

User's Guide

Rev.A2

FIRMWARE REVISIONS

This manual applies
directly to instruments
that have the firmware
Rev.A.x

AT2511/511C

DC Low Resistance Meter



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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.
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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.
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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.
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**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.

CERTIFICATION, 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.

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. APPLMENT 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,
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Contents

Safety Summary	2
CERTIFICATION, LIMITED & LIMITATION OF LIABILITY	3
Contents	4
Figure Contents	5
Table Contents	5
1. Unpacking and Inspection	6
1.1 Packing List	6
1.2 Power Supply Requirements	6
1.3 Setting up the Fuse	7
1.4 Environmental Requirements	7
1.5 Cleaning	7
2. Overview	8
2.1 Introduction	8
2.2 Models Introduction	8
2.3 Main Specifications	8
2.4 Features Overview	9
3. Start up	10
3.1 Front Panel	10
3.1.1 Front panel description	10
3.1.2 Keypad	10
3.1.3 Rear panel description	11
3.2 Power ON/OFF	11
3.2.1 Power up	11
3.2.2 Warm-up time	11
3.3 Connect to Device under Test	11
3.3.1 Connection of test side	11
3.4 Select Test Speed	12
3.5 Select Range	12
3.6 Clear Zero	13
3.7 SETUP Menu (only available for AT2511)	14
3.7.1 Turn on comparator	15
3.7.2 Uper and lower limit Setup	15
3.7.3 Beep Setup	15
3.7.4 How the comparator work	15
4. Specification	16
4.1 Technical Specifications	16
4.2 General Specifications	16
4.3 Dimension	17

Figure Contents

Figure 3-1 Front panel	10
Figure 3-2 Rear panel	11
Figure 3-3 Definition of test terminal pin.....	11
Figure 3-4 Right way	13
Figure 3-5 Wrong way	14
Figure 3-6 Setup Menu	14
Figure 4-1 dimension	17

Table Contents

Table 1-1 Included Accessories.....	6
Table 3-1 Range no., reference Resistance and Range change process.....	13
Table 3-2 AT511C Range no., reference Resistance and Range change process.....	13
Table 4-1 AT2511 specification table	16
Table 4-2 AT511C specification table.....	16

1. Unpacking and Inspection

Thank you for purchasing our product, please refer to this chapter before using the instrument. This chapter describes how to set up and start the AT2511/511C DC Low Resistance Meter.

- Packing List
- Power Supply Requirements
- Setting up the Fuse
- Environmental Requirements
- Cleaning

1.1 Packing List

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

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 options.

Before using the instrument, please:

Table 1-1 Included Accessories

NAME	QTY	REMARK
User's Manual	1	
AC Power Cord	1	220V/50Hz
Fuse	2	0.5A Slow-Blow
ATL503 Kelvin Test Leads	1	
Test Report	1	
Product & Warranty Certification	1	

If there is damaged or shortage in accessories, please contact Applent Sales Department or retailer.

1.2 Power Supply Requirements

Confirm that the power supplied to the AT2511/511C meets the following requirements:

Voltage : 198-252V AC

Frequency : 47.5-52.5Hz

Consumption : <15VA



To prevent electrical shock, please connect to GND.
If users change power cord, please make sure reliable connection of GND.

1.3 Setting up the Fuse

A spare fuse is included with the accessories, the fuse is located on the instrument's rear panel, please refer to Rear Panel section in Chapter 3



Please use the following fuse type :
250V, 0.5A Slow-Blow

1.4 Environmental Requirements

Ensure that AT2511/511C is operated under the following environment:

Temperature Range: 0°C ~ 55°C ,

Humidity Range: <95%RH at 40°C

1.5 Cleaning

To prevent electrical shock, disconnect the AT2511/511C 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 AT2511/511C internally.



WARNING:

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

2. Overview

This chapter provides the following information:

- Introduction
 - Models Introduction
 - Main Specifications
 - Features Overview
-

2.1 Introduction

Thank you for purchasing AT2511/511C DC Low Resistance Meter.

