ONMEAS®

Rev.A5

AT515

Ultra Low DC Resistance Meter



User's Guide

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Applent Instruments, Inc.
Changzhou,
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1. Unpacking and Preparation

This chapter describes how to set up and start the AT515 DC Resistance Meter.

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

1.1 Incoming Inspection

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



WARNING

If the external face of the instrument (such as the cover, front/rear panel, LCD screen, power switch, and port connectors) appears to have been damaged during transport, do not turn on the power switch. Otherwise, you may get an electrical shock.

Make sure that the packing box or shock-absorbing material used to package the instrument has not been damaged.
Referring to <Packing List> in the packing box, check that all packaged items supplied with the meter have been provided as per the specified optioned.

NOTE

If an abnormality is detected, contact the company and transport the meter to your nearest Applent Instruments sales or service office. For inspection by the transport company, save the packing box, shock-absorbing material, and packaged items as you received them.

1.2 Setting up Fuse

~Line: 110VAC/220VAC, 50Hz/60Hz
Fuse: 250V 1A Slow Blow

Please use the following fuse type.

UL/CSA type, Slow-Blow, 5×20-mm miniature fuse, 1A, 250 V



When you need a fuse, contact your nearest Applent Instruments sales or service office. To verify and replace the fuse, remove the power cable and pull out the fuse holder.

1.3 Environmental Requirements

Set up the AT515 where the following environmental requirements are satisfied.

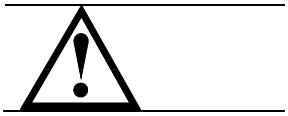
Operating Environments
Ensure that the operating environment meets the following requirements.
Temperature: 0°C to 55°C

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

1.4 Cleaning

To prevent electrical shock, disconnect the AT515 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 AT515 internally.

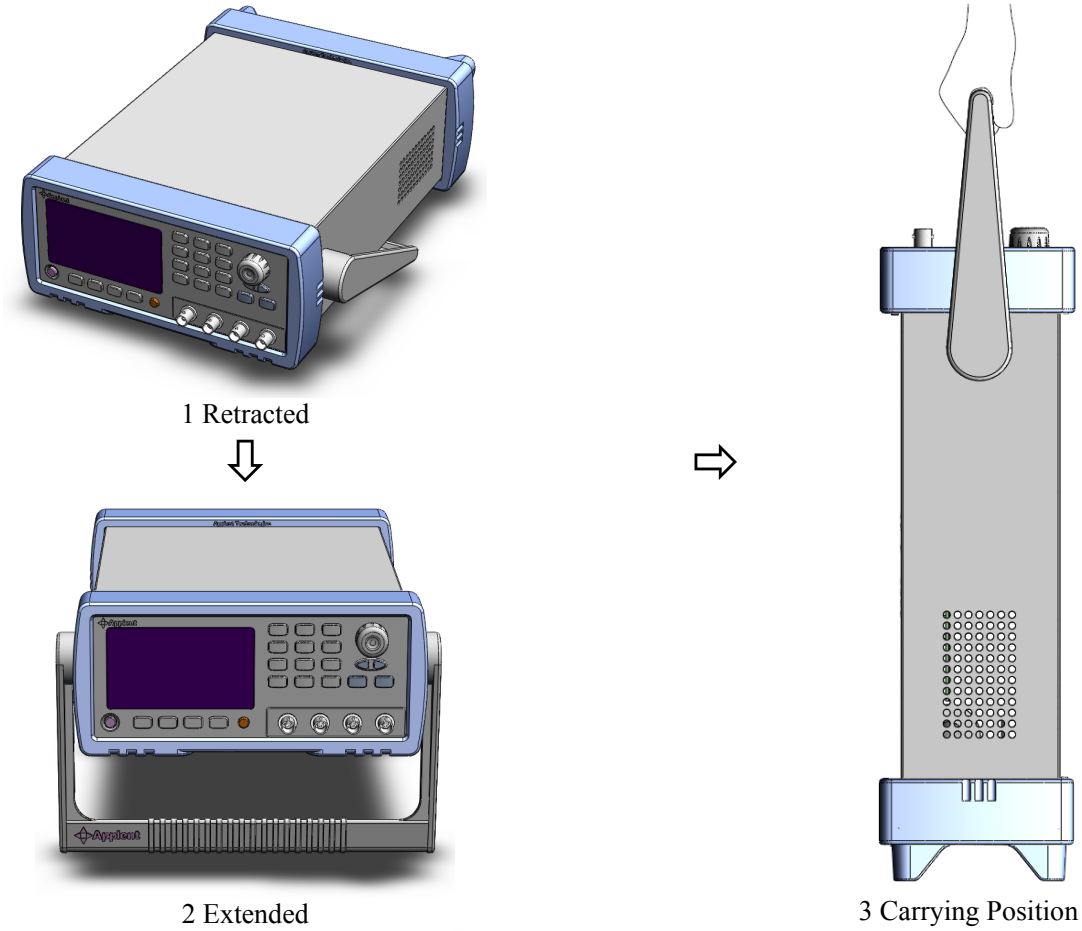


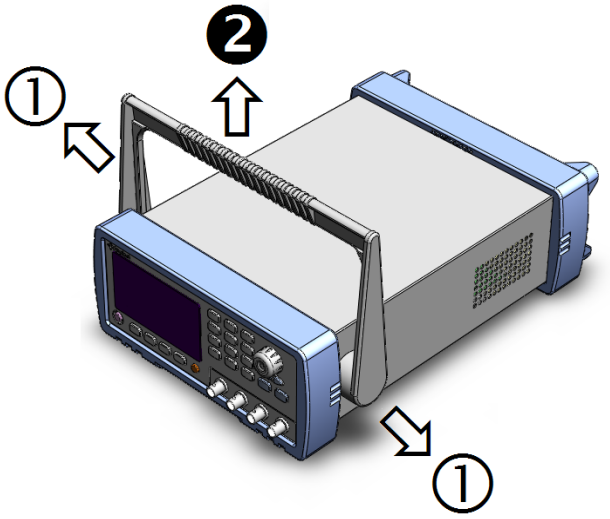
WARNING: Don't Use Organic Solvents (such as alcohol or gasoline) to clean the Instrument.

1.5 How to Remove the Handle

A handle kit is attached to the AT515:

Figure 1-1 How to remove the handle





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

2. Overview

This chapter contains general information about AT515 .The information is organized as follows

- Introduction
- Main Specifications
- Feature overview

2.1 Introduction

Thank you for purchasing AT515 Resistance Meter.

AT515 is an ultra-high-precision wide-range, high-performance ARM microprocessor-controlled resistance meter. Its measurement range of 0.1μΩ ~ 1.2GΩ, the maximum display number 1,200,000. The sampling-rate is 220times/s(4.5ms).

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.

With its built-in comparator, the AT515 can output comparison/decision results for sorting components into a maximum of ten bins. Furthermore, by using the handler interface, the AT515 can be easily combined with a component handler, and a system controller to fully automate component testing, sorting, and quality-control data processing.

AT515 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 Main Specifications and Features

2.2.1 Ranging

Auto, Hold and Nominal range.
Total 12 Ranges
About Nominal ranges: (Applent new definition): The AT515 will automatically select the best range according to the nominal value.

2.2.2 Measurement Speed

Ultra2 (Display Off): 220 readers/second (4.5ms)
Ultra: 130 readers/second (7.7ms)
Fast: 50 readers/second (20ms)
Medium: 10 readers/second (100ms)
Slow: 2 readers/second(500ms).
Note: Measured under HOLD range mode.

2.2.3 Trigger Mode

Internal Trigger
Manual Trigger
Bus Trigger.
External Trigger

2.2.4 Basic Accuracy

Slow Speed:	0.01%
Medium Speed:	0.05%
Fast and Ultra Speed:	0.1%

2.3 Main Functions

2.3.1 Correction Function

SHORT correction:
Eliminates measurement errors due to stray parasitic impedance in the test fixtures.

2.3.2 Comparator Function (Sorting)

Bin sort
The primary parameter can be sorted into BIN1-BIN9, and HI/IN/LO.
The sequential mode or tolerance mode can be selected as the sorting mode.
Limit Setup
Absolute value, deviation value, and % deviation value can be used for setup.

2.4 Measurement Assistance Functions

2.4.1 Key Lock

The front panel keys can be locked.

2.4.2 RS-232

Complies with SCPI.

3. Startup

This chapter describes names and functions of the front panel, rear panel, and screen display and provides the basic procedures for operating AT515.

