANDBY	Stops control.
Esc	Quits and returns to the previous menu.
↵Enter	Confirms the choice and setting.
◂ ▸ ▴ ▾	Move the cursor.
F1、F2、F3、F4	Perform the function defined by the label above each key on the display.
0 ～ 9wxyz、±、•	Numeric keypad. Used whenever a numeric entry is required.

Table 2–4 key functions

2.2.5 Pneumatic port

- ◆ OUTLET port: the calibrator provides the controlled pressure output to the UUT. The range of the pneumatic volume for control is (0~100) cc that cannot be exceeded. If the control is unstable there may be a leak in the system.
- ◆ REF port: it should be left open to the atmosphere in gauge mode. This is the pressure connection to the optional barometric reference and to the reference ports of sensors with a small range in differential mode.
- ◆ VENT: the system gas at the output pressure can be released from the vent port.

2.3 Preparation for use

2.3.1 Installing the battery

As shown in Figure 2–3, install the BP2235 battery in the bottom of calibrator with a 3mm inner hexagonal wrench (standard equipment).

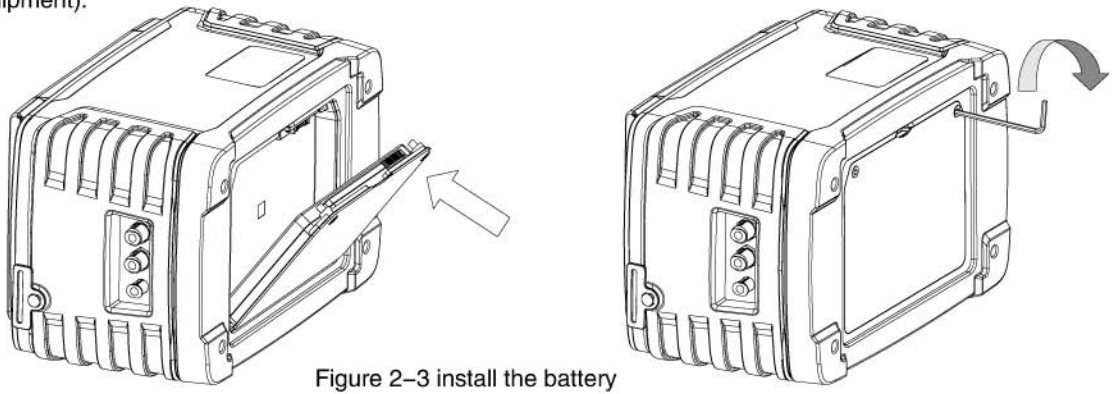

Figure 2–3 install the battery

2.3.2 Installing the belt

As shown in Figure 2–4, install the belt with an 8 inches wrench.

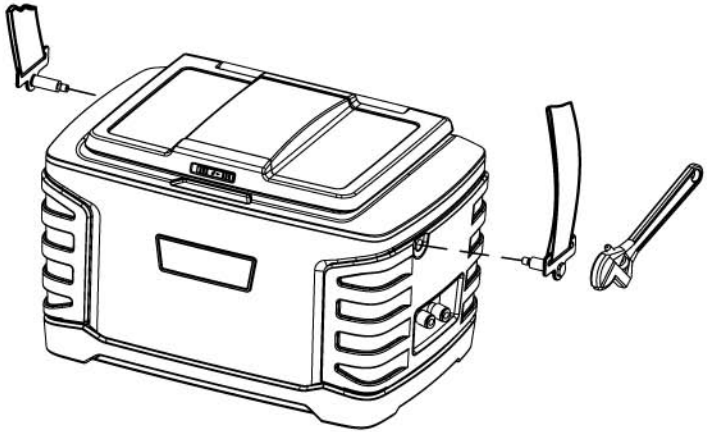

Figure 2–4 install the gallus

2.3.3 Pneumatic connection

As shown in Figure2–5, connect the OUTLET and REF ports to a UUT or blanking plugs (standard equipment).

Figure 2–5 pneumatic connection

2.3.4 Raising the screen

Push the frontal lock rightward and raise the screen to the proper position.

2.4 Getting started

2.4.1 Power on

- Press ⏻ to turn the power on.
- The display screen first shows the manufacturer and logo.
- After a short time the system enables the main screen and changes to the STANDBY mode as shown in Figure 2–6.
- Connect the adapter for charging when the power is low.

2.4.2 Setting the system date and time

The system date, time and the configuration of them can be set (Section 3.4.4).

2.4.3 Generating a pressure

Set an appropriate value, and then the calibrator will generate and control that pressure (Section 3.1.2).

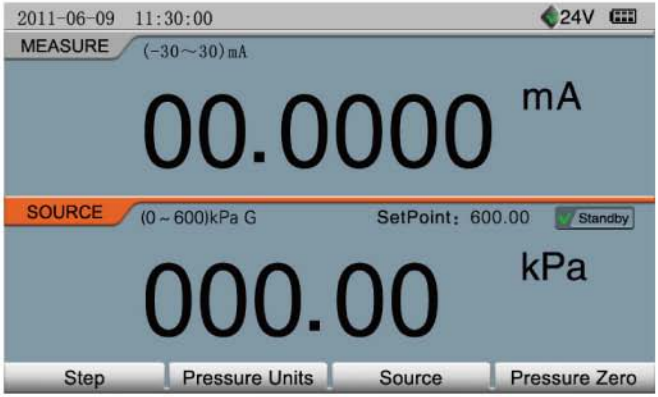

Figure 2–6 the main screen

3. Function and operation

3.1 Display and basic operation

3.1.1 Main screen

Figure 3–1 two data windows

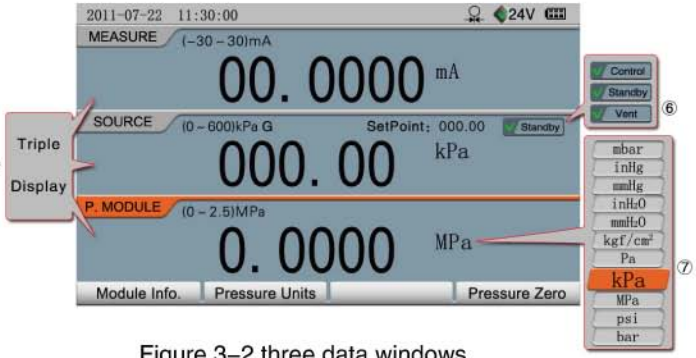

Figure 3–2 three data windows

The main screen normally contains two (measure and source) windows, and the third depends on the state of external pressure module. To select an operating mode, press ▲ / ▼ and the label will change from gray to orange. The softkeys displayed at the bottom of the screen relate to the selected mode. Press F3 / ↵Enter to select the MEASURE / SOURCE function.

① Functions of MEASURE: current measure, voltage measure, switch test, high pressure range, low pressure range, pressure module (online).

② Functions of SOURCE: current source, high pressure range, low pressure range, pressure module (online).

③ Soft keys menu boxes: F1、F2、F3、F4 .

④ Status bar: run mode, snapshot, HART online, pressure module online, 24V power status, batterys charge level.

⑤ The third window: if the TRIPLE DISPLAY of the DISPLAY SETUP is enabled, the display will show three windows when the pressure module is inserted.

⑥ The symbol indicating run mode: press STANDBY / VENT to change to the STANDBY mode, the CONTROL mode, or the VENT function.

⑦ Pressure unit menu: 11 units maximum.

3.1.2 Pressure output

1. Select High/Low Pressure Range as SOURCE.
   - ◆ The control must be stopped first.
   - ◆ The system will be vented during switching the range.
2. Connection: complete the pneumatic connection as shown in Figure 3–3 or 3–4.
3. Set value
   - ◆ Press 0 ~ 9wxyz、+/-、• to set the value, and press F4 / ↵Enter to confirm.
   - ◆ No operation for more than 10 seconds will cause to cancel all.
   - ◆ The set value cannot exceed the range of the calibrator (Appendix A.3).
   - ◆ The maximal negative pressure is –95kPa. But if the atmospheric pressure (P) is less than 100kPa, the limit will be calculated as –(P–5)kPa.

Figure 3–3 gauge pressure source

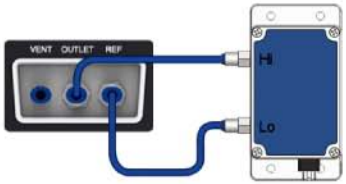

Figure 3–4 differential pressure source

- ◆ The set value cannot exceed the control range of the CONTROL SETUP, or the unit will prompt the user to reset the limits.
- ◆ The calibrator can automatically switch to the suitable range if needed.

4. Control
   - ◆ Confirm the set value and then start control.
   - ◆ The control can be stopped at any time by pressing STANDBY .
   - ◆ The following functions are disabled in the CONTROL mode: zero (Section 3.1.9), step (Section 3.1.10), leak test (Section 3.6.1), vent (Section 3.6.2), system calibration (Section 3.7).
5. Stabilize
   - ◆ If the control has reached the stable condition of the CONTROL SETUP (Section 3.4.1), the color of the displayed value will change from black to green.

3.1.3 Pressure measure

1. Select High/Low Pressure Range as MEASURE.
   - ◆ The system will be vented during switching the range.
2. Connection: complete the pneumatic connection as shown in figure 3–5.
3. External pressure source
   - ◆ Do not apply pressures greater than the maximum working pressure to the equipment.
   - ◆ If the value falls outside the current pressure range, the color of the displayed value will change from black to red and the calibrator will set off the alarm.