AT2511 is a resistance meter with high-cost performance and small volume, it is the upgrade version of AT511A,

AT2511 has wider measurement range compared with previous products: $0.01\text{m}\Omega\sim 200.0\text{k}\Omega$, Max reading 5000 dgts. The fastest test speed is 10t/s and with stable reading. The improved full-automatic range test circuit, full-electronic switch make the possibility of completing switch from the highest range to the lowest range.

AT2511/511C adopts 0.8 inches highlight LED display, which makes the display clearer and easier to operate.

AT2511's built-in sorting function enable users to perform upper and lower limit comparison.

AT2511/511C adopts superior low current test feature, it is quite suitable for measuring resistance that is sensitive for test current, such as platinum thermistor, cooper thermistor, PTC ceramic thermistor, wire type DC resistance, DC resistance for current protective device, etc.

AT2511/511C is also suitable for testing various kinds of contact resistance, transformers, inductors, motors, deflecting coiling resistance, welding contact conductor resistance, the metal riveting resistance of vehicles, boats, airplanes, printed circuit lines and crack detection and so on.

2.2 Models Introduction

Model	Resistance Range	Range NO.	Comparator	Accuracy
AT2511	$0.01\text{m}\Omega\sim 200.0\text{k}\Omega$	8 Ranges	Available	0.2%
AT511C	$0.1\text{m}\Omega\sim 50.00\text{k}\Omega$	6 Ranges	None	0.3%

2.3 Main Specifications

The AT2511/511C technical specifications, including the basic technical specifications of the instrument and equipment testing allows. These specifications are in the instrument factory can achieve.

Reference : Please refer to Chapter 4 for complete technical specifications.

- Basic accuracy : 0.2% (AT2511) 0.3% (AT511C)
- Maximum display digits: 5000
- 8 ranges AUTO and Manual (AT2511)
Provide resistance range $0.01\text{m}\Omega \sim 200.0\text{k}\Omega$, full-electronic switch control, no limitation for lifetime, complete switching range instantly.
- Test speed :
Fast: 10t/s Slow: 3t/s
- Enhanced Shock resistance protection

2.4 Features Overview

- 0.8 inches big characters and highlight LED display
- Full-automatic measurement and provide manual range
- Comparator function (AT2511)
- Short-circuit zero adjust for each range

3. Start up

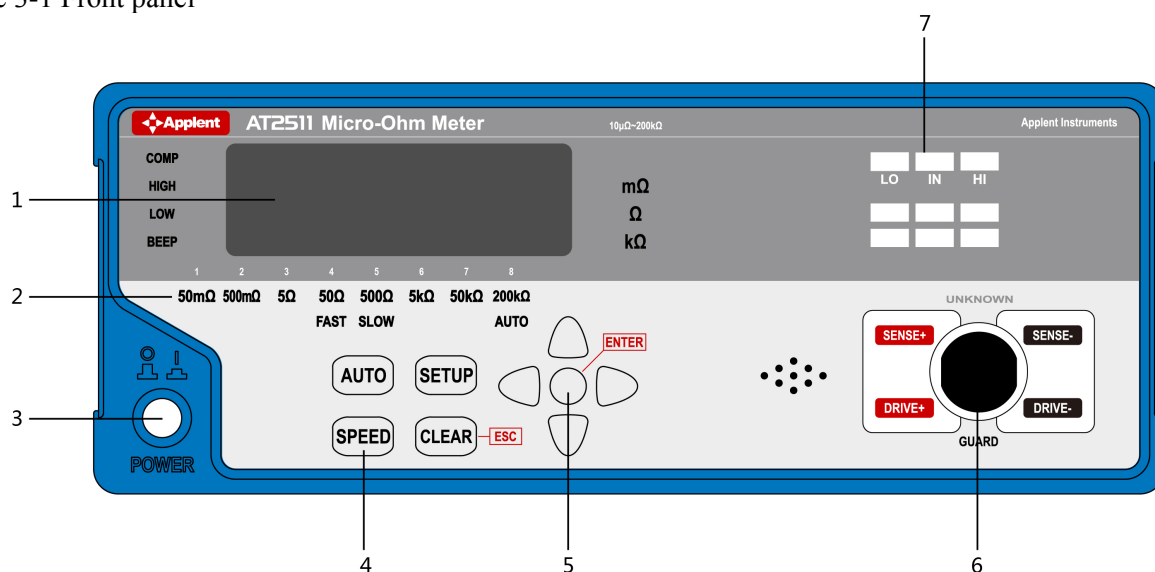
This chapter provides the following information:

