Preface

Dear users:

Hello! Thanks for you choosing the brand new UNI-T device. In order to use the instrument correctly, please read the manual thoroughly and especially the Safety Notes part before using the device.

If you have read through the manul, you are recommended to keep the menu properly with the instrument together or at the place you can read anytime in order to read it in the process of future use.

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ChapterI Safety Information

Safety Terms and Symbol

Terms in the manual

The following terms might be in the manual:

Warning: warning statement indicates the conditions and activities that might endander life.

Notes: noting statement indicates the conditions and activities that might cause damage to the product and other property.

Terms on the product

The following terms might be on the product:

Danger: it means reading the symbol might be harmful to you immediately.

Warning: it means reading the symbol

Notes: it means damage might be caused to the product or other property.

Symbols on the product

The following symbols might be on the product:

High voltage   Please pay attention   Measurement of
                  to the Manual   the ground port

General Safety Overview

The apparatus is strictly designed and produced under the GB4793 Safety Requirements for Electronic Measuring Apparatus and IEC61010-1Safety Standard. The apparatus meets the over voltage standard CATⅢ 600V and safety standards for pollution level Ⅱ.

Please read the following safety prevention measures to prevent personal injury and any damage to the product or other products connected with the product. To avoid any possible danger, the product shall be applicable in the stitulated scope and be repaired by the specially trained personnel.

Warning: to prevent electric shocking or fire, please use the dedicated adapter approved to apply in the country.

Warning: if the oscilloscope input port were connected with the voltage higher than 42 V (30

Vrms),to avoid electric shocking please：

● To use the voltage probe, test lead wire and adapter with certain insulation attached with the oscilloscope or use the accessories designated by UNI-T applicable to oscilloscope apparatus series product.

● Before using, check if any mechanic damage to the multimeter test pen, oscilloscope probe and accessories and please replace it if any damage were found.

● To remove all unused test pen, probe an accessories.

● To insert adapter into the AC socket and connect it with the oscilloscope.

● In measurement in the CATⅢ ambient, don't connect the voltage higher than 300V with the oscilloscope input port and don't connect the voltage higher than 600V with the multimeter input port in the CATⅢ ambient.

● In measurement in the CATⅢ ambient, don't connect the voltage with voltage difference higher than 300V with the oscilloscope input port and don't connect the voltage with voltage difference higher than 600V with the multimeter input port in the CATⅢ ambient.

● Don't use the input voltage higher than apparatus rating value

● Use accessories attached with the product and cease using it if any damage to it.

● Don't plug any metals into the socket.

● Use the oscilloscope with the designated method.

● The voltage rating value mentioned in the Warning information is the limit value of adapter Working Voltage；they represent the Vrms（50-60Hz）of AC sine wave in use.

Maintenance shall be conducted only by qualified techinicians.

Pay attention to all terminals' rating value：to avoid fire or electric shocking, please pay attention to all rating values and marks.

Don't operate if there is any suspected trouble: please let the qualified maitainence personnel to check the product suspected being damaded.

Please don't operate in the moist anbient.

Please don't operate in the explosive anbient.

Keep product suface clean and dry.

Chapte II Brief Instroduction of the UTD1025CL Portable Digital Storage Oscilloscope

Brief Instroduction of the UTD1025CL Portable Digital Storage Oscilloscope

The UTD1025CL series of digital storage oscilloscope（referred hereinafter as oscilloscope）are a perfect combination of usability, uniquie technical index and multipurpose, helping users completing test more quickly.

The manual concludes the following types:

Type	Bandwidth	Sampling velocity	Channel count
UTD1025CL	25MHz	200MS/s	Single channel

The UTD1025CL series of digital storage oscilloscope provides a simple and functionally clear front panel, enabling to conduct all basic operations, meeting the use habit of traditional instrument and enabling the user to operate it proficiently without taking much time to learn and be familiar with operation of the digital storage oscilloscope. In order to speed up the adjustment for measuring, the user can press directly the button AUTO , and then the instrument shall show the proper waveform and the gear setting.

Apart from the usability, UTD1025CL series of digital storage oscilloscope possess high efficiency index and powerful functions required for quick measuring. To simplify the menu operation, the combination operation of key SHIFT on the apparatus and other keys can enable direct operation of more functions. Besides, the powerful trigger and analysis ability shall make it easier to capture and analyze the waveform.The clear liquid crystal display and

mathematical operations help users to observe and analyze the signal problems more quickly and clearly.

UTD1025CL Oscilloscope Components

Unpacke the oscilloscope case, you'll see the following components:

No.	Instruction	Standard configuration
1	UNI-T oscilloscope	●
2	An adapter	●
3	An oscilloscope probe	●
4	2 multimeter test pen(a red and a black)	●
5	An UT-M07 module	●
6	An oscilloscope probe adjusting tool	●
7	A USB data line	●
8	An user manual	●
9	An user disk (inclusive of oscilloscope and comuter communication software)	●
10	A portable soft bag	●

Features of UTD1025CL Oscilloscope Oscilloscope

● Full-automatic setting function（AUTO SCALE) vertical and time base gear could be automatically adjusted according to the signal changes with manual intervention.

● Unique powerful automatic setting function can make quick and correct automatic setting about any signal containing DC components.

● Wider voltage measurement scope 20V/div,reach 200V/div in combination with 10 probe

● USB isolated communication provides safer USB communication

● Transition from color display to B/W display is applicable in the strong outdoor light.

● Smart upgradation function user can upgrade software by local or network.

● Unique waveform recording, storage and playback function

● Color liquid crystal display with high resolution and high contrast

● No less than 8 hours of continuous work

● Automatically measure 19 types of waveform parameters

● Screen printing function

● Help information display both in Chinese and English

Multimeter

● 3 3/4 bit

● Voltage, current, resistance, diode, capacitance and conductive measurement

● Current measurement up to 10A

● Extremely low current measurement internal resistance, precise measurement results

● Mutual isolation between multimeter and osilloscope

Chapter III Oscilloscope Connection

How to Conduct General Check

Please check the new oscilloscope under the following steps if you have one:

Check If Any Damage Resulted By Transportation

If any serious damage of the package carton or plastic foam protective mat were found, please contact with the Uni-T distributor or local Uni-T representative office immediately.

Check Accessory

As regards to the provided accessory details, the above-mentioned UTD1025CL Oscilloscopes Accessory in the manual has clearly stated it. You can check it if there is any damage to the accessory in reference to the manual.

If any lack or damage of accessories were found, please contact UNI-T distributor selling the product

or the local office of UNI-T.

Check the Complete Apparatus

If any damage of accessory surface, or failure to work or to pass the function test were found, please contact with the UNI-T distributor or the local representative office of UNI-T.

If any damage were found, please keep the package and contact with the transportation department and the uni-t distributor that sells the product, UNI-T shall arrange for the maintenance or replacement.

Oscilloscope Connection

Oscilloscope Connection

The oscilloscope connection is referred to the picture 3-1
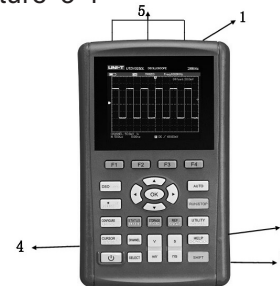
Picture 3-1 Oscilloscope Interface

Instructions:

1. Oscilloscope channel input port
2. USB connection port.
3. Adapter interface used for AC power supply and battery charging.
4. Probe compensation signal output port
5. Multimeter input socket, 3 circular banana sockets are input ports for voltabe/resistance, current and COM port.

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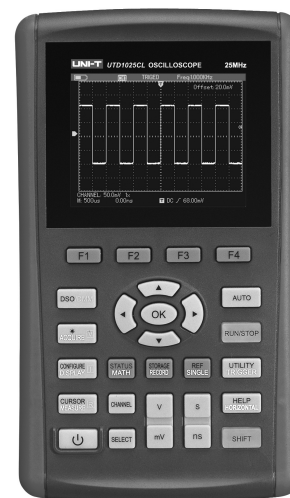**Compensation Signal Output Connection of the Apparatus**

As shown in the following picture, a compensation signal (1kHz/3V) output port on the Left side of the apparatus could be used to adjust the probe.

Picture 3-2 **Compensation** Signal Output Connection of the Apparatus

Oscilloscope panels and keys

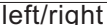Panels and keys of oscilloscope are shown in the picture 3-3:

Picture 3-3 UTD1025CL Panel

⏻ ：Power key to power on／off oscilloscope.

F1～F4:Key for menu option setting

DSO/DMM ：DSO/DMM key：to switch between the working mode of oscilloscope(DSO) and multimeter (DMM).

ACQUIRE ✳ ⟨V⟩ ： ACQUIRE/*(brightness)／〔V〕(voltage measurement) key:under the oscilloscope mode, press the key to enter ACQUIRE (aquire sample) menu； Press the key SHIFT firstly and press it again to adjust brightness and change the screen brightness by shifting the left/right keys. Under the multimeter (DMM) mode, press the key to enter into the voltage measurement menu.

CONFIGURE DISPLAY ⟨I⟩ ： DISPLAY/CONFIGURE/[I] （current measurement）key: under the oscilloscope mode, press the key to enter DISPLAY (display mode) menu；Press the key SHIFT firstly and press it again to enter the CONFIGURE （interface configuration） menu. Under the multimeter

(DMM)mode, press the key to enter into the current measurement menu.

CURSOR MEASURE ⟨R⟩ ：MEASURE/CURSOR/[R] (resistance measurement) key: under the oscilloscope mode, press the key to enter COURSOR (sursor measurement) menu；Press the key SHIFT firstly and press it again to enter the MEASURE (automatic measurement) menu. Under the multimeter (DMM) mode, press the key to enter into the resistance measurement menu and to measure resistance /diode/ continuity/ capacitance.

STATUS MATH :MATH/STATUS key：under oscilloscope mode, press the key to enter into MATH (mathematic operation) menu；Press key SHIFT and press it again, you can open the STATUS (status bar) display.

STORAGE RECORD ：RECORD/STORAGE key： under the oscilloscope mode, press the key to enter into RECORD(waveform record) menu；Press key SHIFT and press it again, you can open the STORAGE （storage) menu.

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REF SINGLE ：SINGLE/REF key： under the oscilloscope mode, press the key to set SINGLE(single trigger) function；Press key SHIFT and press it again, you can back to the REF(waveform reference) menu.

AUTO ： AUTO key：under the oscilloscope mode, press the key to complete waveform automatic setting；Press key SHIFT and press it again, you can open full-automatic setting function, under which, the oscilloscope shall adjust apparatus gear automatically with the changes of input signal and display the waveform in the fittest form without manual intervention.

RUN/STOP ： RUN/STOP key：under the oscilloscope mode, press the key to start or stop data collecting；under the multimeter (DMM) mode, press the key to hold screen measurement reading.

UTILITY TRIGGER ： UTILITY / TRIGGER key：under the oscilloscope mode, press the key to enter the TRIGGER(trigger setting)menu；Press key SHIFT and press it again, you can enter into the UTILITY (auxiliary function) menu.

HELP HIRIZONTAL ： HORIZONTAL / HELP key：under the oscilloscope mode, press the key to enter the HORIZONTAL (horizontal setting) menu；Press key SHIFT and press it again, you can open the HELP (help) information.

SHIFT ： SHIFT key：to select functions in combination with other function keys.

s nS ：Time base：used to change scanning velocity. Scanning velocity of the apparatus is 50s/div～10ns/div with 1-2-5 system. Press "S", the scanning velocity shall slower down a gear relatively or speeded up.

v mV ： Vertical scale： used to change vertical scale gear. Scale scope of the apparatus is 5mV/div～20V/div with 1-2-5 system. Press "V", a vertical scale shall be relatively increased or reduced.

Press "V"，a vertical scale shall be relatively increased or reduced.

SELECT ：Selection key： the selection for switching channel vertical shift and trigger level shift under normal conditions. If vertical shift have been selected, the vertical reference triangle cursor on the screen shall be solid and you can move vertical position on the screen of the waveform by adjusting the up/down keys. If press the key SELECT again， the vertical triangle cursor of trigger level position shall be solid and you can change the trigger position by adjusting the up/down keys.
In the MEASURE menu, the key used to confirm the selected Customization parameter； switch cursor 1 and cursor 2 under the cursor measurement.
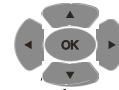
：Direction key and OK key：OK key used to hide/display the present menu bar under normal circumstances；under the multimeter (DMM) mode, the keys are used to confirm the correct connection of 10A CURRENT DIVIDER in A gear current measurement.

Introduction about the shortcut operation：
SHIFT + OK : Store present display interface into the storage and outputted from the host computer；
SHIFT + AUTO : open the full-automatic setting function, under which, the oscilloscope shall adjust vertical scale and scanning time base automatically with the changes of input signal and display the waveform in the fittest form without manual intervention.
SHIFT + F1 **:** Open trigger main menu and select trigger coupling mode and automatic/normal trigger mode by the key F3/F4 .

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Chapter IV Primary Application of Oscilloscope

About the Chapter

The chapter briefly introduces the UTD1025CL oscilloscope functions, not in detail, providing some basic examples for using menus and for basic operations.

Connect Appatatus to the Electricity Power

There are two power supply methods for UTD1025CL oscilloscope: battery power supply for home apparatus and adapter power supply, power supply voltage of which is DC 9V/4A. To assure the normal working of apparatus, please use the adapter configurated with the product. Press power key about 5 seconds, the power-on LOGO picture shall appear on the oscilloscope and the oscilloscope starts working.

Interface Instruction
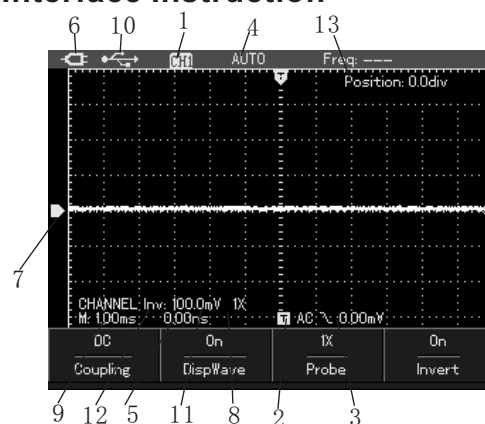
Picture 4-1 Instruction Picture of Display Interface

Apart from the waveform, the display will display some detailed information about waveform and oscilloscope control setting.

