JINHAN ELECTRONIC CO.,LTD

Brief introduces---AD020 Series

Preface

Dear User,

Hello!First of all, thank you for purchasing JINHANIC instrument. In order to use this instrument properly, please read this manual in detail before using this instrument, especially the "safety precautions" section.

If you have read this manual, it is recommended that you keep it properly for future reference.

Content abstract:

This manual introduces the operation information of ADO series digital hand-held oscilloscope.The manual includes the following chapters:

◆Safety and Points for Attention.

◆Getting start guide:The front panel, user interface, function inspection and probe compensation of digital hand-held oscilloscope and multimeter are introduced.

◆Function introduction and operation: the function and operation of general purpose oscilloscope, automobile oscilloscope and multimeter are introduced in detail.

◆The home page features.

◆Applicantion example:Some measurement examples are provided for your reference.

◆System prompt and troubleshooting.

◆Service and support.

◆Appendix:

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Chapter 1
Safety warning and Points for Attention.

1.1 Safety Precautions

To understand the following safety precautions to avoid personal injury, and to prevent damage to the product or any other product connected with it, please be sure to use this product in accordance with the relevant provisions.

● Only the trained personnel can run maintenance procedures.

● Avoid fire and personal injury.

● Use the right power cord (Please use the power cord specially designed for this product and certified by your country).

● Connect the probe correctly (The probe ground wire is the same as ground potential. Do not connect the ground wire to high voltage. And do not touch exposed contacts and parts during testing).

● Ground the product (In order to avoid electric shock, the instrument must be connected to the earth through a ground wire).

● Check all terminal ratings (In order to avoid the impact of fire and excessive current, please have a read of product manual contain all ratings and markup information, before you Connect the product to learn more about ratings).

● Correct probe(To avoid shock of excessive current, use the correct rated probe for measurement).

●Disconnect AC power Avoid fire and personal injury. (The adapter can disconnect the AC power and the user must be able to reach the adapter at any time).

● Use the right power cord (Please use the power cord specially designed for this product and certified by your country).

●Do not disassemble and run.(Do not operate the outer cover or panel if it has been removed.)

●Do not operate when the product is suspected to be out of order.(If the product is suspected to be damaged, please ask the maintenance personnel designated by JINHAN to check it.)

● Charge the battery properly.(Charge the battery according to the power adapter specified by JINHAN and the recommended charging period.)

● Avoid contact with exposed circuits.(When the product is powered on, do not touch any exposed contacts and parts.)

● Maintain good ventilation.

●Do not use in moist environment.

●Do not use in inflammable and explosive environment.

●Please keep the surface clean and dry.

WARNING

● ADO20 series oscilloscope can there is no direct link next to the main circuit of the power grid is measured Not from the main power supply circuit, for example, or from the mains, but after the special protection circuit (internal). In the latter case, the instantaneous stress changes;As a result, the user should understand the moment capacity of equipment AD020 series digital oscilloscope design can safely withstand accidental 750 largest VPK instantaneous overvoltage don't use this equipment in an instant overvoltage exceeds the value of measurement circuit.

1.2 Security terms and symbols

Terms in this manual (The following terms may appear in this manual)

 WARNING (The statement said operations and actions that may cause human injury or endanger life safety.)

ATTENTION (The statement indicates actions and actions that may cause damage to the product or other products.)

Product terms (The following terms may appear on the product)

a、Danger: Represents the immediate harm that occurs when you read this tag.

b、Warning: Represents damage that will not be caused immediately when you read this tag.

c、Attention: Indicates that it may cause damage to the product or other property.

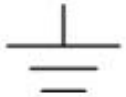
The symbol on the product(The following symbols may appear on the product)

Warning high pressure

refer to the manual

protective ground

shell ground end



Measuring ground

Please read the following safety precautions to avoid personal injury, and to prevent the product or damage in connection with any of the other products, in order to avoid the possibility of danger, this product only can be used within the prescribed scope.

WARNING!

If the input port of the instrument is connected to a voltage above 42V or a power over 4800VA, to avoid electric shock or fire:

- The insulated voltage probe supplied with the apparatus shall be used, or the same product specified in the attached table shall be used.
- Prior to use, check the voltage probe, stylus and accessories for mechanical damage. If any damage is found, please replace it.
- Detach all unused voltage probes and accessories.
- Plug the battery charger into the ac power socket and connect it to the instrument.

Chapter 2
Getting start guide for Oscilloscope.

The ADO20 series digital hand-held storage oscilloscope is a small, portable device that provides users with a convenient and easy-to-use android system and touch screen.

This chapter mainly describes how to perform the following tasks:

▲ Gets a preliminary understanding of ADO's front panel and user interface.

▲ perform a brief functional check.

▲ Parallel probe compensation.

▲ Horizontal matched probe attenuation system.

2.1 A preliminary understanding of the front panel and user interface for the ADO20 series.

Before the use of ADO series digital oscilloscope, first of all to understand the following content before the operation of oscilloscope panel for the operation and function of the front panel ADO20 series of simple description and introduction, to make you in the shortest possible time familiar with the use of this kind of oscilloscope.

1.Front panel and top.

F1-F5: keyboard shortcuts

F1: oscilloscope AUTO/STOP shortcut key

F2: Time base - shortcut key

F3: Time base + shortcut key

F4: Vertical lattice

F5: Vertical lattice

Red button: Power

Top:

CH1-CH4: Chnnel 1-4

CH1: Standard calibration signal

CH2: Standard calibration ground

CH3: Multimeter positive pole

CH4: Multimeter negative pole

1KHZ: Calibration probe

2、Side panel and back panel

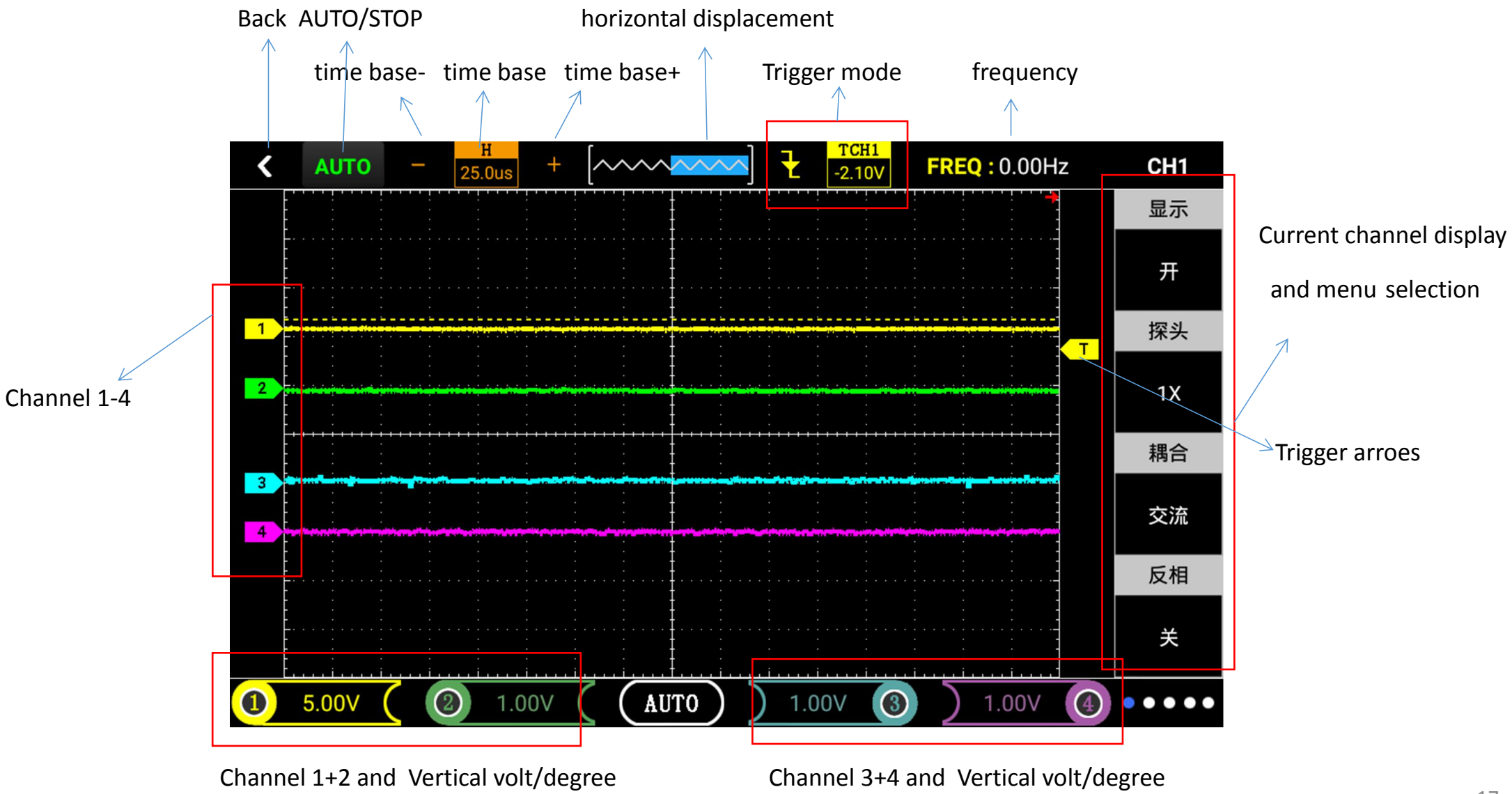
Side panel

back panel

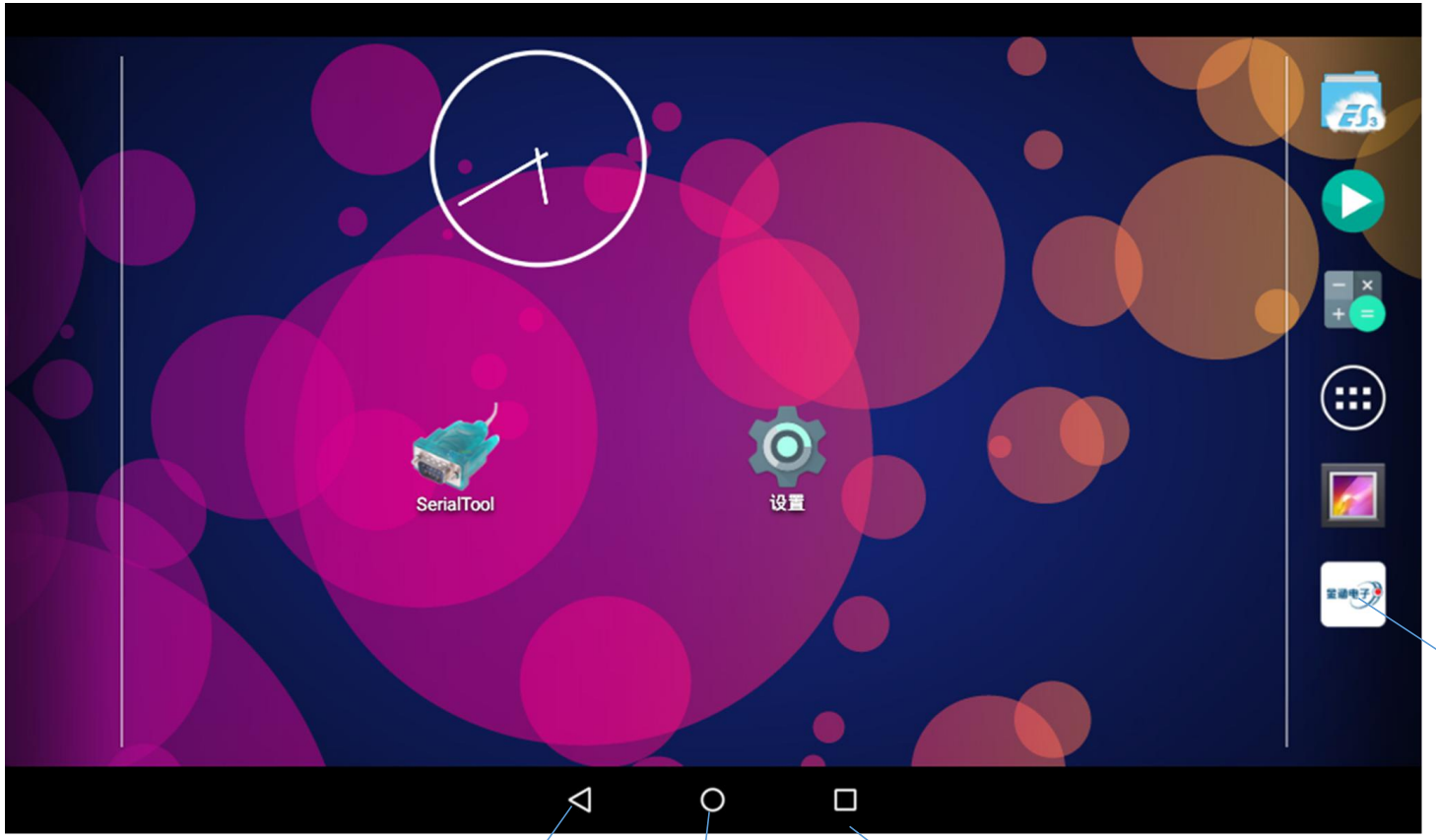
information of oscilloscope

Stand

3、User interface introduction



Note: after pulling down from the top, three ICONS will appear at the bottom of the screen as shown in the figure below.



2.2、 Probe

2.2.1、 The safety of the probe

The protection settings around the probe body can protects the finger from electric shocks.

Connect the probe to the oscilloscope and ground the grounding end before making any measurements.

(Note: the attenuation gear of the probe and oscilloscope must be consistent.)

2.2.2、 Probe compensation (See details in the probe manual, the factory has been calibrated.)

In the first connect the probe to any input channel, this adjustment is required, is the probe to the input channel

Without compensation correction probe will lead to a measurement error or mistakes If the adjustment probe compensation, please click the following steps.

Chapter 3
Function introduction and operation

According to the functional framework, this chapter is divided into the following four modules to introduce oscilloscope: Automobile oscilloscope、universal oscilloscope、multimeter 、endoscope.

3.1、Automobile oscilloscope

The functions of this section of automobile oscilloscope are introduce as follows:

Ignition	sensor	actuator	Bus
1、primary ignition 2、secondary ignition 3、primary and secondary ignition 4、Primary ignition (current) 5、ignition timing 6、Ignition timing and primary ignition 7、Ignition timing and crankshaft 8、Double cylinder secondary ignition	1、Crankshaft and Position 2、Vehicle speed senso 3、Oxygen sensor 4、Throttle position sensor 5、Air flow meter 6、Manifold absolute pressure 7、knock sensor 8、Accelerator pedal 9、Water temperature sensor	1、Electoromagnetic valve 2、Gasoline and natural gas 3、Diesel common rail 4、Gasoline nozzle(voltage and current) 5、Gasoline, diesel, natural gas (natural gas) 6、Variable valve timing	1、CAN-high CAN-low 2、LIN-bus 3、K-Line 4、FlexRay

Note:In the unclear of the measured signal voltage signal voltage, can use first multimeter (this series oscilloscope with multimeter functions), according to measured values, the multimeter to set the oscilloscope and probes attenuation ratio In this paper, the functional test waveform match figure measured the dodgers cool is a 2.4 L version, due to the different models to measure the waveform is different, so there are differences Two kinds of measurement signals at the same time, the low frequency signal can be assumed to be triggered source to ensure the stability of the waveform (change the trigger source, press the trigger button can be changed)

1、Quick action guide

Key points of setting :(oscilloscope is equivalent to a two-dimensional meter, the horizontal axis represents time, and the vertical axis represents voltage measurement.

1）Waveform height adjustment (amplitude): click the corresponding channel first, then slide your finger up and down, or adjust by F4 or F5 keys.

2）Up and down of the waveform as a whole: click the corresponding channel first, and then adjust by moving the finger up and down.

3）The entire waveform moves left and right: the finger clicks on the left and right side of the screen to slide.

4）Waveform density adjustment (time base): finger click the screen to slide in or out, can be adjusted by F2 or F3 keys.

5）Waveform shaking elusive: selected trigger arrow icon, right of the screen by moving up and down again, would trigger the arrow moves to waveform relatively suitable location until the waveform is stable, is usually aligned with the zero potential on the left or the location of the point above and trigger source must be corresponding channel (trigger function in the process of the automobile circuit detection use very frequently, must be familiar with)

6）Wave freeze playback check: first click the AUTO/STOP icon at the top left of the screen or press the F1 key, and finally click the screen to move horizontally to check whether the crankshaft is toothless.

7）When two signals with a large difference in frequency are measured, the waveform of a channel may shake. At this point, the trigger channel needs to be changed to a signal source with a slow frequency.Such as simultaneously measuring crankshaft and camshaft signals;Ch1 is connected with the crankshaft, and ch2 is connected with the camshaft. Click the trigger icon on the screen to enter the menu and change the trigger source to ch2.Then click on the screen trigger arrow for fine tuning.

Supplement:

There are five kinds of signals on the car circuit.

1) DC signal (DC): for example, the reference voltage of the sensor output from the battery voltage control module (PCM);

2) AC signal (AC):abs speed sensor magnetoelectric crankshaft and camshaft position sensor detonation sensor;

3) frequency modulation signal: digital air flow sensor hall speed sensor hall crankshaft and camshaft position sensor;

4) pulse width modulation signal: primary ignition coil injection nozzle various electromagnetic valves;

5) serial multiplexed signal :CAN/LIN bus.

Five criteria for judging automotive electronic signals.

1) the voltage of amplitude electronic signal at a certain instant;

2) the frequency of electronic signals between two events or cycle time, generally refers to cycles per second (Hertz)

3) pulse width of the signal arising from electronic time or space than

4) shape the appearance of electronic signal characteristics;Its curve contour and ascending edge descending edge are equal to

5) columns forming the repetition mode of special information signal

Trigger is introduced

Trigger: And in order to synchronize the scanning signal and measured signal, can set some conditions, the measured signal is constantly compared with those conditions, only when the measured signal to satisfy the conditions to start scanning, so as to make the scanning frequency is the same as the measured signal or exist integer times, which is synchronous Is called a trigger, the technology that we call the trigger condition.

Trigger condition: used as the trigger condition in the form of many, the most commonly used is the most basic edge trigger, the change of the measured signal (i.e., signal rising or falling edge) compared with a certain level, when the signal changes in some selected way to achieve the electricity at ordinary times, generate a trigger signal, start a scan trigger level can be selected in the 0 v, when the measured signal from low to high across the electricity at ordinary times, have a scan, thus obtained and measured signal synchronous scanning signal .

trigger mode:Automatic refers to whether meet the trigger condition, real-time refresh waveform, the waveform oscilloscope screen usually appear to be normal shake refers to satisfy the trigger condition to trigger, stationary wave, the single refers to capture only meet the waveform of the trigger condition, for the first time will stop after capture.

2、Function of ignition.

(1) Ignition is introduced.

1) Type of ignition system

The traditional ignition system with a distributor has long been used in cars and has been gradually replaced by a direct ignition system (DIS).

There are three types of direct ignition systems.

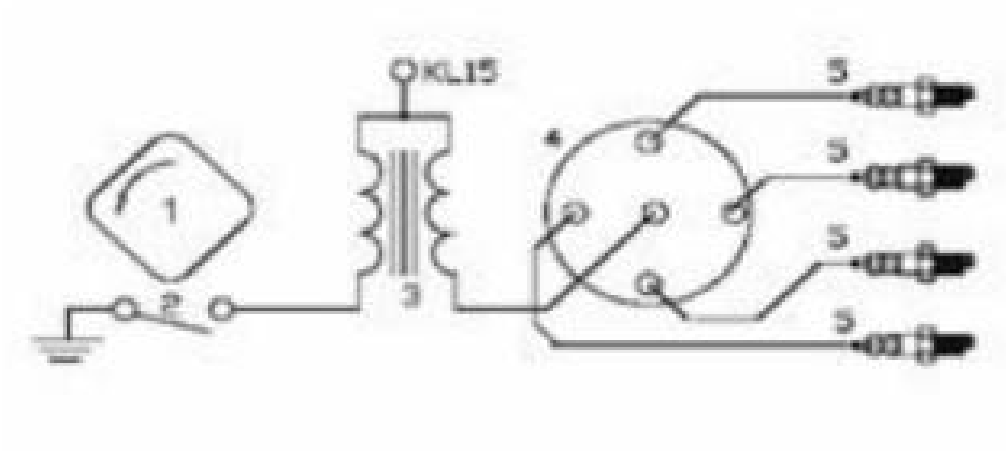
▲ The dual ignition system (DEC) using double-end output ignition coils is used.

▲ Single ignition system (CPC) using single end output ignition coils.

▲ The integrated ignition system (COP) using integrated spark plugs.

