Applent Instruments

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Rev.D

[AT510PRO/510/510SE/510L/510M DC RESISTANCE METER]

User's Manual

Safety Summary

⚠Warning ⚠Dangerous:

When you notice any of the unusual conditions listed below, immediately terminate operation and disconnect the power cable.
Please Contact Applent Instruments Incorporation sales representative for repair of the instrument. If you continue to operate without repairing the instrument, there is a potential fire or shock hazard for the operator.

- Instrument operates abnormally
- Instrument emits abnormal noise, smell, smoke or a spark-like light during the operation.
- Instrument generates high temperature or electrical shock during operation.
- Power cable, plug, or receptacle on instrument is damaged.
- Foreign substance or liquid has fallen into the instrument.

⚠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 Circuits	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.
DO NOT Service Or Adjust Alone	Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.
DO NOT Substitute Parts Or Modify Instrument	Because of the danger of introducing additional hazards, do not install substitute parts or perform unauthorized modifications to the instrument. Return the instrument to an Applent Inc Sales and Service Office for service and repair to ensure that safety features are maintained.
⚠ WARNING & DANGEROUS	**Dangerous voltage levels, capable of causing death, are present in this instrument.** **Use extreme caution when handling, testing, and adjusting this instrument.**

CERTIFIACTION, LIMITED & LIMITATION OF UABILITY

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.

This Applent instrument product is warranted against defects in material and workmanship for a period corresponding to the individual warranty periods of its component products. **The warranty period is 1 years and begins on the date of shipment.** During the warranty period, Applent will, at its option, either repair or replace products that prove to be defective. This warranty extends only to the original buyer or end-user customer of a Applent authorized reseller, and does not apply to fuses, disposable batteries or to any product which, in Applent's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation or handling.

For warranty service or repair, this product must be returned to a service facility designated by Applent. The buyer shall prepay shipping charges to Applent and Applent shall pay shipping charges to return the product to the Buyer. However, the Buyer shall pay all shipping charges, duties, and taxes for products returned to Applent from another country.

Applent warrants that its software and firmware designated by Applent for use with an instrument will execute its programming instruction when properly installed on that instrument. Applent does not warrant that the operation of the instrument, or software, or firmware, will be uninterrupted or error free.

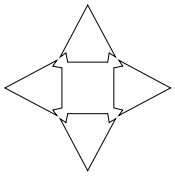
The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by the Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside the environmental specifications for the product, or improper site preparation or maintenance.

THIS WARRANTY IS BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. APPLENT SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT, RELIANCE OR ANY OTHER THEORY.

Applent Instruments, Inc.
Changzhou,
Jiangsu,
The People's Republic of China.
Rev.A2 January, 2005
Rev.B0 January, 2008
Rev.C1 March, 2011

Contents

1. Unpacking and Inspection



This chapter provides the following information:

- Packing List
- Power Supply
- Setup Fuse
- Operating Environment
- Cleaning
- How to Remove the Handle

1.1 Packing List

After you receive the instrument, carry out checks during unpacking according to the following procedure.

1. Check that the packing box or shock-absorbing material used to package the instrument has not been damaged.
2. Referring to Table 1-1, check that all packaged items supplied with the meter have been provided as per the specified optioned.

Table1-1 Included Accessories

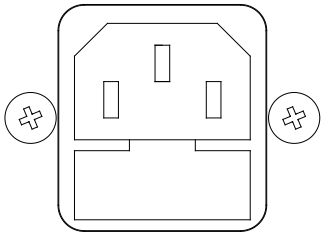
NAME	QTY	REMARK
User's Manual	1	
AC Power Cord	1	220V/50Hz
Fuse	2	1A Slow-Blow
Kelvin Test Leads	1	ATL501
Test Report	1	
Product & Warranty Certification	1	

1.2 Power Supply

Confirm that the power supplied to the AT510x meets the following requirements:
Voltage: 198 -252V AC
Frequency: 47.5 -52.5Hz
Consumption: < 15VA

WARNING :
The ground wire should be earthed to avoid being electric shock.
If you change the power cord, make sure the ground wire earthed.

1.3 Setting up Fuse



~Line: 47.5Hz - 52.5Hz
198VAC - 242VAC
10VA MAX

Fuse: 250V, 0.5AH
Slow Blow

Figure1-1 Fuse Holder

Please use the following fuse type :
UL/CSA type, Slow-Blow, 5×20-mm miniature fuse, 0.5A, 250 V .

1.4 Environmental Requirements

Ensure that the operating environment meets the following requirements.

Temperature Range 0℃ ~55℃,

Humidity Range <=95%RH, 40°C

1.5 Cleaning

To prevent electrical shock, disconnect the AT510x power cable from the receptacle before cleaning.

Use a dry cloth or a cloth slightly dipped in water to clean the casing.

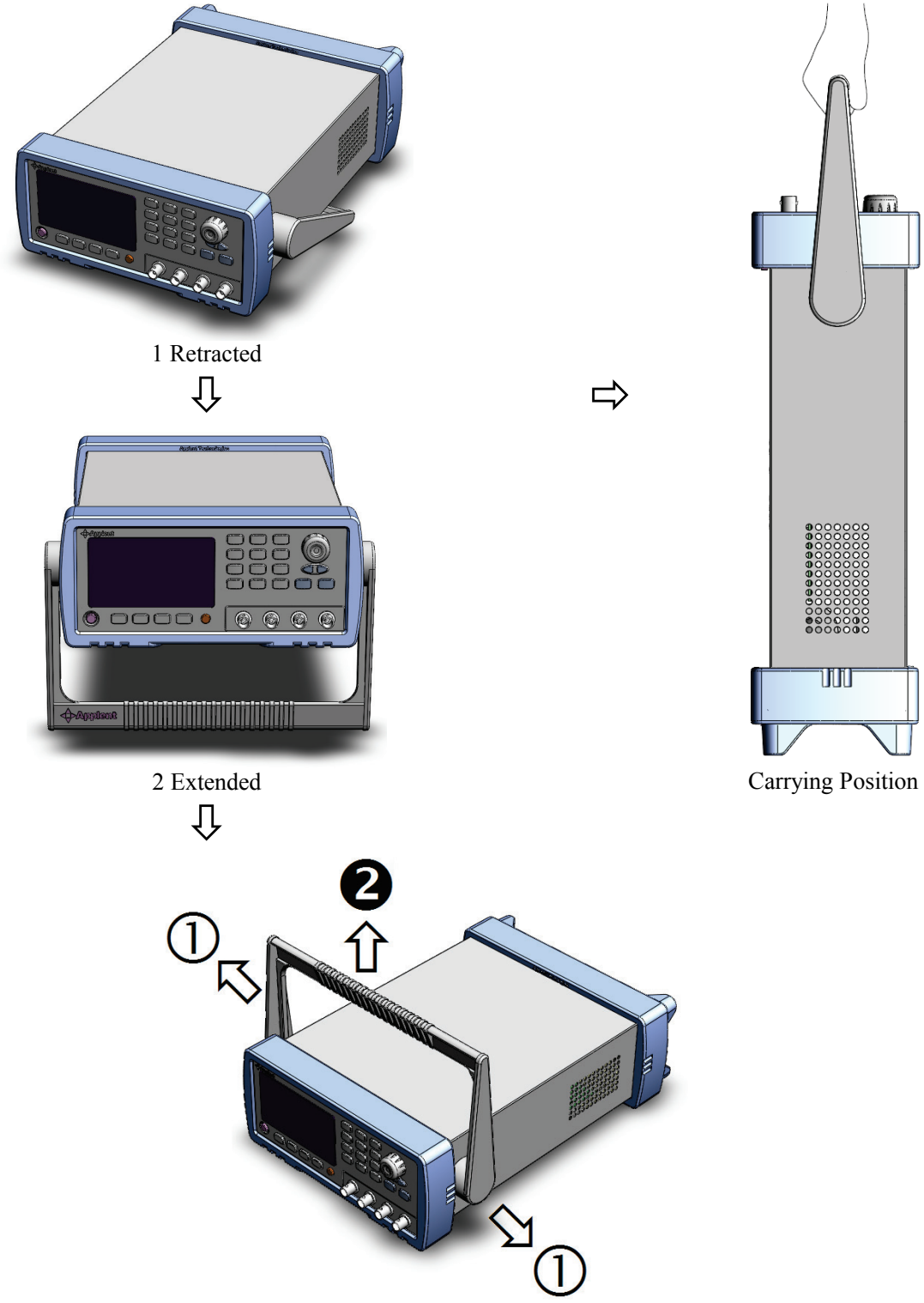
Do not attempt to clean the AT510x internally.