1. The trigger source status display is as follows:
CH1 represents adjusting the channel waveform
REF represents adjusting the reference waveform

FFT represents adjusting the FFT operation waveform

2. Trigger coupling mode display are as follows:

AC trigger coupling mode

DC trigger coupling mode

HF high frequency trigger coupling mode

3. Reading indicates the edge trigger level position.

4. Trigger status display are as follows :

ARMED oscilloscope is collecting pretrigger data, under the status all triggers would be neglected；

READY oscilloscope had collected all pretrigger data and is ready to accept trigger；

TRIG'ED oscilloscope had found a trigger and is collecting the data after triggered；

STOP oscilloscope ceased collecting waveform data；

AUTO oscilloscope is under automatic mode and collecting waveform under the non-trigger status；

SCAN oscilloscope collects and displays waveform continuously under the scanning mode.

5. Display time reading of trigger point to the center scale

6. Symbols indicate power supply modes as follows：

Battery power supply used by oscilloscope

DC adapter power supply used by oscilloscope

7. Symbols on the screen indicate ground baseline

8. 1 symbol indicates the channel probe multiplying power is 1

9. Reading displays main time base setting；

10. Home computer connection symbol；

11. Reading displays present vertical scale coefficient.

12. Waveform opposite phase symbol

13. The reading indicates the shift value of channel reference symbol relative to screen horizontal midline.

Reset Oscilloscope

To reset the oscilloscope as factory setting, please operate under the following steps:

1. Press key $\boxed{\text{SHIFT}}$, the word "shift" would appear on the right upper corner of the screen.
2. Press key $\boxed{\text{UTILITY}}$, select auxiliary function setting. 4 options displayed in the bottom.
3. Press key $\boxed{\text{F2}}$, select Default Set. The oscilloscope shall be set as the factory setting.
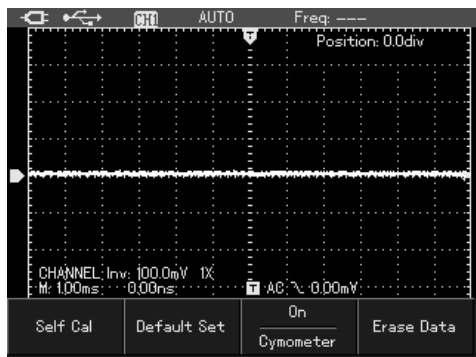
Picuture 4-2 Factory Setting

Status after factory setting:

Function	Setting
Acquire method	Normal acquire
s/div	1ms/div
v/div	100mV/div
Trigger coupling	DC
Trigger types	Automatic
Display format	vector
Continuation time	Automatic
Interface style	Classic
Menu display	Manual

Operation Methods for Function Menu

The following examples introduce how to select function with the oscilloscope menu.

1. press function keys on the keyboard, the relevant set options to keys shall appear on the bottom of screen, select corresponding function with keys $\boxed{\text{F1}}$ ~ $\boxed{\text{F4}}$. after that, press key $\boxed{\text{OK}}$ to hide function menu.

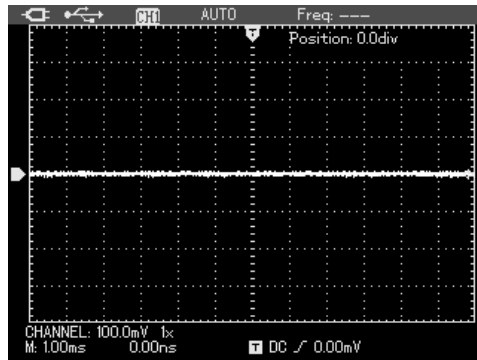2. All keys printed with two lines of words are multifunctions, for acquiring the above functions, please press key $\boxed{\text{SHIFT}}$, the word "shift" shall appear on the right upper corner of screen and then press it again to acquire the corresponding function,

Picuture 4-3 Menu Hiding

Menu Hiding

Press key OK to hide all key symbols and menu. If need to display menu or key symbols, press it again.

Notes: it is possible to set menu automatic hiding time through interface configuration setting.

Oscilloscope Switch-In Probe Compensation Signal

To switch in signal as the following steps:

1. Connect oscilloscope probe with oscilloscope input port, and set attenuation multiplying power on the probe as 10 .

2. Set attenuation coefficient on the probe. It shall change the vertical gear multiplying power and the measurement results would reflects correctly the measured signal's amplitude. Ways to set the probe attenuation coefficient is: to press key $\boxed{\text{CHANNEL}}$ and press $\boxed{\text{F3}}$ to select probe multiplying power 10 in the channel.
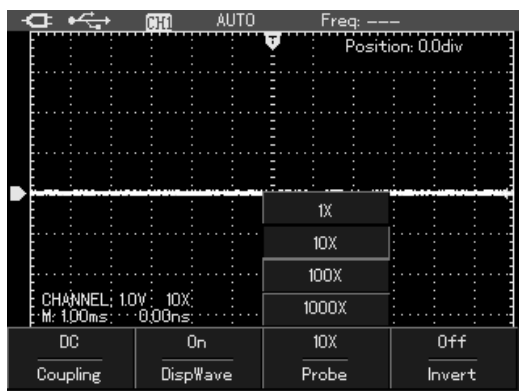
Picture 4-4 Probe Multiplying Power Adjusting

Picture 4-5 Home Computer Squarewave Signal

3. Connect probe with the output port of compensation signal generator, press key AUTO and in few seconds, the squarewave display (1kHz,about 3Vpp,peak peak value) will be seen as shown in picture 4-5.

Probe Compensation

Connecting probe with channel for the first time, it is required to adjust probe compensation to match probe with the input channel. The probe without compensation calibration shall result in measurement error or mistakes. To adjust probe compensation under the steps as shown in the above example;

1. Set the attenuation coefficient of probe multiplying power as 10 firstly, set the switch on probe as 10 ，and connect probe with input channel of oscilloscope. Connect probe pointer with output port of the compensation signal generator.

2. Set automatically；

3. Observe the displayed waveform.

Over compensation correct compensation under compensation

If the displayed waveform on the screen show "under compensation" or "over compensation" as the above picture, use the adjust pen with non-metal handle of the probe auxiliary to adjust variable capacitance of the probe until "correct compensation" were shown on the screen as the above picture.

Warning: to guard against the electric shock in measuring the high voltage with the probe, please make sure that the insulated conductor of probe is intact and do not touch the metal part of the probe when connecting with the high voltage source.

Munual Set Vertical System, Horizontal System and Trigger Level

Vertical System

Press key V～mV to adjust vertical gear（v/div）of oscilloscope, and to adjust signal to appear on the screen with the proper size；

When the channel symbol is solid, press up/down keys to adjust ground baseline position to adjust signal to appear on the screen with the proper size；

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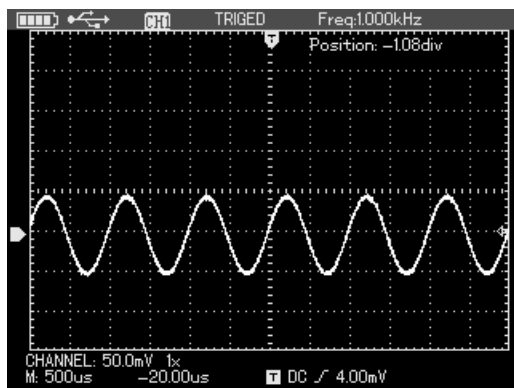
Picture 4-6 Vertical Shift of Waveform

Notes: press key SELECT to change the function needed to adjust between channel vertical shift and trigger level.

Horizontal System

Press key s~ns to change horizontal time base gear setting, and the time base gear display for status bar changes correspondingly. The horizontal scanning velocity is 10ns~50s/div,and step in by the

way of 1－2－5.

Press left/right key to adjust horizontal positon of trigger point to observe more pretrigger information.
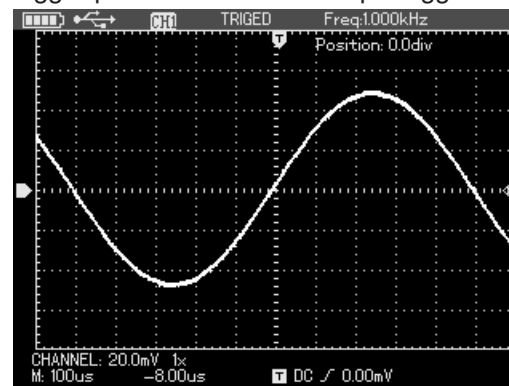
Picture 4-7 Adjust Horizontal Time Base

Trigger Level:

When the trigger level symbol is solid, press up/down key to adjust trigger level posion.
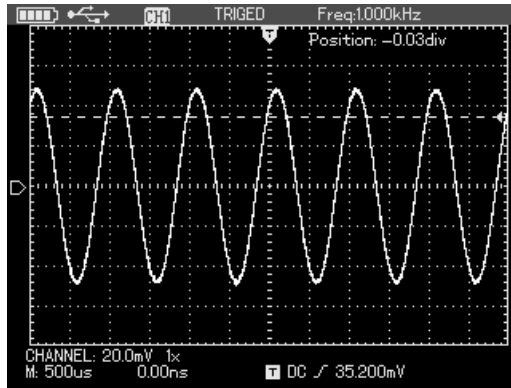
Picture 4-8 Adjust Trigger Level

Notes: press key SELECT to change the function needed to adjust between the channel vertical shifts and trigger level. The above operations shall be detailed in the following chapters.

Automatic Setting of Waveform Display

UTD1025CL oscilloscope has the automatic setting function. Based on the input signal, it is possible to automatically adjust vertical deflection coefficient, scanning time base and trigger modes until the proper waveform display. In application of automatic setting, frequency of the measured signal is required to be bigger than or equivalent to 20Hz, duty ratio bigger than 1%.

Full-Automatic Setting of Input Signal

UTD1025CL oscilloscope has the creative function of full-automatic signal capturing. Under the function, the oscilloscope shall adjust gear automatically with the changes of input signal and display the waveform in the fittest form without manual intervention.

The following steps shall be taken to operate the full-automatic setting function:

1. Press key SHIFT to show the character "shift" on the right upper corner of screen;

2. Press key AUTO to select starting full-automatic setting function and character A shall appear on the upper part of screen, indicating the full-automatic setting function has started;
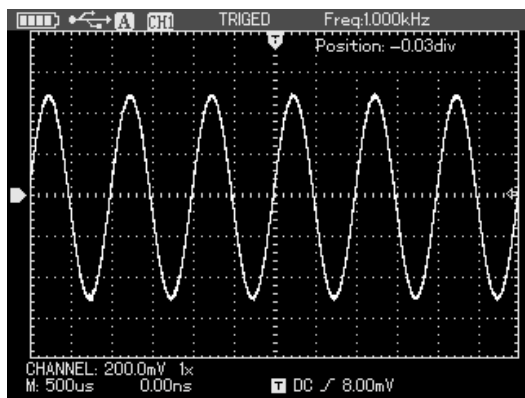
Picture 4-9 Full-Automatic Setting

Notes:

1. Under the full-automatic setting mode, the "automatic" trigger mode shall not be altered.

2. Entering into the full-automatic setting, the following setting shall be compulsory:

(1) Under the non-main time base status, it shall switch to main time base status;

(2) The channel coupling shall switch to AC coupling, which is unchangeable.

3. To modify vertical scale coefficient of oscilloscope, horizontal time base, change vertical and horizontal position of oscilloscope, the apparatus shall exit full-automatic setting mode automatically.

Stop / Restore Data Collection

To operate under the following steps to stop data collection

1. Press key RUN/STOP , the oscilloscope shall STOP data collection and trigger status on the upper part of screen shall display STOP.

2. Press key RUN/STOP to restore data collection and the oscilloscope shall restart collecting data.
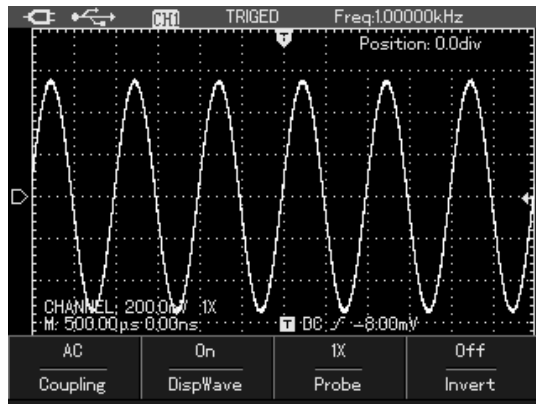
Picture 4-10 Stop Data Collection

Trigger Frequency Count Setting

To operate under the following steps to open the trigger frequency count:

1. Press key SHIFT , character shift shall appear on the right corner of screen;

2. Press key UTILITY to show auxiliary function menu;

3. Press key F3 to select frequency count function as open;
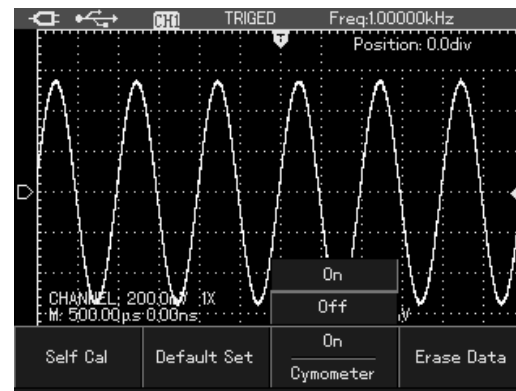
Picture 4-11 Trigger Frequency Count

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Screen Brightness Adjustment

To operate under the following steps to adjust screen brightness:

1. Press key $\boxed{\text{SHIFT}}$ to show character shift on the right corner of screen；

2. Press key $\boxed{\text{ACQUIRE}}$ to show backlight menu；

3. Press key $\boxed{\text{F1}}$ to opern backlight adjustment box；

4. Press right∕left key to adjust backlight brightness to the proper value；

5. Press key to close the backlight adjustment box；

Notes: press key $\boxed{\text{AUTO}}$；the backlight adjustment box shall close automatically.
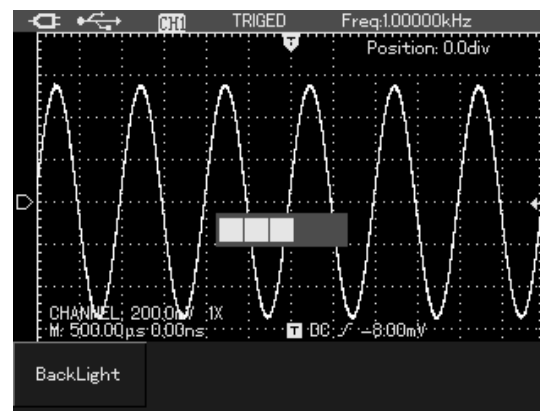
Picture 4-12 Backlight brightness Adjustment

Store Bitmap

To store bitmap under the following steps:

1. Press key $\boxed{\text{SHIFT}}$ to show character shift on the right corner of screen;

2. Press key $\boxed{\text{OK}}$ to store bitmap into the inner memory of the apparatus;

Notes: to output bitmap into computer by the home computer software and to store it in the BMP format, it is allowed to store 10 groups of bitmap.