The common feature of these three ignition systems is that the output of the ignition coil is sent directly to the spark plug without passing through the distributor.

2) traditional ignition system



1、**Cam**

2、Breaker

3、Ignition coil

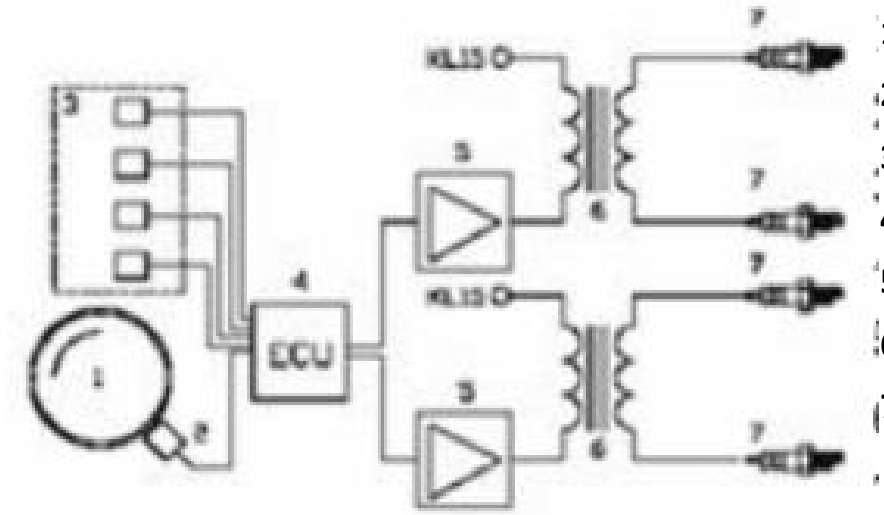
4、Distributor ignition

5、Ignition plug

Conventional ignition system is mainly composed of CAM battery circuit breaker distributor spark plug ignition coil electricity needed by the battery supply is the function of the ignition system, CAM and circuit breaker connected or disconnect the ignition system to store power ignition coil ignition energy and the battery voltage into the role of high voltage circuit breaker is connected or ignition cutoff point coil primary circuit;Is the role of distributor ignition coil produced by high pressure according to the working order of the engine ignition to each cylinder spark plug plug to the introduction of the ignition pressure cylinder combustor, and produce electric spark between the electrodes, ignite combustible mixture.

This ignition system has the advantage of relatively easy maintenance detection.one disadvantage is the mechanical parts and electric ignition introduced high-pressure cylinder combustor, and produce electric spark between the electrodes, ignite combustible mixture this ignition system has the advantage of relatively easy maintenance detection, one disadvantage is the mechanical parts and electrical contact easy to wear and tear, short life and high pressure connection part is easy to damage.

3）Dual ignition system (DEC)



1、Impeller

2、Impeller sensor

3、Other sensors

4、Ignition control template

5、Ignition amplifier

6、Ignition coil

7、Ignition plug

Dual ignition system completely composed of electronic devices, there is no mechanical parts every two Shared a cylinder ignition coil and secondary coil of two electrodes, respectively, by a spark plug. That is to say, there are always two spark plug ignition at the same time, one of the cylinder at a normal ignition, another in the process of the cylinder is in the exhaust waste (spark) in the exhaust gas, in the exhaust of the cylinder pressure is close to the air pressure, only a very low ignition voltage, little waste of electricity.

Dual ignition system is one of the advantages of low malfunction, almost do not need to maintain another advantage is the ignition system of adjustable, less in the waves of the radiation of the performance, fuel consumption low defect is still need high tension line and spark plug connector these places are still problematic.

4) Single ignition system (CPC) and integrated ignition system (COP)

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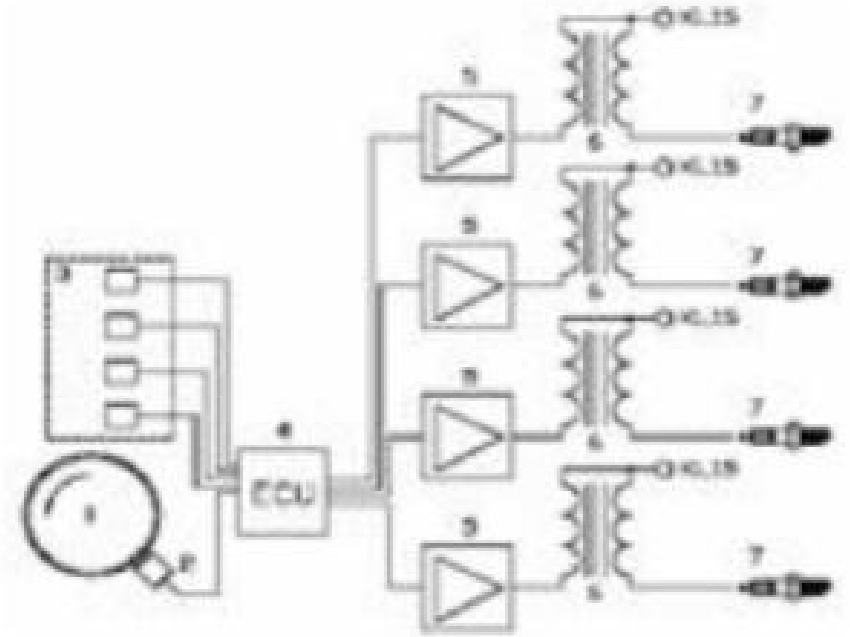


1、Impeller

2、Impeller sensor

3、Other sensors

4、Ignition control template

5、Ignition amplifier

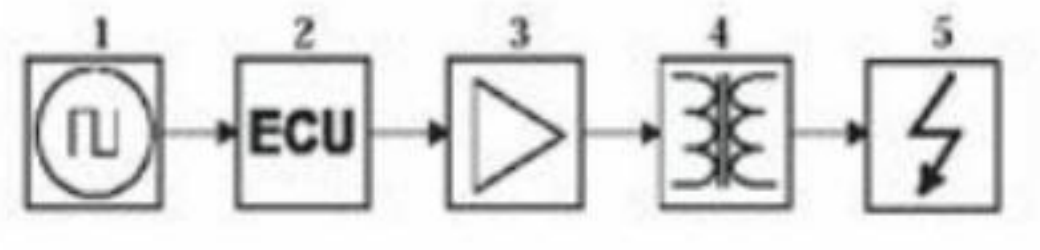
6、Ignition coil

7、Ignition plug

Each cylinder has an independent ignition coil, which is the most advanced ignition system today. This ignition system is divided into two types: single ignition (CPC) integrated ignition (COP);The integrated ignition system integrates the ignition coil into the spark plug, and the single ignition is connected from the ignition coil to the spark plug by a high pressure wire.\

5）Ignition principle

▲ Electronic ignition



1、Signal emitter

2、Ignition control module（ECU）

3、Ignition amplifier

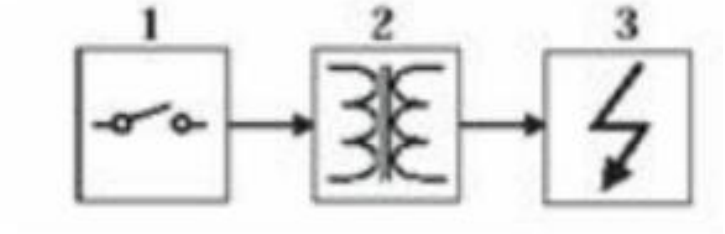
4、Ignition coil

5、High pressure wire and spark plugs

Electronic control ignition system with a set of sensors to collect information related to the engine, such as temperature and engine speed cooling load such as position sensor and speed sensor is ignition system needs to be the most important information, the information from the impeller sensors or camshaft sensors ignition control module according to the collected information to calculate the ignition time and charging time.

If a sensor is not normal work, will cause the output signal is not correct, so the modern control module to check whether sensor signal from authentic, if there is not credible signal may not be any output signalIgnition control module of the output signal cannot be directly drive the ignition coil, go through the ignition amplifier amplification, in fact, usually the ignition amplifier installed within the ignition coil, in this case the primary ignition signal is measured;Or it is installed in the ignition control module. In this case, the output signal of the ignition control module cannot be detected. Therefore, it is particularly important to detect engine failure and performance through secondary ignition signals.

▲ **Mechanical ignition system**

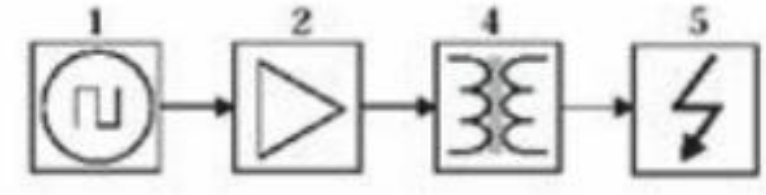


1、Touch spot

2、Ignition coil

3、Distributor /high voltage wire /spark plug

Contact driven



1、sensor

2、Ignition amplifier

3、Ignition coil

4、Distributor /high voltage wire /spark plug

Inductive drive

In the mechanical ignition system, charging time and ignition timing is controlled by the distributor camshaft electric sensor (hall or magnetoelectric) or contact ACTS as sensor contact can directly drive the ignition coil, ignition amplification and telex machine passes before driving ignition coil, in fact, the generally installed within the ignition coil, ignition amplifier in this case the primary ignition signal is measured.

6）Sensor

a、Commonly used sensors are hall device and magnetoelectric induction coil.

b、Hall devices output 0 5 v or 0 12 v square waves.

c、The magnetic induction coil outputs sine waves whose amplitude is related to the speed of rotation.

d、Ignition control signal.

e、The control signal output from the ignition control module is 0 5 v or 0 12 v wave.

7） The correct way of thread breakage is shown in the figure (except for secondary ignition, all the wires shall be broken to measure secondary ignition, and the ignition probe can be directly clamped on the cylinder line).

Cross section of ignition coil (inside secondary coil, outside primary coil)

Independent ignition probe（JH-01 COP）

1） Primary ignition

① Press the red power button of the oscilloscope for a long time until you see the starting screen and let go. At this point, the oscilloscope enters the main menu interface (enter the functional interface of the oscilloscope by default), as shown in figure 1

Figure 1

② After entering the main menu interface, the product adopts touch screen android, so it can be directly with a finger click screen instrument working mode, can enter the ignition function selection interface, and then select primary ignition by finger touch key to enter the function of oscilloscope operating interface, as shown in figure 2.

Figure 2

③Connect the probe to the oscilloscope CH1 and set the probe to 10X.The ground clamp is then connected to the signal ground or the lapping iron.

④As the oscilloscope primary ignition has the default Settings (probe file 10 x, time base file 1 ms, vertical amplitude, 50 v), only need to connect the probe needle ignition coil can be intuitive display waveform As shown in figure 3 (when waveform shaking changes too fast to catch, you can set the trigger mode to normal trigger again to check).

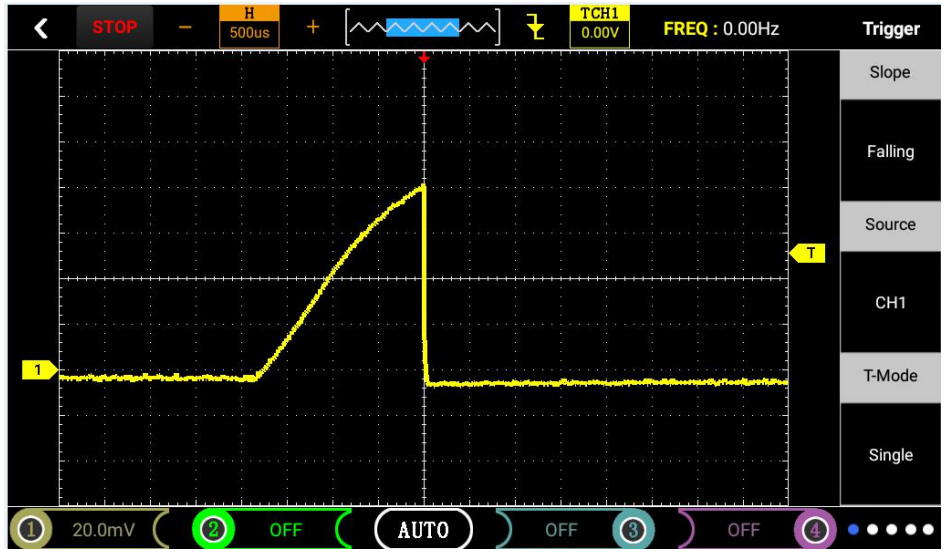


Figure 3

⑤Click the yellow icon 1 in the lower left corner of the screen (and CH1, refer to the introduction of user interface 2.1) to view various values and configurations of CH1 (the configuration has been default).

⑥Display the waveform of can adjust the time base v/vertical and trigger mode to realize their own needs (v/vertical and other concrete operation method please refer to the general oscilloscope operation).

Note: when the base reference waveforms and the adjustment of the v/vertical storage screenshot function in general oscilloscope function of horizontal vertical system and storage system, operating with common oscilloscope function operation.

Waveform is jeep guide who measured the idle speed of the primary ignition voltage waveform, dc coupling, coupling way as the starting voltage is the battery voltage and then start charging coil, at this time of inverse time base is 1 ms, for two and a half, so the charging time is around 2.5 millisecond;The induction electromotive force combustion time after a power cut is the outline of a 2-millisecond combustion line.There are more than two shock waves, which are damped shock waves caused by the mutual inductance between the primary and secondary coils of ignition. This waveform directly reflects the working state of the two coils.

To a high voltage ignition, the secondary coil, when the voltage is gradually increased to a certain value, the spark plug, the ignition voltage is the voltage and the voltage drops rapidly to another voltage value and maintain a period of time, the voltage is burning, burning time is the time of voltage to maintain in the combustion voltage value at the end of the burning time, ignition coil depleted of energy, the residual energy in coil form damped oscillation.

Observe the graph allows you to analyze the vehicle's running status from scratch Ideally, the graphics is very stable, says every time the ignition combustion process of the voltage of each cylinder are consistent graphic should be in line Actual situation is not ideal, however, the graphics assembly will be a big or small jitter, such as fire or high and low breakdown voltage, burning time may also have different length, these do not necessarily indicate the engine failure They may need do we have a certain time of the accumulation of experience, and makes a comprehensive analysis combined with other graphic, but it can be said that the ideal graphics may be you can't to catch every time.

gnition or breakdown voltage: if the ignition voltage is too high, even more than the screen area, show that in the secondary ignition circuit of high electrical resistance line open circuit, the spark plug is damaged, the high tension line or the spark plug gap is too big, etc are likely to cause the phenomenon of high breakdown voltage, on the contrary, if the breakdown voltage is too low, indicate that the ignition secondary circuit CLP resistance below normal, may be a spark plug is too dirty or rupture, high tension line leakage causes .

Lines and burning time: combustion online if you have too much clutter, said cylinder misfiring, or due to premature ignition, fuel injector is damaged, the spark plug smudgy causes such as combustion duration to the length of the line related to the concentration of mixed gases in cylinder.

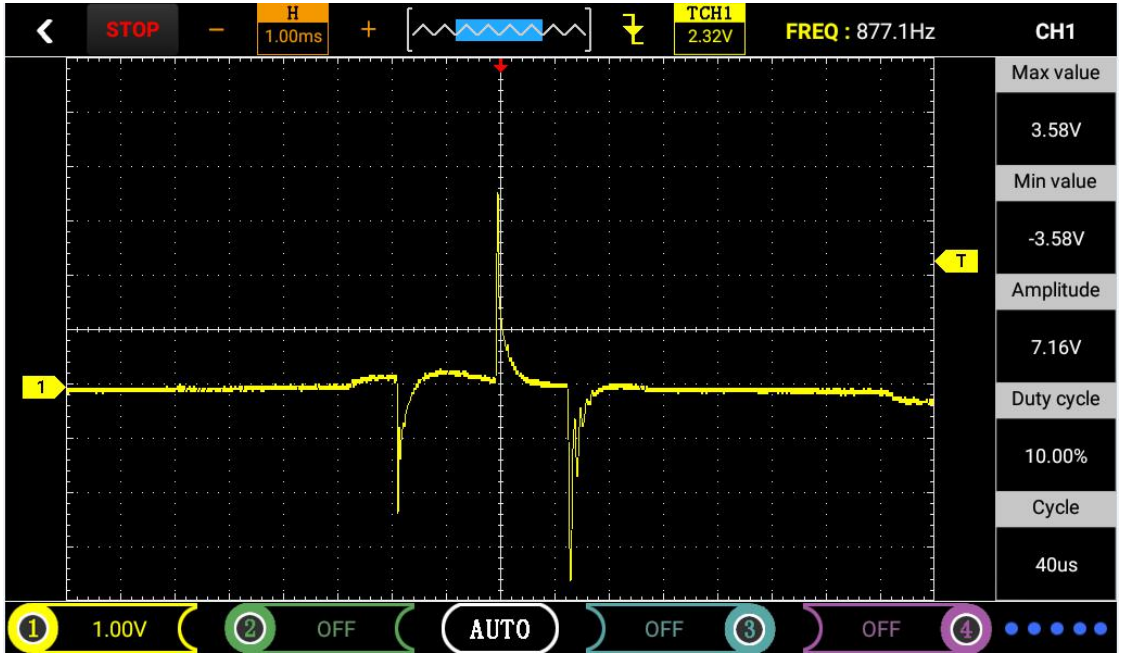
Because now basically popularized the independent ignition system of vehicle, so our standard is a independent ignition probe through the measured, it is concluded that the damping ratio of about 5000:1, which means we or fire ignition of the breakdown voltage of the voltage can be calculated this way: maximum voltage multiplied by 5000 multiples attenuation (probe), can the results of the following graphs, maximum value is 3.88 v, 3.88 * 5000 = 19400 v. startup ignition voltage higher than when you idleThe waveform principle of primary and secondary ignition can be analyzed in the same way (1 second =1000ms milliseconds).1ms milliseconds =1000us microseconds;1u microseconds =1000ns nanoseconds).

2）Secondary ignition

① Same as primary ignition step 1

② After entering the main menu interface, select ignition, and then enter the sub-menu to click secondary ignition. When entering the operating interface, the special ignition probe will be prompted to wait a few seconds before entering the oscilloscope interface.

③ The independent ignition probe must be used to connect the ignition probe to the oscilloscope CH1. The blue induction module is attached to the ignition coil as shown below:



We all know the classification of the engine ignition system is divided into three types: the first is the engine all share a cylinder ignition coil, ignition coil produced by high voltage by distributor is assigned to each cylinder of the spark plug early carburetor when adopt this way, the electronically controlled engine also has use this ignition system, such as santana (electric control system adopts M1.5.4) xiali and minibus.

The second is the two Shared a cylinder ignition coil, like elantra buick excelle for common four-cylinder engine, a cylinder and four cylinder Shared a ignition coil, two cylinders and three Shared a cylinder ignition coil and the third is called independent ignition, per cylinder on a spark plug ignition coil, the ignition system has three advantages:

1. Strong ignition energy.

2. Sealing good anti-interference ability.

3. The service life is long, now the car is essentially the ignition system.

Primary ignition waveform is generated by the primary coil, secondary ignition waveform is generated by the secondary coil is relatively low pressure produced by the primary ignition, ignition secondary produce tens of thousands of volts is pay attention to the high pressure here just a moment when breakdown the spark plug electrode ignite mixture in cylinder of the pulse signal, the same principle can be understood as lighters ignition, the tens of thousands of volts would not harm the person both primary ignition voltage and ignition secondary voltage, the energy is composed of 12 v or 24 v battery voltage through the primary coil of the primary voltage, the secondary high pressure are generated from the secondary coil .

3） Primary ignition、 secondary ignition

This function is the primary ignition Ignition secondary respectively by CH1 and CH2, more intuitive observation contrast two primary ignition waveform selected Ignition secondary Into operation before world will prompt CH1: primary use standard probe, CH2: secondary use special ignition probe Wait a few seconds into the interface of oscillograph, and other specific operation, please refer to the above junior secondary ignition function.

Note: this function CH1 is primary ignition, and CH2 is secondary ignition. Note the probe connection.

4）Primary ignition

① Same as primary ignition step 1.

②Choose the ignition after entering the main menu interface, and then click to enter submenu selected primary ignition (current), enter the operation before world you will be prompted to fit the current clamp wait a few seconds into the interface of oscillograph.

③Connect the current clamp to the oscilloscope CH1. Since the primary ignition of the oscilloscope has been set by default (the probe file is 1X and the base file is 1ms), the waveform can be visually displayed by simply connecting the current clamp to the ignition coil, as shown in figure 6.

