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English

Rev.A5

[AT8612 DC Electronic load]

User's Guide

CERTIFIACTION, LIMITED & LIMITATION OF LIABILITY

Applent Instruments, Inc. （shortened form **Applent**）certifies that this product met its published specifications at the time of shipment from the factory. Applent further certifies that its calibration measurements are traceable to the People's Republic of China National Institute of Standards and Technology, to the extent allowed by the Institution's calibration facility or by the calibration facilities of other International Standards Organization members.

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The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside the environmental specifications for the product, or improper site preparation or maintenance.

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People's Republic of China
Jiangsu Province
Changzhou Applent Instruments Inc.
Oct. 2009
Rev.A1

Safety Summary

⚠Warning  Dangerous:

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS elsewhere in this manual may impair the protection provided by the equipment. In addition it violates safety standards of design, manufacture, and intended use of the instrument.

Disclaimer	The Applent Instruments assumes no liability for the customer's failure to comply with these requirements.
Ground The Instrument	To avoid electric shock hazard, the instrument chassis and cabinet must be connected to a safety earth ground by the supplied power cable with earth blade.
DO NOT Operate In An Explosive Atmosphere	Do not operate the instrument in the presence of inflammable gasses or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.
Keep away from live circuit	Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.
Operations not included in the manual are forbidden	The protection measurements will be failure while beyond the scope.

Safety Sign:

Provide double insulation or reinforced insulation protection

Waste Electrical and Electronic Equipment (WEEE) order 2002/96/EC

Do not leave in the trash can

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1. Unpacking and Preparation

This chapter describes how to set up and start the AT8612.

- Incoming Inspection
- Power Requirements
- Setting up the Fuse
- Environmental Requirements
- Cleaning
- How to Remove the Handle

1.1 Incoming Inspection

After you have receive the instrument, carry out inspection during unpacking according to the following procedures.

WARNING

If the outside of the instrument (such as the cover, front/rear panel, LCD screen, power switch, and port connectors) appears to be damaged during transport, do not turn on the power switch, in case you get an electrical shock.

Check whether the packing box or shock-absorbing material used to package the instrument has been damaged.
Referring to <Packing List>in the packing box, check whether all packaged items supplied together with the meter have been provided as per the specified optioned.

1.2 Power requirement

~Line: 110V/220VAC
Frequency: 47-440Hz
Power: <20VA

1.3 Setting up Fuse

Please use the following fuse type.

UL/CSA type, Slow-Blow, 5×20-mm miniature fuse, 0.5A, 250 V

To verify and replace the fuse, remove the power cable and pull out the fuse holder. Two fuses in Fuse Holder.

1.4 Environmental Requirements

Set up the AT8612 according to following environmental requirements.

Operating Environments
Ensure the operating environment meets the following requirements.
Temperature: 0°C to 55°C

Temperature range at calibration: 23°C±5°C (<1°C deviation from the temperature when performing calibration)

Humidity: 15% to 85% at wet bulb temperature ≤ 40°C (non-condensation)

Altitude: 0 to 2,000m
Vibration: Max. 0.5 G, 5 Hz to 500 Hz

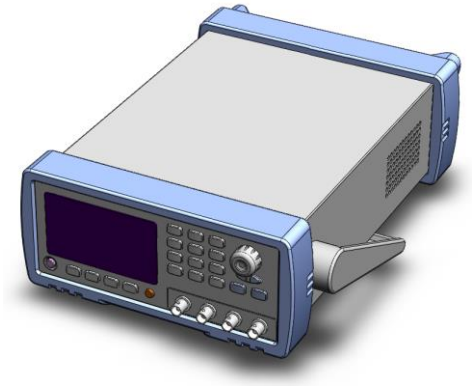
1.5 Cleaning

To prevent electrical shock, disconnect the AT861x power cable from the receptacle before cleaning.
Use dry clothes slightly dipped in water to clean the case.
Do not attempt to clean the internal of the AT861x.

WARNING:
Don’t Use Organic Solvents (such as alcohol or gasoline) to clean the Instrument.

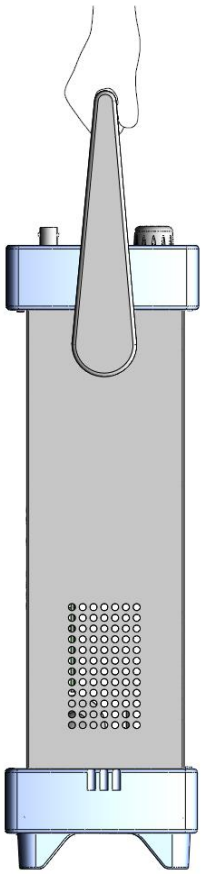
1.6 How to Remove the Handle

Figure 1-1 A handle kit is attached to the AT861x:

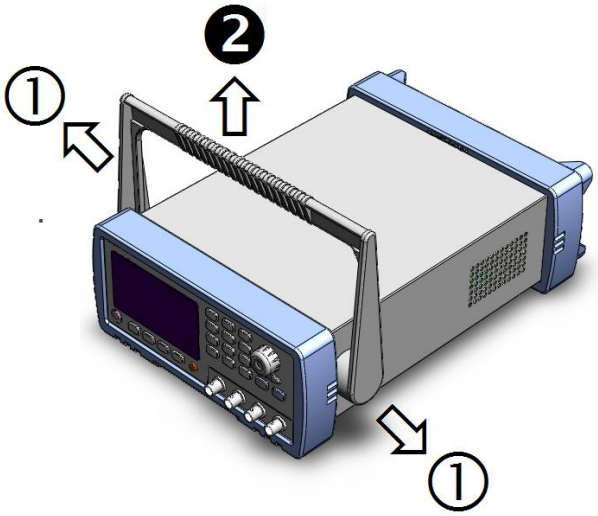


1 Retracted

2 Extended



3 Carrying Position



Remove Handle（*Lift the handle perpendicular to the unit while pulling it in the direction of 1.*）

1.7 Overview

This chapter is organized as follows

- Introduction
- Main Specifications
- Feature overview

1.8 Introduction

Thank you for purchasing AT8612 DC Electronic Load.

AT8612 DC Electronic load adopts high-performance ARM microprocessor with multiple processors. It has superior speed and performance. AT8612 offers four load modes (CC, CV, CP, CR), and there are 9 modes of measurement function: NRM, TRN, SEQ, ATF, BAT, SHT, LED, OCP and OPP.
You can use the built-in file editor or RS232 and USB interface to edit the order list and list file automatically, and complete high-efficient measurement. In addition to testing linear power supply and switching power supply, AT8612 can better test battery charger and batteries, it can meet the requirements of power supply factories and related factories.

1.9 Main Specification

- DC INPUT RATE: 300W/300V/30A
- CONSTANT CURRENT: 0~30A
  0~3A: Resolution: 0.0001A, Accuracy: 0.1%
  0~30A: Resolution: 0.001A, Accuracy: 0.2%
- CONSTANT VOLTAGE: 0~300V
  0~18V: Resolution: 0.001V, Accuracy: 0.05%
  0~300V: Resolution: 0.01V, Accuracy: 0.05%
- CONSTANT POWER: 0~300W
  0~100W: Resolution: 0.001W, Accuracy: 1%
  >100W: Resolution: 0.01W, Accuracy: 1%
- CONSTANCE RESISTANCE: 0 ~ 4000Ω
  0~100Ω: Resolution: 0.01, Accuracy: 1%
  >100Ω: Resolution: 0.1, Accuracy: 1%
  Accuracy of voltmeter: 0.05%
  Accuracy of ammeter: 0.1%
- 25kHz dynamic Testing
- Battery test function
  Maximum time 1000 hours, can display maximum 999.99AH capacity, display of discharge time is available.
- Test speed
  Fast 10t/s, Medium 5t/s, Slow 3t/s

- Trigger
  Internal trigger, BUS trigger, External trigger
- Independent multi-file
  There are 10 files available for both sequence list files and automatic list files, 20 files in total.

1.10 Features

- 3.5 inches true color LCD display
- Operation Mode:
  NORMAL (CC/CV/CP/CR),
  TRANSIENT (TRN),
  SEQUENCE LIST (SEQ),
  AUTOMATIC TESTING FUNCTION (ATF),
  BATTERY TESTING FUNCTION (BAT)
  SHORT CIRCUIT TEST (SHT).
  LED TESTING FUNCTION (LED).
  OCP TESTING FUNCTION (OCP).
  OPP TESTING FUNCTION (OPP).
- 4-wires test function
- Interface:
  1. Triggered Input Interface.
  2. Built-in RS-232C Interface
     Use 3-wire serial port, compatible with SCPI command and ASCII transfer.
  3. RS485 interface (optional)
     Support multi-instrument communication.

2. Start up

This chapter describes:

1. The front panel and rear panel
2. How to connect with AT8612

2.1 Front panel and rear panel

Figure 2-1 Front panel

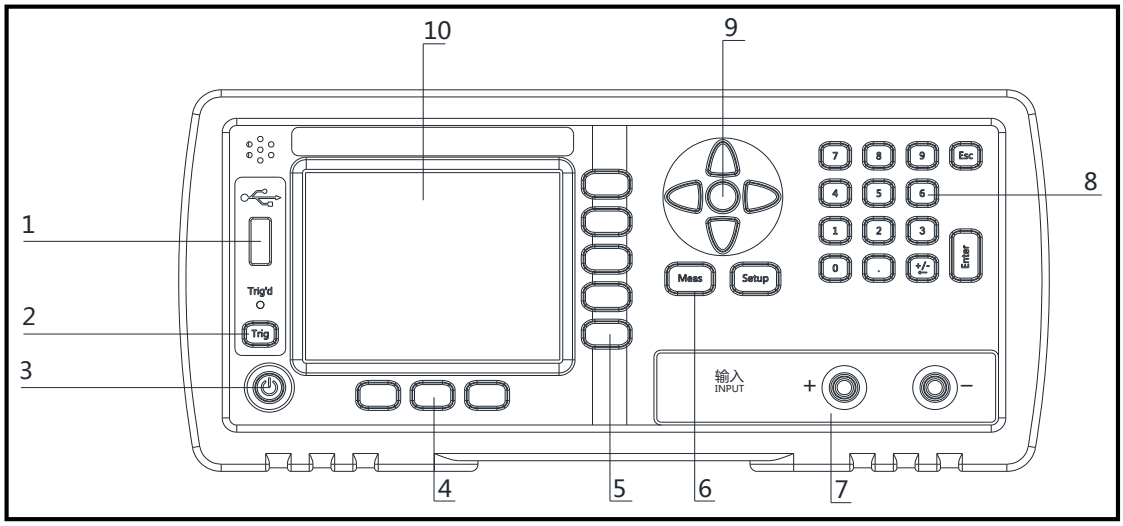


Table 2-1 Front panel description

No.	Description
1	USB disk interface (optional)
2	Trigger key
3	Power switch
4	System function keys: *Turn load on/off, system and keypad lock.*
5	Function soft-key
6	Main function key: *Measurement and setup*
7	Input Terminals
8	Numeric keys
9	Cursor keys
10	LCD display screen

Figure 2-2 Rear panel

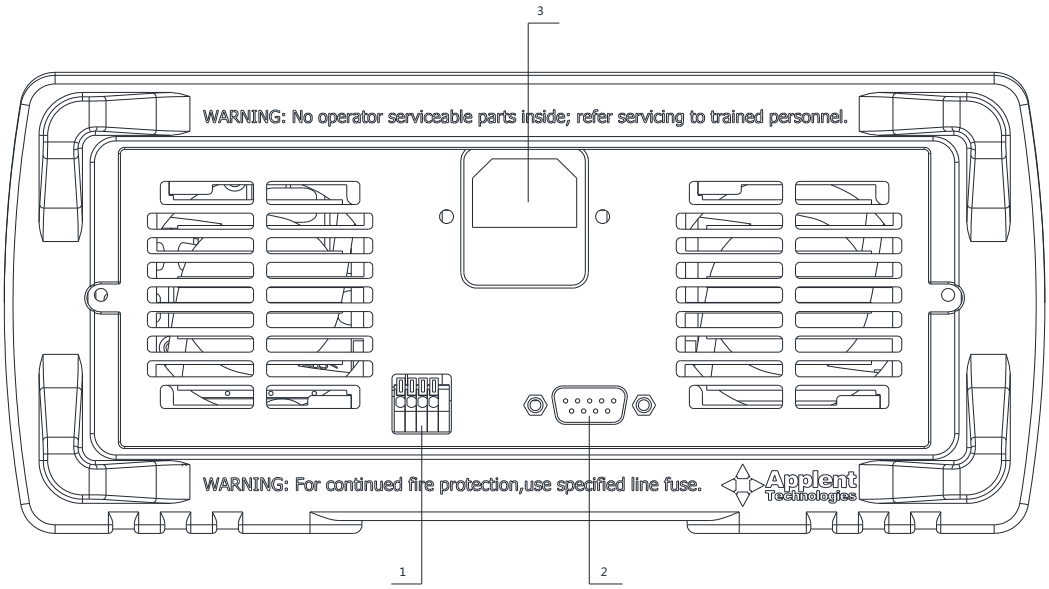


Table 2-2 Rear panel description

NO.	Description
1	Handler interface. (Include External Trigger Input and Remote Sense)
2	RS232C interface
3	Power socket and fuse holder

2.2 How to Connect Load

WARNING

FIRE HAZARD

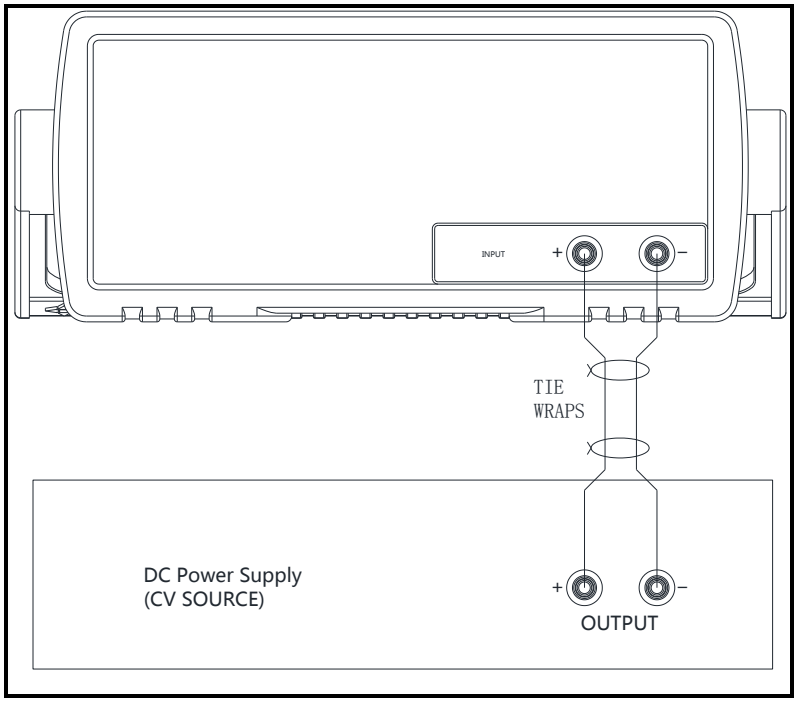
To satisfy safety requirements, load wires must be heavy enough to not overheated while carrying the short-circuit output current of the device connects to AT861x.

