ATTEN®
INSTRUMENTS

AT-H501 (5-in1) Scope Meter

User's Manual

INTRODUCTION

Thank you for purchasing ATTEN product ---- AT-H501 which is an **Auto Oscilloscope 5-IN-1 Instrument** (hereafter referred to as “the meter”). The meter is called complex instrument for its function of “FIVE IN ONE”. It can be believed that it will give you great convenient for its innovative function and humane design.

The meter is battery & adapter powered with a digital display.

The meter has been designed to storage the “HELP” information. For the information of help, you can open the HELP window as the way stated in this manual.

CONTENT

SAFETY INSTRUCTIONS

The ATTEN AT-H501 complies with IEC1010-1 CATII-1000V overvoltage standards, See the specification Use the meter only as specified in this manual, otherwise the protection provided by the meter may be impaired.
In this manual, a **Warning** identifies conditions and actions that pose hazards to the user.

A **Caution** identifies conditions and actions that may damage the Meter or the equipment under test.

International symbols used on the meter and in this manual are explained in Table1

⚠⚠ Warnings and Precautions

- To avoid possible electric shock or personal jury, and to avoid possible damage to the meter or to the equipment under test, comply with the following practices:
- Before using the meter, inspect the case. Do not use the meter if it is damaged. Look for cracks or missing plastic. Pay particular attention to the insulation around the connectors.
- Inspect the test leads for damaged insulation or exposed metal check the test leads for continuity. Replace damaged test leads before using the meter.
- Verify a meter's operation by measuring a known voltage. Do not use the meter if it operates abnormally. Protection may be impaired. When in doubt, have the meter serviced.

- Do not apply more than the rated voltage, as marked on the meter, between the terminals or between any terminal and earth ground.
- Use caution when working with voltage above 30V ac rms, 42V ac peak, or 60V dc. These voltages pose a shock hazard.
- Use the proper terminals, function, and rang for your measurements.
- Do not operate the meter around explosives gas, vapor, or dust.
- Remove test leads from the meter before opening the meter case or battery door.
- Do not operate the meter with the case (or part of the case) removed.

✓ Please DO NOT input the voltage & current over the meter endure and operate as the following forms:

Function	Input Terminal	Max Input
V DC	V/Ω, COM	2000V DC，not exceed 10secs, manual ranging measurement
V AC	V/Ω, COM	1000V AC rms，not exceed 10secs, manual ranging measurement
Hz%	V/Ω, COM	250V DC/AC rms，not exceed 10secs
mA AC/ DC	600mA,COM	600mA DC/ACrms，250V/600mA fuse

A AC/ DC	V/Ω, COM	Adapter 10A DC/AC rms， not exceed 10secs，build-in 250V/10A fuse
Ω	V/Ω，COM	250V DC/AC rms，not exceed 10secs
Cap	V/Ω，COM	250V DC/AC rms，not exceed 10secs
Lx	Lx，COM	DO NOT input any voltage

- ✓ Connect the test leads or the oscilloscope probe to the meter as the symbol indicator ○ ◉ ◉ ◎.
- ✓ When use the multimeter function, please disconnect the signal output line and the oscilloscope probe to the meter to avoid high voltage electric shock.
- ✓ Oscilloscope and the signal generator when used simultaneously, please keep the leave of oscilloscope probe being the same with the signal output line to avoid damaging the meter or equipment
- ✓ Do not measuring voltage if the voltage between COM and ground is up to 500V.
- ✓ Do not measuring AC voltage if the voltage of the test circuit is up to 250V AC, except the external clamp accessory.
- ✓ Do not connect to test leads and output line to voltage when in current, resistance, capacitance, inductance measurements, as well as in signal output function.
- ✓ Please turn off the meter when change the built-in fuse in current input terminal with the specified fuse.
- ✓ When servicing the meter, use only specified replacement parts.

Table 1 International Electrical Symbols

	AC(alternating current)		Earth ground
	DC(direct current)		Fuse
	AC or DC		Double insulate
	Safety information		Shock hazard
	Battery		Complies with EU directives

PRODUCT INTRODUCTION

Feature

- 25M Digital Storage Oscilloscope Meter (DSO) & 6600 count Auto Ranging Waveform Digital Multimeter (DMM) & 10Hz~156 kHz Function Generator (DDS)
- 60MHz frequency / duty cycle, 156kHz auto-ranging inductance/ 66000μF capacitance/ 60MΩ resistance(LCR), remote control/ crystal detected measurements
- Panel calibration without open the meter
- The bandwidth of AC voltage is up to 20kHz and one key switch to waveform display, the max range is up to 2000V
- In voltage range measurement, peak value detected and peak value hold, and display the MAX/MIN/current value simultaneously on one screen.
- In DSO mode, one key to switch auto-ranging measuring, automatically display the test waveform and automatically ZERO calibrating.
- Digital read out Vp-p, +Vp, -Vp, F, T, dV, dt and measuring parameters
- Storage/ readout over 40 DSO waveform and 200 groups of DMM data; automatically record 200 groups of data for detecting IC conveniently.
- Generate Sine Wave, Triangle Wave, Saw Tooth Wave and Square Wave, and match using the DSO simultaneously to found the test system.

- 200μS/400μS test square wave to detect the Ring signal generated by short circuit in Line output transformer
- 320 X 240 industry level LCD with contrast adjustment LED backlight
- Built-in 1600mAh Ni-Hi charge battery, external matched power adapter
- USB interface
- Function extended with optional accessories.

