

SOURCETRONIC – Qualitäts-Elektronik für Service, Labor und Produktion

## Manual

### Insulation resistance meter ST2683A



## Contents

1)	Introduction to Instrument, Unpacking and Installing.....	1
1.1	Introduction to Instrument.....	1
1.2	Unpacking.....	1
1.3	Power Connection.....	1
1.4	Fuse.....	2
1.5	Environment.....	2
1.6	Use of Test Fixture.....	2
1.7	Warm-up.....	2
1.8	Other Features.....	2
2)	Introduction to Front and Rear Panels.....	3
2.1	Introduction to Front Panel.....	3
2.2	Introduction to Rear Panel.....	4
2.3	Display Zone.....	5
2.4	Introduction to Buttons on Front Panel.....	6
2.4.1	[MEAS].....	6
2.4.2	[SYSTEM].....	6
2.5	Simple Operation.....	6
2.6	Starting Up.....	7
3)	Basic Operation.....	8
3.1	<MEAS DISP>.....	8
3.1.1	Measurement Functions.....	9
3.2	<MEAS SETUP>.....	10
3.2.1	OUTP VOLT.....	10
3.2.2	MEAS MODE.....	11
3.2.3	CHAR TIME.....	11
3.2.4	MEAS SPEED.....	12
3.2.5	RANGE SET.....	12
3.2.6	LOCK RANGE.....	12
3.2.7	CONT CHEC.....	13

---

3.2.8	OPEN CLR .....	13
3.2.9	Average.....	14
3.2.10	MEAS DISP .....	15
3.3	<PICKOUT SETUP> .....	15
3.3.1	PICK FUNC.....	15
3.3.2	PICK ITEM.....	16
3.3.3	LOLI ONE .....	16
3.3.4	BEEP SET .....	16
3.3.5	Steps for BIN Disp .....	17
3.3.6	Steps for PICK LIVA .....	17
3.3.7	Steps for OUTP RESU .....	18
3.3.8	PULSE WID .....	18
3.4	Start Test.....	18
3.4.1	Test Method .....	18
3.4.2	Operation Process .....	20
3.4.3	Range Selection .....	20
4)	System Setup and File Manage .....	21
4.1	System Setup .....	21
4.1.1	BEEPER .....	21
4.1.2	PASSWORD .....	21
4.1.3	BUS MODE .....	22
4.1.4	LANGUAGE.....	22
4.1.5	KEYSOUND .....	23
4.1.6	TRIGGER.....	23
4.1.7	BAUD RATE .....	23
4.1.8	HANDLER VCC .....	24
4.1.9	Setting Time and Date .....	24
4.2	<File Manage> .....	25
4.2.1	Introduction to Save/Recall .....	25
4.2.2	Structure of File Folder/File in a U Disk.....	25

---

5)	Performance Index .....	29
5.1	Measurement Function .....	29
5.1.1	Measurement Parameters and Notations.....	29
5.1.2	Range .....	29
5.1.3	Trigger.....	29
5.1.4	Mode of Test Terminal .....	29
5.1.5	Measurement Speed (when MEAS DISP & BIN DISP is set as OFF) .....	29
5.1.6	Display Digits .....	30
5.2	Test Signal.....	30
5.2.1	Output Voltage Range .....	30
5.2.2	Output Voltage Accuracy.....	30
5.2.3	Maximum Display Range .....	30
5.3	Measurement Accuracy.....	31
5.3.1	Basic Accuracy for Resistance Measurement.....	31
6)	Remote Control .....	32
6.1	RS232C Connection .....	32
6.2	SCPI (Standard Commands for Programmable Instruments).....	33
6.3	USBTMC Remote Control System.....	33
6.3.1	System Configuration .....	33
6.3.2	Install the Driver .....	33
6.4	USBVCOM Virtual Serial Port.....	35
6.4.1	System Configuration .....	35
6.4.2	Installing Driver.....	35
7)	SCPI Command Reference.....	36
7.1	Data Conventions of This Manual: .....	36
7.2	ST2683A Subsystem Commands .....	36
7.2.1	DISPlay Subsystem Commands.....	36
7.2.2	FUNcTION Subsystem Commands .....	37
7.2.3	DISCharge Subsystem Commands.....	42
7.2.4	TRIGger Subsystem Commands.....	42

---

7.2.5	FETCH? Subsystem Commands .....	43
7.2.6	COMParator Subsystem Commands .....	44
7.2.7	SYSTem Subsystem Commands .....	47
7.2.8	Mass MEMory Subsystem Commands .....	48
7.3	GPIB Common Comamnds .....	49
8)	Handler Interface .....	50
9)	Package Contents and Warranty .....	53
9.1	Package Contents .....	53
9.2	Marks .....	53
9.3	Package .....	53
9.4	Shipping .....	54
9.5	Storage .....	54
9.6	Warranty .....	54

## Declaration

The descriptions contained in this manual may not cover all information about this instrument. Introductions to the improvements of the instrument in performance, function, internal structure, outer appearance, accessories, packing material, etc. are subject to change without notice. If you find any inconformity of this manual with our instruments, please contact us for further consultation by the address listed on the cover.

---

# 1) Introduction to Instrument, Unpacking and Installing

Thank you for your purchase and use of our products! This chapter will introduce the basic instrument performance, which is followed by notes of unpacking and installing.

## 1.1 Introduction to Instrument

With touch, color LCD screen and unique insulation resistance/leakage current dual test function, ST2683A Insulation Resistance Meter is an intelligent measurement instrument that is used for rapid measurements on insulating properties of electronic parts and components (especially the capacitance), dielectric material, equipment, wires, cables, etc.

ST2683A is provided with sorting output and external single pulse signal input interface, making it easy for pipeline operation. The equipped communication interface can achieve the remote operations of all functions of the instrument through a microcomputer. The instrument has a powerful anti-jamming capability, which makes the measurement more reliable

## 1.2 Unpacking

Inspect the shipping container for damage after unpacking it. It is not recommended to power on the instrument in the case of a damage container.

If the contents in the container do not conform to the packing list, notify us or your dealer.

## 1.3 Power Connection

- 1) Power supply: 90V to 121Vac (60Hz) or 198 to 242Vac (50Hz).
- 2) Power supply power range:  $\leq 50VA$ .
- 3) L (line wire), N (neutral wire) and E (earth ground wire) of the power supply input socket should correspond to the power plug of the instrument.
- 4) The instrument has been specially designed for decreasing noise jamming caused by the input in AC power terminal, but it is also recommended to use it in the environment of low noise. If noises cannot be avoided, install a power source filter please.

---

**WARNING: To avoid injury to personnel and damage to the instrument resulting from electric shock, do sure that the earth ground wire is safely grounded.**

---

## 1.4 Fuse

The fuse is a standard configuration, so use the included custom fuse please.

## 1.5 Environment

- 1) Do not store or use the instrument where it could be exposed to many dusts, great vibration, direct sunshine and corrosive gas.
- 2) The instrument should operate under the temperature ranging from 10°C to 40°C, relative humidity of no greater than 90%. For high accuracy, use the instrument in the environment above mentioned.
- 3) For high accuracy, do not block the left air vent so as to ensure good ventilation.
- 4) The instrument has been specially designed for decreasing noise jamming caused by the AC power input, but it is also recommended to use it in the environment of low noise. If noise cannot be avoided, install a power filter please.
- 5) If the instrument will not be used for a long time, please place it in the original or a similar packing box. The environment temperature should be kept in the range of 0°C to 40°C, and the relative humidity should not be greater than 90%RH. The box should be located in an airy room where it could be exposed corrosive impurities and direct sunlight.
- 6) Test leads on the instrument that are connected to DUTs should be kept away from strong electromagnetic fields to avoid interference.

## 1.6 Use of Test Fixture

Only use the test fixture or cable made by our company, because the use of other test fixtures or cables may result in incorrect measurement results. In addition, for good contact of DUT and fixture, keep the test fixture or cable and pins of DUT clean.

Connect the test fixture or cable to HV (-) and INPUT terminals on the instrument front panel.

## 1.7 Warm-up

- 1) For accurate measurement, the warm-up time should not be less than 30 minutes.
- 2) Do not turn on or off the instrument frequently. This may cause internal data confusion.

## 1.8 Other Features

- 1) Consumption: ≤50VA
- 2) Dimensions (W\*H\*D): 235mm\*104mm\*360mm; this dimension is the final packaging size.
- 3) Weight: Approx. 3.6kg

## 2) Introduction to Front and Rear Panels

This chapter will describe the basic operation of ST2683A. Before using the instrument, please read this chapter carefully.

### 2.1 Introduction to Front Panel

Figure 2-1 shows the front panel of ST2683A.

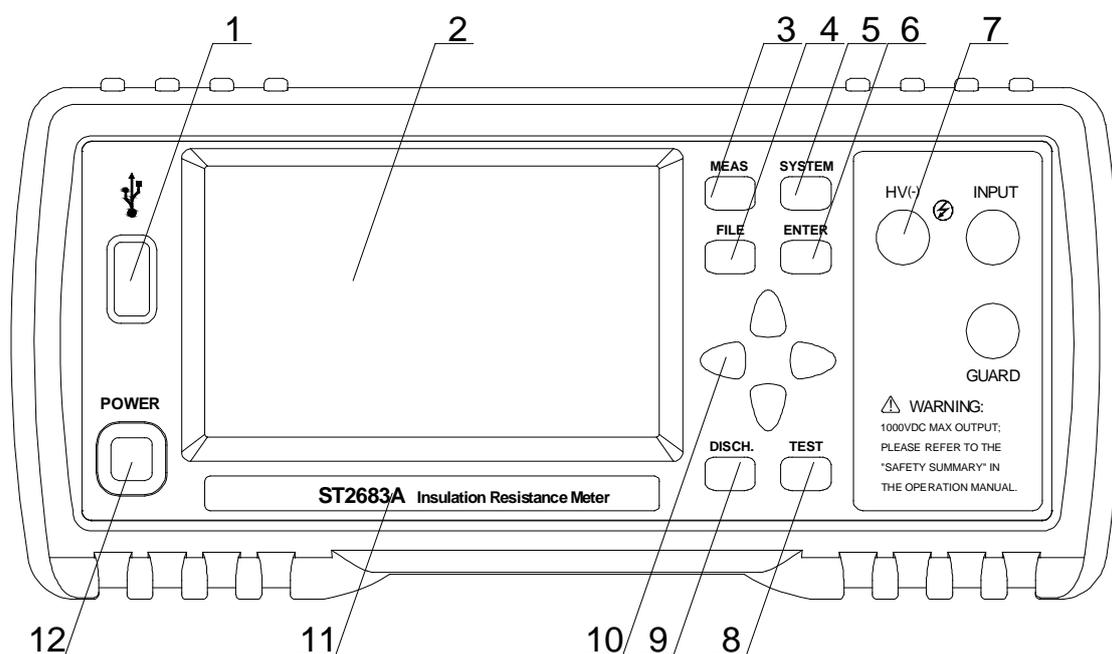


Figure 2-1 Front Panel

- 1) **USB interface**  
**HOST interface of USB**
- 2) **LCD and touch screen**  
480\*272 dot-matrix, 24-bit, 4.3-inch TFT and touch LCD is used for measurement setup and result display.
- 3) **[MEAS]**  
Press [MEAS] to enter into the MEAS DISP page.
- 4) **[FILE]**  
Press [FILE] to enter into the page of internal and external File Manage.
- 5) **[SYSTEM]**  
Press [SYSTEM] to enter into the SYSTEM SETUP page.
- 6) **[ENTER]**  
Press this key to confirm and store input data.
- 7) **Test terminals (HV-), INPUT, GUARD**  
(HV-): voltage output terminal  
INPUT: sampling input terminal

GUARD: ground shield terminal

#### 8) [TEST]

When the trigger mode is set as MANU (manual), pressing this key can trigger the instrument manually.

#### 9) [DISCH.]

Press this key to make the instrument return to discharge state from test state.

#### 10) Universal Arrow Keys

There are four arrow keys: up, down, left and right arrow keys.

#### 11) Trademark and Model

Show instrument trademark and model.

#### 12) POWER

It is the power switch.

## 2.2 Introduction to Rear Panel

Figure 2-2 shows the rear panel of ST2683A.

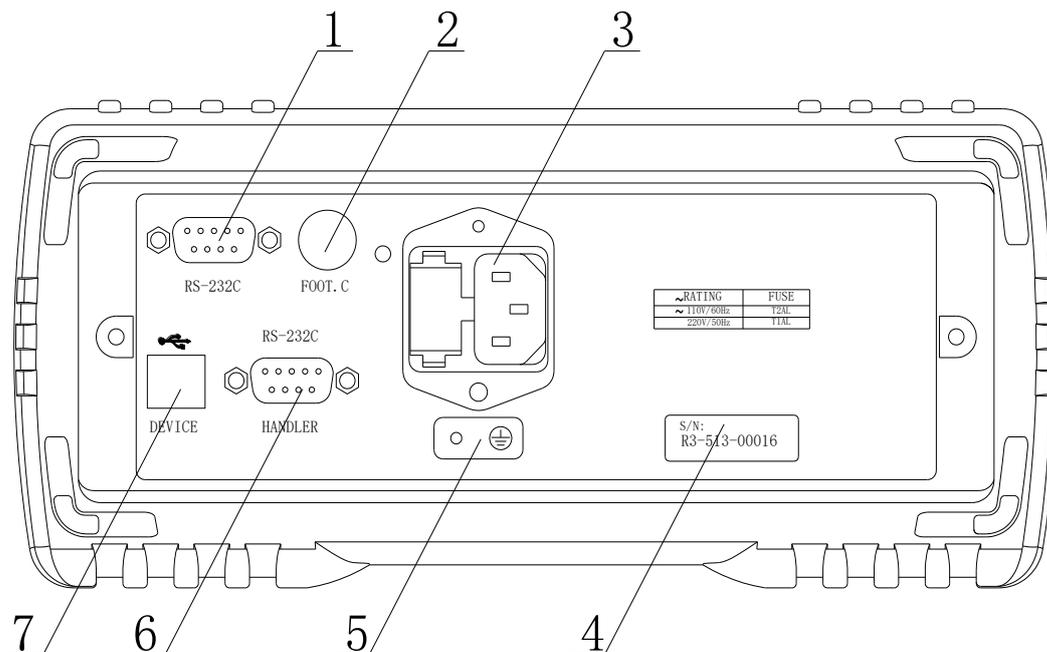


Figure 2-2 Rear Panel

#### 1) RS232C Serial Interface

It realizes serial communication of the instrument with PC.

