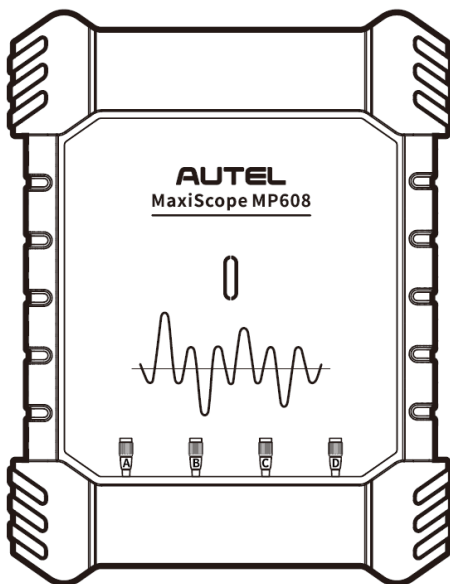


Autel MaxiScope MP608

Android Version



Patent

This product is protected by patents in the U.S. and elsewhere. For more information, please visit <https://autel.us/virtual-patents/>.

Trademarks

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All information, specifications, and illustrations in this manual are based on the latest information available at the time of printing.

Autel reserves the right to make changes at any time without notice. While information of this manual has been carefully checked for accuracy, no guarantee is given for the completeness and correctness of the contents, including but not limited to the product specifications, functions, and illustrations.

Autel will not be liable for any direct, special, incidental, or indirect damages, or for any economic consequential damages (including the loss of profits) as a result of using this product.

IMPORTANT

Before operating or maintaining this unit, please read this manual carefully, paying extra attention to the safety warnings and precautions.

For Services and Support



pro.autel.com

www.autel.com



1-855-288-3587 (North America)
+86 (0755) 8614-7779 (China)



support@autel.com

For technical assistance in all other markets, please refer to [Service](#) in this manual.

Safety Information

For your own safety and the safety of others, and to prevent damage to the device and vehicles upon which it is used, it is important that the safety instructions presented throughout this manual be read and understood by all persons operating or coming into contact with the device.

There are various procedures, techniques, tools, and parts required for servicing vehicles, as well as the skills of the person doing the work. Because of the vast number of test applications and variations in the products that can be tested with this equipment, we cannot possibly anticipate or provide advice or safety messages to cover every circumstance. It is the automotive technician's responsibility to be knowledgeable of the system being tested. It is crucial to use proper service methods and test procedures. It is essential to perform tests in an appropriate and acceptable manner that does not endanger your safety, the safety of others in the work area, the device being used, or the vehicle being tested.

Before using the device, always refer to and follow the safety messages and applicable test procedures provided by the manufacturer of the vehicle or equipment being tested. Use the device only as described in this manual. Be sure to read, understand, and follow all safety messages and instructions in this manual.

Safety Messages

Safety messages are provided to help prevent personal injury and equipment damage. All safety messages are introduced by a signal word indicating the hazard level.

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury to the operator or to bystanders.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to the operator or to bystanders.

Safety Instructions

The safety messages herein cover situations Autel is aware of at the time of publication. Autel cannot know, evaluate or advise you as to all of the possible hazards. You must be certain that any condition or service procedure encountered does not jeopardize your personal safety.

Follow these instructions below to reduce the risk of injury from electric shock and prevent equipment damage.

A. Maximum input ranges

Observe all terminal ratings and warnings marked on the product.

DANGER

To prevent electric shock, take all necessary safety precautions when working on equipment where voltages beyond the specified input range may exist. Contact with voltages outside of the specified measuring range presents a risk of electric shock.

WARNING

Operation outside of the safe input range is likely to cause permanent damage to the oscilloscope and other connected equipment.

B. Grounding

DANGER

- The scope's ground connection through the USB cable is for measurement purposes only. The oscilloscope does not have a protective safety ground.
 - Do not connect the ground input (chassis) to any electrical power source. To prevent personal injury or death, use a voltmeter to check that there is no significant AC or DC voltage between the oscilloscope ground and the point to which you intend to connect the ground input.
-

WARNING

- Applying a voltage to the ground input is likely to cause permanent damage to the oscilloscope, the attached computer, and other equipment.
 - To prevent measurement errors caused by poor grounding, always use the high-quality USB cable supplied with the oscilloscope.
-

C. External connections

DANGER

To prevent injury or death, use only the power cord and adaptor supplied with the product.

