ONMEAS®

Rev.A2

AT525

BATTERY METER



User's Guide

Scan QR code for operation video

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Applent Instruments, Ltd.
Changzhou, Jiangsu,vChina,
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1. Unpacking and Preparation

This chapter describes:

- Incoming Inspection
- Power Supply
- Working Environment
- Cleaning
- Replace Battery
- Adjust Support

1.1 Incoming Inspection

1. Referring to <Packing List> in the packing box, check that all packaged items supplied with the meter have been provided as listed
2. Check the appearance of whether there is damage or scratches ;

If there is damage or lack of accessories, please contact Applent Instruments Sales Department or local agency

1.2 Power Supply

AC power adapter: ATL909
Rechargeable Li battery: ATL805
Input: 90V-260VAC, 49Hz~62Hz, <10VA



Warning: Do Not use any other power adapter or battery

1.3 Working Environment

Environmental Requirements:
Temperature: 0℃～55℃,
Humidity: At 23℃ less than70%RH
Altitude: 0 ~ 2000m

1.4 Cleaning

Do not clean the inside of the instrument



Warning: Do not use the cleaning solvent (alcohol or gasoline, etc.) on the instrument.

Please use a clean cloth dipped in some water to do the case and panel cleaning.

1.5 Replace Battery

The instrument built-in rechargeable lithium battery, the battery has been installed in the battery compartment of the instrument at the factory. You should replace the battery according to the following procedure.

Figure 1-1 Replace Battery



1. Use a screwdriver to loosen the screws of the battery cover, remove the battery cover.
2. Remove the plug on the old battery, plug in new battery plug
3. Put a new battery into the battery compartment, replace the battery cover and tighten the screws.

1.6 Adjust Support

The support has two positions:
60 degrees and 45 degrees.
45 degrees, makes the instrument more stable.

Figure 1-2 60 Degrees Supporting



Figure 1-3 45 Degrees Supporting



2. Overview

This chapter contains general information about AT525 .The information is organized as follows

- Introduction
- Main Specifications
- Feature overview

2.1 Introduction

Thank you for choosing AT525 Battery Meter.

AT525 adopts high-performance 32-bit ARM processor. It is a meter with wide resistance measurement range from 0.001mΩ to 3.3Ω and DC voltage range from 0.0001V to 60.000V.

The instrument features an m-Ohm and V mode that allows simultaneous measurement and comparison of battery internal resistance and open-circuit voltage. This meter is highly suitable for battery inspection lines as one unit can act as both a low-resistance meter and a voltmeter.

The AT525 completes with comparator function and external interface (handler) utilizing the principles of the AC 4-terminal method that gives priority to line use and offers high speed, high accuracy and high resolution.

With its built-in comparator, the AT525 can output comparison/decision results for sorting components into resistance HIGH-IN-LOW bins and voltage HIGH-IN-LOW bins.

AT525 measures all kinds of battery's resistance and DC voltage, such as lithium batteries, lead-acid batteries, Button Cell Batteries and etc. **Especially, AT525 can measures UPS batteries while UPS working online**.

AT525 is equipped with RS232 interface to apply to remote control, data acquisition and analysis.

AT525 is also equipped with USB-Disk interface, and you can store the test values into your USB Disk over 500 sets.

2.2 Main Specifications and Features

- Basic Accuracy: Resistance: 0.5% Voltage: 0.05%
- Test Frequency: 1kHz±2Hz
- Max Display: Resistance: 33,000 digit, DC Voltage: 60,000 digit
- 4 rangers with Auto, Manual and Nominal Modes

- Four-terminal test method
- Test Speed: 10 times/s (Fast Speed Mode)
- Trigger Mode: Internal and Manual trigger

2.3 Main Functions

2.3.1 Correction

Short-circuit Clear Zero correction for all ranges.

2.3.2 Comparator (Sorting Function)

Set up sorting function to do GD/NG sorting.
Comparator Methods:
Absolute value of tolerance ±TOL sorting
Percentage tolerance %TOL sorting
Sequence comparison sorting
Beep Feature:
Beep: OFF/GD/NG

2.3.3 System Setup

- Keypad Lock Function
- Switch Both in Chinese and English
- Time and Date Settings
- Administrator Accountant Settings

2.3.4 Remote Control

Max baud rate: 115200bps, SCPI available, ASCII transmit.