Instrument overview

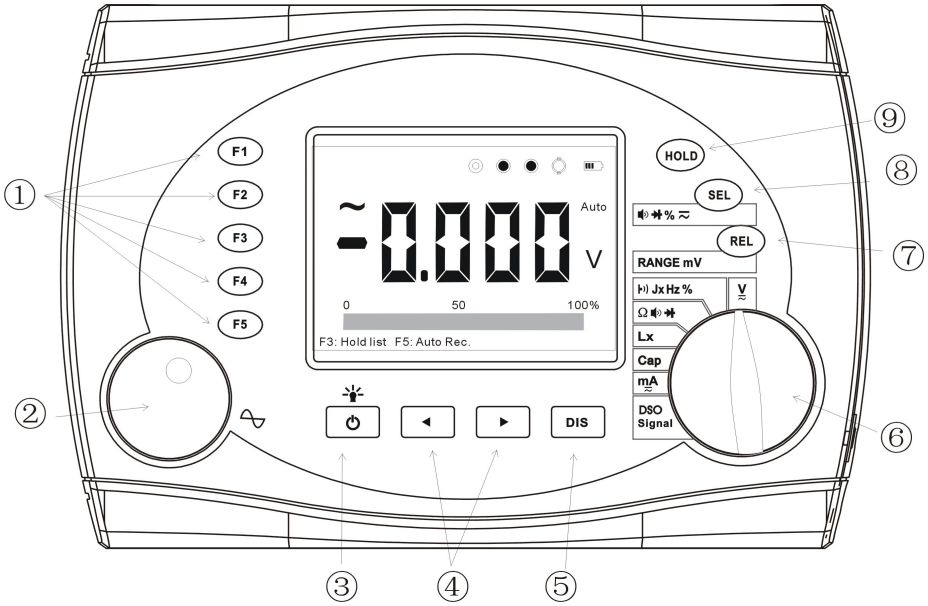


Fig1. Panel of the meter

Instruction of every button, switch and keys

Item	Description
1	F1~F5 function key used to adjust the setting in DSO mode. Including system, menu settings and settings in measuring mode
2	Code switch, matched F1~F5key and ◄ ► to set the frequency of the output signal and to adjust the measuring parameters in DSO mode
3	Power button; backlight display button. Press and hold this button no more than 2secs, the backlight will be turned on, repeat the step again to turn off the backlight
4	Used to change the frequency of the output signal and test parameters in DSO mode
5	In DSO mode, this button used to enter or exit the systems setting; in DDM mode, this button used to display waveform in V~ and mA~ measurement mode
6	Function rotary switch, used to select the range in DMM mode and DSO, DMM, DDS mode selection
7	Relative value measurement in DMM mode and used to choose voltage range manually in voltage measurement range; press this button to select the mV range measurement.
8	AC/DC select button and continuity test, diode test and duty cycle test selection
9	Data hold/ waveform suspend

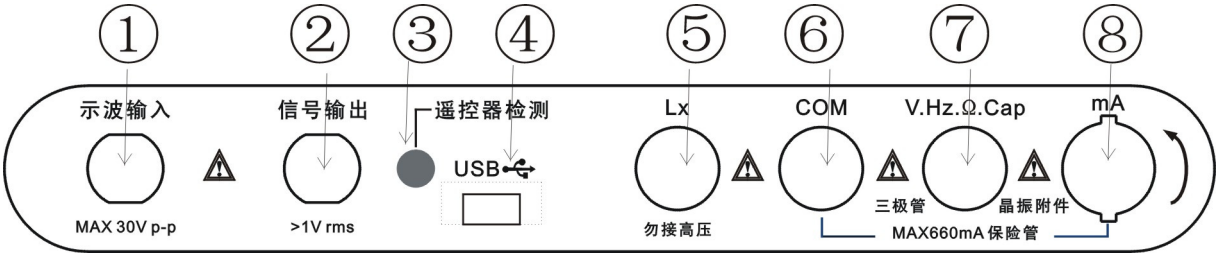


Fig2. Input terminal indicator

I/O Terminals

Item	Description
1	Input terminal for oscilloscope
2	Signal (sine wave, square wave, saw tooth wave, triangle wave)output terminal
3	Receive port for Remote Control
4	USB interface
5	Input terminal for inductance measurement
6	COM terminal for all DMM measurements

7	Input terminal for voltage, frequency, resistance and capacitance measurements and for 10A adapter measurement.
8	Input terminal for mA measurement (turn this jack with a coin to replace the spare fuse)

Back view of the meter

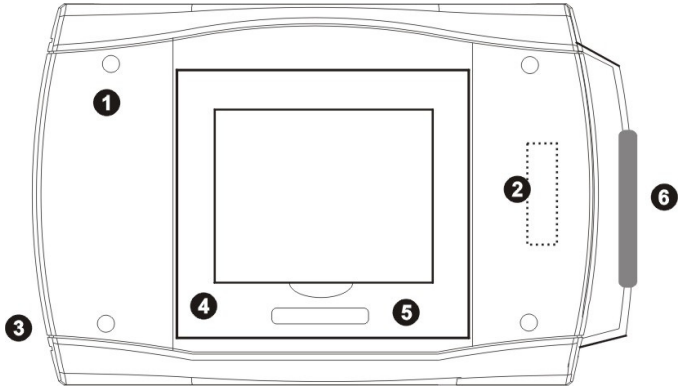


Fig3. Back view of the meter

Item	Description

1	Four screws for fixing the back lid
2	Spare fuse(open the small lid and fetch)
3	Terminal for Adapter charging the power and LED guide charging statues
4	Built-in reset switch
5	Back support lid
6	Scalable carry belt

BASIC OPERATION

Turn ON and Turn OFF the meter

Press the ⏻ button and hold for over one second to turn the meter on, press this button again to turn the meter off.

Auto power-off

The meter comes with auto switch-off function, 10mins after no change of the last selection function or rotary switch position.
This function can be selected to close in system setting where you can select manual power –off.
To protect the battery from excessive discharging, the meter will auto power-off when the capacity of the battery is low.
Buzzer alert following by consecutive 30secs before the power comes off.

Backlight display

Turn on the backlight in dark line environment to light the display reading. Press the ⏻ button to turn on the backlight after turning on the meter. Press this button again to turn off the backlight.

Battery charging

Warning: *Press the ⏻ button for many times will damage the battery, please avoid to pressing and holding this button for long time.*

When the meter is powered from the built-in battery/ adapter, the battery symbol icon will be displayed on the right-up corner of the screen. It can show you the capacity of the current battery.