D. Environment

DANGER

To prevent injury or death, do not use the product in wet or damp conditions, or around explosive gas or vapor.

 WARNING

To prevent any damage, always use and store your oscilloscope in an appropriate environment.

E. Product Maintenance

The product contains no user-repairable parts. Repair, servicing, and calibration require specialized test equipment and must be performed by Autel Tech Support or an approved service provider.

 DANGER

To prevent injury or death, do not use the product if it appears to be damaged in any way. Stop using the product when any abnormal operations occur.

 WARNING

- Do not tamper with or disassemble the oscilloscope, connectors, or accessories. Internal damage will affect performance.
 - Do not block any of the instrument's air vents to avoid damage caused by overheating.
 - When cleaning the oscilloscope, use a wet soft cloth with mild detergent in water. Do not allow water to enter the oscilloscope casing.
-

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1 Using this Manual

This manual contains device usage instructions.

Some illustrations shown in this manual may make reference to modules and optional equipment that are not included in your system. Contact your sales representative for availability of other modules and optional tools or accessories.

1.1 Conventions

The following conventions are used:

1.1.1 Bold Text

Bold text is used to highlight selectable items such as buttons and menu options.

Example:

- Tap **OK**.

1.1.2 Notes and Important Messages

1.1.2.1 *Notes*

A **NOTE** provides helpful information such as additional explanations, tips, and comments.

1.1.2.2 *Important*

IMPORTANT indicates a situation which, if not avoided, may result in damage to the test equipment or vehicle.

1.1.3 Hyperlinks

Hyperlinks are available in electronic documents. Blue italic text indicates a selectable hyperlink; blue underlined text indicates a website link or an email address link.

1.1.4 Illustrations

Illustrations used in this manual are samples; the actual testing screen may vary for each vehicle being tested. Observe the menu titles and on-screen instructions to make correct option selection.

1.1.5 Procedures

An arrow icon indicates a procedure.

Example:

➤ **To set the Spectrum View**

1. Tap the **Settings** button on the upper toolbar. A dialog box opens.
2. Select the **Mode** option in the dialog box, and then tap to select **Spectrum View**.
3. Tap the input field or the dropdown arrow icon to select the desired options from the column. Tap **OK** to confirm.

2 General Introduction

The Autel MaxiScope MP608 (hereinafter referred to as “MP608”) is a portable, USB-powered, 4-channel automotive oscilloscope that transforms your Autel next-generation MaxiSys tablet into a professional diagnostic tool. With 12-bit vertical resolution, one-click setup, and support for modern protocols like CAN FD/FlexRay, the Autel MaxiScope MP608 delivers precise waveform analysis from an intuitive interface.

The Autel MaxiScope App works only with an Autel Android tablet, and it is not supported on other Android tablets. It is compatible with Autel next-generation MaxiSys tablets, including MaxiSys MS909S2, MaxiSys MS909, MaxiSys MS909EV, MaxiSys MS909CV, MaxiSys Ultra ADAS, MaxiSys MS908S3, MaxiSys MS906 MAX, MaxiSys MS908S II, MaxiSys MS908S Pro II, MaxiSys MS906 Pro, MaxiSys MS906 Pro-TS, and MaxiSys MS906 Pro2-TS. Additional MaxiSys tablets may be supported in future software updates.

NOTE

The illustrations depicted in this section are only for reference. Please refer to the actual product.