- Front panel summary
- Rear panel summary
- Power On/Off
- Connect to Device under Test

3.1 Front panel

Figure 3-1 Front panel

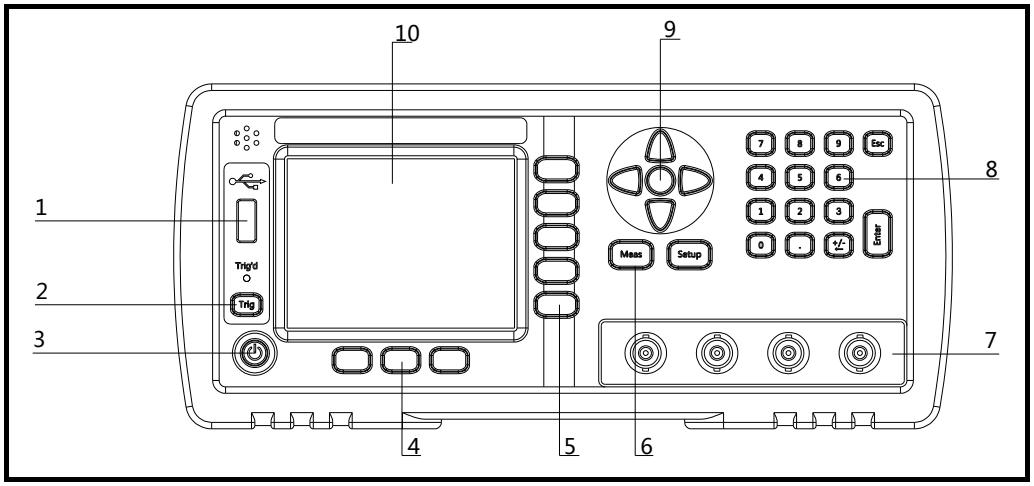


Table 3-1 Front panel description

No.	Description
1	USB Disk Port (USB-Host)
2	Trigger Key
3	Power Switch
4	System Key (Include File, System and Key Lock)
5	Soft Key
6	Menu key
7	UNKNOWN Terminal
8	Entry Key
9	Cursor Key
10	LCD Display

3.2 Real Panel

Figure 3-2 Real Panel

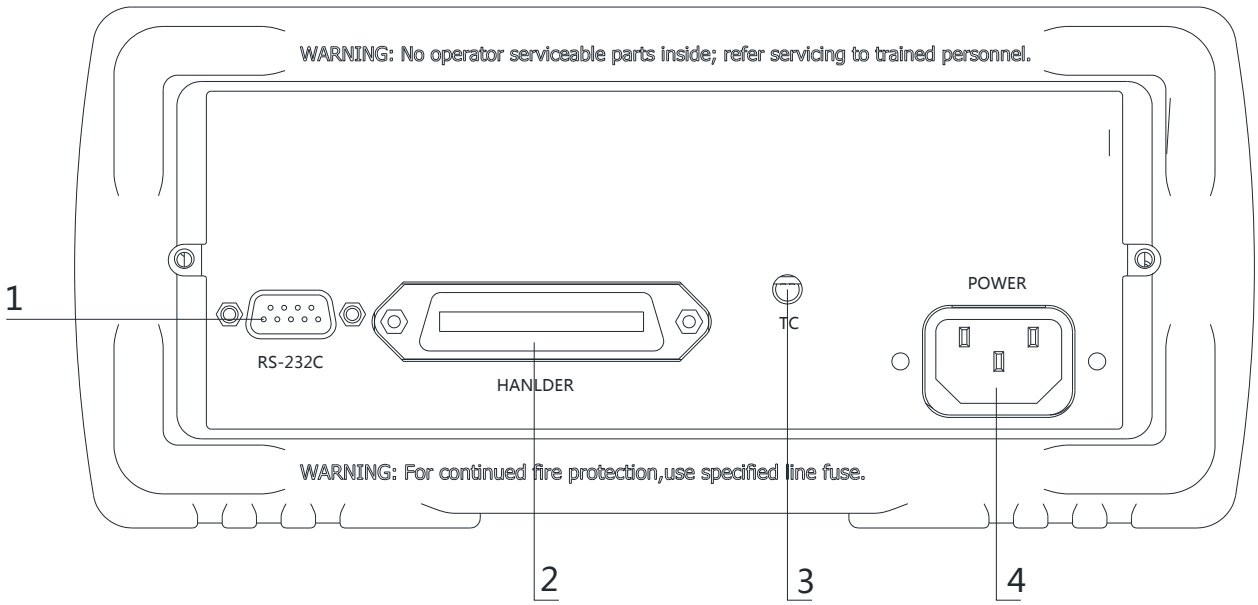


Table 3-2 Real panel description

No.	Description
1	RS-232C Interface
2	Handler Interface
3	Temperature Compensation Interface
4	AC Power Cord Receptacle

3.3 Power On/Off

3.3.1 Line Power Connection

 Power ON.  Power OFF.

3.4 Warm-up Time

AT515 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.

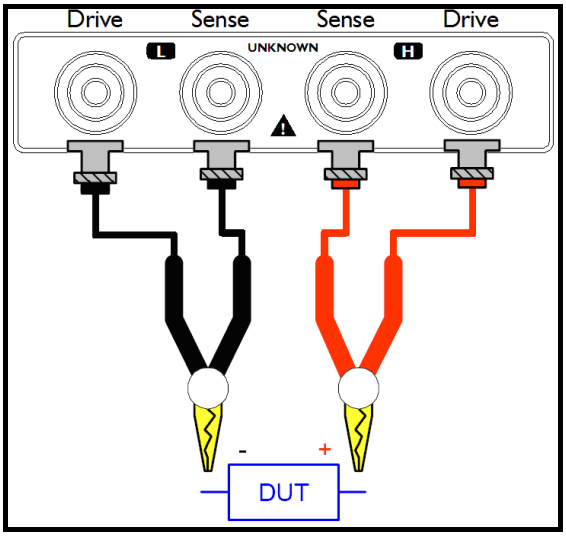
3.5 Connect to Device under Test (DUT)

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 3-3 Connect to DUT



Warning:

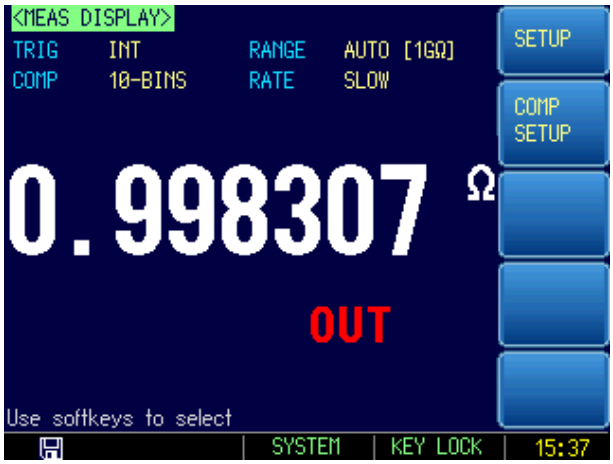
No putting current source, voltage source directly access test side. Energy storage device access to testing after discharging.

4. <MEAS DISPLAY> Page

When press the [Meas] key, the <MEAS DISPLAY> page appears.
The following measurement controls can be set.

- TRIG – Trigger Mode
- COMP – Turn the comparator ON/OFF
- RANGE – Measurement Range
- SPEED – Measurement Speed

Figure 4-1 <MEAS DISPLAY> Page



4.1.1 Trigger Mode [TRIG]

SCPI Command: `TRIGger:SOURce {INT,MAN,EXT,BUS}`
AT515 supports four trigger modes: INT (internal), EXT (external), MAN (manual) and BUS (RS-232).

Trigger Mode	Description
INT	AT515 continuously repeats the measurement cycle.
MAN	AT515 performs one cycle of measurement each time you press the [Trig] key.
BUS	AT515 performs one cycle of measurement each time it receives a trigger command sent via RS-232.
EXT	AT515 performs one cycle of measurement each time a rising pulse is input to the handler external trigger input pin on the rear panel.

Procedure for choosing trigger mode [TRIG]

Step 1. Press the [Meas] key
Step 2. Use the cursor key to select [TRIG] field
Step 3. Use the soft keys to select desired trigger mode.