#### 2) FOOT.C

External trigger signal, foot switch ST1801-001 (optional) can be used to trigger measurement when the trigger source is EXT.

#### 3) Power Socket

It is used to input AC power and it is equipped with fuse socket. Fuse will be placed in fuse socket to protect the instrument.

#### 4) Nameplate

It shows the instrument model.

### 5) Ground Terminal

This terminal connects the instrument chassis thus to protect or shield ground connection.

### 6) HANDLER Interface

Through HANDLER interface, an automatic test system can be conveniently constructed to realize auto test. ST2683A will output sorting comparator result signals and link signals. Meantime, "START" signal can be obtained through this interface.

### 7) USB Interface

PC can remotely control ST2683A through USB DEVICE.

## 2.3 Display Zone

ST2683A adopts 24-bit 4.3-inch LCD touch screen with a resolution of 480\*272. The display screen is divided into the following zones, as shown in figure 2-3.

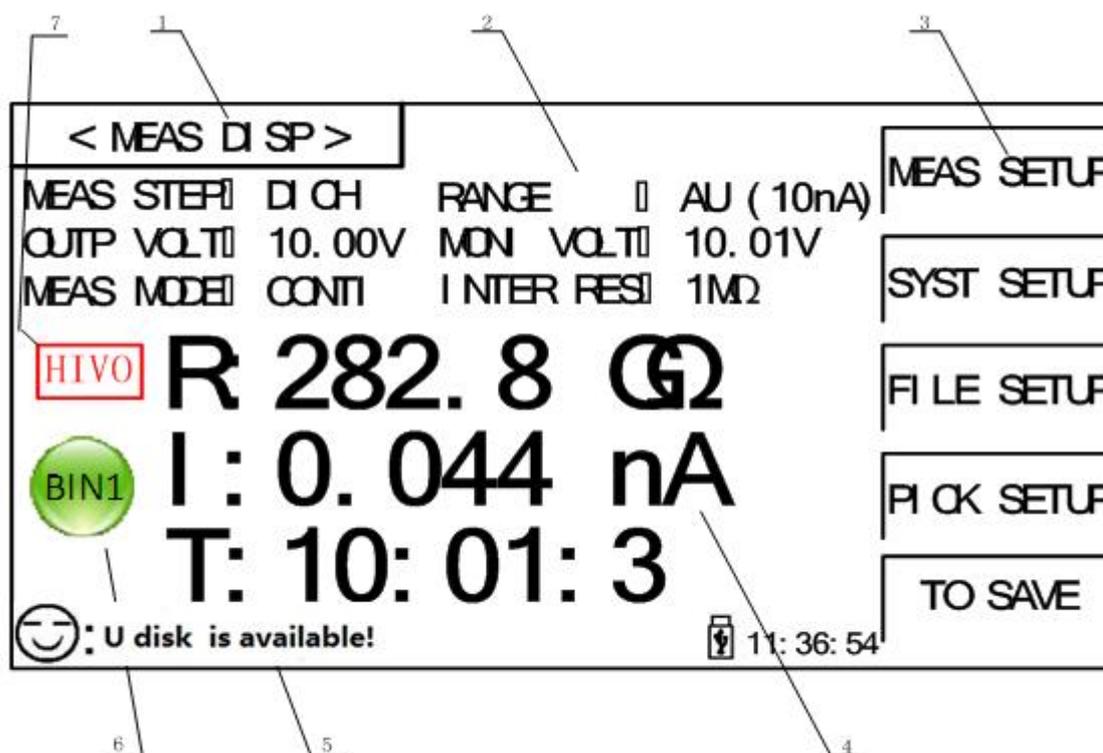


Figure 2-3 Display zone

#### 1. Page name

This zone shows the current page name.

#### 2. Function zone

On measurement display page, this zone is used to show the measurement parameters (**parameters on this page can only be shown, but not be changed**); on other page, it is used to change the measurement parameters and **zones after colon** of functional parameters can be touched to change.

#### 3. Soft keys

This zone displays the function menu corresponding to the cursor-located zone.

#### 4. Result display

This zone displays the measurement result and the time of each test procedures (counting down).

#### 5. Prompt information

This zone displays all prompt information.

#### 6. Bin display

This zone displays sorting results of bins (**when sorting function is ON**).

#### 7. Warning sign

This zone is used to blinking display some warning information, for example, when **HV** is displayed, it is warning that there is high voltage in test terminal. The instrument user should be careful.

## 2.4 Introduction to Buttons on Front Panel

### 2.4.1 [MEAS]

Press <MEAS> to enter into display homepage. Selectable functions on this page are shown as follows:

<MEAS SETUP>

<SYSTEM SETUP>

<FILE SETUP>

<SORTING SETUP>

<START SAVING>

### 2.4.2 [SYSTEM]

Press the [SYSTEM] button to enter into the <SYSTEM SETUP> page; the setup items of system can be changed on this page.

## 2.5 Simple Operation

Simple operation steps for ST2683A:

- Use [MEAS], [SYSTEM] or [FILE] or soft keys to enter into the page required to enter. (Refer to figure 2-5)
- Use arrow buttons ([←] [↑] [→] [↓]) to move the cursor to desired zone.
- When the cursor is moved to a soft key zone, press ENTER to confirm the selection. If it is required to input a number or a file name, use the keyboard to input and press ENTER to finish entry. You can use arrow buttons to select a number or a letter.

---

**NOTE: DO NOT use acute units or nails to touch the screen. Doing so will cause damage to the screen, our company shall not be liable to this case.**

---

## 2.6 Starting Up

Ensure the power earth (ground) wire is grounded, plug into a 3-wire power socket. Press down the power switch on the bottom left corner of the front panel, the instrument will be started up and a boot screen will be displayed.

Figure 2-4 shows the boot screen of ST2683A, indicating product information such as instrument trademark, model and version.



Figure 2-4 ST2683A Boot Screen

If the password protection is enabled, you will be asked to input your password. After inputting your password, press [ENTER] to enter into the main menu page.

**NOTE:** This series of products have enabled password protection and the default password is 2683. You can reset the password by yourself. Refer to the password function on <SYSTEM SETUP> page for more details.

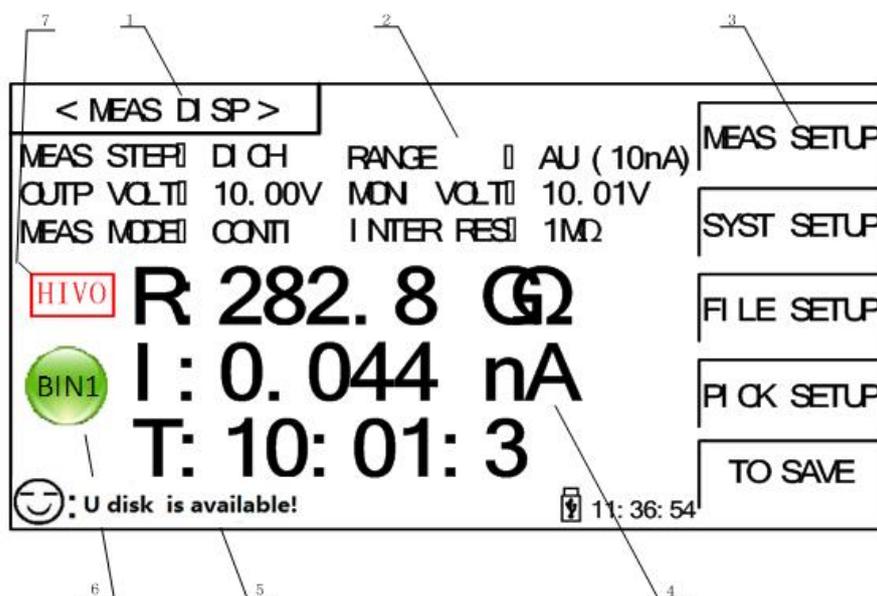


Figure 2-5 ST2683A Main Display

## 3) Basic Operation

### 3.1 <MEAS DISP>

Touch the screen or press down [MEAS] and then the <MEAS DISP> page will be displayed on the screen shown as figure 3-1.

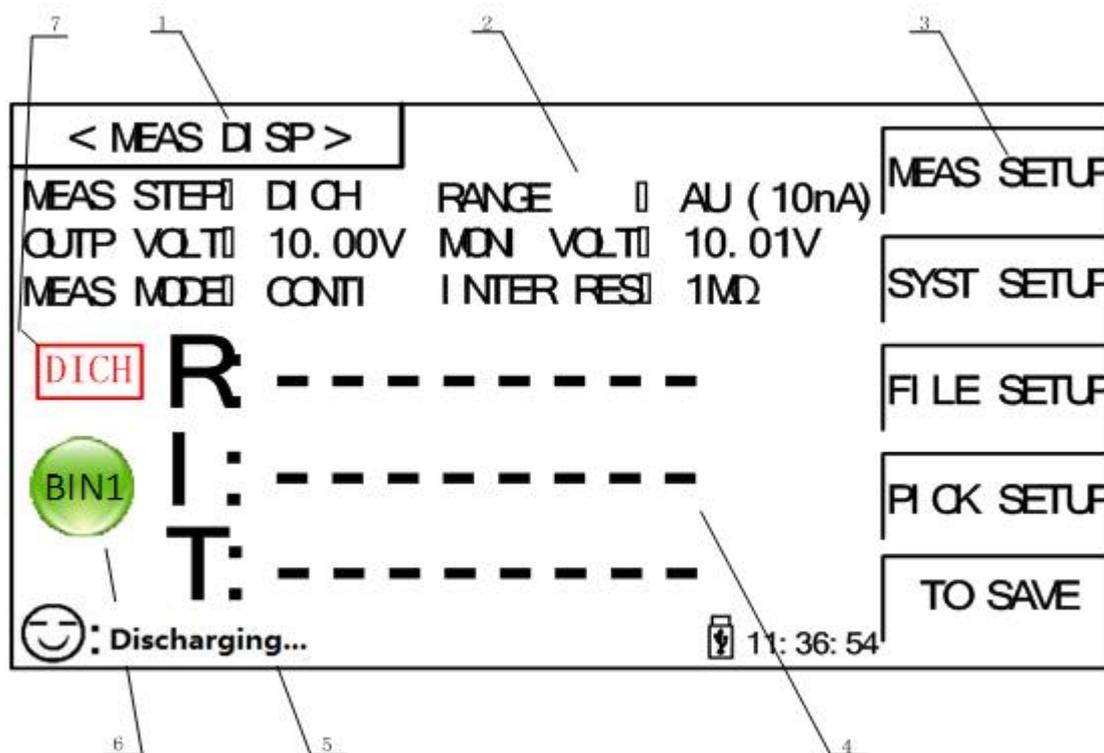


Figure 3-1 Measure Display

The following functions can be achieved by touching the related key in soft key area on this page.

- **MEAS SETUP** (entering into the measurement setup page)
- **SYSTEM SETUP** (entering into the system setup page)
- **FILE SETUP** (entering into the internal file setup page)
- **PICKOUT SETUP** (entering into the pick out setup page)
- **START Save** (the current measurement results will be saved to U-disk by pressing this touch key. If there is no U-disk inserted in the interface, the measurement results will not be saved; if there is U-disk, the touch key of **START Save** will change into **STOP Save** and it will stop saving the data into U-disk by pressing the touch key of **STOP Save**).

**NOTE:** *Be sure to press **STOP Save** to end saving after **START Save**. Otherwise, the data may be lost.*

The following test condition information will be displayed in measurement/condition display zone on this page. These conditions (except the measurement internal resistance) can be set on **<MEAS SETUP>** page.

- MEAS STEP.

- RANGE.
- OUTP VOLT.
- MONI VOLT.
- MEAS MODE.
- INTER RES.

### 3.1.1 Measurement Functions

Measurable parameters on ST2683A are as follows:

#### Primary Parameters

- **R** (Insulation resistance)
- **I** (Leakage current)

#### Secondary Parameter

- **T** (Time count value of each procedure)

The measurement results of primary parameters and secondary parameter are respectively displayed in three lines in the form of large characters. The upper two lines indicate the primary parameters, while the lower line shows the secondary parameter.

#### Note:

1. If the primary parameter R exceeds the maximum value of  $10T\Omega$  (with RANGE SET: AUTO) or the selected range (with RANGE SET: LOCK), then (and only then) the display will show ----.
2. Settings and modifications of all functions can be taken by the following steps: 1): **Touch the corresponding function zone and then select the desired function in the soft key zone on the right side of the screen;** 2): **Use arrow buttons and [ENTER] button to set and modify the corresponding function.**
3. **Settings and modifications of all functions can only be taken in discharging state. Only discharging key and start saving function response in measurement state.**

## 3.2 <MEAS SETUP>

Touch the main menu and then touch the soft key <MEAS SETUP> to enter into the <MEAS SETUP> page shown as figure 3-2.

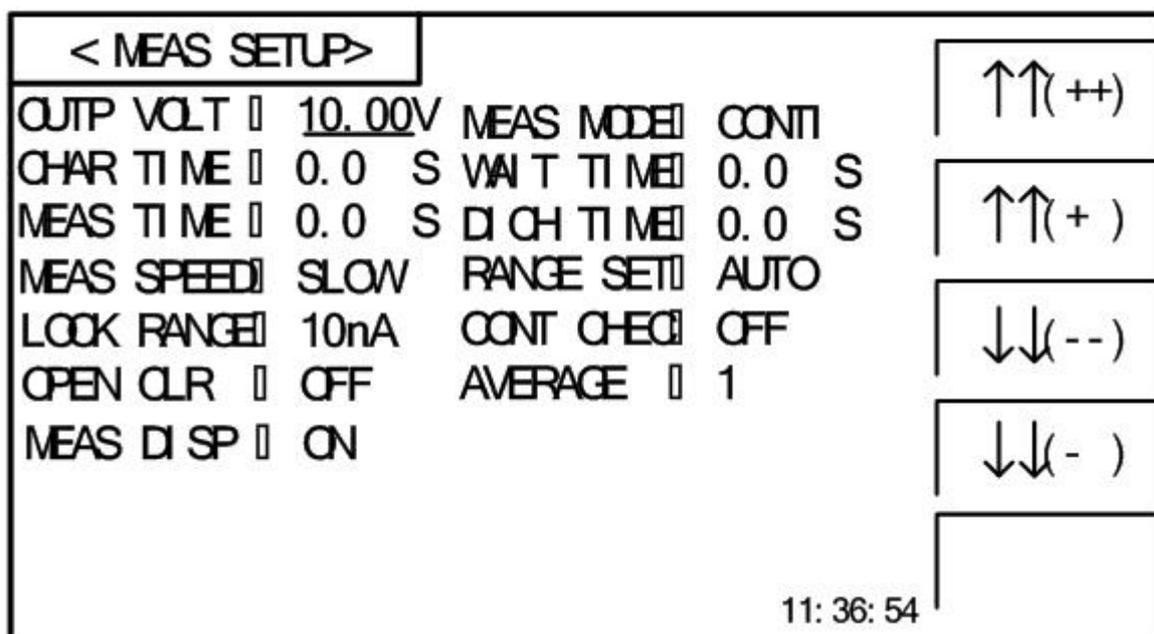


Figure 3-2 Measurement Setup

The OUTP VOLT, MEAS MODE, CHAR TIME, WAIT TIME, MEAS TIME, DICH TIME, MEAS SPEED, RANGE SET, LOCK RANGE, CONT CHEC, OPEN CLR and other functions can be set on this page.