2.1 Autel MaxiScope MP608

2.1.1 Product Overview

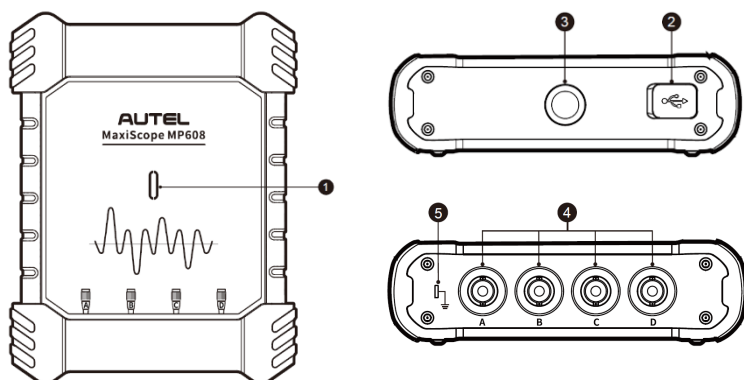


Figure 2-1 Autel MaxiScope MP608

1. Oscilloscope LED — refer to Table 2-1 Oscilloscope LED Description for details
2. USB Port
3. QD (Quick Detach) Socket
4. Input Channel A/B/C/D
5. Ground Terminal

NOTE

For best signal quality, connect a user-supplied grounding wire to the oscilloscope Ground Terminal when the connected Windows PC or Autel tablet is charging. Grounding is optional when the connected device is operating on battery power.

Table 2-1 Oscilloscope LED Description

LED	Color	Description
Oscilloscope	Red	● Illuminates solid red automatically at power-up during self-test. ● Illuminates solid red if a firmware failure occurs during the upgrade.
	Green	● Flashes green when upgrading or communicating. ● Illuminates solid red first, then solid green when connected to an Autel next-generation MaxiSys tablet via USB cable.

2.1.2 Power Source

The Autel MaxiScope MP608 is powered directly by the USB port of the connected Autel next-generation MaxiSys tablet or Windows PC, so no batteries or power leads are required, making it suitable for use both for workshop-based and mobile automotive diagnostics.

2.1.3 Technical Specification

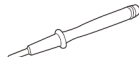
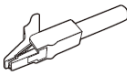
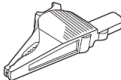
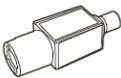
Table 2-2 Technical Specifications

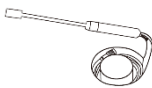
Item	Description
Channels	4

Item	Description
Bandwidth	20MHz
Maximum Sample Rate	80 MS/s* Single Channel 20 MS/s* Combined Channel * MS/s = mega samples per second
Input Ranges (Full Scale)	± 50 mV to ± 200 V
Sensitivity	10 mV/div to 40 V/div
Input Coupling	AC/DC
Input Impedance	1 M Ω in parallel with 25 pF
Vertical Resolution	12 bits
Buffer Memory	32M samples shared among active channels
Time Base Ranges	100 ns/div to 1000 s/div
Connection	USB 2.0
DC Accuracy	$\pm 1\%$
Storage Humidity Range	5 to 95 % RH, non-condensing

2.1.4 Accessories

	Autel USB Cable V2 (the V2 icon can be seen on the cable) Connects the oscilloscope to the tablet to ensure reliable signal transmission.
	Secondary Ignition Pickup The BNC connector is connected to the oscilloscope to measure the secondary ignition voltage of conventional ignition systems

	and most HEI (High Energy Ignition) and DIS (Distributorless Ignition) systems.
	Scope Test Lead (Red/Green/Blue/Yellow) The BNC connector is connected to the oscilloscope, and the 4mm banana plug is connected to various probes.
	Flexible Back-pinning Probe (Red/Black) Designed for back-probing under the insulation of multi-plug terminals to detect the signal of the test component. The flexible part can be bent and access to difficult areas. The probe tip is not replaceable.
	Back-pinning Probe Set Designed for back-probing under the insulation of plugs to pick up the signal of the test component. The probe tip is replaceable.
	Multimeter Probe (Red/Black) Designed for connecting exposed wires or terminals.
	Small Alligator Clips (Red/Black) Used to connect exposed wires or terminals.
	Large Dolphin Clips (Red/Black) Used to connect exposed wires or terminals, including battery terminals.
	Attenuators 20:1 Passive 20:1 attenuator that reduces a 20 V input signal to 1 V at the oscilloscope input, allowing higher-voltage signals to be measured safely.