Soft key	Function
INT	Internal Trigger Mode
MAN	Manual Trigger Mode
BUS	BUS Trigger Mode
EXT	External Trigger Mode

4.1.2 Range [RANGE]

SCPI Command: `FUNCtion:RANGe {<range number>,min,max}`

SCPI Command: `FUNCtion:RANGe:MODE {AUTO,HOLD,NOMinal}`

Table 4-1 Range Mode

Mode	Function overview	Advantage	Disadvantage
Auto range	AT515 sets the optimum range automatic.	You don't need to select range.	The measurement time is longer due to the ranging time
Hold range	Measurement is performed with a fixed range	No ranging time is required	You need to select a proper range depending on the value of the DUT.
Nominal Range	AT515 sets the optimum range depending on the nominal value.	You don't need to select range. No ranging time is required	

Table 4-2 Effective measurement range of AT515

Range No.	Range	Measurement range
0	10mΩ	0.0000mΩ~12.0000mΩ
1	100mΩ	11.900mΩ~120.000mΩ
2	1Ω	0.119000mΩ~1.200000Ω
3	10Ω	1.19000Ω~12.00000Ω
4	100Ω	11.9000Ω~120.0000Ω
5	1kΩ	0.119000kΩ~1.200000kΩ
6	10kΩ	1.19000kΩ~12.00000kΩ
7	100kΩ	11.9000kΩ~120.0000kΩ
8	1MΩ	0.11900MΩ~1.20000MΩ
9	10MΩ	1.1900MΩ~12.0000MΩ
10	100MΩ	11.900MΩ~120.000MΩ
11	1GΩ	119.00MΩ~1200.00MΩ

Procedure for setting the range [RANGE]

Step 1. Press the [Meas] key

Step 2. Use the cursor key to select [RANGE] field

Step 3. Use the soft keys to select the range mode or range.

Soft key	Function
AUTO RANGE	
HOLD RANGE	
NORMINAL RANGE	
INCR +	Increments the range in the HOLD mode
DECR -	Decrements the range in the HOLD mode

4.1.3 Comparator Bins [COMP]

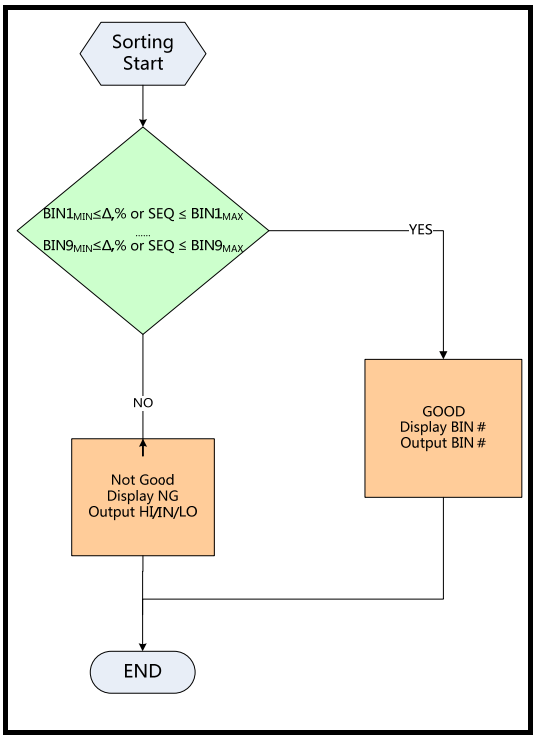
SCPI Command: `COMParator[:STATe] {OFF,##-BINS}`

While the comparator function is OFF, sorting system will no longer work and the Handler interface signals on the comparator output will be shut down.

Please refer to the comparator section for detail.

AT515's built-in comparator can sort devices into a maximum of 10 bins (BIN1 to BIN9 and NG) using a maximum of 10 pairs limits

Figure 4-2 Comparator Workflow



Procedure for setting the comparator function [COMP]

Step 1. Press the [Meas] key

Step 2. Use the cursor key to select [COMP] field

Step 3. Use the soft keys to turn on/off the comparator

Soft key	Function
OFF	
01-BINS	

02-BINS	
03-BINS	
04-BINS	
05-BINS	
06-BINS	
07-BINS	
08-BINS	
09-BINS	
10-BINS	

4.1.4 Measurement Speed [RATE]

SCPI Command: `FUNCtion:RATE {SLOW,MED,FAST,ULTRA,ULTRA2}`

SLOW, MED, FAST, ULTRA and ULTRA2 (DISPLAY OFF) can be selected for AT515.

SLOW mode will result in more stable and accurate measurement result.

When in Range-Hold mode:

Ultra2 (Display Off): 220 readers/second (4.5ms)

Ultra: 130 readers/second (7.7ms)

Fast: 50 readers/second (20ms)

Medium: 10 readers/second (100ms)

Slow: 2 readers/second (500ms).

Procedure for setting measurement speed mode

Step 1. Press the [Meas] key

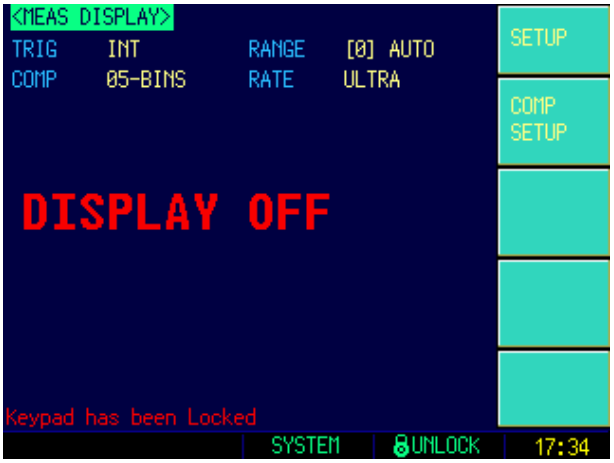
Step 2. Use the cursor key to select [RATE] field

Step 3. Use the soft keys to set measurement speed

Soft key	Function
SLOW	
MED	
FAST	
ULTRA	
ULTRA(DISP OFF)	

When in ULTRA2 mode, “DISP OFF” will appear on the screen.

Figure 4-3 Display OFF when in ULTRA2 speed



5. <SETUP> Page

This section includes the following information:

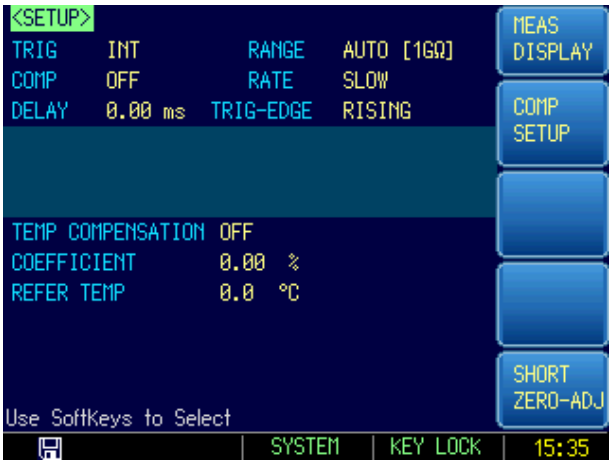
- SETUP page
- Temperature Compensation Setup
- SHORT Correction
- Comparator Setup

Every time or everywhere you can press the [Setup] key to open the <SETUP> page.

NOTE

In <SETUP> page, the Instrument does not display test result and sorting result, and testing is stopped.

Figure 5-1 < SETUP> Page



In the <SETUP> Page, you can configure each of the following measurement controls with the cursor placed in the corresponding field.

- Trigger Mode [TRIG] *1
- Comparator ON/OFF [COMP] *1
- [RANGE] *1
- Measurement Speed [SPEED] *1
- Trigger [DELAY]
- TRIG-EDGE
- Temperature Compensation ON/OFF [TEMP]
- Temperature Coefficient [COEFFICIENT]
- Reference Temperature [REFER TEMP]

NOTE: *1. These four settings can be set in <MEAS DISPLAY> page.

5.1.1 TRIGGER [DELAY]

In external trigger mode, to synchronize with external devices (such as PLC), you can set the trigger delay time.

The trigger delay time is the interval time from receiving the trigger signal to begin measure.

Procedure for inputting the trigger delay time:

Step 1. Press the [Setup] key
Step 2. Use the cursor key to select [DELAY] field
Step 3. Enter the trigger delay time using the entry keys and press the Enter to confirm.

5.1.2 Trigger Edge [TRIG-EDGE]

You can select the external trigger signal edge.

Procedure for selecting the trigger edge.

Step 1. Press the [Setup] key
Step 2. Use the cursor key to select [TRIG-EDGE] field
Step 3. Use the soft keys to select

Soft key	Function
RISING EDGE	
FALLING EDGE	

5.1.3 Turn Temperature Compensation ON/OFF

SCPI Command: `FUNCtion:TC {ON,OFF,1 , 0}`

The AT515 built in Temperature Compensation Interface.

