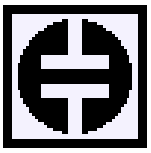
Operational Manual

MODEL TH2882A-3/-5

Impulse Winding Tester



Tonghui Electronics Co. , Ltd.

Address: NO. 3, TianShan Road, XinBei District, Changzhou, Jiangsu, China

TEL：（0519）85132222，85113342

FAX：（0519）85109972

E-MAIL：sales@tonghui.com.cn

Http://www.tonghui.com.cn

Contents

Chapter 1 Overview

Thank you for your use of our products. Before the use of it, please locate the items listed in this manual to ensure nothing is missing. If in the case that any item is missing, please contact us immediately.

Please read this manual carefully before your proper use of TH2882A impulse winding tester!

WARNING !

1) Operation
   Do not put heavy objects on the tester.
   There is a cooling fan on the rear side of this instrument, so any block of the air inlet is prohibited.
2) Rigid Power Input
   The stability of high voltage depends on stable power input. Be sure to provide rated AC power or corrected power.
3) Grounding
   For the safety of personnel and instrument, ensure the grounding terminal, designed in power cord, be grounded correctly.
4) Test Cable
   To avoid electrical shock hazard, do not touch test terminals and test samples. The reason is that a high voltage test cable is connected to the rear panel of this instrument, thus when testing, the cable and test samples connected will carry a high voltage.
5) DO NOT Open Case Unauthorized!
   To avoid the injury to personnel and damage to the instrument, do not open the case unauthorized due to the existence of high voltage in instrument.
6) Carry or Move
   Before moving the instrument, unplug the AC power sockets and remove high voltage test line or external control line.
7) Maintenance
   In non-use state, the instrument should be covered with a plastic or cloth cover. To clean the tester, wipe the dirty parts with a soft cloth soaked with diluted neutral detergent. Do not use the following chemicals to clean the instrument: diluent, benzene or organic solvent with similar chemical property with above materials.
8) Location
   Do not locate the instrument in the environment of high temperature, direct sunlight or poor ventilation. In addition, the instrument will generate high voltage, so it must be used at room temperature and in the absence of much dust.

1.1 Product Introduction

Due to the influence of wire material, magnetic material, framework and manufacture technics, winding products such as transformers, motor windings may have defects of low insulation between winding layers, circles and leads. TH2882A Series Impulse Winding Tester, adopting the high-speed sampling technique, is a new generation test instrument for insulation performance of winding products.

TH2882A compares the standard waveform stored in the non-volatile memory with the current tested waveform. TH2882A provides the PASS or FAIL comparison result according to AREA SIZE, DIFFERENTIAL AREA, CORONA DISCHARGE or DIFFERENTIAL PHASE. With its strong functions, accurate comparison methods, easy operation and various interfaces, TH2882A can provide a perfect test solution for most winding products.

Principles of Impulse Winding Test

The impulse winding tester tests the electrical characteristics of coil winding without damaging the DUT. The prerequisite condition is to test the quality of a coil at just a glance. The detection is carried out when the same electric impulse, as used in the standard coil and here discharged by a capacitor, is applied to the DUT. The voltage attenuation wave is generated in response to the impulse, related to the Q-factor and inductance of the coil. In this sense, the tester can detect turn& layer short, the differences in the number of turns and the material of the core. If high impulse voltage is applied, the poor insulation will appear as a corona or layer discharge.

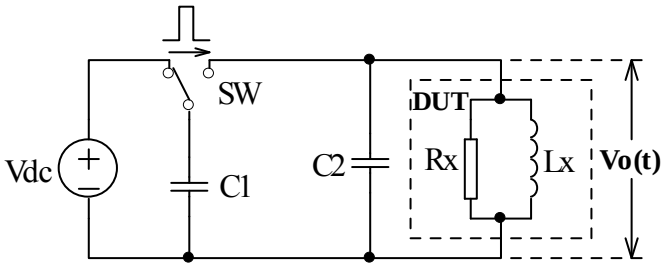


Figure 1-1 Simplified diagram for principles of impulse winding test

In figure 1-2, the self-oscillation attenuation wave has a close relation with the inductance L and quality factor Q, while L and Q depend on the number of turn, manufacture technology, properties of iron core material and whether it has air-coils. What' more, the applied voltage is a high impulse voltage, thus, it is easy to observe the short circuit, partial short of turns and layers or turns discharge phenomenon caused by insulation damage.

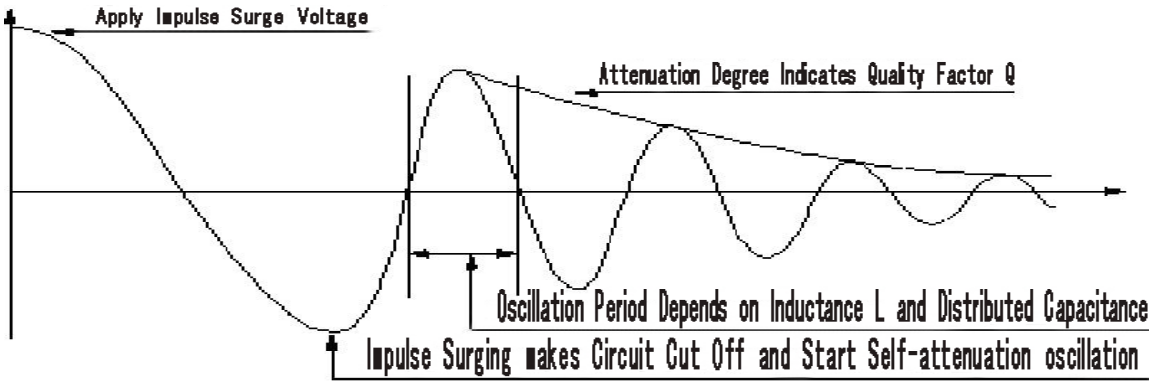


Figure 1-2 Typical Self-attenuation oscillation Wave

1.2 Operation Environment

1.2.1 Power Supply

Voltage: 198V-242V AC, 99V-121V AC

Frequency: 47.5Hz-63Hz

Consumption: ≤40VA

1.2.2 Environment Temperature and Humidity

Normal Working Temperature：0℃~40℃，Humidity: ≤ 90%RH

Referential Working Temperature: 20℃±8℃, Humidity: ≤ 80%RH

Transferring Environment Temperature: 0℃~50℃, Humidity: ≤ 93%RH

1.3 Dimensions and Weight

Dimensions (W*H*D): 400mm×132mm×360mm

Weight (Weight): Approx. 7.5kg

Chapter 2 General Specifications

2.1 Specifications

Specifications	TH2882A-3	TH2882A-5
Output for Impulse Voltage	300V ~3000V 50V steps 5%±15V	500V~5000V 100V steps 5%±25V
Inductance Test Range	More than 10μH	More than 20μH
Impulse Energy	Max 90mili-Joules	Max 250mili-Joules
LCD Display Resolution Waveform Display Area Contents	320 x 240 dot-matrix LCD 240×200 dot-matrix Setup parameters, standard wave and test wave, comparison result, file information, etc.	
Sample Wave	Sampling rate: 40MSPS/25ns, 20MSPS/50ns, 10MSPS/100ns, 5MSPS/200ns, 2.5MSPS/400ns, 1.25MSPS/800ns, 625kSPS/1.6μs, 312kSPS/3.2μs Resolution: 8bits Sampling Point: 960 bytes/phase	
Input Impedance	10MΩ	
Test Speed	Three-phase test: 5.5 times/sec（waveform display is off, comparator is on） 3.3 times/sec（waveform display is on, comparator is on）	
Averaging Rate	Number of test impulse	1 to 30 averaging rate programmable
	Number of demagnetizing impulse	0 to 7 averaging rate programmable
Measurement Function	Voltage, Time and Frequency	
Trigger Mode	Internal, Manual(Foot), External and Bus	
Comparison Method	Area Size Comparison Differential Zone Comparison Corona Discharge Comparison Differential Phase Comparison	
Area Size Measurement Accuracy	±1%	

Area Difference Measurement Accuracy	±1%
Comparison Output	PASS/FAIL display Beeper alarm
Beep Mode	Long High, Long Low, Single Short, Double Short tone and OFF
Memory	Built-in memory: 60 files USB Disk memory: 500 files (optional)
Interface	HANDLER (START, STOP, PASS, NG, BUSY, EOC, etc.) RS232C, USB host interface, IEEE488(optional)

2.2 Comparison Methods

2.2.1 Area Size Comparison

As shown in figure 2-1, when comparison method is set to AREA SIZE, the area sizes of both standard waveform and the tested waveform are calculated (integration method) between A and B. The percent deviation is the ratio of the area size difference to the area size of the standard waveform between A and B, expressed as a percentage.

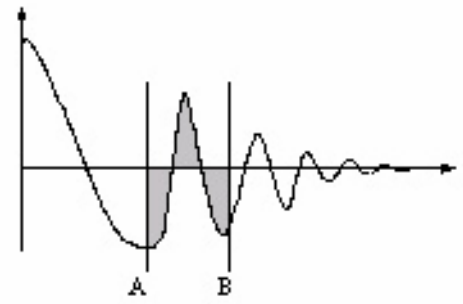


Figure 2-1 Area size comparison

The area size of the waveform is nearly proportional to the energy loss in the winding. When a sample winding has a short circuit between layers, the short circuit area is reflected as an increase of energy loss.

2.2.2 Differential Area Comparison

When comparison method is set to Differential Area, the TH2882A calculates the area size

of differential portion between the standard waveform and the tested waveform from A to B. (The differential portion area size is indicated as the shaded part in Figure 2-2.) The percent deviation is the ratio of the differential portion area size to the area size of the standard waveform between A and B, expressed as a percentage.

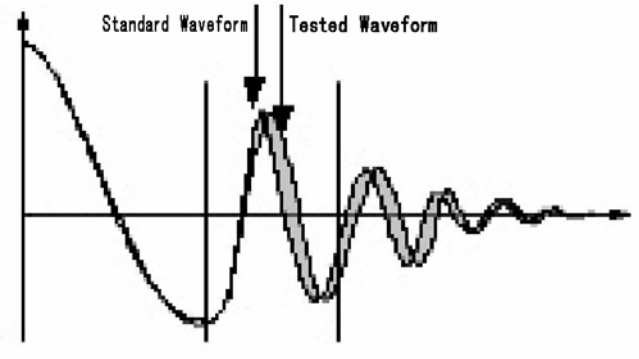


Figure 2-2 Differential area comparison

The differential area size reflects the value of inductance and total energy loss. This method is especially effective to detect the differences of inductance L between the standard winding and the tested winding.

2.2.3 Corona Discharge Comparison

When comparison method is set to Corona Discharge, the TH2882A detects the high frequency energy of corona discharge from A to B as shown in Figure 2-3. When the corona evaluation value is less than the corona difference limit, then the comparison result will be PASS. When the corona evaluation value is more than the corona difference limit, then the comparison result will be FAIL. The corona evaluation value and difference limit are both expressed as an integer.

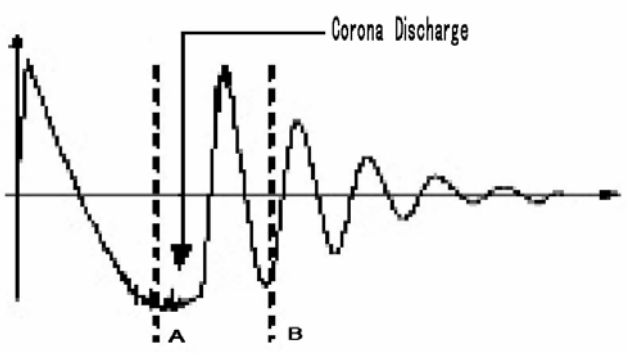


Figure 2-3 Corona discharge comparison

User can sample some coil samples (e.g. 10 samples) to set an effective corona discharge value. First, applying an impulse voltage to each coil will gain the corona discharge value of each coil. Then, a new effective value can be set by adding 20% to the maximum corona discharge value. In order to ensure the correctness of the new value, user can test these coils once more and observe the corona PASS or FAIL.

2.2.4 Differential Phase Comparison

User can specify a zero-crossing point to compare. The instrument will judge the zero-crossing offset between the tested waveform and standard waveform and then compare the oscillation period between the two waveforms. The percentage of the two values will be taken as the judging criterion and the reference is set by percentage. As is shown in figure 2-4, A~B is the offset and C~D is the oscillation period of standard waveform. The third zero-crossing point of the compared waveform is to set.

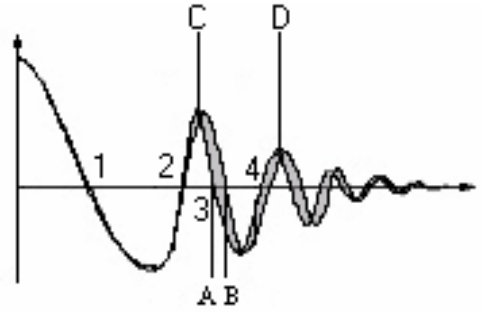
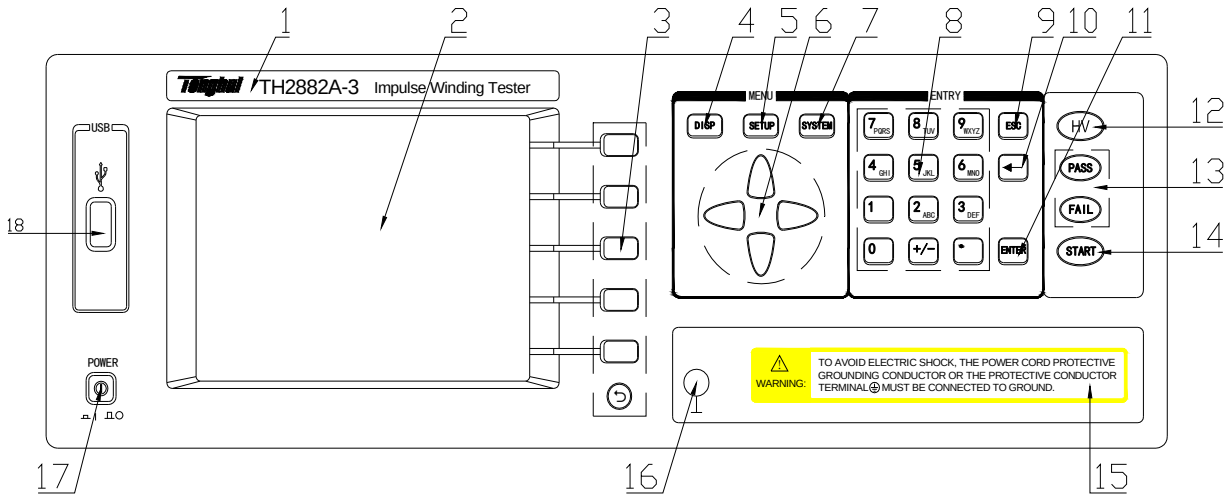


Figure 2-4 Phase differential comparison

☞**Note:** The tester can only set zero-crossing points from 2 to 10. The first zero-crossing point cannot reflect the actual performance of coils, so it is not necessary to set the first point. In real phase differential comparison, there are four results generated: PASS, FAIL, FAIL1 and FAIL2. PASS is up to standard; FAIL, below standard. While FAIL1 means the zero-crossing point has not been found, that is to say, it is unable to find the set zero-crossing point on the waveform of the tested coil; FAIL2 indicates that a complete period cannot be found on the standard waveform. As is shown in figure2-4, the third zero-crossing point must be present in the waveform to ensure the normal operation of phase differential comparison.

Chapter 3 Panels and Display Instruction

3.1 Front Panel Instruction

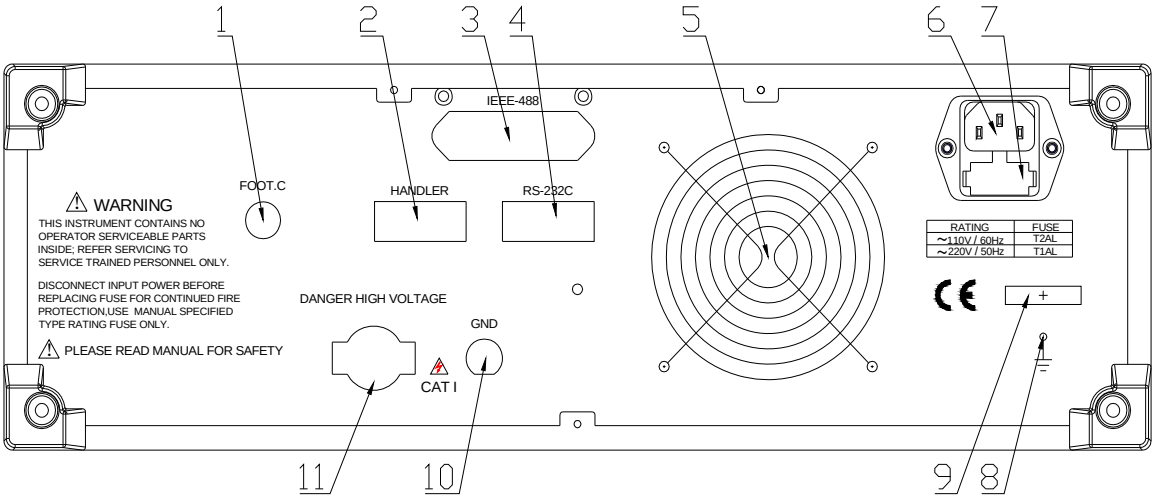


Serial Number	***Name***	***Instruction***
1	Brand and Model	
2	LCD	320×240 Large-Scale dot-matrix LCD displays measurement waveform, test conditions and system configurations, etc.
3	SOFT KEY	The five keys' functions are not fixed and have different functions in different menus. Five soft keys are used to select control and parameter functions. Current function of each soft key is displayed along its left side.
4	DISP menu key	Press DISP menu key to enter the <MEAS DISP> page.
5	SETUP menu key	Press SETUP menu key to enter the <MEAS SETUP> page.
6	CURSOR keys	The CURSOR keys are used to move the field select cursor from field to field on the LCD display page. When the cursor is moved to a field, the field changes to an inverse video image of the original field.
7	SYSTEM menu key	Press SYSTEM menu key to enter the <SYSTEM SETUP> page.

8	NUMBER keys	The NUMBER keys are composed of the digits 0 to 9 , a period . , a minus sign - . The number keys are used to enter numeric data into the TH2882A.
9	ESC key	ESC key is used to cancel the enter of numbers or characters.
10	BACKSPACE key	The function of BACKSPACE key is to delete numbers or characters wrongly entered.
11	ENTER key	ENTER key terminates numeric input data and enters the displayed value on the data input line (bottom line of the LCD screen).
12	High Voltage Indicator (HV)	High Voltage Indicator indicates that the TH2882A is outputting dangerous impulse test voltage to the HV terminal on the rear panel.
13	Pass/ Fail Indicator	When PASS indicator flashes ，the comparison result is up to standard；while FAIL，below standard. Valid only in comparison function.
14	START key	Press the START key to start a measurement. In the process of test, pressing the key will terminate the measurement.
15	Warning Message	This Warning Message calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death to personnel.
16	Ground Terminal	The terminal is used to connect the instrument to the ground, thus to protect the operating personnel.
17	POWER key	Switch on or off the main power
18	USB Interface	An USB disk can be connected for standard waveforms and measurement conditions storage.

Table 3-1 Front panel instruction

3.2 Rear Panel Instruction

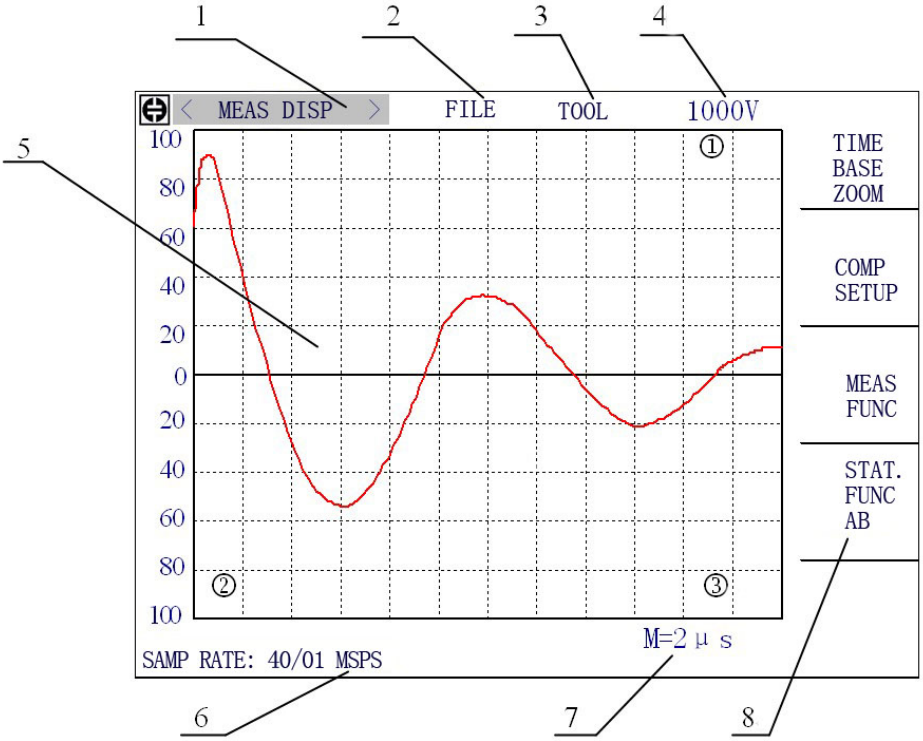


Serial Number	***Name***	***Instruction***
1	FOOT CONTROL	A footswitch can be used to start a measurement instead of pressing the START key from the front panel.
2	HANDLER Interface	This is the HANDLER Interface connector used when operation with an external handler to fully automate testing, comparing, and quality control data processing. Comparison results are output via the handler interface. You can also start or stop a test through the interface.
3	IEEE488 Interface (option)	IEEE488 general purpose interface bus can be connected to a computer for remote control and operation.
4	RS232C Interface	RS232C Communication Interface can be connected to a computer for remote control and operation.
5	Cooling Fan	Make sure that sufficient space must be kept around the TH2882A to avoid obstructing the air flow of the cooling fans.
6	Line Input Receptacle	AC power cord receptacle
7	Fuse Holder	Fuse holder is used to protect the instrument.