Online Help

To conduct online help under the following steps:

1. Press key $\boxed{\text{SHIFT}}$ to show character shift on the right corner of screen;

2. Press key $\boxed{\text{HELP}}$ to open help function and character $\boxed{\text{H}}$ shall appear on the upper part of screen, indicating the help function has started;

3. Press corresponding menu keys to see detailed help information;

4. Reapeat step 1 and 2 to close help function.
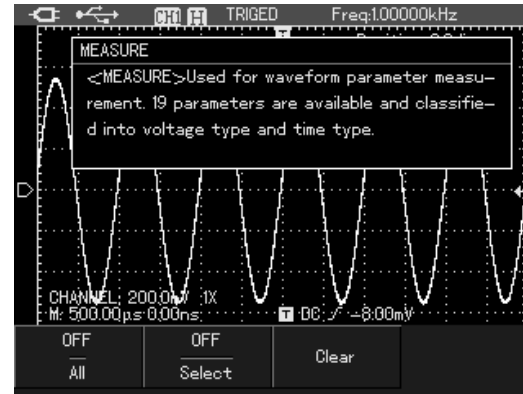
Picture 4-13 Help System

Set Single Trigger

To conduct single trigger setting quickly under the following steps:

1. Press key $\boxed{\text{SINGLE}}$, the oscilloscope shall be set as single trigger mode quickly;
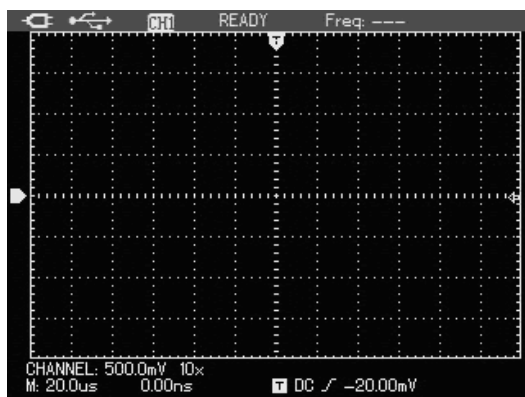
Picture 4-14 Single Trigger

Check Oscilloscope Status

To conduct online help under the following steps:

1. Press key SHIFT to show character shift on the right corner of screen;

2. Press key STATUS and the present setting status of oscilloscope shall appear on the screen;

3. Reapeat step 1 and 2 to close help status information.

Notes: press key AUTO the status information shall close automatically.
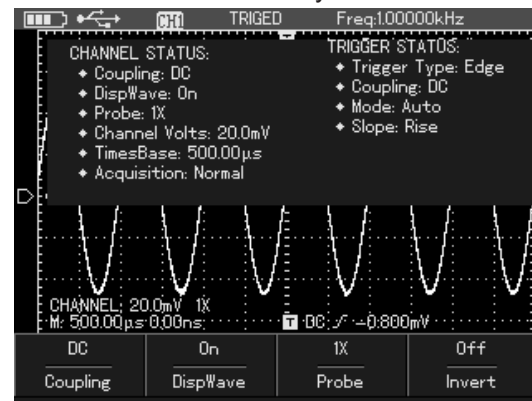
Picture 4-15 Status Information

Check Oscilloscope System Information

To check oscilloscope system information under the following steps:

1. Press key SHIFT to show character shift on the right corner of screen;

2. Press key CONFIGURE to open interface configuration menu;

3. Press key F4 the screen shall display informations such as: type, versionof the present oscilloscope.

4. Press key F1 to close system information window.
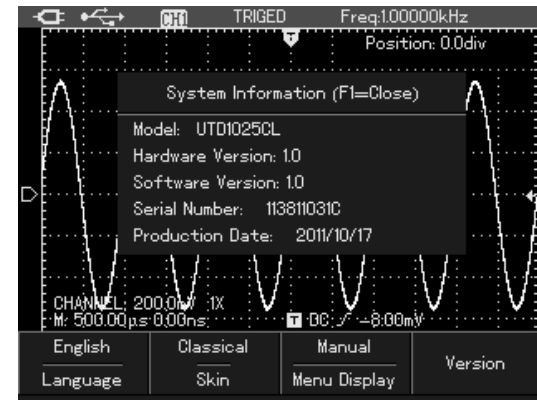
Picture 4-16 System Information

Automatic Parameter Measurement

There are two ways of automatic parameter measurement, showing all parameters or individually set measured parameter to display on screen with maximum of 4 parameter items.

Measurement of All Parameters

To measure all parameters automatically under the following steps:

1. Press key MEASURE to show parameter measurement menu；
2. Press key F1 the screen shall display measuremen results of all parameters.
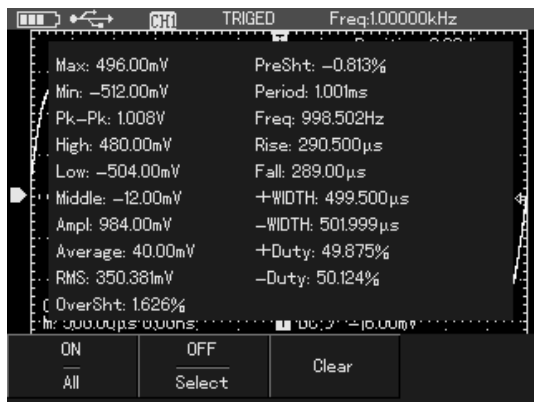
Picture 4-17 Measurement of All Parameters

Customization Parameter Measurement
To measure all customization parameters automatically under the following steps:
1. Press key MEASURE to show customization parameter menu；
2. Press key F2, the screen shall display measurement parameters for choice.
3. Press key up/down/left/right to select type of parameter being measured, marked by complement color；
4. Press key SELECT to confirm, the parameter shall display on the screen automatically with set maximum of 4 measuremnt parameters.
5. Press key F2 to close customization parameter menu.
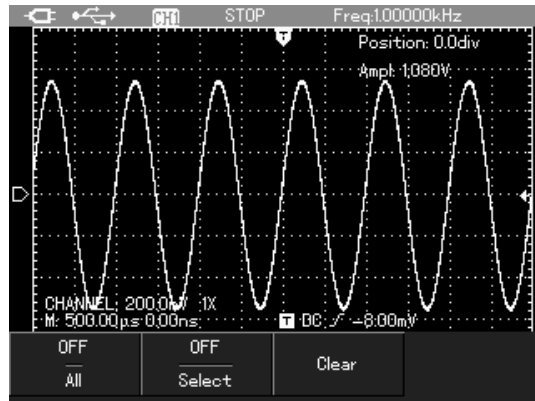
Picture 4-18Customization Parameters Menu

Smooth Waveform by Average Treatment

To smooth waveform under the following steps:

1. Press key ACQUIR to show acquisition mode menu；

2. Press key F1 to select acquisition mode as average；

3. Press key right/left to select average frequency as 16 and measurement results shall display 16 times in average.
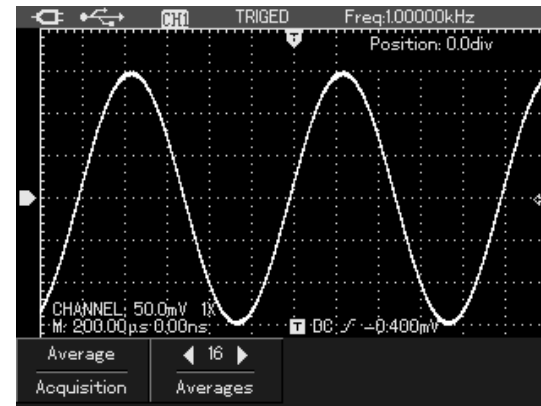
Picture 4-19 Average Treatment with 16 Times

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Display Spike Pulse by the Peak Value Test Function

The function could be used to show results of 50 ns or even wider（pike pulse or other nonsynchronous wavefoms）

1. Press key ACQUIR to show acquisition mode menu；

2. Press key vto select acquisition mode as peak value .
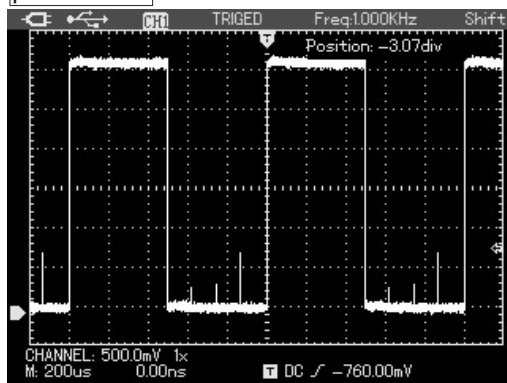
Picture 4-20 Peak Value Acquisition

Use Persistence to Show Waveform

You can use persistence function to observe dynamic signal continuously.

1. Press key DISPLAY to show display mode menu；

2. Press key F4 to select 1 second, 3 seconds, 5 seconds, limitless or automatic in a cycle. Select Limitless, the observed dynamic signal shall persist on the screen and the persistence function shall close if select Automatic.
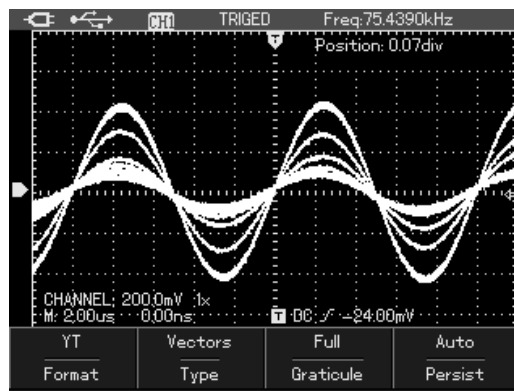
Picture 4-21 Display 3 Seconds in Consecutive

Select AC Coupling

After resetting, the oscilloscope shall be DC coupling and screen shall display AC and DC voltage. To use AC coupling when want to observe a small AC signal loaded on the DC signal. To select AC coupling under the following steps:
1. Press key CHANNEL to show channel menu ;
2. Press key F1 to select channel coupling as AC.
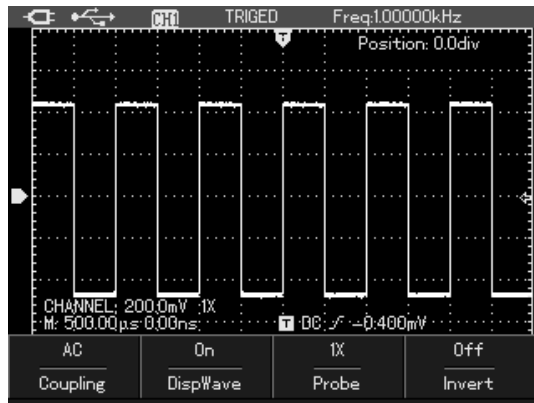
Picture 4-22 AC coupling

Reverse Polarity of the Displayed Waveform

To display input port waveform in opposite phase under the following steps:
1. Press key CHANNEL to show channel menu ;
2. Press key F4 to select starting opposite phase and the opposite phase waveform shall be displayed on the screen.
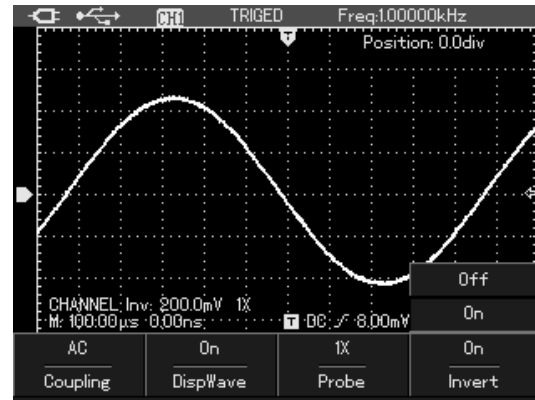
Picture 4-23 opposite phase display of waveform

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Automatic Setting for Small Signal with DC Bias

The unique powerful automatic setting function of UTD1025CL oscilloscope make it possible to complete quick, correct automatic setting for signal containing any DC components under the channel DC coupling mode.

On the left upper part of screen display a parameter position.

Position: the parameter indicates the shift value of channel reference symbol relative to the screen horizontal midline. Being positive indicates that channel referenece symbol is above the screen horizontal midline and negative indicates that channel referenece symbol is below the screen horizontal midline.

For example: input in the channel AC peak peak value70mV with sine signal containing 1.1V DC bias signal, set oscilloscope to display waveform

and read reference value. Compare UTD1025CL with traditional oscilloscope in terms of operation convenience.

Connect signal with input channel, set channel coupling mode as DC, and conduct automatic setting, then the screen shall display the waveform shown as in the picture 4-24.

Of which:

Position: −55. 0div indicates that the channel reference symbol shift downward 55div relative to screen midpoint. Based on the present gear and shift, we can calculate the DC bias voltage: 20mV/div   55div=1.1V

Peak peak value: 71.199mV represents the AC peak peak value of the signal and DC level of present signal could be read directrly by the average value.

Average value: 1.120V represents the DC level of the signal and the signal's parameter could be calculated easily based on the above parameters.
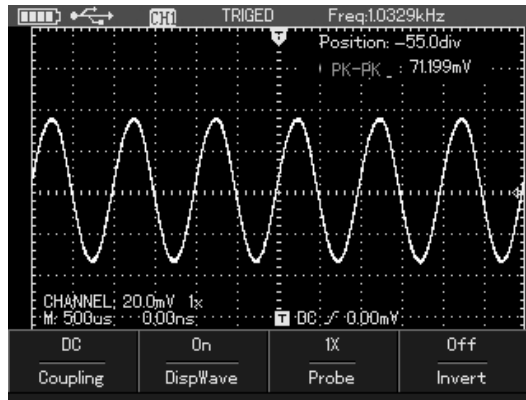
Picture 4-24 Setting the Signal with DC Bias

Picture 4-25 AC parameter measurement

For trational oscilloscope, it is necessary to set it as AC coupling and measure signal's AC parameter; set channel as DC, manually adjust channel vertical scale coefficient and measure signal's DC parameter by the cursor, and get the test value finally, as shown in following picture.
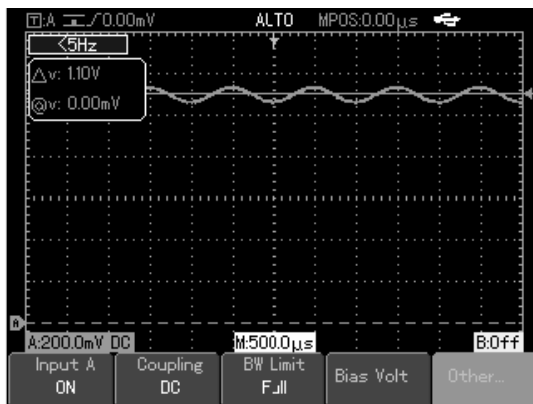
Picture 4-26 DC parameter measurement

After comparison, we can see UTD1025CL's quicker measurement speed and more intuitive measurement results.