2.2.1 General Connection

Input connections are made to the + and - binding posts on the front panel. A major consideration in making input connections is the wire size.

The minimum wire size required to prevent overheating may not be large enough to maintain good regulation. Stranded, copper wires are recommended to use. The wires should be large enough to limit the voltage drop no more than 0.5 V per lead.

Figure 2-3 Local Sensing



WARNING

Before connecting to the measured power supply, make sure the measured power supply is outage, and there is no voltage in the output end, otherwise it will cause electric spark.
Please connect load according to polarity.
If the load consume too much current, line resistance can't be ignored, recommend to use 4W remote sensing method to make measurement.

2.3 Remote Sensing Connection (4-Wires)

The remote sense terminals of AT861x are connected to the output of the power supply. Remote sensing compensates for the voltage drop in applications require long lead lengths. Before using remote sensing connections, you must set the 4W to ON state under [SETUP] page.

Remote sensing at the rear panel of the instrument:

Figure 2-4 the remote sensing interface on real panel.

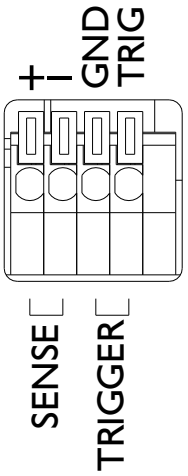
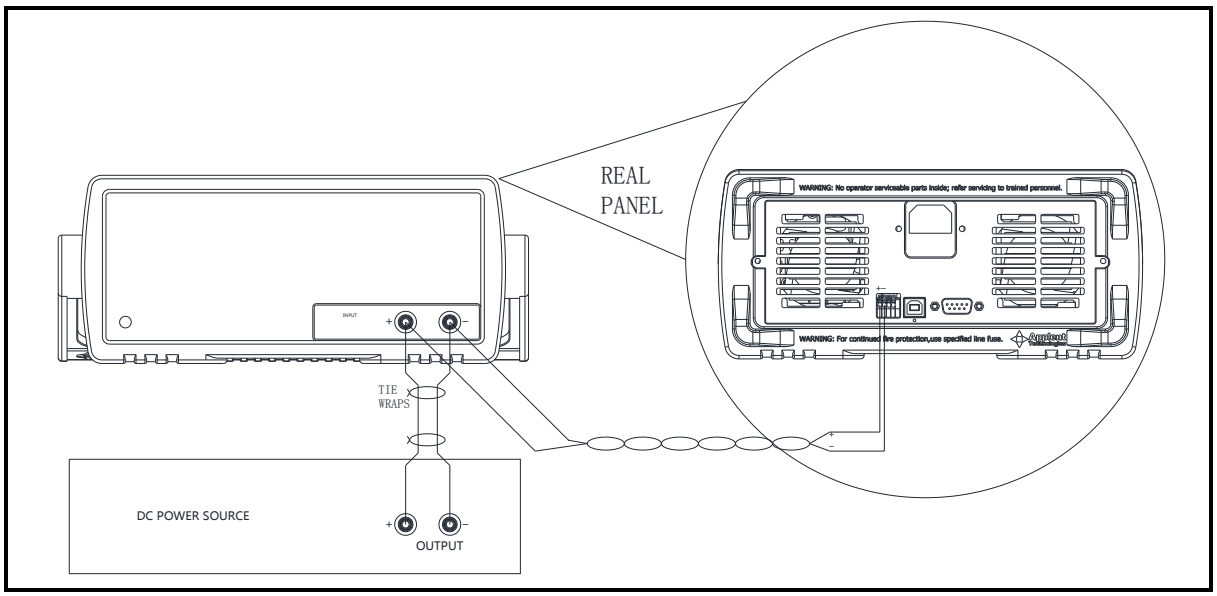
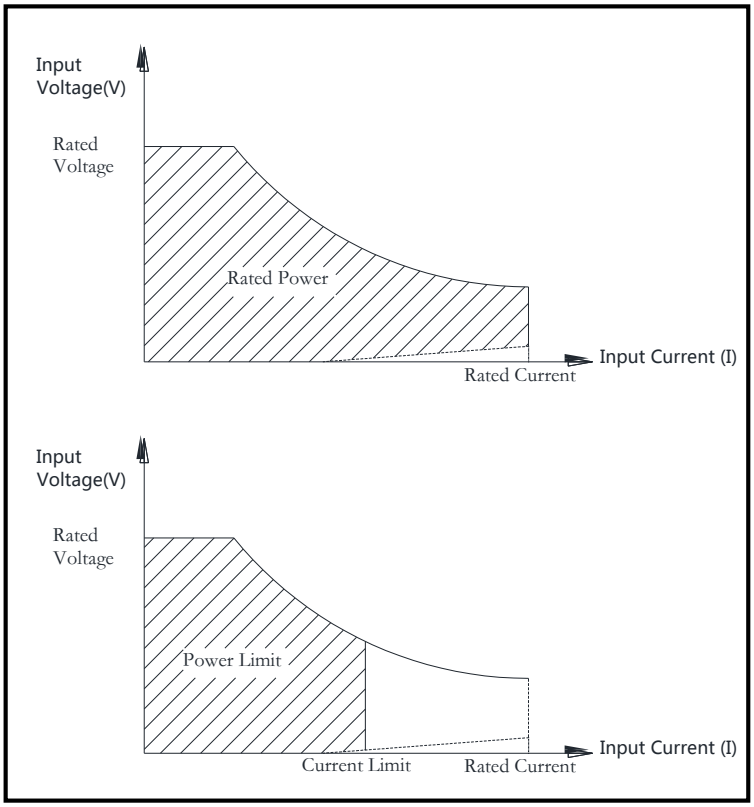


Figure 2-5 Remote Sensing



2.4 Load Operation Range

Figure 2-6 Rate power and Power Limit



2.5 Protection Features

To maximize protect the measured power supply, AT861x includes five protection features.

2.6 Over Voltage

Load input will be turned OFF immediately if input voltage exceeds the 105%*V-MAX, load overvoltage alerts, voltage value glitters.
When input voltage exceed 110%, load input is turned off and display [**OV**], the buzzer beeps.

WARNING

1. Don't input voltage that exceeds rated voltage, over voltage protection is dangerous for load.
2. NOTE: In the setup page, over voltage protection only provide [**OV**] and buzzer beeping.
3. Suggestion: Make sure there's no over voltage happened before enter all setup pages.
4. Over voltage, the load input will be turned off under any mode.

2.7 Over Current

In the CV mode, when input current exceeds I-MAX, load over-current alerts, current value glitters and the buzzer beeps. Once input current exceeds 102%, load input is turned off and display [**OC**].
When work in the CR or CC and CP mode, input current is ascending continuously and

the load current will be limited to I-MAX , load over current alerts, current value glitters (but the buzzer does not beep). Load will work in the OC protection state.

2.8 Over Power

CV mode:
If the input power exceeds the power limit (101%*P-MAX), load will work under over-power protection state and the buzzer beeps, current value flashed and [OP] displayed.
If the input power exceeds the power limit (102%*P-MAX), load will be turned off.

CC, CP and CR mode:
If the input power exceeds the power limit (102%*P-MAX), load will work under over-power protection state and voltage and current value flashed, but the buzzer is silent.

2.9 Reverse Voltage

This feature protects the load module in case of the input DC voltage lines are connected with wrong polarity.
Once the reverse voltage condition detected, buzzer beeps and [RV] displayed, and input will be turned off immediately.

2.10 Over Heat

Once the load internal power devices' temperature exceeds the safe limits (80°C), load input will be turned off, [OH] will be displayed and buzzer beeps.

3. <MEAS DISPLAY> Page

This chapter will describe:

- [NRM] Function
- [SHT] Function
- [TRN] Function
- [BAT] Function
- [SEQ] Function
- [ATF] Function
- [LED] Function
- [OCP] Function
- [OPP] Function

3.1 Operation Functions

The instrument includes 6 test functions:
[NRM] Normal Operation Mode (CC/CV/CP/CR)
[TRN] Transient Operation Mode
[SEQ] Sequence List Operation
[ATF] Automatic Testing Function
[BAT] Battery Testing Function
[SHT] Short Circuit Testing Function
[LED] LED Testing Function
[OCP] OCP Testing Function
[OPP] OPP Testing Function

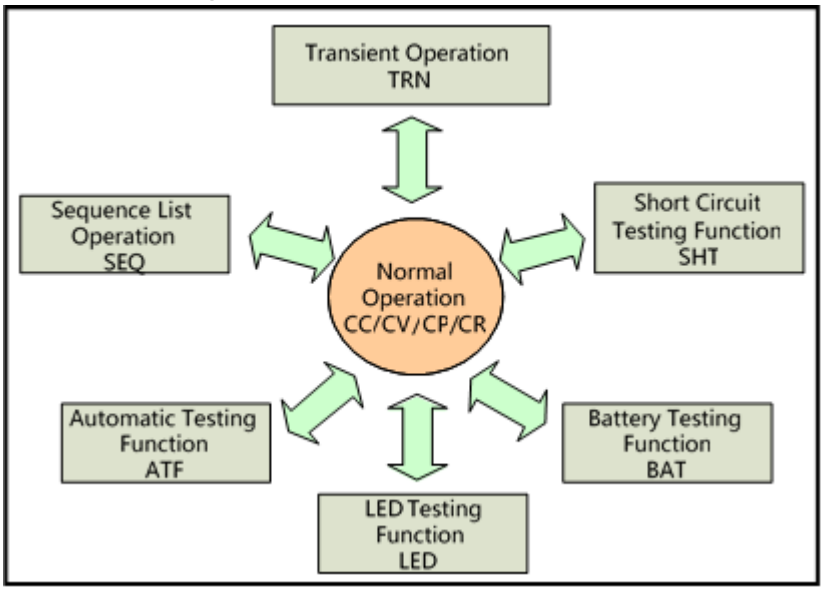


Figure 3-1 Functions of Operation

Once the instrument turned on, it will enter normal operation function, all the basic operation is finished under this mode.

3.2 <NRM MEAS PAGE> Page

You can enter <NRM MEAS PAGE> page by pressing the [Meas] shortcut key.

<NRM MEAS PAGE> page mainly highlights the measured results, and display main parameter and sub parameter.

In this page, you can finish the setting up of two basic functions, they include:

- Basic Operating Mode – Set up four basic operating modes (CC/CV/CP/CR)
- Input Value – Set up operating parameter

Note: measured data and sorting results are only valid in [Meas] Page.

Figure 3-2 <NRM MEAS PAGE> Page

3.2.1 Basic Operating mode

The basic four operation features of the Electronic Load are:

Constant current (CC) mode;

Constant voltage (CV) mode;

Constant power (CP) mode;

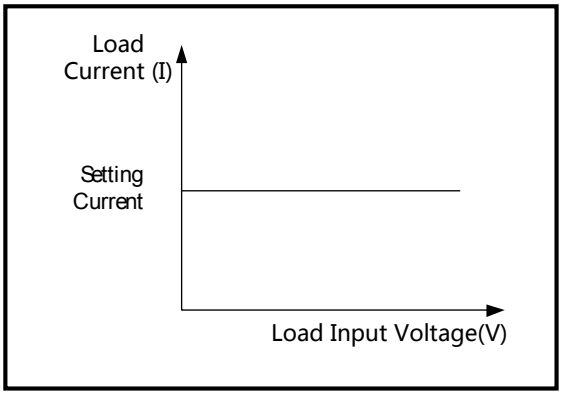
Constant resistance (CR) mode.

3.2.1.1 [CC] Constant current Mode

Under [CC] mode, the load will always consume constant current, no matter the input voltage is changed or not.

If your measured power supply is constant voltage source, constant current mode is recommended.

Figure 3-3 [CC] Mode

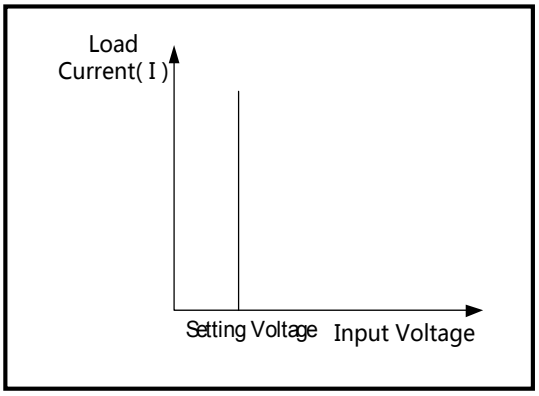


The maximum of current input is 5 digits, but the decimal point will vary according to the I-MAX.
When I-MAX ≤ 3A, reserve 4 decimal points;
When I-MAX > 3A, reserve 3 decimal points;

3.2.1.2 [CV] Constant Voltage Mode

Under [CV] mode, electronic load will always consume enough current to make sure the load input voltage is constant.
If your measured power supply is constant voltage source, use [CV] mode can make the efficient measurement. [CV] mode can also efficiently simulate LED constant current power supply.