### 3.2.1 OUTP VOLT

This function is used for setting the voltage of the instrument output terminal.

#### Operation Procedures One for setting the OUTP VOLT:

1. Touch this key to select this option and then the color of this option will become the color of the cursor.
2. Touch this key again to enter into the soft keyboard and then input the required voltage and voltage range of 1~1000V (ST2683A four-digit significant figures), 1~500V (ST2683B four-digit significant figures) through number soft keyboard.

#### Operation Procedures Two for setting the OUTP VOLT:

Touch the output voltage zone needs to be modified on the screen and the following items will be displayed in the soft key zone.

- ↑↑ (++)

This key is the increase rough adjustment key of output voltage (set value). Touch this key and then the voltage will increase according to the sequence of the common voltage point. The commonly used several default voltage points of the instrument are: 1V, 10V, 25V, 50V, 75V, 100V, 125V, 150V, 200V, 250V, 500V (ST2683B), 750V (ST2683A), 1000V (ST2683A).

- **↑ (+)**  
This key is the increase fine adjustment key of output voltage (set value). Touch this key and then the voltage will increase by 1V.
- **↓ (-)**  
This key is the decrease fine adjustment key of output voltage (set value). Touch this key and then the voltage will decrease by 1V.
- **↓↓ (- -)**  
This key is the decrease rough adjustment key of output voltage (set value). Touch this key and then the voltage will decrease according to the sequence of the common voltage point. The commonly used several default voltage points of the instrument are: 1V, 10V, 25V, 50V, 75V, 100V, 125V, 150V, 200V, 250V, 500V (ST2683B), 750V (ST2683A), 1000V (ST2683A).

### 3.2.2 MEAS MODE

This function is used for setting the measurement mode of the instrument.

#### Steps for setting the MEAS MODE:

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **SINGLE**  
It is used for setting the measurement mode of the instrument as SINGLE.
- **CONTI**  
It is used for setting the measurement mode of the instrument as CONTI.

Touch the corresponding key in soft key zone to select the relevant function.

### 3.2.3 CHAR TIME

This function is used for setting the charge time of the instrument.

#### Operation Procedures One for setting the CHAR TIME:

1. Touch this key to select this option and then the color will become the color of the cursor.
2. Touch this key (cursor) again to enter into the number soft keyboard, input the required charge time (correct to 0.1s) through number soft keyboard and then press the ENTER key to confirm and return to <MEAS SETUP> page.

#### Operation Procedures Two for setting the CHAR TIME:

Touch the time zone needs to be modified on the screen and the following items will be displayed in the soft key zone.

- **↑↑ (++)**  
Touch this key and then the instrument will increase the charge time (set value) rapidly by 10s.
- **↑ (+)**  
Touch this key and then the instrument will increase the charge time (set value) by 1s.
- **↓ (-)**  
Touch this key and then the instrument will decrease the charge time (set value) by 1s.
- **↓↓ (--)**  
Touch this key and then the instrument will decrease the charge time (set value) rapidly by 10s.

Steps for setting the **WAIT TIME**, **MEAS TIME** and **DICH TIME** are the same as **CHAR TIME**. The setting range of **CHAR TIME**, **WAIT TIME**, **MEAS TIME** and **DICH TIME** is 0~999s. When the time is set to 0s, the step is skipped (**details for measurement procedure please refer to 3.4.2**). During **DICH** time, the discharge current is limited by the 1k $\Omega$  charge resistor *and* a maximum of 5mA. At the end of **MEAS TIME**, the last measured value is held and displayed.

### 3.2.4 MEAS SPEED

This function is used for setting the measurement speed of the instrument.

#### Steps for setting the MEAS SPEED:

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **FAST**  
It is used for setting the MEAS SPEED as FAST.
- **SLOW**  
It is used for setting the MEAS SPEED as SLOW.

Touch the corresponding key in soft key zone to select the relevant function.

### 3.2.5 RANGE SET

This function is used for setting the range selection mode of the instrument.

#### Steps for setting the RANGE SET:

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **AUTO**  
It is used for setting the range selection mode as AUTO.
- **LOCK**  
It is used for setting the range selection mode as LOCK.

Touch the corresponding key in soft key zone to select the relevant function.

### 3.2.6 LOCK RANGE

This function is used for selecting the lock range of the instrument.

#### Steps for setting the LOCK RANGE:

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **1mA**  
It is used for setting the LOCK RANGE as AUTO.
- **100UA**  
It is used for setting the LOCK RANGE as 100 $\mu$ A.
- **10uA**  
It is used for setting the LOCK RANGE as 10 $\mu$ A.
- **1uA**  
It is used for setting the LOCK RANGE as 1 $\mu$ A.
- **More**

Touch this key and then the following items will be displayed in the soft key zone:

- **100nA**  
It is used for setting the LOCK RANGE as 100nA.
- **10nA**  
It is used for setting the LOCK RANGE as 10nA.
- **More**  
Return.

Touch the corresponding key in soft key zone to select the relevant function.

**NOTE: This option can be modified only when the RANGE SET is set as LOCK.**

### 3.2.7 CONT CHEC

This function is used for setting the contact check of the instrument. As the unique contact check function of ST2683A/ST2683B, this function can well identify the contact performance of components for capacitance, cable and other capacitive materials and reduce the occurring of error test. In addition, the contact check will not increase any measurement time.

When the CONT CHEC function is set as ON, **NO CONT** (NO CONTACT), not R or I will be displayed on the screen if the instrument is in test mode and no capacitive material is detected.

When the CONT CHEC function is set as OFF, the instrument will test the value directly, not check the capacitive material.

#### Steps for setting the CONT CHEC:

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **ON**  
It is used for setting the CONT CHEC as ON.
- **OFF**  
It is used for setting the CONT CHEC as OFF.

Touch the corresponding key in soft key zone to select the relevant function.

**NOTE: The contact check function is useful when testing capacitive materials and the capacity is larger than 100pF.**

### 3.2.8 OPEN CLR

This function is used for operating open clear of the instrument.

#### Steps for setting the OPEN CLR:

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **ON**  
It is used for setting the OPEN CLR as ON. If the open clear is successful, the OPEN CLR state changes to ON; if the open clear is failing, the OPEN CLR state keeps OFF.
- **OFF**  
It is used for setting the OPEN CLR as OFF.

Touch the corresponding key in soft key zone to select the relevant function.

#### NOTE:

1. **If the user operates the open clear successfully, the clear base used in the instrument is the**

*base obtained when operating this open clear; if the user operates the open clear unsuccessfully or sets the OPEN CLR as OFF, the clear base used in the instrument is the Factory Default.*

2. *When operating open clear, the user must conform to the condition described in Chapter One—"Environment", pull out all the test lines in test terminals and heat the instrument for more than 30 minutes, otherwise it may result in inaccurate clear base and then affect the accuracy of measurement results.*

### 3.2.9 Average

This function is used for setting the test average times of the instrument. The set range is 1~199.

#### Operation Procedures One for setting the CHAR TIME:

1. Touch this key to select this option and then the color of this option will become the color of the cursor.
2. Touch this key (cursor) again to enter into the number soft keyboard, input the required average times and then press the ENTER key to confirm and return to <MEAS SETUP> page.

#### Operation Procedures Two for setting the CHAR TIME:

Touch the average zone needs to be modified on the screen and the following items will be displayed in the soft key zone.

- **↑↑ (++)**  
Touch this key and then the instrument will increase the average times (set value) rapidly by 10.
- **↑ (+)**  
Touch this key and then the instrument will increase the average times (set value) by 1.
- **↓ (-)**  
Touch this key and then the instrument will decrease the average times (set value) by 1.
- **↓↓ (--)**  
Touch this key and then the instrument will decrease the average times (set value) rapidly by 10.

#### NOTE:

1. *When the MEAS TIME is set as 0s (i.e. this procedure is set as OFF), the Average times can be set as 1~999.*
2. *When the MEAS TIME is not set as 0s (i.e. this procedure is set as ON), the set value of the Average times is subject to the MEAS TIME. Specifically, the following restriction rules are required:*
  - (1) *When the MEAS SPEED is set as SLOW, it takes 0.06s to make a measurement, so the restrictive relation between the Average times and the MEAS TIME is:*  
$$\text{Average times} \times 0.06 \leq \text{MEAS TIME}$$
  - (2) *When the MEAS SPEED is set as FAST, it takes 0.03s to make a measurement, so the restrictive relation between the Average times and the MEAS TIME is:*  
$$\text{Average times} \times 0.03 \leq \text{MEAS TIME}$$
3. *For the same reason, when setting the MEAS TIME, the above restriction rules are also required.*

### 3.2.10 MEAS DISP

This function is used for setting the MEAS DISP of the instrument as ON/OFF.

#### Steps for MEAS DISP:

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **ON**  
It is used for setting the MEAS DISP as ON.
- **OFF**  
It is used for setting the MEAS DISP as OFF.

Touch the corresponding key in soft key zone to select the relevant function.

### 3.3 <PICKOUT SETUP>

Touch the soft key **PICKOUT SETUP** to enter into the <PICKOUT SETUP> page as shown in figure 3-3.

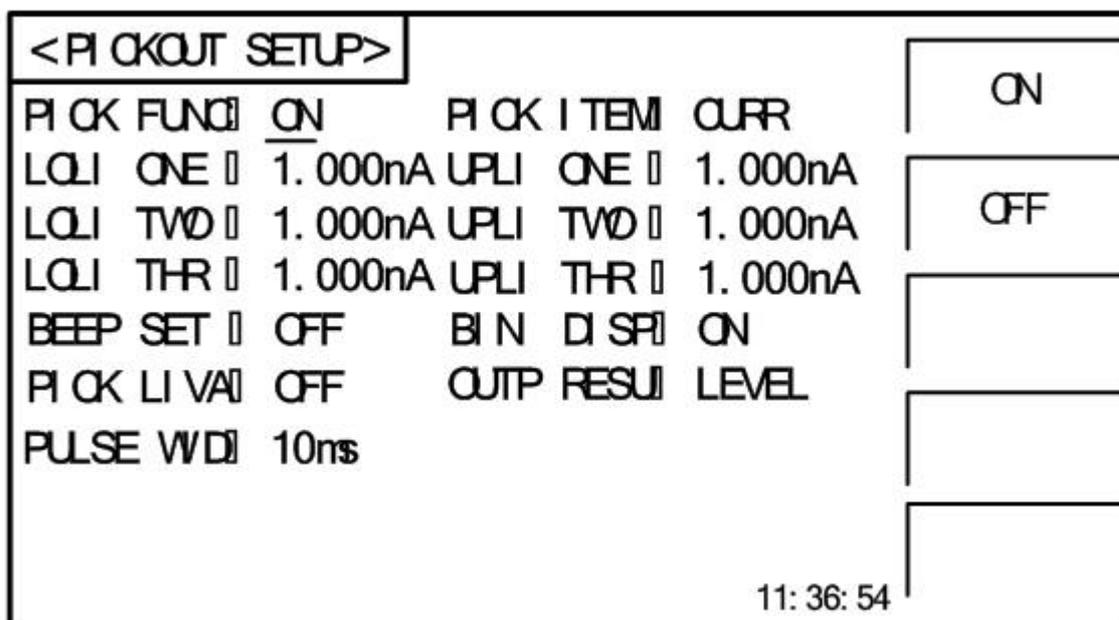


Figure 3-3 PICKOUT SETUP

The comparator functions of the instrument can be set on this page. ST2683A can set three groups of limit values for primary parameters.

The function introduction of <PICKOUT SETUP> page

#### 3.3.1 PICK FUNC

This function is used for controlling the switch of the instrument pickout function.

#### Steps for PICK FUNC:

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **ON**  
It is used for setting the PICK FUNC as ON.
- **OFF**  
It is used for setting the PICK FUNC as OFF.

Touch the corresponding key in soft key zone to select the relevant function.

**NOTE: The following steps can be operated under the premise of setting the PICK FUNC as ON.**

### 3.3.2 PICK ITEM

This function is used for selecting the pick item of the instrument.

#### Steps for PICK ITEM:

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **CURR**  
It is used for setting the PICK ITEM as CURR.
- **RESIS**  
It is used for setting the PICK ITEM as RESIS.

Touch the corresponding key in soft key zone to select the relevant function.

### 3.3.3 LOLI ONE

This function is used for setting the lower limit value of the instrument Bin One.

#### Steps for setting the LOLI ONE:

1. Touch this key to select this option and then the color of this option will become the color of the cursor.
2. Touch this key (cursor) again to enter into the number soft keyboard, input the required lower limit value (four-digit significant figures) and then press the ENTER key to confirm and return to <PICKOUT SETUP> page.

The setting methods of UPLI ONE, LOLI TWO, UPLI TWO, LOLI STR and UPLI STR are the same as LOLI ONE, the setting ranges for three groups of lower/upper limit value are:

1. **When the PICK ITEM is set as CURR, the range is 1pA—1.25mA.**
2. **When the PICK ITEM is set as RESIS, the range is 100kΩ-10TΩ.**
3. **The lower limit value of each bin cannot be larger than the upper limit value, otherwise “please re enter due to over-limit data” will be noticed.**
4. **The pickout ranges of three bins can be overlapped.**

### 3.3.4 BEEP SET

This function is used for setting the pickout beep of the instrument.