	Adjustable Strap with Hook Connects to the QD Socket for hanging the oscilloscope.
	Battery Clip (Optional) (Red/Black) Dedicated to connecting car battery terminals.
	65A AC/DC Current Clamp (Optional) Used to measure AC or DC currents up to 65A. Two scales are available: 1mV/10mA for 10mA to 20A, 1mV/100mA for 100mA to 65A.
	650A AC/DC Current Clamp (Optional) Used to measure AC or DC currents up to 650A. Two scales are available: 1mV/100mA for 100mA to 200A, 1mV/1A for 1A to 650A.
	Coil On Plug (COP) Probe (Optional) Used with the oscilloscope to measure the secondary ignition voltage of COP.
	HT Extension Lead (Optional) Fit the HT extension leads between the coil pack and the plugs of the independent ignition system (COP), and then place the (SA273) secondary ignition pickup on each lead to obtain the secondary ignition voltage.

3 Operations

3.1 Getting Started

Before opening the **MaxiScope** application, the MP608 must be connected to a compatible MaxiSys tablet via the provided USB cable.

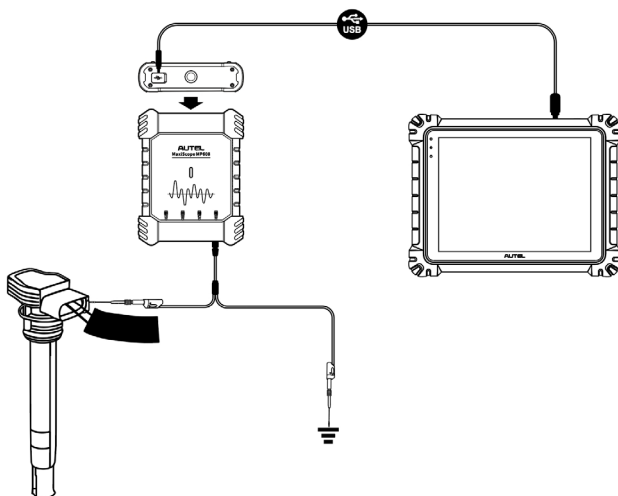


Figure 3-1 Connection Diagram Example

➤ **To open the MaxiScope application**

1. Connect the Autel MaxiScope MP608 to an Autel next-generation MaxiSys tablet using the USB 2.0 Cable V2.
2. Insert the applicable test lead or probe terminal ends into the input channel(s) to complete the connection. (See [Figure 3-1 Connection Diagram Example](#))
3. Tap the **MaxiScope** application to open the oscilloscope menu.
4. Select a desired testing option to continue.

❗ IMPORTANT

- Please use the included cords and probes only. Using unauthorized accessories may cause unexpected damage to the tool.
 - Connect the probe ground lead to the circuit ground before connecting the probe tip to the test point. When disconnecting the probe, remove the probe tip from the test point before disconnecting the ground lead. Incorrect probe connection may cause short circuits, excessive current, damage to the oscilloscope or the vehicle, or personal injury
-

3.1.1 Message Prompt

If the MP608 is not connected to a compatible MaxiSys tablet, a message showing "You can connect MP608 immediately or enter demo mode, do you want to enter demo mode?" displays after opening the oscilloscope menu. Please tap **OK** to enter demo mode or tap **Cancel** to exit.

3.1.2 Oscilloscope Update

The operating software for the oscilloscope is regularly updated. Tap the **Help** button in the upper toolbar and then tap the **Update the APK** button in the dropdown list to update the software.

Before updating the oscilloscope's software, please make sure the tablet has a stable Internet connection.

3.1.2.1 APK Update

🔧 NOTE

The acronym APK (Android Package Kit) is used on the tablet and in this manual. An APK file contains all the assets of a particular app. Updating an APK means installing the latest version of the app on your tablet.

➤ To update the APK

1. Tap the **Help** button on the upper toolbar of the screen. A dropdown menu displays. Tap **Update the APK** in the dropdown menu.