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

1.6 How to Remove the Handle

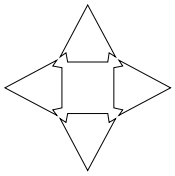
A handle kit is attached to the AT512:

Figure 1-1 Hand Handle



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

2. General



This chapter provides the following information:

- Index
- Models Introduction
- Main Specification
- Feature Overview

2.1 Introduction

Thank you for purchasing AT510x DC Resistance Meter.

AT510x is a high-precision wide-range, high-performance microprocessor-controlled resistance meter. Its measurement range of 1μΩ ~~0~~2Ω, the maximum display number 30000. Test speed of 15 times / sec, it still can guarantee high test accuracy, and reading can be controlled beating 3 words or less. It is unique to the current modes of three tests to adapt different requirements. Sorting equipment with professional features, with a group of stored data, various sorting information ring settings, can also be equipped with Handler interface, used in automatic sorting system to complete fully automatic production line testing. And an optional RS232C interface or IEEE-488 interface for remote control, data acquisition and analysis.

Computer remote control commands compatible with SCPI (Standard Command for Programmable Instrument Programmable Instruments standard command set), complete and efficient remote control and data acquisition functions.

AT510x measures of high, medium and low-value resistor; various switch contact resistance; connector contact resistance; relay line package and the contact resistance; transformers, inductors, motors, deflection coil winding resistance; wire resistance; cars, boats, aircraft riveting metal resistance; printed version of the line and pore of resistance and so on.

2.2 Models Introduction

Model	Resistance Range	Accuracy
AT510PRO	1μΩ-20MΩ	0.05%
AT510	1μΩ-3MΩ	0.05%
AT510SE	10μΩ-300kΩ	0.05%
AT510L	1μΩ-30kΩ	0.1%
AT510M	100μΩ-20MΩ	0.1%

Full AT510x specifications are included in Appendix A.

2.3 Main Specification

AT510x technical specifications, including the basic technical specifications of the instrument and equipment testing allows. These specifications are in the instrument factory can achieve.

Detailed technical specifications see Appendix A.

- Basic Accuracy：0.05%
- Maximum display digits:30000
- 10 ranges automatic and range hold
  Resistance range :1μΩ ～ 20MΩ
- Fast-high accuracy measurement
  Test speed of 15 times / sec, it still can guarantee high test accuracy (0.05%) and maxim display digits: 30000.
- 4-Terminal Test
- High test current ,Low test current and Plus test current modes
  Test current modes are used for the different type DUT.
- Dual-display.
  Direct display ,ΔABS,Δ%,GD/NG
- Temperature function.
  Measure the temperature by the temperature probe.
- Trigger Modes:
  Internal Trig, External Trig and Remote Trig.

2.4 Feature Overview

- High brightness Vacuum Fluorescent Display
  window size: 98mm×58mm
- Calibration
  Short Zeroing
- Comparator (sorting) function:
  Built-in 30 sorting files (AT510Pro/AT510/AT510SE) and
  Output 3 levels (HI, IN and Low) or (GD, NG), display, beep sound.
  ·Display：Direct display on the VFD displayer.
  ·Output：Output the sorting results by the Handler interface or RS232C interface.
  ·Beep：Setup the sorting results and turn ON/OFF Beep.
- Beep and VFD Brightness can be Adjusted
  Setup GD or NG Beep and adjust VFD Brightness.
- Thermoelectric power compensation
  Small current pulse test mode, to compensate for thermoelectric power, minimizing the impact of thermoelectric power
- Keypad locked function
- Interface: (Optional functions for AT510L/AT510M):
  Handler interface：**Output**: the results of comparator ,EOC signal.
  Input: the numbers of the compare file, Trigger signal.
  RS232C interface：Used SCPI with single 3-wire serial interface.

3. Start up

This chapter provides the following information:

- A tour of front panel
- A tour of rear panel
- Power Up
- Display information
- Measurement configuration

3.1 Front panel

3.1.1 Front Panel Overview

Figure 3-1 Front Panel Overview

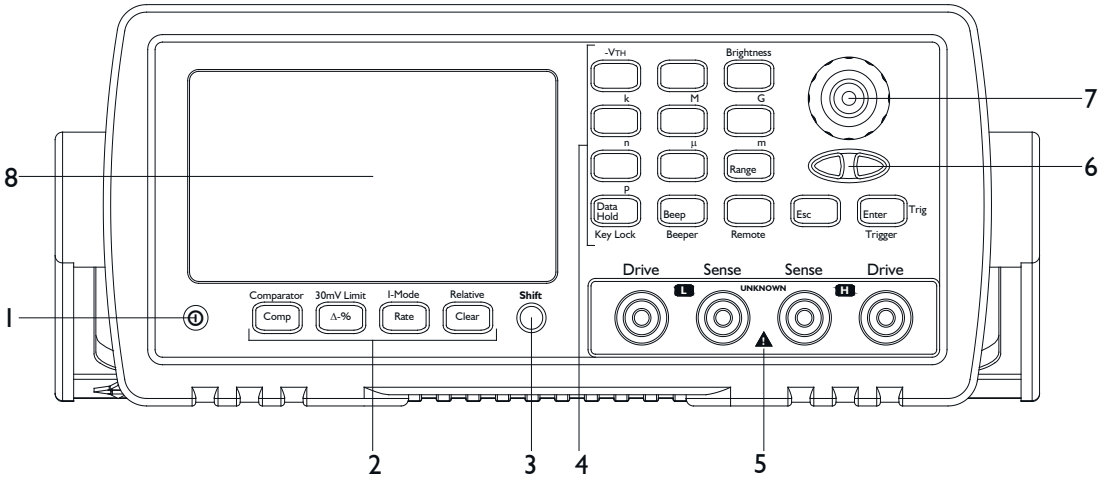


Table 3-1 Front panel description

No.	Function
1	Power Switch. Down :ON; Up: OFF.
2	Keypad I
3	Shift key (Yellow).Press the key, the "shift" indication is ON and the keys are the 2nd Function (Yellow).
4	Keypad II
5	UNKNOWN Terminal
6	Arrow keys: Select the options.
7	Knob: To choose function and input number value.