ChapterV Use Multimeter

About the Chapter

The chapter introduces the multimeter function of oscilloscope in phases and provides basic examples for using menu and basic operations. Press key DMM/DSO , the oscilloscope shall switch to multimeter measurement and screen displays multimeter interface.

Connect Apparatus

3 4-mm safety banana socket input ports for multimeter: COM、V/Ω、μA/mA

One 10A CURRENT DIVIDER: UT-M07.

Interface Indication Instruction

Instructions:

1. ▥ Battery indication
2. AUTO automatic setting indication
3. Measurement types indication:

ı|ı   DC voltage measurement

⊘ AC voltage measurement
Ⓐ DC current measurement
Ⓐ AC current measurement
⊏⊐ Resistance measurement
⊀⊢ Diode measurement
◁ Continuity measurement
⊣⊦ Capacitance measurement

4. △ Relative value measurement indications

5. Operation status indication: HOLD indicates the screen has been hold.

6. $0.995_{kΩ}$ Relative value measures reference value.

7. $DC\ 400.0mV$ Measurement value main reading.

Multimeter Measurement

Press key DMM/DSO , the oscilloscope shall switch to multimeter measurement and screen displays multimeter interface, then you can measure with the multimeter.

Measure Resistance Value

To measure resistance under the following steps:

1. Press key R , the menu shall display the measurement type: resistance.

2. Insert blace table pen into COM banana socket input port and red one into Ω banana socket input port.

3. Connect the red and blace table pen with the measured resistor, the screen shall display resistance value reading of the measured resistor.
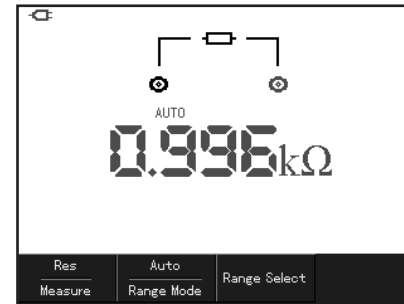
Picture 5-1 Resistance Measurement

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Measure Diode

To measure diode under the following steps:

1. Press key R, the menu shall display the measurement type: resistance.

2. Press key F1 , the menu shall display the measurement type: diode.

3. Insert blace table pen into COM banana socket input port and red one into Ω banana socket input port.

4. Connect the red and blace table pen with the measured resistor, the screen shall display the turn-on voltage drop voltage value reading of the diode.
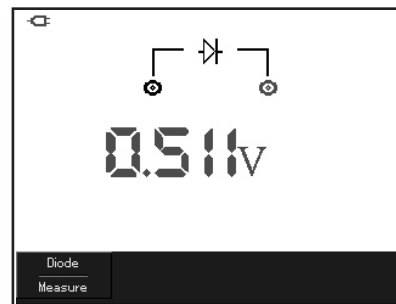
Picture 5-2 Diode Measurement

Continuity Test

To conduct continuity test under the following steps:

1. Press key R , the menu shall display the measurement type: resistance.

2. Press key F1 , the menu shall display the measurement type: continuity.

3. Insert blace table pen into COM banana socket input port and red one into Ω banana socket input port.

4. Connect the red and blace table pen with the measured point, when the measured point resistance is lower than 10 Ω, the meter shall sound "tick…"
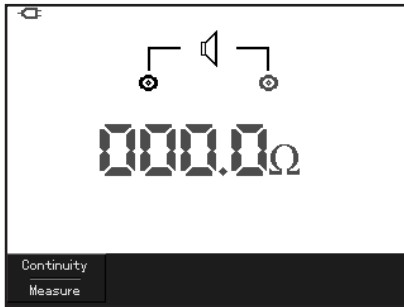
Picture 5-3 Continuity Measurement

Measure Capacitance
To measure capacitance under the following steps:
1. Press key $\boxed{R}$, the menu shall display the measurement type: resistance.
2. Press key $\boxed{F1}$, the menu shall display the measurement type: continuity.
3. Insert blace table pen into COM banana socket

input port and red one into Ω banana socket input port.
4. Connect the red and blace table pen with the capacitor being measured; the screen shall display capacitance value reading of the capacitor being measured.
Notes: please use the relative value measurement method in measuring capacitance lower than 5 nF and to improve measurement accuracy.
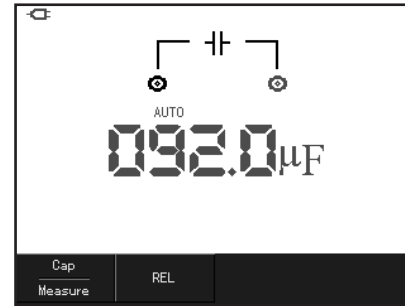
Picuture 5-4 Continuity Measurement

Measure DC Voltage

To measure DC voltage under the following steps:
1. Press key $\boxed{V}$, the menu shall display the measurement type: $\boxed{DC}$ Voltage.
2. Insert blace table pen into COM banana socket input port and red one into V banana socket input port.
3. Connect the red and blace table pen with the measured point, and the screen shall display the DC voltage value of the measured point as shown in the following picture:
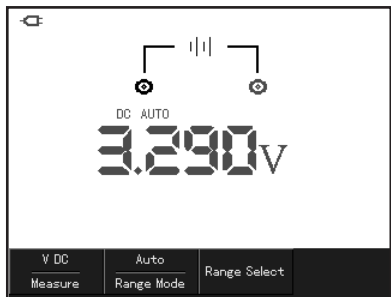
Picture 5-5 DC Voltage Measurement

Measure AC Voltage

To measure AC voltage under the following steps:
1. Press key $\boxed{V}$, the menu shall display the measurement type: DC Voltage.
2. Press key $\boxed{F1}$, the menu shall display the measurement type: AC voltage.
3. Insert blace table pen into COM banana socket input port and red one into V banana socket input port.
4. Connect the red and blace table pen with the measured point, and the screen shall display the AC voltage value of the measured point
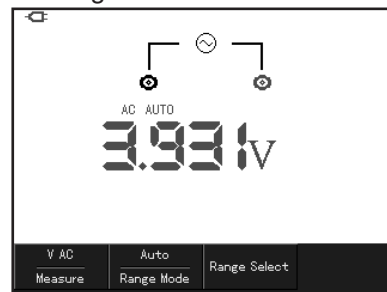
Picture 5-6 AC Voltage Measurement

Measure DC Current

To measure DC current lower than 4mA under the following steps:

1. Press key $\boxed{I}$ and the menu shall display measurement type: DC current, measurement unit: µA. to select different range (µA、mA、A) with the key $\boxed{F3}$, the fault range is mA .

2. Insert blace table pen into COM banana socket input port and red one into µA/mA banana socket input port.

3. Connect the red and blace table pen with the measured point, and the screen shall display the DC current value of the measured point.
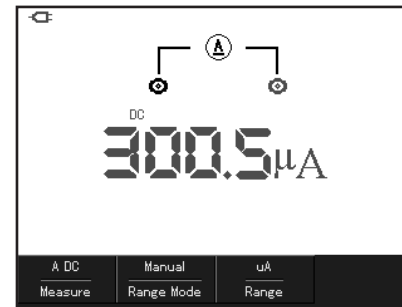
Picture 5-7 Measurement of DC Current Lower Than 4mA

To measure DC current lower than 400mA under the following steps:

1. Press key $\boxed{I}$ and the menu shall display measurement type: DC current.

2. Press key $\boxed{F3}$ to set range as mA, and the measurement unit shall be mA.

3. Insert blace table pen into COM banana socket input port and red one into µA/mA banana socket input port.

4. Connect the red and blace table pen with the measured point, and the screen shall display the DC current value of the measured point
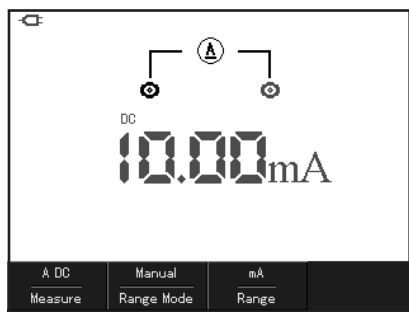
Picture 5-8 Measurement of DC Current Lower Than 400mA

To measure DC current higher than 400mA under the following steps:

1. Press key I and the menu shall display measurement type: DC current.

2. Press key F3 to set range as A, and the measurement unit shall be A.

3. Insert 10A CURRENT DIVIDER into current

measurement socket and then insert the table pen with the 10A CURRENT DIVIDER.

4. Connect the red and blace table pen with the measured point, and the screen shall display the DC current value of the measured point

Warning: in measuring current higher than 400mA, the fuse in the machine shall be blown if plug in μA /mA port directly without using 10A CURRENT DIVIDER, please replace the fuse by the special personnel.
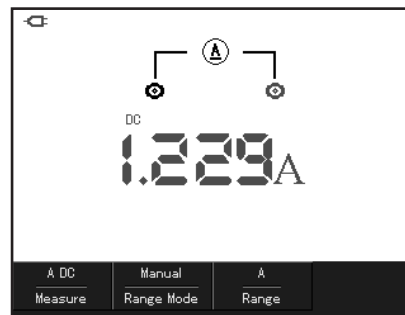
Picture 5-9 Measurement of DC Current Higher Than 400mA

Measure AC Current

To measure AC current lower than 4mA under the following steps：

1. Press key $\boxed{\text{I}}$ and the menu shall display measurement type：AC current, measurement unit：µA. to select different range（µA、mA A)with the key $\boxed{\text{F3}}$, the fault range is µA.

2. Insert blace table pen into COM banana socket input port and red one into µA /mA banana socket input port.

3. Connect the red and blace table pen with the measured point, and the screen shall display the AC current value of the measured point.
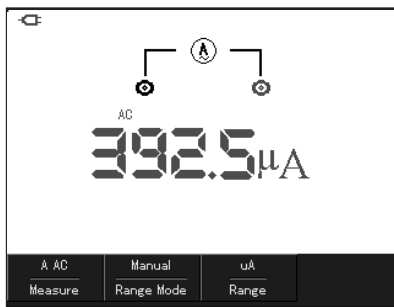
Picture 5-10 Measurement of AC Current lower than 4mA

To measure AC current lower than 400mA under the following steps：

1. Press key $\boxed{\text{I}}$ and the menu shall display measurement type： AC current.

2. Press key $\boxed{\text{F3}}$ to set range as mA and the measurement unit shall be mA.

3. Insert blace table pen into COM banana socket input port and red one into µA /mA banana

4. Connect the red and blace table pen with the measured point, and the screen shall display the AC current value of the measured point.
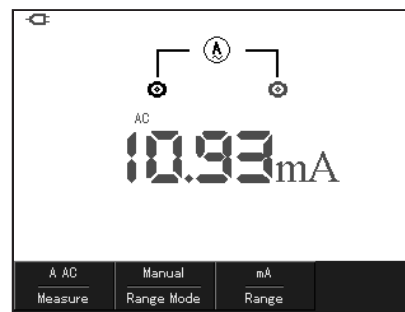
Picture 5-11 Measurement of AC Current lower than 400mA

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To measure AC current higher than 400mA under the following steps:

1. Press key ⬛I and the menu shall display measurement type: AC current.

2. Press key ⬛F3 to set range as A, and the measurement unit shall be A.

3. Insert 10A CURRENT DIVIDER into current measurement socket and then insert the table pen with the 10A CURRENT DIVIDER.

4. Connect the red and blace table pen with the measured point, and the screen shall display the AC current value of the measured point.

> **Warning: in measuring current higher than 400mA, the fuse in the machine shall be blown if plug in μA/mA port directly without using 10A CURRENT DIVIDER**, please replace the fuse by the special personnel.
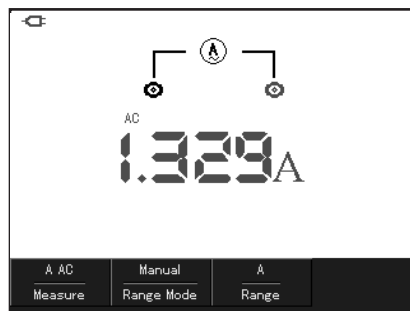
Picture 5-12 Measurement of AC Current higher than 400mA

Hold Measurement Value

You can hold the displayed reading antime.

1. Press key RUN /STOP to hold the measurement value and character Hold shall flicker on the screen.

2. Press the key RUN /STOP again to restore measurement.
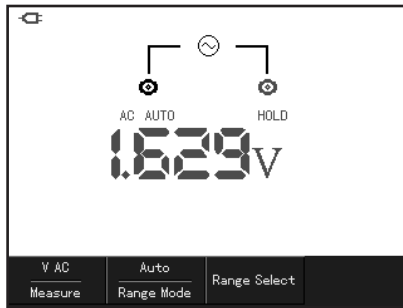
Picuture 5-13 Hold Measurement Value

Relative Measurement

Relative measurement shall display the present measurement results relative to the difined reference value.

The following example introduces how to conduct relative capacitance measurement. Firstly, to get a reference value:

1. Press key R and the menu shall display measurement type: resistance.

2. Press key F1 , the screen shall display measurement type: capacitance.

3. Insert blace table pen into COM banana socket input port and red one into V/Ω banana socket input port.

4. When the reading is stable, press key F2 to enter into relative value measurement status and the △ shall appear on the upper part of screen , under △ the appear reference value.

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5. Connect the red and blace table pen with the capacitor being measured, and the screen shall display the capacitance reading of capacitor being measurend.
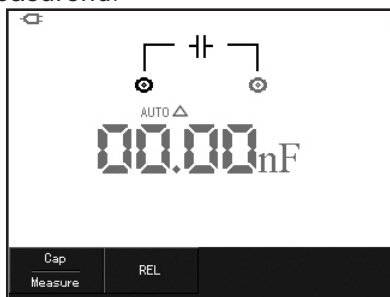
Picture 5-14 Relative Measurement of Capacitance

Select Automatic/Manual Range Adjustment

The fault mode of meter is full-automatic setting mode, to switch to manual range under the following steps:

1. Press key $\boxed{V}$ or $\boxed{R}$, menu display measurement mode: automatic.

2. Press key $\boxed{F2}$ to switch measurement mode, and enter into manual measurement mode, menu display range mode: manual.

3. Under manual range mode, press key $\boxed{F3}$ once, jump a gear upward and press key $\boxed{F3}$ to the lowest gear when it reaches to the highest gear in a cycle. The present range displays above the measurement reading.