Figure 3-4 [CV] Mode



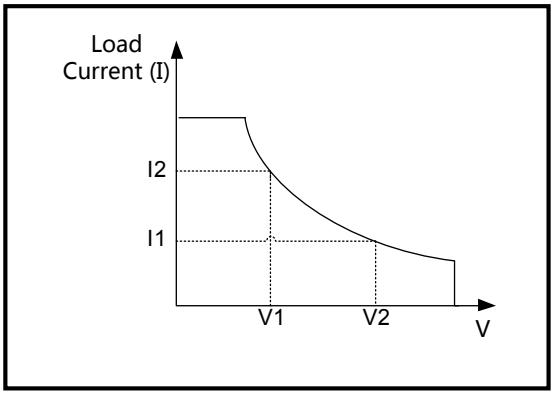
The maximum of voltage input is 5 digits, but the NO. of decimal point will vary according to V-MAX:
When V-MAX ≤ 18V, reserve 4 decimal points;
When V-MAX > 18V, reserve 3 decimal points.

3.2.1.3 [CP] Constant Power Mode

Under [CP] mode, electronic load will always constant power.
[CP] mode can efficiently simulate constant voltage source, it may not reach expecting effect for the measurement of constant current source, and using [CV] mode may be more effective for the measurement of constant current source.

According to the formula: $P=U\times I$, if the input voltage V is increasing, current I will be forced to decrease to keep power constant.

Figure 3-5 [CP] Mode

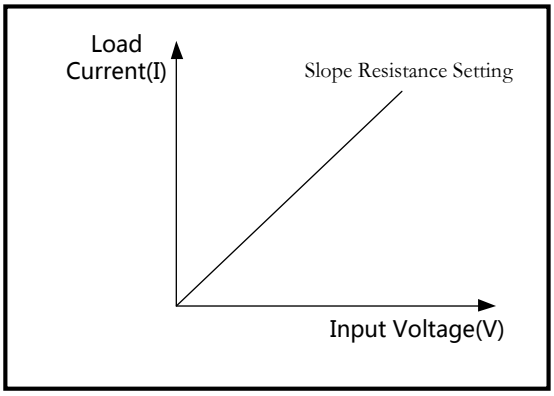


The maximum of power input is 5 digits, reserve 3 decimal points.

3.2.1.4 [CR] Constant Reentrance Mode

Under [CR] mode, electronic load be equivalent to constant resistance.
[CR] mode can efficiently simulate constant voltage source, it may not reach expecting effect for the measurement of constant current source. Due to there is feedback circuit in inner of constant current source to keep current constant, it may cause load be unable to operate, then electronic load will keep state of shock adjust, and make it unstable, using [CV] mode is the most effective way to measure constant current source.
According to the formula R=U/I: if the input voltage V is increasing, current I will be forced to increase to keep resistance constant.

Figure 3-6 [CR] Mode



The maximum of resistance input is 5 digits, reserve 3 decimal points.

■ Steps of setting up operating mode:

Step 1	Press[Meas] and enter <NRM MEAS PAGE> Page	
Step 2	Use Soft-key to choose	
	Soft-key	Function
	CC	Enter [CC] Mode
	CV	Enter [CV] Mode
	CP	Enter [CP] Mode
	CR	Enter [CR] Mode

3.2.2 Input Value

■ Steps of setting up parameter:

Step 1	Press[Meas] to enter <NRM MEAS PAGE> Page
Step 2	Use [◂] key and[▸] key to choose output setting digit
Step 3	Use[▲] key and[▼] key to change the value of setting digit, it can automatic carry or abdicate or you can use numeric keypad to input set value, press [Enter] key and finish the setting.

3.2.3 How to measure constant current source

Due to there is feedback circuit in inner of constant current source to keep current constant, it may cause load be unable to operate , then electronic load will keep state of shock adjust, and make it unstable, using [CV] mode is the most effective way to measure constant current source.

Take 3 series and 2 parallel, 10W LED constant current source for example as below to illustrate the test method.

Specification:

LED constant current source
Constant power: 10W
Output voltage: DC7~12V
Output current: 900mA ±5%

The test method is as below:

	If the current mode is not in constant voltage mode
Step 1	Press[Meas] to enter <NRM MEAS PAGE> Page
Step 2	Use soft-key to choose [CV]
Step 3	Use [◄] and [►] key to choose output setting digit
Step 4	Use[▲] key and[▼] key to change the value of setting digit, it can automatic carry or abdicate or you can use numeric keypad to input set value, press [Enter] key and finish the setting. Here we input MAX value 12V (it is equivalent to resistance value 12/0.9 = 13.3Ω), if you want to simulate a resistance value, you need to convert to voltage value, for example, simulation 10Ω resistance, the pre-set voltage = 10x0.9 = 9V
Step 5	Press q key to boot the load, voltage value is constant as set value, load will operate normally.

3.3 <SHT MEAS PAGE> Page

Press [Setup] key, then press function key [SHT] to enter <SHT MEAS PAGE> Page.

Figure 3-7 <SHT MEAS PAGE> Page

Short-Circuit [SHT] Page mainly highlights the measured results, and display main parameter and sub parameter.

AT861x is allowed to simulate a short circuit at the input terminals of load.

If [SHT] mode is under CC/CP/CR mode, the instrument will set the maximum short circuit current as limit value (when it is in 3A RANGE, the maximum current is around

3.2A, when in 30A range, the maximum current is around 32A.) .

If SHT is under CV mode, short circuit is equivalent to set load voltage as 0V.

3.3.1 Steps of setting up [SHT] mode

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press function key [SHT] to enter <SHT MEAS PAGE>page	
Step 3	Use cursor key to choose [SHT] field;	
Step 4	Use Soft-key to choose	
	Soft-keys	Functions
	CC	Setup [CC] mode
	CV	Setup [CV] mode

Warning:
Under [SHT] mode, over current protection is turned off.

3.4 <TRAN MEAS PAGE> Page

Press [Setup] key, then press function key [TRN] to enter <TRN MEAS PAGE> page.

Figure 3-8 <TRAN MEAS PAGE> page

3.4.1 Steps of setting up TranPara

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press function key [TRN] to enter <TRN MEA PAGE>page	
Step 3	Choose [TranPara] field by using cursor key;	
Step 4	Use Soft-keys to choose	
	Soft-keys	Function
	CC	Setting up [CC] mode
	CV	Setting up [CV] mode
	CP	Setting up [CP] mode
	CR	Setting up [CR] mode

3.4.2 Parameter A

■ Steps of setting up Parameter A

Step 1	Press [Setup] to enter <SETUP> page
Step 2	Press Soft-key [TRN] to enter < TRN MEAS PAGE> page
Step 3	Use Cursor key to choose [ValueA] field;
Step 4	Use Numeric keypad to input parameter value, press [Enter] to confirm.

3.4.3 Pulse Width A

■ Steps of setting up Pulse Width A

Step 1	Press [Setup] to enter <SETUP> page
Step 2	Press soft-key [TRN] to enter < TRN MEAS PAGE > page
Step 3	Use cursor key to choose[TimingA] field;
Step 4	Use numeric keypad to input parameter value, press [Enter] to confirm.

3.4.4 Parameter B

■ Steps of setting up Parameter B

Step 1	Press[Setup] to enter<SETUP> page
Step 2	Press soft-key [TRN] to enter < TRN MEAS PAGE> page
Step 3	Use cursor key to choose [ValueB] field;
Step 4	Use numeric keypad to input parameter value, press [Enter] to confirm.

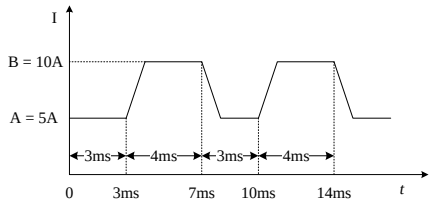
3.4.5 Pulse Width B

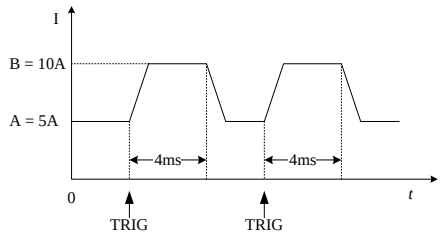
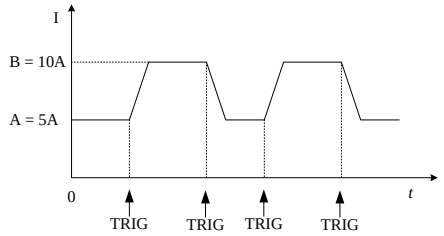
■ Steps of setting up Pulse Width B

Step 1	Press[Setup] to enter<Setup> page
Step 2	Press soft-key [TRN] to enter < TRN MEAS PAGE> page
Step 3	Use cursor key to choose[TimingB] field;
Step 4	Use numeric keypad to input parameter value, press [Enter] to confirm.

3.4.6 Test Mode

■ Steps of setting up Test Mode

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [TRN] to enter <TRN MEAS PAGE>page	
Step 3	Choose [TEST MODE] field by using cursor key;	
Step 4	Use soft-key to choose	
	Soft-keys	Function
	Continuous Mode	Under continuous mode, turn on the load, the load will continuously switch between A and B value, unless the load is turned off. 

	Pulse Mode	Under Pulse Mode, turn on load, in external trigger mode, each time the instrument receives a low level trigger signal from trigger end at the rear panel (means TRIG pin and GND pin short circuit), the load will switch to B value, after keeping pulse width B, it will return to A value. In internal trigger, instrument receives trigger signal from TRIG at the front panel. In remote trigger, instrument receives trigger signal from the remote control side. 
	Trigger Mode	Under [TRN] mode, in external trigger mode, each time the instrument receives a low level trigger signal from trigger end at the rear panel (means TRIG pin and GND pin short circuit), the load will switch between A and B value. In internal trigger, instrument receives trigger signal from TRIG at the front panel. In remote trigger, instrument receives trigger signal from the remote control side.  Under Trigger Mode, pulse width A and B are invalid, pulse width is controlled by trigger signal.

3.5 <BAT MEAS PAGE> Page

AT861x can use constant current (CC) mode to test battery capacity.
Users can ensure battery capacity and discharge time by programming discharge current and off-voltage, cooperate RS232/USB interface programming, users can see battery discharge curves.

Figure 3-9 <BAT MEAS PAGE> Page

Battery testing can well respond the reliability of battery and exact lifetime. Check the battery regularly in this way can provide theory basis to look whether the battery need to be replaced or not and save the cost.

After finishing the test, users need to retest the battery, please reenter after retreat battery test state.

Discharge time (T) format is: HHH-MM

3.5.1 Discharging Current

■ Steps of setting up discharging current

Step 1	Press[Setup] to enter <SETUP> page
Step 2	Press soft-key [BAT] to enter < BAT MEAS PAGE > page
Step 3	Use cursor key to choose [BAT-I] field;
Step 4	Use numeric keypad to input parameter value, press [Enter] to confirm.

3.5.2 Off -Voltage

■ Steps of setting up off -voltage

Step 1	Press[Setup] to enter <SETUP> page
Step 2	Press soft-key [BAT] to enter < BAT MEAS PAGE > page
Step 3	Use cursor key to choose[BAT-V] field;
Step 4	Use numeric keypad to input parameter value, press [Enter] to confirm.

3.5.3 Sub Parameter

■ Steps of setting up off -voltage

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press function key [BAT] to enter <BAT MEAS PAGE> page	
Step 3	Choose [SECPARA] field by using cursor key;	
Step 4	Use soft-keys to choose	
	Soft-keys	Function
	POWER	Setup sub parameter, display power value
	CAPACITY	Setup sub parameter, display battery capacity
	DIS TIME	Setup sub parameter, display discharge time

3.6 <SEQ MEAS PAGE> Page

Press [Setup] key, then press function key [SEQ] to enter <SEQ MEAS PAGE> page.

SEQ can program as many as 99 steps of value and timing list, and complete multi input and change order.

SEQ timing from 0.01s to 60.00s.

SEQt has 10 files, 99 steps /file.

Figure 3-10 <SEQ MEAS PAGE> Page

3.6.1 SEQ FILE

■ Steps of setting up SEQ FILE

Step 1	Press [Setup] key to enter <SETUP> page	
Step 2	Press soft-key [SEQ] to enter <SEQ MEAS PAGE> page	
Step 3	Choose [SEQ FILE] field by using cursor key	
Step 4	Use function key to choose	
	Soft-keys	Function
	File 0	SEQ File 0
	File 1	SEQ File 1
	File 2	SEQ File 2
	File 3	SEQ File 3
	File 4	SEQ File 4
	File 5	SEQ File 5
	File 6	SEQ File 6
	File 7	SEQ File 7
	File 8	SEQ File 8
	File 9	SEQ File 9

3.6.2 FILE SET

■ Steps of setting up FIEL SET

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press function key [SEQ] to enter <SEQ MEAS PAGE> page	
Step 3	Choose [FILE SET] field by using cursor key;	
Step 4	Use function key to choose.	
	Soft-keys	Function
	YES	Enter <SEQ VALUE SET PAGE> page

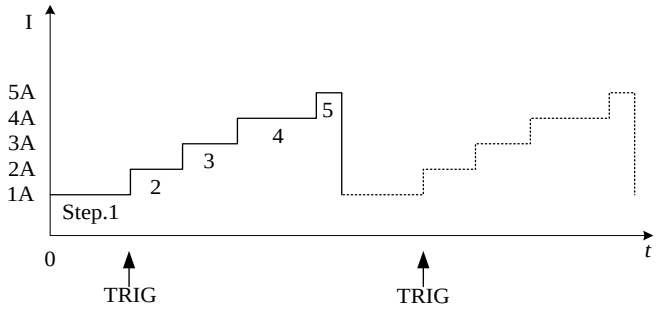
3.6.3 SEQ PARA

■ Steps of setting up SEQ PARA

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press function key [SEQ] to enter <SEQ MEA PAGE> page	
Step 3	Choose [SEQ PARA] field by using cursor key;	
Step 4	Use soft-key to choose	
	Soft-keys	Function
	CC	Setting up [CC] mode
	CV	Setting up [CV] mode
	CP	Setting up [CP] mode
	CR	Setting up [CR] mode

3.6.4 TEST MODE

■ Steps of setting up TEST MODE

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [SEQ] to enter <SEQ MEA PAGE> page	
Step 3	Choose [TESTMODE] field by using cursor key;	
Step 4	Use soft-keys to choose	
	function keys	function
	CONT	Make loop test according to list order.
	TRIG	Load will work in the first step initially, when it receives BUS or external trigger, the instrument will begin list test, after finish one circle, it will return to the first step.  Under BUS or external trigger, the pulse width of the first step is infinite.