3.1.2 Keypad

ASSUMER：

On the front Panel:
Black Words on Button represents 1st Function;
Orange Words on Panel represents 2nd Function;
Blue Words on Button represents Numeric Key.

1. Primary Function

ASSUMER：

Black Words on Button represents 1st Function;
The keys will be 1st functions while the Shift mark on VFD is off.

Figure 3-2 Keypad I

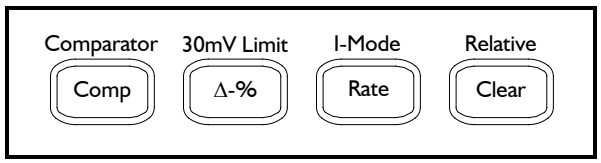


Figure 3-3 Keypad II

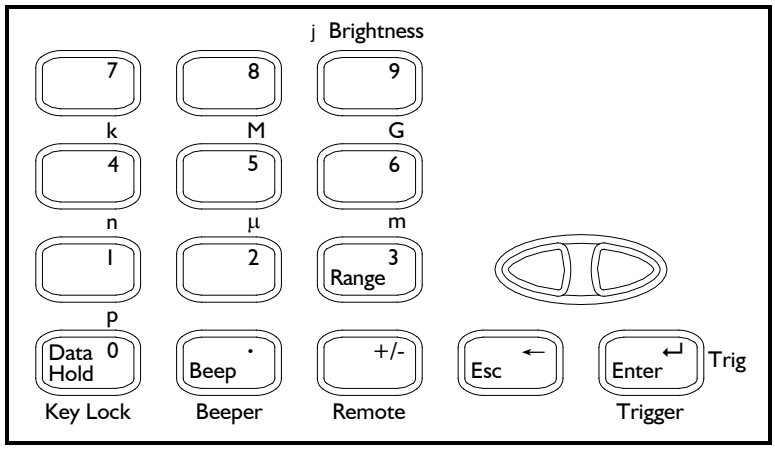


Table 3-2 Primary Functions description

Key	Function
Comparator	Setup comparator
Δ-Δ%	*The function is invalid.
Speed	Measurement speed:（Slow），（Medium），（Fast）.
Clear	Correction(Short Zeroing)
Range	Automatic, Range Hold. The AUTO indication is ON, range is automatic.
DH	Data maintained. Equipment to stop testing, current measurements remains on the displayer, not to refresh. The *DH* indication is ON, the data is held.
Beep	Turn ON/OFF Beep.
<,> Arrow keys	Select the range. It is enabled in the range hold status.
Esc	Return to the upper status. It is enabled in the setup status.
Enter	Confirm the operations. It is enabled in the setup status.

2 Secondary Function（Shift）

ASSUMER：

On the front Panel:
Orange Words on Panel represents 2nd Function;
The keys will be 2nd function while the Shift mark on VFD is on.

Table 3-3 Secondary Functions description

Key	Function
Comparator	Open or close comparator function.
20mV-limited	*The function is invalid in these AT510x versions.
Test Current Modes	Select test current modes: High current（H-Cur）、Low current（L-Cur）and Plus current（P-Cur）
Relative Value	Relative value display. The REL indicator is ON, the value is the Correction value.
Clear	Correction(Short Zeroing)
Temperature Correction	Used to set the compensation coefficient and temperature.
Brightness	Adjust VFD Brightness
p,n,μ,m,k,M	Unit. Select the unit in the input status.
Key Lock	Keypad Locked. Keypad locked, only Shift + keypad lock (KeyLock) button can respond.
Beep	Setup beep's on/off.
Remote Control	Choose interfaces: RS232, GPIB and setup communication parameters.
Trigger	Choose Trig modes: internal, external, manual and remote.

3 Numeric Keys

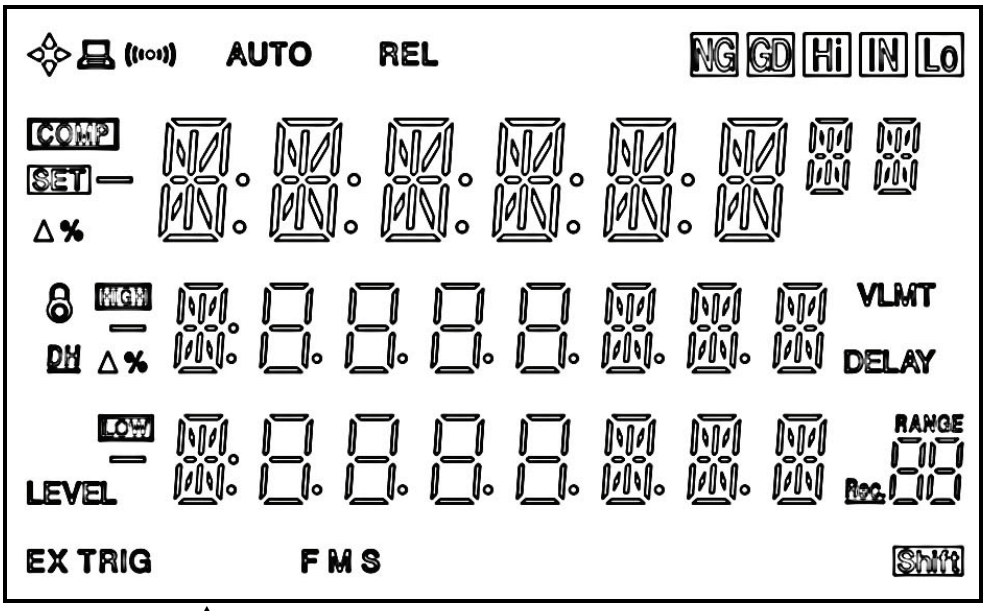
ASSUMER：

On the front Panel:
Blue Words on Button represents Numeric Key.
The numeric keys include blue word keys, ESC key, Enter key and units (p, n, μ,m,

k, M, G).