4. Press key $\boxed{F2}$, the left upper part of screen displays Auto, and switch back to full-automatic setting mode.
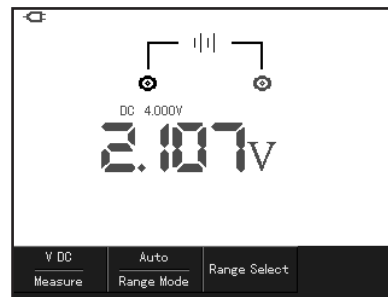
Picture 5-15 Manual Measurement

Chapter VI Details about Using Oscilloscope

About the Chapter

The chapter will introduce functions of UTD1025CL oscilloscope step by step and make detailed introduction about each function keys on the board, and provide some basic examples for using menu and operations.

You are strongly recommended to read the chapter to know more about the measurement function and system operation methods.

Vertical System Setting

Channel Setting

Channel has independent setting menu, press key CHANNEL , the system shall display channel operation menu as shown in the following picture:
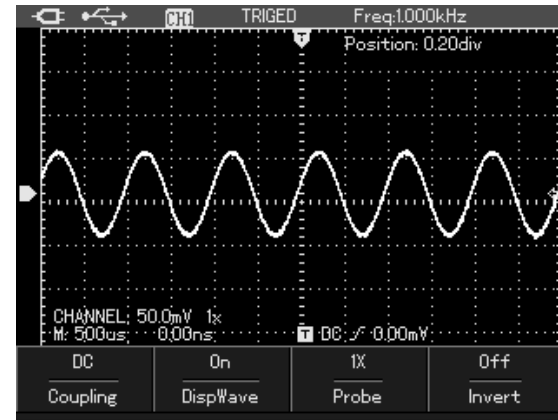
Picture 6-1 Channel Menu Setting

Channel menu as shown in the following table:

Table 6-1

Coupling	DC	Pass AC and DC components of the input signal.
	AC	Stop the DC components of the input signal.
	Ground	Display DC level of the channel input port being equivalently grounded.
Waveform display	On	Display channel waveform；
	Off	Close channel waveform.
Probe	1	Based on the probe attenuation coefficient, select one of them to assure the accuracy of the vertical bias coefficient reading.
	10	
	100	Four types: 1 、10 、100 、1000 .
	1000	
Invert	Off	Normal Waveform display
	On	Waveform being displayed in the opposite phase mode.

Vertical Shift of the Waveform

When the channel triangle symbol is solid, press up/down key to shift channel waveform vertically.
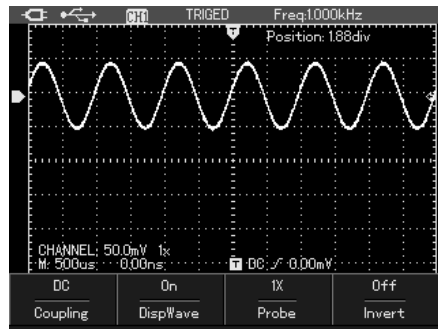
Picture 6-2 Vertical Shift of Waveform

Notes: when the channel vertical shift triangle symbol is blank, press key SELECT to switch channel vertical shift triangle symbol to solid.

Set Waveform Display

In the channel menu, press key F2 to open or close channel waveform display.
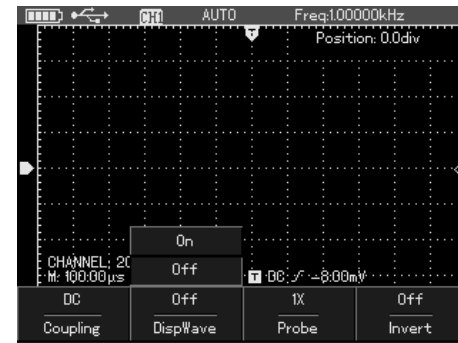
Picture 6-3 Close Waveform Display

Set Probe Multiplying Power

To cooperate with the probe attenuation coefficient setting, it is required to set probe attenuation coefficient correspondingly in the channel operation menu. For example: the probe attenuation coefficient is 10:1,the probe coefficient in menu shall be correspondingly set as 10

, others are on the analogy of the above to assure accuracy of voltage reading.

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In the channel menu, press key $\boxed{\text{F3}}$ to set probe multiplying power.

Table for probe attenuation coefficient and corresponding menu settng

Table 6-2

Probe attenuation coefficient	Corresponding menu
1:1	1
10:1	10
100:1	100
1000:1	1000

Horizontal Sysmem Setting

Change of Time Base

Press key $\boxed{\text{s~ns}}$ to slow down or speed up scanning velocity of the apparatus from 10ns/div to 50s/div.

Notes: minimum time base gear shall vary with types.

Horizontal Shift of Waveform

Press key $\boxed{\text{left/right}}$ to adjust pretrigger depth. The trigger position generally is set at the screen horizontal center and you can see the 6 div pretrigger and delay information. Through adjusting waveform horizontal position, you can see more pretrigger information and based on the observed pretrigger data to see the waveform status prior to trigger. For example：if capture the glitch produced during the circuit start time, to find the reason by observing and analizing pretrigger data.

Press key $\boxed{\text{HORIZONTAL}}$ to open horizontal setting menu as shown in the following picture
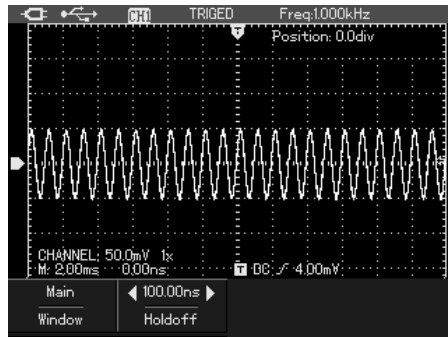
Picture 6-4 Horizontal Setting Menu

There are two function options in the horizontal setting menu: window extension and trigger holdoff.

Window Extension Function

In the horizontal setting menu, press key F1 to open window extension function to amplify a sector of waveform, checking the picture details. Window extension setting shall not be slower than the main time base setting.
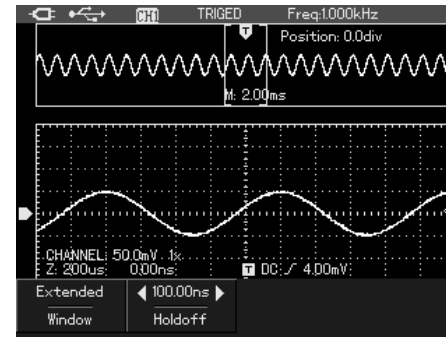
Picture 6-5 Screen Display after Window Extension

Two display sector in the window extension function, as shown in the above picture. The upper part displays the original waveform, after pressing the key OK to hide menu, the sector could be used to shift horizontal extension part left/right by adjusting right/left key and increase or reduce the selection area by the key s~ns .

The lower half part is the waveform after horizontal extension of the selected original sector. It is noteworthy that resolution of the extension time base

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has improved compared with main time base (as shown in picture 6-5). As waveform displayed by the whole lower half part is corresponding to the upper half part sector, it is able to improve extension time base by adjusting key $\boxed{s\sim ns}$ to reduce selected area, thus increasing horizontal extension times of waveform.

Trigger Holdoff Time Adjustment

In the horizontal setting menu and display status of menu, press $\boxed{left/right}$ key to adjust holdoff time (100ns-1.5s). Use trigger holdoff time adjustment to observe complet waveform (ex. pulse serial). Holdoff time is to adjust the data collection period of oscilloscope, integral multiple of and sychoronous to the period of complex waveform being measured.

For example: the signal being measured is a combination wave signal imposed on the channel CH1. Press key $\boxed{HORIZONTAL}$ to open horizontal setting menu and press key $\boxed{left/right}$ to adjust holdoff time, the trigger holdoff time shall

vary with it till the waveform display is stable, as shown in the following picture.
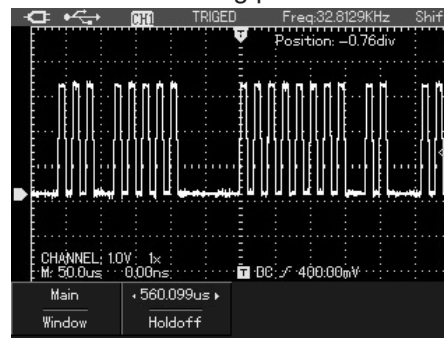
Picture 6-6 Trigger Holdoff

Notes:

1. Trigger holdoff time only be adjusted under the menu display status.

2. Holdoff time is generally slightly shorter than "big period" time. In observing the signal of RS232 communication, the holdoff time is frame is slightly shorter than the start edge time of each frame data, it is easy to get stable synchronization.

Trigger System Setting

Trigger decides when to start collecting data and displaying waveform for oscilloscope. If trigger has been set correctly, it shall transform the unstable display into meaningful waveform. In collecting data, the oscilloscope shall collect enough data to draw wavefrom on the left of trigger point. In waiting for the occurrence of trigger conditions, it shall collect enough data countinously to draw wavefrom on the right of trigger point. The trigger function of oscilloscope could be set by the trigger function key TRIGGER .

TRIGGER：Key for trigger function setting menu

Trigger level: used to set the signal voltage relative to trigger point.

Press key TRIGGER to open trigger menu as shown in the following picture and press key F1 to switch trigger types.
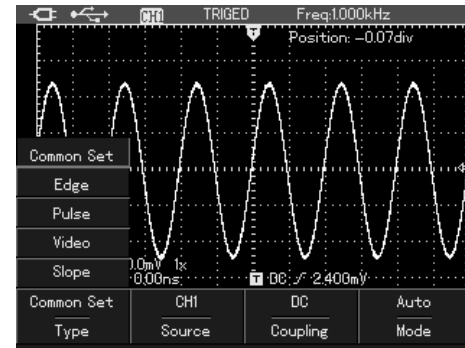
Picture 6-7 Trigger Function Menus

Trigger control

Four trigger modes: edge, vedio, pluse width and slope, different function menu for each trigger and a general setting mode used to set trigger source, trigger coupling and trigger modes.

Edge trigger: produce trigger when signal is set as rising or falling edge. To change vertical positon of trigger point on the trigger edge by setting trigger level, namely the intersection point of trigger level line and signal edge on the interface.

Pulse width trigger: trigger will occur when the pulse width of trigger signal reaches set conditions.

Vedio trigger: to trigger in the vertical or horizontal signal of standard vedio signal

Slope trigger: signal's rising or falling velocity is the trigger condition

Sorts of trigger menu shall be introduced in the following contents.

Common Trigger Setting

The Common setting is used to set common trigger options as shown in the following table:
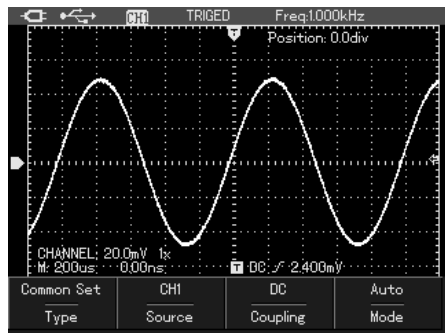
Picture 6-8 Trigger-Common Setting

Table 6-3

Function menu	Set	Instruction
Trigger Type	Common set	Set general trigger options
Trigger source	CH1	Set CH1 as information source trigger signal
Trigger coupling	AC	Stop DC components contained in the input signal
	DC	Pass AC and DC components in the input signal;
	High frequency restriction	Resitrict high frequency components higher than 80kHz in the signal
Trigger modes	Automatic	Automatically collect waveform if without detecting any trigger conditions
	Normal	Collect waveform only trigger conditions have been met

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Notes:

General setting menu can also set by shortcut ways, as shown in the following steps:

1. Press key SHIFT and character shift shall appear on the right upper corner of screen；

2. Press key F1 to show trigger general setting menu；

Edge Trigger

Edge trigger is the trigger on the trigger threshold of input signal edge. Edge trigger setting are as shown in the following table.
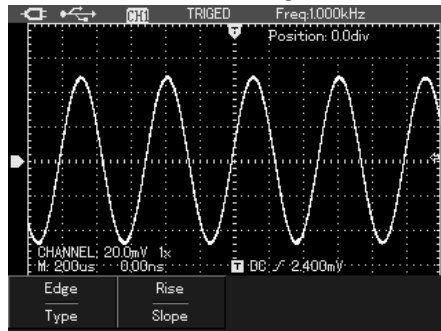
Picture 6-9 Trigger-Edge Trigger

Table 6-4

Function menu	Set	Instruction
Trigger Type	Edge	Set trigger type as edge trigger.
Slope	Rise	Set trigger on the signal rising edge；
	Fall	Set trigger on the signal falling edge.

Pulse Width Trigger

Pulse width trigge defines trigger time based on the pulse width. You can capture abnormal pulse by setting pulse width conditions.
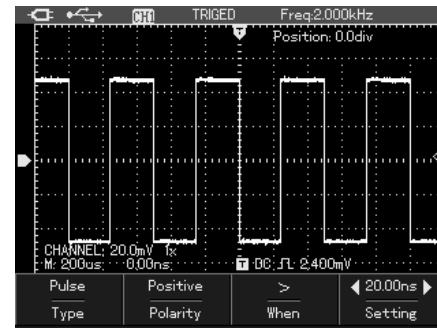
Picturen 6-10 Trigger-Pulse Width Trigger

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Table 6-5

Function menu	Set	Instruction
Trigger Type	Pluse width	Set trigger type as edge trigger.
Pulse width polarity	Positive Negative	Set positive pulse width as the trigger signal Set negative pulse width as the trigger signal
Pulse width conditions	= < >	Trigger when pulse width equals to setting value； Trigger when pulse width is bigger than setting value； Trigger when pulse width is smaller than setting value.
Pulse width time	―――	Set pulse width time value，under the menu display conditions, set the pulse width time by left/right key.