The battery will be in charging mode or charging protection mode once the meter connected to the power adapter
The meter will automatically enter into charging mode and LED will show the charging statues when the meter is not supplied the power. During charging, LED release orange light; when going to charge fully, LED release green light and flash; when charging fully, LED release green light. If LED releases red light, power happens fault.

The adapter will supply power to the meter and charge the battery when the meter is turned on. The symbol icon will be displayed on the LCD.

If the meter is not used for a long period, please charge the meter every three months and the charging time should be longer than 8hs.

Charging With Adapter

Warning: *To avoid to damaging the meter permanently, please do not measure 250VAC or 360VDC when connecting the adapter.*

The main function of the AC adapter is charging the built-in battery. What's more, it also can supply power to the meter directly and no consuming the battery. It can be connected to the meter any time.

The meter will change the statue from charging to working if press the power button ⏻ when the adapter is charging the batter. Instead the step, the meter will change the statue from working to charging. To stop working, the meter should be turned off and the adapter be disconnected.

The adapter is 12V1A switch power type and has the feature of low ripple voltage, board voltage range, short circuit protection and so on. Please change it with the same type.

Resetting

Warning: *Before opening the back lid, please make the test probe away from the test point.*

It may make the CPU to be down when measuring voltage. Resetting the meter will resolve the problem. Two resetting way to choose: one is pressing the HOLD, SEL, REL buttons simultaneously; another is pressing the built-in switch (this way needs to open the back lid with a screw, see the back view chapter).

OSCILLOSCOPE OPERATION

Basic content in oscilloscope mode

Warning: *Do not touch the metal during the measuring process to avoid electric shock!*

Display in oscilloscope mode (Fig 4.) (here after called "DSO Mode")

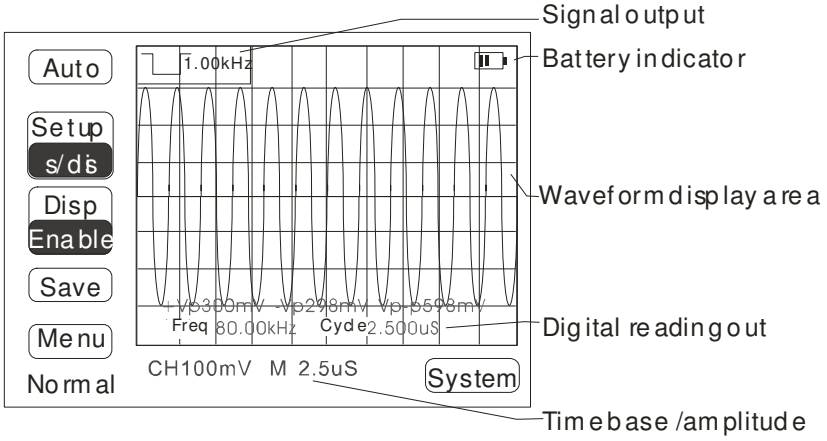


Fig4. Fig of the first time entering into DSO Mode

System setting and the menu

Turn the rotary switch to the DSO position and press the power button⏻, the buzzer release in-continuous beep sounds and the screen display analog bar indicating from 0% to 100%.

When the meter enters into the DSO mode, the current setting displayed. Press F5 key or wait for 30secs to exit and enter into Normal Mode.

Press the DIS button to enter into DSO system setting window (Fig5.), the function of F1~F5 keys:

Key	Function settings	Selection
F1	Power-off	Manual/auto
F2	Coupling way	AC/DC
F3	Probe attenuation	1:1, 10:1, 100:1
F4	contrast	Rotary the Code switch or press the button ◄ ► to adjust the contrast
F5	Back	Back to the DSO mode
DIS	🔊 🔇	Open or close the buzzer

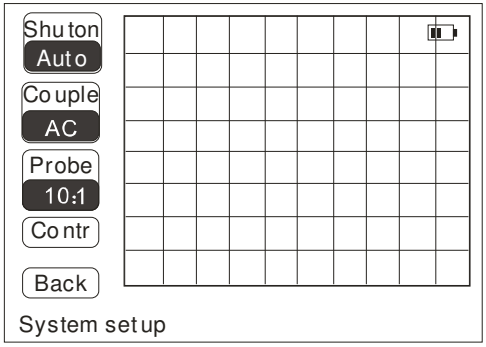


Fig5. Fig of system setting window

Tips for Key F1~F5 and button in DSO system setting:

1. *Press Key F1 to select manual/ auto power off. Auto power-off selected, the meter will power-off in 10 mins without any action. The meter will not auto power-off if the meter is connected to the PC through USB.*
2. *Press Key F2 to select couple way. When set DC couple, both DC and AC signal will pass; when set AC couple, only AC signal will pass. If the percentage of DC signal is much bigger, the waveform of the test signal may displayed out of the screen.*
3. *Press Key F3 to set the probe attenuation. The setting will be the same as the probe's attenuation. If the probe's is x 1, please set the probe attenuation to be 1:1; if x10, to be 10:1; if X100, to be 100:1(should purchase with this ratio probe). If the setting of probe attenuation in system is different from the probe attenuation in the probe which may affect the test reading.*

4. *Press Key4 to adjust the contrast. Rotary the Code Switch or press the button* ◄ ► *to adjust the contrast as the working condition.*
5. *Press Key5 to back. Press this key, "save" or "not save" will be showed for you to choose. Please choose "save" to save the setting.*
6. *Press DIS button (* 🔇 *) to close the buzzer. If the meter enters into continuity/ diode tests, the buzzer will be opened.*

Press Key5 to enter into the menu on the Normal, Video, Single or Graphic mode (Fig 6.). The instruction of the Key1~Key5:

Key	Function setting	Selection
F1	Normal Mode	Measuring the repeatable waveform
F2	Video Mode	Detection of the waveform of the video
F3	Single Mode	Measuring complex waveform
F4	Function Extend	Spare function
F5	Graphic play	1~40 groups storage waveform