		220V/1A
8	Ground Terminal	Connect the case with the ground.
9	Name Plate	Name Plate is used to provide the information of date, model, serial number and manufacturer, etc.
10	GND Test Terminal	GND Test Terminal is used to connect the DUT with the test terminal.
11	Test Terminals	Three phase HV output terminal is connected to the tested coils.

Table 3-2 Rear panel instruction

3.3Display Area Definition



Specific definition for each area:

1 Display Page Area

This is the display page area. This area identifies the current display page.

2 FILE Field

When the cursor is set on the ***FILE*** field, FILE Manage function is available. Select FILE Manage function, common file functions which are not displayed on the display pages (for example, LOAD, SAVE, DELETE, COPY functions) are made available.

3 TOOL Field

Some special controls which cannot be set on a display page's fields are made available: OPEN LOAD, CLOSE LOAD, CLOSE GRID and LOCK KEY.

4 Impulse Voltage Field

Move the cursor to the Impulse Voltage Field to set the test impulse voltage.

5 Waveform Display Area

In this area, tested waveforms, standard waveforms and comparison results are displayed.

- The GO/NG comparison results for 4 different comparison modes are displayed on the location ① of the Display Area.
- The calculation results for 4 different comparison modes are displayed on the location ③ of the Display Area.
- The measurement results of voltage, time, frequency and current file information are displayed on the location ② of the Display Area.

6 Sampling Rate Area

This area is where the current sampling rate is displayed. In comparison measurement mode, sampling rate can be selected when the select bar is moved in this area. In other display pages, this area shows system messages or input numbers.

7 Time Display Area

This area shows the time between the two dash lines of this waveform display area in X direction. The time shown in this area cannot be modified by user but varies with the sampling rate and time base zoom.

8 Soft key Area

This area is reserved for soft key labels. The soft keys displayed correspond to the field at the cursor’s position on the LCD.

Chapter 4 Operation Instruction

4.1 Basic Operation

1. Display the desired display page using the MENU keys: DISP, SETUP, and SYSTEM.
2. Move the cursor to the desired field using CURSOR arrow keys: [⇧], [⇩], [⇦], [⇨].
3. The soft keys corresponding to the field pointed to by the cursor will be displayed. Select and press a soft key.
4. The numeric entry keys and ENTER key are used to enter numeric data. When one of the numeric entry keys is pressed to input an impulse voltage on the <MEAS DISP> page, the soft keys will change to the available unit soft keys. You can use these unit soft keys instead of ENTER. When ENTER is used, the numeric data is entered with V as the default unit.

   Figure 4-1 shows an operation example to set the trigger mode to the External mode. As the figure shows, press [⇩] key to enter into picture 1; [⇨] key, picture 2; press the soft key 2, the trigger mode will be changed to EXT. The operation sequence of keys is corresponding to the numeric label of picture 3.

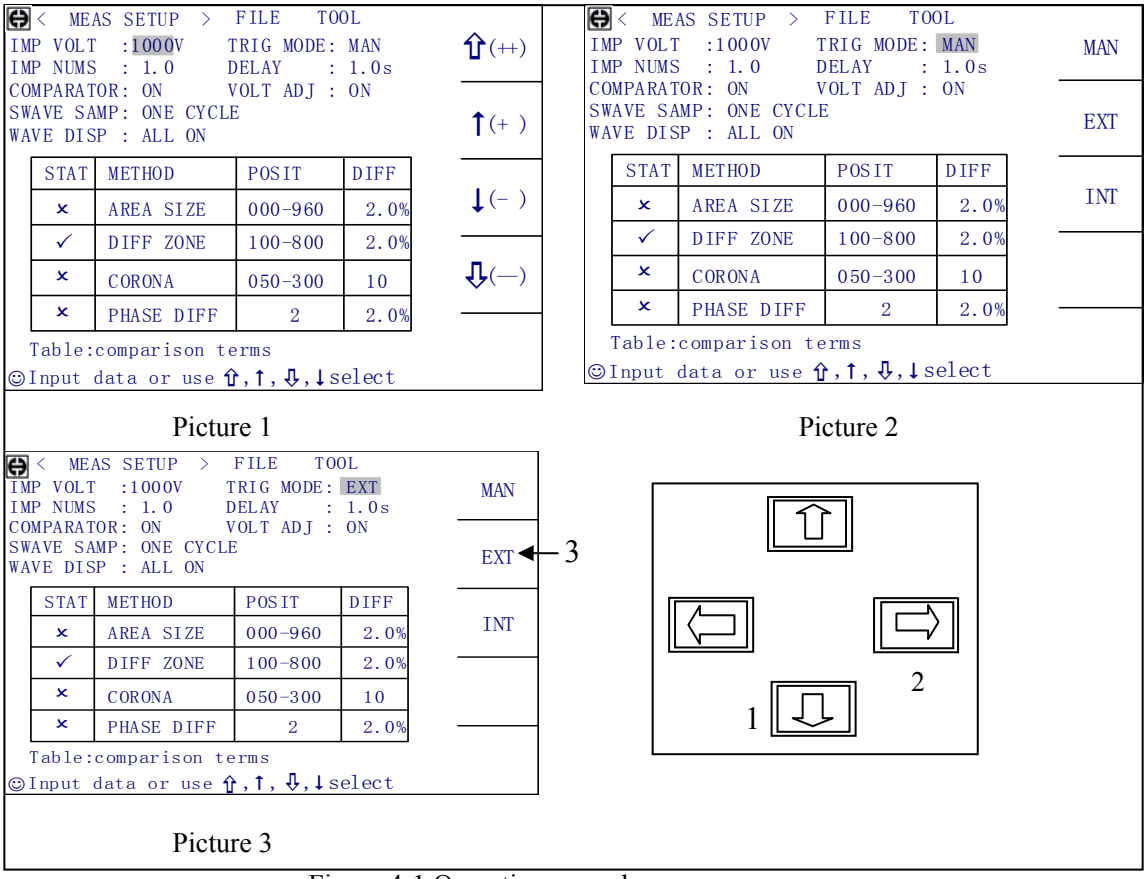


Figure 4-1 Operation procedure

4.2 DISP Menu Operation

4.2.1 Startup Display Page

Press the power button to enter into startup display page.

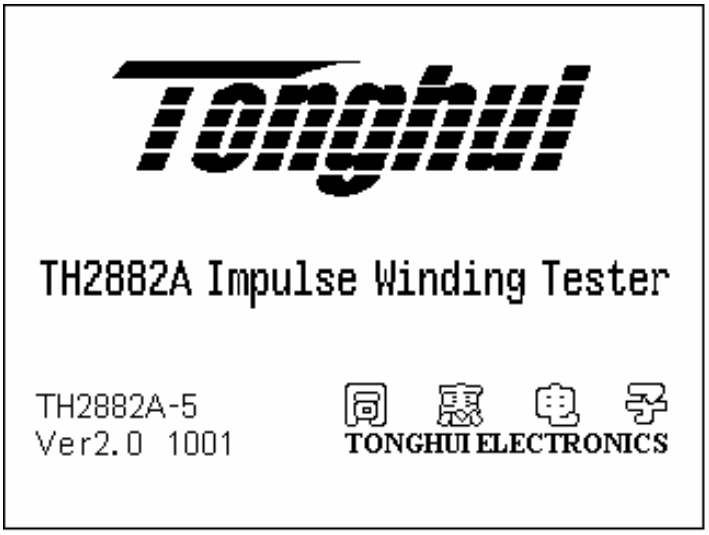


Figure 4-2

The bottom left corner of the page indicates the model and version of the instrument.

An indicator on this page will prompt user to enter password, if user starts up the password protection (as shown in figure 4-3). The page will enter into the measurement display page only when the correct password is input, or the instrument will restart and require user to enter other passwords. Be sure to REMEMBER your PASSWORD!

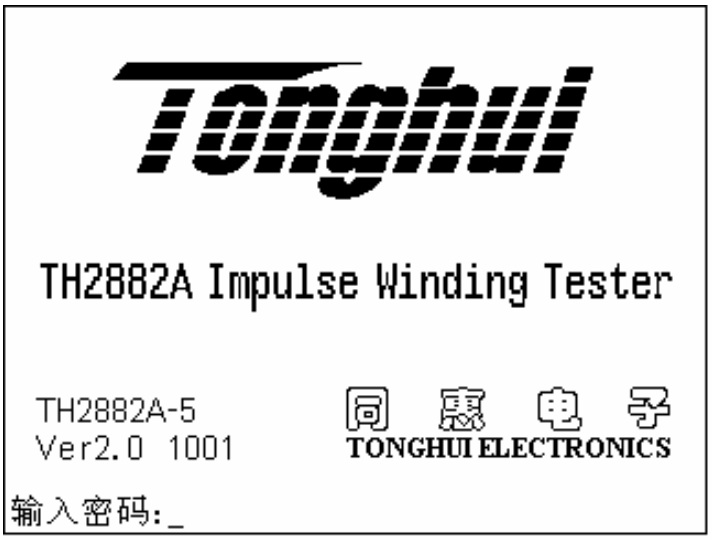


Figure 4-3

☞ **NOTE**：Default password is 2882.

4.2.2 MEAS DISP Page

Press the DISP menu key to enter the < MEAS DISP> page (the default page). On this page, voltage measurement (VOLT MEAS), time measurement (TIME MEAS), frequency measurement (FREQ MEAS) can be made and the impulse voltage (IMP VOLT), file manage (FILE), tools (TOOL), sample rate (SAMP RATE), time base zoom (TIME BASE ZOOM) and four comparison measurements (COM SETUP) can be set. Figure 4-4 is the measurement display page, while figures 4-5 and 4-6 show the soft keys available on this display page.

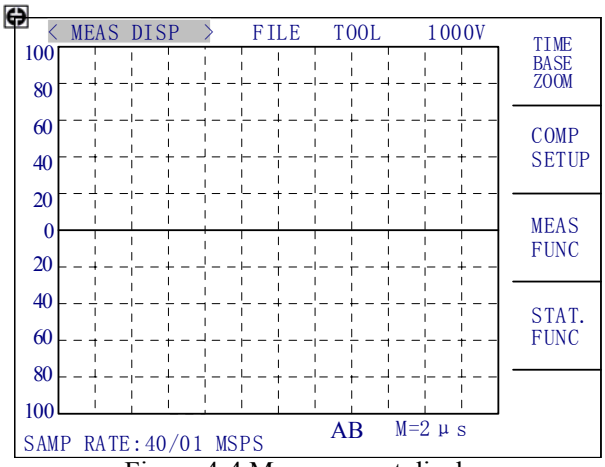


Figure 4-4 Measurement display page

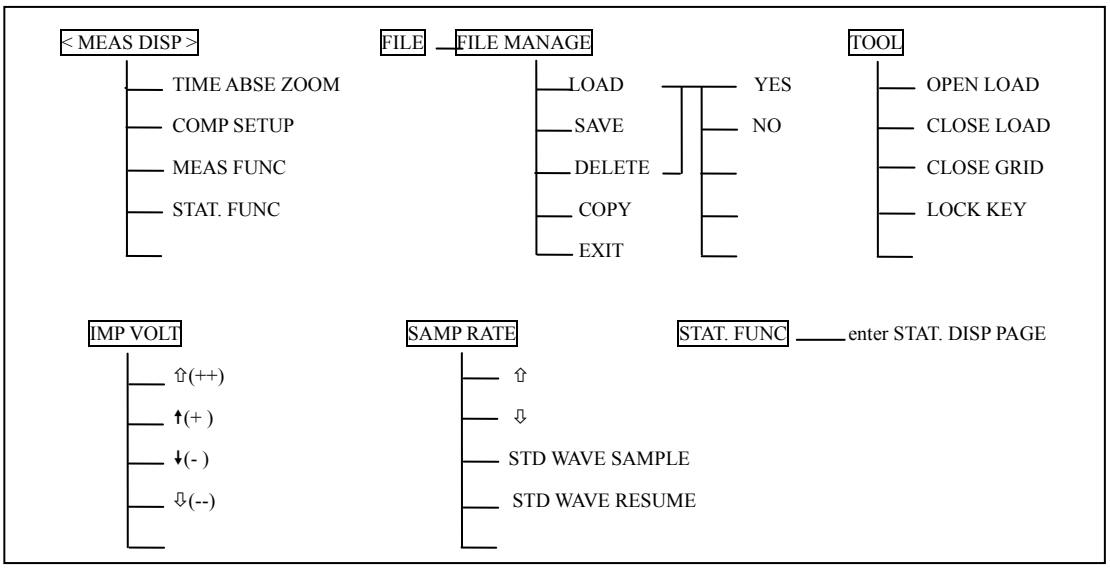


Figure 4-5 Available soft keys on the MEAS DISP page (1)

As above figure shows that when the cursor stops at the MEAS DISP key, pressing any soft key will enter the corresponding measurement or parameter setup. The available soft keys is shown in figure 4-6.

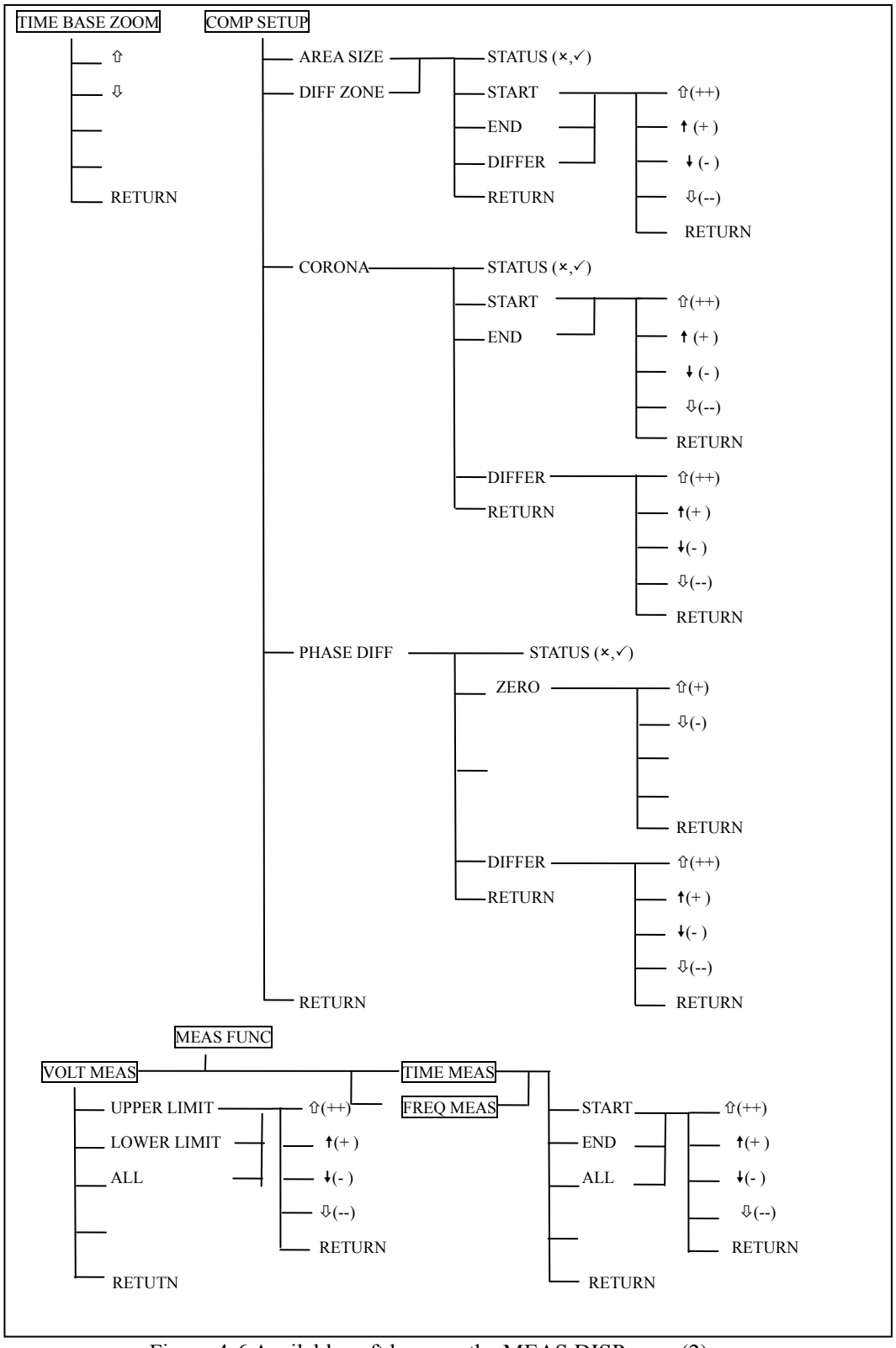


Figure 4-6 Available soft keys on the MEAS DISP page (2)

4.2.2.1 <MEAS DISP>

When the cursor is in this area, user can take operations such as time base zoom, comparator setup, voltage measurement, time measurement and frequency measurement. Specific introduction is given in later instruction. Figure 4-6 shows the soft keys in this mode. For the layered structure, pressing the RETURN key can go back the previous page after selection or operation.

4.2.2.2 TIME BASE ZOOM

There are three kinds of time per horizontal division available so that user can observe the waveform clearer. Soft keys ⇨ and ⇦ can be used to select time division. Please note that time varies with the selection.

4.2.2.3 COMP SETUP

TH2882A provides four kinds of comparator methods as follows: Area Size Comparison, Differential Area Comparison, Corona Discharge Comparison and Differential Phase Comparison.

The instrument collects the waveform data of 960 points, thus user can select the comparison area between the start position and 960.

- Area Size Comparison: Press the COMP SETUP soft key to set the comparison parameters, the following soft keys will be displayed.
  - AREA SIZE
  - DIFF ZONE
  - CORONA
  - PHASE DIFF
  - RETURN

  Then press the AREA SIZE soft key to set the comparison range. The data displayed on the bottom left of the page is the area size comparison value (S is the start position; E, the end poison; D, difference value.), while two vertical dash lines on the page show the comparison area.
  - Press the STATUS soft key to toggle the AREA SIZE comparator status between ✓ (ON) and × (OFF).
  - Press Start and End soft keys to set the comparison range. The following soft keys are available in this mode.

    ⇧(++) and ⇩(--) soft keys are the coarse adjustment keys used to increase or decrease the dash line by 20 dots.

    ↑(+) and ↓(-) soft keys are the fine adjustment keys used to increase or decrease the dash line by 1dot.

    Press the RETURN soft key to get back to the previous page.
  - Press the DIFFER soft key to set the percent difference for AREA SIZE comparison.

    ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to increase or decrease the

difference by 1.0%.

↑(+) and ↓(-) soft keys are fine adjustment keys used to increase or decrease the difference by 0.1%.

Press the RETURN soft key to get back to the previous page.

- Press the RETURN soft key to get back to the previous page.

- DIFF ZONE Comparison: Press the COMP SETUP soft key to set the comparison parameters, the following soft keys will be displayed.
  - AREA SIZE
  - DIFF ZONE
  - CORONA
  - PHASE DIFF
  - RETURN

  Then press the DIFF ZONE soft key to set the comparison range. The data displayed on the bottom left of the page is the differential area size comparison value (S is the start position; E, the end poison; D, difference value.), while two vertical dash lines on the page show the comparison area.
  - Press the STATUS soft key to toggle the DIFF ZONE comparator status between ✓ (ON) and × (OFF).
  - Press Start and End soft keys to set the comparison range. The following soft keys are available in this mode.

    ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to increase or decrease the dash line by 20 dots.

    ↑(+) and ↓(-) soft keys are fine adjustment keys used to increase or decrease the dash line by 1dot.

    Press the RETURN soft key to get back to the previous page.
  - Press the DIFFER soft key to set the percent difference for DIFF ZONE comparison.

    ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to increase or decrease the difference by 1.0%.

    ↑(+) and ↓(-) soft keys are fine adjustment keys used to increase or decrease the difference by 0.1%.

    Press the RETURN soft key to get back to the previous page.
  - Press the RETURN soft key to get back to the previous page.
- CORONA Comparison: Press the COMP SETUP soft key to set the corona parameters, the following soft keys will be displayed.
  - AREA SIZE
  - DIFF ZONE
  - CORONA
  - PHASE DIFF
  - RETURN

  Then press the CORONA soft key to set the comparison range. The data displayed on the

bottom left of the page is the corona comparison value (S is the start position; E, the end poison; D, difference value.), while two vertical dash lines on the page show the comparison area.

