

TH2512
DC Milliohmmeter
Instruction Manual

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Warranty

This Tonghui instrument product is warranted against defects in material and workmanship for a period of one year from the date of shipment. During the warranty period, Tonghui company will, at its option, either repair or replace products which prove to be defective. For warranty service or repair, this product must be returned to a service facility designated by Tonghui.

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modifications for the product, or improper site preparation or maintenance.

No other warranty is expressed or implied. Tonghui specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

Tonghui shall not be liable for any direct, indirect, special or consequential damages, whether based on contract, tort, or any other legal theory.

Safety Precautions

CAUTION

The TH2512 DC Milliohmmeter is a low voltage instrument and provides no more than 1A DC output to the device under test (DUT). Some devices tested (especially capacitors) can store charge and may cause a hazard if not discharged properly. Follow these safety instructions.

1. Operate the TH2512 unit with its chassis connected to earth ground. The instrument is shipped with a three-prong power cord to provide this connection to ground. This power cord should only be plugged in to a receptacle that provides earth ground.
2. Plug the Kelvin low ohm clip leads into the unknown terminal.
3. Before touching the test lead wires or output terminals make sure any capacitive device has been fully discharged.
4. In the case of an emergency, turn OFF the POWER switch using a “hot stick” and disconnect the AC power cord from the wall. Do not touch the TH2512 instrument.

Chapter 1. Introduction

1.1 Unpacking and Inspection

Inspect the shipping carton before opening. If damaged, contact the carrier agent immediately. Inspect the TH2512 DC Milliohmeter instrument for any damage. If the instrument appears damaged or fails to meet specifications notify Tonghui (refer to instruction manual front cover) or its local representative. Retain the original shipping carton and packing material for future use such as returning the instrument for recalibration or service.

1.2 Product Overview

The TH2512 DC Milliohmeter is a precision low resistance meter for production or laboratory testing of individual components, materials, printed circuit boards and other resistive items. The TH2512 instrument provides nine measurement ranges from 20mΩ to 2MΩ over seven current ranges from 1 μ A to 1A. The basic measurement accuracy is 0.05%. Measurement rate is selectable (Slow or Fast) with rates up to 10 measurements per second. Automatic or Hold Range can also be selected. Measurements can be made continuously or triggered. The Handler interface is standard and the IEEE-488/RS232 interface is optional equipment on the TH2512 instrument. The effects of series resistance in the test leads can be zeroed with the short correction function. The TH2512 instrument is equipped with Pass/Fail bins. High and low limits set in the Comparator function display the measured result as a percent. Compare results can be indicated on the front panel as well. Four-terminal Kelvin connection to the device under test is obtained through the unknown terminal on the front panel.

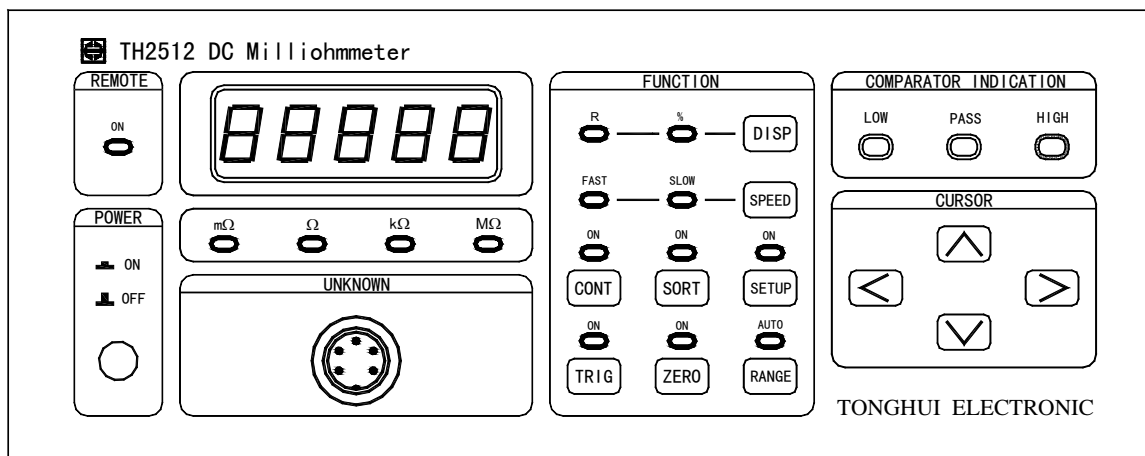


Figure 1-1: TH2512 DC Milliohmeter

1.3 Controls and Indicators

1.3.1 Front Panel Controls and Indicators

Figure 1-2 illustrates the controls and indicators on the front panel of the TH2512 DC Milliohmmeter instrument. Table 1-1 identifies them with description and function.