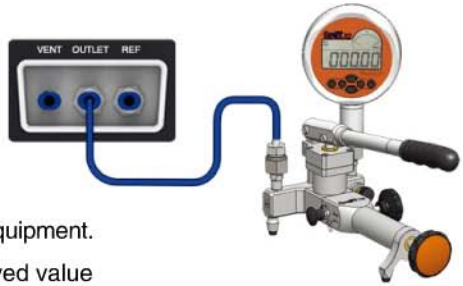

Figure 3–5 pressure measure

◆ If the external pressure is unacceptable to the calibrator, the unit will automatically vent for protecting the pressure. sensor from over pressurization.

3.1.4 Pressure unit

◆ Press **F2** to select a pressure unit in the pressure output, pressure measure or pressure module functions.

◆ The acceptable units relate to the range and resolution (Section 3.4.3).

Ranges	Digits	Pa	kPa	MPa	psi	bar	mbar	inHg	mmHg	inH_2O	mmH_2O	kgf/cm^2
(0~700) kPa	6 digits	√	√	√	√	√	√	√	√	√	√	√
	5 digits	×	√	√	√	√	√	√	√	√	√	√
	4 digits	×	√	√	√	√	√	√	√	√	×	√
(–95~160) kPa	6 digits	√	√	√	√	√	√	√	√	√	√	√
	5 digits	×	√	√	√	√	√	√	√	√	√	√
	4 digits	×	√	√	√	√	√	√	√	√	×	√
(–40~40) kPa	6 digits	√	√	√	√	√	√	√	√	√	√	√
	5 digits	√	√	√	√	√	√	√	√	√	√	√
	4 digits	×	√	√	√	√	√	√	√	√	√	√
(–2~2) kPa	6 digits	√	√	√	√	√	√	√	√	√	√	√
	5 digits	√	√	√	√	√	√	√	√	√	√	√
	4 digits	√	√	√	√	√	√	√	√	√	√	√

Table 3–1 the acceptable units to the standard configuration

Ranges	Digits	Pa	kPa	MPa	psi	bar	mbar	inHg	mmHg	inH_2O	mmH_2O	kgf/cm^2
(0~2) kPa、 (0~5) kPa	6 digits	√	√	√	√	√	√	√	√	√	√	√
	5 digits	√	√	√	√	√	√	√	√	√	√	√
	4 digits	√	√	√	√	√	√	√	√	√	√	√
(0~10) kPa、 (0~20) kPa	6 digits	√	√	√	√	√	√	√	√	√	√	√
(0~25) kPa、 (0~40) kPa	5 digits	√	√	√	√	√	√	√	√	√	√	√
(0~60) kPa	4 digits	×	√	√	√	√	√	√	√	√	√	√
(–100~0) kPa、(0~100) kPa	6 digits	√	√	√	√	√	√	√	√	√	√	√
(0~160) kPa、(0~250) kPa	5 digits	×	√	√	√	√	√	√	√	√	√	√
(0~400) kPa、(0~600) kPa	4 digits	×	√	√	√	√	√	√	√	√	×	√
(0~1) MPa、 (0~1.6) MPa	6 digits	×	√	√	√	√	√	√	√	√	√	√
(0~2) MPa、 (0~2.5) MPa	5 digits	×	√	√	√	√	√	√	√	√	×	√
(0~4) MPa、 (0~6) MPa	4 digits	×	√	√	√	√	×	√	√	√	×	√
(0~10) MPa、(0~16) MPa	6 digits	×	√	√	√	√	√	√	√	√	×	√
(0~20) MPa、(0~25) MPa (0~30) MPa、(0~40) MPa	5 digits	×	√	√	√	√	×	√	√	√	×	√
(0~60) MPa、(0~80) MPa	4 digits	×	×	√	√	√	×	√	×	×	×	√
(0~100) MPa	6 digits	×	√	√	√	√	×	√	√	√	×	√
(0~160) MPa	5 digits	×	×	√	√	√	×	√	×	×	×	√
(0~250) MPa	4 digits	×	×	√	×	√	×	×	×	×	×	√

Table 3–2 the acceptable units to the external pressure module

3.1.5 Current output

1. Select Current as SOURCE
   - ◆ The control must be stopped first.
2. Connection: complete the electrical connection as shown in figures 3–6 or 3–7.
3. Power supply
   - ◆ Press F4 to change to the internal loop power function or the external loop power function.
   - ◆ The DC24V power will stay activated in internal loop power function, and will return to the original state after the loop power function is changed.
4. Set value
   - ◆ Press 0 ~ 9wxyz、+/-、• to set the value, and press F4 / ↵Enter to confirm.
   - ◆ No operation for more than 10 seconds will cause to cancel all.
   - ◆ The set value cannot exceed the range of (0~22) mA.

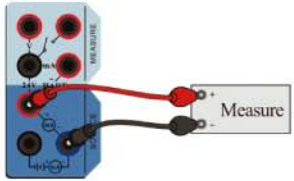

Figure 3–6 internal 24V power supply

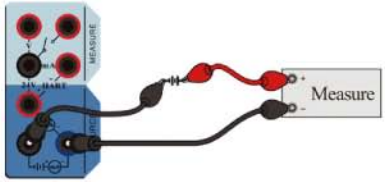

Figure 3–7 external power supply

3.1.6 Current / voltage measure

1. Select current or voltage as measure
   - ◆ Do not apply more than the rated current / voltage.
   - ◆ You can zero them with short circuit.

- ◆ If the value falls outside the current range, the color of the displayed value will change from black to red and the calibrator will set off the alarm.
- ◆ If the measure is unacceptable to the calibrator, the measured value will change to red "--------" and the calibrator will set off the alarm.

2. Connection: complete the electrical connection as shown in figures 3–8 and 3–9.

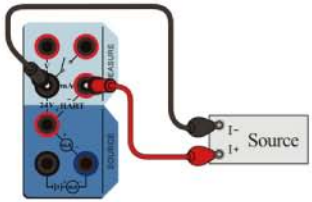

Figure 3–8 current measure

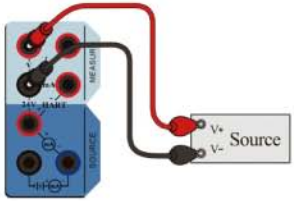

Figure 3–9 voltage measure

3.1.7 Switch test

1. Select Switch Test as MEASURE.
2. Connection: complete the electrical connection as shown in figure 3–10.
3. Trip values.
   - ◆ Record and display trip values with pressurization.
   - ◆ Press **F2** to erase trip values.

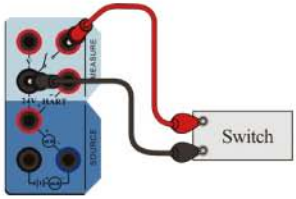

Figure 3–10 switch test

3.1.8 External pressure module

1. Connection: complete the pneumatic connection as shown in figure 3–11.

Figure 3–11 external pressure module

2. Display

- ◆ A symbol indicating the communication will be shown on the right of the status bar when an external pressure module is online. The main screen will show the third window with the TRIPLE DISPLAY of DISPLAY SETUP enabled (Section 3.4.3).
- ◆ Both the MEASURE and SOURCE can be changed to external pressure module function.
- ◆ If the value falls outside the current pressure range, the color of the displayed value will change from black to red and the calibrator will set off the alarm.
- ◆ If the measure is unacceptable to the pressure module, the measured value will change to red "--------" and the calibrator will set off the alarm.

3. Operations

◆ Press F2 to select a pressure unit (Section 3.1.4 and Table 3–2).

◆ Press F1 to display the information of the pressure module.

3.1.9 Zero

◆ Zero either the selected MEASURE or SOURCE displays.

◆ Provide that the displayed reading is already within 1%FS of the pressure or 0.1%FS of the electricity.

3.1.10 Step

1. Set

◆ Press ▲ / ▼ to select SOURCE, and then press F1 to set the parameters.

◆ Starting point (V_s) and Ending point (V_e).

1) They cannot be equal (if $V_s<V_e$, ascend first and $V_{min}=V_s$, $V_{max}=V_e$. If $V_s>V_e$, descend first and $V_{min}=V_e$, $V_{max}=V_s$).

2) The unit is the same as the unit of the source.

◆ Step mode and size. The output values of the steps are calculated in the formulas as following:

1) The step size of scale (P), and the output values (n):

$$V_{min}+ (V_{max}-V_{min})*(n-1)*P\%, \qquad n = 1, 2, \cdots \qquad (n-1)*P\% \leqq 1$$

The step size of engineering unit (E), and the output values (n):

$$V_{min}+ (n-1)*E, \qquad n = 1, 2, \cdots \qquad (n-1)*E \leqq V_e$$

The step size of point number (N), and the output values (n):

$$V_{min}+ (n-1)*(V_{max}-V_{min}) / (N - 1), \qquad n = 1, 2, \cdots \qquad (n-1) \leqq N -1$$

① If the step size cannot be divided by the step range, the steps will be dissymmetrical.

② The step range cannot exceed the range of the source.

③ The pressure step range cannot exceed the control range of the CONTROL SETUP, or the unit will prompt the user to reset the limits.

◆ Repeats: for the auto mode only, the range is 1~9999.

◆ Wait time: for the auto mode only, the range is 1~3600. When the source is current, it is the time between the mA steps. When the source is pressure, it is the duration after the pressure stabilized.

2. Run

◆ Press F4 to start.

◆ Manual mode: press F4 to operate the steps manually, and then press F1 to end.

◆ Auto mode: the calibrator will run the steps automatically. Press F4 to pause or continue, and then press F1 to end.

3.1.11 Snapshot

1. Snapshot

◆ In the main screen press SAVE to store a record that includes the indicators of MEASURE and SOURCE, the information of the pressure module (online), the real time and the DC24V state. A snapshot symbol is located on the right side of the status bar.

◆ The snapshot files are named numerically, adding 1 every time automatically.

◆ Store up to 100 snapshots.

2. Snapshot management

◆ To view the snapshot list, press SAVE for two seconds or press SETUP and select the SNAPSHOT.