3.6.5 STEPS Setup

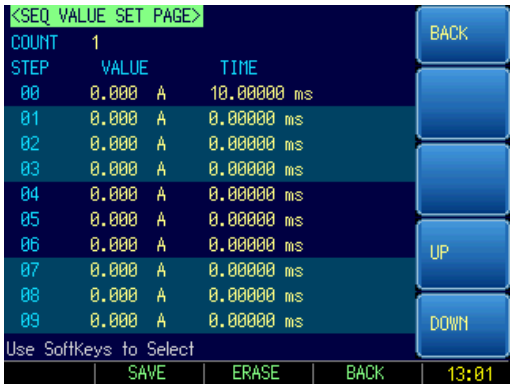
■ Steps of setting up STEPS

Step 1	Press [Setup] to enter <SETUP> page
Step 2	Press soft-key [SEQ] to enter <SEQ MEAS PAGE> page
Step 3	Choose [STEPS] field by using cursor key
Step 4	Use numeric keypad to input count value, press [Enter] to confirm.

3.7 <SEQ VALUE SET PAGE> Page

Press [Setup] key, then press soft-key [SEQ], choose [FILE SET] to enter <SEQ VALUE SET PAGE> Page.

Figure 3-11 <Sequence List Effective Value Setup> Page



3.7.1 STEP 1 Setup

■ Steps of setting up Numerical Value of STEP 1

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [SEQ] to enter <SEQ MEAS PAGE> page	
Step 3	Choose [FILE SET] field by using cursor key;	
	Soft-keys	Function
	YES	Enter <SEQ VALUE SET PAGE> Page
Step 4	Choose [VALUE] field by using cursor key;	
Step 5	Use numeric keypad to input value, press [Enter] to confirm.	

■ Steps of setting up Timing of STEP 1

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [SEQ] to enter <SEQ MEAS PAGE> page	
Step 3	Choose [FILE SET] field by using cursor key;	
	Soft-keys	Function
	YES	Enter <SEQ VALUE SET PAGE> Page
Step 4	Choose [TIMING] field by using cursor key;	
Step 5	Use numeric keypad to input timing value, press [Enter] to confirm.	

* The setup of other STEP is the same as the above.

Example will be given to illustrate how to edit files:

Suppose:

Sequence list parameter: CC

Test Mode: Continuous Mode

STEPS: 5 steps

1. Step 1: 1.000A, 0.01s
2. Step 2: 2.000A, 0.02s
3. Step 3: 3.000A, 0.03s
4. Step 4: 4.000A, 0.04s
5. Step 5: 5.000A, 0.05s
6. Save data in the File 9.

3.8 <ATF MEAS PAGE> Page

Press [Setup] key, then press soft-key [ATF] to enter < ATF MEAS PAGE> page.

Automatic Testing Function allows users to make different load integrated measurement of measured power supply (such as charger and so on). Users can perform CC, CV, CP, CR, SHORT and OPEN to the measured power supply, users can also perform GD/NG judgment of comparative results.

There are 10 files in Automatic Testing Function file and 20 steps/file.

Figure 3-12 <ATF MEAS PAGE> Page

3.8.1 ATF Files

■ Steps of setting up listing files

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [ATF] to enter <ATF MEAS PAGE>page	
Step 3	Choose [ATF Files] field by using cursor key;	
Step 4	Use soft-key to choose	
	soft-keys	Function
	File 0	Automatic list File 0
	File 1	Automatic list File 1
	File 2	Automatic list File 2
	File 3	Automatic list File 3
	File 4	Automatic list File 4
	File 5	Automatic list File 5
	File 6	Automatic list File 6
	File 7	Automatic list File 7
	File 8	Automatic list File 8
	File 9	Automatic list File 9

3.8.2 File Setup

■ Steps of setting up Files

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [ATF] to enter <ATF MEAS PAGE>page	
Step 3	Choose [FILE SET] field by using cursor key;	
Step 4	Use function key to choose	
	Soft-keys	Function

	YES	Enter <ATF VALUE SET PAGE> page

3.8.3 V-MAX Setup

■ Steps of setting up V-MAX

Step 1	Press[Setup] to enter <SETUP> page
Step 2	Press soft-key [ATF] to enter < ATF MEAS PAGE >page
Step 3	Choose [V-MAX] field by using cursor key;
Step 4	Use numeric keypad to input V-max value, press [Enter] to confirm.

3.8.4 I-MAX Setup

■ Steps of setting up I-MAX

Step 1	Press[Setup] to enter <SETUP> page
Step 2	Press soft-key [ATF] to enter < ATF MEAS PAGE >page
Step 3	Choose [I-MAX] field by using cursor key;
Step 4	Use numeric keypad to input value, press [Enter] to confirm

3.8.5 P-MAX Setup

■ Steps of setting up P-MAX

Step 1	Press[Setup] to enter <SETUP> page
Step 2	Press soft-key [ATF] to enter < ATF MEAS PAGE >page
Step 3	Choose [P-MAX] field by using cursor key;
Step 4	Use numeric keypad to input value, press [Enter] to confirm.

3.8.6 STEPS Setup

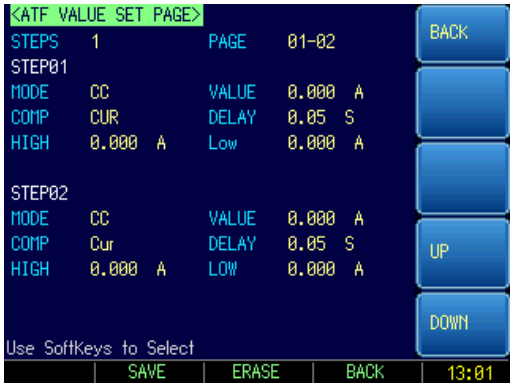
■ Steps of setting up STEPS

Step 1	Press[Setup] to enter <SETUP> page
Step 2	Press soft-key [ATF] to enter < ATF MEAS PAGE >page
Step 3	Choose [STEPS] field by using cursor key;
Step 4	Use numeric keypad to input count value, press [Enter] to confirm.

3.9 < ATF VALUE SET PAGE > Page

Press [Setup] key, then press soft-key [ATF], choose bottom soft-key [FILE SET] to enter <ATF VALUE SET PAGE> Page.

Figure 3-13 < ATF VALUE SET PAGE > Page



3.9.1 STEPS Setup

■ Steps of setting up Numerical Value of STEPS 1

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [ATF] to enter < ATF MEAS PAGE > page	
Step 3	Choose [FILE SET] field by using cursor key;	
	Soft-keys	Function
	YES	Enter < ATF VALUE SET PAGE > Page
Step 4	Choose [STEPS] field by using cursor key;	
Step 3	Use numeric keypad to input count value, press [Enter] to confirm.	

3.9.2 GROUP Setup

■ Steps of setting up GROUP

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [ATF] to enter <ATF MEAS PAGE>page	
Step 3	Choose [FILE SET] field by using cursor key;	
	Soft-keys	Function
	YES	Enter < ATF VALUE SET PAGE > Page
Step 4	Choose [GROUP] field by using cursor key;	
Step 3	Use function key to choose	
	function keys	function
	01-02	Page Setup of STEP 1 and 2
	03-04	Page Setup of STEP 3 and 4
	05-06	Page Setup of STEP 5 and 6
	07-08	Page Setup of STEP 7 and 8
	09-10	Page Setup of STEP 9 and 10
	11-12	Page Setup of STEP 11 and 12
	13-14	Page Setup of STEP 13 and 14
	15-16	Page Setup of STEP 15 and 16
	17-18	Page Setup of STEP 17 and 18
	19-20	Page Setup of STEP 19 and 20

3.9.3 STEP 1 Setup

■ Steps of setting up the mode of Step 1:

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [ATF] to enter < ATF MEAS PAGE >page	
Step 3	Choose [FILE SET] field by using cursor key;	
	Soft-keys	Function
	YES	Enter < ATF VALUE SET PAGE > Page
Step 4	Choose [MODE] field by using cursor key;	
Step 3	Use Soft-keys to choose	
	Soft-keys	Function
	CC	Setting up[CC] mode
	CV	Setting up[CV] mode
	CP	Setting up[CP] mode

	CR	Setting up[CR] mode
	SHORT	Setting up p[SHT] mode
	OPEN	Setting up[OPEN] mode

■ Steps of setting up compare parameter

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [ATF] to enter < ATF MEAS PAGE >page	
Step 3	Choose [FILE SET] field by using cursor key;	
	Soft-keys	Function
	YES	Enter < ATF VALUE SET PAGE > Page
Step 4	Choose [COMP] field by using cursor key;	
Step 5	Use soft-key to choose	
	Soft-keys	Function
	CUR	Setting up comparator parameter as Current
	VOLT	Setting up comparator parameter as Voltage
	POWER	Setting up comparator parameter as Power

■ Steps of setting up Value

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press function key [ATF] to enter < ATF MEAS PAGE >page	
Step 3	Choose [FILE SET] field by using cursor key;	
	function keys	function
	YES	Enter < ATF VALUE SET PAGE > Page
Step 4	Choose [VALUE] field by using cursor key;	
Step 5	Use numeric keypad to input parameter value, press [Enter] to confirm.	

■ Steps of setting up TIMING

Step 1	Press[Setup] to enter < SETUP > page	
Step 2	Press soft-key [ATF] to enter < ATF MEAS PAGE >page	
Step 3	Choose [FILE SET] field by using cursor key;	
	Soft-keys	Function
	YES	Enter < ATF VALUE SET PAGE > Page
Step 4	Choose [TIMING] field by using cursor key;	
Step 5	Use numeric keypad to input parameter value, press [Enter] to confirm.	

■ Steps of setting up HIGH LIMIT

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [ATF] to enter < ATF MEAS PAGE >page	
Step 3	Choose [FILE SET] field by using cursor key;	
	Soft-keys	Function
	YES	Enter < ATF VALUE SET PAGE > Page
Step 4	Choose [HIGH] field by using cursor key;	
Step 5	Use numeric keypad to input parameter value, press [Enter] to confirm.	

■ Steps of setting up LOWER LIMIT

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [ATF] to enter < ATF MEAS PAGE >page	
Step 3	Choose [FILE SET] field by using cursor key;	
	Soft-keys	Function
	YES	Enter < ATF VALUE SET PAGE > Page
Step 4	Choose [LOW] field by using cursor key;	
Step 5	Use numeric keypad to input parameter value, press [Enter] to confirm.	

* The setup of other STEP is the same as the above.

Example will be given to illustrate how to edit files:

Suppose:

ID	Mode	Voltage Range	Current Range	Power	Timing
Step 1	CC	5.8-6.2V	0.2A	≤4W	1s
Step 2	OPEN	5.9-6.3V	0	≤2W	1s
Step 3	CV	5V	0.2-0.25A		1s
Step 4	CV	3V	0.2-0.25A		1s
Step 5	CV	2V	0.2-0.25A		1s
Step 6	CV	0	0-0.25A		1s

1. **Max protection current**: 3A
2. **Max protection voltage**: 18V
3. **Max protection power**: 150W
4. Steps: 6
5. Steps 1: CC, COMP-V, 0.2A, 1s, UPPER=6.2V, LOW=5.8V
6. Steps 2: OPEN, COMP-I , 0A, 1s, UPPER =0.25A, LOW=0.2A
7. Steps 3: CV, COMP-I, 5V, 1s, UPPER =0.25A, LOW=0.2A
8. Steps 4: CV, COMP-I, 3V, 1s, UPPER =0.25A, LOW=0.2A
9. Steps 5: CV, COMP-I, 2V, 1s, UPPER =0.25A, LOW=0.2A
10. Steps 6: SHORT, COMP-I, 0V, 1s, UPPER =0.25A, LOW=0A
11. Save data in the File 1.

3.10 < LED MEAS PAGE > Page

Press [Setup] key, then press soft-key [LED] to enter < LED MEAS PAGE> page.

Figure 3-14 < LED VALUE SET PAGE > Page

3.10.1 LED-V

■ Steps of setting up LED-V

Step 1	Press[Setup] to enter <SETUP> page
Step 2	Press soft-key [LED] to enter <LED MEAS PAGE>page
Step 3	Choose [LED-V] field by using cursor key;
Step 4	Use numeric keypad to input LED-V value, press [Enter] to confirm.

3.10.2 LED-RES

■ Steps of setting up LED-RES

Step 1	Press[Setup] to enter <SETUP> page
Step 2	Press soft-key [LED] to enter <LED MEAS PAGE>page
Step 3	Choose [LED-RES] field by using cursor key;
Step 4	Use numeric keypad to input LED-RES value, press [Enter] to confirm.

3.11 < OCP MEAS PAGE > Page

Press [Setup] key, then press soft-key [OCP] to enter < OCP MEAS PAGE> page.

OCP working principle: after OCP starts testing, when input voltage reaches Von value, it delays for some time, current starts working, every certain time, it increases in stepping, and judge if load input voltage is less than OCP voltage value according to OCP voltage value.

if OCP value is less, it runs down operation, and continues delaying increase according to cut-off current value, until operating to cut-off current value. By OCP voltage adjustment, and decide if current is within the range according to set current range, if it is within range, it is GD, otherwise, it is NG, and measurement complete. There are 10 files for OCP test file.

Figure 3-15 < OCP VALUE SET PAGE > Page

3.11.1 OCP FILE

■ Steps of setting up OCP FILE

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [OCP] to enter <OCP MEAS PAGE>page	
Step 3	Choose [OCP FILE] field by using cursor key;	
Step 4	Use function key to choose	
	function keys	function
	FILE0	OCP Save the file 0
	FILE1	OCP Save the file 1

	FILE2	OCP Save the file 2
	FILE3	OCP Save the file 3
	FILE4	OCP Save the file 4
	FILE5	OCP Save the file 5
	FILE6	OCP Save the file 6
	FILE7	OCP Save the file 7
	FILE8	OCP Save the file 8
	FILE9	OCP Save the file 9

3.11.2 FILE SET

■ Steps of setting up FILE SET

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [OCP] to enter <OCP MEAS PAGE>page	
Step 3	Choose [FILE SET] field by using cursor key;	
Step 4	Use function key to choose	
	function keys	function

3.12 < OCP SET PAGE > Page

Press [Setup] key, then press soft-key [OCP], choose bottom soft-key [FILE SET] to enter <OCP SET PAGE> Page.