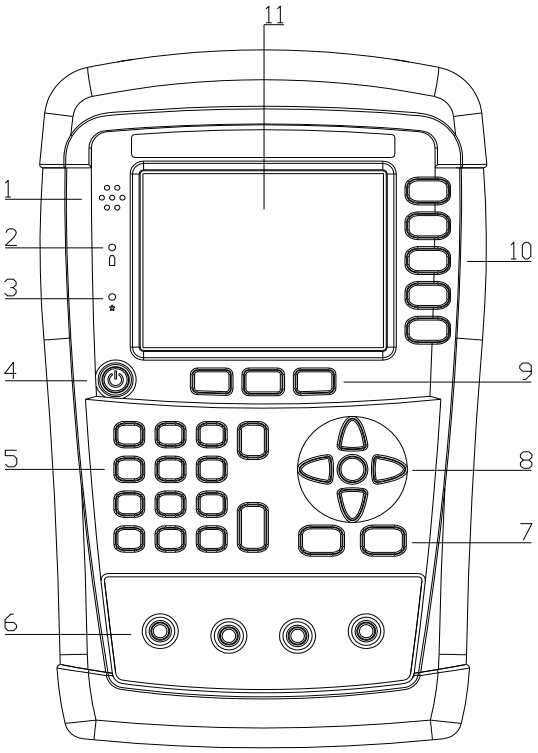
3. Startup

This chapter describes:

- Front Panel Summery
- Interfaces
- Power Supply
- Turn on/off
- Test Slots

3.1 Front Panel Summery

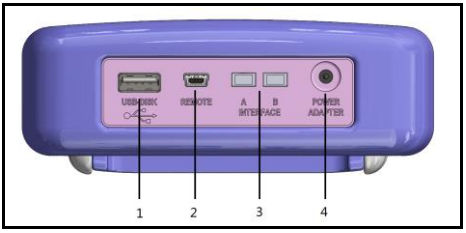
Table 3-1 Front panel summery



1	Beep
2	Battery Charging Indicator
3	Trigger Indicator
4	Power on/off
5	Numeric Keys
6	Test Slots
7	Main Page Key
8	Direction Keys
9	Soft keys 1
10	Soft keys 2
11	TFT-LCD Screen

3.2 Interfaces

Figure 3-1 Interfaces



1. USB Host Port
2. Mini-USB Slave Port
3. Reserved Interfaces
4. Power Adaptor

3.3 Power Supply

Power adaptor: ATL909
The instrument can be powered by Li battery. When the battery is low, only power adaptor can charge the battery.

Figure 3-2 Instrument and power adaptor



3.3.1 Charge the Battery

Use the power adaptor to charge the battery. The power key is orange when charging the battery even the instrument is turned off. When the battery is full, the indicator is out.

Figure 3-3 Power key is orange when charging.



Attention!	The power key is still orange while charging even when the instrument is shut down.

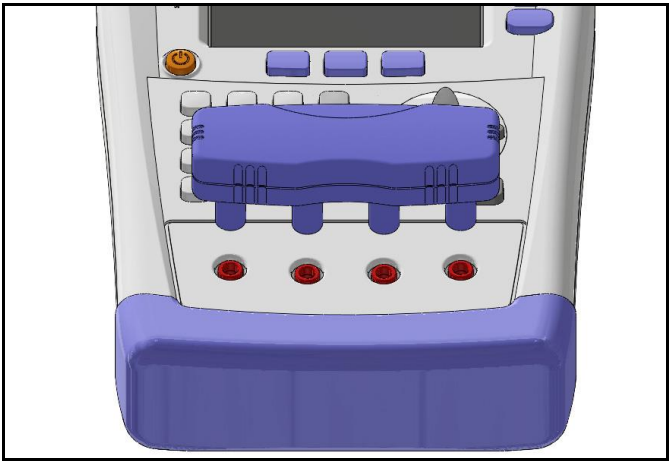
3.4 Turn On/Off

Press power key softly to turn on or turn off the instrument.

3.5 Test Slots

Insert the cable box into test slots

Figure 3-4 Test Slots



3.5.1 Clips and Cables:

Using clip or cable from other brands may cause mistakes
After a long time（1~2 Years）, the surface of the accessories may be damaged, which will lead to some inaccuracy.

4. <Meas> Key

This section includes the following information:

- MEAS DISPLAY page
- VIEW DATA page

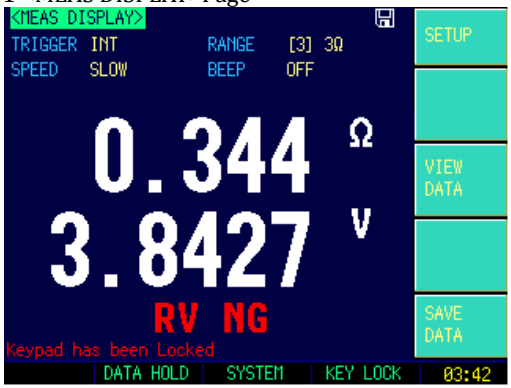
4.1 <MEAS DISPLAY> Page

Press [Meas] key to enter <MEAS DISPLAY>Page.