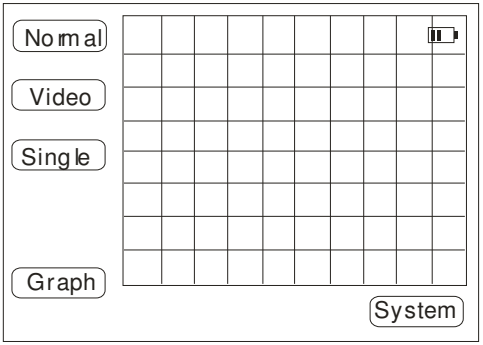


Fig6. Fig of Menu

***Tips for Key F1~F5 in Menu*:**

1. *Press Key1 to choose Normal Mode. When choosing auto ranging mode, the meter will automatically choose the suitable Time base, the input amplitude control and the trigger level, and display many Cycles stable waveform and digital readout Vp-p, +Vp, -Vp, frequency and Cycle simultaneously.*
2. *Press Key2 to enter into Video Mode. Line and Field sync selection. Choose with the button.*
3. *Press Key3 to select the Single Mode which is suitable to measure some complex waveform or capture sporadic signal. Before measuring, Time base, Amplitude, Rising edge, Falling edge should to be set as the feature of the signal.*
4. *Press Key3 to play the 1~40 stored waveform. Choose one by pressing the button* ◄ ► *or rotary the Code Switch.*

Normal Mode

When enter into Normal Mode, see Fig7. The function of the Key F1~F5, DIS and SEL button in this mode:

Button/key	Function	Selection
F1	Auto	Automatically set Time Base, Amplitude and Trigger
F2	Time Base/Amplitude	Manual adjust Time Base and Amplitude
F3	Digital read out	Display +Vp / -Vp / Vp-p Frequency and Cycle
F4	Save	Waveform save
F5	Menu	Choose the measuring mode or waveform readout
DIS	system	Couple way and attenuation setting

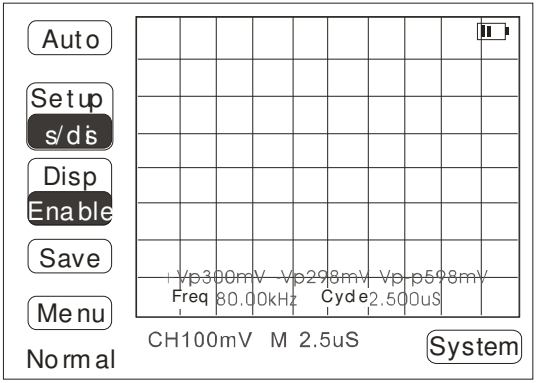


Fig7. Fig of Normal mode

Tips for operation of KeyF1 ~KeyF5:

1. *Press Key F1 to enter into automatically measuring. The meter will choose the suitable Time Base, Amplitude and the Trigger condition and display stable waveform. During measuring, if Random Signal or Interference Signal comes on, the sync may be unstable. Then please changing the measuring mode to the Single mode or press KeyF2 to manual set the Time Base/ Amplitude.*
2. *Press Key F2 to manual set the Time Base/ Amplitude. Select the suitable setting by turning the Code switch or pressing the button* ◄ ►.
3. *Press Key F3 to display digital readout. Press Key F3 to open or close readout.*
4. *Press Key F4 to save the current test waveform. (see Note1 and Fig 8.)*

5. Press Key F5 to enter into Menu. Then the measuring mode can be choose again.

Note1: press Key F4 to enter into save windows. The following form is the Function of Key F1~F5:

Key	Function	Selection
F1	Position No.	Choose by turn the Code Switch or press the button ◄ ►
F2	Save	Confirm to save
F3	Delete	Delete the choose Position No.
F4	Clear	Clear 1~ 40 of the stored waveform
F5	Back	Back to the mode before entering here

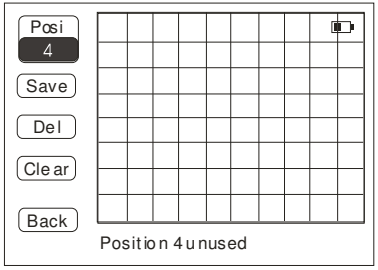


fig8. Fig of save window

Tips for Note1:

1. *Press KeyF1 to change the Number of the position. Every pressing Key F1 or ◄ ►, the number of the position is plus or subtract 1; or rotary the Code switch to choose the position quickly.*
2. *Press KeyF2 to confirm saving. After press this button, the screen will show "be saving the data" and "saved successfully".*
3. *Press KeyF3 to delete the selected position. Press this key and choose "Yes" or "No".*
4. *Press KeyF4 to clear all the stored waveform. Press this key and choose "Yes" or "No".*
5. *Press KeyF5 to choose "Yes" to confirm saving the data into the storage list and back to the current measuring mode.*

Time base adjustment

In Normal Mode, press F2 to choose and set Time Base. Rotary the Code Switch or press the button◄ ►, the range of Time Base change from 10ns/div ~ 1s/div. If measuring an un-known frequency signal, capture the waveform from the high range of Time base and work down. Otherwise, because of "aliasing effect", the waveform can not show the real waveform of the signal.

To avoid Aliasing Effect, there are many ways: adjust the Time Base or press KeyF1 to choose auto measuring.

Vertical amplitude control

In Normal Mode, press F2 to choose and set Amplitude. Rotary the Code Switch or press the button◄ ►, the range of Amplitude change from 20mV/div ~ 500V/div.

Waveform auto triggering

Waveform auto measuring adopts auto trigger mode. That is to say no detecting trigger condition but the meter still can trigger. If no trigger condition, the meter will wait some time and self trigger to capture some data. Because of no setting trigger level, the meter will show the rolling waveform or until capture the waveform. The waveform may be unstable if the measuring signal includes interference signal, non-equal amplitude and unrepeatable waveform. At this time, press HOLD button to show one waveform captured by high speed A/D for analysis of the feature of the signal. This function is called “pause”. It had better choose Single Mode to measure no-rule signal.