- Press the STATUS soft key to toggle the CORONA comparator status between ✓ (ON) and × (OFF).
- Press Start and End soft keys to set the comparison range. The following soft keys are available in this mode.

  ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to increase or decrease the dash line by 20 dots.

  ↑(+) and ↓(-) soft keys are fine adjustment keys used to increase or decrease the dash line by 1 dot.

  Press the RETURN soft key to get back to the previous page.
- Press the DIFFER soft key to set the percent difference for corona comparison. Use the following displayed soft keys to input the difference value.

  ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to increase or decrease the difference by 10.

  ↑(+) and ↓(-) soft keys are fine adjustment keys used to increase or decrease the difference by 1.

  Press the RETURN soft key to get back to the previous page.
- Press the RETURN soft key to get back to the previous page.

- Differential phase comparison: Press the DIFF ZONE soft key to set the comparison parameters, the following keys will be displayed.
  - AREA SIZE
  - DIFF ZONE
  - CORONA
  - PHASE DIFF
  - RETURN

  Then press the PHASE DIFF soft key to comparison parameters. The data displayed on the bottom left of the page is the differential phase comparison value (P is the zero-crossing position; D, difference value.).
  - Press the STATUS soft key to toggle the CORONA comparator status between ✓ (ON) and × (OFF).
  - Set the zero-crossing position, that is, select a zero-crossing position to compare its phase difference. The following soft keys are available in this mode.

    ⇧(+) and ⇩(-) soft keys are the coarse adjustment keys used to increase or decrease the zero-crossing position by 1. The selection of the zero-crossing position is between 2 and 10.

    Press the RETURN soft key to get back to the previous page.
  - Press the DIFFER soft key to set the percent difference for differential phase comparison. Use the following displayed soft keys to input the difference value.

⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to increase or decrease the difference by 1.0%.

↑(+) and ↓(-) soft keys are fine adjustment keys used to increase or decrease the difference by 0. 1%.

Press the RETURN soft key to get back to the previous page.

- Press the RETURN soft key to get back to the previous page.

4.2.2.4 VOLT MEAS

Voltage measurement function is used to measure the voltage value between the upper and the lower limits, but the major use is to measure the crest of impulse voltage. Press VOLT MEAS soft key to select the voltage measurement function. The voltage between the upper and the lower limits will be displayed on the bottom left of the page. The upper and the lower limits are two horizontal dash lines.

ⓘ **NOTE**: The default lower limit locates on the central line.

- Press the UPPER LIMIT soft key to set the upper limit position of voltage.

  ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to move the upper limit by 10 dots.

  ↑(+) and ↓(-) soft keys are fine adjustment keys used to move the upper limit by 1 dot.

  Press the RETURN soft key to get back to the previous page.
- Press the LOWER LIMIT soft key to set the upper limit position of voltage.

  ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to move the lower limit by 10 dots.

  ↑(+) and ↓(-) soft keys are fine adjustment keys used to move the lower limit by 1 dot.

  Press the RETURN soft key to get back to the previous page.
- Press the ALL soft key to set the upper and the lower limit positions of voltage at the same time.

  ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to move the upper and the lower limits by 10 dots.

  ↑(+) and ↓(-) soft keys are fine adjustment keys used to move the upper and the lower limits by 1 dot.

  Press the RETURN soft key to get back to the previous page.

4.2.2.5 TIME MEAS

Time Measurement Function is used to measure the time value between the start and the end position, but the major use is to measure the oscillation period for DUT. Press TIME MEAS soft key to select the time measurement function. The time value is displayed on the bottom left of the page. The start and the end positions are two vertical dash lines.

ⓘ **Note**: Data of the start and the end position used in time measurement function and frequency measurement function are the same data, which means any change of the start or the end position in one function will cause the corresponding change of positions in another function.

- Press the START soft key to set the start time.
  ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to move the start time by 10 dots.
  ↑(+) and ↓(-) soft keys are fine adjustment keys used to move the start point by 1 dot.
  Press the RETURN soft key to get back to the previous page.
- Press the END soft key to set the end time.
  ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to move the end time by 10 dots.
  ↑(+) and ↓(-) soft keys are fine adjustment keys used to move the end time by 1 dot.
  Press the RETURN soft key to get back to the previous page.
- Press the ALL soft key to set the start time and the end time.
  ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to move the start time and the end time by 10 dots.
  ↑(+) and ↓(-) soft keys are fine adjustment keys used to move the start time and the end time by 1 dot.
  Press the RETURN soft key to get back to the previous page.

4.2.2.6 FREQ MEAS

Frequency Measurement Function is used to measure the frequency value between the start and the end position, but the major use is to measure the oscillation frequency for DUT. Press FREQ MEAS soft key to select the frequency measurement function. The frequency value is displayed on the bottom left of the page. The start and the end positions are two vertical dash lines.

- Press the START soft key to set the start frequency.
  ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to move the start frequency by 10 dots.
  ↑(+) and ↓(-) soft keys are fine adjustment keys used to move the start frequency by 1 dot.
  Press the RETURN soft key to get back to the previous page.
- Press the END soft key to set the end frequency.
  ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to move the end frequency by 10 dots.
  ↑(+) and ↓(-) soft keys are fine adjustment keys used to move the end frequency by 1 dot.
  Press the RETURN soft key to get back to the previous page.
- Press the ALL soft key to set the start frequency and the end frequency.
  ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to move the start frequency and the end frequency by 10 dots.
  ↑(+) and ↓(-) soft keys are fine adjustment keys used to move t the start frequency and the end frequency by 1 dot.
  Press the RETURN soft key to get back to the previous page.

4.2.2.7 FILE

TH2882A uses the internal non-volatile memory for storing and retrieving a maximum of 60 sets of instrument control settings, comparison parameters, statistic data and standard waveform. An USB disk can also be used to store and retrieve another 500 files. System configuration parameter is not stored in internal memory and USB disk.

TEST the standard waveform before storing a file!

Move the cursor to the FILE field, and the FILE MANAGE soft key will be displayed. After the press of the FILE MANAGE soft key, figure 4-7 will be shown on the screen. No. is the file number; files from 1to 60 are the internal files while files from 61 to 560 are stored on the USB disk. State indicates that files are present or not; "1" means present, while "0" is absent. File name is entered by user when storing the file. If user press the ENTER button without inputting file name, the file will be stored as <Unnamed>. Current file number will show in the message line. If the file number is 0, it means that the instrument has not called a file or the file has not been saved. **After saving, the file number will automatically direct to the position that the file is stored.**

User can move the cursor to the next operated file by using arrow buttons or pressing the ENTER button after input file number.

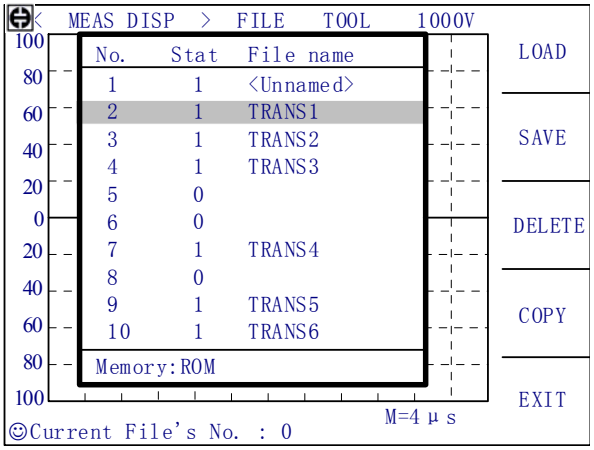


Figure 4-7 Operation page in file manage mode

Following keys are the five soft keys available in FILE MANGE.

- LOAD: Press this key to load a file stored in the internal non-volatile memory or an USB disk. As figure 4-7 indicates, using arrow buttons can select the needed file. Press the LOAD soft key to load the file. If the selected file is needed to load, press YES; otherwise, press NO.
- SAVE: Press this key to save a file. Move the arrow key to choose the catalog storing the file. The file can be saved after entering a file name and pressing the ENTER button. If user press the ENTER button without entering the file name, the file will be saved as the default

name- <Unnamed>. Pressing the ESC soft key can exit the operation of saving file. Letters from A to Z, numbers from 0 to 9, and special characters such as: (,), /, \, @, #, $, &, +, -, *, %, etc. can be used for a file name.

Enter Rules: Pressing a numeric key, the corresponding letters or characters will be displayed on the screen. If user wants to input a number, the numeric key should be pressed again; while a letter or character is needed, then the soft key corresponding to the letter or character should be pressed.

☞**Note**: New file will cover the original one.

- DELETE: Pressing this key to delete the saved file, message "☺ *Sure to delete?*" will be displayed on the system message and input line. YES and NO soft keys will also be displayed. Press YES to delete the file and Press NO to cancel the delete operation. If the deleted file number is identical to the file number currently using, the current file number will be set to 0.
- COPY: Press this key to copy a file. This operation consists of 3 procedures.
  - Input the source file No. Message "☺ *Target File's No.:*_" will be displayed on the system message and input line, Use the numeric keys and press ENTER key.
  - Input the target file No. Message "☺ *Input File's Nums:*_" will be displayed on the system message and input line, use the numeric keys and press ENTER key.
  - Use the numeric keys to input the number of files you want to copy from the source position to the target position.
- EXIT: Press this key to exit the function of file manager.

☞**Note**: In measurement display page, pressing the button can enter the file manager function directly.

☞**Note:** An identifier will be displayed after the insertion of a U disk.

4.2.2.8 TOOL

Move the cursor to the TOOL file, the following soft keys will be displayed.

- OPEN LOAD: Press this key to enable the LOAD function and message "☺ *Open load OK!*" will be displayed on the system message and input line for a while. Then each time when TH2882A is turned on, the file used last time will be reloaded automatically. This function will be valid only when user calls the file, otherwise the instrument will load the default setting. If the file is deleted in the phase of use, this function will be automatically invalid.
- CLOSE LOAD: When this function is selected, the instrument will load the default setting at the next start-up.
- CLOSE GRID or OPEN GRID: Turn off or on the dash gridlines displayed in the waveform display zone.
- LOCK KEY: Press the key to disable the key operation from the front panel except the RELEASE KEY soft key. Message "☺ *Key locked*" and a sign of key "🗝" will be displayed on the system message and input line.

Press RELEASE KEY to enable the key operation from the front panel. If password function is enabled, you are required to input the password before unlocking the key operation.

4.2.2.9 IMP VOLT

Impulse voltage range for TH2822A-3: 300V to 3000V with a 50V resolution

Impulse voltage range for TH2822A-5: 500V to 5000V with a 100V resolution.

Move the cursor to the impulse voltage display field, the following soft keys will be displayed.

- ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to choose the following impulse voltages:

  TH2882A-3：300V,500V,1000V,1500V,2000V,2500V,3000V.

  TH2882A-5：500V,1000V,1500V,2000V,2500V,3000V,3500V,4000V,4500V,5000V.
- ↑(+) and ↓(-) soft keys are fine adjustment keys used to change the impulse voltage by resolution.

ⓘ**Note:** Standard waveform must be measured again after the impulse voltage is changed. The previous standard waveform will be cleared and cannot be recovered once the impulse voltage has been changed.

4.2.2.10 SAMP RATE

Different sample rates can be used for different windings in order to display the tested waveform with the best visual effect. The tested waveform with better visual effect can be compared more accurately. Eight different sample rates are available as follows: 40MSPS，40/02MSPS，40/04MSPS，40/08MSPS，40/16MSPS，40/32MSPS，40/64MSPS，40/128MSPS.

Move the cursor to the sample rate field, the following soft keys will be displayed.

- ⇧ and ⇩ soft keys can change the sample rate.
- STD WAVE SAMPLE: Press the key to sample the standard waveform. When the cursor locates in the sample rate field, pressing the STRART button will also start the function of standard wave sample.

  There are three modes available to sample standard waveform: SEQ CYCLE, ONE CYCLE and ONE SAMPLE. The standard waveform sample mode can be set on the measurement setup page.

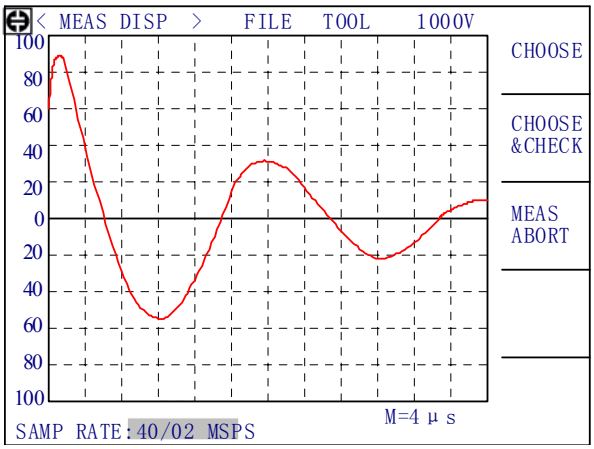


Figure 4-8 Standard waveform sample-SEQ CYCLE

1. SEQ CYCLE mode: Press the START button, the instrument will sample standard waveforms under each sample rate in turn. Each waveform will be displayed for several seconds for you to choose. The soft keys available are shown in figure 4-8.

- CHOOSE: Press the key to choose the currently displayed waveform as the standard waveform.
- CHOOSE& CHECK: TH2882A will test and sample the waveform again under the same rate. If the percent difference of differential area size meets the internal requirement, the current displayed waveform can be chosen as the standard waveform; otherwise, the previous waveform will not be chosen as a standard waveform. In this case, a warning will be displayed to prompt user testing and choosing again or changing another standard winding.

☞**Note**: The CHOOSE& CHECK soft keys is used to determine whether the percent difference of differential area size is less than 2%, which will ensure a good standard waveform.

- MEAS ABORT: Press this key to terminate the standard waveform measurement.

2. ONE CYCLE mode: Press the START button or the STD WAVE SAMPLE soft key, the instrument will sample standard waveforms for all sample rates without interval. The message-TESTING will be displayed on the center of the screen and user can press the MEAS ABORT soft key to terminate the standard waveform measurement. After sampling, the page as figure 4-9 shown will be displayed for user to operate. The soft keys available are as follows.

- ⇧ and ⇩ soft keys are keys used to choose the sample rate. The standard waveform will be displayed in the waveform display field.
- CHOOSE: When the required waveform is displayed in waveform display field, press the key to choose the current waveform as standard waveform.
- CHOOSE& CHECK: Press this key to test the DUT again when the required waveform is displayed on the screen. If the percent difference of differential area size meets the internal requirement, the currently displayed waveform can be chosen as the

standard waveform; otherwise, the previous waveform will not be chosen as the standard waveform. In this case, a warning will be displayed to prompt user testing and choosing again or changing another standard winding.

- EXIT: Press this key to terminate the standard waveform measurement without choosing.

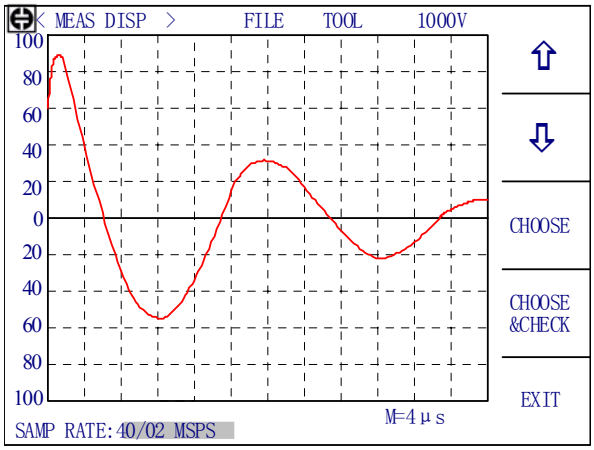


Figure 4-9 Standard waveform sample-ONE CYCLE

3. ONE SAMPLE mode: This mode is suitable for users who know the oscillation frequencies of tested coil and resonant capacitor (2000pF). Sample averaging can be taken in this mode. Operation is shown in figure 4-10.

Sample averaging: Average standard waveforms of two or more samples, so as to get a standard waveform for more universal use and decrease the test error.

- When the cursor is moved to the SAMP RATE key, press ⇧ and ⇩ soft keys to choose an appropriate sample rate.
- Press STD WAVE SAMPLE or the START button to get a standard waveform. Change the similar samples to sample standard waveform, that is, to average standard waveforms sampled in two samples. This average can be taken 20 times.
- FINISH: Press this key to choose the current waveform as the standard waveform. The number displayed below FINISH is the times of sample averaging, the maximum is 20.
- EXIT: Back to the page of ONE SAMPLE.

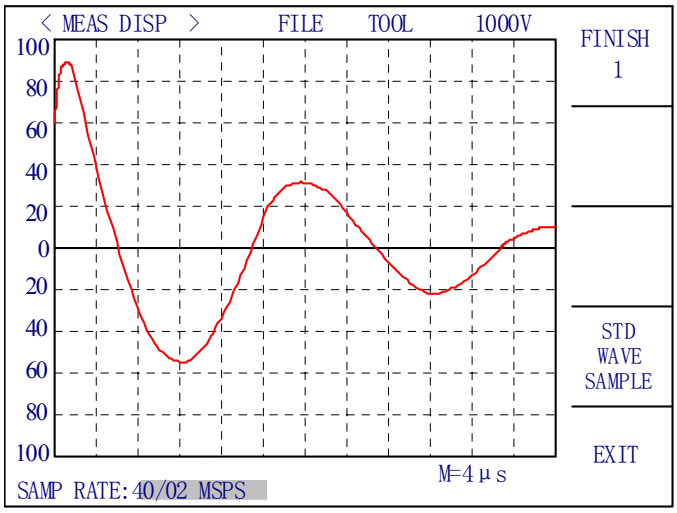


Figure 4-10 Standard waveform sample-ONE SAMPLE

ⓘ **Note**: When the instrument is in the state of overload, it cannot output the rating impulse voltage and a prompt message “OVERLOAD” will be displayed on the screen. In above case, decreasing the impulse voltage can make the test continue.

ⓘ**Note**: In the phase of measurement, if the message of “Serious Error 1” or “Serious Error 2” is displayed, please contact us without delay. There are two potential reasons for the two cases: first, the instrument goes wrong and cannot work normally; second, the instrument is not suitable for the tested winding.

4.2.3 Statistic Display Page

TH2882A provides the statistic function. Press the STAT. FUNC soft key to enter into the STAT. DISP page which shows the statistic results, CLEAR DATA or SAVE DATA. Figure 4-10 shows the statistic display page, while figure 4-11 are the soft keys available on the statistic display page.

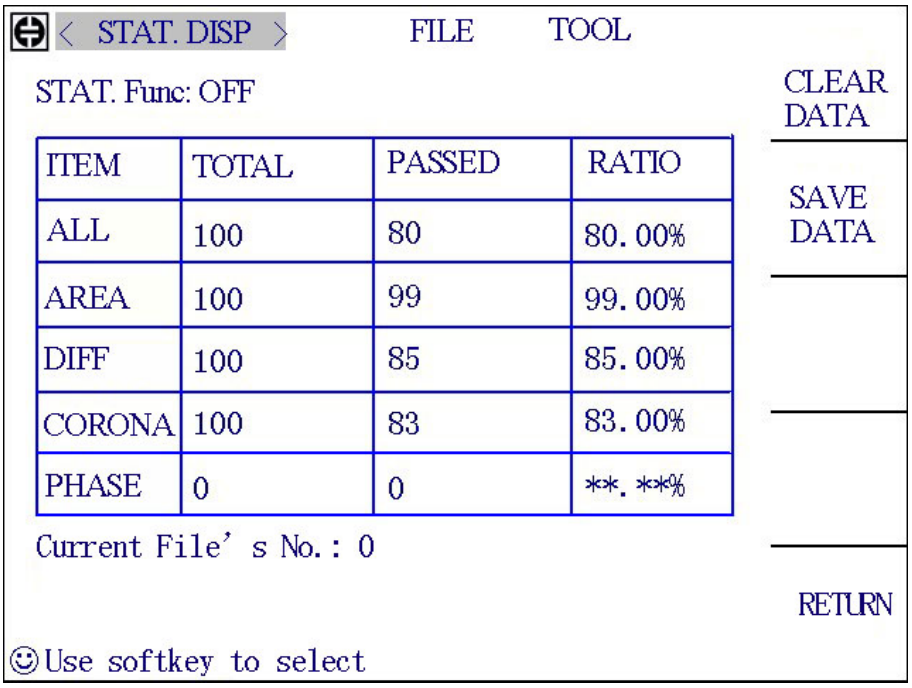


Figure 4-10 Statistic display page

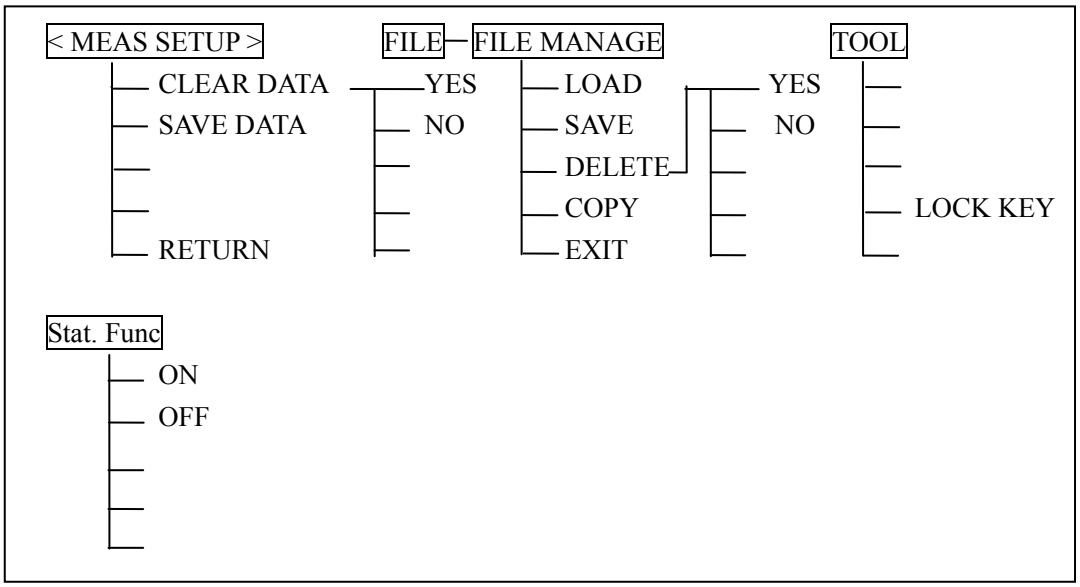


Figure 4-11 Available soft keys on the STAT. DISP page

4.2.3.1 FILE

Refer to 4.2.2.7.