Vedio Trigger

Select vedio trigger and trigger on the vertical or horizontal line of NTC or PAL standard vedio signal.
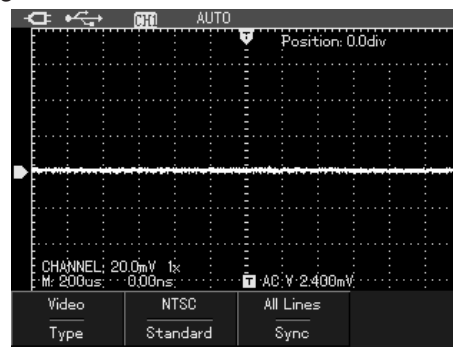
Picture 6-11 Trigger-Vedio Triger

Tabel 6-6

Function menu	Set	Instruction
Trigger Type	Vedio	Set trigger type as vedio trigger
Standard	PAL	Vedio signal applicable to PAL system
	NTSC	Vedio signal applicable to NTSC system.
Sync	All lines	Set vedio horizontal trigger sync
	Odd field	Set to trigger sync on the vedio odd field
	Even field	Set to trigger sync on the vedio even field

Slope Trigger

Select slope trigger, and produce trigger when signal rising or falling velocity meets set value conditions.
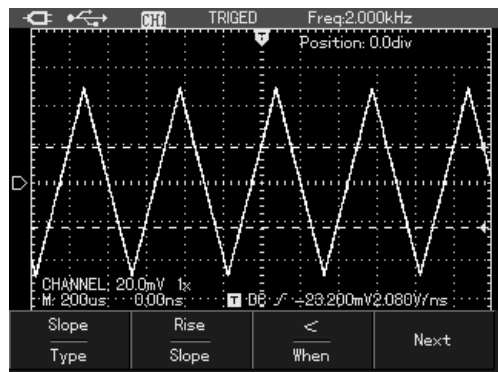
Picture 6-12 the First Page of Trigger-Slope Trigger
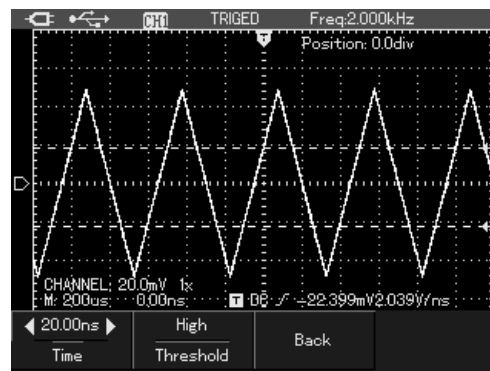
Picture 6-13 the Second Page of Trigger-Slope Trigger

Tabel 6-7

Function menu	Set	Instruction
Trigger Type	Slope	Set trigger type as slope trigger.
Slope	Rise	Select a threshold between the rising edge of trigger signal
	Fall	Select a threshold between the falling edge of trigger signal
Slope conditions	>	Trigger when signal slope between thresholds is bigger than slew rate set value
	<	Trigger when signal slope between thresholds is smaller than slew rate set value
	=	Trigger when signal slope between thresholds equals to slew rate set value
Next page	––––	Second page of slope menu
Time	––––	Set slew rate value and under the menu display conditions to set pulse width time by left/right key.
Threshold	Low level	Shift low level threshold by up/down key
	High level	Shift high level threshold by up/down key
	High/low level	Shift high/low level threshold by up/down key
Back	––––	Back to the first page of slope page

Terms explanation

1. Trigger Source: trigger information source is the input channel CH1.

■ **Input Channel:** the commonly used channel information source is input channel（CH1）. The channel selected as trigger information source are under normal operation only its. corresponding input channel have been opened.

2. Trigger Mode: decides activity modes of oscilloscope under no trigger event status. Three trigger modes: automatic, normal and single trigger.

■ Automatic trigger: when no trigger signal input status, the system shall collect waveform data automatically, enabling to display scan baseline on the screen；when there is trigger signal, the automatic shall switch to trigger scanning and sync with signal.

Notes: when scan waveform is set at the 50ms/div

or slower time base, oscilloscope shall enter into SCAN mode.

■ **Normal trigger:** oscilloscope shall collect waveform under normal trigger mode only trigger conditions have been met. When there is no trigger signal, it stops collecting data and awaits trigger. While there is trigger signal, it shall produce trigger scan.

■ **Single trigger:** under the single trigger mode, press "operation" key once, oscilloscope shall await trigger and when detecting a trigger, it shall collect and display the collected waveforms, then stop it.

3. Trigger coupling：it decides which components of signal will be transmitted to trigger circuit. Coupling types include: DC, AC and high frequency restriction.

■ **DC:** pass all components of signal.

■ **AC**：stop "DC" component and attenuate signal lower than 10HZ.

■ **High frequency restriction:** attenuate high frequency components over 80kHz.

4. pretrigger/delay trigger: data collected before/after trigger event. Generally, trigger is set at the horizontal center of screen；you can observe 6div pretrigger and delay information. You can adjust horizontal position of waveform to see more pretrigger information, by observing pretrigger data to see waveform before trigger. For example: if capturing glitch when the circuit is power on, we can find the reason of occurrence of glitch by observing and analyzing pretrigger data.

Collection Mode Setting

Press key ACQUIRE to enter into collection mode menu, as shown in the following table：

Table 6-8

Function menu	Set	Instruction
Acquisition	Normal	Set as common acquisition mode
	Peak value	Set as peak value test mode
	Average	Set as average acquisition mode and display average frequency
Averages （appear only the acquisition mode is average）	2~256	Set average frequency and step in with multiple of 2, from 2, 4, and 8, 16, 32, 64, 128 to 256. Under collection menu display status, set average frequency by left/right key.

Notes:
1. Select acquisition mode to observe single signal.
2. Select peak value test mode to observe envelop of signal to avoid confusion.
3. Select average acquisition mode to reduce random noise in the displayed signal and the average value frequency shall step in with multiples of 2, setting average frequency selection from 2 to 256.

Nouns explanation

Normal mode: oscilloscope collects signal to reconstruct waveform with equal time interval.

Peak value test mode: under the acquisition mode, oscilloscope shall find out the maximum and minimum value of input signal in each acquisition intervals and to display waveform by those values. Thus, oscilloscope can acquire and display narrow pulse or those narrow pulses will be leaked under the "acquisition" mode and

noise seems louder.

Average mode: under the mode, oscilloscope will acquire several waveforms to calculate average value and display waveform finally, thus, reducing random noise.

Display Set

Press key DISPLAY to enter into display menu, as shown in the following picture:
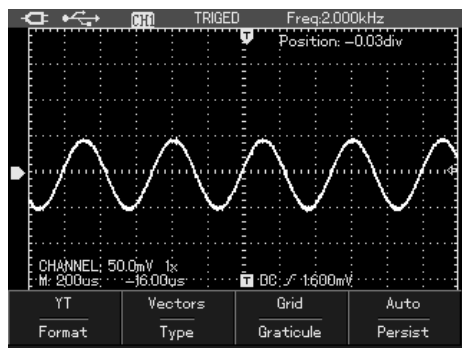
Picture 6-14 Waveform Display Set

Table 6-9

Function menu	Set	Instruction
Format	YT	Indicate relative relations between vertical voltage and horizontal time.
Types	Vectors points	Display in the way of linking acquisition points Display acquisition points directly
Graticule	Full Grid Cross Hairs	Set mesh display mode in the waveform display area : full, grid, crosshairs.
Persist	Automatic 1s 3s 5s Infinite	Screen waveform updates at normal refresh rate ; Waveform data on screen updates after holding 1 s. Waveform data on screen updates after holding 3 s. Waveform data on screen updates after holding 5s. Wavefrom data on screen shall hold continuously and new data, if any, shall display in continuity.

Nouns explanation:

Display types: sector display will fill in blanks between adjacent acquisition points during display, and point display shall only display acquisition point.

Refresh rate: it is the refresh frequency per seconds of screen waveforms. Speed of refresh rate will affect oscilloscope's ability to observe signal dynamic changes.

Y-T mode: Y axis represents voltage quantity and X axis time quantity.

Slow scan mode: when horizontal time base control is set at 50ms/div or slower, the apparatus shall enter into slow scan acquisition mode. It is recommended to set channel coupling as DC in using slow scan mode toobserve low frequency signal.

Parameter Measurement Setting

The following introduction shall help you to know more about the powerful automatic measurement function of oscilloscope. Press key MEASURE to open parameter measurement menu, as shown in the following picture:
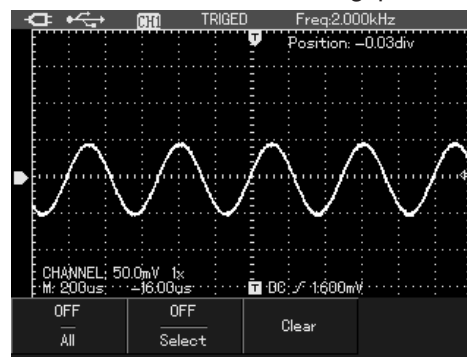
Picture 6-15 Parameter Measurement Menu

Table 6-10

Function menu	Set	Instruction
All parameters	ON	Display measurement value of all parameters
	OFF	Close automatic measurement function
Select paramter	ON	Open customization parameter selection box to select the needed measured parameter by key SELECT. The parameter will appear on screen and you can select at most four customization parameters.
	OFF	Close customization parameter selection box
Clear	---	Delete customization parameter displayed on screen

Example 1: display all measurement values of channel. Measurement steps are as follows:

1. Press key MEASURE to open parameter measurement menu；
2. Press F1 to select all parameter measurement: open

Screen will display all measurement parameters, as shown in the following picture:

Picture 6-16 All Parameters Measurement

Example 2: to display channel peak peak value, amplitude under the following steps:

1. Press key $\boxed{\text{MEASURE}}$ to open parameter measurement menu;

2. Press key $\boxed{\text{F2}}$ to open customization parameter selection box;

3. Press $\boxed{\text{up/down /left/right}}$ key to select peak peak value parameter;

4. Select peak peak value parameter and to press key $\boxed{\text{SELECT}}$ to confirm; a dot shall appear before the peak peak value in the customization parameter selection box, indicating the parameter has been customized and will appear on screen concurrently.

5. Same to the above operation press $\boxed{\text{up/down/left/right}}$ key to select amplitude parameter;

6. Press key $\boxed{\text{SELECT}}$ to confirm, a dot shall appear before the amplitude paramters,

indicating the parameter has been customized successfully and will appear on screen concurrently.

7. Press $\boxed{\text{F2}}$ to close customization parameter selection box;

Then, "peak peak value" and "amplitude" parameter shall appear on the right upper part of screen, as shown in the following picture:
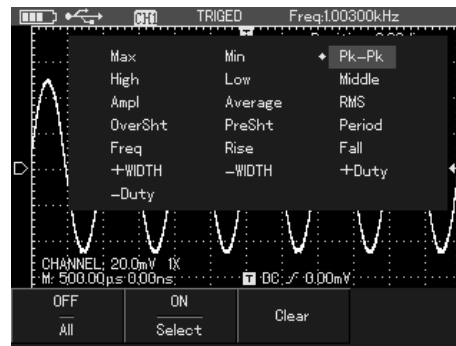
Picture 6-17 Peak Peak Value Parameter Customizations
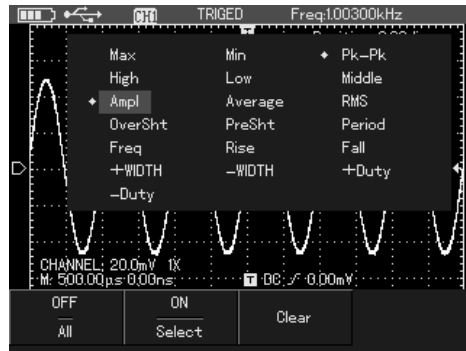
Picture 6-18 Amplitude Parameter Customizations
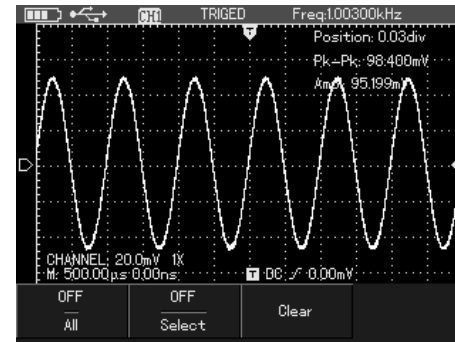
Picture 6-19Amplitude Parameter Customizations

Notes: Designated parameters are used for quick parameter measurement. There are 19 types of measurement parameters and generally user just need to measure some of them and set as customization parameter instead of all. All customization parameters shall appear on screen.

Automatic measurement of parameter
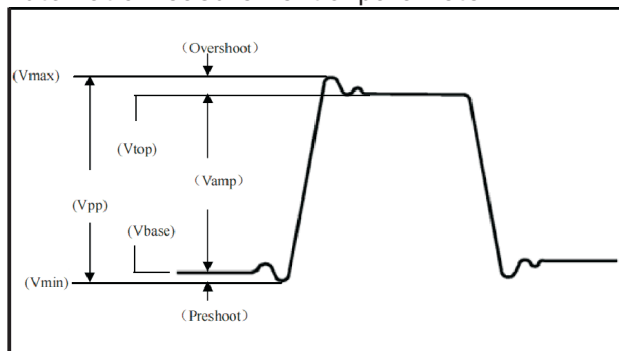
Picture 6-20 Voltage Parameter Measurement

Voltage parameters that oscilloscope can automatically measure include：

Maximum value (Vmax)：Voltage value from waveform highest point to GND（ground）

Minimum value (Vmin)：Voltage value from waveform lowest point to GND (ground)

Top value (Vtop): Voltage value from waveform top to GND (ground)

Base value (Vbase): voltage value from waveform base to GND (ground)

Middle value (Vmid)：half of amplitude value

Peak peak value (Vpp): voltage value from waveform highest point to the lowest point

Amplitude value (Vamp): voltage value from waveform top to bottom

Overshoot: ratio of difference between waveform maximum value and top value with amplitude value

Preshoot: ratio of difference between waveform minimum value and bottom value with amplitude

Average value: average amplitude of signal during a period

Root-mean-square value: the valid value. It means the converted energy of AC signal in a period is corresponding to the DC voltage that produces equivalent energy.
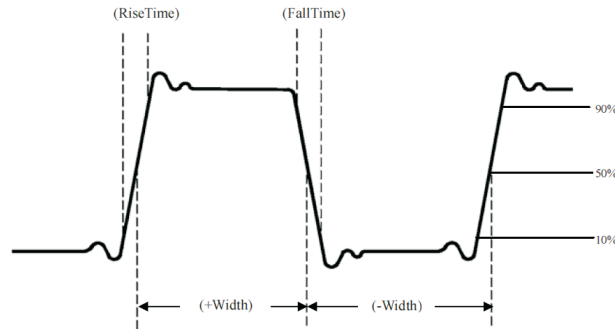
Picture 6-21 Time Parameter Measurement

The time parameters that oscilloscope can measure automatically include：

Rise time: duration for waveform rising from 10% to 90%

Fall time: duration for waveformfalling from 90% to10%

Positive pulse width: pulse width when positive pulse is at 50% amplitude

Negative pulse width: pulse width when negative pulse is at 50% amplitude

Rise delay: delay time of A to B rise edge

Fall delay： delay time of A to B fall edge

Positive duty ratio: ratio of positive pulse width with period

Negative duty ratio：ratio of negative pulse width with period

Storage and Record

Record Function

Press key RECORD to open waveform record function menu, two independent menus as shown in the following picture：
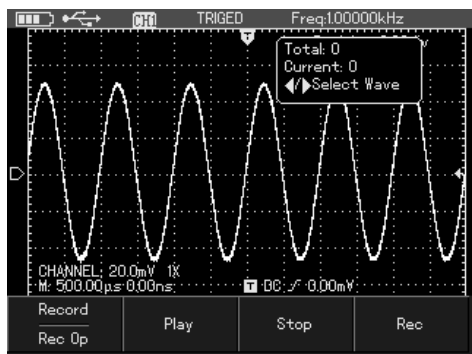
Picture 6-22 Waveform Record Menu

Picture 6-23 record file storage menu

Table 6-11 Record Menu

Function menu	Set	Instruction
Rec Op...	Record	Open/close waveform record function
Play	----	Play recorded waveform files
Stop	----	Stop the waveform files being recorded or played
Rec	----	Record waveform

Table 6-12 record file storage menu

Function menu	Set	Instruction
Rec Op...	Savec	Open/close waveform recording function
Location	1-5	5 storage positions "1-5" Set storage position by left/right key under the menu display condition
Save	----	Save recorded files into inner memory of the machine
Load	----	Callbacke recorded files saved into inner memory and playback it.