#### Steps for BEEP SET:

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **BIN ONE**  
It is used for setting that the buzzer will alarm when the test value passes BIN ONE.

- **BIN TWO**  
It is used for setting that the buzzer will alarm when the test value passes BIN TWO.
- **BIN STREE**  
It is used for setting that the buzzer will alarm when the test value passes BIN STREE.
- **NG**  
It is used for setting that the buzzer will alarm when the test value of three bins fail.
- **OFF**  
It is used for setting the PICKOUT BEEP as OFF.

Touch the corresponding key in soft key zone to select the relevant function.

**NOTE:**

1. *The BIN ONE enjoys the top priority in the three bins, followed by BIN TWO and BIN STREE. BIN TWO and BIN STREE will not compare when BIN ONE passes, and so on, the test fails when all three bins fail.*
2. *The pickout results will be displayed on the main display interface when the PICK FUNC is set as ON. When one of the three bins passes, the main display interface will light up the green light and indicates BIN1, BIN2 and BIN3. When all three bins fail, the main display interface will light up the red light and indicates FAIL.*

### 3.3.5 Steps for BIN Disp

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **ON**  
It is used for setting the BIN Disp as ON.
- **OFF**  
It is used for setting the BIN Disp as OFF.

Touch the corresponding key in soft key zone to select the relevant function.

### 3.3.6 Steps for PICK LIVA

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **ON**  
It is used for setting the PICK LIVA as ON.
- **OFF**  
It is used for setting the PICK LIVA as OFF.

Touch the corresponding key in soft key zone to select the relevant function.

**NOTE:**

1. *When the PICK LIVA is set as OFF, if the PICK ITEM is set as RESIS, the upper limit value of BIN1, BIN2 and BIN3 will be set as infinitely great and become unchangeable and drop out of compare, namely, the pickout changes from interval pickout to single-point pickout; if the PICK ITEM is set as CURR, the lower limit value of BIN1, BIN2 and BIN3 will be set as 0 and become unchangeable and drop out of compare, namely, the pickout also changes from interval pickout to single-point pickout.*
2. *When the PICK LIVA is set as ON, whether the PICK ITEM is set as RESIS or CURR, set the limit*

*value according to the above steps.*

3. Whether the **PICK LIVA** is set as ON or OFF, the priority level of BIN1, BIN2 and BIN3 keeps invariant.

### 3.3.7 Steps for OUTP RESU

Touch the corresponding zone. The following items will be displayed in the soft key zone.

- **LEVEL**  
It is used for setting the OUTP RESU as LEVEL.
- **PULSE**  
It is used for setting the OUTP RESU as PULSE.

Touch the corresponding key in soft key zone to select the relevant function.

### 3.3.8 PULSE WID

This function is used for setting the pulse width of pulse signal for Handler PICKOUT (*this item can be changed when the **OUTP RESU** is set as PULSE*). The setting range is 1~25ms.

#### Operation Procedures One for setting the PULSE WID:

1. Touch this key to select this option and then the color of this option will become the color of the cursor.
2. Touch this key (cursor) again to enter into the number soft keyboard, input the required pulse width and then press the ENTER key to confirm and return to <PICKOUT SETUP> page.

#### Operation Procedures Two for setting the PULSE WID:

Touch the average zone needs to be modified on the screen and the following items will be displayed in the soft key zone.

- **↑↑ (++)**  
Touch this key and then the instrument will increase the pulse width (set value) rapidly by 5.
- **↑ (+)**  
Touch this key and then the instrument will increase the pulse width (set value) by 1.
- **↓ (-)**  
Touch this key and then the instrument will decrease the pulse width (set value) by 1.
- **↓↓ (--)**  
Touch this key and then the instrument will decrease the pulse width (set value) rapidly by 5.

## 3.4 Start Test

### 3.4.1 Test Method

Please connect the DUT (especially the DUT with polarity, such as the capacitor) according to the method as shown in figure 3-4 before testing.

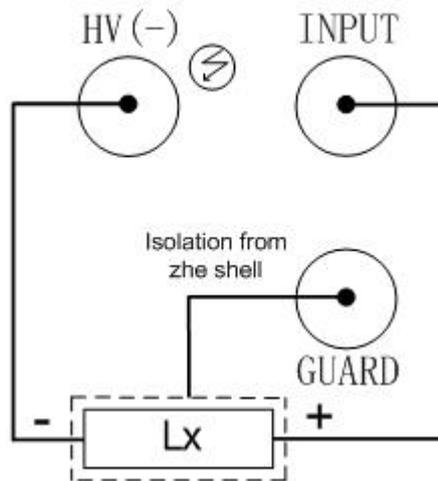


Figure 3-4 Test connection program

## NOTE:

- There is voltage output in HV (-) terminal. Please connect the DUT in discharged condition. Beware of electric shock. The device is **not potential-free**, so any voltage output from the HV (-) terminal is relative to ground.
- Only current flowing into the INPUT terminal is considered for calculating the impedance of the DUT. This is to prevent stray capacitive charging current to ground from influencing the measurement as these currents will be diverted to the GUARD terminal or another ground connection. However, this will lead to wrong results when the DUT itself is not potential-free and has a connection to ground somewhere, because the current will rather flow directly to ground than through the internal resistor of the selected current range and *then* to ground, resulting in a measured current that is too low and respectively a calculated resistance that is too high. Thus, the measuring setup has to be designed in such a way that the impedance to be tested has **no connection to ground**, so e.g. in an insulation resistance test, all parts that are normally connected to ground have to be connected to INPUT instead.
- Accordingly, if the monitored voltage breaks down even though there is no or only a small current displayed, there is a low-impedance parasitic connection to ground somewhere.
- **DO NOT** attempt to remove the device's ground connection to try to make the device potential-free and circumvent the above mentioned restrictions, as this can lead to the device's case and exposed metal parts being charged to dangerous voltage.
- Be sure to connect DUTs with polarity (electrolytic capacitor, etc.) according to the positive and negative terminals shown in the diagram, otherwise it may result in the explosion of components. Take it down after discharging for a few seconds to prevent electric shock.
- Short circuit of the instrument for a long time is not allowed; otherwise it will damage the instrument.
- In order to obtain ideal accuracy and stability, the test environment must first be guaranteed to be according to the conditions described in the Chapter One---"Environment".

### 3.4.2 Operation Process

1. Press **TEST** key to enter the test status.
2. Press **DISCH.** Key to finish testing and return to discharge condition.

The specific steps are as follow:



Where, the HV mark will blink in the three steps of charging, waiting and testing. The DICH mark will blink when discharging. In addition, the three steps of charging, waiting and testing (when the DICH TIME is set as 0s, you have to press the DISCH key, for the system to change from test status to discharge status) can be set as ON or OFF. Charge and discharge current is limited by the 1mA range's 1k $\Omega$  charge resistor and also by an additional 5mA limit of the discharge circuit.

### 3.4.3 Range Selection

There are six range resistances in ST2683A. They constitute six range segments (refer to figure 3-1 below).

Range	Input Internal Resistance
1(1mA)	1k $\Omega$
2(100uA)	10k $\Omega$
3(10uA)	100k $\Omega$
4(1uA)	1M $\Omega$
5(100nA)	10M $\Omega$
6(10nA)	100M $\Omega$

Figure 3-1 Range resistances

When the RANGE SET of the instrument is set as **AUTO**, for different resistances being measured, the instrument will choose the optimal input resistance to achieve ideal measurement results.

## 4) System Setup and File Manage

### 4.1 System Setup

Press [SYSTEM] to enter into the <SYSTEM SETUP> page as shown in figure 4-1.

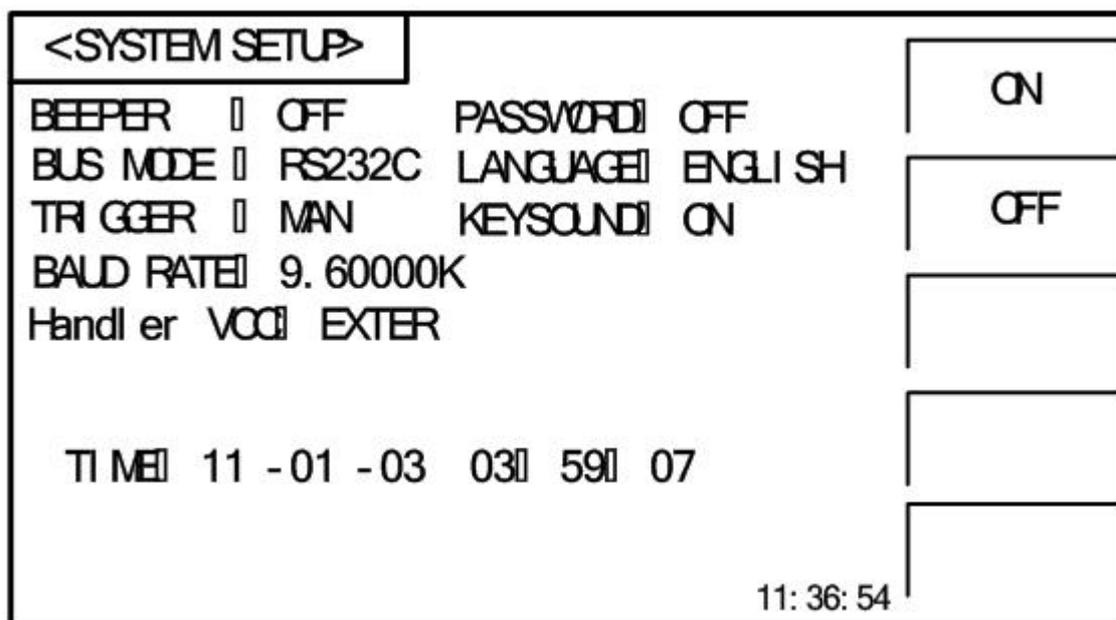


Figure 4-1 System Setup

On this page, the following functions can be set: BEEPER, PASSWORD, BUS MODE, LANGUAGE, TRIGGER, KEYSOUND, BAUD RATE, HANDLER VCC AND TIME.

#### 4.1.1 BEEPER

This function is used to control the switch of beeper. If the system beeps, it indicates the warning beep of illegal key or touch.

##### Steps for setting the beeper:

Touch **BEEPER**, the following soft key zone will be displayed:

- **ON**  
Touch this key to turn on the beeper function.
- **OFF**  
Touch this key to turn off the beeper function.

You can touch soft key zone to set corresponding functions.

#### 4.1.2 PASSWORD

This function is used to set the password.

##### Steps for setting the password:

Touch **PASSWORD**, the following soft key zone will be displayed:

- **OFF**  
Touch this key to turn off the password protection function. This function would be disabled only when the preset password is correctly input.
- **LOCK SYSTEM**  
Touch this key to enable the password function. Please input the password which will be required to be input when opening a file or starting up the instrument.
- **LOCK FILE**  
It is used for file protection of users.
- **MODIFY**  
Touch this key to modify the password.

Steps for modify the password:

Touch **MODIFY**, a numeric keyboard will pop up then you should input the original password and press [ENTER] to confirm. Input the new password when the numeric keyboard is shown once again and press [ENTER] to confirm. Then the numeric keyboard will be displayed for the third time, please input the new password. Press [ENTER] to finish the password modification.

---

**NOTE:** The default password is 2683.

---

### 4.1.3 BUS MODE

This function is used for selecting the communication interface.

**Steps for setting the bus mode:**

- 1) Touch **BUS MODE**, the following soft key zone will be displayed:
  - **RS232C**
  - **USBTMC**
  - **USBVCOM**
- 2) Touch **RS232C** to select the RS232C interface.
- 3) Touch **USBTMC** to select the USBTMC interface. The instrument communicates with PC through the USB interface (USB DEVICE) on the rear panel.
- 4) Touch **USBVCOM** to select the USBVCOM interface. The instrument communicates with PC through the USB interface (USB DEVICE) on the rear panel.

### 4.1.4 LANGUAGE

This function is used to set the language.

**Steps for setting the language:**

Touch **LANGUAGE**, the following soft key zone will be displayed:

- **English**  
Touch this soft key to set the language as English.
- **Chinese**  
Touch this soft key to set the language as Chinese.

You can touch soft keys to set corresponding functions.

### 4.1.5 KEYSOUND

This function is used to control the key sound when the users touch the touch screen and press the machinery keys.

#### Steps for setting the KEYSOUND:

Touch **KEYSOUND**, the following soft key zone will be displayed:

- **ON**  
Touch this key to turn on the key sound of touch screen.
- **OFF**  
Touch this key to turn off the key sound of touch screen.

You can touch soft key zone to set corresponding functions.

### 4.1.6 TRIGGER

This function is used to select the trigger source of triggering the instrument to test.

#### Steps for setting the TRIGGER:

Touch **TRIGGER**, the following soft key zone will be displayed:

- **MAN**  
Press the "**TEST**" key on the panel, the instrument will test a DUT once and display the result. This mode keeps in waiting mode when it is not used.
- **EXT**  
Test a DUT once and display the result when the instrument receives an external "start up" signal from the footswitch of HANDLER interface or FOOT.C interface on the rear panel and then enter into the waiting mode again.
- **BUS**  
The measurement of the instrument will be triggered through the communication interface.

You can touch soft key zone to set corresponding functions.

### 4.1.7 BAUD RATE

This function is used to select the baud rate of RS232 interface. The following twelve baud rates are selectable: 9.60000k, 19.2000k, 28.8000k, 38.4000k, 48.0000k, 57.6000k, 67.2000k, 76.8000k, 86.4000k, 96.0000k, 105.600k and 115.200k.

#### Steps for setting the baud rate:

Touch **BAUD RATE**, the following items will be displayed in the soft key zone:

- **↑ (+)**  
Touch the key to increase the baud rate.
- **↓ (-)**  
Touch the key to decrease the baud rate.

## 4.1.8 HANDLER VCC

This function is used to control the VCC selection for handler interface of the instrument.

### Steps for setting the HANDLER VCC:

Touch **HANDLER VCC**, the following soft key zone will be displayed:

- **INTER**  
It is used for setting the Handler interface powered by internal VCC.
- **EXTER**  
It is used for setting the Handler interface powered by external VCC.

You can touch soft key zone to set corresponding functions.