Figure 3-15 < OCP SET PAGE > Page

3.12.1 START

■ Steps of setting up Start

Step 1	Press[Setup] to enter <SETUP> page	
Step 2	Press soft-key [OCP] to enter <OCP MEAS PAGE>page	
Step 3	Choose [FILE SET] field by using cursor key;	
Step 4	Use function key to choose	
	function keys	function

4. [Setup] page

This chapter will describe:

■ <Setup> Page

4.1 <Setup> Page

Users can enter <Setup> Page at any time when pressing <Setup> key.
All setup related to measurement can be finished In <Setup> Page, but the instrument will not display measuring results nor sorting results, and the instrument is in waiting state. These parameters include:

- Operating Mode – Four basic operating mode Setup
- Parameter – Operating parameter Setup
- Voltage Range – Voltage Range Setup
- Current Range – Current Range Setup
- Rate – Sampling Rate Setup
- I-MAX – Current Upper Limit Setup
- V-MAX – Voltage Upper Limit Setup
- P-MAX – Power Upper Limit Setup
- V-On Load – On Load Voltage Setup
- V-Off Load – Off Load Voltage Setup
- Timing-On Load – Timing On Load Time Setup
- Trigger – Trigger Mode Setup
- 4W Test – Test Method Setup

Figure 4-1 <Setup> Page

4.1.1 Setting up [Rate]

■ Steps of setting up Rate

Step 1	Press [Setup] to enter <Setup> page
Step 2	Choose [Rate] field by using cursor key;

Step 3	Use soft-key to choose	
	Soft-key	Function
	Slow	Setting up sampling rate as 3t/s
	Medium	Setting up sampling rate as 5t/s
	Fast	Setting up sampling rate as 10t/s

4.1.2 Setting up V-MAX

■ Steps of setting up V-MAX

Step 1	Press [Setup] to enter <Setup> page
Step 2	Choose [V-MAX] field by using cursor key;
Step 3	Use numeric keypad to input value, press [Enter] to confirm

4.1.3 Setting up I-MAX

■ Steps of setting up I-MAX

Step 1	Press [Setup] to enter <Setup> page
Step 2	Choose [I-MAX] field by using cursor key;
Step 3	Use numeric keypad to input value, press [Enter] to confirm.

4.1.4 Setting up P-MAX

■ Steps of setting up P-MAX

Step 1	Press [Setup] to enter <Setup> page
Step 2	Choose [P-MAX] field by using cursor key;
Step 3	Use numeric keypad to input value, press [Enter] to confirm.

4.1.5 Setting up V-On Load

■ Steps of setting up V-On Load

Step 1	Press[Setup] to enter <Setup> page
Step 2	Choose [V-On Load] field by using cursor key;
Step 3	Use numeric keypad to input parameter value, press [Enter] to confirm.

4.1.6 Setting up V-Off Load

■ Steps of setting up V-Off Load

Step 1	Press[Setup] to enter <Setup> page
Step 2	Choose [V-Off Load] field by using cursor key;
Step 3	Use numeric keypad to input parameter value, press [Enter] to confirm.

4.1.7 Setting up Timing-On Load

■ Steps of setting up Timing- On Load

Step 1	Press[Setup] to enter <Setup> page
Step 2	Choose [Timing- On Load] field by using cursor key;
Step 3	Use numeric keypad to input parameter value, press [Enter] to confirm.

4.1.8 Setting up [Trigger]

■ Steps of setting up Trigger

Step 1	Press [Setup] to enter <Setup> page
Step 2	Choose [Trigger] field by using cursor key;
Step 3	Use soft-key to choose

	Soft-key	Function
	Internal	Setting up trigger mode as internal trigger
	External	Setting up trigger mode as external trigger
	Remote	Setting up trigger mode as remote trigger

4.1.9 Setting up [4W Test]

■ Steps of setting up 4W Test

Step 1	Press [Setup] to enter <Setup> page	
Step 2	Choose [4W Test] field by using cursor key;	
Step 3	Use soft-key to choose	
	Soft-key	Function
	Turn off	Turn off 4W test function
	Turn on	Turn on 4W test function

5. System Configuration

This chapter will describe the system configuration of the instrument:

- <SYSTEM CONFIG> Page
- <SYSTEM INFO> Page
- <SYSTEM SERVICE> Page

5.1 <SYSTEM CONFIG> Page

Users can enter <Meas> Page at any time when pressing <Meas> key or [Setup] key, choose bottom [SYSTEM] soft-key.

<System Configuration> Page include the following setup:

- Language
- Date/Time Setup
- Account/Password Setup
- Baud Rate
- Address

Figure 5-1 <System Configuration> Page

5.1.1 [Language]

Chinese and English is switchable for AT8612.

■ Steps of setting up Language:

Step 1	Press [Setup] to enter <Setup> page	
Step 2	Choose [SYSTEM] key in bottom soft-key to enter <System Configuration> Page	
Step 3	Choose [Language] field by using cursor key	
Step 4	Setting up language by using soft-keys	
	Soft-key	Function
	CHINESE	Chinese
	ENGLISH	ENGLISH

5.1.2 [Date], [Time]

AT861x adopts 24 hours format.

■ Steps of setting up Date:

Step 1	Press [Setup] to enter <Setup> page

Step 2	Choose [SYSTEM] key in bottom soft-key to enter <System Configuration> Page	
Step 3	Choose [Date] field by using cursor key	
Step 4	Setting up Date by using soft-key in sidebar	
	Soft-key	Function
	YEAR INCR+	Increases the year in steps of 1.
	YEAR DECR-	Decreases the year in steps of 1.
	MONTH INCR+	Increases the month in steps of 1.
	DAY INCR+	Increases the day in steps of 1.
	YEAR INCR+	Increases the year in steps of 1.
	YEAR DECR-	Decreases the year in steps of 1.

■ Steps of setting up Time:

Step 1	Press [Setup] to enter <Setup> page	
Step 2	Choose [SYSTEM] key in bottom soft-key to enter <System Configuration> Page	
Step 3	Choose [Time] field by using cursor key	
Step 4	Setting up Time by using soft-key in sidebar	
	Soft-key	Function
	HOUR INCR+	Increases the hour in steps of 1.
	HOUR DECR-	Decreases the hour in steps of 1.
	MINUTE INCR+	Increases the minute in steps of 1.
	MINUTE INCR+	Decreases the minute in steps of 1.
	SECOND DECR-	Increases the second in steps of 1.
	SECOND DECR-	Decreases the second in steps of 1.

5.1.3 [Account] , [Password]

Tow modes is available for the AT861x:

- Administrator – Except [System Service] page, all pages is open for administrator.
- User – Except [System Service] and [Files] page, users can use other pages

■ Steps of setting up Account:

Step 1	Press [Setup] to enter <Setup> page	
Step 2	Choose [SYSTEM] key in bottom soft-key to enter <System Configuration> Page	
Step 3	Choose [Account] field by using cursor key	
Step 4	Changing Account by using soft-key in sidebar	
	Function Key	function
	ADMIN	Except [System Service] page, all pages is open for administrator.
	USER	Except [System Service] and [Files] page, users can use other pages, the setup parameters are not saved.

■ Steps of setting up Administrator's password:

Step 1	Press [Setup] to enter <Setup> page	
Step 2	Choose [SYSTEM] key in bottom soft-key to enter <System Configuration> Page	
Step 3	Choose [PASSWORD] field by using cursor key	
Step 4	Setup PASSWORD by using soft-key in sidebar	
	Soft-key	Function
	CHANGE PASSWORD	Input password(less than 9 numbers).

	DELETE PASSWORD	The password will be removed.

5.1.4 [Baud Rate]

■ Steps of setting up Baud Rate:

Step 1	Press[Setup] to enter <Setup> page	
Step 2	Choose [SYSTEM] key in bottom soft-key to enter <System Configuration> Page	
Step 3	Choose [Baud Rate] field by using cursor key	
Step 4	Setup Baud Rate by using soft-key in sidebar	
	Soft-key	Function
	9600	
	19200	
	38400	
	57600	
	115200	

5.1.5 RS485 [Address]

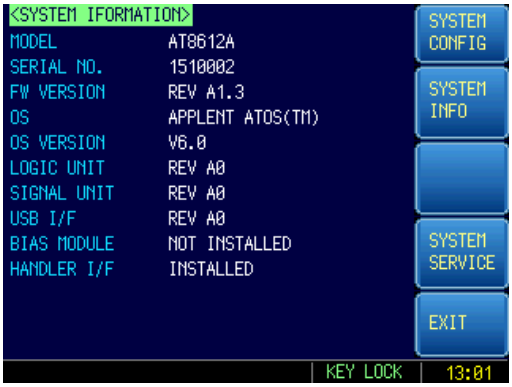
■ Steps of setting up Address:

Step 1	Press [Setup] to enter <Setup> page	
Step 2	Choose [SYSTEM] key in bottom soft-key to enter <System Configuration> Page	
Step 3	Choose [Address] field by using cursor key	
Step 4	Setting up Address by using soft-key in sidebar	
	Soft-key	Function
	Setting up Address	Input instrument address, if the address > 0, the communication mode is RS485, if the address=0, the communication mode is RS232.

5.2 <SYSTEM INFO> Page

There is no configurable options for users in <System information> Page.

Figure 5-2 <System information> Page



■ Steps of checking System information:

Step 1	Press [Setup] to enter <Setup> page
Step 2	Choose [SYSTEM] key in bottom soft-key to enter <System Configuration> Page
Step 3	Choose soft-key [System Information] in sidebar to enter [System Information] Page

5.3 <System Service> Page

Warning:

This page is not open for users, this page is only used to calibrate before leaving factory. Non-professional person cannot enter this page, otherwise it will cause losing calibration data and big deviation of measured data.

6. Remote Control

This chapter will describe:

- About RS-232C
- RS-232C Connection
- About USB-Serial Interface
- Shake Hand [SHAKE HAND]
- SCPI Protocol

6.1 About RS-232C

You can connect a controller (i.e. PC and PLC) to the RS-232 interface using Applent RS-232 DB-9 cable. The serial port uses the transmit (TXD), receive (RXD) and signal ground (GND) lines of the RS-232 standard. It does not use the hardware handshaking lines CTS and RTS.

NOTE:
JUST ONLY Use an Applent (not null modem) DB-9 cable.
Cable length should not exceed 2m.

Figure 6-1 ΔThe RS-232 connector in the real panel

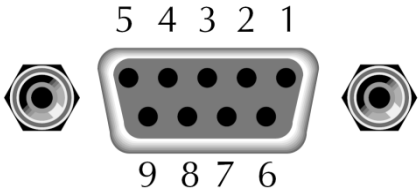


Table 6-1 RS-232 connector pin out

NAME	DB-25	DB-9	NOTE
DCD	8	1	Not Connection
RXD	3	2	Transmit data
TXD	2	3	Receive date
DTR	20	4	Not Connection
GND	7	5	Ground
DSR	6	6	Not Connection
RTS	4	7	Not Connection
CTS	5	8	Not Connection

■ Make sure the controller you connect to AT861x also uses these settings.

The RS-232 interface transfers data using:

8 data bits,
1 stop bit,
And no parity.

6.2 About USB-Serial Interface (Option)

The USB-Serial Interface allows you to connect AT681x to a USB port on your PC.

NOTE:
Please install the USB-Serial driver before using USB-Serial Interface.

6.3 To Select Baud Rate

Before you can control the AT281x by issuing RS-232 commands from built-in RS-232 controller connected via its DB-9 connector, you have to configure the RS-232 baud rate. The AT861x's built-in RS-232 interface uses the SCPI language.
The configuration of RS-232
RS-232 configuration is as follows:
Data bits: 8-bit
Stop bits: 1-bit
Parity: none

To set up the baud rate

Step 1. Press the [Meas] or [Setup] key
Step 2. Press the [SYSTEM] bottom soft key.
Step 3. Use the cursor key to select [BAUD] field
Step 4. Use the soft-keys to select baud rate.

Soft-key	Function
9600	
19200	
38400	
57600	
115200	Recommend, system default.

6.4 Hand Shake [SHAKE HAND]

AT861x supports software "hand shake". AT861x will return the whole command to host and then response the command when the [SHAKE HAND] is turned ON.

■ Procedure to turn ON the "Shake Hand":

Step 1. Press the [Meas] or [Setup] key
Step 2. Press the [SYSTEM] bottom soft-key.
Step 3. Use the cursor key to select [SHAKE HAND] field
Step 4. Use the soft keys to turn ON.

ON	
OFF	

NOTE: If you use Applent Software, please make sure that the [SHAKE HAND] was turned OFF.

6.5 SCPI Language

Standard Commands for Programmable Instruments (SCPI) is fully supported by the RS-232 interfaces.

NOTE:
AT8612 ONLY supports the SCPI Language.

7. SCPI Command

This chapter contains reference information on programming AT8612 with the SCPI commands.

This chapter provides descriptions of all the AT861x's available RS-232 commands which correspond to Standard Commands for Programmable Instruments (SCPI) command sets, listed in functional subsystem order.

7.1 Terminator

<NL>：The EOI line is asserted by New Line or ASCII Line Feed character (decimal 10,

Hex 0x0A，or ASCII '\n')

7.2 Notation Conventions and Definitions

The following conventions and definitions are used in this chapter to describe RS-232 operation.

< > Angular brackets enclose words or characters that are used to symbolize a program code parameter or an RS-232 command.

[ ] A square bracket indicates that the enclosed items are optional.

\n Command Terminator

7.3 Command Structure

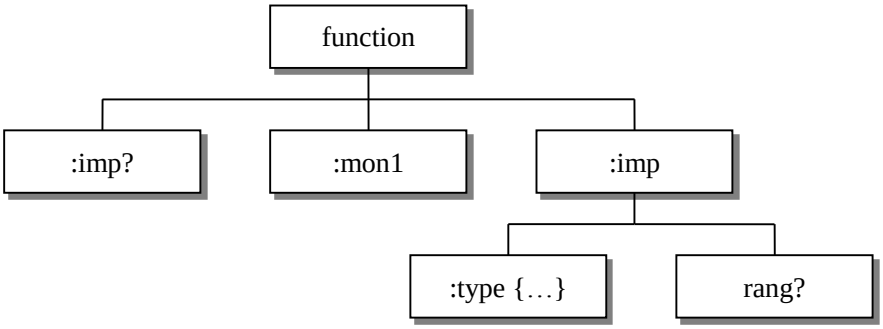
The AT281x commands are divided into two types: Common commands and SCPI commands.