4.2.3.2 TOOL

LOCK KEY Refer to 4.2.2.8.

4.2.3.3 STAT. DISP

- CLEAR DATA Reset the statistic data of the current file, but this operation can only clear data displayed; if it is required to clear statistic data in memory, the SAVE DATA soft key must be used.
- SAVE DATA Save the current statistic data to a file.
- RETURN Return to the measurement display page.

☞Note: If the current file number is 0, the current setting must be saved as a file before storing data.

4.2.3.4 Stat. Func

- ON Turn on the statistic function.
- OFF Turn off the statistic function

4.2.4 System Setup Page

Enter the measurement setup page by pressing the SETUP menu key. The function of this page is to set measurement parameters and comparison terms, such as impulse voltage (IMP VOLT), impulse numbers (IMP NUMS), comparator switch (COMPARATOR), standard waveform sample mode (SWAVE SAMP), waveform display mode (WAVE DISP), trigger mode (TRIG MODE), delay time (DELAY), voltage adjustment (VOLT ADJ) and four comparison methods. Figure 4-12 is the measurement setup page and figure 4-13 shows soft keys available on measurement setup page.

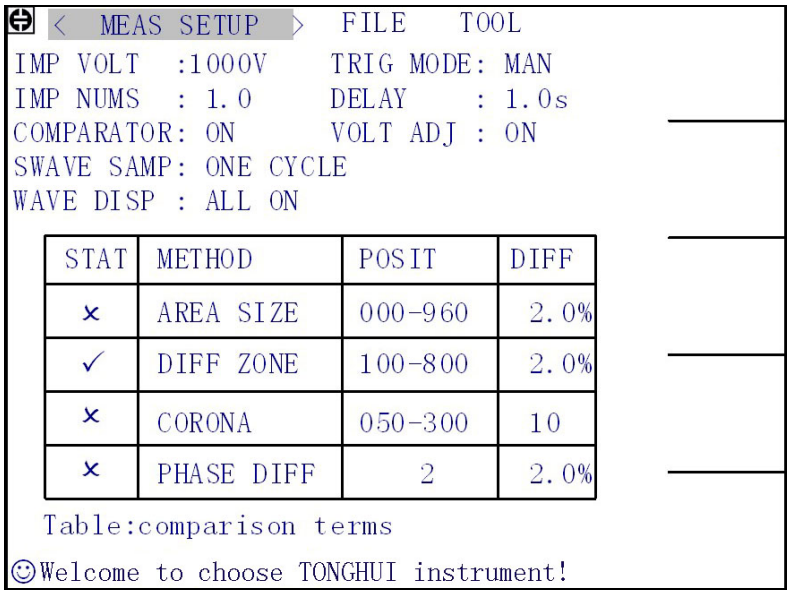


Figure 4-12 Measurement setup page

Comparison setups in this page and in measurement display page have the same function. The comparison setup in measurement display page is much clearer because user can observe the setup range by the dash lines on the page and change the setup only by soft keys; while all setup on this page is numeric setup, user can change the corresponding setup just by numeric keys. Impulse voltage setup, too, can only be changed by soft keys on measurement display page but can be directly changed by numeric key on measurement setup page.

4.2.4.1 FILE

Refer to 4.2.2.7.

4.2.4.2 TOOL

- LOCK KEY Refer to 4.2.2.8.

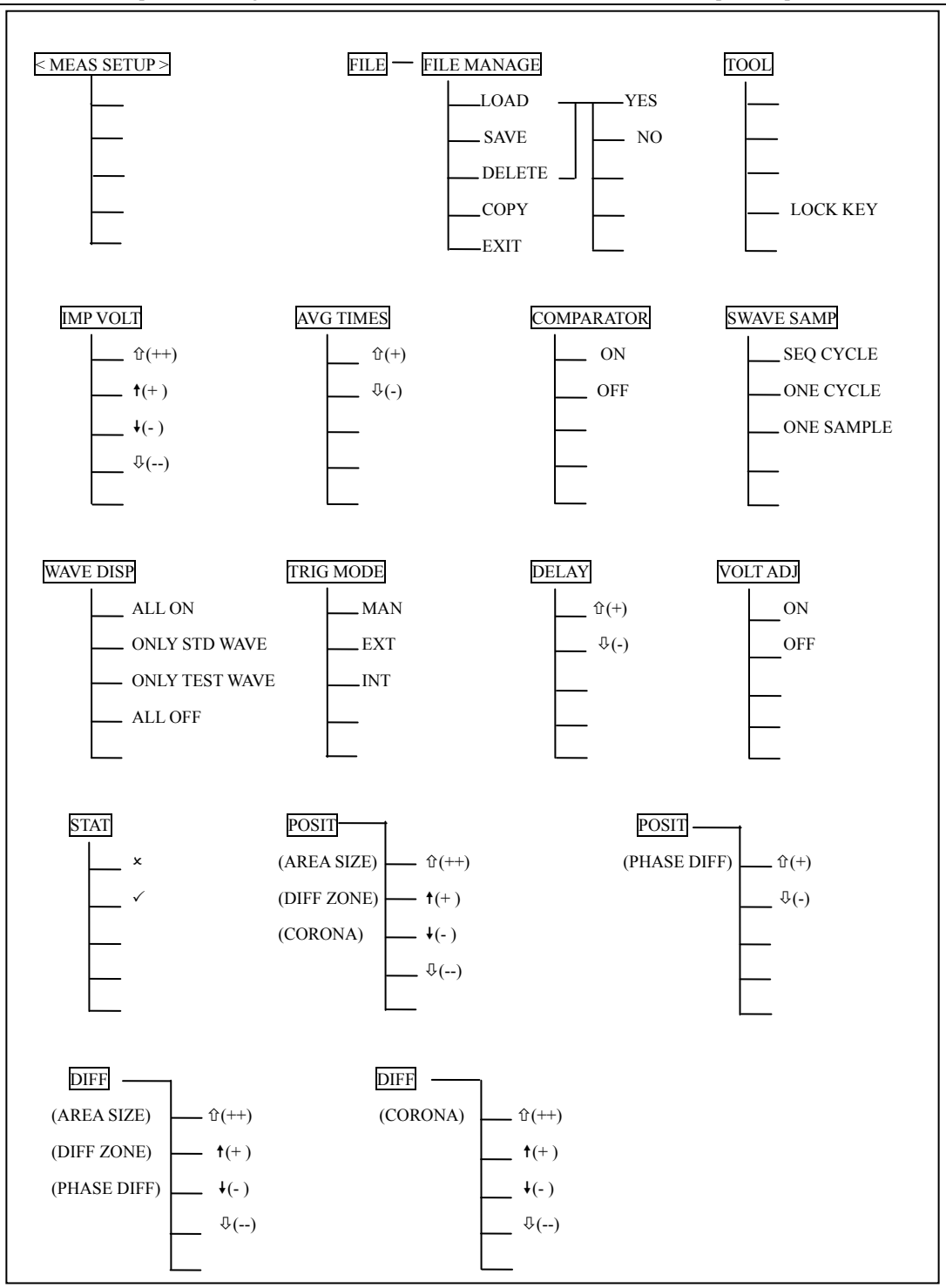


Figure 4-13 Available soft keys on the measurement setup page

4.2.4.3 IMP VOLT

Impulse voltage range for TH2882A-3: 300V to 3000V with a 50V resolution
Impulse voltage range for TH2882A-5: 500V to 5000V with a 100V resolution.
Move the cursor to the IMP VOLT field, the following soft keys will be displayed.

- ⇧(++) and ⇩(--) soft keys are keys used to select the following impulse voltages.
  TH2882A-3: 300V, 500V, 1000V, 1500V, 2000V, 2500V, 3000V.
  TH2882A-5: 500V,1000V,1500V,2000V,2500V,3000V,3500V,4000V,4500V,5000V.
- ↑(+) and ↓(-) soft keys are fine adjustment keys used to increase or decrease the impulse voltage by resolution.

☞**Note:** User can input the impulse voltage value using the numeric keys. When one of the numeric entry keys is pressed, three soft keys, KV, V, EXIT, will be displayed. In the phase of entry, KV or V can be chosen as the input unit and pressing the EXIT soft key will terminate this phase. If ENTER is used to terminate the impulse voltage input, unit V will be used as the default unit.

4.2.4.4 IMP NUMS

There is a remained magnetic field in magnetic device after winding like motor being powered off，the magnetic core winding will be magnetized if leaving for a long time or being affected by external magnetic field, the impulse test will be performed under this situation. The first impulse tested waveform is quite different from the second one, which will bring some uncertain factors.
The instrument has the function to eliminate the initial impulse with magnetized direction. The setting is as below：

For example） IMP NUMS 4. 2
                    │ └─demagnetized impulse numbers
                    └──tested impulse numbers

Tested impulse number is used to judge, average is a kind of digital filter，“number” is the depth of filter，the average result is the test result after several measurements, which can improve the stability and reliability of test result. The range of average number is 1-30，which can be input by numeric keys.
Demagnetized impulse number is used for demagnetization in device under test. The range of demagnetized impulse number is 0-7，which can be input by numeric key，if 0 is input，then no demagnetized impulse.

- ⇧(+) and ⇩(-) soft keys are keys used to adjust impulse numbers by 1 resolution.

☞**Note**: User can input impulse numbers using the entry keys. Press the ENTER button to confirm the input or press EXIT to terminate the input.

4.2.4.5 COMPARATOR

This comparator function allows you to set all comparators to ON or OFF. Once the comparator is turned off, the instrument cannot make any comparison no matter the comparison mode is on or off. Anther function is to observe the oscillation waveform of DUT. Before a test, the

instrument must measure a standard waveform. However, in some cases, the comparison is not necessary, thus user can turn off the comparator to make measurement and observe oscillation waveforms.

Move the cursor to the COMPARATOR field, the following two soft keys will be displayed.

- ON Turn on the comparator.
- OFF Turn off the comparator.

4.2.4.6 SWAVE SAMP

TH2822A provides three kinds of methods for standard wave sampling: SEQ CYCLE, SINGLE CYCLE and ONE SAMPLE.

Move the cursor to the SWAVE SAMP field, the following soft keys will be available on this page.

- SEQ CYCLE: Set the standard wave sampling mode as sequence.
- SINGLE CYCLE: Set the standard wave sampling mode as single cycle.
- SINGLE SAMPLE: Set the standard wave sampling mode as single sample.

Refer to 4.2.2.10.

4.2.4.7 WAVE DISP

If user only wants the comparison result, the wave display can be turned off so as to obtain a test speed much faster.

Move the cursor to the WAVE DISP field, the following soft keys will be available.

- ALL ON: Both the standard waveform and the test waveform will be displayed on the screen at the same time. For the consumption of display time, the test speed will be decreased. This display will bring convenience for user to observe waveforms.
- ONLY STD WAVE: In the phase of measurement, only the standard waveform will be displayed on the screen, so the measurement will be taken at the fastest speed. This way is suitable for users only needing the comparison result.
- ONLY TEST WAVE: In this mode, only the test waveform is displayed thus it will take some time to refresh the tested waveforms after each test and the test speed will be decreased.
- ALL OFF: With the exception of comparison result, none waveforms will be displayed, therefore the test speed is the fastest in this mode.

ⓘ **Note:** In the latter two modes, when SEQ CYCLE or SINGLE CYCLE is selected, the standard waveform will disappear; when SINGLE SAMPLE is selected, none waveforms will be displayed. Thus it is highly recommended for user to turn on standard waveform.

4.2.4.8 TRIG MODE

The instrument will perform a measurement only ate the receipt of a trigger signal. TH2882A provides four kinds of trigger mode: MAN (manual including foot control), EXT (external), INT (internal) and BUS. Trigger signals only in the current trigger mode can be received and will be valid only on the MEAS DISP page.

- MAN: This is the default trigger mode. Pressing the START button or using the foot switch to start a measurement.
- EXT: Via HANDLER interface, input a negative TTL pulse (more than 1 μs) from external to the instrument, the rising edge of which will form a trigger impulse.
- INT: When the trigger mode is set to this mode, TH2882A starts a measurement once the START button is pressed on the MEAS DISP page, and then the instrument will continuously repeat measurements until MEAS EXIT soft key is pressed.

☞**Note**: Another press of the START button will also exit from the measurement.

- Bus: TRIGGER command is sent to the TH2882A via RS232C or GPIB interface.
  Move the cursor to the TRIGGER field, there are three soft keys available: MAN, EXT, INT.
  When the trigger mode is set to BUS trigger mode, TH2882A performs a single measurement every time the TRIGGER command is sent to the TH2882A via RS232C or GPIB interface.

ⓘ**Note**: The BUS trigger mode can only be set by TRIGGER command. Refer to Chapter 6 for details.

ⓘ**Note**: TH2882A ignores triggers that applied while a measurement is in progress. Trigger the TH2882A after the measurement is completed.

4.2.4.9 DELAY

Delay, delay trigger, refers to the time between the end of a measurement and the start of the next measurement. The delay function is only available when trigger mode is set to INT trigger mode. The trigger delay time can be set from 0.1s to 99s by 0.1 steps.

Delay is used to achieve the synchronism of measurement status and control the measurement speed. For instance, in a mechanical sorting system, trigger mode may enter the test status earlier than DUT, and then setting an appropriate delay becomes necessary.

Move the cursor to the DELAY field, User can input the delay by pressing entry buttons and the ENTER button for confirmation. The input unit is s. The following soft keys can also be used to change the delay time.

- ⇧(+) and ⇩(-) soft keys are keys used to increase or decrease the delay time by 0.1s.

4.2.4.10 VOLT ADJ

For a rating impulse voltage, if the DUT is different, the actual output voltage might also be different. Therefore, it is necessary to turn on voltage adjustment so as to make the test impulse voltage on the DUT be constant.

Move the cursor to the VOLT ADJ field, the following soft keys will be displayed.

- ON: Turn on the voltage adjustment.
- OFF: Turn off the voltage adjustment.

4.2.4.11 STAT

Choose to turn on or off a comparison method.

- ✓ Turn on the corresponding comparison method.
- × Turn off the corresponding comparison method.

4.2.4.12 POSIT （AREA SIZE, DIFF ZONE, CORONA）

Set the comparison range for comparison methods of AREA SIZE, DIFF ZONE and CORONA that range from 0 to 960. Use the numeric buttons to enter the required value and press the ENTER button for confirmation or the EXIT soft key for termination of entry.

Move the cursor to these fields, the following soft keys will be displayed.

- ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to increase or decrease the comparison range by 40.
- ↑(+) and ↓(-) soft keys are fine adjustment keys to increase or decrease the comparison range by 1.

4.2.4.13 POSIT (PHASE DIFF)

Set the zero-crossing position for PHASE DIFF that is to select a zero-crossing position for the comparison of phase difference. The zero-crossing position ranges from 2 to 10. Use the numeric buttons to enter the required value and press the ENTER button for confirmation or the EXIT soft key for termination of entry.

Move the cursor to the field, the following soft keys will be displayed.

- ⇧(+) and ⇩(-) soft keys are used to increase or decrease the zero-crossing position by 1 dot.

4.2.4.14 DIFF (AREA SIZE, DIFF ZONE, PHASE DIFF)

Set the limit values for comparison methods of AREA SIZE, DIFF ZONE, PHASE DIFF which range from 0 to 99.9% by 0.1% resolution. Use the numeric buttons to enter the required value and press the ENTER button for confirmation or the EXIT soft key for termination of entry.

- ⇧(++) and ⇩(--) soft keys are coarse adjustment keys used to increase or decrease the limit value by 1.0% resolution.
- ↑(+) and ↓(-) soft keys are fine adjustment keys used to increase or decrease the limit value by 0.1% resolution.

4.2.4.15 DIFF (CORONA)

Set the limit values for comparison methods of CORONA which range from 0 to 999. Use the numeric buttons to enter the required value and press the ENTER button for confirmation or the EXIT soft key for termination of entry.

- ⇧(++) and ⇩(--) soft keys are coarse keys used to increase or decrease limit value by 10 dots.
- ↑(+) and ↓(-) soft keys are fine adjustment keys used to increase or decrease limit value by 1 dot.

4.2.5 SYSTEM SETUP Page

The system parameters on SYSTEM SETUP page are not related to measurement and are the same in all files with the exception that used modify them. The modified parameters are valid for current use and will automatically reset default parameters after power-off if user does not save them. Refer to 4.2.5.2 TOOL for details.

When you press the SYSTEM menu key, the SYSTEM SETUP page will be displayed. On this page, all of the following system control function can be set: LCD CONST, PASS ALARM, FAIL ALARM, PASS& FAIL, KEY BEEP, LANGUAGE, PASSWORD, BUS MODE, BAND RATE, BUS ADDR and TEST MODE. Figure 4-14 is the system setup page and figure 4-15 shows the available soft keys on the system setup page.

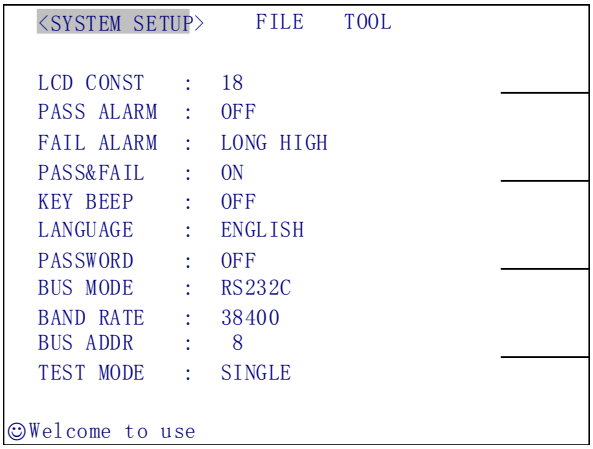


Figure 4-14 SYSTEM SETUP page

4.2.5.1 FILE

Refer to 4.2.2.7.

4.2.5.2 TOOL

Move the cursor to this field, the following soft keys will be available.

- SYSTEM RESET The instrument will restart.
- SAVE SETTING Press this key will save the current system configuration in internal memory.

☞**NOTE**: For valid use of the system configuration afterwards, SAVE SETTING must be executed before power-off, PASSWORD function is as well.

- LOCK KEY Refer to 4.2.2.8.

4.2.5.3 LCD CONST

Use the soft keys ⇧(+) and ⇩(-) to adjust the LCD's contrast from 1 to 31 until the proper contrast effect is obtained.