## 4.1.9 Setting Time and Date

This function is used for setting the correct time of the local time zone.

For example: 9 o'clock 13 minute and 25 second a.m. on November 12, 2010 will be shown as 10-11-12 09:13:25.

Operations are as follows: Touch the time zone to be modified, the following items will be displayed.

- **↑↑ (+ +)**  
Touch this key and then the time will increase rapidly by 5.
- **↑ (+)**  
Touch this key and then the time will increase by 1.
- **↓ (-)**  
Touch this key and then the instrument will decrease by 1.
- **↓↓ (- -)**  
Touch this key and then the instrument will decrease rapidly by 5.

## 4.2 <File Manage>

ST2683A series can save parameters that are set by user to the internal non-volatile memory in the file format. User can load the file to use these parameters instead of resetting.

This section will introduce the information about the function of Save/Recall.

Notation Explanation:

E: Abbreviation of External, representing external memory, like U disk.

I: Abbreviation of Internal, representing internal memory, like internal Flash of ST2683A.

### 4.2.1 Introduction to Save/Recall

By the function of save/recall, user can save measurement results and configuration information to ST2683A internal Flash or external U disk; meanwhile user can recall data from ST2683A internal Flash or external U disk.

On powerup, the ST2683A will autoload the configuration in the first internal slot.

Introduction to Methods and Applications of Save

The table below shows the applicable save methods and applications:

Table 4-1 Methods and Applications of Save

Save method		Recall	Application
Type	File format		
Configuration save (internal Flash)	*.STA	Yes	Save the current configuration to internal Flash.
Configuration save (external U disk)	*.STA	Yes	Save the current configuration to a U disk.
Data save (external U disk)	*.CSV	No	Save measurement results to a U disk.

### 4.2.2 Structure of File Folder/File in a U Disk

Before saving data to a U disk, you are recommended to save it into a file and folder that have existed in the memory as shown in table 4-2. If you want to save the configuration file into a file folder in PC, you should enter into the folder on the instrument and then take relative file operations.

Table 4-2 Folder in U disk

Folder	Maximum Amount of File	Description
CSV	999	Including measurement result, like *.CSV file.
STA	999	Including configuration data, like *.STA file.

**NOTE:** CSV and STA folders might be automatically generated when a U disk is connected.

Structure of Folder/File in a U disk is shown in figure 4-2.

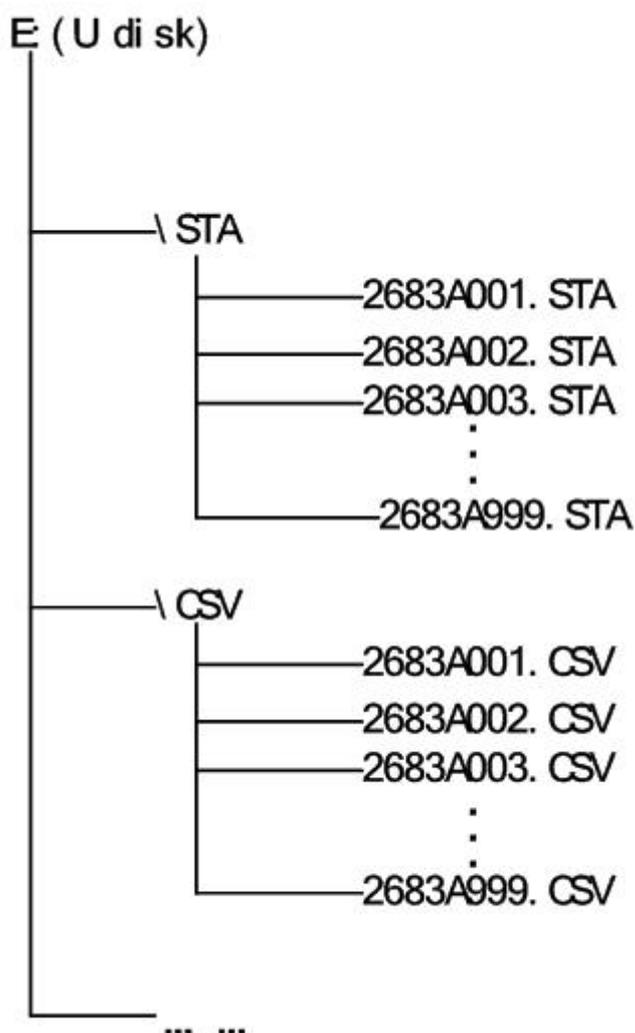


Figure 4-2 file structure in a U disk

When using a U disk on ST2683A, you should pay special attention to the following points:

1. Use a U disk with the USB2.0 interface.
2. The U disk file system should be FAT16 or FAT32. FAT16 or FAT32 standard should be used to format the U disk. If the U disk memory exceeds 512M, it is recommended to use FAT32 standard to format the disk.
3. Before a U disk is connected to ST2683A, you are recommended to save the data on it and Sourcetricon will not be liable for the data loss.
4. In order to rapidly save the instrument data to a U disk, it is not recommended to store too many files or folders.

#### Operation Procedures

Touch **FILE** in any page and select **File Manage** to enter into the internal file page (or directly press the FILE button on the front panel) as shown in figure 4-3 below.

Touch [Inter File] and [External File] to respectively display files stored in the internal FLASH and the external U disk. Touch [Exit] to exit the file manage page.

INTERNAL FILE			Internal File
1	P. STA	2013/ 01/ 28 14: 08	
2	Q STA	2013/ 01/ 28 14: 12	External File
3			
4			Exit
Page 1			
		14: 12: 18	

Figure 4-3 internal file page

External file page is shown in figure 4-4 below:

EXTERNAL FILE		E: \	
	CSV	2013/ 01/ 28 14: 08	
	STA	2013/ 01/ 28 14: 12	
Page 1			
		14: 12: 18	Return

Figure 4-4 external file page

Four files' information will be displayed in the internal file page or the external file page, including file names and time of being saved.

Operations of the internal file and the external file are similar. Take internal file operations as an example to describe the specific procedures of file operations.

Operations on file are as follows:

Touch the file name to be edited (If the file name does not exist in the current page, you can touch [Page 1] and select [Previous Page] and [Next Page] to toggle between file pages, and then select the desired file.), the following items will be displayed.

- **Load**

Touch this key, if the file name that the cursor locates is not empty, [YES] and [NO] will be displayed in the soft key zone. When [YES] is selected, the instrument will load the setup data in the file; when [NO] is selected, the current operation will be cancelled.

- **Save**

Touch this key, [YES] and [NO] will be displayed in the soft key zone. When [NO] is selected, the current operation of save file will be cancelled; when [YES] is selected, the numerical keyboard will pop up and then you can input the file name and press [ENTER] to finish inputting. Thus the current settings in all pages will be saved to the file. (**NOTE: When storing a file, if the inputting file number has already existed, the save operation will overwrite the original file.**)

- **Delete**

Touch "Delete", if "YES" is selected, the instrument will delete the file that the cursor locates.

- **Copy to E:**

Touch "Copy to E". The instrument will copy the file the cursor locates or the selected file to a U disk.

- **Select**

Touch "Select", the file the cursor locates will be selected. ST2683A can simultaneously copy several files to a U disk.

Touch "Select" once again, the selected file will be cancelled from selection.

#### Save Measurement Results

In the "MEAS DISP" page, touch "Start Save" in soft key zone to save measurement results to a U disk. Touch "Stop Save", the instrument will stop saving measurement results.

#### Operations of External File and Folder

Operations of external file are similar to that of internal file.

Operations of external file folder are as below:

- (1) Touch the name of the desired file folder to enter into the corresponding folder;
- (2) Touch "Upper Page" in the right soft key zone to return to the upper page shown as figure 4-4 above.

## 5) Performance Index

### 5.1 Measurement Function

#### 5.1.1 Measurement Parameters and Notations

R: Resistance

I: Leakage current

#### 5.1.2 Range

Resistance Mode: AUTO, MANU (HOLD, UP, DOWN)

#### 5.1.3 Trigger

Manual, external, bus

Manual: Press the "TRIGGER" button on the panel, the instrument will test a DUT once and display the result. This mode keeps in waiting mode when it is not used.

External: Test a DUT once and display the result when the instrument receives an external "start up" signal from the footswitch of HANDLER interface on the rear panel.

BUS: The measurement of the instrument will be triggered through the communication interface.

#### 5.1.4 Mode of Test Terminal

2-terminal measurement mode

HV (-): DCV output terminal      INPUT: Sampling input terminal

#### 5.1.5 Measurement Speed (when MEAS DISP & BIN DISP is set as OFF)

Speed Parameter	FAST	SLOW
R	Meas/sec≤30ms	Meas/sec≤60ms
I	Meas/sec≤30ms	Meas/sec≤60ms

## 5.1.6 Display Digits

Item	
Resistance	4-digit significant figures
Leakage current	Range 1: correct to 100nA Range 2: correct to 10nA Range 3: correct to 1nA Range 4: correct to 100pA Range 5: correct to 10pA Range 6: correct to 1pA
Time	Correct to 0.1s

## 5.2 Test Signal

### 5.2.1 Output Voltage Range

Max. output DVC range of ST2683A test terminal: 1 – 1000V.

Max. output DVC range of ST2683B test terminal: 1 – 500V.

### 5.2.2 Output Voltage Accuracy

Voltage  $\geq$  10V: 1%  $\pm$  1V

Voltage < 10V: 10%  $\pm$  0.1V

### 5.2.3 Maximum Display Range

Parameter	Measurement Display Range
Resistance test	100.0k $\Omega$ ~ 10.00T $\Omega$
Leakage current test	Range 1: 100uA ~ 1mA, input internal resistance 10k $\Omega$ Range 2: 10uA ~ 100uA, input internal resistance 10k $\Omega$ Range 3: 1uA ~ 10uA, input internal resistance 10k $\Omega$ Range 4: 100nA ~ 1uA, input internal resistance 10k $\Omega$ Range 5: 10nA ~ 100nA, input internal resistance 1M $\Omega$ Range 6: 1nA ~ 10nA, input internal resistance 1M $\Omega$

## 5.3 Measurement Accuracy

Measurement accuracy depends on measurement stability, temperature coefficient, linearity, repeatability and correction interpolation error.

Checking the measurement accuracy should be taken under the following circumstances:

- a. Warm-up time should be more than 30 minutes.
- b. Correctly open the output terminal and perform zero clearing by pressing the start key on the MEAS SETUP page.

### 5.3.1 Basic Accuracy for Resistance Measurement

SLOW, FAST: (This accuracy is obtained under the temperature of  $20\pm 5^{\circ}\text{C}$ )

Test accuracy	Voltage $\geq 10\text{V}$ and $I > 10\text{nA}$	: $\pm 2\%$
	Voltage $\leq 10\text{V}$ or $I \leq 10\text{nA}$	: $\pm 5\%$

## 6) Remote Control

### 6.1 RS232C Connection

RS-232 standard, also called as asynchronous serial communication standard, has already been widely used for data communication between computers, computer and external equipment. RS is the English abbreviation of Recommended Standard; 232, the standard number. This standard is issued by EIA in 1969, which rules to send one bit in a data line every time.

As most serial interfaces, the serial interface of ST2683A is also not strictly based on RS-232 standard but only uses the smallest subset of this standard. The signals are listed in the following table.

Signal	Code	Connector Pin Number
Transmitted Data	TXD	2
Received Data	RXD	3
Signal Ground Common	GND	5

Table 6-1 RS-232 Signal and Pin Connector

The reason is that the use of three lines is much more inexpensive and much simpler than that of five lines or six lines, which is the biggest advantage of using serial interface for communication.

The connection of the instrument with PC is shown in figure 6-1.

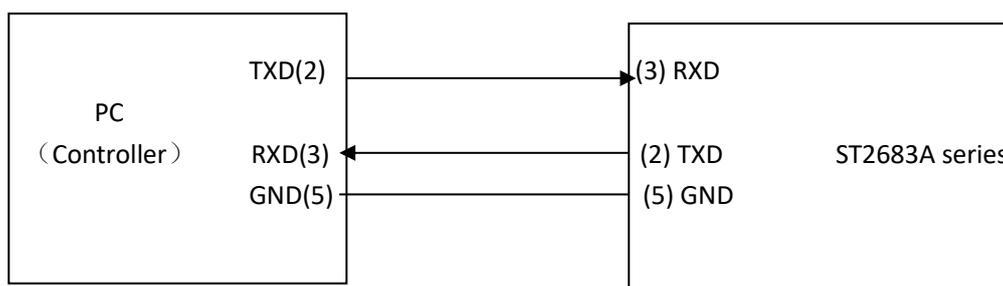


Figure 6-1 Connection of the instrument with PC

Figure 6-1 shows that the serial interface pin definition of this instrument is different from that of 9 pin connector used in the computer. User can purchase the serial interface cable from our company.

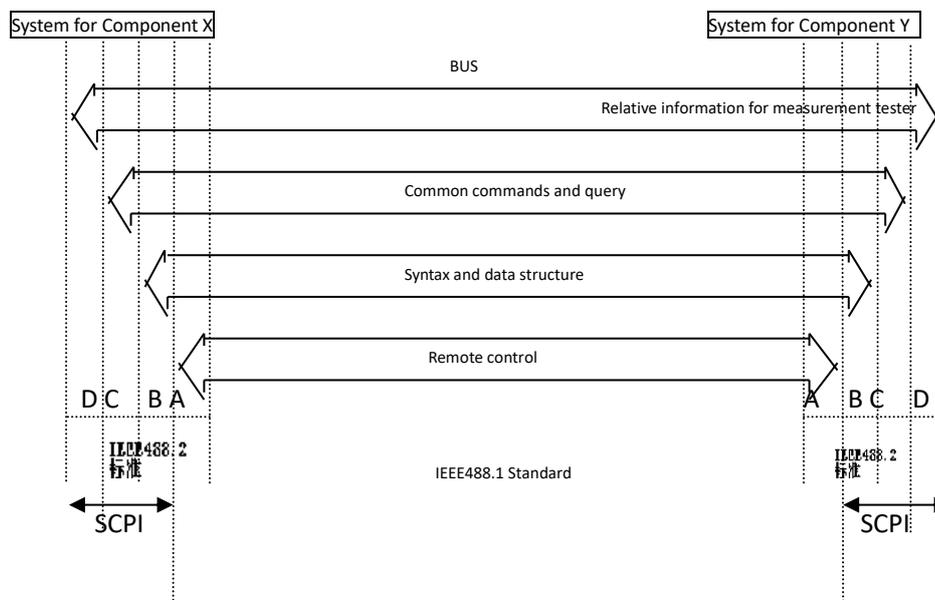
RS232 interface characterizes with a baud rate ranging from 9600 to 115200, no parity, 8-bit data bit, 1-bit stop bit.

