OPERATION MANUAL

SM6030A

Automatic Transformer Test System

Contents

Announcement

The description of the manual may not cover all contents of the instrument, and our company is subject to change and to improve the performance, function, inner structure, appearance, accessory and package of the instrument without notice. If there is puzzle caused by inconsistency of manual and instrument, then you can contact with our company by the address on the cover.

Chapter 1 Out of Box Audit

When you receive the instrument, some inspections are necessary, and the condition must be understood and available before installing the instrument.

1.1 To Inspect the package

Inspect the shipping container for damage after unpacking it. It is not recommended to power on the instrument in the case of a damaged container.
If the contents in the container do not conform to the packing list, notify us or your dealer.

1.2 Power connection

1) Power-supplying voltage range: 100 ~ 120 Vac or 198 ~ 242 Vac. Related to the rear panel power setting.
2) Power-supplying frequency range: 47~63Hz.
3) Power-supplying power range: not less than 80VA.
4) Power supplying input phase line L, zero line N, ground lead E should be as same as the power plug of the instrument.
5) After careful design, the instrument can reduce the clutter jamming caused by AC power terminal input; however, it should be used under the environment with low-noise. Please install power filter if being unavoidable.

Warning: In order to prevent user and instrument from being hurt by leakage, it is necessary for user to guarantee the ground line of supply power being reliably grounded.

1.3 Fuse

The instrument has installed fuse, so operators should use the installed fuse of our company.

Warning: Be sure that the location of fuse is consistent with power-supplying voltage range before charging.

1.4 Environment

1) Please do not operate the instrument in the place that is vibrative, dusty, under direct sunlight

or where there is corrosive air.

2) The normal working temperature is 0℃~40℃, relative humidity ≤75%, so the instrument should be used under above condition to guarantee the accuracy.
3) There is heat abstractor on the rear panel to avoid the inner temperature rising. In order to keep good airiness, please don't obstruct the left and right airiness holes to make the instrument maintain the accuracy.
4) Although the instrument has been specially designed for reducing the noise caused by ac power, a place with low noise is still recommended. If this cannot be arranged, please make sure to use power filter for the instrument.
5) Please store the instrument in the place where temperature is between 5℃ and 40℃, humidity is less than 85%RH. If the instrument will not be put in use for a time, please have it properly packed with its original box or a similar box for storing.
6) The instrument, especially the test cable should be far from strong electro-magnetic field, to avoid the jamming on measurement.

1.5 Use of Test Fixture

Please use the accessory test fixture or cable, **the test fixture made by user or from other company may cause the incorrect measurement result**. The test fixture or cable should be kept clean, as well as the pin of DUT, thus to guarantee the good connection between DUT and fixture.
Connect the fixture or cable to four test terminals Hcur, Hpot, Lcur, Lpot on the front panel. As for the DUT with shielding shell, connect shielding layer or ground "⊥".
Note: When test fixture or cable has not being installed, the instrument will display an unstable test result.

1.6 Warm-up

1) To guarantee the accurate measurement, the warm-up time is no less than 15min.
2) Please not turn on or off instrument frequently, in order to avoid the inner data fluster.

1.7 Other features

1) Power: consumption power≤80VA.
2) Dimension (W*H*D): 235mm*105mm*360mm
3) Shelf Size (W*H*D): 215mm*88mm*335mm
4) Weight: About 3.6 kg.

Chapter 2 Introduction

In this chapter, the basic operation features of SM6030A series are described. Please read the content carefully before using SM6030A series instruments, thus you can learn the operation of SM6030A.

2.1 Introduction to front panel

Figure 2-1 shows the front panel of SM6030A.

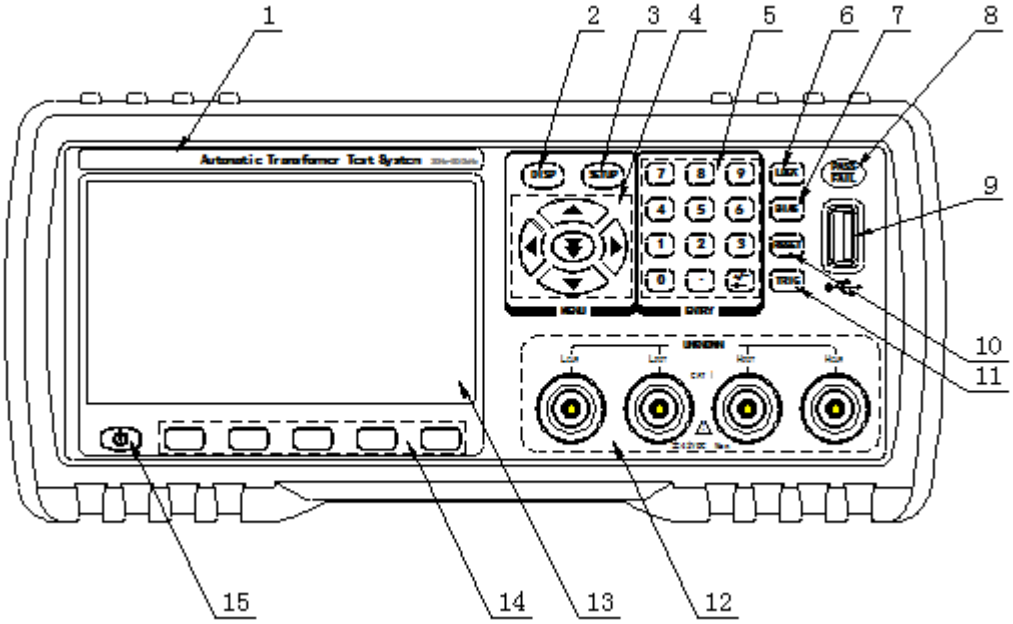


Figure 2-1 Front panel

1) Brand and model
   Brand and model.
2) [DISP]
   Press this key to enter into the corresponding measurement display page of instrument functions.
3) [SETUP]
   Press this key to enter into the corresponding measurement setup page of instrument functions.
4) CURSOR
   This key is used to move the cursor on the LCD displayed page. When the cursor moves to a zone, the corresponding zone will be lightened.
5) Numerical keys
   These keys are used to input data to the instrument. The key consists of numerical keys [0] to [9], decimal point [.] and [+/-] key. If the first digit of the input data is the symbol selection, otherwise it is equivalent to BACKSPACE, the function of deleting the last digit.
   (NOTE: long press [.] key is equivalent to copying screen function)

6) [KEYLOCK]
Press [KEYLOCK], it will be lighted, which means the function of current panel is locked. Press it again, it will be off, which means discharging the lock status. If the password function is ON, it means correct password is necessary when discharging the key-lock, otherwise the key cannot be unlocked.
When the instrument is controlled by RS232, [KEYLOCK] will be lighted. Press [KEYLOCK] again, it will be off, which means returning to the local discharging lock status.

7) [BIAS]
[BIAS] is used to permit or forbid the output of 0-50mA/5V DC bias source. Press this key, it will be lighted which means DC bias output is permitted. Press this key once more, it will be off which means DC bias output is prohibited. The key is useless in some pages where the DC BIAS cannot be added. In some non-test pages that cannot be added to DC BIAS, pressing this key will have no response. When the FUNC is set as DCR, Lp-Rd, Ls-Rd, this function is invalid.

8) PASS/FAIL indicator
PASS LED indicator shows the test result has passed.
FAIL LED indicator shows the test result has failed.

9) USB HOST interface
Connect U flash disk so as to save or load the file.

10) [RESET]
Press this key to stop scanning only in transformer automatic scanning. No operation will be executed on other pages.

11) [TRIGGER]
When the trigger mode is set to MAN mode, press this key to trigger the instrument.

12) Test terminals (UNKNOWN)
4-teminal test pair is used to connect 4-terminal test fixture or cable to measure DUT.
The 4 terminals are respectively as follows: Hcur, Hpot, Lpot and Lcur.
Current excitation high end: (Hcur)
High voltage sampling: (Hpot)
Low voltage sampling: (Lpot)
Current excitation low end: (Lcur)

13) LCD
480*272 colorful TFT LCD displays measurement results and conditions.

14) Soft keys
Five soft keys are used to select parameters. The corresponding function of each soft key has been displayed above. The function definition varies with different pages.

15) POWER
Power switch

2.2 Introduction to rear panel

Figure 2-2 shows the rear panel of SM6030A.

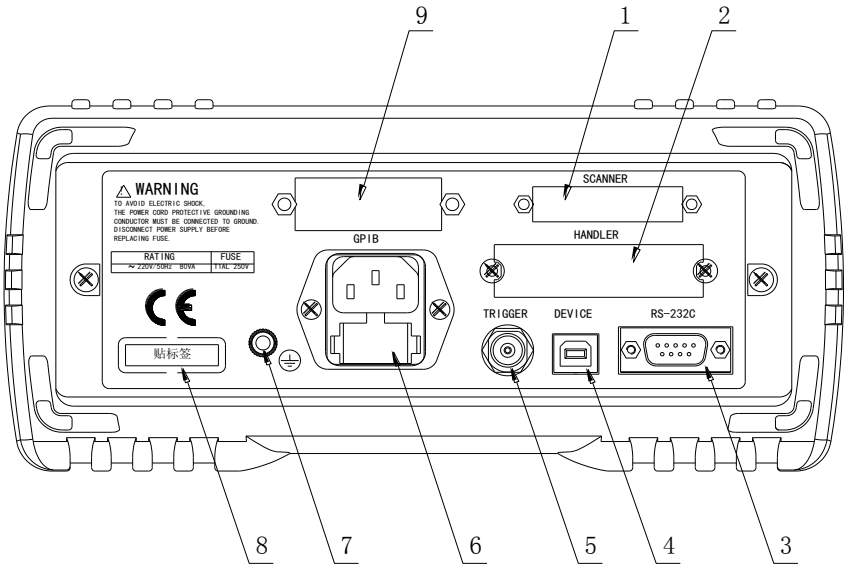


Figure 2-2 Rear panel

1) SCANNER Interface
   Control transformer scan box via SCANNER interface.
2) HANDLER interface
   Handler interface is used to realize the sorting output of test results.
3) RS232C interface
   Series communication interface can realize the communication with PC.
4) USB DEVICE interface
   The tester can communicate with PC through the USB DEVICE interface.
5) TRIGGER interface
   The tester can communicate with foot control and other external trigger devices.
6) Power socket
   Input AC power.
7) Ground terminal
   The ground terminal is connected with instrument casing, being available for protecting or shielding ground connection.
8) Nameplate
   Information about production date, instrument number and manufacturer etc..
9) IEEE-488 (GPIB) interface
   The tester can communicate with PC through GPIB interface.

Warning: Be sure that the direction of fuse is accordant with power-supply voltage range before charging.

2.3 Introduction to display zone

SM6030A applies a 65k, 4.3-inch TFT display. The display screen is divided into the following

zones:

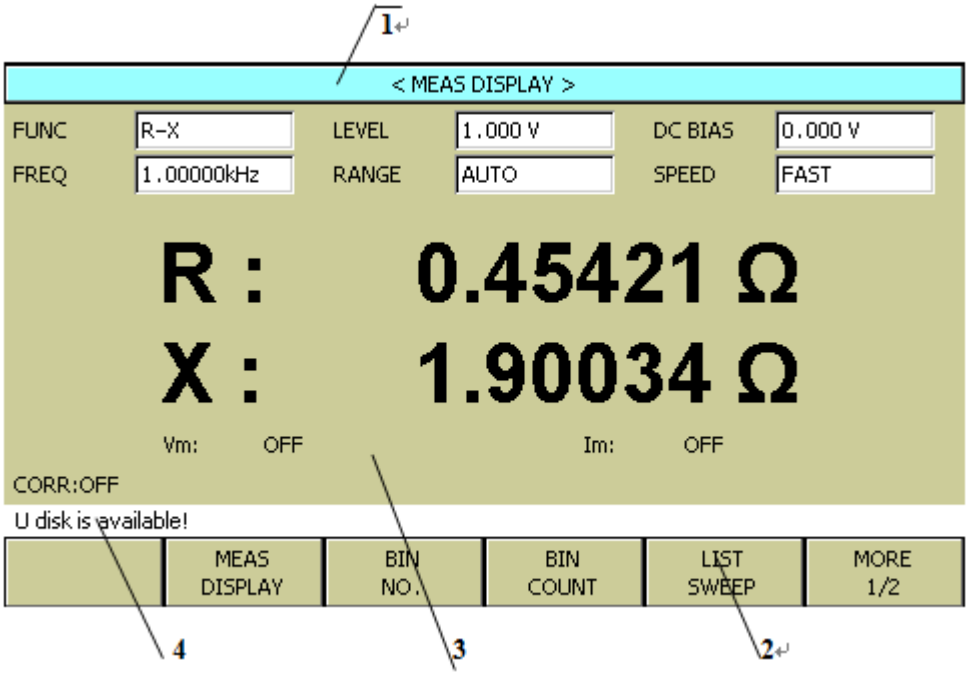


Figure 2-3 display zones

1) Display page name
   Indicate the name of the currently displayed page.
2) Soft keys
   The zone is used to display the function definition of soft key. The definition of soft key can be different as the difference of cursor's direction in the zone.
3) Test result/ condition display zone
   In this zone, test result information and current condition are displayed.
4) Assistant Display Zone
   This area is used to display system prompts.

2.4 Main menu keys and corresponding displayed pages

2.4.1 [DISP]

When the LCR function is active, press this key-**[DISP]** to enter into the LCR measurement display page, mainly about the start button of the capacitance, resistance, inductance, impedance measurement function menu, the following soft keys will be displayed in the soft key zone.

<MEAS DISPLAY>

<BIN NO. DISP>

<BIN COUNT DISP>

<LIST SWEEP DISP>

<FILE MANAGE>

When the transformer measurement function is active, it is used to enter the transformer measurement display page. This part of the function page has

<TRANS MEAS DISP>
<FILE MANAGE>
When the transformer sweep function is active, it is used to enter the transformer sweep display page. The function pages of this section are:
<TRANS DEVIATION SETUP>
When positioning scan function is active, there is no function page here.

2.4.2 [SETUP]

When the LCR function is active, press this key-**[SETUP]**, the following soft keys will be displayed in the soft key zone on the LCR measurement setup page.
<MEASURE SETUP>
<CORRECTION>
<LIMIT TABLE SETUP>
<LIST SWEEP SETUP>
MORE ▶
1/2
<FILE MANAGE>
<SYSTEM SETUP>
<TOOLS>
MORE ▶
2/2
When the transformer measurement function is active, it is used to enter the transformer measurement display page. This part of the function page has
<TRANS TEST SET>
<TRANS LIMIT SET>
<CORRECTION>
<FILE MANAGE>
When the transformer scan function is active, it is used to enter the transformer scan display page. The function pages of this section are:
<TRANSFORMER ID>
<PIN SETUP>
<TEST CONDITION>
<STAT>
<FILE MANAGE>
<TOOLS>
When positioning sweep function, same as sweep function.

2.4.3 [SYSTEM SETUP]

This key-**[SYSTEM SETUP]** is used to enter into the system setup page. The following soft keys will be available:
<SYSTEM SETUP>
<MEAS SETUP>

<DEFAULT SETTING>
<SYSTEM RESET>

2.5 Basic Operation

Basic operation of SM6030A is as follows:

- Use menu keys ([DISP], [SETUP]) and soft keys to select the desired page.
- Use cursor keys ([←][→] [↑] [↓]) to move the cursor to the desired zone. When the cursor moves to a specified zone, the zone will become reverse expression.
- The soft key functions corresponding to the current zone of the cursor will be displayed in the soft key zone. Users can select and use the desired soft keys, numeric keys, [BACKSPACE] and [ENTER] to input data.

  When a numeric key is pressed down, the usable unit soft key will be displayed in the soft key zone. You can choose a unit soft key or [ENTER] to end data inputting. When the data input is ended using the [ENTER] key, the data unit is the default unit of the corresponding domain parameter: Hz, V or A. Such as the default unit for test frequency is Hz.

2.6 Start the instrument

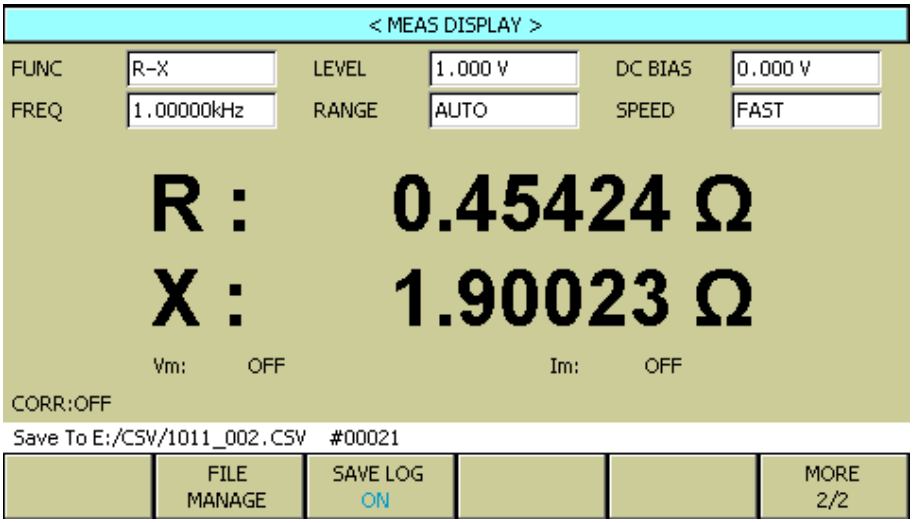
Plug in 3-line power plug.
Caution: Keep the power-supply voltage and frequency conform to above specifications. Power input phase line L, zero line N, ground line E should be the same as that of the instrument.
Press the power switch at the left corner on the front panel and then a boot screen will appear which displays our company logo, instrument model, and the version number of the software.

Note: The factory password is set in this series of products. The factory password is 2832X. The user can reset the password according to their needs during use. For details, see the password item on the <System Settings> page.

Chapter 3 Introduction to [DISP]

3.1 <MEAS DISPLAY>

When the LCR function is applied, press [DISP], the <MEAS DISPLAY> page will be displayed on screen as shown in the following figure.



Pic301

On this page, the test result is displayed in upper-case character. The measurement control parameters can be set on this page:

- Test function (FUNC)
- Test frequency (FREQ)
- Test level (LEVEL)
- Test range (RANGE)
- DC BIAS (BIAS)
- Test speed (SPEED)

There are 6 zones in this page: **FUNC, FREQ, LEVEL, RANG, BIAS** and **SPEED.** The details will be discussed later.

The test result/ condition display zone shows the information about test condition. These conditions can be set on <MEAS SETUP> page or <CORRECTION> page.

- Signal source voltage/ current monitor (**Vm, Im**)
- Open, short, load correction ON/OFF status (**CORR**)

3.1.1 Test function

In a measurement period, SM6030A can test four parameters for an impedance component: two primary parameters and two secondary parameters. Parameters that can be tested are as follows:

Primary parameters

- |Z| (Module of impedance)

- |Y| (Module of admittance)
- L (Inductance)
- C (Capacitance)
- R (Resistance)
- G (Conductance)
- DCR (DC resistance)

Secondary Parameters

- D (Dissipation factor)
- Q (Quality factor)
- R_s (Equivalent Series Resistance ESR)
- R_p (Equivalent Parallel Resistance)
- Rd (DC resistance)
- X (Reactance)
- B (Susceptance)
- θ (Phase Angle)

Test results of primary and secondary parameters are respectively displayed in two lines in the form of upper-case characters. The primary parameter displays in the upper line while the secondary parameter displays in the lower line.

Operation steps for setting test function:

1) Move the cursor to FUNC zone, the following soft keys will be displayed on the screen.
   - C_p—…→
   - C_s—…→
   - L_p—…→
   - L_s—…→
   - MORE→
     1/3

2) Press the soft key corresponding to C_p—…→, the following parameters will be shown for your choice.
   - C_p-D
   - C_p-Q
   - C_p-G
   - C_p-R_p
   - RETURN←

Press the soft key corresponding to your desired parameter. Then press RETURN← to return to upper soft key menu.

3) Press Cs—…→, the following parameters will be shown for your choice.
   - Cs-D
   - Cs-Q
   - Cs-Rs
   - RETURN←

Press the soft key corresponding to your desired parameter. Then press RETURN← to return to upper soft key menu.

4) Press L_p—…→, the following parameters will be shown for your choice.
   - L_p-Q
   - L_p-R_p
   - L_p-R_d
   - MORE→
     1/2
   - RETURN←

Press the soft key corresponding to your desired parameter. Then press RETURN← to return to upper soft key menu.

5) Press MORE→, the following parameters will be shown for your choice.
   - L_p-D
   - L_p-G
   - MORE→
     2/2
   - RETURN←

Press the soft key corresponding to your desired parameter. Then press RETURN← to return to upper soft key menu.

6) Press Ls—…→, the following parameters will be shown for your choice.
   - Ls-D
   - Ls-Q
   - Ls-Rs
   - Ls-Rd
   - RETURN←

Press the soft key corresponding to your desired parameter. Then press RETURN← to return to upper soft key menu.

7) Press MORE→1/3, the following parameters will be shown for your choice.
   - Z—…→
   - Y—…→
   - R—…→
   - G-B
   - MORE→
     2/3

Press the soft key corresponding to your desired parameter. Then press MORE to switch to the next set of functions

8) Press Z—…→, the following parameters will be shown for your choice.
   - Z-d
   - Z-r
   - RETURN←

Press the soft key corresponding to your desired parameter. Then press RETURN← to return to

upper soft key menu.

9) Press Y—…→, the following parameters will be shown for your choice.
   - Y-d
   - Y-r
   - RETURN←

Press the soft key corresponding to your desired parameter. Then press RETURN← to return to upper soft key menu.

10) Press R—…→, the following parameters will be shown for your choice.
   - R-X
   - Rp-Q
   - R_s-Q
   - RETURN←

Press the soft key corresponding to your desired parameter. Then press RETURN← to return to upper soft key menu.

11) Press MORE→2/3, the following parameters will be shown for your choice.
   - DCR
   - MORE→
     3/3

Press DCR, choose the desired parameter. Then press MORE→3/3 to return to the first page of soft key menu.

3.1.2 Test range

Measurement range should be selected in accordance with the impedance value of the tested LCR component.
SM6030A has 10 AC measurement ranges: 3Ω, 10Ω, 30Ω, 100Ω, 300Ω, 1kΩ, 3kΩ, 10kΩ, 30kΩ, 100kΩ.
SM6030A has 11 DCR measurement ranges: 1Ω, 3Ω, 10Ω, 30Ω, 100Ω, 300Ω, 1kΩ, 3kΩ, 10kΩ, 30kΩ, 100kΩ.

Operation steps for setting test range:

1) Move the cursor to the RANGE zone, the following soft keys will be displayed:
   - AUTO The soft key is used to set the range mode to AUTO.
   - HOLD The soft key is used to switch the AUTO mode to the HOLD mode. When the range mode is set to HOLD, the range will be locked in the current measurement range. The current measurement range will be displayed in the range zone.
   - DECR- The soft key is used to decrease the range under HOLD mode.
   - INCR+ The soft key is used to increase the range under HOLD mode.
2) Use soft keys to set measurement range.

3.1.3 Test frequency

The measurement range of SM6030A ranges from 20Hz to 200kHz, resolution is 0.01Hz. When the test function is set as DCR, the **FREQ** zone will display "---". The total frequency points are 15025.

Operation steps for setting test frequency:

SM6030A provides two methods to set measurement frequency. The first one is to use soft keys and the other one is to input data by using numeric keys.

1) Move the cursor to the **FREQ** zone, the following soft keys will be displayed.
   - INCR(++)

     This is a coarse adjustment soft key used to increase the frequency. Press this key, the frequency will change between the following six typical frequencies: 20 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz and 200 kHz

   - INCR(+)

     This is a fine adjustment soft key used to increase the frequency. Press this key, the frequency will switch between the following ones:

     20Hz 25Hz 30Hz 40Hz 50Hz 60Hz 75Hz 100Hz 120Hz 150Hz 200Hz 250Hz 300Hz 400Hz 500Hz 600Hz 750Hz 1 kHz 1.2kHz 1.5kHz 2kHz 2.5kHz 3kHz 4kHz 5kHz 6kHz 7.5kHz 10kHz 12kHz 15kHz 20kHz 25kHz 30kHz 40kHz 50kHz 60kHz 75kHz 100kHz 120kHz 150kHz 200kHz

     NOTE: according to the different frequency range, the minimum and maximum frequency of SM6030A/2831/2832 is different.

   - DECR(-)

     This is a fine adjustment soft key used to decrease the frequency. The selectable frequencies are the same as that of INCR(+).

   - DECR(--)

     This is a coarse adjustment soft key used to decrease the frequency. The selectable frequencies are the same as that of INCR(++).
2) Use soft keys or numeric keys to select or set frequency. When using numeric keys to input the required frequency value, the soft key displays the available frequency units (Hz, kHz and MHz). You can use unit soft key to input unit and data. When using [ENTER] key to input frequency, the default unit of frequency value is Hz.

NOTE: if the frequency point input is not within the frequency range, the value will be automatically modified to the nearest frequency point higher than the input frequency.

3.1.4 Test level

The measurement level of SM6030A can be set according to the RMS value of sine wave signal. The frequency of sine wave signal is the test frequency which is generated by inner oscillator. You can set measurement voltage or current. Level range is 10mV ~ 2V. There is a liner relationship between the corresponding current level mode value and internal resistance. (30Ω internal resistance corresponds to the current level is 333.3μA~66.67mA, 100Ω internal resistance corresponds to the current level is 100μA ～ 20mA). The output impedance of SM6030A signal source can be 30Ω or 100Ω. When the test function is DCR, **level** zone display is "----".

Note: The measurement current is the output one when the tested terminal is short, while the measurement voltage is the output one when the tested terminal is open.

The auto level control function of SM6030A can realize the measurement of constant voltage or current. The auto level control function (ALC) can be set as ON in <MEASURE SETUP> page. When the auto level control function is set to ON, "*" will be displayed following the current level value. Refer to <MEASURE SETUP> for more information.

Operation steps for setting test level:

SM6030A provides two methods to set the level of test signal source. The first one is to use soft keys, while the second one is to input data by numeric keys.

1) Move the cursor to LEVEL, the following soft keys will be displayed.
   - INCR(+)
     This soft key is used to increase the level of test signal source.
   - DECR(-)
     This soft key is used to decrease the level of test signal source.

2) Soft or numeric keys are used to select or set the test level. When numeric keys are used to input the desired level, the available units (mV, V, μA, mA and A) will be displayed in the soft key zone. Users can use these unit keys to input unit and data. When using [ENTER] to input level，the default unit of level is V or A.

NOTE: When you need to switch the level between current and voltage, numeric keys and unit soft keys must be used.

3.1.5 DC BIAS

SM6030A provides internal DC bias voltage from -5V to +5V. When the test function is selected as DCR, the BIAS zone will display "---".

Operation steps for setting DC bias:

SM6030A provides two methods to set the DC bias. The first one is to use soft keys, while the second one is to input data by numeric keys.

1) Move the cursor to BIAS, the following soft keys will be displayed.
   - INCR(++)
     This is a coarse adjustment soft key used to increase the output level of DC bias.
   - INCR(+)
     This is a fine adjustment soft key used to increase the output level of DC bias.
   - DECR(-)
     This is a fine adjustment soft key used to decrease the output level of DC bias.
   - DECR(--)

2) Soft or numeric keys can be used to select or set the DC bias source. When numeric soft keys are used to input the desired bias level, the available units ((mV, V, μA, mA and A) will be displayed in the soft key zone. Users can use these soft keys to input unit or data. When [ENTER] key is used to input the bias value , the default unit is V or A for DC bias value.

NOTE: When you need to switch the DC bias level between current and voltage, numeric keys and unit soft keys must be used.

Press the **[DC BIAS]** key on the front panel to allow the output of DC bias. When DC bias is permitted to output, the **[DC BIAS]** key will be lighted.

3.1.6 Test speed

The test speed of SM6030A is determined by the following factors:

- Integration time (A/D conversion)
- Average times (number of times used for obtaining a moving average of continuous measurement results)
- Measurement delay (from startup to the start of measurement)
- Display time of test results

Generally, the test result is more stable and accurate in SLOW test mode. You can select test mode as FAST, MED or SLOW.

Operation steps for setting test speed:

1) Move the cursor to SPEED, the following soft keys will be displayed:
   - FAST
   - MED
   - SLOW
2) Use above soft keys to set the test speed.

3.1.7 Tools

The SM6030A test result is displayed according to the corresponding function of the display tool.

Decimal point function can make SM6030A output the test result in fixed way, meanwhile this function can change the displayed digits of test result.

Follow the steps below to set the result display of decimal point.

Operation steps for tools

Set the display mode of decimal point in fixed mode according to the following operation steps. Also the character size of test result can be set.

1) Move the cursor to **MEAS RESULT DISP** zone, the following soft keys will be displayed:
   - **D.P. AUTO**
   - **D.P. FIX**
   - **D.P.POS INCR +**
   - **D.P.POS DECRL-**
2) Press **D.P. AUTO** to reset the decimal position of the primary or the secondary parameter test result to its default setting.
3) Press **D.P. FIX** to lock the decimal location of primary parameter TEST result.
4) Press **D.P.POS INCR +** to increase the displayed digit by ten times.
5) Press **D.P.POS DECL -** to decrease the displayed digit by ten times

---

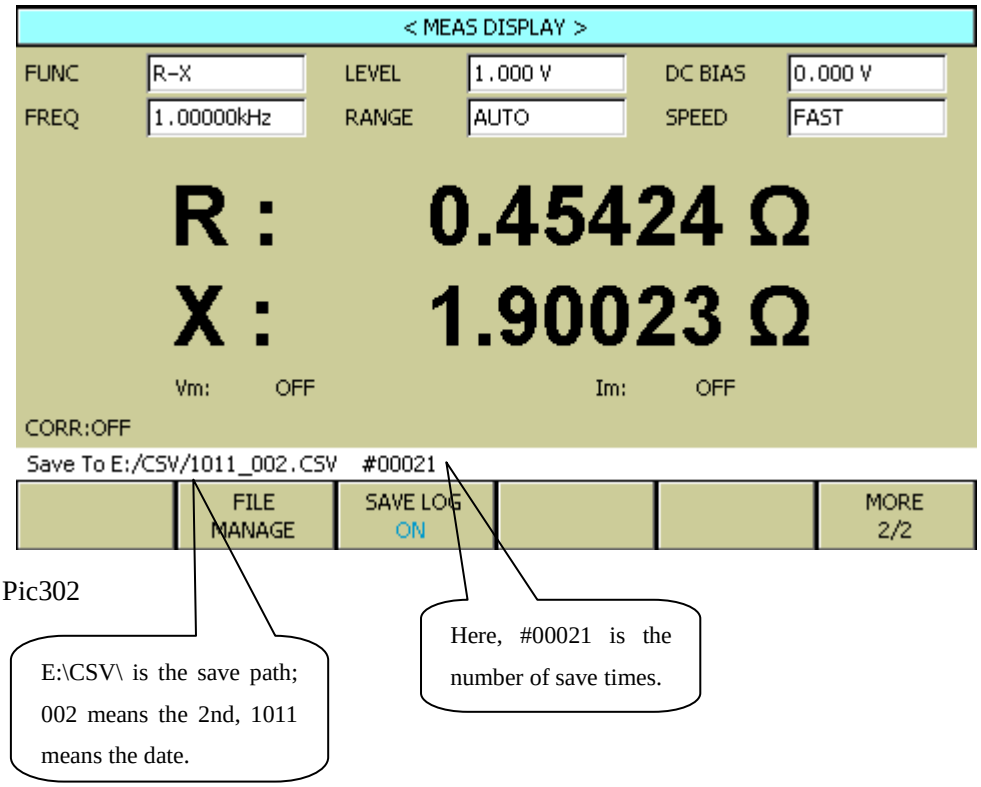
NOTE: Under the following circumstance, the function of decimal lock will be cancelled automatically to recover to floating decimal point status.

- Test function is changed.
- In deviation test, the deviation test mode (ΔABS, Δ%, OFF) is changed.

3.1.8 Use USB to Save LCR Test Results

Use the USB stick to save the test results. The test results and format that can be saved are as follows:

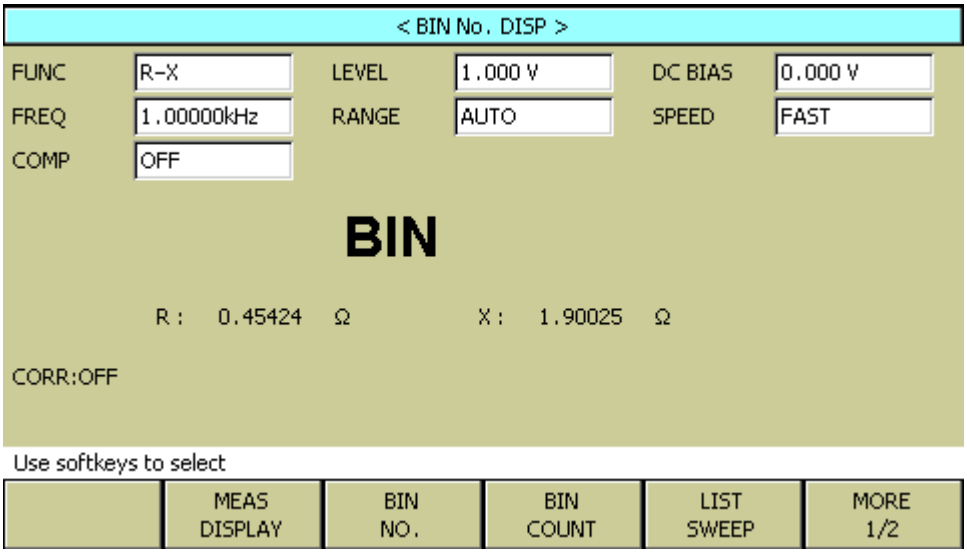
1. Compare-ON: FUNCA, primary parameter, secondary parameter, status (0 normal), sorting results;
   Compare-OFF: FUNCA, primary parameter, secondary parameter, status (0 normal)
2. DCR: Dcr, primary parameter;
3. List Sweep: List, function, function parameter, primary parameter, secondary parameter, status (0 normal), compare result (-1 low, 1 high), row mark, sorting parameter, low limit, high limit;



Pic302

3.2 <BIN NO. DISP>

Press **[DISP]** firstly and then the **BIN NO.** soft key to enter into <BIN NO. DISP> display page. On this page, BIN NO. is displayed in upper-case character while the test result, in lower-case character. As figure below:



Pic 303

The following control parameters can be set on <**BIN NO. DISP**>.

- Compare function ON/OFF (**COMP**)

There are 2 zones: **BIN NO. DISP**, **COMP**. Their detailed information will be introduced as below.

The following test conditions are displayed in the measurement result/condition zone. These zones cannot be set on this page but can be set on **<MEAS SETUP>**, **<MEAS DISP>** or **<CORRECTION>**.

- Test function (FUNC)
- Test frequency (FREQ)
- Test level (LEVEL)
- Test range (RANG)
- BIAS
- Test speed (SPEED)
- ON/OFF set state of OPEN, SHORT, LOAD (CORR)

3.2.1 Comparator function

SM6030A has an inserted compare function which can divide DUT to up to 10 bins (from BIN1 to BIN9 and BIN OUT). Users can set 9 pairs of primary parameter limit and one pair of secondary bin limit. If the primary parameter of DUT is within the range of the bin limit but the secondary parameter is outside of the bin limit, the DUT will be sorted into the auxiliary bin. When SM6030A has installed a HANDLER interface, the compare result will be output into the automatic test system and further realizing auto-sorting test. These limits can only be set on the <**LIMIT TABLE SETUP**> page. Users can set the compare function to ON or OFF in the **COMP** zone.

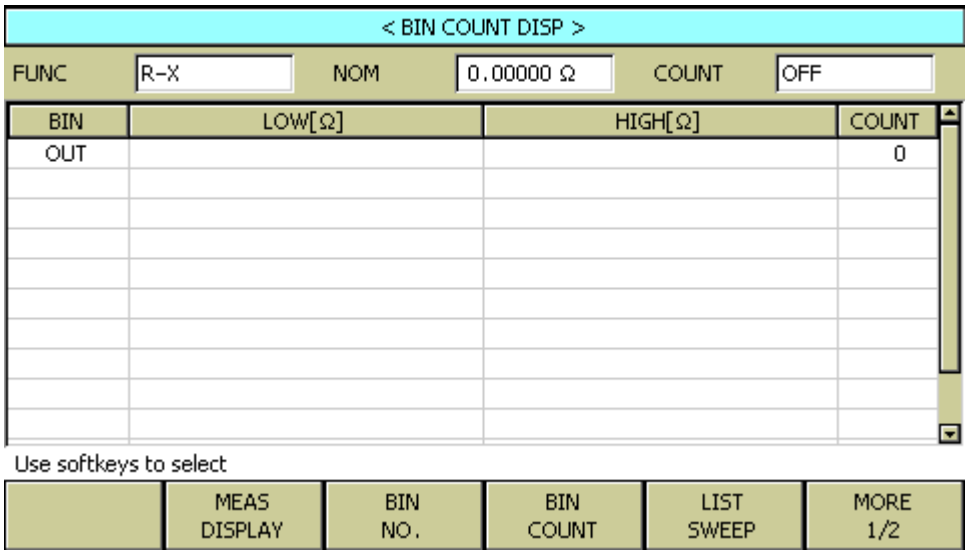
Operation steps for compare function

1) Move the cursor to **COMP**, the following soft keys will be displayed.
   - ON
   - OFF
2) Select one of above soft keys to set the compare function as ON or OFF.

3.3 <BIN COUNT DISP>

Press **[DISP]** and then select the soft key of **BIN COUNT** to enter into the <**BIN COUNT**> page which shows the count of each bin.

This page only display the corresponding bin number of the high and low limit values in the limit setting page. The bin number without the high and low limit values is not displayed. Similarly, for auxiliary bin, if it is on, then, there is AUX bin count display, If AUX's state is off, it is not displayed. As figure:



Pic304

The following control parameters can be set on the <**BIN COUNT**> page.

- Count function ON/OFF (**COUNT**)

There are 2 zones are displayed in this page: **BIN COUNT DISP**, **COUNT**. The function of each zone will be introduced as below.

The following test result/ condition can be displayed in this page but cannot be set in this page. Users can set them on the **<LIMIT TABLE SETUP>** page.

- Test parameter (PARAM)
- Nominal value (NOM)
- Bin limit value (HIGH/ LOW)

3.3.1 PARAM

Parameter zone shows the "Function" parameter, if user selects primary and secondary parameter swap compare mode, the parameter will be displayed as swap parameter, such as: "Cp-D" is displayed as "D-Cp", which means the current D is compared as primary parameter while Cp is compared as secondary parameter.

3.3.2 NOM.

Nominal parameter is the nominal value used to make bin compare.

3.3.3 BIN

This zone shows the bin number of the limit list. "2nd" means the secondary parameter limit.

3.3.4 HIGH/LOW

This zone shows the high and the low limits of the limit list.

3.3.5 COUNT

This zone shows the count value of the current bin.

3.3.6 OUT

This zone shows the count value of the out bin.

Operation steps for bin count function

1) On < **BIN COUNT DISP**> page, move the cursor to **COUNT** zone, the following soft keys will be displayed.
   - **ON**
   - **OFF**
   - **Previous Page**
   - **Next Page**
   - **RESET COUNT**
2) Press the soft key **ON** to turn on the count function.
3) Press the soft key **OFF** to turn off the count function.
4) If the limit settings of the ten bins are set, the auxiliary 2nd bin is also set, and when the auxiliary bin (AUX) is on, one page cannot display all the data, and then this key can be used to switch to the second page to view the data.
5) This key can be used to switch to the first page to view the data.
6) Press the soft key **RESET COUNT**, "☺ : Reset count, Sure?" will be displayed in the help zone. Then the following soft keys will be displayed.

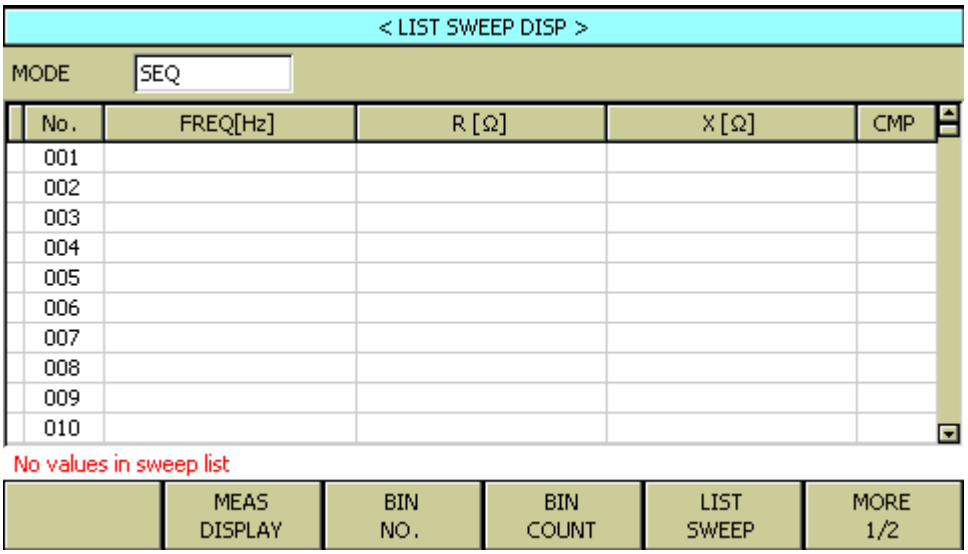
- **YES**
- **NO**

7) Press the soft key **YES** to reset all bin counts to 0.
8) Press the soft key **NO** to cancel the reset operation.

3.4 <LIST SWEEP DISP>

The list sweep function of SM6030A can make automatic sweep test for up to 201 points' test frequencies, test levels or DC bias. Each list sweep test point can be set to its high and low limits. These test points will be automatically swept and the test results will be compared to their respective limit values.

Press down the menu key **[MEAS DISPLAY]** and then the soft key **LIST SWEEP** to enter into the **<LIST SWEEP DISP>** page, shown as below.



Pic305

Test points will be automatically tested in a scanning mode. Meanwhile, comparison will be made between test results and limit values. In the process of list sweep test, "►" denotes the current sweep test point. The following control parameters can be set on <**LIST SWEEP DISP**>.

- Sweep mode (**MODE**)

There are 2 zones on this page: **LIST SWEEP DISP** and **MODE**. List sweep points cannot be set on this page but can be set on <**LIST SWEEP SETUP**>.

3.4.1 Sweep mode

The list sweep function of SM6030A can make automatic scan test for up to 201 points' test frequencies, test levels or DC bias. Two sweep modes are available on SM6030A: SEQ and STEP. In SEQ mode, each press of [**TRIGGER**] will direct SM6030A to automatically test all list sweep test points. In STEP mode, each press of [**TRIGGER**] will direct SM6030A to test one list sweep point.

NOTE: When the trigger mode is set to **INT**, sweep test modes of SEQ and STEP will not be controlled by [**TRIGGER**].

When the trigger mode is set to **MAN**, [**TRIGGER**] can be used to trigger the list sweep test.

During SEQ test mode, press [**RESET**] 1 time to pause the test, press again to reset to restart the sweep test.

Operation steps for setting the list sweep mode:

Set the sweep mode on the <**LIST SWEEP DISP**> page as **SEQ** or **STEP**.

1) On the < **LIST SWEEP DISP** > page, move the cursor to the **MODE** zone, the following soft keys will be displayed:
   - **SEQ**
   - **STEP**

2) Press **SEQ** to set the sweep mode as sequential sweep test mode.
3) Press **STEP** to set the sweep mode as single step sweep test mode.

3.4.2 FREQ (Hz)

This zone shows the currently swept parameter mode and its unit. What are right below this item are parameters of the sweep list.

3.4.3 Cp[:] D[:]

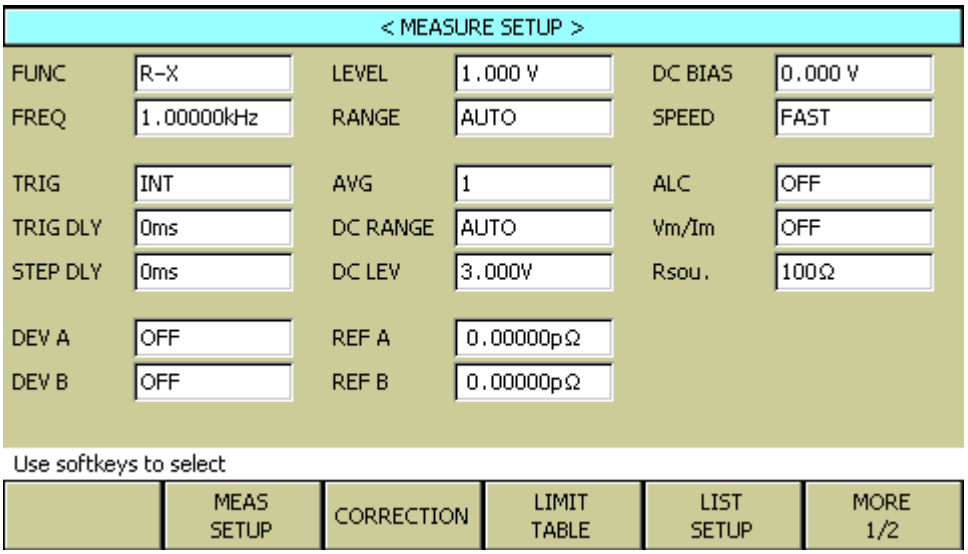
This zone is the currently swept Function parameter and its unit. What are right below this item are the sweep results.

3.4.4 CMP (Compare)

This zone indicates the compare results of the currently swept points.
"L" means the result is lower than the standard and "H" is higher than the standard, " " is neither over high nor below low.

3.5 <MEASURE SETUP>

Press **[SETUP]** to enter into the **<MEASURE SETUP>** page shown as below:



Pic306

In this page, the following control parameters can be set. (Items in parenthesis can be set)

- Test function (**FUNC**)
- Test frequency (**FREQ**)
- Test level (**LEVEL**)
- Test range **(RANGE**)

- DC Bias (**BIAS**)
- Test speed (**SPEED**)
- Trigger Mode (**TRIG**)
- Auto Level Control (**ALC**)
- Output Resistance (**Rsou.**)
- Average times (**AVG**)
- Voltage/Current Level Monitor ON/ OFF (**Vm/Im**)
- DCR polarity (**DCR POL**)
- Trigger delay **(TRIG DLY)**
- Step delay **(STEP DLY)**
- DC range (**DC RNG**)
- DC level (**DC LEV**)
- Deviation Test Mode A (**DEV A**)
- Deviation Test Mode B (**DEV B**)
- Deviation Test Reference Value A (**REF A**)
- Deviation Test Reference Value B (**REF B**)

Some zones listed below are as same as that on **<MEAS DISPLAY>** page, so it is not necessary to introduce in this section, but others will be introduced briefly in the following sections.

- Test function (**FUNC**)
- Test frequency (**FREQ**)
- Test level (**LEVEL**)
- Test range **(RANGE**)
- Test speed (**SPEED**)
- DC Bias (**BIAS**)

3.5.1 Trigger mode

There are 4 trigger modes on SM6030A: INT, MAN, EXT and BUS.
When the trigger mode is set as INT, SM6030A will make sequential and repeated tests.
When the trigger mode is set as MAN, press [TRIGGER] once, SM6030A will make one test.
When the trigger mode is set as EXT, once the HANDLER interface receives a positive impulse, SM6030A will execute one measurement.
When the trigger mode is set as BUS, once the IEEE 488 interface receives a **TRIGGER** command, SM6030A will execute a test. The BUS mode cannot be set on the front panel.

Note: In the process of testing, when SM6030A receives a trigger signal, it will be ignored. So the trigger signal should be sent after the test is done.
When optional HANDLER interface triggers SM6030A the trigger mode is set as EXT.

Operation steps for the trigger mode setup

Execute the operation of below modes:

1) Move the cursor to the **TRIGGER** zone, the following soft keys will be displayed:
   - **INT**

- **MAN**
- **EXT**
- **BUS**

2) Use above soft keys to set the trigger mode.

3.5.2 Auto level control function

Auto level control function can adjust the real test level (voltage across or current through DUT) to the test level value. This function can guarantee the test voltage or current being constant.
When using this function, the test level can be set within the range below:
The range of constant voltage: 10 mV_{rms} to 1 V_{rms}
The range of constant current: 100 μA_{rms} to 10 mA_{rms}

NOTE: When the constant level function is valid, if the level exceeds above ranges, this function will be automatically set as OFF. The level value currently set is generally deemed as non-constant level value.

Operation steps for setting auto level control function
Execute the following steps and set the constant level function as ON or OFF.

1) Move the cursor to **ALC** zone, the following soft keys are displayed.
   - **ON**
   - **OFF**
2) Press **ON** to turn on the auto level control function.
3) Press **OFF** to turn off the auto level control function.

3.5.3 Average

The AVERAGE function can calculate the average value of two or more test results. The average times can be set from 1 to 255 with an increase or decrease of 1.
Operation steps for setting test average times.

1) Move the cursor to the **AVG** zone, the following soft keys are displayed.
   - **INCR (+)**
     This key is used to increase the average times.
   - **DECR (-)**
     This key is used to decrease the average times.
2) Use above soft keys to set the average times, or use the numeric keys and the [ENTER] key to enter the average times directly.

3.5.4 Voltage/Current Level Monitor function

The level monitor function can monitor the real voltage across DUT or real current through DUT. The monitored voltage value is displayed in **Vm** zone on <**MEASURE DISP**> page while the

monitored current value is in **Im** zone.

Note: The correction function can influence the level monitor function, so when the correction data changes the level monitor value will change. When the correction is switched between OPEN or SHOR or LOAD, the level monitor value will be influenced as well

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Operation steps for setting the level monitor function

Execute the following operation steps to set the level monitor function as ON or OFF.

1) Move the cursor to **Vm/Im** zone, the following soft keys will be displayed.
   - **ON**
   - **OFF**
2) Press **ON** to set the voltage monitor function as ON while press **OFF** to set the voltage monitor function as OFF.

3.5.5 Trigger Delay

SM6030A trigger delay means the delay time from triggering to test-start. Delay function can set the trigger delay time. When the list sweep test function is used, all set delay time will be delayed at each sweep test point. The range of the trigger delay time can be set from 0s to 60s with 1ms as the resolution. The trigger delay function is great useful when the instrument is applied in an auto test system. When the instrument is triggered by HANDLER interface, the trigger delay time can ensure DUT and test terminal has a reliable contact.

Operation steps for setting the delay function

Execute the following steps to set the measurement delay time.