- Front Panel Summary
- Rear Panel Summary
- Power ON/OFF
- Connect to Device under Test

3.1 Front Panel

3.1.1 Front panel description

Figure 3-1 Front panel



1	Display Window 0.8 inches LED display measuring result
2	Function Indicator Range Number, Test Speed and AUTO Range Indicator
3	Power Switch Down : ON; Up : OFF.
4	Function Key
5	Direction key
6	Tested Terminal
7	Comparison Indicator (AT511C NONE)

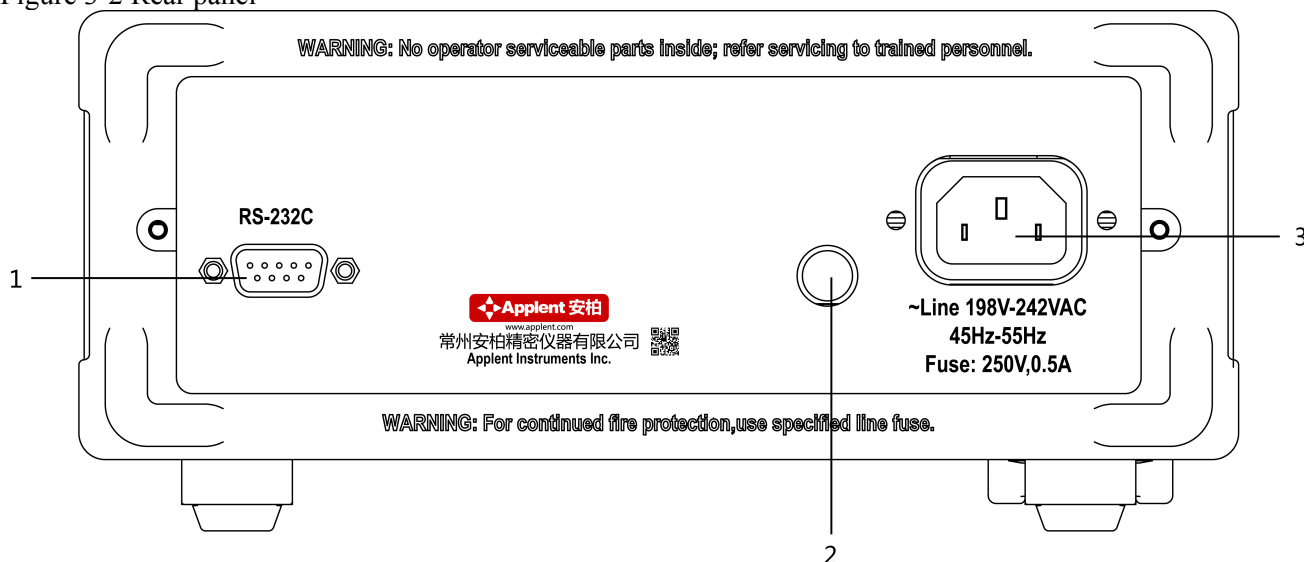
3.1.2 Keypad

- AUTO** Switch AUTO and Manual Range
When AUTO indicator is lit, it means range is AUTO.
- SPEED** Select test speed
- SETUP** Setup Menu for comparator SETUP (AT2511) .

Clear Perform short-circuit zero calibration.