The common commands are defined in IEEE std. 488.2-1987, and these commands are common for all devices. The SCPI commands are used to control all of the AT281x's functions.

The SCPI commands are tree structured three levels deep. The highest level commands are called the subsystem commands in this manual. So the lower level commands are legal only when the subsystem commands have been selected.

A colon (:) is used to separate the higher level commands and the lower level commands. Semicolon (;) A semicolon does not change the current path but separates two commands in the same message.

Figure 7-1 Command Tree Example



Example:

function:imp:type Cp-D
function Subsystem Command
imp Level 2
type Level 3
Cp-D Parameter

■ The basic rules of the command tree are as follows.

- Letter case (upper and lower) is ignored.
  For example,
  FUNCTION: IMPEDANCE = function:impedance
- Spaces (_ used to indicate a space) must not be placed before and/or after the colon (:).
  For example,
  ☒ func_:_imp → ☑ func:imp
- The command can be completely spelled out or in abbreviated.(The rules for command abbreviation are described later in this section)
  For example,
  function: impedance = func:imp
- The command header should be followed by a question mark (?) to generate a query for that command.
  For example,
  function:imp?
  - The semicolon (;) can be used as a separator to execute multiple commands on a single line. The multiple command rules are as follows.
    Commands at the same level and in the same subsystem command group can be separated by a semicolon (;) on a multiple command line.
    For example,
    func:imp:type cp-d ; rang 4
    To restart commands from the highest level, a semicolon (;) must be used as the separator, and then a leading colon (:), which shows that the restarted command is a command at the top of the command tree, must follow.
    For example,
    func:imp:range:auto on; : func:imp cp-d
- The common commands can restart only after a semicolon on a multiple command line.

For example,

func:rang 8;*IDN?;auto on

- Command abbreviations:

  Every command and character parameter has at least two forms, a short form and a long form. In some cases they will be the same. The short form is obtained using the following rules.

  A) If the long form has four characters or less, the long form and short form are the same.

  B) If the long form has more than 4 characters:

  (a) If the 4th character is a vowel, the short form is the first 3 characters of the long form.

  For example:

comparator	abbr. to	comp
current	abbr. to	curr
range	abbr. to	rang

  (b) If the 4th character is not a vowel, the short form is the first 4 characters.

  For example:

resistance	abbr. to	res
volume	abbr. to	vol

- If the long form mnemonic is defined as a phrase rather than a single word, then the long form mnemonic is the first character of the first word(s) followed by the entire last word. The above rules, when the long form mnemonic is a single word, are then applied to the resulting long form mnemonic to obtain the short form.

For example:

PercentTolerance	abbr. to	ptol

The AT861x accepts the three forms of the same SCPI commands: all upper case, all lower case, and mixed upper and lower case.

7.4 Header and Parameters

The commands consist of a command header and parameters. (See the following.)

For example

comp:nom 100.0e3

Header Parameter

- Headers can be of the long form or the short form. The long form allows easier understanding of the program code and the short form allows more efficient use of the computer.
- Parameters may be of two types as follows.

  (A) Character Data and String Data Character data consists of ASCII characters. The abbreviation rules are the same as the rules for command headers.

  (B) Numeric Data

  (a) **NR1** integer: For example, 1,+123,-123

  (b) **NR2** fix float: For example, 1.23,+1.23,-1.23

(c) **NR3** floating point: For example, 1.23e3, 5.67e-3, 123k, 1.23M, 2.34G, The available range for numeric data is 9.9E37. When numeric data is used as a parameter, the suffix multiplier mnemonics and suffix units (The suffix multiplier must be used with the suffix unit.) can be used for some commands as follows.

Table 7-1 Multiplier Mnemonics

Definition	Mnemonic
1E18 (EXA)	EX
1E15 (PETA)	PE
1E12 (TERA)	T
1E9 (GIGA)	G
1E6 (MEGA)	MA
1E3 (KILO)	K
1E-3 (MILLI)	M
1E-6 (MICRO)	U
1E-9 (NANO)	N
1E-12 (PICO)	P
1E-15 (PEMTO)	F
1E-18 (ATTO)	A

7.5 Command Reference

All commands in this reference are fully explained and listed in the following functional command order.

- IDN? query subsystem
- FETCH attain result subsystem
- BASIC setup subsystem
- TRAN transient setup subsystem
- SEQ Sequence list setup subsystem
- ATF automatic list setup subsystem
- BAT battery setup subsystem
- TRIG trigger setup subsystem
- PRSC copying screen subsystem
- ADDR multimachine communicate with subsystem
- SAVE files save subsystem

7.6 IDN? Subsystem

Table 7-2 IDN? Subsystem tree

IND?	

IDN? Subsystem is used to return the version of the instrument.

Query Syntax: **IDN?**

Query Response: **<Model>,<Revision>,< SN >,< Manufacturer>**

Example: **SEND> IDN?**

RET > AT8612,REV A1.1,1210001,Applent Instruments

```
Inc.
```

7.7 FETCH subsystem

Table 7-3 FETCh Subsystem Command Tree

FETCH	:MEASURE	
	:CURRENT	
	:VOLTAGE	
	:POWER	
	:RESISTANCE	

FETCh subsystem is used to retrieve measurement data

7.7.1 FETCH:MEASURE

FETCH:MEASURE query all measurement data

Query Syntax: `FETCH:MEASURE`

Query Response: {float, float, float, float}
Group 1's data: current value
Group 2's data: voltage value
Group 3's data: power value
Group 4's data: resistance value

Example:
```
SEND> fetch:meas
RECEIVE> 1.0000,120.00,300.00,4000.0
```

7.7.2 FETCH: CURRENT

FETCH: CURRENT command is used to retrieve the actual current value currently, unit A.

Query Syntax: `FETCH:CURRENT`

Query Response: < float>

Example:
```
SEND> fetch:curr
RET > 1.0000
```

7.7.3 FETCH: VOLTAGE

FETCH:VOLTAGE command is used to retrieve the actual voltage value currently, unit V.

Query Syntax: `FETCH:VOLTAGE`

Query Response: < float>

Example:
```
SEND > fetch:volt
RET > 120.00
```

7.7.4 FETCH:POWER

FETCH:POWER command is used to retrieve the actual power value currently, unit W

Query Syntax: `FETCH:POWER`

Query Response: < float>

Example:
```
SEND > fetch:POW
RET > 10.000
```

7.7.5 FETCH:RESISTANCE

FETCH:RESISTANCE command is used to retrieve the actual resistance value currently, unit Ω

Query Syntax: `FETCH:RESISTANCE`

Query Response: < float>

Example: `SEND > fetch:res`
`RET > 12.000`

7.8 BASIC subsystem

Table 7-4 BASIC subsystem tree

BASIC	:MODE	{CC,CV,CP,CR}
	:FUNC	{NRM,SHT,TRN,BAT,SEQ,ATF}
	:RATE	{SLOW,MED,FAST}
	:VMAX	{FLOAT}
	:IMAX	{FLOAT}
	:PMAX	{FLOAT}
	:STATE	{ON,OFF}
	:TRIG	{INT,EXT,BUS}
	:4W	{ON,OFF}
	:VON	{FLOAT}
	:VOFF	{FLOAT}
	:TIME	{FLOAT}
	:VALUE	<PARA>,<LEVEL>

BASIC subsystem is used to set up the basic parameter of the instrument.

7.8.1 BASIC:MODE

BASIC:MODE command sets the instrument's operating mode.

Command Syntax: `BASIC:MODE <cc,cv,cp,cr >`

Parameter: `<cc,cv,cp,cr >`

Example: `SEND > basic:mode cc`

Query Syntax: `basic:mode?`

Query Response: `<cc,cv,cp,cr>`

Example: `SEND > basic:mode?`
`RET > cc`

Restriction: Can only be used in conventional testing status
Other command followed by this command will be ignored.
Example: basic:mode cc; *idn? // *idn? command will be ignored.

7.8.2 BASIC:FUNC

BASIC:FUNC command sets the operating function.

Command Syntax: `BASIC:FUNC <nrm,sht,trn,bat,seq,atf>`

Parameter: `<nrm,sht,trn,bat,seq,atf>`

Example: `SEND > basic:func nrm`

Query Syntax:	`basic:func?`
Query Response:	`<nrm,sht,trn,bat,seq,atf>`
Example:	`SEND > basic:func?` `RET > nrm`

7.8.3 BASIC:RATE

BASIC:RATE command sets the sampling rate.

Command Syntax:	`BASIC:RATE < slow,med,fast >`
Parameter:	`< slow,med,fast >`
Example:	`> basic:rate slow`
Query Syntax:	`basic:rate?`
Query Response:	`< slow,med,fast >`
Example:	`SEND > basic:rate?` `RET > slow`

7.8.4 BASIC:VMAX

BASIC:VMAX command sets the voltage upper limit.

Command Syntax:	`BASIC:VMAX <float>`
Parameter:	`<float>`
Example:	`SEND > basic:vmax 120.00`
Query Syntax:	`basic:vmax?`
Query Response:	`<float>`
Example:	`SEND > basic:vmax?` `RET > 120.00`

7.8.5 BASIC:IMAX

BASIC:IMAX command sets the current upper limit.

Command Syntax:	`BASIC:VMAX <float>`
Parameter:	`<FLOAT>`
Example:	`SEND > basic:imax 3`
Query Syntax:	`basic:imax?`
Query Response:	`<float>`
Example:	`SEND > basic:imax?` `RET > 3.000`

7.8.6 BASIC:PMAX

BASIC:PMAX command sets the power upper limit.

Command Syntax:	`BASIC:PMAX <float>`
Parameter:	`<float>`
Example:	`SEND > basic:pmax 120`
Query Syntax:	`basic:pmax?`
Query Response:	`<float>`
Example:	`SEND > basic:pmax?` `RET > 120.00`

7.8.7 BASIC:STATE

BASIC:STATE command turns on/off load input.

Command Syntax:	**BASIC:STATE <ON,OFF>**
Parameter:	**<ON,OFF>**
Example:	**SEND > basic:state on**
Query Syntax:	**basic:stat?**
Query Response:	**<on, off>**
Example:	**SEND > basic:stat?** **RET > on**

7.8.8 BASIC:TRIG

BASIC:TRIG command sets instrument's trigger mode.

Command Syntax:	**BASIC:TRIG <INT,EXT,BUS>**
Parameter:	**<INT,EXT,BUS >** **INT: internal trigger mode** **EXT: external trigger mode** **BUS: BUS trigger mode**
Example:	**SEND > basic:trig int**
Query Syntax:	**basic:trig?**
Query Response:	**<int, ext, bus>**
Example:	**SEND > basic:trig?** **RET > int**

7.8.9 BASIC:FW

BASIC:4W command sets the 2W/4W input mode.

Command Syntax:	**BASIC:FW** <on, off>
Parameter:	< on, off >
Example:	**SEND >** basic:fw on
Query Syntax:	**basic:fw?**
Query Response:	< on, off >
Example:	**SEND > basic:fw?** **RET > on**

7.8.10 BASIC:VON

BASIC:VON command sets the on-load voltage.

Command Syntax:	**BASIC:VON** < float >
Parameter:	< float >
Example:	**SEND >** basic:von 18.00
Query Syntax:	**basic:von?**
Query Response:	< float >
Example:	**SEND > basic:von?** **RET > 18**

7.8.11 BASIC:VOFF

BASIC:VOFF command sets the off-load voltage.

Command Syntax:	**BASIC:VOFF** <level>

Parameter:	< float >
Example:	**SEND >** basic:voff 5.00
Query Syntax:	**basic:voff?**
Query Response:	< float >
Example:	**SEND > basic:voff?** **RET > 5.00**

7.8.12 BASIC:TIME

BASIC:TIME command sets the on-load time.

Command Syntax:	**BASIC:TIME** < float >
Parameter:	< float >
Example:	**SEND >** basic:time 1.000
Query Syntax:	**basic:time?**
Query Response:	< float >
Example:	**SEND > basic:time?** **RET > 1.000**
Restriction:	Can only be used in conventional testing status

7.8.13 BASIC:VALUE

BASIC:VALUE command sets the operating parameter.

Command Syntax:	**BASIC:VALUE** <para>, <level>
Parameter:	<para>, <level> para: instrument's operating mode level: instrument's load parameter
Example:	**SEND>** basic:value cc,1.0000 //constant current, current value 1.0000A
Query Syntax:	**basic:value?**
Query Response:	< float, float, float, float > Group 1's data: current value Group 2's data: voltage value Group 3's data: power value Group 4's data: resistance value
Example:	**SEND > basic:value?** **RET > 18.0000, 1.0000,20.0000,1.0000**

7.9 TRAN subsystem

Table 7-5 TRAN subsystem tree

TRAN	**:CURRENT(CUR)**	**:VALUEA**	**<level>,<width>**
		:VALUEB	**<level>,<width>**
	:VOLTAGE(VOL)	**:VALUEA**	**<level>,<width>**
		:VALUEB	**<level>,<width>**
	:POWER(POW)	**:VALUEA**	**<level>,<width>**

		:VALUEB	<level>,<width>
	:RESISTANCE(RES)	:VALUEA	<level>,<width>
		:VALUEB	<level>,<width>
	:TRIG	{CONT,PULS,TRIG}	

TRAN subsystem is used to set up transient parameter.

7.9.1 TRAN:CURRENT:VALUEA

TRAN:CURRENT:VALUEA command sets the current transient parameter A.

Command Syntax: **TRAN:CURRENT: VALUEA** <level>, <width>

Parameter: <level>, <width>
Level: transient parameter current A value.
width: transient parameter timing A value.

Example: **SEND >** tran:cur:a 1.0000,0.001 //current value 1.0000A, timing 1ms

Query Syntax: **tran:current:valuea?**

Query Response: <level>, <width>
level: transient parameter current A value.
width: transient parameter timing A value.

