FNIRSI 菲尼瑞斯

DSO-TC3

三合一示波器
使用说明书

DIGITAL MULTIMETER INSTRUCTION MANUAL



CATALOG

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NOTICE TO USER

- This manual introduces the use method, precautions and related matters of the product. When using this product, please read the manual carefully in order to obtain the best performance of the product.
- Do not use the instrument in a flammable and explosive environment.
- The used batteries cannot be disposed of with domestic waste. Please follow the national or local relevant laws and regulations to deal with it.
- If there is any quality problem with the instrument or you have questions about it's use, you can contact FNIRSI online customer service or the manufacturer, we will promptly solve it for you.

1.INTRODUCTION

This product combines a digital oscilloscope, electronic component tester, signal generator, continuity test, voltage test, temperature and humidity measurement, infrared decoding and other functions are skillfully integrated. It is equipped with a large-size color TFT display, built-in rechargeable lithium battery, brings users stronger and more practical functions with good portability.

2.TECHNICAL SPECIFICATIONS

2.1 Specifications and parameters of the device

Display screen	2.4 inch TFT color screen, LED backlight
Supply voltage	Rechargeable lithium battery
Charging specifications	USB Type-C, +5V
Product volume	79*103*31mm
Bracket specifications	All-in-one foldable stand

2.2 Specifications and parameters of the DSO Digital Oscilloscope

- The oscilloscope has a real-time sampling rate of 10MSa/s and a bandwidth of 500KHz.
- With complete trigger function (single, normal, automatic), no matter if you' re using periodic analog signals or non-periodic digital signals.
- Maximum measured voltage signal is 400V.
- Equipped with efficient AUTO, the measured waveform can be displayed without cumbersome adjustments.

Real-time sample rate	10MSa/s
Analog Bandwidth	500Khz
Input resistance	1MΩ
Coupling method	AC/DC
Test voltage range	400V
Vertical Sensitivity (x1)	10mV-10V
Horizontal time base range	1us-10s
Trigger mode	Auto / Normal / Single
Trigger type	Rising edge / Falling edge
Waveform Freeze	Yes
Automatic measurement	Yes

2.3 Specifications and parameters of TC3 component test mode

- The instrument can automatically identify and measure various transistors, including NPN and PNP triodes, N-channel and P-channel mosfet, junction mosfet, diodes, dual diodes, thyristors, and resistors, inductors, capacitors and other passive components.
- Automatic detection of pin definition.
- Automatically analyze NEC protocol infrared code.
- Other functional modes: Including circuit continuity test, 0~40V input voltage measurement, PWM output,0~32V regulated diode measurement, DS18B20 temperature sensor measurement, DHT11 temperature and humidity sensor measurement, etc.

Category	Range	Parameter Description
Triodes	β is greater than 10 and less than 600	Magnification hfe, base-emitter voltage Ube, Ic/Ie, collector-emitter reverse cut-off current Iceo, Ices, protection diode forward voltage drop Uf①
Diodes	Forward voltage drop <4.5V	Forward voltage drop, junction capacitance, reverse leakage current②
Reglulated diode	0.01~4.5V	(1-2-3 test area) forward voltage drop, reverse breakdown voltage.
	0.01~32V	(K-A-A test area) reverse breakdown voltage
MOSFET③	JFET	Gate capacitance Cg, drain current Id under Vgs, protection diode Tube forward pressure drop Uf④
	IGBT	Drain current Id under Vgs, protection diode forward voltage drop Uf④
	MOSFET	Turn-on voltage Vt, gate capacitance Cg, drain-source resistance Rds, protection Diode forward voltage drop Uf④
SCRs	Turn-on voltage <5V, gate Pole trigger current <6mA	Gate voltage
TRIAC		
Capacitor	5pF~100mF	Capacitance value, loss factor Vloss⑤

Category	Range	Parameter Description
Resistor	0.01Ω~50MΩ	Resistance
Inductor	10uH~1000mH	Inductance value, DC resistance⑥
Battery	0.1~4.5V	Voltage value, positive and negative polarity
Input voltage	0~40V	Voltage value
DS18B20	0-85°C	Temperature
DHT11	0-60°C/5-95%	Humidity
Infrared remote decoding	NEC protocol infrared code	Display user code and data code, and display the corresponding infrared waveform.