◆ Press ◂ / ▸ to page up and down. Press F2 / F3 to delete the snapshot.

◆ They all can be uploaded to a computer with a RS–232 interface cable.

3. Prefix

◆ Press F4 to edit the prefix and the snapshot names will be recounted.

◆ Enter an alphanumeric prefix, and press ±/ to input special codes.

3.1.12 Vent

◆ The calibrator opens the vent valve to release the test pressure.

◆ Gather the pollutions from the VENT port during venting as shown in Figure 3–12.

◆ The VENT port cannot face to the operator during venting.

◆ The leak test will end by pressing VENT .

Figure 3–12 vent

◆ Press VENT to release the test pressure and switch to the VENT function. Press VENT again to close the vent valve and switch to the STANDBY mode.

◆ If the AUTO VENT is enabled, when the real pressure is less than the VENT P during controlling to the zero pressure, the calibrator will automatically vent.

3.2 HART

3.2.1 Poll

1. Connect

◆ Use the internal series resistor and the internal 24V loop power supply as shown in Figure 3–13. Use the internal series resistor and the external loop power supply as shown in Figure 3–14. Use the external series resistor and the external loop power supply as shown in Figure 3–15.

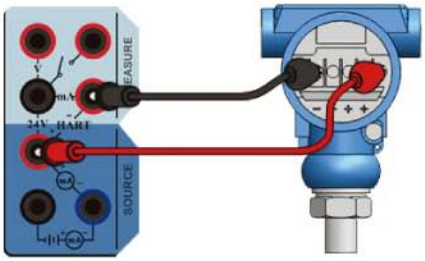

Figure 3–13 internal series resistor and internal 24V loop power supply

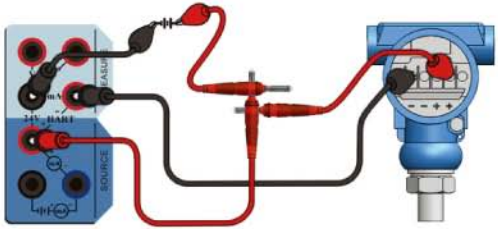

Figure 3–14 internal series resistor and external loop power supply

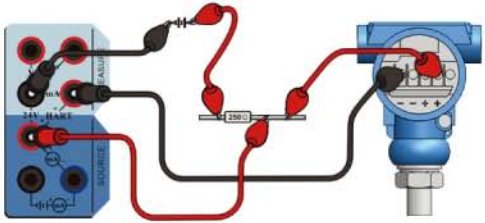

Figure 3–15 external series resistor and external loop power supply

2. Poll

- Press HART to startup the HART function in the main screen. Select either the internal or the external loop power supply and either the internal or the external series resistor, and then begin polling.
- The calibrator tries poll on address 0 (single transmitter per loop). If no connection is made, it will scan poll from address 1 to 15 (multidrop).
- Once the calibrator establishes communication with the transmitter, the transmitter will be added into the HART device list.
- Press F1 / Esc to stop it midway.
- Press F3 to poll again in the end.

3. Online/offline

- The HART function will be shown as MEASURE in the main screen after connecting, and a symbol indicating communication will be shown on the right side of the status bar. Press F1 / Esc to disconnect the HART instrument and the symbol will disappear.
- If the HART communication is terminated, the HART function will be replaced by the current measure and the calibrator will prompt to poll again in the main screen.
- If the HART communication is terminated in use, the function will end.

3.2.2 Process variables

- Display PV, PVAO, PV%, loop mA.
- Press F3 / ↵Enter to highlight the one you have selected.

◆ Select the process variable as MEASURE first before running a HART transmitter calibration task.

3.2.3 Setup

1. Parameters

◆ Press F2 to setup the following functions.

Function	Read and Write	Introduction	Function	Read only
Tag	Tag	Enter an alphanumeric tag. (8 max length)	Manufacturer	Manufacturer
Device Information	Polling address	Integer (0~15)	Device type	Model
	Date	Any accepted date	Device ID	Device ID
	Description	Enter an alphanumeric description. (16 max length)	Write protect	Write protect
	Message	Enter an alphanumeric message. (32 max length)	Revision	Number of preambles
Signal Condition	PV unit	LRV and URV will change with it		Hardware revision
	PV LRV	10% max overpressure		Software revision
	PV URV	10% max overpressure	Sensor	Sensor serial number
	PV damping	Decimal fraction (0~199)		Sensor unit
	Transfer function	Linear/square root		Sensor lower limit
				Sensor upper limit
				Sensor minimum span
			AO alarm type	Alarm state

Table 3–3 HART setup

2. Operations

Press ▲ / ▼ to read HART parameters, and press F4 / ↵Enter to open the setting status.

◆ In the setting status press ▲ / ▼ to select and press F4 / ↵Enter to reset.

◆ If the operation is canceled or fails, the parameters will remain the same.

3.2.4 Service

1. Loop test

◆ Press ▲ / ▼ or manually input a value to command the transmitter to set its analog output to the corresponding value, and the range is (4–20) mA.

◆ You can use the loop test as a quick way to check the calibration of the transmitter's output stage.

◆ The loop test is not available in the multidrop mode.

2. D/A output trim

◆ An output trim adjusts the tranmitter's output stage. You can perform an output trim on both generic and supported transmitters.

◆ Press F4 / ↵Enter to trim the low and high analog output points, and press F1 or Esc to review.

◆ The output trim is not available in the multidrop mode.

3. Pressure zero trim

◆ Reduce the measure to near zero to avoid failure.

4. Sensor trim

◆ A sensor trim adjusts the input stage of the HART transmitter if accepted.

◆ A sensor trim may involve one or more trim points. It is controlled by the transmitter's software. You can select the pressure source.

◆ Internal pressure source: the calibrator pressurizes the HART transmitter. Press F4 / ↵Enter to continue after the source is stabilized, and press F1 / Esc to review.

- ◆ External pressure source: pressurize the HART transmitter with another standard source. Press F4 / ↵Enter to continue after the measure is stabilized, and press F1 / Esc to review.
- ◆ The trim points in the internal pressure source mode cannot exceed the control range of the CONTROL SETUP, or the unit will prompt the user to reset the limits.

5. Special trim
   - ◆ A special trim adjusts the input stage of the HART transmitter as the linearity of the loop mA.
   - ◆ If the HART transmitter is considered as a common transmitter, just use special trim to adjust it.
   - ◆ The steps are similar with the sensor trim.

3.3 Typical applications in the main screen

3.3.1 Calibrating pressure gauges

1. Prepare
   - ◆ Select High/Low Range as SOURCE (according to the range of the UUT).
2. Connect
   - ◆ Complete the pneumatic connection as shown in Figure 3–16.
   - ◆ Connect the REF port to the reference port of the gauge with a small range in differential mode as shown in Figure 3–4.

Figure 3–16 calibrating pressure gauges

3. Pressurize manually or by the step function (Section 3.1.10).
4. Record the indicator of the UUT manually after the pressure is stabilized.

3.3.2 Calibrating pressure transmitters

1. Prepare
   - ◆ Select High / Low Range as SOURCE (according to the range of the UUT).
   - ◆ Select Current / Voltage as MEASURE (according to the signal of the UUT).
   - ◆ Activate 24V power.
2. Connect
   - ◆ Complete the pneumatic and the electrical connections as shown in Figure 3–17.
   - ◆ Connect the REF port to the reference port of the transmitter with a small range in differential mode as shown in Figure 3–4.
3. Pressurize manually or by the step function (Section 3.1.10).
4. Record the measure value of the UUT manually or by snapping (Section 3.1.11) after the pressure is stabilized.

Figure 3–17 calibrating a pressure transmitter

3.3.3 Calibrating HART transmitters

1. Prepare
   - ◆ Select High / Low Range as SOURCE (according to the range of the UUT).
   - ◆ Select Current as MEASURE.
   - ◆ Activate 24V power.
2. Connect

◆ Complete the pneumatic and the electrical connections as shown in Figures 3–13 and 3–17, in the internal series resistor and internal 24V loop power mode.

3. Press HART to start to communicate with the HART transmitter (Section 3.2.1), and press F3 to change the process variable to PVAO (Section 3.2.2).
4. Press F2 to set the parameters of the HART transmitter (Section 3.2.3).
5. Press F4 to service the HART transmitter (Section 3.2.4).
6. Pressurize manually or by the step function (Section 3.1.10).
7. Record the measure value of the UUT manually or by snapping (Section 3.1.11) after the pressure is stabilized (including 4 process variables).

3.3.4 Calibrating pressure switches

1. Prepare
   ◆ Select High/Low Range as SOURCE (according to the range of the UUT).
   ◆ Select Switch Test as MEASURE.
2. Connect
   ◆ Complete the pneumatic and the electrical connections as shown in Figure 3–18.
3. Capture trip values
   ◆ Automatic
   1) Pressurize to the high limit of the UUT until the switch trips.
   2) Decompress to the low limit of the UUT until the switch trips.
   3) Display a couple of trip values.

Figure 3–18 calibrating a pressure switch

4) Change the slew rate to slow in the CONTROL SETUP for more precise trip values.

◆ Manual

1) Pressurize to the anticipated trip point of the switch and wait for the displayed pressure to stabilize.

2) Press ◂ / ▸ to start the microoperation and continue pressing to move the cursor.

3) Press 0 ~ 9wxyz / ▲ / ▼ to increase or reduce the set value.