3.1.3 VFD

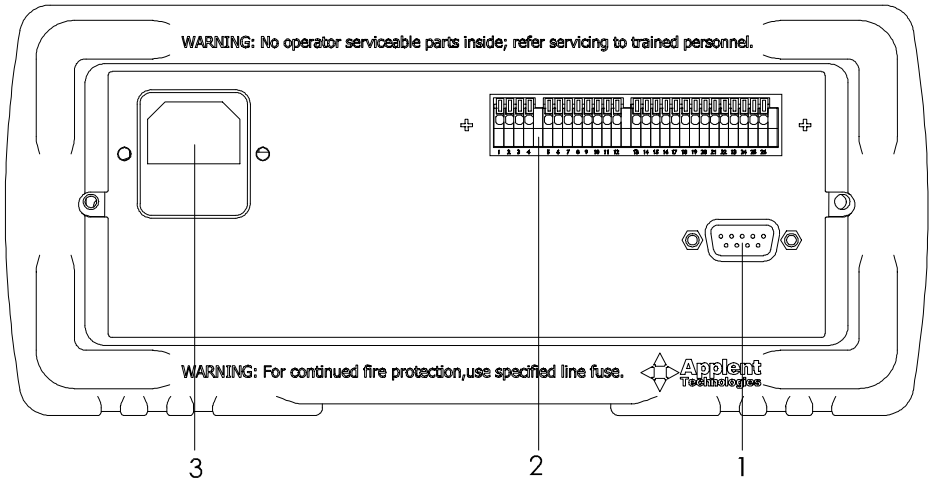
Figure 3-4 VFD



	Applent's Trade Mark.
	Remote Control Indication.
	Beep is ON.
AUTO	Range automatic indication.
REL	Relative function is ON.
NG	Fail.
GD	Good.
Hi	Above the upper limit value.
IN	Pass.
Lo	Blow the lower limit value.
COMP	Comparator function is ON.
SET	Setup comparator status.
HIGH	Upper limit value.
LOW	Lower limit value.
	Keypad Locked.
DH	Data Hold.
LEVEL	Test Current Mode
EX	External Trigger Mode.
TRIG	Manual Trigger Mode.
F M S	Speed: Fast, Medium and Slow.
DELAY	The function is invalid in the version.
RANGE Rec.	Display Range number in the measurement status and display the sorting number in the comparator setup status.
Shift	Shifted to the 2nd Function.

3.2 Rear Panel

Figure 3-5 Real Panel



1. RS232C interface.
2. Handler interface.
3. AC power cord receptacle and fuse holder

3.3 Power Up

3.3.1 Line Power Connection

 Power ON.  Power OFF.

3.3.2 Power-up Sequence :

AT510x is power up, it performs self-tests on its Flash-Rom, RAM and momentarily lights all segments and indicators. If a failure is detected, the instrument will not enter the measurement state.

3.3.3 Power-up Defaults

The power-on default will be the last configuration you saved.

3.3.4 Warm-up Time

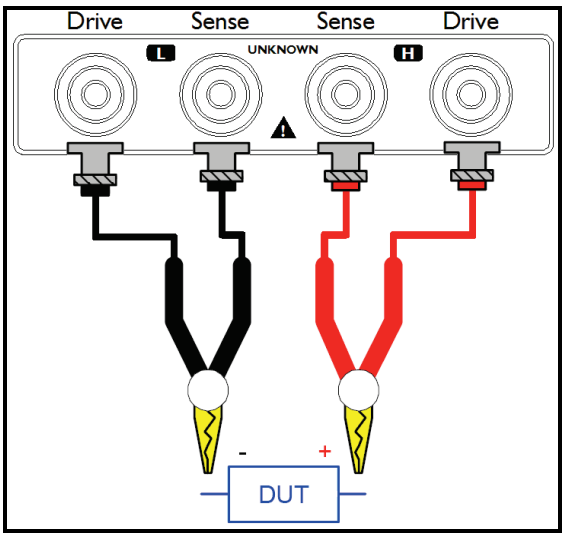
AT510x is ready to be used as soon as the power-up sequence has completed. However, to achieve the accuracy rating, warm up the instrument for 30 minutes.

3.4 Measurement configuration

3.4.1 Connection Test side

Red logo testing BNC cables into the H in the first rotation;
black logo testing BNC cables into the L in the first rotation.
Red cable to test the high-pot
Black cable to test the low-pot

Figure 3-6 Connect to DUT



Warning:
No putting current source, voltage source directly access test side. Energy storage device access to testing after discharging.

3.4.2 Test Current Modes

In the 2nd function status, press Current Mode to select: High Current Mode—Low Current Mode—Plus Current Mode.
The present current mode displays in the 3rd line.

H-CUR	High Current Mode
L-CUR	Low Current Mode
P-CUR	Plus Current Mode

Detailed test current modes see Appendix A.

3.4.3 Range

In the automatic range status, AT510x will choose the fit range by the following table:

Table 3-4 Range no., reference Resistance and Range change process（AT510Pro）

NO.	Reference Resistance	Up	Down
1	10mΩ	↓ 30mΩ	↑ 29mΩ
2	100mΩ	↓ 300mΩ	↑ 290mΩ
3	1Ω	↓ 3Ω	↑ 2.9Ω
4	10Ω	↓ 30Ω	↑ 29Ω
5	100Ω	↓ 300Ω	↑ 290Ω
6	1kΩ	↓ 3kΩ	↑ 2.9kΩ
7	10kΩ	↓ 30kΩ	↑ 29kΩ
8	100kΩ	↓ 300kΩ	↑ 290kΩ
		↓ 3MΩ	↑ 2.9MΩ
		↓	↑

9	1MΩ		
10	10MΩ		

Press Range ◁ ▷ keys to choose the fit range.

Tip：

Range Hold is help increasing the measurement rate..
In the "automatic range" status, the meter should be calibration (zeroing) when it can't choose the fit Range.
Full calibration (Zeroing) in the "Calibration".

In the range hold status ("AUTO" indication is OFF), the meter will choose the fit range by the upper limit value.

3.4.4 Speed

Press Rate key to choose the following speed:
Fast: Fast Sampling
Medium: Medium Sampling
Slow: Slow Sampling

Full Sampling Speed in the Appendix A.

3.4.5 Calibration (Short Zeroing)

1 Press Clear key to the Clearing status and make the test clips short-circuit like the following way before zeroing.

Figure 3-7 Right Way

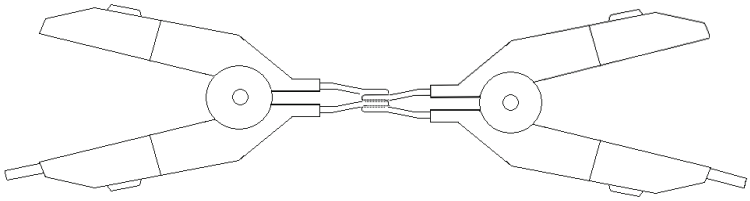
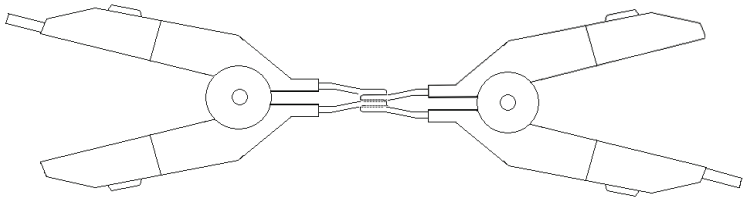


Figure 3-8 Wrong Way



2 Press Enter key to Calibration.The meter zeroing all ranges in the automatic range or the present range in the hold range.
Data will be saved in the nonvolatile memory when zeroing is over.
3 Press Esc or when zeroing is over, return to the measurement status.