The Temperature Compensation Formula is:

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

Where,

T0: Reference Temperature

T: Current Room Temperature

α: Temperature coefficient of reference temperature (%)

F1: Without compensation value

F2: Temperature compensated value

Procedure for turning the temperature compensation ON/OFF

Step 1. Press the [Setup] key
Step 2. Use the cursor key to select [TEMP COMPENSATION] field
Step 3. Use the soft keys to turn on/off

Soft key	Function
ON	
OFF	

5.1.4 Temperature [COEFFICIENT] α

SCPI Command: `FUNCtion:TC:COEFficient <float>`

Before using the Temperature Compensation Function, you must enter the coefficient of the DUT material. Such as the coefficient of copper is 0.393%.

Procedure for inputting the coefficient:

Step 1. Press the [Setup] key
Step 2. Use the cursor key to select [COEFFICIENT] field
Step 3. Enter the coefficient value using the entry keys and press the Enter to confirm.

5.1.5 Reference Temperature [REFER TEMP]

SCPI Command: `FUNCtion:TC:REFEr <float>`

The temperature unit is Celsius degree.

Procedure for inputting the reference temperature:

Step 1. Press the [Setup] key

Step 2. Use the cursor key to select [REFER TEMP] field

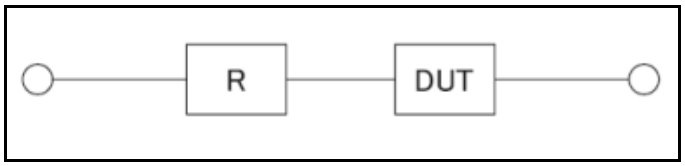
Step 3. Enter the temperature value using the entry keys and press the Enter to confirm.

5.2 Short-circuit Clear Zero

SCPI Command: `CORRect:SHORt`

The short correction feature of the AT515 compensates for any residual resistance that may exist within the interval from the calibration plane, which is determined by the selected cable length, to the DUT connecting points (see Figure 5-2)

Figure 5-2 Residual Resistance



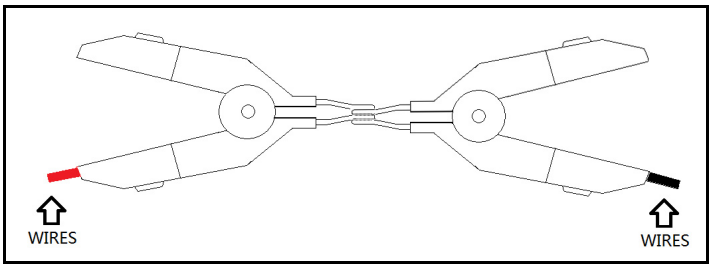
To perform short correction

Step 1. Press the [Setup] key

Step 3. Press the [Clear Zero] soft key.

Step 4. Press [MEAS SHORT] soft key, a dialog message display "Short-circuit the test terminals".

Please make the test clips short-circuit like the following way:



Step 5. Press [OK] soft key. The AT515 measures short resistance at the all ranges.

During the measurement, an "SHORT measurement in progress" dialog message is shown on the display.

When the measurement has finished, a message "Correction finished" is displayed.

5.3 <Comparator> Page

Press [Setup] key and press [Comp Setup] soft key to open <COMPARATOR> page.

Figure 5-3 <COMPARATOR> Page



This page allows you to configure the AT515's built-in comparator.

AT515's built-in comparator can sort DUTs into a maximum 11 levels (BIN1 through BIN10 and BIN0 (OUT) using up to 10 sets limit.

To take full advantage of the comparator, AT515 was equipped a handler interface for use in conjunction with the comparator. All BIN1~BIN10 and HI/IN/LO bins signal can output to yours PLC via the handler interface.

In the < COMPARATOR > page, you can configure each of the following controls with the cursor placed in the corresponding field.

- Total Comparator bins and OFF [COMP] *1
- Nominal value [NOM]
- Comparator limit mode [MODE]

NOTE:

*1. This setting also can be set in the <MEAS DISPLAY> page.

5.3.1 Comparator limit mode [MODE]

SCPI Command: `COMParator:MODE {ABS,PER,SEQ}`

You can specify the primary parameter limit values in one of the following 2 ways:

- Tolerance mode [%] [Δ]

In tolerance mode, the comparison limit values are based on the deviations from the specified nominal value, which can be specified in the [NOM] field. You configure the tolerance mode limit values as a deviation percentage (%) or absolute (Δ) parameter value.

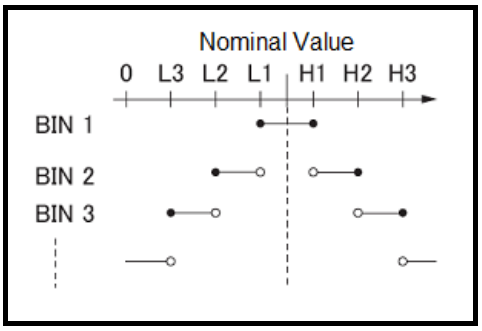
- Sequential mode [SEQ]

In sequential mode, the comparison limit values are based on the absolute value of the measurement. When you configure these limit values, you have to first define the minimum value and then the maximum value.

Tolerance mode

Tolerance mode includes deviation percentage (%) or absolute (Δ).

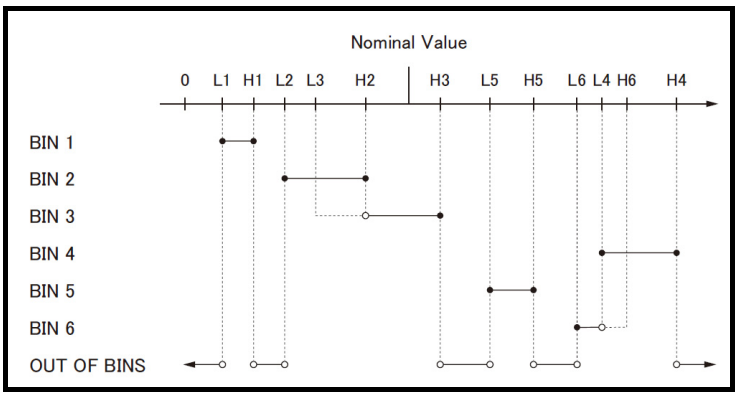
Figure 5-4 Tolerance mode



● Includes the point
○ Excludes the point

Absolute value (Δ) = UNKNOWN value – nominal value
Deviation percentages (%) = Absolute value (Δ) / nominal value × 100%

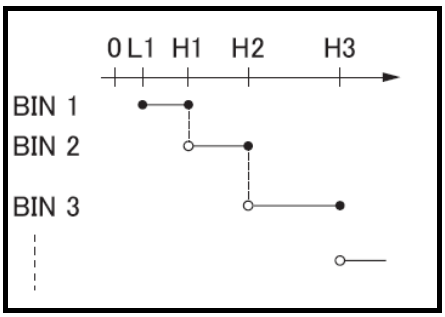
Figure 5-5 Example of sorting in tolerance mode



● Includes the point
○ Excludes the point

Sequential mode

Figure 5-6 Sequential mode



● Includes the point
○ Excludes the point

In Sequential mode, the comparison limit values are based on the absolute value of the measurement. The nominal value does not need to participate in operation.

To set up the comparator limit mode

Step 1. Press the [Meas] or [Setup] key
Step 2. Press the [COMP SETUP] soft key
Step 3. Use the cursor key to select [MODE] field
Step 4. Use the soft keys to select comparator mode

Soft key	Function
ABS	Absolute parameter values
PER	Deviation percentages.
SEQ	Sequential mode.

5.3.2 Nominal value for tolerance mode

`COMParator:NOMinal <float>`

You must configure the nominal value when you use tolerance mode as the limit mode. In sequential mode the nominal value does not affect sorting. In sequential mode you can configure nominal value or not, but if you have set the Range Mode to [NOM] the nominal value must be configured.

To enter the nominal value

Step 1. Press the [Meas] or [Setup] key
Step 2. Press the [COMP SETUP] soft key
Step 3. Use the cursor key to select [NOM] field
Step 4. Enter the nominal value using the entry keys. Use the soft key to select unit.

5.3.3 Lower and Upper Limits

SCPI Command: `COMParator:BIN < 1~10>,<LOWER>,<UPPER>`

AT515's built-in comparator can sort DUTs into a maximum 10 levels (Bin1 thru Bin10 and OUT) using up to 10 sets limits.