The <MEAS DISPLAY> page includes following setup:

- Trigger Mode [TRIGGER]
- Measurement Range [RANGE]
- Test Speed [SPEED]
- Comparator [COMP] ON/OFF
- [BEEP] Feature
- Soft-key VIEW DATA – To Enter [VIEWDATA] page
- Soft-key SAVE DATA – To Store measurement result into internal flash disk.

Figure 4-1 <MEAS DISPLAY>Page



4.1.1 [TRIGGER]

SCPI Command: TRIGger:SOURce {INT,MAN,BUS}
SCPI Query Command: **TRIGger:SOURce?**

AT525 supports four trigger modes: INT (internal), EXT, MAN (manual) and BUS (RS-232)

Table 4-1 Trigger Setting

Trigger	Description

Mode	
INT	Continuously repeats the measurement cycle.
MAN	Performs one cycle of measurement each time you press the [Trig] key.
BUS	Performs one cycle of measurement each time it receives a trigger command sent via RS-232.

■ Procedure to set the trigger:

Step 1	Press [Meas] key to enter <MEAS DISPLAY>Page	
Step 2	Use cursor keys to select [TRIGGER] field	
Step 3	INT	Automatic Internal trigger
	MAN	Manual Trigger by pressing [Trig] key
	BUS	BUS Trigger by RS232 SCPI command

4.1.2 [RANGE]

SCPI Command: FUNCtion:RANGe {<range number>,min,max}
SCPI Command: FUNCtion:RANGe:MODE {AUTO,HOLD,NOMinal}
SCPI Query Command: **FUNCtion:RANGe?**
SCPI Query Command: FUNCtion:RANGe:MODE?

AT525 has three resistance range modes and two voltage ranges.

Resistance Ranges:
Auto range, Manual range and Nominal range

Table 4-2 Resistance Range Mode

Range	Description	Pros	Cons
AUTO	Automatically select the best range according to impedance Range is automatically set.	Very convenient	Test speed is slower than manual ranging,
HOLD	The instrument will always use the user-specified range	Highest speed	Set the range previously
NOMINAL	Automatically select the best range according to nominal value.	Best mode for sorting.	Only available in sorting mode

Table 4-3 Resistance Measurement Ranges of AT525

Range	Range Name	Measurement Range
3	3Ω	320mΩ ~3.3Ω
2	300Ω	320Ω~ 330mΩ
1	30mΩ	32mΩ ~330mΩ
0	3mΩ	0mΩ ~3.3mΩ

■ Procedure of setting the range:

Step 1	Press [Meas] key to enter measurement page	
Step 2	Use the cursor key to select [RANGE]	
Step 3	AUTO	Auto range
	HOLD	Current range is hold
	NOMINAL	Select the range according to resistance nominal value [RNom].
	INCR+	Increase range
	DECL-	Decline range

4.1.3 Measurement Speed [SPEED]

SCPI Command: FUNCtion:RATE {SLOW,MED,FAST}
SCPI Query Command: **FUNCtion:RATE?**

SLOW, MED, FAST and ULTRA speed mode can be selected for AT525.

SLOW mode will result in more stable and accurate measurement result.
The following speed is measured in range-hold mode and comparator is ON:

SLOW: 1 times/sec (1s)
MED: 5 times/sec (100ms)
FAST: `0 times/sec (33ms)

- Procedure to set test speed:

Step 1	Press [Meas] key to enter measurement page;	
Step 2	Use the cursor key to select [SPEED] field	
Step 3	SLOW	
	MED	
	FAST	

4.1.4 [BEEP] Feature

SCPI Command: COMParator:BEEP {OFF,GD,NG}
SCPI Query Command: **COMParator:BEEP**

- Procedure to set the beep:

Step 1	Press [Meas] key to enter measurement page;	
Step 2	Use the cursor key to select [BEEP]	
Step 3	OFF	Turn Beep Off
	GD	Beep while Pass
	NG	Beep while Fail

4.2 Status Bar on <MEAS DISPLAY>

- HOLD – Hold the data under internal trigger mode, test stops.
- SYSTEM– Go to <SYSTEM CONFIG>Page
- KEY LOCK – Lock the keypad.
- Time

4.2.1 Icons on <MEAS DISPLAY>

Table 4-5 Icons

Icon	Description
	USB-Disk is available.
H	Hold current data.