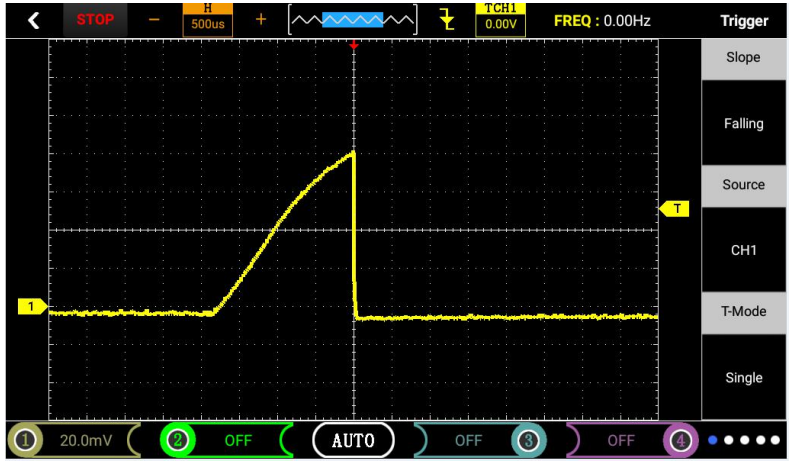


Figure 6

Above for primary ignition current waveform, when the current into the ignition coil, due to the nature of specific resistance and inductance coil, the waveform will rise at a certain slope, the rise of the slope is a very important judgment standard.Usually the primary ignition waveform will rise to about 60 ° Angle.While at the same time base unit (1 ms) under primary ignition current waveform of the coil current length is the primary ignition coil voltage waveform is consistent with the charging time (about 3.5) and the largest by current about 5 a and 6 a.When the ignition module disconnects the current, the current waveform drops almost vertically.Need is important when current begins to flow into the ignition coil, to observe the current waveform of the ignition coil, if the left is almost vertical rise, is a sign of ignition coil resistance is too small (short circuit), might cause performance issues, and will damage the switch transistor ignition module.In addition, the time it takes for the current waveform to rise from the beginning to the peak is usually constant, because it is filled with a good ignition coil current, and the time it takes remains constant.ECU can control the current flowing into the ignition coil by increasing or reducing the pass time of the ignition coil through the ignition module.It is necessary to use the current clamp to measure the current waveform. The current clamp directly clamps the signal line.If you want to measure the current, we can recommend one or two current pliers with high cost performance.

④Click the yellow icon 1 in the lower left corner of the screen (and CH1, refer to the introduction of user interface 2.1) to view various values and configurations of CH1 (the configuration has been default).

⑤Can adjust the time base on its own, the wave v/vertical and trigger mode to realize their own needs (time base, v/vertical and other specific operation method please refer to the general oscilloscope operation).

Note: if the current measured waveform inversion will clamp to change direction as shown in figure 7, to use current clamp, please refer to the purchase of current clamp use manual (if you want to buy current clamp may contact manufacturers recommended).

Figure 7 : Usage of current clamp.

5）Ignition signal

①With primary ignition choose ignition after step 1.

②After entering the main menu interface, select ignition, then enter the sub-menu, click the ignition signal, and wait for a few seconds to enter the oscilloscope interface.

③The oscilloscope probe from the oscilloscope CH1, due to the oscilloscope ignition timing has default Settings (probe file 1 x, time base 10 ms), the oscilloscope probe must be connected to the ignition module signal can be intuitive display waveform.

④Click the yellow icon 1 in the lower left corner of the screen (and CH1, refer to the introduction of user interface 2.1) to view various values and configurations of CH1 (the configuration has been default).

⑤Display the waveform of can adjust the time base v/vertical and trigger mode to realize their own needs (v/vertical and other concrete operation method please refer to the general oscilloscope operation).

6）Ignition signal and primary ignition

This function is the ignition signal and primary ignition respectively by CH1 and CH2, more intuitive observation contrast two waveform selected ignition signal and primary ignition into the interface wait a few seconds into the interface of oscillograph, other specific operation, please refer to the above the function of the primary ignition ignition signal.

Note: this function CH1 is the ignition signal and CH2 is the primary ignition.Note the probe connection.

7）Ignition signal and crankshaft

This function is the ignition signal and crankshaft respectively by CH1 and CH2, more intuitive observation contrast two waveform selected ignition signal and the crankshaft into interface wait a few seconds into the interface of oscillograph, other specific operation please refer to the ignition timing crankshaft and crankshaft position sensor in sensor .

Note: this function CH1 is the ignition signal and CH2 is the crankshaft.

8）Dual cylinder secondary ignition (see operation of secondary ignition function for details)

①Same as primary ignition step 1.

②After entering the main menu interface, select ignition, and then enter the sub-menu, click the selected dual-cylinder secondary ignition, and wait a few seconds to enter the oscilloscope interface.

③The oscilloscope probe receives oscilloscope CH1 and CH2, due to the oscilloscope double cylinder ignition secondary has default Settings (probe file 1 x, time base file 1 ms), each need to connect the oscilloscope probe to its end can be intuitive display waveform.

④Click the yellow icon 1 in the lower left corner of the screen (and CH1, refer to the introduction of user interface 2.1) to view various values and configurations of CH1 (the configuration has been default).

⑤Display the waveform of can adjust the time base v/vertical and trigger mode to realize their own needs (v/vertical and other concrete operation method please refer to the general oscilloscope operation).

3、Sensor function

1）Crankshaft position sensor (magnetoelectric hall type)

①When the flat panel oscilloscope is started up, click the jinhan electronic icon. Enter the main menu interface of jinhan electronic instrument, as shown in figure 9.

Figure 9

②After entering the main menu interface sensor choice, then click select to enter submenu Crankshaft position sensor (as shown in figure 10), enter the secondary menu click magnetoelectric or hall type, enter the interface of oscillograph.

Note: If the oscilloscope interface is stuck, wait for a few seconds to enter.

figure 10

③Connect the probe to the oscilloscope CH1 and set the probe to bonding.

④Since the “Magnetic” and “Hall” functions of the oscilloscope have been set by default (probe 1X, time base 10.0ms), simply by connecting the probe to the corresponding signal, the waveform can be displayed intuitively, as shown in Figure 11.

⑤Click CH1 to view the various numerical configurations (the configuration is already default).

⑥The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and triggering mode (for time base, vertical volts/div, and other specific operations, refer to General Oscilloscope Operation.

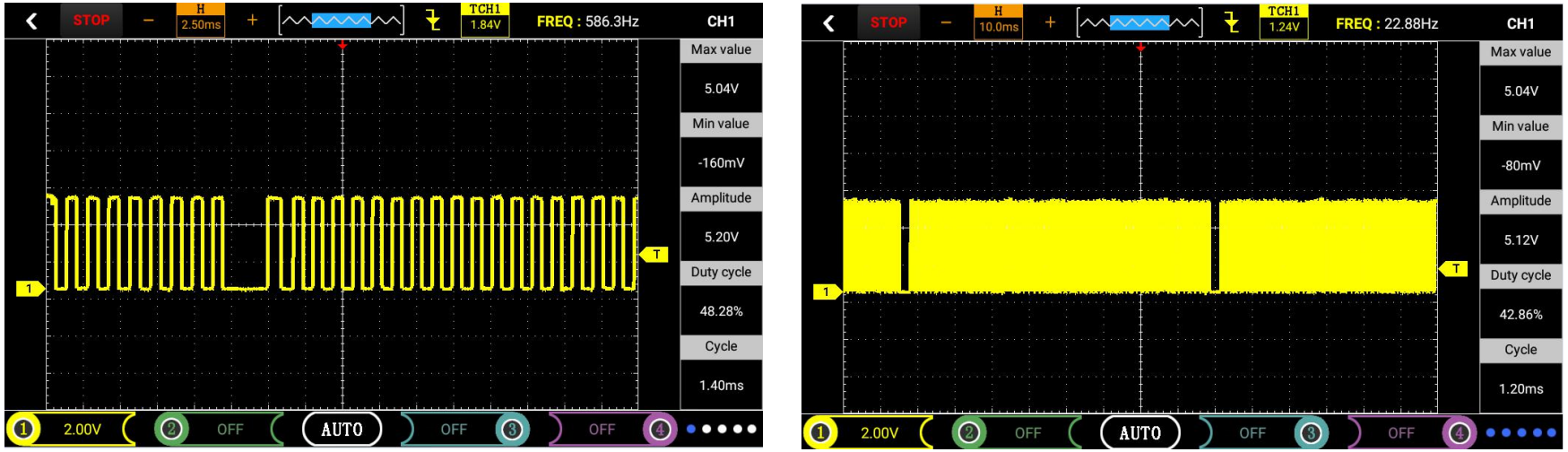


Figure 11

2）camshaft position sensor (magnetoelectric、 Hall type、variable reluctance）

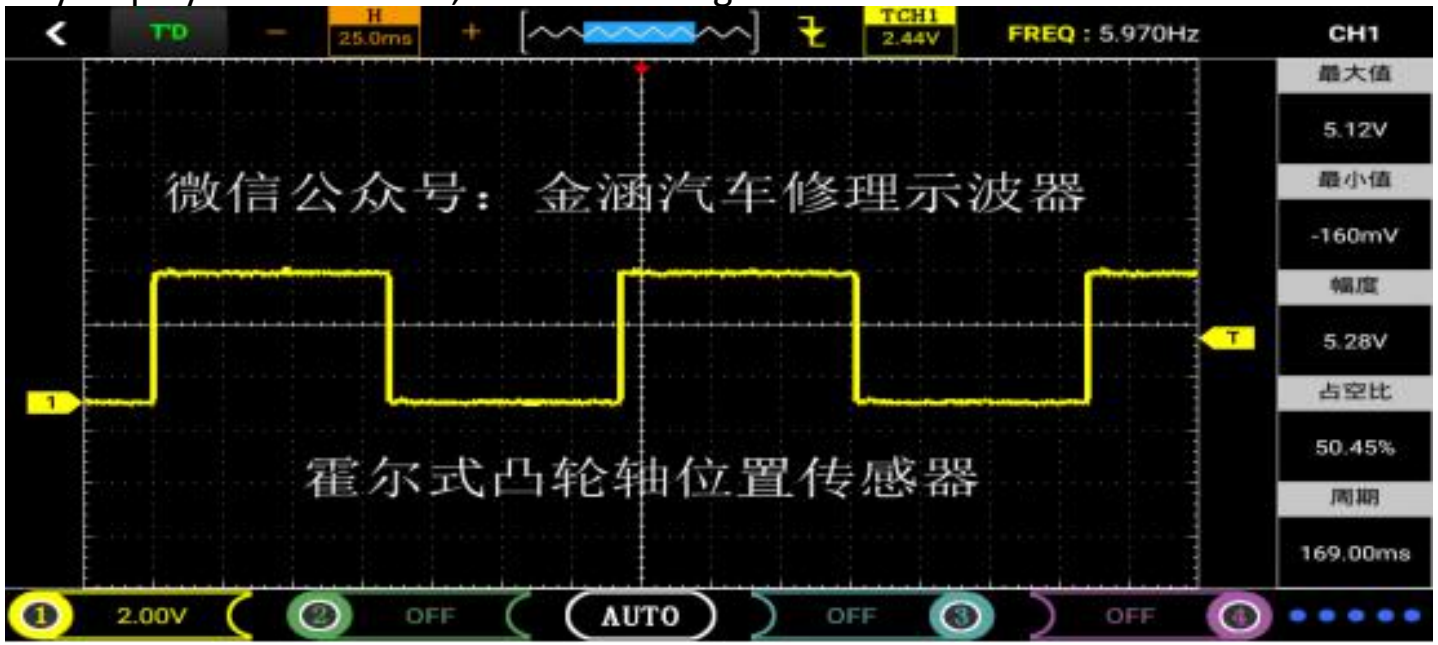
①Same as crankshaft position sensor.

②After entering the main menu interface, select "Sensor", then enter the sub-menu and click on "Camshaft Position Sensor" to enter the secondary submenu. Click "Magnetic" or "Hall" or "Magnetic" to enter Oscilloscope interface.

Note: If the oscilloscope interface is stuck, wait for a few seconds to enter.

③Connect the probe to the oscilloscope CH1 and set the probe in 1X position, then ground it to signal ground or ground.

④Because the oscilloscope "Magnetic" "Hall type" and "Magnetic resistance" function has been set by default (Magnetic and Hall type:Probe file 1X, time base file: 25.0ms; magnetoresistive type: probe file 1X, time base file: 50.0ms), just send the probe to the corresponding signal to visually display the waveform, as shown in Figure 12.



⑤Click CH1 to view the various numeric configurations (the configuration is default).

⑥The waveform can realize its own requirements by adjusting the time base vertical volt/latticeand triggering mode (time base vertical volt/lattice and other specific operation methods refer to the general oscilloscope operation.

3）Crankshaft camshaft position sensor (magnetoelectric and hall type)

①Same as the crankshaft position sensor.

②After entering the main menu interface, select "Sensor", then enter the sub-menu and click on "Crankshaft, camshaft position sensor" to enter the secondary submenu. Click "Magnetic" or "Hall type" to enter the oscilloscope interface. (Note:If the oscilloscope interface is stuck, wait for a few seconds to enter.)

Note: The channel and function must correspond to CH1: crankshaft position sensor, CH2: camshaft position sensor.

③Connect the two probes to the oscilloscopes CH1 and CH2 and set the probe to 1X, and then ground the signal to ground or ground.

④Since the “Magnetic” and “Hall” functions of the oscilloscope have been set by default (probe 1X, time base 10.0ms), simply connect the two probes to the corresponding signals to visualize the waveforms, as shown in the figure 13.

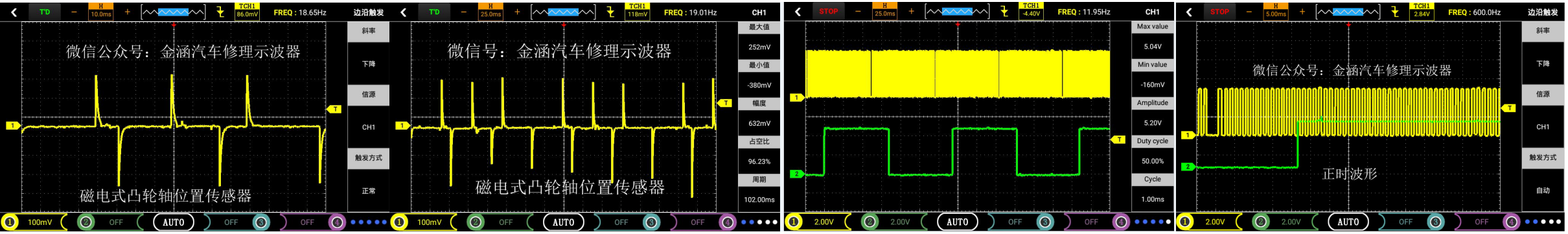


Figure 13

⑤Click "CH1" or "CH2" to view the various numerical configurations (the configuration is already default).

⑥The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and triggering mode (for time base, vertical volts/div, and other specific operations, refer to General Oscilloscope Operation.

Note: Precautions when measuring magnetoelectric and Hall waveforms:

1、Measuring range: magnetoelectric time base 1ms-500ms (line grid); voltage 500mv-50v (horizontal grid)); Hall type timebase 1-500ms (line grid)) Voltage 1v-10v (horizontal grid).

2、The amplitude and frequency of the magneto-electric type change with the speed (similar to the principle of a generator), and the Hall-type amplitude fixed frequency changes with the speed.

4）Wheel speed sensor(Magnetoelectric, Hall-type, Two-wire Hall)

①Same as crankshaft position sensor.

②Enter the main menu interface and select "Sensor", then enter the sub-menu and click on "Speed Sensor" to enter the secondary sub-menu. Click "Magnetic", "Hall", "Two-wire Hall" to enter the oscilloscope interface.

(Note: If the oscilloscope interface is stuck, wait for a few seconds to enter).

③Connect the probe to the oscilloscope CH1 and set the probe in the 1X position, and then ground it to ground or ground.

④Because the oscilloscope "magnetic type", "Hall type", "two-wire Hall type" function has been set by default (Magnetic and Hall type: probe file 1X, time base file 5.00ms; two-wire Hall type: probe File: 1X, time base file: 10.0ms; photoelectric type: probe file 1X, time base file 25.0ms), just send the probe to the corresponding signal to display the waveform intuitively.

⑤Click "CH1" to check the values and configuration (configuration has been defaulted)

⑥The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and triggering

(For timing, vertical volts/div, and other details, refer to General Oscilloscope Operation).

5）Oxygen Sensor(Zirconium oxygen, zirconium oxygen, oxygen, titanium oxide)

①Same as crankshaft position sensor.

②Enter the main menu interface and select “Sensor”. Then enter the sub-menu and click on “Oxygen Sensor” to enter the secondary sub-menu. Click “Zirconium Oxygen”, “Zirconium Oxygen Front and Rear Oxygen”, “Titanium Oxygen” or “Broadband Type” Enter the oscilloscope interface.

(Note: If the oscilloscope interface is stuck, wait for a few seconds to enter).

③Connect the probe to the corresponding channel of the oscilloscope and set the probe in 1X position, then ground it to signal ground or ground.

④Since the oscilloscope "zirconia oxygen" "zirconia oxygen front and rear oxygen" and "titanium oxygen" "broadband type" function has been set by default (probe block 1X, time base profile 1s), simply send the probe to the corresponding signal can be intuitive The waveform is shown in Figure 14,15.

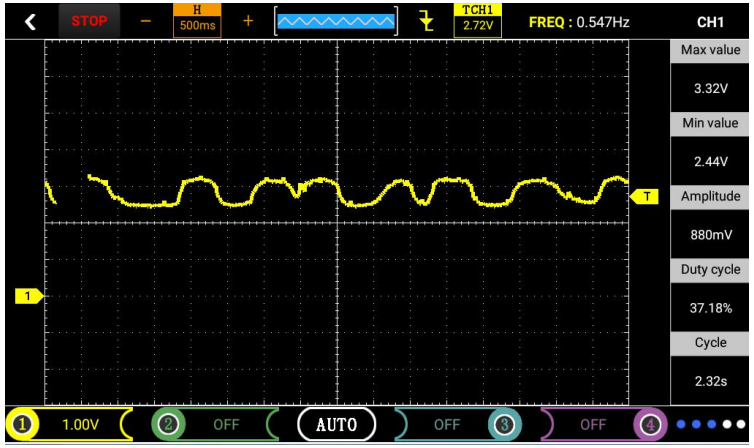


Figure 14

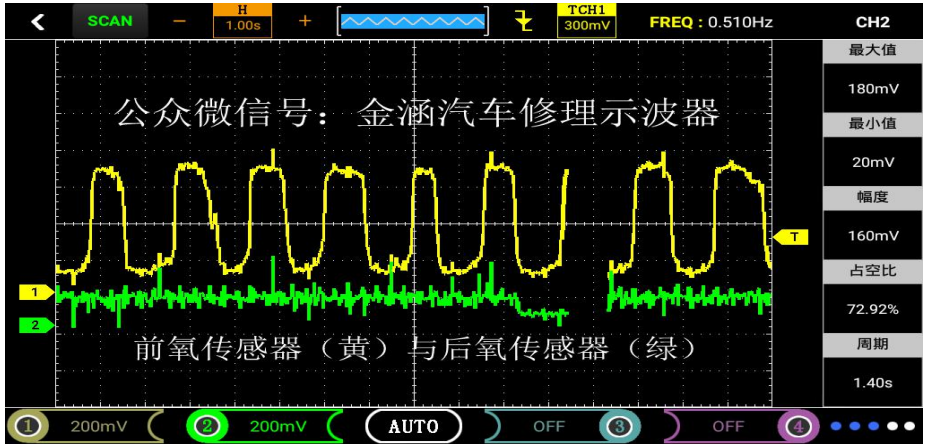


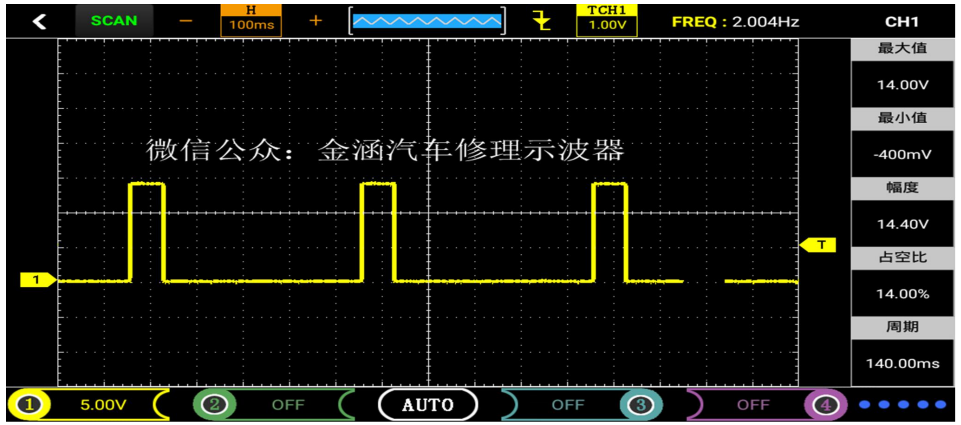
Figure 15

⑤Click "CH1" or "CH2" to view various values and configurations (configuration has been defaulted).