Waveform measurement in Normal Mode

Connect the test signal to the oscilloscope input terminal. View LCD (system default setting probe attenuation ratio 10:1) to check for the test waveform and press Key F1 to make the waveform to be stable (see note2). The digital read out area show digital result. Press the button ◄ ► or rotary the Code Switch to change the Time base setting. And press Key F2 to

change into the amplitude setting mode and the same way to change the amplitude setting.
The default setting is 1mV, 1ms(system setting 10:1)

When the meter display a stable waveform, the digital readouts +Vp、-Vp、Vp-p directly displayed on the screen。If the absolute value of +Vp equals –Vp's which indicates the test wave is symmetrical wave; if choose DC Couple way, the margin of +Vp and –Vp is the DC weight of the signal; if the amplitudes of the test wave are different, +Vp and –Vp is the max value of the displayed wave. Therefore, getting the parameter readings of the test cycle signal should be computed as the reading of CH xx(mV), M xx ms (s, ms, μs、ns) under the display area. Every horizontal grip stands for xx ms (s, ms, μs、ns) and every vertical grip stands for xx (mV).

Note2: press KeyF2, the meter does not capture the stable waveform. There may be some reasons: A, the input amplitude of the test wave is too low to capture; B, the frequency of the test signal is lower than 1Hz; C, the probe attenuation ratio setting is wrong; D, the frequency is over the range; E, the weight of reference signal is larger than the test signal; F, the probe is broken down or wrong connection; G, machine fault. (see the probe calibration way to check for the machine fault)

Video Mode

Before entering into the Video Mode, a safety information window will be opened. Press Key F5 to exit or wait for 30secs, the meter will enter into Video measuring mode.

Key	Function	Selection
F1	Sync	Line, Field sync selection
F2	Polarity	Positive/negative
F3	Set	Time base/ Amplitude
F4	Save	Waveform saved
F5	Menu	Select the measuring mode and waveform playback
DIS	System	Attenuation and couple way setting

Tips for instruction of operation of the key & button in video mode:

1. *Press KeyF1 to enter into sync selection. Capture the Line or Field sync of the composite signal and display Line/ Field sync.*
2. *Press Key F2 to select the positive/negative polarity.*
3. *Press Key F3 to set Time base/ amplitude setting. Adjust the setting by pressing the button or rotary the Code switch.*
4. *Press KeyF4 to save the current waveform.*
5. *Press KeyF5 to enter into menu.*
6. *Press DIS button to enter into system setting mode.*

Waveform measurement in Video Mode

Select the Video Mode Connect the test signal to the oscilloscope input terminal. View LCD (system default setting probe attenuation ratio 10:1) to check for the waveform of the Line/Field sync The digital read out area show digital result. Press the button ◄ ► or rotary the Code Switch to change the quantities of the displayed waveform. And press Key F3 to change the Time Base setting mode into the amplitude setting mode and the same way to change the amplitude setting.

The default setting is 500mV, 25μs (system setting 10:1)

When getting a stable waveform, the parameter readings of the test sync signal should be computed as the reading of CH xx(mV), M xx ms (s, ms, μs、ns) under the display area. Every horizontal grip stands for xx ms (s, ms, μs、ns) and every vertical grip stands for xx (mV).

If the waveform is unstable, press the HOLD button and the screen will display one of captured waveform by high speed A/D to analysis the feature of the signal.

Single Mode

In Single Mode (see fig9.), the function of KeyF1~F5:

Key	Function	Selection
F1	Single	Statues: start, wait

F2	Time Base/ amplitude/trigger	Time Base/ amplitude/trigger setting
F3	Trigger mode	Rising edge, falling edge
F4	Save	Save the waveform and stored in to the record list
F5	Menu	Select the measuring mode or waveform read out
DIS	System	Attenuation and couple
Code switch	Parameters setting Press to enter displacement	Time Base/ Amplitude/ Trigger Level Display the stored waveform in the Buffer
HOLD	Cursor measuring	Cursor measuring

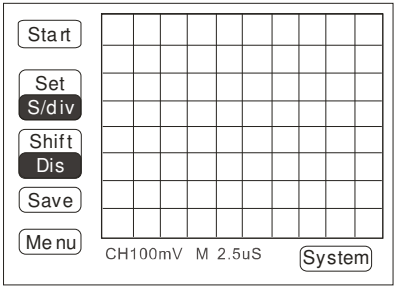


Fig9: fig of Single Mode

Tips for KeyF1~F5 in Single Mode:

1. *Press KeyF1 to start measuring, the statues will changed form "start" to "waiting". If the trigger level of the input signal meets the setting condition, the screen shows the stable waveform. Press this key again to exit waiting mode*
2. *Press KeyF2 to set the Time Base/ amplitude/Trigger mode. Turn the Code Switch or press the button to change the setting value.*
3. *Press KeyF3 to select trigger way. Rising edge or Falling edge selection*
4. *Press KeyF4 to save waveform. Press this key to save the current test waveform*
5. *Press KeyF5 to enter into menu*
6. *Press DIS button to enter into system setting*
7. *Press the Code Switch to enter into displacement setting. Rotary the Code Switch to change the setting.*

Time base setting

Press Key2 to choose the Time Base, rotary the Code Switch or press the button ◄ ► to change the setting (default 2.5μs) and get the suitable waveform. (Fig 10)