4.2.2 [VIEW DATA] Soft-key

To enter the <VIEW DATA> page by pressing [VIEW DATA] soft-key.

4.2.3 [SAVE DATA] Soft-key

Every press this key a line of measurement result will be stored into internal flash disk.
The saved data can be reviewed on <VIEW DATA> page by pressing [VIEW DATA] soft-key.

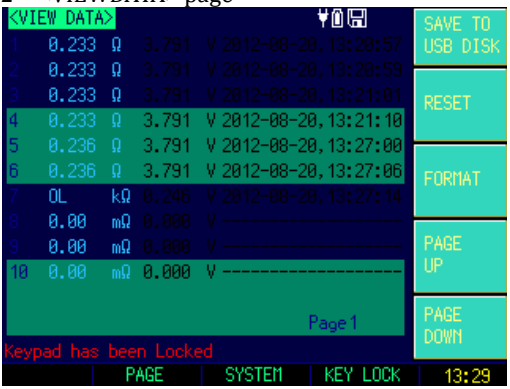
4.3 <VIEW DATA> page

The measurement result can be stored in AT525's internal nonvolatile memory by pressing the [SAVE DATA] soft-key in <MEAS DISPLAY> page.
Over 500 sets data can be saved.

The format of measurement result is:
[Resistance][Voltage][Date][Time]

You can review the saved data on the <VIEW DATA> page by pressing the [VIEW DATA] soft-key in <MEAS DISPLAY> page.

Figure 4-2 <VIEWDATA> page



- SAVE TO DISK – Store all data into USB Disk
- RESET – The data will be stored from the start of the

table.

- FORMAT – To format the internal nonvolatile memory disk, all data will be lost.
- PAGE – Jump to the provided page

5. [SETUP] Key

This chapter describes:

- <STEUP> page
- Short-circuit Clear Zero

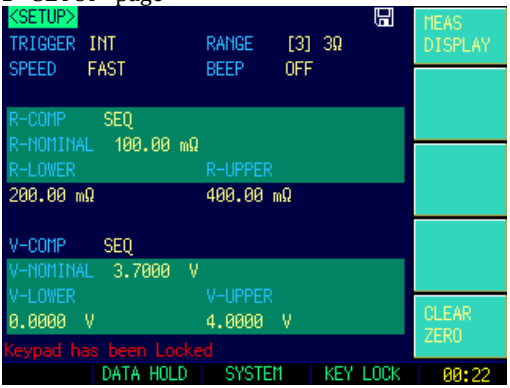
5.1 < SETUP> page

Press [Setup] key to enter <SETUP>page.
In <SETUP> page, the Instrument does not display measurement result and comparator result, testing is not in progress.
The <SETUP> page includes following setup:

- Trigger Mode [TRIGGER]
- Measurement Range [RANGE]
- Measurement Speed [SPEED]
- BEEP Feature
- Soft-key CLEAR ZERO – Clear Zero Correction
- R-COMP – AC Resistance Sorting Methods
- V-COMP– DC Voltage Sorting Methods
- R-NOMINAL – Input Resistance Nominal Value
- R-LOWER – Input Resistance Lower Limit
- R-UPPER – Input Resistance Upper Limit
- V-NOMINAL – Input Voltage Nominal Value
- V-LOWER – Input Voltage Lower Limit
- V-UPPER – Input Voltage Upper Limit

Some settings can be also setup in <MEAS DISPLAY> page. Please refer to the chapter: <Meas> Key

Figure 5-1 <SETUP>page



5.2 Short-circuit Clear Zero [CLEAR ZERO]

SCPI Command: `CORR:SHOR`

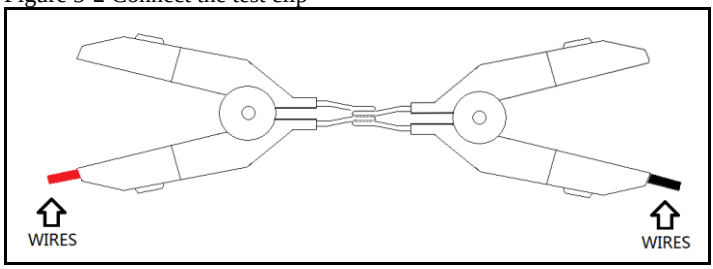
Press [Setup] key to enter < SETUP> page, and then press [CLEAR ZERO] soft-key to perform short-circuit clear zero.
After correction, the value will be saved into internal flash disk.



It is necessary to do short-circuit clear zero correction.
When replacing the test fixture or test cables, please do short –circuit clear zero.

How to connect the test clips before executing short-circuit clear.