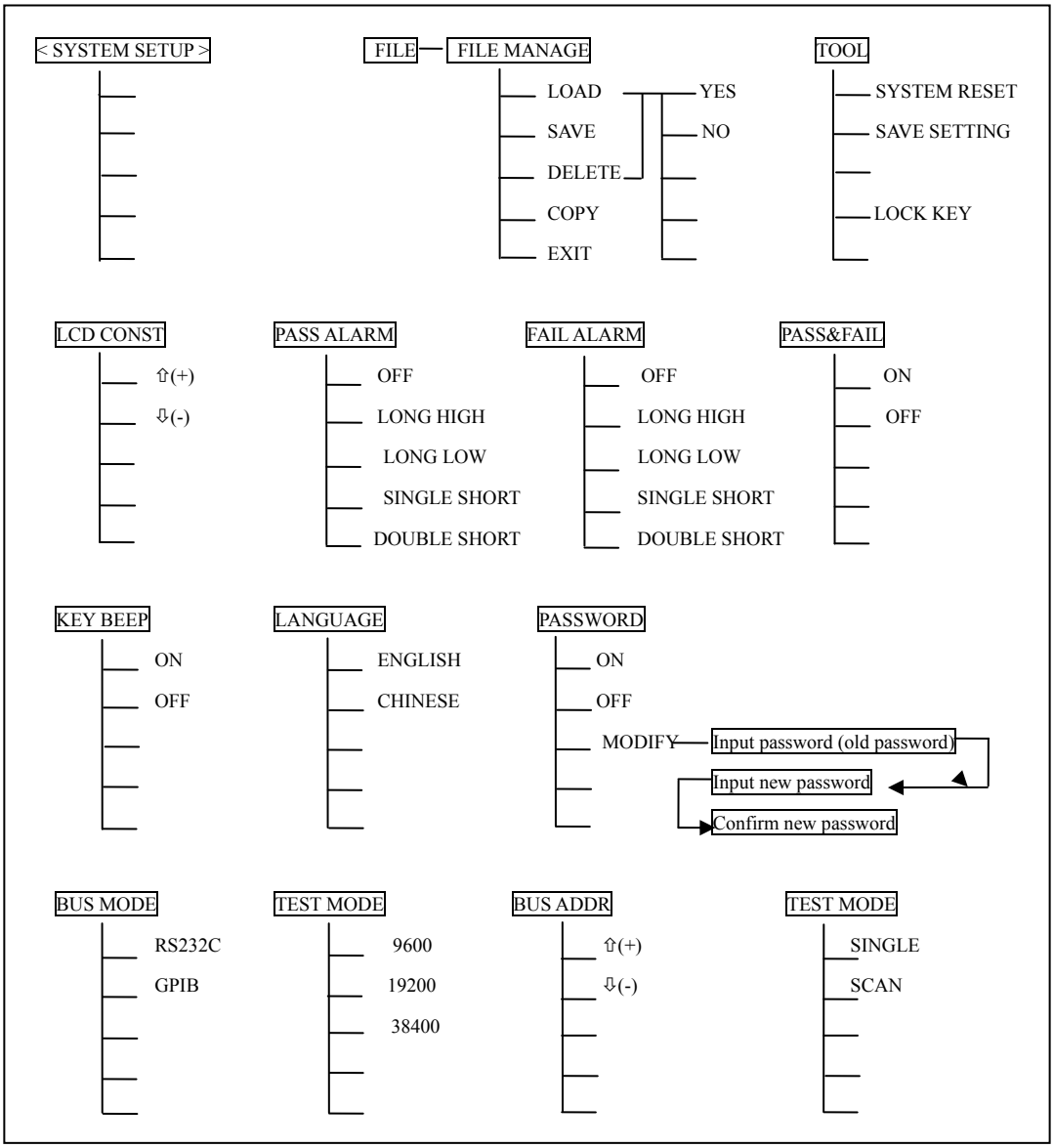


Figure 4-15 Available soft keys on the SYSTEM SETUP page

4.2.5.4 PASS ALARM

User can select the alarm mode for PASS. Move the cursor to the PASS ALARM field and the following soft keys will be displayed.

- OFF Turn off pass alarm.
- ON Turn on pass alarm.
- LONG HIGH Emit a long and high beep when the comparison result is PASS.
- LONG LOW Emit a long and low beep when the comparison result is PASS.

- SINGLE SHORT Emit a single short beep when the comparison result is PASS.
- DOUBLE SHORT Emit two short beeps when the comparison result is PASS.

4.2.5.5 FAIL ALARM

User can select the alarm mode for FAIL. Move the cursor to the FAIL ALARM filed and the following soft keys will be displayed.

- OFF Turn off fail alarm.
- ON Turn on fail alarm.
- LONG HIGH Emit a long and high beep when the comparison result is FAIL.
- LONG LOW Emit a long and low beep when the comparison result is FAIL.
- SINGLE SHORT Emit a single short beep when the comparison result is FAIL.
- BOUBLE SHORT Emit two short beeps when the comparison result is FAIL.

4.2.5.6 PASS&FAIL

When comparison mode enables, comparison result can be included on LCD screen by alarm mode of PASS&FAIL. PASS is up to standard, and FAIL is below standard. Move the cursor to this field, the following two soft keys will be displayed.

- ON Turn on the PASS&FAIL function.
- OFF Turn off the PASS&FAIL function.

4.2.5.7 KEY BEEP

Move the cursor to this field, the following two soft keys will be displayed.

- ON Turn on key beep.
- OFF Turn off key beep.

4.2.5.8 LANGUAGE

TH2882A provides two kinds of system languages used for display and operation.

- ENGLISH Choose English as the display and operation language.
- CHINESE Choose Chinese as the display and operation language.

4.2.5.9 PASSWORD

The password used to turn on and unlock the instrument is the same.
Move the cursor to this field, the following soft keys will be displayed.

- ON Turn on the password function. When user turns on or unlocks the instrument, it is required to input password.
- OFF Turn off the password function. When user turns on or unlocks the instrument, it is not required to input password.
- MODIFY This key is used to modify the password. The instrument will prompt user to input old password, new password and new password again in turn.

☞**Note**: The default password for TH2882A is 2882.

☞**Note**: If you want the modified password to be still valid hereafter, it is necessary to save it before power-off. Refer to 4.2.5.2.

4.2.5.10 BUS MODE

TH2882A provides two kinds of bus modes: GPIB and RS232C.

Move the cursor to the BUS MODE field and the following soft keys will be available.

- RS232C Bus mode for serial interface.
- GPIB This mode can not be set until the GPIB interface card is purchased and installed.

☞**Note**: For details of communication interface, please refer to Chapter 5 –Remote Control and Chapter 6 –Command Reference.

4.2.5.11 BAND RATE

Band rate means the communication speed used in specified interface. When RS232C interface is applied, the selectable band rate are 9600, 19200 and 38400.

4.2.5.12 BUS ADDR

When the instrument is applied to GPIB interface bus, a GPIB address, different from GPIB addresses of the other equipments connected on the same bus, must be allocated. TH2882A's GPIB address can be set from 1 to 31.

Move the cursor to the BUS ADDR field and use ⇧(+) and ⇩(-) keys to change the bus address.

4.2.5.13 TEST MODE

When the optional SCANNER interface is installed inside the TH2882A, then TH2882A can be operated under the SCAN measurement mode.

Move the cursor to the TEST MODE field, the following soft keys will be displayed.

- SINGLE Use the instrument to test coil.
- SCAN Use the instrument and a purchased scanning box to take scanning test. This option cannot be set until the SCANNER interface plate is installed.

4.3 Operation Steps

1. Test standard waveforms: Collect the standard waveform of a coil. User can judge the quality of a coil by comparing its waveform with the standard waveform.
   (1) Switch on the instrument and connect the standard coil to test terminals.
   (2) Set the desired impulse voltage on MEAS DISP (refer to 4.2.2.9) or MEAS SETUP (refer to 4.2.4.3). Set the standard waveform sampling mode on MEAS DISP (refer to 4.2.4.6).
   (3) Move the cursor to the SMP RATE field on the MEAS DISP page. Then press the STD WAVE SAMPLE soft key or the START button to start standard waveform sample and select the desired standard waveform.
2. Set and save test parameters and comparison parameters.
   (1) Set test parameters, such as impulse number, trigger mode, comparator, delay and wave display on the MEAS SETUP page. Refer to 4.2.4 for details.
   (2) Set comparison parameters on MEAS DISP (refer to 4.2.2.3) or MEAS SETUP (refer to 4.2.4.11~4.2.4.15).

(3) Save the current setup in FILE (refer to 4.2.2.7) for future use.

3. Test

(1) Remove the standard coil and connect the tested coil to the test terminal. Then press the START button to start test. When the test is done, the instrument will automatically judge the tested coil PASS or FAIL.

(2) If the corresponding file of the tested coil has already existed, above process can be skipped and the setup can be directly called form the file. Then connect the tested coil for measurement.

ⓘ**Note**: In the phase of measurement, if the message of "Serious Error 1" or "Serious Error 2" is displayed, please contact us without delay. There are two potential reasons for two cases: first, the instrument goes wrong and cannot work normally; second, the instrument is not suitable for the tested winding.

Chapter 5 Remote Control

Besides the front panel control, TH2882A supports RS232C serial interface (standard) and GPIB parallel interface (optional) for remote control. User can use only one interface at a time. Standard Commands for Programmable Instrument (SCPI) is fully supported by the RS-232 and GPIB interfaces, however they use different hardware configurations and communication protocols. The operation method is dealt with in this chapter, the use for interface commands, in chapter 6.

5.1 RS232C Interface Operation

5.1.1 RS232C Connection

RS232 standard, also called as asynchronous serial communication standard, has already been widely used for data communication between computers, computer and external equipment. RS is the English abbreviation of Recommended Standard; 232, the standard number. This standard is issued by EIA in 1969, which rules to send one bit in a data line every time.

Configurations of most serial interfaces are not strictly based on RS-232 standard. A 25 pin connector is used on each terminal (IMBAT uses a 9 pin connector). The most frequently used RS-232 signals are as follows:

Function	Code	25 Pin Connector Pin Number	6 Pin Connector Pin Number
Request To Send	RTS	4	7
Clear To Send	CTS	5	8
Data Set Ready	DSR	6	6
Data Carrier Detect	DCD	8	1
Data Terminal Ready	DTR	20	4
Transmitted Data	TXD	2	3
Received Data	RXD	3	2
Signal Ground Common	GND	7	5

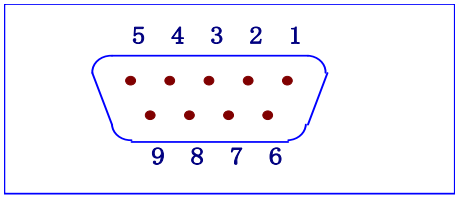
As most serial interfaces, the serial interface of TH2882A is also not strictly based on RS-232 standard but only uses the smallest subset of this standard. The signals are listed in the following table.

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

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

ⓘ **Note:** The definition for serial interface pin used by the instrument is different from that of standard 9 pin connector.

RS232C used on this instrument applies 9-pin DB socket, and the sequence of pin is as follow.



（side view）

Figure 5-1 Serial interface connector

Use standard 9-pin DB plug to connect the connector.

ⓘ**Note:** Before connect or disconnect the connector, please power off the instrument to avoid electrical shock hazard.

ⓘ**Note:** Do not short the output terminal or case so as to avoid damage to the DUT.

5.1.2 Communication with PC

■ The connection of the instrument with PC is shown in figure 5-2.

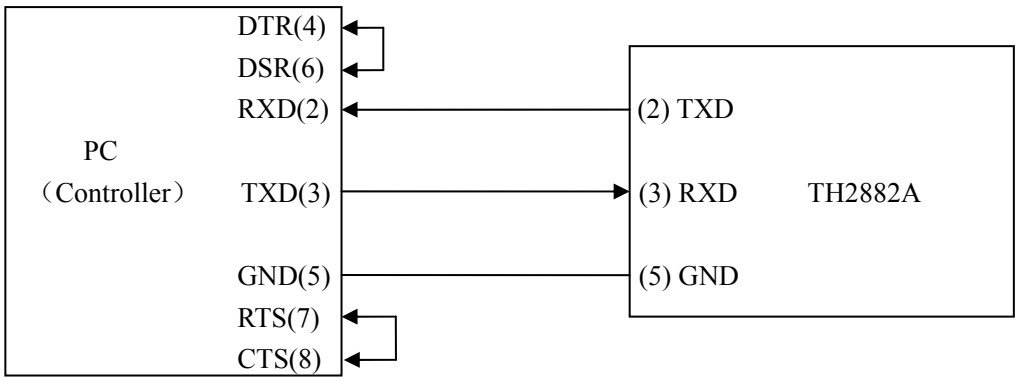


Figure 5-2 Connection of the instrument with PC

Figure 5-2 shows that the serial interface pin definition of this instrument is different from that of 9 pin connector used in IMB AT compatible computer. User can make three-wire connection cable (the length should be less than 1.5m) by using double-core shielding lines or

purchase the serial interface cable from our company.

When making connection cable, please short the 4th pin and the 6th pin, the 7th pin and the 8th pin.

- Connect the instrument with PC through serial interface. Set the bus mode firstly, and the operation sequence is as follow.

  Press the SYSTEM menu key and then move the cursor to BUS MODE to select the RS232C soft key.

  Move the cursor to BAUD RATE to select the desired communication rate.

- Serial Interface Specifications

Transmitting Mode	Full Duplex Asynchronous Communication containing start bit and stop bit.
Baud Rate	9600/19200/38400 bps
Data Bits	8 BIT
Stop Bits	1 BIT
Parity Bits	None
Terminal Character	NL（Line Break，ASCII Code 10）
Handshake Mode	Software handshake
Connector	DB 9 pin

- Software Protocol

For the instrument cannot use hardware for handshake and RS232C serial communication is quite simple, the following protocols should be strictly conducted to program PC communication software. Thus data lose or error, occurred in communication, can be greatly reduced.

(1) For command syntax and format, refer to “Chapter 6 SCPI Command Reference”.

(2) The controller transmits the command in ASCII code with <NL> as the terminal character (New Line, ASCII code is 10). TH2882A executes the command after the terminal character <NL> is received.

(3) Once a query command is received, TH2882A will send the query response information immediately even if the rest commands have not been finished. So if the command includes two queries, the controller should read the query responses twice. One query is recommended to be included in a single command.

(4) A query response is sent out in ASCII codes with <NL> as the terminal character.

(5) Several query responses will be sent continuously with 1ms interval. The controller should be ready to receive the responses; otherwise the response information will be lost.

(6) The query response of waveform data is sent out in ASCII codes with <NL> as the terminal character. If <NL> is received as the first ASCII code, this means that there is no waveform data available.

(7) If the communication software is programmed by DOS application software, the software should be operated in pure DOS environment, instead of WINDOWS environment, that supports serial interface.

5.2 GPIB Interface Operation

5.2.1 GPIB Bus

IEEE488 (GPIB) is an international bus interface standard used on intelligent instruments. IEEE is the English abbreviation of Institute of Electrical and Electronics Engineers, and 488 is the standard number. Through this interface, TH2882A can communicate with PC or others intelligent equipments and meanwhile can make up automatic test system with the other test equipments. Two or more equipments can be connected on a same bus. TH2882A applies IEEE488.2 and the interface plate can be optionally purchased by user. Control command system is open so that user can use the PC operation interface provided by TH2882A or take measurements by the control command system. The control command system supports most functions of the instrument, that is to say, user can execute almost all operations on PC. Thus remote control to the instrument is realized.

When configuring a GPIB system, the following restrictions must be adhered to.

1. The total length of cable in one bus system must be less than or equal to two meters times the number of devices connected on the bus (the GPIB controller counts as one device) and the total length of cable must not exceed 20 meters.
2. A maximum of 15 devices can be connected on one bus system.
3. There are no restrictions on how the cables are connected together. However, it is recommended that no more than four piggyback connectors be stacked together on any one device.

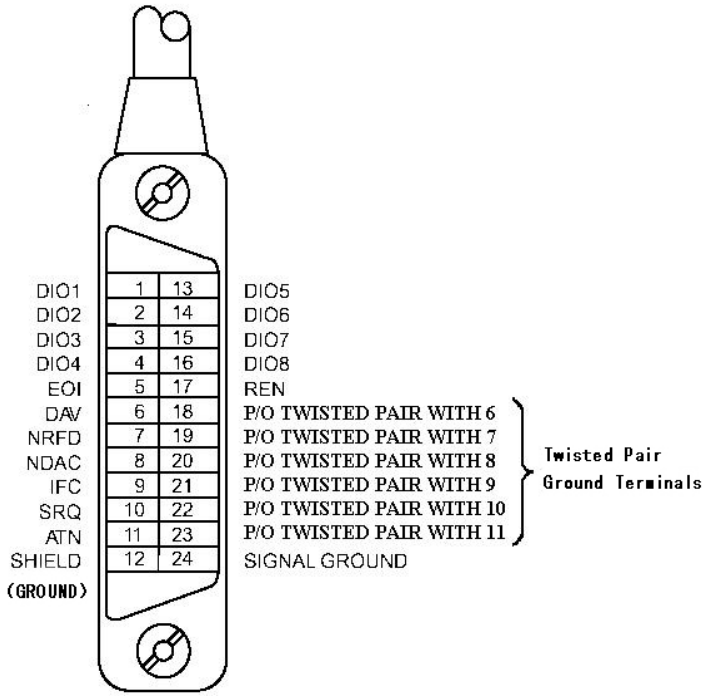


Figure 5-1 GPIB connector/pin structure

GPIB System Interconnection-1:

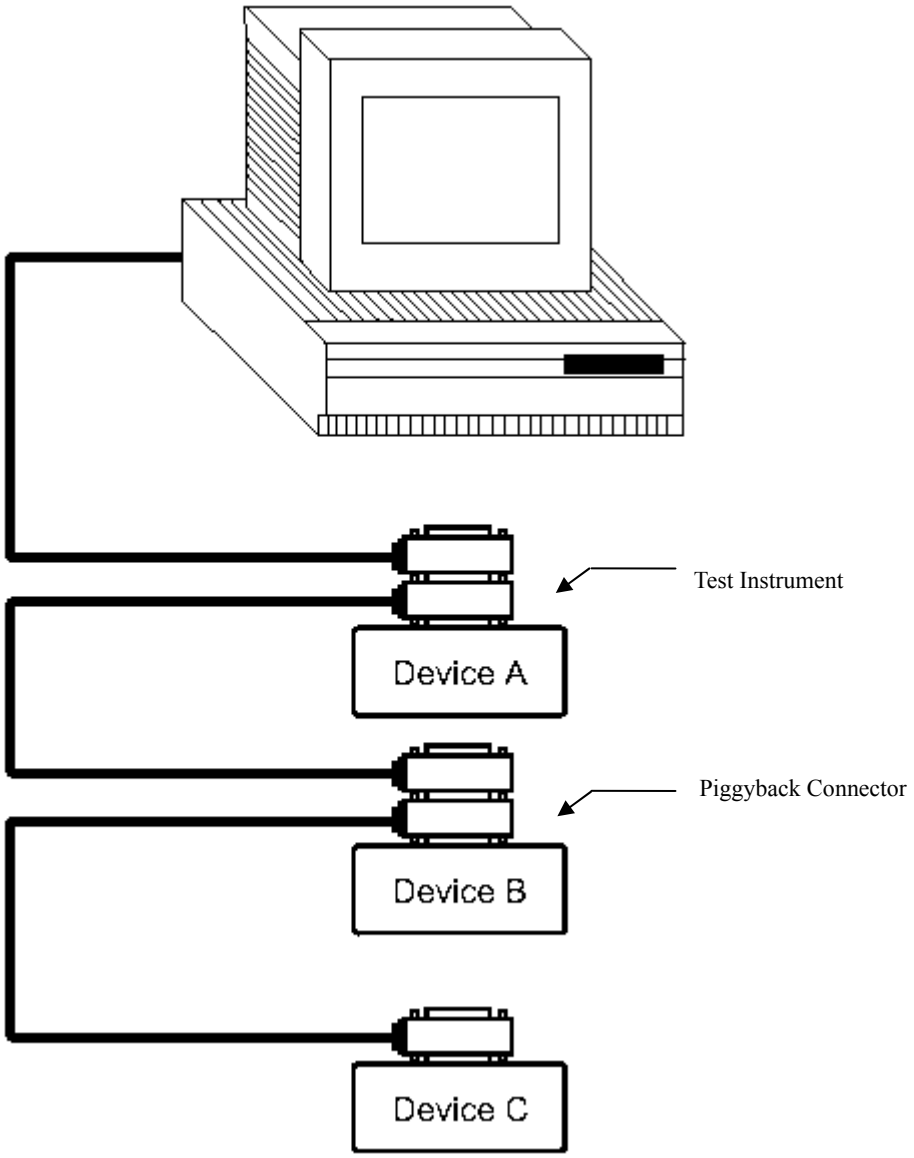


Figure 5-2 Typical GPIB system interconnection-1

GPIB System Interconnection-2:

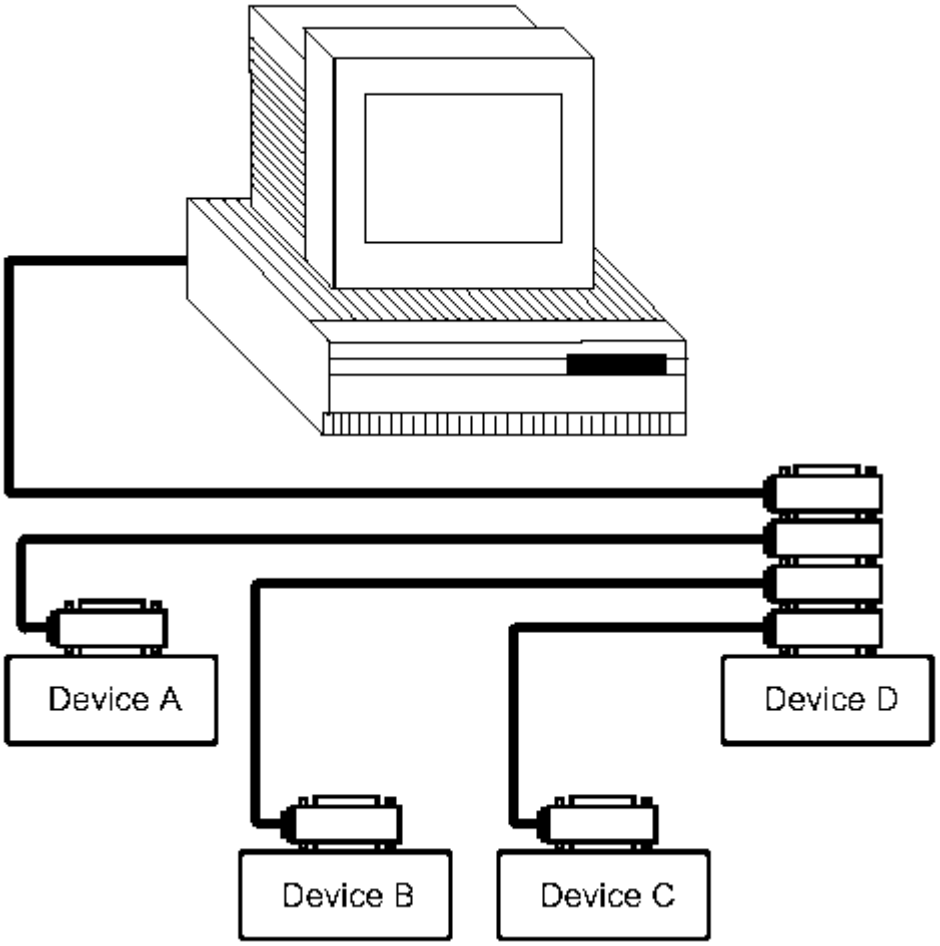


Figure 5-3 Typical GPIB system interconnection

5.2.2 GPIB Interface Capability

The following table provides the TH2882A's GPIB capabilities and functions.