4. Record the trip values manually or by snapping (Section 3.1.11) in the end.

3.3.5 Calibrating I/P converters

1. Prepare
   - ◆ Select Current as SOURCE.
   - ◆ Select High/Low Range as MEASURE (according to the range of the UUT).
   - ◆ The external pressure module also can be used as MEASURE.
2. Connect
   - ◆ Complete the pneumatic and the electrical connections as shown in Figure 3–19.
   - ◆ Do not overpressurize the calibrator.
   - ◆ Do not use the calibrator as the pressure source.
   - ◆ Check the load ability of the UUT for the internal 24V power supply.
3. Source the current manually or by the step function (Section 3.1.10) .
4. Record the measure value of the UUT manually or by snapping (Section 3.1.11) when the pressure measured is stabilized.

Figure 3–19 calibrating a I/P converter

3.3.6 Calibrating isolator/convert/signal–acquiring devices

1. Prepare
   - ◆ Select Current as SOURCE.
   - ◆ Select Current/Voltage as MEASURE (according to the signal of the UUT).
2. Connect
   - ◆ Complete the electrical connection as the requirement of the UUT.
3. Source the current manually or by the step function (Section 3.1.10).
4. Record the measure value of the UUT manually or by snapping (Section 3.1.11) when it stabilizes.

3.4 Setup

◆ Press SETUP to enter the setup screen that contains 12 options. Press ◀ ▶ and F4 / ↵Enter to select.

◆ All the settings are the power–up defaults.

3.4.1 Control setup

1. Control limits
   - ◆ Define a smaller range than the calibrator's as the limits of the output pressure for protecting the sensitive UUT.
   - ◆ The set value of controlling cannot exceed this range, or the unit will prompt the user to reset the limits.
2. Stable conditions
   - ◆ Control stability: the tolerance limit in %FS will change the measuring value's color from black to green when the current pressure value has approached the set value for the stable delay time. The range is (0.005~10) %FS.
   - ◆ Stable delay: when the reading is within adjustable limits of the set point, the wait timer counts down until zero then a stable signal is generated. The range is 2– 250.
   - ◆ The control is considered stable in the following conditions.

1) (Output Value−Set Value) <= High Limit of the using Range × Control Stability.

2) Keep the status of "1)" for the stable delay time.

◆ Stable beep: the stable prompt sound.

3. Slew rate

◆ Pressurize at a fast/medium/slow speed.

◆ Change it to slow for more precise trip values of the switch.

4. Switch damping

◆ Smoothing of the last several trips. The range of the time is 0.1−99 and 0.1 seconds is the default.

◆ Set it suitably, or the overlong damping time may cause the loss of the correct trip.

5. REF port

◆ Enabled: the calibrator controls it automatically. The relief valve will be left open to atmosphere pressure.

◆ Disabled: the REF port keeps airtight.

◆ For the differential mode only.

6. Auto vent

◆ If enabled, when the real pressure is less than the VENT P during controlling to the zero pressure, the calibrator will automatically vent.

◆ The range of the vent pressure is (0~40) kPa for the Low Pressure Calibrator and (0~700) kPa for the Pneumatic Pressure Calibrator.

3.4.2 24V power

◆ Short circuit protected, and then the symbol indicating 24V status on the right side of the status bar will flicker.

◆ The DC24V power will stay activated when used the current source or the HART function with the internal loop power

and will return to the original status after the loop power is changed.

3.4.3 Display setup

1. Resolution
   - ◆ In the SNAPSHOT of the SETUP, the data displays according to the resolution when stored (Section 3.1.11).
   - ◆ In the TASK REPORT, the data displays according to the resolution when the task was created (Section 3.5).
   - ◆ If there is a display error, it will display according to six digits.
2. Triple display
   - ◆ If enabled, the main screen will show the third window when the pressure module is connected (Figure 3–2).
   - ◆ If the pressure module is selected as MEASURE/SOURCE, then dual display will appear.
3. Auto turn off the backlight
   - ◆ Automatically turn off the backlight after a set time.
   - ◆ Accepted timeout period: never, 5 minutes, 10 minutes, 30 minutes, 1 hour, 2 hours, and 4 hours.
   - ◆ Turn on by pressing any key.
   - ◆ It is invalid in the STEP function and the CONTROL mode.
4. Auto turn off the power
   - ◆ Automatically turns off the power after a set time.
   - ◆ Accepted timeout period: never, 30 minutes, 1 hour and 2 hours.
   - ◆ It is invalid in the STEP function, the CONTROL mode and the charge status.
5. Brightness
   - ◆ Press **F2** / **F3** to increase or decrease the brightness.
   - ◆ Accepted eleven levels.

3.4.4 Date and time

- The date and time are shown on the left of the status bar according to the configuration.
- The range of the date setting is from 2000–01–01 to 2099–12–31, and the range of the time setting is from 00:00:00 to 23:59:59.
- It also takes into account the limites of the month, day, leap year, month, hour, minute, second and so on.

3.4.5 Language

- Chinese/English.

3.4.6 Factory default

- Restore instrument settings to factory default including the CONTROL SETUP, the DISPLAY SETUP and the RS–232 SETUP. It also deletes all the snapshots and taskfiles.
- The password is 811.
- Pay attention that all new settings will be erased.

3.5 Task

The calibrator provides a strong task function for automated calibration while also storing and archiving the calibration data. To use this function, press TASK and it provides five kinds of calibration tasks for the following UUTs: dial pressure gauge, digital pressure gauge, pressure transmitter, pressure switch and I/P converter. When using different types of equipments the measure and source will be set automatically. The maximum task is 120.

- When the cursor is on NEW TASK, press F2 to delete all the tasks and data. Carefully select your operation as they cannot be reversed.
- When the cursor on NEW TASK, press F4 / ↵Enter to create a new task with the last one as a templet.
- Press ▲ / ▼ to select a task and view its information, and press ◄ / ► to page up and down.

- ◆ Press F2 to save as a new task.
- ◆ Press F3 to delete the selected task and its data. Carefully select your operation as they cannot be reversed.
- ◆ If the selected task has not been calibrated, press F4 / ↵Enter to be ready to run and show the run information screen.
- ◆ If the selected task has been calibrated, press F4 / ↵Enter to view the report.
- ◆ The task can be executed repeatedly, but only the last result can be recorded. Carefully select your operation as they cannot be reversed.
- ◆ View the run information and report. The failures are red and "--------" stands for no record.
- ◆ The data can be uploaded to a computer with a RS-232 interface cable.

3.5.1 Calibrating dial pressure gauges

1. Connect
   - ◆ Connect the calibrator to the dial pressure gauge as shown in Figure 3-20.
   - ◆ Connect the REF port to the low pressure port of the differential pressure gauge.

Figure 3-20 calibrating a dial pressure gauge

2. New
   - ◆ Task name
     1) Enter an alphanumeric name, and press ±/ to input special codes.
     2) The name cannot be the same as the existing task.
     3) Task + serial number (999 maximum) is the default format.
     4) The characters of the inputing test name cannot exceed 13 spaces.
   - ◆ Range of UUT

1) Cannot exceed the output range of the calibrator.
2) The high and low limit cannot be equal.
3) The calibrator will automatically select the range for higher precision.
4) The calibrator will use dual range if needed.
5) The overpressurization will result in damage to the UUT.

◆ Pressure form: gauge/absolute/differential: the pressure form of the task is suitable for the UUT.

◆ Accuracy: the custom range is (0.01~100) %.

◆ Calibration points

1) The range is 2~17.
2) Scale the steps in accordance with the linear of the UUT for the default.
3) Every point can be edited.
4) The points less than –95kPa will be adjusted to –95kPa.

◆ Division

1) To format the indicator of the UUT.
2) When the SCALE datemode is selected, Real Indicator = Experted + Offset × Division.

◆ Tapping: tap or not during the calibration process.

◆ Data mode: indicator/offset scale.

◆ Cycles: 1~3.

3. Run

◆ Input the information before running including the date (the default is the system date), the ambient temperature (the default is 25℃ and the range is 0~50℃) and the relative humidity (the default is 40%RH and the range is 0~100%RH).

- ◆ Start and wait for the displayed pressure to stabilize. Input the indicator of the UUT that cannot exceed 110% full–scale of the UUT. When continuing with no input, the standard value will be recorded as the indicator. If tapping is enabled, input the tapped indicator by request. Complete this step and continue.
- ◆ Generate the pressure of the set points until the end and generate a report automatically.
- ◆ When dual range is being used, switch the range under the following conditions:

  1) The next set value has a different sign from the last.

  2) Continue from zero pressure to the next.
- ◆ Recall the previous steps: press STANDBY to pause and the calibrator will switch to the STANDBY mode. Press ▲ / ▼ to select the previous steps, and then press STANDBY to recalibrate this setpoint.
- ◆ The calibration points of the task cannot exceed the control range of the CONTROL SETUP， or the unit will prompt the user to reset the limits.
- ◆ The calibrator will automatically switch to the suitable range if needed.

3.5.2 Calibrating digital pressure gauges

1. Connect
   - ◆ Connect the calibrator to the digital pressure gauge as shown in Figure 3–21.
   - ◆ Connect the REF port to the low pressure port of the differential pressure gauge.
2. New and run

   The introduction about creating and running the task are similar with calibrating a dial pressure gauge (Section 3.5.1) except:

Figure 3–21 calibrating a digital pressure gauge

◆ No tapping function.

◆ The resolution formats the indicator of the UUT instead of the division.

3.5.3 Calibrating pressure transmitters

The calibrator can measure and record the current/voltage from the UUT so the task can calibrate a pressure transmitter automatically.

1. Connect

◆ Connect the calibrator to the pressure transmitter as shown in Figure 3–22.

◆ Connect the REF port to the low pressure port of the differential pressure transmitter.

2. New

◆ Task name

1) Enter an alphanumeric name, and press ±/- to input special codes.

2) The name cannot be the same as the existing task.

3) Task + serial number (999 maximum) is the default format.

4) The characters of the inputing test name cannot exceed 13 spaces.