3.1.3 Rear panel description

Figure 3-2 Rear panel



1	RS232C. Reserved port, this version does not use.
2	Fuse Holder 250V, 0.5A fuse
3	AC Power Cord Receptacle 198V~242VAC, 45Hz~55Hz

3.2 Power ON/OFF

3.2.1 Power up



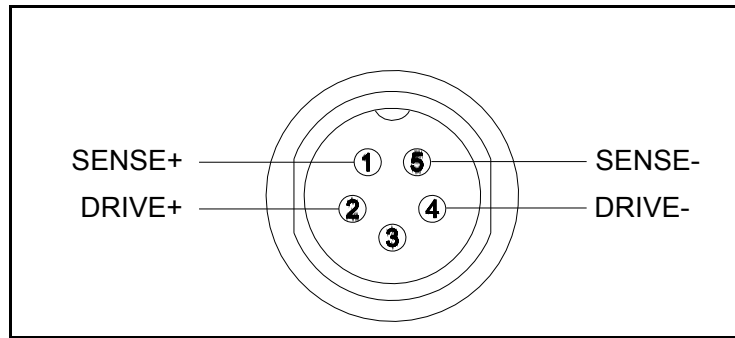
3.2.2 Warm-up time

AT2511/511C 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 15 minutes.

3.3 Connect to Device under Test

3.3.1 Connection of test side

Figure 3-3 Definition of test terminal pin



To make sure instrument's accuracy, please use the "Kelvin Test Clip" that follows the instrument to test.

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

3.4 Select Test Speed

2 test speed is available for the instrument:

Slow: 3 t/s

Fast: 10 t/s

Press **Speed** key, switch speed, correspond indicator indicates current speed.

3.5 Select Range

Under status of AUTO range, the AUTO indicator is lit, and the range indicator indicates the current range.

AT2511 will choose the fit range to measure according to the following table:

Table 3-1 Range no., reference Resistance and Range change process

NO.	Reference Resistance		
1	50mΩ		
2	500mΩ	50mΩ ↓	49mΩ ↑
3	5Ω	500mΩ ↓	490mΩ ↑
4	50Ω	5Ω ↓	4.9Ω ↑
5	500Ω	50Ω ↓	49Ω ↑
6	5kΩ	500Ω ↓	490Ω ↑
7	50kΩ	5kΩ ↓	4.9kΩ ↑
8	200kΩ	200kΩ	49kΩ

AT511C will choose the fit range to measure according to the following table:

Table 3-2 AT511C Range no., reference Resistance and Range change process

NO.	Reference Resistance		
1	500mΩ	↓	↑
2	5Ω	500mΩ ↓	490mΩ ↑
3	50Ω	5Ω ↓	4.9Ω ↑
4	500Ω	50Ω ↓	49Ω ↑
5	5kΩ	500Ω ↓	490Ω ↑
6	50kΩ	5kΩ	4.9kΩ

Press **AUTO** key can switch AUTO Range/ Range Hold

Use Manual Range can effectively improve test speed.

Tip : If instrument can't choose suitable Range under status of AOTO Range, please perform clear zero.

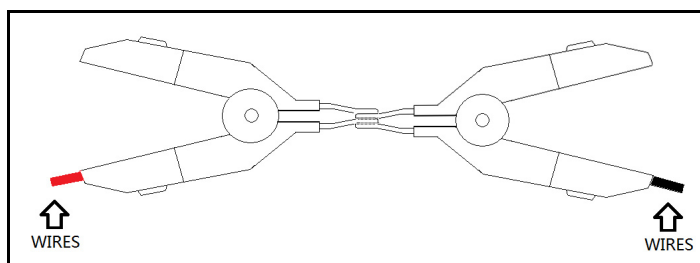
About clear zero operation, please refer to “clear zero” section.

3.6 Clear Zero

To achieve high accuracy measurement, clear zero in necessary.

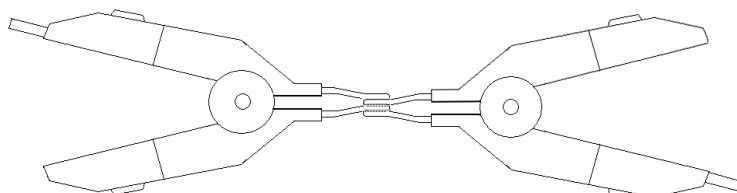
1. Press **Clear** key the Clearing status and make the test clips short-circuit like the following way before zeroing.