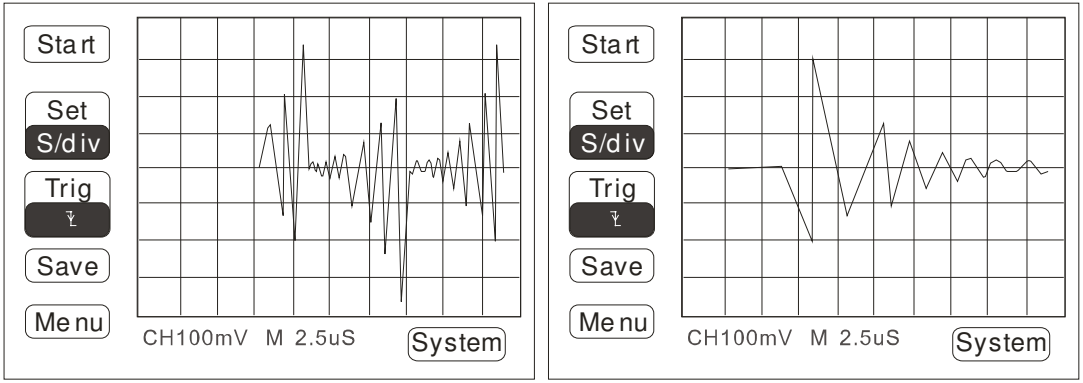


Fig10: Fig of Time base setting in Single Mode

Amplitude settings

Press Key F2 to choose Amplitude setting, rotary the Code Switch or press the button ◄ ► to change the setting (default 1V，system 10：1) and get the suitable waveform.

Trigger condition settings

Press Key F2 to choose Trigger setting, rotary the Code Switch or press the button ◄ ► to change the Trigger condition and get the suitable waveform.

Press Key F3 to choose Rising Edge/ Fall Edge.

Horizontal displacement adjustment

When getting the stable waveform, press the Code Switch to enter into the horizontal displacement adjustment mode. Rotary the Code Switch to change to adjust the displacement, and play back the waveform stored in the buffer. The sample reading is displayed on the bottom of the displayed area.

Cursor measurement reading-out function

In the Single Mode, Press the HOLD button, the cursor will enter into the next window as the followings

Key	Function	Selection
F1	Top cursor	Amplitude, top cursor moving
F2	Bottom cursor	Amplitude, bottom cursor moving
F3	Left cursor	Time, left cursor moving
F4	Right cursor	Time, right cursor moving
F5	Back	Back to Single mode
Code Switch	Cursor moving	Rotary the Code Switch to change the position of the cursor

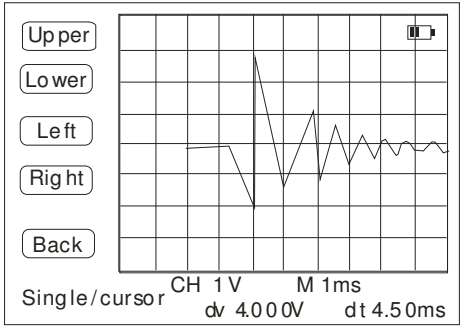


Fig11: fig of cursor measurement

Tips for Key F1~ F5 in Cursor measurement reading-out function:

1. *Press KeyF1 to choose the top cursor and rotary the Code Switch to change the position*
2. *Press KeyF2 to choose the bottom cursor and rotary the Code Switch to change the position*
3. *Press KeyF3 to choose the left cursor and rotary the Code Switch to change the position*
4. *Press KeyF2 to choose the right cursor and rotary the Code Switch to change the position*
5. *Press Key F5 (or HOLD button) to exit and back to the single measuring mode menu*

Press HOLD button to enter the cursor measuring mode. The reading dv/ dt will show the voltage difference and time difference between two cursor.

Waveform measurement in Single Mode

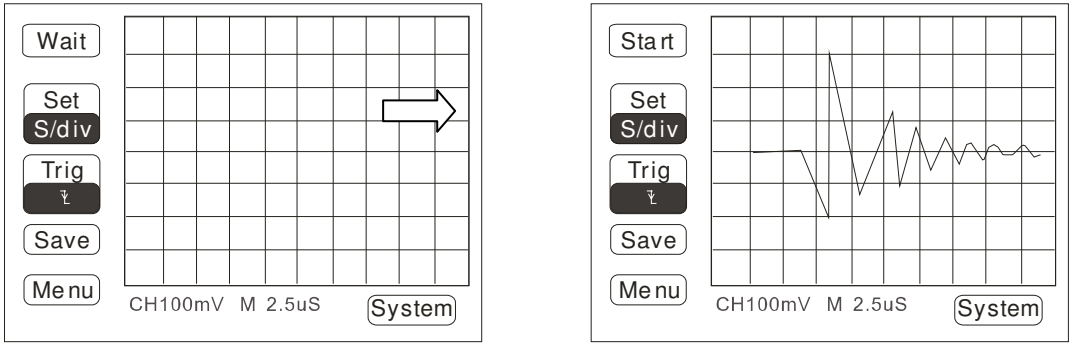


Fig12. Fig of Waveform measurement in Single Mode

In Menu mode, press KeyF3 to select the Single Mode. Set the Time Base, Amplitude, Trigger way as the characteristics of the test signal connected to the input terminal of the oscilloscope. Press Key F1, “waiting…” indicates. View the LCD to check if a stable waveform displayed on the screen. Press the Code switch to adjust the displacement. Press the HOLD button to enter into the cursor measuring mode and analysis the feature of the test signal. If the waiting time is too long, please press Key F1 to exit waiting.

The default of Single measuring 1V 2.5μS (system setting 10:1)

Signal waveform hold

Continuative sampling the data, the waveform will be flushed. Hold the waveform is used to hold the current data or the wave for analysis. Two ways can be applied to hold the waveform: press the HOLD button or sweep mode in single trigger measuring.

Holding the waveform is different from saving the waveform. Waveform is used to hold the displayed reading, press this button or change to other position, the data will be lost. If want to hold the waveform for long time, please use the saving function.

Storage and reading out of the signal waveform

DSO database has 40 DSO waveform-data memory area. The operation of the storage/ read out:

1. Waveform storing: in Normal Mode, Video Mode, Single Mode, press Key F4 to enter into saving window; as the operation to choose to save the waveform.
2. Waveform readout: in Normal Mode, Video Mode, Single Mode, press Key F5 to enter into the Menu to choose Graphical Mode.
3. Connect the meter to the PC, the stored waveform of DSO database will be displayed on the PC interface.