Code	Function
SH1	Complete Data Source Handshake capability
AH1	Complete Acceptor Handshake capability
T5	Basic Talker; Talk-Only; Unaddressed if MLA; no serial poll.
L4	Basic Listener; Unaddressed if MTA; no Listen Only.
RL1	Remote/Local capability
DC1	Device Clear capability
DT1	Device Trigger capability
C0	No controller capability
E1	Drivers are open-collector

5.2.3 GPIB Addressing

The addressing mode provided by TH2882A is single address. TH2882A is shipped from the factory with a GPIB address of 8. User can set the address to a value of 0 to 30 and the address is saved in the non-volatile memory. For more details about address setup, please refer to 4.2.4.11 BUS ADDR.

5.2.4 GPIB Bus Commands

TH2882A will respond to the following bus commands.

■ ABORT I/O（IFC）

■ DEVICE CLEAR（SDC or DCL）

As soon as this command is received, the instrument will clear input and output buffer and GPIB interface will be in ready status.

■ LOCAL（GTL）

LOCAL returns local control and buttons on the front panel will be valid.

■ LOCAL LOCKOUT（LLO）

LOCAL LOCKOUT disables the LOCAL operation of all devices on the bus. After this command is sent you will be unable to operate TH2882A from the front panel including the soft key LOCAL. Execute the LOCAL command to undo LOCAL LOCKOUT.

■ REMOTE（RMT）

REMOTE sets TH2882A to the remote mode. When this command is sent, front panel with the exception of LOCAL soft key will be disabled.

■ TRIGGER（GET）

This command is used to trigger the TH2882A and TH2882A will send tested waveform data to the output buffer. This command is equal to the command TRIG + FETCh:TWAVE? or the common command *TRG.

For SCPI commands please refer to next Chapter: SCPI Command reference.

5.3 Waveform Data Format

TH2882A outputs the waveform data using the ASCII via the GPIB bus. The format is described as follows.

Waveform Data Trans-format:

<DATA[1][0]><DATA[1][1]><DATA[2][0]><DATA[2][1]><DATA[3][0]><DATA[3][1] ……
<DATA[960][0]> <DATA[960][1]> ⟶ <NL^END>

Figure 5-4 Data format

In Figure 5-4, <NL> is New Line character (decimal 10), ^END is EOI terminator signal. If waveform data is ready, TH2882A sends out waveform data in ASCII string with <NL ^END> as the terminal character, otherwise TH2882A returns <NL ^END> directly.

As shown in figure 5-4, each point data of a waveform is returned as two ASCII codes. TH2882A sends the two ASCII codes, the first output ASCII code is the 4 high bits and the second output ASCII code is the 4 low bits. Controller should compose the two ASCII codes as one HEX data for displaying and calculating.

ⓘ **Note:** As soon as the query command is sent PC should be in receiving status so as to avoid data lose.

Chapter 6 SCPI Command Reference

6.1 Command Structure

TH2882A' commands are divided into two types: GPIB common commands and SCPI commands. The GPIB common commands are defined in IEEE std. 488.2-1987, and these commands are common for all devices. Not all GPIB commands are supported by the TH2882A. The SCPI commands are used to control all of the TH2882A' functions. The SCPI commands are tree structured three levels deep. (The highest level commands are called the subsystem commands in this manual.) So the lower level commands are legal only when the subsystem commands have been selected. A colon (:) is used to separate the higher level commands and the lower level commands. See Figure 6-1 for a sample.

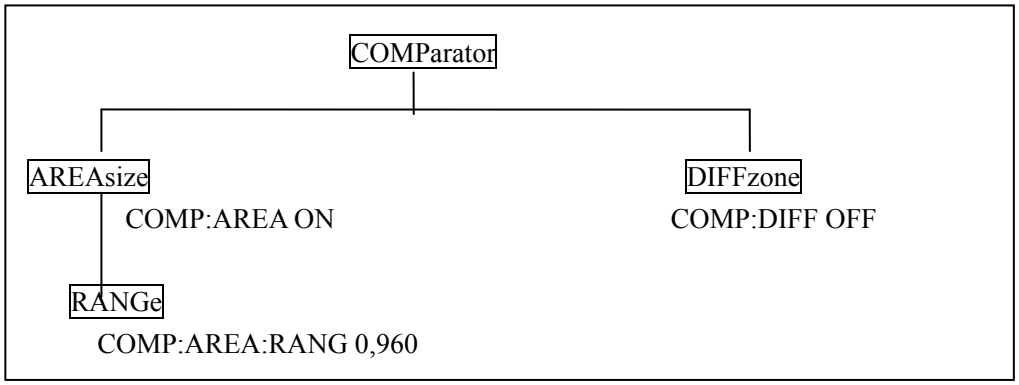


Figure 6-1 Command tree example

Basic Rules of Command Structure:

- Letter case (upper and lower) is ignored.
  For example: COMP:AREA ON = comp:area on = Comp:aRea On
- Space (_ indicates a space) must not be placed before and/or after a colon (:).
  For example: ☒ COMP _:_ AREA ON → ☑ COMP: AREA ON
- Space is used to partition off command and parameter. Commands locate before space and their corresponding parameters put after space.
  For example: COMP:AREA_ON，AREA is command，ON is parameter.
- Some commands have no parameter.
  For example: Trigger command-TRIG and standard waveform choosing command SWAVE: CHOOSE
- The command can be completely spelled out or in abbreviated type. (The rules for command abbreviation are described later in this section, and abbreviation is spelling out in upper letter case.)

For example: COMPARATOR:AREASIZE ON = COMP:AREA ON

- The command header should be followed by a question mark (?) to generate a query for that command.

  For example: COMP: AREA?

Multiple Command Rules

The semicolon (;) can be used as a separator to execute multiple commands on a single line. The multiple command rules are as follows.

- Commands at the same level and in the same subsystem command group can be separated by a semicolon (;) on a multiple command line.

  For example: COMP:AREA:STAT ON;RANG 0,960

  STAT ON and RANG 0,960 are commands in the same level and subcommands under AREA.

- To restart commands from the highest level, a semicolon (;) must be used as the separator, and then a leading colon (:), which shows that the restarted command is a command at the top of the command tree, must follow.

  For example: COMP:AREA:STAT ON;:COMP:AREA:RANG 0,960

- The GPIB common commands can be placed in previous, middle or last on a multiple command line, partitioned off with semicolons.

  For example: COMP:AREA ON;*trg;DIFF ON

Short-form Rules:

- If complete commands and parameters (called long form afterwards) have four characters or less, the long form and short form are the same.
- When the long form has more than 4 characters:

  1. And if the 4th character is a vowel, the short form is the first 3 characters of the long form.

  2. If the 4th character is not a vowel, the short form is the first 4 characters.

  For exampel:

  TIME abbreviates to TIME.

  TRIGger abbreviates to TRIG.

  DELete abbreviates to DEL.

  FREQuency abbreviates to FREQ.

- If the long form mnemonic is defined as a phrase rather than a single word, then the long form mnemonic is the first character of the first word(s) followed by the entire last word. The above rules, when the long form mnemonic is a single word, are then applied to the resulting long form mnemonic to obtain the short form.

  For example: Mass MEMory abbreviates to MMEM (long form is MMEMory)

  Impulse VOLTage abbreviates to IVOLT(long form is IVOLTage)

☞**Note:** At the process of commands, the instrument does not distinguish letter case including units.

For example: disp:page meas = DISP:PAGE MEAS = DiSp:PAGe MEas

6.2 Notation Conventions and Definitions

1. The following characters are used in the command syntax.

: A colon is used to separate the higher level commands and the lower level commands.

; The semicolon can be used as a separator to execute multiple commands on a single line.

* Asterisk is used to indicate that the command followed is a common command.

？ A question mark is used to generate a query for the command in front of it.

， Comma is used to separate the multi-parameters in the command.

_ White space is used to separate the command and the parameters.

“” Double quotation marks indicate that the enclosed test is string data.

2. The following characters will be used in this chapter to describe GPIB commands.

NR1 Integer numeric data For example: 123

NR2 Fixed point numeric data For example: 12.3

NR3 Floating point numeric data For example: 12.3E+5

NL New Line character (decimal 10) is the end of the input/output string.

^END: EOI terminator signal of IEEE-488 bus.IEEE-488

< > Angular brackets enclose words or characters that are used to symbolize a program code parameter or a GPIB command.

[ ] Square brackets indicate that the enclosed items are optional.

{ } When several items are enclosed by braces, one and only one of these elements may be selected.

6.3 Command Reference

TH2882A Subsystem Commands

- DISPlay
- COMParator
- Impulse VOLTage
- Sample RATE
- Standard WAVE
- TRIGger
- FETCh?
- MEASure
- ABORt
- Mass MEMory
- Control DATA

GPIB Common Commands:

- *RST
- *TRG
- *IDN

6.3.1 DISPlay Subsystem Commands

The DISPlay subsystem command group sets the display page. Figure 6-2 shows the command tree of the DISPlay Subsystem Command Tree.

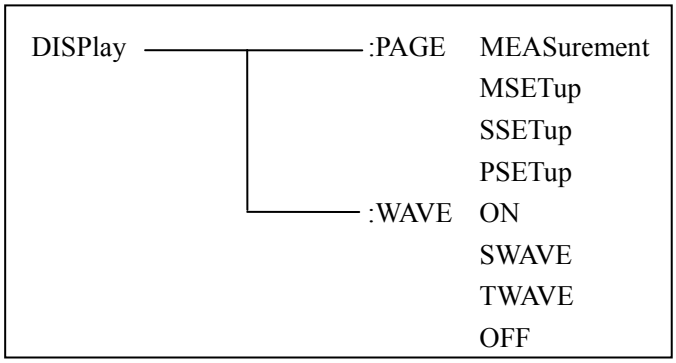


Figure 6-2 DISPlay subsystem command tree

:PAGE

The :PAGE command sets the display page. The :PAGE? query returns the abbreviated page name currently displayed on the LCD screen.

Command Syntax:

DISPlay:PAGE <page name>

Where, <page name> is:

MEASurement sets display page to Measurement Display page.

MSETup sets display page to Measurement Setup page.

PSETup sets display page to Three Phase Setup page.

SSETup sets display page to System Setup page.

For example: WrtCmd(“DISP:PAGE MEAS”)； Set display page to the Measurement Display page.

ⓘ**Note:** This command will be ignore in the phase of measurement!

Query Syntax: DISPlay:PAGE?

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

Where, <page name> return the abbreviated name of the current display page as shown below.

<MEAS DISP > Current displaying page is Measurement Display page.

< MEAS SETUP > Current displaying page is Measurement Setup page.

<SYSTEM SETUP> Current displaying page is Three Phase Setup page.

<SYSTEM SETUP> Current displaying page is System Setup page.

:WAVE

The :WAVE command sets the waveform display mode. The :WAVE? query returns the current

waveform display mode.

Command Syntax:

DISPlay:WAVE { ON | SWAVE | TWAVE | OFF }

Where:

ON Display both the standard and the tested waveforms on the LCD screen.

SWAVE Only display the standard waveform on the LCD screen.

TWAVE Only display the tested waveform on the LCD screen.

OFF No waveform will be displayed.

For example: WrtCmd(“DISP:WAVE SWAVE”)；Set to display standard waveform only.

Query Syntax: DISPlay:WAVE?

Query Response:

{ ALL ON | ONLY STDWAVE | ONLY TESTWAVE | ALL OFF } <NL^END>

Where：

ALL ON Both the standard waveform and the tested waveform are currently displayed on the LCD screen.

ONLY STDWAVE Only the standard waveform is currently displayed on the LCD screen.

ONLY TESTWAVE Only the tested waveform is currently displayed on the LCD screen.

ALL OFF No waveform is displayed on the screen.

6.3.2 COMParator Subsystem Commands

The COMParator subsystem command group sets the comparison functions including AREA SIZE, DIFF ZONE, CORONA and PHASE DIFF. Figure 6-3 shows the command tree of the COMParator subsystem command group.

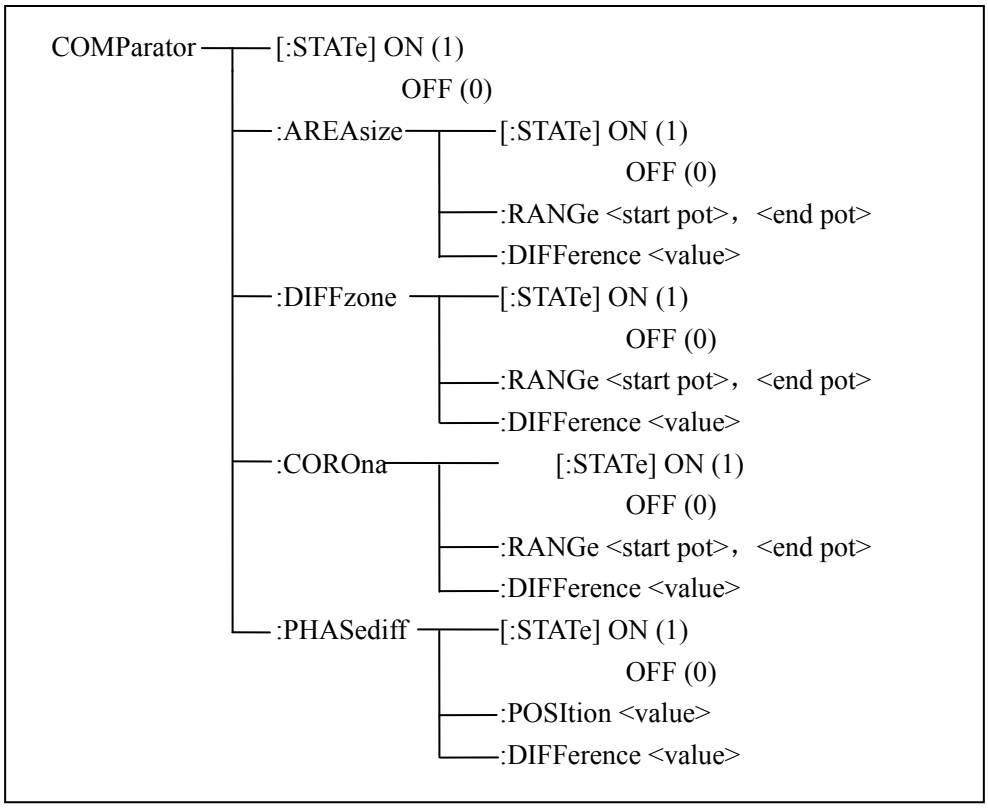


Figure 6-3 COMParator subsystem command tree

[:STATe]

The [:STATe] command sets the comparator to ON or OFF. THE [:STATe]? query returns the current comparator ON/OFF state.

Command Syntax:

COMParator[:STATe] { ON | OFF | 1 | 0 }

Where:

1(decimal49) When the function is ON

0(decimal48) When the function is OFF

For example: WrtCmd(“COMP ON”)； Set the comparator to ON.

Query Syntax: COMParator[:STATe]?
Query Response: <NR1><NL^END>

:AREAsize[:STATe]

The :AREAsize[:STATe] command sets the AREA SIZE comparator to ON or OFF. The :AREAsize[:STATe]? query returns the current AREA SIZE comparator ON/OFF state.

COMParator:AREAsize[:STATe] { ON | OFF | 1 | 0 }

Where:
1(decimal49) When the function is ON
0(decimal48) When the function is OFF

For example: WrtCmd("COMP:AREA ON")；Set AREA SIZE comparator to ON.

Query Syntax: COMParator:AREAsize[:STATe]?
Query Response: <NR1><NL^END>

:AREAsize:RANGe

The :AREAsize:RANGe command sets the comparison range of AREA SIZE comparator. The :AREAsize:RANGe? query returns the current comparison range of AREA SIZE comparator.

Command Syntax: COMParator:AREAsize:RANGe <start pot>，<end pot>
Where:
<start pot> start point of comparison range. NR1 format, range 0 to 960, no unit.
<end pot> end point of comparison range. NR1 format, range 0 to 960, no unit.

For example: WrtCmd("COMP:AREA:RANG 0,960)；Set comparison range from 0 to 960

Note: End point value should be larger than start point. Otherwise an error message will be displayed on the system message line.

Query Syntax: COMP:AREA:RANG?
Query Response: <start pot>，<end pot><NL^END>
Where, <start pot> and <end pot> are NR1 format.

:AREAsize:DIFFerence

The :AREAsize:DIFFerence command sets the difference limit value of AREA SIZE comparator. The :AREAsize:DIFFerence? query returns the current difference limit value of AREA SIZE comparator.

Command Syntax: COMParator:AREAsize:DIFFerence <value>

Where,

<value> Set the difference limit value. NR1 or NR2 or NR3 format, no unit.

For example: WrtCmd(“COMP:AREA:DIFF 2.5”)； Set difference limit value to 2.5%

Note: The <value> here is a percent value. For example, Input 2.5 for 2.5%.

Query Syntax: COMParator:AREAsize:DIFFerence?

Query Response: <NR2><NL^END>

:**DIFFzone[:STATe]**

The :DIFFzone[:STATe] command sets the DIFF ZONE comparator to ON or OFF. The :DIFFzone[:STATe]? query returns the current DIFF ZONE comparator ON/OFF state.

Command Syntax: COMParator:DIFFzone[:STATe] { ON | OFF | 1 | 0 }

Where,

1 (decimal 49) When the function is ON

0 (decimal 48) When the function is OFF

For example: WrtCmd(“COMP:DIFF ON”)； Set DIFF ZONE comparator to ON.

Query Syntax: COMParator:DIFFzone[:STATe]?

Query Response: <NR1><NL^END>

:DIFFzone:RANGe

The :DIFFzone:RANGe command sets the comparison range of DIFF ZONE comparator. The :DIFFzone:RANGe? query returns the current comparison range of DIFF ZONE comparator.

Command Syntax: COMParator:DIFFzone:RANGe <start pot>，<end pot>

Where,

<start pot> start point of comparison range. NR1 format, range 0 to 960, no unit.

<end pot> end point of comparison range. NR1 format, range 0 to 960, no unit.

For example :WrtCmd(“COMP:DIFF:RANG 0,960)； set comparison range from 0 to 960

Note: End point value should be larger than start point. Otherwise an error message will be displayed on the system message line.

Query Syntax: COMP:DIFF:RANG?

Query Response: <start pot>，<end pot><NL^END>

Where, <start pot> and <end pot> are NR1 formats.

:DIFFzone:DIFFerence

The :DIFFzone:DIFFerence command sets the difference limit value of DIFF ZONE comparator. The :DIFFzone:DIFFerence? query returns the current difference limit value of DIFF ZONE comparator.

Command Syntax: COMParator:DIFFzone:DIFFerence <value>

Where,

<value> Set the difference limit value. NR1 or NR2 or NR3 format, no unit.

For example: WrtCmd("COMP:AREA:DIFF 2.5")；Set difference limit value to 2.5%

ⓘ**Note:** Here <value> is a percent value. For example, Input 2.5 for 2.5%.

Query Syntax: COMParator:DIFFzone:DIFFerence?

Query Response: <NR2><NL^END>

:**CORONa[:STATe]**

The :CORONa[:STATe] command sets the CORONA comparator to ON or OFF. The :CORONa[:STATe]? query returns the current CORONA comparator ON/OFF state.

Command Syntax

COMParator:CORONa[:STATe] { ON | OFF | 1 | 0 }

Where,

1 (decimal 49) When the function is ON

0 (decimal 48) When the function is OFF

For example: WrtCmd("COMP:CORO ON") Set CORONA comparator to ON.

Query Syntax: COMParator:CORO[:STATe]?

Query Response: <NR1><NL^END>

:CORONa:RANGe

The :CORONa:RANGe command sets the comparison range of CORONA comparator. The :CORONa:RANGe? query returns the current comparison range of CORONA comparator.

Command Syntax: COMParator:CORONa:RANGe <start pot>，<end pot>

Where,

<start pot> start point of comparison range. NR1 format, range 0 to 960, no unit.

<end pot> end point of comparison range. NR1 format, range 0 to 960, no unit.

For example:WrtCmd("COMP:CORO:RANG 100,200) Set comparison range from 100 to 200

ⓘ**Note:** End point value should be larger than start point. Otherwise an error message will be displayed on the LCD screen.