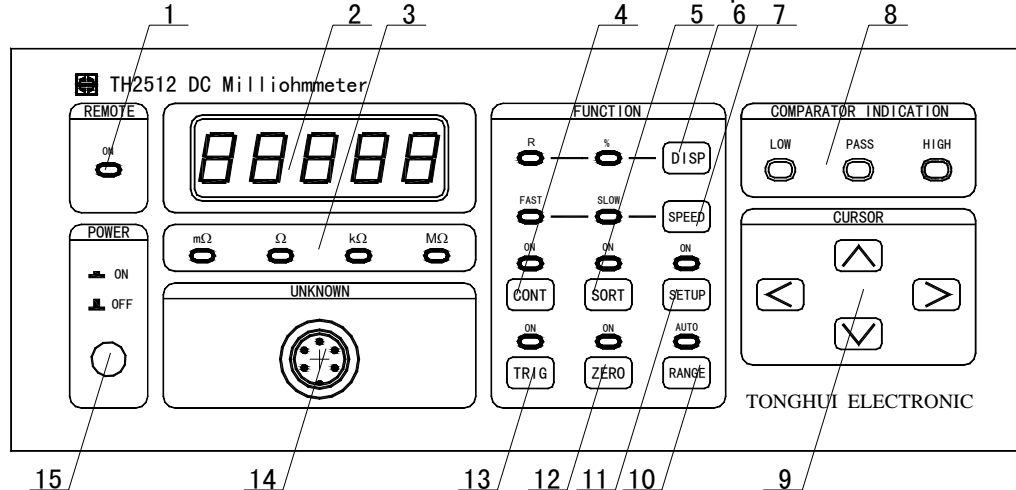


Figure 1-2: TH2512 Front Panel Controls & Indicators

Table 1-1: TH2512 Front Panel Controls & Indicators

NO.	Name	Function
1	Remote Indicator	When TH2512 is controlled by IEEE488/RS232 interface, this led is ON.
2	Measurement display	Display the measurement result. Display the limit setup information.
3	Unit indicators	Display the current unit.
4	CONT key	Set the instrument continuous test mode.
5	SORT key	Turn on/off the comparator function.
6	DISP key	Select the direct or percent display mode.
7	SPEED key	Set the measurement rate: FAST/SLOW.
8	Comparator indication	Indicate the comparator results.
9	CURSOR keys	Select a digit to modify. Increase/decrease by 1. Range selection.
10	RANGE key	Set range mode: AUTO/HOLD.
11	SETUP key	Comparator parameters setup.
12	ZERO key	Eliminate the lead resistor effect.
13	TRIG key	Set the trig mode and trigger the measurement.
14	UNKNOWN terminal	Current Drive Terminal, Low (-) Voltage Sense Terminal, Low (-) Voltage Sense Terminal, High (+) Current Drive Terminal, High (+) Shielding Terminal.
15	POWER button	POWER ON/OFF switch.

1.3.2 Rear Panel Controls and Connectors

Figure 1-3 illustrates the controls and connectors on the rear panel of the TH2512 DC Milliohmmeter instrument. Table 1-2 identifies them with description and function.