Signal source Operation

Signal source settings

Warning: *In DMM current measuring mode, there will be high voltage danger if connect the output signal to the Ground terminal. And please do not connect any voltage signal to the signal source. Please keep the voltage levels of the signal output line and the DSO probe are the same when simultaneously used the DSO and DMM.*

Rotary the Function Switch to choose the DSO position, the meter is in Normal measuring mode.

Signal generating

The signal source adopts DDS Digital frequency synthesis technology and got a stable basic frequency through FPGA. The frequency of the signal source is 156.25 kHz/n. Adjust the frequency of the signal as the following rule:

- 10Hz~100Hz, frequency step interval 1Hz.
- 100Hz~1000Hz, frequency step interval 10Hz.
- 1kHz~10kHz, frequency step interval 100Hz.
- Above10kHz: 10427Hz, 11161Hz, 12019Hz, 13021Hz, 14205Hz, 15625Hz, 17361Hz, 19531Hz, 22321Hz, 26042Hz, 31250Hz, 39063Hz 52083Hz, 65500Hz, 65530Hz, 78125Hz, 156250Hz.

Signal source settings

In the Normal Mode, press and hold the Code switch for 2 secs until to hear the sound changing from “DI” to “DI DI”. Release the button and the screen pop a window (Fig 12.)

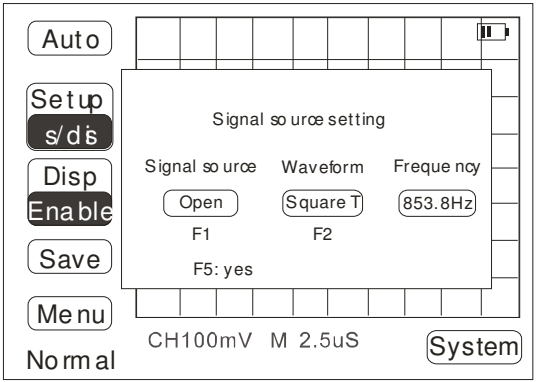


Fig12. Fig of signal source setting

Press KeyF2 to choose the type of the signal. The types of the wave: sine wave, triangle wave, positive saw tooth wave, negative saw tooth wave, square wave and square T wave. The square T produce a special signal: 1kHz square wave generated to be used to calibrate the probe; 200μs、400μs signal is used to match the DSO to detect the fault generated from the Line output transformer.

Frequency selection

Press KeyF2 to choose the type of the signal. Press the button ◄ ► or rotary the Code Switch to set the frequency of the signal source. The adjustment range of the frequency is 10~15625Hz. Turn the Code Switch clockwise to set higher frequency and counterclockwise to choose lower frequency. The higher the speed of the turning, the step interval is bigger. Another way, press the button ◄ ► to adjust the frequency. Press Key F5 to confirm the setting to be saved. The type and the frequency of the setting signal source is showed on the left-top of the screen.

Close the output of the signal source

Repeat the above operation step to enter into signal source setting and press KeyF1 to choose closing the signal source output. Then press Key F5 to confirm the changing setting again.

Calibration for the oscilloscope signal

If the probe is used at the first time, please calibrate it before using.

Rotate the Function switch to choose DSO Normal mode.

Choose the square T wave and turn the Code Switch and press the ◄ ► to set the frequency to be 1.00kHz. Press keyF5 to confirm saving the setting. Place the probe compensation switch to be X10 position and connect the head of the

probe to the signal output terminal. Press Key F1 to get a stable square wave.

Check the mode of the displayed waveform is “Over-compensation”“ Right compensation” ”Inadequate compensation”. Please use the insulated screwdriver matched with the meter to adjust the capacitor in the front of the probe until the mode to be “Right compensation” (see Fig13)

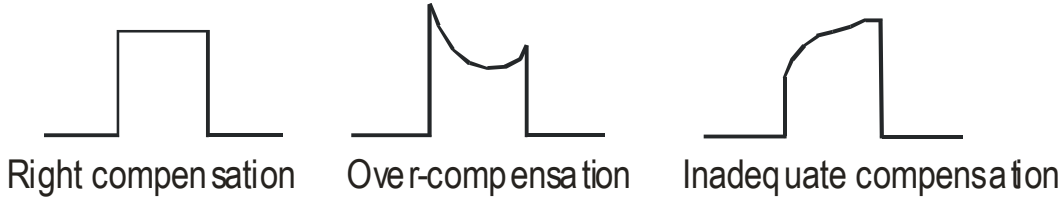


Fig13. Fig of compensation type

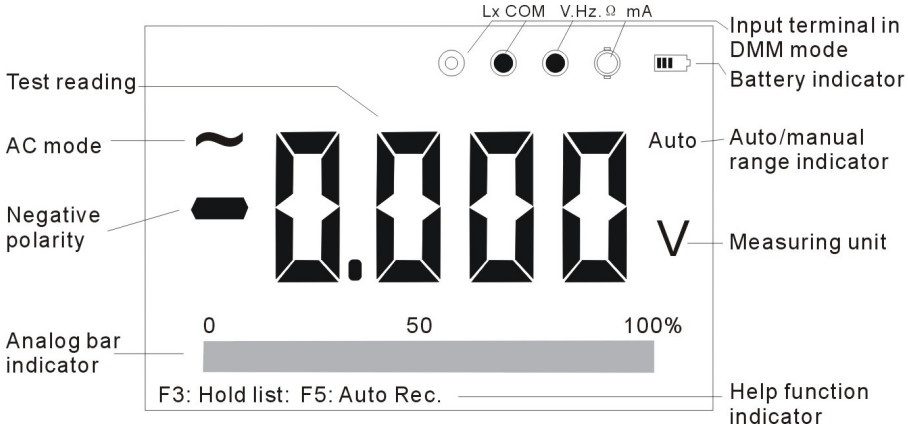
Tips: when the probe compensation is in X1position, the bandwidth is lower than 10MHz; after calibrating and the probe compensation is in X10 position, the bandwidth can be up to 25MHz.