Example: **SEND > tran:cur:a?**
RET > 1.0000,0.001

7.9.2 TRAN:CURRENT:VALUEB

TRAN:CURRENT:VALUEB sets the current transient parameter B.

Command Syntax: **TRAN:CURRENT: VALUEB** <level>, <width>

Parameter: <level>, <width>
level: transient parameter current B value.
width: transient parameter timing B value.

Example: **SEND >** tran:cur:b 1.0000,0.001 //current value 1.0000A, timing 1ms

Query Syntax: **tran:current:valueb?**

Query Response: <level>, <width>
level: transient parameter current B value.
width: transient parameter timing B value.

Example: **SEND > tran:cur:b?**
RET > 1.0000,0.001

7.9.3 TRAN:VOLTAGE:VALUEA

Setup method is the same as that of current.

7.9.4 TRAN:VOLTAGE:VALUEB

Setup method is the same as that of current.

7.9.5 TRAN:POWER:VALUEA

Setup method is the same as that of current.

7.9.6 TRAN:POWER:VALUEB

Setup method is the same as that of current.

7.9.7 TRAN:RESISTANCE:VALUEA

Setup method is the same as that of current.

7.9.8 TRAN:RESISTANCE:VALUEB

Setup method is the same as that of current.

7.9.9 TRAN:TRIG

TRAN:TRIG command sets the transient trigger mode.

Command Syntax: `TRAN:TRIG < cont, puls, trig >`

Parameter:
`< cont, puls, trig >`
`cont: continuous mode`
`puls: pulse mode`
`trig: trigger mode`

Example: `SEND > tran:trig cont`

Query Syntax: `tran:trig?`

Query Response: `< cont, puls, trig >`

Example:
`SEND > tran:trig?`
`RET > cont`

7.10 SEQ subsystem

Table 7-6 SEQ subsystem tree

SEQ	:FILE	{FILE0,FILE1…,FILE9}
	:MODE	{CC,CV,CP,CR}
	:REPT	{CONT,TRIG}
	:COUNT	{FLOAT}
	:SAVE	
	:ERASE	
	:SET	<STEP>,<LEVEL>,<WIDTH>

SEQ subsystem is used to set up sequence list parameter.

7.10.1 SEQ:FILE

SEQ:FILE command sets the sequence list file.

Command Syntax: `SEQ:FILE < file0, file1…, file9 >`

Parameter:
`< file0, file1…, file9 >`
`File0: Load SEQ listed file 0`
`File1: Load SEQ listed file 1`
`File2: Load SEQ listed file 2`
`File3: Load SEQ listed file 3`

File4: Load SEQ listed file 4
File5: Load SEQ listed file 5
File6: Load SEQ listed file 6
File7: Load SEQ listed file 7
File8: Load SEQ listed file 8
File9: Load SEQ listed file 9

Example: **SEND > seq:**file file0

Query Syntax: **seq:file?**

Query Response: < file0, file1…, file9 >

Example: **SEND > seq:file?**
RET > file0

7.10.2 SEQ:MODE

SEQ:MODE command sets the sequence list operating mode.

Command Syntax: **SEQ:MODE** < cc, cv, cp, cr >

Parameter: < cc, cv, cp, cr >
cc: constant current
cv: constant voltage
cp: constant power
cr: constant resistance

Example: **SEND > seq:mode cc**

Query Syntax: **seq:mode?**

Query Response: < cc, cv, cp, cr >

Example: **SEND > seq:mode?**
RET > cc

7.10.3 SEQ:REPT

SEQ:REPT command sets the sequence list cyclical mode.

Command Syntax: **SEQ:REPT** < cont, trig >

Parameter: < cont, trig >
cont: constant mode
trig: trigger mode

Example: **SEND > seq:rept cont**

Query Syntax: **seq:rept?**

Query Response: < cont, trig >

Example: **SEND > seq:rept?**
RET > cont

7.10.4 SEQ:COUT

SEQ:COUT command sets the sequence list count.

Command Syntax: **SEQ:COUT** < float >

Parameter: < float >

Example: **SEND > seq:cout 10**

Query Syntax: **seq:cout?**

Query Response:	< float >
Example:	**SEND > seq:cout?** **RET > 10**

7.10.5 SEQ:SAVE

SEQ:SAVE command set the sequence list file saving.

Command Syntax:	**SEQ:SAVE**
Parameter:	NONE
Example:	**SEND > seq:save**

7.10.6 SEQ:ERASE

SEQ:ERASE command sets the sequence list file erasing

Command Syntax:	**SEQ:ERASE**
Parameter:	NONE
Example:	**SEND > seq:ers**

7.10.7 SEQ:SET

SEQ:SET command sets the data of sequence list file

Command Syntax:	**SEQ:SET** <step>, <level>, <width>
Parameter:	<step>, <level>, <width> step: integer, which step level: single-precision floating-point format, numerical value, unit according to operating mode (A, V, W, Ω) width: single-precision floating-point format, pulse width, unit is "s"
Example:	**SEND> seq:set 0,1.0000,0.01** // Setting up the data of the first step as 1(A,V,W,Ω), 0.01s
Query Syntax:	**seq:set?**
Parameter:	<step> Step: integer, which step
Query Response:	<level>,<width> level: single-precision floating-point format, numerical value width: single-precision floating-point format, pulse width
Example:	**SEND > seq:set? 0** **RET > 1.0000,0.01**
Restriction:	**Can only be used in normal test status.** **The execution of this command only aims at the operating mode of the system being used, example: if system's current operating mode is CC, then amend or query CC list data.**

7.11 ATF subsystem

Table 7-7 ATF subsystem tree

ATF	**:FILE**	**{FILE0,FILE1…,FILE9}**
	:VMAX	**{FLOAT}**
	:IMAX	**{FLOAT}**
	:PMAX	**{FLOAT}**
	:COUNT	**{FLOAT}**
	:SAVE	
	:ERASE	
	:SET	**<STEP>,<PARA>,<COMP>,<LEVEL>, <WIDTH>,<HIGH>,<LOW>**
	:FETCH	**<FLOAT>**

ATF subsystem is used to setting up automatic list parameter.

7.11.1 ATF:FILE

ATF:FILE command sets the automatic list files.

Command Syntax: **ATF:FILE** < file0, file1…, file9 >

Parameter: < file0, file1…, file9 >
File0: Load ATF listed file 0
File1: Load ATF listed file 1
File2: Load ATF listed file 2
File3: Load ATF listed file 3
File4: Load ATF listed file 4
File5: Load ATF listed file 5
File6: Load ATF listed file 6
File7: Load ATF listed file 7
File8: Load ATF listed file 8
File9: Load ATF listed file 9

Example: **SEND > atf**:file file0

Query Syntax: **atf:file?**

Query Response: < file0, file1…, file9 >

Example: **SEND > atf:file?**
RET > file0

7.11.2 ATF:VMAX

ATF:VMAX command sets the ATF's V-MAX.

Command Syntax: **ATF:VMAX** < float >

Parameter: < float >

Example: **SEND** > atf:**vmax 120.0000**

Query Syntax: **atf:vmax?**

Query Response: < float >

Example: **SEND > atf:vmax?**

	RET > 120.0000

7.11.3 ATF:IMAX

ATF:IMAX command sets the ATF's I-MAX.

Command Syntax:	**ATF:IMAX** < float >
Parameter:	< float >
Example:	**SEND >** atf:**imax 3.0000**
Query Syntax:	**atf:imax?**
Query Response:	< float >
Example:	**SEND > atf:imax?** **RET > 3.0000**

7.11.4 ATF:PMAX

ATF:PMAX command sets the ATF's P-MAX.

Command Syntax:	**ATF:PMAX** < float >
Parameter:	< float >
Example:	**SEND > atf:pmax 120.00**
Query Syntax:	**atf:pmax?**
Query Response:	< float >
Example:	**SEND > atf:pmax?** **RET > 120.00**

7.11.5 ATF:COUT

ATF:COUT command sets the automatic list count.

Command Syntax:	**ATF:COUT** < int >
Parameter:	< int >
Example:	**SEND > atf:cout 10**
Query Syntax:	**atf:cout?**
Query Response:	< int >
Example:	**SEND > atf:cout?** **RET > 10**

7.11.6 ATF:SAVE

ATF:SAVE command sets the automatic list file saving.

Command Syntax:	**ATF:SAVE**
Parameter:	NONE
Example:	**SEND >** atf:**save**

7.11.7 ATF:ERASE

ATF:ERASE command sets the automatic list file erasing.

Command Syntax:	**ATF:ERASE**
Parameter:	NONE
Example:	**SEND >** atf:**ers**

7.11.8 ATF:SET

ATF:SET command sets the data of automatic list file.

Command Syntax: **ATF:SET** <step>,<para>,<comp>, <level>,<width>,<high>,<low>

Parameter: <step>,<para>,<comp>, <level>,<width>,<high>,<low>

step: integer, which step

para: alphabetic string, {cc|cv|cp|cr|short|open}

comp: alphabetic string, {i|v|p}

level: single-precision floating-point format, numerical value, unit according to operating mode（A, V, W, Ω）

width: single-precision floating-point format, pulse width, unit is "s", maximum is 25.5s

high: single-precision floating-point format, limitation upper limit

low: single-precision floating-point format, limitation lower limit

Example: **SEND > atf:set 0,cc, v, 1,2,4,3**

//Setting up the first step as CC mode, numerical value 1A, delay 2s, compare voltage value V, voltage upper limit 4V, lower limit 3V

Query Syntax: **atf:set? <step>**

Parameter: <step>

Step: integer, which step

Query Response: <para>,<comp>, <level>,<width>,<high>,<low>

Example: **SEND > atf:set? 0**

RET > cc,v,1.0000,2.0,4.0000,3.0000

Restriction: After finishing setup data, suggest to using ATF:SAVE command saving data.

7.11.9 ATF:FETCH

ATF:FETCH command retrieves each step's data.

Query Syntax: **atf:fetch <float>, <step>**

Parameter: <float>

float: floating-point number

step: integer

Query Response: <float>

Example: **SEND > atf:fetch 0**

RET > 1.000

7.12 BAT subsystem

Table 7-8 BAT subsystem tree

BAT	**:CURRENT**	**{FLOAT}**
	:OFFVOLT	**{FLOAT}**
	:SECPARA	**{P,B,T}**

BAT subsystem is used to set up battery measuring parameter.

7.12.1 BAT:CURRENT

BAT:CURRENT Setting up battery discharging current.

Command Syntax:	**BAT:CURRENT** < float >
Parameter:	< float >
Example:	**SEND > bat:**cur 1.0000
Query Syntax:	**BAT:CURRENT?**
Query Response:	**<** float **>**
Example:	**SEND > bat:cur?** **RET > 1.0000**

7.12.2 BAT:OFFVOLT

BAT:OFFVOLT command sets the battery off voltage.

Command Syntax:	**BAT:OFFVOLT** < float >
Parameter:	< float >
Example:	**SEND >** bat:volt 8.0000
Query Syntax:	**BAT:OFFVOLT?**
Query Response:	**<** float **>**
Example:	**SEND > bat:volt?** **RET > 8.0000**

7.12.3 BAT:SECPARA

BAT:SECPARA sets the battery measuring sub parameter.

Command Syntax:	**BAT:SECPARA** < p, b, t >
Parameter:	< p, b, t > P: power value B: battery capacity T: discharge time
Example:	**SEND > bat:para p**
Query Syntax:	**BAT:SECPARA?**
Query Response:	< p, b, t >
Example:	**SEND > bat:para?** **RET > p**

7.13 LED subsystem

Table 7-9 LED subsystem tree

LED	**:VOL**	**{FLOAT}**
	:RES	**{FLOAT}**

LED subsystem is used to set up led measuring parameter.

7.13.1 LED:VOL

LED:VOL Setting up LED start voltage.

Command Syntax:	**LED:VOL** < float >
Parameter:	< float >

Example:	**SEND > led:**vol 5.0000
Query Syntax:	**LED:VOL?**
Query Response:	**<** float **>**
Example:	**SEND > led:vol?** **RET > 5.0000**

7.13.2 LED:RES

LED:RES command sets the LED load impedance

Command Syntax:	**LED:RES<** float **>**
Parameter:	< float >
Example:	**SEND > led:**res 20.000
Query Syntax:	**LED:RES?**
Query Response:	**<** float **>**
Example:	**SEND > led:res?** **RET > 25.000**

7.14 OCP subsystem

Table 7-10 OCP subsystem tree

OCP	**:FILE**	**{FILE0,FILE1,…FILE9}**
	:RANGE	**{3A,30A}**
	:VV	**{FLOAT}**
	:VD	**{FLOAT}**
	:START	**{FLOAT}**
	:STEP	**{FLOAT}**
	:SD	**{FLOAT}**
	:END	**{FLOAT}**
	:OV	**{FLOAT}**
	:MAX	**{FLOAT}**
	:MIN	**{FLOAT}**

OCP subsystem is used to set up OCP measuring parameter.

7.14.1 OCP:FILE

OCP:FILE Setting up OCP FILE.