NOTE:

①Ices, Iceo, Uf are only displayed when they are valid.

② Junction capacitance and reverse leakage current are only displayed when they are valid.

③The turn-on or turn-off voltage of the FET must be less than 5V.

④ Displayed only when there is a protection of diode.

⑤Vloss is only displayed when it is valid.

⑥Two-legged components and measure the inductance when the resistance is less than 2.1kΩ.

2.4 Specifications and parameters of the signal Generator

The signal generator has a total of 6 waveforms to choose from, with adjustable frequency and amplitude.

Triangle wave	1-10KHz/0-3.3V/50%
Square wave	1-100KHz/3.3V/50%

Pulse wave	1-100KHz/3.3V/0-100%
Triangle wave	1-10KHz/0-3.3V/50%
Ramp	1-10KHz/0-3.3V/0-100%
DC	0-3.3V

3. KEY INTERFACE ANALYSIS

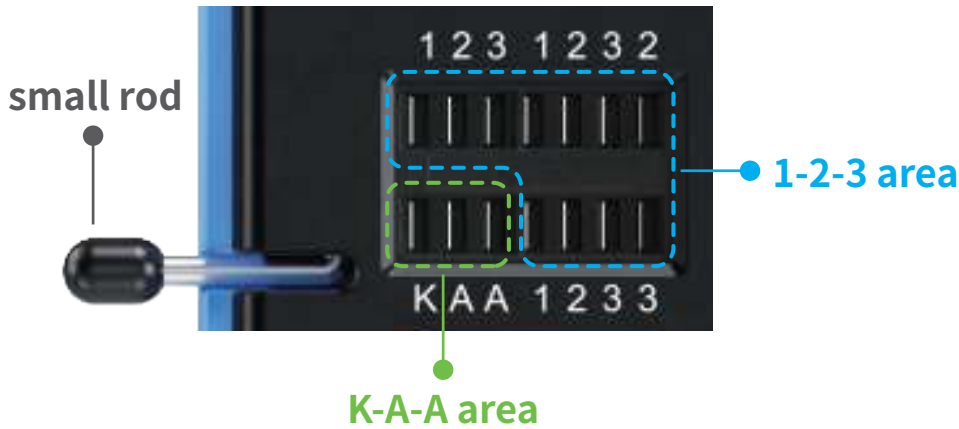
3.1 Button



Hide button	Operation	Function
Side hole	Tap	Reset

Button	Operation	Function
↩	Short press	Start up/Return
	Long press	OFF
OK / MENU	Short press	Enter/confirm operation/remeasure
	Long press	Enter system settings
▶ / HOLD	Short press	Move right/toggle
	Long press	To turn off or on the parameter display when displaying a waveform in oscilloscope mode.
◀ / RUN	Short press	Move left/switch
	Long press	Stop or run while displaying waveforms in scope mode.
▼	Short press	Move down/switch/value minus
	Long press	Continuous switching/value continuous subtraction.
▲	Short press	Move up/Switch/Add
	Long press	Continuous switching/continuous addition of values.

3.2 Test socket



●A total of five different test sockets are divided into 1-2-3 area and K-A-A area for the convenience of description(as pictured above).

●The test socket is at the bottom left of the screen, it is a 14-hole double-row socket with a locking device, and each socket is marked

1, 2, 3, K, A, those with the same label are short-circuited internally, and have the same function.

●There is a small lever at the left end of the socket. When standing up, the socket is relaxed. At this time, insert or take out the component under test, turn the socket is locked and tested when lowered.

●After inserting the tested component and locking it, press **OK / MENU** to test, and the tester will automatically identify the pin name of the component and the test point where it is located are displayed on the screen.

●When testing 2-pin components, you can insert any two different labels in the 1-2-3 area holes, in any order.

●When testing 3-pin components, you can insert any three different labels in the 1-2-3 area holes, in any order.

●The K-A-A jack is a special area for withstand voltage testing, which contains a DC high voltage of about 30V or more, K is positive and A is negative, and is used for withstand voltage pressure test, do not mix. Insert the anode of the component under test, such as a Zener diode, into A and the cathode into K.