1) Move the cursor to the **DELAY** zone.
2) Use numeric keys to input delay time. After pressing a numeric key, the following unit keys will be displayed. You can use these soft keys instead of the [ENTER] key to input the delay time.
   - **msec**
   - **sec**

3.5.6 Step delay

SM6030A step delay means the delay time from outputting drive signal to test-start. Delay function can set the step delay time. The range of the step delay time can be set from 0s to 60s with 1ms as the resolution. When measuring DCR or Rd parameter, such as Lp-Rd, the step delay time can ensure accurate measurement while alternate measuring inductive devices by two drive signals.

Operation steps for setting the delay function

Execute the following steps to set the measurement delay time.

1) Move the cursor to the **STEP DLY** zone.
2) Use numeric keys to input delay time. After pressing a numeric key, the following unit keys will be displayed.

- **msec**
- **sec**

3.5.7 Output Impedance

SM6030A provides two output impedances for your choice: 100 Ω and 30 Ω. When testing inductance, it is necessary to input the same output impedance so as to make data comparison with other instruments.

Note: When an optional bias board is selected, only 100Ω is available.

Operation steps for setting output resistance

Execute the following operations to set output impedance:

1) Move the cursor to the **Rsou** zone, the following soft keys will be displayed.
   - **100 Ω**
   - **30 Ω**
2) Press soft key **100Ω** to select the output impedance as 100Ω. Press soft key **30Ω** to select the output impedance as 30Ω.

3.5.8 DCR Polarity

SM6030A can provide two DC resistance test mode: ALT and FIX. At present, only ALT mode can be used. ALT mode is positive and negative DC voltage measurement. FIX is to fix positive voltage measurement. ALT mode is conductive to the demagnetization when measuring the DC resistance of inductors, which makes the test more accurate.

Execute the following operation steps to set the DCR polarity.

1) Move the cursor to **DCR POL** zone, the following soft keys will be displayed.
   - **FIX**
   - **ALT**
2) Press ALT to select alternate mode. Press FIX to select lock of positive level mode. At present, only ALT mode can be used.

3.5.9 DC Resistance Range

SM6030A can set the DC resistance range separately. The specific range is the same as the LCR range, please refer to 3.1.2.

3.5.10 DC Level

The DC level of SM6030A ranges from 50mV-2V with 0.5mV as the resolution.

Operation steps for setting the DC level

Execute the following steps to set the measurement delay time.

Move the cursor to the **DC LEV** zone.

1) Use numeric keys to input level. After pressing a numeric key, the following unit keys will be displayed.

- **mV**
- **V**

After pressing the numeric key and choosing the unit, the result will be automatically converted to the final level.

3.5.11 Deviation Test Function

The deviation test function can make the deviation value (instead of real test value) be directly displayed on the screen. The deviation value is equivalent to the real test value subtracting the pre-set reference value. This function brings great convenience to observe variations of component parameters with temperature, frequency, bias. Bias test function can be used for primary or secondary parameter or primary and secondary parameters meanwhile. The instrument provides two deviation test modes as below:

- ΔABS (Absolute Deviation mode)
  The deviation currently displayed is the difference between the test value of the DUT and the preset reference value. The formula of calculating ΔABS is as below:
  ΔABS=X-Y
  Where, X is the test value of DUT
  Y is the preset reference value.
- Δ% (Percentage deviation mode)
  The deviation currently displayed is the percentage of the difference between the test value of DUT and the preset reference value divided by the reference value. Its calculating formula is as below:
  Δ% = (X-Y)/Y*100[%]
  Where, X is the test value of DUT.
  Y is the preset reference value.

Operation steps for setting deviation test function

1. Move the cursor to the **REF A** zone to input the reference value of the primary parameter, the following soft key will be displayed.
   - **MEASURE**

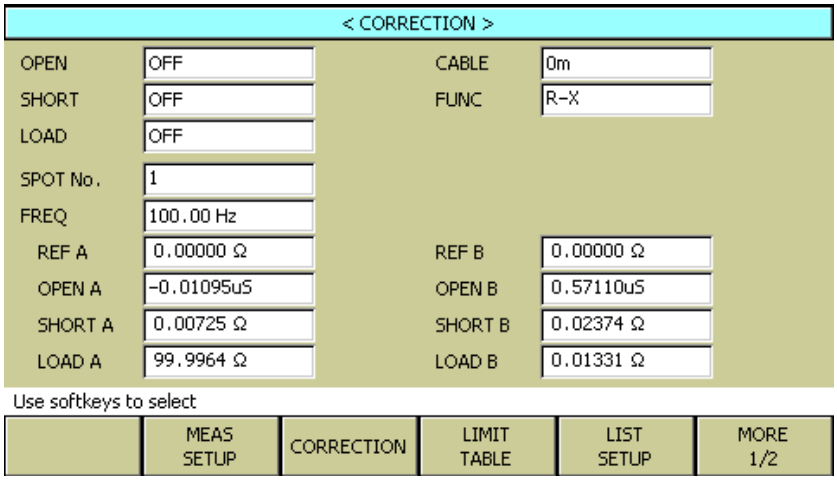
   When the reference component is connected with the test terminal, you should press **MEASURE**. Then SM6030A will test the reference component and the test result will be automatically input as the value of **REF A**.
2. Use **MEASURE** or numeric keys to input the reference value of primary parameter.
3. Move the cursor to the **REF B** to input the reference value of the secondary parameter, the following soft key will be displayed.
   - **MEASURE**

   When the reference component is connected to the test terminal, you should press **MEASURE**. Then SM6030A will test the reference component and the test result will be automatically input as the value of **REF B**.
4. Use MEAS or numeric keys to input the reference value of the secondary parameter. If the reference values of primary and secondary parameters have been set in steps 2), you can skip this step.

5. Move the cursor to the **DEV A** zone, the following soft keys will be displayed:
   - **ΔABS**
   - **Δ%**
   - **OFF**
6. Use above soft keys to se the deviation mode of the primary parameter.
7. Move the cursor to the **DEV B** zone, the following soft keys will be displayed.
   - **ΔABS**
   - **Δ%**
   - **OFF**
8. Use above soft keys to set the deviation mode of the secondary parameter.

3.6 <CORRECTION>

Press **[SETUP]** to select **CORRECTION** to enter into the **<CORRECTION>** page.



Pic307

Open, short and load correction on the **<CORRECTION>** page can be used to eliminate the distribution capacitance, spurious impedance and other measurement errors. SM6030A provides two correction modes: the first one is executing open and short correction on all frequency points through interpolation method; the other one is executing open, short and load correction on the frequency point currently set. There are 201 calibration spots. The following measurement control parameters can be set on the **<CORRECTION>** page.

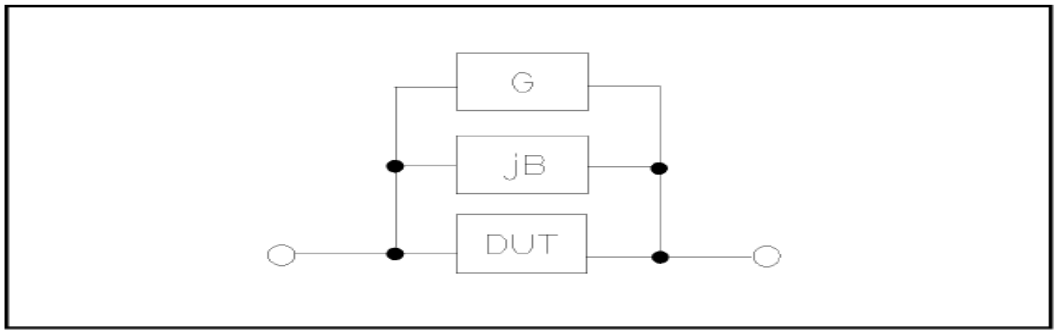
- Open correction (**OPEN**)
- Short correction (**SHORT**)
- Load correction (**LOAD**)
- Cable length selection (**CABLE**)
- Load correction test function (**FUNC**)
- Calibration spot numbers **(SPOT No.)(1-201)**
- Frequency of current calibration spot (**FREQ**)
- Reference values for 2 frequency points of load correction (**REF A**, **REF B**)
- Real test results of the open correction (**OPEN A**, **OPEN B**)
- Real test results of the short correction (**SHORT A**, **SHORT B**)
- Real test results of the load correction (**LOAD A**, **LOAD B**)

There are 16 zones on this page: **Correction**, **Open**, **Short**, **Load**, **Cable**, **Mode**, **Function**, **SPOT No.**, **FREQ**, **REF A**, **REF B**, **OPEN A**, **OPEN B**, **SHORT A**, **SHORT B,** **LOAD A**, **LOAD B** .Each control function zone will be introduced in the following paragraphs.

Besides above setting zones, the <**CORRECTION**> page will also display the following monitoring zones. The monitoring zones are similar with the setting zones, but the monitoring zones can only provide reference information and you cannot change state or parameter of these zones. Other than (REFA, REFB) can set, others can only display but cannot set.
The real test results of the load correction can be tested in the **FREQ** zone.

3.6.1 OPEN

The open correction function of SM6030A can eliminate the error caused by the stray admittance (G, B) parallel-connected with DUT, shown as figure below.



Stray Admittance

SM6030A adopts the following two kinds of open correction data:

- SM6030A will automatically make open correction test on 41 fixed frequency points no matter what frequency you currently set. Besides the 41 fixed frequency points, the instrument will adopt interpolation method to calculate the open correction data of different test frequencies which correspond to different ranges. Move the cursor to **OPEN** and then used **MEAS OPEN** to execute full frequency open correction.
- 201 open correction spots can be set in **FREQ** and **SPOT No.** on **<CORRECTION>**. Move the cursor to **FREQ** to set the frequency that requires open correction, then use the **MEAS OPEN** soft key to execute open correction at the currently set frequency respectively.

Operation steps of open correction function

The open correction includes open correction on full frequency through the interpolation method and open correction on single frequency for the set 201 frequency points. The following steps are executing open correction on all frequency points through interpolation method. The operation method of open correction on single frequency, please refer to "load correction".

1) Move the cursor to OPEN, the following soft keys will be displayed:

- **ON**
- **OFF**
- **MEAS OPEN**
- **DCR OPEN**

2) Connect test fixture to test terminal. The fixture is open and not connecting to any DUT.

3) Press **MEAS OPEN,** SM6030A will test the open admittance (capacitance and inductance) under 41 frequencies. It will take about 50 seconds to finish the open full-frequency correction. In the process of correction , the following soft key will be displayed:

■ **ABORT**

This soft key can be used to terminate the current open correction operation and reserve the formal open correction data.

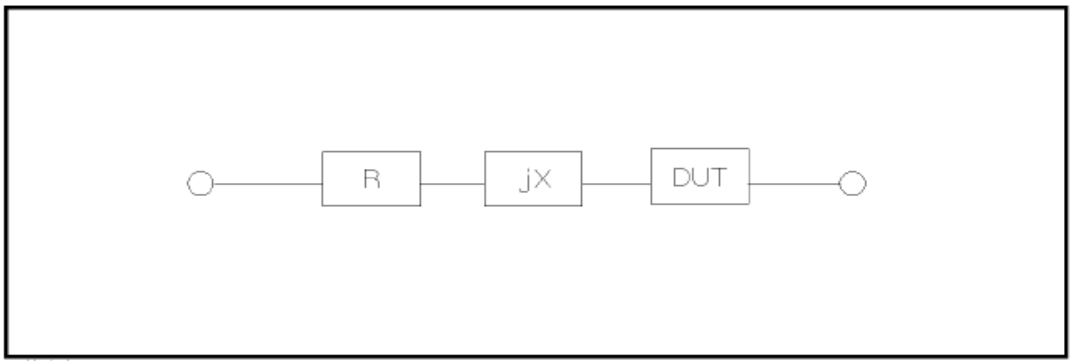
4) Press **DCR OPEN**, SM6030A will test the open-circuit resistance under the DC resistance function.

5) Press **ON** to turn on the function of open-circuit correction, then SM6030A will perform open-circuit correction calculation in the later testing process. If FREQ of 1 to 201 are set as OFF, the open-circuit correction data of the current frequency will be calculated by interpolation method. If FREQ of 1 to 201 are set as ON, the value of the current test frequency will be that of FREQ1, FREQ2 or FREQ 201, in this case, the open correction data of FREQ1, FREQ2 or FREQ201 will be used to the calculation of open correction.

6) Press **OFF** to turn off the open correction function. In later measurement, no open correction calculation will be taken.

3.6.2 SHORT

The short correction function of SM6030A can eliminate the error caused by spurious inductance (R, X) in serial with DUT as shown in figure below.



Spurious Inductance

SM6030A adopts two kinds of short correction data.

- SM6030A will automatically make short correction test on 41 fixed frequency points no matter what the currently set frequency is. Besides the 41 fixed frequency points, the instrument will adopt interpolation method to calculate the short correction data of different test frequencies which correspond to different ranges. Move the cursor to **SHORT** and then used **MEAS SHORT** to execute full frequency short correction. Same for 41 fixed frequency points and open correction.
- 201 short correction spots can be set in **FREQ** and **SPOT No.** on **<CORRECTION>**. Move the cursor to **FREQ** to set the frequency which need to short correction, then use the **MEAS OPEN** soft key to execute short correction at the currently set frequency respectively.

Operation steps of short correction function

The short correction includes short correction on full frequency through the interpolation method

and short correction on single frequency for the set 201 frequency points. The following steps are executing short correction on all frequency points through interpolation method. The operation method of short correction on single frequency, please refer to "load correction".

1) Move the cursor to the **SHORT** zone, the following soft keys will be displayed:
   - **ON**
   - **OFF**
   - **MEAS SHORT**
   - **DCR SHORT**
2) Connect the test fixture to the test ports. Short the test fixture by using short plate.
3) Press the **MEAS SHORT** soft key, SM6030A will test the short spurious impedances (resistance and reactance) of 41 frequencies. Short full frequency correction takes about 50 seconds and in this process, the following soft keys will be displayed.
   - **ABORT**

   This soft key can be used to cancel the current short correction operation and reserve the formal open correction data.
4) Press **DCR SHORT**, SM6030A will test the short resistance under DC resistance function.
5) Press **ON** to validate the short correction function. SM6030A will perform short correction calculation in latter test. If FREQ of 1 to 201 are set as OFF, the short-circuit correction data of the current frequency will be calculated by interpolation method. If FREQ of 1 to 201 are set as ON, the value of the current test frequency will be that of FREQ1, FREQ2 or FREQ 201, in this case, the short correction data of FREQ1, FREQ2 or FREQ201 will be used to the calculation of short correction.
6) Press **OFF** to turn off the short correction function. In latter test, no short correction calculation will be performed.

3.6.3 LOAD

By using transport coefficient between the real test value of set frequency point(FREQ1, FREQ2……FREQ201) and the standard reference value at the preset frequency (**FREQ**), the load correction of SM6030A can eliminate the test error. It is obvious that open, short, and load correction can be performed at preset frequencies. 201 load points can be set in the setup zone of **LOAD,** the frequency can be set in the setup zones of **FREQ**. The standard reference values can be set in the setup zones of **REF A** and **REF B**. The standard test function must be set in the **FUNC** zone before setting standard reference value. When the cursor moves to **FREQ**, the **MEAS LOAD** soft key will be displayed. Press **MEAS LOAD** to perform the load correction test.

Operation steps for setting load correction

According to the following steps, perform open/ short/ load correction test at preset frequencies.

1) Move the cursor to **FREQ**, the following soft keys will be displayed:
   - **ON**

     Press this soft key to make the open/short/load correction data be available.
   - **OFF**

     Press the soft key to make the open/short/load correction data be unavailable.
   - **MEAS OPEN**

Press this soft key to execute open correction at FREQ.

- **MEAS SHORT**

  Press this soft key to execute short correction at FREQ.

- **MEAS LOAD**

  Press this soft key to execute the load correction at FREQ.

2) Press the soft key **ON**, the original preset open/short/load correction frequency is displayed on the frequency setting zone.
3) Use numeric keys to input the correction frequency. After pressing any numeric key, the available unit keys (**Hz**, **kHz** and **MHz**) will be displayed on the soft key zone and press these soft keys to input correction frequency. You can use these soft keys instead of [ENTER] to input the correction frequency. When using [ENTER] to input the correction frequency, the default unit is Hz.
4) Connect the test fixture to the test terminal.
5) Make the test fixture be open.
6) Press **MEAS OPEN** to perform open correction at the current set frequency. The test result (G, B) of the open correction test will be displayed in the help line (the bottom line).
7) Move the cursor to **OPEN**.
8) Press **ON** to perform the open correction calculation at preset frequency in latter measurements.
9) Move the cursor to **FREQ** to set the required correction frequency.
10) Make the test fixture be short.
11) Press **MEAS SHORT** to perform short correction at preset frequency. The test result (R, X) of the short correction will be displayed in the help line (the bottom line).
12) Move the cursor to **SHORT**.
13) Press **ON** to perform the short correction calculation at preset frequency in latter measurements.
14) Prepare a standard test component.
15) Move the cursor to **FUNC**.
16) Set the function parameters required to be set.
17) Move the cursor to **REF A**.
18) Use numeric keys and unit keys to input the primary reference values of the standard component.
19) Move the cursor to **REF B**.
20) Use numeric keys and unit keys to input the secondary reference value of the standard component.
21) Move the cursor to the corresponding **FREQ**.
22) Connect the standard component to the test fixture.
23) Press **MEAS LOAD**, the instrument will execute a load correction. The real test results of the standard component will be displayed in **MEAS A** and **MEAS B**.
24) Move the cursor to **LOAD**.
25) Press **ON** to perform load correction calculation at preset frequencies in latter measurements.

3.6.4 Load correction test function

When performing load correction, the reference value of the standard component is required to be input in advance. The test parameters of reference value should be the same as the preset load correction test function.

Load correction function adopts the transport coefficient between the real test value of preset frequency and the standard reference value to eliminate the test error. Load correction function is only available for calculating transport coefficient.

Operation steps for load correction test function

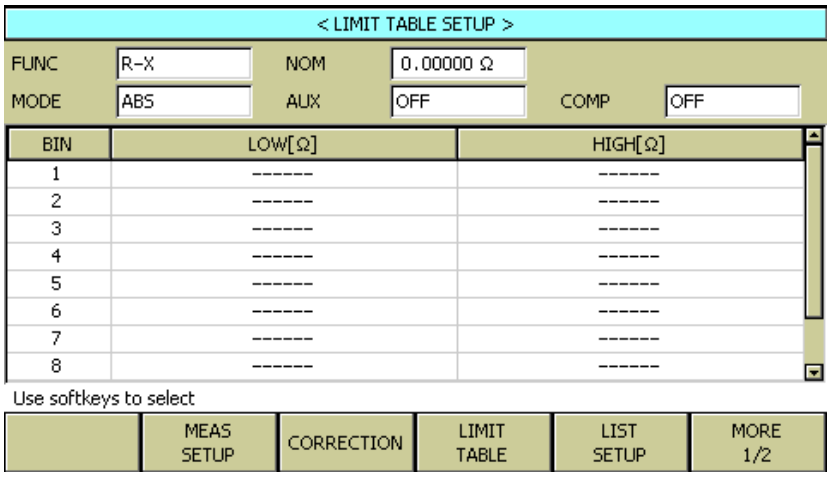
Please refer to 3.1.1.

3.6.5 Cable length selection

The available cable length is 0m, 1m, 2m, 4m.

3.7 <LIMIT TABLE>

Press **[SETUP]** and then **LIMIT TABLE** to enter into the **<LIMIT TABLE SETUP>** page as the following figure shown.



Pic308

Compare function can be set on this page. SM6030A can set 9 bin limits of primary parameters and one of secondary parameters. The tested result can be divided into up to 10 bins (BIN 1 to BIN 9 and BIN OUT). If the primary parameter of DUT is within the limit range from BIN1 to BIN9, but the secondary parameter is out of the limit range, in this case the DUT will be sorted into aux bin. When SM6030A installs the HANDLER interface and it is used in automatic sorting system, the compare function will be especially useful. The following limit parameter of compare function only be set on **<LIMIT TABLE SETUP>** page.

- Test parameter (**PARAM**)
- Limit mode of compare function (**MODE**)
- Nominal value (**NOM**)
- Auxiliary bin ON/OFF (**AUX**)

- Compare function ON/OFF (**COMP**)
- Low limit of each bin (**LOW**)
- High limit of each bin (**HIGH**)

3.7.1 Swap parameter

The swap parameter function can swap the primary and the secondary parameter in **PARAM**. For example, when the test parameter is Cp-D, the swap parameter function can change the test parameter as D-Cp. Then user can set 9 pairs of compare limits for D, but only 1 pair of compare limit can be set for Cp.

Operation steps for the swap parameter function

Execute the following operations to swap the primary and the secondary parameters.

1) Move the cursor to **PARAM**, the following soft key will be displayed.
   - **SWAP PARAM**
2) Press **SWAP PARAM** to swap the primary and the secondary parameters.
3) Press **SWAP PARAM** to swap the primary and the secondary parameter, which is to recover the formal setup.

3.7.2 Limit modes of compare function

Compare functions has two limit setup modes for primary parameters as shown in figure 3-3.

- Tolerance mode

Under tolerance mode, set the deviation value of the nominal one (be set in the **NOM** zone) as the compare limit value. Deviation value has two modes: percentage deviation and absolute deviation.

- Sequential mode

Under sequential mode, the range of the test value is the compare limit value. The compare limit value should be set in the order from small to large.

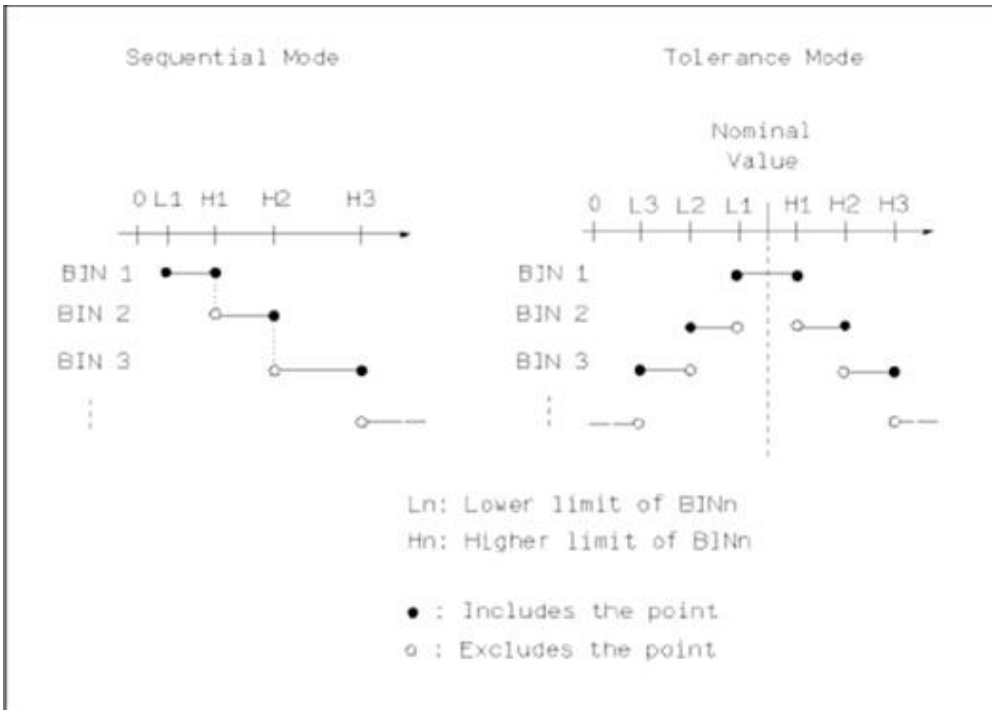


Figure 3-3 Tolerance mode and Sequential mode

Note: When setting limit values of tolerance mode, the error range should be set in the order from small to large. If the error range of BIN1 is the largest one, then all DUT will sort into BIN 1.
Under tolerance mode, the low limit is not necessary to be smaller than the nominal value and the high limit is not necessary to be larger than the nominal value. The limit range of each bin can be discontinues or overlapped.

Operation steps for setting the limit mode of the compare function

1) Move the cursor to the **MODE** zone, the following soft keys will be displayed.
   - **%TOL**

     This soft key is used to set the limit mode as the tolerance mode of percentage deviation (% TOL).
   - **ABS TOL**

     This soft key is used to set the limit mode as the tolerance mode of absolute deviation (ABS TOL).
   - **SEQ MODE**

     This soft key is used to set the limit mode as sequential mode.
2) Use above soft keys to set the limit mode.

3.7.3 Set nominal value of tolerance mode

When the tolerance mode is selected as the limit mode of the primary parameter, it is necessary to set the nominal value. The nominal value can be any one within the display range.
When the sequential mode is selected as the limit mode the primary parameter, the nominal value

can be set, but it is not necessary to use it under this mode.

Operation steps for setting the nominal value

1) Move the cursor to **NOM**.
2) Use numeric keys to input nominal value. After inputting the data, the following soft keys (**p**, **n**, **μ**, **m**, **k**, **M**, ***1**) can replace the **[ENTER]** key to input the nominal value. When using [ENTER] to input the nominal value, the default unit is the same as that input last time. Press ***1** to input nominal value, the instrument will select F, H or Ω as the default unit of the nominal value according to primary parameter.

3.7.4 Comparator function ON/OFF

SM6030A can set 9 bin limits of primary parameters and 1 bin limit of secondary parameters. The tested results can be sorted into 10 bins (BIN 1 to BIN 9 and BIN OUT) at most. If the primary parameter of DUT is within the limit range from BIN 1 to BIN 9, but the secondary parameter is out of the limit range, in this case the DUT will be sorted into aux bin. When SM6030A installs the HANDLER interface and it is used in the automatic sorting system, the compare function will be especially useful.

Operation steps for setting the compare function ON/OFF

1) Move the cursor to **COMP**, the following soft keys will be displayed.
   - **ON**
   - **OFF**
2) Use above soft keys to set the compare function as ON or OFF.

3.7.5 Auxiliary bin ON/OFF

When it is necessary to sort the secondary parameters, the limits of the secondary parameter can be set in **HIGH** and **LOW** of 2nd.

Three cases may occur in the process of secondary parameter sorting:

- On **<LIMIT TABLE SETUP>** page, no low / high limit of the secondary parameters has been set.
- On **<LIMIT TABLE SETUP>** page, the low/high limit of secondary parameters has been set but **AUX** function is set as OFF.

In this case, only those components whose secondary parameters are qualified can perform primary parameter sorting according to sorting limits. If the secondary parameters are unqualified and the corresponding primary parameters are within limit ranges, those components will be sorted into BIN OUT.

- On <**LIMIT TABLE SETUP**> page, the low/high limit of the secondary parameters has been set and the **AUX** function is set as ON.

If the primary parameter is out of the limit range, it is sorted into BIN OUT. If the primary parameter of DUT is within the limit range but its secondary parameter is out of the limit range, the DUT will be sorted into the **AUX** bin.'

Note: When the secondary parameter only has low limit and the auxiliary bin is set as ON, if the primary parameter of DUT is within the limit range and the secondary parameter is smaller than or equal to its low limit, the DUT will be sorted into the auxiliary bin. When the secondary parameter only has high limit and the auxiliary bin is set as ON, if the primary parameter of DUT is within the limit range and the secondary parameter is larger than or equal to its high limit, the DUT will be sorted into the auxiliary bin.

Operation steps for setting the auxiliary bin function ON/OFF

1) Move the cursor to **AUX**, the following soft keys will be displayed.
   - **ON**
   - **OFF**
2) Use above soft keys to set the auxiliary function as ON or OFF.

3.7.6 HIGH/LOW

SM6030A can set bin limits of 9 primary parameters and one secondary parameter. The test results can be sorted into 10 bins at most (BIN 1 to BIN 9 and BIN OUT). The high/low limits of primary parameters can be set in high limit and low limit of bins from BIN 1 to BIN 9. The limit of the secondary parameter can be set in **HIGH** and **LOW** of 2nd.

Operation steps for setting high/low limit

Execute the following steps to set sorting limits.

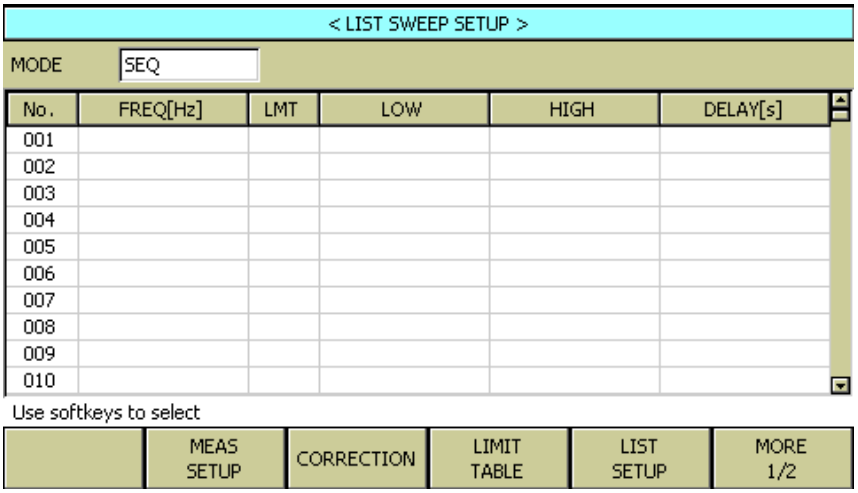
1) Set **PARAM** and **NOM** in the compare function menu and the limit **MODE** of the primary parameter.
2) Move the cursor to Low limit of BIN 1. If you select tolerance mode, the following operation steps should be from step 3 to step 6; if you select sequential mode, the following operation steps should be from step 7 to step 11.
3) User numeric keys to input low limit value in Low limit. After inputting the data, you can use (**p**, **n**, **μ**, **m**, **k**, **M**, ***1**) to input the limit value. When pressing ***1**, the default unit will be F, H or Ω. After inputting limit value in **LOW** of BIN 1, the low limit of BIN 1 will be automatically set as – (absolute limit) and the high limit will be + (absolute limit).
4) The cursor will automatically move to **LOW** of BIN 2. Repeat step 3 until the limits of BIN 9 are input. Then the cursor will automatically move **LOW** of 2nd.
5) After inputting the low limit of the secondary parameter, the cursor will automatically move to **HIGH** of 2nd.
6) Input the high limit of the secondary parameter.
7) In Low limit of BIN 1, use numeric keys to input the low limit. After inputting the data, you can use (**p**, **n**, **μ**, **m**, **k**, **M**, ***1**) to input the limit value. When pressing ***1**, the default unit will be F, H or Ω.
8) After inputting the low limit of BIN 1, the cursor will automatically move to **HIGH** of BIN 1. Input the high limit of BIN 1.
9) The cursor will automatically move **HIGH** of BIN 2. For the limit mode is sequential mode,

the low limit of BIN 2 will be the high limit of BIN 1. Input the high limit of BIN 2.

10) Repeat step 9 until the high limit of BIN 9 is input. Then the cursor will automatically move to **LOW** of 2nd. Input the low limit of the secondary parameter.
11) The cursor will automatically move to **HIGH** of 2nd. Input the high limit of the secondary parameter.

3.8 <LIST SWEEP SETUP>

Press **[SETUP]** and then **LIST SETUP** to enter into the **<LIST SWEEP SETUP>** page as shown below.



Pic309

The list sweep function of SM6030A can perform auto sweep test for the test frequency, test level or bias voltage of 201 points. On **<LIST SWEEP SETUP>** page, the following list sweep parameters can be set.

- Sweep mode (**MODE**)
- Sweep parameter setup (frequency **[Hz]**, level **[V]**, level **[I]**, bias **[V]**, bias **[I]**)
- Sweep test point setup (sweep point)
- Selection of limit parameter (**LMT**)
- High/low limit (**HIGH**, **LOW**)
- Single point delay **(DELAY [s])**

3.8.1 MODE

Mode menu is the same as the mode on <List sweep display> page.

3.8.2 Test parameter

Sweep parameters can be: frequency **[Hz]**, level voltage **[V]**, level current **[I]**, bias voltage **[V]**, bias current **[I]**.

Operation steps for setting test parameter

1) Move the cursor the line following **MODE**; the following soft keys will be displayed.

- FREQ [Hz]
- LEVEL [V]
- LEVEL [A]
- BIAS [V]
- BIAS [A]

2) Press one of above soft keys to select the list sweep parameter.

3.8.3 Sweep parameter setup

Move the cursor to the table to perform the setup of each sweep parameter: **FREQ (HZ)**, **LMT**, **HIGH** and **LOW**. Use numeric keys on the front panel to input the data of test frequency/level/bias and high/low limit used to compare, as well as the selected primary/secondary use to compare. After setting, if some inputs are unnecessary, you can execute the function of "Delete line" in the soft key zone to delete the corresponding value.

In the bottom of the **LMT** zone, parameter A indicates that the primary parameters of the measurement result are use to compare with the high and low limits of the table. Parameter B indicates that the secondary parameters of the measurement result are used to compare with the high and low limits of the table. "---" means no compare. The soft key zone has corresponding items. Press the soft key **LIMIT DATA A**, "A" will be displayed in the **LMT** zone. When press the soft key **LIMIT DATA B**, "B" will be displayed in the **LMT** zone. While press the soft key **OFF**, data in LMT zone and the corresponding high and low limits will be cleared and be displayed as "---".

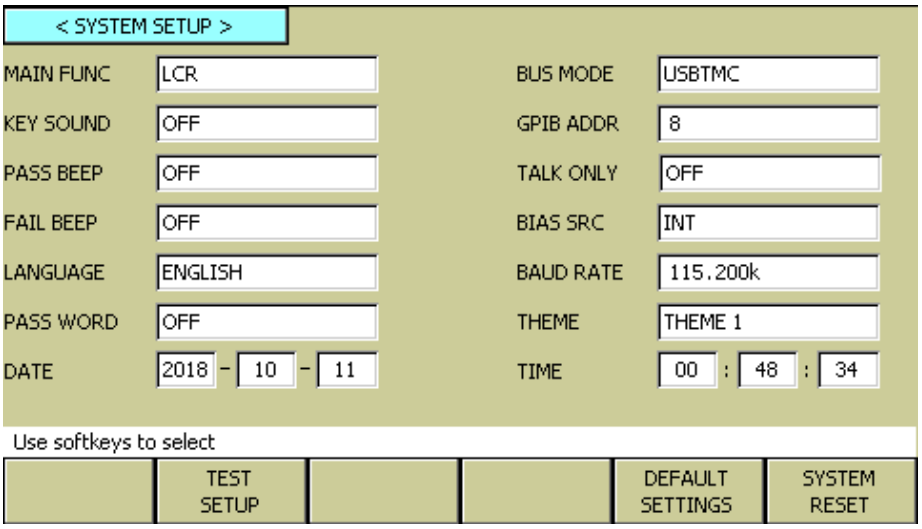
The **DELAY** parameter indicates the delay time from the completion of the last measurement to the next scan measurement. It is mainly used to connect an external bias source (such as 1778) to adapt to the delay time setting required by the external bias current source. (Note: The delay time here can be added to the delay time in the MEAS SETUP interface.)

There are total 201 sweep points, corresponding to 21 pages. Move the cursor to the No. or Sweep point area, press the soft key "PAGE" to make the arrow light and then use the scroll wheel to switch the page. In the No. area, you can execute the "Clear Table" to clear all the data of 201 points. In the sweep point area, you can perform "FILL LINEAR" or "FILL LOG" to automatically input the sweep point data.

Chapter 4 [SYSTEM] and <FILE MANAGE>

4.1 <SYSTEM SETUP>

Press **[SETUP]** and then **SYSTEM SETUP** to enter into the **<SYSTEM SETUP>** page shown as below.



Pic401

On this page, most system setup items are displayed, such as instrument main function, beeper, PASS beeper, FAIL beeper, language, PASS word, bus mode, GPIB address, TALK only, Bias SRC, baud rate, menu display and data/time.

4.1.1 MAIN FUNC

This item is reserved function. This area is used to control and display current instrument functions

Operation steps for setting Function:

Move the cursor to the **MAIN FUNC** area. The following soft keys are displayed in the soft key area of the screen.

- **LCR**

This soft key is used to select the measurement function element.

- **TRANS MEAS**
- **TRANS SCAN**

This soft key is used to select the transformer scan test function.

4.1.2 THEME

This area is used to control the different color styles displayed on the instrument's interface.

Operation steps for setting THEME:

Move the cursor to the **THEME** area. The following soft keys are displayed in the soft key area of the screen.

- **Theme1**

This soft key is used to select the interface color style of the instrument as theme 1.

- **Theme2**

This soft key is used to select the interface color style of the instrument as theme 2.

4.1.3 PASS BEEP

This zone is used to control and display the beep mode when the test result is qualified.

Operation steps for setting PASS BEEP

1) Move the cursor to **PASS BEEP**, the following soft keys will be displayed.

- **HIGH LONG**

  This soft key is used to select high and long beep.

- **HIGH SHORT**

  This soft key is used to select high and short beep.

- **LOW LONG**

  This soft key is used to select low and long beep.

- **TWO SHORT**

  This soft key is used to select two low and short beeps.

- **OFF**

  This soft key is used to set the pass beep function OFF.

Note: Since the sweep box uses a potentiometer to adjust the sound volume, when the sound source is the sweep box, only the length of the sound can be controlled without controlling its volume.

4.1.4 FAIL BEEP

This zone is used to control and display the beep mode as **FAIL BEEP** when the test result is unqualified.

Operation steps for setting FAIL BEEP

1) Move the cursor to **FAIL BEEP**, the following soft keys will be displayed.

- **HIGH LONG**

  This soft key is used to select high and long beep.

- **HIGH SHORT**

  This soft key is used to select high and short beep.

- **LOW LONG**

  This soft key is used to select low and short beep.

- **TWO SHORT**

  This soft key is used to select two low and short beeps.

- **OFF**

  This soft key is used to set the fail beep mode OFF.

Note: Since the sweep box uses a potentiometer to adjust the sound volume, when the sound source is the sweep box, only the length of the sound can be controlled without controlling its volume.

4.1.5 LANGUAGE

This zone is used to control and display the current language mode of the operating instrument.

Operation steps for setting language

1) Move the cursor to **LANGUAGE**, the following soft keys will be displayed.

   ■ **ENGLISH**

   This soft key is used to select English as the operation language.

   ■ **CHINESE**

   This soft key is used to select Chinese as the operation language.

4.1.6 PASS WORD

This zone is used to display the password–protection mode.

Operation steps for setting the password

1) Move the cursor to **PASS WORD**, the following soft keys will be displayed.

   ■ **OFF**

   This soft key is used to turn off the password protection mode.

   ■ **LOCK SYSTEM**

   This soft key is used to turn on the password protection function including file protection and starting up password.

   ■ **LOCK FILE**

   This soft key is used to protect user's file.

   ■ **MODIFY**

   This soft key is used to modify the password. The operation steps are as follows:

   Press **MODIFY** to input a new password. After inputting, the prompt information will appear on the screen to prompt you to confirm the new password. Input the new password again till the modification finishes.

Note: The default password is 2832.

   ■ **LOCK SETUP**

   This soft key is used to restrict the tester's modification of the setting file. The operation can only be switched between the DISP key and the SYSTEM key.

4.1.7 BUS MODE

This mode is used to select RS232C, GPIB, USBTMC or USBCDC.

Operation steps for setting bus mode

1) Move the cursor to **BUS**, the following soft keys will be displayed.

   ■ **RS232C**

   ■ **GPIB**

   ■ **USBTMC**

   ■ **USBCDC**

2) Use above soft keys to select the required interface bus.

Note: GPIB optional must be installed before GPIB mode is available.

4.1.8 GPIB ADDR

This zone is used to control and display the current GPIB address.

Operation steps for setting GPIB address:

1) Move the cursor to **GPIB ADDR**, the following soft keys will be displayed.
   - ↑ (+)

   This soft key is used to increase the GPIB address.
   - ↓ (-)

   This soft key is used to decrease the GPIB address.

4.1.9 TALK ONLY

The Talk only function is used to control the instrument to send each measurement result to bus through its interface of RS232C, GPIB, USBTMC or USBCDC. When the talk only function is ON, the instrument cannot be controlled by PC.

Operation steps for setting the talk only function

1) Move the cursor to **TALK ONLY**, the following soft keys will be displayed.
   - **ON**
   - **OFF**
2) Press **ON** to turn on the talk only function or **OFF** to turn off this function.

4.1.10 BIAS SRC

Bias source is used to select the DC bias power.

- INT mode

  30Ω output resistance (-1.5V to +1.5V); DC bias current source (-50mA to 50mA)

  100Ω output resistance (-5V to +5V); DC bias current source (-100mA to 100mA)
- 1778

  Please select the 1778 mode when the instrument is tested online using the 1778 bias current source

NOTE: This mode is available only when 1778 is connected.

Operation steps for setting bias source:

1) Move the cursor to the **BIAS SRC** zone. The following soft keys are displayed in the soft key area of the screen.
   - **INT**
   - **1778**

2) Press soft key **INT**, select INT bias source.

3) Press soft key **1778**, select 1778 bias source.

4.1.11 BAUD RATE

Baud rate is used select the baud rate of the RS232C interface. The available baud rate of this instrument is from 9.600k to 115.200k.

Operation steps for setting the baud rate

Move the cursor to **BAUD RATE**, the following soft keys will be displayed.

- ↑ (+)

  This soft key is used to increase the baud rate.

- ↓ (-)

  This soft key is used to decrease the baud rate.

4.1.12 DATA/TIME

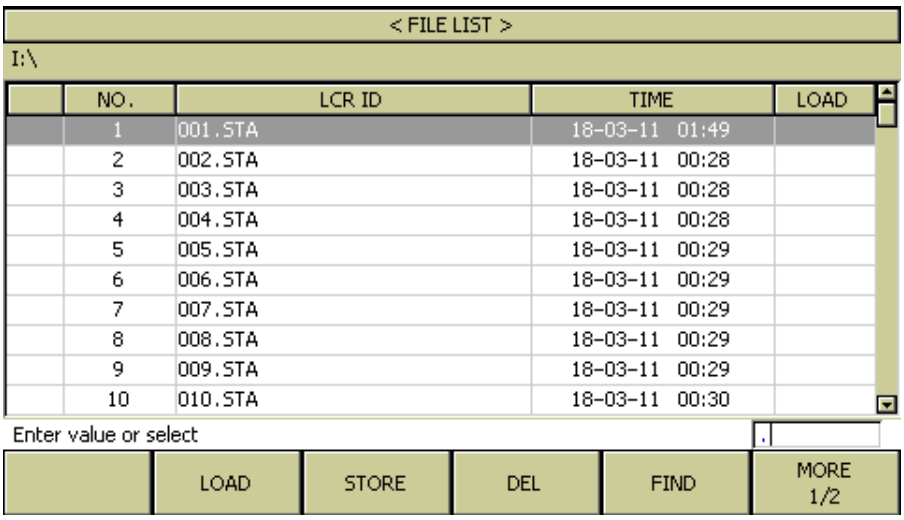
When moving to the **TIME** zone, users can modify the system time, including year, month, date, hour, minute, second.

4.2 LCR <FILE LIST>

SM6030A series instrument can save the user-set parameter to the nonvolatile memory in the form of file, so when use the same setting next time user can load a corresponding file to obtain the parameter set and used last time. By doing so, it can save the time of setting parameter and improve the production efficiency.

The file management function of the transformer sweep will be described in the Transformer Test Settings section.

Press [FILE MANAGE] to enter into the file manage page, shown as below:



Pic402

4.2.1 Setup file for single-group component (*.STA)

40 groups of different single groups of component set file (*.STA file) can be saved in the instrument (it is 6 groups when LCR and transformer functions are turned on at the same time), but external storage U-disk can display/operate 500 groups of different single groups of component set file (note: U-disc is an optional accessory).

Use **FILE LIST** function on the following File menus, the following data will be saved or loaded in the form of file, which are called *.STA file.

- Control and setting parameter on <MEASURE SETUP> page
  - FUNC
  - FREQ
  - LEVEL
  - RANGE
  - SPEED
  - Voltage BIAS
  - Current BIAS
  - TRIG
  - ALC
  - TRIG DLY
  - STEP DLY
  - DC RANGE
  - DC LEV
  - Rsou
  - AVG
  - Vm
  - Im
  - DEV A
  - DEV B
  - REF A
  - REF B
- Control and set parameters on <BIN COUNT DISP> page
  - BIN COUNT (ON/OFF)
- Control and set parameter on <LIMIT TAABLE SETUP> page
  - PARAM (swap parameter)
  - NOM (reference value)
  - MODE (%-TOL/ABS-TOL/SEQ-MODE)
  - AUX (ON/OFF)
  - COM (ON/OFF)
  - High and low limits of each bin
- Control and set parameters on <List Sweep Setup> page
  - List Sweep Mode (SEQ/STEP)
  - List Sweep Parameter (Frequency/Level/Bias)
  - Test points of all sweep parameters
  - High and low limits of all test points, including limit parameters (LIMIT-DATA

A/LIMIT-DATA B)

- Page format currently displayed
- Control and set parameters on<Transformer Test Setup>page
  - Transformer Sweep Mode (SEQ/STEP)
  - Test frequency of inductance, capacitance, impedance, ACR and DCR
  - Test level of inductance, capacitance, impedance, ACR and DCR
  - ON/OFF state of inductance, capacitance, impedance, ACR and DCR
- Control and set parameters on<Transformer Limit Setup>page
  - Limit Mode (ABS/Δ%)
  - Nominal value of Inductance-Q, Capacitance-D, Impedance-θ, ACR –X and DCR
  - High limit of Inductance-Q, Capacitance-D, Impedance-θ, ACR –X and DCR
- Low limit of Inductance-Q, Capacitance-D, Impedance-θ, ACR –X and DCR

4.2.2 U-disk manage performance

As described above, SM6030A has a standard configuration of USB HOST interface, so the external U-disk can be used as the memory media. In this condition, it breaks the memory limit of 100 groups of *.LCR files. Meanwhile those files can be copied to IBM PC or compatible desk-top computer, laptop with USB interface to reach the infinite extension.

SM6030A supports the USB memory devices as below:

- Meet the USB 1.0/1.1 standard
- Capacity: 32MB/256MB/2GB/4GB
- File format: FAT16, FAT32 (Format the USB memory on Microsoft Windows operation system)

4.2.3 Operation steps for file management

A. Search an existed file

1) Use the [↑] and [↓] to view one by one.
2) Use the [←] and [→] to view one page by one page.
3) Press the soft key **FIND**. Input the file character and then press the [ENTER] to search the target file.
4) Input the page number and press the [ENTER] to search the file.

B. Save the following control and setting parameters to a file by the following steps

1) Select and set all control and setting parameters on the desired page.
2) Move the cursor to **FILE MANAGE**, the following soft keys will be displayed.
   - **LOAD**
   - **STORE**
   - **DEL**
   - **FIND**
   - **MORE 1/2**
   - **COPY TO E:**
   - **EXT. FILE**

- **MORE 2/2**

3) In the file list, move the cursor to the file-saved position or input the file number directly.
4) Press **STORE**, the following soft keys will be displayed.

- **Yes**
- **No**

5) Press **No** to cancel the current save operation and return step 2.
6) Press **Yes**, and "LCR file name:" will be displayed on the assistant line
7) Use the numeric keys to enter the current file name and press [ENTER]. SM6030A saves the current control setting parameters with the file name.

C. Load the control and setting parameters from a file by the following steps

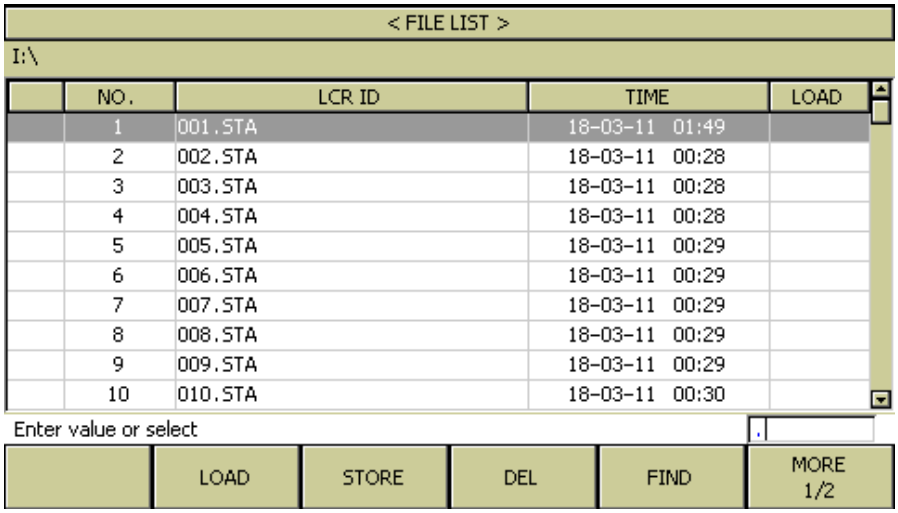
1) Press **FILE MANAGE**, the file list and the following soft keys will be displayed.
   - **LOAD**
   - **STORE**
   - **DEL**
   - **FIND**
   - **MORE 1/2**
2) In the file list, move the cursor to the file-saved position or input the file number directly.
3) Press **LOAD**, the following soft keys will be displayed.

- **Yes**
- **No**

4) Press **No** to cancel the current load operation and return step 1.
5) Press **Yes** to load the currently selected file. Then SM6030A will return the current display page.

D. Copy a file to an U disk by the following steps

1) Assuming that it is necessary to copy internal files 2 to external U-disk.
2) Press **FILE MANAGE**, the file list and the following soft keys will be displayed.
   - **COPY to E:**
   - **EXT. FILE**
   - **MORE 2/2**
3) Move the cursor the file to be copied and press [ENTER] to confirm (multiple files can be selected).
4) Press **COPY to E:** to copy the file the instrument.
5) While copying the file, the progress bar will present the progress of the file copy. When the progress bar is disappeared, the operation of the file copy is finished.



Pic403

NOTE: Please make sure that your U-disk meets the standard that described in this chapter and no write-read protection.

Chapter 5 Execute LCR operation and some examples

5.1 Correction operation

To execute correction operation (in order to prevent the stray impedance from affecting the test accuracy, it is necessary to make open/short correction), users can select one of the two correction modes.

5.1.1 Sweep correction

a) Press the menu key **[SETUP]** and then the soft key **CORRECTION**, the instrument will enter into the **< CORRECTION>** page.
b) Move the cursor to the **OPEN** zone. **ON**, **OFF**, **MEAS OPEN** and **DCR OPEN** will be displayed in the soft key zone.
c) Keep the test fixture in the open status, and then press **MEAS OPEN** to execute open correction till the prompt information zone displays that open correction is finished.
d) Press **ON** to turn on the open correction function.
e) Insert the short plate (26010) to the test fixture.
f) Move the cursor to the **SHORT** zone. **ON**, **OFF**, **MEAS SHORT** and **DCR OPEN** will be displayed in the soft key zone.
g) Press **MEAS SHORT** to execute the short correction till the prompt information zone displays that the short correction is finished.
h) Press **ON** to turn the short correction function.
i) Move the cursor to the **LOAD** zone. **ON**, **OFF** will be displayed in the soft key zone.
j) Press **OFF** to turn off the load correction function.
k) Move the cursor to the **Spot No.** zone. INCR++ , INCR+ , DECR- , DECR-- will be displayed in the soft key zone.
l) Press the corresponding key or numeric key, change the sequence number of the current **Spot No**.
m) Move the cursor to the **FREQ** zone, **ON**, **OFF**, **MEAS OPEN**, **MEAS SHORT** and **MEAS LOAD** will be displayed in the soft key zone.
n) Press **OFF** to turn off the point-frequency correction function of **FREQ**.