◆ Range of UUT

1) Cannot exceed the output range of the calibrator.

2) The high and low limit cannot be equal.

3) The calibrator will automatically select the range for higher precision.

Figure 3–22 calibrating a two–wire pressure transmitter

4) The calibrator will use dual range if needed.

5) The overpressurization will result in damage to the UUT.

◆ Pressure form: gauge/absolute/differential: the pressure form of the task is suitable for the UUT.

◆ Accuracy: the custom range is (0.01~100)%.

◆ Calibration points:

1) The range is 2~17.

2) Scale the steps in accordance with the linear of the UUT for the default.

3) Every point can be edited.

4) The points less than –95kPa will be adjusted to –95kPa.

◆ Measure signal

1) Includes five selections of typical pressure transmitters.

2) Calibrate a HART transmitter as seen in Section 3.5.4.

◆ Transfer function

1) Linear: the output and measure are both linear.

2) Sqrt: the output is linear, but the measure is square root.

◆ Cycles: 1~3.

3. Run

◆ Input the information before running including the date (the default is the system date), the ambient temperature (the default is 25℃ and the range is 0~50℃) and the relative humidity (the default is 40%RH and the range is 0~100%RH).

◆ Select the run mode:

1) Automatic: set the wait time and the delay time, and their ranges are both 0~3600. When the pressure is stable,

the wait time will count down to zero, then the task will continue to the next setpoint. When the run direction is ready to descend, the delay time will count down to zero then the task turns to the descending.

2) Manual: press F4 / ↵Enter to continue after the pressure is stabilized.

◆ Start and wait for the displayed pressure to stabilize. Then record the measure value. Complete this step and continue.

◆ Generate the pressure of the set points until the end and generate a report automatically.

◆ When dual range is used, switch the range under the following conditions:

1) The next set value has a different sign from the last.

2) Continue from zero pressure to the next.

◆ Recall the previous steps: press F4 / STANDBY to pause and the calibrator will switch to the STANDBY mode. Press ▲ / ▼ to select the previous step, and then press F4 / STANDBY to recalibrate this setpoint.

◆ The calibration task points cannot exceed the control range of the CONTROL SETUP, or the unit will prompt the user to reset the limits.

◆ The calibrator will automatically switch to the suitable range if needed.

3.5.4 Calibrating HART transmitters

1. Connect

◆ Connect the calibrator to the HART transmitter as shown in Figure 3–13 and 3–22 in the internal series resistor and internal 24V loop power mode.

2. New

◆ Measure signal: HART.

◆ Transfer function

1) Linear: the output and measure are both linear.

2) Sqrt: when the process variable is AO or loop mA, the output is linear, but the measure is the squares root.

◆ The other introduction is similar with calibrating a common pressure transmitter (Section 3.5.3).

3. Run

◆ Poll HART devices automatically if needed or press HART to do it manually (Section 3.2.1).

◆ Compare the range of the task settings with the real range of the HART transmitter.

◆ Press ▲ / ▼ and F4 / ↵Enter to select a process variable as the measure.

◆ HART disconnection will cause the task to end.

◆ The other introduction is similar with calibrating a common pressure transmitter (Section 3.5.3).

4. Service

◆ As found data is the task result showing the condition of a HART transmitter before it is calibrated.

◆ Press F2 to trim the HART transmitter.

◆ Press F3 to restart the task after servicing, and the result is recorded as Left.

3.5.5 Calibrating pressure switches

The calibrator can record the trip values of the pressure switch automatically and repeatedly. For higher precision the task slows the slew rate near the anticipated trip point of the switch, and the pressure at this time is the start of slow pressurization.

The start of slow pressurization = the anticipated trip point – 0.12 × the range of the switch.

The calibrator pressurizes to the low limit of the switch and waits for the displayed pressure to stabilize. Pressurize to the high limit of the switch rapidly and slow the slew rate at the start of slow pressurization. Pressurize slowly until the first trip and turn to descending. Decompress slowly until the second trip and end this cycle. Run repeatedly to capture trip values.

1. Connect
   - ◆ Connect the calibrator to the pressure switch as shown in Figure 3–23.
2. New
   - ◆ Task name
     1) Enter an alphanumeric name, and press ⅊ to input special codes.
     2) The name cannot be the same as the existing task.
     3) Task + serial number (999 maximum) is the default format.
     4) The characters of the inputing test name cannot exceed 13 spaces.
   - ◆ Range of UUT
     1) Cannot exceed the output range of the calibrator.
     2) The high and low limit cannot be equal.
     3) The calibrator will automatically select the range for higher precision.
     4) The calibrator will use dual range if needed.
     5) The overpressurization will result in damage to the UUT.
   - ◆ Pressure form: gauge/absolute/differential: the pressure form of the task is suitable for the UUT.
   - ◆ Accuracy: the custom range is (0.01~100)%.
   - ◆ Anticipated trip point:
     1) The anticipated trip value when ascending.
     2) Cannot exceed the range of the switch.
   - ◆ Anticipated switch difference = the trip value when ascending – the trip value when descending.
   - ◆ Cycles: 1~3.

Figure 3–23 calibrating a pressure switch

3. Run

- ◆ Input the information before running including the date (the default is the system date), the ambient temperature (the default is 25℃ and the range is 0~50℃) and the relative humidity (the default is 40%RH and the range is 0~100%RH).
- ◆ The process of testing a manual switch runs as follows:
  1) Start to pressurize to the low limit of the switch first and wait for the displayed pressure to stabilize.
  2) Pressurize to the high limit of the switch rapidly and wait for the displayed pressure to stabilize.
  3) Automatically adjust the slew rate to slow at the start point of slow pressurization.
  4) Pressurize slowly until the first trip (if this does not occur, there might be a problem with the switch being calibrated).
  5) Keep the slow speed and turn to discending after recording.
  6) Decompress to the low limit of the switch slowly until the next trip, then end this cycle.
  7) Keep the slow speed and turn to ascending after recording if needed.
  8) Pressurize to the high limit of the switch slowly to continue to capture.
  9) Run repeatedly for capturing and recording the trip values until the end.
- ◆ Record and display trip values in the table right.
- ◆ When dual range is used, switch the range under the condition of zero pressure.
- ◆ Press F4 / STANDBY to pause and continue the task and the mode will be changed from the STANDBY to the CONTROL.
- ◆ The calibration points of task cannot exceed the control range of the CONTROL SETUP, or the unit will prompt the user to reset the limits.
- ◆ The calibrator will automatically switch to the suitable range if needed.

3.5.6 Calibrateing I/P converters

1. Connect
   - ◆ Connect the calibrator to the I/P converter as shown in Figure 3–24.
   - ◆ Do not overpressurize the calibrator.
   - ◆ Check the load ability of the UUT for the internal 24V power supply.
2. New
   - ◆ Task name
     1) Enter an alphanumeric name, and press ±/- to input special codes.
     2) The name cannot be the same as the existing task.
     3) Task + serial number (999 maximum) is the default format.
     4) The characters of the inputing test name cannot exceed 13 spaces.
   - ◆ Output signal: according to the current range of the UUT.
   - ◆ Pressure form: gauge/absolute/differential: the pressure form of the task is suitable for the UUT.
   - ◆ Accuracy: the custom range is (0.01~100)%.
   - ◆ Calibration points
     1) The range is 2~17.
     2) Scale the steps in accordance with the linear of the UUT for the default.
     3) Every point can be edited.

Figure 3–24 calibrating an I/P converter

◆ Measure

1) With internal pressure range: the output range of the UUT cannot exceed the range of the calibrator.

2) With external pressure module: the output range of the UUT cannot exceed the range of the external pressure module.

◆ Range of UUT

1) Cannot exceed the measure range of the calibrator.

2) The high and low limit cannot be equal.

3) The input cannot exceed six digits.

◆ Cycles: 1~3.

3. Run

◆ Input the information before running including the date (the default is the system date), the ambient temperature (the default is 25℃ and the range is 0~50℃) and the relative humidity (the default is 40%RH and the range is 0~100%RH).

◆ Select the run mode:

1) Automatic: set the wait time, and the range is 0~3600. The wait time is the time between two output steps. It cannot reach zero before the pressure measured is stabilized.

2) Manual: press F4 / ↵Enter to continue after the pressure measure is stabilized.

◆ Start and wait for the displayed pressure measure to stabilize. Then record the measure value. Complete this step and continue.

◆ Source the current of the set points until the end and generate a report automatically.

◆ To recall the previous steps: press F4 to pause. Press ▲ / ▼ to select the previous steps, and then press F4 / STANDBY to recalibrate this setpoint.

3.6 Tools

3.6.1 Leak test

Pressurization mode:

1) Pressurize with the calibrator: select the internal high/low range for pressurizing to the leak test point automatically with the calibrator.
2) Pressurize with an external pressure source: pressurize with an external pressure source and measure the real pressure with an external pressure module.

1. Setup

◆ Select the leak test of tools in the setup screen.

◆ Leak test with the internal ranges or the external pressure module.

1) The set point and the wait time do not have to be set with the external pressure module.
2) If the unit is unacceptable for the pressurization mode, the unit of the leak test will automatically return to the kPa unit (Section 3.1.4).

◆ The pressure unit will return to the previous one if it is unacceptable for the pressurization mode (Section 3.1.4).

◆ Set point

1) Do not exceed the range of the selected pressurization mode.
2) Consider it as the leak test point.
3) Pressurize to it for testing.

◆ Wait time: when the pressure is stable, the wait time will count down to zero then the control will stop and the test will start.

◆ Test time: when the test begins, the test time count down to zero then the test will end.