⚠ Notice

●Discharge the capacitor before measuring the capacitance, otherwise it may burn out the instrument.

●It is not recommended to test online or live.

3.3 Signal interface



Three MCX coaxial sockets are evenly distributed on the top surface, and their outer rings are connected together for a common ground, and they are used for different purposes:

【IN (0~40V)】-Test voltage input port, the core wire is positive, the maximum measured voltage cannot exceed DC40V.

【DDS】-Signal generator signal output port, output five waveform signals with adjustable pulse width.

【DSO】-Oscilloscope test signal input port, the maximum input voltage cannot exceed 40Vpk.

Notice

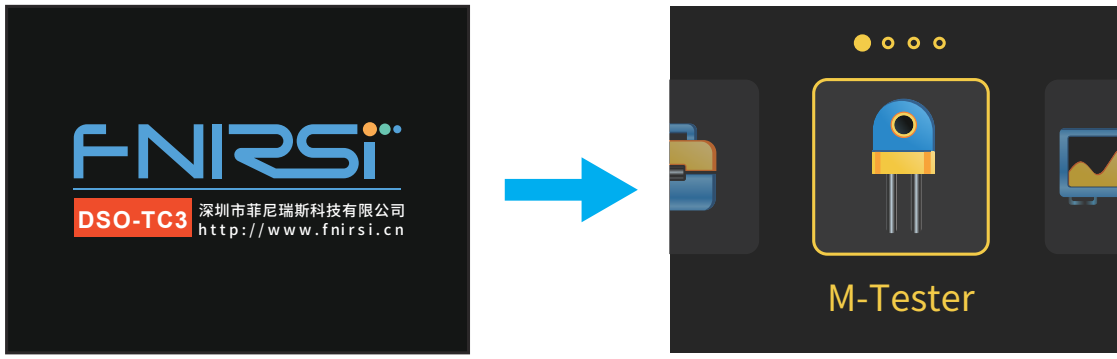
When testing the connection, use the test line with MCX plug to connect with the instrument.

3.4 Charging interface

- The instrument is powered by a built-in large-capacity lithium battery, and the bottom surface is equipped with a USB Type-C charging port connected to a 5V charger.
- The indicator light is always red when charging, and the indicator light is green when fully charged.

4.OPERATION AND DESCRIPTION

4.1 Switching on and off

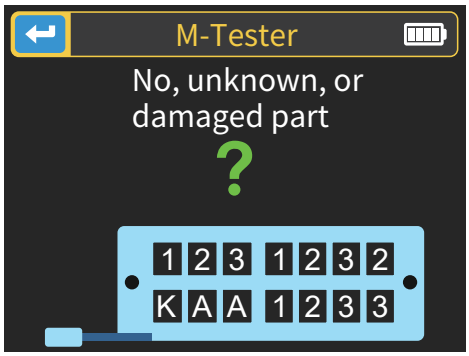


There are four options on the home page, short press the left and right keys to switch functions:

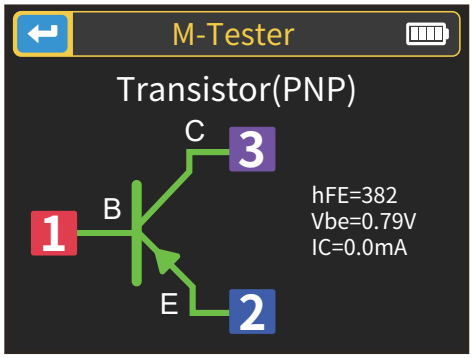


M-Tester | Oscilloscope | Generator | Tools

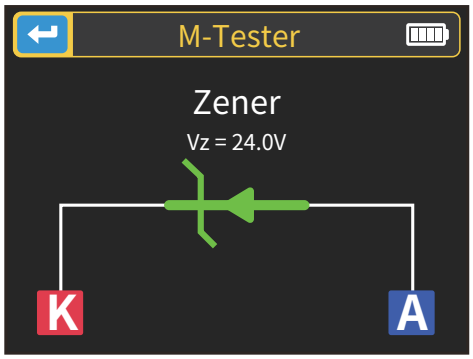
4.2 Operation and function description of the transistor tester



Short press the left and right keys RUN / HOLD to switch to the transistor detector, short press the confirmation key OK MENU to enter the transistor measurement page (as follows), this is the situation under not measured any components.