5.1.2 Point-frequency correction

This function will gain better results in single-frequency test.
If the test frequency is 5.5 kHz,

a) Press the menu key **[SETUP]** and then **CORRECTION**, then instrument will display the **<CORRECTION>** function.
b) Move the cursor to the **OPEN** zone, **ON**, **OFF**, **MEAS OPEN** and **DCR OPEN** will be displayed in the soft key zone.

c) Press **ON** to turn on the open correction function.
d) Move the cursor to the **SHORT** zone, **ON**, **OFF**, **MEAS OPEN** and **DCR SHORT** will be displayed in the soft key zone.
e) Press **ON** to turn on the short correction function.
f) Move the cursor to the **LOAD** zone, **ON**, **OFF** will be displayed in the soft key zone.
g) Press **OFF** to turn off the load correction function.
h) Move the cursor to the **FREQ** zone, **ON**, **OFF**, **MEAS OPEN**, **MEAS SHORT** and **MEAS LOAD** will be displayed in the soft key zone.
i) Press **ON** to turn on the point-frequency correction function of **FREQ**.
j) Press [5][.][5], 5.5 will be displayed in the cursor zone of the screen, meanwhile the available units (**Hz**, **kHz** and **MHz**) will be displayed in the soft key zone. Press **kHz**, the **FREQ** zone will be changed as 5.5000 kHz (be the same as that of test frequency).
k) Keep the test fixture be in open status and press **MEAS OPEN** to execute open correction.
l) Insert the short plate (26010) to the test fixture.
m) Press **MEAS SHORT** to execute short correction.

5.2 Correct connection of DUT

There are 4 pairs of test terminal: Hcur, Lcur, Hpot, Lpot and corresponding shielding terminal of each terminal.

Each terminal contains shielding layer whose function is to reduce the influence of the ground stray capacitance and the interference of the electromagnetic field. In the process of testing, Hcur, Hpot and Lpot, Lcur should be connected with DUT lead to form a complete 4-terminal measurement, thus reducing the effect of the lead and the connection points on the test results (especially the dissipation measurement). When testing low-ohm components, Hpot, Lpot should be connected to the lead terminal so as to avoid the impedance being added to the lead impedance and the connection principle is that the Hpot and Lpot test should be the actual existed voltage on DUT.

In other words, before connecting to DUT, it is not recommended to connect Hcur, Hpot with Lpot, Lcur, for doing this will increase test error.

If the connection point and the lead resistance R lead are far weaker than the tested impedance (for example: $R_{lead}<Z_x/1000$, the accuracy error is required to be less than 0.1%), before connecting to DUT, it is recommended to connect Hcur, Hpot and Lpot, Lcur (Two terminal test).

In the test with high accuracy requirement, using Kelvin test fixture (standard accessory) will gain better results than using test leads. When Kelvin test lead is used under 10kHz, a better measurement result can be obtained. However, when the frequency is higher than 10kHz, it cannot meet the measurement demand. In high frequency, the change of the clearance between test leads will directly change stray capacitance and inductance on test terminals and this problem is unavoidable, because the test leads cannot be fixed in a position.

So, the use of the test fixture should be used as possible in high frequency. If the test fixture is unavailable or cannot be used, the status of test leads should be the same in the processes of correction and test.

No matter the standard Kelvin test fixture or Kelvin test leads or user-made fixture is used, the following requirements should be met.

1. Distribution impedance must be reduced to the Min. especially when testing high impedance

components.

2. Contact resistance must be reduced to Min.

3. Short and open must be available between contact points. Open and short correction can easily reduce the influence of distribution impedance of the test fixture on measurement. For open correction, the clearance between test terminals should be the same with that when they connects with DUT. For short correction, the short plate of low impedance should be connected between test terminals. Another way is to directly connect Hc with Lc or Hp with Lp, then connect both.

Note: When the DUT is a polarity component, before testing, the high potential terminal should be connected to the terminal with mark "+", "Hc" or "Hp" and the low terminal should be connected to the terminal with mark "-", "Lc" or "Lp".

Warning: Before testing, please discharge the tested polarity component so as to avoid the damage to the instrument.

5.3 Eliminate the influence of stray impedance

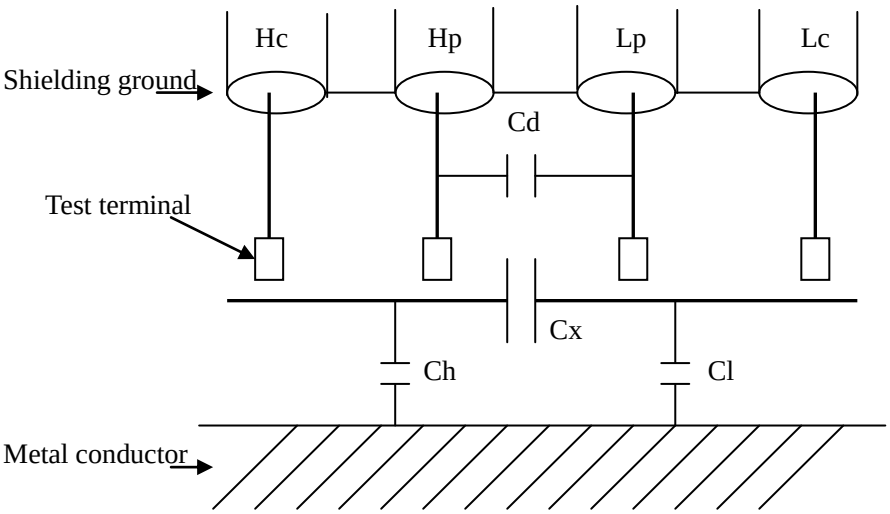


Figure 5-1 Influence of stray capacitance

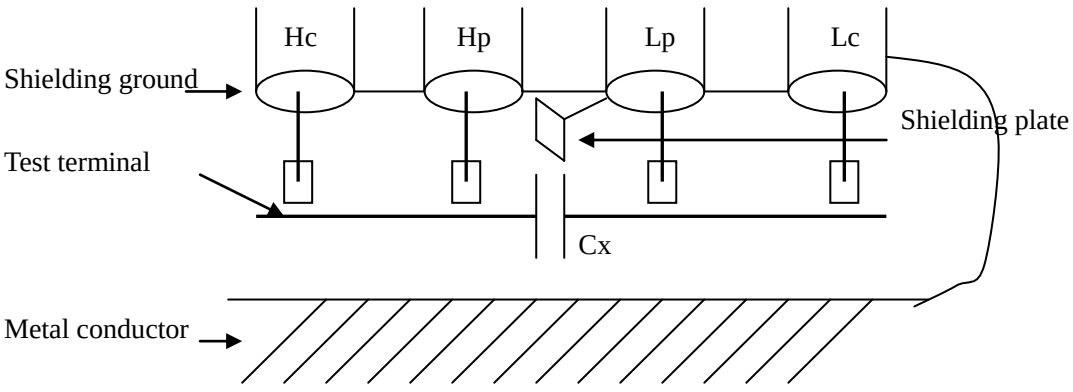


Figure 5-2 Eliminate the influence of stray capacitance

When the DUT is with high impedance (such as small capacitance), the influence of stray capacitance could not be ignored. Figure 5-1 is an example of the use of 4 terminal pair measurement. In this figure, Cd is connected with Cx in a parallel way and when a conductance plate is positioned under DUT, capacitance Ch will connect with Cx in parallel after connecting with Cl in series and by this way the measurement result will have errors. If a ground conductor is installed between high and low terminals, Cd can be reduced to Min. Meanwhile if the ground terminal is connected to the conductance plate, the influence of Ch and Cl will be eliminated.

When the DUT is low impedance (such as small inductance, large capacitance), a large current will flow through test leads Hc and Lc. In this case, **electromagnetic coupling between test leads becomes the main source of test errors** except the influence of the contact resistance on test terminals. If this coupling cannot be eliminated, it will bring unexpected influence on test results. Generally, contact resistance affects the resistance of impedance and electromagnetic affects the reactance of impedance. Test terminals can adopt 4TP connection method. For 4TP connection, the currents flow though Hc and Lc are equal in value and opposite in direction with those flowing through each shielding terminals. By this way, the magnetic fields produced by these currents can be mutually offset and further eliminate the influence of mutual inductance coupling on test results.

5.4 Operation example for testing inductance with SM6030A

Test Condition

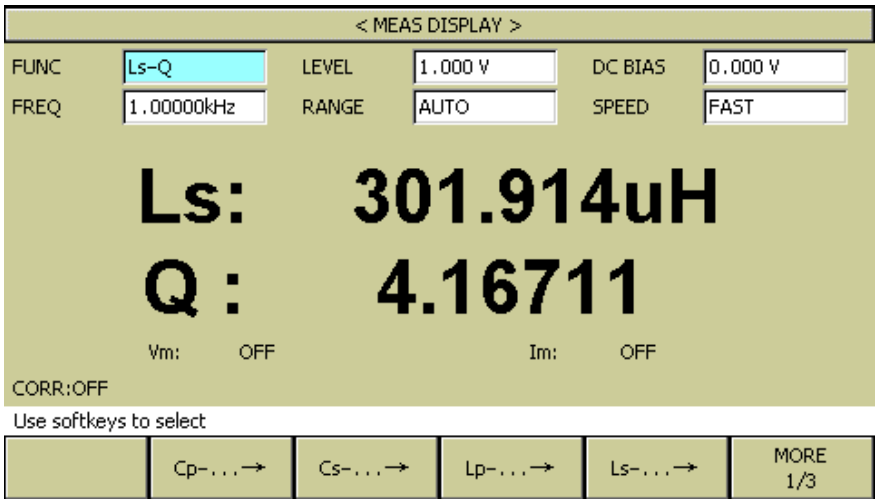
Function: Ls-Q
Frequency: 5kHz
Level: 1.5Vrms
Internal impedance: 100Ω

Operation steps

1) Turn on the instrument.
2) Set basic parameters
   a) Press [DISP] to enter into the <MEAS DISP> page.
   b) Move the cursor to FUNC, the current item is displayed as Cp-D. Meanwhile Cp—…→, Cs—…→, Lp—…→, Ls—…→, Z—…→, ↓ will be displayed in the soft key zone.
   c) Press the soft key Ls—…→, Ls-D, Ls-Q and Ls-Rs will be displayed.
   d) Press Ls-Q to select the Ls-Q function.
   e) Move the cursor to **FREQ**, the current frequency is 1.0000kHz.
   f) Press [5], 5 will be displayed in the prompt information zone at the bottom of the screen. The available units Hz, kHz and MHz will be displayed in the soft key zone. Press kHz, the frequency will be changed as 5.00000kHz.
   g) Move the cursor to **LEVEL**, the current displayed level will be 1.000V.
   h) Press [1][.][5], +1.5 will be displayed in the prompt information zone at the bottom of the screen. The available units mV, V, μA, mA and A will be displayed in the soft key zone. Press [V], the level will be changed as 1.5V.
   i) Press [SETUP] to enter into the <MEAS SETUP> page.
   j) Move the cursor to R_{sou} zone, 100Ω, 30Ω will be displayed in the soft key zone.
   k) Press 100Ω to select 100Ω as the signal internal impedance.

3) Connect the test fixture (26005) to the test terminals of SM6030A.
4) Execute correction (To avoid the influence of stray impedance on measurement accuracy, Open/ Short correction must be operated) (refer to 5.1.2 “Point-frequency correction”)
5) Mount the tested inductance to the test fixture.
6) Execute test operation.

Press [DISP] to enter SM6030A into the <MEAS DISP> page. The instrument can test continuously and the test result will be displayed in upper case character in the center of the page. As shown in below picture:



Pic501

7) If the test result is obviously incorrect, please check the following items.
a) Check the tested inductance is in good connection with the test fixture or not.
b) Check the test fixture is in good connection with the test terminals of the instrument or not.
c) Redo the open/short correction.

❋**NOTE:** When the sweep open/short correction is used, the point-frequency correction function should be set as OFF. Refer to Correction operation in this chapter.

5.5 Operation example of testing capacitance by multi-frequency list sweep

Test condition:

Function: Cp-D
Level: 1Vrms
Other parameters

Frequency	Compare parameter	Low limit	High limit
1kHz	Cp(capacitance)	325.0nF	333.0nF
10kHz	D（Dissipation）	0.0001	0.0003
100kHz	D（Dissipation）	0.0060	0.0100

Beep: HIGH LONG
Alarm mode: OUT

Operation steps

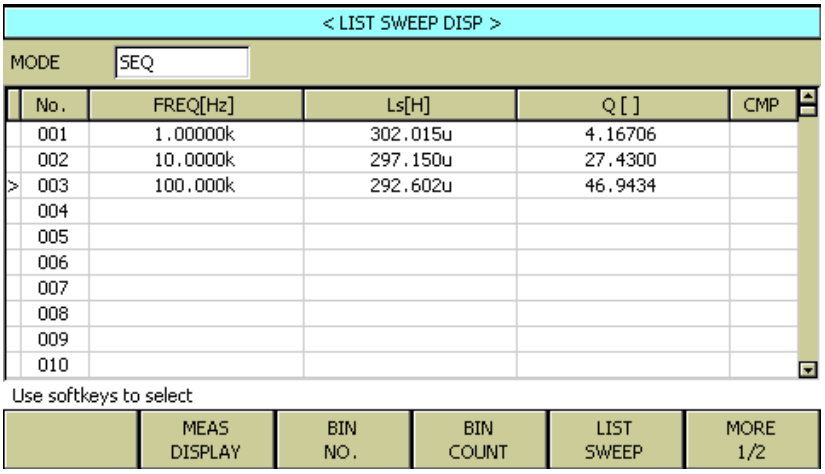
1) Turn on the instrument.
2) Set basic parameters.
   a) Press [DISP] to enter into the <MEAS DISP> page.
   b) The **FUNC** zone is currently displayed as Cp-D and the Level zone is 1.000V.
   c) Press [SETUP] to enter into the <MEAS SETUP> page, meanwhile the following soft keys will be displayed in the soft key zone: MEAS SETUP, CORRECTION, LIMIT SETUP, SWEEP SETUP and FILE MANAGE.
   d) Press LIST SETUP to enter into the <LIST SWEEP SETUP> page.
   e) Move the cursor to the **SWEEP PARAM** zone. Then this zone will be displayed as FREQ[Hz].
   f) Move the cursor to the parameter zone of sweep point 1, then this zone will displayed as ---.
   g) Press [1], +1 will be displayed in the prompt information zone and the soft key zone will display available units: Hz, kHz and MHz. Press kHz, this zone will be changed as 1.00000k.
   h) Press [→] to move the cursor to the LMT zone of sweep point 1, then this zone will be displayed as ---. The soft key zone will display: LIMIT DATA A, LIMIT DATA B and OFF.
   i) Press LIMIT DATA A to select the compare primary parameter Cp function. This zone will be display A and the cursor will automatically move the low limit zone of sweep point 1.
   j) Press [3][2][5], +325 will be displayed in the prompt information zone and the following available units will be displayed in the soft key zone: p, n, μ, m and k. Press n, this zone will be changed as 325.000n. Then the cursor will automatically move the high limit zone of the sweep point 1.
   k) Press [3] [3] [3], +333 will be displayed in the prompt information zone and the following units will be displayed in the soft key zone: p, n, μ, m and k. Press n, this zone will be changed as 333.000n and the cursor will automatically move to the parameter zone of sweep point 2.
   l) Press [10], +10 will be displayed in the prompt information zone and the soft key zone will display the following available units: Hz, kHz and MHz. Press kHz, this zone will be displayed as 10.0000k.
   m) Press [→] to move the cursor to the LMT zone of sweep point 2, this zone will be displayed as---. The following soft key will be displayed in the soft key zone: LIMIT DATA A, LIMIT DATA B and OFF.
   n) Press LIMIT DATA B to select the compare secondary parameter D function. This zone will be displayed as B and the cursor will be automatically moved to the low limit zone of the sweep point 2.
   o) Press [0][.][0][0][0][1], +0.0001 will be displayed in the prompt information zone and the soft key zone will display the following available units: p, n, μ, m and k, M, *1. Press [*1], this zone will be changed as 100.000μ and the cursor will automatically move to the high limit zone of sweep point 2.
   p) Press [0][.][0][0][0][3], +0.0003 will be displayed in the prompt information zone and the soft key zone will display the following available units: p, n, μ, m and k, M, *1. Press [*1],

this zone will be changed as 300.000μ and the cursor will automatically move to the parameter zone of sweep point 3.

q) Based on 1-p steps, input 100kHz, B, 0.0060 and 0.0100 for the 3rd sweep point.

3) Alarm setup
   a) Press [SYSTEM] to enter into the <System Setup> page.
   b) Move the cursor to the FAIL BEEP zone to select HIGH LONG.
4) Mount the test fixture (26005) to the test terminals of SM6030A.
5) Execute correction function (To avoid the influence of the stray impedance on the measurement accuracy, it is necessary to execute open/short correction (refer to chapter 5.1.1 Sweep Correction)).
6) Insert the tested capacitor to the test fixture.
7) Execute test operations.

Press [DISP] and then press List Sweep to enter into the <List Sweep Display> page. The instrument will test continuously and then display the test and the compare results on page. If the compare result is H (higher than the high limit) or L (lower than the low limit), there is a beep alarm. The following figure shows the measurement display page.



Pic502

8) If the test result is obviously incorrect, please check the following items.
   a) Check the tested inductance is in good connection with the test fixture or not.
   b) Check the test fixture is in good connection with the test terminals of the instrument or not.
   c) Redo the open/short correction.

✱**NOTE:** When the sweep open/short correction is used, the point-frequency correction function should be set as OFF. Refer to Correction operation in this chapter.

5.6 Operation Example of Load Correction

Operation steps:

Test condition

Frequency: 100kHz

Cp: 11nF

D: 0.0005

a) Press [SETUP], the following soft keys will be displayed in the soft key zone: MEAS SETUP, CORRECTION, LIMIT TABLE, LIST SETUP, FILE MANAGE and TOOLS.
b) Press CORRECTION to enter into the <CORRECTION> page.
c) Move the cursor to **OPEN**, the following soft keys will be displayed in the soft key zone: ON, OFF and MEAS OPEN And DCR OPEN.
d) Press ON to turn on the open correction function.
e) Move the cursor to **SHORT**, the following soft keys will be displayed in the soft key zone: ON, OFF and MEAS SHORT And DCR SHORT.
f) Press ON to turn on the short correction function.
g) Move the cursor to **LOAD**, the following soft keys will be displayed in the soft key zone: ON and OFF.
h) Press ON to turn on the load correction function.
i) Move the cursor to **FUNC**, this zone will display Cp-D. Meanwhile Cp—…→, Cs—…→, Lp—…→, Ls—…→, Z—…→, ↓ will be displayed in the soft key zone.
j) Press Cp-D to select the Cp-D function.
k) Move the cursor to FREQ zone, the following soft keys will be displayed in the soft key zone: ON, OFF, MEAS OPEN, MEAS SHORT and MEAS LOAD.
l) Press ON to turn on the point-frequency correction function of **FREQ**.
m) Press [1][0][0], +100 will be displayed in the prompt information zone and the soft key zone will display the following available units: Hz, kHz and MHz. Press kHz, the **FREQ** zone will be changed as 100.000kHz (the same with the test frequency).
n) Move the cursor to the **REF A:** zone of the frequency 1. Press [1][1], +11 will be displayed in the prompt information zone and the following available units will be displayed in the soft key zone: p, n, μ, m and k. Press n, this zone will be changed as 11.0000nF.
o) Move the cursor the **REF B:** zone of the frequency 1. Press [0][.][0][0][0][5], +0.0005 will be displayed in the prompt information zone and the following available units will be displayed in the soft key zone: p, n, μ, m and k. Press [ENTER], this zone will be changed as 0.00050.
p) Move the cursor to Freq 1. The following soft keys will be displayed: ON, OFF, MEAS OPEN, MEAS SHORT and MEAS LOAD.
q) Hold the test fixture in open status and keep user's hands or other interference source far away from the test fixture. Press the soft key MEAS OPEN to execute open correction.
r) Insert the short plate (26010) into the test fixture. Please ensure that the short plate and the reeds of the test fixture have good contact.
s) Press the soft key MEAS SHORT to execute short correction.
t) Insert a standard capacitance into the test fixture. Please ensure that the pins of the standard capacitance have good connection with the reeds of the test fixture.
u) Press the soft key MEAS LOAD to execute load correction.

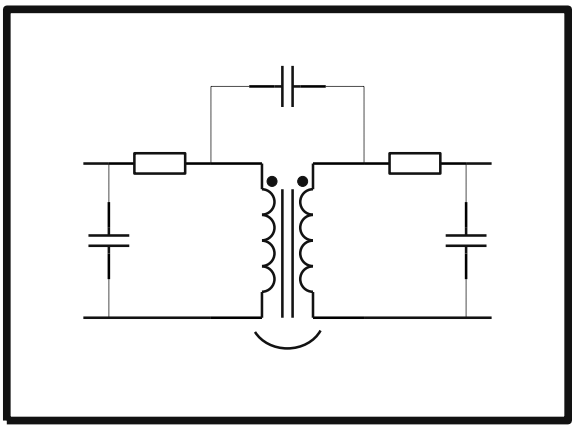
Note:

a) Because of the different software editions, the soft keys and status information may be different form this book, but it may not affect users' understanding.
b) The load correction is only valid for the components with the same specification. If the specification is changed, it is required to redo load correction.

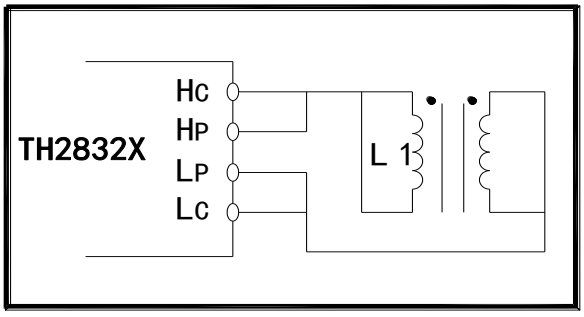
Chapter 6 Transformer Stand Alone Test

6.1 Circuit for Transformer Stand Alone Test

6.1.1 Some Parameters of Transformer

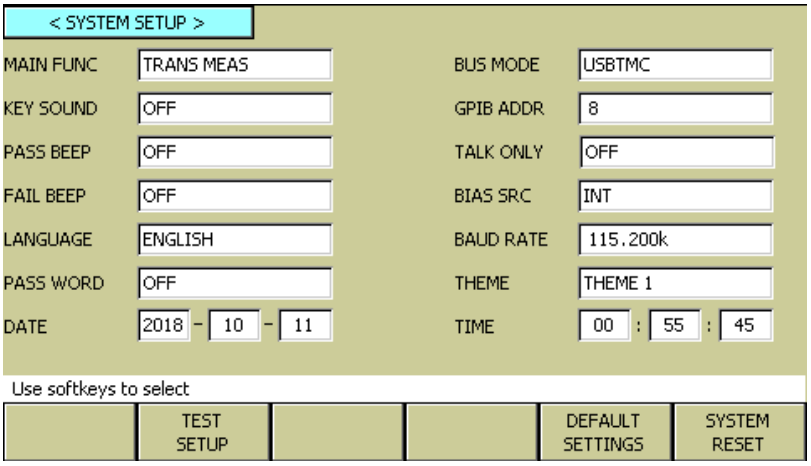


6.1.2 Capacitance Test between Transformer Windings



6.2 <TRANS TEST SET> interface

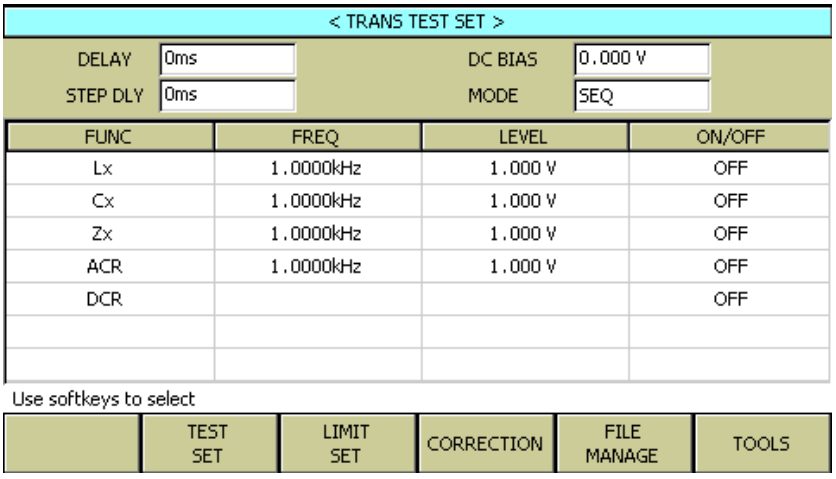
Press [SYSTEM] to enter into the system setup main menu.



Pic601

Move the cursor to **MAIN FUNC** and then press the soft key TRANS MEAS to enter into the <TRANS TEST SET> interface.

On this page, the following measurement parameters of the transformer can be set: test conditions of turns, test conditions of primary inductance, test conditions of primary leakage inductance, test conditions of primary DC resistance, where, test conditions include test voltage, frequency, switch, etc.



Pic602

6.2.1 Delay

Trigger delay means the delay time from trigger start to test start. Delay function allows users to set the trigger delay time. When the instrument makes auto sweep test for transformer parameters, at each sweep test point, the instrument will trigger delay for preset delay time. The delay time ranges from 0s to 60s with the resolution of 1ms. When the instrument is used in automatic test system, the delay function will be useful.

Operation steps for setting delay function

Execute the following operations to set delay time.

1) Move the cursor to **DELAY**.

2) Use numeric keys to input the delay time. Press a numeric key, the following unit soft keys will be displayed. Use them to replace **[ENTER]** and input delay time.

- **msec**
- **sec**

6.2.2 Bias

There are two modes for setting DC bias. The first one is using soft keys and the other one is using numeric keys.

1) Move the cursor to **DC BIAS**, the following soft keys will be displayed.

- INCR (+)

Press this key to increase the output level of DC bias.

- DECR (-)

Press this key to decrease the output level of DC bias.

2) Use soft keys or numeric keys to select or set DC bias level. When using numeric keys to input the bias level value, the available units (mV, V, μA, mA and A) will be displayed in the soft key, which can be used to input unit and data. When using [ENTER] to input the bias value, the default unit is V or A.

Note: When you want to switch DC bias level between current and voltage, the numeric keys and unit keys must be used.

When using transformer parameter auto sweep function to test inductance, the instrument will automatically output the preset DC bias. When DC bias is allowed to output, [DC BIAS] will light up.

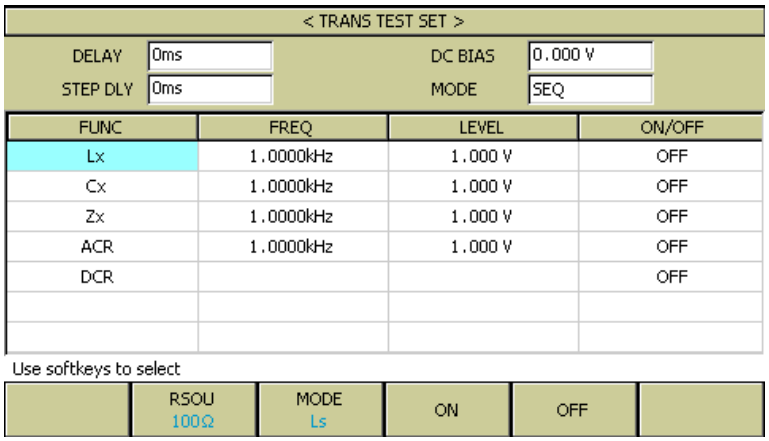
6.2.3 Mode

Move the cursor to **MODE**, the soft key zone will display SEQ and STEP.

Press SEQ, the **MODE** zone will display SEQ which means the instrument is in external trigger mode or manual trigger mode, trigger once, the instrument will sweep the transformer parameter for a circle.

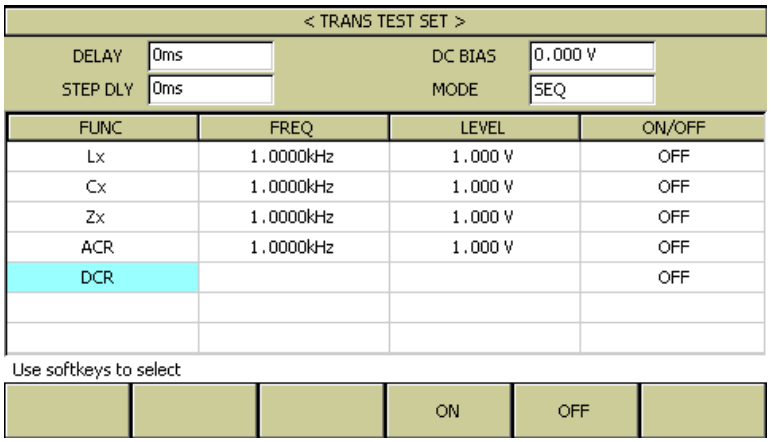
Press STEP, the Mode zone will displays STEP which means the instrument is in external trigger mode or manual trigger mode, trigger once, the instrument will sweep the transformer parameter for one time.

6.2.4 Setting Lx Test Conditions



Pic603

6.2.5 Setting DCR Test Conditions



Pic604

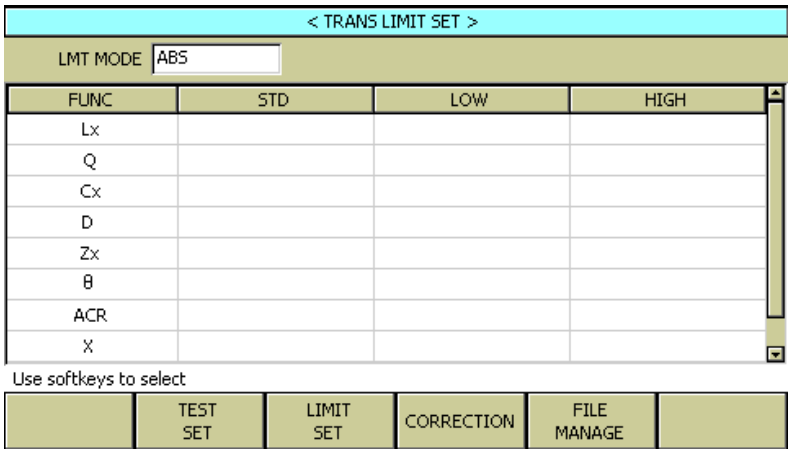
6.2.6 Test Frequency, Voltage and Switch

The parameter column consists of Lx, Cx, Zx, ACR, and DCR. Each parameter corresponds to three parameter variables: frequency, level and ON/OFF. Move the cursor to the corresponding setting area and change the (test) frequency and (test signal) level according to the screen prompts to meet the user's needs.

- Frequency: 20Hz to 200kHz
- Inductance: 5mV to 2V
- ON and OFF. If selecting ON, then the corresponding parameter is valid, otherwise, the parameter is invalid.

6.3 <TRANS LIMIT SET> interface

Press **SETUP** key and then press **LIMIT SET** to enter into the <TRANS LIMIT SET> page as shown in the following figure



Pic605

On this page, the following parameters can be set: turn ratio, primary inductance, secondary inductance, primary DC resistance, nominal value used for judge and display, high and low limits, high/ low limit mode.

6.3.1 LMT MODE

This zone displays the compare deviation modes of the current transformer: ABS (Absolute value) and Δ% (percent).

Move the cursor to **LMT MODE**: the following soft keys will be displayed.

- ABS
- Δ%

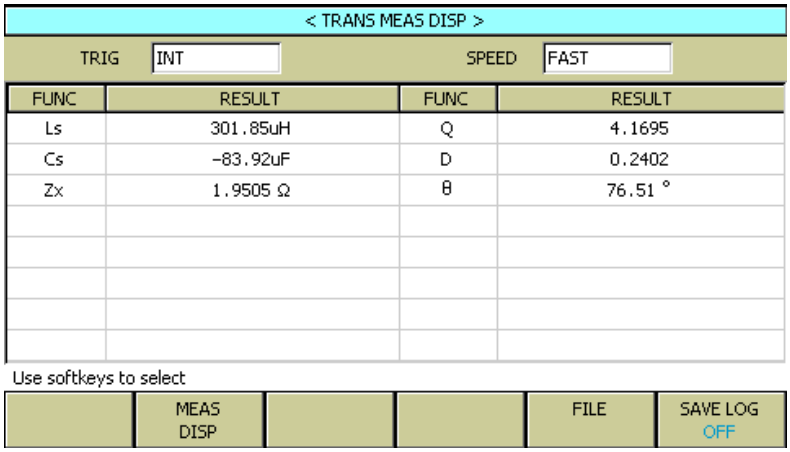
6.3.2 Parameter Column

The parameter column is made up of Lx, Cx , Zx, ACR and DCR, each of them has 3 variables: nominal value, low limit and high limit.

Move the cursor to the parameter table and input nominal value, high and low limits. The high limit should be larger than the low limit. **Note: the nominal value's unit has the memory function, if the unit needs to be changed, please press the multiplying unit in the soft key zone. If the multiplying unit is not necessary, please press [ENTER] key.**

6.4 <TRANS MEAS DISP> interface

Press **[DISP]** to enter into the <TRANS MEAS DISP> page, as below figure:



Pic606

On this page, results of the transformer test parameters will be displayed. If the test result is in red, it means Fail.

6.4.1 Save Transformer Single-Group Test Result by U Disk

Use U disk to save the test result, the following test results and formats can be saved:

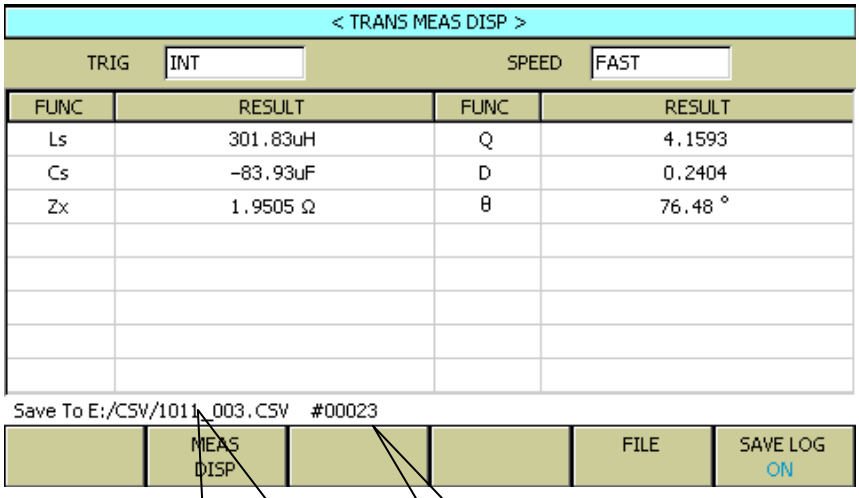
1：TrLx: Lx, primary parameter, secondary parameter, compare result;

2：TrDcr: Dcr, primary parameter, compare result;

3：TrZx: Zx, primary parameter, secondary parameter, compare result;

4：TrAcr: Acr, primary parameter, secondary parameter, compare result;

5：TrCx: Cx, primary parameter, secondary parameter, compare result.



Pic607

E:\CSV\ is the saving path 1011 indicates the date, 003 is the serial number.

#00023 is the saving times

The saved data can be used on <TRANS MEAS DISP> and <JUDGE DISP>.

Chapter 7 Transformer Auto Scanning Test

7.1 Introduction to Scan Test Function

Automatic transformer test system consists of 1831 transformer scanning box and SM6030A. It can test the following parameters: inductance (Lx), leakage inductance (Lk), quality factor (Q), turn (TURN), phase (PHASING), stray capacitance (Cx), DC impedance (DCR), AC impedance (ACR), impedance (Zx), inductance balance (Lx-BALANCE), DC impedance balance (DCR-BALANCE), short test (PIN-SHORT) diode test (LED) and current bias (DCI-BIAS), etc.

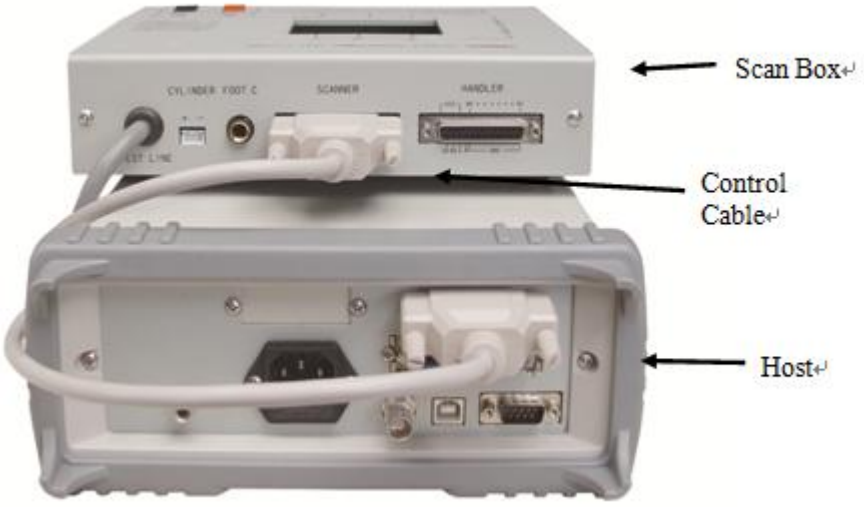
SM6030A can realize the automatic conversion between transformer pins and fixture pins, automatic test time of rescan interval setup, multi-group primary winding test, multi-group leakage test, deviation compensation for test values, PASS and FAIL count for test result, save and load function for test parameter, repeat test for FAIL product, etc. SM6030A can test several transformers at the same time.

7.2 Install and Connect the Scanning Test System

Automatic transformer test system is the connection of 1831 and SM6030A, and the connection steps are as follows:

1. Use 25PIN double-headed cable (26067 transformer test control cable) to connect the SCANNER socket on the rear panel of 1831 and the SCANNER socket on the rear panel of SM6030A as shown in the following figure.

NOTE: It is forbidden to plug the cable with electricity. Keep the direction of cable be correctly routed.



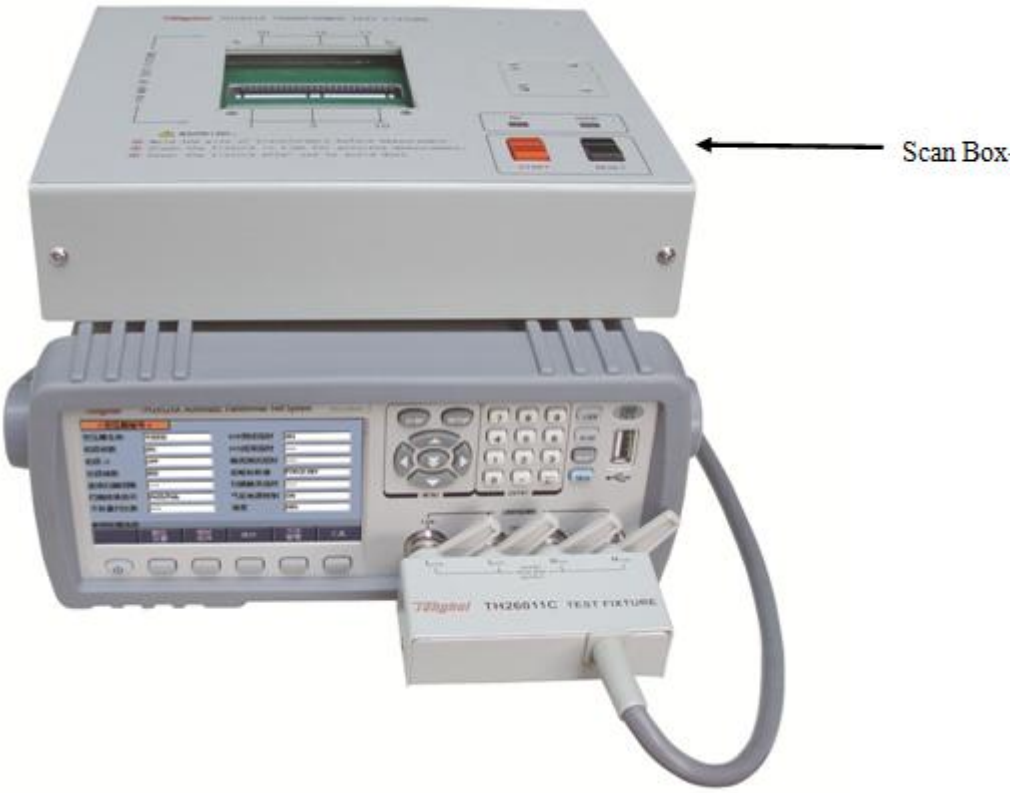
Pic701

2. If it is necessary to use the foot switch, connect the foot switch to the FOOT.C interface on the rear panel of 1831.

NOTE: Once the foot switch is used, the START button on 1831 will not work anymore.

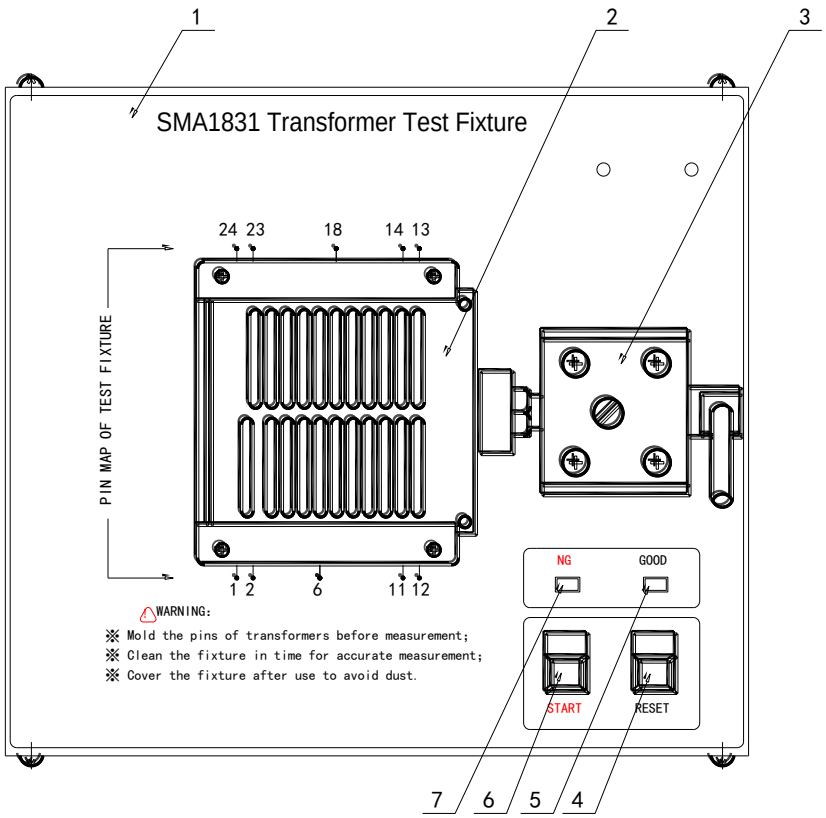
3. If the scanning box is 1831, user should connect the trachea to the valve controller.

4. Connect 1831L 4-terminal scanning box to the corresponding terminal on the front panel of SM6030A and lock it as shown in the following figure.



Pic702 Connect the scanning test cable to SM6030A

7.3 Upper Panel of Scanning Box



1831 Upper panel of Manual Fixture

Introduction to the marking numbers:

1) Model Label

2) Test fixture: This fixture is flexible and replaceable.

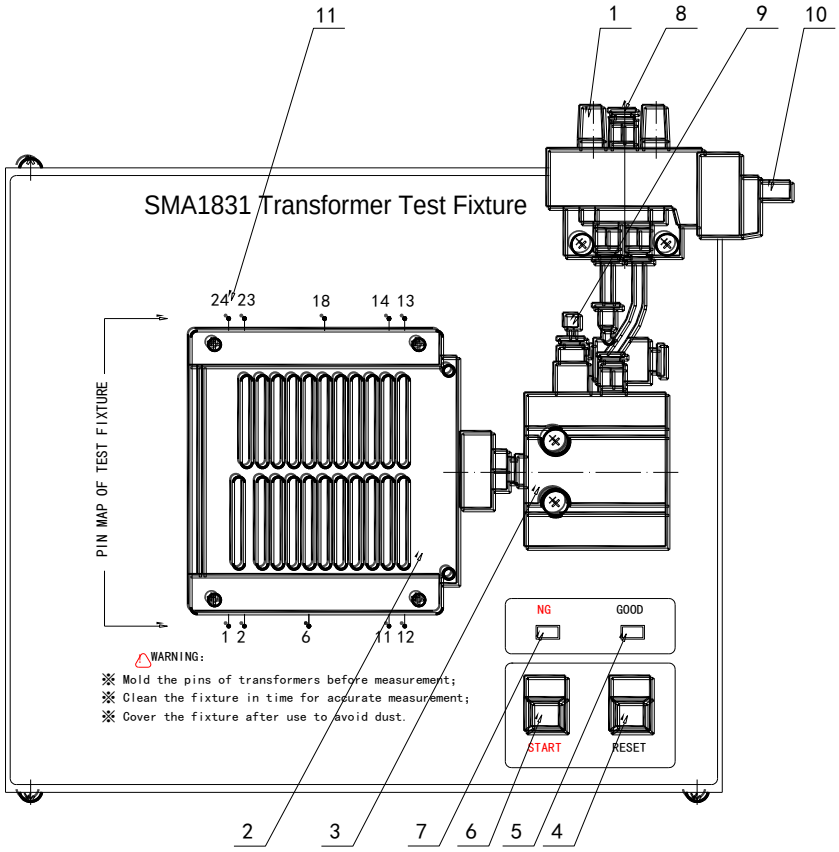
3) Manual push rod.

4) RESET button: When pressing this button, all tests will be terminated and the instrument will recover to the original preparing test state.

5) GOOD indicator: If the specified test results meet the preset requirements, this indicator will light up, which indicates that the tested device is GOOD.

6) START button: It is used to control test. Press this button, the instrument will start test.

7) NG indicator: If one or more test results cannot meet the preset requirements, this indicator will light up, which indicates that the DUT is NOT GOOD.



1831 Upper Front Panel of Pneumatic test fixture

Introduction to the marking numbers:

8) Silencer: This is a silencer used for noise reduction and dust proof.

9) Test fixture: This fixture is flexible and replaceable.

10) Cylinder: This is the main driving force for 1831;

11) RESET button: When pressing this button, all tests will be terminated and the instrument will recover to the original preparing test state.

12) GOOD indicator: If the specified test results meet the preset requirements, this indicator will light up, which indicates that the tested device is GOOD.

13)START button: It is used to control test. Press this button, the instrument will start test.

14) NG indicator: If one or two test results cannot meet the preset requirements, this indicator will light up, which indicates that the DUT is NOT GOOD.

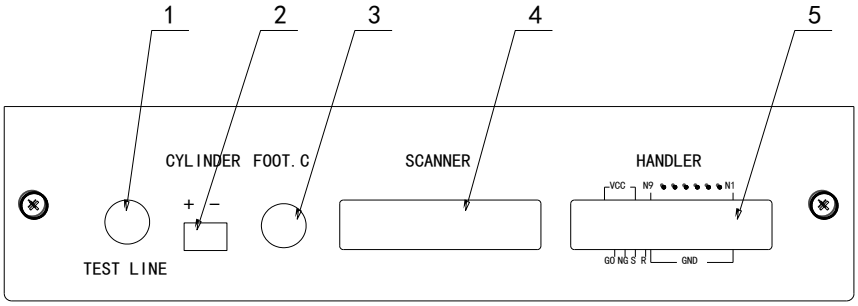
15)Inlet of the air pipe：This is the connection interface connecting with external air pipe. Note: It is recommended to install a water filtering device between the inlet and the inlet valve so as to improve the service life of the cylinder and the inlet valve.

16) Speed control knob: The knob is used to adjust the driving speed of the cylinder.

17) Control socket of air valve controller (electromagnetic valve): The switch for controlling 1901A and the cylinder. The power is DC24V.

18) Fixture pin number. In above figure, 1~24 is the corresponding pin number.

7.4 Lower Panel of Scanning Box



Introduction to each number on the lower panel

1. TEST LINE: inlet port of the test cable, 1831L 4-terminal test box is connected to inner part of 1831 through this line.

2. CYLINDER: 24V DC voltage output terminal, providing the working voltage for 1831 solenoid valve.

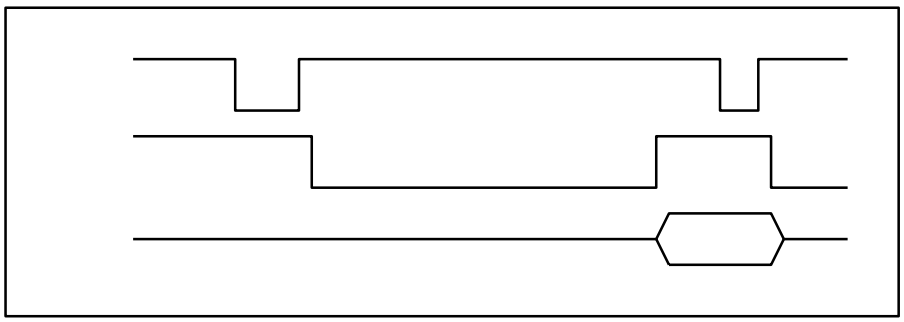
3. FOOT. C: Used to connect footswitch.