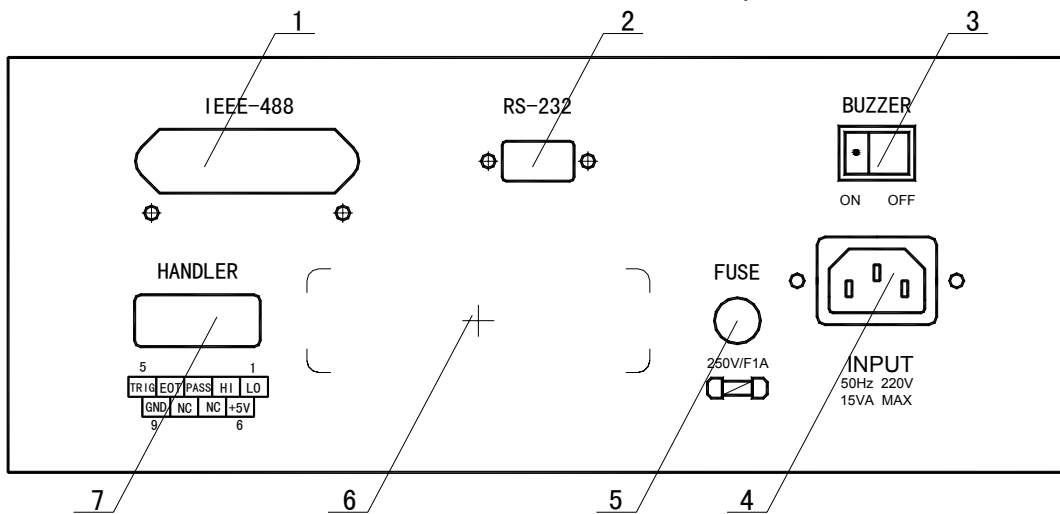


Figure 1-3: Rear Panel TH2512 Instrument

Table 1-2: TH2512 Rear Panel Controls & Connectors

NO.	Name	Function
1	IEEE488 Interface	IEEE-488 Interface connector for data transfer
2	RS232 Interface	RS 232 interface for remote operation
3	Buzzer switch	Turn ON/OFF the buzzer
4	AC line input	Connection to AC power source
5	FUSE	Short circuit protection
6	Nameplate	Nameplate for production information.
7	Handler interface	Handler Interface connector for remote operation

1.4 Installation

1.4.1 Dimensions

W×H×D: 270 mm×110 mm×330 mm

1.4.2 Power Requirements

The TH2512 can be operated from a power source of 190 to 250V AC. Power connection is via the rear panel through a standard receptacle. Always use an outlet that has a properly connected protection ground.

1.4.3 Safety Inspection

Before operating the instrument inspect the fuse holder on the rear of the TH2512 instrument to ensure that the properly rated fuse is in place, otherwise damage to the unit is possible.

Make sure the instrument is only used with the approved international cord set to ensure that the instrument is provided with connection to protective earth ground.

The surrounding environment should be free from excessive dust to prevent contamination of electronic circuits. The surrounding environment should also be free from excessive vibration. Do not expose the TH2512 instrument to direct sunlight, extreme temperature or humidity variations, or corrosive chemicals.

1.5 Specifications

1.5.1 Resistance Range:

Range F.S	Resolution	Accuracy	Test I (typical)	Test Voltage
20 m Ω	1 $\mu\Omega$	$\pm(0.1\%$ of rdg+ 3ct)	1A	<1.0V DC
200 m Ω	10 $\mu\Omega$	$\pm(0.05\%$ of rdg + 2ct)	100mA	
2 Ω	100 $\mu\Omega$	$\pm(0.05\%$ of rdg + 2ct)	100mA	
20 Ω	1 m Ω	$\pm(0.05\%$ of rdg + 2ct)	10mA	<4.0V DC
200 Ω	10 m Ω	$\pm(0.05\%$ of rdg + 2ct)	1mA	
2 k Ω	100 m Ω	$\pm(0.05\%$ of rdg + 2ct)	100 μ A	
20 k Ω	1 Ω	$\pm(0.05\%$ of rdg + 2ct)	10 μ A	
200 k Ω	10 Ω	$\pm(0.05\%$ of rdg + 2ct)	10 μ A	
2 M Ω	100 Ω	$\pm(0.05\%$ of rdg + 2ct)	1 μ A	

1.5.2 Measurement Rate

Fast: 10 measurements/second
Slow: 2.5 measurements/second

1.5.3 Trigger

Manual, Internal or External

1.5.4 Ranging

Automatic or Hold Range

1.5.5 Zeroing

Short circuit compensation

1.5.6 Comparator

LOW, PASS and FAIL indication.

Comparator parameters setup: Nominal, Hi and Lo Limits

1.5.7 Display

4 1/2 digits LED display.

1.5.8 Beep Alarm

Beep alarm for PASS can be turned on/off by the switch from the rear panel.

1.5.9 Interfaces

Standard Interfaces: Handler

Optional Interfaces: RS232 and IEEE-488

1.5.10 Unknown Connector

Current Drive Low Terminal: D-

Voltage Sense Low Terminal: S-

Voltage Sense High Terminal: D+

Current Drive High Terminal: S+

Shielding Terminal.