To enter the limit values

Step 1. Press the [Meas] or [Setup] key
Step 2. Press the [COMP SETUP] soft key
Step 3. Use the cursor key to select [BIN 1 LOWER] field
Step 4. Enter the limit value using the entry keys.
When in the ABS and SEQ mode, please enter the unit using the soft keys.
When in the PER mode, the unit is %.
Step 5. Repeat Step 4 using the cursor keys until you have entered all limit values.

6. System Configurations

This section includes the following information:

- SYSTEM INFO page
- SYSTEM CONFIG page

6.1 <SYSTEM CONFIG> Page

When press the [Meas] or [Setup] key followed by [SYSTEM] bottom soft key, the <SYSTEM CONFIG> page appears.

Following information can be configured in the <SYSTEM CONFIG> page.

- System date and time configuration [DATE/TIME]
- Account settings [ACCOUNT]
- Beep setting [BEEP]
- RS-232 Baud rate setting [BAUD]
- RS-232 Shake Hand [SHAKE HAND]
- RS-232 Result Send Mode [RESULT SEND]

Figure 6-1 <SYSTEM CONFIG> Page



6.1.1 Setting the system date and time

AT515 features a built-in 24-hour clock.

To change the date

Step 1. Press the [Meas] or [Setup] key

Step 2. Press the [SYSTEM] bottom soft key.

Step 3. Use the cursor key to select date field

Step 4. Use the soft keys to edit date

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.
DAY DECR-	Decreases the day in steps of 1.

To change the time

Step 1. Press the [Meas] or [Setup] key

Step 2. Press the [SYSTEM] bottom soft key.

Step 3. Use the cursor key to select time field

Step 4. Use the soft keys to edit time

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.

6.1.2 Account Setting

The AT515 has two accounts, administrator and user.

Administrator: All functions can be configured by administrator except <SYSTEM SERVICE> page.

User: All functions can be configured by user except < SYSTEM SERVICE> page and <FILE> page.

To Change Account

Step 1. Press the [Meas] or [Setup] key

Step 2. Press the [SYSTEM] bottom soft key.

Step 3. Use the cursor key to select date field

Step 4. Use the soft keys to change account.

Soft key	Function
ADMIN	Administrator
USER	User

Switch user mode to administrator mode, you must input a correct password.

To Change Administrator's Password

Step 1. Press the [Meas] or [Setup] key

Step 2. Press the [SYSTEM] bottom soft key.

Step 3. Use the cursor key to select [ADMIN] field.

When the account field is [USER], you should change to [ADMIN].

Step 4. Use the soft keys to change password or delete password.

Soft key	Function
CHANGE PASSWORD	Input password(less than 9 numbers).
DELETE PASSWORD	The password will be removed.

NOTE: If you forget your password, please send an E-Mail to tech@applent.com.

6.1.3 Beep Feature

SCPI Command: `COMParator:BEEP {OFF,GD,NG}`

To set up the beep feature

Step 1. Press the [Meas] or [Setup] key
Step 2. Press the [SYSTEM] bottom soft key.
Step 3. Use the cursor key to select [BEEP] field
Step 4. Use the soft keys to set beep feature

Soft key	Function
OFF	Turn off the beep feature.
GD	Beep while the comparator sorting result is GD
NG	Beep while the comparator sorting result is NG

6.1.4 RS-232 Baud Rate [BAUD]

Before you can control the AT515 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 AT515'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
1200	
9600	
38400	
57600	
115200	Recommend

6.1.5 RS-232 Shake Hand [SHAKE HAND]

AT515 support software "shake hand". AT515 will return the whole command to host and then response the command when the [SHAKE HAND] was turned ON.

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.

Soft key	Function
ON	
OFF	

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

6.1.6 RS-232 Result Send Mode [RESULT SEND]

SCPI Command: `SYSTem:SENDmode {FETCH,AUTO}`

When you set the [RESULT SEND] to AUTO, the test result will be sent to host every end of measurement instead of by sending “FETCH?” command.

The format is:

```
+9.9651e+01,BIN 01
+1.0000e+20,BIN 00
…
```

Where,

“+1.0000e+20” stands for overload or open.

“BIN 00” stands for Not Good (NG) or invalid

To set up the result send mode:

Step 1. Press the [Meas] or [Setup] key

Step 2. Press the [SYSTEM] bottom soft key.

Step 3. Use the cursor key to select [RESULT SEND] field

Step 4. Use the soft keys to turn ON.

Soft key	Function
FETCH	Acquire the test result by sending “FETCH?” command only.
AUTO	AT515 return the result every EOM

6.2 <SYSTEM INFO> Page

When press the [Meas] or [Setup] key followed by [SYSTEM] bottom soft key, and press [SYSTEM INFO] soft key, the <SYSTEM INFO> page appears.

There are no configurable options in the <SYSTEM INFO> page.

7. Handler Interface

This chapter provides information of AT515's built-in handler interface. Include:

- Pin Assignment
- Circuit Diagram
- Timing Chart

The AT515'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 AT515 with a component handler or system controller. This means that you can fully automate such tasks as component inspection, component sorting, and processing of quality management data for higher manufacturing efficiency.

7.1 Pin Assignment

Figure 7-1 Pin Assignment

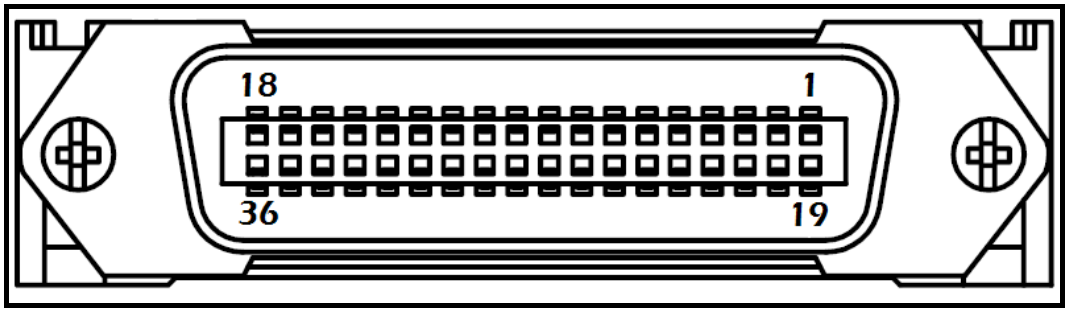


Table 7-1 Description of Handler Interface Signals

Pin	Signal	Direction	Overview
1	/BIN8	Output	0:GD
2	/BIN9	Output	0:GD
3	/BIN10	Output	0:GD
4	/HI	Output	0:HI
5	IN	Output	0:NG
6	/LO	Output	0:LO
7	/EOC	Output	"End of measurement cycle" signal. When this signal is output, the measurement data and sorting results are available.
18	Trigger	Input	Rising-Edge, 5V~24V
19	/BIN7	Output	0:GD
20	/BIN6	Output	0:GD
21	/BIN5	Output	0:GD
22	/BIN4	Output	0:GD
23	/BIN3	Output	0:GD
24	/BIN2	Output	0:GD

25	/BIN1	Output	0:GD
27-28	Internal GND	Power	Internal GND Common signal of internal VCC.
29-30	External GND	Power	External GND Common signal for external DC current External VCC
33-34	Internal VCC	Power	Internal VCC (5VDC)
35-36	External VCC	Power	External VCC (3.3V~35V) Supplies voltage for DC isolation input signal

7.2 Power Rating

	Input/Output device	Logic	Electrical requirements
OUTPUT	Corrector out with pull-up resistance	Negative logic	35VDC 50mADC max
INPUT		Rising-edge	50mADC max
EXT.DCV	DC voltage input		35VDC max
INT.DCV	Built-in VCC		5VDC,1A max

7.3 Electrical Characteristics

7.3.1 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.

7.3.2 Output Signal:

Each output signal is outputted via a pull-up 5kΩ (0.1W) resistor by using a photo-coupler.

7.3.3 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.
An internal VCC (5V DC) has been supplied for testing purpose.
To using the internal power, please connect PIN-34 and PIN-35 together and PIN-28 and PIN-29 together.

7.3.4 Schematic

Figure 7-2 Typical Circuit Diagram of Handler Interface Input signals.