⑥The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and triggering methods. (For timing, vertical volts/div, and other specific operations, refer to General Oscilloscope Operation).

Note: Oxygen sensors, also known as exhaust gas sensors, play a very important role in the emission control of vehicles equipped with catalytic converters. The oxygen sensor is mounted on the exhaust pipe before the catalyst. The zirconium oxygen voltage varies from 0 to 1 volt and the titanium oxygen voltage varies from 0 to 5 volts because the titanium oxygen sensor requires a power source to provide the voltage. A vehicle equipped with an aerobic sensor is said to have a "closed loop", meaning that after the fuel is burned, the sensor analyzes the exhaust gas and readjusts the engine's fuel supply based on the results. No matter how many connecting lines are between the oxygen sensor and the engine control module, the sensor output is always on the black line. Single line: This line is used to output the voltage generated by the sensor itself, usually black. Two lines: One output line and one output ground line. Three lines: One output line and two heater lines (power line and ground line). The internal heating device raises the temperature during the cold start so that the car can be quickly controlled. Four lines: One signal line and one signal ground line. The other two are heater lines.

The zirconium oxygen sensor needs to reach the temperature above 350° C to work normally. The normal output feedback voltage of this type of oxygen sensor varies between 0 and 1V (measured 0.1 to 0.85v). The output above 0.5V indicates that the mixture is too rich; the 0.5V output indicates the proper balance between over- and over-concentration; the output below 0.5V indicates that the mixture is over-lean. The change in output voltage indicates that the engine control module is changing the air-fuel ratio (air to fuel ratio, mixture gas concentration).



Oxygen sensor heating signal

Normal zirconium oxygen sensor output voltage waveform should satisfy 3 elements: highest voltage value the minimum voltage value, response time (voltage changes from high to low). In general, the allowable range is a maximum voltage value of >850 mV, a minimum voltage value of 75 to 175 mV, and a response time of <100 ms (reaction speed). The requirement for the waveform amplitude change is that the amplitude of the waveform is not less than 8 times within 10s in the idle state. That is, in the case of the time base 1S, the waveform reflects the change of the dilute concentration of the oxygen content in the exhaust gas 8 times, that is, the high and low voltages 8 The changes. The oxygen sensor's frequency changes faster as it accelerates.

Start the engine and maintain the engine speed of 1500-2000rpm. After 3 minutes, until the engine reaches the normal operating temperature, because the engine must reach the normal operating temperature and enter the closed loop, the instrument reads the oxygen sensor signal is correct.

If the oxygen sensor is detected when the oxygen sensor is detected, but the waveform change is not seen, the cause of the malfunction may be as follows:

- Bad connection
- Oxygen sensor failure
- Engine vacuum leak
- Poor fuel mixture control

Note: The multimeter measures the average value. The oscilloscope reflects the instantaneous change of the voltage.

6) Throttle position sensor (Sliding resistance, Hall type, Eddy current type)

①Same as crankshaft position sensor**.**

② After entering the main menu interface, select "Sensor", then enter the sub-menu and click to select "Throttle position sensor". Enter the secondary sub-menu and click "Sliding resistance type", "Hall type" or "Eddy current type" to enter. Oscilloscope interface. (Note: If the oscilloscope interface is stuck, wait for a few seconds to enter)

③ Connect the probe to the corresponding channel of the oscilloscope and set the probe in 1X position, and then ground it to signal ground or ground.

④Since oscilloscope “throttle position sensor” function has been set by default (probe file 1X, time base file 500ms)

Simply send the probe to the corresponding signal to display the waveform intuitively, as shown in Figure 16.

(Note: Due to the “SCAN” scan mode, you need to wait patiently for the waveform to be scanned out).

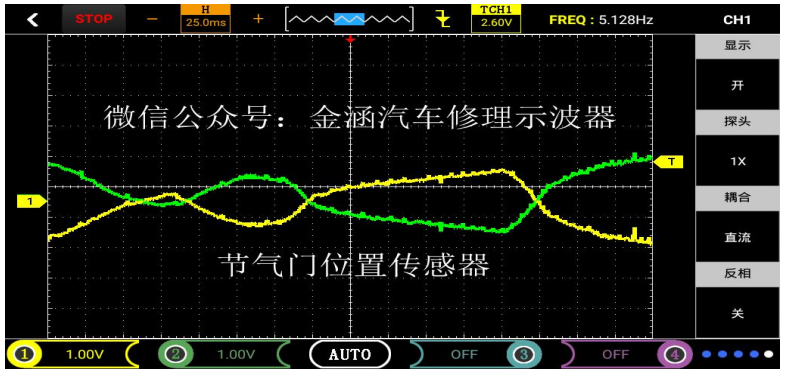
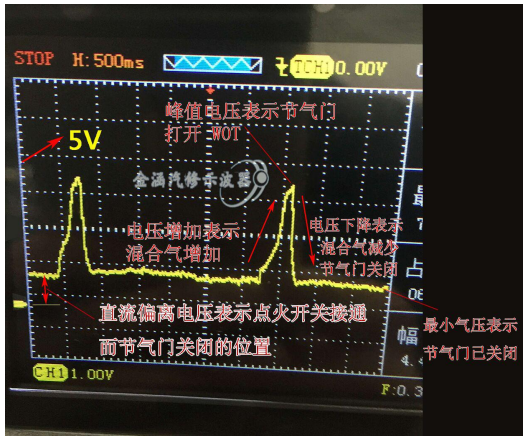


Figure 16



Now the throttle position sensor has two signals. The maximum voltage of the two signal lines together is 5v. The right figure shows the old cable-type throttle position sensor waveform.

⑤ Click "CH1" or "CH2" to view the values and configuration (configuration has been defaulted).

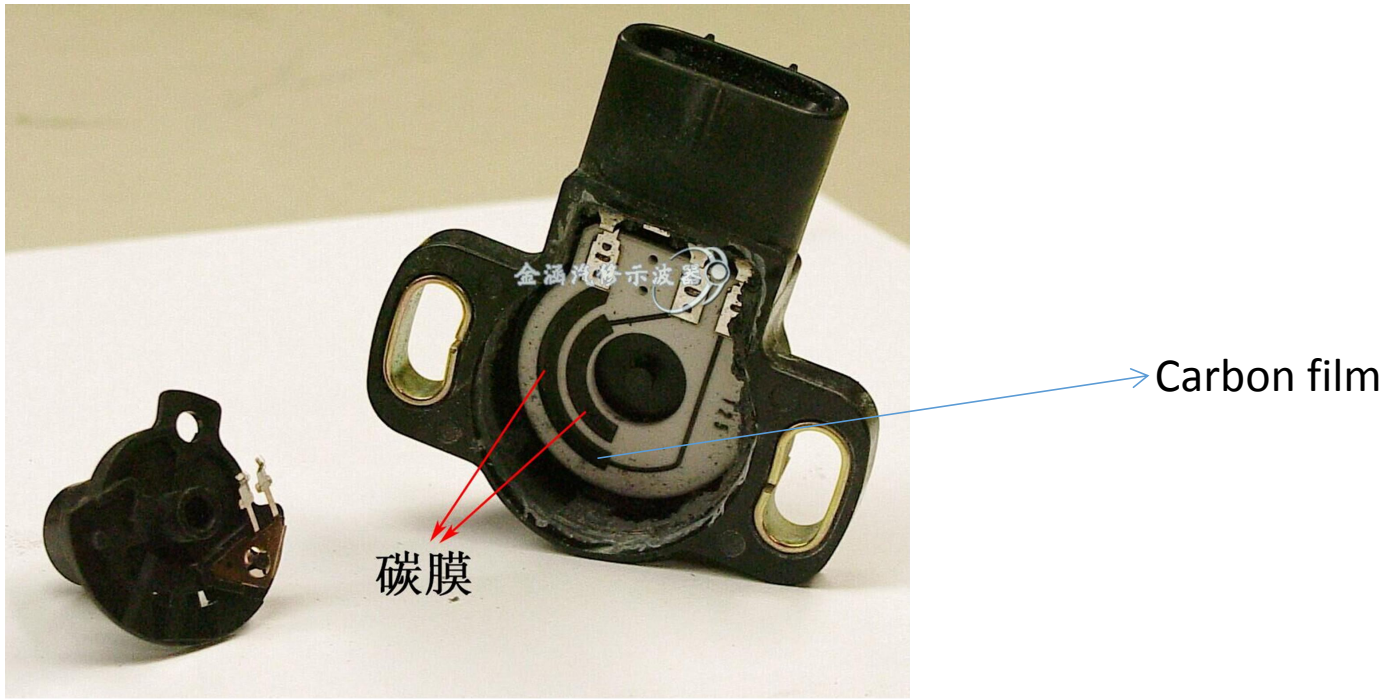
⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations).

Note: Turn on the ignition switch, do not start the engine, detect the throttle position sensor signal, slowly open and close the throttle, observe the waveform for any surge or irregular changes. When analyzing the position signal of the throttle position sensor, you should find any abnormal signal waveform in the signal waveform. For example, the instantaneous voltage drop may indicate that the sensor itself is wrong in specification, damaged, or dirty. This abnormal signal waveform can easily cause the oscilloscope to misjudge and cause the vehicle to malfunction. Most of the throttle position sensors at idle speed, the voltage value should be below 1.25V, and when the throttle is fully open, the voltage value should be 3.4V or more, and the voltage should be stable changes can not have any surge or voltage drop Etc.

When the ignition switch is turned on and the engine is not started, when the ignition switch is turned on and the engine is not started, when the throttle position sensor signal is detected, if the waveform does not change with the throttle opening, the cause of the failure may be as follows:

- Bad connection
- Bad sensor itself

As shown in the following figure, the anatomical view of the throttle position sensor, the red key head refers to the carbon film, and the trajectory of the metal contact on the carbon film at different opening of the throttle valve will also change correspondingly, and the output voltage will also change accordingly. Normally the throttle position sensor voltage should be less than 1 volt at idle and less than 5 volts when the throttle is fully open. There should be any breaks in the waveform above or below the ground and a large drop. Pay particular attention to the waveform in the first quarter of the valve opening, which is the part of the sensor carbon film that is most commonly used in driving. The first one-third to one-third of the carbon film of the throttle is usually subject to wear or the shedding of the carbon film, resulting in a direct drop of the waveform. If the throttle position sensor fails, it may cause the engine to run idly (such as too high or too low idling speed, unstable idling speed, easily idle at idle speed) or abnormal engine acceleration (such as engine shivering at acceleration, sluggish response, etc.) , It sometimes causes the engine to intermittently shake during operation.



7） Air Flow Sensor (Hotline Thermal Mode, Digital High Frequency, Digital Low Frequency)

① with the crankshaft position sensor.

② After entering the main menu interface, select “Sensor”, then enter the sub-menu and select “Air Flow Meter” to enter the secondary sub-menu. Click “Hotline Hot Mode”, “Digital High Frequency” or “Digital Low Frequency” to enter Oscilloscope interface. (Note: If the oscilloscope interface is stuck, wait for a few seconds to enter).

③ Connect the probe to the oscilloscope CH1 and set the probe in 1X position, and then ground it to signal ground or ground.

④Because the oscilloscope "air flow meter" function has been set by default (hotline hot mode: probe file 1X, time base file: 500ms, high frequency: probe file 1X, time base file: 100us, low frequency: probe file 1X, time base file 10ms) Simply connect the probe to the corresponding signal to visualize the waveform.

(Note: Since you are in "SCAN" mode, you need to wait patiently for the waveform to be scanned out).

⑤ Click “CH1” to view the values and configurations (configuration has been defaulted).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other For detailed operation method, please refer to general oscilloscope operation).

Note: Air flow meters are generally divided into analog air flow meters and digital air flow meters.

- Hotline hot film air flow meter

The function of the air flow meter is to measure the air flow into the throttle body. The air flow entering the throttle body varies with the engine speed. The analog air flow meter converts the detected air flow into a voltage signal that varies between 0-5 V and transmits it to the oscilloscope. Start the engine and press the accelerator pedal. At this time, the air flow signal should increase as the throttle opening increases.

When it is at idle, it should be stable. When the throttle is fully open, the signal will rise to its maximum value.

Observe abnormal phenomena in the waveform signal, such as whether the waveform is smooth, whether there is a sudden wave, and the shape o the waveform is suddenly deformed, which usually indicates a line between the oscilloscope and the sensor, a poor contact condition, or a poor sensor line.

The sensor voltage output signal, which is usually the lowest at idle and increases with increasing engine load, is typically about 800mv at idle and about 4.5V at full throttle.

- Digital air flow meter

The function of the digital air flow meter is to measure the air flow into the throttle body. The air flow entering the throttle body varies with the engine speed. The digital air flow meter converts the detected air flow to a frequency signal. The higher the frequency signal, the greater the amount of air. Start the engine and a square wave pattern will appear on the screen. If no waveform is displayed.

Observe abnormal phenomena in the signal waveform, for example, whether the square wave waveform changes at right angles, or whether there is a surge or the like. Abrupt changes in the signal waveform of the sensor frequency usually indicate a bad connection between the oscilloscope and the sensor, or the sensor itself has a bad circuit.

The digital air flowmeter produces a neat square wave signal. As the speed of the vehicle increases, the frequency of the pulse signal increases, but the duty cycle remains constant. We refer to such signals as frequency modulated signals. If the sensor is tapped when the ignition key is turned on and the engine is not started, a change in the waveform at this time indicates that the air flow sensor itself is defective, or the circuit has a short circuit or an open circuit.

The signal generated by the air flow sensor is a frequency signal. The so-called frequency is how many square wave signals appear per second. Generally, the normal air flow sensor produces little change in the frequency signal value of the fixed engine speed. If the variation is too large, it means that Defective air flow sensor. If the air flow meter is tested, the air flow meter has power, but no waveform changes. The cause of the failur may be as follows:

- The oscilloscope did not receive the signal sent from the air flow meter.
- The sensor itself is not stable.

8）Intake Manifold Absolute Pressure (Analogue, Digital)

① with the crankshaft position sensor.

②After entering the main menu interface, select “Sensor”, then enter the sub-menu and click to select “Intake Manifold Absolute Pressure” to enter the secondary sub-menu and click “Analog” or “Digital” to enter the oscilloscope interface.

(Note: If the oscilloscope interface is stuck, wait for a few seconds to enter).

③Connect the probe to the oscilloscope CH1 and set the probe in 1X position, and then ground it to signal ground or ground.

④Since the oscilloscope “intake manifold absolute pressure sensor” function has been set by default (analog type: probe file 1X, time base file: 500ms, digital: probe file: 1X, time base file: 10.0ms) Receive a corresponding signal to visually display the waveform, as shown in Figure 17.

(Note: Since you are in "SCAN" mode, you need to wait patiently for the waveform to be scanned out)。

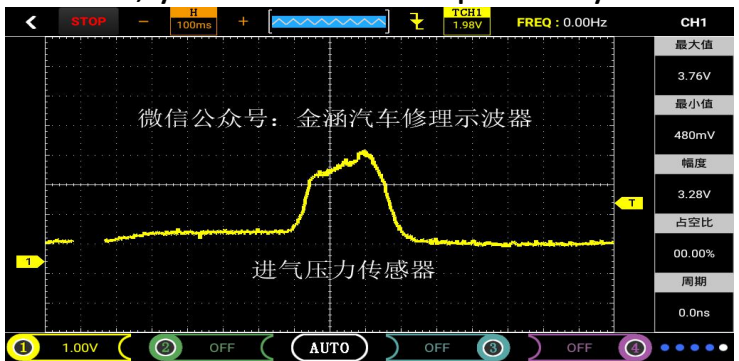


Figure 17

⑤ Click on “CH1” to view various values and configurations (configuration has been defaulted)

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations).

9) Knock sensor

① with the crankshaft position sensor.

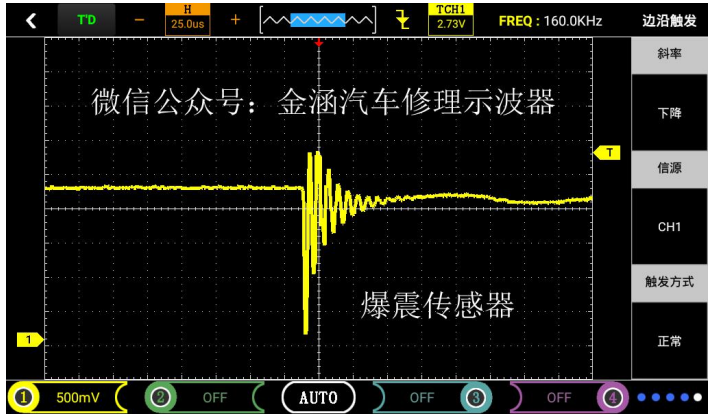
② Enter the main menu interface and select “Sensor”. Then enter the submenu and click “Knock Sensor” to enter the oscilloscope interface. (Note: If the oscilloscope interface is stuck, wait for a few seconds to enter).

③ Connect the probe to the oscilloscope CH1 and set the probe in 1X position, and then ground it to signal ground or ground.

④ Because the oscilloscope “knock sensor” function has been set by default (probe file 1X, time base file 500us), simply send the probe to the corresponding signal and tap the cylinder with a small stick to visualize the waveform.

⑤ Click on “CH1” to view various values and configurations (configuration has been defaulted).

⑥The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations).



10） Accelerator pedal (slip resistance type, Hall type, eddy current type)

① With the crankshaft position sensor.

② After entering the main menu interface, select "Sensor", then enter the sub-menu and select "Accelerator Pedal" to enter the secondary sub-menu. Click "Sliding Resistance", "Hall" or "Eddy Current" to enter the oscilloscope. interface.

(Note: If the oscilloscope interface is stuck, wait for a few seconds to enter).

③ Connect the probe to the oscilloscope CH1 and set the probe in 1X position, and then ground it to signal ground or ground.

④ As the oscilloscope "accelerator pedal" function has been set by default (probe file 1X, time base file 500ms), just by connecting the probe to the corresponding signal can be intuitively displayed waveform, as shown in Figure 18.

(Note: Due to "SCAN" scan The pattern needs to wait patiently for the waveform to be scanned out).

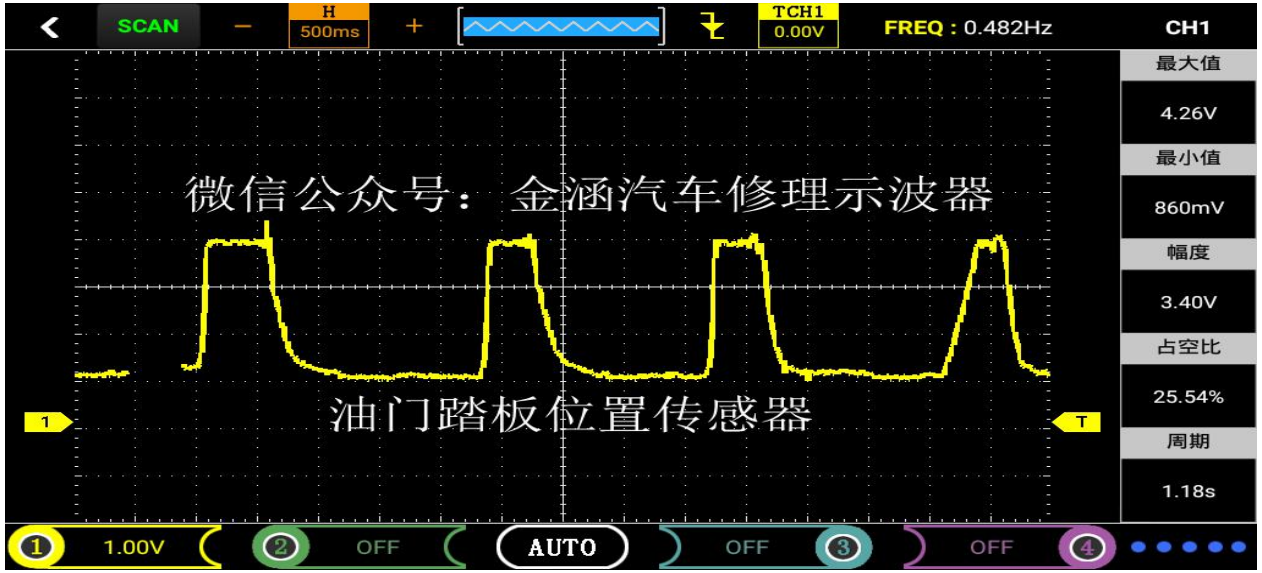


Figure 18

⑤ Click on “CH1” to view various values and configurations (configuration has been defaulted).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations).