1.5.11 Dimensions

W x H x D: 270 mm x 110 mm x 330 mm

1.5.12 Weight

About 3.5 kg net

1.5.13 Environmental

Specifications: 10°C to 30°C, <75% RH

Operating: 0°C to 40°C, <75% RH

Storage: -25°C to 55°C, <90% RH

1.5.14 Power

198-242VAC

50Hz/60Hz

Consumption <30VA

Chapter 2. Operation

2.1 Startup

Connect the instrument power cord to the source of proper voltage.

The instrument is to be used only with three-wire grounded outlets.

Power is applied to the TH2512 instrument by pressing the red power switch on the front panel to the ON position. The TH2512 unit should warm up for a period of at least 15 minutes prior to measurements being made.

2.2 Display

TH2512 provides two display mode: "R" and "%".

R: The direct measurement value of the device under test.

%: The difference of the measured value and a previously stored reference value is displayed as a percentage of the reference value.

Perform the following steps to set the display mode.

1. The default display mode is "R", when TH2512 is turned on.
2. "%" mode can only be used when comparator function is turned on.
3. Press **[SORT]** key to turn on the comparator function and the corresponding led turns on.
4. Press **[DISP]** key to select the display mode "R" or "%".
5. If you press **[SORT]** key to turn off the comparator function. The display mode will return to "R" mode, despite of the original display mode you select.

2.3 SPEED

The TH2512 instrument can be programmed for Slow (2.5measurements/second), or Fast (10 measurements/second) test times. The basic accuracy (0.05%) is specified for the slow measurement speed. The instrument default setting is SLOW.

Perform the following steps to set the measurement speed.

1. Press **[SPEED]** key to select the measurement speed: FAST or SLOW.
2. The FAST or SLOW led flashes one time after a measurement is finished.

2.4 Measurement mode

The TH2512 provides two measurement mode: "CONT" and "TRIG". The instrument default setting is CONT mode.

CONT: TH2512 measures the device and displays the result continuously.

TRIG: TH2512 measures the device and displays the result once after TH2512 is

triggered from the front panel or through the Handler interface.

Perform the following steps to set the measurement mode.

1. The instrument default setting is "CONT" mode, the CONT led is ON.
2. Press **TRIG** key to set the "TRIG" mode, the TRIG led is ON and the CONT led is OFF.
3. Press **TRIG** key to start a measurement, when TRIG led is ON.
4. You can also start a measurement through the Handler interface, when TRIG led is ON.
5. Press **CONT** key to set the "CONT" mode, the CONT led is ON and the TRIG led is OFF.

2.5 Comparator Function

With its built-in comparator, the TH2512 can output comparison results for sorting components into PASS, HIGH, and LOW bins. By using the handler interface, the TH2512 can easily be combined with a component handler, and a system controller to fully automate component testing, sorting, and quality control data processing.

Perform the following steps to set the comparator on/off.

1. The instrument default setting is comparator OFF and SORT led is off.
2. Press **SORT** key to turn on the comparator function, and SORT led is on; Ranging mode is automatically changed to HOLD, and current measurement range is held.
3. When comparator is ON, you can change the display mode: "R" or "%". The comparison results are indicated by the LEDs on the front panel and sent out through the Handler interface at the same time.
4. Press **SORT** key again to turn off the comparator function. The ranging mode is automatically changed to AUTO. The display mode will be set to "R" mode, if the previous display mode is "%".

Perform the following steps to set the comparator parameters.

1. Press **SETUP** key, "-Std-" will be displayed for 1 second, and then the previously stored standard value will be displayed. The SETUP led flashes.
2. The first digit flashes. Use the **←** key and **→** key to select which digit to be modified.
3. Use the **↑** key and **↓** key to increase or decrease the flashing bit.
4. Press **SETUP** key again, "-Lo-" will be displayed for 1 second, and then the previously stored low limit value will be displayed.
5. The first digit flashes. Use the **←** key and **→** key to select which digit to be modified.
6. Use the **↑** key and **↓** key to increase or decrease the flashing bit.
7. Press **SETUP** key again, "-Hi-" will be displayed for 1 second, and then the previously stored high limit value will be displayed.
8. The first digit flashes. Use the **←** key and **→** key to select which digit to be modified.
9. Use the **↑** key and **↓** key to increase or decrease the flashing bit.
10. Press **SETUP** key again, the TH2512 will return back to the measurement state and the SETUP led turns off.