For triode measurement, short presst OK/MENU to start measurement.



For reglulated diode measurement (Note: reglulated diode is K-A-A socket, positive and negative), short press OK/MENU to start measurement.

1-2-3 Zone Test Bench Instructions for Use

Select an appropriate position in this area and jacks with different labels, and connect transistors, resistors, capacitors, inductances, etc. After the pins of the components are inserted and locked, click OK/MENU to start the test, wait for a few seconds, the result will be displayed on the screen.

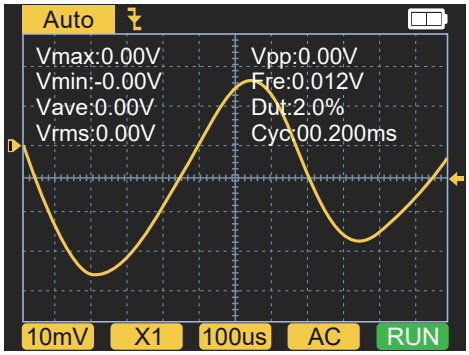
- The inside bipolar transistors of the Protective diodes and MOSFETs can be detected and displayed on the screen.
- Measure the current amplification factor (hFE) of the bipolar transistor and the conducting voltage of the emitter junction. Darlington transistors can be identified by the high threshold voltage and high current amplification factor.
- Measuring triode, its parameters will only be displayed when the measurement is valid.
- The equivalent capacitance C and reverse leakage current of the diode will only be displayed when the measurement is valid.
- The turn-on or turn-off voltage of the mosfet must be less than 5V, otherwise the measured result is only its equivalent parameters (diodes, capacitors, etc.).

- The turn-on voltage of the thyristor must be less than 5V, in addition, the trigger current for maintaining conduction must be less than 6mA,Otherwise it cannot be measured correctly.
- The vLoss displayed when measuring capacitance means loss and attenuation. The larger the value, the worse the capacitance performance.For capacitors below 20pF, the rule of thumb is to test with a 20pF capacitor.
- The measuring range of inductance is 10uH-1000mH. The inductance is only measured when the resistance is less than 2.1kΩ. Air-core coils and power inductors cannot directly measure the inductance. It is recommended to try to connect a suitable color ring electrode in series to test.
- The output current of the test socket is 6MA, which requires a SCR driven by a larger current.
- The LED is detected as a diode, and the forward voltage drop ratio is higher than the normal value. Dual LEDs are detected as dual diode. The leds will flash while detecting.

K-A-A Test Socket Instructions

Insert of the component postive, such as the reglulated diode, into A and the cathode into K, lock the socket and click OK/MENU to start the test. The max measurement range of the reglulated diode is 24V.

4.3 Operation and function description of the oscilloscope



On the home page, short press the left and right keys ◀ RUN / ▶ HOLD to switch to the oscilloscope function, and short press the confirmation key OK/MENU to enter the oscilloscope page (as shown).

The parameters in the bottom and upper left corners of the screen can be selected by short pressing the left and right keys ◀ RUN / ▶ HOLD , and switching one by one after the effect is selected, and the up and down keys ▲ / ▼ , to switch or adjust; short press the OK MENU AUTO key to automatically adjust the shape, and long press the left key ◀ RUN to switch between STOP and RUN.

- The trigger mode indicator icon is the trigger edge indicator icon.
- Auto means automatic trigger, Single means single trigger, Normal means normal trigger.
- The vertical sensitivity, indicating the voltage represented by a large grid in the vertical direction.
- 1X/10X mode indicator icon must be kept consistent with the 1X/10X switch setting on the probe handle, if the probe is 1X, then the oscilloscope should also be set to 1X, 1X measures ± 40V voltage, 10X measures ± 400V voltage.
- 100uS is the horizontal time base, which means the length of time represented by a large grid in the horizontal direction.
- AC/DC is the indicator icon of the input coupling mode, AC means AC coupling, and DC means DC coupling.
- RUN/STOP is the indicator icon for running/pause, RUN means running, STOP means pause, long press the left button to switch.