3.4.6 Relative Value for Temperature Compensation

AT510pro, AT510 (Standard), AT510se (Optional), AT510L, AT510M (invalid)
Press Shift Relative key to Turn ON/OFF the relative function. The REL indicator is OFF; the value is the real measurement value.

3.4.7 Δ-Δ% (The function is invalid in the version.)

3.4.8 Keypad Locked

Press Shift Key Lock key to lock/unlocked the keypad.
The Key Lock key is only available and the other keys are in vain when the keypad is locked.

Indicator lighted means the keypad is locked.

3.4.9 20mV limit（ The function is invalid in the AT510x's version.）

The function is invalid in the AT510x's version.

3.4.10 Temperature Correction Function

AT510PRO, AT510: Standard function.AT510SE: Optional function.AT510L/510M: Invalid function.

The temperature probe is plugged into the jack, the function is enabled.

Resistance value of temperature compensation works when the meter is equipped with temperature probe temperature.

When the temperature probe is properly plugged into the jack and turn on the meter, the temperature value will display in the 2nd line.

Press Shift Relative keys to turn ON/OFF temperature relative function. The REL indication is ON, the function works.

Input temperature coefficientα:

1. Press Shift Relative keys to input password "11111"（5 digits）and setup the α.
2. For example, copper material temperature coefficient of 20 ℃ is 0.00393,enter 0.393%.
3. Press Shift Relative keys to input password"22222"(5 digits)and setup temperature status.
4. Press number keys to input the temperature value. The normal relative temperature is room-temperature (20°C).

Compensation formula：

$$F2 = \frac{100 + \alpha \times (T - To)}{100} \times F1$$

T0 — Reference temperature（take 20℃）

T — Current temperature

α— Temperature coefficient of reference temperature

F1 — Without compensation value

F2 — Temperature compensated value

3.4.11 Remote Control

Remote control function is used for opening series communication interface.

The indication is ON,Remote control function is ON.

1. Press Shift +Remote to the Remote control status.
2. Select RS-232 and setup Bond rate..(Normal: 9600)
3. Press Esc key to the measurement status.
4. Press Enter key to save and exit.

3.4.12 Adjust VFD Brightness

Press Shift Brightness key to adjust VFD Brightness.

The first line of VFD displays "VFD-LT" and the 2nd line shows current brightness level.

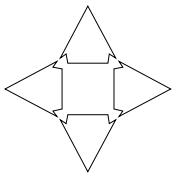
Press <, > or turn the Knob to change a new level.

Press Enter to save and exit to discharge state. Press Esc to exit to discharge state but not be saved.

Brightness includes 8 levels:

0(dark) ~ 7(bright)

4. Comparator



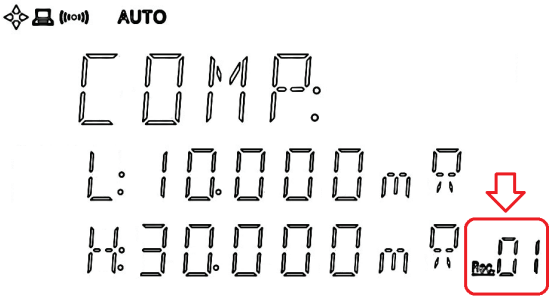
This chapter provides the following information:

- Turn ON/OFF
- Setup comparator record number file
- Setup nominal value and limit value
- Setup Beep

4.1 Turn ON/OFF Comparator

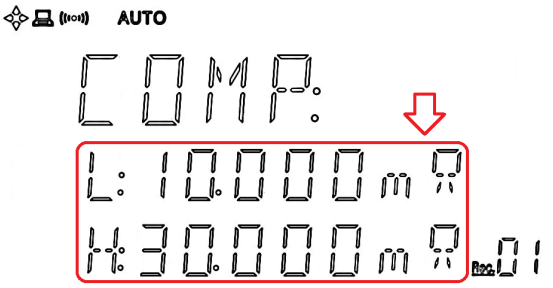
AT510X's comparatorcan be turned OFF by pressing Comp key.
When the comparator function is OFF, sorting system will no longer work and the Handler interface signals on the comparator output will be shut down.

4.1.1 Setup Comparator Record File Number（ invalid at AT510L/AT510M version）



1. Press Shift Comparator to the setup comparator.
2. Rec.09 indicator at the lower right corner of screen flashes means you can setup record number.
3. Press ◁ ▷or twist knob to choose the record number which built-in 30 files.
4. Press digits to input value.
   a. Press Enter to input nominal value and limit value.
   b. Press Esc to exit setup comparator and the record file is saved.

4.1.2 Setup nominal value and limit value



1. Press Comparator key to the setup comparator status.
2. Repeat steps from 2-3 and press Enter to input the comparator status and the digits are blink.
3. Press ◁ ▷ keys or twist knob to choose the resistance's nominal value (1st line), upper limit value (2nd line) and lower limit (3rd line)
4. Press digit number keys or Enter key to input the value.
5. Press Enter key orShift + Unit keys to input the current value.
6. Repeat steps from 3~5 to input the other values.
7. PressEsckey to exit the setup and return the measurement status.

TIP：

Using skill: The present value is flashed ,you can press digits to input the value directly and it's not necessary to press the Enter key first to enter the input status.

NOTE: In the number input status, press Enter key, the unit is 1.
For example: 10+Enter :input value is :10Ω。

In the range hold status (“AUTO” indication is OFF), Meter will select the range by the upper limit value when it is exit setup status.

4.1.3 Turn ON/OFF Beep

Press Beep key to turn ON/OFF beep function.

Indication is ON, the beep function is ON.

4.1.4 Setup Beep

1. Press Shift + Beep keys to the beep setup status.
2. Twist the Knob to choose: GD(Pass), NG(Fail).
3. Press Esc key to exit the setup and back to the measurement state.
4. Press Enter key to end the setup and back to the measurement status.

4.1.5 Flow of comparator work

When the comparator function is enabled, the measure value compares with the upper limit and the lower limit values.

Sorting Flow:

Limit Lower value ≤ Rx ≤ Upper Limit	Pass	Display GD and IN
Rx < Limit Lower value	Fail	Display NG and LO
Rx > Limit Upper value	Fail	Display NG and HI

5. Handler Interface

Note: AT510PRO/AT510 (Standard interface), AT510SE/510L/510M(Optional interface).