The instrument commands comply with the SCPI standard. When a command string is transmitted to the instrument, it is required to send LF (hexadecimal: 0AH) as the terminating character. Each time the maximum receivable number of SPCI command string is 2kByte.

For result data formats transmitted to a PC from the instrument, see Commands Reference.

## 6.2 SCPI (Standard Commands for Programmable Instruments)

SCPI is a new general command based on the IEEE488.2-1987 standard. (SCPI is the same as TMSL, a system language for measurement testers adopted by HP.)



Where: Level D shows the instrument functions  
 Level C shows the common system functions  
 Level B shows the information communication functions  
 Level A shows the interface functions (IF)

Figure 6-2 SCPI functions levels

## 6.3 USBTMC Remote Control System

USB (Universal Serial Bus) remote control system controls the instrument through the USB interface. This connection conforms to USBTMC-USB488 and USB2.0 protocols. You need to have LabView or equivalent installed to use this type of connection.

### 6.3.1 System Configuration

Connect USB interfaces on PC and ST2683A through a USB cable.

### 6.3.2 Install the Driver

When ST2683A is first connected to a PC through a USB cable, the prompt information –Found

New Hardware will show on the right bottom of the computer desktop, as is shown below:

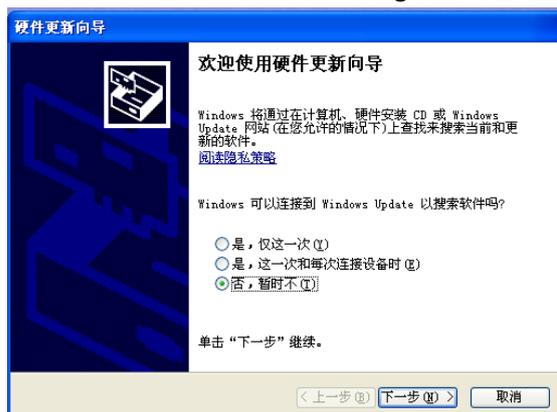


Figure 6-3 Procedure 1 of Installing USB Driver

Click “NEXT”, dialogue 6-4 will pop up. Choose “Install the software automatically (recommended)”.



Figure 6-4 Procedure 2 of Installing USB Driver

When the installation of driver is finished, user can see “usb test and measurement device” in the device manager of PC, as is shown in the following figure.

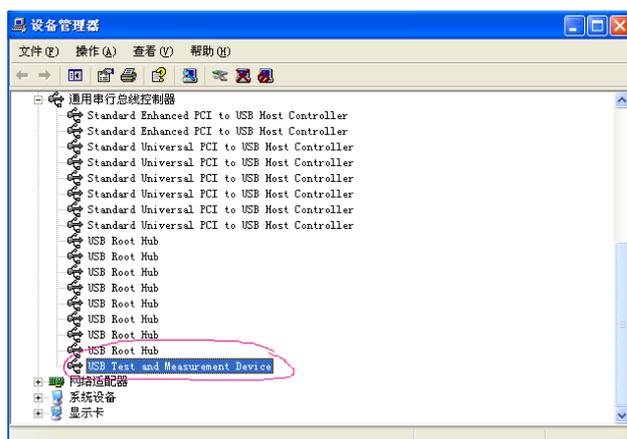


Figure 6-5 USBTMC Display of PC Device Manager

When user is using USBTMC interface, labview software can be used to access the instrument.

## 6.4 USBVCOM Virtual Serial Port

When “USBVCOM” is selected, the USB interface can be configured as a virtual serial port (VCom).

### 6.4.1 System Configuration

Connect PC and ST2683A to the USB interface through a USB cable.

### 6.4.2 Installing Driver

Methods of installing USB CDC driver are the same with that of installing USB TMC driver. Windows 10 will install the driver automatically from Windows update without the need of any driver package when the computer is connected to the internet. When the installation of driver is finished, user can see “usb VCom port” in the PC device manager, as is shown in figure 6-6.

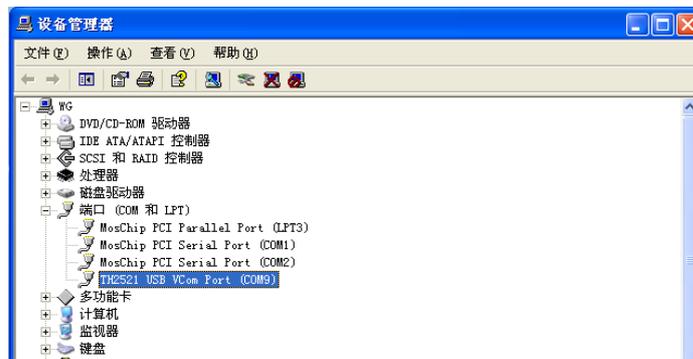


Figure 6-6 VCom Display of PC Device Manager

Now, USB VCom port acts as a serial port. When the PC has no serial port, communication software relying on a serial port can be used with the USB virtual serial port.

## 7) SCPI Command Reference

### 7.1 Data Conventions of This Manual:

NR1 : integer, for example:123

NR2 : fixed number, for example: 12.3

NR3 : floating number, for example: 12.3E+5

NL : CR character, integer: 10

^END: EOI (end) signal of IEEE-488 bus.

### 7.2 ST2683A Subsystem Commands

- DISPlay      ●TRIGger      ●COMParator      ●DISCharge      ●SYSTem
- FUNction    ●FETCh?      ●Mass MEMory

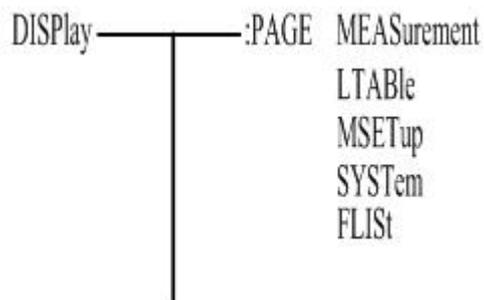
**NOTE: All the following commands relating to changing the instrument setup are recommended to be used when the instrument is in discharge condition, otherwise it may result in wrong results.**

#### 7.2.1 DISPlay Subsystem Commands

DISPlay subsystem commands are mainly used to set the instrument display page.

The :DISPlay? query returns to the current page.

Command Tree:



The :PAGE command sets the display page.

The DISPlay:PAGE? query returns to the current page.

Command Syntax: DISPlay:PAGE <page name>

Functions of <page name> are as follows:

- |             |   |
|-------------|---|
| MEASurement | Set the display page to measurement display.  |
| MSETup      | Set the display page to measurement setup.    |
| LTABLE      | Set the display page to pickout setup.        |
| SYSTem      | Set the display page to system setup.         |
| FLISt       | Set the display page to (internal) file list. |

For example: WrtCmd("DISP:PAGE MEAS"); Set the display page to measurement display.

Query syntax: DISPlay:PAGE?

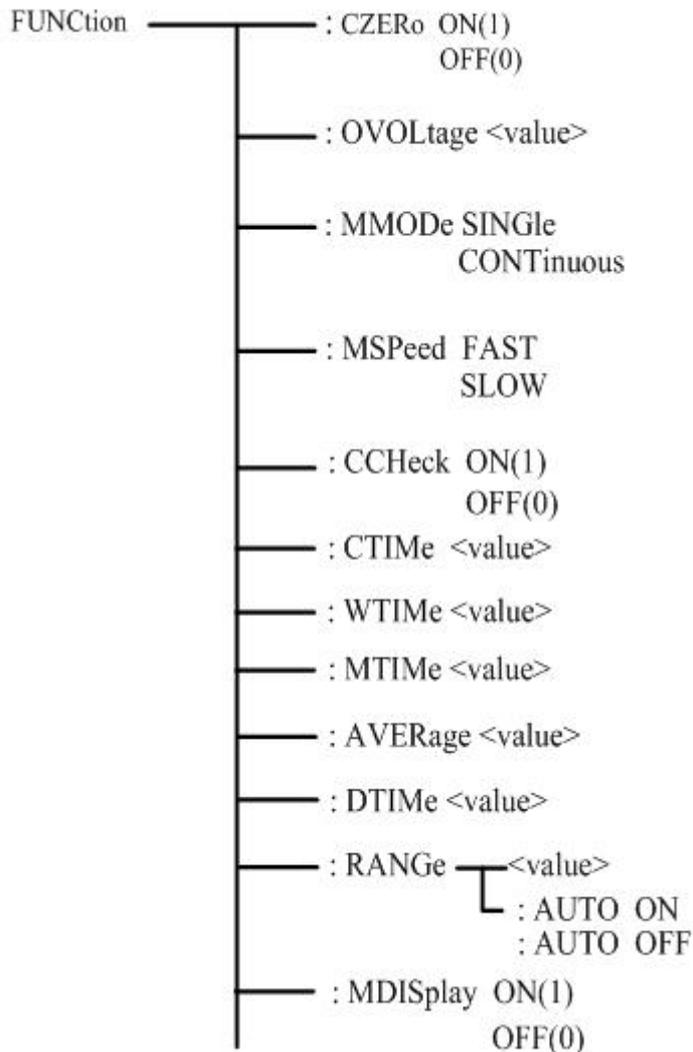
Return format: <page name><NL^END>

<page name> refer to the above set value.

## 7.2.2 FUNCTION Subsystem Commands

FUNCTION subsystem commands are mainly used to set the items relating to MEAS SETUP: "voltage", "measurement mode", "charge time", "wait time", "measurement time", "discharge time", "range", "contact check" and "zero clearing".

Command Tree:



The :CZERo ON command is used to execute open clear zero of the instrument, "?" can query the

current zero clearing passes or fails. If this zero clearing passes, the zero base used in this measurement is obtained from this open zero clearing; if this zero clearing fails, the zero base used in this measurement is factory default.

The :CZERo OFF command is used to cancel the influence of the zero base toward measurement results when users execute zero clearing successfully. At this time, the zero base used in the measurement is the factory default.

Command syntax: FUNCtion: CZERo ON(1)  
OFF(0)

Where,

Character 1 (integer:49) means ON.

Character 0 (integer: 48) means OFF.

For example: WrtCmd(":FUNC:CZER:ON"); Execute open zero clearing of the instrument.

Query syntax: FUNCtion:CZERo?

Return Format:

SUCCESS }  
                  } <NL^END>  
FAILED }

The FUNCtion:CZERo? query returns to the zero clearing result (success or failed).

The : OVOLTage command sets the output voltage of the instrument.

The :FUNCtion: OVOLTage? query returns to the current output voltage of the instrument.

Command Syntax: :FUNCtion: OVOLTage <value>

Where, <value> is any real value among the output voltage range (1-1000V) of the instrument.

For example: WrtCmd("FUNCtion:OVOL 12.50"); set the output voltage of the instrument as 12.50V.

Query syntax: FUNCtion: OVOLTage ?

Return Format: <value><NL^END>

The :FUNCtion: OVOLTage? query returns to the current output voltage of the instrument.

The : MMODE command sets the measurement mode of the instrument.

The :FUNCtion:MMODE? query returns to the measurement mode of the instrument.

Command Syntax:FUNCtion: MMODE { SINGLE  
CONTInuous

Where, SINGLE and CONTInuous are respectively indicate single and continuous measurement.

For example: WrtCmd("FUNCtion:MMOD SINGLE"); set the measurement mode of the instrument as SINGLE.

Query syntax: FUNCtion: MMODE ?



For example: WrtCmd("FUNCTION:CTTM 12.5"); set the charge time of the instrument as 12.5s.

Query syntax: FUNCTION: CTTMe?

Return Format: <value><NL^END>

The :FUNCTION:CTTMe? query returns to the charge time of the instrument.

The :WTIME command set the wait time of the instrument.

The FUNCTION:WTIME? query returns to the current wait time of the instrument.

Command syntax: FUNCTION: WTIME <value>

Where, <value> is any real value among the wait time range (0-999.0s) of the instrument (correct to 0.1s).

For example: WrtCmd("FUNCTION:WTime 12.5"); set the wait time of the instrument as 12.5s.

Query syntax: FUNCTION: WTIME?

Return Format: <value><NL^END>

The :FUNCTION:WTIME? query returns to the wait time of the instrument.

The :MTIME command set the measurement time of the instrument.

The FUNCTION:MTIME? query returns to the current measurement time of the instrument.

Command syntax: FUNCTION: CTIME <value>

Where, <value> is any real value among the measurement time range (0-999.0s) of the instrument (correct to 0.1s).

For example: WrtCmd("FUNCTION:MTIME 12.5"); set the measurement time of the instrument as 12.5s.

Query syntax: FUNCTION: MTIME?

Return Format: <value><NL^END>

The :FUNCTION:MTIME? query returns to the measurement time of the instrument.

The :DTIME command set the discharge time of the instrument.

The FUNCTION:DTIME? query returns to the current discharge time of the instrument.

Command syntax: FUNCTION: DTIME <value>

Where, <value> is any real value among the discharge time range (0-999.0s) of the instrument (correct to 0.1s).

For example: WrtCmd("FUNCTION:DTIME 12.5"); set the discharge time of the instrument as 12.5s.

Query syntax: FUNCTION: DTIME?

Return Format: <value><NL^END>

The :FUNCTION:DTIME? query returns to the discharge time of the instrument.

The :AVERage command sets the measurement average time of the instrument.

The :FUNCTION:AVERage? query returns to the current measurement average times of the instrument.

Command syntax: FUNCTION: AVERage <value>

Where, <value> is any integer value among the average times range (1-999) of the instrument.  
For example: WrtCmd("FUNCTION:AVERAge 12"); set the average times of the instrument as 12.

Query syntax: FUNCTION: AVERAge?

Return Format: <value><NL^END>

The :FUNCTION:AVERAge? query returns to the average times of the instrument.

The :RANGe command sets the range of the instrument.

The FUNCTION:RANGe? query returns to the current range parameters .

Command syntax: FUNCTION: RANGe <value>

Where, <value> can be 1mA、 100uA、 10uA、 1uA、 100nA、 10nA

For example: WrtCmd("FUNC:RANG 1mA"); Set the range of the instrument as 1mA.