4. SCANNER: Signal control port. Use 26067 control line to connect the scanning box with SM6030A through SCANNER port.

5. HANDLER: HANDLER port. Refer to section 7.5 for instruction of HANDLER port.

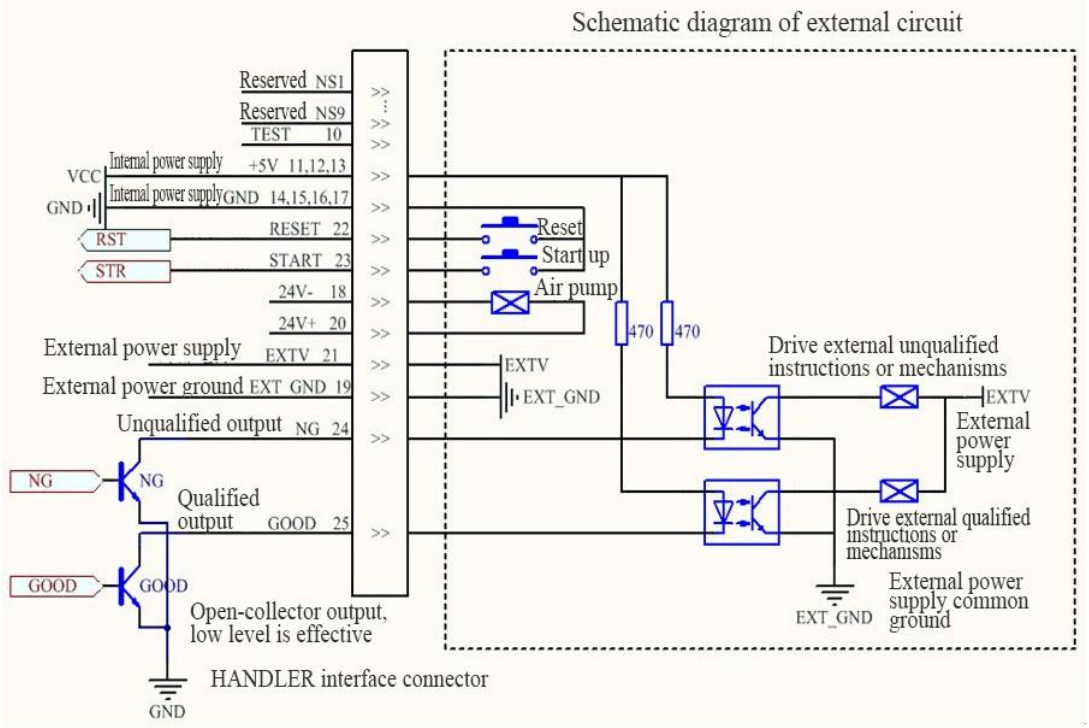
7.5 HANDLER Interface

7.5.1 Timing Diagram of HANDLER signal



7.5.2 Distribution and Connection Diagram for HANDLER

The distribution and external circuit of HANDLER signal pin:



HANDLER PIN & Function

Pin1	NS1, Open Drain Output	Pin14	GND
Pin2	NS2, Open Drain Output	Pin15	GND
Pin3	NS3, Open Drain Output	Pin16	GND
Pin4	NS4, Open Drain Output	Pin17	GND
Pin5	NS5, Open Drain Output	Pin18	air pump power 24V-
Pin6	NS6, Open Drain Output	Pin19	GND_EXT
Pin7	NS7, Open Drain Output	Pin20	air pump power 24V+
Pin8	NS8, Open Drain Output	Pin21	VCC_EXT
Pin9	NS9, Open Drain Output	Pin22	RST_Ext, Low Level Trigger
Pin10	TEST signal, Open Drain Output	Pin23	Start_Ext, Low Level Trigger
Pin11	Internal Power Supply VCC	Pin24	FAIL, Open Drain Output
Pin12	Internal Power Supply VCC	Pin25	GOOD, Open Drain Output
Pin13	Internal Power Supply VCC		

Explanations:

1. The "open drain output" described in the table can output low level, but the high level output must have an external pull-up resistor or relevant circuit.

2. The "reserved" pin described in the table is for in-plant testing or other reserved purposes. The signal has no meaning, please do not connect.

3. VCC_EXT maximum input voltage is 25V, beyond this limit will damage the interface.

4. The air pump power supplies 24- and 24+ are a floating power supply and should not be connected to the reference ground.

5. If you do not need to use optical isolation, you must set J7, J8 and J9 in the 1-2 state. At this time, the instrument Handler interface uses internal power and internal reference ground, the photoelectric isolation inside the machine is invalid.

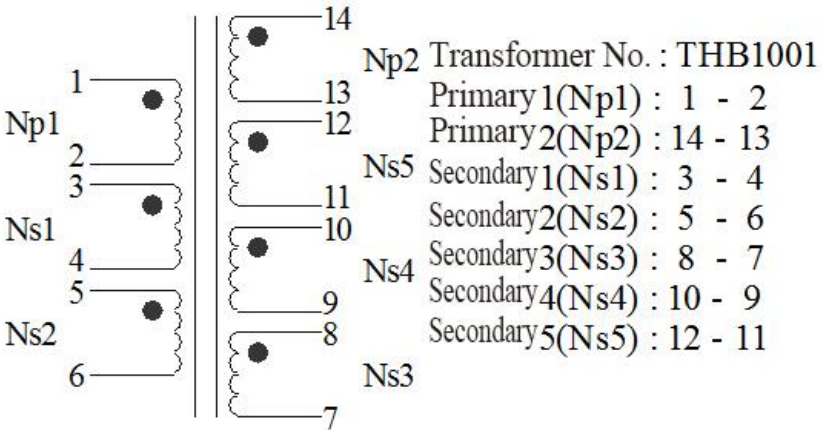
The interface can be configured as a photoelectric isolated interface, use external power supply and external reference ground, the current jumpers J7, J8, and J9 are set in the 2-3 state, please be careful not to use an external voltage that exceeds the limit.

This instrument is factory-set without opto-isolation, using internal power supply and internal reference ground

6.If you have any questions, please call our customer service number.

7.6 Example of Transformer

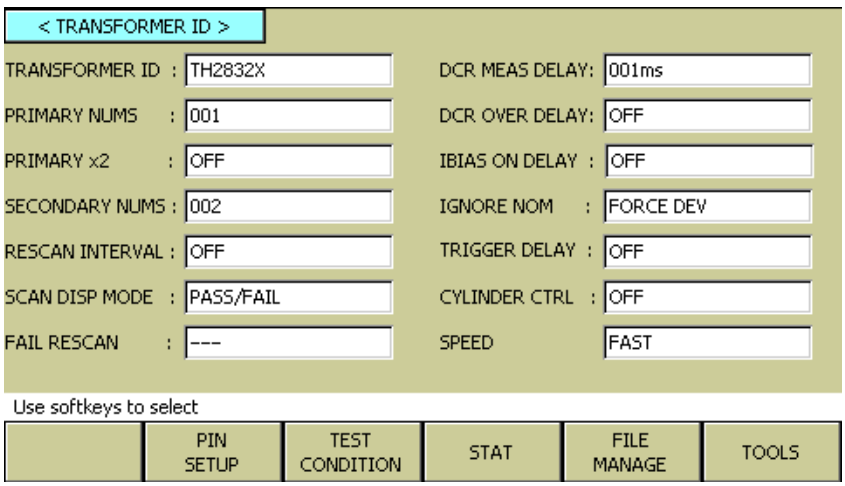
In order to understand the operation of transformer scanning test, the setting figures listed in the following chapters are based on the sample below.



The detailed information will be described in later sections.

7.7 <Transformer ID>

Press [SYSTEM] and then select the instrument function as TRANS SCAN to enter into the <TRANSFORMER ID> page, shown as below:



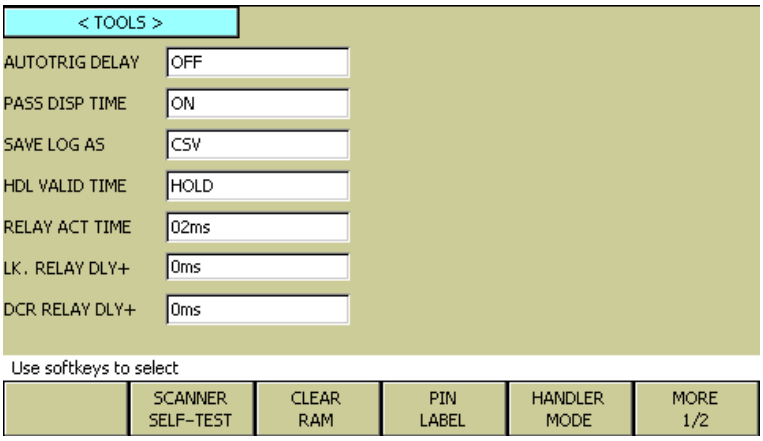
Pic703

<TRANSFORMER ID> includes the following parameters: transformer ID, primary numbers,

secondary numbers, rescan interval, scan display mode, FAIL RESCAN, DCR measure delay, DCR over delay, I-bias ON delay, ignore nominal, trigger delay, cylinder control.

7.7.1 CLEAR RAM

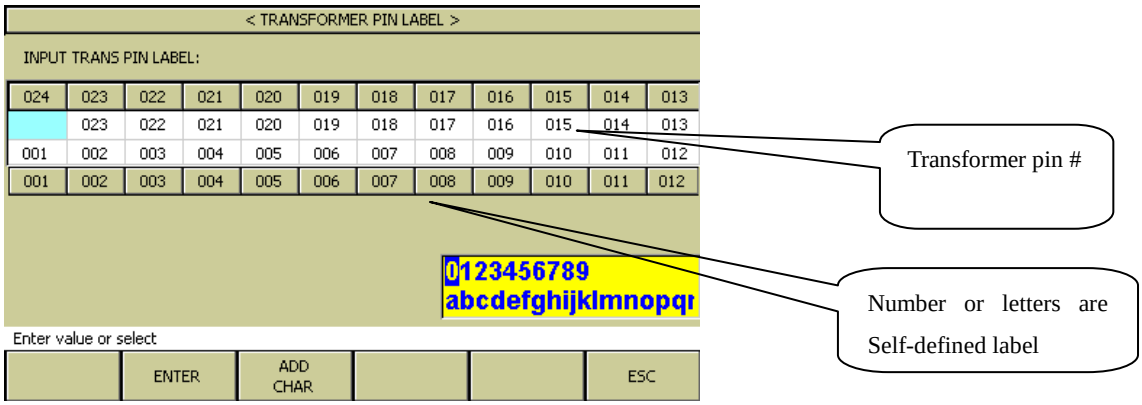
When setting a new transformer ID test condition, user must execute CLEAR RAM to clear the unexpected data stored in the memory of the instrument (by this way, the new test conditions may occur unexpected error, the method is as below:
On <TRANSFORMER ID> page, press TOOLS to enter into the <TOOLS> page and press CLEAR RAM again.



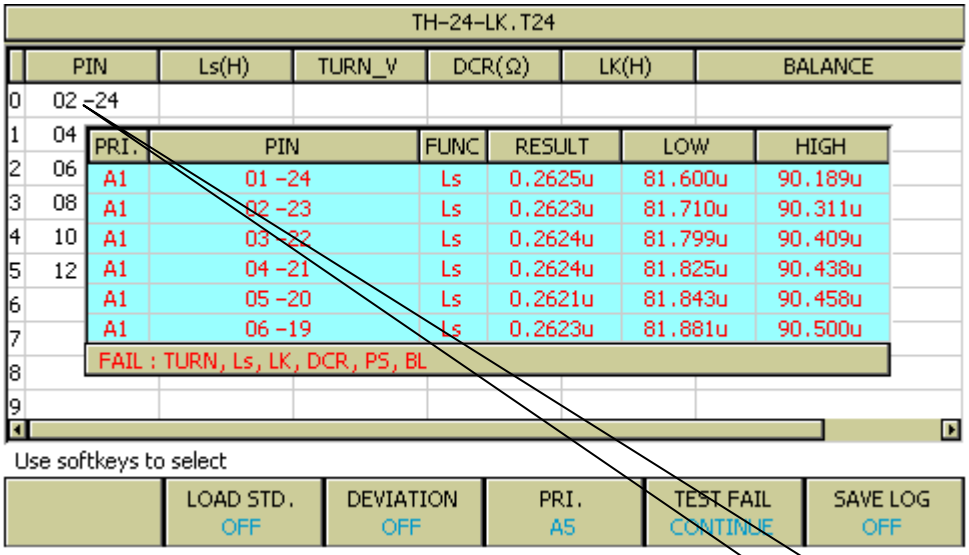
Pic704
User can restart the instrument to clear RAM.

7.7.2 Transformer Pin Label

This function is used to set the original transformer pin number as user-defined number or letters.



Pic705
After setting the transformer pin label and the corresponding test conditions, the instrument will display the data in the mode of user-defined pin label on the transformer test display page, as shown below:



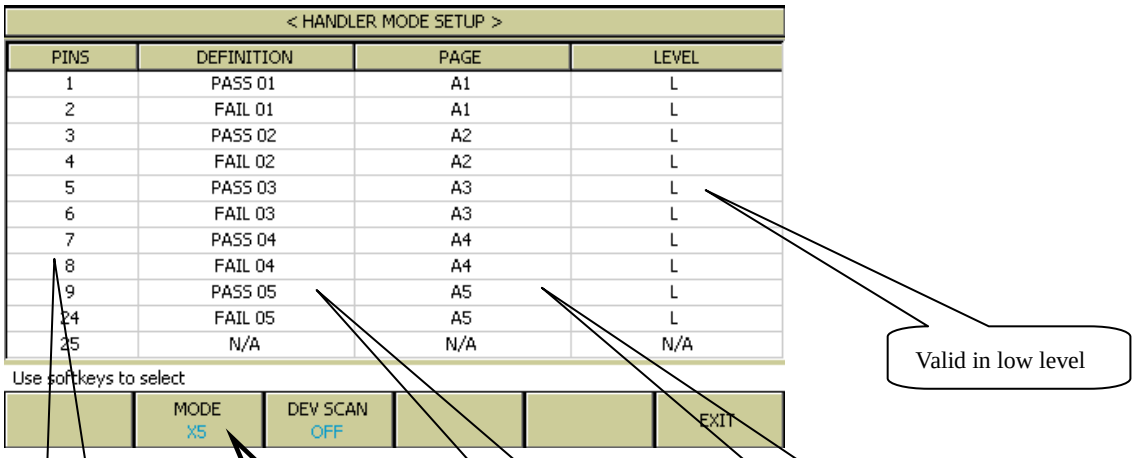
Pic706

Here is user defined pin label.

7.7.3 Handler Mode

①When measuring several transformers, Handler can output the judgment results of each transformer (single page or two pages):

On <TRANSFORMER ID> page, press TOOL to enter into the <TOOLS> page and press HANDLER MODE to enter into the <HANDLER MODE> page. Select the MODE to change the mode from DEFAULT, LxLk, GD1|GD2, X5 .



Pic707

Valid in low level

Corresponding pins of Handler

Press it to change mode; X5: max. 5 transformers can be tested at one time.

PASS 05: Qualified signal of No.5 transformer.

A5: Corresponding page of qualified signal of No.5 transformer.

NOTE:

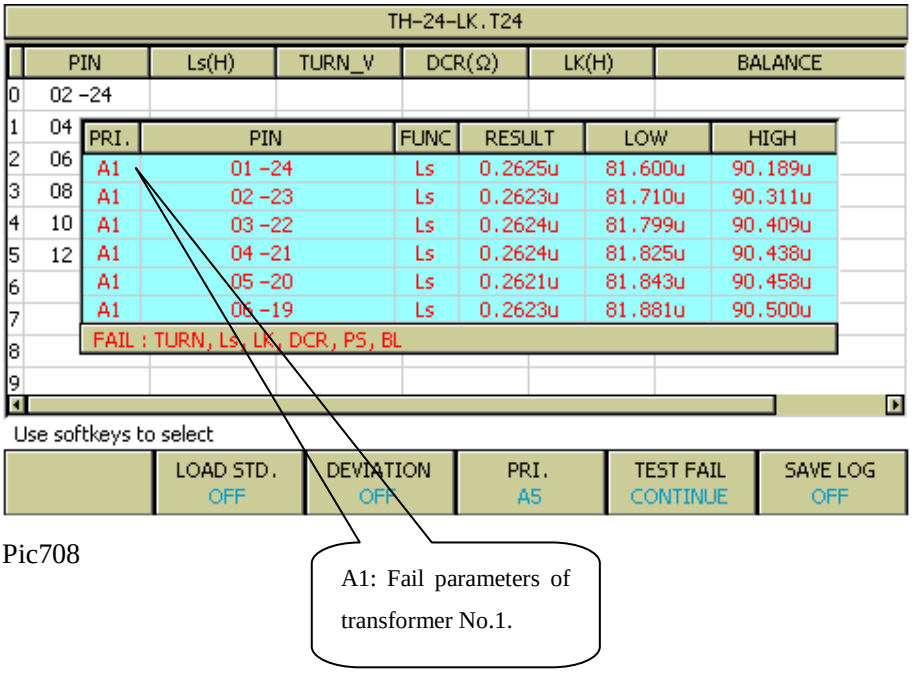
LxLk: Lx PASS is the output of PIN1, FAIL is the output of PIN2; Lk PASS is the output of PIN3, FAIL is the output of PIN4.

GD1|GD2: only test 2 pages of data, if 1 page of the 2 pages of data is PASS, output PASS signal PIN25, or output the FAIL signal PIN24.

②DEV SCAN

When using the same DUT to carry out deviation deduction of several transformers, select ON of this function can achieve one step test and deduct the same DUT. Also, it is convenient to put the DUT on another PIN of the transformer; after deviation deduction of all the transformers has been finished, this function will be turn off automatically, which is convenient for the follow-up test.

③FAIL interface of fail parameters of each transformer will change according to the Handler mode

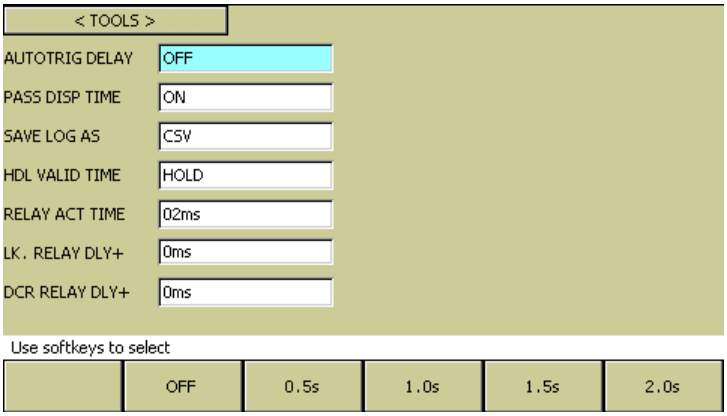


Pic708

A1: Fail parameters of transformer No.1.

7.7.4 AUTOTRIG DELAY

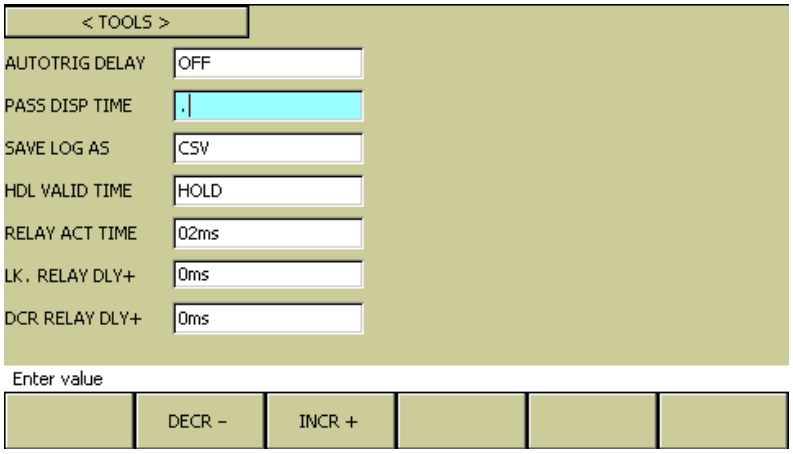
This function is used to trigger test automatically after the DUT has been placed on the test fixture. On <TRANSFORMER ID> page, press TOOLS to enter into the <TOOLS> page and move the cursor to AUTOTRIG DELAY, press the soft keys on the right to select the response time or OFF function of AUTOTRIG DELAY.



Pic709

7.7.5 PASS DISP TIME

On <TOOLS> page, move the cursor to PASS DISP TIME and press the number key (0-200) to confirm the display time.



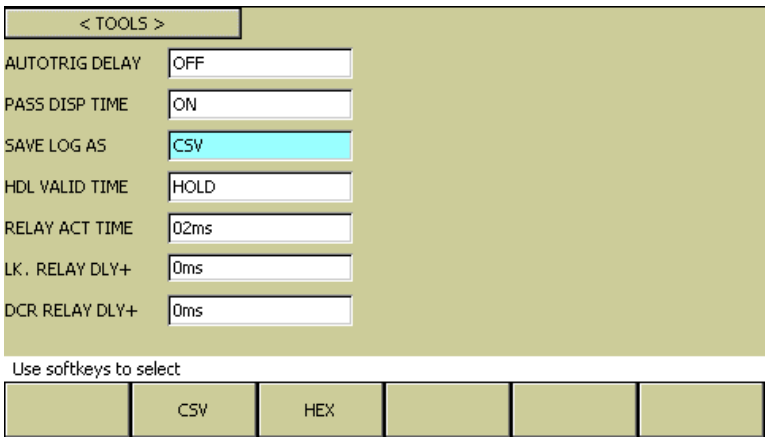
Pic710

This function is used to set the PASS display time after scanning. If the test result is FAIL, the result will be displayed all the time. This function is independent of RESCAN INTERVAL. For example, if PASS DISP TIME is set as 3 seconds and RESCAN INTERVAL is set as 4 seconds, PASS state will be maintained for 3 seconds and start testing after 1 second. If PASS DISP TIME is set as 3 seconds and RESCAN INTERVAL is set as 2 seconds, it will start testing after 2 seconds.

(**NOTE:** when entering 0, ON will be displayed in PASS DISP TIME and the result will be displayed all the time.)

7.7.6 SAVE LOG AS

On <TOOLS> page, move the cursor to SAVE LOG AS, Press the corresponding soft key to select the save format as CSV or HEX.



Pic711

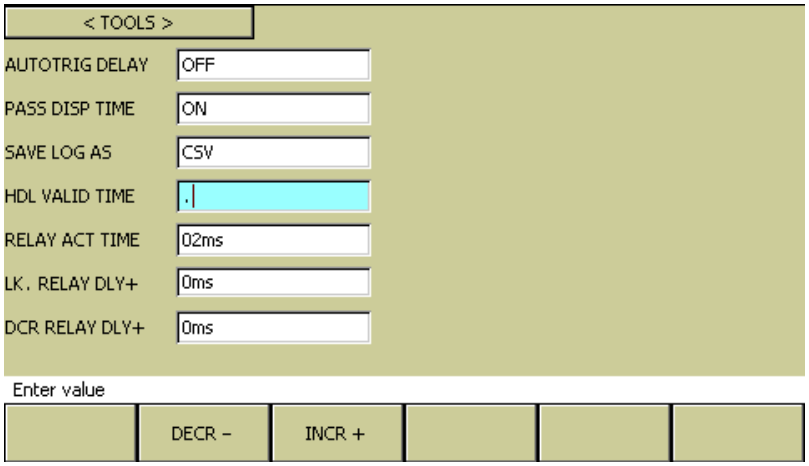
Select the data save format, in the transformer scan interface, open the save data function to automatically save the data after the test.

Note: When saving data in HEX format, the corresponding transformer settings file will be

generated under the CSV folder, then through the host computer software analysis (HEX + settings file) to view the saved data content.

7.7.7 HDL VALID TIME

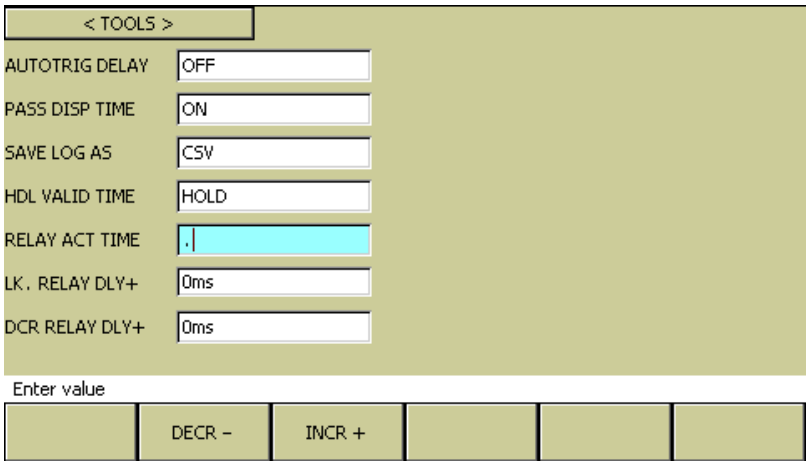
On <TOOLS> page, move the cursor to HDL VAL ID TIME and press the number to confirm. It ranges from 1-255 and indicates the valid time of handler signal is 1-255ms. When 0 or number greater than 255 is entered, ALWAYS is displayed and it indicates the handler signal is always valid.



Pic712

7.7.8 RELAY ACT TIME

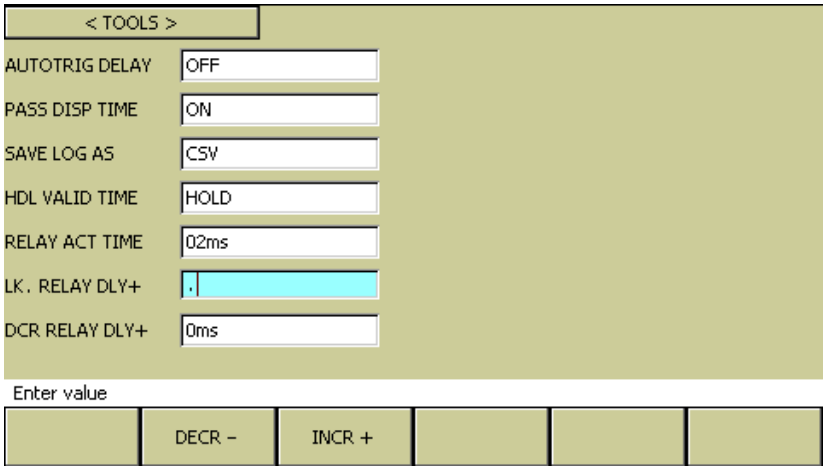
On <TOOLS> page, move the cursor to RELAY ACT TIME and press the number to confirm. It ranges from 2-10 (ms) and indicates the switch act time of relay in scan box or scan board. Due to the aging of the relay, appropriately increase the act time to keep the measurement accuracy.



Pic713

7.7.9 LK. RELAY DLY+

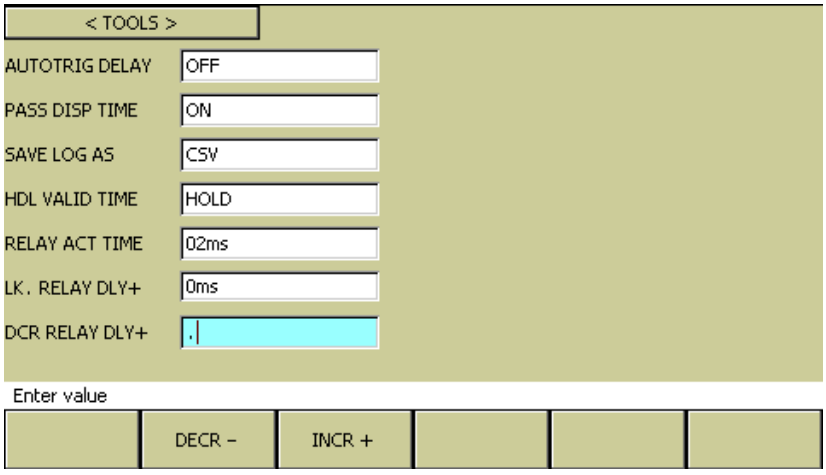
This area is the relay delay time for the LK leakage test. Press the soft key to change or press the numeric key to enter, range (0 ~ 5ms), the actual delay time is this time plus the relay action time.



Pic714

7.7.10 DCR RELAY DLY+

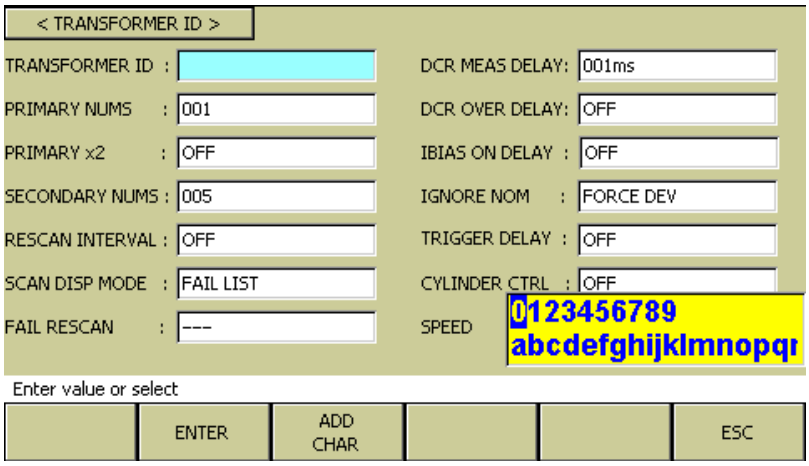
This area is the relay delay time for the DCR test, range (0 ~ 5ms), the actual delay time is this time plus the relay action time.



Pic715

7.7.11 TRANSFORMER ID

In this zone, user can input the transformer ID (file name when the testing file is saved.) The setting methods are as follows:



Pic716

1. Press any key to enter the input character pop-up box, and then use the arrow keys to move to the corresponding input characters.
2. Press 【ENTER】 to confirm

7.7.12 PRIMARY NUMS

This zone is used to input the transformer primary winding group.
For transformers with multi-magnetic core, it is necessary to set more PRI.
The range of primary winding group is 1 to 5.

7.7.13 SECONDARY NUMS

This zone is used to input the transformer secondary winding group. The range of secondary winding group is 1 to 9.

7.7.14 RESCAN INTERVAL

This zone is used to input the interval time of auto continuous test.
The range of auto test interval is 0 to 60; 0 will not be displayed, which means there is no auto continuous test.
Note: (s/10) means the unit is 1/10s (the same as below).

7.7.15 SCAN DISP MODE

This zone is used to set the judge display option which is used to control the display mode in the process of scanning test. There are totally 4 modes:

- **PASS/FAIL:** It means the scanning test data of each parameter will not be displayed one by one, only PASS/FAIL will be displayed, thus the test speed can be improved.
- **DATA ONLY:** It means the scanning test data of each parameter will be displayed one by one,

but PASS/FAIL will not be displayed. By doing this, users can check more test details.

- **ALL:** It means the test data of each parameter will be displayed one by one and PASS/FAIL will also be displayed.
- **FAIL LIST:** It means the test data of each parameter will be displayed one by one and FAIL parameters and its limit value setting will be displayed on the center screen. If there are more than 6 parameters, ……will be displayed.

7.7.16 FAIL RESCAN

This zone is used to set the times of retesting for defective products, which can increase the final measurement accuracy. The range of retesting is 0 to 9.

7.7.17 DCR MEAS DELAY

This zone is used to set DC resistance delay test. Generally, it is necessary to set this parameter when the tested inductance is larger than 100mH; however, the specific value is determined by the user's own test.
DCR test delay range: 0 to 250ms. When 0 is selected, the delay will not be displayed and indicating that no delay is set.
NOTE: ms is the unit

7.7.18 DCR OVER DELAY

This zone is used to set the delay after DC resistance test finishes. Generally, it is necessary to set this parameter when the tested inductance is larger than 100Mh; however, the specific value is determined by the user's own test.
DCR OFF delay range: 0 to 99; When 0 is selected, the delay will not be displayed and indicating that no delay is set.
NOTE: (10*ms) is the delay rate. For example, when inputting 2, the delay is 20ms.

7.7.19 BIAS ON DELAY

This zone is used to set the delay when a DC current bias is used to test.
The delay range is 0 to 99. When 0 is selected, the delay will not be displayed and indicating that no delay is set.
NOTE: The function of (10*ms) is the same as above.

7.7.20 IGNORE NOM

This zone has two functions, one is to make test by ignoring nominal values while the other one is to limit deviation deducting. The two functions are related to nominal value.

- **FORCE DEV:** When selecting this item, deducting deviation cannot be limited by STD. This is to say, the deduction can be performed even the deviation between the test value and STD is large. For example, transformer pins are inserted wrong.
- **FORCE TEST:** When this item is selected, if the winding pins are set, the parameters to be tested can be measured without setting standard value. This function is convenient for user to test if the standard value of the sample is unknown.
- **SKIP TEST LMTED DEV:** When this item is selected, it means winding pins have been set but the standard value has not. In this condition, the parameter will not be tested in the process of test. This mode will be limited by standard value when deducting deviation. The deduction cannot be successful if the deviation between the test value and the standard value (STD) is too large.

7.7.21 TRIGGER DELAY

This zone is used to delay time from the instrument being triggered to scanning starts.
Delay range: 0 to 99. When 0 is selected, the delay will not be displayed and indicating that no delay is set.

7.7.22 CYLINDER CTRL

This zone is used to set the switch of cylinder 24V power.

- ON: Output of 24V cylinder power is allowed.
- OFF: Output of 24V cylinder power is forbidden.
- FAIL HOLD: FAIL product has been detected and the test is stopping.
- FAIL LOCK: FAIL product has been detected and the instrument has been locked. Only when the correct password is input, the instrument will be unlocked.

7.8 ALLOCATE PIN TO FIXTURE

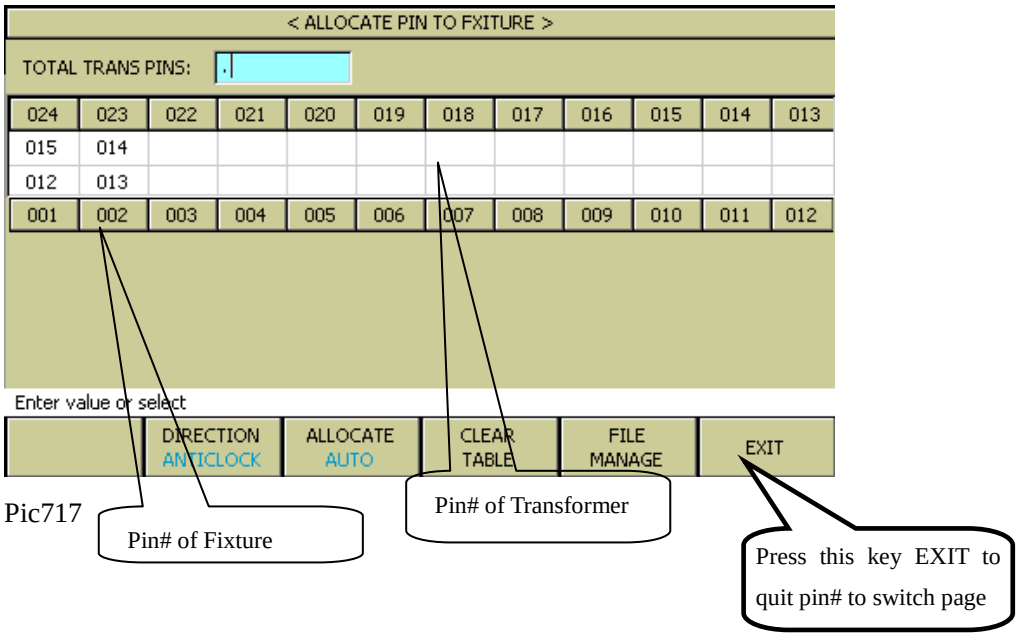
7.8.1 PIN TO FIXTURE

On <Transformer ID>, press the **PIN SETUP** key till the **Pin to Fixture** page appears.
The page is used to realize the correspondence of pin and fixture and set the transformer pins.
The setting steps are as follows: (Figure below shows the anticlockwise correspondence relation of pins, where, Pin 1 of the sample transformer connects with the Pin 2 of the fixture.)
1. Press Man/Auto.

2. If selecting manual switch, the cursor should be moved to the corresponding pin position one by one so as to input corresponding transformer pin. Note: Inputting 0 means to clear the corresponding pin input.

3. If selecting auto switch, then Clock wise/ Anti-clock must be selected. Move the cursor to the

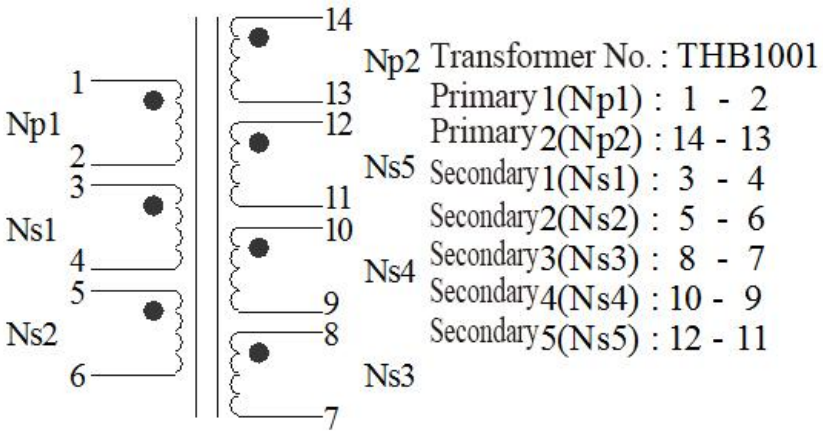
corresponding fixture position and input the corresponding transformer pin 1.



Pic717

7.9 PIN SETUP

Press **PIN SETUP** in <TRANSFORMER ID> interface to enter into the <TRANSFORMER PIN SET> page, which is used to set the pin of each winding group. Please have a look at the figure of transformer and pin setup.



The following is the pin setup page of PRI: 1 (PRI: 1 is used as the primary winding group of Np 1):

< TRANSFORMER PIN SET >

PRI: A1	TRANSFORMER		FIXTURE	
PHASING	+	-	+	-
PRI.	001	024	---	---
SEC. 1	004	023	---	---
SEC. 2	003	022	---	---
SEC. 3	---	---	---	---
SEC. 4	---	---	---	---
SEC. 5	---	---	---	---

Enter value or select

	SERIES PINSET	PARALLEL PINSET	PIN TO FIXTURE	PRI: A1	TEST CONDITION

pic718

Connect Ns1 and Ns2 in series to execute test. It is necessary to set pins in series connection.

Connect Ns1 and Ns2 in parallel to execute test. It is necessary to set pins in parallel connection.

The following figure is the pin setup page of PRI:2 (PRI: 2 is available when Np2 is used as primary winding group.)

< TRANSFORMER PIN SET >

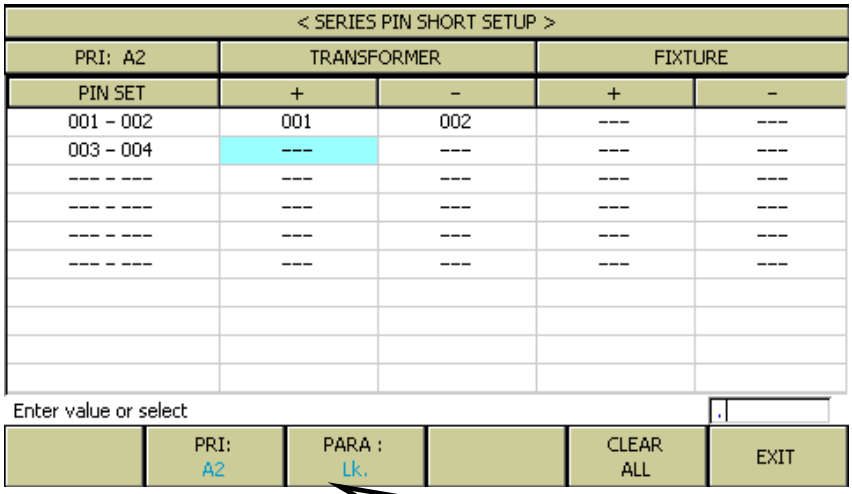
PRI: A2	TRANSFORMER		FIXTURE	
PHASING	+	-	+	-
PRI.	001	002	---	---
SEC. 1	003	004	---	---
SEC. 2	---	---	---	---
SEC. 3	---	---	---	---
SEC. 4	---	---	---	---
SEC. 5	---	---	---	---

Enter value or select

	SERIES PINSET	PARALLEL PINSET	PIN TO FIXTURE	PRI: A2	TEST CONDITION

Pic719

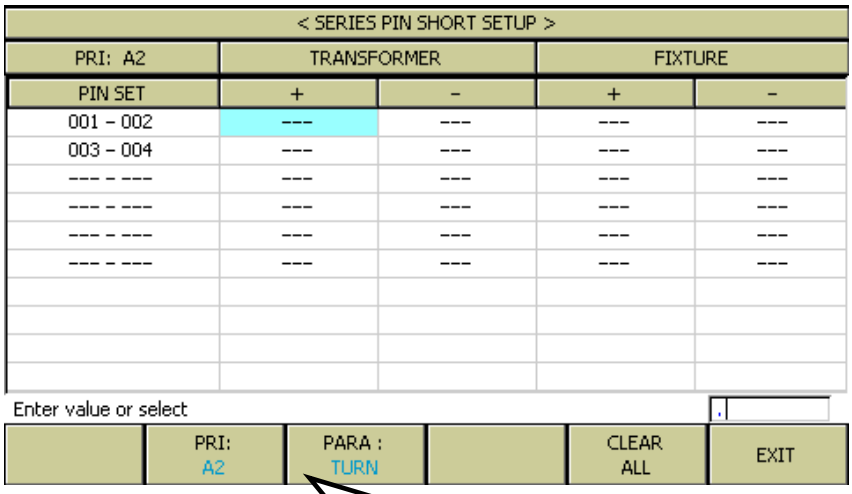
7.10 SERIES PIN SHORT SETUP



Pic720

Press this key to select the parameters of the series pin and switch the parameters with the knob. The current parameter is Lx. Note: When Lx is selected, other parameters are invalid.

Above figure shows the short pin setup when series transformers Ns1 and Ns2 test Lx.

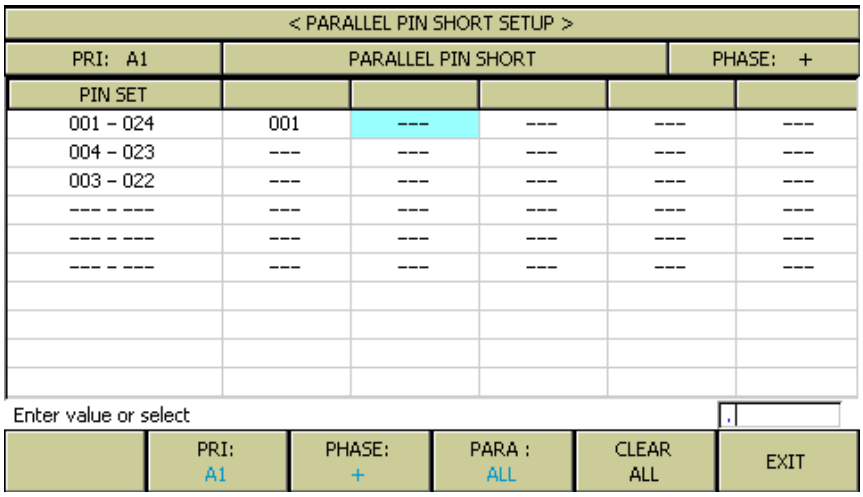


Pic721

Press the key to select the parameters of the series pin and press this key continuously to switch parameters.
Note: When TURN is selected, other parameters are invalid.

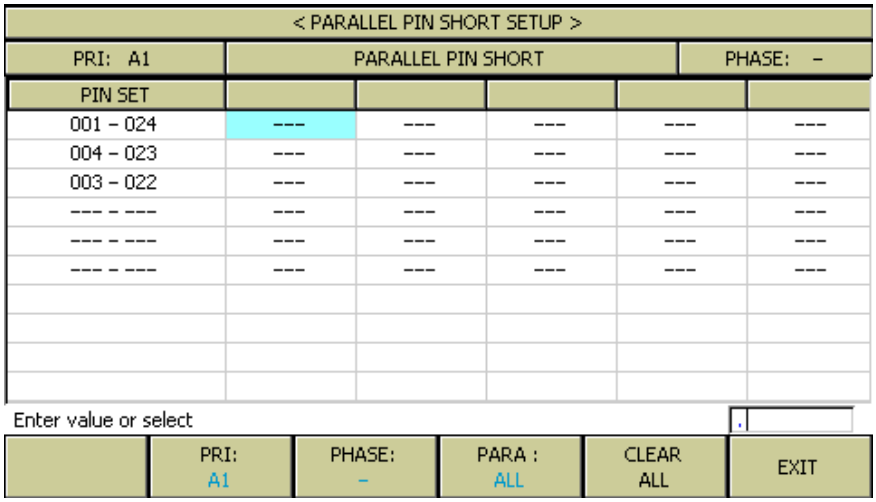
Above figure shows the short pin setup when series transformers Ns1 and Ns2 test TURN.

7.11 PARALELL PIN SHORT SETUP



Pic722

Above figure shows the short pin setup of the "+" terminal when series transformers Ns1 and Ns2 tests.



Pic723

Above figure shows the short pin setup of the "-" terminal when series transformers Ns1 and Ns2 tests.

7.12 <TEST CONDITION> interface

The page is used to set the parameters of untested transformer and test compare conditions. The parameters are as follows: TURN, Lx (inductance), Q (quality factor), L.K. (leakage inductance), Cx (turn-turn distribution capacitance), Zx (impedance), ACR (AC resistance), DCR (DC resistance), PS (pin short detection), BL (balance) and LED (diode).

The scanning sequence can also be changed, as well as the test frequency, voltage and mode, etc.

7.12.1 Frequency, Voltage, Switch and Scanning Sequence

Each parameter has 4 variables: frequency, level, ON/OFF and scanning sequence. Move the cursor to the corresponding setting zones to modify frequency and level. Note:

- Frequency: 20Hz to 200kHz
- Turn ratio (test level): 5mV to 10V
- Primary inductance, leakage inductance (test level): 5mV to 2V
- ON/OFF, when ON is selected, the corresponding parameters will be valid, otherwise, the parameter is invalid.
- The number of scanning sequence is in the same line with ON/OFF and users can input numbers to change it. **BAL is automatically set as the last item 10.**

< TEST CONDITION >

FUNC	FREQ	LEVEL	STATE	SEQ
TURN	1.0000kHz	1.000 V	ON	3
Lx	1.0000kHz	1.000 V	ON	2
Lk	1.0000kHz	1.000 V	ON	1
Cx	1.0000kHz	1.000 V	ON	5
Zx	1.0000kHz	1.000 V	ON	8
ACR	1.0000kHz	1.000 V	ON	7
DCR			OFF	4
PS			OFF	6
BAL			ON	9

STEP SEQ: – Lk – Lx – Tr – Cx – ACR – Zx – BAL –

Use softkeys to select

	TURN MODE TURN_V	SRC RES 100Ω	LIMIT SETUP	SHORT SETUP	

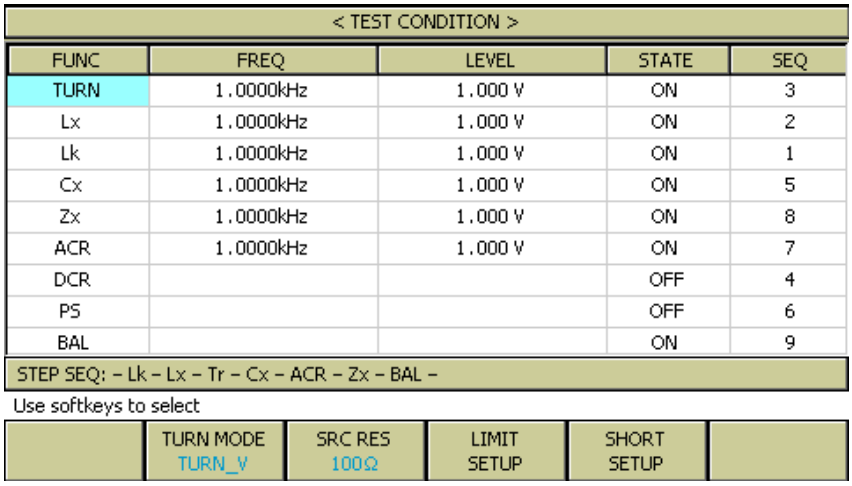
Pic724

This line displays the scanning sequence of each parameter.

The number is the sequence of each parameter and it can be modified by inputting numbers. √ means this parameter is selected.

7.12.2 Setting TURN Test Conditions

On <TEST CONDITION> page, move the cursor to the TURN zone.



Pic725

7.12.2.1 TURN MODE

Eight modes can be selected when SM6030A tests TURN.

- **TURN_v= primary nominal * secondary voltage/ primary voltage.** This mode is used test transformer turn number.
- **TURN = primary nominal * secondary turn/ primary turn.** When the primary inductance is small, using this mode can test the turn number more accurately. But, when testing magnetic core with high magnetic conductivity, in such mode, the data will be unstable due to the polarized magnetic core.
- **VOLT = Primary test voltage * secondary voltage / primary voltage**
- **Vs:Vp = Secondary voltage/ primary voltage**
- **Ns:Np = Secondary turn/ primary turn**
- **TURN_L= Inductance ratio mode**
- **Np:Ns = Primary turn/ secondary turn**
- **Lp:Ls = Primary inductance/ secondary inductance**
- **Ls:Lp = Secondary inductance/ Primary inductance**

It is recommended to put the windings with multi-turns in the primary turn ratio, the reasons are as follows:

1. By the influence of output internal resistance (30, 100), when the primary inductance is small, the distributed voltage signal will also be small and the energy the transformer gets is also weak. The test cable and the relay will attenuate a part of energy, so the stability and accuracy will be affected.

2. If the primary signal is forced to be enlarged, then the voltage generated by secondary multi-winding will be high and it may be over the range of the instrument and thus further affect the test accuracy.

3. If the winding with multi-turns is put in primary test, then the energy of the transformer will be strong and above 2 problems can be ignored.

When testing turn, can set the primary winding as lesser turns and set secondary winding as more

turns. Secondary turn/ primary turn ≤100/1.

< TURN RATIO LIMIT SETUP >

PRI: A1	NOM (T)	LOW (T)	HIGH (T)
001 – 008	1.0000	------	------
002 – 007	2.0000	1.0000	3.0000
003 – 006	3.0000	2.0000	4.0000
004 – 005	4.0000	3.0000	5.0000

U disk is available!

	LMT MODE ABS	PRI: A1	CLEAR TABLE	FILE MANAGE	EXIT

Pic726

7.12.2.2 TURN Source Internal Resistance

When testing TURN, SM6030A provides 2 source internal resistance modes:

- **30Ω** This mode is most commonly used in testing TURN.
- **100Ω** When testing the magnetic core with high magnetic inductivity, using **100Ω** internal resistance can reduce the polarization to improve the accuracy and stability of testing Lx.

7.12.2.3 Setting TURN Limits

Turn ratio limit setup page is used to set the nominal values and high and low limits to TURN.
Move the cursor to the corresponding zones and use numeric keys, corresponding soft keys and [ENTER] to fulfill the setup.