Real-time measurement parameters

Long press the right button to show/hide the 8 real-time measurement parameters displayed in the upper part of the screen:

Vmax=Maximum voltage	Vpp=Peak-to-Peak voltage
Vmin=Minimum voltage	Fre=Frequency
Vave=Average value	Dut=Duty
Vrms=RMS voltage	Cyc=Cycle

Oscilloscope probe

●Insert the oscilloscope probe with MCX plug into the [DSO] jack on the top surface, first adjust the attenuation gear on the probe, and connect the ground clip of the probe to the "reference ground" of the tested circuit.

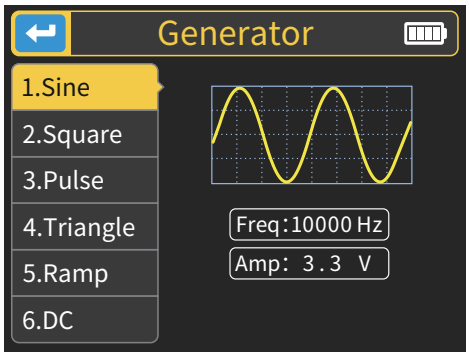
●Connect the probe tip or hook to the measured node of the circuit, and observe the voltage waveform of the measured point on the screen.

⚠ Notice

●The attenuation factor of the probe should match with the voltage of the measured signal, and the voltage signal exceeding the maximum range cannot be measured.

●When measuring signals exceeding the safe voltage, must not touch the exposed metal parts of the instrument to avoid electric shock.

4.4 Operation and function description of the signal generator



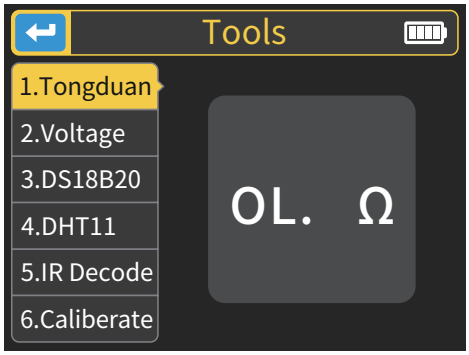
On the home page, short press the left and right keys ◀ RUN / ▶ HOLD to switch to the signal generator function, and short press the confirmation key OK MENU to enter the signal generator page (as shown).

There are 6 signal waveforms to choose from:

- Sine wave
- Square wave
- Pulse wave
- Sawtooth wave
- Triangle wave
- DC

Short press the up and down keys ▲ / ▼, and the right key ▶ HOLD to choose to change the frequency or amplitude, and then short press the right key ▶ HOLD to change the value, short press the left key ◀ RUN to exit. (Frequency upper limit is 10000Hz, amplitude value capped at 3.3V)

4.5 Toolbox



On the home page, short press the left and right keys ◀ RUN / ▶ HOLD to switch to the toolbox, and short press the confirmation key OK MENU to enter the toolbox page as shown in the figure.

There are 6 functions to choose from:

- Continuity test
- Voltage test
- DS18B20 digital temperature test
- DHT11 temperature and humidity test
- Infrared decoding
- Automatic calibration

Short press the up and down ▲ / ▼, after switching to the corresponding function, it will automatically measure.

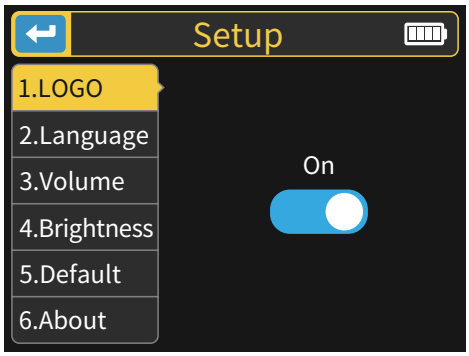
- **Continuity test:** Use any two corners of the jack 1, 2, and 3 of the test socket to conduct continuous resistance tests. If the circuit is low resistance, it will be judged as "connected" and a buzzer will sound.
- **Voltage detection:** Insert the MCX test line into the top jack [IN (0~40V)] to detect the voltage between the test lines.
- **DS18B20:** Follow the prompts on the screen to insert the temperature sensor into the test socket for measurement.
- **DHT11:** Follow the prompts on the screen to insert the temperature and humidity sensor into the test socket for measurement (Do not connect the third pin of the DHT).
- **Infrared decoding:** When the tester is under test, point the infrared remote control at the "IR" mark on the tester panel, press the button on the remote control, and the instrument will automatically start receiving infrared signals and performing decoding processing. After successful decoding, the user code will be displayed and data code, and display the corresponding infrared waveform. If the decoding fails or cannot be decoded, the user code and data code will not be displayed. At this time, if you are on the tester interface, you cannot enter the infrared decoding interface. If you are on the infrared decoding interface, the last successful decoding information will still be displayed.