The :RANGe:AUTO command sets the range auto selection mode of the instrument.

The FUNCTION:RANGe:AUTO? query returns to the current range mode.

Command syntax:

$$\text{FUNCTION:RANGe:AUTO} \left\{ \begin{array}{l} \text{ON (1)} \\ \text{OFF (0)} \end{array} \right.$$

Where,

Character 1 (integer:49) means ON.

Character 0 (integer: 48) means OFF.

For example: WrtCmd("FUNC:RANG:AUTO ON"); Set the range mode of the instrument as AUTO.

Query syntax: FUNCTION:RANGe:AUTO?

$$\text{Return format:} \left\{ \begin{array}{l} \text{ON} \\ \text{OFF} \end{array} \right. \text{ <NL^END>}$$

The :MDISplay command sets the measurement display switch of the instrument.

The FUNCTION:MDISplay? query returns to the current measurement display switch of the instrument.

Command syntax:

$$\text{FUNCTION:MDISplay} \left\{ \begin{array}{l} \text{ON (1)} \\ \text{OFF (0)} \end{array} \right.$$

Where,

Character 1 (integer:49) means ON.

Character 0 (integer: 48) means OFF.

For example: WrtCmd("FUNC:RANG:MDIS: ON"); Set the measurement display switch of the instrument as AUTO.

Query syntax: FUNCTION:MDISplay?

$$\text{ON} \left. \vphantom{\text{ON}} \right\}$$

Return format: <NL^END>  
OFF

## 7.2.3 DISCharge Subsystem Commands

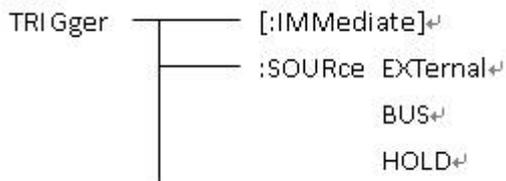
DISCharge [:GO]

Set the instrument to discharge.

## 7.2.4 TRIGger Subsystem Commands

The TRIGger subsystem commands set the instrument trigger source and the delay time after triggering, and triggers instrument measurement.

Command Tree:



The :IMMEDIATE command triggers a measurement.

Command syntax: TRIGger[:IMMEDIATE]

For example: WrtCmd("TRIG");

The :SOURce command sets the mode of trigger source.

The :SOURce? query returns to the current mode of trigger source.

Command syntax:

```

TRIGger:SOURce { EXTernal
                 BUS
                 HOLD
  
```

Where,

EXTernal      Be triggered by the HANDLER interface.  
 BUS            Be triggered by the RS232 interface or the USB interface (DEVICE).  
 HOLD          Be triggered by pressing the **TEST** key.

For example: WrtCmd("TRIG:SOUR BUS");

Query syntax: TRIGger:SOURce?

Return format:

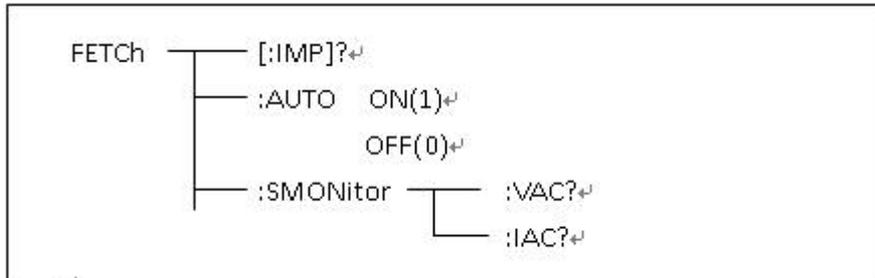
```

{ EXT
  BUS
  HOLD } <NL^END>
  
```

## 7.2.5 FETCH? Subsystem Commands

The FETCH? Subsystem commands are used to get the measurement result of ST2683A.

Command Tree:



The [:IMP]? query returns ST2683A's last measurement result to its output buffer.

Query syntax: FETCH[:IMP]?

For example, WrtCmd ("TRIG:SOUR BUS");

WrtCmd ("TRIG");

WrtCmd ("FETC?");

When the PICKOUT function is set as ON:

Data format: < insulation resistance>, < leakage current>, <pickout item>, <pickout comparator results>,< ultralimit>

0	BIN1 passes
1	BIN2 passes
2	BIN3 passes
3	Three bins all failed

The figure below is the range value of ultralimit compare for each range (**NOTE: lower limit is not compared in range 6**)

Parameter	Compare range
Current	Range 1: 95uA ~ 1.05mA
	Range 2: 9.5uA ~ 105uA
	Range 3: 0.95uA ~ 10.5uA
	Range 4: 95nA ~ 1.05uA
	Range 5: 9.5nA ~ 105nA
	Range 6: ~ 10.5nA

Ultralimit:

0	downlap
1	between the range
2	onlap

When the PICKOUT function is set as OFF:

Data format: <insulation resistance>, <leakage current>, <ultralimit>

Ultralimit:

0	downlap
1	between the range
2	onlap

AUTO command makes ST2683A to send each measurement result to its output buffer automatically.

Command syntax:  $\text{FETCh:AUTO} \left\{ \begin{array}{l} \text{ON} \\ \text{OFF} \\ 1 \\ 0 \end{array} \right.$

For example: `WrtCmd("FETC:AUTO ON");`

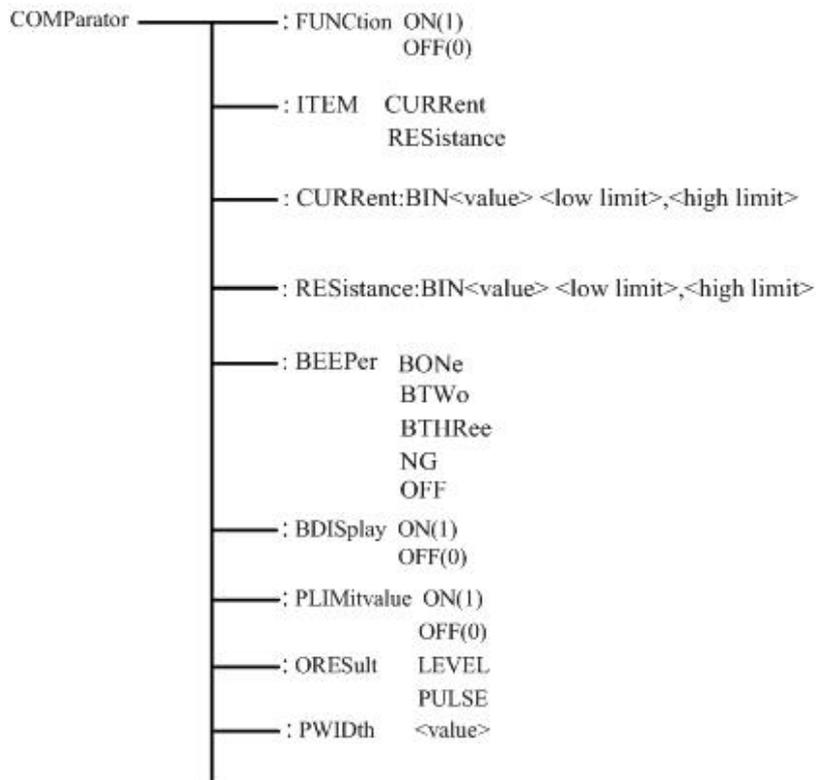
The SMONitor command queries the monitor voltage.

Command syntax: `FETCh:SMONitor:VOLT?`

## 7.2.6 COMParator Subsystem Commands

COMParator subsystem commands are used to set the pickout function of the instrument, including the setup of pickout switch and pickout list.

Command Tree:



The :FUNCTION command is used to set the pickout function as ON or OFF. It can query the current pickout function state.

Command syntax:

$$\text{COMParator:FUNcTion} \left\{ \begin{array}{l} \text{ON(1)} \\ \text{OFF(0)} \end{array} \right.$$

Where,

Character 1 (integer:49) means ON.

Character 0 (integer: 48) means OFF.

For example: WrtCmd("COMP:FUNC ON")

Query syntax: COMParator:FUNcTion ?

Return format: <NR1><NL^END>

The :ITEM command sets the pickout item of the instrument.

COMParator:ITEM? Query returns to the current pickout item.

Command syntax:

$$\text{COMParator:ITEM} \left\{ \begin{array}{l} \text{CURRent} \\ \text{RESistance} \end{array} \right.$$

Where,

CURRent set the pickout item as CURR

RESistance set the pickout item as RESIS

For example: WrtCmd("COMP:ITEM CURR")

Query syntax: COMParator:ITEM?

Return format:

$$\left. \begin{array}{l} \text{CURRent} \\ \text{RESistance} \end{array} \right\} \text{<NL^END>}$$

The :Current:BIN<value> <low limit>,<high limit> and :RESistance:BIN<value> <low limit>,<high limit> commands are used to set the high limit and low limit when the pickout item is set as CURR or RESIS.

Command syntax: COMParator: Current:BIN<value> <low limit>,<high limit>

Where,

<value> is the BIN No. of NR1 data format, input range: 1-3.

<low limit> is the low limit of NR1,NR2 or NR3 data format.

<high limit> is the high limit of NR1,NR2 or NR3 data format.

For example: WrtCmd("COMP: Current :BIN1 12.00n, 50.00n"),the default unit of resistance is  $\Omega$  and the default unit of current is A.

Query syntax: COMP: Current:BIN<n>?

Return format: <NR3>,<NR3><NL^END>

:BEEPer BONe

BTWo

BSTRee

NG

OFF

The above commands are used to specify the indication of beeper toward pickout results or turn off the beeper function.

Command syntax:

COMParator:BEEPer	BONe	it beeps when the beeper passes BIN1
COMParator:BEEPer	BTWo	it beeps when the beeper passes BIN2
COMParator:BEEPer	BSTRee	it beeps when the beeper passes BIN3
COMParator:BEEPer	NG	it beeps when three bins of the beeper all failed
COMParator:BEEPer	OFF	turn off the beeper function

Query Syntax:

COMParator:BEEPer?

Return format:

BONe, BTWo, BSTRee, NG, OFF

The :BDISplay command is used to set the bin display of the instrument as ON or OFF.

The :BDISplay? query returns to the current bin display state.

Command syntax:

COMParator: BDISplay	}	ON(1)
		OFF(0)

Where,

Character 1 (integer:49) means ON.

Character 0 (integer: 48) means OFF.

For example: WrtCmd("COMP:BDIS ON")

Query Syntax: COMParator: BDISplay?

Return format: <NR1><NL^END>

The :BLIMitvalue command is used to set the bin limit value of the instrument as ON or OFF.

The :BLIMitvalue? query returns to the current bin limit value.

Command syntax:

COMParator: BLIMitvalue	}	ON(1)
		OFF(0)

Where,

Character 1 (integer:49) means ON.

Character 0 (integer: 48) means OFF.

For example: WrtCmd("COMP:BLIM ON")

Query Syntax: COMParator: BLIMitvalue?

Return format: <NR1><NL^END>

The :OREsultcommand sets the bin output results type of the instrument.

COMParator:OREsult? query returns to the current bin output results type.

Command syntax:

COMParator:OREsult {  
 LEVel  
 PULSe

Where,

LEVel set the bin output results type as LEVel

PULSe set the bin output results type as PULSe

For example: WrtCmd("COMP:ORES LEV")

Query syntax: COMParator:ORES?

Return format:

LEVel }  
 PULSe } <NL^END>

The :PWIDth command is used to set the Handler bin output pulse width of the instrument.

The :PWIDth? query returns to the current Handler bin output pulse width.

Command syntax: COMParator: PWIDth <value>

Where,

<value> is any integer value among the range (1-25ms) of Handler bin output pulse width.

For example: WrtCmd ("FUNCTion:PWID 10"); set the Handler bin output pulse width as 10ms..

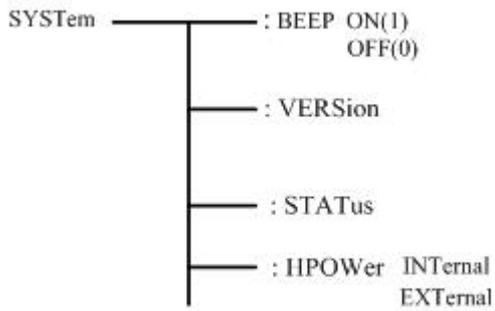
Query syntax: FUNCTion: PWIDth?

Return format:<value><NL^END>

The command query returns to the current Handler bin output pulse width.

## 7.2.7 SYSTEM Subsystem Commands

Command tree:



The :SYSTem:BEEP OFF (0) and ON (1) commands are used to set and query the system beeper of the instrument.

For example:

SYST:BEEP 0      turn off the beeper

Query Syntax:

SYST:BEEP?

Return format: 0 or 1

SYSTem:VERSion?      It can query the current version number of the instrument, for example: Ver 1.00

SYSTem:STSTus?      It can query the current status of the instrument.

Return format: DISCharging (indicating the system is in discharging), TESTing (indicating the system is in test).

The SYSTem:HPOWer INTernal or EXTernal commands are used to set the Handler interface power. Command syntax: SYSTem:HPOWer INTernal      set the HANDler power as INTernal.

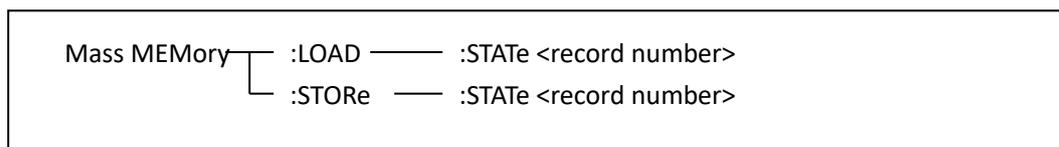
Query Syntax: SYSTem:HPOWer?

Return format: INTernal (indicating the current HANDler power is INTernal), EXTernal (indicating the current HANDler power is EXTernal).

## 7.2.8 Mass MEMory Subsystem Commands

Mass MEMory subsystem commands are used to set the storing and loading of the files (specific to the internal files).

Command tree:



The :LOAD:STATe command is used to load the files stored.

Command syntax: MMEMory:LOAD:STATe <value>

Where,

<value> file sequence number of 1-20 (NR1)

For example, WrtCmd("MMEM:LOAD:STAT 1");

The :STORE:STATe command is used to store the current setup of the instrument to a file.