< TURN RATIO LIMIT SETUP >

PRI: A1	NOM (T)	LOW (T)	HIGH (T)
001 – 024	1.0000	------	------
004 – 023	2.0000	1.0000	3.0000
003 – 022			
--- – ---			
--- – ---			
--- – ---			

Enter value or select

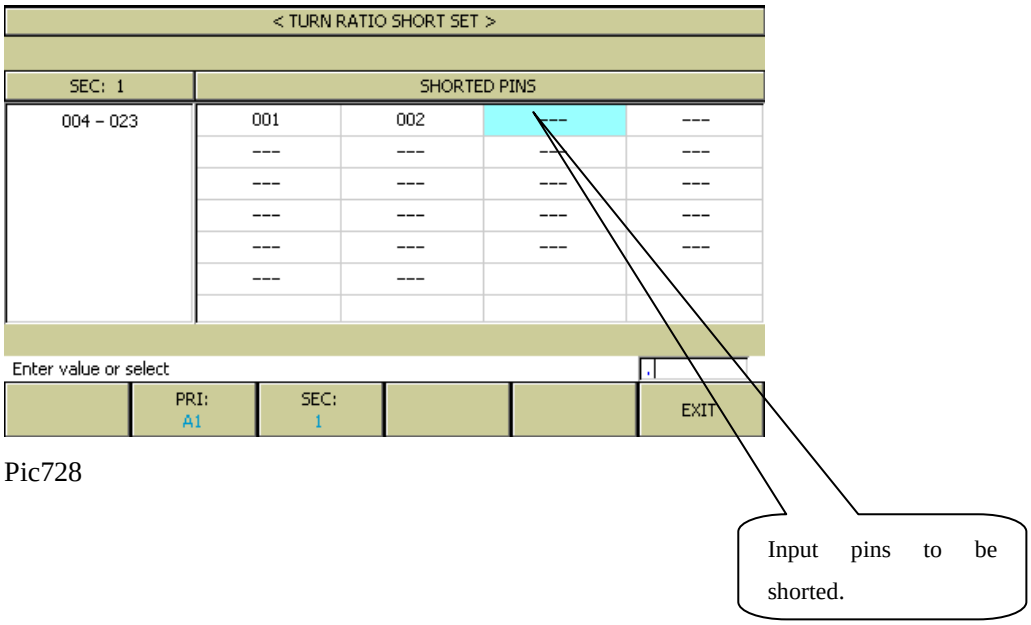
	T	V	%		

Pic727

No nominal value here, no test in the process of scanning, except **Ignore Nominal Value: FORCE TEST**, below is same.

7.12.2.4 Turn-Ration Short Set

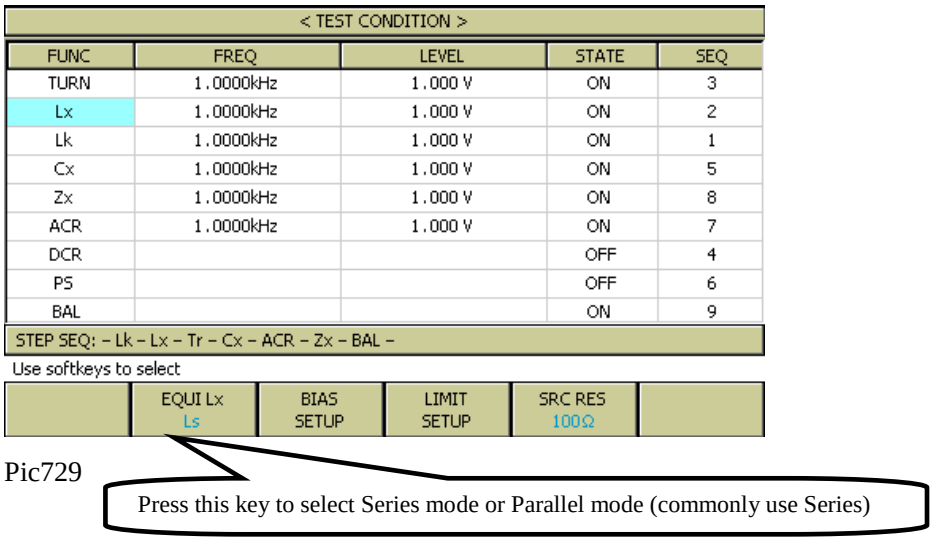
When testing transformer turn number, user can set the shorted pins on this page.



Pic728

7.12.3 Setting Lx Test Conditions

On <TEST CONDITION> page, move the cursor to the Lx zone.



Pic729

7.12.3.1 Setting Lx Multi-Frequency

If it is necessary to test different pins with different frequencies, move the cursor to the Lx frequency zone on < TEST CONDITION > page.

Press the multi-frequency setting corresponding soft key to enter the multi-frequency test setting.

< TEST CONDITION >

FUNC	FREQ	LEVEL	STATE	SEQ
TURN	1.0000kHz	1.000 V	ON	3
Lx	1.0000kHz	1.000 V	ON	2
Lk	1.0000kHz	1.000 V	ON	1
Cx	1.0000kHz	1.000 V	ON	5
Zx	1.0000kHz	1.000 V	ON	8
ACR	1.0000kHz	1.000 V	ON	7
DCR			OFF	4
PS			OFF	6
BAL			ON	9

STEP SEQ: – Lk – Lx – Tr – Cx – ACR – Zx – BAL –

Enter value or select

Hz | kHz | MHz

Pic730

On Lx multi-frequency test setup page, the frequency setup of different pins is as the figure below:

< LX MULTI-FREQ TEST SETUP >

PRI: A1	FREQUENCY
001 – 024	1.0000kHz
004 – 023	1.0000kHz
003 – 022	1.0000kHz
--- – ---	1.0000kHz
--- – ---	1.0000kHz
--- – ---	1.0000kHz

Enter value or select

Hz | kHz | MHz

Pic731

After exiting from multi-frequency setup, MULTI will be displayed in the Lx frequency zone indicating that the instrument is in Lx multi-frequency test, as shown below:

< TEST CONDITION >

FUNC	FREQ	LEVEL	STATE	SEQ
TURN	1.0000kHz	1.000 V	ON	3
Lx	MULTI	1.000 V	ON	2
Lk	1.0000kHz	1.000 V	ON	1
Cx	1.0000kHz	1.000 V	ON	5
Zx	1.0000kHz	1.000 V	ON	8
ACR	1.0000kHz	1.000 V	ON	7
DCR			OFF	4
PS			OFF	6
BAL			ON	9

STEP SEQ: – Lk – Lx – Tr – Cx – ACR – Zx – BAL –

Enter value or select

Hz | kHz | MHz

pic732

MULTI indicates that SM6030A is in the process of multi-frequency test.

7.12.3.2 Setting Lx Multi-Level

If it is necessary to test different pins with different levels, move the cursor to the Lx level zone on

< TEST CONDITION > page.

< TEST CONDITION >

FUNC	FREQ	LEVEL	STATE	SEQ
TURN	1.0000kHz	1.000 V	ON	3
Lx	MULTI	1.000 V	ON	2
Lk	1.0000kHz	1.000 V	ON	1
Cx	1.0000kHz	1.000 V	ON	5
Zx	1.0000kHz	1.000 V	ON	8
ACR	1.0000kHz	1.000 V	ON	7
DCR			OFF	4
PS			OFF	6
BAL			ON	9

STEP SEQ: – Lk – Lx – Tr – Cx – ACR – Zx – BAL –

Enter value or select

	mV	V	uA	mA	A

Pic733

On Lx multi-level test setup page, the level setup of different pins is as the figure below:

< LX MULTI-LEVEL TEST SETUP >

A1	LEVEL
001 – 024	1.000 V
004 – 023	1.000 V
003 – 022	1.000 V
--- – ---	1.000 V
--- – ---	1.000 V
--- – ---	1.000 V

Enter value or select

	mV	V	uA	mA	A

Pic734

After exiting from multi-frequency setup, MULTI will be displayed in the Lx frequency zone indicating that the instrument is in Lx multi-level test, as shown below:

< TEST CONDITION >

FUNC	FREQ	LEVEL	STATE	SEQ
TURN	1.0000kHz	1.000 V	ON	3
Lx	MULTI	MULTI	ON	2
Lk	1.0000kHz	1.000 V	ON	1
Cx	1.0000kHz	1.000 V	ON	5
Zx	1.0000kHz	1.000 V	ON	8
ACR	1.0000kHz	1.000 V	ON	7
DCR			OFF	4
PS			OFF	6
BAL			ON	9

STEP SEQ: – Lk – Lx – Tr – Cx – ACR – Zx – BAL –

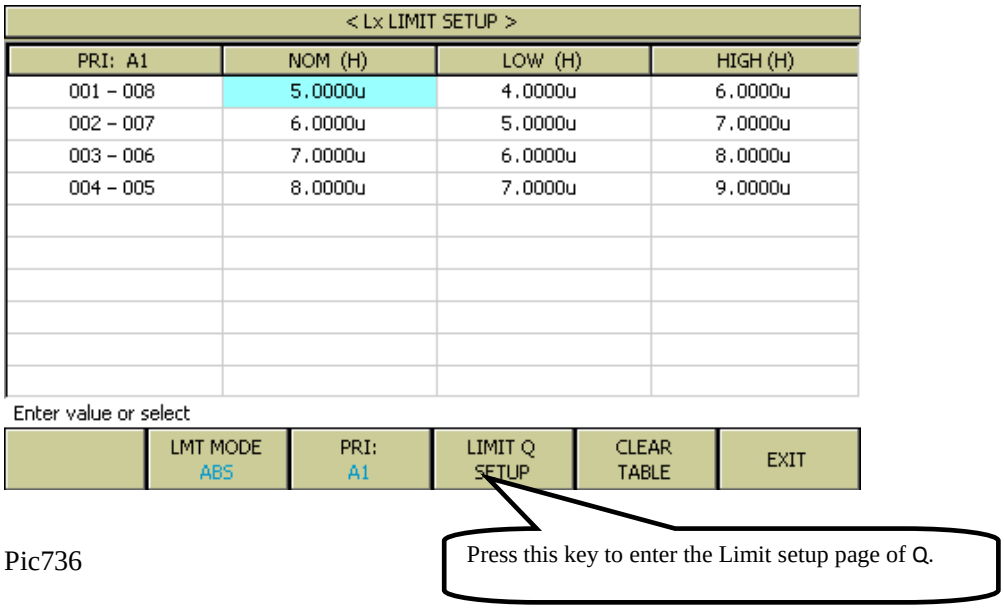
Enter value or select

	mV	V	uA	mA	A

Pic735

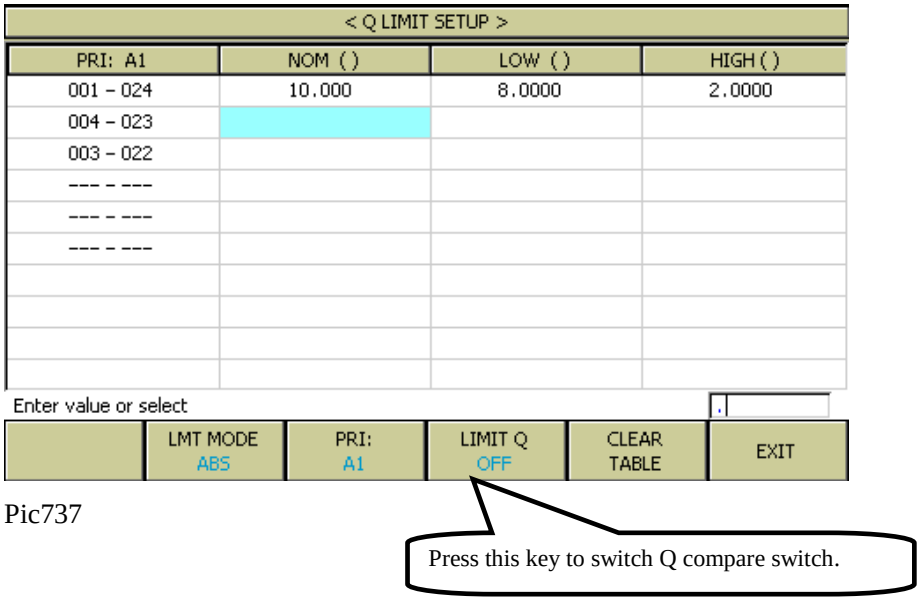
MULTI indicates that SM6030A is in the process of multi-level test.

7.12.3.3 Setting Lx Limits



Pic736

7.12.3.4 Setting Q Limits



Pic737

7.12.3.5 Setting Lx DC Bias

SM6030A provides 50mA internal DC bias source as the standard bias source.

Note: If users do not install corresponding DC bias source board, then the instrument will prompt "NO BIAS CARD" and [BIAS] indicator will not light up.

< Lx I-BIAS TEST SETUP >

PRI: A1	I-BIAS
001 – 008	1.0mA
002 – 007	2.0mA
003 – 006	3.0mA
004 – 005	4.0mA

Enter value or select

	PRI : A1		CLEAR TABLE	FILE MANAGE	EXIT

Pic738

7.12.4 Setting Lk Test Conditions

On <TEST CONDITION> page, move the cursor to Lk zone.

< TEST CONDITION >

FUNC	FREQ	LEVEL	STATE	SEQ
TURN	1.0000kHz	1.000 V	ON	3
Lx	MULTI	MULTI	ON	2
Lk	1.0000kHz	1.000 V	ON	1
Cx	1.0000kHz	1.000 V	ON	5
Zx	1.0000kHz	1.000 V	ON	8
ACR	1.0000kHz	1.000 V	ON	7
DCR			OFF	4
PS			OFF	6
BAL			ON	9

STEP SEQ: – Lk – Lx – Tr – Cx – ACR – Zx – BAL –

Use softkeys to select

	EQUI Lk Ls		TEST SETUP		

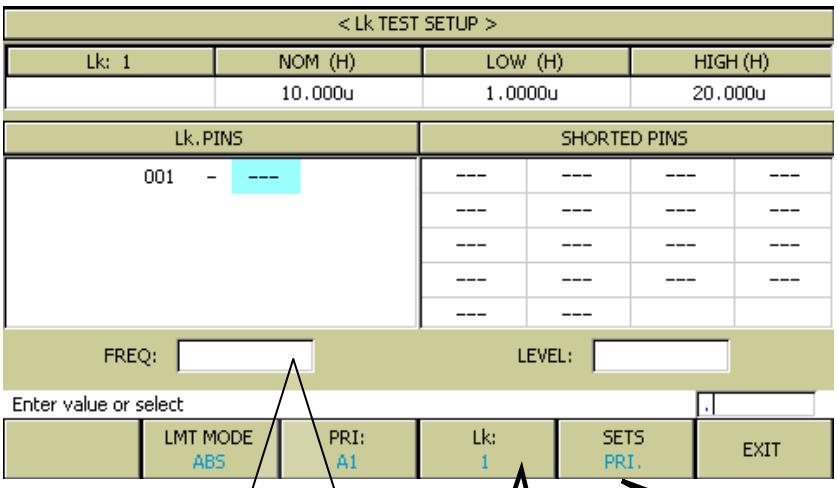
Pic739

Press this key to select Series mode or Parallel mode (commonly use Series)

7.12.4.1 Lk Test Setup Page

The pin input of Lk can be performed automatically or manually.

- Input Lk pins automatically: Press the Winding: soft key, the instrument will automatically select the corresponding winding pins to input to the leakage-inductance pin zone, and the other winding pins are input to short pin zone.
- Input Lk pins manually: User can input the leakage-inductance pins and the short pins flexibly. Move the cursor to the corresponding zone and use numeric keys to input.



Pic740

Input the frequency required to make multi-frequency test. The next item is the voltage level. If this zone is blank, the frequency and the voltage on <TEST CONDITION> will be automatically used in the process of measurement.

Press this key to switch the Lk serial number, the maximum number is 10.

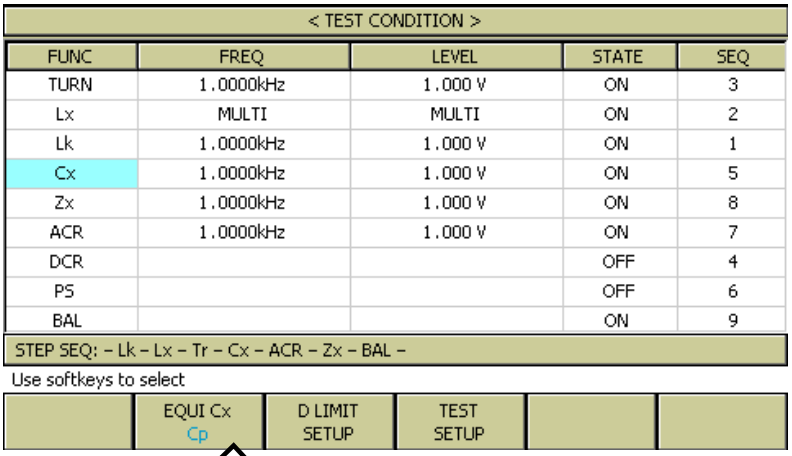
Press this key to switch the Lk winding, and then automatically input the tested pins and the short pins.

If users need to test Lk under different frequencies and voltages, input the frequencies and the voltages of different Lk serial number on **FREQ:** and **LEVEL:**

Note: If multi-frequency and multi-voltage is not required, do not input any value on the FREQ: and LEVEL: zone.

7.12.5 Setting Cx Test Conditions

On <TEST CONDITION> page, move the cursor to the Cx zone.

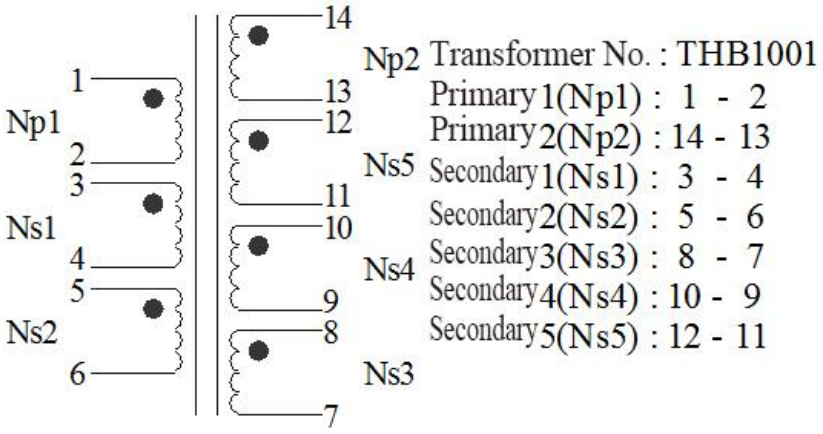


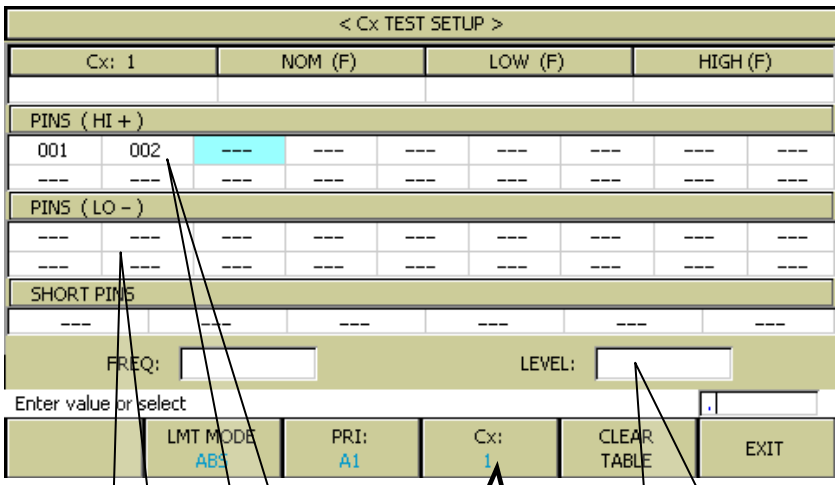
Pic741

Press this key to select Series mode or Parallel mode (commonly use Series)

7.12.5.1 Cx Test Setup Page

The following figure shows the example transformer. Test the capacitance between two turns: Np1 and Np2.





Pic742

Input another winding pin here.

Input a winding pin here.

Cx serial number, the maximum number is 10.

Input the frequency required to make multi-frequency test. The next item is the voltage level. If this zone is blank, the frequency and the voltage on <TEST CONDITION> will be automatically used in the process of measurement.

If users need to test Cx under different frequencies and voltages, input the frequencies and the voltages of different Cx serial number on **FREQ:** and **LEVEL:**.

Note: If multi-frequency and multi-voltage is not required, do not input any value on the **FREQ**: and **LEVEL**: zone.

7.12.6 Setting Zx Test Conditions

On <TEST CONDITION> page, move the cursor to the Zx zone.

< TEST CONDITION >

FUNC	FREQ	LEVEL	STATE	SEQ
TURN	1.0000kHz	1.000 V	ON	3
Lx	MULTI	MULTI	ON	2
Lk	1.0000kHz	1.000 V	ON	1
Cx	1.0000kHz	1.000 V	ON	5
Zx	1.0000kHz	1.000 V	ON	8
ACR	1.0000kHz	1.000 V	ON	7
DCR			OFF	4
PS			OFF	6
BAL			ON	9

STEP SEQ: – Lk – Lx – Tr – Cx – ACR – Zx – BAL –

Use softkeys to select

[ ] [BIAS SETUP] [ ] [LIMIT SETUP] [ ] [ ]

Pic743

7.12.6.1 Zx Limit Setup Page

< Zx LIMIT SETUP >

PRI: A1	NOM (Ω)	LOW (Ω)	HIGH (Ω)
001 – 024	100.00		
004 – 023			
003 – 022			
--- – ---			
--- – ---			
--- – ---			

Enter value or select

[ ] [mΩ] [Ω] [kΩ] [MΩ] [%]

Pic744

No nominal value here and no test in the process of scanning, except **Ignore: TEST**, the following is the same.

7.12.6.2 Zx Multi-Frequency Setup Page

If it is necessary to test different pins with different frequencies, move the cursor to the Zx frequency zone on < TEST CONDITION > page. Press multi-frequency setup page to enter into the page setup and press EXIT key to quit after setup. Detailed operation, please refer to **"7.12.3.1 Setting Lx multi-frequency".**

7.12.6.3 Zx Multi-Level Setup Page

If it is necessary to test different pins with different levels, move the cursor to the Zx level zone on

< TEST CONDITION > page. Press multi-level setup page to enter into the page setup and press EXIT key to quit after setup. Detailed operation, please refer to **"7.12.3.2 Setting Lx multi-level".**

7.12.7 Setting ACR Test Conditions

On <TEST CONDITION> page, move the cursor to the ACR zone.

< TEST CONDITION >

FUNC	FREQ	LEVEL	STATE	SEQ
TURN	1.0000kHz	1.000 V	ON	3
Lx	MULTI	MULTI	ON	2
Lk	1.0000kHz	1.000 V	ON	1
Cx	1.0000kHz	1.000 V	ON	5
Zx	1.0000kHz	1.000 V	ON	8
ACR	1.0000kHz	1.000 V	ON	7
DCR			OFF	4
PS			OFF	6
BAL			ON	9

STEP SEQ: – Lk – Lx – Tr – Cx – ACR – Zx – BAL –

Use softkeys to select

	EQUI ACR Rs		LIMIT SETUP		

Pic745

7.12.7.1 ACR Limit Setup Page

< ACR LIMIT SETUP >

PRI: A1	NOM (Ω)	LOW (Ω)	HIGH (Ω)
001 – 024			
004 – 023			
003 – 022			
--- – ---			
--- – ---			
--- – ---			

Enter value or select

	mΩ	Ω	kΩ	MΩ	%

Pic746

7.12.7.2 ACR Multi-Frequency Setup

If it is necessary to test different pins with different frequencies, move the cursor to the ACR frequency zone on < TEST CONDITION > page. Press multi-frequency setup page to enter into the page setup and press EXIT key to quit after setup. Detailed operation, please refer to **"7.12.3.1 Setting Lx multi-frequency".**

7.12.7.3 ACR Multi-Level Setup

If it is necessary to test different pins with different levels, move the cursor to the ACR level zone on < TEST CONDITION > page. Press multi-level setup page to enter into the page setup and press EXIT key to quit after setup. Detailed operation, please refer to **"7.12.3.2 Setting Lx multi-level"**

7.12.8 Setting DCR Test Conditions

On <TEST CONDITION> page, move the cursor to the DCR zone.

< TEST CONDITION >

FUNC	FREQ	LEVEL	STATE	SEQ
TURN	1.0000kHz	1.000 V	ON	3
Lx	MULTI	MULTI	ON	2
Lk	1.0000kHz	1.000 V	ON	1
Cx	1.0000kHz	1.000 V	ON	5
Zx	1.0000kHz	1.000 V	ON	8
ACR	1.0000kHz	1.000 V	ON	7
DCR			OFF	4
PS			OFF	6
BAL			ON	9

STEP SEQ: – Lk – Lx – Tr – Cx – ACR – Zx – BAL –

Use softkeys to select

			LIMIT SETUP		

Pic747

7.12.8.1 DCR Limit Setup Page

< DCR LIMIT SETUP >

PRI: A1	NOM (Ω)	LOW (Ω)	HIGH (Ω)
001 – 024			
004 – 023			
003 – 022			
--- – ---			
--- – ---			
--- – ---			

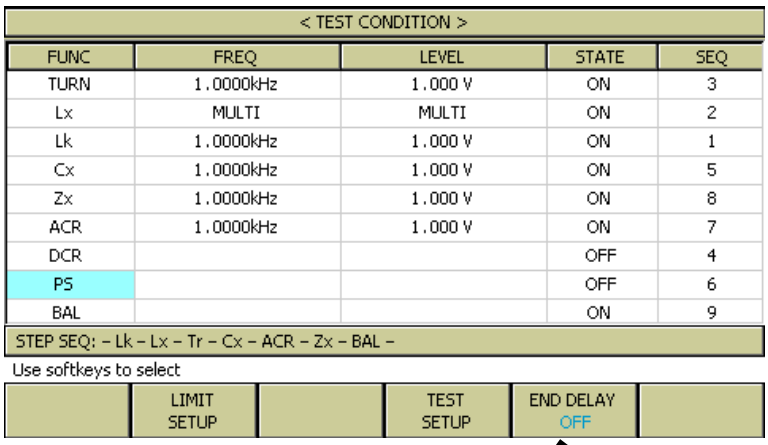
Enter value or select .

	mΩ	Ω	kΩ	MΩ	%

Pic748

7.12.9 Setting PS Test Conditions

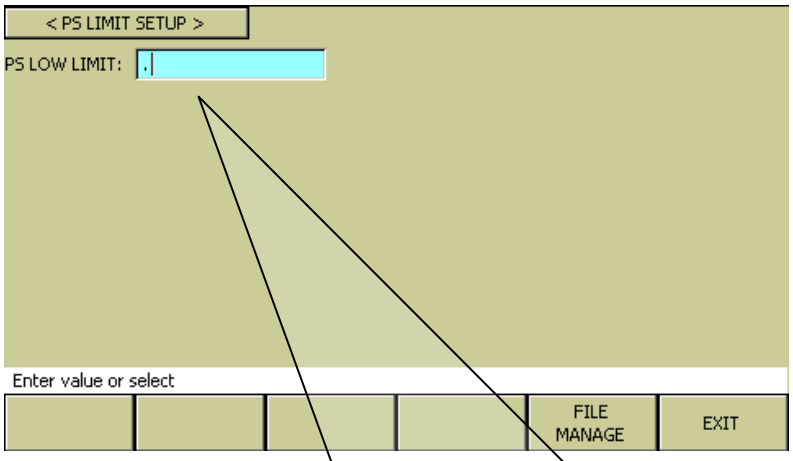
On <TEST CONDITION> page, move the cursor to the PS zone.



Pic749

Press this button to switch the end delay of the PS test to 1-5ms.

7.12.9.1 PS Limit Setup Page

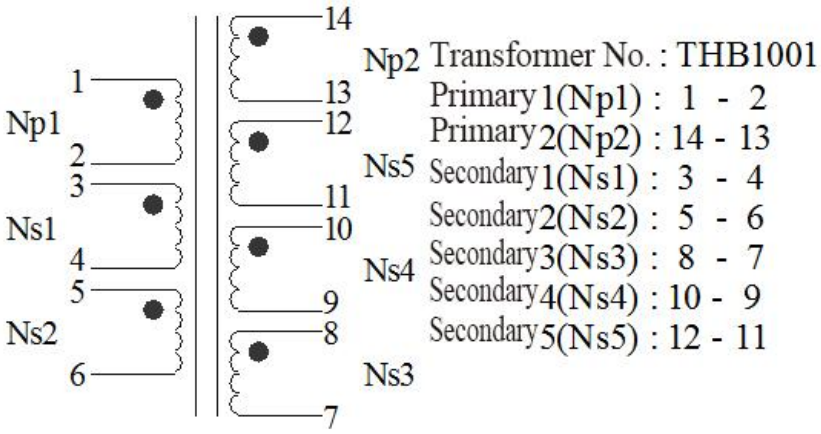


Pic750

This page is used to set the low limit of the short pin. When the test result is smaller than the low limit, the test result is not good.

7.12.9.2 PS Test Pin Setup Page

This page is used to set the shorted pins. In the process of auto scanning test, the instrument will test DCR of each set pin and make comparison with the PS low limit set on PS limit setup page.
The following figure shows the example transformer and its setup page of pin short test.



< PS TEST SETUP >

PRI: A1	TRANSFORMER		FIXTURE	
PHASING	+	-	+	-
SHORT 1	001	002	---	---
SHORT 2	---	---	---	---
SHORT 3	---	---	---	---
SHORT 4	---	---	---	---
SHORT 5	---	---	---	---
SHORT 6	---	---	---	---
SHORT 7	---	---	---	---
SHORT 8	---	---	---	---
SHORT 9	---	---	---	---
SHORT 10	---	---	---	---

Enter value or select

[ ] [PRI : A1] [ ] [ ] [FILE MANAGE] [EXIT]

Pic751

7.12.10Setting BL Test Conditions

On <TEST CONDITION> page, move the cursor to the BL zone.

< TEST CONDITION >

FUNC	FREQ	LEVEL	STATE	SEQ
TURN	1.0000kHz	1.000 V	ON	3
Lx	MULTI	MULTI	ON	2
Lk	1.0000kHz	1.000 V	ON	1
Cx	1.0000kHz	1.000 V	ON	5
Zx	1.0000kHz	1.000 V	ON	8
ACR	1.0000kHz	1.000 V	ON	7
DCR			OFF	4
PS			OFF	6
BAL			ON	9

STEP SEQ: - Lk - Lx - Tr - Cx - ACR - Zx - BAL -

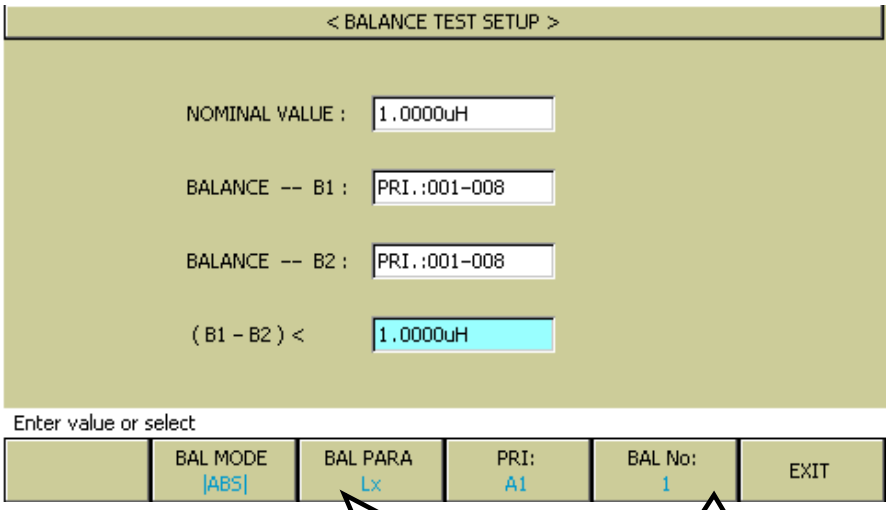
Use softkeys to select

[ ] [ ] [ ] [TEST SETUP] [ ] [ ]

Pic752

7.12.10.1 BL Test Setup Page

BL (balance) is parameter used to compare the conformity of two windings.



Pic753

Press the key to select the BL parameter: Lx, DCR, Lk, Cx, Lk/Lk.

Press the key to switch the BL serial number, the maximum number is 5.

Users can compare Lx, Lk, Cx or DCR BL of two windings.

BL provides three judge modes:

- |**ABS**| When |**L1-L2**| **>High limit value,** it means the result is not good. If this mode is selected, nominal value is only used as the switch of testing compare. (Note: If no nominal values are set, the comparison will not be performed.)
- **%** When (**100% ×|L1-L2| / nominal value**)**>high limit value** it means the result is not good.
- **Lo~Hi** When this mode is selected, **Nom**: ____zone will be changed to **Low Limit**:___, judge method is: when **Low limit value < (L1-L2) < High limit value,** the result is good.

Steps for setting L1, L2 winding pins:

1. Move the cursor to the setting zone of L1, L2 winding pins.
2. press numeric key 0~9, where: 0 means PRI winding, 1 means SEC1 winding, 2 means SEC2 winding.
3. Press **[ENTER]** to confirm.

7.13 <TRANS SCAN TEST>

After all setups finish, select the TRANS SCAN TEST function and then press [DISP] to enter into the <TRANS SCAN TEST>.

Before starting test, user can press [.] key to enter <FILE MANGE> page to save your setup for loading. More details can be referred to <FILE MANAGE> instruction.

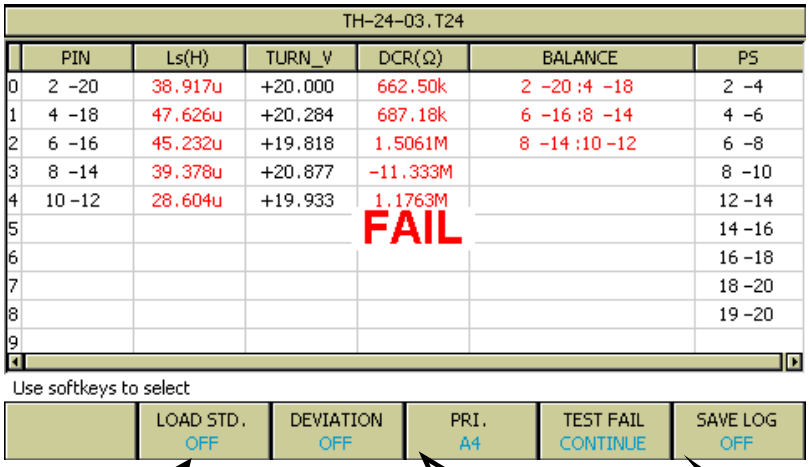
Save the file and return to <TRANS SCAN TEST> page. If user has installed host and scan box, now just put the untested transformer to test fixture and press [START] in scan box to start scanning, and the test value is displayed on LCD screen, when the test result is bad, the value is displayed in red color.

The instrument displays the scan data and PASS/FAIL according to **SCAN RESULT DISP:** on

<Transformer ID> page.

In scanning, if some pins of Lx or Zx sets DC bias current, the instrument would add corresponding DC bias current automatically, and [BIAS] key will be lighted.

Note: I f user does not install DC bias current board, the instrument would display "NO BIAS CARD", and [BIAS] will not light up.



Pic754

Press the key to switch as ON, the next test value will be changed to formal nominal value.

In multi-group primary winding, press the key to switch the test reading of each primary winding.

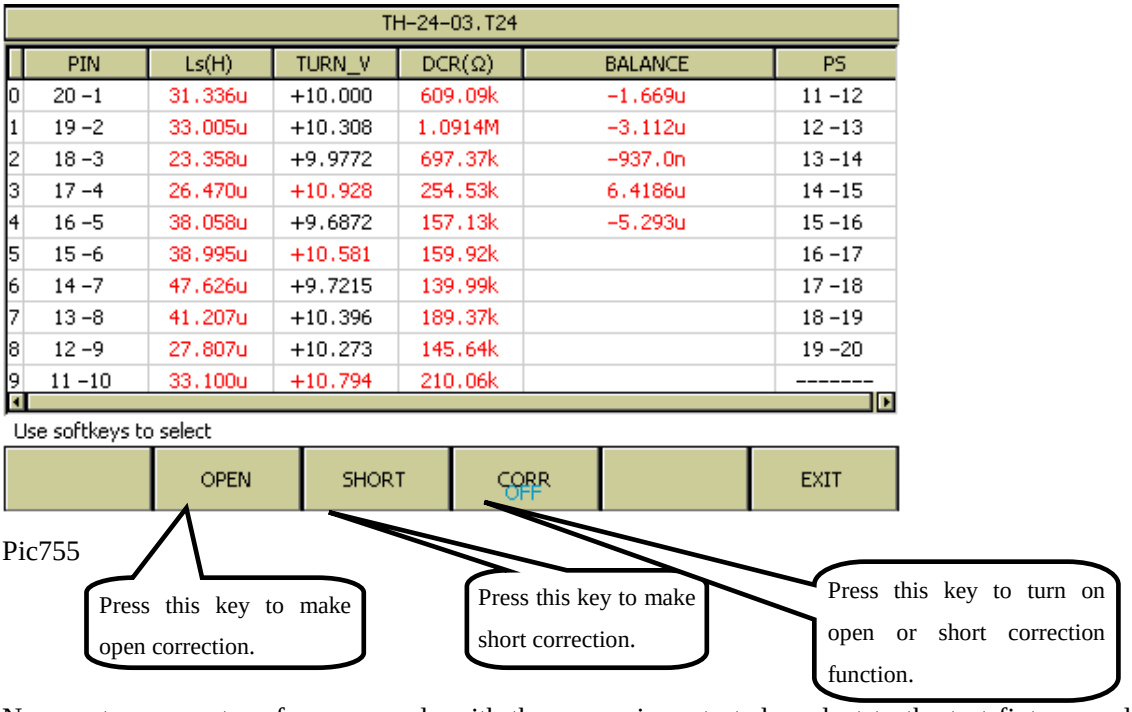
Press the key to switch (STOP) or (Continue) once to check a bad product.

7.13.1 Display Zone

- **ID** It displays the current transformer No. and storing time, the number is the one set on <Transformer No.>
- **P** The polarity of TURN is displayed in the bottom zone of this page, where "+" means the winding has the same phase with primary winding, "-" means the winding has the opporsite phase with primary winding.
- **BALANCE** The right zone displays if the balance is qualified, N means not good, and Y means pass. There are 5 groups of balance at most.
- **PS** The zone displays short pin test judge, if one group of 00~10 is displayed with highlighting mode, it means the corresponding pin is not good.
- **PIN** The zone displays the pin of each winding. In Cx or Lk, only the first pin position is displayed.
- **Results display Lx, Q, ACR, TURN, ZX, DCR, Cx, LK**
  Use the left and right arrow keys to view all parameters.

7.13.2 Function Key

- **[TRIGGER]** Being used to startup the instrument to perform the scanning test.
- **[RESET]** Being used to interrupt the scanning test.
- **[KEYLOCK]** User can still perform other operations after the keyboard is locked, but the parameter setup cannot be modified. Turn off the instrument after the keyboard is locked, the current test file will be loaded next time.
- **[.]** Enter the file manage page.
- **[0]** Turn on the scanning and correction function of the OPEN test fixture, shown as below.



Pic755

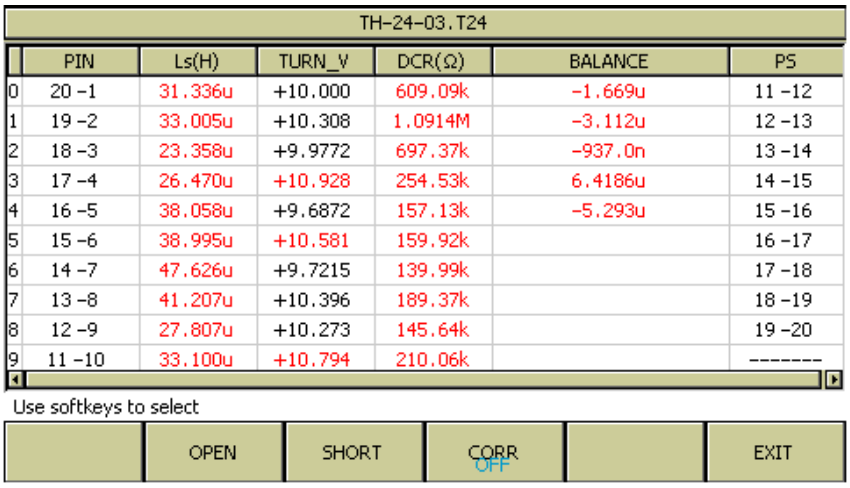
Press this key to make open correction.

Press this key to make short correction.

Press this key to turn on open or short correction function.

Now, put an open transformer sample with the same pin as tested product to the test fixture, and press **OPEN**, then the instrument will perform open scanning correction to the test fixture. The function can improve the test accuracy of small turn-turn capacitance and enlarge inductance (>300mH), OPEN values of DCR and PS as well.

- **[0]** Turn on the scanning and correction function of the SHORT test fixture, shown as below.

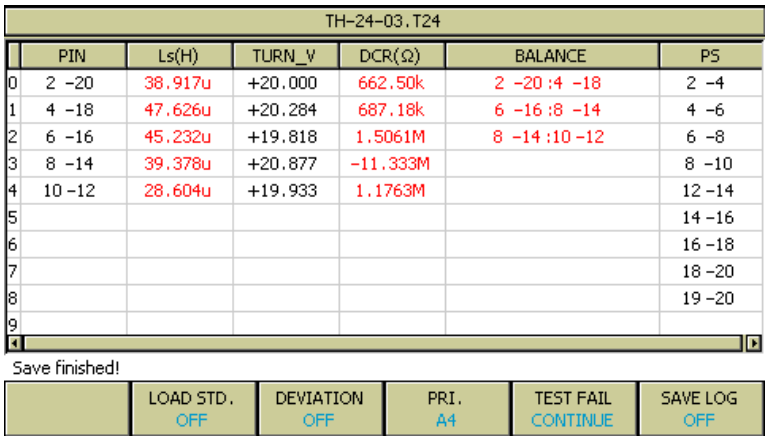


Pic756

Now, put an open transformer sample with the same pin as tested product to the test fixture, and press **SHORT**, then the instrument will perform open scanning correction to the test fixture. The function can improve the test accuracy of small DC resistance and small inductance.

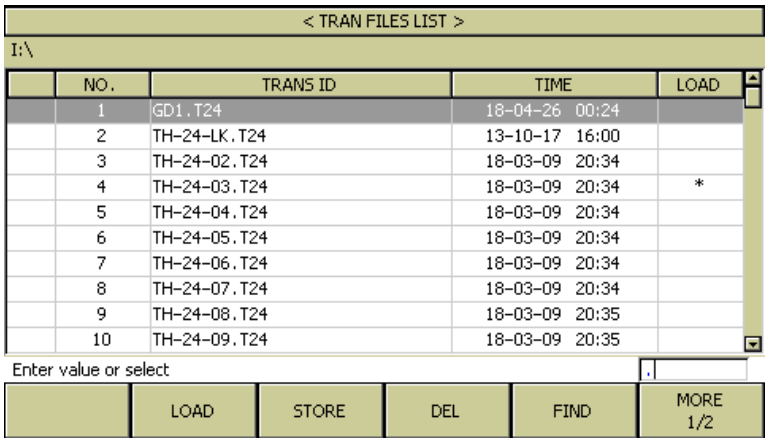
7.13.3 PRI Page-Turning Function

On <TRANS SCAN TEST> page, after finishing testing transformers, user can use the right and the right keys or the knob to change the PRI page. This function brings much convenience for user to view the test results.



Pic757

7.13.4 <FILE MANAGE>



Pic758

7.13.4.1 Transformer Scan Setup File(*.TRS)

Up to 100 groups of different transformer scan setup files can be saved in the internal memory (*.TRS file). 500 different groups of single component setup files can be stored in external U disks. All setup data as below can be saved or loaded in the form of file which is called*.TRS file.

- <Transformer ID>
- <Transformer Pin Setup> and the corresponding sub-pages
- <Transformer Test Condition> and the corresponding sub-pages
- <Transformer Scan Test> and the corresponding sub-pages

7.13.4.2 U-Disk Manage Performance

Just as the description mentioned above, USB HOST interface is a standard configuration of SM6030A, so external U disks can be used as the storage media and can store setup files of 500 groups.

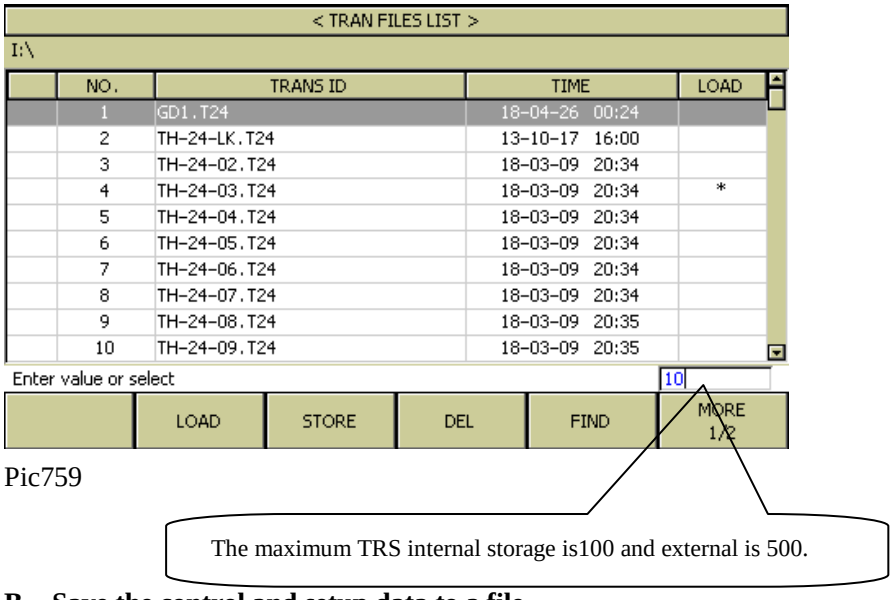
SM6030A supports the following storage devices (U disk):

- Meet the standard of USB 1.0/1.1/2.0
- Capacitance: 32MB/256MB/2GB/4GB
- File format: FAT16, FAT32 (Formatting under Microsoft Windows operation system)

7.13.5 Operation Steps for File Manage

A. Find the existed file

1) Press [↑] [↓] up or down to scroll through them one by one.
2) Use the [←], [→] buttons to scroll through pages.
3) Press the soft key file to search, input the file characters, and then press [ENTER] to find the file name directly.
4) Enter the number and press [ENTER] to jump directly to the page.



Pic759

B. Save the control and setup data to a file.

1) Select and set all control and setup parameters on specific page.

2) Press the soft key **File Manage**, the following soft keys will be displayed.

- **LOAD**
- **STORE**

- **DELETE**
- **FIND**
- **More 1/2**
- **COPEY E:**
- **EXT. FILE**
- **More 2/2**

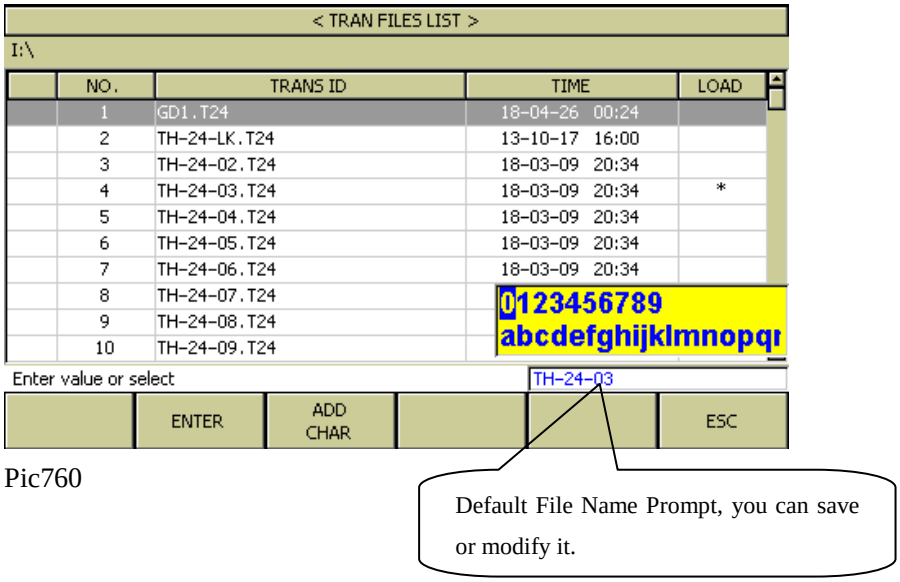
3) In file list, move the cursor to the location where the file will be saved. Another method is to input the file name directly.

4) Press the **STORE** soft key, the following soft keys will be displayed.

- **Yes**
- **No**

5) If **No** is selected, the save operation will be cancelled and return to Step 2)

6) If **Yes** is selected, SM6030A will have the default transformer name as the file name prompt to save, you can directly press the enter key to save the current control setting parameters, or use [←] to re-edit the file name to save.



Pic760

7) Press **Exit** to return to the current display page.

C. Load a File

1) Press the soft key File Manage, the following soft keys will be displayed.

- **LOAD**
- **STORE**
- **DELETE**
- **FIND**
- **MORE 1/2**

In file list, move the cursor to the file required to be load. Or input the file name directly.

2) Press the soft key **Load**, the following soft keys will be displayed.

- **Yes**
- **No**

3) If **No** is selected, the current load operation will be cancelled and return to step 1).

4) If **Yes** is selected, the selected file will be loaded. Then SM6030A will return to the current displayed page.

D. Copy a File

1) Supposing the file is required to be copied to the external memory.

2) Press the soft key File Manage, the following soft keys will be displayed.

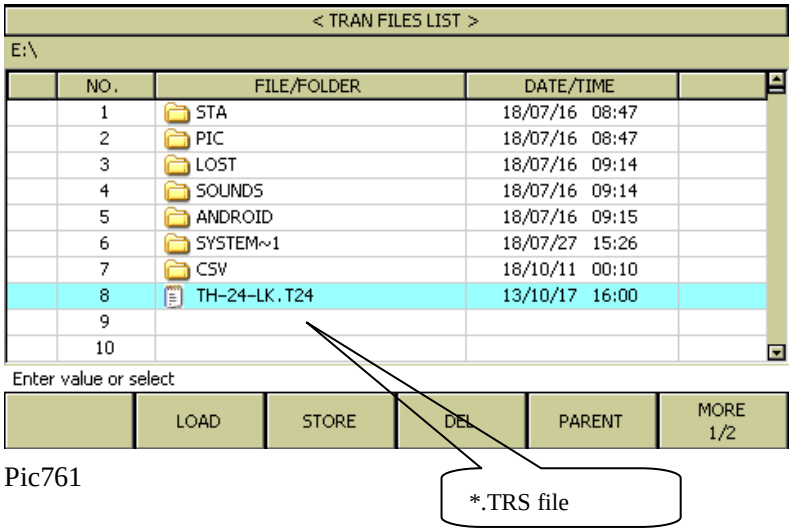
- **COPEY E:**
- **EXT. FILE**
- **MORE 2/2**

3) Move the cursor to the file required to be copied and press [ENTER] to select.

4) Press **COPEY E:** to copy the file to the external memory of the instrument.

7.13.6 Stored File of SM6030A

Except *.T24 files, SM6030A can also support *.TRS files used on SM6030A.