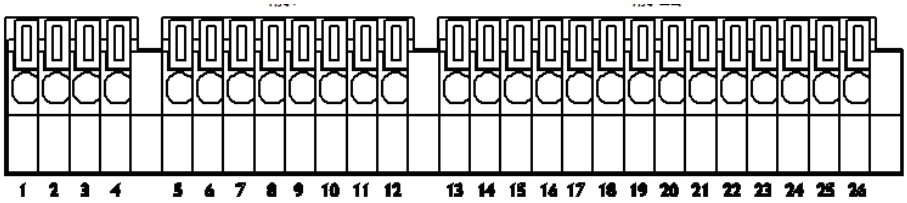
This chapter provides information of AT510x's built-in handler interface. Include:

- Pin Assignment
- Circuit Diagram
- Timing Chart

The AT510x's built-in handler interface outputs signals that indicate the end of a measurement cycle, the result of bin sorting by the comparator. In addition, the instrument accepts input of external trigger. You can use these signals to easily integrate the AT510x with system controller.

5.1 Pin Assignment

Figure 5-1 Pin Assignment



■ Power Supply

PIN	Signal	Description
1	NC	Unused
2	EXT.DC+5V	External DC Voltage: +5V.
3	GND	Power ground.
4	NC	Unused

■ External control signal input

5	TRIG	An external trigger signal
6	NC	Unused
7	NC	Unused
8	COMP.4	Comparator record files.
9	COMP.3	Built-in 30 files.
10	COMP.2	
11	COMP.1	
12	COMP.0	

■ Comparator record files

COMP 4-0	NO.	COMP 4-0	NO.	COMP 4-0	NO.	COMP 4-0	NO.
11111	Unchanged	10111	7	01111	15	00111	23
11110	0	10110	8	01110	16	00110	24
11101	1	10101	9	01101	17	00101	25
11100	2	10100	10	01100	18	00100	26
11011	3	10011	11	01011	19	00011	27
11010	4	10010	12	01010	20	00010	28
11001	5	10001	13	01001	21	00001	29

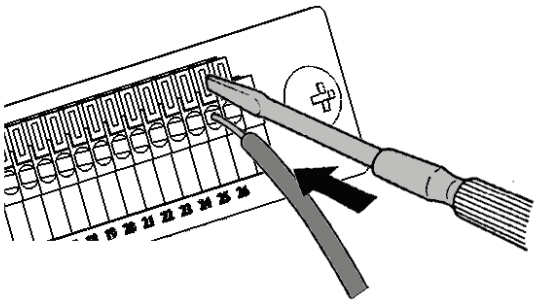
11000	6	10000	14	01000	22	00000	Unchanged

■ External signal output

13	NC	Unused
14	NC	Unused
15	NC	Unused
16	NC	Unused
17	NC	Unused
18	NC	Unused
19	Lo	"Parameter below lower limit" signal. This signal is output when the parameter is below the lower limit.
20	IN	Output the Pass signal.
21	Hi	"Parameter beyond upper limit" signal. This signal is output when the parameter has above the upper limit.
22	GD	Output the Pass signal.
23	NG	Output the Fail signal.
24	NC	Unused
25	NC	Unused
26	EOC	"End of measurement cycle" signal. When this signal is output, the measurement data and sorting results are available.

5.2 Connection method

Figure 5-2 How to insert the cables



Step1: Push down the button with an appropriate tool, such as a flathead screw driver
Step2: With the button pushed down, insert the cables into the holes
Step3: Release the button and the cables secured.

Recommended wire: Single strand 0.65mm dia.(AWG #22)
Multi-strand 0.32 mm^2. (AWG #22)
Usable limits: Single strand 0.32 to 0.65mm dia.
Multi-strand 0.08 to 0.32mm^2.
Standard insulation stripping length: 10mm
Button pressing tool: Blade screwdriver (shaft diameter ϕ3, tip width 2.6mm)

- To prevent damage to the handler, avoid applying voltage or current exceeding the rated value.
- In order to avoid electric shock, turn off the instrument power before plugging in or plugging any of the interface connectors.
- AT520 handler output signal CAN NOT drive relay. If you need to connect a relay, use external transistor to drive.
- Avoid short-circuiting the external output and control terminals.

5.3 Power Rating

	Input/Output device	Logic	Electrical requirements
OUTPUT	Corrector out with	Negative logic	35VDC

	pull-up resistance		50mADC max
INPUT		Negative logic	50mADC max
EXT.DCV	DC voltage input		35VDC max

5.4 Electrical Characteristics

5.4.1 Input Signal:

Each input signal is connected to the LED (cathode side) of the photo-coupler. The LED (anode side) is connected to the pull-up power supply voltage.

5.4.2 Output Signal:

Each output signal is outputted via a open collector by using a photo-coupler. The voltage of each output is obtained by connecting pull-up resistors, inside or outside of the AT520.

5.4.3 Power supply

The power supply for the judgment output signal pull-up and that for the operation output signal pull-up and input signal drive can be set separately. You can select from +3.3V to +35V external power supply.

Figure 5-3 Typical Circuit Diagram of Handler Interface Input signals.

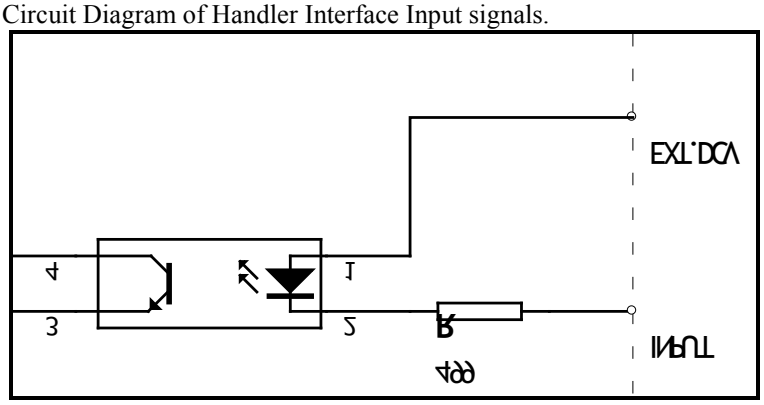
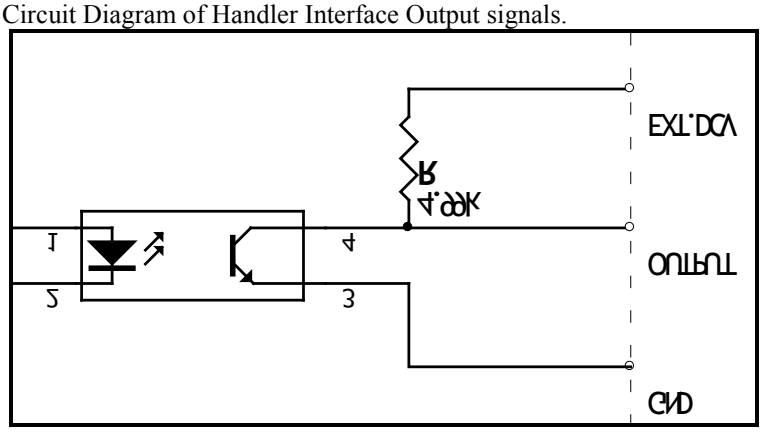
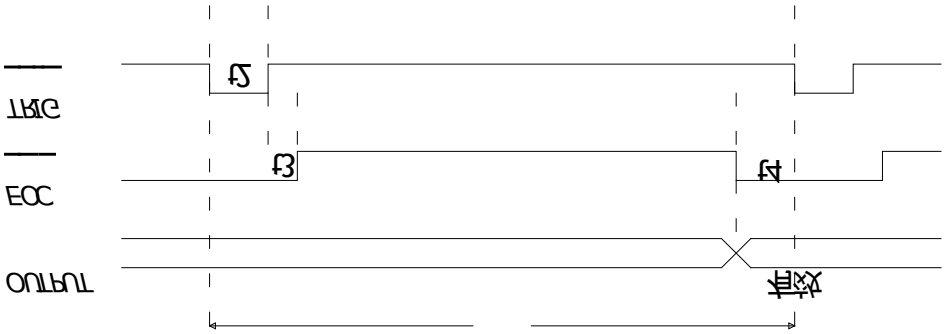