Digital Multimeter Operation

Turn the function switch to choose the DMM position

Warning: *To avoid the damage to the meter or the user, please make the probe away from the test point when change the test range.*

Display in Digital Multimeter (DMM) Mode



Basic function Instruction

Measuring function exchanging

Turn the function switch to choose the voltage **V** ; AC/DC voltage measurement(10A adapter, transistor hFE);))) JxHz%: Remote Control/ Duty cycle/ Crystal oscillator; Ω)))→|: resistance/ continuity test/ diode test; Lx: auto ranging inductance test; Cap (Cx): broad capacitance range; mA: auto ranging AC/DC current measurement

Manual ranging and auto ranging selection

In the AC/DC voltage measurement range: after turning the meter or changing the range, the setting is auto ranging measurement. Press REL button to change to manual range and the “manu” displayed on the screen. The range changes from 6.000V to 60.00V/600.0V/2000V/600.0mV. Press and hold the REL button for 2secs to back to auto-ranging and “Auto” is displayed. *(Note: in mV range, it’s normal that there are some digits on the screen)*

600mV AC/DC voltage range is only manual ranging.

Data hold and list

1. Press the HOLD button to hold the test reading and the symbol “H” is displayed. Press this button again to exit the hold mode.
2. Once the test reading is held, the measuring result is stored in the list and the stored position “ xxx(01~200) “ is displayed.
3. If change the function range, the meter will automatically exit hold mode.

In holding data mode, press KeyF3 to enter into the HOLD list.

Key	Function	Selection
F1	Storage	Store all the data
F2	Cursor↑	Move up
F3	Cursor↓	Move down
F4	Delete	Delete the current content
F5	Back	Confirm saving and back to the measuring mode
◀ ▶	Pre./Nex.	Previous Page/ Next Page

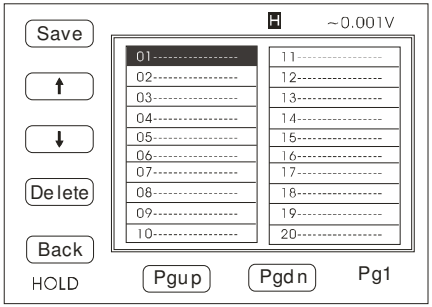


Fig15. Fig of data list

Tips of data hold list:

1. *Press Key F1 to put new record to the list. If not save, the data will be lost after changing the function.*
2. *Press KeyF2 to move up the cursor*
3. *Press Key F3 to move down the cursor*
4. *Press Key F4 to delete the content of the current page.*
5. *Press Key F5 to choose "yes" or "NO" to save the stored data. Press KeyF1 to exit.*
6. *Press the button*   *to view the stored data.(total pages: 10; every page 20 group data)*
7. *Turn the Code Switch to set the threshold. The setting range of threshold is 50~2000.Press this button to confirm*

Auto record (threshold settings)

The smaller the threshold is, the sensitivity is higher (but easily referenced). If the threshold is 500 and the test range is 6.000V, when automatically record, if the reading is bigger than 500 digit (0.5V), the meter will judge the signal as an effective reading; if the test range changed to 60.00V, the meter will judge the signal as the threshold is 5V(500 digit).

Continuously test and record 1~200 groups data. Only need to move the test point, the meter will automatically record the test reading.

Alternate and direct voltage measurements

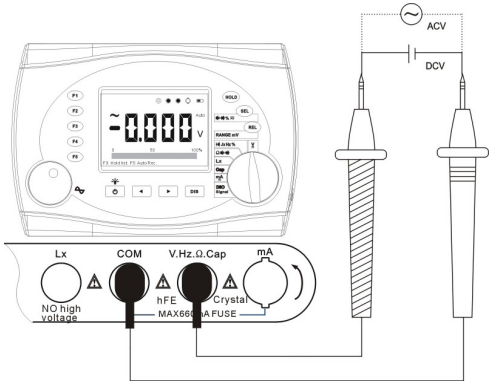


Fig16: Fig of AC/DC measurement

1. Turn the function switch to choose the $\underset{\approx}{\mathbf{V}}$ position,
2. Plug the black test lead to the COM terminal and the red to **V** terminal.
3. Press the SEL button to choose AC/DC mode (AC mode will display “~” symbol)
4. Connect the test leads to the test point and get the measuring result from the screen.
5. Press the REL button to select manual ranging; press the HOLD button to hold the reading result and the Key F3 to enter in to the HOLD list; press KeyF5 to enter into auto record mode.

Warning: *To avoid to damage the meter, please do not input 1000V AC or 2000V DC to the test terminal for 10secs and please measuring the voltage of the electric circuit which is over 600V*

Alternative and directive current (30mA/600mA) measurements

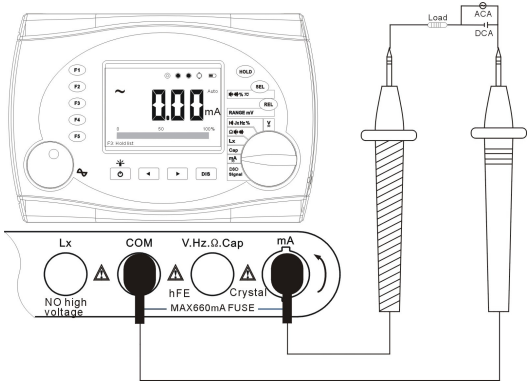


Fig17: Fig of mA measurement

1. Turn the function switch to the mA position;
2. Connect the test leads as the connection of Fig17 and the indicator in the screen. Plug the black test lead to the COM jack and the red into the mA jack.

3. Press the SEL button to select DC/AC mode (in AC mode, there will show the symbol “~”).
4. Connect the test leads to the test point and get the measuring result from the screen.
5. Press the REL button to do the relative value measurement; press the HOLD button to hold the reading result and the Key F3 to enter in to the HOLD list.

Warning: *Please DO NOT measure the AC current in AC 250V circuit to avoid the electric shock.*

Operation of 10A adaptor