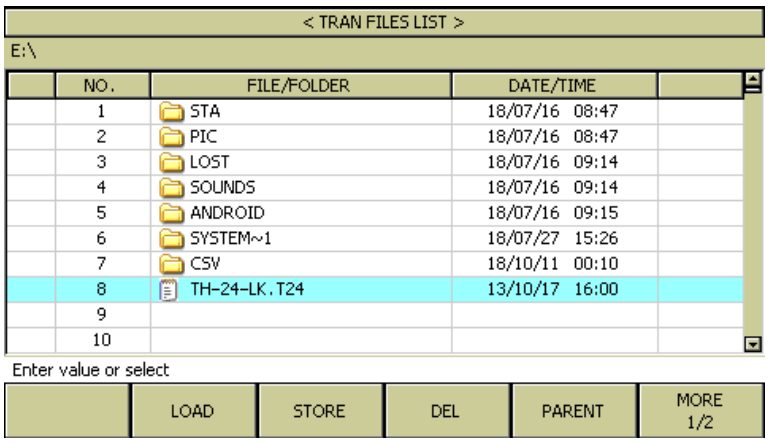


Pic761

7.13.7 Compatibility of Stored Files

Files stored on 2818X, 2819X, 2829X can be directly used on SM6030A.

Files stored on SM6030A whose file name is over 40 can be directly used on 2818X and 2819X.



Pic762

Note: Ensure the U disk you are using meets the standard mentioned above and has not been write-protected.

7.13.8 Transformer Deviation-Deduction

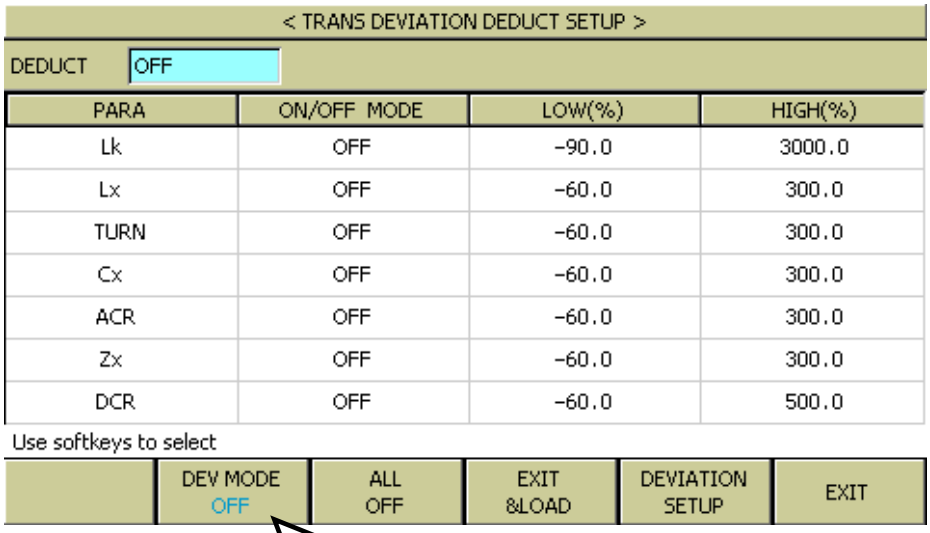
If user has the standard samples of untested transformer, and its data of each test can serve as the measurement standard, the deviation-deduction function is available.

The operation of deviation function is listed as below:

1. According to the set method, enter<SCAN TEST> page after setting parameter.

2. Put standard transformer to test fixture and lock it, press [START] in scan box or foot switch for several times to get a stable test value;

3. Press [DEVITION OFF] to enter <TRANS DEVIATION DEDUCT SETUP> page; the figure is as below:



Pic763

Press the key to turn ON/OFF of the deviation function. When in the parameter setup zone, press the key to switch between SUB and DIV modes or OFF, which is suitable for different distribution parameter.

4. Set [DEDUCT] as ON;

5. Set the correction parameter switch as ON; And set the deduction mode of the corresponding parameter;

6. Set the high and low limits allowed for deduction of each parameter.

< TRANS DEVIATION SETUP >

	PIN	Lx(DIV)	Q(DIV)	TURN(SUB)	Cp(SUB)	D(SUB)	LK(DIV)
0	001-008	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	002-007	1.0000	1.0000	1.0000			1.0000
2	003-006	1.0000	1.0000	1.0000			1.0000
3	004-005	1.0000	1.0000	1.0000			1.0000
4							
5							
6							
7							
8							
9							

Enter value or select

	DEFAULT SETTING		PRI: A1		EXIT

Pic764

7.Press [DEDUCT] to perform correction and back to <SCAN TEST> page.

TH-24-03.T24

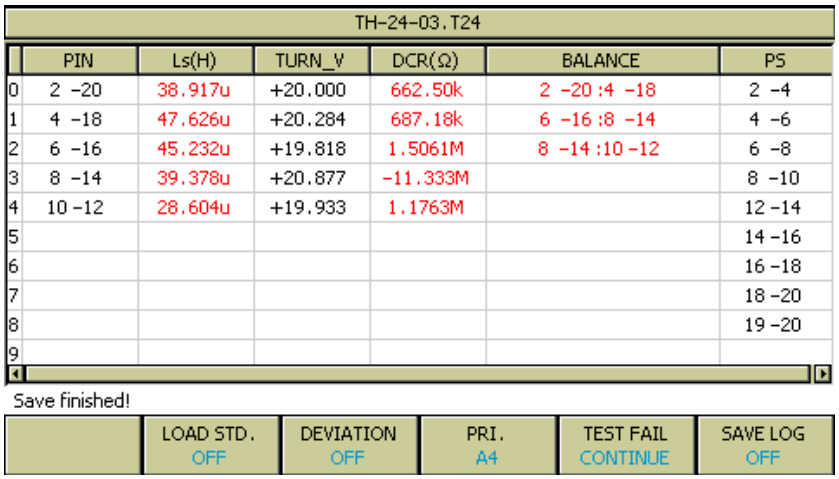
	PIN	Ls(H)	TURN_V	DCR(Ω)	BALANCE	PS
0	2 -20	38.917u	+20.000	662.50k	2 -20 :4 -18	2 -4
1	4 -18	47.626u	+20.284	687.18k	6 -16 :8 -14	4 -6
2	6 -16	45.232u	+19.818	1.5061M	8 -14 :10 -12	6 -8
3	8 -14	39.378u	+20.877	-11.333M		8 -10
4	10 -12	28.604u	+19.933	1.1763M		12 -14
5						14 -16
6						16 -18
7						18 -20
8						19 -20
9						

Save finished!

	LOAD STD. OFF	DEVIATION OFF	PRI. A4	TEST FAIL CONTINUE	SAVE LOG OFF

Pic765

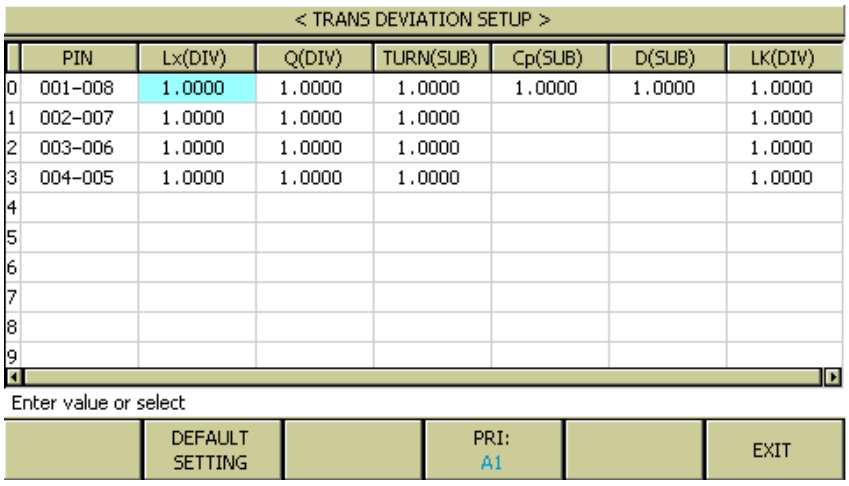
When <TRANS ID> displays **Ignore Nom: SKP TEST LIMITED DEV,** the deduction can't be succeeded due to the deviation between test value and nominal value is too large; now user has to check the contact if reliable or the standard sample is correct.



Pic766

8. After deduction finishes, user press [START], the test value is displayed same as standard value.

9. If the deviation value needs to be viewed, enter into the <TRANS DEVIATION DEDUCT SETUP> page and select <DEVIATION SETUP> key to enter into the setup page of the deviation value.



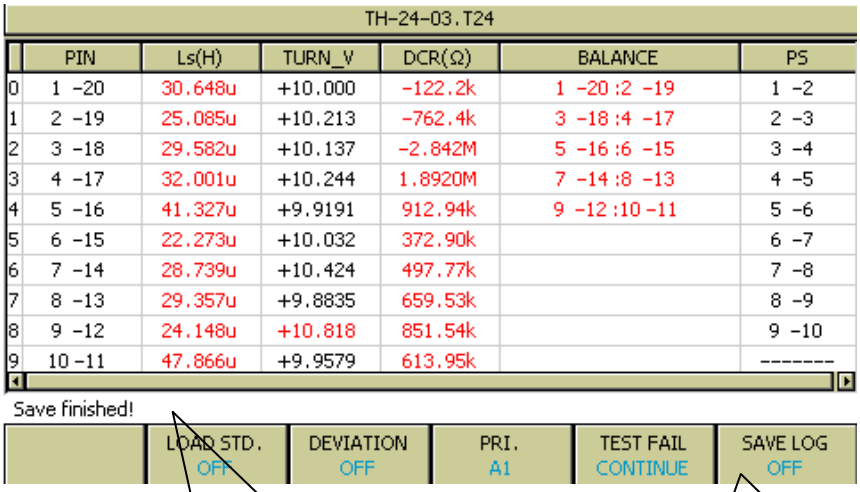
Pic767

NOTE: the initial value of the DIV value and SUB value are all 1. If SUB is selected, DEVIATION SETUP can be entered. Press CLEAR ALL key to restores default value 0.

When modifying the DIV value, it cannot be revised as 0.

10. If deviation value needs storing, press numeric key "." to enter file manage page, then save the file according to prompt information for the next use.

7.13.9 Save Scan Test Results by U Disk



Pic768

E:\CSV is the saving path, while **1225_001.CSV** is the saved file, and **#00003** is the saving times.

Save the data on this page.

The saved data format is as follow:

SN: serial number of the instrument

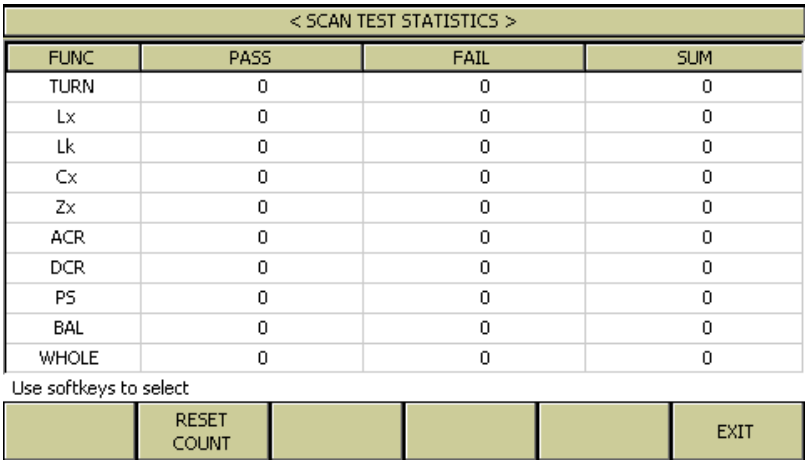
TRS ID: name of the instrument

Date: date

No. (number of times) Func (parameter Lx, TURN.....) Index (primary and secondary) Pins (pin) Result (result) Min (lower limit) Max (upper limit) Comp (judge) Time (time) Status (total judge)

7.14 Statistic Page of Transformer Scan Test

On <TRANSFORMER ID> page, press STAT to enter into the <SCAN TEST STATISTICS> page.



Pic769

- **[Pass]** It means the pass times of L.K.~DCR parameter, which is pass count value;
- **[Pass] + [Total]**: in one test, all test parameters in L.K.~DCR are qualified, then the value of

total column will add by 1.

- **[Fail]** It means fail count value of L.K.~DCR each parameter;
- **[Fail] + [Total]**: in one test, one or one more parameter of L.K.~DCR is unqualified, then the value of total column will add by 1.
- **[Sum]** It means the total test times of one parameter;
- **[Sum] + [Total]** it means the total test times, which is equal to total pass times + total fail times.

7.14.1 Reset Statistic Count Value

Press the soft key RESET COUNT to reset all data on the <SCAN TEST STATISTICS> page.

7.15 Frequently asked questions and answers in transformer scan test

7.15.1 High & Low Limits

In test, if you find the test value of transformer is obviously and seriously unqualified, but the judge table still displays that the parameter is qualified.
Reason: User only sets standard value (STD) but not the high/low limit or just set one of high/low limit value.
Solution: Set high and low limits.

7.15.2 Measurement item loss

In the process of test, user finds some parameter such as (Lx) is set to be tested, but the parameter is not tested and no data displays.
Reason：user only sets ON/OFF as ON, but does not set standard value on parameter set menu, and meanwhile, "Ignore std test" is set as OFF on [Transformer ID].
Solution：
1. Set "Ignore std." as ON.
2. Set standard value on parameter limit setup menu.

7.15.3 Measurement Interruption

In the process of test, user finds the instrument only tests the test parameter in the first several groups of value, but the last ones has not been tested.
Reason 1: When setting pin position, user only sets the first groups of pins, but does not set one or more group of pin in the middle, and then the left groups will not be set in the process of test.
Reason 2: On [Scan test], user sets (TEST FAIL:———) as STOP, so in test when some parameters are unqualified, then the test will not be performed.
Solution: set (TEST FAIL) as Continue, meanwhile, reset the blank pin on parameter limit setup

menu or set “Ignore Std.” as ON.

7.15.4 Poor DCR Accuracy

If the sheet metal is oxygenized, tore and defaced, or user makes a fixture without applying 4-cable test method, it will cause the deviation of DCR.

Solution:

1. Keep the sheet metal being new, so it can contact with transformer pin well.
2. Use 4-cable measurement. Refer to User-made test fixture
3. Use deviation deduction.

7.15.5 Poor Lk Accuracy

If the sheet metal is oxygenized, tore and defaced, or the lead resistance of user-made test fixture is too large. It will cause the deviation when testing Lk.

Solution:

1. Keep the sheet metal being new, so it can contact with transformer pin well.
2. Use 4-cable measurement. Refer to User-made test fixture
3. Use deviation deduction.

7.15.6 Inaccurate Turn

For transformers with low magnetic permeability magnetic-core, the number of winding is not the same with that of real winding because the inductor will take some ACR voltage.

Resolution:

Use the TURN mode to test winding.

7.15.7 Unstable Turn

For the transformer with high magnetic permeability magnetic-core, test winding will be unstable.

Solution:

1. Use the TURN-v mode to test winding (voltage-turn mode).
2. Use deviation deduction.

7.15.8 Difference between the first and the second Lx

Because the transformer, with high magnetic permeability magnetic-core, is polarized in the test of DCR or TURN, the test results of the first and the second Lx test will be quite different.

Solution:

Use the 100Ω internal resistance in the test of TURN or DCR.

7.15.9 Poor Stability of Cx and Zx Open Test Data

If the shielding and ground of test system is not good, it will cause the test value unstable when testing Cx or Zx.

Solution:

Through a thick metal lead, connect ground poles of the instrument and the scan box as well as the metal frame of the test fixture together and ground it reliably.

7.15.10DCR and PS Open Cannot Reach Infinite Large

Due to the existence of circuit distribution parameter, so the infinite large cannot be displayed when testing DCR or PS open, it is a normal phenomenon, if user wants to display it, execute the sweep open correction function on the test fixture.

7.16 User-made Test Fixture

There are many kinds of transformers, so our company can't offer a test fixture to each transformer, which requires user to make a test fixture according to some principles. The followings are caution items of making test fixture:

1. Use 4-cable measurement method to extend test cable. Don't use 5.0mm test fixture to hold test lead.

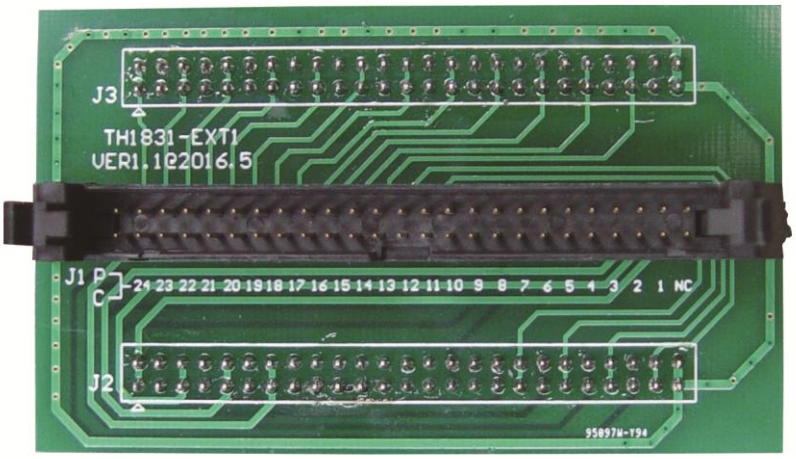
2. Use multi-strand lacquer cable with good tenacity to be the test extension cable. And use the stands as much as possible to reduce the resistance of cable.

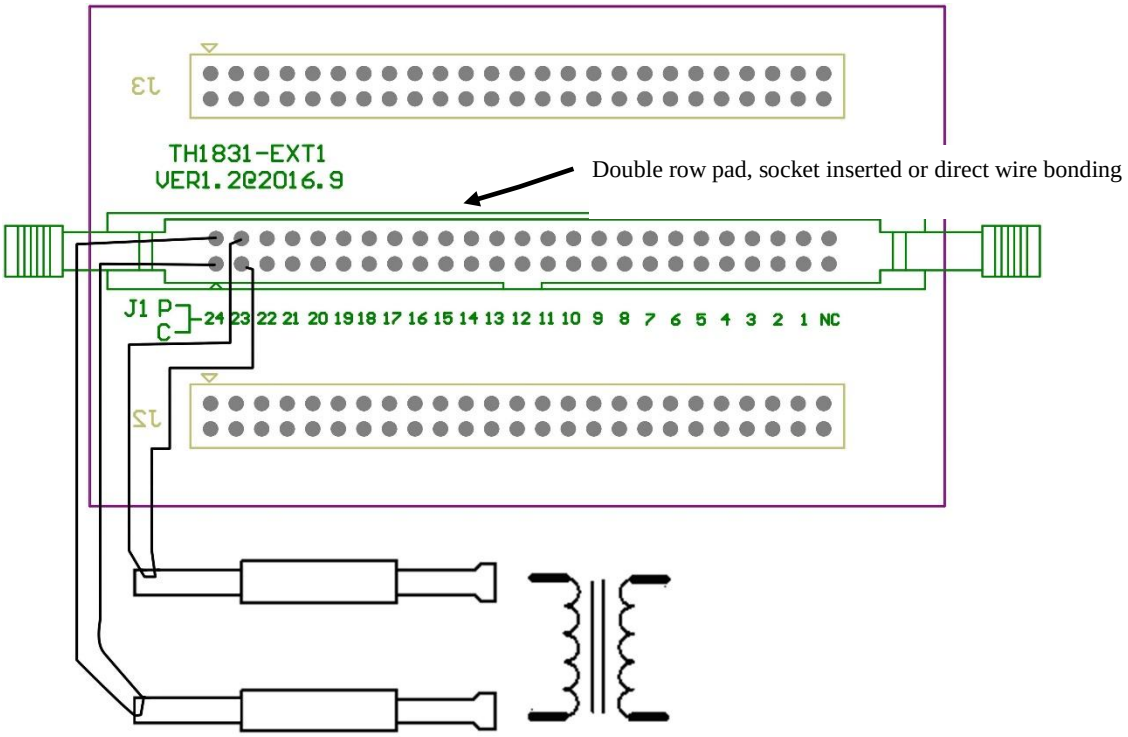
3. If high frequency testing is used, the distribution parameters between the extension cables should be minimized and the cable should not be used for extension.

4. It is better to use metal frame which is connected to ground pole through a thick metal lead.

7.16.1 Use 1831-EXT1 to Make Test Fixture

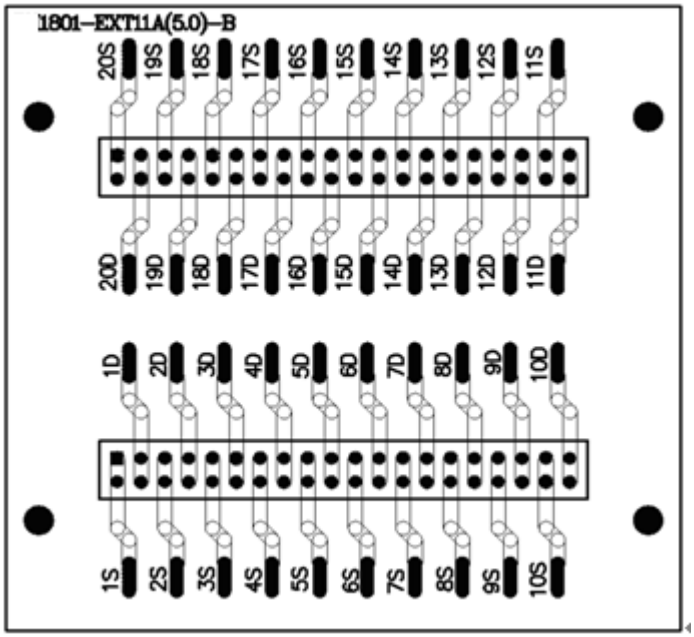
User should buy the 1831-EXT1 extension ground board from our company. The figure below also shows the connection of using 2 spring thimble to make test probe.





The theory of 4-cable measurement is the test cable of DRIVE and SENSE should be divided. In this figure, 1D means the drive terminal of pin1, 1S means sense terminal of pin1.

7.16.2 Example of using 1801-EXT11A(5.0)-B pin signal



The theory of 4-cable measurement is the test cable of DRIVE and SENSE should be divided. In this figure 1D means the drive terminal of pin1, 1S means sense terminal of pin 1.

7.17 Self-check Function of Scanner Relay

7.17.1 Operation steps for scan self-check

1. Remove all fixtures on scan box, leave the box as below.

2. Connect scan box and instrument correctly.

3. Enter self-check figure to perform scan self-check, as the figure below:

< SCANNER SELF TEST >

No.	Hc	Hp	Lc	Lp	ST	No.	Hc	Hp	Lc	Lp	ST
01						13					
02						14					
03						15					
04						16					
05						17					
06						18					
07						19					
08						20					
09						21					
10						22					
11						23					
12						24					

Use softkeys to select

	SCAN				EXIT

Pic770

Press the key to start scan test.

Press the key to stop scanning. Quit when scanning stops.

7.17.2 Displayed Information on Screen

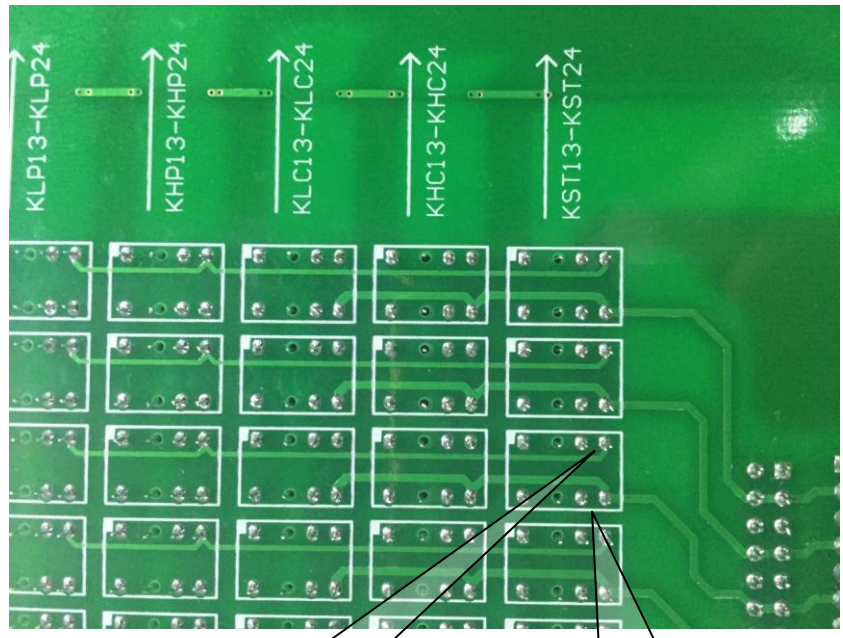
- **OP:** Open, the relay is not closed when it is controlled.
- **ST:** Short, the relay is closed when it is controlled.
- **OK:** OK, the relay works normally.
- **DR:** DR, the relay works abnormally.

The unfavorable condition of scan box circuit and relay is very complicated, so the instrument cannot figure out the unfavorable condition of each relay completely, and then user can solve the problems according to the hints and the rules.

1. ST doesn't mean the relay is short certainly, because ST condition can be tested without charge, then user can remove the relay and use multimeter to test. The resistance of ST may be several hundred kilo ohms, or even several mega ohms, not necessarily a few ohms.

2. When one of SH, SL, ST displays as OP, if HcHp is displayed as OP, then it maybe a miscarriage, so user has to change the relay on HcHp terminal, and scan self-check again.

7.17.3 Detection Method for Relay Short



Pic771

Resistance should be bigger than 10 MΩ without charge.

Resistance should be bigger than 10 MΩ without charge.

7.18 RELAYS ACT COUNT

7.18.1 View Steps of Scan Box for <RELAYS ACT COUNT>

1. The scan box should be properly connected to the SM6030A in order to see the number of relay actions.
2. On <TOOLS> Page, press More 1/2 to enter the 2nd page, press <RELAYS ACT DOUNT> to check
3. Enter the scan box <RELAYS ACT DOUNT> interface. As shown below:

< RELAYS ACT COUNT >

No.	ST	HP	HC	LP	LC
01	0	0	0	0	0
02	0	0	0	0	0
03	0	0	0	0	0
04	0	0	0	0	0
05	0	0	0	0	0
06	0	0	0	0	0
07	0	0	0	0	0
08	0	0	0	0	0
09	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	0	0	0

Use softkeys to select

	PREV PAGE	NEXT PAGE			EXIT

Pic772

7.18.2 Screen Display Information Description

- **ST**：Short relay act count
- **HP**：HP terminal relay act count
- **HC**：HC terminal relay act count
- **LP**：LP terminal relay act count
- **LC**：LC terminal relay act count

Chapter 8 Performance and Test

8.1 Test Function

8.1.1 Parameter and Symbol

C：capacitance　　L：Inductance
R：resistance　　Z：impedance　　Y：admittance
X：reactance　　B：susceptance　　G：conductance
D：dissipation　　θ：phase angle　　Q：quality factor

Lk: leakage inductance　　DCR: DC resistance　　Turn-Ratio
Turns　　Phase

8.1.2 Test combination

Parameters described above are combined in the following modes:

Primary parameter	Z, Y	L, C	R	G
Secondary parameter	θ(deg phase), θ(rad radian)	D, Q, RS, RP, G	X	B

There is no combination for DCR.
Turns-Ratio, Turns and Phase are only used in transformer measurement.

8.1.3 Mathematical Operation

Operation between the measurement value and the programmable nominal value: absolute deviation ΔABS and percent deviation Δ%.

8.1.4 Equivalent mode

Series and parallel

8.1.5 Range

Auto, Manual (Hold, increase and decrease)

8.1.6 Trigger

Internal, external and manual
Internal: Test DUT constantly and display the result
Manual: Press TRIGGER to test once then the result will be displayed.
External: After HANDLER receiving “start” signal, perform a measurement and output test result.

8.1.7 Delay time

Delay time: time from trigger to start. 0 to 60s are programmable with a resolution of 1ms.

8.1.8 Connection modes of test terminals

SM6030A adopts 4-terminal test method.
HD (Hcur): current sample high terminal
LD (Lcur): Current sample low terminal
HS (Hpot): voltage sample high terminal
LS (Lpot): Voltage sample low terminal

8.1.9 Test speed (Frequency>=10kHz)

Fast：about 75 times/s（13ms/time）
Medium：about 12 times/s（83ms/time）
Slow：about 6 times/s（167ms/time）
The fast and middle speed will be slow down when frequency <10kHz.

8.1.10 Average

Be programmable from 1 to 255.

8.1.11 Display digit

6 digits, max. displayed digit: 999999

8.2 Test signal

8.2.1 Test signal frequency

Test signal is sine wave, accuracy: 0.01%
Frequency range: 20Hz～200kHz
Min. resolution: 0.01Hz

8.2.2 Signal mode

Normal: When testing, on measurement display page, voltage across test terminals may be smaller than preset voltage.
Constant level: The auto adjustment of internal level makes the voltage of DUT accordant with preset voltage.

8.2.3 Test signal level

	Mode	Range	Accuracy	Resolution
Voltage	Normal Constant Level	$10mV_{RMS}$ ~ $2V_{RMS}$ $10mV_{RMS}$ ~ $1V_{RMS}$	±(10%×preset value+2mV) ±(6%×preset value+2mV)	100μV
Current	Normal Constant Current	$5O\mu A_{RMS}$ ~$100mA_{RMS}$ $100\mu A_{RMS}$ ~ $50mA_{RMS}$	±(10%×preset value+$10\mu A_{RMS}$) ±(6%×preset value+$10\mu A_{RMS}$)	1μA

When testing Turns Ratio, Phase, the voltage range is:
5mVRMS—10VRMS, ±(10%×preset value+2mV), with resolution of 1mV.

8.2.4 Output impedance

30Ω and 100Ω ±2% are selectable.

8.2.5 Monitor for test signal level

Mode	Range	Accuracy
Voltage	$5mV_{RMS}$—$2V_{RMS}$ $0.01mV_{RMS}$—$5mV_{RMS}$	±（3%×reading+0.5mV） ±（12%×reading +0.1mV）
Current	$50\mu A_{RMS}$—$20mA_{RMS}$ $0.001\mu A_{RMS}$—$10\mu A_{RMS}$	±（3%×reading +5μA） ±（12%×reading +1μA）

8.2.6 Maximum measurement display range

Parameters	Measurement display range
L、Lk	0.00001μH ～ 99.9999kH
C	0.00001pF ～ 9.99999F
Z、R、X、DCR	0.00001Ω～ 99.9999MΩ
Y、B、G	0.00001μs ～ 99.9999S
D	0.00001 — 9.99999
Q	0.00001 — 99999.9
θ	Deg -179.999°～179.999° Rad -3.14159 ～ 3.14159
Turns Ratio	1：0.001—1000：1

8.2.7 DC bias voltage source

100Ω	0V—±5V	Minimum resolution: .05mV,
		Accuracy: 1% x preset voltage+5mV
	0mA—±50mA	Minimum resolution: 5μA
30Ω	0V—±3V	Minimum resolution: 0.5mV,
		Accuracy: 1% x preset voltage+5mV
	0mA—±100mA	Minimum resolution: 5μA

8.3 Measurement accuracy

Test accuracy includes stability, temperature coefficient, linear degree, test repeatability and calibration inter-error.

Check the accuracy of instrument should be under the following circumstances:

a. warm-up time:≥ 30 min
b. cable: 0m, 1m
c. correct open and short correction after warming up
d. DC bias is in the position of "OFF"
e. The range works in "AUTO" to select correct test range

8.3.1 Accuracies of │Z│, │Y│, L, C, R, X, G, B

The accuracy Ae of │Z│, │Y│, L, C, R, X, G and B are expressed as:

$$\mathbf{A_e = \pm[A_L \times A + (K_a + K_b + K_c) \times 100 + K_d + K_f] \times K_e [\%]}$$

A： basic test accuracy（figure A）

A_L: level correction factor（table A）

K_a：impedance rate factor（table B）

K_b：impedance rate factor（table B）

K_c：calibrated interpolating factor（table E）

K_d：cable length factor

K_e：temperature factor（table G）

K_f：scan fixture modification factor（no adding：$K_f = 0$, adding：$K_f = 0.2$）

Using condition of L, C, X, B accuracy A_e：D_x（test value of D）≤0.1

Using condition of R, G accuracy A_e：Q_x（test value of Q）≤0.1

When D_x≥0.1, accuracy factor A_e of L, C, X, B should be multiplied by $\sqrt{1+D_x^2}$

When Q_x≥0.1, accuracy factor A_e of R, G should be multiplied by $\sqrt{1+Q_x^2}$

8.3.2 Accuracy of D

The accuracy of D is given by D_e:

$$D_e = \pm \frac{A_e}{100}$$

The formula is only available when $D_x \leq 0.1$.

When $D_x > 0.1$, D_e should be multiplied by $(1+D_x)$

8.3.3 Accuracy of Q

The accuracy of Q is given by the formula below:

$$Q_e = \pm \frac{Q_x^2 \times D_e}{1 \mp Q_x \times D_e}$$

Where, Q_x is the value of the tested Q.

D_e is the accuracy of D

Above formula should be used when $Q_x \times D_e < 1$.

8.3.4 Accuracy of θ

The accuracy of **θ** is given by the formula below:

$$\boldsymbol{\theta e} = \frac{180}{\pi} \times \frac{A_e}{100} \quad \text{[deg]}$$

8.3.5 Accuracy of G

When D_x (tested value of D) ≤ 0.1

The accuracy of G is given by the formula below:

$$G_e = B_x \times D_e \quad \text{[S]}$$

$$B_x = 2\pi f C_x = \frac{1}{2\pi f L_x}$$

Where,

B_x is the value of tested B with the unit [S].

C_x is the value of tested C with the unit [F].

L_x is the value of tested L with the unit [H].

D_e is the accuracy of D.

F is test frequency.

8.3.6 Accuracy of Rp

When D_x (value of tested D) ≤ 0.1

The accuracy of R_p is given by the formula below:

$$R_p = \pm \frac{R_{px} \times D_e}{D_x \mp D_e} \quad [\Omega]$$

Where,

R_{px} is the value of tested R_p with the unit [S].

D_x is the value of test D with the unit [F].
D_e is the accuracy of D.

8.3.7 The accuracy of Rs

When D_x (value of tested D) ≤ 0.1
The accuracy of R_s is given by the formula below:

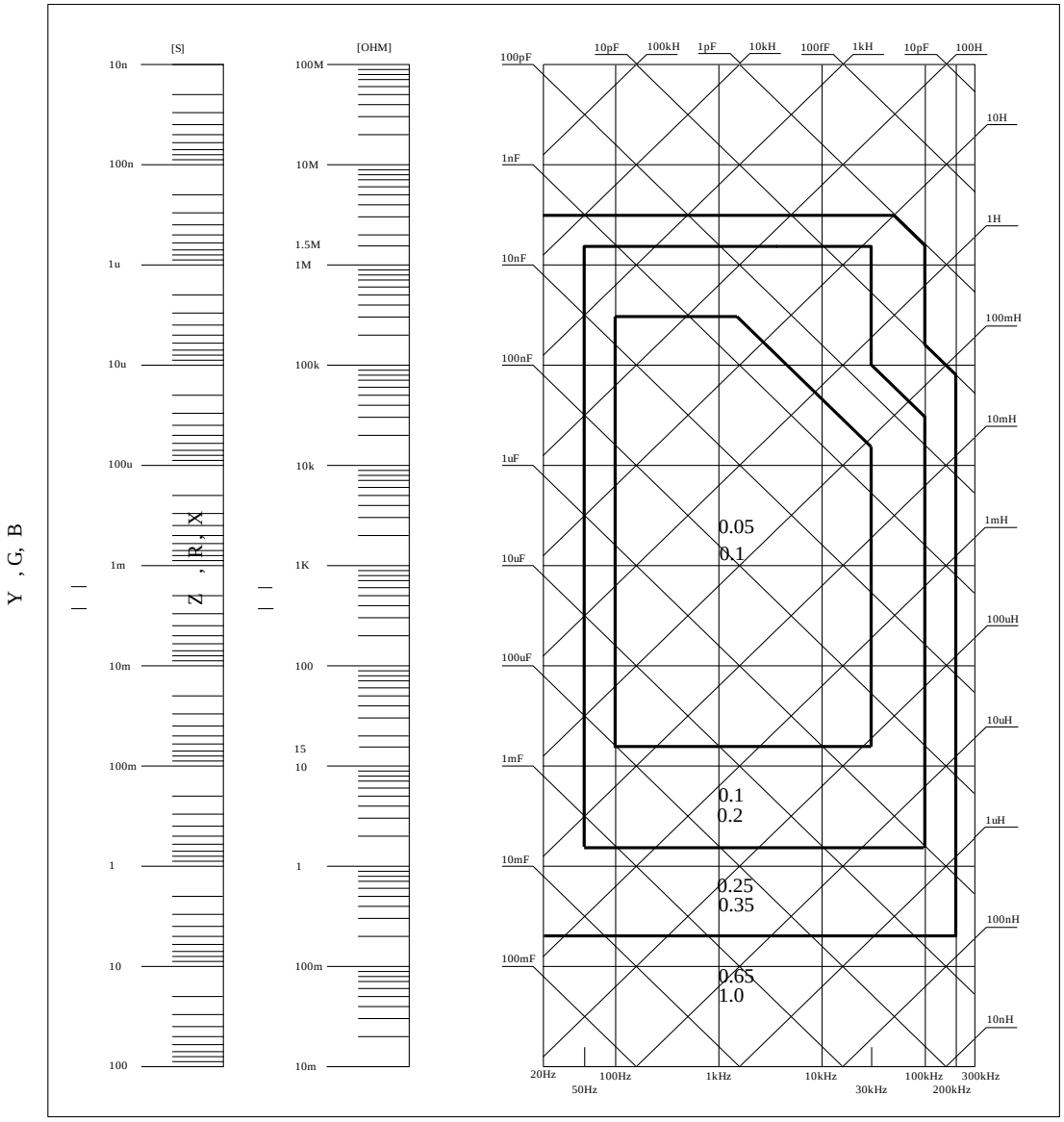
$$R_{se} = X_x \times D_e \qquad [\Omega]$$

$$X_x = 2\pi f L_x = \frac{1}{2\pi f C_x}$$

Where,
X_x is the value of test X with the unit [S].
C_x is the value of test C with the unit [F].
L_x is the value of test L with the unit [H].
D_e is the accuracy of D
F is test frequency

8.3.8 Accuracy factor

Figure A Basic measurement accuracy factor



In figure A, on the boundary line, choose a smaller value.

The basic measurement accuracy factor A can be obtained by the following methods:

0.1----When 0.4Vrms≤Vs≤1.2Vrms, test speed is the A value of medium, slow, fast

0.1 ----When 0.4Vrms≤Vs≤1.2Vrms, test speed is A value.

When $V_s<0.4V_{rms}$ or $V_s>1.2V_{rms,}$ the A value is calculated as: selected A according to the current measurement speed, select the accuracy correction coefficient Ar according to the current test signal voltage (see Figure B), and A is multiplied by Ar to obtain the current basic measurement accuracy A. Where, Vs is test signal voltage.

Figure B Basic Accuracy Correction Curve

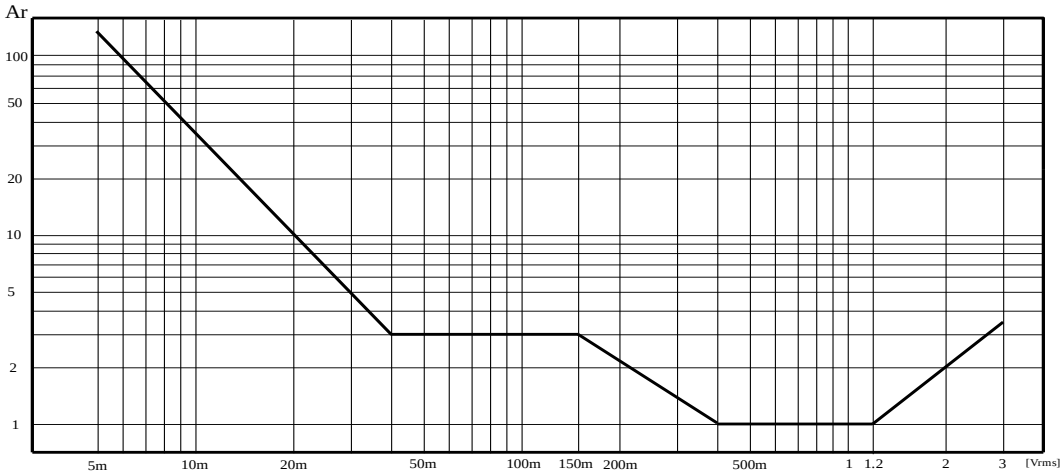


Table A Impedance rate factors: K_a, K_b

Speed	Frequency	K_a	K_b
Medium Slow	$f_m \le 1.2kHz$	$(\frac{1\times10^{-3}}{\lvert Z_m\rvert})(1+\frac{200}{V_s})\sqrt{\frac{100}{f_m}}$	$\lvert Z_m\rvert(0.3\times10^{-9})(1+\frac{70}{V_s})\sqrt{\frac{100}{f_m}}$
	1.2kHz<fm ≤8kHz	$(\frac{1\times10^{-3}}{\lvert Z_m\rvert})(1+\frac{200}{V_s})$	$\lvert Z_m\rvert(1\times10^{-9})(1+\frac{70}{V_s})$
	8kHz<fm ≤150kHz		$\lvert Z_m\rvert(3\times10^{-9})(1+\frac{70}{V_s})$
	150kHz<fm ≤1MHz	$(\frac{1\times10^{-3}}{\lvert Z_m\rvert})(3+\frac{200}{V_s})$	$\lvert Z_m\rvert(10\times10^{-9})(1+\frac{70}{V_s})$
Fast	$f_m \le 1.2kHz$	$(\frac{2.5\times10^{-3}}{\lvert Z_m\rvert})(1+\frac{400}{V_s})\sqrt{\frac{100}{f_m}}$	$\lvert Z_m\rvert(0.6\times10^{-9})(1+\frac{100}{V_s})\sqrt{\frac{100}{f_m}}$
	1.2kHz<fm ≤8kHz	$(\frac{2.5\times10^{-3}}{\lvert Z_m\rvert})(1+\frac{400}{V_s})$	$\lvert Z_m\rvert(2\times10^{-9})(1+\frac{100}{V_s})$
	8kHz<fm ≤150kHz		$\lvert Z_m\rvert(6\times10^{-9})(1+\frac{100}{V_s})$
	150kHz<fm ≤1MHz	$(\frac{2.5\times10^{-3}}{\lvert Z_m\rvert})(2+\frac{400}{V_s})$	$\lvert Z_m\rvert(20\times10^{-9})(1+\frac{100}{V_s})$

Where, f_m is the test frequency and the unit is [Hz].

The unit of the tested impedance is [Ω].

The unit of the test signal voltage is [mV_{rms}].

When the impedance is smaller than 500Ω, K_a, K_b is unavailable.
When the impedance is larger than 500Ω, K_b, K_a is unavailable.

Table B calibrated interpolating factor K_C

Test frequency	K_c
Direct calibrated frequency	0
Other frequency	0.0003

Table C Direct Calibrated frequency

			20	25	30	40	50	60	80	[Hz]
100	120	150	200	250	300	400	500	600	800	[Hz]
1	1.2	1.5	2	2.5	3	4	5	6	8	[kHz]
10	12	15	20	25	30	40	50	60	80	[kHz]
100	120	150	200							[kHz]

Table D Cable length factor K_d

Test signal level	Cable length		
	0m	1m	2m
≤1.5V_{rms}	0	2.5×10^{-4}（$1+50\times f_m$）	5×10^{-4}（$1+50\times f_m$）
>1.5V_{rms}	0	2.5×10^{-3}（$1+16\times f_m$）	5×10^{-3}（$1+50\times f_m$）
f_m: test frequency [MHz]			

When using the scan jig, take the correction factor K_d when the cable length is 2m.

Table E Temperature factor K_e

Temperature（℃）	5		8	18	28	38
K_e	6	4	2	1	2	4

8.3.9 Accuracy of DCR

A $(1+R_x/5M\Omega+16m\Omega/R_x)$[%] ±0.2mΩ
When the instrument is in Middle and slow speed, A=0.25
In Fast speed, A=0.5
Where, R_x is the tested resistance.

8.3.10 Lk Accuracy

Inductance L's accuracy +0.2%

8.3.11 Turns to Ratio accuracy

$\pm A_t \times A_r$（1+1Ω/Zp+1/Q）[%]±0.002
Fast: $A_T = 0.5$
Middle and slow: $A_T = 0.25$
Zp is the impedance of the tested primary inductance
A_r is the test signal accuracy modification value in figure B
The accuracy index is used when the coupling coefficient is 1 or next to 1.

8.4 Safety requirement

The instrument is the Ⅰ class safety instrument.

8.4.1 Insulation resistance

Under reference working condition， the insulation resistance between power terminal and instrument jacket should not be smaller than 50MΩ.
Under humility condition, the insulation resistance between voltage terminal and instrument jacket should not be smaller than 2 MΩ.

8.4.2 Insulation intensity

Under reference working condition, the insulation between the power terminal and the instrument jacket should bear an AC voltage (50Hz frequency and 1.5kV rated voltage) for 1 minute and there is no breakdown and flashover.

8.4.3 Leakage current

The leakage current should not be larger than 3.5mA (AC effective value).

8.5 Electromagnetic compatibility

- Transient sensitivity, based on the requirement of GB6833.4.
- Conductive sensibility, based on the requirement of GB6833.6.
- Radiated interference, based on the requirement of GB6833.10.

8.6 Performance test

8.6.1 Working condition

All tests should be performed under the working condition listed in Chapter 1. In this part, only the main indexes are listed. Users can make test under the specified condition mentioned in this manual. Performance test can be worked in the warm up conditions discussed in Chapter 1.

8.6.2 The used instruments and devices

No.	Instrument and Device		Specification
1	Standard capacitor	100pF	0.02% D is known
		1000pF	
		10000pF	
		10nF	
		0.1uF	
		1uF	
2	AC standard resistor	10Ω	0.02%
		100Ω	
		1kΩ	
		10kΩ	
		100kΩ	
3	DC standard resistor	0.1Ω	0.02%
		1Ω	
		10Ω	
		100Ω	
		1kΩ	
		10kΩ	
		100kΩ	
4	Standard inductor	100μH	0.02%
		1mH	
		10mH	
		100mH	
5	Frequency counter		(0 ~1000)MHz
6	Digital Multimeter		0.5%
7	Insulation resistance meter		500V 10 levels
8	Hipot Tester		0.25kW (0 ~ 500) V

8.6.3 Function check

Ensure function keys, displayer and terminal etc. can work normally.

8.6.4 Test signal level

Adjust multimeter in AC voltage range, where one test cable is connected to H_{CUR} and the other is connected to ground terminal. Change level as: 10mV, 20mV, 100mV, 200mV, 1V, 2V, the reading should meet the demand of test signal level in this chapter.

8.6.5 Frequency

Connect frequency meter to ground terminal. The test terminal of the frequency meter is connected with $H_{CUR.}$ Change the frequency as: 20Hz, 100Hz, 1kHz, 10kHz, 100kHz, 200kHz. The reading of frequency meter should meet the demand of the test signal frequency in this chapter.

8.6.6 Measurement accuracy

Basic parameters are R, L, C and D, so measurement accuracy is mainly about R, L, C and D.

8.6.7 Accuracy of C and D

Function	C_p-D				
Test frequency	100Hz	1kHz	10kHz	100kHz	Test respectively
Level	1V				
Range	AUTO				
Bias	0V				
Speed	Slow				

Open and short correction should be made before testing. Connect standard capacitors: 100pF, 1000pF, 10nF, 0.1uF, 1uF and change the frequency. The error capacitance C between reading and nominal value should be in the range ruled in this chapter, dissipation D should be in the range ruled in this chapter.

8.6.8 Accuracy of L

Test condition:

Function	L_s-Q		
Test frequency	100Hz	1kHz	Test respectively
Level	1V		
Range	AUTO		
Bias	0V		
Speed	Slow		

Open and short correction should be made before testing. Connect standard inductors: 100μH, 1mH, 10mH, 100mH and change the frequency. The error between reading and nominal value should be in the range ruled in this chapter.

8.6.9 Accuracy of Z

Test condition:

Function	Z-θ				
Test frequency	100Hz	1kHz	10kHz	100kHz	Test respectively
Level	1V				
Range	AUTO				
Bias	0V				
Speed	Slow				

Open and short correction should be made before testing. Connect standard AC resistors: 10Ω, 100Ω, 1kΩ, 10kΩ, 100kΩ and change the frequency. The error between reading and nominal value should be in the range ruled in this chapter.

8.6.10 Accuracy of DCR

Test condition

Function	DCR
Test frequency	-----
Level	-----
Range	AUTO
Bias	-----
Speed	Slow

Short correction should be made before testing. Connect standard DC resistors: 0.1Ω, 1Ω, 10Ω, 100Ω, 1kΩ, 10kΩ, 100kΩ. The error between reading and nominal value should be in the range ruled in this chapter.