Query Syntax: COMP:CORO:RANG?

Query Response: <start pot>，<end pot><NL^END>

Where, <start pot> and <end pot> is NR1 format.

:CORONa:DIFFerence

The :CORONa:DIFFerence command sets the difference limit value of CORONA comparator. The :CORONa:DIFFerence? query returns the current difference limit value of CORONA

comparator.

Command Syntax: COMParator:CORONa:DIFFerence <value>

Where,

<value> is the difference limit value. NR1 format, without unit.

For example: WrtCmd(“COMP:CORO:DIFF 20”) Set difference limit value to 20

Query Syntax: COMParator:CORONa:DIFFerence?

Query Response: <NR1><NL^END>

:PHASediff[:STATe]

The :PHASediff[:STATe] command sets the PHASE DIFF comparator to ON or OFF. The :PHASediff[:STATe]? query returns the current PHASE DIFF comparator ON/OFF state.

Command Syntax:

COMParator:PHASediff[:STATe] { ON | OFF | 1 | 0 }

Where,

1 (decimal 49) When the function is ON

0 (decimal 48) When the function is OFF

For example: WrtCmd(“COMP:PHAS ON”) Set PHASE DIFF comparator to ON.

Query Syntax: COMParator:PHAS[:STATe]?

Query Response:<NR1><NL^END>

:PHASediff:POSItion

The :PHASediff:POSItion command sets which zero-crossing point is used in PHASE DIFF comparator.

The : PHASediff:POSItion? query returns the zero-crossing position value of PHASE DIFF comparator.

Command Syntax: COMParator:PHASediff:POSItion <value>

Where,

<value> Zero-crossing position value. NR1 format, range 2 to 10, without unit.

For example: WrtCmd(“COMP:PHAS:POSI 3) Set the third zero-crossing point.

Query Syntax: COMP:PHAS:POSI?

Query Response: <NR1><NL^END>

:PHASediff:DIFFerence

The :PHASediff:DIFFerence command sets the difference limit value of PHASE DIFF comparator.

The :PHASediff:DIFFerence? query returns the current difference limit value of PHASE DIFF comparator.

Command Syntax: COMParator:PHASediff:DIFFerence <value>

Where,

<value> May be NR1 or NR2 or NR3 format, no unit.

Note: Here <value> is a percent value. For example, Input 2.5 for 2.5%.

Query Syntax: COMParator:PHASediff:DIFFerence?

Query Response: <NR2><NL^END>

6.3.3 Impulse VOLTage Subsystem Commands

The Impulse VOLTage Subsystem command group sets the impulse voltage, average times, impulse voltage auto adjust and delay etc. Figure 6-4 shows the Impulse VOLTage Subsystem command Tree.

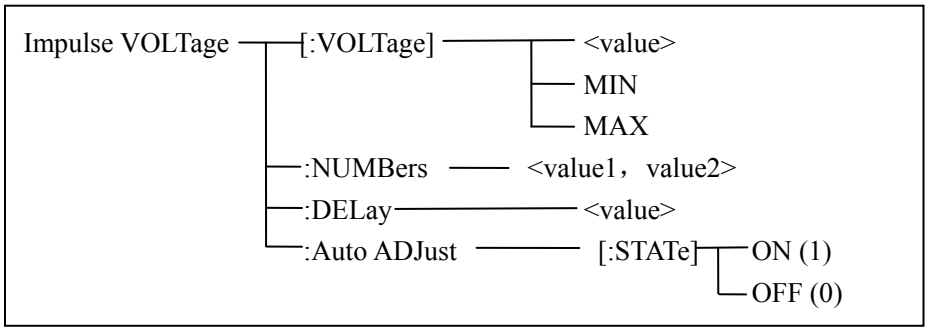


Figure 6-4 Impulse VOLTage Subsystem command Tree

[:VOLTage]

The [:VOLTage] command sets the impulse voltage for testing.

The [:VOLTage]? query returns the current impulse voltage value.

Command Syntax:

IVOLTage[:VOLTage] { <value> | MIN | MAX }

Where,

<value> NR1, NR2, or NR3 format followed by KV or V, the value must be between 300V to 3000 V(TH2882A-3).

MIN Set the impulse voltage to 300V (TH2882A-3).

MAX Set the impulse voltage to 3000V (TH2882A-3).

For example: WrtCmd(“IVOLT:VOLT 1000V”) Set impulse voltage to 1000V.

Query Syntax: IVOLTtage:[VOLTage]?

Query Response: <NR1><NL^END>

:NUMBers

The:NUMBers command sets impulse numbers for testing.

The:NUMBers？query returns the current impulse numbers .

Command Syntax: IVOLTage:NUMBers <value1，value2>

Where:

<value1> is NR1 format, range from 1 to 30, test impulse number applied, no unit.

<value2> is NR1 format, range from 0 to 7, degaussing impulse number applied, no unit.

For example: WrtCmd(“IVOLT:NUMB 2,1”)；Set the averaging rate to 2, degaussing rate to 1.

Query Syntax: IVOLTage:NUMBers？

Query Response: <NR1，NR1><NL^END>

:DELay

The :DELay command sets the delay time between two measurement when trigger mode is set to INTernal mode. The :DELay? query returns the current delay time.

Command Syntax: IVOLTage:DELay <value>

Where,

<value> may be NR1,NR2 or NR3 format followed by s or ms, the value must be from 0 to 99.9s.

For example: WrtCmd(“IVOLT:DEL 1s”) Set the delay time to 1s when trigger mode is INTernal mode.

Query Syntax: IVOLTage:DELay?

Query Response: <NR2><NL^END>

:Auto ADJust

The :Auto ADJust command sets the impulse voltage auto adjust to ON or OFF.

The :Auto ADJust? query returns the current impulse voltage auto adjust ON/OFF state.

Command Syntax:

IVOLTage:AADJust { ON | OFF | 1 | 0 }

Where,

1 (decimal 49) When the function is ON.

0 (decimal 48) When the function is OFF.

For example: WrtCmd(“IVOLT:AADJ OFF”) Set the impulse voltage auto adjust to OFF.

Query Syntax: IVOLTage:AADJust?

Query Response: <NR1><NL^END>

6.3.4 Sample RATE Subsystem Commands

The Sample RATE Subsystem command group sets the sample rate and time base zoom. Figure 6-5 shows the Sample RATE Subsystem Command Tree.

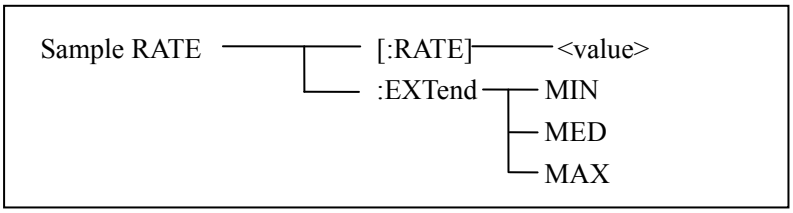


Figure 6-5 Sample RATE subsystem command tree

[:RATE]

The [:RATE] command sets the sample rate.

The [:RATE]? query returns the current sample rate setting.

Command Syntax: SRATE[:RATE] <value>

Where:

<value> The available values are listed as follows.

40/01msps, 40/02msps, 40/04msps, 40/08msps, 40/16msps, 40/32msps，
40/64msps, 40/128msps

40/01, 40/02, 40/04, 40/08, 40/16, 40/32, 40/64, 40/128

For example: WrtCmd(“SRATE:RATE 40/02msps”)； Set the sample rate to 40/02MSPS .

☞**Note:** When TH2882A is not in the test state, SRATE[:RATE] command changes the current sample rate. When TH2882A is in the test state, three cases may occur.

1. When the standard waveform is tested in the mode of SEQ CYPLE or SINGLE SAMPLE, this command will be ignored.
2. When the standard waveform is tested in the mode of SINGLE CYCLE, if the test has not put an end, this command will be ignored; if the test is nearly finished, this command will select the standard waveforms under different sample rate.
3. When the tested device is under test, this command will be ignored.

Query Syntax: SRATE[:RATE]?

Query Response: { 40/01 MSPS | 40/02 MSPS | 40/04 MSPS | 40/08 MSPS | 40/16 MSPS | 40/32 MSPS | 40/64 MSPS | 40/128MSPS } <NL^END>

:EXTend

The :EXTend command sets the time base zoom function.

The :EXTend? query returns the current time base zoom value.

Command Syntax

SRATE:EXTend { MIN | MED | MAX }

Where,

MIN Set to display waveform with the all 960 points data

MED Set to display waveform with the front 480 points data

MAX Set to display waveform with the front 240 points data

For example: WrtCmd(“SRATE:EXT MIN”) Set to display waveform with the all 960 points data

☞**Note:** This command will be ignored when TH2882A is in the testing state.

Query Syntax: SRATE:EXTend?

Query Response:

{ MIN | MED | MAX } <NL^END>

6.3.5 Standard WAVE Subsystem Commands

The Standard WAVE Subsystem command group sets the parameters for sampling the standard waveform, including setting the standard waveform sample mode, triggering the measurement of a standard waveform and choosing a sampled standard waveform. Figure 6-6 shows the standard WAVE subsystem command tree.

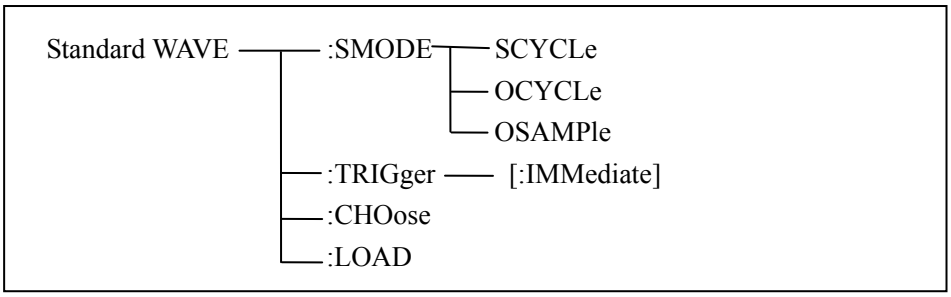


Figure 6-6 Standard WAVE subsystem command tree

:SMODE

The :SMODE command sets the standard waveform sample mode.

The :SMODE? query returns the current standard waveform sample mode.

Command Syntax：

SWAVE:SMODE { SCYCLe | OCYCLe | OSAMPle }

Where,

SCYCLe Set the standard waveform sample mode to sequence-cycle.

OCYCLe Set the standard waveform sample mode to one-cycle.

OSAMPle Set the standard waveform sample mode to one-sample.

For example: WrtCmd(“SWAVE:SMODE OSAMPle”) Set the standard waveform sample mode to one-sample.

Query Syntax: SWAVE:SMODE?

Query Response

ONE CYCLE { SEQ CYCLE | <NL^END> | ONE SAMPLE }

Where: SEQ CYCLE is sequence-cycle mode，ONE CYCLE is one-cycle mode，ONE SAMPLE is one-sample mode.

:TRIGger[:IMMediate]

The :TRIGger[:IMMediate] command is used to start sampling of the standard waveform.

Command Syntax: SWAVE:TRIGger[:IMMediate]

For example: WrtCmd("SWAVE:TRIG")；

ⓘ**Note:** 1**.** This command is available only on the <MEAS DISP> page.

2. This command will be ignored if the trigger mode is not set to BUS mode.

3. This command will be ignored when TH2882A is in testing state.

☞**Note:** The :TRIGger[:IMMediate] command starts a measurement of standard waveform and TH2882A returns the standard waveform data directly without receiving the FETCh SWAVE? command. In SEQ CYCLE mode, TH2882A returns standard waveform data when each sampling test is completed. In ONE CYCLE mode, TH2882A returns the last standard waveform, and returns the standard waveform when sample rate is changed.

:CHOose

The :CHOose command is used to choose the standard waveform data.

Command Syntax: SWAVE:CHOose

For example: WrtCmd("SWAVE:CHO")；

ⓘ**Note:** 1. This command is available only on <MEAS DISP> page.

2. This command is valid only when sampling test is finished in SEQ CYCLE mode or ONE CYCLE mode.

:LOAD

The :LOAD command is used to load the standard waveform data.

Command Syntax: SWAVE:LOAD < standard waveform data >

For the standard waveform data, refer to 5.3 Data Format.

☞**Note:** Use FETCh SWAVE？command to obtain the standard waveform data and CDATA:VOLT? And CDATA:SAMP? Commands, voltage and the frequency control words corresponding to the standard waveform. SWAVE:LOAD and CDATA:VOLT、CDATA:SAMP commands are used to restore the standard waveform data.

6.3.6 STATistic Subsystem Commands

The STATistic subsystem commands set the statistic function to ON or OFF, and clear or save statistic data. Figure 6-7 shows the STATistic subsystem command tree.

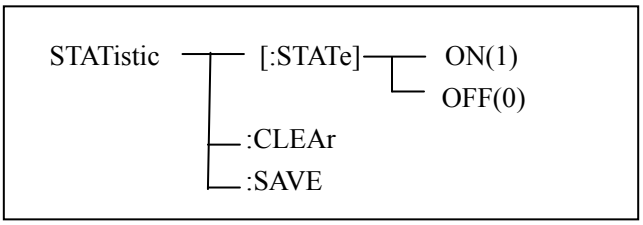


Figure 6-7 STATistic subsystem command tree

[:STATe]

The [:STATe] command sets the statistic function to ON or OFF. The [:STATe]? query returns the current statistic function ON/OFF state.

Command Syntax:

STATistic[:STATe] { ON | OFF | 1 | 0 }

Where,

1 (decimal 49) When the function is ON

0 (decimal 48) When the function is OFF

For example: WrtCmd (“STAT ON”) Turn on the statistic function.

Query Syntax: STATistic[:STATe]?

Query Response: <NR1><NL^END>

:CLEAr

The :CLEAr command clears the statistic data.

Command Syntax: STATistic:CLEAr

:SAVE

The :SAVE command saves the statistic data to a file.

Command Syntax: STATistic:SAVE

6.3.7 Control DATA Subsystem Commands

Control DATA subsystem command group sets to obtain the voltage and the sample rate control words corresponding to the standard waveform. When PC and the instrument read the standard waveform, its corresponding voltage and the sample rate control words are required to read as well.

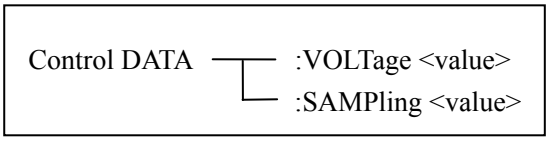


Figure 6-7 Control DATA subsystem command tree

:VOLT

The :VOLT command sets the voltage control word.

The :VOLT? command query returns the voltage control word corresponding to the current standard waveform.

Command Syntax: CDATA:VOLTage <value>

Where:

<value> is NR1data format，no unit.

:SAMP

The :SAMP command sets the sample rate control word.

The :SAMP? command query returns the sample rate control word corresponding to the current standard waveform.

Command Syntax: CDATA:SAMPling <value>

Where:

<value> is NR1 format, no unit.

Note: The complete standard waveform is made up of data points, the voltage control word and the sample rate control word. The instrument can carry correct measurement unless the three elements are sent to the instrument at the same time.

6.3.8 TRIGger Subsystem Commands

The TRIGger Subsystem command group is used to trigger a measurement or to set the trigger mode. Figure 6-9 shows the TRIGger Subsystem Tree.

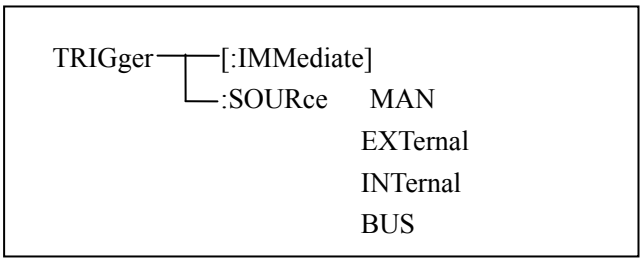


Figure 6-9 TRIGger subsystem command tree

[:IMMediate]
The [:IMMediate] command triggers a measurement.
Command Syntax: TRIGger[:IMMediate]
For example: WrtCmd("TRIG")；
ⓘNote: The TRIGger[:IMMsdiate] command, available on the <MEAS DISP> page, will be ignored when TH2882A is in the testing state. The trigger mode must set to BUS mode, or this command will be ignored. This command is only used to trigger the test of DUT. Refer to Standard WAVE Subsystem command for the details of triggering standard waveform test.

:SOURce
The :SOURce command sets the trigger mode.
The :SOURce? query returns the current trigger mode.
Command Syntax:

TRIGger:SOURce { MAN | EXTernal | INTernal | BUS }

Where:
MAN Triggered by pressing the START button or using foot control switch
EXTernal Triggered by the HANDLER interface.
INTernal Automatically triggered after pressing the START button.
BUS Triggered by RS232 interface or GPIB interface.
For example: WrtCmd("TRIG:SOUR BUS"); Set to bus mode.

Query Syntax: TRIGger:SOURce?

Query Response: { INT | EXT | BUS | HOLD } <NL^END>

6.3.9 FETCh？Subsystem Commands

The FETCh? Subsystem command group is used to output the results of measurement, including waveform data, comparison results, statistic data, time, frequency and voltage. Figure 6-10 shows the FETCh? subsystem command tree.

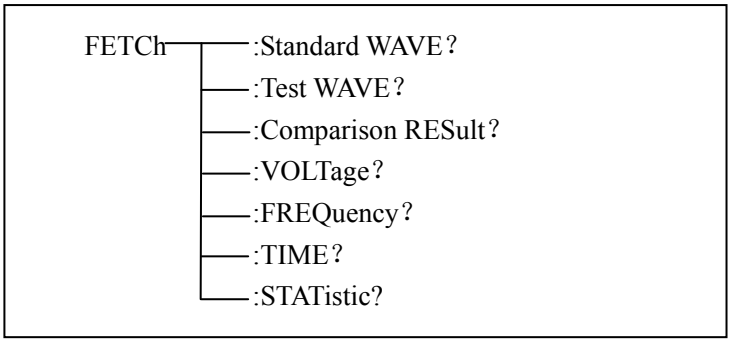


Figure 6-10 FETCh? subsystem command tree

:Standard WAVE？

The :Standard WAVE? query puts the current standard waveform date into output buffer.

Query Syntax: FETCh:SWAVE？

For example: WrtCmd(“FETC:SWAVE?”)；

:Test WAVE？

The :Test WAVE? query puts the latest tested waveform data into output buffer.

Query Syntax: FETCh:TWAVE？

For example: WrtCmd(“TRIG:SOUR BUS”)；
WrtCmd(“TRIG”)；
WrtCmd(“FETC:TWAVE?”)；

☞**Note:**

1. If the waveform data is not ready, the FETCh SWAVE? and FETCh TWAVE? query will be executed after the current measurement or next measurement is finished.
2. Refer to previous chapter Data Format for the returned data format.

Comparison RESult?

The Comparison RESult? query returns the latest comparison result.

Query Syntax: FETCh:CRESult?

Query Response: There are three cases as follows.

1. If the comparator function or four comparison methods is set to OFF, the query response will be <NR1><NL^END>, here NR1 is 2.
2. If there is no waveform data available, the query response will be <NR1>< NL^END>, here NR1 is 3.
3. If the comparator function is set to on, the query response will be <NR1, NR3, NR3, NR1, NR3><NL^END>, the first NR1 is the general comparison result: 1 (PASS) or 0 (FAIL). The following four data are the comparison results corresponding to each comparator: AREA SIZE, DIFF ZONE, CORONA and PHASE DIFF.

ⓘ**Note:** TH2882A returns the comparison result when the comparator is turned on. TH2882A returns 9.9E37 when the AREA SIZE, DIFF ZONE or PHASE DIFF comparator is turned off. TH2882A returns 9999 when the CORONA comparator is turned off.

:VOLTage?

The VOLTage? query returns the current voltage value between the two voltage cursor. Refer to MEASure Subsystem about voltage cursor setting.

Query Syntax: FETCh:VOLTage?

Query Response: <NR1><NL^END>

☞ **Note:** The default unit is V.

:FREQuency?

The :FREQuency? query returns the current frequency value between the two time cursor. Refer to MEASure Subsystem about time cursor setting.

Query Syntax: FETCh:FREQuency?

Query Response: <NR3><NL^END>

☞ **Note:** The default unit is Hz. If the start cursor is overlapped with the end cursor completely, then 9.9E37 will be returned.

:TIME?

The TIME? query returns the current time value between the two vertical cursors. Refer to MEASure Subsystem about voltage cursor setting.

Query Syntax: FETCh:TIME?

Query Response: <NR3><NL^END>

☞ **Note:** The default unit is s.

:STATistic?

The :STATistic? query returns the current statistic result.

Query syntax: FETCh:STATistic?

Return format: <NR1>, <NR1>, <NR1>, <NR1>, <NR1>, <NR1>, <NR1>, <NR1>, <NR1>, <NR1>, <NL^END>

The returned data are in turn as follows: total test times and times of PASS, total test times for Area Size comparison and times of PASS, total test times for Diff Zone comparison and times of PASS, total test times for Corona comparison and times of PASS, total times for Phase Diff comparison and times of PASS. PASS rate can be automatically calculated according to the returned data.

6.3.10 MEASure Subsystem Commands

The MEASure Subsystem command group sets the measurement range of voltage, frequency and time. Figure 6-11 shows the MEASure subsystem command tree.