11) Water temperature sensor

① with the crankshaft position sensor.

② Enter the main menu interface and select “Sensor”. Then enter the submenu and select “Water Temperature Sensor” to enter the oscilloscope interface. (Note: If the oscilloscope interface is stuck, wait for a few seconds to enter).

③Connect the probe to the oscilloscope CH1 and set the probe in 1X position, and then ground it to signal ground or ground.

④ As the oscilloscope "water temperature sensor" function has been set by default (probe file 1X, time base file 5.00s), just by connecting the probe to the corresponding signal, the waveform can be displayed intuitively.

⑤ Click on “CH1” to view various values and configurations (configuration has been defaulted).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations).

4. Actuator

1) Solenoid valve

① Long press on the oscilloscope's red  " button until you see the boot screen to let go. At this point, the oscilloscope enters the main menu interface.

② Enter the main menu interface and select “Actuator”. Then enter the sub-menu and press “Serial Valve” to enter the oscilloscope operation interface,as shown in Figure 19.

③ Connect the probe to the oscilloscope CH1 and set the probe in 1X position, and then ground it to signal ground or ground.

Figure 19

④ Because the oscilloscope “solenoid valve” function has been set by default (probe file 1X, time base file 25ms), simply send the probe to the corresponding signal to visually display the waveform, as shown in Figure 20.

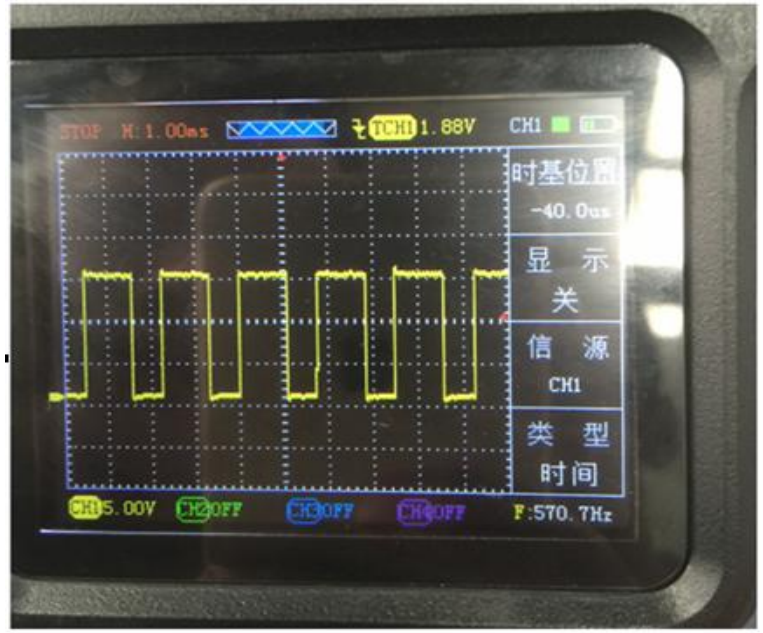


Figure 20

⑤ Click the yellow icon 1 in the lower left corner of the screen (and CH1, refer to 2.1 Introduction to User Interface). You can view the values and configurations of CH1 (the configuration is already default).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations)

⑦ If the waveform exceeds the screen, you need to switch the probe and oscilloscope to x10. The waveform of the solenoid will change with the speed. We will refer to this kind of signal as the pulse width modulation signal.

2) Gasoline and natural gas (single cylinder (solenoid valve), multi-cylinder (solenoid valve), piezoelectric crystal (high pressure), PNP type).

① with solenoid valve step 1

② After entering the main menu interface, select “Actuator”, then enter the sub-menu to select “Gasoline, Natural Gas”, and enter the secondary sub-menu to select the “single cylinder (solenoid valve)” and “multiple cylinder (solenoid valve)” corresponding functions. , "Piezoelectric crystal (high pressure)" or "PNP type", click to enter the oscilloscope operation interface.

③ Connect the probe to the oscilloscope and adjust to the corresponding function parameter (this function oscilloscope default 10X position, so the probe needs to be adjusted to 10X position), and then ground to the signal ground or ground.

④ Since the oscilloscope has been set by default for this function (Probe 10X, Timebase 1ms), simply send the probe to the corresponding signal to display the waveform intuitively.

⑤ Click the yellow icon 1 in the lower left corner of the screen (and CH1, refer to 2.1 Introduction to User Interface). You can view the values and configurations of CH1 (the configuration is already default).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations).

Automotive solenoid valve is the executive component of the electronic control system, mainly to play the role of the switch, such as gasoline solenoid valve is to open and shut off the role of the oil.

Solenoid valve is the use of electric energy flow through the coil to generate electromagnetic suction to attract the valve core (overcoming the spring or self-gravity), divided into two categories: normally open and normally closed. It is generally used to cut off the circulation of oil, water, gas, etc., and to automatically control electrical equipment such as pressure and temperature sensors.

3) Diesel common rail (single cylinder (solenoid valve), multi-cylinder (solenoid valve), piezoelectric crystal (high pressure))

① with solenoid valve step 1

② After entering the main menu interface, select “Actuator”, then enter the sub-menu to select “Common diesel common rail”, and enter the secondary sub-menu to select corresponding functions “single cylinder (solenoid valve)” and “multiple cylinder (solenoid valve)” , "Piezoelectric crystal (high pressure)", click to enter the oscilloscope operation interface.

③ Connect the probe to the oscilloscope and adjust to the corresponding function parameter (this function oscilloscope default 10X position, so the probe needs to be adjusted to 10X position), and then ground to the signal ground or ground.

④ Since the oscilloscope's function has been set by default (probe level 10X, time base level 1ms), the waveform can be displayed visually by simply connecting the probe to the corresponding signal.

⑤ Click the yellow icon 1 in the lower left corner of the screen (and CH1, refer to 2.1 Introduction to User Interface). You can view the values and configurations of CH1 (the configuration is already default).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and triggering mode (for timing, vertical volts/div, and other specific operations, refer to General Oscilloscope Operation).

Note: The single-cylinder uses only single-channel CH1, and the multi-cylinder uses dual-channel CH1 and CH2.

The common rail system refers to the diesel from the fuel tank, sucked by the gear pump, through the oil-water separator, the gear pump, to the diesel fine filter, to the high pressure pump, the common rail tube, the injector, and the closed loop fuel supply composed of sensors and ECU System, an oil supply method that completely separates the injection pressure generation and the injection process from each other.

The common rail pump conveys the high-pressure fuel to the common oil supply pipe (common rail). The ECU controls the opening of the common-rail pump's flow electromagnetic control valve to achieve precise control of the oil pressure of the common-rail pipe and make the pressure of the high-pressure pipe It has nothing to do with the speed of the engine, so it overcomes the drawback of the diesel fuel supply pressure changing with the engine speed. The ECU controls the injection quantity of the injector. The injection quantity depends on the pressure of the fuel rail (public supply pipe) and the length of the solenoid valve opening time.

4) Gasoline, diesel (voltage and current) (solenoid valve, piezoelectric crystal (high pressure))

① with solenoid valve step 1.

② After entering the main menu interface, select “Actuator” and then enter the sub-menu and select “Gasoline, Diesel (Voltage and Current)”. In the second level submenu, corresponding functions can be selected “Solenoid valve” and “Piezoelectric crystal (High pressure)” , Click to enter the oscilloscope operation interface (because this function is to measure the voltage and current separately, so the corresponding channel is CH1: probe, CH2: current clamp).

③ Connect the probe to the oscilloscope CH1 and adjust it to the corresponding function parameter. The current clamp is connected to the oscilloscope's CH2 and adjusted to the corresponding function parameter. (First check the probe position of each channel in the corresponding function oscilloscope, then keep the probe position and oscilloscope position. Consistent), and then ground the grounding pin to signal ground or ground.

④ Since the oscilloscope has been set by default, simply connect the probe to the corresponding signal to visually display the waveform.

⑤ Click the yellow icon 1 in the lower left corner of the screen (and CH1, refer to 2.1 Introduction to User Interface). You can view the values and configurations of CH1 (the configuration is already default).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations).

5) Gasoline, diesel, natural gas (current) (solenoid valve, piezoelectric crystal) (high pressure))

① with solenoid valve step 1.

② After entering the main menu interface, select “Actuator” and then enter the sub-menu to select “Gasoline, Diesel, Natural Gas (Current)”, and enter the secondary sub-menu to select the corresponding function “Solenoid Valve”, “Piezoelectric Crystal (High Voltage) ” Click to enter the oscilloscope operation interface.

③ Connect the current clamp to the oscilloscope and adjust it to the corresponding function parameter (firstly check the probe position of each channel in the corresponding function oscilloscope, and then keep the probe position consistent with the oscilloscope position), and then ground it to signal ground or ground.

④ As the oscilloscope has been set by default, simply connect the probe to the corresponding signal to display the waveform intuitively.

⑤ Click the yellow icon 1 in the lower left corner of the screen (and CH1, refer to 2.1 Introduction to User Interface). You can view the values and configurations of CH1 (the configuration is already default).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations).

6) Variable valve timing (single, double)

① with solenoid valve step 1.

② Enter the main menu interface and select “Actuator”. Then enter the sub-menu and select “Variable Valve Timing” to enter the secondary sub-menu. You can select “Single” and “Double” for the corresponding function and enter the oscilloscope operation interface after clicking.

③ Connect the probe to the corresponding channel of the oscilloscope (“single” function connects to CH1, “dual” function connects to CH1 and CH2 respectively) and adjusts to the corresponding function parameter. (First check the probe position of each channel in the corresponding function oscilloscope, then keep the probe file. The bit is consistent with the oscilloscope's gear position, and then grounded to signal ground or ground.

④ As the oscilloscope has been set by default, simply connect the probe to the corresponding signal to display the waveform intuitively.

⑤ Click the yellow icon 1 in the lower left corner of the screen (and CH1, refer to 2.1 Introduction to User Interface). You can view the values and configurations of CH1 (the configuration is already default).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations).

5、Bus test

1) CAN-high, CAN-low

① After the tablet oscilloscope is turned on, click on the Han Han electronic icon, then enter the main menu of Jinhan electronic instrument, as shown in Figure 21.

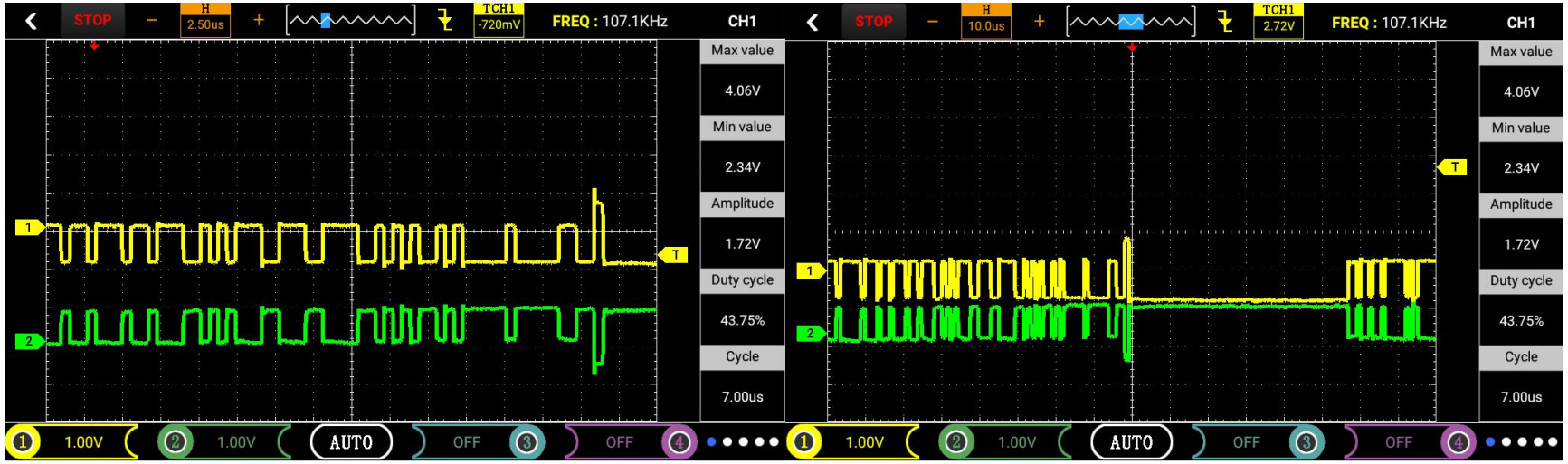


Figure 21

② Enter the main menu interface and select “Bus Test”. Then enter “CAN-High, CAN-Low” in the sub-menu to enter the oscilloscope operation interface, as shown in Figure 22.

③ Connect the two probes to the oscilloscopes CH1 and CH2 and set the probe to 1X. Then ground the signal to ground or ground.

④ The oscilloscope “CAN-high, CAN-low” function has been set by default (CH1, CH2) Probe file 1X, time base file 25.0us), simply send the probe to the corresponding signal to visualize the waveform.

⑤ Click "CH1" or "CH2" to view the values and configuration (configuration has been defaulted).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations).

Figure 22

2) LIN-bus

① with CAN-high, CAN-low step 1.

② Enter the main menu interface and select “Bus Test”. Then enter the sub-menu and click LIN-bus to enter the oscilloscope operation interface.

③ Connect the probe to the oscilloscope CH1 and set the probe in 1X position, and then ground it to signal ground or ground.

④ Because the oscilloscope "LIN-bus" function has been set by default (CH1 probe file 1X, time base file 500us), simply touch the probe to the corresponding signal to visually display the waveform, as shown in Figure 23.

⑤ Click “CH1” to view the values and configurations (configuration is already default).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations).

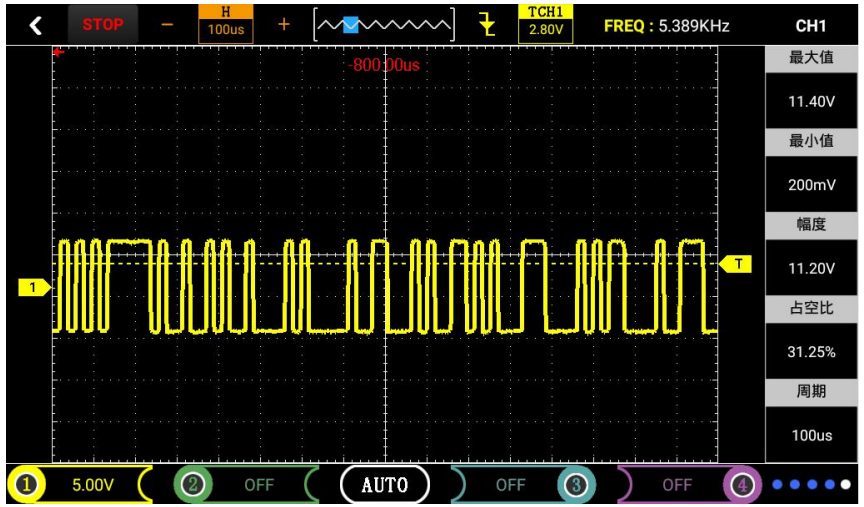


Figure 23

3) K-Line

① with CAN-high, CAN-low step 1.

② Enter the main menu interface and select “Bus Test”. Then enter the sub-menu and click K_Line to enter the oscilloscope operation interface.

③ Connect the probe to the oscilloscope CH1 and set the probe in 1X position, then ground it to signal ground or ground.

④ Since the “K_Line” function of the oscilloscope has been set by default (CH1 probe file 1X, time base file 25.0ms), simply by connecting the probe to the corresponding signal, the waveform can be displayed intuitively.

⑤ Click “CH1” to view the values and configurations (configuration is already default).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and trigger mode (time base, vertical volts/div, and other specific operation methods refer to general oscilloscope operations).

4) FlexRay

① 1 with CAN-high, CAN-low step 1

② Enter the main menu interface and select “Bus Test”. Then enter the submenu and click on FlexRay to enter the oscilloscope operation interface.

③ Connect the two probes to the oscilloscopes CH1 and CH2 and set the probe to 1X. Then ground the signal to ground or ground.

④ The oscilloscope "FlexRay" function has been set by default (CH1, CH2 probe file 1X, time base File 10.0us), just send the probe to the corresponding signal to visually display the waveform.

⑤ Click on "CH1" or "CH2" to view the values and configurations (configuration is already default).

⑥ The displayed waveform can be self-determined by adjusting the time base, vertical volts/div, and triggering mode (for timing, vertical volts/div, and other specific operations, refer to General Oscilloscope Operation).

3.2 Univerasl Oscilloscope

General Oscilloscope This section describes the functions as follows:

▲ function menu

▲ Connector

▲ automatically set

▲Default setting

▲Vertical system

▲ Horizontal system

▲ trigger system

▲ Mathematical Calculation System

▲ system settings

▲Storage System

▲USB connection

▲Quick operation

1. Function menu

ADO series menu description (This product adopts a tablet oscilloscope of Android system, and the method of use is the same as that of Android mobile phone operation by directly touching the screen.)

Time base	Display "Horizontal" control menu (for details, see 2.1 Introduction to User Interface)
Trigger	Display "trigger" control menu (for details, refer to 2.1 Introduction to User Interface)
Below the screen 1, 2, 3, 4	Click to display the corresponding channel 1, channel 2, channel 3, channel 4 settings and numerical display
AUTO	Automatically set the oscilloscope control state, press this key channel 1 to channel 4 can achieve 20HZ-10MHZ one-button trigger function.
AUTO/STOP	Collect waveforms or stop acquisitions continuously. Note: In the stop state, the vertical and horizontal time bases of the waveform can be adjusted within a certain range, which is equivalent to the horizontal or vertical expansion of the signal.
Multimeter	Click on the screen "Multimeter" icon to enter the multimeter mode.
Back	Press "Back" to return to the previous menu
F1、F2、F3、F4、F5	Only use the oscilloscope function to use: F1: AUTO/STOP toggle F2: Timebase - F3: Timebase + F4: Vertical volts/div - F5: Vertical volts/div +
	On/Off button

2. Connector

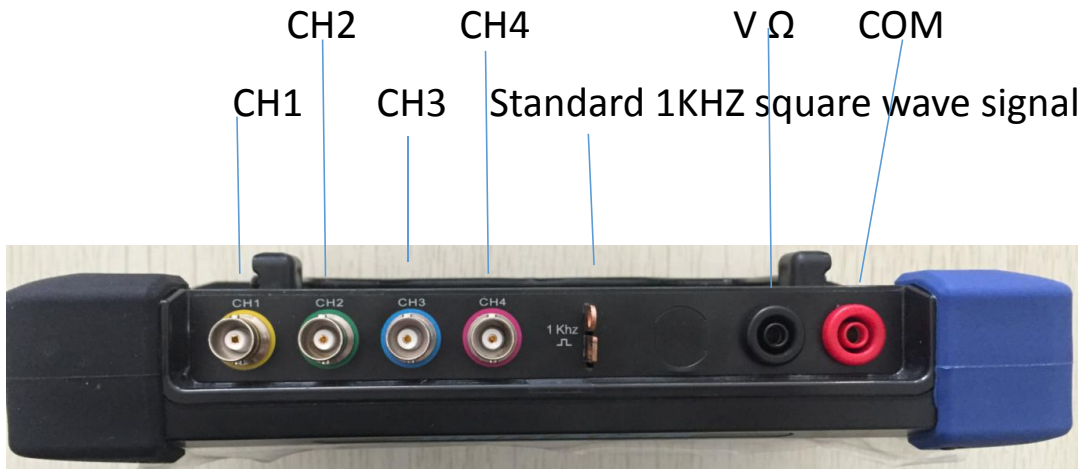


Figure 3-2 ADO 204 connection port

Figure 3-2 CH1-CH4: Input connection for displaying waveforms. The "COM port" and "VΩ port" are used to connect the black and red test leads. The middle is the standard 1KHZ square wave output and grounding.