Figure 5-4 Typical Circuit Diagram of Handler Interface Output signals.

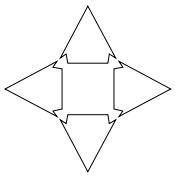


5.5 Timing Chart



t1 Measurement time: Fast: 66.7ms , Medium : 200ms , Slow : 330ms
t2 μs
t3 μs200
t4 μs

6. Specification



Appendix provides the following information:

- Feature Index
- General Specification
- Dimensions

The following data are measured under the following conditions：
Temperature：23℃±5℃
Humidity: <=80% R.H
Correction：Short Zeroing
Warm up：60 minutes and more
Calibration Time：6 months

6.1 High Current Test Mode

Sample Speed：
Fast： 60 meas/sec
Medium： 15 meas/sec
Slow： 2meas/sec

AT510PRO:

Range		Maxim Display Value	Resolution	Fast	Medium & Slow	Test Current	Open-circuit terminal voltage
1	**30mΩ**	30.000mΩ	1μΩ	0.1%	0.1%±5	670mA	<1V
2	**300mΩ**	300.00mΩ	10μΩ	0.1%	0.05%±2	670mA	<1V
3	**3Ω**	3.0000Ω	100μΩ	0.1%	0.05%±2	67mA	<1V
4	**30Ω**	30.000Ω	1mΩ	0.1%	0.05%±2	6.7mA	<1V
5	**300Ω**	300.00Ω	10mΩ	0.1%	0.05%±2	670uA	<5V
6	**3kΩ**	3.000kΩ	100mΩ	0.1%	0.05%±2	670uA	<5V
7	**30kΩ**	30.000kΩ	1Ω	0.1%	0.05%±2	67uA	<5V
8	**300kΩ**	300.00kΩ	10Ω	0.1%	0.05%±2	6.7uA	<5V
9	**3MΩ**	3.0000MΩ	100Ω	0.1%	0.05%±2	0.67uA	<5V
10	**20MΩ**	20.000MΩ	1kΩ	0.1%±3字	0.1%±5		<3V

AT510:

Range		Maxim Display Value	Resolution	Fast	Medium & Slow	Test Current	Open-circuit terminal voltage
1	**30mΩ**	30.000mΩ	1μΩ	0.1%	0.1%±5	670mA	<1V
2	**300mΩ**	300.00mΩ	10μΩ	0.1%	0.05%±2	670mA	<1V
3	**3Ω**	3.0000Ω	100μΩ	0.1%	0.05%±2	67mA	<1V
4	**30Ω**	30.000Ω	1mΩ	0.1%	0.05%±2	6.7mA	<1V
5	**300Ω**	300.00Ω	10mΩ	0.1%	0.05%±2	670uA	<5V
6	**3kΩ**	3.000kΩ	100mΩ	0.1%	0.05%±2	670uA	<5V
7	**30kΩ**	30.000kΩ	1Ω	0.1%	0.05%±2	67uA	<5V
8	**300kΩ**	300.00kΩ	10Ω	0.1%	0.05%±2	6.7uA	<5V
9	**3MΩ**	3.0000MΩ	100Ω	0.1%	0.05%±2	0.67uA	<5V

AT510SE

Range		Maxim Display Value	Resolution	Fast	Medium & Slow	Test Current	Open-circuit terminal voltage
1	300mΩ	300.00mΩ	10μΩ	0.05%+4	0.05%+2	670mA	<1V
2	3Ω	3.0000Ω	100μΩ	0.05%+4	0.05%+2	67mA	<1V
3	30Ω	30.000Ω	1mΩ	0.05%+4	0.05%+2	6.7mA	<1V
4	300Ω	300.00Ω	10mΩ	0.05%+4	0.05%+2	670uA	<5V
5	3kΩ	3.000kΩ	100mΩ	0.05%+4	0.05%+2	670uA	<5V
6	30kΩ	30.000kΩ	1Ω	0.05%+4	0.05%+2	67uA	<5V
7	300kΩ	300.00kΩ	10Ω	0.05%+6	0.05%+3	6.7uA	<5V

AT510L

Range		Maxim Display Value	Resolution	Fast	Medium & Slow	Test Current	Open-circuit terminal voltage
1	30mΩ	30.000mΩ	1μΩ	0.1%+4	0.1%+5	670mA	<1V
2	300mΩ	300.00mΩ	10μΩ	0.1%+4	0.1%+2	670mA	<1V
3	3Ω	3.0000Ω	100μΩ	0.1%+4	0.1%+2	67mA	<1V
4	30Ω	30.000Ω	1mΩ	0.1%+4	0.1%+2	6.7mA	<1V
5	300Ω	300.00Ω	10mΩ	0.1%+4	0.1%+2	670uA	<5V
6	3kΩ	3.000kΩ	100mΩ	0.1%+4	0.1%+2	670uA	<5V
7	30kΩ	30.000kΩ	1Ω	0.1%+4	0.1%+2	67uA	<5V

AT510M

Range		Maxim Display Value	Resolution	Fast	Medium & Slow	Test Current	Open-circuit terminal voltage
1	30Ω	30.000Ω	1mΩ	0.1%	0.1%±2	6.7mA	<1V
2	300Ω	300.00Ω	10mΩ	0.1%	0.1%±2	670uA	<5V
3	3kΩ	3.000kΩ	100mΩ	0.1%	0.1%±2	670uA	<5V
4	30kΩ	30.000kΩ	1Ω	0.1%	0.1%±2	67uA	<5V
5	300kΩ	300.00kΩ	10Ω	0.1%	0.1%±2	6.7uA	<5V
6	3MΩ	3.0000MΩ	100Ω	0.1%	0.1%±2	0.67uA	<5V
7	20MΩ	20.000MΩ	1kΩ	0.1%±3字	0.1%±5	-	<3V