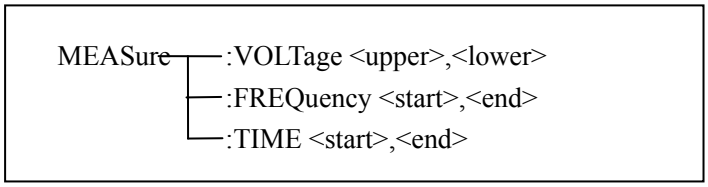


Figure 6-11 MEASure subsystem command tree

:VOLTage

The VOLTage command sets the measurement range of voltage.

The VOLTage? query returns the current position of voltage cursor.

Command Syntax: MEASure:VOLTage <upper>,<lower>

Where:

<upper> is the upper cursor of voltage, NR1 format, range from 1 to 199, no unit.

<lower> is the lower cursor of voltage, NR1 format, range from 1 to 199, no unit.

For example: WrtCmd(“MEAS:VOLT 1,199”); Set the measurement range of voltage from 1 to 199.

ⓘ**Note:** The lower value must be smaller than the upper value. Otherwise an error message will be displayed on the system message line.

Query Syntax: MEASure:VOLTage?

Query Response: <upper>,<lower><NL^END>

Upper and lower are NR1data format.

:FREQuency

The :FREQuency command sets the measurement range of frequency.

The :FREQuency? query returns the current position of frequency cursor.

Command Syntax: MEASure:FREQuency <start>,<end>

Where:

<start> is the start cursor of frequency, NR1 format, range from 1 to 239, no unit.

<end> is the end cursor of frequency, NR1 format, range from 1 to 239, no unit.

For example: WrtCmd("MAES:FREQ 100,200"); Set the frequency range from 100 to 200.

ⓘ **Note:** The end value must be larger than the start value. Otherwise an error message will be displayed on the system message line.

☞**Note:** The measurement ranges of frequency and time are the same, thus the change of frequency is that of time.

Query Syntax: MEASure:FREQuency?

Query Response: <start>, <end><NL^END>

Start and end are NR1data formats.

:TIME

The :TIME command sets the measurement range of time.

The :TIME? query returns the current position of time cursor.

Command Syntax: MEASure:TIME <star>,<end>

Where:

<start> is the start cursor of time, NR1 format, range from 1 to 239, no unit.

<end> is the end cursor of time, NR1 format, range from 1 to 239, no unit.

For example: WrtCmd("MAES:TIME 100,200"); Set the time range from 100 to 200.

ⓘ **Note**: The end value must be larger than the start value. Otherwise an error message will be displayed on the system message line.

☞**Note:** The measurement ranges of frequency and time are the same, thus the change of frequency is that of time.

Query Syntax: MEASure:TIME?

Query Response: <start>, <end><NL^END>

Start and end are NR1data formats.

6.3.11 ABORt Subsystem Command

TH2882A will abort the current measurement as soon as the ABORt command is received.

Command Syntax: ABORt

For example: WrtCmd("ABOR");

6.3.12 Mass MEMory Subsystem Commands

The Mass MEMory subsystem command group loads or stores setting data from/to the internal EEPROM. Figure 6-12 shows the Mass MEMory Subsystem Command Tree.

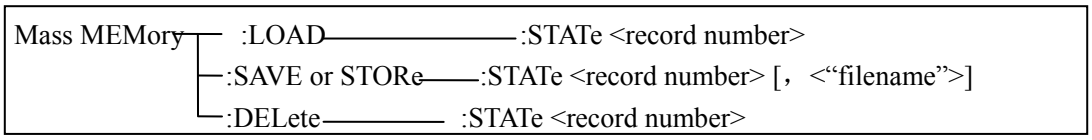


Figure 6-12 Mass MEMory subsystem command tree

ⓘ **Note:** When TH2882A is in the test state, the Mass MEMory Subsystem Command will be ignored.

:LOAD:STATe

The :LOAD:STATe command loads the file data from the internal EEPROM.

Command Syntax: MMEMory:LOAD:STATe <record number>

Where:

<record number> file number，range from 1 to 560.，NR1 format，no unit.

For example: WrtCmd(“MMEM:LOAD:STAT 1”)；loading file-1.

ⓘ **Note:** 1. If the file you want to load is not available, “File not exist” message will be displayed on the system message line.

2. If the input file number is out of 1 to 560, message “Out of file range” will be displayed on the system message line.

☞**Note:** The file contains the page information. When a file is loaded, TH2882A will display the saved page.

:SAVE:STATe or STORe:STATe

The :STORe:STATe or :SAVE:STATe command stores the setting data to a file in the internal EEPROM.

Command Syntax: MMEMory:STORe:STATe <record number> [,<“filename”>]

Where：

<record number> file number，range from 1 to 560.，NR1 format，no unit.

<“filename”> The file name consists of less than 12 ASCII characters. <Unnamed> will be the default name, if you don’t input a file name.

For example: WrtCmd(“MMEM:STOR:STAT 1，“#TH2882A*””)；

ⓘ NOTE: 1. TH2882A will not give a warning message when the existent file is to be over written.

2. TH2882A will display warning message “Test standard wave first” on the system message line when you try to save a file without the standard waveform data.

☞**Note:** The file name assigned by bus will be quoted without any change, thus user can enter some special characters such as special symbols and letters in lower case that cannot be input on the panel of the instrument.

:DELete:STATe

The DELete:STATe command deletes a file from the internal EEPROM.

Command Syntax: MMEMory:DELete:STATe <record number>

Where:

<record number> file number，range from 1 to 560.，NR1 format，no unit.

For example: WrtCmd("MMEM:DEL:STAT 1")；the deleted file-1 。

ⓘ **Note**: TH2882A will not give a warning message when a file is to be deleted.

6.3.13 Common Commands

TH2882A' acceptable GPIB common commands are described as follows.

***RST**

The *RST command (reset command) sets the TH2882A to its initial settings.

Command Syntax: *RST

For example: WrtCmd("*RST")；

***TRG**

The *TRG command (trigger command) triggers a measurement and puts the tested waveform data into the output buffer. This command is equal to TRIG+FETCh TWAVE? command.

Command Syntax: *TRG?

For example: WrtCmd("*TRG？")；

ⓘ **Note:** This command is only available on the <MEAS DISP> pages. This command will also be ignored when TH2882A is in the testing state. This command is only used to trigger a measurement except for sampling a standard waveform. Refer to **Standard WAVE Subsystem for standard waveform test.**

***IDN?**

The *IDN? query returns the TH2882A' ID information.

Query Syntax: *IDN?

Query Response: <product>，<version><NL^END>

Where:

<product> TH2882A-3 Impulse Winding Tester

TH2882A-5 Impulse Winding Tester

<version> software revision number

Example:

Steps for standard waveform sampling:

Firstly, send the test parameters: voltage, sampling rate…

1.SWAVE:TRIG standard waveform sampling(wait for 3000ms)

2.SWAVE:CHO standard waveform selection(wait for 10ms)

3.FETCH:SWAVE? query the standard waveform data 960points (wait for 500ms)

4.CDAT:VOLT? query the real voltage(wait for 500ms)

5.CDAT:SAMP? query the real sampling rate

Save the above value queried. The time between brackets is the stabilization time and it can be changed according to the actual conditions.

Steps for standard waveform sending:

Send the test parameters: voltage, sampling rate…

(the value is the same as standard waveform sampling)

1.CDAT:VOLT X send the real voltage (X is the sampled real voltage)

2.CDAT:SAMP X send the real sampling rate (X is the sampled real sampling rate)

3.SWAVE:LOAD X send the standard waveform data(X is standard waveform data, 960 points)

NOTE: The standard waveform sampling must be single sampling and test mode must be BUS mode.

6.4 Error and Warning Messages

The bus commands may have some spelling errors, syntax errors or wrong parameters. TH2882A executes a command after the command is analyzed. If one of above errors occurs, TH2882A halts the command analysis, and the rest commands will be ignored. If a command (for example a trigger command is ignored.) is ignored, the rest commands will be executed. The error and warning messages will be displayed on the system message line.

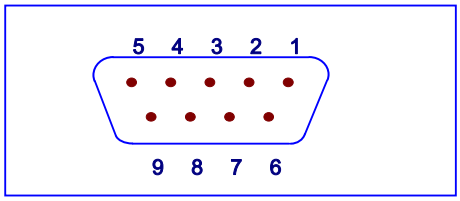
The following table shows the common error and warning messages, which will be displayed on the message line when they occur.

Error Message	Description
Unknown message!	Unknown command is received. Usually there is a spelling error in the command. For example: TRG should be TRIG DISP:PAG MEAS should be DISP:PAGE MEAS
Data error!	Improper type of data is used or the value is out of range. For example: IVOLT 200，the impulse voltage is out of range.
Error parameter!	Unrecognizable parameter is used. For example: TRIG:SOUR INTER，INTER is not the correct shot-form and should not used.
Error suffix!	Units are unrecognizable, or the units are not correct. For example: IVOLT:DEL 200us，us can not be the unit of the impulse voltage.
Data too long!	Data is too long. For example: The number of characters for a file name can not exceed 12 characters and numeric parameter, 10 characters.
File not exist!	Load a file that is not available.
Out of file range!	File number for internal memory must be between 1 and 60.
Trigger ignores!	When TH2882A is in the testing state, all trigger signals will be ignored.
Command ignores!	Some command may be ignored. For example: DISP:PAGE MSET When TH2882A is in the testing state, this command will be ignored.

Chapter 7 Handler Interface

7.1 Basic Information

The handler interface employs a 9-pin DB connector. Pin sequence is as follow.



（side view）

The signal definitions for each pin are described as follows.

NOTE: The / (back slash) in the signal name means that the signal is asserted when low.

PIN1 EXGND: Common for external voltage source EXV.
When TH2882A uses the internal voltage as the power supply for handler interface, TH2882A' circuit common will be connected to EXGND.

PIN2 /EOC: End of conversion
/EOC signal is asserted when the A/D conversion is completed and TH2882A is ready for the next DUT to be connected to the test terminals. The measurement data, however, is not valid until BUSY is asserted to low.

PIN3 BUSY: TH2882A is in the test state. When calculation, comparison and display are all completed, this signal is asserted to low.

PIN4 /PASS: Pass signal output.

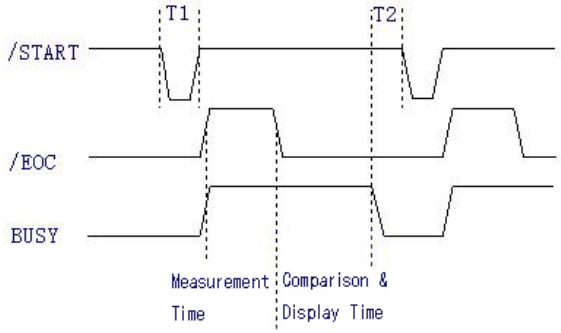
PIN5 /FAIL: Fail signal output.

PIN6 EXV: External DC voltage.
DC voltage supply pins for DC isolated open collector outputs, /EOC, /START, /STOP, /PASS, /FAIL, /EOM. The setting of internal jumpers must be changed when using the internal voltage supply.

PIN7 /START: External Trigger Signal.
TH2882A is triggered on the rising edge of a pulse applied to this pin when the trigger mode is set to EXT mode.

PIN8 /STOP: External Stop Signal.
Test is interrupted on the rising edge of a pulse applied to this pin.

PIN9 VCC: Internal voltage source supply(+5V). Internal source is not recommended for user to use. Make sure the current is lower than 0.1A and keep the signal line be away from interference source when use.



The timing diagram for handler interface is displayed in above figure, T1 is the trigger pulse width and the minimum pulse width is 1us. T2 is the delay time, after the foregoing measurement completed, to next trigger signal; its minimum pulse width is 0us. /PASS and /FAIL signal are asserted after the measurement completed, till next trigger. The request of the /STOP pulse signal is the same as /START pulse signal.

7.2 Electrical Characteristics

7.2.1 DC Isolated Output

Each DC output (pins 2 through 5) is the collector output of the built-in pull-up resistor and isolated by an opto-coupler. The output voltage of each line is set by a pull-up resistor on the handler interface board. The pull-up resistors can be connected to the internally supplied voltage (+5V), or to an externally applied voltage (EXV: +5V to +24V) by setting jumpers. Table 7-1 shows the electrical characteristics of the DC isolated outputs.

Output Signal	Voltage Output Rating		Maximum Current	Circuit Common
	Low	High		
/EOC BUSY /PASS /FAIL	≤0.5V	+5V～ +24V	6mA	Internal pull-up voltage: TH2882A circuit common (GND) External voltage(EXV): EXGND

Table 7-1 **DC** Isolated output electrical characteristics

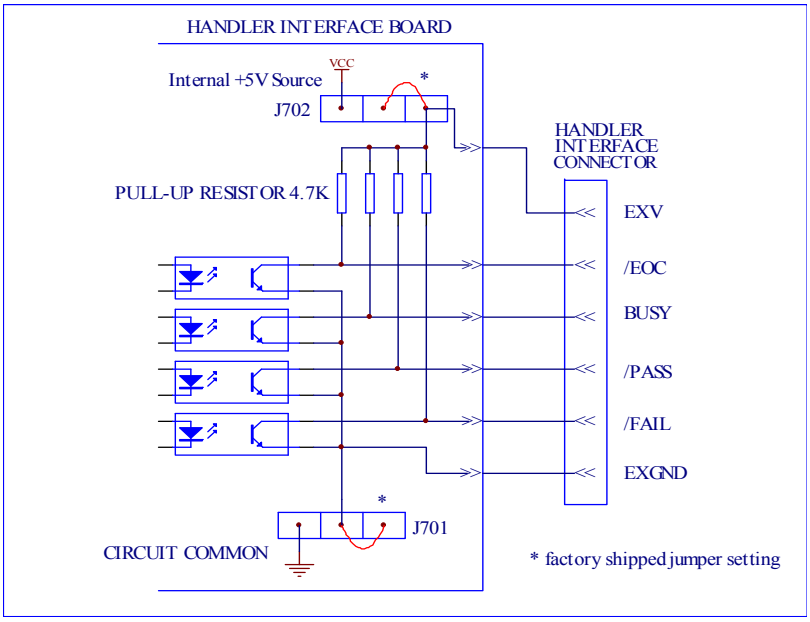


Figure 7-1 Simplified diagram of the output signals

A simplified diagram of the output signals is shown in Figure 7-1. * is the default jumper setting when shipped from factory. That is to say, the default jumper setting is to use external voltage source.

Refer to the next section Jumper Setup.

7.2.2 DC Isolated Input

The /START signal (pin 7) and the /STOP signal (pin 8) are connected to the cathode of the LED in an opto-coupler. TH2882A is triggered on the rising edge of the /START pulse and stopped on the rising edge of the /STOP pulse. The anode of the LED can be connected to the internal +5V, or an external voltage source EXV (the same external voltage source used for output signal).

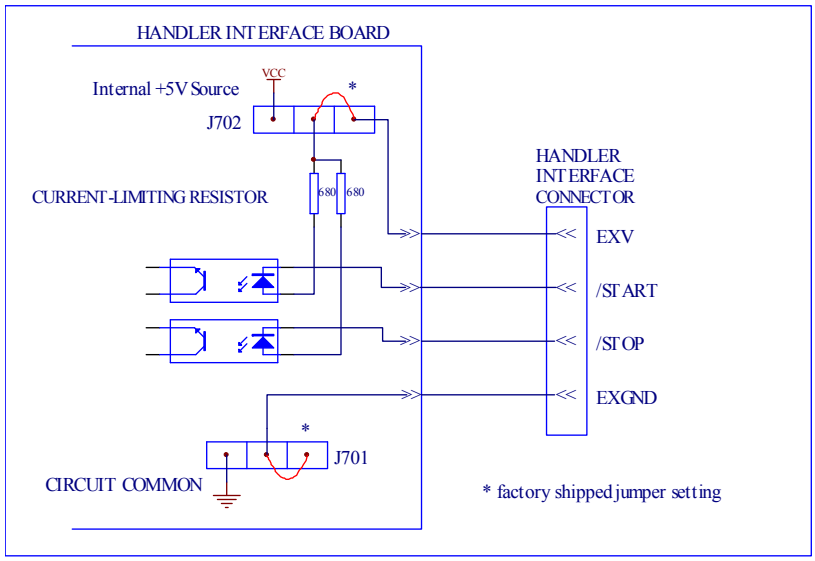


Figure 7-2 Simplified diagram of the input signal

In the Figure 7-2, the default jumper setting is to use external voltage source. Actually, the input signals and the output signals use the same external voltage source together. The CURRENT-LIMITTING RESISTOR is used to limit current and the default resistor is only suitable for external voltage source range from 5V to 8V. If the external voltage source is higher than 8V, you should replace the CURRENT-LIMITTING RESISTOR to avoid damaging circuit components. Current-Limiting resistors R712 and R713 should be both replaced. The detailed replacement information about CURRENT-LIMITING RESISTOR is listed in Table 7-2.

CURRENT-LIMITTING RESISTOR	Range of external voltage source
680Ω	5V to 8V
1.2KΩ	8V to 15V
2.2KΩ	15V to 24V

Table 7-2 Current limiting resistors for different voltages

7.3 Jumper Setup on HNADLER Interface

There are two jumpers on the Handler Interface Board. The two jumpers are used to select the internal voltage source or external voltage source for the output signal and input signal. Their locations are shown in Figure 7-3.

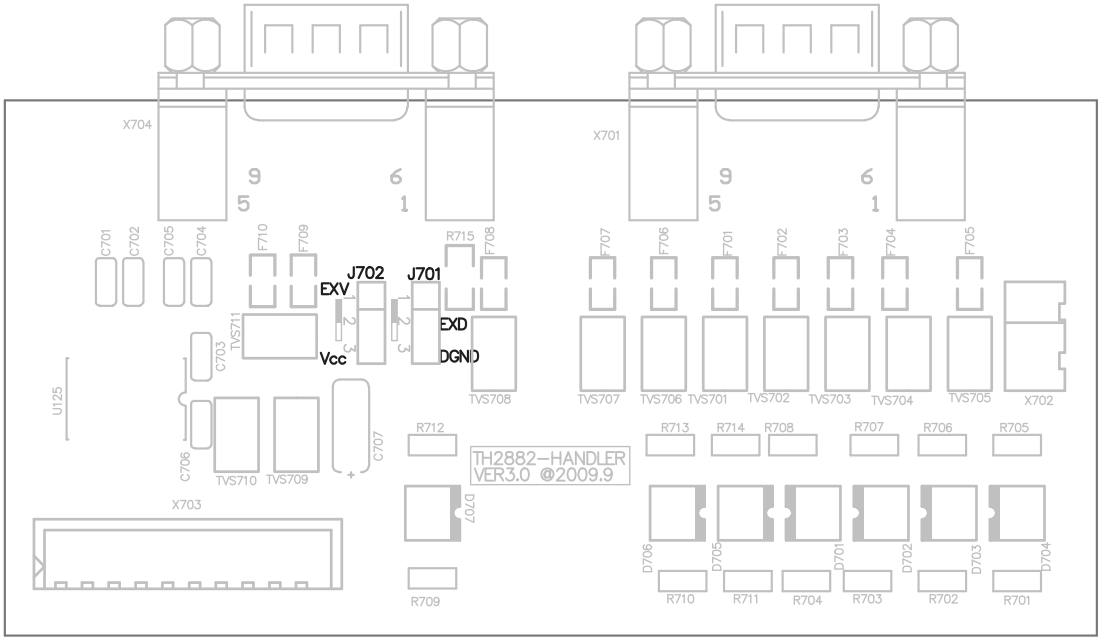


Figure 7-3 Jumper position on the handler interface board

As above figure shown, when shipped from the factory, both jumpers are set at the upper position. If you want to apply the internal power supply, you must set both jumpers at the lower position. Likewise, when using external power supply to substitute the internal power supply, the two jumpers should be set at the same time.

Warning: Make sure the instrument has been powered off and the plug has been removed before opening the case to alter jumper setting.

Chapter 8 Package Contents and Warranty

8.1 Package Contents

Following items should be contained in the package.

Serial Number	Name	Quantity
1	TH2882A-3/-5 Impulse Winding Tester	1
2	TH26035A High-voltage Test clip leads	1
3	TH2881-001 Foot Switch	1
4	Three-Wire power line	1
5	fuse of 1A	2
6	Operational Manual	1
7	Manufacturer Certificate	1
8	Test Report	1
9	Warranty Card	1

Verify that you have received all above items and any optional accessories you may have ordered. If any one is missing, please contact us without delay.
IEEE-488 interface is optional.

8.2 Warranty

This Tonghui instrument product is warranted against defects in material and workmanship for a period of two years from the date of shipment. You should supply us with the warranty card before you enjoy the free maintenance service. This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. Tonghui will, without charge, repair or replace, at its option, defective product or component parts.
The maintenance for this instrument should be performed by professional maintenance personnel. Do not substitute the internal components unauthorized when maintaining. In order to ensure the measurement accuracy, the instrument must be measured and corrected after maintenance. You should bear the maintenance expense for damages caused by unauthorized repairing or substituting components.
The instrument should not be placed in the environment present direct sunlight and moisture.
Place the instrument in the original package box if you do not use it for a long time.