Figure 5-2 Connect the test clip



5.3 Comparator Mode [R-COMP],[V-COMP]

SCPI Command: COMP:RMOD {OFF,ABS,PER,SEQ}
SCPI Command: COMP:VMOD {OFF,ABS,PER,SEQ}

There are several items for choosing:
SEQ – Sequential Mode
PER – Percentage Mode [PER = (Result – Nominal) / Nominal * 100%]
ABS – Absolute Mode [ABS = Result – Nominal]

■ Procedure of setting comparator mode:

Step 1	Press [Setup] key to enter <SETUP> page	
Step 2	Use cursor key to select [RESMODE]	
Step 3	SEQ	Sequential Mode: Compare result with low and high limited values.
	PER△%	Percentage Mode: (Result – nominal) / nominal × 100%
	ABS△	Absolute Mode: Result – Nominal

5.3.1 Comparator Nominal [R-NOMINAL],[V-NOMINAL]

SCPI Command: COMParator:TOLerence:RNOMinal <*float*>
SCPI Command: COMParator:TOLerence:VNOMinal <*float*>

When using the ABS and PER mode, the nominal value must be inputted.
The field is ignored when in SEQ mode.
The Nominal value must be positive.

■ Procedure of inputting nominal value:

Step 1	Press [Setup] key to enter <SETUP> page
Step 2	Use cursor key to select [R-NOMINAL] or [V-NOMINAL] field.
Step 3	Input the nominal value by numeric keypad.

5.3.2 Limit [R-LOWER] [R-UPPER] [V-LOWER], [V-UPPER]

SCPI Command: COMParator:TOLerence:RLMT <*lower*>,<*upper limit*>
SCPI Command: COMParator:TOLerence:VLMT <*lower*>,<*upper limit*>



The high limited value should be greater than low nominal value.

When in SEQ Mode, please input the direct value of resistance or voltage.
When in ABSΔ Mode, please input the absolute value of resistance or voltage.
When in PERΔ% Mode, please input the relative value of resistance or voltage in %.

■ Procedure of inputting high/low limited values:

Step 1	Press [Setup] key to enter < SETUP> page
Step 2	Use cursor keys to select : [R-LOWER] [R-UPPER] or [V-LOWER] [V-UPPER] field
Step 3	Please input the percentage value in when [PER Δ%] mode Please input the Direct value when in ABSΔ and SEQ mode.

6. <SYSTEM CONFIG> page

This chapter describes:

- SYSTEM CONFIG
- SYSTEM INFORMATION
- SYSTEM SERVICE

6.1 <SYSTEM CONFIG> page

Press [SYSTEM] bottom soft-key to enter <**SYSTEM CONFIG**> page.

- LANGUAGE – Choose English or Chinese Language
- DATE/TIME
- ACCOUNT
- BEEP Feature
- BAUD – RS232/RS485 Communication Baud Rate.
- RS-485 Address
- SHAKE HAND – RS232/RS485 Shake Hand
- RESULT SEND – Acquire the test result by FETCH? Command or auto send.

All settings in <**SYSTEM CONFIG**> will be saved into internal flash disk automatically.

Figure 6-1 <SYSTEM CONFIG> page



6.1.1 [LANGUAGE]

■ Procedure to change language:

Step 1	Press [Meas] or [Setup] key to enter main page
Step 2	Press bottom soft-key [SYSTEM] to enter <SYSTEM CONFIG>
Step 3	Use cursor keys to select [Language] field

Step 4	中文 [CHN]	Chinese
	ENGLISH	

6.1.2 [ACCOUNT], [PASSWORD]

- ADMIN – All settings are available and can be saved.
- USER – All settings are available but **cannot** be saved.

■ Procedure to set up account:

Step 1	Press [Meas] or [Setup] key to enter main page	
Step 2	Press bottom soft-key [SYSTEM] to enter <SYSTEM CONFIG> page	
Step 3	Use cursor key to select [ACCOUNT] field	
Step 4	ADMIN	Administrator
	USER	

■ Procedure to set password:

Step 1	Press [Meas] or [Setup] key to enter main page	
Step 2	Press bottom soft key [SYSTEM] to enter <SYSTEM CONFIG>	
Step 3	Use cursor key to select [PASSWORD] field	
	CHANGE PASSWORD	No more than 9 digits and only digits and letters can be input. Contact us if you forget password.
	DELETE PASSWORD	

6.1.3 [DATE], [TIME]

The instrument uses a 24-hour time.