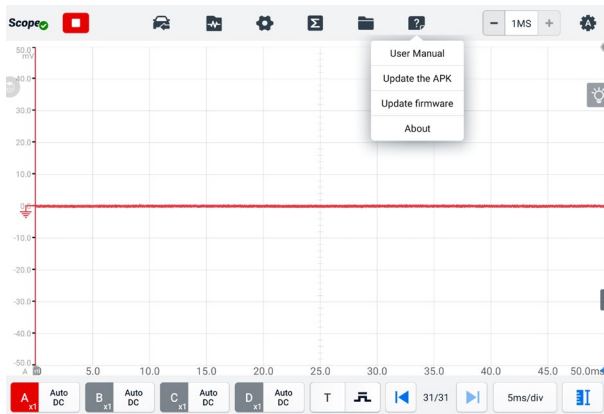


Figure 3-2 Help Screen

2. A confirmation message will display.
3. Tap **OK** to update the software or tap **Cancel** to exit.

3.1.2.2 Firmware Update

➤ To update the firmware

1. Tap the **Help** button on the upper toolbar of the screen. A dropdown menu displays. (See [Figure 3-2 Help Screen](#))
2. Tap **Update Firmware** in the dropdown list. The firmware of the MP608 can be updated automatically.

ⓘ NOTE

Please do not leave the update page during upgrading.

3.2 Screen Layout and Operations

The MaxiScope application measures changing voltages in an electrical system over a period of time and displays them as waveforms. The on-screen grid shows voltage and time divisions, enabling accurate measurements.

Tap the **MaxiScope** application on your tablet to open the oscilloscope menu. The screen typically includes the following sections.

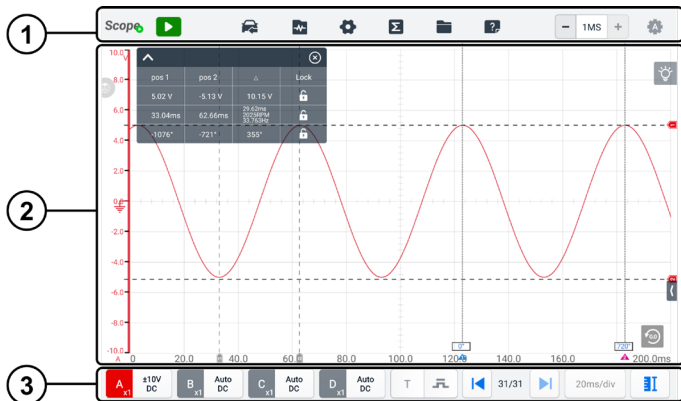


Figure 3-3 Oscilloscope Menu Screen

1. Upper Toolbar
2. Main Section
3. Lower Toolbar

3.2.1 Upper Toolbar

The upper toolbar is used for configurations of various settings and operations. The following table provides brief descriptions of each button.

Table 3-1 Upper Toolbar

Button	Name	Description
	Scope Icon	Indicates the oscilloscope connection status.
	Start/Stop	Start or stop the oscilloscope device.
	Presets	Access preset guide. Select Preset to correctly configure the oscilloscope to capture a waveform of the specified type.
	Waveform Library	Search, upload, share, open, load as reference waveform, and follow the waveforms in the waveform library.
	Settings	Configurations of mode setting, waveform generator (not available), decoding setting, startup setting, and demo setting.

Button	Name	Description
	Math Channel	Tap to display the math channel on the screen.
	File	Print, open, save, delete the waveform data or upload the waveform to the waveform library. Moreover, save, import the configuration, and open the recent documents.
	Help	View the user manual, update the APK (oscilloscope software) and firmware.
	Number of Samples	Set the maximum number of samples that will be captured on each channel.
	Auto Scale	Set the appropriate amplitude range to display the signal correctly.

3.2.1.1 Scope Icon

This icon displays the oscilloscope connection status. A green check mark means the tablet and oscilloscope are connected successfully; a red “X” means the tablet and the scope are not connected.

3.2.1.2 Start/Stop Button

Tap the **Start/Stop Button** icon to start or stop the oscilloscope device.

Button	Name	Description
	Start	Tap to start the oscilloscope and initiate sampling.
	Stop	Tap to stop the oscilloscope and terminate sampling.

3.2.1.3 Presets Menu

Tap the vehicle icon button in the top navigation bar to enter the **Presets Menu**. This menu offers a wide variety of preset guided information for you to view.

The frequently used test components and options are listed in the Presets menu:

✧ **Actuators** — test the common car actuators such as injectors, fuel pumps, and

canister purge solenoids.