6.2 Low Current Test Mode(AT510PRO/AT510)

Only for range 300mΩ ~3kΩ, other rangs are the same as High Current Mode
Sample Speed：

Fast： 60 meas/sec
Medium： 15 meas/sec
Slow： 2 meas/sec

Range		Maxim Display Value	Resolution	Fast ,Medium & Slow	Test Current	Open-circuit terminal voltage
2	300mΩ	300.00mΩ	10μΩ	0.1%±5	67mA	<1V
3	3Ω	3.0000Ω	100μΩ	0.1%±5	6.7mA	<1V
4	30Ω	30.000Ω	1mΩ	0.1%±5	670uA	<1V
5	300Ω	300.00Ω	10mΩ	0.1%±5	67uA	<1V
6	3kΩ	3.000kΩ	100mΩ	0.1%±5	67uA	<1V

6.3 Plus Current Test Mode (AT510PRO/AT510)

Only for range below 300Ω, other ranges are the same with High Current.
Sample Speed：

Fast： 3 meas/sec
Medium：2 meas/sec
Slow：1meas/sec

Range		Maxim Display Value	Resolution	Fast	Medium & Slow	Test Current	Open-circuit terminal voltage
1	30mΩ	30.000mΩ	1μΩ	0.1%±5	0.1%±5	670mA	<1V
2	300mΩ	300.00mΩ	10μΩ	0.05%±5	0.05%±5	67mA	<1V
3	3Ω	3.0000Ω	100μΩ	0.05%±5	0.05%±5	6.7mA	<1V
4	30Ω	30.000Ω	1mΩ	0.05%±5	0.05%±5	670uA	<1V
5	300Ω	300.00Ω	10mΩ	0.05%±5	0.05%±5	67uA	<1V

6.4 General Specification

Displayer： Vacuum Fluorescent Display,Size: 98mmx55mm.
Parameters： Direct reading，(ΔABS)，(Δ%) and Sorting Results..
Resistance Range： 0.001mΩ ~ 20MΩ ， Resolution：1μΩ。
Maxim Display Value: 30000
Test Signal： 30mΩ~300kΩ (Constant Current), 2MΩ~20MΩ (Constant Voltage).
Trigger Mode： Internal, External and Remote.
Range： Automatic and Range Hold
Correction： Short Zeroing
Comparator： Output NG-LO, GD-IN, NG-HI，built-in 30 sorting files.
Beep： GD、NG、Open/Close Function and Adjust volume.
Test Terminal： 4 terminals with ground shielding.
Interface： Handler interface (AT510PRO/AT510/AT510SE)
RS232 interface (AT510PRO/AT510/AT510SE)
Programmed Language： SCPI

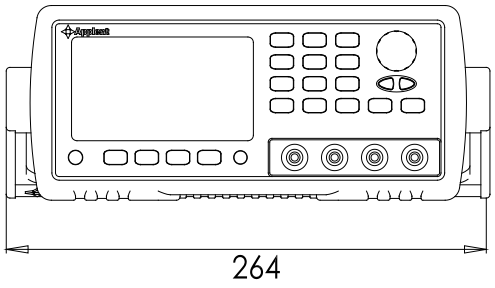
Environment： Index： T & H: 15℃~35℃, <=80% RH
Operating： T & H: 10℃~40℃, 10~90% RH
Storage： T & H: 0℃~50℃, 10~90% RH

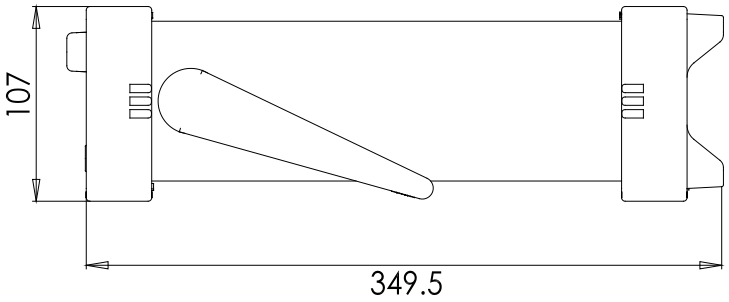
Power： 198V ~ 252VAC, 48.5Hz ~ 52.5Hz
Fuse： 0.5A ,Slow-Blow
Consumption： <15VA

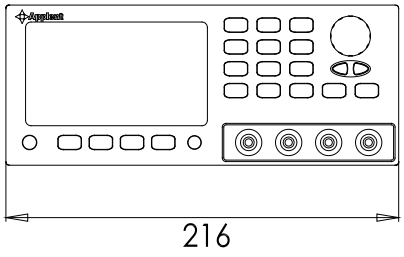
Weight： 3.5kg Net

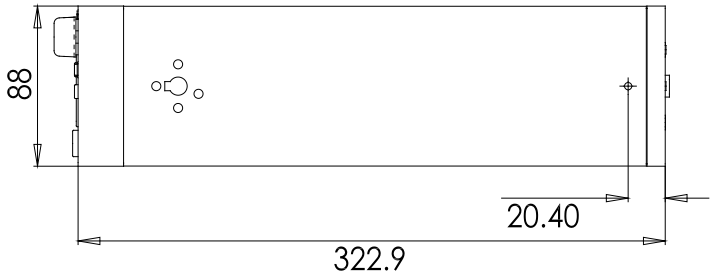
Included Accessories： User's Manual, ATL501 Kelvin Test Leads, AC Power Cord and Warranty Certification.

6.5 Dimensions

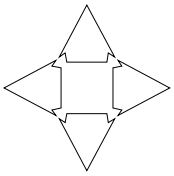








7. Models



This chapter provides the information of AT510x models.

	AT510PRO	AT510	AT510SE	AT510L	AT510M
Resistance Range	1μΩ - 20MΩ	1μΩ - 3MΩ	10μΩ - 300kΩ	1μΩ - 30kΩ	100μΩ - 20MΩ
Basic Accuracy	30mΩ: 0.1% 20MΩ: 0.1% Others：0.05%	30mΩ: 0.1% Others：0.05%	0.05%	0.1%	0.1%
Range	10 Ranges 30mΩ-20MΩ	9 Ranges 30mΩ-3MΩ	7 Ranges 300mΩ-300kΩ	7 Ranges 30mΩ-30kΩ	8 Ranges 3Ω-20MΩ
Trigger Mode	Internal/Manual/External/Remote		Internal/Manual	Internal/Manual	Internal/Manual
Test Current Mode	High/Low/Plus			High	High
Comparator Record File	30 Files			1 File	1 File
Temperature Relative Function	Standard			Optional	
Interface	RS232C HANDLER		RS232C(Optional) HANDLER(Optional)		
Comparator	Hi/IN/Lo/GD/NG				
Range Mode	Automatic/Range Hold				
Display	30000 digitals (4-2/3) VFD Display				
Beeper	GD/NG/OFF, adjust the volume				
Correction	Short Zeroing				
Test Terminal	4-terminals Test				

Applent Instruments

AT510PRO/510/510L/510M/510SE User's Manual
English