■ Procedure to set data:

Step 1	Press [Meas] or [Setup] key to enter main page
Step 2	Press bottom soft key [SYSTEM] to enter <SYSTEM CONFIG> page
Step 3	Use cursor keys to select [DATE] field
Step 4	YEAR INCR+
	YEAR DECR-
	MONTH INCR+
	DAY+
	DAY-

■ Procedure to set time:

Step 1	Press [Meas] or [Setup] key to enter main page	
Step 2	Press bottom soft key [SYSTEM] to enter <SYSTEM CONFIG> page	
Step 3	Use cursor keys to select [TIME] field	
Step 4	HOUR INCR+	
	HOUR DECR-	
	MINUTE DECR+	
	MINUTE DECR-	

	SECOND INCR+	
	SECOND DECR-	

6.1.4 RS232 [BAUD] rate

Before you can control the AT525 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 AT525's built-in RS-232 interface uses the SCPI language.
The configuration of RS-232

The keypad will be locked when the commutation is established.
Use SCPI language in Mini-USB programming.

RS-232 configuration is as follows:

- Data bits: 8
- Stop bits: 1
- Parity: none

■ Procedure to set baud rate:

Step 1	Press [SYSTEM] bottom soft-key to enter <SYSTEM CONFIG> page	
Step 2	Use cursor to select [BAUD] field	
Step 3	1200	For communication converter with opt coupler isolation
	9600	
	38400	
	57600	
	115200	Best for communication with PC

6.1.5 RS-232 Shake Hand [SHAKE HAND]

AT525 supports software "shake hand". AT525 will return the whole command to host and then response the command when the [SHAKE HAND] is turned ON.

■ Procedure to turn ON the "Shake Hand":

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

ON	
OFF	

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

6.1.6 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:
+3.549568e-01,+3.827993e+00,RV GD
+3.549911e-01,+3.827931e+00,RV GD
+1.000000e+20,+1.000000e+20,RV NG
…
Where,
“+1.000000e+20” stands for overload or open.
“RV GD” stands for Resistance and Voltage are Good (GD).
“RV NG” stands for Resistance and Voltage are Not Good (NG) or invalid

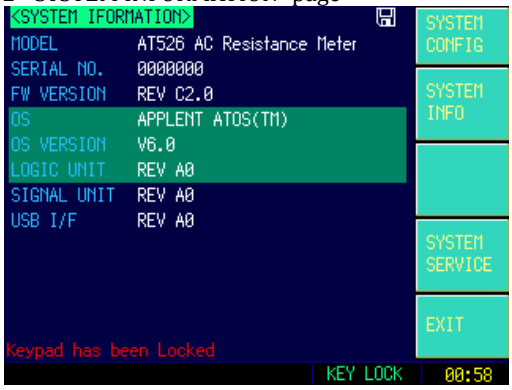
- Procedure of setup the result send mode:
  Step 1. Press the [Meas] or [Setup] key
  Step 2. Press the [SYSTEM] bottom soft-key.
  Step 3. Use the cursor key to select [RESULT SEND] field
  Step 4. Use the soft keys to turn ON.

FETCH	Acquire the test result by sending “FETCH?” command only.
AUTO	AT525 return the result every EOM

6.2 <SYSTEM INFORMATION>

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

Figure 6-2 <SYSTEM INFORMATION>page



- Procedure of viewing system information:

Step 1	Press [Meas] or [Setup] key to enter main page
Step 2	Press bottom soft key [SYSTEM] to enter <SYSTEM CONFIG>
Step 3	Press soft-key [SYSTEM INFORMATION] to enter <**SYSTEM INFOR**

6.3 <SYSTEM SERVICE> page



Warning:
Not available for users
Any unprofessional person is not allowed to have access to this page.

7. Remote Control

This chapter provides the following information to remotely control the AT525 via the RS-232C or USB interface.

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

AT525 can use the RS-232 interface or USB interface to communicate with the computer to complete all the instrument functions.

■ Make sure the controller you connect to AT525 also uses these settings.
The RS-232 interface transfers data b using:
8 data bits,
1 stop bit,
And no parity.

7.1 To Select Baud Rate

Before you can control the AT525 by issuing RS-232 commands from built-in RS-232 controller connected via its USB connector, you have to configure the RS-232 baud rate.
The AT525'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

7.2 SCPI Language

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

RS-232 interfaces.



NOTE:
AT525 ONLY supports the SCPI Language.

8. Command Reference

This chapter contains reference information on programming AT525 with the SCPI commands.

This chapter provides descriptions of all the AT525's available RS-232 commands which correspond to Standard Commands for Programmable Instruments (SCPI) command sets, listed in functional subsystem order.