Figure 3-4 Right way



The following example is wrong !

Figure 3-5 Wrong way



2. Press ESC to retreat Clear, press **Enter** to begin clearing, the instrument will clear zero all ranges.
3. Data will be saved in the nonvolatile memory when zeroing is over.

Tip :

To reach instrument's specified accuracy, after the meter is warmed up and before using, we recommend users to perform Clear Zero.

When instrument is used with tremendous temperature change, performing clear zero is also recommended.

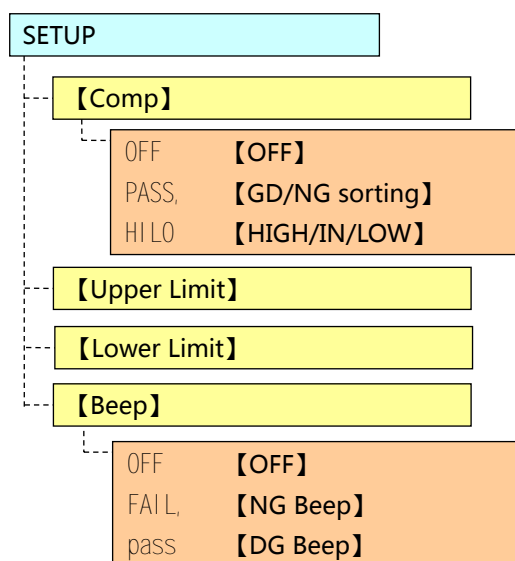
When instrument is used with different environment, we recommend users to perform Clear Zero.

3.7 SETUP Menu (only available for AT2511)

AT2511 built-in upper limit and lower limit comparator, comparator function is turned on by SETUP menu, setup upper limit, low limit and start beep indication.

Press **SETUP** key to enter SETUP menu:

Figure 3-6 Setup Menu



3.7.1 Turn on comparator

There are 2 ways for comparator to compare:

1. GD/NG compare. Under this way, instrument has 2 status indication: if exceeding upper and lower limit, it is regarded as NG; if within upper and lower limit, it is GD indication.
2. HI/LO compare. Under this way, instrument has 3 status indication: HIGH/IN/LOW

Steps of turning on comparator:

Step 1 Press **SETUP** key to enter SETUP page;

Step 2 Press **Enter** key to enter Comp page

Step 3 Use Up and Down key to choose

Item	Function
OFF	Comparator is turned off, beep and comparator indicator is turned off too.
PASS	2 comparator ways indicate simultaneously.
HILO	HIGH/IN/LOW compare mode. PASS/FAIL indicator will be turned off.

Step 4 Press **Enter** key to save setting, and return to SETUP page.

Or press **ESC** key to cancel current setting and return to SETUP page.

3.7.2 Upper and lower limit Setup

If comparator SETUP is turned on, users need to set correct comparator upper and lower value.

Steps of setting up comparator upper and lower limit:

Step 1 Press **SETUP** key to enter SETUP page;

Step 2 Press UP/DOWN key to choose correspond upper or lower limit menu;

Step 3 Press **Enter** key to enter INPUT page.

Step 4 Use left and right key to locator data area, decimal point and entity unit. Use UP and DOWN key to change numerical values, decimal place and unit value.

Step 5 Press **Enter** key to save setting and return to SETUP page.

Or press **ESC** key to cancel current setting and return to SETUP page.

3.7.3 Beep Setup

Instrument provides 2 types of beep: NG and GD beeps.

Steps of setting up beep:

Step 1 Press **SETUP** key to enter SETUP page;

Step 2 Press UP/DOWN key to choose Beep menu;

Step 3 Press **Enter** key to enter Comp menu;

Step 4 Use UP and DOWN key to choose

Item	Function
OFF	Beep is turned off.
FAIL	NG beep
PASS	GD beep

Step 5 Press **Enter** key to save setting and return to SETUP page.