3. Automatic setting

ADO series digital storage oscilloscopes have automatic setting function. According to the input signal, the voltage range, time base, and trigger mode can be automatically adjusted to the best mode display. Click the "AUTO" button just below the screen:

- If there are signals on multiple channels, the channel with the lowest frequency signal serves as the trigger source.
- If no signal is found, channel 1 is connected to a signal and click on the "AUTO" button. As shown in Figure 3-3:

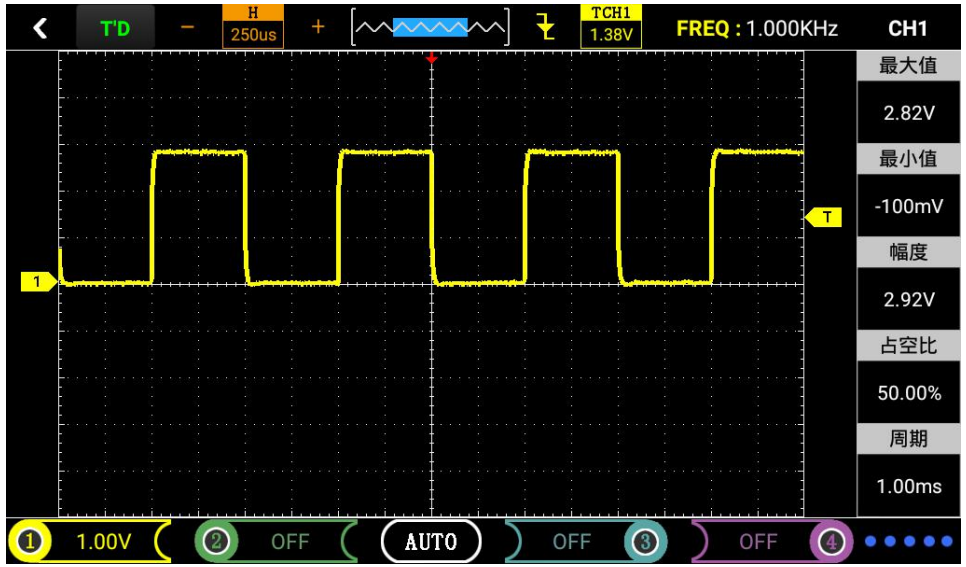


Figure 3-3

4. Default setting

The oscilloscope is set at the factory for normal operation, the default setting. In the oscilloscope main menu "System Settings" there is "factory mode recovery" operation, by selecting "restore factory" click "OK" button to determine, the instrument is saved shutdown

And restore the factory settings, you can use after restarting the instrument.

5. Vertical system

Oscilloscope channels and their settings

The operation menu of the channel is described in the following table 2-1:

Display	Switch	Turn on display waveforms and turn off display waveforms
Probe	1X 10X 100X	Select one of the values based on the probe attenuation factor to maintain the correct reading of the vertical deflection factor. There are three kinds: 1X, 10X, 100X
Coupling	AC	Block the DC component of the input signal.
	DC	Through the input signal AC and DC components.
Inverting	positive	Inverting positive function
	Reverse	Reverse function
Maximum	/	Automatically display the current input signal maximum (and crest)
minimum	/	Automatically display the current input signal minimum (and trough)
Magnitude	/	Automatically display the current input signal amplitude
Duty cycle	/	Automatic display of current input signal duty cycle
Cycle	/	Automatic display of the current input signal period

1) Set channel coupling and inversion

For example, if the signal is applied to an oscilloscope channel, the measured signal is a square wave signal with AC component.

In the main menu, select “Universal Oscilloscope” and click to enter the oscilloscope interface. Click the yellow “1” icon at the lower left of the screen. → The right side of the screen shows the corresponding CH1 function menu. Click the “DC” below the coupling and select the DC coupling mode. The measured signal contains both DC and AC components. Figure 3-4

Click the yellow “1” icon at the bottom left of the screen → the corresponding CH1 function menu is displayed on the right side of the screen, and click “AC” below the coupling. The measured signal contains a dc component that is blocked. Picture 3-5

Click the yellow “1” icon at the bottom left of the screen. → The right side of the screen shows the corresponding CH1 function menu, and click Select “Invert” below the “ON” button to set it to the opposite way. The measured signal is displayed in reversed phase.

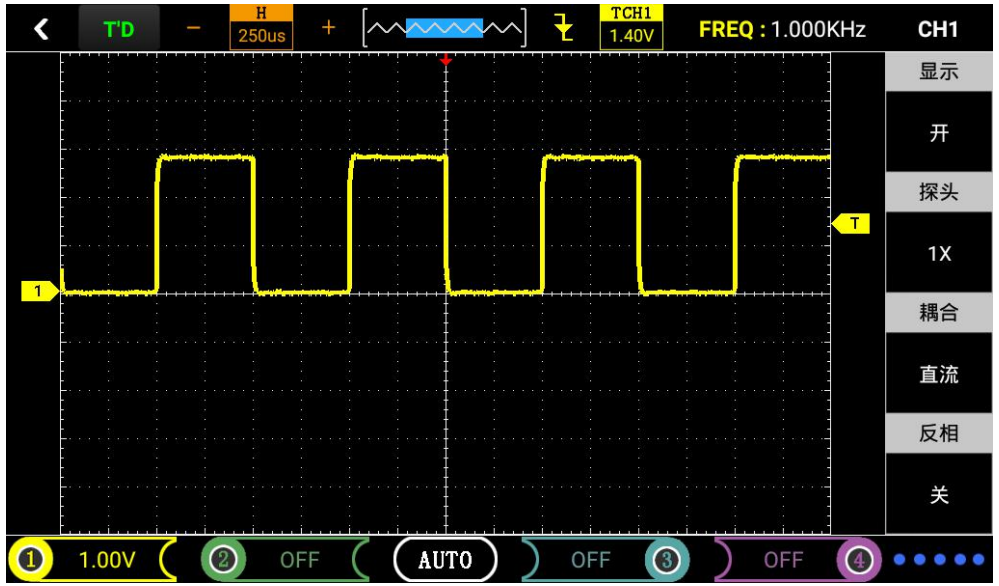


Figure3-4

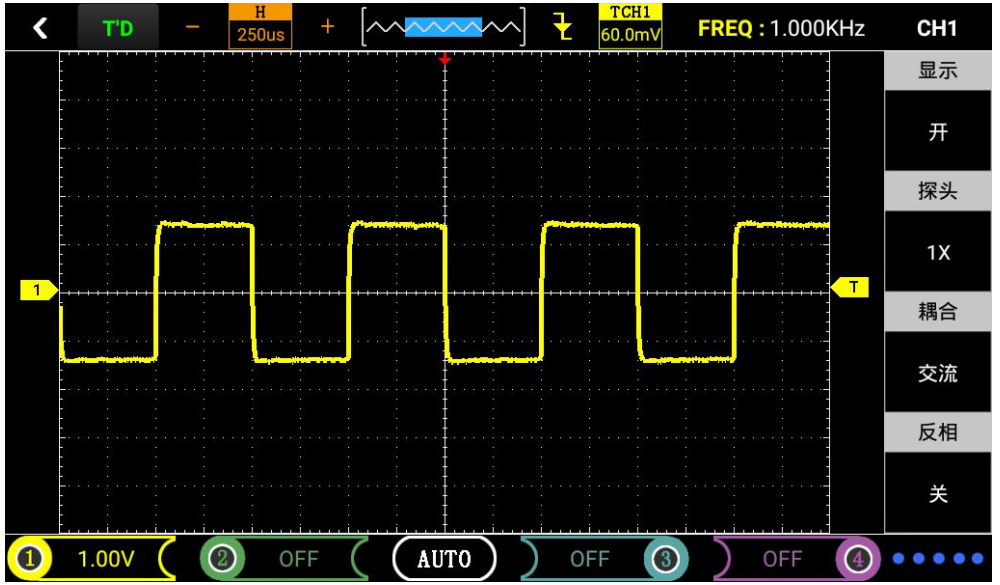


Figure3-5

2) Probe ratio setting

In order to match the attenuation coefficient setting of the probe, it is necessary to respond to adjust the attenuation coefficient of the probe in the channel operation menu. If the probe attenuation ratio coefficient is 10:1, the oscilloscope input channel ratio should also be set to 10X, and so on to avoid errors in the displayed information and measured data.

- Select “Universal Oscilloscope” in the main menu and click to enter the oscilloscope interface. Click the yellow “1” icon in the lower left of the screen → the corresponding menu of CH1 function is displayed on the right side of the screen. Set the probe ratio to 10X.

3) Vertical volts/division adjustment settings

When adjusting the vertical volts/div, the vertical volts/div ranges from 100mV/div-50V/div (probe 10X) to 1-2.5-5 steps, or 10mV/div-5V/div (probe 1X), 1V /div-500V/div (probe 100X). Take the CH1 channel as an example:

- If you set the vertical direction to 2.00V/div, click on the corresponding channel at the bottom of the screen, then use the “F4” button for -, and press the “F5” button for +.
- If you set the vertical direction to 1.00V/div, the operation procedure is as above. As shown in Figure 3-6, 3-7.

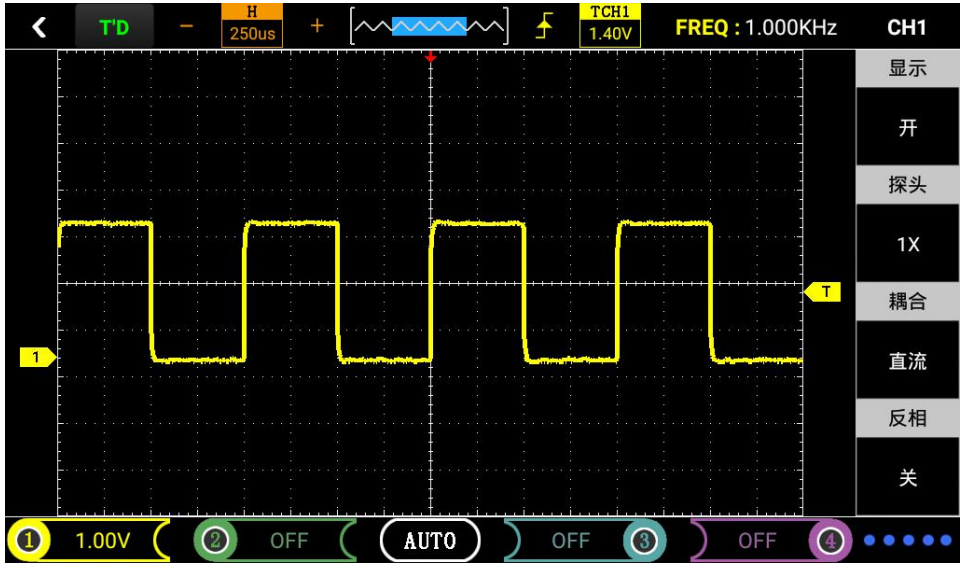


Figure 3-6

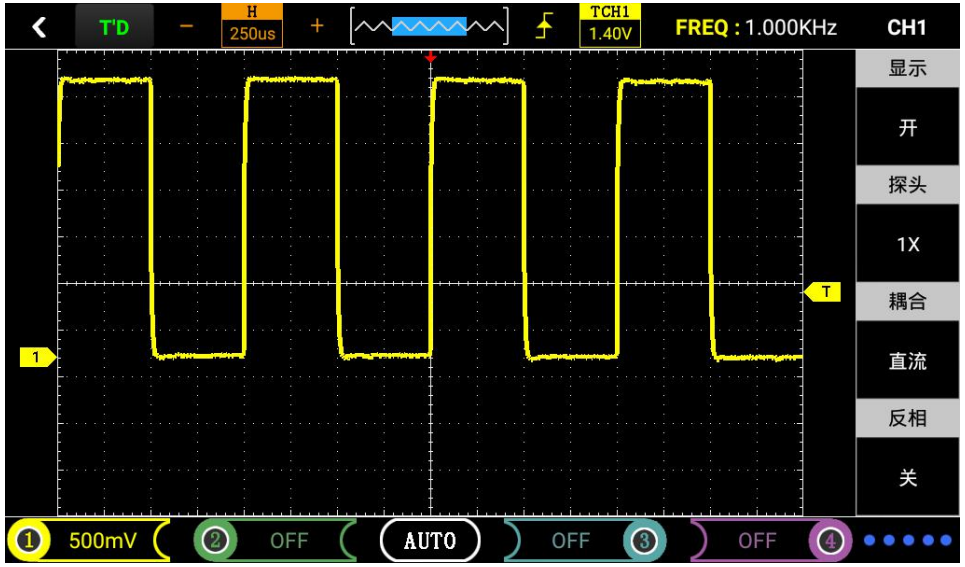


Figure 3-7

6. Horizontal system

Use the horizontal control buttons to change the horizontal scale (time base) and trigger the horizontal position in memory (trigger position). Changing the horizontal scale causes the waveform to expand or contract relative to the center of the screen. When the horizontal position changes, it changes relative to the trigger point of the waveform.

Table 3-2 : Cursor display function menu

Main time base	Horizontal master time base setting for waveform display	
Cursor display	display	Set cursor display or not display
	Source	Selection Cursor Measurement Source (CH1-CH4)
	Types	There are two types of time and voltage, you can set the display time or voltage cursor
Cursor display	Cursor A Cursor B	Relative main time base offset vector

- Horizontal Scale: To adjust the time base, change the scale between levels by tapping the “-” or “+” key next to the time base icon at the top left of the screen to zoom in or out. If you want to stop waveform acquisition, click the "AUTO" button at the top left of the screen to achieve or directly press the "F1" key to achieve. As shown in Figure 3-8 and Figure3-9.

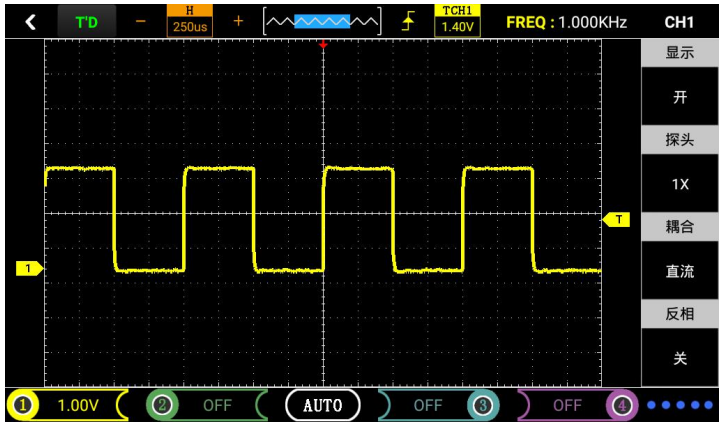


Figure 3-8

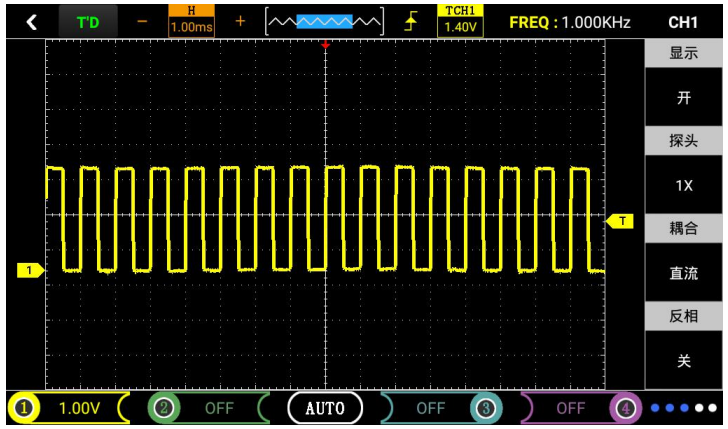


Figure 3-9

7. Trigger system

The trigger determines when the digital storage oscilloscope starts to acquire data and display waveforms. Once the trigger is set correctly, he can convert the unstable display to a meaningful waveform. Trigger control menu button trigger;

- Trigger control

Trigger mode: The oscilloscope trigger mode is edge trigger.

- Edge triggering: When the edge of the trigger signal reaches a given level, the trigger is generated. The edge trigger mode triggers on the trigger threshold of the input signal edge. When "Edge triggered", it is triggered on the rising edge and falling edge of the input signal.

Table 3-3 Edge-triggered function menu

Slope	Rise and fall	Select trigger signal in the up trigger selection trigger signal in the down trigger.
Source	Oscilloscope	Set CH1 as the source trigger signal (CH2-CH4 empathy).
Trigger method	Automatic normal single	Set to acquire waveforms without triggering. Set to acquire waveforms only when trigger conditions are met. Collect a waveform when one trigger is detected, then stop.

Operating instructions (take channel 1 as an example):

Set the trigger level:

1) Select "Universal oscilloscope" in the main menu to enter the oscilloscope interface after clicking, move the finger 1 to select the channel 1 icon to move to adjust the channel 1 mark; finger to select the trigger icon to move can adjust the trigger mark arrow, according to the trigger flag relative to the channel 1 flag position and The trigger level is set by the voltage value represented by each cell in the current vertical direction.

Set the slope:

2) Click the channel CH1-CH4 icon in the upper right corner of the screen to enter the menu selection. Click “Edge trigger” to enter the menu and click “Slope” to set “Up” or “Down”.

Set up the source:

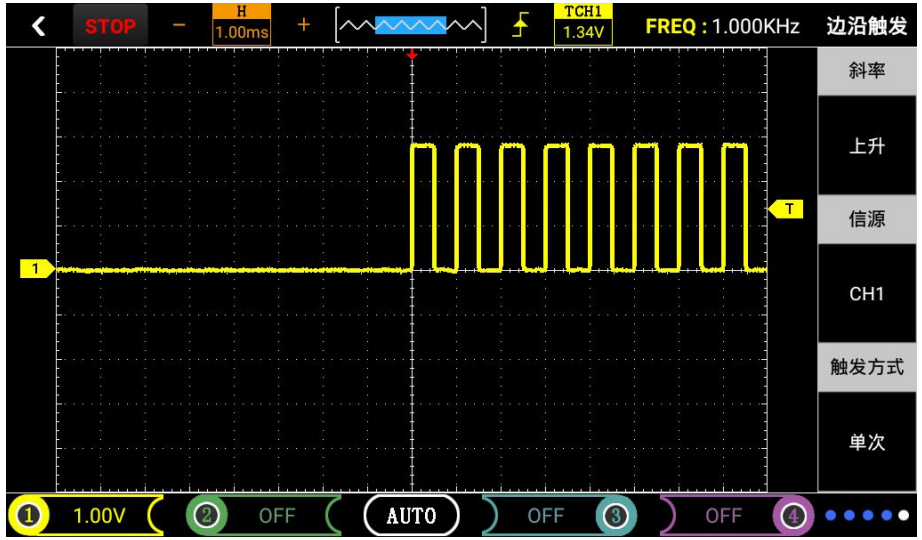
3) Tap the channel CH1-CH4 icon in the upper right of the screen to enter the menu selection. Click “Edge trigger” to enter the menu and click “Source” to set “CH1-CH4”.

4) Click on the channel CH1-CH4 icon in the upper right corner of the screen to enter the menu selection. Click on “Edge trigger” to enter the menu and click on “Trigger mode” to set “Auto”, “Normal” or “Single”.

Auto: The waveform is refreshed regardless of whether the trigger condition is satisfied.

Normal: The waveform is refreshed when it satisfies the condition. If the trigger condition is not satisfied, the waveform does not wait for the next trigger event.

Single shot: The waveform is acquired once the trigger condition is met and then stopped.



Note: You can use the shortcut operation, directly click the trigger icon at the top of the screen to enter the trigger menu,

and click the icon on the left of the trigger icon to change the slope “up” or “down”.

8. Mathematical calculation system

Mathematical calculation function is to display the sum of the waveforms of the CH1, CH2, CH3, and CH4 channels.

Table 3-4 Mathematical Functions

Function menu	Settings	Instructions
Arithmetic function	switch	Operation function on/off
Source A	Set up the source CH1-CH4	Set CH1, CH2, CH3, and CH4 as source A respectively
Source B	Set up the source CH1-CH4	Set CH1, CH2, CH3, and CH4 as source B respectively.
operating	A+B、A-B	Perform A+B or A-B operation based on source A and source B set above

▲ Click the channel CH1-CH4 icon in the upper right of the screen to enter the menu selection. Click to select “Mathematical calculation” to enter the menu, then you can select the calculation method and open the display.

9. System settings

Table 3-5 System Function Menu

Function menu	Settings	Instructions
Key sound	sound	Set sound "on" or "off"
language selection	/	Choose a language
Software version	/	Check the oscilloscope software version
Check for updates	/	Check the latest oscilloscope software version after networking
Restore Factory	/	restore factory settings

System settings

1) Sound settings: Select “System Settings” from the main menu to enter the setting interface, and modify the sound by selecting “On” or “Off”.

2) Restore to the factory: Click “System Settings” in the main menu to enter the setting interface, and click “OK” to restore it by selecting “Restore Factory”.

10. Storage System

The ADO20 series can store five sets of reference waveforms, several screenshots (depending on the memory size of the oscilloscope), and recording waveforms into the oscilloscope's internal memory or USB flash drive.

ADO20 series provides USB interface, you can save the saved waveform screenshot to U disk, the picture is a general PNG image file, can be opened by computer software. Or go directly to the gallery view (see the home page for more details on how to do this). In addition, the five stored waveforms and parameters can be recalled via the “reference waveform” and displayed on the screen.