2. Run

◆ Internal high/low range

1) Press ↵Enter / F4 to start to pressurize to the setpoint and wait for the displayed pressure to stabilize.
2) Keep controlling and the wait time will count down.
3) When the wait time reaches zero, change to the STANDBY mode and record the displayed pressure as the start pressure.
4) Start test and the test time will count down, Real Leakage = Start Pressure – Real Pressure.
5) When the test time reaches zero, reduce the system pressure to near the atmospheric pressure and record the displayed pressure as the end pressure.
6) Finally Leakage = Start Pressure – End Pressure.
7) By pressing STANDBY / F4 to pause and continue during steps 1), 2), 3), 4), the run mode will be changed between the STANDBY and the CONTROL in 1), 2).

◆ External pressure source

1) Connect to an external pressure module.
2) Pressurize to the leak test point with an external pressure source.
3) Press ↵Enter / F4 to run and record the displayed pressure as the start pressure.
4) Start test and the test time will count down. Real Leakage = Start Pressure – Real Pressure.
5) When the test time reaches zero, record the displayed pressure as the end pressure.
6) Finally Leakage = Start Pressure – End Pressure.
7) Press F4 to pause and continue during step 4).

- ◆ A sketch map is shown for every prompt step during the test.
- ◆ Press VENT to vent and end the test.
- ◆ The set point with the internal ranges cannot exceed the control range of the CONTROL SETUP, or the unit will prompt the user to reset the limits.

3.6.2 Vent

Pressurize the calibrator first, and then the vent valve will open.

So the air flow will clear impurities out from the calibrator.

1. Connect
   - ◆ Plug up the OUTLET port.
   - ◆ Please gather and properly dispose of all the pollutions during venting as shown in Figure 3–25.
   - ◆ The VENT port cannot face to the operator.
2. Run
   - ◆ Select the vent of tools in the setup screen.
   - ◆ Switch to the the high range automatically if needed.
   - ◆ Press F4 / ↵Enter to pressurize to the full–scale pressure.
   - ◆ When the pressure reaches the full–scale pressure, the vent valve will open to release the system gas and the unrestricted gas flow occurs in this operation.
   - ◆ The venting can be performed repeatedly.
   - ◆ The set point cannot exceed the control range of the the CONTROL SETUP, or the unit will prompt the user to reset the limits.

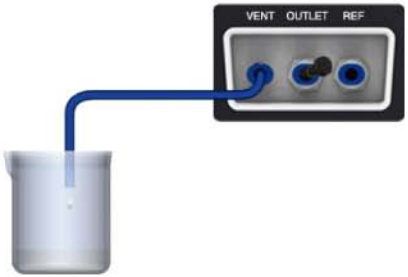

Figure 3–25 vent

3.6.3 Unit conversion

- Selects the converter of tools in the setup screen.
- Supports the conversion for eleven pressure units.

3.6.4 Help

The calibrator provides images and introductions about basic connections and typical applications.

- Select the "Help" in the setup screen.
- Press ▲ / ▼ to view.

3.7 System calibration

- To ensure optimum instrument operation, the current/voltage measure, the current source and the internal dual pressure range should be calibrated at regular intervals.
- The calibrator also provides a way to calibrate the external CDP pressure module.
- The wrong operation will affect the precision and possibly even cause abnormalities.
- The calibration data can be restored to the factory default, and the calibration date changes to "----/--/--".
- Recommend the use of appropriately accurate primary standards when calibrating this instrument.
- Enter the system calibration in the setup screen and select the function.
- The confidential password is 811.

3.7.1 Current/voltage measure

1. Calibration points
   - The default is –30mA, 0mA, 30mA for current measure and –30V, 0V, 30V for voltage measure.
   - Calibration points can be edited with the respective range as follows if needed:

     1) (–30~–18)mA or (–30~–18)V for negative full scale.

2) (–12~12)mA or (–12~12)V for zero.

3) (18~30)mA or (18~30)V for positive full scale.

2. Run

◆ Press F4 / ↵Enter to start.

◆ When the calibrater generates to a standard gauge, it will first wait for the gauge to stabilize, then it will import the gauge date. Press F4 / ↵Enter to record and continue and press F1 / Esc to review.

3.7.2 Current source

1. Calibration points

◆ The default is 4mA, 20mA that cannot be edited.

2. Run

◆ Press F4 / ↵Enter to start.

◆ The calibrator will provide the current to a standard ampere–meter on schedual. When the reading is stable, input the reading into the calibrator. Press F4 / ↵Enter to record and continue and press F1 / Esc to review.

◆ The accepted range of the standard gauge is (0~30)mA.

3.7.3 High/low range

1. Calibration points

◆ If the range has negative full scale, execute in two–point mode with the low limit and the zero as default.

◆ If the range has Positive full scale, execute in two–point mode calibration with the zero and the high limit as default.

◆ If the range is mixed, execute in three–point mode with the low limit, the zero and the high limit as default.

◆ They are can be edited with the respective limit as follows if needed:

1) LRV~ LRV × 80% for negative full scale.

2) Zero ± 20%FS for zero.

3) URV × 80%~URV for negative full scale.

◆ The negative full scale value should suit the atmospheric pressure.

◆ Select the pressurization mode with the calibrator or an external source.

1) Internal pressurization: the calibration points cannot exceed the control range of the CONTROL SETUP, or the unit will prompt the user to reset the limits.

2) External pressurization: do not overpressurize the calibrator.

2. Run

◆ The calibrator will automatically switch to the suitable range if needed.

◆ Pressurization mode:

1) With the calibrator itself: use a standard gauge to measure the pressure that the calibrator generates and controls.

2) With an external pressure source standard: use a standard source to pressurize the calibrator in the STANDBY mode.

◆ Internal pressurization

1) Press F4 / ↵Enter to start.

2) The calibrator pressurizes to a standard gauge and waits for the control and the indicator to stabilize. Input the indicator into the calibrator as the calibration data. Press F4 / ↵Enter to record and continue and press F1 / Esc to review.

◆ External pressurization

1) Press F4 / ↵Enter to start.

2) Use a standard pressure source to pressurize the calibrator and wait for the measure value to stabilize. Press F4 / ↵Enter to record and continue and press F1 / Esc to review.

◆ Once user calibration is completed, the system date will be recorded by the date of calibration.

3.7.4 External pressure module

1. Calibration points (as shown in Section 3.7.3–1).
2. Run

◆ Connect to the pressure module.

◆ Press F4 / ↵Enter to start.

◆ Use a standard pressure source to pressurize the pressure module and wait for the measure value to stabilize. Press F4 / ↵Enter to record and continue and press F1 / Esc to review.

3.7.5 Self tune

For factory test only.

3.8 RS232 communication

3.8.1 RS232 setup

◆ Select the RS232 setup in the setup screen.

◆ Set the baudrate, databits and stopbits.

◆ Press 0 ~ 9wxyz to set the address, and the range is 001~121.

3.8.2 Commands

◆ The instrument is connected by a point–to–point connection to a control computer with a cable.

◆ Commands are addressed with the address of the RS–232 setup.

◆ Command format: A: X: nnnn: C0: C1 + end symbol

A	1 Byte. Communication address.
X	1 Byte. W (write) or R (read).
nnnn	2–18 Bytes. Function code.
C0, C1	Parameters as Appendix B
End Symbol	0x0(HEX)

Table 3–4 command

◆ Reply format: A: X: nnnn: C0: C1+ end symbol

A	1 Byte. Communication address.
X	1 Byte, E or F. E stands for the error information and F stands for the reply information.
nnnn	2–18 Bytes. The same as command.
C0, C1	Reply the data or the error code as Appendix B
End Symbol	0x0(HEX)

Table 3–4 command

◆ Refer to appendix B RS–232 Commands of ADT761 for command details.

4. Service

4.1 Device Information

◆ Select the device information in the setup screen.

◆ View the software revision, factory date, serial number and so on.

◆ View the information of the high /low range inside.

◆ View the information of the external pressure module (online).

4.2 Prompt

The display shows a screen prompt warning as follows:

Prompt	Description and Disposal
Power low. Recharge soon!	Charge the battery with the adapter now.
The system temperature is abnormity!	Ambient temperature exceeds the range of (0~50℃).
Control is not stable. Our pump is overloaded!	The pump cannot pressurize to the set point for more than 5 minutes. Fix it and try again.
Control is not stable due to leakage!	Airproof the leak point and try again.
Your system is attempting to overpressurize our unit.Our unit will continue to automatically vent all pressures.	The protective vent causes the discharge of pressure at a controlled rate if the measured pressure exceeds 120% full–scale. This protects the pressure sensor from over–range.

Table 4–1 prompt and disposal

4.3 Checking system for leaks

4.3.1 Checking

The calibrator must be leak free in order to functuion properly. Leakage may lead to control errors. A rapid pressure drop will indicate a leak in the system. Check them as follows:

◆ Plug up the OUTLET port.

◆ Generate a pressure to stabilize and turn to stangby mode. Wait for 2 minutes.

◆ The leak rate should be less than 0.002kPa/s for low pressure calibrator and 0.02kPa/s for pneumatic pressure calibrator, or consider the calibrator must have leakage.

◆ The ADT761 also be leak tested (as shown in Section 3.6.1).

4.3.2 Disposal

- Turn off the OUTLET port again.
- The sealing property may be influenced by the residual impurities to operate the venting function (Figure 3.6.2).
- Contact Additel for other reasons.

4.4 Quick connector

- Check the shape of the head of the tube before installing, and cut it if needed (Figures 3–26 and 3–27).

Note: Please use the standard equipment, to ensure that its diameter is 6mm and that can meet the condition of full–scale pressure.

Figure 3–26 reject

Figure 3–27 eligibility

- Insert the tube to the quick connector with about 12mm inside so as to airproof it.
- Disassemble as follows in case of damage:

Press the blue quick connector with two fingers first, and then pull the tube out (Figure 3–28).