Chapter 9 Command Reference

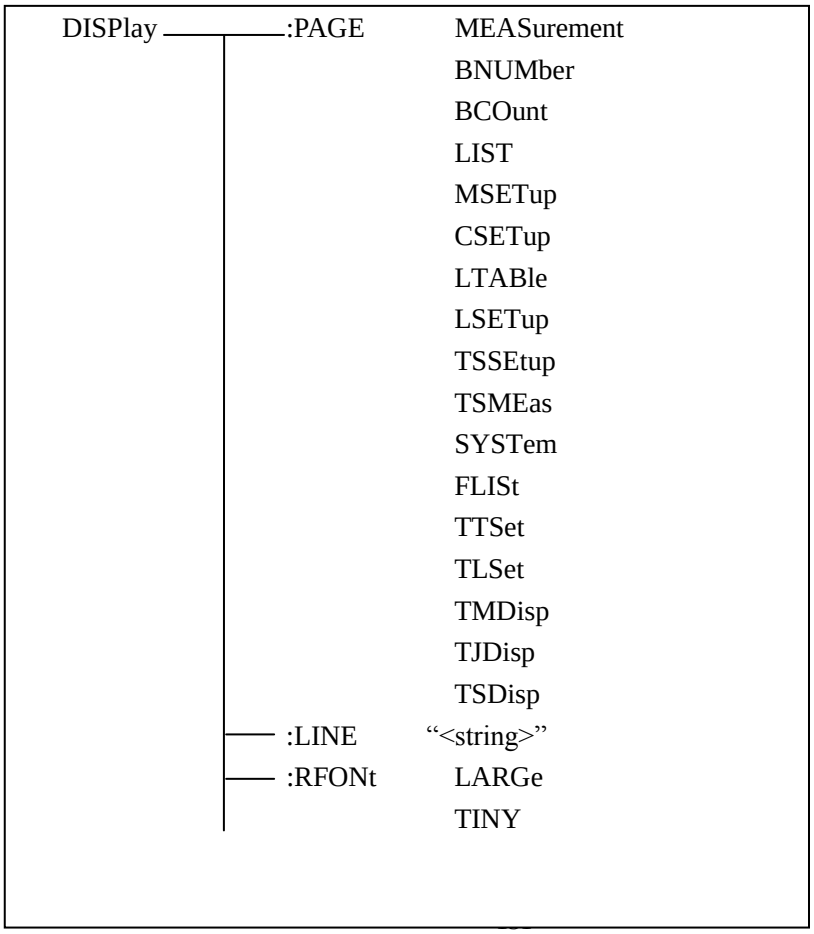
The signs in this manual are as follows:
NR1: integer, e.g.:123
NR2: fix-point number, e.g.: 12.3
NR3: floating-point number, e.g.: 12.3E+5
NL: carriage key, ASCII code: 10 ^END: EOI signal in IEEE-488

9.1 Subsystem commands for SM6030A

●DISPlay	●ORESister	●TRIGger	●CORRection
●FREQuency	●BIAS	●INITiate	●COMParator
●VOLTage	●FUNCtion	●FETCh?	●Mass MEMory
●CURRent	●LIST	●ABORT	●TRAN
●AMPLitude	●APERture	●STATus	

9.1.1 DISPlay subsystem commands

MEASlay subsystem commands are mainly used to set the display page for the instrument. The :MEASlay? Query returns the current page.
Command tree:



OFF

The :PAGE command sets the display page.
The :DISPlay:PAGE? query returns the current page.
Command syntax: DISPlay:PAGE<page name>
<Page name> can be set as the following items:

MEASurement	Set the display page as the LCR measurement display.
BNUMber	Set the display page as the bin number display.
BCOunt	Set the display page as the bin count display.
LIST	Set the display page as the list sweep display.
MSETup	Set the display page as the measurement display.
CSETup	Set the display page as the correction setup.
LTABle	Set the display page as the limit table setup.
LSETup	Set the display page as the list sweep setup.
SYSTem	Set the display page as the system setup page.
FLISt	Set the display page as the file list page.
TTSet	Set the display page as the transformer test setup.
TLSet	Set the display page as the transformer list setup.
TMDisp	Set the display page as the transformer measurement display.
TJDisp	Set the display page as the transformer judge display.
TSDisp	Set the display page as the transformer scan test page.

For example: WrtCmd ("DISP:PAGE MEAS"), Set the display page as the LCR measurement display page.

Query syntax: DISPlay:PAGE?
Return format: <page name><NL^END>
<page name> can be set as the following items:

<LCR MEAS MEAS>	The current page is the LCR measurement display page.
<BIN No. MEAS>	The current page is the bin number display page.
<BIN COUNT MEAS>	The current page is the bin count display page.
<LIST SWEEP MEAS>	The current page is the list sweep display page.
<MEAS SETUP>	The current page is the measurement setup page.
<CORRECTION>	The current page is the correction page.
<LIMIT TABLE SETUP>	The current page is the limit table setup page.
<LIST SWEEP SETUP>	The current page is the list sweep setup page.
<SYSTEM SETUP>	The current page is the system setup page.
<FILE LIST>	The current page is the file list page.
<TRANS TEST SET>	The current page is the transformer test setup page.
<TRANS LIMIT SET>	The current page is the transformer limit setup page.
<TRANS MEAS DISP>	The current page is the transformer measurement display page.
<TRANS JUDGE DISP>	The current page is the transformer judge display page.

The :LINE command is used to set the current measurement item which can be a substring with up to 16 characters. The :LINE? query returns the current measurement item. The character string of the measurement item can be used as the file name when saving a file.
Command syntax: DISPlay:LINE”<string>”
Where,
<string> can be an ASCII character string (maximum number is 16).
For example: WrtCmd (“DISP:LINE” Resistor meas””)
Query syntax: DISPlay:LINE?
Return format: <string><NL^END>

The :ResultFONt command is used to set the current font of the measurement result. The :ResultFONt? Query returns the current font of the measurement result.
Command syntax: DISPlay:RFONt <font>
<font> can be the following information:
LARGe: Use large character to display the measurement result, 12ms/meas.
TINY: Use tiny character to display the measurement result, 5ms/meas.
OFF: Measurement result will not be displayed but can be read from the bus.
Query syntax: DISPlay:FRONt?
Return format: <font><NL^END>
<font> can be the following information:
LARGE
TINY
OFF

9.1.2 FREQuency subsystem commands

The FREQuency subsystem commands are mainly used to set the measurement frequency of the instrument. The :FREQuency query returns the current measurement frequency.

Command syntax: FREQuency { <value> | MIN | MAX }

Where,
<value> NR1, NR2 or NR3 data format followed by Hz, kHz, MHz.
MIN Set the measurement frequency as 20Hz
MAX Set the measurement frequency as 200kHz
For example: WrtCmd(“FREQ 1KHZ”) Set the frequency as 1000Hz.

Query syntax: FREQuency?
Return format: <NR3><NL^END>

9.1.3 VOLTage subsystem commands

The VOLTage subsystem commands are mainly used to set the measurement voltage. The VOLTage? query returns the current measurement voltage.
Command syntax:

VOLTage { <value> | MIN | MAX }

Where,
<value> NR1, NR2 or NR3 data format followed by V.
MIN Set the measurement voltage as 5mV.
MAX Set the measurement voltage as 2V.

For example: WrtCmd("VOLT 1V") Set the measurement voltage as 1V.

Query syntax: VOLTage?
Return format: <NR3><NL^END>

9.1.4 CURRent subsystem commands

The CURRent subsystem commands are mainly used to set the measurement current. The CURRent? query returns the current measurement current.

Command syntax:

CURRent { <value> | MIN | MAX }

Where,
<value> NR1, NR2 or NR3 data format followed by MA.
MIN Set the measurement current as 50μA.
MAX Set the measurement current as 20mA.

For example: WrtCmd ("CURR 10MA") Set the measurement current as 10mA.

Query syntax: CURRent?
Return format:<NR3><NL^END>

9.1.5 AMPLitude subsystem commands

The :AMPLitude subsystem commands are mainly used to set the auto level control (ALC) function as ON or OFF. The :AMPLiture? query returns the current status of the ALC function.
Command systax:

AMPLitude:ALC { ON | OFF | 1 | 0 }

Where,

Character 1 (49) is equal to ON.

Character 0 (48) is equal to OFF.

For example: WrtCmd (“AMPL:ALC 0”) Set the ALC function as OFF.

Query syntax: AMPLitude:ALC?

Return format: <NR1><NL^END>

9.1.6 Output RESister subsystem commands

The Output RESister subsystem commands are mainly used to set the output internal resistor mode. The Output RESister? query returns the current output internal resistance status.

Command syntax:

ORESister { 30 | 100 }

For example: WrtCmd (“ORES 30”); Set the output internal resistance is 30 OHM.

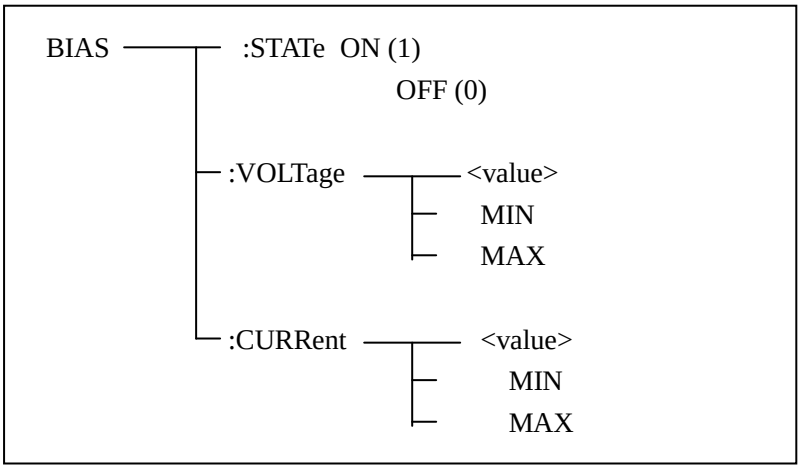
Query syntax: ORESister?

Return format: <NR1><NL^END>

9.1.7 BIAS subsystem commands

The :BIAS subsystem commands are mainly used to set the internal bias voltage and the bias status.

Command tree:



The BIAS:STATe command is used to set the bias status. The :STATe? query returns the current bias status.

Command syntax:

BIAS:STATe { ON | OFF | 1 | 0 }

Where,

Character 1 (49) is equal to ON.

Character 0 (48) is equal to OFF.

For example: WrtCmd (“BIAS:STATe 0”) Set the DC bias function as OFF.

Query syntax: BIAS:STATe?

Return format: <NR1><NL^END>

The BIAS:VOLTage command is used to set the internal bias voltage. The BIAS:VOLTage? query returns the current bias voltage.

Command syntax:

BIAS:VOLTage { <value> | MIN | MAX }

Where,

<value> NR1, NR2 or NR3 data format.

MIN Set the bias voltage as 0V.

MAX Set the bias voltage as 10V.

For example: WrtCmd (“BIAS:VOLT MIN”) Set the DC bias voltage as 0V.

Query syntax: BIAS:VOLTage?

Return format: <NR3><NL^END>

The BIAS:CURRent command is used to set the external bias current. The BIAS:CURRent? query returns the bias current. The external bias current is controlled by the serial interface of the instrument, so only GPIB interface supports this command.

Command syntax:

BIAS:CURRent { <value> | MIN | MAX }

Where,

<value> NR1, NR2 or NR3 data format

MIN Set the bias current as 0A.

MAX Set the bias current as 100mA.

For example: WrtCmd (“BIAS:CURR MIN”) Set the DC bias current as 0A.

Query syntax: BIAS:CURRent?

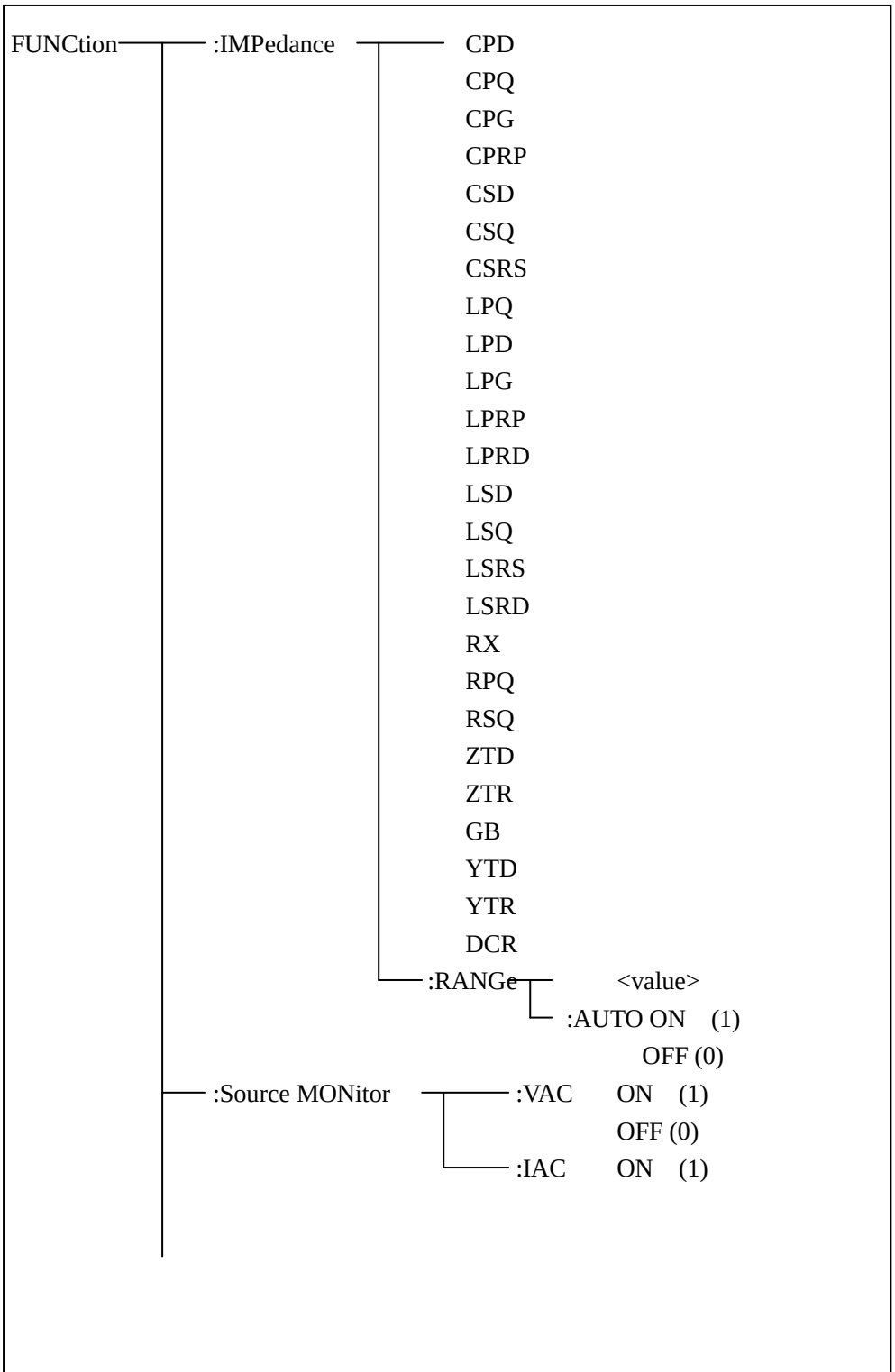
Return format: <NR3><NL^END>

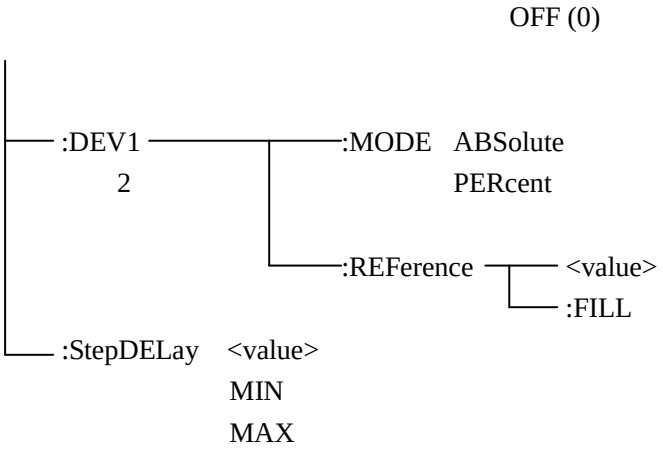
(NOTE: when the internal resistance is 30Ω, the range of bias voltage is ±1.5V and the range of bias current is ±100mA; when the internal resistance is 100Ω, the range of bias voltage is ±5V and the range of bias current is ±50mA.)

9.1.8 FUNCtion subsystem commands

The FUNCtion subsystem commands are mainly used to set measurement functions, range, current/voltage monitor ON/OFF, deviation display mode, nominal setting.

Command tree:





The FUNCtion:IMPedance command is used to set instrument functions. The FUNCtion:IMPedance? query returns the current function parameters.

Command syntax: FUNCtion:IMPedance <function>
<function> can be one of the following items.

CPD	Set the function as Cp-D	LPRP	Set the function as Lp-Rp
CPQ	Set the function as Cp-Q	LSD	Set the function as Ls-D
CPG	Set the function as Cp-G	LSQ	Set the function as Ls-Q
CPRP	Set the function as Cp-Rp	LSRS	Set the function as Ls-Rs
CSD	Set the function as Cs-D	RX	Set the function as R-X
CSQ	Set the function as Cs-Q	ZTD	Set the function as Z-θ°
CSRS	Set the function as Cs-Rs	ZTR	Set the function as Z-θr
LPQ	Set the function as Lp-Q	GB	Set the function as G-B
LPD	Set the funxtion as Lp-D	YTD	Set the function as Y-θ°
LPG	Set the function as Lp-G	YTR	Set the function as Y-θr
LPRD	Set the function as Lp-Rd	RPQ	Set the function as Rp-Q
LSRD	Set the function as Ls-Rd	RSQ	Set the function as Rs-Q
DCR	Set the function as DCR		

For example: WrtCmd ("FUNC:IMP RX") Set the function as R-X.

Query syntax: FUNCtion:IMPedance?
Return format: <function><NL^END>

The FUNCtion:IMPedance:RANGe command is used to set the range. The FUNCtion:IMPedance:RANGe? query returns the current range.

Command syntax: FUNCtion:IMPedance:RANGe <value>
Where, <value> can be the impedance of the DUT or NR1, NR2 or NR3 data format followed by OHM or KOHM.
For example: WrtCmd ("FUNC:IMP:RANG 1KOHM") Set the range as 1kOHM.

Query syntax: FUNCtion:IMPedance:RANGe?

Return format: <value><NL^END>
Where, <value> can be

3	10	30	
100	300	1000	3000
10000	30000	100000	

The FUNCtion:IMPedance:RANGe:AUTO command is used to set the automatic range selection status. The FUNCtion:IMPedance:RANGe:AUTO? query returns the current range status.

Command syntax:

FUNCtion:IMPedance:RANGe:AUTO { ON (1) / OFF (0) }

Where,

Character 1 (49) is equal to ON.

Character 0 (48) is equal to OFF.

For example: WrtCmd ("FUNC:IMP:RANG:AUTO ON") Set the automatic range as ON.

Query syntax: FUNCtion:IMPedance:RANGe:AUTO?
Return format: <NR1><NL^END>

The FUNCtion:Source MONitor:VIAC command is used to set the voltage monitor ON or OFF. The FUNCTtion:Source MONitor:VIAC? query returns the current voltage monitor status.

FUNCtion:SMONitor:VIAC { ON (1) / OFF (0) }

Where,

Character 1 (49) is equal to ON.

Character 0 (48) is equal to OFF.

For example: WrtCmd ("FUNC:SMON:VIAC ON") Set the voltage monitor as ON.

Query syntax: FUNCtion:SMONitor:VIAC?
Return format: <NR1><NL^END>

The FUNCtion:DEV<n>:MODE command is used to set the deviation measurement mode. The FUNCtion:DEV<n>:MODE? query returns the current deviation measurement mode.

Command syntax:

FUNCtion:DEV<n>:MODE { ABSolute / PERCent / OFF }

Where,

ABSolute Absolute value deviation display

PERCent Percent deviation display

OFF Real value display
Where, <n> is
Character 1 (49) is equal to the nominal value of primary parameter.
Or character 2 (50) is equal to the nominal value of the secondary parameter.
For example: WrtCmd (“FUNC:DEV1:MODE ABS”)

Query syntax: FUNCtion:DEV<n>:MODE?
Return format:

ABX
PERC } <NL^END>
OFF

The FUNCtion:DEV<n>:REFerence<value> command is used to set the nominal value of the deviation. The FUNCtion:DEV<n>:REFernece<value>? query returns the current nominal value of the deviation.

Command syntax: FUNCtion:DEV<n>:REFerence<value>
Where,
<value> is NR1, NR2 or NR3 data format.
<n> is
Character 1 (49) is equal to the nominal value of primary parameter.
Or Character 2 (50) is equal to the nominal value of the secondary parameter.
For example: WrtCmd (“FUNC:DEV1:REF 10”)

Query syntax: FUNCtion:DEV<n>:REFerence?
Return format：<NR3><NL^END>

The FUNCtion:DEV<n>:REFerence:FILL command is used to set the nominal value of the deviation. This command directs the instrument to make a test and then copies the results of the primary and the secondary parameters as the nominal values of the deviation.

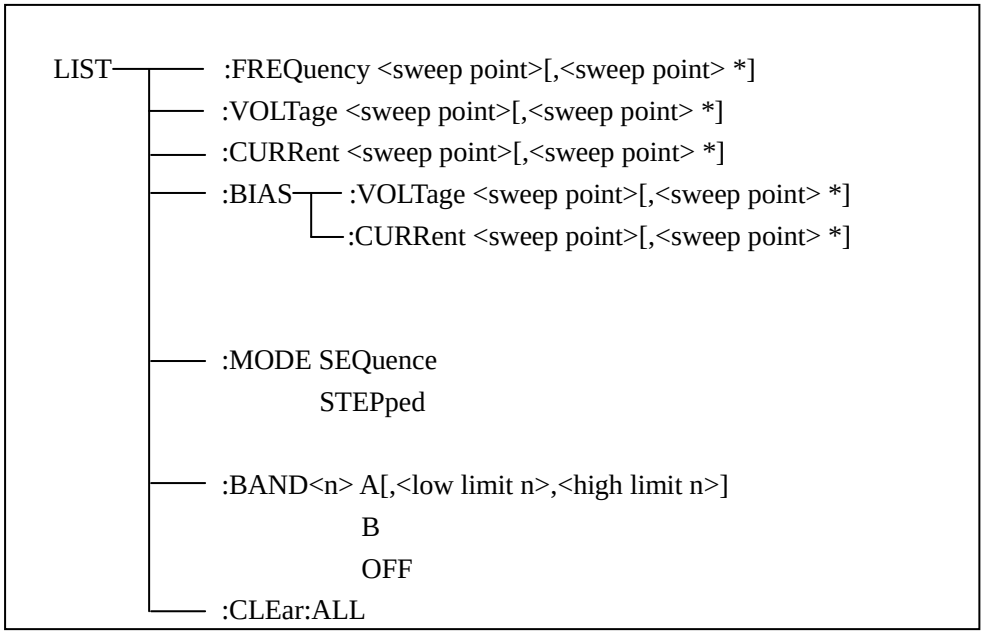
Command syntax: FUNCtion:DEV<n>:RERerence:FILL
Where,
Character 1 (49) or character 2 (50) is equal to the nominal values of the primary and secondary parameters.

For example: WrtCmd (“FUNC:DEV1:REF:FILL”)

9.1.9 LIST subsystem commands

The LIST subsystem commands are mainly used to set the list sweep function, sweep points, sweep mode, sweep limits.

Command tree:



The LIST:FREQuency command is used to clear the original sweep points and set the frequencies of the sweep points. The LIST:FREQuency? query returns the current frequency of each sweep point.

Command syntax: LIST:FREQuency<value>[,<value>*]

NOTE: * part means 201 sweep points at most can be set.

Where,

<value> is NR1, NR2 or NR3 data format.

<value> should be set from 20HZ to 200KHZ, or return format will report errors.

For example: WrtCmd("LIST:FREQ 1E3, 2E3, 3E3, 4E3")

Set the frequency of the sweep point 1 as 1KHZ;

Set the frequency of the sweep point 2 as 2KHZ;

Set the frequency of the sweep point 3 as 3KHZ;

Set the frequency of the sweep point 4 as 4KHZ;

NOTE: HZ(hertz) is the suffix unit, MAHZ and MHZ is MHz (1E6 Hz).

Query syntax: LIST:FREQuency?

Return format: <NR3>, [,<NR3>*]<NL^END>

The LIST:VOLTage command is used to clear the original voltage of the each sweep point and reset the voltage. The LIST:VOLTage? query returns the current voltage of each sweep point.

Command syntax: LIST:VOLTage<value>[,<value>*]

NOTE: * part means 201 sweep points at most can be set.

Where,

<value> is NR1, NR2 or NR3 data format.

For example: WrtCmd (“LIST:VOLT 1.5”)

Set the frequency of the sweep point 1 as 1.5V.

WrtCmd (“LIST:VOLT 1E-2, 2E-2, 3E-2, 4E-2”)

Set the frequencies of sweep point 1, 2, 3 and 4 respectively as 10mV, 20mV, 30mV and 40mV.

NOTE: This command can be followed by suffix unit V.

Query syntax: LIST:VOLTage?
Return format:<NR3>[,<NR3>*]<NL^END>

NOTE: <value> should be set from 10mV to 2V, or return format will report errors.

The LIST:CURRent command is used to clear the measurement current of each sweep point and reset the current. The LIST:CURRent? query returns the current of each sweep point.
Command syntax: LIST:CURRent<value>[,<value>*]
NOTE: * part means 201 sweep points at most can be set.
Where,

<value> is NR1, NR2 or NR3 data format.

For example: WrtCmd (“LIST:CURR 10MA”)

Set the measurement current of the sweep point 1 as 10mA.

WrtCmd (“LIST:CURR 1E-2, 2E-2, 3E-2, 4E-2”)

Set the currents of sweep points 1, 2,3 and 4 respectively as 10mA, 20mA, 3mA and 4mA.

NOTE: This command can be followed by a suffix unit A (ampere).

Query syntax: LIST:CURRent?
Return format: <NR3>[,<NR3>*]<NL^END>

NOTE: The current of each sweep point should be set from 100μA to 20mA when the internal resistance is 100Ω, 333μA to 66.7mA when the internal resistance is 30Ω, or return format will report errors.

The LIST:BIAS:VOLTage command is used to clear the original DC bias voltage of each sweep point and reset the voltage. The LIST:BIAS:VOLTage? query returns the current DC bias voltage of each sweep point.
Command syntax: LIST:BIAS:VOLTage<value>[,<value>*]

NOTE: * part means 201 sweep points at most can be set.
Where,

<value> is NR1, NR2 or NR3 data format.

For example: WrtCmd (“LIST:BIAS:VOLT 1.5V”)
Set the DC bias voltage of sweep point 1 as 1.5V.

Query syntax: LIST:BIAS: VOLTage?
Return format: <NR3> [, <NR3>*] <NL^END>

The LIST:BIAS:CURRent command is used to clear the original DC bias current of each sweep point and reset them. The LIST:BIAS:CURRent? query returns the the DC bias current of each sweep point.
Command syntax: LIST:BIAS:CURRent<value>[,<value>*]

NOTE: * part means 201 sweep points at most can be set.
Where,

<value> is NR1, NR2 or NR3 data format.

For example: WrtCmd ("LIST:BIAS:CURR 500MA")

Set the DC bias current of the sweep point 1 as 500mA.

WrtCmd ("LIST:BIAS:CURR 1E-2, 2E-2, 3E-2,4E-2")

Set the DC bias currents of sweep points 1, 2, 3 and 4 respectively as 10mA, 20mA, 30mA and 40mA.

Query syntax: LIST:BIAS:CURRent?
Return format: <NR3> [,<NR3>*]<NL^END>

NOTE: SM6030A instrument has installed a 5V/50mA internal DC bias current source. The instrument can be used with 1778 DC Bias Source (providing DC current from 0 to 20A and can be bought from our company).

The LIST:MODE command is used to set the list sweep mode. The LIST:MODE? query returns the current list sweep mode.
Command syntax:

LIST:MODE { SEQuence | STEPped }

Where,

SEQuence means sequential mode.

STEPped means single step mode.

For example: WrtCmd ("LIST:MODE SEQ")

Query syntax: LIST:MODE?
Return format:

{ SEQ | STEP } <NL^END>

The LIST:BAND<n> command is used to set the limits of list sweep table. The LIST:BAND<n>? query returns the current limits.
Command syntax: LIST:BAND<n><parameter>[,<low limit n>,<high limit n>]
Where,

<n> 1 to 10 (NR1 format): sweep points on the n_{th} line

<parameter> A Compare the primary parameter of the test results with the high and the low limits.

B Compare the secondary parameter of the test results with the high and the low limits.

OFF No comparison

<low limit n> NR1, NR2 or NR3 data format, low limit of the sweep point on the n_{th} line.

<high limit n> NR1, NR2 or NR3 data format, high limit of the sweep point on the n_{th} line.

For example: WrtCmd ("LIST:BAND1 A, 10, 20")

WrtCmd ("LIST:BAND3 OFF")

Query syntax: LIST:BAND<n>?

Return Format: <parameter>, <low limit n>, <high limit n>

The LIST:CLEar command is used to clear all the data in list sweep mode.

Command syntax:

LIST: CLEar

For example: WrtCmd("LIST:CLEAR")

9.1.10 APERture subsystem commands

The APERture subsystem commands are mainly used to set the measurement speed, average times used in measurement. The APERture? query returns the current measurement speed, average times.

Command syntax:

APERture { FAST | MEDium | SLOW } [,<value>]

Where,

FAST: 75 times/sec

MEDium: 11 times/sec

SLOW: 2.7 times/sec

<value> 1 to 255 in NR1

For example: WrtCmd ("APER MED, 55")

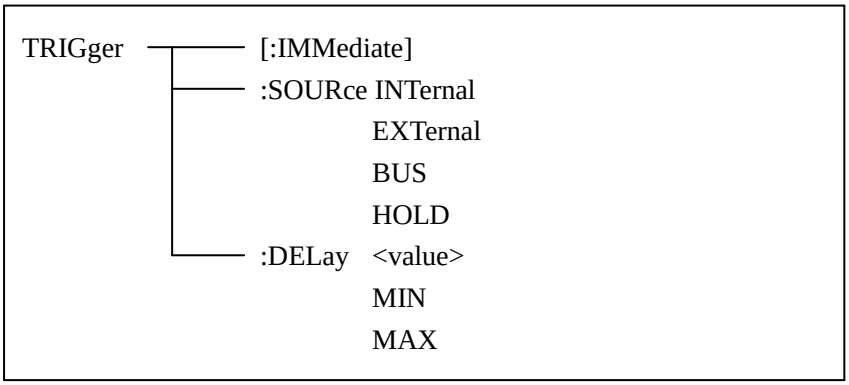
Query syntax: APERture?

Return format:

{ FAST | MED | SLOW } , <NR1><NL^END>

9.1.11 TRIGger subsystem commands

The TRIGger subsystem commands are mainly used to set the instrument trigger source, trigger delay and trigger measurement.
Command tree:



The TRIGger[:IMMediate] command is used to trigger a test.
Command syntax: TRIGger[:IMMediate]
For example: WrtCmd("TRIG")

The TRIGger:SOURce command is used to set the trigger source mode. The TRIGger:SOURce? query returns the current trigger source mode.
Command syntax:

TRIGger:SOURce { INTernal | EXTternal | BUS | HOLD }

Where,

INTernal	The default trigger mode.
EXTernal	Triggered by HANDLER interface.
BUS	Triggered by RS232C interface or GPIB interface
HOLD	Triggered by pressing TRIGGER.

For example: WrtCmd ("TRIG:SOUR BUS")
Query syntax: TRIGger:SOURce?
Return format:

{ INT | EXT | BUS | HOLD } <NL^END>

The TRIGger:DELay command is used to set the delay time after triggering. The TRIGger:DELay? query returns the current delay time.
Command syntax:

TRIGger:DELay { <value> | MIN | MAX }

Where,

<value> In NR1, NR2 or NR3 data format, from 0 to 60s with 1ms as the resolution.

MIN Set the delay time as 0s.

MAX Set the delay time as 60s.

For example: WrtCmd ("TRIG:DEL 5s") Set the delay time as 5s.

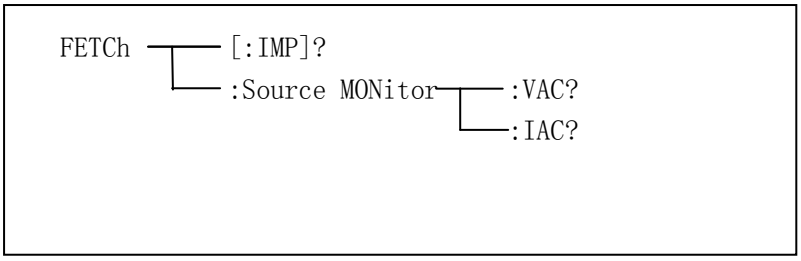
Query syntax: TRIGger:DELay?

Return format: <NR3><NL^END>

9.1.12 FETCh? subsystem commands

The FETCh? subsystem commands are mainly used to direct SM6030A to input a measurement result.

Command tree:



The FETCh[:IMP]? query directs SM6030A to input the last measurement result to the output buffer zone.

Query syntax: FETCh[:IMP]?

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

WrtCmd ("TRIG")

WrtCmd ("FETC?")

SM6030A applies ASCII to delivery result, details are follows.

On measurement display page, bin NO. display page, bin count display page, ASCII data output format are described as below:

SN.NNNNNESNN	,	SN.NNNNNESNN	,	SN	,	SN or SNN	NL^END
<DATA A>		<DATA B>		<Status>		<BIN number>	

Where,

<DATA A>, <DATA B> format: <DATA A> (primary measurement data), <DATA B> (secondary measurement data)

12-digits ASCII format are as below:

SN.NNNNNESNN

(S:+/-,N: from 0 to 9, E: Exponent Sign)

Status	Description
-1	(In data buffer memory) no data
0	Common measurement data
+1	Analog LCR unbalance
+2	A/D converter is not working.
+3	Signal source is over loading.
+4	Constant voltage cannot be adjusted.

<status> format: When above measurement data is used, <status> data will display measurement status.

The output format of the <Status> display data uses 2-digits ASCII: SN (S: +/-, N: from 0 to 4)

NOTE: When <status> is -1, 1 or 2, the measurement data is 9.99999E37. When <status> is 0, 3 or 4, the real measurement data is beyond the limits.

Data	Sort result
0	Out of tolerance
+1	Bin 1
+2	Bin 2
+3	Bin 3
+4	Bin 4
+5	Bin 5
+6	Bin 6
+7	Bin 7
+8	Bin 8
+9	Bin 9
+10	Auxiliary bin

<Bin No.> format: The data displays the sorting results of the displayed bin, shown as above.
Only when the instrument compare function is set as ON, <bin No.> data can be displayed.
The output format of <bin No.> data applies 2 to 3 digits ASCII: SN or SNN (S: +/_, N: from 0 to 9).

On list sweep display page, the ASCII data output format is shown as below, that is, the return-circuit replaces sweep point number.

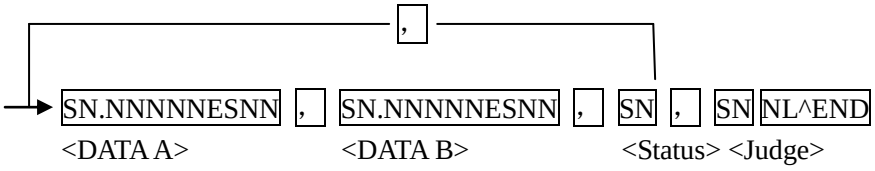


Figure 6 ASCII format 2 (list sweep)

Where,
Descriptions for <DATA A>, <DATA B>, <Status> are the same described before. <Judge> format is as below:

<Input/Output> format: The data displays the compare result of the list sweep..

Data	Result
-1	low
0	pass
+1	high

When the compare function of the list sweep measurement is turned off, the output result of <Input/Output> is 0.

<Input/Output> data output format applies 2-digits ASCII format: SN (S: +/_, N: from 0 to 1)

On transformer single-machine measurement display page, ASCII data output format is as below:

SN , SN.NNNNNESNN , SN.NNNNNESNN , SN NL^END

<Serial #> <DATA A> <DATA B> <Status>

<SN> is described as below:

SN#	Description
1	TURN
2	Zx
3	Acr
4	Lx
5	Lk
6	DCR

Description of <DATA A> is the same as that described above. Secondary parameter of <DATA B> has two formats:

When the measurement parameter is the turn ratio (TURN), secondary parameter <DATA B> is the phase and input format is + (in-phase), - (anti-phase);

When the measurement parameter is inductance (Zx), secondary parameter <DATA B> is the phase angle θ, its description is the same as that of <DATA A>.

When the measurement parameter is inductance (Acr), secondary parameter of <DATA B> is inductance X, its description is the same as that of <DATA A>.

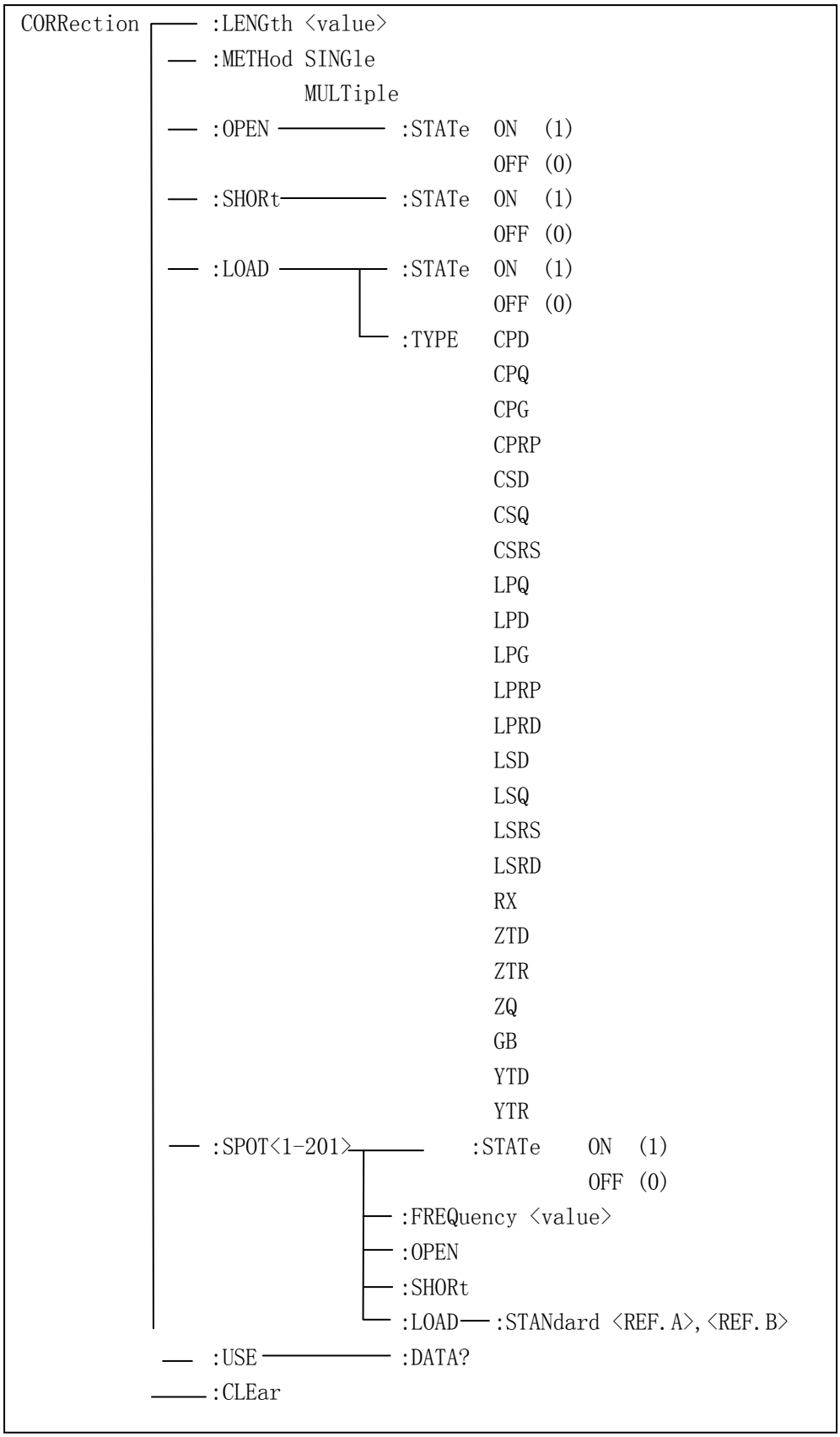
When the measurement parameter is inductance Lx, the secondary parameter of <DATA B> is the quality factor Q, its description is the same as that of <DATA A>.

Meanwhile when the measurement serial number is equal to or larger than 5 (that is to say testing leakage inductance LK and DC resistance DCR), no secondary parameter will be displayed but directly display the status. The status format is: SN: +/_, N is 0/1.

Status	Description
-1	Low
0	Pass
+1	High

9.1.13 CORRection subsystem commands

The CORRection subsystem commands are mainly used to set the correction function, OPEN, SHORT, LOAD.
Command tree:



The CORRection:LENGth command is used to set the correction cable length. The CORRection:LENGth? query returns the current set cable length.

Command syntax: CORRection:LENGth<value>
Where,
<value> is 0, 1, 2 or 4 followed by M.
For example: WrtCmd ("CORR:LENG 1M") Set the cable length as 1 meter.

Query syntax: CORRection:LENGth?
Return format: <NR1><NL^END>

The CORReciton:METHod command is used to set the correction mode. The CORRection:METHod? query returns the current correction mode.
Command syntax: CORRection:METHod { SINGle | MULTi }
Where,
SINGle Set or return single channel mode.
MULTi Set or return multi channel mode.
For example: WrtCmd ("CORR:METH MULT") Set the instrument as multi channel mode.
Query syntax: CORRection:METHod?
Return format: { SINGle | MULTi } <NL^END>

The CORReciton:OPEN command is used to execute open correction for 41 preset test points.
Command syntax: CORRection:OPEN
For example: WrtCmd ("CORR:OPEN")

The CORRection:OPEN:STATe command is used to set the open correction ON or OFF. The CORReciton：OPEN:STATe? query returns the current open correction status.
Command syntax:
CORRction:OPEN:STATe { ON | OFF | 1 | 0 }
Where,
1 (decimal 49) is equal to ON.
0 (decimal 48) is equal to OFF.
For example: WrtCmd ("CORR:OPEN: STAT ON")

Query syntax: CORRection:OPEN:STATe?
Return format: <NR1><NL^END>

The CORRection:SHORt command is used to execute short correction for 41 preset test points.
Command syntax: CORRection:SHORt
For example: WrtCmd ("CORR:SHOR")

The CORRection:SHORt:STATe command is used to set the short correction status. The

CORRection:SHORt:STATe? query returns the current short correction status.
Command syntax：

CORRection:SHORt:STATe { ON | OFF | 1 | 0 }

Where,
1 (decimal 49) is equal to ON.
0 (decimal 48) is equal to OFF.
For example: WrtCmd ("CORR:SHOR:STAT ON")

Query syntax: CORRection:SHORt:STATe?
Return format: <NR1><NL^END>

The CORRecition:LOAD:STATe command is used to set load correction. The CORRection:LOAD:STATe? query returns the current load correction status.
Command syntax:

CORRection:LOAD:STATe { ON | OFF | 1 | 0 }

Where,
1 (decimal 49) is equal to ON.
0 (decimal 48) is equal to OFF.
For example: WrtCmd ("CORR:LOAD:STAT ON")

Query syntax: CORRection:LOAD:STATe?
Return format: <NR1><NL^END>

The CORRection:LOAD:TYPE command is used to set the tested parameter type. The CORRection:LOAD:TYPE query returns the current parameter type.
Details of function are as follows:

CPD	Set the function as Cp-D	LPRP	Set the function as Lp-Rp
CPQ	Set the function as Cp-Q	LSD	Set the function as Ls-D
CPG	Set the function as Cp-G	LSQ	Set the function as Ls-Q
CPRP	Set the function as Cp-Rp	LSRS	Set the function as Ls-Rs
CSD	Set the function as Cs-D	RX	Set the function as R-X
CSQ	Set the function as Cs-Q	ZTD	Set the function as Z-θ°
CSRS	Set the function as Cs-Rs	ZTR	Set the function as Z-θr
LPQ	Set the function as Lp-Q	GB	Set the function as G-B
LPD	Set the function as Lp-D	YTD	Set the function as Y-θ°
LPG	Set the function as Lp-G	YTR	Set the function as Y-θr
LPRD	Set the function as Lp-Rd	RPQ	Set the function as Rp-Q
LSRD	Set the function as Ls-Rd	RSQ	Set the function as Rs-Q

For example: WrtCmd (“CORR:LOAD:TYPE CPD”)

Query syntax: CORRection:LOAD:TYPE?
Return format: <function><NL^END>

The CORRection:SPOT<n>:STATe command is used to set the state of some specific frequency spots. The CORRection:SPOT<n>:STATe query returns the current state of each frequency spot (FREQ 1, FREQ 2…FREQ 201).
Command syntax:

CORRection:SPOT<n>:STATe { ON | OFF | 1 | 0 }

Where,
1 (decimal 49) is equal to ON.
0 (decimal 48) is equal to OFF.
<n>:
Frequency spot 1~201.
For example: WrtCmd (“CORR:SPOT1:STAT ON”)

Query syntax: CORRection:SPTO<n>:STATe?
Return format: <NR1><NL^END>

The CORRection:SPOT<n>:FREQuency command is used to set the frequencies of frequency spots1, 2…201. The CORRection:SPOT<n> query returns the current frequency of specific frequency spot.
Command syntax: CORRection:SPOT<n>:FREQeuency<value>
Where,
<value> can be NR1, NR2 or NR3 data format followed by HZ, KHZ and MHZ.
<n>:
Frequency spot 1~201

For example: WrtCmd (“CORR:SPOT1:FREQ 2KHZ”) Set the frequency of frequency spot 1 as 2KHZ.
NOTE: <value> should be ranged from 20HZ to 200KHZ, or return format will report errors.

Query syntax: CORRection:SPOT<n>:FREQuency?
Return format: <NR3><NL^END>

The CORRection:SPOT<n>:OPEN command is used to execute open correction for specific frequency spots (frequency 1, frequency 2 … frequency 201).
Command syntax: CORRection:SPOT<n>:OPEN

Where,
Frequency spot 1~201

For example: WrtCmd (“CORR:SPOT1:OPEN”) Execute open correction for correction point 1.

The CORRection:SPOT<n>:SHORt command is used to execute short correction for specific frequency spots (frequency 1, frequency 2 … frequency 201).
Command syntax: CORRection:SPOT<n>:SHORt
Where,
Frequency spot 1~201

For example: WrtCmd (“CORR:SPOT1:SHOR”) Execute short correction for correction point 1.

The CORRection:SPOT<n>:LOAD:STANdard command is used to set the standard reference of specific frequency spots (frequency spot 1, frequency spot2 … frequency spot 201 which are taking load correction). The CORRection:SPOT<n>:LOAD:STANdard query returns the current standard reference of specific frequency spot.

Command syntax: CORRection:SPOT<n>:LOAD:STANdard <REF. A><REF. B>
Where,
Frequency spot 1~201

<REF. A> can be NR1, NR2 or NR3 data format and taken as the standard reference of the primary parameter.
<REF. B> can be NR1, NR2 or NR3 data format and taken as the standard reference of the secondary parameter.
For example: WrtCmd (“CORR:SPOT1:LOAD:STAN 100.7, 0.0002”)

Query syntax: CORRection:SPOT<n>:LOAD:STANdard?
Return format: <NR3><NL^END>

The CORRection:USE:DATA? query returns the OPEN/SHORT/LOAD correction measurement data of specific frequency spot 1, 2 … 201.
Command syntax: CORRection:USE:DATA?

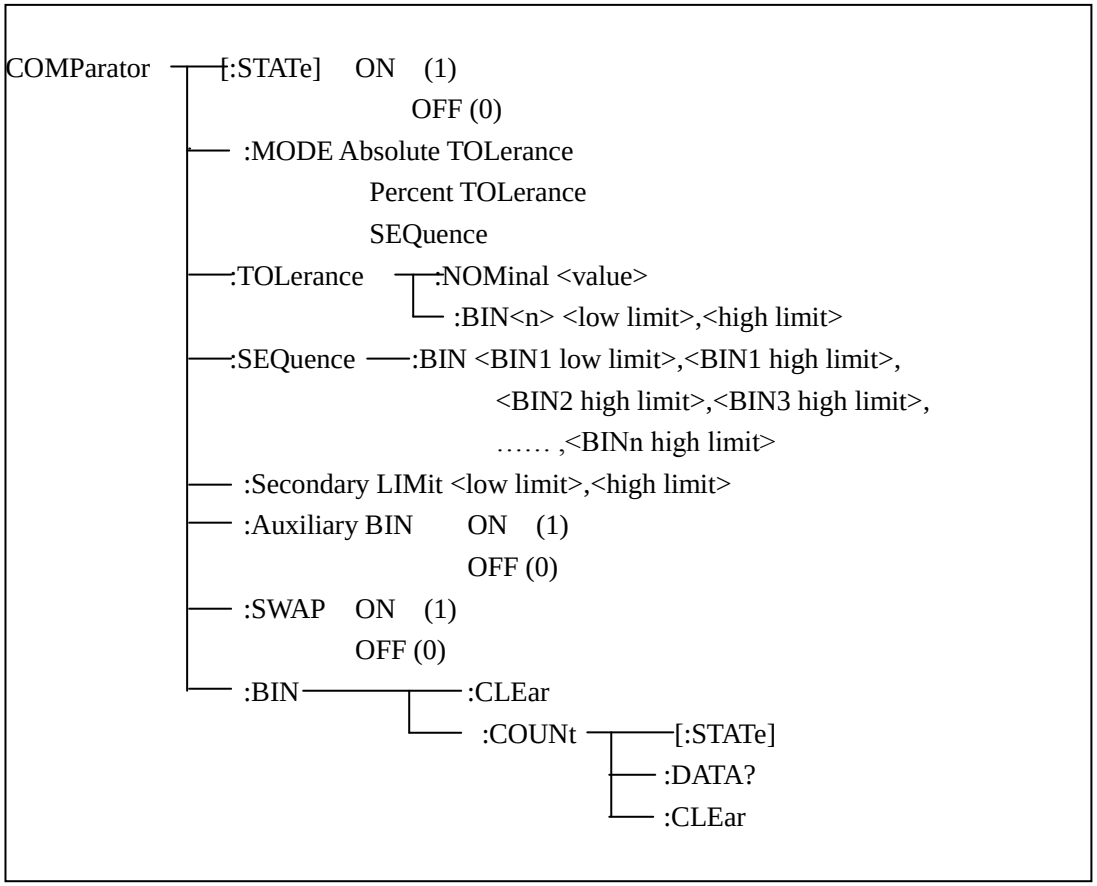
Return format: <open (n) A>,<open(n) B>,<short (n) A>,<short (n) B>,<load (n) A>,<load (n) B>
<open1 A>,<open1 B>,<short1 A>,<short1 B>,<load1 A>,<load1 B>,
<open2 A>,<open2 B>,<short2 A>,<short2 B>,<load2 A>,<load2 B>,
……
<open201 A>,<open201 B>,<short201 A>,<short201 B>,<load201 A>,<load201 B>,
Where,
<open1/2/……/201 A> is NR3 data format and the primary open correction data at frequency spot 1/2/……/201.

<open1/2/……/201 B> is NR3 data format and the secondary open correction data at frequency spot 1/2……/201.
<short 1/2/……/201 A> is NR3 data format and the primary short correction data at frequency spot 1/2/……/201.
<short 1/2/……/201 B> is NR3 data format and the secondary short correction data at frequency spot 1/2/……/201.
<load1/2/……/201 A> is NR3 data format and the primary load correction data at frequency spot 1/2/……/201.
<load1/2/……/201B> is NR3 data format and the secondary load correction data at frequency spot 1/2/……./201.

The CORRection:CLEAR query is used to clear all the correction data.
Query syntax: CORRection:CLEAR

9.1.14 COMParator subsystem commands

The COMParataor subsystem commands are used to set the bin comparator function including ON/OFF setting, Limit table setting.
Command tree:



The COMParator[STATe] command is used to set the comparator function as ON or OFF. The COMParator[STATe]? query returns the current comparator state.

Command syntax:

COMParator[:STATe] { ON | OFF | 1 | 0 }

Where,

1 (decimal 49) is equal to ON.

0 (decimal 48) is equal to OFF.

For example: WrtCmd ("COMP ON")

Query syntax: COMParator[:STATe]?

Return format: <NR1><NL^END>.

The COMParator:MODE command is used to set the comparator mode. The COMParator:MODE? query returns the current mode.