Notes: recorded files saved into the machine could be output to computer by host computer and played in it.

For example: it is required to record waveform of channel and save the file into inner memory.

1. Press key RECORD to enter into waveform recording menu;
2. Press key F1 to select menu function as record;
3. Press key F4 to start recording and press key F3 to stop;
4. Press key F1 to select menu function as store;
5. Press left/right key to adjust address as 1;
6. Press key F3 to store recorded waveform and screen shall display saving···, await saving··· indicator to disappear, the waveform shall be stored into inner memory of the machnine.
Notes: oscilloscope can record at most 300 screens of waveform data and during recording, if the following operations are conducted the record shall stop.
■ Change horizontal position of signal(under stop status)

For example: it is required to callbacke waveform recorded file that saved into inner memory in the example 1 to oscilloscope and playback.

1. Press key RECORD to enter into waveform record menu;

2. Press key F1 to select menu function as store;

3. Press left/right key to adjust address as 1;

4. Press key F4 to select callback; screen will display loading···, after successful callback, indicating Load Success;

5. Press key F1 again to select menu function as record;

6. Press key F2 to play automatically the callbacked waveform and press key F3 to stop it, to manual play with left/right key.
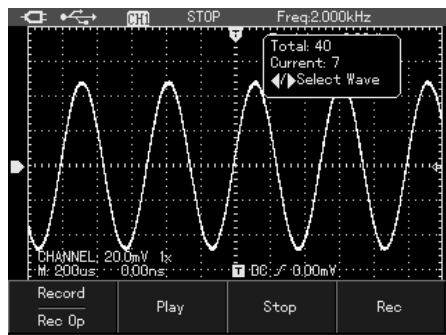
Picture 6-24 Recorded waveform playback

Storage Function

To store wavefom under the following steps:

1. Press key SHIFT and character shift will appear on the right upper corner of screen.

2. Press key STORAGE to enter into waveform storage setting menu.
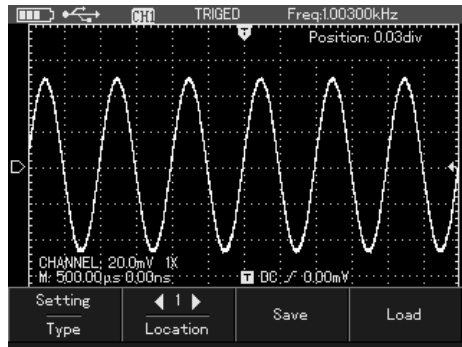
Picture 6-25 Set storage menu
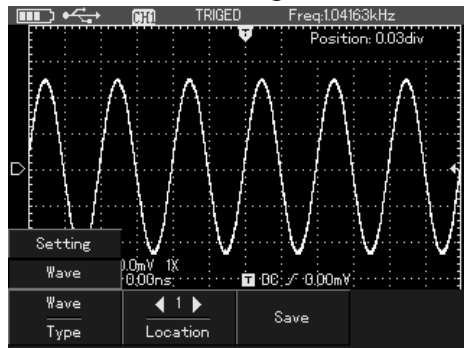
Picture 6-26 Waveform storage menu

In the storage memu, set as follows:

Table 6-13

Function menu	Set	Instruction
Type	Setting	Store sets in oscilloscope present menus;
	wave	Store waveform of channel.
Location	1-20	Select storage position with left/right key.
Save	----	Save as the former selected operationswith left/right key.
Load (appear below set menu)	1-20	Callback saved apparatus configuration parameters in the set menu.

Callback Function

ress key REF to enter into reference waveform
callback set menu for waveform callback.
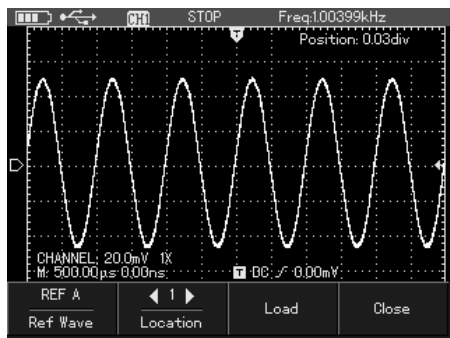
Picture 6-27 Reference Waveform Callback
Set as shown in the following table:
Table 6-14

Function menu	Set	Instruction
Ref Wave	REF A	Select callback route
Location	1-20	Select callback position with the right/left key
Load	————	mplement the former selected operations
Close	————	Close and callback to reference waveform on screen

For example: it is required to save channel waveform into oscilloscope and callback.

Waveform storage

1. Press key SHIFT and character shift will appear on the right upper corner of screen；
2. Press key STORAGE to enter into waveform storage setting menu；
3. Press key F1 to select storage type as waveform；
4. Press left/right key to select storage position as 1；
5. Press key F3 to save, storage success indicated on screen means save successful and waveform shall be stored into oscilloscope；

Waveform callback

6. Press key SHIFT and character shift will appear on the right upper corner of screen；
7. Press key REF to enter into reference waveform callback set menu

8. Press ⌊left/right⌋ key to select storage position as 1；

9. Press key ⌊F3⌋ to callback, Load Success indicated on screen means callback successful and waveform shall appear on screen；

10. Press key ⌊F4⌋ to close reference waveform.

Cursor Measurement

To callback waveform under the following steps:

1. Press key ⌊SHIFT⌋ and character shift will appear on the right upper corner of screen；

2. Press key to enter into cursor set menu；

3. Press key ⌊F3⌋ to select cursor measurement type；

There are two cursor measurement types in cursor measurement menu: voltage and time.

In measuring voltage, you can use key ⌊SELECT⌋ on board and ⌊up/down/left/right⌋ key to adjust cursor position respectively, it means to measure ΔV, if select time , you can measure Δt.

Voltage/time measurement method: when cursor 1or 2 appear at the same time, adjust cursor position with the ⌊up/down/left/right⌋ key and press key ⌊SELECT⌋ to select cursor. Reading displayed shall be voltage or time value between the two cursors.

If cursor function is open, measurement value shall appear automatically on the left upper corner of screen.
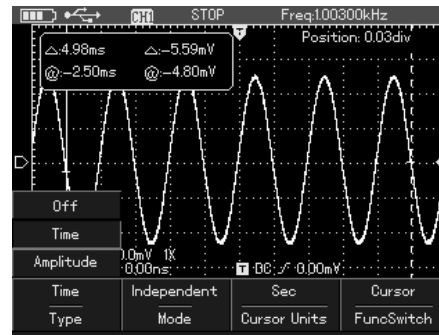
Picture 6-28 Time Cursor Measurement Menu

Table 6-15

Function menu	Set	Instruction
Types	Time	Cursor used to measure time
Modes	Independent	To shift any one of two cursors independently
	Tracking	To shift two cursors concurrently,maintaining Δt
Cursor Units	Second	Measurement parameter is time
	Hz	Measurement parameter is frequency
Function switch	Channel	To select shift target as channel waveform ;
	Trigger	To select shift target as trigger level ;
	Cursor	To select shift target as measuring cursor ,and press key SELECT to switch cursor 1 and 2.
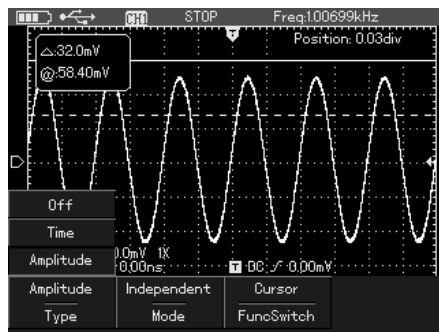
Picture 6-29 Voltage Cursor Measurement Menu

Table 6-16

Function menu	Set	Instruction
Types	Amplitude	Cursor used to measure voltage
Modes	Independent	To shift any one of two cursors independently
	Tracking	To shift two cursors concurrently,maintaining Δt
Function switch	Channel	To select shift target as channel waveform ;
	Trigger	To select shift target as trigger level ;
	Cursor	To select shift target as measuring cursor , and press key SELECT to switch cursor 1 and 2.

Interface Set

To set oscilloscope display interface under the following steps :

1. Press key SHIFT and character shift will appear on the right upper corner of screen ;

2. Press key CONFIGURE to enter into interface set menu.

Table 6-17

Function menu	Set	Instruction
Language	Multi-lingual	Select menu language types
Skin	Classic, traditional, modern and black white	Select display style
Menu display	____	Set awaited close time for menu box：5s、10s、20s and manul；The last one can not close automatically and need to press key OK to close or open.
Version	____	Display informations such as oscilloscope types, hardware version,software version etc.

Auxiliary Function Set

To set oscilloscope display interface under the following steps:

1. Press key SHIFT and character shift will appear on the right upper corner of screen；

2. Press key UTILITY to enter into auxiliary functino set menu.

Set as follows:

Table 6-18

Function menu	Set	Instruction
Self Cal...	____	Implement system self-Adjust
Default set	____	Oscilloscope back to factory set status
Cymometer	On Off	Open/close trigger frequency count
Erase Data	____	Delete data information saved in the apparatus such as waveform, set etc.

Major instructions:

Self-correction: it can correct oscilloscope-produced measurement error resulted by environmental changes, you can operate the program based on need. For more accurate calibration, please power on oscilloscope and wait preheat 20 minutes.

Full automatic set: the oscilloscope shall adjust apparatus gear automatically with the changes of input signal and display the waveform in the fittest form without manual intervention.

Mathematic Operation Function

Mathematic operation function is used to display operation results of channel waveform FFT.

To conduct mathematic operation under the following steps:

1. Press key MATH to open mathematic operation menu;

2. Press key F1 to select FFT operation as open.
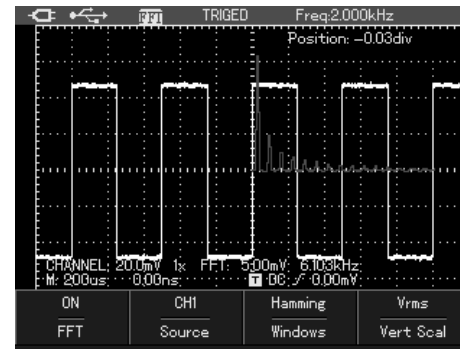
Picture 6-30 FFT operation

Set as following table:

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Table 6-19

Function menu	Set	Instruction
FFT	On Off	Open/close FFT operation function.
Source	————	Select information source involved in operation when it is dual channel model.
Windows	Hanning Hamming Blackman Rectangle	Set Hanning window function Set Hanning window function Set Blaclman window function Set Blaclman window function
Vert Scal	Vrms dBVrms	Set vertical coordinate unit as linear or vdb

FFT frequency analysis

Use FFT (fast Fourier transform) mathematic operation to transform time-domain signal into frequency-domain signal.

It is convenient to observe the following types of signals by using FFT:

● Measure harmonic content and distortion
● Indicate noise property in DC power
● Analyze vibration

FFT operation techniques

As signal containing DC component or bias will result in mistakes or bias in FFT waveform components, in order to reduce DC components, you can select AC coupling. For reducing random noise and aliased frequency components in the repeat or single pulse event, you can set oscilloscope's acquisition mode as average.

Select FFT window

Suppose YT waveform is repeating continuously, oscilloscope takes FFT transformation of the time record with limit length. When the period is an integral, ampliltude value of YT waveform remains the same at thestart and finish, the waveform shall not discontinue.

Table 6-20

FFT window	Characteristics	Fittest contents for measurement
Hanning	Compared with rectangular window, it has good frequency resolution and inferior amplitude resolution	Sine, period and narrow band random noise.
Hamming	Frequency resolution of Hamming window is rather better than that of Hanning window.	Transient or short pulse, signal level varies greatly before/after it.
Blackman	With the best amplitude resolution and worst frequency resolution.	Mainly used for single frequency signal to find higher order harmonics.
Rectangle	With the best frequency resolution and worst amplitude resolution.	Transient or short pulse, signal level remains the same basically. constant amplitude sinusoid with similar frequency carries broadband random noise of wave spectrum with slow changes

Nouns explanations：

FFT resolution: it is the quotient of acquisition and operation point. When operation point count is fixed, the lower the acquisition rate is, the better the FFT resolution is.

Nyquist frequency (NYQUIST)：for waveform with highest frequency f, it is required to use acquisition rate at least 2f to reconstruct original waveform. It is called the Nyquist Creterion, the f represents Nyquist frequency and 2f the Nyquist acquisition rate.

Automatic Set

It is used to simplify operation. Press key , the oscilloscope will adjust vertival bias coefficient and horizontal time base gear based on the amplitude and frequency of waveform automatically and will display stable waveform on screen. The system automatic set are as following：

Table 6-21

Function menu	Set
Acquisition mode	Normal acquisition
Display format	YT
s/div	Adjust according to signal frequency
v/div	Adjust according to signal amplitude
Trigger mode	Edge
Trigger level	Signal midpoint
Trigger coupling	DC
Trigger slope	Rise
Trigger type	Automatic

Chapter VII Troubleshooting

Oscilloscope Fails To Start

Battery electricy might be depleted. Supply power for oscilloscope with the adapter and try to open oscilloscope. If it fails to start again, please contact with UNI-T and we will serve you.

Oscilloscope Shuts Down Several Seconds after Start

Battery electricy might be depleted. Check the battery electricity symbol on the right upper part of screen. If symbol indicates battery is depleting, charge it.

The Measured Voltage Amplitude Value Is 10 Times Higher Or Lower Than Real Value:

Check if channel attenuation coefficient meets with attenuation multiplying power of the probe being used.