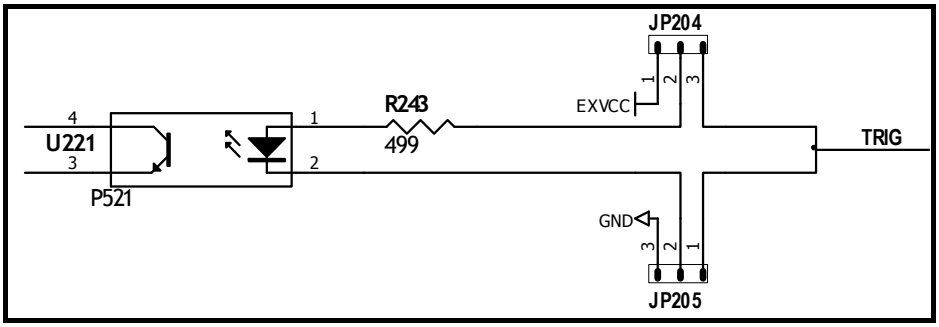
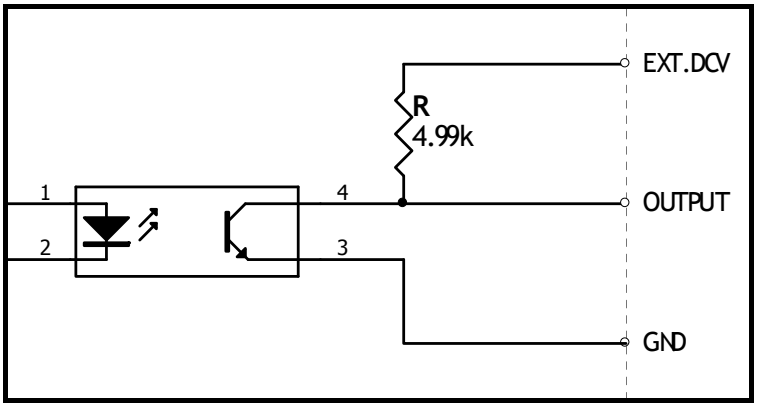


Figure 7-3 Typical Circuit Diagram of Handler Interface Output signals.



8. Remote Control

This chapter provides the following information to remotely control the AT515 via the RS-232C or USB interface.

- About RS-232C
- About USB Interface
- Select Baud Rate.
- About SCPI

AT515 can use the RS-232 interface or USB interface to communicate with the computer to complete all the instrument functions.

8.1 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 8-1 The RS-232 connector in the real panel

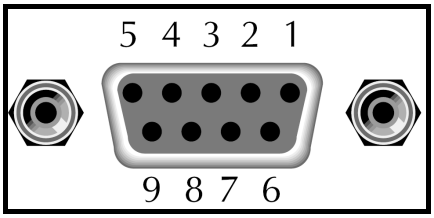


Table 8-1 RS-232 connector pinout

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 AT515 also uses these settings.

The RS-232 interface transfers data using:

8 data bits,

1 stop bit,

And no parity.

8.2 About USB-Serial Interface (Option)

The USB-Serial Interface allows you to connect AT515 to a USB port on your PC.

NOTE:
Please install the USB-Serial driver before using USB-Serial Interface.
The Applent USB-Serial interface model is ATN2.

Figure 8-2 USB-Serial Interface ATN2



8.3 To Select Baud Rate

Before you can control the AT515 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 AT515'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
1200	
9600	
38400	
57600	
115200	Recommend

8.4 SCPI Language

Standard Commands for Programmable Instruments (SCPI) is fully supported by the

RS-232 interfaces.



NOTE:
AT515 ONLY supports the SCPI Language.

9. Command Reference

This chapter contains reference information on programming AT515 with the SCPI commands.

This chapter provides descriptions of all the AT515's available RS-232 commands which correspond to Standard Commands for Programmable Instruments (SCPI) command sets, listed in functional subsystem order.

9.1 Terminator

<NL>：The EOI line is asserted by New Line or ASCII Line Feed character (decimal 10, Hex 0x0A，or ASCII '\n')

9.2 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

9.3 Command Structure

The AT515 commands are divided into two types: Common commands and SCPI commands.

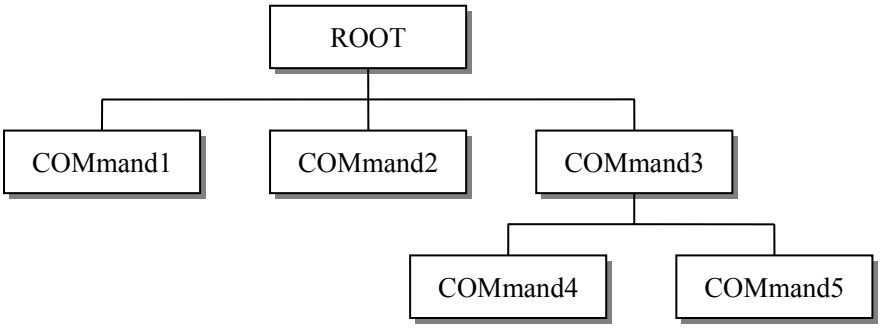
The common commands are defined in IEEE std. 488.2-1987, and these commands are common for all devices. The SCPI commands are used to control all of the AT515's functions.

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 9-1 Command Tree Example



Example:

ROOT:COMmand3:COMmand5 ppp
ROOT Subsystem Command
COMmand3 Level 2
COMmand5 Level 3
ppp Parameter

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

- Letter case (upper and lower) is ignored.
  For example,
  ROOT:COMMAND3 = root:command3
- Spaces (_ used to indicate a space) must not be placed before and/or after the colon (:).
  For example,
  ☒ root_:_command3 → ☑ root:command3
- The command can be completely spelled out or in abbreviated.(The rules for command abbreviation are described later in this section)
  For example,
  root:command3 = root:com3
- The command header should be followed by a question mark (?) to generate a query for that command.
  For example,
  root:com3?
- 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,
  root:com3:com5 ppp ; com4 ppp
  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,
  root:com3:com5 ppp; : root:com1 ppp

The AT515 accepts the three forms of the same SCPI commands: all upper case, all lower case, and mixed upper and lower case.

9.4 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) <integer>: For example, 1,+123,-123
    (b) <float>: For example, 1.23e3, 5.67e-3, 123k, 1.23M, 2.34G, 1.234
    (c) <scifloat>: For example, +1.23456e+03

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 9-1 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

9.5 Command Reference

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

- DISPlay Subsystem
- FUNCtion Subsystem
- FETCh Subsystem
- COMParator Subsystem
- CORRection Subsystem
- TRIGger Subsystem

- ERRor Subsystem

Common Command:

- TRG
- IDN?

9.6 DISPlay Subsystem

The DISP Subsystem command group sets the display page.

Figure 9-2 DISP Command Tree

DISPlay	:PAGE	{MEASurement, SETUp, COMParator,SYSTem, SYSTEMINFO(SINF)}
	:LINE	<string>

9.6.1 DISP:PAGE

The :PAGE command sets the display page.

The :PAGE? Query returns the abbreviated page name currently displayed on the LCD screen.

Command Syntax	**DISP:PAGE <*page name*>**
Parameter	**Where, <page name> is:** MEASurement [or MEAS] Sets display page to MEAS DISPLAY SETUP [or SETU] Sets display page to SETUP COMParator [or COMP] Sets display page to COMPARATOR SYSTem [or SYST] Sets display page to SYSTEM CONFIG SYSTEMINFO [or SINF] Sets display page to SYSTEM INFORMATION
Example	**SEND> DISP:PAGE SYST<NL> //Set to the SYSEMT CONFIG**
Query Syntax	**DISP:PAGE?**
Query Response	**<*page name*>**
Example	**SEND> DISP:PAGE?<NL>** **RET> SYST<NL>**

9.6.2 DISP:LINE

The :LINE command enters an arbitrary comment line of up to 30 ASCII characters in the comment field.

Command Syntax	**DISP:LINE "<*string*>"**
Parameter	Where, <string> is ASCII character string (30 ASCII characters)
Example	**SEND> DISP:LINE "This is a comment."<NL>**

9.7 FUNCtion Subsystem

The FUNCtion subsystem command group sets the measurement function, the measurement range, monitors parameter control.

Figure 9-3 FUNCtion Subsystem Tree

FUNCtion	:RANGe	{Range Number , max , min}	
		:MODE	{AUTO,HOLD,NOMinal}
	:RATE	{SLOW,MED,FAST,ULTRA,ULTRA2}	
	:TC	: COEFficient	<float>
		:REFEr	<float>

9.7.1 FUNCtion:RANGe

The FUNCtion:RANGe command sets the range.