Save the reference waveform steps:

1) Click on the main menu to select "Universal oscilloscope" (Auto oscilloscope will select the corresponding module), enter the operating interface

2) Click the channel CH1-CH4 icon in the upper right of the screen to enter the menu selection, click to select the “reference waveform” to enter the menu, and then set the selection

3) After entering the “Reference Waveform” menu, click “On/Off” under “Display”, click “Reference” to select the reference waveform (each set of sources can save five sets of reference waveforms Ref1-Ref5), click “Source” Below the source selection, click on the "F storage" below to save the reference waveform and display.

Waveform recording steps:

Similar to the screen capture function, the video recording function can store the display information of the current display in a video format to a local or USB flash drive. When a U disk is not connected, the file is stored locally by default.

Video recording method:

1) Pull down the pull-down menu from the top of the screen and tap the waveform recording icon to record video. As shown in Figure 3-12.

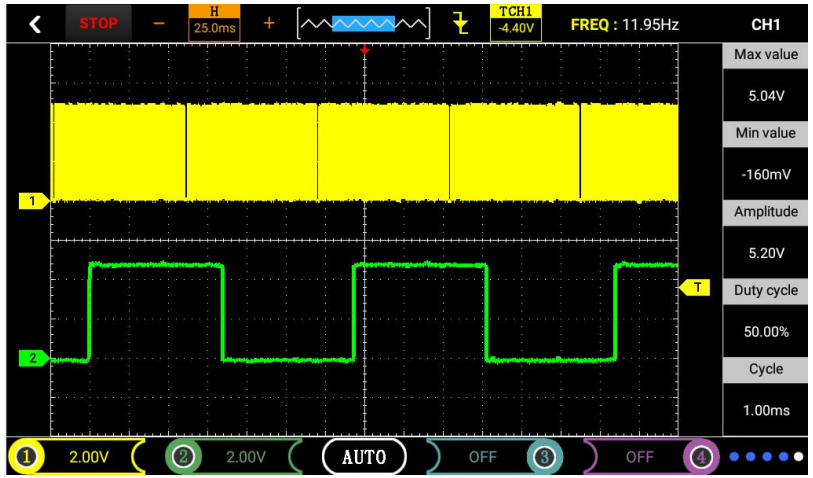


Figure 3-12.

2) Using shortcuts to take screenshots: Three fingers can be quickly recorded by moving horizontally from the right side of the screen.

Check the oscilloscope stored picture method:

1 After the screenshot is complete, you can view it in the drop-down menu. Click to quickly view the current screenshot.

2 The home screen button appears from the top drop-down screen. Click the icon to return to the home page to view the gallery. The steps are as follows:

Steps to store pictures:

Any interface screenshot:

1) Use shortcuts for screenshots: Two fingers move horizontally from the right side of the screen for quick screenshots.

2) Pull down the drop-down menu from the top of the screen and click on "Screenshot", as shown in Figure 3-11.

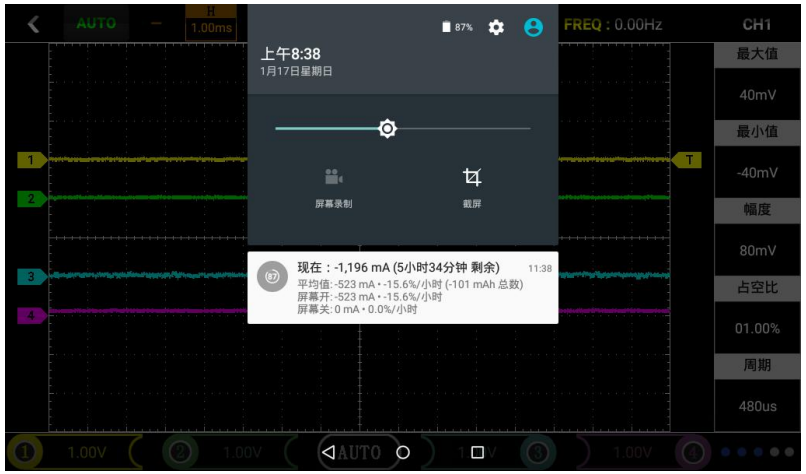
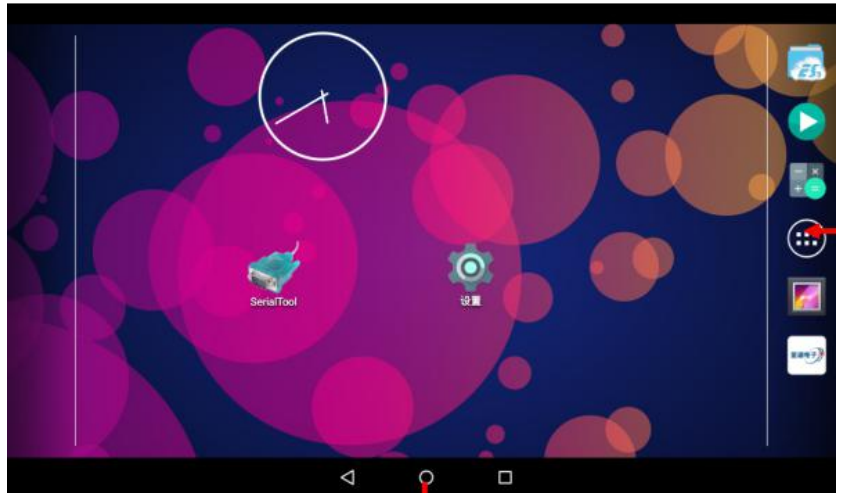
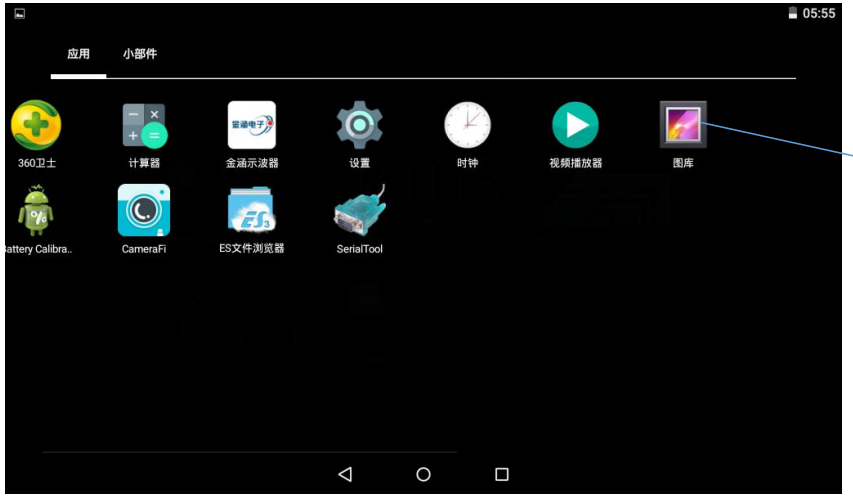


Figure3-11

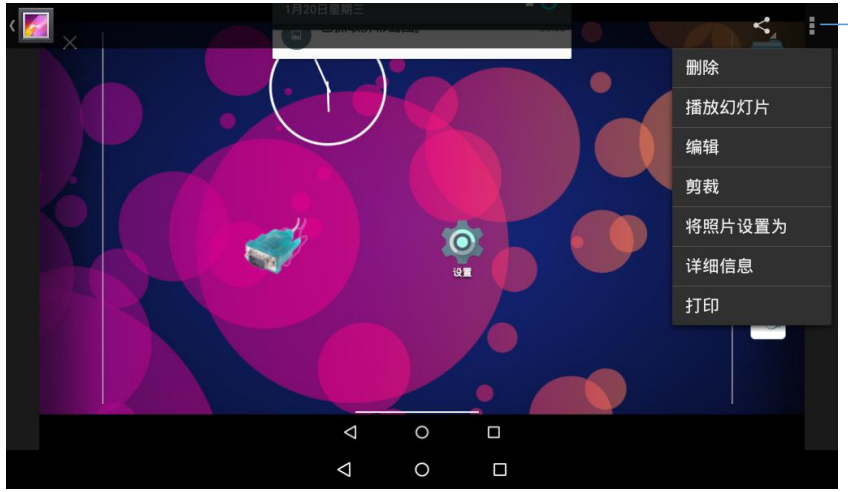
Note: The screenshot function can save a number of pictures, depending on the size of the memory, if the screenshot fails, retake the screenshot, or not, then check if the memory is full, delete a few pictures.



Home screen button



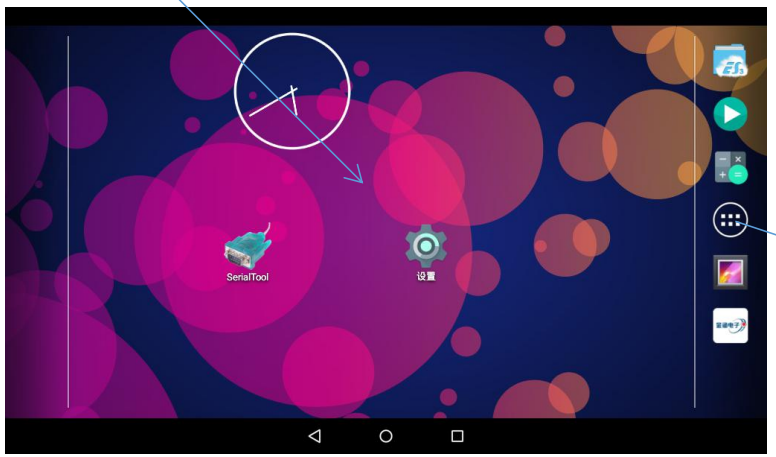
Gallery



Click here to edit pictures

Check the waveform recording method and operation:

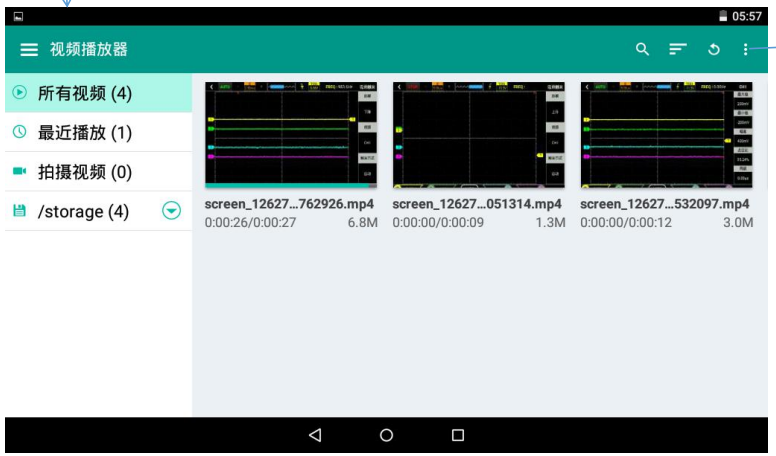
First enter the home screen and then click "Program Manager" to enter the program management interface. Click "Video Player" icon or "Video Player" icon directly on the homepage to enter the setting interface, as the follows picture.



Step 1

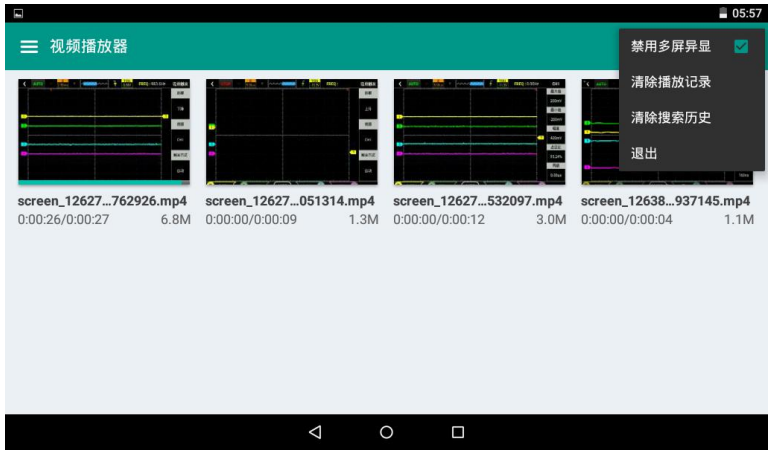
Step 2

Click here to see the corresponding menu below



Step 3

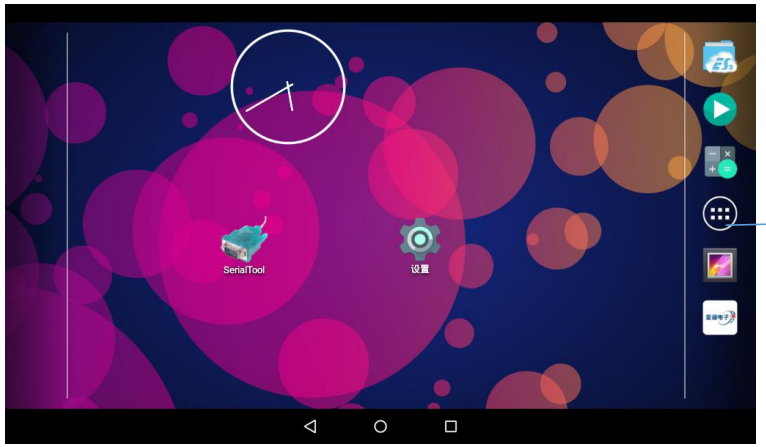
Click here to see the corresponding menu as shown below



Step 4

10.USB connection setup step method

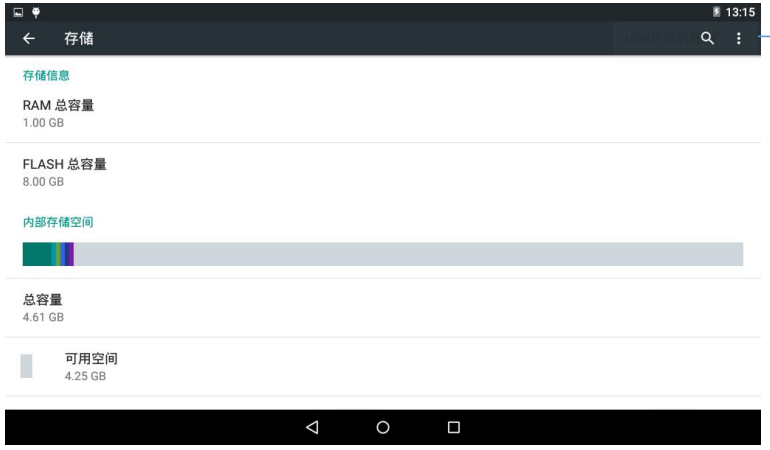
Firstly, enter the home screen and then click "Program Manager" to enter the program management interface. Click the "Settings" icon or the "Settings" icon on the home page to enter the setting interface.



Step 1

Step 2

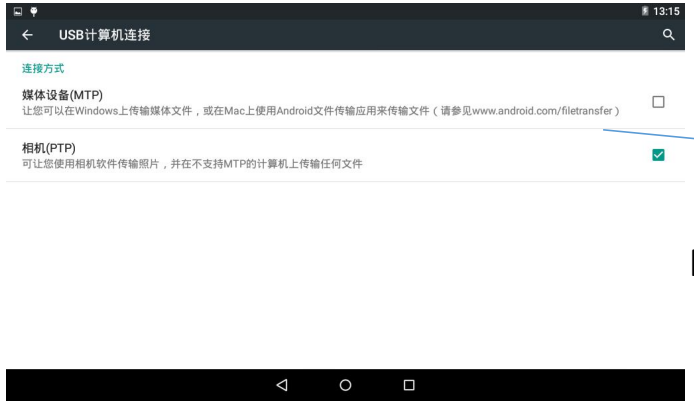
Click here to enter the store menu



Click here for USB connection

Step 3

Step 4



Step 5

Note: Select the connection method: Media connection can view all files in the system, and the camera can only view the camera to take pictures.

11. Shortcut operation

Screenshot: Two fingers move horizontally from the right side of the screen to the left to take a screenshot.

Recording waveforms: Three fingers can be recorded by moving horizontally from the right side of the screen to the left side.

Vertical volts/divisions: Vertical two-finger zoom adjusts the vertical volts/division size.

Timebase: The size of the timebase can be adjusted by scaling both fingers horizontally.

3.3 Oscilloscope multimeter function introduction and operation

This series of oscilloscopes is dual-purpose. Can be used as a digital multimeter and can be used for DC and AC voltage, resistance, capacitance, diode, and continuity measurements. With range display, polarity display, overload display.

Table 2- 6 Multimeter Range

Measurement type	Range					
DC voltage	600.0mV	6.000V	60.00V	600.0V	1000V	
AC voltage	600.0mV	6.000V	60.00V	600.0V	1000V	
Resistance	600.0Ω	6.000KΩ	60.00KΩ	600.0KΩ	6.000MΩ	60.00MΩ
Capacitance	51.2nF	512.0nF	5.120uF	51.20uF	100uF	
Diode	0V-6V					
Interruption	Buzzer alarm below 600Ω					

Measurement methods:

Table 2- 7 Function Description of Multimeter Operation Keys

Icon	**Instructions**
Multimeter	Turn on the main menu interface and select "Multimeter" to enter the function of the multimeter
Function icons	The type of measurement is selected by clicking on the bottom of the screen, and the function name is displayed at the top of the screen
AUTO	On the top right of the screen, click to adjust the range and switch between automatic and manual measurements
RUN/STOP	Multimeter Run/Hold (HOLD) Button

Note 1: The multimeter's default range is “Auto”.If you need to manually set the range, please first predict the voltage to be measured.

Note 2: "AUTO" means to set the range automatically.

(1) DC and AC voltage measurements

Connect the black test lead to the COM terminal on the top of the instrument (ie, the corresponding black port), and the red test lead to the VΩ terminal on the instrument (corresponding to the red terminal).

②Press and hold the oscilloscope red button for a long time. After power on, tap the "Multimeter" under the screen to switch to the multimeter function.

③Select the "DC Voltage File" or "AC Voltage" file according to the screen icon.

④ Connect the test pen to the voltage to be measured or the power supply to read out the displayed value. At the same time, the polarity of the end of the red lead can also be seen by the positive and negative values displayed on the LCD. (The polarity is not displayed when the AC voltage is measured.) This instrument defaults to the “Auto” range. If you need to manually set the range, you can change the range by clicking the “AUTO” icon and then perform the measurement.

(2) Resistance measurement

① Select the "Resistance" file according to the screen icon. As shown below.

② Connect the measurement probe to the two ends of the resistance to be measured. The display value can be read out. If needed, the range can also be manually set.

(3) Capacitance measurement

① Select the "Capacitor" file according to the screen icon. As shown below.

② Connect the measurement probes to both ends of the capacitor to be measured to read out the display values.

Note: The capacitance file can't be set manually.

(4) Diode and continuity test

①Select “Diode” or “On/Off” according to the screen icon, as shown below:

②Connect the test leads to the ends of the diode or line to be tested and read the readings. (Measured diode reading is diode turn-on voltage drop)

③The built-in buzzer will sound when testing a resistance or line less than 600Ω.

Note:

a. The meter shows a positive and negative voltage drop. When the diode is reversed, the meter shows a negative number.

b. The default range of the diode and the off-capacity range is "Auto", and the range cannot be manually set.

c. When the test is on and off, you need to ensure that the “sound” is turned on. Otherwise, the buzzer will not sound. You can set the following steps:

- Return to the main menu interface Click on the screen to select "System Settings" to enter settings
- Select the sound to open or close after entering the setting interface

(5) Data retention function

Click on the "RUN" icon in the multimeter interface to "STOP" and the data being displayed will remain on the display. Even if the input signal is changed or eliminated, the value does not disappear.

Note 1: Do not ground the oscilloscope probe when measuring with a multimeter!

Note 1: Please select the correct measurement range and range before measuring!