8.1 Terminator

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

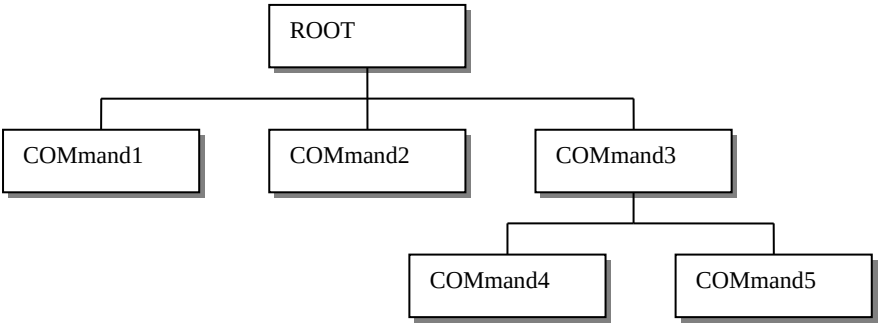
8.2 Notation Conventions and Definitions

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

8.3 Command Structure

The AT525 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 AT525'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 8-1 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 AT525 accepts the three forms of the same SCPI commands: all upper case, all lower case, and mixed upper and lower case.

8.4 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 8-1 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

8.5 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:

- IDN?
- SAV
- TRG

8.6 DISPlay Subsystem

The DISP Subsystem command group sets the display page.

Figure 8-2 DISP Command Tree

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

8.6.1 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 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>

8.6.2 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>

8.7 FUNCtion Subsystem

The FUNCtion subsystem command group sets the measurement function, the

measurement range, monitors parameter control.

Figure 8-3 FUNCtion Subsystem Tree

FUNCtion	:RANGe	{#Range Number，max，min}	
		:MODE	{AUTO,HOLD,NOMinal}
	:RATE	{SLOW,MED,FAST,ULTRA}	

8.7.1 FUNCtion:RANGe

The FUNCtion:RANGe command sets the range.

Command Syntax	FUNC:RANGe *<0-4,MIN,MAX>*
Parameter	Where, <0-3,MIN, MAX> is: 0-4, The range number MIN, =Range 0 MAX, =Range 3
Example	SEND> FUNC:RANG 2<NL> //Set range to [2] 300mΩ
Query Syntax	FUNC:RANGe?
Query Response	<0-3><NL>
Example	SEND> FUNC:RANG?<NL> RET> 0<NL>

8.7.2 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>

8.7.3 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>	SLOW<NL>

8.8 COMParator Subsystem

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

Figure 8-4 COMParator Subsystem Command Tree

COMParator	:BEEP	{OFF,GD,NG}	
	:RMODe	{OFF,SEQ,PER,ABS}	
	:VMODe	{OFF,SEQ,PER,ABS}	
	:TOLerance	RNOMinal	<float>
		VNOMinal	<float>
		RLIMIT(RLMT)	<LOWER,UPPER>
		VLIMIT(VLMT)	<LOWER,UPPER>

8.8.1 COMParator:RMODe

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

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

8.8.2 COMParator:VMODe

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

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

Example	SEND> COMP:VMODe?<NL> RET> abs<NL>

8.8.3 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>

8.8.4 COMParator:TOLerence:RNOMinal

The COMParator:TOLerence:RNOMinal command sets resistance nominal value for the tolerance mode of the comparator function.

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

8.8.5 COMParator:TOLerence:RLiMiT

The COMParator:TOLerence:RLiMiT command sets resistance lower/upper limit values.

Command Syntax	COMParator:TOLerence:RLiMiT <*lower*>,<*upper limit*>
Parameter	Where,<lower>,<upper> is: lower <float> lower limit value upper<float> upper limit value
Example	SEND> COMP:TOL:RLMT 100m,330m<NL>
Query Syntax	COMParator:TOL:RLMT? <n>
Query Response	<float: lower limit>,<float: upper limit>
Example	SEND> COMP:TOL:RLMT?<NL> RET> 1.000000e-01,3.300000e-01<NL>

8.8.6 COMParator:TOLerence:VNOMinal

The COMParator:TOLerence:VNOMinal command sets resistance nominal value for the tolerance mode of the comparator function.

Command Syntax	COMParator:TOLerence:RNOMinal <*float*>
Example	SEND> COMP:TOL:VNOM 1.23m<NL> SEND> COMP:TOL:VNOM 50<NL>
Query Syntax	COMParator:TOLerence:RNOMinal?
Query Response	<scifloat>
Example	SEND> COMP:TOL:VNOM?<NL> RET> +1.00000e+01<NL>

8.8.7 COMParator:TOLerence:VLiMiT

The COMParator:TOLerence:VLiMiT command sets voltage lower/upper limit values.