●**Automatic calibration:** Insert the three-pin short wire into the 1-2-3 jack of the test socket according to the prompts, and the calibration will start automatically. After disconnecting the short wires according to the prompts in the calibration process, wait until the progress bar reaches 100% to complete the calibration under the current mode of the instrument, no other operations are required.

Notice

The external circuit must be powered off, otherwise the instrument may be damaged.

5. MENU SETTING



Long press OK/MENU to enter the system setting page as shown in the figure.

The configurable items are:

●Boot LOGO ●System volume ●Default mode

●System language ●Backlight brightness ●About

Short press the up and down keys ▲ / ▼ to switch, short press the left and right keys , ◀ RUN / ▶ HOLD to adjust parameters or switch states.

6.FIRMWARE UPGRADE

Open the upgrade software on the host computer, connect the computer and the device with a USB cable, then while pressing ▼ key, press the power key to enter the upgrade page. Finally select the corresponding firmware upgrade on the host computer page to complete the firmware upgrade.

7.ANALYSIS OF COMMON PROBLEMS

Q: How to judge whether the battery is fully charged?

A: After the battery is fully charged, the charging indicator will change from red to green.

Q: Why does the test waveform keep shaking from side to side and cannot be fixed?

A: The trigger voltage needs to be adjusted, which is the yellow arrow on the right. In trigger mode, press the up and down keys to adjust trigger voltage. After adjusting the yellow indicator arrow between the upper and lower of the waveform, the waveform can be triggered and fixed.

Q: Why is there no waveform when measuring a battery or other DC voltage?

A: The battery voltage signal is a stable DC signal without a curved waveform. Adjust the vertical sensitivity in the DC coupling mode, there will be an upward or downward offset straight line waveform, if it is AC coupling, no matter how you adjust it, there will be no waveform.

Q: Why is the measured 220V mains waveform not a standard sine wave with distortion?

A: The mains power grid is generally polluted and contains more high-order harmonic components. These harmonics are superimposed, so a distorted sine will appear on the sine wave, which is a normal phenomenon. General mains waveforms are all distortion, nothing to do with the oscilloscope itself.

Q: Why are the parameters of diodes and capacitances obtained when measuring MOSFETs and IGBTs?

A: Because the turn-on or turn-off voltage of the MOSFET or IGBT is greater than 5V (the maximum supply voltage of the chip), the MOSFET or IGBT cannot be turned on or off normally, so only its equivalent parameters can be measured.

8. PRECAUTIONS

- After receiving the device, please use it after it is fully charged.
- When measuring high voltage, do not touch any metal part of the oscilloscope to avoid the risk of electric shock.
- Try not to perform high voltage test while charging.
- Do not place the machine in an unstable place or where it may be subject to strong vibrations.
- Do not place the machine in places with high humidity, dust, direct sunlight, outdoors or near heat sources.
- The instrument is powered by a built-in 3.7V rechargeable lithium battery, please use a power adapter when using it for a long time in order to prolong battery life.
- When not in use for a long time, the battery should be discharged to 3.7V before storage, and it needs to be charged and discharged every quarter.
- Please use the voltage within the range specified in the manual for charging.
- When using the oscilloscope mode, pay attention to the selection of the 1X/10X attenuation, the attenuation of the oscilloscope needs to be same as the attenuation of the probe.
- When calibrating, it is necessary to unplug the BNC probe, or short the positive and negative poles of the probe.

9.CONTACT US

Any FNIRSI'users with anyquestions who comes to contact us wiil have our promise to get asatisfactory solution + an Extra 6-Month Warranty to thanks for yoursupport!

By the way, We have created an interesting community, welcome to contact FNIRSI staff to join our community.

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