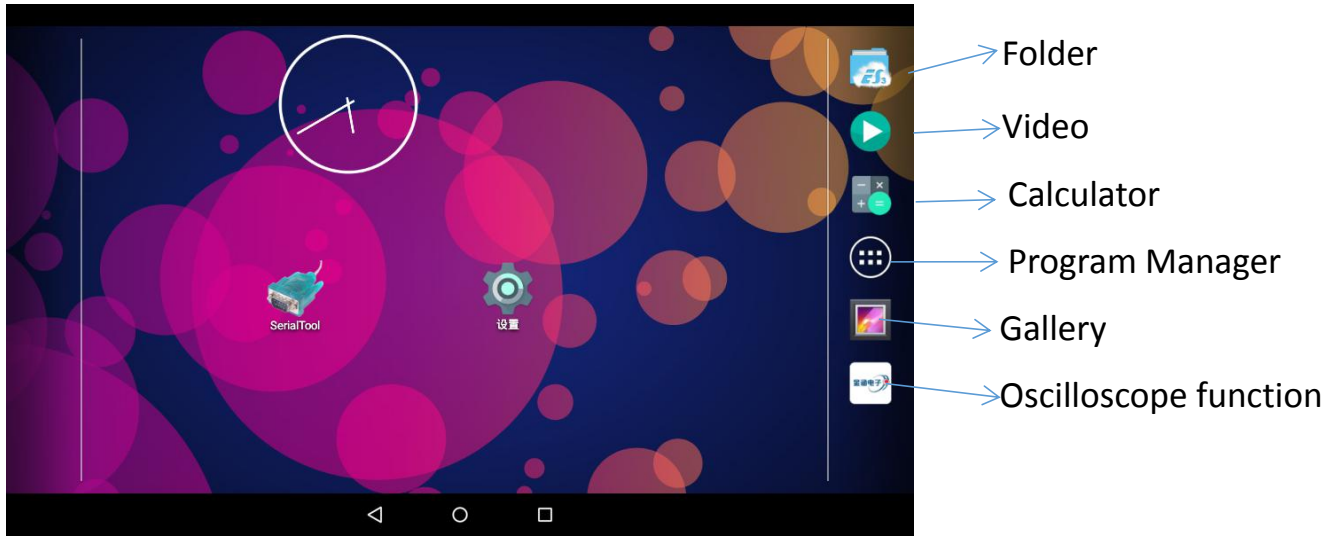
Note 2: Do not use the oscilloscope to measure while connected to USB, otherwise it may damage the instrument!

3.4 Home page features

This chapter contains the functions of the oscilloscope's home page. It describes the functions of the icons on the home page and how to set them. It is recommended that you read this chapter in detail to understand the ADO 20 Series oscilloscope home page features.

This chapter includes Oscilloscope、File Manager、Settings、Picture viewing 、Video playback、Remote Desktop、Time 、Shutdown, restart.

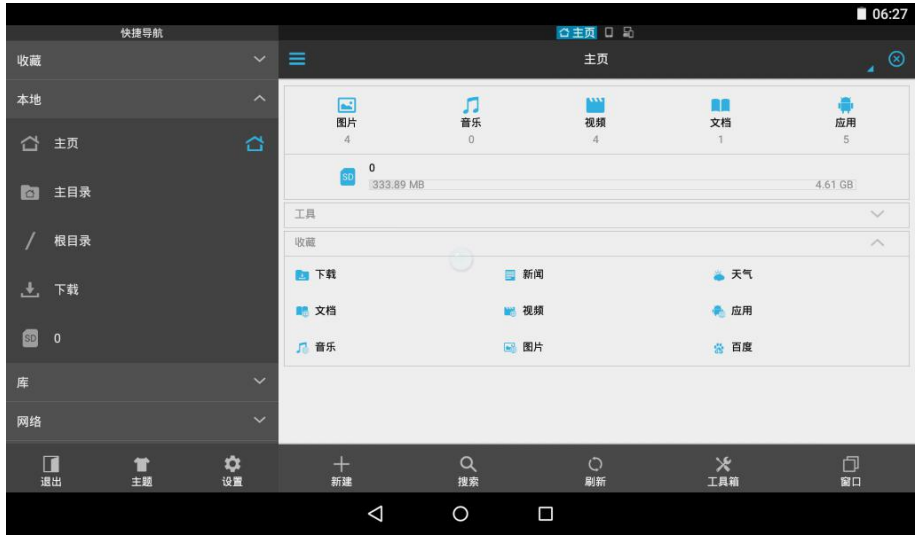
The following figure shows the oscilloscope main page display:



1. Oscilloscope (see Section 3.1-3.4)

2. File Manager

Click on the program manager icon on the homepage, enter the program management interface, click on the icon ES file browser to enter the file manager, when the SD is not inserted, the local file is displayed; when the SD is inserted, the "local" and "SD" soft keys appear, click to Select and manage files in Local or SD. Can realize the function of naming, deleting, exporting. As shown below:



Click "picture" lightly, open the picture list, and enter the picture management interface.

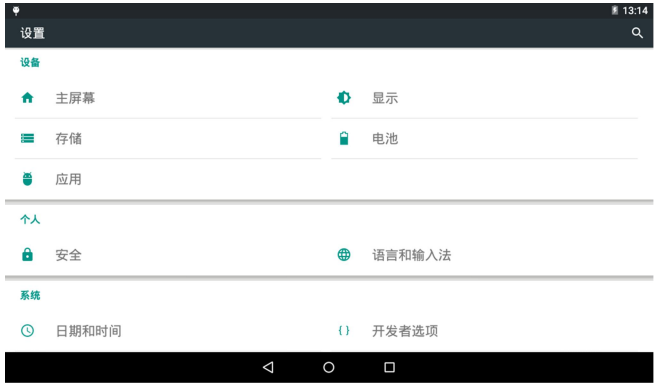
Long press the image. The image is selected. Click the icon at the bottom of the screen to cancel the selection.If a single image file is selected, the image file can be deleted and renamed, and the file can be exported to SD by inserting SD.If more than one image file is selected, the file can be deleted and the file can be exported to SD by inserting the SD.

Click the "select all" button on the right side to quickly select all the picture files. Click cancel again.

Video files, file management and picture files are the same.

3. Settings

Click on the program manager icon on the homepage, enter the program management interface, click the icon to enter the settings interface, the settings interface can be set to include the main screen, display, storage, battery, application, security, language and input method, date and time, developer options About tablet computers. As shown below:



Home screen: Make a home screen selection. The default is the launcher.

Display:Can perform brightness, wallpaper, hibernation, interactive screen savers, font size, device rotation, projection screen, HDMI settings, color system, smart backlight function operation.

Storage:You can view the system storage information and also perform the USB connection setup interface (For details on USB connection settings, see Section 3.2-10)

Battery:Check battery usage.

Application:See what applications have been downloaded and running on the system.

Safety:With screen security, encryption, password, device management, credential storage, advanced feature settings.

Language and input methods:The oscilloscope supports multiple language displays, including Chinese Simplified and English. There are also spell checker, personal dictionary, keyboard and input method, language, mouse/touchpad (can be connected to external devices) function settings.

Date and time:The system can automatically determine the date and time, as well as manually adjust the date and time.

Developer Options:Developers apply.

About tablet:You can view tablet status information, legal information, model number, processor type, software version, firmware version, kernel version, and version number.

4. Picture viewing (see Section 3.2-10 Storage System)

5. Video playing (see Section 3.2-10 Storage System)

6. Cast screen

On the settings screen, tap "Display" to enter the menu, then select the cast screen to enter the searchable castable device selection.

7. Power off, restart, information board

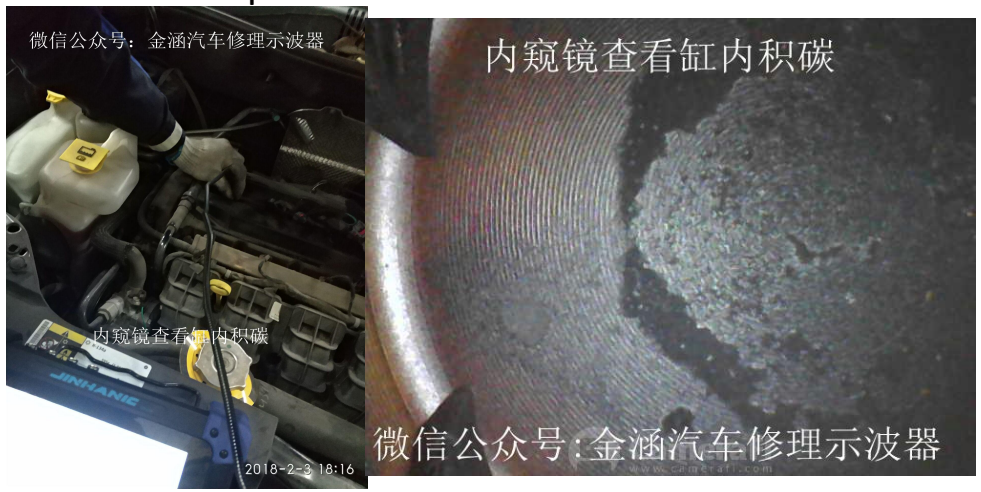
Long press "  " button will pop up the secondary menu to "shut down" or "restart" selection, short press to enter the information screen operation.

3.5 Endoscope

This series of products supports the external equipment endoscope, insert the endoscope, enter the oscilloscope function interface, click the "endoscope" icon to enter the endoscope function can clearly see the inside of the machine. As shown below:

Endoscope

Measured map:



Endoscopy to see the carbon deposit in the cylinder

Endoscope measurement display effect

Endoscope measured throttle condition

3.6 Screen Mirroring

For the convenience of some users can easily use the screen to use on the computer in real time, add this function step as follows:

①When used on the table, it is best to add a cushion below to increase friction.

②Operates with the mouse.

③Download 360 mobile assistant on the computer and the flat panel oscilloscope at the same time, according to the picture instructions to complete the corresponding steps can make the flat panel oscilloscope synchronized display with the computer, convenient live training, network teaching, and even can be displayed on the projector.

Chapter 4
Application Examples

4.1 Simple Signal Measurement

Observe an unknown signal in the circuit to quickly display and measure the frequency and peak-to-peak value of the signal.

- To quickly display the signal, follow these steps:

①After booting, click to enter the "General Oscilloscope" interface, set the probe menu attenuation coefficient to 10X, and set the switch on the probe to 10X;

②Connect the CH1 probe to the circuit test point.

③Click the "AUTO" button.

The digital storage oscilloscope will automatically set the waveform display to its optimum. On this basis, you can further adjust the vertical and horizontal scale of the waveform until the waveform display meets your requirements.

- Voltage and time parameters for automatic measurement signals

The digital storage oscilloscope can automatically measure most of the displayed signals. To measure the various parameters of the signal (maximum, minimum, duty, amplitude, and period), follow these steps:

a) Enter the “General Oscilloscope” and click the “AUTO” button to quickly measure the current signal waveform.

b) Click on CH1 to page, you can observe the maximum, minimum, duty cycle, amplitude. (similar to CH2-CH4). As the Figure 4-1.

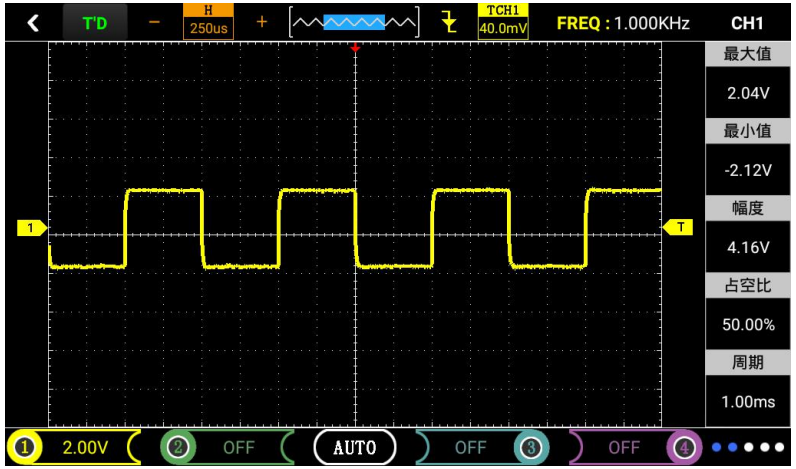


Figure 4-1

4.2 Cursor Measurement

This digital storage oscilloscope can automatically measure a variety of waveform parameters. All automatic measurement parameters can be measured with the cursor. Use the cursor to quickly perform time and voltage measurements on the waveform.

- Measure the peak voltage of the square wave signal.

Take the CH1 channel as an example. To measure the peak voltage of the square wave signal, follow the steps as below.

1, enter the oscilloscope interface, click on "CH1" switch to the "menu selection" item, and then click on the "cursor display" item to enter the "cursor display" interface.

2, in the "cursor display" interface, click on the display as "on" state to open the cursor;

In the "cursor display" interface, click on the "voltage" type;

In the "Cursor Display" interface, click on the source (CH1~CH4) status.

3. At this time, Cursor A (corresponding to the red line above) and Cursor B (corresponding to the red line below) in the "Cursor Display" interface show the voltage value relative to the middle zero voltage reference horizontal line. A voltage value -B voltage value can be added. Voltage.

4, by dragging the upper and lower red lines to align with the highest end of the measured waveform, the peak voltage can be obtained by the voltage value of A-B voltage. See Figure 4-2 and Figure 4-3.

Note: If you use the cursor to measure time, just follow the second step above and set the cursor type to time.

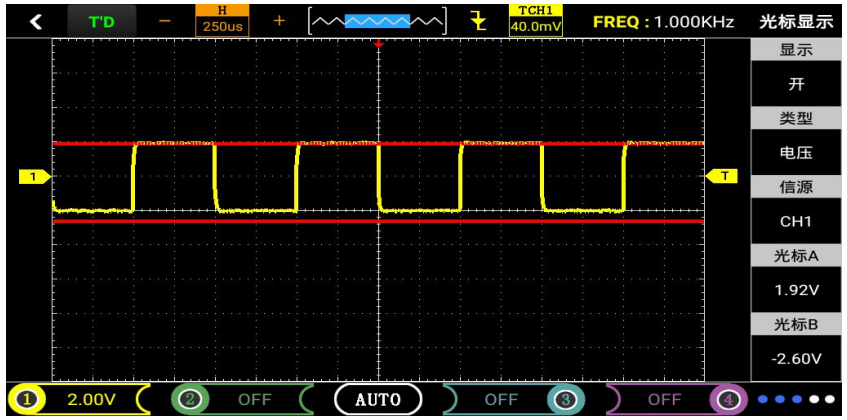


Figure4-2

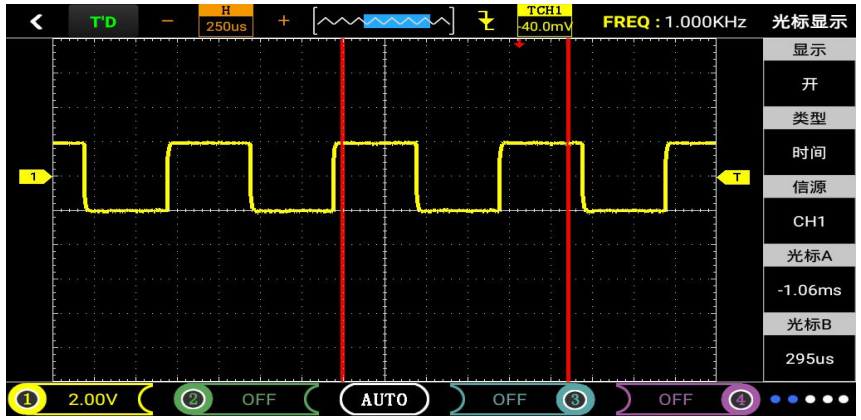


Figure 4-3

4.3 Measuring DC Voltage with an Oscilloscope

1、using automatic (AUTO) measurement DC voltage

1) After booting, enter the main interface of the instrument and click on "Multimeter" to enter the multimeter mode. The default is automatic.

2) Click V⎓ to select "DC voltage" block;

3) Connect the multimeter probe to the DC voltage to be measured and read out as shown in Figure 4-4.

Figure 4-4

Figure 4-5

2、manually set the range measurement DC voltage

1) Click V⎓ to select "DC voltage" block;

2) Click “ AUTO ” to adjust the range. This example is adjusted to “6.000V” based on the estimated range. See Figure 4-5.

Chapter 5

System prompts and troubleshooting

5.1 System prompts

The trigger level has reached the limit:

Horizontal position has reached the limit:

The voltage range has reached the limit:

USB storage device connected successfully:

5.2 Troubleshooting

1、If you press the "  " button, the oscilloscope is still drake and there is no display, follow these steps:

(1) Connect the power supply and check if the battery is powered.

(2) After checking, restart the instrument.

(3) If you still cannot use the product normally, please contact us.

2、After the signal is collected, the waveform of the signal does not appear on the screen. Please follow these steps:

(1) Check if the probe is properly connected to the signal connection line.

(2) Check if the signal cable is properly connected to the BNC.

(3) Check if the probe is properly connected to the test object.

(4) Check if there is a signal in the object to be tested.

(5) Reacquire the signal again.

3、The measured voltage amplitude is 10 times larger or 10 times smaller than the actual value:

Check whether the channel attenuation coefficient matches the actually used probe attenuation ratio.

4、there is a waveform display, but can not be stabilized:

Check whether the trigger source setting in the trigger menu is the same as the channel input by the actual signal. If it is the same, the jitter position can be moved by the up and down keys.

5、click on the icon "AUTO" without any display:

Check whether the trigger mode of the trigger menu is in “normal” or “single” mode, and whether the trigger level has exceeded the waveform range. If so, center the trigger level or set the trigger mode to "auto".

6、 the waveform display is ladder-like:

This phenomenon is normal. It may be that the horizontal time base is too low. Increasing the horizontal time base can improve the horizontal resolution and improve the display.

Chapter 6

Service and Support

6.1 Warranty Summary

We guarantees that the products it produces and sells will not suffer from material and process defects within one year from the date of shipment from the authorized distributor. If defects are found in the detailed provisions of the product warranty, we will repair or replace the service.

Except as provided in this summary or use of the warranty provided in the warranty, we make no other warranties, either express or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. The company is not responsible for indirect, special or consequential damages.

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Appendix A: Technical Specifications

Unless otherwise stated, all specifications are for probes with attenuation switches set to 10X and this series of oscilloscopes. To verify that the oscilloscope meets specifications, the oscilloscope must first meet the following conditions:

- The oscilloscope must operate continuously for more than thirty minutes at the specified operating temperature.
- If the operating temperature variation range reaches or exceeds 5 degrees, correct it. All specifications are guaranteed except those marked with “typical”.
- The oscilloscope must belong to the factory calibration period.

Technical specifications

Import	
Input coupling	AC、DC
input impedance	1MΩ 25pF
Maximum input voltage	40V（probeX1）；400V（probeX10）； can be measured 220V voltage;（probeX10）can measure 2000V voltage
Probe attenuation	1X、10X、100X
Set the probe attenuation factor	1X、10X、100X
Signal acquisition system	
Sampling method	Real-time sampling, random sampling
Memory depth	16K
Acquisition mode	Sampe, peak detec
Vertical system	
Vertical sensitivity	10mV-5V（probe 1X）100mV-50V（probe 10X）（1,2.5,5 step）
Vertical accuracy	+/-3%

Vertical resolution	8bit
bandwidth	10MHz
Horizontal system	
Real-time sampling rate	100 MSa/s
Horizontal scanning range	25nS/div-5S/div
Trigger system	
Mode	Automatic, normal, and single
Type	Rising edge trigger and falling edge trigger
Automatic detection	Support（20Hz-10MHz）
measurement system	
Cursor measurement	Support time and voltage cursors
measurements	Manual
Measure	Amplitude, frequency, period, duty cycle
Equipment	
screen	9.18 inch 1024*600
battery	10000mA lithium battery (continuous work for about 5 hours)

Appendix B: ADO20 Series Handheld Digital Storage Oscilloscope Accessories

ADO 202 Oscilloscope:

- User manual (CD or U disk)
-Certificates and Warranty Cards
-A decicated high-voltage ignition probe
(Found 1: 5000)
-1: 1/10: 1 probe two
-Multimeter table pen one pair
-Four broken wire needle
-Battery charger (9V)
-Portable kit
-USB cable one
-A sticker
-One endoscope probe

ADO 202 Oscilloscope:

- User manual (CD or U disk)
-Certificates and Warranty Cards
-Two decicated high-voltage ignition probe
(Found 1: 5000)
-1: 1/10: 1 probe four
-Multimeter table pen one pair
-Six broken wire needle
-Battery charger (9V)
-Portable kit
-USB cable one
-A sticker
-One endoscope probe

Appendix C: Routine Maintenance and Cleaning

Routine maintenance

Do not store or place the instrument in places where the LCD monitor will be exposed to direct sunlight for long periods of time.

Do not allow sprays, liquids, and solvents on the instrument or probe to prevent damage to the instrument and probe.

Please charge the battery in time when the battery is used up.

clean

The instrument and probe are often checked depending on the operating conditions. Please clean the outer surface of the instrument as follows:

1. Use a soft cloth to wipe external dust from the instrument and probe. When cleaning the LCD screen, be careful not to scratch the transparent plastic protection screen.

2. Wipe the instrument with a damp, soft cloth without dripping water. Remove the battery before wiping. Use a mild detergent or cleansing water. Do not use any corrosive chemicals to prevent damage to the instrument and probe.

Warning: Before reinstalling the battery, please confirm that the instrument is dry and avoid damage to the instrument due to electrical short circuit due to moisture.