Command Syntax	COMParator:TOLerence:VLiMiT <*lower*>,<*upper limit*>
Parameter	Where,<lower>,<upper> is: lower <float> lower limit value upper<float> upper limit value
Example	SEND> COMP:TOL:VLMT 1.1,3.9<NL>
Query Syntax	COMParator:TOL:VLMT? <n>
Query Response	<float: lower limit>,<float: upper limit>
Example	SEND> COMP:TOL:VLMT?<NL> RET> 1.100000e+00,3.900000e+00<NL>

8.9 TRIGger Subsystem

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

Figure 8-5 TRIGger Subsystem Command Tree

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

8.9.1 TRIGger[:IMMediate]

The TRIGger[:IMMediate] command causes the trigger to execute one measurement under BUS trigger mode.

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

8.9.2 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 BUS Remote Trigger Mode
Example	SEND> TRIG:SOUR BUS<NL>
Query Syntax	TRIGger:SOURce?
Query Response	{INT,MAN,BUS}
Example	SEND> TRIG:SOUR? 1<NL> RET> INT<NL>

8.9.3 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> +3.514007e-01,+3.827861e+00,RV GD +1.000000e+20,+1.000000e+20,RV NG //OPEN or OVERLOAD
Note	This command can be used ONLY in BUS trigger mode.

8.10 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 8-6 FETCh Subsystem Command Tree

FETCh?	

8.10.1 FETCh?

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

Query Syntax	FETCh?
Query Response	<float>,<comparator result>
Example	SEND> FETC?<NL> RET> +3.506759e-01,+3.827991e+00,RV GD<NL>

8.11 CORRection Subsystem

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

Figure 8-7 CORRection Subsystem Command Tree

CORRect	:SHORt	

8.11.1 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.

8.12 SYSTem subsystem

Figure 8-8 SYSTem commad tree

SYSTem	:SENDmode	{FETCH,AUTO}

8.12.1 SYSTem:SENDmode

SYST:SEND command sets the RS-232 Result Send Mode.
Please refer to Page.24 Section 0

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

RS-232 Result Send Mode [RESULT SEND]

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

8.13 ERRor Subsystem

The ERRor subsystem retrieves last error information.

Query Syntax	ERRor?
Query Response	Error string

Example	SEND>	ERR?<NL>
	RET>	no error.<NL>

8.14 IDN?

The *IDN? query returns the instrument ID.

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

8.15 SAV

The SAV command will save all changed settings into internal flash disk.

Query Syntax	SAV
Query Response	OK

9. Specification

This chapter describes:

- Basic Specifications
- Dimensions

9.1 General Specifications

Accuracy is defined as meeting all of the following conditions.

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

Working Environment:

- Nominal：Temperature 15℃~35℃ Humidity<80%RH
- Working： Temperature 10℃~40℃ Humidity10~90%RH
- Storage： Temperature 0℃~50℃ Humidity10~90%RH

9.2 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.

9.3 AC Resistance Range

RANGE		Max Reading	Res.	SLOW	Test Current
0	3mΩ	3.300mΩ	1μΩ	0.5% ± 10	150mA
1	30mΩ	33.00mΩ	10μΩ	0.5% ± 5	150mA
2	300mΩ	330.0mΩ	100μΩ	0.5% ± 5	15mA
3	3Ω	3.300Ω	1mΩ	0.5% ± 5	1.5mA

9.4 DC Voltage Range

RANGE		Max Reading	Resolution	SLOW
0	60V	60.000V	0.0001V	0.05%±5

9.5 Features

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

Measurement Range: 0.001mΩ~3.3000Ω

Measurement Speed: **Range-hold** mode and comparator is ON:

SLOW: 1 times/sec (1s)

MED: 5 times/sec (200ms)

FAST: 10 times/sec (100ms)

Ranging: Auto, Hold and Nominal range. Total 5 Ranges.

Correction Function: SHORT-CIRCUIT Clear Zero

Terminals: Four-terminal test method

Comparator: ABS, PER and SEQ sorting methods

Beep Feature: OFF/GD/NG

Trigger Mode: Internal, Manual, BUS trigger.

Built-in Interface: USB-RS232 interface

Programming language: SCPI

Others Data hold function, Keypad lock

9.6 Environment

Temperature and humidity range: 15℃~35℃, 80% RH or less

Storage temperature and humidity range: 10℃~40℃, 10~90% RH

Power Supply: 8.4V Li, 2200mAh rechargeable battery

Charging time: < 5h

Working time: ≥8h @25% Brightness

Power: <5W

Dimension: 210.76mm*130.23mm*37.88mm

Weight: 500g

A

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