Command Syntax:	**OCP:FILE** < INT >
Parameter:	< INT >
Example:	**SEND > OCP:**FILE 1
Query Syntax:	**OCP:FILE?**
Query Response:	**<** INT **>**
Example:	**SEND > OCP:FILE?** **RET > file1**

7.14.2 OCP:RANGE

OCP:RANGE command sets the OCP CUR RANGE

Command Syntax:	**OCP:RANGE<** INT >

Parameter:	< INT >
Example:	**SEND > OCP:**RANGE 1
Query Syntax:	**OCP:RANGE?**
Query Response:	**<** INT **>**
Example:	**SEND > OCP:RANGE?** **RET > 3A**

7.14.3 OCP:VV

OCP:VV command sets the OCP Start Voltage

Command Syntax:	**OCP:VV**< float >
Parameter:	< float >
Example:	**SEND > OCP:**VV 10.00
Query Syntax:	**OCP:VV?**
Query Response:	**<** float **>**
Example:	**SEND > OCP:VV?** **RET > 10.00**

7.14.4 OCP:VD

OCP:VD command sets the OCP Start Delay

Command Syntax:	**OCP:VD**< float >
Parameter:	< float >
Example:	**SEND > OCP:**vd 1.00
Query Syntax:	**OCP:VD?**
Query Response:	**<** float **>**
Example:	**SEND > OCP:VD?** **RET > 1.00**

7.14.5 OCP:START

OCP:START command sets the OCP Start Cur

Command Syntax:	**OCP:START**< float >
Parameter:	< float >
Example:	**SEND > OCP:**START 0.1000
Query Syntax:	**OCP:START?**
Query Response:	**<** float **>**
Example:	**SEND > OCP:START?** **RET > 0.1000**

7.14.6 OCP:STEP

OCP:STEP command sets the OCP Cur Step

Command Syntax:	**OCP:STEP**< float >
Parameter:	< float >
Example:	**SEND > OCP:**STEP 1.00
Query Syntax:	**OCP:STEP?**
Query Response:	**<** float **>**
Example:	**SEND > OCP:STEP?** **RET > 1.00**

7.14.7 OCP:SD

OCP:SD command sets the OCP Step Delay

Command Syntax:	**OCP:STEP**< float >
Parameter:	< float >
Example:	**SEND > OCP:**STEP 1.00
Query Syntax:	**OCP:STEP?**
Query Response:	**<** float **>**
Example:	**SEND > OCP:STEP?** **RET > 1.00**

7.14.8 OCP:END

OCP:END command sets the OCP Stop Cur

Command Syntax:	**OCP:END**< float >
Parameter:	< float >
Example:	**SEND > OCP:**END 3.0000
Query Syntax:	**OCP:END?**
Query Response:	**<** float **>**
Example:	**SEND > OCP:END?** **RET > 3.0000**

7.14.9 OCP:OV

OCP:OV command sets the OCP Vol Value

Command Syntax:	**OCP:OV**< flaot >
Parameter:	< float >
Example:	**SEND > OCP:**OV 10.00
Query Syntax:	**OCP:OV?**
Query Response:	**<** float **>**
Example:	**SEND > OCP:OV?** **RET > 10.00**

7.14.10 OCP:MAX

OCP:MAX command sets the OCP Cur high value

Command Syntax:	**OCP:MAX**< flaot >
Parameter:	< float >
Example:	**SEND > OCP:**MAX 2.0000
Query Syntax:	**OCP:MAX?**
Query Response:	**<** float **>**
Example:	**SEND > OCP:MAX?** **RET > 2.0000**

7.14.11 OCP:MIN

OCP:MIN command sets the OCP Cur low value

Command Syntax:	**OCP:MIN**< float >
Parameter:	< float >
Example:	**SEND > OCP:**MIN 0.001
Query Syntax:	**OCP:MIN?**

Query Response:	**< float >**
Example:	**SEND > OCP:MIN?** **RET > 0.001**

7.15 OPP subsystem

Table 7-11 OPP subsystem tree

OPP	**:FILE**	**{FILE0,FILE1,…FILE9}**
	:RANGE	**{3A,30A}**
	:VV	**{FLOAT}**
	:VD	**{FLOAT}**
	:START	**{FLOAT}**
	:STEP	**{FLOAT}**
	:SD	**{FLOAT}**
	:END	**{FLOAT}**
	:OV	**{FLOAT}**
	:MAX	**{FLOAT}**
	:MIN	**{FLOAT}**

OPP subsystem is used to set up OPP measuring parameter.

7.15.1 OPP:FILE

OPP:FILE Setting up OPP FILE.

Command Syntax:	**OPP:FILE** < INT >
Parameter:	< INT >
Example:	**SEND > OPP:**FILE 1
Query Syntax:	**OPP:FILE?**
Query Response:	**< INT >**
Example:	**SEND > OPP:FILE?** **RET > file1**

7.15.2 OPP:RANGE

OPP:RANGE command sets the OPP CUR RANGE

Command Syntax:	**OPP:RANGE**< INT >
Parameter:	< INT >
Example:	**SEND > OPP:**RANGE 1
Query Syntax:	**OPP:RANGE?**
Query Response:	**< INT >**
Example:	**SEND > OPP:RANGE?** **RET > 3A**

7.15.3 OPP:VV

OPP:VV command sets the OPP Start Voltage

Command Syntax:	**OPP:VV**< float >
Parameter:	< float >
Example:	**SEND > OPP:**VV 10.00

Query Syntax:	**OPP:VV?**
Query Response:	**<** float **>**
Example:	**SEND > OPP:VV?** **RET > 10.00**

7.15.4 OPP:VD

OPP:VD command sets the OPP Start Delay

Command Syntax:	**OPP:VD**< float >
Parameter:	< float >
Example:	**SEND > OPP:**vd 1.00
Query Syntax:	**OPP:VD?**
Query Response:	**<** float **>**
Example:	**SEND > OPP:VD?** **RET > 1.00**

7.15.5 OPP:START

OPP:START command sets the OPP Start Cur

Command Syntax:	**OPP:START**< float >
Parameter:	< float >
Example:	**SEND > OPP:**START 0.1000
Query Syntax:	**OPP:START?**
Query Response:	**<** float **>**
Example:	**SEND > OPP:START?** **RET > 0.1000**

7.15.6 OPP:STEP

OPP:STEP command sets the OPP Cur Step

Command Syntax:	**OPP:STEP**< float >
Parameter:	< float >
Example:	**SEND > OPP:**STEP 1.00
Query Syntax:	**OPP:STEP?**
Query Response:	**<** float **>**
Example:	**SEND > OPP:STEP?** **RET > 1.00**

7.15.7 OPP:SD

OPP:SD command sets the OPP Step Delay

Command Syntax:	**OPP:STEP**< float >
Parameter:	< float >
Example:	**SEND > OPP:**STEP 1.00
Query Syntax:	**OPP:STEP?**
Query Response:	**<** float **>**
Example:	**SEND > OPP:STEP?** **RET > 1.00**

7.15.8 OPP:END

OPP:END command sets the OPP Stop Cur

Command Syntax:	**OPP:END**< float >
Parameter:	< float >
Example:	**SEND > OPP:**END 3.0000
Query Syntax:	**OPP:END?**
Query Response:	**<** float **>**
Example:	**SEND > OPP:END?** **RET > 3.0000**

7.15.9 OPP:OV

OPP:OV command sets the OPP Vol Value

Command Syntax:	**OPP:OV**< flaot >
Parameter:	< float >
Example:	**SEND > OPP:**OV 10.00
Query Syntax:	**OPP:OV?**
Query Response:	**<** float **>**
Example:	**SEND > OPP:OV?** **RET > 10.00**

7.15.10 OPP:MAX

OPP:MAX command sets the OPP Power high value

Command Syntax:	**OPP:MAX**< flaot >
Parameter:	< float >
Example:	**SEND > OPP:**MAX 2.0000
Query Syntax:	**OPP:MAX?**
Query Response:	**<** float **>**
Example:	**SEND > OPP:MAX?** **RET > 2.0000**

7.15.11 OPP:MIN

OPP:MIN command sets the OPP Power low value

Command Syntax:	**OPP:MIN**< float >
Parameter:	< float >
Example:	**SEND > OPP:**MIN 0.001
Query Syntax:	**OPP:MIN?**
Query Response:	**<** float **>**
Example:	**SEND > OPP:MIN?** **RET > 0.001**

7.16 TRIG subsystem

Table 7-12 TRIG subsystem tree

TRIG	

TRIG subsystem is used to remote trigger.

7.16.1 TRIG

TRIG command is used to execute remote trigge.

Command Syntax: `TRIG`

Example: `SEND > trig`

7.17 PRSC subsystem

Table 7-13 PRSC subsystem tree

PRSC	

PRSC subsystem is used for copying screen.

7.17.1 PRSC

PRSC is used for copying screen

Command Syntax: `PRSC`

Example: `SEND > prsc`

7.18 SAVE subsystem

Table 7-14 SAVE subsystem tree

SAVE	

SAVE subsystem is used to save the instrument's parameter.

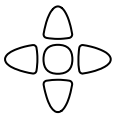
7.18.1 SAVE

Command Syntax: `SAVE`

Parameter: NONE

Example: `SEND > save`

8. Specifications



This chapter will describe:

- Basic Specifications
- General Specifications
- Dimensions

8.1 Basic Specifications

Accuracy is defined as meeting all of the following conditions.

- Temperature：23℃ ±5℃
- Humidity：≤65% R.H.
- Correction：Short-circuit Clear Zero
- Warming Time：>60min
- Adjustment Time：12months

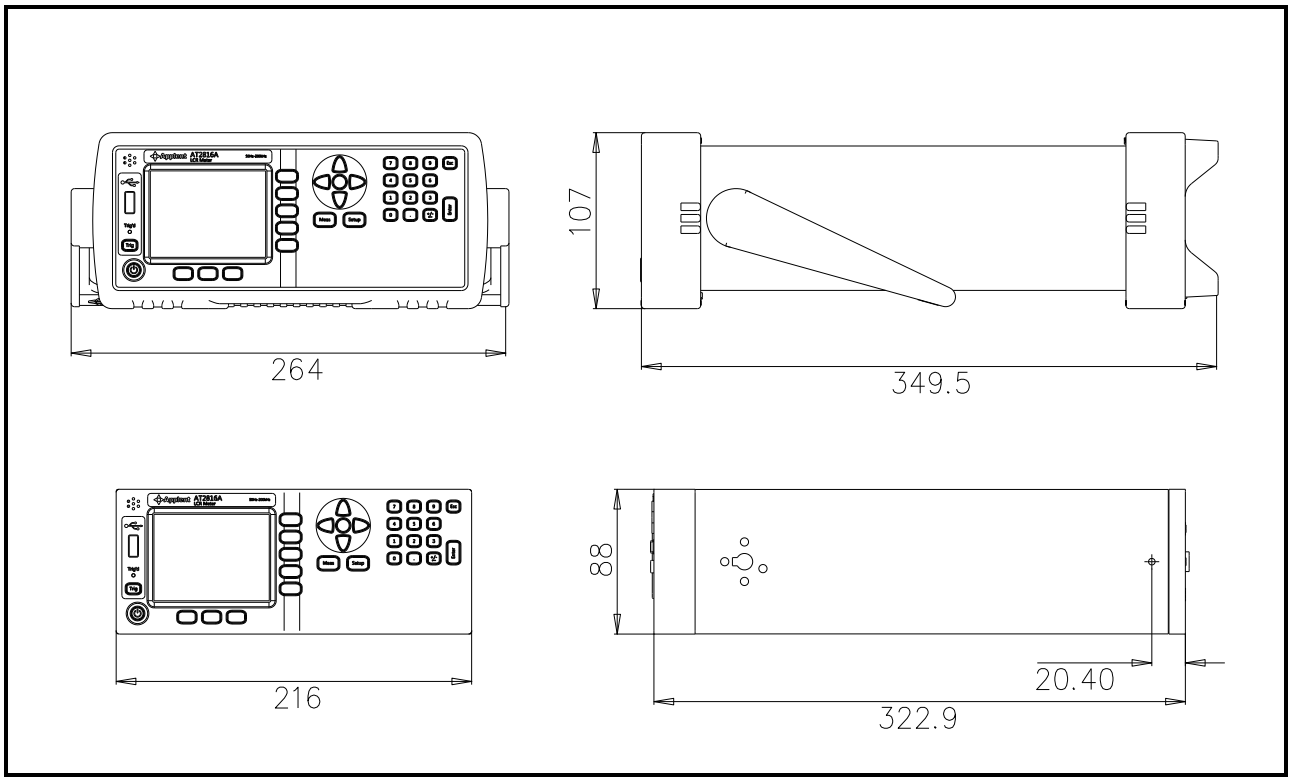
Sampling rate: Slow: 3t/s, Medium: 5t/s, Fast: 10t/s

Constant Current mode CC	Measurement range	0-3A	0-30A
	Resolution	0.0001A	0.001A
	Basic accuracy	0.1%+0.1%FS	0.2%+0.1%FS
Constant Voltage mode CV	Measurement range	0-18V	0-150V
	Resolution	0.001V	0.01V
	Accuracy	0.05%+0.02%FS	0.05%+0.025%FS
Constant Power mode CW	Measurement range	0-100W	100-300W
	Resolution	0.001W	0.01W
	Accuracy	1%+0.1%FS	1%+0.1%FS
Constant Resistance mode CR	Measurement range	0.1-99Ω	100-4KΩ
	Resolution	0.01Ω	1Ω
	Accuracy	1%+0.3%FS	1%+0.8%FS
Voltmeter	Measurement range	0-18V	0-150V
	Resolution	0.001V	10mV
	Accuracy	0.05% + 0.02%FS	0.05% + 0.025%FS
Ammeter	Measurement range	0-3A	0-30A
	Resolution	0.0001A	0.001A
	Accuracy	0.1% + 0.1%FS	0.2% + 0.3%FS
Short-circuit test	Short-circuit current	≈30A	
	Internal resistance	≈40mΩ	
Battery test	Capacity	999.99AH	
	Discharge time	999H	

8.2 General Specifications

Display	True color TFT-LCD, Size: 3.5”
Rating Power	AT8612: 300W AT8611: 150W
Rating Voltage	AT8612:0.1V~300V AT8611: 0.1V~150V
Rating Current	0A~30A
Display Parameter	Voltage, Current, Power, Resistance, Battery Capacity and Battery Discharge Time
Measurement Speed	Fast: 10t/s , Medium: 5t/s, Slow: 3t/s
Trigger Mode	Internal, BUS and External Trigger
Transient Test	0.1Hz~25kHz
Sequence List Function (SEQ)	0.1Hz~25 kHz, 10 files and 99 steps/file
Automatic Testing Function (ATF)	10 files and 20 steps/file
Interface	Remote Sensing, External Trigger Built-in RS-232C RS-485 (Option)
Programming language	SCPI
Environment	Temperature and humidity range: 18℃~28℃, 65% RH or less Operating temperature and humidity range: 10℃~40℃,10~80% RH Storage temperature and humidity range: 0℃~50℃,10~90% RH
Power Supply	110V/220V 48.5Hz ~ 62.5Hz
Fuse	250V 1A Slow-Blow
Maximum rated power	15VA
Weight	5kg, net
Accessory	User's Manual, AC Power Cord, Warranty Card

8.3 Dimensions



Applent Instruments

-AT861x User's Guide-

English