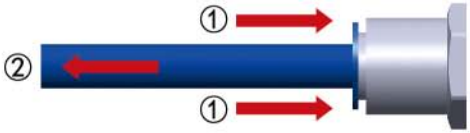

Figure 3–28 disassembling the tube

- Replace the quick connector due to leakage as follows (Figure 3–29):
  Use the standard equipment, to ensure the screw thread is G1/8.
  Disassemble the broken quick connector by turning the 4mm allen wrench counter–clockwise.
  Install the new quick connector by circumgyrating the 4mm allen wrench clockwise.

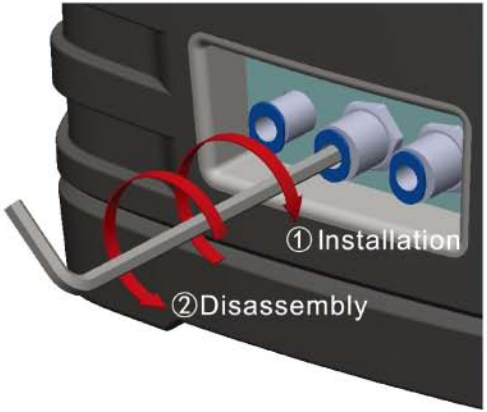

Figure 3–29 replacing the quick connector

4.5 Abnormality

If the pressure has been unstable for more than 3 minutes in the CONTROL mode, the calibrator will switch to the STANDBY mode and prompt to fix it as follows:

- Check the rationality of stable conditions (Section 3.4.1). Release them and try again.
- Check the pneumatic system for leaks.

Appendix A Data Sheet

A.1 Environment

- Operating temperature: (0 ~ 50)℃.
- Storage temperature: (–20 ~ 60)℃.
- Humidity: <90%RH, non–condensing.
- Atmospheric pressure: (86 ~ 106)kPa.

A.2 Power

- Power: internal rechargeable battery or adapter.
- Charging time: less than 3 hours.
- Battery operation: typical 8 hours depending on the pressurizing frequency.

A.3 Technical specifications

- Internal pressure ranges and accuracy.

  Low pressure calibrator: high range (–100~100)kPa differential, 0.02%FS, low range (–2.5~2.5)kPa differential, 0.05%FS.

  Pneumatic pressure calibrator: high range (0~2.5)MPa gauge, 0.02%FS, low range (–0.09~0.16)MPa gauge, 0.02%FS.
- Output range.

  Low pressure calibrator: (–95~100)kPa differential.

  Pneumatic pressure calibrator: –0.09MPa absolute~2.5MPa gauge.
- Control stability: 0.005%FS.
- Response time: < 30sec. (regarding a 20% press, increase in a 50cc test volume in high speed mode).
- Pressure media: clean dry non–corrosive gases.
- Electrical measurements (ambient temperature 20℃ ± 5℃, 1 year accuracy).

Signal	Range	Resolution	Accuracy
Voltage	(–30.0000 ~ 30.0000)V	0.1mV	0.01%RD+0.005%FS
Current	(–30.0000 ~ 30.0000)mA	0.1 μA	0.01%RD+0.005%FS
Switch	Test voltage DC 3V ~ DC 24V		

Table A–1 electrical measurements

Note 1: temperature coefficient < ±0.0015% RDG/℃ outside of (15 ~ 25)℃.

Note 2: input features:

1) Voltage measurement: input impedance > 1MΩ. Max input voltage is ±300V DC.

2) Current measurement: input impedance < 10Ω. Max input current is ±1A DC.

◆ Electrical source (ambient temperature 20℃ ± 5℃, 1 year accuracy).

Signal	Range	Resolution	Accuracy
Current	(0 ~ 22.000)mA	1 μA	0.02%RD+0.01%FS
Loop supply	24V	N/A	±0.5V

Table A–2 electrical source

Note 1: temperature coefficient < ±0.0015% RDG/℃ outside of (15 ~ 25)℃.

Note 2: input features:

1) Current source: in the internal power mode maximum load current is 20mA@1kΩ.
in the external power mode (0~36V) the peak load meets: output current × load resistance < (voltage –4)V.

2) Short circuit protected.

- Display: 7.0" 800 × 480 pixels color LCD.
- Dimensions and weight: 296 (w) × 186(h) × 180(d) mm, and approx. 5.6kg.
- Electrical interface: Φ4mm electrical jack.
- Charging interface: 2 pin aviation connector.
- RS−232 interface: RS−232−DB9 female.
- Pressure module interface: 5 pin aviation connector.

Appendix B RS232 Commands

Command									Function	Reply
A	X	Knnnn	C0	C1	C2	C3	C4	Ending		
	R	CPV	–	–	–	–	–	0x0	Read the output pressure value	A:F:CPV: pressure value:KPA+Ending
	R	ORANH	–	–	–	–	–		Read the high pressure range	A:F:ORANH:low limit:high limit:KPA+Ending
	R	ORANL	–	–	–	–	–		Read the low pressure range	A:F:ORANL: low limit:high limit:KPA+Ending
	R	ORANE	–	–	–	–	–		Read the range of the pressure module	A:F:ORANE: low limit:high limit:KPA+Ending
	R	CSTABSTAT	–	–	–	–	–		Read the control state	A:F:CSTABSTAT:0(unstable)/1(stable)+Ending
	R	OCTRLPRESSURE	–	–	–	–	–		Read the accepted control range	A:F:OCTRLPRESSURE: low limit:high limit:KPA+Ending
	R	CSLEWRATE	–	–	–	–	–		Read the slew rate	A:F:CSLEWRATE:0(fast)/1(mediun)/2(low)+Ending
	R	CSTABVALUE	–	–	–	–	–		Read the control stability	A:F:CSTABVALUE:set value+Ending
	R	CSTABDELAY	–	–	–	–	–		Read the stable delay time	A:F:CSTABDELAY:set value:S+Ending
	R	CSTABBEEP	–	–	–	–	–		Read the state of the stable beep	A:F:CSTABBEEP:0(disabled)/1(enabled)+Ending
	R	CVENTSTAT	–	–	–	–	–		Read the state of auto venting	A:F:CVENTSTAT: 0(disabled)/1(enabled)+Ending
	R	CVENTVALUE	–	–	–	–	–		Read the value of auto venting	A:F:CVENTVALUE:pressure value:KPA+Ending
	R	CSWDAMP	–	–	–	–	–		Read the damping time of the switch	A:F:CSWDAMP:set value+Ending
	R	OLEDBRIGHT	–	–	–	–	–		Read the backlight brightness	A:F:OLEDBRIGHT:set value+Ending
	R	OSYSTIME	–	–	–	–	–		Read the system time	A:F:OSYSTIME:HH:MM:SS+Ending
	R	OSYSDATE	–	–	–	–	–		Read the system date	A:F:OSYSDATE:YYYY–MM–DD+Ending
	R	OSYSDATEFAT	–	–	–	–	–		Read the format of the system date	A:F:OSYSDATEFAT:0(yyyy/mm/dd)/1(mm/dd/yyyy)/2(dd/mm/yyyy)+Ending

Command									Function	Reply
A	X	Knnnn	C0	C1	C2	C3	C4	Ending		
	R	OLANGINDEX	–	–	–	–	–	0x0	Read the language type	A:F:OLANGINDEX:0(Chinese)/1(English)+Ending
	R	O24POWER	–	–	–	–	–		Read the state of the 24V powersupply	A:F:O24POWER: 0(disabled)/1(enabled)/2(protected)+Ending
	R	OTYPE	–	–	–	–	–		Read the device type	A:F:OTYPE:name of type+Ending
	R	ODEVSN	–	–	–	–	–		Read the device SN	A:F:ODEVSN:serial number+Ending
	R	OSOFTVER	–	–	–	–	–		Read the software revision	A:F:OSOFTVER:revision+Ending
	R	OMFRDATE	–	–	–	–	–		Read the factory date	A:F:OMFRDATE:yyyy–mm–dd+Ending
	R	MVAL	–	–	–	–	–		Read the measure value	A:F:CSWDAMP:measure value+Ending
	R	OEPMUNIT	–	–	–	–	–		Read the unit of the pressuremodule (online)	A:F:OEPMUNIT:0(Pa)/1(kPa)/2(MPa)/3(psi)/4(bar)/5(mbar)/6(inHg)/7(mmHg)/8(inH20)/9(mmH2O)/10(kgf/cm2)+Ending
	R	MITEM	–	–	–	–	–		Read the measure type	A:F:MITEM:MA(current)/V(voltage)/SW(switch)/HPM(highrange)/LPM(low range)/EPM(pressure module)/HART+Ending
	R	SITEM	–	–	–	–	–		Read the source type	A:F:SITEM:MA(current)/HPM(high range)/LPM(low range)/EPM (pressure module)+Ending
	R	CSV	–	–	–	–	–		Read the pressure set value	A:F:CSV:pressure value:unit+Ending
	R	HPMVALUE	–	–	–	–	–		Read the pressure value from the high range	A:F:HPMVALUE:pressure value:unit+Ending
	R	LPMVALUE	–	–	–	–	–		Read the pressure value from the low range	A:F:LPMVALUE:pressure value:unit+Ending
	R	EPMVALUE	–	–	–	–	–		Read the pressure value from the pressure module	A:F:EPMVALUE:pressure value:unit+Ending
	R	SMAVALUE	–	–	–	–	–		Read the current output value	A:F:SMAVALUE:current value:MA+Ending