Command syntax:

COMParator:MODE { ATOLerance | PTOLerance | SEQuence }

Where,

ATOLerance means absolute tolerance mode.

PTOLerance means proportional tolerance mode.

SEQuence means sequential tolerance mode.

For example: WrtCmd ("COM:MODE ATOL")

Query syntax: COMParator:MODE?

Return format: { ATOL | PTOL | SEQ } <NL^END>

The COMParator:TOLerance:NOMinal command is used to set the nominal value (this function is valid only when the limit mode is set as deviation mode). The COMParator:TOLerance:NOMinal? query returns the current nominal value.

Command syntax: COMParator:TOLerance:NOMinal<value>

Where,

<value> is a nominal value in NR1, NR2 or NR3 data format.

For example: WrtCmd ("COMP:TOL:NOM 100E-12")

Query syntax: COMParator:TOLerance:NOMinal?

Return format: <NR3><NL^END>

The COMParator:TOLerance:BIN<n> command is used to set the high and the low limits of each bin (this function is valid only when the limit mode is set as deviation mode). The

COMParator:TOLeance:BIN<n>? query returns the current high and the low limits of each bin.
Command syntax: COMParatro:TOLerance:BIN<n><low limit><high limit>
Where,

<n> is the bin number from 1 to 9.

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

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

NOTE: The low limit should be smaller than the high limit, or error information will be reported.

For example: WrtCmd ("COMP:TOL:BIN1 -5,5")

WrtCmd ("COMP:TOL:BIN2 -10,10")

Query syntax: COMParator:TOLerance:BIN<n>?
Return format: <low limit><high limit><NL^END>

The COMParator:SEQuence:BIN command is used to set the high and the low limits of sequential mode (this function is valid only when the limit mode is set as the sequential mode.). The COMParator:SEQuence:BIN? query returns the current high and the low limits of each bin.

Command syntax: COMParator:SEQuence:BIN <BIN1 low limit>, <BIN 1 high limit>, <BIN2 high limit>, …, <BINn high limit>
Where,
<BIN1 low limit> is the low limit of BIN 1 in NR1, NR2 or NR3 data format.
<BIN1 high limit> is the high limit of BIN1 in NR1, NR2 or NR3 data format.
<BINn high limit> is the high limit of BINn (the maximum of n is 9) in NR1, NR2 or NR3 data format.

NOTE: The low limit should be smaller than the high limit, or error information will be reported.

For example: WrtCmd ("COMP:SEQ:BIN 10, 20, 30, 40, 50")

Query syntax: COMParator:SEQuence:BIN?
Return format: <BIN1 low limit>, <BIN1 high limit>, <BIN2 high limit>, …,
<BINn high limit><NL^END>

The COMParator:Secondary LIMit command is used to set the high and the low limits of the secondary parameter. The COMParator:Secondary LIMit query returns the current high and the low limits of the secondary parameter.
Command syntax: COMParator:SLIMit<low limit><high limit>
Where,

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

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

NOTE: The low limit should be smaller than the high limit, or error information will be reported.

For example: WrtCmd ("COMP:SLIM 0.001, 0.002")

Query syntax: COMParator:SLIMit?
Return format: <NR3>, <NR3> <NL^END>

The COMParator:Auxiliary BIN command is used to set the auxiliary bin as ON or OFF. The COMParator:Auxiliary BIN? query returns the current auxiliary bin state.
Command syntax:

COMParator:Auxiliary BIN { ON | OFF | 1 | 0 }

Where,
1 (decimal 49) is equal to ON.
0 (decimal 48) is equal to OFF.
For example: WrtCmd ("COMP:ABIN ON")

Query syntax: COMParator:Auxiliary BIN?
Return format: <NR1><NL^END>

The COMParator:SWAP command is used to set the swap mode ON or OFF. For example: the original function parameter is Cp-D, after the SWAP mode is set as ON, the function parameter will be changed as D-Cp. In this case, the limits from BIN1 to BIN9 become the high and the low limits of D, the original secondary limits become that of Cp. That is to say, this function is to make swap comparison between the primary and the secondary parameters. On the contrary, If OFF is selected, the comparison will be made according to the original sequence. The COMParator:SWAP? query returns the current state of the swap function.
Command syntax:

COMParator:SWAP { ON | OFF | 1 | 0 }

Where,
1 (decimal 49) is equal to ON.
0 (decimal 48) is equal to OFF.
For example: WrtCmd ("COMP:SWAP ON")

Query syntax: COMParator:SWAP?
Return format: <NR1><NL^END>

The COMParator:BIN:CLEar command is used to clear all limits on limit table setup page.
Command syntax: COMParator:BIN:CLEar
For example: WrtCmd ("COMP:BIN:CLE")

The COMParator:BIN:COUNt[:STATe] command is used to set the bin count function as ON or OFF. The COMParator:BIN:COUNt[:STATe]? query returns the current state of the bin count function.

Command syntax:

COMParator:BIN:COUNt[:STATe] { ON | OFF | 1 | 0 }

Where,

1 (decimal 49) is equal to ON.

0 (decimal 48) is equal to OFF.

For example: WrtCmd (“COMP:BIN:COUN ON”)

Query syntax: COMParator:BIN:COUNt[STATe]?

Return format: <NR1><NL^END>

The COMParator:BIN:COUNt:DATA? query returns the current comparison result of the bin count.

Query syntax: COMParator:BIN:COUNt:DATA?

Return format: <BIN1 count>, <BIN2 count>, …, <BIN9 count>, <OUT OF BIN count>, <AUX BIN count><NL^END>

Where,

<BIN1-9 count> is the count result of BIN1-9, in NR1 data format.

<OUT OF BIN count> is the count result of the OUT OF BIN, in NR1 data format.

<AUX BIN count> is the count result of the auxiliary bin, in NR1 data format.

The COMParator:BIN:COUNt:CLEar command is used to clear all bin count results.

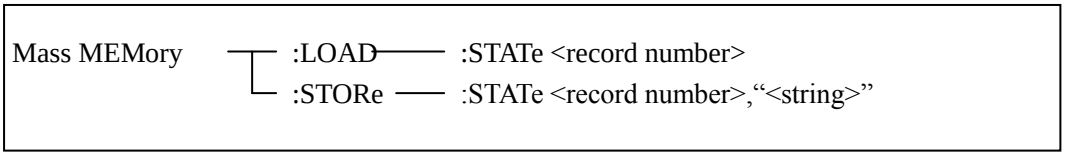
Command syntax: COMParator:BIN:COUNt:CLEar

For example: WrtCmd (“COMP:BIN:COUN:CLE”)

9.1.15 Mass MEMory subsystem commands

The Mass MEMory subsystem commands are used for file storing and load.

Command tree:



The MMEMory:LOAD:STATe command is used to load the existed file.

Command syntax: MMEMory:LOAD:STATe<value>

Where,

<value> is the file number ranging from 0 to 39 (NR1).

For example: WrtCmd (“MMEM:LOAD:STAT 1”)

The MMEMory:STORe:STATe command is used to storing the current setting to a file.
Command syntax: MMEMory:STOR:STATe<value>, "<string>"
Where,

<value> is the file number ranging from 0 to 39 (NR1).

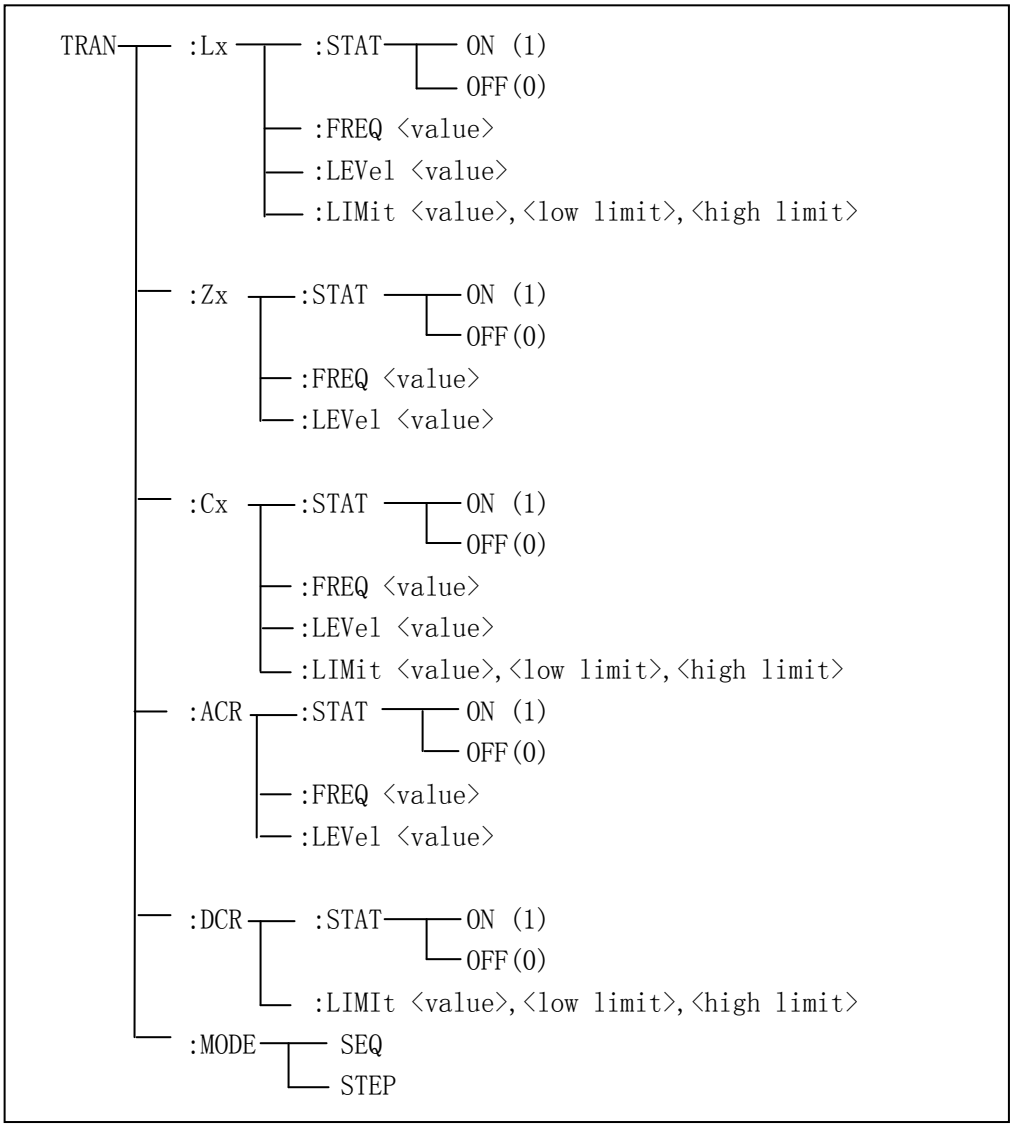
<string> can be ASCII character string (maximum length is 16).

For example: WrtCmd ("MMEM:STOR:STAT 1, "Resistor meas"")

or WrtCmd ("MMEM:STOR:STAT 1"), IF ","<string>"" has not been input, the default file name will be stored.

9.1.16 TRAN Subsystem Commands

The TRAN subsystem commands are mainly used to transformer parameters, such as turn-ratio, primary inductance, leakage inductance, stray capacitance, impedance, AC impedance, DC resistance, working mode and limits of each parameter.
Command tree:



The TRAN:Lx:STAT command is used to set the primary Lx ON or OFF. The TRAN:Lx:STAT? query returns the current state of the primary Lx.
Command syntax:

TRAN:Lx:STAT { ON | OFF | 1 | 0 }

Where,
1 (decimal 49) is equal to ON.
0 (decimal 48) is equal to OFF.
For example: WrtCmd ("TRAN:Lx:STAT:ON") Set all Lx parameters to be valid.

Query syntax: TRAN:Lx:STAT?
Return format: <NR1><NL^END>

The TRAN:Lx:FREQ command is used to set the Lx test frequency. The TRAN:Lx;FREQ query returns the current Lx test frequency.
Command syntax: TRAN:Lx:FREQ <value>
Where,
<value> is NR1, NR2 or NR3 data format followed by HZ, KHZ and MHZ.

For example: WrtCmd ("TRAN:Lx:FREQ 1KHZ") Set the Lx test frequency as 1KHZ.

Query syntax: TRAN:Lx:FREQ?
Return format: <NR3><NL^END>

The TRAN:Lx:LEVel command is used to set the Lx test level. The TRAN:Lx:LEVel query returns the current Lx test level.
Command syntax: TRAN:Lx:LEVel<value>
Where,
<value> can be NR1, NR2 or NR3 data format followed by mV or V.
NOTE: <value> ranges from 5mV to 2V. Beyond this range, error information will be reported.

For example: WrtCmd ("TRAN:Lx:LEVel 1V")

Query syntax: TRAN:Lx:LEVel?
Return format: <NR3><NL^END>

The TRAN:Lx:LIMit command is used to set the Lx nominal value, high and low limits. The TRAN:Lx:LIMit query returns the current nominal value, high and low limits.
Command syntax: TRAN:Lx:LIMIit <value>, <low limit>, <high limit>

Where,
<value> is the Lx nominal value in NR1, NR2 or NR3 data format followed by H.
<low limit> is the Lx low limit in NR1, NR2 or NR3 data format.
<high limit> is the Lx high limit in NR1, NR2 or NR3 data format.
NOTE: The low limit should be smaller than the high limit, or error information will be reported.

For example: WrtCmd ("TRAN:Lx:LIMit 0.01H, -0.01, 0.01")

Query syntax: TRAN:Lx:LIMit?
Return format: <NR3>,<NR3><NR3><NL^END>

The TRAN:Zx:STAT command is used to set the Zx test parameter as ON or OFF. The TRAN:Zx:STAT? query returns the current state of the Zx test parameter.
Command syntax:

TRAN:Zx:STAT { ON | OFF | 1 | 0 }

Where,
1 (decimal 49) is equal to ON.
0 (decimal 48) is equal to OFF.

For example: WrtCmd ("TRAN:Zx:STAT:ON") Set all Zx test parameters to be valid.

Query syntax: TRAN:Zx:STAT?
Return format: <NR1><NL^END>

The TRAN:Zx:FREQ command is used to set the Zx test frequency. The TRAN:Zx:FREQ query returns the current Zx test frequency.
Command syntax: TRAN:Zx:FREQ<value>
Where,
<value> is NR1, NR2 or NR3 data format followed by HZ, KHZ or MHZ.

For example: WrtCmd ("TRAN:Zx:FREQ 1KHZ") Set the Zx frequency as 1KHZ.

Query syntax: TRAN:Zx:FREQ?
Return format: <NR3><NL^END>

The TRAN:Zx:LEVel command is used to set the Zx test level. The TRAN:Zx:LEVel query returns the current Zx test level.
Command syntax: TRAN:Zx:LEVel<value>
Where,
<value> can be NR1, NR2 or NR3 data format followed by mV or V.

NOTE: <value> ranges from 5mV to 2V. Beyond this range, error information will be reported.

For example: WrtCmd ("TRAN:Zx:LEVel 1V")

Query syntax: TRAN:Zx:LEVel?
Return format: <NR3><NL^END>

The TRAN:ACR:STAT command is used to set the ACR test parameter to be ON or OFF. The TRAN:ACR:STAT query returns the current state of the ACR test parameter.

Command syntax: TRAN:ACR:STAT { ON | OFF | 1 | 0 }

Where,
1 (decimal 49) is equal to ON.
0 (decimal 48) is equal to OFF.

For example: WrtCmd ("TRAN:ACR:STAT:ON") Set the ACR test parameter to be valid.

Query syntax: TRAN:ACR:STAT?
Return format: <NR1><NL^END>

The TRAN:ACR:FREQ command is used to set the ACR test frequency.
The TRAN:ACR:FREQ? query returns the current ACR test frequency.
Command syntax: TRAN:ACR:FREQ<value>
Where,
<value> is NR1, NR2 or NR3 data format followed by HZ, KHZ, or MHZ.

For example: WrtCmd ("TRAN:ACR:FREQ 1KHZ") Set the ACR test frequency as 1KHZ.

Query syntax:
Return format: <NR3><NL^END>

The TRAN:ACR:LEVel command is used to set the ACR test level. The TRAN:ACR:LEVel query returns the current ACR level.

Command syntax: TRAN:ACR:LEVel<value>
Where：
<value> is NR1, NR2 or NR3 data format followed by mV and V.
NOTE: <value> ranges from 5mV to 2V. Beyond this range, error information will be reported.

Query syntax: TRAN:ACR:LEVel?
Return format: <NR3><NL^END>

The TRAN:Cx:STAT command is used to set the Cx test parameter to be ON or OFF. The TRAN:Cx:STAT query returns the current state of the Cx test parameter.
Command syntax:

TRAN:Cx:STAT { ON | OFF | 1 | 0 }

Where,
1 (decimal 49) is equal to ON.
0 (decimal 48) is equal to OFF.

For example: WrtCmd ("TRAN:Cx:STAT:ON") Set the Cx test parameter to be valid.

Query syntax: TRAN:Cx:STAT?
Return format: <NR1><NL^END>

The TRAN:Cx:FREQ command is used to set the Cx test frequency. The TRAN:Cx:FREQ? query returns the current Cx test frequency.
Command syntax: TRAN:Cx:FREQ <value>
Where,
<value> is NR1, NR2 or NR3 data format followed by HZ, KHZ and MHZ.

For example: WrtCmd ("TRAN:Cx:FREQ 1KHZ") Set the Cx test frequency as 1KHZ.

Query syntax: TRAN:Cx:FREQ?
Return format: <NR3><NL^END>

The TRAN:Cx:LEVel command is used to set the Cx test level. The TRAN:Cx:LEVel? query returns the current Cx text level.
Command syntax: TRAN:Cx:LEVel <value>
Where,
<value> is NR1, NR2 or NR3 data format followed by mV or V.
NOTE: <value> ranges from 5mV to 2V. Beyond this range, error information will be reported.

For example: WrtCmd ("TRAN:Cx:LEVel 1V")

Query syntax: TRAN:Cx:LEVel?

Return format: <NR3><NL^END>

The TRAN:Cx:LIMit command is used the set the Cx nominal value, high and low limits. The TRAN:Lx:LIMit? query returns the current Cx nominal value, high and low limits.
Command syntax: TRAN:Cx:LIMit <value>,<low limit>,<high limit>
Where,
<value> is the Cx nominal value in NR1, NR2 or NR3 data format followed by H.
<low limit> is the low limit in NR1, NR2 or NR3 data format.
<high limit> is the high limit in NR1, NR2 or NR3 data format.
NOTE: The low limit should be smaller than the high limit, or error information will be reported.

For example: WrtCmd ("TRAN:Cx:LIMit 0.01H, -0.01, 0.01")

Query syntax: TRAN:Cx:LIMit?
Return format: <NR3>, <NR3><NR3><NL^END>

The TRAN:DCR:STAT command is used to set the DCR test parameter to be ON or OFF. The TRAN:DCR:STAT? query returns the current state of the DCR test parameter.
Command syntax:

$$\text{TRAN:DCR:STAT} \left\{ \begin{array}{c} \text{ON} \\ \text{OFF} \\ 1 \\ 0 \end{array} \right\}$$

Where,
1 (decimal 49) is equal to ON.
0 (decimal 48) is equal to OFF.

For example: WrtCmd ("TRAN:DCR:STAT:ON")

Query syntax: TRAN:DCR:STAT?
Return format: <NR1><NL^END>

The TRAN:DCR:LIMit command is used to set the DCR nominal value, high and low limit. The TRAN:DCR:LIMit? query returns the current DCR nominal value, high and low limits.
Command syntax: TRAN:DCR:LIMit <value>,<low limit>,<high limit>
Where,
<value> is the DCR nominal value in NR1, NR2 or NR3 data format followed by Ω.
<low limit> is the DCR low limit in NR1, NR2 or NR3 data format.
<high limit> is the DCR high limit in NR1, NR2 or NR3 data format
NOTE: The low limit should be smaller than the high limit, or error information will be reported.

For example: WrtCmd("TRAN:DCR:LIMIT 50 Ω, -0.01, 0.01")

Query syntax: TRAN:DCR:LIMI?
Return format: <NR3>,<NR3><NR3><NL^END>

The TRAN:MODE command is used to set the transformer working mode. The TRAN:MODE? query returns the current working mode of the transformer.
Command syntax:

TRAN:MODE { SEQuence | STEPped }

Where,
SEQuence refers to sequential mode.
STEPped refers to single step mode.

For example: WrtCmd ("TRAN:MODE SEQ")

Query syntax: TRAN:MODE?

Return format { SEQ | <NL^END> | STEP }

9.2 GPIB Common Commands

- *RST
- *TRG
- *IDN
- *TST
- *ESE
- *SRE
- *ESR
- *STB
- *OPC
- *CLS

- The *RST command resets the instrument.
  For example: WrtCmd ("*RST")
- The *TRG command triggers the measurement and then sends the result to the output buffer.
  For example: WrtCmd ("*TRG")
- The *CLS command clears the standard event status register and the service request status register.
  Command syntax: *CLS
  For example: WrtCmd ("*CLS")
- The *IDN? query returns SM6030A ID.
  Query syntax: *IDN?
  Return format: <manufacturer>,<model>,<firmware><NL^END>
  Where,
  <manufacturer> Name of Manufacturer
  <model> Instrument Model
  <firmware> Firmware Version
  <HW_version> Hardware Version
  For example: WrtCmd("*IDN?");

- The *TST? query executes an internal self test and returns the test result as the sum of all existing errors codes. If there are no error SM6030A returns 0.

  Query syntax: *TST?

  Return format: 0<NL^END>

  Where,

  0 0（NR1 format）

  For example: WrtCmd(“*TST?”);

- The *ESE (standard Event Status Enable command) command sets each open bit of the standard event status register. This command returns setups of each open bit for the standard event status permission register.

  Command syntax: *ESE<value>

  Where,

  <value> NR1 format: decimal expression for each bit of operation status register.

  Descriptions for each byte of the standard event status register are shown as follows:

Bit number	Description
7	Power On(PON) Bit
6	User Request(URQ) Bit
5	Command Error(EME) Bit
4	Execution Error(EXE) Bit
3	Device Dependent Error(DDE) Bit
2	Query Error(QYE) Bit
1	Request Control(RQC) Bit
0	Operation Complete(OPC) Bit

Query syntax: *ESE?

Return format: <value><NL^END>

For example: WrtCmd (“*ESE?”)

- The *SRE （Service Request Enable command）command sets each open bit of the service status byte register. This command returns the current setups for each open bit of the status byte permission register.

  Command syntax: *SRE<value>

  Where,

  <value> NR1 format: decimal expression for each permission bit of the status byte register.

  Descriptions for each byte of the status byte register are shown as follows:

Bit number	Description
7	Operation Status Register Summary Bit
6	RQS(Request Service) Bit
5	Standard Event Status Register Summary Bit
4	MAV(Message Available) Bit
3-0	Always 0(zero):

Query syntax: *SRE?
Return format: <value><NL^END>
For example: WrtCmd("*SRE?");

- The *ESR? query returns the contents of the standard event status register.
  Query syntax: *ESR?
  Return format: <value><NL^END>
  Where,
  <value> NR1 format: decimal expression for contents of the standard event status register.

  Descriptions for each bit of the standard event status register

Bit number	Description
7	Power On(PON) Bit
6	User Request(URQ) Bit
5	Command Error(EME) Bit
4	Execution Error(EXE) Bit
3	Device Dependent Error(DDE) Bit
2	Query Error(QYE) Bit
1	Request Control(RQC) Bit
0	Operation Complete(OPC) Bit

  For example: WrtCmd ("*ESR?")
- The *STB? query returns contents of the standard service status byte register. The execution of this command will not affect contents of the standard status byte register.
  Query syntax: *STB?
  Return format: <value><NL^END>
  Where,
  <value> NR1 format: decimal expression for contents of the standard status byte register.
  Descriptions for each bit of the standard status byte register

Bit number	Description
7	Operation Status Register Summary Bit
6	RQS(Request Service) Bit
5	Standard Event Status Register Summary Bit
4	MAV(Message Available) Bit
3-0	Always 0(zero)

  For example: WrtCmd ("*STB?")
- The *OPC command equals to set the OPC bit of the standard event status register when SM6030A finishes all parameter measurements. Ever since all pending operations have been completed, this command will inform the instrument to add a ASCII number "1" (decimal number: 49) into the output buffer.
  Command syntax: *OPC
  For example: OUTPUT 717; "*OPC"! Set the OPC bit of the instrument when the last command is done.

Query syntax: *OPC?

Return format: 1 <NL^END>

Where,

1 ASCII number 1（decimal number: 49）

For example: WrtCmd(“*OPC?”)

Chapter 10 The description for Handler (optional)

The SM6030A provides the Handler interface for you. The interface is mainly used for the output of the sorted result. The interface offers the communication signal and the signal for the output of the sorted result. The separator result is corresponding to the output of BIN 10. The design for the Handler interface is very smart with the status of the output signal can be defined according to your application target.

10.1Technical description

The following table shows the description for SM6030A HANDLER.

The output signal: low effective, open collector output, optoelectronic isolation Output signal judgment: BIN comparator: good, over the standard, not good List sweep comparator: IN/OUT for every sweep point and pass/fail for all the compared result. INDEX: AD Conversion ended EOC: end of one test and comparison Alarm: alarm for circuit interruption The input signal: optoelectronic isolation Keylock: lock the keys on the front panel External Trigger: pulsewidth≥1μS

Table 1 Technical description

10.2The operation description

10.2.1 The definition for the signal line

The Handler interface has 3 signal lines: comparison output, control output and control input. The signal line's definition for the BIN comparison or list sweep comparison is below:

Comparison signal lines:

- Comparison output signal

/BIN1 - /BIN9, /AUX, /OUT, /PHI (the main parameter is higher), /PLO (the main parameter is lower), /SREJ (the secondary parameter is not good). The signal line distribution for comparison out is shown in the figure above.

- Control output signal

/INDEX (analog test finished signal), /EOM (test ended and the compared data effective), /ALARM (the circuit interruption)

- Control input signal

/EXT.TRIG (external trigger signal), /Keylock (the key lock).

The signal distribution for the pins is described in table 2 and figure 2.

Pin	Signal name	Description
1 2 3 4 5 6 7 8 9 10 11	/BIN1 /BIN2 /BIN3 /BIN4 /BIN5 /BIN6 /BIN7 /BIN8 /BIN9 /OUT /AUX	BIN sorted result /BIN (BIN number) output are all open collector output.
12 13	/EXT.TRIG	External trigger: when the trigger mode is EXT.TRIG, SM6030A will be triggered by the positive-edge pulse signal in this pin.
14 15	EXT.DCV2	External DC voltage 2: The DC provider pin for the optoelectronic coupling signal(/EXT_TRIG, /KeyLock, /ALARM, /INDEX, /EOM)
16 17 18	+5V	The internal power +5V: to use the internal power is not recommended. If you use the internal power, please ensure that the current is lower than 0.3A and the signal line is far from the disturbance source.
19	/PHI	The main parameter is higher: the test result is greater than the high limit in BIN1 to BIN9.
20	/PLO	The main parameter is lower: the test result is less than the low limit in BIN1 to BIN9.
21	/SREJ	The secondary parameter is not good: the test result is not in the range of the high limit and the low limit.
22 23 24		Please do not connect.
25	/KEY LOCK	When this line is effective, the keys in the front panel are locked.

27 28	EXT.DCV1	The external DC voltage 1: the pull-up DC power provider pin for optoelectronic coupling signal (/BIN-/BIN9,/AUX, /OUT,/PHI,/PLO,/SREJ).
29	/ALARM	When circuit is interrupted, /ALARM is effective.
30	/INDEX	When the analog test is finished and the UNKNOWN terminal can be connected to another DUT, /INDEX is effective. But the comparison signal is effective until /EOM is effective.
31	/EOM	End Of Measurement: when the test data and the compared result are effective, this signal is effective.
32,33	COM2	The reference ground for external power EXTV2.
34,35,36	COM1	The reference ground for external power EXTV1.

Table 2 signal distribution for the pins

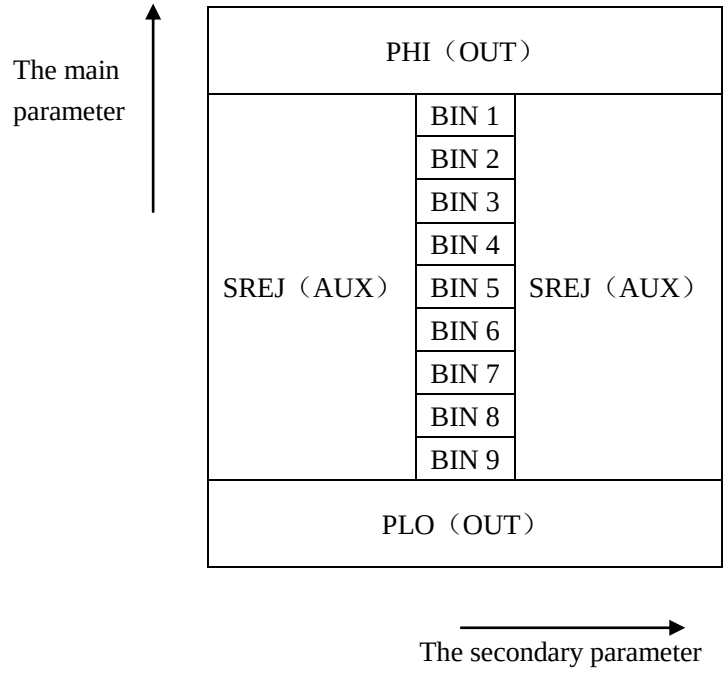
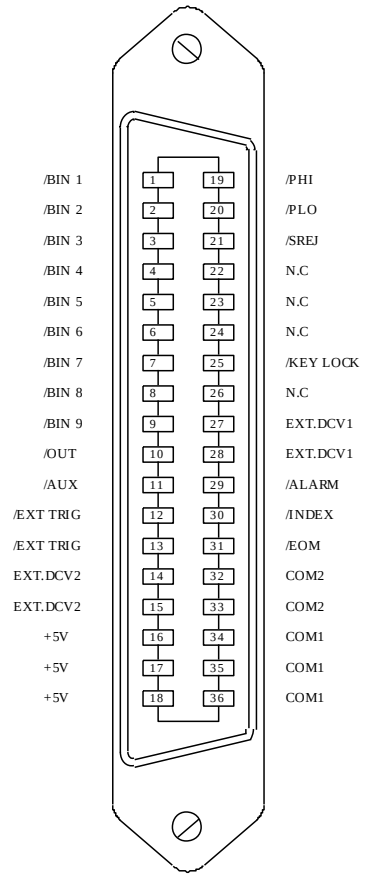
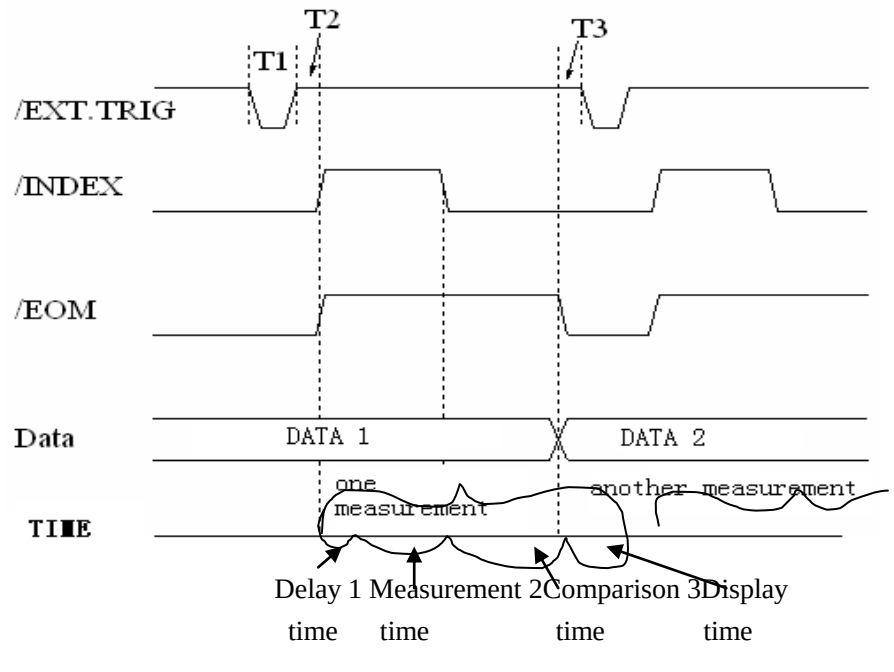


Figure 1 The /PHI, /PLO, /SREJ signal distribution for BIN comparison



Note: the signal to /BIN1 - /BIN9, /OUT, /AUX, /PHI, /PLO and /SREJ in the list sweep comparison is different from that in the BIN comparison.

Figure 2 The pin definition for HANDLER



Time	The minimum	The maximum
T1: trigger pulse-width T2:delay time T3:the trigger waiting time after /EOM output	1us 200us 0us	--- Display time[3] + 200us ---

1. For the measurement time, please refer to the operation manual;
2. The typical comparison time is approximately 1ms;
3. The display time for every display page is below:

MEAS DISPLAY: 8ms;
BIN NO.DISPLAY: 5ms;
BIN COUNT DISPLAY: 0.5ms

Figure 3-The timing chart

List sweep comparison signal line

The definition for list sweep comparison is different from that for the BIN comparison.

- Comparison output signal

/BIN-/BIN9 and /OUT show the IN/OUT (good or over the standard) judgment. /AUX shows PASS/FAIL judgement.

When a sweep test is finished, these signals will be the output signal.

- Control output signal

/INDEX (analog test finished), /EOM (the test ended).

The timing is below when /INDEX and /EOM are effective:

SEQ sweep mode:

/INDEX is defined as the effective signal when the last sweep point of the analog test is finished. /EOM is defined as the effective signal when all the test results are effective after every list sweep task is finished.

STEP sweep mod:

/INDEX is defined as the effective signal when the analog test of every sweep point is finished. /EOM is defined as the effective signal when the test and the comparison of every step are finished.

The pin distribution for list sweep is shown in table 3 and figure 2. (The pin definition for the list sweep comparison is the same to that for the BIN comparison). The timing chart is shown in figure 5.

Table 3 the pin distribute for the list sweep comparison

pin	signal	description
1	/BIN1	out of the limit of sweep point1
2	/BIN2	out of the limit of sweep point2
3	/BIN3	out of the limit of sweep point3
4	/BIN4	out of the limit of sweep point4
5	/BIN5	out of the limit of sweep point5
6	/BIN6	out of the limit of sweep point6
7	/BIN7	out of the limit of sweep point7
8	/BIN8	out of the limit of sweep point8
9	/BIN9	out of the limit of sweep point9
10	/OUT	out of the limit of sweep point10
11	/AUX	/AUX is defined as the effective signal when at least one is not good in the list.
30	/INDEX	SEQ: when the analog test of the last sweep point is finished and the UNKNOWN terminal can be connected to another DUT, /INDEX is effective. But the comparison signal is effective until /EOM is effective. STEP: when the analog test at each sweep point is finished, /INDEX is effective. But the comparison signal is effective until /EOM is effective.
31	/EOM	Test ended: SEQ: when the test is finished and the compared results are effective, this signal is effective. STEP: When the test of every sweep point is finished, /EOM is finished. the comparison result signal is effective until /EOM is effective.
others		The definition is the same to that of the comparison.

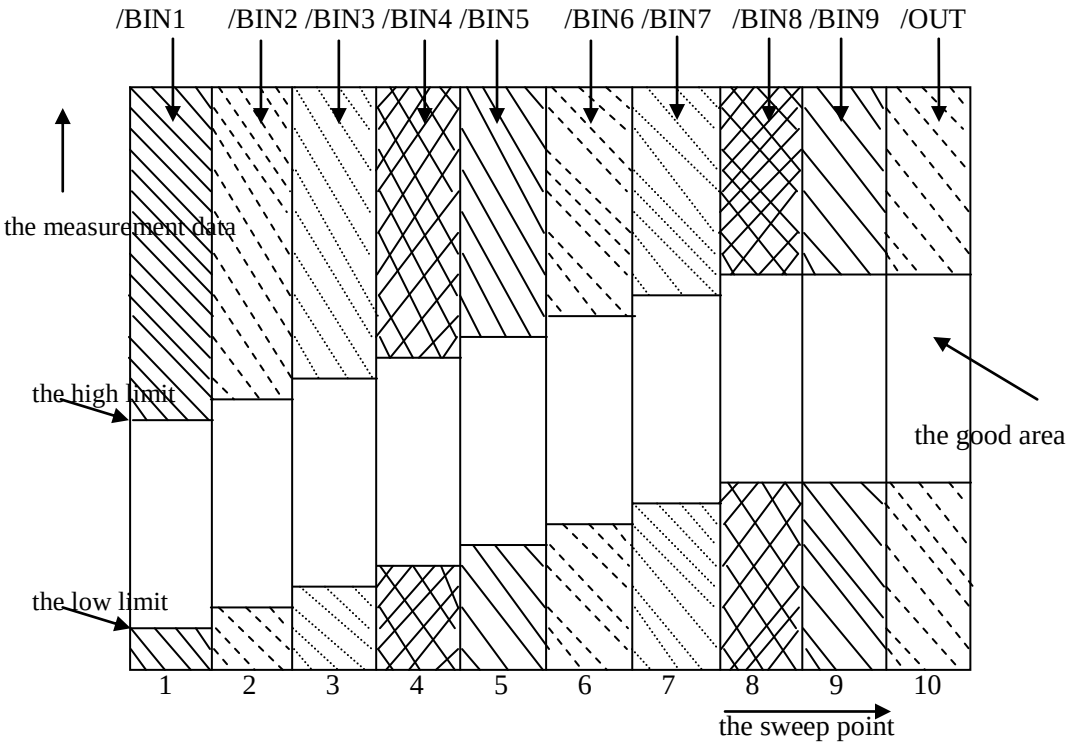
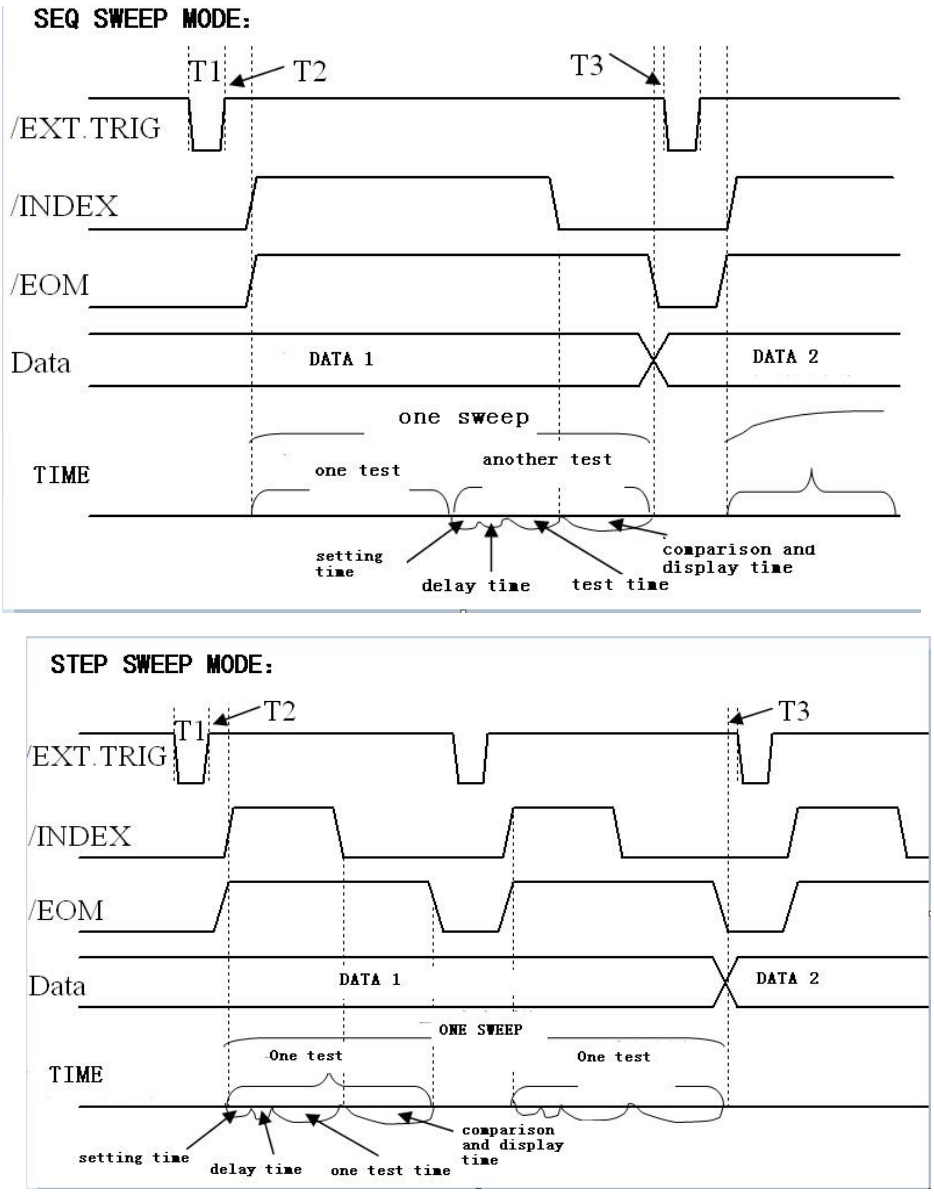


Figure 4 the signal area of the list sweep comparison



Note:

(1) The setting time includes the correction ON/OFF time.

(2)The comparison and display time is 4.5ms approximately. T1,T2,T3, refer to Figure 3

Figure 5 the time counting

10.2.2 Electrical feature

As it is shown above, the signal definition for the comparison and the list sweep comparison are different. But the electrical feature is same. So the description can be applied to BIN comparison and list sweep comparison.

DC isolation output: the DC isolation output (pin1 to pin16) generates the isolation by the optoelectronic coupler with the collector open. The output voltage on every line is set by the pull-up

resistance on the HANDLER interface board. The pull-up resistance is connected to the internal voltage (+5v), or the external voltage (EXTV:+5v).

The electrical feature of the DC isolation output can be divided into 2 types shown in Table 4.

Table 4 the electrical feature of the DC isolation output

The output signal	The output rated voltage		The maximum current	The reference ground for the circuit
	LOW	HIGH		
Compared signal /BIN1 - /BIN9 /AUX /OUT /PHI /PLO	≤0.5V	+5V--+24V	6mA	Internal pull-up voltage: SM6030A GND EXTV1: COM1
Control signal /INDEX /EOM /ALARM	≤0.5V	+5V--+24V	5mA	Internal pull-up voltage : SM6030A GND EXTV2: COM2

10.2.3 HANDLER Interface board circuit

The output circuit for the comparison result is shown in the figure 6 below.

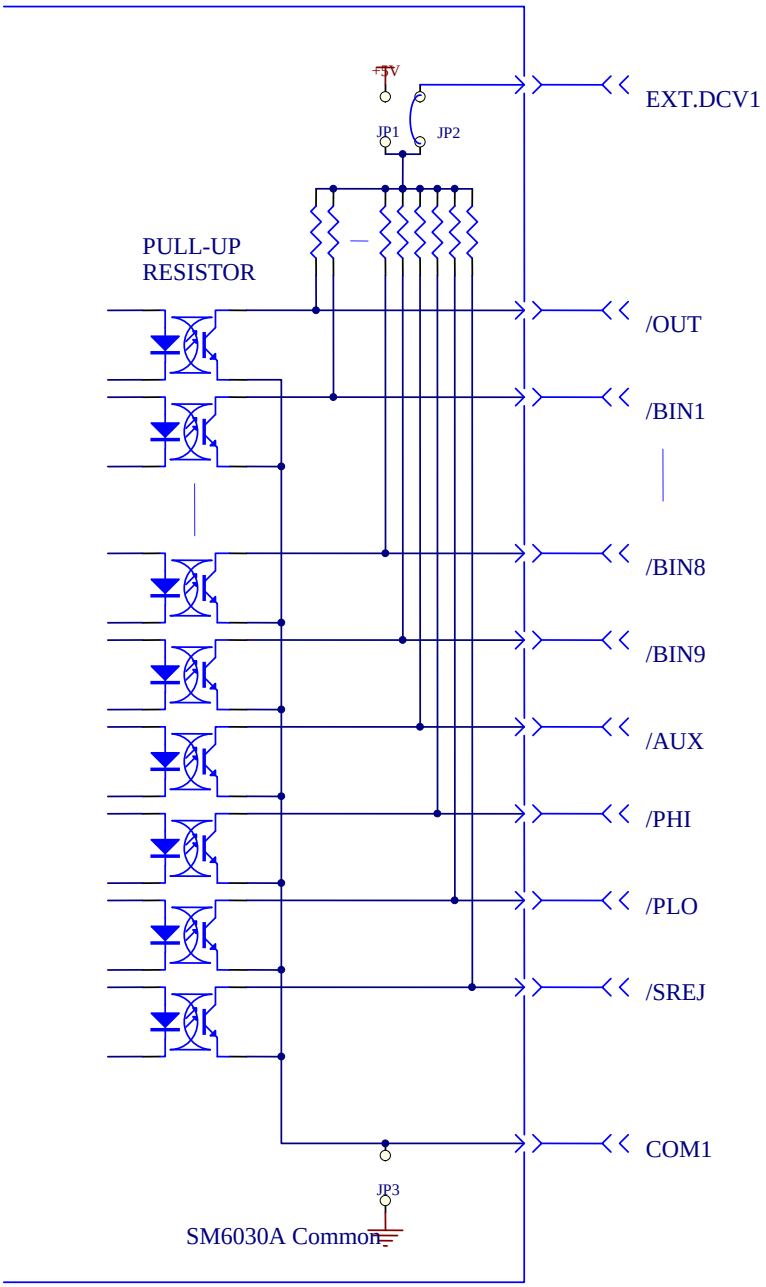


Figure 6 the output circuit for the comparison result

The output circuit for control signal is shown in the figure 7 below.

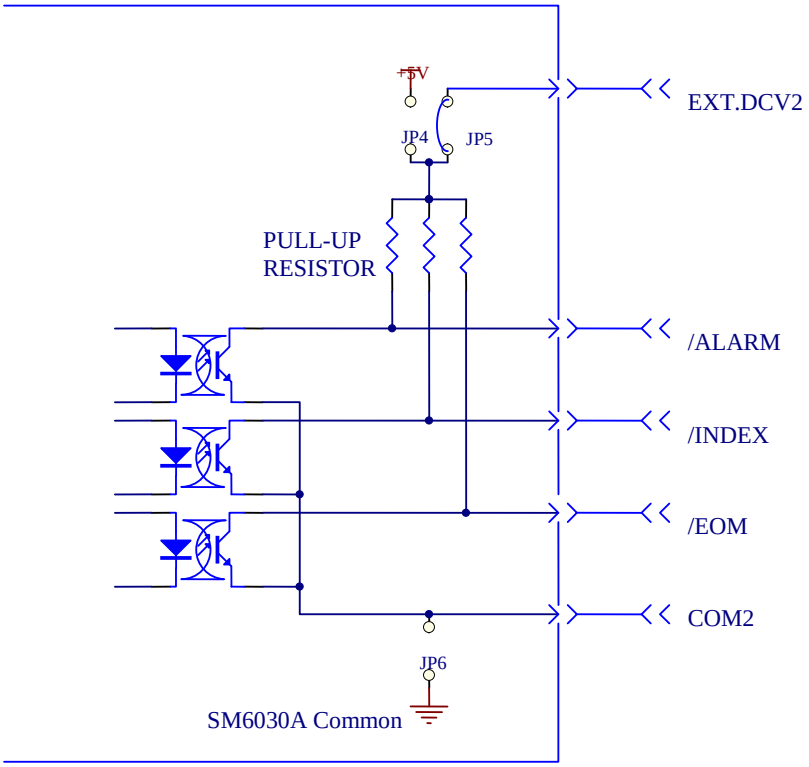


Figure 7 the output circuit for control signal

The input circuit for control signal is shown in the figure 8 below.

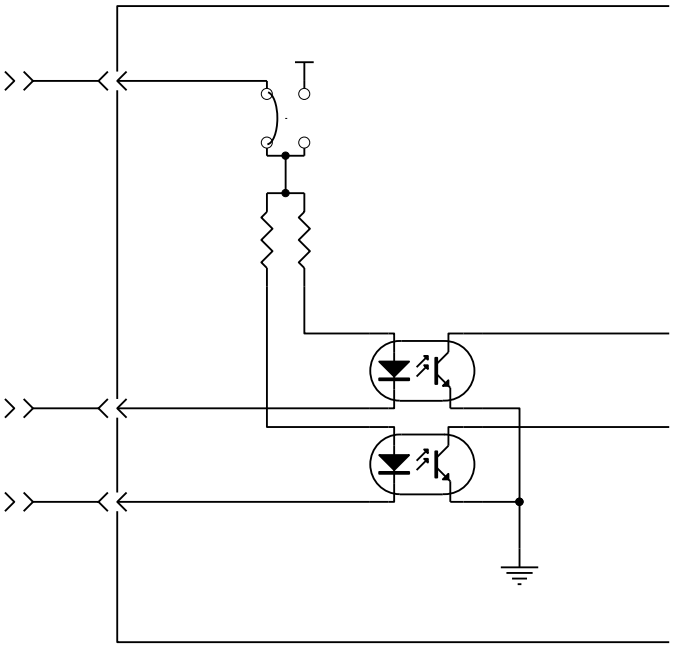


Figure 8 the input circuit for control signal

10.2.4 Operation

Before you use the HANDLER function, you should ensure that your instrument has install the HANDLER interface board.The following procedure will show you how to use the interface comparison and the list sweep comparison.

The procedure for comparison setting:

(1) Press the softkey [LIMIT TABLE]. LIMIT TABLE SETUP page will be displayed.

(2) Set the standard value and the high limit and the low limit in LIMIT TABLE SETUP. Refer to the LCR menu key description to see more details.

(3) Move the cursor to COMP field. The softkey area will display :

- ON
- OFF

(4) Press the softkey ON to enable the comparison function.

(5) Press [DISP], and then press the sotfkey BIN NO. or BIN COUNT, the DUT will be tested; at the same time, you can set the counter for the DUT and the auxiliary.

Note: COMP ON/OFF can be set in BIN COUNT page.

The procedure for list sweep comparison:

(1)Press LIST SETUP, LIST SWEEP SETUP page will be displayed.

(2)Set the sweep mode, sweep frequency point, reference value, the high limit and the low limit. Refer to the DISP menu key description to see more details.

(3)Press [DISP] and then press the soft key LIST SWEEP, LIST SWEEP DISP page will be displayed. Refer to the DISP menu key description to see more details.

Note: the following methods can be used to improve the speed:

(1)Set the range to the maximum that the capacitance may be, and lock this range.

(2)Set Vm: OFF and Im: OFF in the MEAS SETUP page.

(3)Test the DUT in the BIN COUNT page.