Command syntax: MMEMory:STOR:STATe <value>,<name>

Where,

<value> file sequence number of 1-20 (NR1).

<name> file name (suffix .STA is not required, the length is less than 15 characters).

For example, WrtCmd("MMEM:STOR:STAT 1,ABC");

## 7.3 GPIB Common Comamnds

- \*RST
- \*TRG
- \*IDN

- The \*RST command resets the instrument.

Command syntax: \*RST

For example: WrtCmd("\*RST");

- The \*TRG command triggers the measurement and then sends the result to the output buffer.

Command syntax: \*TRG

For example: WrtCmd("\*TRG");

NOTE: "\*trg" will be valid when :INIT:CONT ON and trig:sour bus commands are enabled.

- The \*IDN? query returns ST2683A's identification string.

Query syntax: \*IDN?

Return format: <manufacturer>,<model>,<firmware><NL^END>

Where,

<manufacturer> Name of Manufacturer ( Sourcetronic)

<model> Instrument Model (ST2683A/ST2683B)

<firmware> Firmware Version (Version 1.0.0)

For example: WrtCmd("\*IDN?");

## 8) Handler Interface

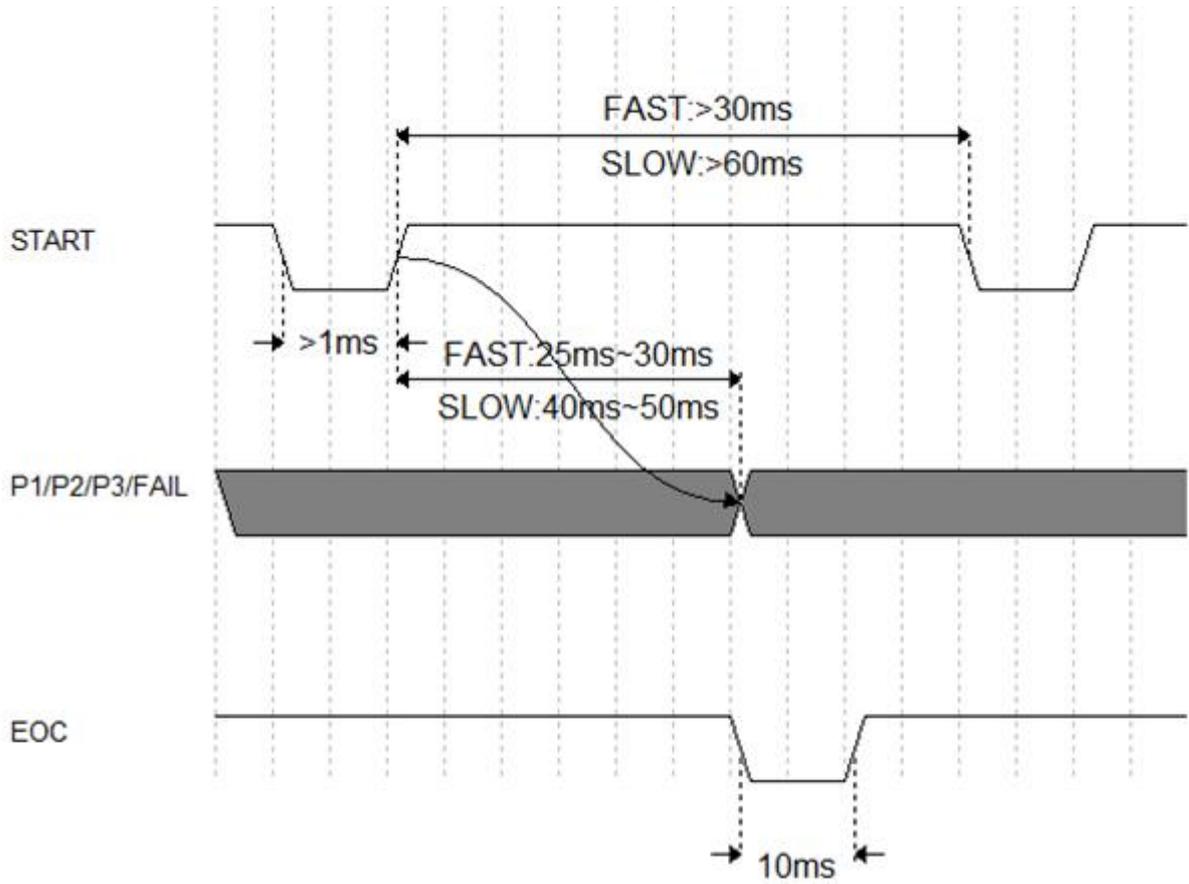
ST2683A Insulation Resistance Meter equips with a Handler interface which is mainly used to output the sorting result. When the instrument is applied to an automatic component sorting test system, this interface will output the handshake signal and the sorting result output signal. The sorting result output corresponds to the comparison result output of the current comparator bin.

Terminals and Their Descriptions:

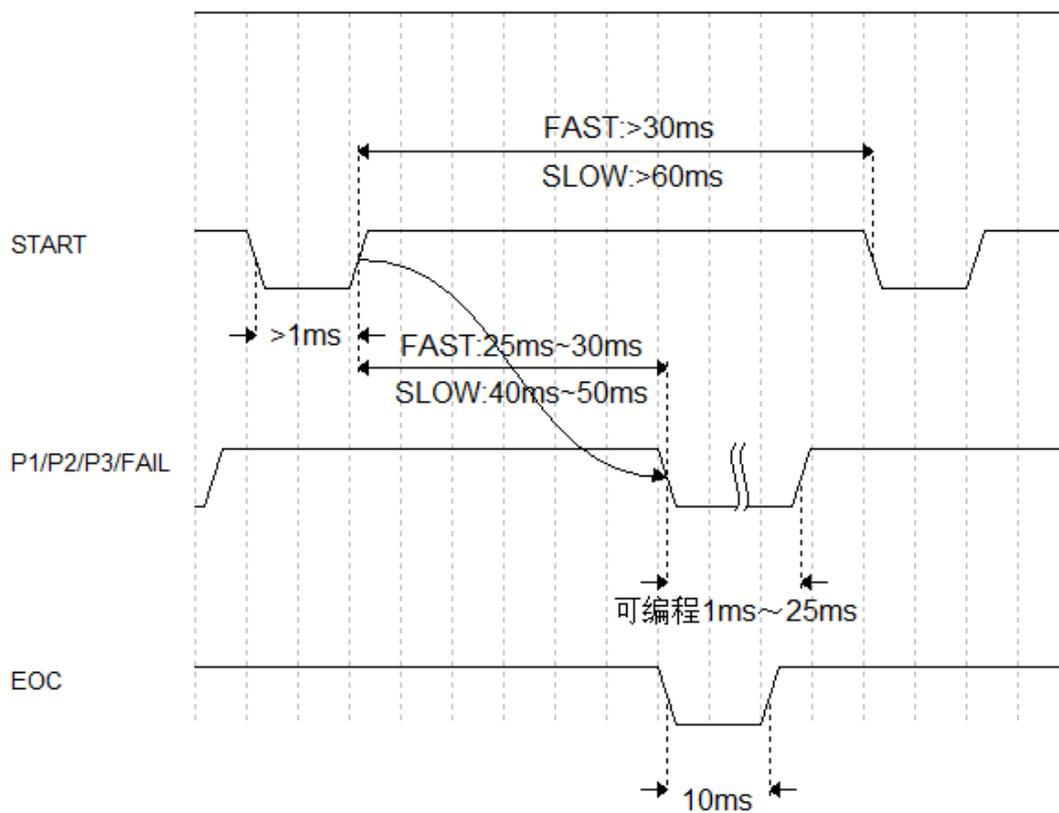
Port No.	Port name	Description
1	/START	Low level pulse, it is valid when in falling edge. When the instrument is in external trigger mode and this signal is valid, the instrument will trigger one measurement.
2	/PASS2	BIN2 passes.
3	/FAIL	BIN failed.
4	VCC	Internal electric source, +5V.
5	EXTV	External power supply, +5V.
6	/PASS1	BIN1 passes.
7	/PASS3	BIN3 passes.
8	/EOC	End of the measurement.
9	COM	External power supply ground.

**NOTE: the sequence chart below is obtained when the MEAS DISP and BIN DISP are set as OFF.**

Non-programmable Handler sequence chart (OUTP RESU is set as LEVEL)



Programmable Handler sequence chart (OUTP RESU is set as PULSE)



Time	Min. value	Max.value
Trigger pulse width	1ms	---
Tip time when measurement ended (EOC)	10ms	---
Interval time between two triggers	1 Sampling Time	---

Sampling Time = above 30ms      FAST

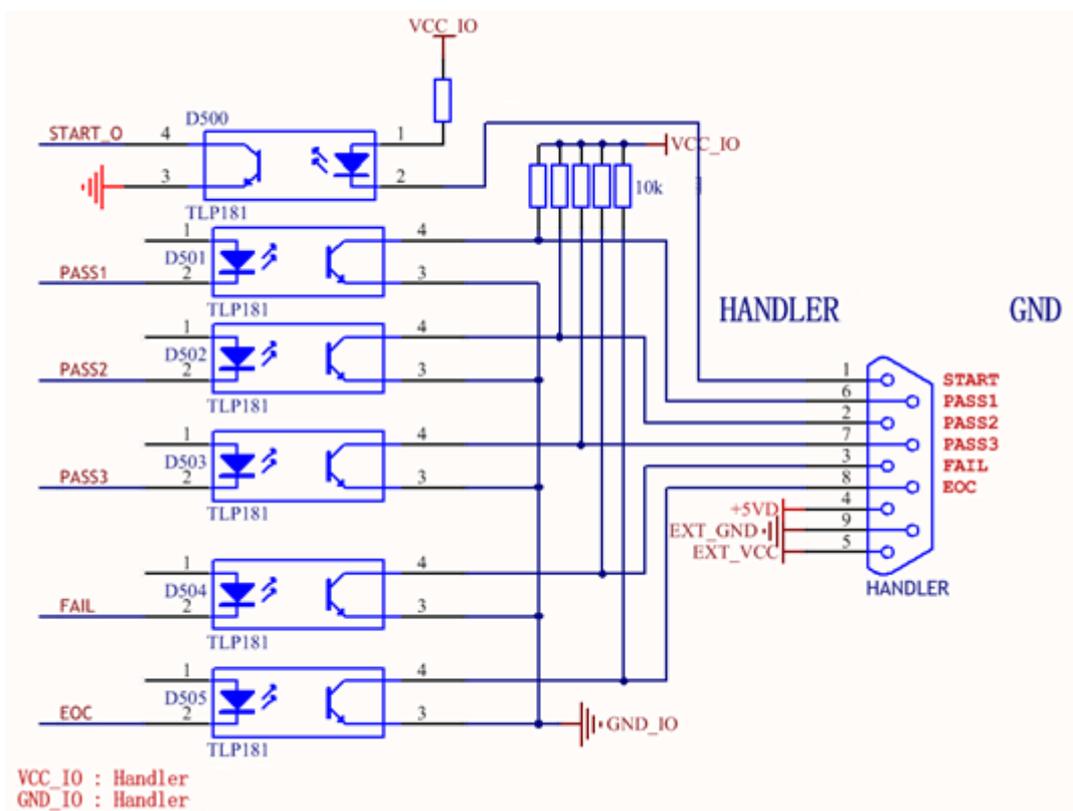
Above 60ms      SLOW

### Electrical Characteristics

DC isolated output

Each DC output (pins 1 through 5) is opened by a collector, output and isolated by a photoelectric coupler. The output voltage of each line is set by a pull-up resistor on the handler interface board. The pull-up resistors can be connected to the internally supplied voltage (+5V), or to an externally applied voltage (EXV: +5V) selectable through [the setup item on the <SYSTEM SETUP> page](#).

Comparator result output circuit and external control signal input circuit are shown as follows:



VCC\_IO: Handler VCC connected to internal +5V or external HANDLER Pin 5, selectable by setting [4.1.8 HANDLER VCC](#) as INTERN or EXTERN

GND\_IO: Handler GND connected to internal GND or external HANDLER Pin 9, selectable by setting HANDLER VCC as INTERN or EXTERN

## 9) Package Contents and Warranty

### 9.1 Package Contents

Following items should be contained in the package.

Serial Number	Name	Quantity
1	ST2683A series instrument	1
2	Test cable (ST26004B)	1
3	Three-Wire power line	1
4	Fuse (1A/2A)	1 of each
5	Operation Manual	1
6	Manufacturer Certificate	1
7	Test Report	1
8	Warranty Card	1

Verify that you have received all above items and any optional accessories you may have ordered. If anyone is missing, please contact our company or operating division without delay.

**NOTE:** foot switch is optional component and it is sold separately.

### 9.2 Marks

The following marks can be seen on each instrument panel and nameplate:

- a. Manufacturer name and trademark
- b. Product name and model
- c. Product number and date
- d. the License for Manufacturing Measurement Instruments and its number
- e. Marks for test terminal

### 9.3 Package

The instrument, generally wrapped in a plastic bag, should be packed in a strong packing box that could resist dust, vibration and moisture. Accessories, spare parts, operation manual and manufacturer certificates, etc. should also be included in it.

## 9.4 Shipping

In the shipment, the instrument should be handled with care and some precautions must be taken to resist moisture and water.

## 9.5 Storage

The instrument should be stored in an airy room where the environment temperature ranges from 5°C to 40°C, relative humidity is not greater than 85% and the air contains no detrimental impurities that might corrode the instrument.

## 9.6 Warranty

This Sourcetric instrument product is warranted against defects in material and workmanship for a period of two years from the date of shipment. You should supply us with the warranty card before you enjoy the free maintenance service. This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. Sourcetric will, without charge, repair or replace, at its option, defective product or component parts.

The maintenance for this instrument should be performed by professional maintenance personnel. Do not substitute the internal components unauthorized when maintaining. In order to ensure the measurement accuracy, the instrument must be calibrated and, if necessary, adjusted after maintenance. You shall bear the maintenance expense for damages caused by unauthorized repairing or substituting of components.

SOURCETRONIC GMBH  
Fahrenheitstrasse 1  
28359 Bremen  
Germany

T +49 421 2 77 99 99  
F +49 421 2 77 99 98  
info@sourcetric.com  
www.sourcetric.com  
skype: sourcetric