2.6 ZERO

Short circuit compensation can be performed on the test leads/fixture by selecting the ZERO function = ON.

Perform the following steps to ZERO the short circuit offset.

1. The instrument default setting is ZERO off.
2. Short the test clips as shown in Figure 2-1, make sure that "S+" and "S-" are connected directly and "D+" and "D-" are also connected directly.

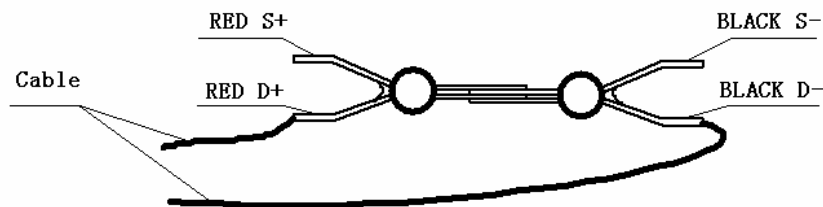


Figure 2-1 Short the test clips

3. The instrument displays the current short circuit resistance.
4. Press **ZERO** key to turn on the ZERO function, ZERO led turns on.
5. When ZERO function is ON, the short circuit resistance will be eliminated from the measurement value every measurement.
6. Press **ZERO** key again to turn off the ZERO function, ZERO led turns off and the short circuit resistance will not be eliminated from the measurement value every measurement.

2.7 RANGE

The TH2512 instrument's measurement range can be set as AUTO or HOLD. TH2512's measurement ranges are 20mΩ, 200mΩ, 2Ω, 20Ω, 200Ω, 2kΩ, 20kΩ, 200k Ω and 2MΩ. The instrument default setting is AUTO Range.

Perform the following steps to set the range mode.

1. The instrument default setting is AUTO Range, the AUTO led is ON.
2. Press **RANGE** key to set the range HOLD mode. The AUTO led is off and the current range is held.
3. Press **←** or **→** key to select a measurement range manually. The display point and unit will be changed with the range selected as shown in Table 2-1.

Table: 2-1: Measurement Range, Point and Unit

Full-Scale Range	20mΩ	200mΩ	2Ω	20Ω	200Ω	2kΩ	20kΩ	200 kΩ	2MΩ
Resolution	1 μΩ	10 μΩ	100 μΩ	1mΩ	10mΩ	100mΩ	1Ω	10Ω	100Ω
Unit	mΩ	mΩ	Ω	Ω	Ω	kΩ	kΩ	kΩ	MΩ
Point Position	xx.xxx	xxx.xx	x.xxxx	xx.xxx	xxx.xx	x.xxxx	xx.xxx	xxx.xx	x.xxxx

2.8 Beeper

The beeper alarms when the device under test is sorted into PASS Bin. The beeper can be turned off from the rear panel.

Chapter 3. Handler Interface

3.1 Handler Interface

Turn on comparator function, the comparison results will be sent out through the Handler interface. And the TH2512 can be triggered through the handler interface. The pin assignments is shown as table 2-2 and the timing diagram is shown as figure 2-2.

Table 2-2 Handler Interface Pin Assignments

Pin No.	Signal Name	Description
1	/LOW	Measurement value is less than the low limit
2	/HIGH	Measurement value is more than the high limit
3	/PASS	Measurement value is between the high and low limits
4	/EOT	End of test signal
5	/EXT.TRIG	External trigger signal(Low valid)
6	+5V (VCC)	+5V Power source
7	N.C.	Not connected
8	N.C.	Not connected
9	GND	Ground terminal

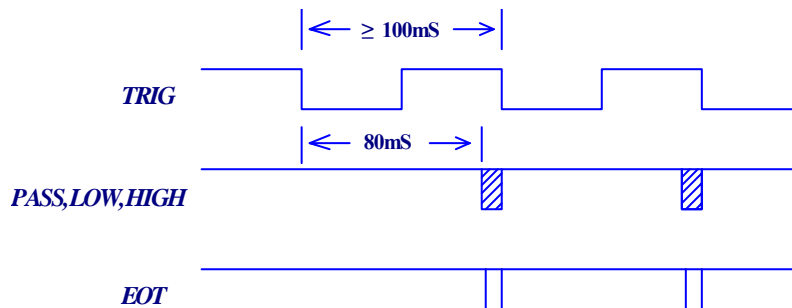


Figure 2-2 Timing Diagram (Fast Speed)