Command Syntax	FUNC:RANGe *<0-11,MIN,MAX>*
Parameter	Where, <0-11,MIN, MAX> is: 0-9, The range number MIN, =Range 0 MAX, =Range 11
Example	SEND> FUNC:RANG 2<NL> //Set range to [2] 300mΩ
Query Syntax	FUNC:RANGe?
Query Response	*<0-11>*<NL>
Example	SEND> FUNC:RANG?<NL> RET> 0<NL>

9.7.2 FUNCtion:RANGe:MODE

The FUNCtion:RANGe:MODE command sets the range mode.

Command Syntax	FUNCtion:RANGe:MODE *{HOLD, AUTO, NOMinal}*
Parameter	Where, *{HOLD, AUTO, NOMinal}* is: HOLD: Sets the auto range to off. AUTO: Sets the auto range to on. NOMinal: Sets the range mode to nominal.
Example	SEND> FUNC:RANG:MODE AUTO<NL> //Sets to auto range.
Query Syntax	FUNC:RANGe:AUTO?
Query Response	*{HOLD,AUTO,NOM}*
Example	SEND> FUNC:RANG:MODE?<NL> RET> auto<NL>

9.7.3 FUNCtion:RATE

The FUNCtion:RATE command sets the test speed.

Command Syntax	FUNCtion:RATE *{SLOW,MED,FAST,ULTRa,ULTraNodisp(ULTN)}*
Example	SEND> FUNC:RATE FAST<NL> //Sets to FAST Speed
Query Syntax	FUNC:RATE?
Query Response	*{SLOW,MED,FAST,ULTR,ULTN}*
Example	SEND> FUNC:RATE?<NL> RET> ULTR<NL>

9.7.4 FUNCtion:TC

The FUNC:TC command turns the temperature compensation function ON/OFF.

Command Syntax	FUNCtion:TC *{on,off,1,0}*
Example	SEND> FUNC:TC ON<NL>

Query Syntax	FUNC:TC?
Query Response	{ON,OFF}

9.7.5 FUNCtion:TC: COEFficient

The FUNC:TC:COEF command sets the material coefficient.

Command Syntax	FUNCtion:TC:COEFficient {float}
Example	SEND> FUNC:TC:COEF 0.393<NL> //the unit is %
Query Syntax	FUNC:TC:COEF?
Query Response	{fixfloat}
Example	SEND> FUNC:TC:COEF?<NL> RET> +0.39300

9.7.6 FUNCtion:TC: REFErence

The FUNC:TC:REFE command sets the compensation reference temperature.

Command Syntax	FUNCtion:TC:REFErence {float}
Example	SEND> FUNC:TC:REFE 25<NL> //the unit is Celsius degree ℃
Query Syntax	FUNC:TC:REFE?
Query Response	{fixfloat}
Example	SEND> FUNC:TC:REFE?<NL> RET> +25.00

9.8 COMParator Subsystem

The COMParator subsystem command group sets the comparator function, including its ON/OFF setting, limit mode, and limit values.

Figure 9-4 COMParator Subsystem Command Tree

COMParator	[:STATe]	{OFF,ON,0,1}
	:BEEP	{OFF,GD,NG}
	:MODE	{ABS,PER,SEQ}
	:NOMinal	<float>
	:BIN	<BIN 1~10>,<float LOW LIMIT>, <float HIGH LIMIT>

9.8.1 COMParator:STATe

The COMParator:STATe command sets the comparator function to OFF or the total number of bins..

Command Syntax	COMParator[:STATe] {OFF,##-BINS}
Parameter	Where, ##-BINS from 01-BIN to 10-BINS
Example	SEND> COMP:STAT 10-BINS<NL>
Query Syntax	COMParator:STATe?
Query Response	{on,##-BINS}
Example	SEND> COMP:STAT?<NL> RET> 10-BINS<NL>

9.8.2 COMParator:MODE

The :COMParator:MODE command sets the limit mode of the comparator function.

Command Syntax	**COMParator:MODE {ABS,PER,SEQ}**
Parameter	**Where,{ABS,PER,SEQ} is:** ABS Absolute tolerance mode PER Percent tolerance mode SEQ Sequential mode
Example	**SEND> COMP:MODE PER**<NL>
Query Syntax	**COMParator:MODE?**
Query Response	**{abs,per,seq}**
Example	**SEND> COMP:MODE?**<NL> **RET> abs**<NL>

9.8.3 COMParator:BEEP

COMP:BEEP sets the beep feature.

Command Syntax	**COMParator:BEEP <OFF,GD,NG>**
Example	**SEND> COMP:BEEP GD**<NL> **SEND> COMP:BEEP OFF**<NL>
Query Syntax	**COMParator:BEEP?**
Query Response	**<OFF,GD,NG>**
Example	**SEND> COMP:BEEP?**<NL> **RET> OFF**<NL>

9.8.4 COMParator:NOMinal

The COMParator:NOMinal command sets the nominal value for the tolerance mode of the comparator function.

Command Syntax	**COMParator:NOMinal *<float>***
Example	**SEND> COMP:NOM 100m**<NL> **SEND> COMP:NOM 1E-6**<NL>
Query Syntax	**COMParator:NOMinal?**
Query Response	**<scifloat>**
Example	**SEND> COMP:NOM?**<NL> **RET> +1.00000e-03**<NL>

9.8.5 COMParator:BIN

The COMParator:BIN command sets the low/high limit values of each BIN

Command Syntax	**COMParator:BIN *<n>,<lower limit>,<upper limit>***
Parameter	**Where,*<n>,<lower limit>,<upper limit>* is:** n (1 to 10): Bin number low limit <float> lower limit value high limit <float> upper limit value
Example	**SEND> COMP:BIN 1,1,2**<NL> **SEND> COMP:BIN 2,-10,10**<NL>
Query Syntax	**COMParator:BIN? <n>**
Parameter	**Where,*<n>* is:** Bin number 1~10

Query Response	**<float:lower limit>,<float:upper limit>**
Example	**SEND> COMP:BIN? 2<NL>** **RET> 1.000000e-00,2.000000E-00<NL>**

9.9 TRIGger Subsystem

The TRIGger subsystem command group is used to enable a measurement and to set the trigger mode.

Figure 9-5 TRIGger Subsystem Command Tree

TRIGger	**[:IMMediate]**	
	:SOURce	**{INT,MAN,EXT,BUS}**
TRG		

9.9.1 TRIGger[:IMMediate]

The TRIGger[:IMMediate] command causes the trigger to execute a measurement, regardless of the trigger state.

Refer to Page 10 Sector 2.2.3 Trigger Mode.

Command Syntax	**TRIGger[:IMMediate]**
Example	**SEND> TRIG<NL>**
Note	**This command can be ONLY used in BUS trigger mode.**

9.9.2 TRIGger:SOURce

The TRIGger:SOURce command sets the trigger mode.

Command Syntax	**TRIGger:SOURce {INT,MAN,EXT,BUS}**
Parameter	Where, {INT,MAN,EXT,BUS} is INT Internal Trigger Mode MAN Manual Trigger Mode EXT External Trigger Mode BUS BUS Trigger Mode
Example	**SEND> TRIG:SOUR BUS<NL>**
Query Syntax	**TRIGger:SOURce?**
Query Response	**{INT,MAN,EXT,BUS}**
Example	**SEND> TRIG:SOUR? 1<NL>** **RET> INT<NL>**

9.9.3 TRG

The TRG command (trigger command) performs the same function as the Group Execute Trigger command but return the test result.

Command Syntax	***TRG**
Query Response	**<primary value>,<comparator result>**
Example	**SEND> TRG** **RET> +5.566785e-01,BIN01** **RET> +1.00000E+20,BIN00 //OPEN or OVERLOAD**
Note	This command can be used ONLY in BUS trigger mode.

9.10 FETCh Subsystem

The FETCh subsystem command group is a sensor-only command which retrieves the measurement data taken by measurement(s) initiated by a trigger, and places the data into the output buffer.

Figure 9-6 FETCh Subsystem Command Tree

FETCh?	

9.10.1 FETCh?

The FETCh? retrieves the latest measurement data and comparator result.

Query Syntax	**FETCh?**
Query Response	<float>,<comparator result>
Example	**SEND> FETC?**<NL> **RET> +1.00000e-05,BIN01** <NL>

9.11 CORRection Subsystem

The CORRection subsystem command group to execute the short-circuit clear zero correction function.

Figure 9-7 CORRection Subsystem Command Tree

CORRect	:SHORt	

9.11.1 CORRection:SHORt

The CORRection:SHORt command execute the short-circuit clear zero for all ranges.