After Signal Collection, Signal Waveform Fails To Appear In Picture, Please Operate Under The Following Steps:

1. Check if probe is in normal connection with signal connection line.
2. Check if signal connection line is in normal connection with BNC (channel connector)
3. Check if probe is in normal connection with object being measured.
4. Check if any signal produced by the object being measured (to confirm the problem by connecting channel with signal with the problematic channel)
5. Restart collecting signal once.

Unstable Waveform Display:

1. Check the trigger source set in trigger menu, to confirm if it is consistent with channel input by real signal.

2. Check trigger type: the common signal shall use edge trigger mode and vedio signal vedio trigger mode. Waveform will display stably only with correct trigger mode.

3. Try to change trigger coupling into high frequency restriction, remove high frequency noise that interferes trigger.

without Display after Pressing Key RUN/STOP

1. Check if trigger method in trigger menu is at the normal or single gear and if trigger level exceeds waveform scope. If so, center trigger level or set trigger method as automatic gear.

2. Press key to complete above settings automatically.

After Select Opening Average Acquisition Method Time, Display Speed Slows Down:

1. Generally, it is normal to slow down when average frequency is over 32.

2. Reduce average frequency.

Waveform Displays in Echelonment:

1. It is normal and probably caused by low horizontal time base gear and could be improved by increasing horizontal time base to improve horizontal resolution.

2. Probably the display type is vector, lines between acquisitions points might result in the echelonment display. It can be solved by setting display type as point display method.

Chater VIII Service and Support

Product Program Upgradation

Two ways to acquire program upgradation package: from UNI-T company market department or via company website, the user can upgrade program of the present oscilloscope by the embedded program upgradation system in the oscilloscope to make sure that program of the present oscilloscope is the newly published program version of UNI-T company.

Preparations before Upgradation:

1. Own an UTD1025CL oscilloscope produced by UNI-T and acquire the type, hardware and software vision information of the present oscilloscope through the system information menu box under the CONFIGURE menu.

2. To acquire from UNI-T company market department or via company website the program upgradation package that type and hardware version is identical to the oscilloscope being upgraded and software version is bigger than that of the present oscilloscope.

Program Upgradation Conditions

1. Product type of the program upgradation package shall be in accord with that of the oscilloscope being upgraded.

2. Hardware version of the program upgradation package shall be in accord with that of the oscilloscope being upgraded.

3. Software version of the program upgradation package shall be bigger than or equal to that of the present oscilloscope.

Program Upgradation

1.Install the home computer software in disk correctly in accordance with the home computer installation instruction;

2. Copy the prepared program upgradation package (with suffix .upp) into the computer. The program upgradation package shall be acquired by downloading from UNI-T official website and from UNI-T market department.

3. Connect oscilloscope with computer by USB wire and open the home computer software, click button Connect Button in the home computer software interface to realize normal communication between it and oscilloscope. After successful connection, home computer indicates USB connection successful.
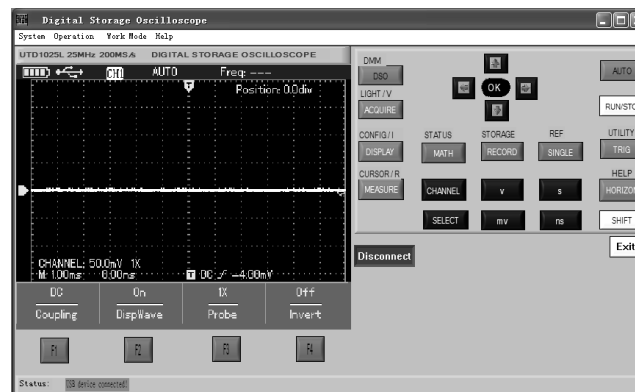
Picuture 8-1 Connect With Home Computer

4. by selecting option Operate→Program Upgradation in home computer software menu, select the program upgradation package copied into computer, oscilloscope program starts upgradation, the home computer indicates " in upgradation, please await… ".
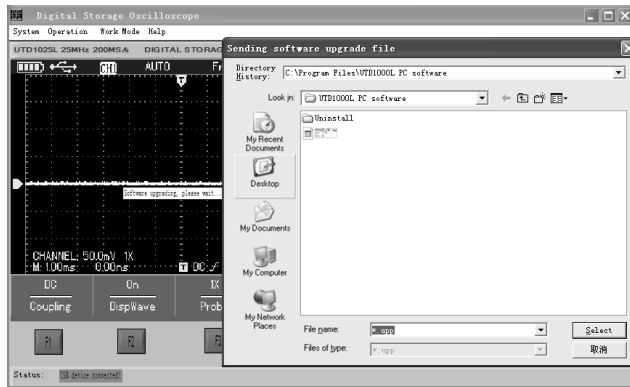
Picture 8-2 Program Upgradation

5. After upgradation, oscilloscope display shall appear indication：upgradation successful. No operation to the oscilloscope at the moment, and restart it, the program upgradation is completed.
Notes:
1. When there is any mistakes about program upgradation package, home computer shall indicate： mistakes about upgradation files, please check it. The oscilloscope shall stop upgradation and the program version shall not change before storage.
2. If communication disconnection from home computer, power-off of oscilloscope or computer etc. during the upgradation, oscilloscope shall stop it and the program version shall not change before storage.

Chapter IX Appendix

Appendix A Performance Index

Unless otherwise stated, all technic specifications shall apply to probe with attenuation switch being set 10   and UTD1025CL series of digital oscilloscope. Digital oscilloscope reaches those specifications and standards only if meet the following two conditions：

■ The instrument shall be in continuous operation more than 30 minutes under the stipulate operation temperature.

■ If operation temperature shift reaches to or over 5 degrees, the system function menu shall be opened to implement the Self-correction procedure and except the specification labeled with character Typical, all specifications shall be guaranteed.

Technical:

Oscilloscope

Acquisition mode	
Acquisition mode	Real-time acquisition
Acquisition rate	200MS/s
Acquisition	Acquisition, peak peak test, average
Average value	All channels reach N times of acquisition concurrently and N should be chosen among 2、4、8、16、32、64、128、256

Input	
Input coupling	Direct current, alternative current, ground (DC、AC、GND)
Input impedance	1 2%MΩ, connect with 20 3PF in parallel
Probe attenuation coefficient setting	1X,10X,100X,1000X
Maximum input voltage	300V(DC＋AC peak value、input impedance 1MΩ)
Time delay in channel(typical)	50ps

Horizontal	
Waveform interpolation	sin(x)/x
Record length	3.5M
Storage depth	12K
Scanning sope (S/div)	10ns/div-50s/divWith 1-2-5 system
Acquisition rate and delay time accuracy	50ppm(any time interval ≥1ms)
Time interval (△T) measure accuracy (full bandwidth)	Single： (1 sampling time interval 50ppm reading+0. 6ns) ＞16 average value： (1 acquisition time interval 50ppm reading+0. 4ns)

Vertical	
Analogue digital transformer(A/D)	8 bit resolution
(V/div)Deflection coefficient (V/div)scope	5mV/div～20V/div(at the input BNC port)
Shift sope	5mV/div～100mV/div: 1.2V;200mV/div～1V/div: 24V;2V/div～20V/div: 240V
Analogue bandwidth	25MHz
Single bandwidth	25MHz
Low frequency response(AC coupling,−3dB)	≤10Hz(at the input BNC port)
Rise time	≤14ns
DC current gain accuracy	Vertical sensitivity is 5mV/div: 4%(acquisition or average value acquisition mode);Vertical sensitivity is 10mV/div～20V/div: 3% (acquisition or average value acquisition mode)
DC measurement accuracy (average value acquisition mode)	Vertical shift is zero and N≥16: (4% reading+0.1 grid+1mV)and select 5mV/div; (3% reading+0.1 grid+1mV) and select 10mV/div～20V/div. Vertical shft is not zero, N≥16: [3% (reading+vertical shift reading)+(1% vertical shift reading)]+0.2div set from 5mV/div to 200mV/div+2mV;Set value ＞200mV/div to 20V/div+50mV.
Voltage difference (△V) measurement accuracy(average sampling mode)	Under the same set and environmentconditions ,after gaining the average value of the ≥16 captured waveform, voltage difference between any two points (ΔV)is: (3% reading+0.05div)

Oscilloscope

Trigger	
Trigger sensitivity	≤1div
Trigger level scope	To screen center 10div
Pretrigger ability	Normal mode/scanning mode, pretrigger/delay trigger pretrigger depth are adjustable
Holdoff scope	100ns - 1.5s
Edge trigger	
Edge type	Rise edge, fall edge

Pulse width trigger	
Trigger mode	(> , < , =) positive pulse width, (> , < , =)negative pulse width
Pulse width scope	20ns-10s
Vedio trigger	
Trigger sensitivity (vedio trigger, typical)	2divs peak-to-peak value
Signal system and horizontal/vertical frequency (vedio trigger type)	Support standard NTSC and PAL, Scope horizontally 1-525(NTSC) and 1-625(PAL)
Slope trigger	
Trigger condition	<(smaller than), >(bigger than), =(equal to)
Slew rate scope	40pV/µs～1.6kV/µs

measurement		
Cursor	Manual mode	Voltage difference between cursors(ΔV),time difference between cursors(ΔT)
		Reciprocal of ΔT(Hz) (1/ΔT)
	Automatic measurement mode	Allowable to display cursor in automatic measurement.
Automatic measurement		Measurement includes: Peak peak value, amplitude value, maximum value, minimum value,top value, bottom value, medium value, , average value, mean square root value, overshoot, preshoot, frequency, period, rise time, fall time, positive pulse width, negative pulse width, +duty ratio, −duty ratio (19 items).
Measurement of designated parameter		4 types
Mathematic operation		FFT operation
Store waveform		10 groups of interface storage, 20 groups of waveform storage；screen print function
Record waveform		5 groups of recorded waveform storage
FFT	Window	Hanning, Hamming, Biackman, Rectangular
	Acquisition point	512 points

Multimeter

The accuracy of all measurements is within

（%ofreading＋number of counts）from15℃to 25℃.

Add 0.1　(specific accuracy) for each℃below15℃　or above 25℃.

DC　voltage

Input impedance: 10MΩ.

Maximum input voltage: DC 400V

Range	Accuracy
400.0mV	(1%＋5 character)
4.000V	
40.00V	
400.0V	

AC voltage:

Input impedance：10MΩ.

Maximum input voltage: AC 400V valid value.

Frequency scope: 40Hz to 400Hz

Display: sine wave valid value

Range	Accuracy
400.0mV	(1.2%＋5 character)
4.000V	
40.00V	
400.0V	

DC current:

Maximum input DC current: DC 10A

Range	Accuracy
μA	(1.2%＋5 character)
mA	(1%＋5 character)
10A (use UT−M07 10A CURRENT DIVIDER)	(1.5%＋5 character)

AC current

Maximum input DC current: AC 10 A valid value

Frequency scope: 40Hz to 400Hz

Range	Accuracy
μA	(2%＋5 character)
mA	(1.5%＋5 character)
10A (use UT−M07 10A CURRENT DIVIDER)	(2.5%＋5 character)

Resistance

Range	Accuracy
400.0 Ω	(1.2%＋5 character)
4.000kΩ	
40.00kΩ	
400.0kΩ	
4.000MΩ	
40.00MΩ	(1.5%＋5 character)

Capacitance

Range	Accuracy
51.20nF	(3%＋5 character)
512.0nF	
5.120uF	
51.20μF	
100μF	

Diode:

Voltage reading: 0 V to 1.5 V

Continuity test:

Circuit interruption resistance value is set as: ＞

75Ω, buzzer remain silent；Good circuit connection, on-resistance value is: ≤10Ω, buzzer sounds continuously.

Display	
Display types	3.5inch TFT crystal display
Display resolution (display)	320 horizontal RGB 240 vertical picture element
Display color	Color/black & white
Waveform display area	Horizontal 12 grids, 25dot/div；vertically 8 grids, 25dot/div
Backlighty brightness	Adjustable
Backlight intensity	300nit
Display language types	Chines English

Port function	
tandard configuration	An UT-M07 10A CURRENT DIVIDER；an USB connection wire；
Fittings	－－－－

Power	
Power voltage	100~220 V AC rms,45~440Hz
Output voltage	9VDC
Output current	4000mA

Battery: 7.4 V, 3600mA rechargeable lithium ion battery with more than 8 hours power supply.

Environment	
Temperature	Operation: 0℃～+40℃
	Non-operation: −20℃～+60℃
Cooling method	Natural cooling
Humidity	+35℃:≤90%
	+35℃～+40℃:≤60%
Height	Operation: 3，000m
	Non-operation: 15，000m

Mechanic specifications		
Dimension (reference data)	199mm　118mm　49mm	
Weight (net weight)	Exclusive of package	0.9kg
	Inclusive of package	2.3kg

IP protection
IP2X

Adjustment interval
Calibration interval is one year (recommended)

Appendix B Maintenance and Cleaning

General Maintenance

Please do not store or put the instrument on the place where the monitor would be exposed to sunshine for a long time. Be careful: keep the instrument or probe away from the sprays, fluids and solvents to guard against damage to the instrument or probe.

Clean

Check the instrument and probe usually in accordance with the operation status and clean the instrument surface under the following steps:

1. Please wipe dust on the instrument and probe with the soft cloth and do not scrap the transparent LCD protection screen.

2. Please power off when clean the instrument with the wet cloth without dripping. The soft detergent or clean water could be used to clean the instrument instead of any corrosive chemical detergent which might damage the instrument or probe.
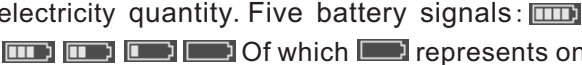
Warning：Before using the apparatus after being powered on again, please confirm that it has been dry, guarding against the electric short circuit caused by water and even the personal hurt.

Deposite Oscilloscope

It is required to recharge lithium ion battery before deposit the oscilloscope if want to deposite it for a long time.

Recharge Battery

In delivery, lithium ion battery may not be recharged enough. To maintain enough battery electricity, recharge it 4 hours, after that, the battery shall supply power at least 8 hours.

Supply power by the battery, the battery indicator on the top of screen indicates the usage of electricity quantity. Five battery signals：▯▯▯▯ ▯▯▯ ▯▯ ▯▯ ▯ Of which ▯ represents only five minutes usage time left. If need to recharge battery and supply power for apparatus, please to recharge battery by connecting adapter with oscilloscope.

Notes:
To guard against overheat in recharging battery, the ambient temperature shall not exceed the allowable value(0℃～+40℃) stipulated in the technical specification.

Notes:
It shall not result in any danger in long-time connection with recharger, for instance during a whole weekend,The apparatus shall switch to slow recharge status.

Replace lithium ion battery
Usually it is unnecessary to replace batteries, if necessary；it shall be replaced by the qualified personnel and by the lithium ion battery with same specification.

This user manual may be revised without prior notice.

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