Or press **ESC** key to cancel current setting and return to SETUP page.

3.7.4 How the comparator work

After comparator is turned on, current measurement value will be compared with upper value and lower value.

Comparator work flow:

Lower value < Refer < Upper value	PASS	Display IN (PASS)
Refer ≤ Lower value	LOW FAIL	Display LO (FAIL)
Refer ≥ Upper value	HIGH FAIL	Display HI (FAIL)

4. Specification

This chapter provides the following information:

- Technical Specifications
- General Specifications
- Dimension

4.1 Technical Specifications

The following data are measured under the following conditions:

Temperature: $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$

Humidity: $\leq 80\%$ R.H.

Zero Correction: Zeroing before testing

Warm up: 60 minutes and more

Calibration Time: 6 months

Sample Speed: Slow: 3 times/sec

Test current accuracy: 10%

Table 4-1 AT2511 specification table

	Range	Maxim Display Value	Resolution	Accuracy	Test Current	Open-circuit terminal voltage
1	50m Ω	50.0m Ω	10 $\mu\Omega$	0.2%+5 digits	100mA	<0.7V
2	500m Ω	500.0m Ω	100 $\mu\Omega$	0.2%+3 digits	100mA	<0.7V
3	5 Ω	5.000 Ω	1m Ω	0.2%+2 digits	100mA	<3V
4	50 Ω	50.00 Ω	10m Ω	0.2%+2 digits	10mA	<3V
5	500 Ω	500.0 Ω	100m Ω	0.2%+2 digits	1mA	<3V
6	5k Ω	5.000k Ω	1 Ω	0.2%+2 digits	100 μA	<3V
7	50k Ω	50.00k Ω	10 Ω	0.2%+3 digits	10 μA	<3V
8	200k Ω	200.0k Ω	100 Ω	0.2% \pm 5 digits	10 μA	<3V

Table 4-2 AT511C specification table

	Range	Maxim Display Value	Resolution	Accuracy	Test Current	Open-circuit terminal voltage
1	500m Ω	500.0m Ω	100 $\mu\Omega$	0.2%+3 digits	100mA	<0.7V
2	5 Ω	5.000 Ω	1m Ω	0.2%+2 digits	100mA	<3V
3	50 Ω	50.00 Ω	10m Ω	0.2%+2 digits	10mA	<3V
4	500 Ω	500.0 Ω	100m Ω	0.2%+2 digits	1mA	<3V
5	5k Ω	5.000k Ω	1 Ω	0.2%+2 digits	100 μA	<3V
6	50k Ω	50.00k Ω	10 Ω	0.2%+3 digits	10 μA	<3V

4.2 General Specifications

Resistance Range : AT2511: 0.01m Ω ~ 200.0k Ω

AT511C: $0.1\text{m}\Omega \sim 50.00\text{k}\Omega$
 Resolution : AT2511 : $0.01\text{m}\Omega$
 AT511C : $0.1\text{m}\Omega$
 Maxim Display Value : 5000
 Range : Automatic and Manual
 Test speed : Slow : 3 t/s fast : 10 t/s
 Correction : Short-circuit clear zero for each range
 Test Terminal : 4 terminals

 Power : 198V ~ 252VAC 48.5Hz ~ 52.5Hz
 Fuse : 0.5A Slow-Blow
 Consumption : $\leq 15\text{VA}$

 Dimension : 220mm×85mm×259mm
 Weight : 2kg Net
 Environment : Index : T $15^{\circ}\text{C} \sim 35^{\circ}\text{C}$ H <80% RH
 Operating : T $10^{\circ}\text{C} \sim 40^{\circ}\text{C}$ H 10~90% RH
 Storage : T $0^{\circ}\text{C} \sim 50^{\circ}\text{C}$ H 10~90% RH

Accessories : User's manual, ATL503 Kelvin test leads, AC power cord, test report, warranty card, backup fuse

4.3 Dimension

Figure 4-1 dimension