Command Syntax	**CORRection:SHORt**
Example	**SEND> CORRection:SHOR**<NL> **RET> Short Clear Zero Start.** <NL> **RET> PASS**<NL>
Note	**Before sending this command, please short circuit the terminals.** **Please refer to page 21 section 5.2** Short-circuit Clear Zer

9.12 SYSTem subsystem

Figure 9-8 SYSTem

SYSTem	:SENDmode	{FETCH,AUTO}

9.12.1 SYSTem:SENDmode

SYST:SEND command sets the RS-232 Result Send Mode.

Please refer to Page.28 Section 6.1.6 RS-232 Result Send Mode [RESULT SEND]

Command Syntax	**SYSTe** **m:SENDmode {FETCH,AUTO}**
Example	**SEND> SYST:SEND AUTO**<NL>
Query Syntax	**SYST:SEND?**
Query Response	**<FETCH,AUTO >**

9.13 ERRor Subsystem

The ERRor subsystem retrieves last error information.

Query Syntax	**ERRor?**
Query Response	**Error string**
Example	**SEND> ERR?<NL>** **RET> no error.<NL>**

9.14 IDN?

The *IDN? query returns the instrument ID.

Query Syntax	**IDN? Or *IDN?**
Query Response	**<MODEL>,<Revision>,<SN>,< Manufacturer>**

10. Specification

This chapter describes the specifications and supplemental performance characteristics of the AT515：

- Specifications
- Dimension

Accuracy is defined as meeting all of the following conditions.

Temperature: 23℃±5℃

Humidity: ≤65% R.H.
Zeroing: Open and Short Correction
Warm up time is 30 min or more.
1-year calibration cycle
Test Current Accuracy: 10%

10.1 About Accuracy

Accuracy is calculated from the reading error (±% rdg.) determined by the measurement value and range, and the digit error (± dgt.).
Calculation Example:
Measurement value: 1 Ω, Measurement range: 3 Ω
Specified accuracy (from table below): ±0.5% rdg., ±5 dgt.
(A) Reading error (±% rdg.): 1 [Ω] × 0.5% = ±0.005 [Ω]
(B) Digit error (± dgt.): ±5 dgt. = ±0.0005 [Ω] (at 0.0001 Ω resolution)
(C) Total error (A + B): ±0.0055 [Ω]
Applying total error (C) to the measurement value of 1 Ω gives an error limit of 0.9945 to 1.0055 Ω.

AT515:

RANGE		Maximum Readers	Resolution	ULTRA,FAST	MEDIUM	SLOW	TEST CURRENT	OPEN VOLTAGE
0	10mΩ	12.0000mΩ	0.1μΩ	0.5%±5	0.2%±5	0.05%±3	1A	<1V
1	100mΩ	120.000mΩ	1μΩ	0.1%±5	0.05%±3	0.01%±2	1A	<1V
2	1Ω	1.000000 Ω	10μΩ	0.1%±5	0.05%±3	0.01%±2	100mA	<1V
3	10Ω	12.00000 Ω	100μΩ	0.1%±5	0.05%±3	0.01%±2	10mA	<1V
4	100Ω	120.0000 Ω	1mΩ	0.1%±5	0.05%±3	0.01%±2	1mA	<5V
5	1kΩ	1.200000kΩ	10mΩ	0.1%±5	0.05%±3	0.01%±2	1mA	<5V
6	10kΩ	12.00000kΩ	100mΩ	0.1%±5	0.05%±3	0.01%±2	100μA	<5V
7	100kΩ	120.0000kΩ	1Ω	0.2%±5	0.1%±3	0.05%±2	10μA	<5V
8	1MΩ	1.20000MΩ	10Ω	0.5%±5	0.2%±5	0.1%±5	1μA	<10V
9	10MΩ	12.0000MΩ	100Ω	1%±5	0.5%±5	0.5%±5	100nA	<10V
10	100MΩ	120.000MΩ	1kΩ	2%±5 字	1%±5 字	1%±5 字	10nA	<10V
11	1GΩ	1200.00MΩ	10kΩ	5%±5 字	2%±5 字	2%±5 字	1nA	<10V

10.2 General Specification

Display: True color TFT-LCD, Size: 3.5”

Measurement Range: 0.0001mΩ~1200.00MΩ

Measurement Speed: Under Range Hold Mode:

Ultra2 (Display Off):	220 readers/second (4.5ms)
Ultra:	130 readers/second (7.7ms)
Fast:	50 readers/second (20ms)
Medium:	10 readers/second (100ms)
Slow:	2 readers/second (500ms).

Maximum Readers: 1,200,000

Ranging: Auto, Hold and Nominal range.

Correction Function: SHORT-CIRCUIT Clear Zero

Comparator: Total 13 Bins, 10 bins GD, 3 bins HI/IN/LO <AT515>

Beep Feature: OFF/GD/NG

Trigger Mode: Internal, Manual, External and Bus Trigger.

Built-in Interface: Handler interface, RS232 interface, Temperature Compensation interface.

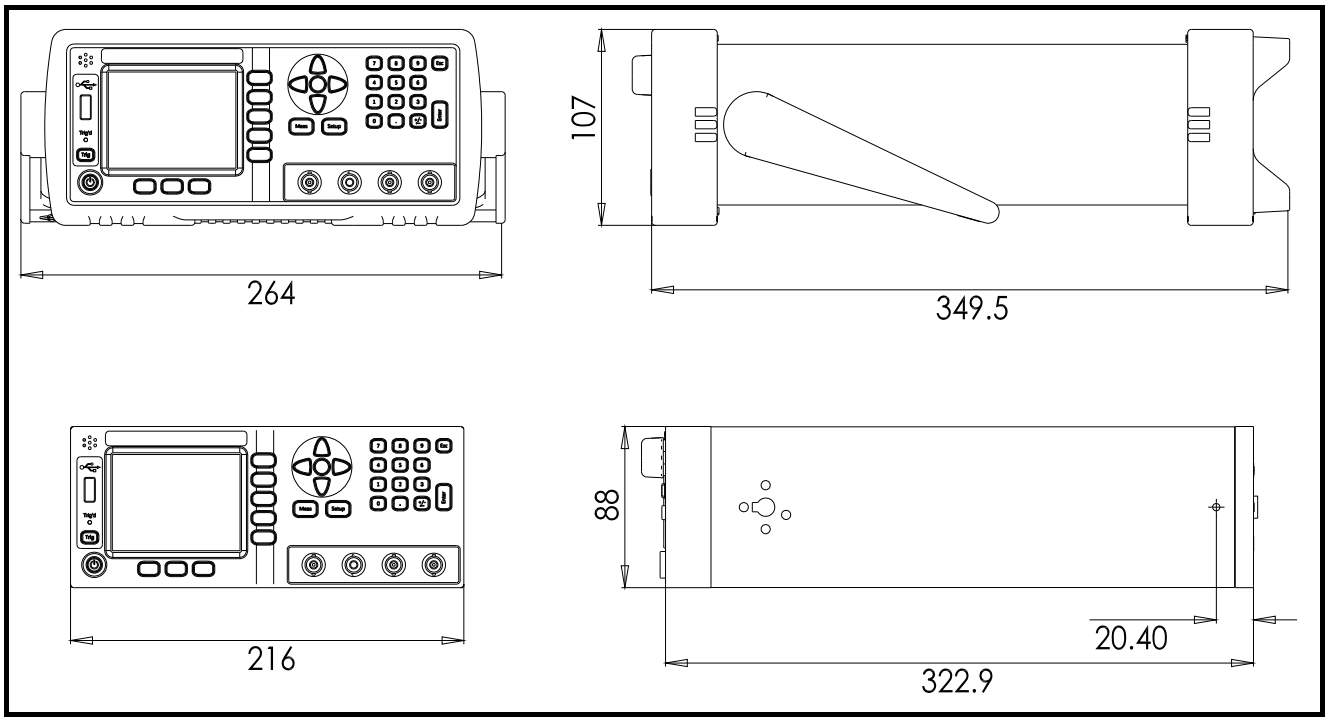
Programming language: SCPI

Environment:

Temperature and humidity range:	15℃~35℃, 80% RH or less
Storage temperature and humidity range:	10℃~40℃, 10~90% RH
Power Supply:	AC 110V/220V, 48.5Hz-62.5Hz
Fuse:	1A Slow-Blow
Maximum rated power:	20VA
Weight:	3.5kg, net

10.3 Dimensions

Figure 10-1 Dimensions



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