Command									Function	Reply
A	X	Knnnn	C0	C1	C2	C3	C4	Ending		
	R	SMAPOWER	–	–	–	–	–	0x0	Read the mode of the power supply for current output	A:F:SMAPOWER:0(external power)/1(internal power)+Ending
	R	OEPMENABLED	–	–	–	–	–		Read the state of the pressure module	A:F:OEPMENABLED:0(offline)/1(online)+Ending
	R	MSWDATALAST	–	–	–	–	–		Read the trip values of the switch	A:F:MSWDATALAST:trip value on to off:trip value off to on:unit+Ending
	R	OHARTENABLED	–	–	–	–	–		Read the state of HART	A:F:OHARTENABLED:0(offline)/1(online)+Ending
	R	OTRIPLE	–	–	–	–	–		Read the state of the display	A:F:OTRIPLE:0(dual display)/1(triple display)+Ending
	R	OHARTPARASET	–	–	–	–	–		Read the parameters of the HART (online)	A:F:OHARTPARASET:tag:PV unit:PV LRV:PV URV:damping time:transfer function:description:message:date:address:sensor SN:sensor LRV:sensor URV:sensor minimum span:manufacturer:model:device ID:write protect:alarm state:number of preambles:hardware revision:software revision+Ending
	R	OHPMINFOR	–	–	–	–	–		Read the information of the high range	A:F:OHPMINFOR:pressure form:precise+Ending
	R	OLPMINFOR	–	–	–	–	–		Read the information of the low range	A:F:OLPMINFOR:pressure form:precise+Ending
	R	OATMO	–	–	–	–	–		Read the atmospheric pressure	A:F:OATMO: atmospheric pressure:KPA+Ending
	R	ORUNKIND	–	–	–	–	–		Read the running state	A:F:ORUNKIND:0(standby)/1(control)/2(vent)+Ending
	R	OHARTVARIABLE	0(PV) 1(AO) 2(Per) 3(CA)	–	–	–	–		Read the process variables of the HART (online)	A:F:OHARTVARIABLE:process variable value+Ending
	R	CHIGHPRESSURE	Control URV	–	–	–	–		Set the control high limit	A:F:CHIGHPRESSURE:OK+Ending

Command									Function	Reply
A	X	Knnnn	C0	C1	C2	C3	C4	Ending		
	R	CLOWPRESSURE	Control LRV	–	–	–	–	0x0	Set the control low limit	A:F:CLOWPRESSURE:OK+Ending
	R	CSTANDBY	0(Standby) 1(Control)	–	–	–	–		Set the running state	A:F:CSTANDBY:OK+Ending
	R	CSLEWRATE	0(Fast) 1(Medium) 2(Slow)	–	–	–	–		Set the slew rate	A:F:CSLEWRATE:OK+Ending
	R	CSTABVALUE	Control stability	–	–	–	–		Set the control stability	A:F:CSTABVALUE:OK+Ending
	R	CSTABDELAY	Stable delay	–	–	–	–		Set the stable delay time	A:F:CSTABDELAY:OK+Ending
	R	CSTABBEEP	0(Disabled) 1(Enabled)	–	–	–	–		Set the state of the stable beep	A:F:CSTABBEEP:OK+Ending
	R	CVENTSTAT	0(Disabled) 1(Enabled)	–	–	–	–		Set the state of auto venting	A:F:CVENTSTAT:OK+Ending
	R	CVENTVALUE	Pressure value	–	–	–	–		Set vent pressure point	A:F:CVENTVALUE:OK+Ending
	R	CSWDAMP	Damping time	–	–	–	–		Set the damping time of the switch	A:F:CSWDAMP:OK+Ending
	R	CSWITCHRANGE	0(High range) 1(Low range)	–	–	–	–		Switch the range	A:F:CSWITCHRANGE:OK+Ending
	R	CSV	Pressure value	–	–	–	–		Set the control target value by the current unit	A:F:CSV:OK+Ending
	R	CVENT	0(Disabled) 1(Enabled)	–	–	–	–		Vent	A:F:CVENT:OK+Ending

Command									Function	Reply
A	X	Knnnn	C0	C1	C2	C3	C4	Ending		
	R	OLEDBRIGHT	Percent of brightness	–	–	–	–	0x0	Set the backlight brightness (0–100)%	A:F:OLEDBRIGHT:OK+Ending
	R	OSYSTIME	HHMMSS						Set the system time	A:F:OSYSTIME:OK+Ending
	R	OSYSDATE	YYYYMMDD	–	–	–	–		Set the system date	A:F:OSYSDATE:OK+Ending
	R	OSYSDATEFAT	0(yyyy/mm/dd) 1(mm/dd/yyyy) 2(dd/mm/yyyy)	–	–	–	–		Set the format of the system date	A:F:OSYSDATEFAT:OK+Ending
	R	OLANGINDEX	0(Chinese) 1(English)	– –	– –	– –	– –		Set the language type	A:F:OLANGINDEX:OK+Ending
	R	O24POWER	0(Disabled) 1(Enabled)	–	–	–	–		Set the state of 24V power supply	A:F:O24POWER:OK+Ending
	R	MAZERO	–	–	–	–	–		Zero current	A:F:MAZERO:OK+Ending
	R	VZERO	–	–	–	–	–		Zero voltage	A:F:VZERO:OK+Ending
	R	PINTHZERO	–	–	–	–	–		Zero pressure of the high range	A:F:PINTHZERO:OK+Ending
	R	PINTLZERO	–	–	–	–	–		Zero pressure of the low range	A:F:PINTLZERO:OK+Ending
	R	PEXTZERO	–	–	–	–	–		Zero pressure of the pressure module	A:F:PEXTZERO:OK+Ending
	R	OTASKFORMAT	–	–	–	–	–		Format the nandflash with the task files	A:F:OTASKFORMAT:OK+Ending
	R	SMAPOWER	0(Ext. power) 1(Int. power)	–	–	–	–		Set the mode of the power supply for current output	A:F:SMAPOWER:OK+Ending

Command									Function	Reply
A	X	Knnnn	C0	C1	C2	C3	C4	Ending		
	R	CALSTART	Calibration password	1(Current measure) 2(Voltage measure) 3(Current source)	–	–	–	0x0	Start to calibrate	A:F:CALSTART:OK+Ending
	R	MCALPOINT	Negative	Zero	Positive	–	–		Set the calibration points of measure	A:F:MCALPOINT:OK+Ending
	R	MCALVALUE	SN of calibration point	–	–	–	–		Set the calibration data of measure	A:F:MCALVALUE:OK+Ending
	R	SCALPOINT	SN of calibration point	–	–	–	–		Set the SN of calibration point of source	A:F:SCALPOINT:OK+Ending
	R	SCALVALUE	The value of calibration point	–	–	–	–		Set the calibration data of source	A:F:SCALVALUE:OK+Ending
	R	CALDONE	–	–	–	–	–		End the calibration (the whole process starts from CALSTART and end by CALDONE)	A:F:CALDONE:OK+Ending
	R	CALFACTORY	1(Current measure) 2(Voltage measure) 3(Current source)	–	–	–	–		Restore the factory default of calibration	A:F:CALFACTORY:OK+Ending
	R	SMAVAL	Output value	–	–	–	–		Set the current output value	A:F:SMAVAL:OK+Ending
	R	OCLSSWDATA	–	–	–	–	–		Eraze the trip values of the switch	A:F:OCLSSWDATA:OK+Ending

Command									Function	Reply
A	X	Knnnn	C0	C1	C2	C3	C4	Ending		
	R	MITEM	MA(Current) V(Voltage) SW (Switch) HPM(High range) LPM(Low range) EPM(Pressure module) HART	–	–	–	–	0x0	Set the measure type	A:F:MITEM:OK+Ending
	R	SITEM	MA(Current) HPM(High range) LPM(Low range) EPM(Pressure module) 0(Pa)	–	–	–	–		Set the source type	A:F:SITEM:OK+Ending
	R	OIPMUNIT	1(kPa) 2(MPa) 3(psi) 4(bar) 5(mbar) 6(inHg) 7(mmHg) 8(inH20) 9(mmH2O) 10(kgf/cm2)	–	–	–	–		Set the unit of the pressure range	A:F:OIPMUNIT:OK+Ending

Command									Function	Reply
A	X	Knnnn	C0	C1	C2	C3	C4	Ending		
	R	OEPMUNIT	0(Pa) 1(kPa) 2(MPa) 3(psi) 4(bar) 5(mbar) 6(inHg) 7(mmHg) 8(inH20) 9(mmH2O) 10(kgf/cm2)	–	–	–	–	0x0	Set the unit of the pressure module (online)	A:F:OEPMUNIT:OK+Ending
	R	OHARTPARASET	0(Tag) 1(PV Unit) 2(PV LRV) 3(PV URV) 4(Damping time) 5(Transfer function) 6(Description) 7(Message) 8(Date) 9(Address)	Set value					Set the parameters of the HART (online)	A:F:OHARTPARASET:OK+Ending
	R	OSNAPFILE	–	–	–	–	–		Store the snapshot	A:F:OSNAPFILE:OK+Ending
	R	OSNAPFORMAT	–	–	–	–	–		Format the nandflash with the snapshots	A:F:OSNAPFORMAT:OK+Ending

Command									Function	Reply
A	X	Knnnn	C0	C1	C2	C3	C4	Ending		
	R	ODELSNAPFILE	SN of snapshots	–	–	–	–	0x0	Delete a snapshot	A:F:ODELSNAPFILE:OK+Ending
	R	OTRIPLE	0(Dual display) 1(Triple display)	–	–	–	–		Set the state of display	A:F:OTRIPLE:OK+Ending
	R	OKEYLOCK	0(Unlocked) 1(Locked)	–	–	–	–		Lock the keyboard	A:F:OKEYLOCK:OK+Ending

Table B–1 RS232 commands of ADT761

Error/status code:

1001 Command over length

1002 Parameter over length

1003 Command not accepted

1004 Wrong password

1005 State not accepted

1006 Format not accepted

1007 Over range

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