- ✧ **Battery Charging** — test the functions related to car charging, including current and voltage idle test.
- ✧ **Combination Test** — combined test of the vehicle's sensors or actuators, such as the crankshaft position sensor and camshaft position sensor test; the primary ignition and crankshaft position test; the throttle position sensor and front oxygen sensor test.
- ✧ **Data Communication** — test the vehicle communication buses, including CAN-bus, LIN-bus, and K-Line.
- ✧ **Engine Starting** — Test the functions related to car starting, including starting current and voltage test.
- ✧ **Ignition Systems** — test the ignition process of the vehicle, including the voltage and current test of the primary and secondary ignition.
- ✧ **Sensors** — test the common car sensors such as oxygen sensors, camshaft sensors, and crankshaft sensors.

NOTE

Do not connect to the HV control signal, such as the ignition control wire. It may cause damage to the product. The measured voltage value during the actuator test may be different from the actual value.

➤ **To use the Presets menu**

1. Tap the **Presets** button in the upper toolbar. A submenu opens.
2. Tap the desired test component or option in the left column.

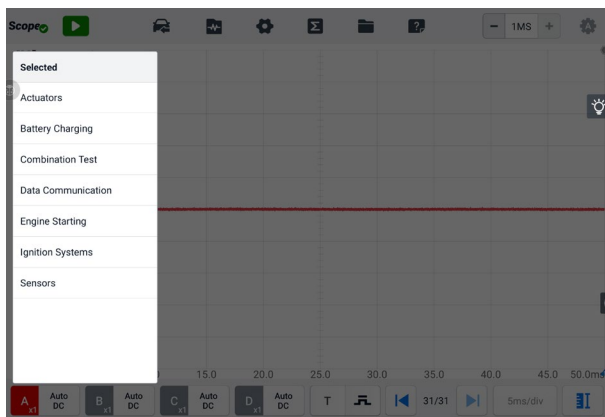


Figure 3-4 Presets Menu Screen 1

3. Tap an option you need from the submenu, and if there is no preset case or the version of the preset case is too low, tap the  button to download the new

preset case you need. If the current preset case is already a new version, the download button  will not be displayed.

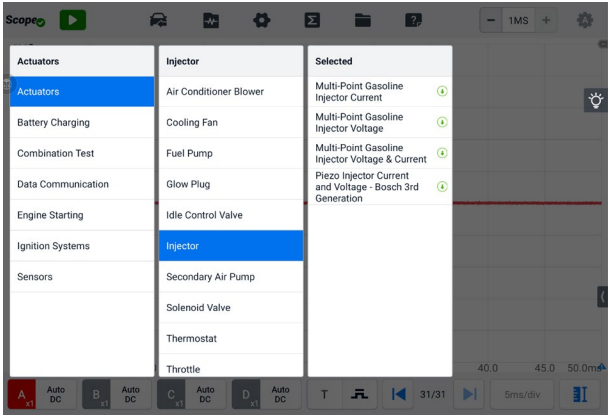


Figure 3-5 Presets Menu Screen 2

4. View the preset guided information. A reference signal waveform displays (an injector selection is used here as an example) on the main section and the preset guided information on the right side of the screen.

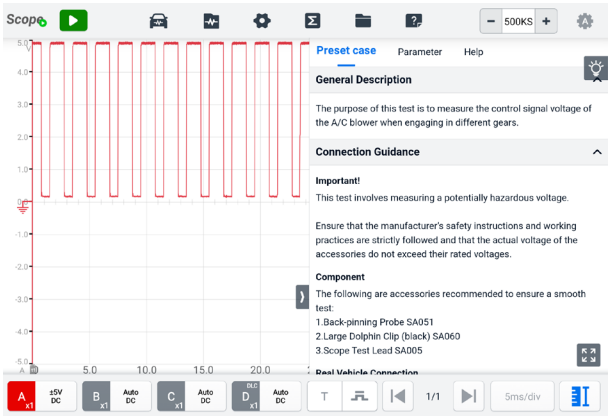


Figure 3-6 Presets Display Screen

5. Tap the arrow button to hide the preset guided information and display the waveform.

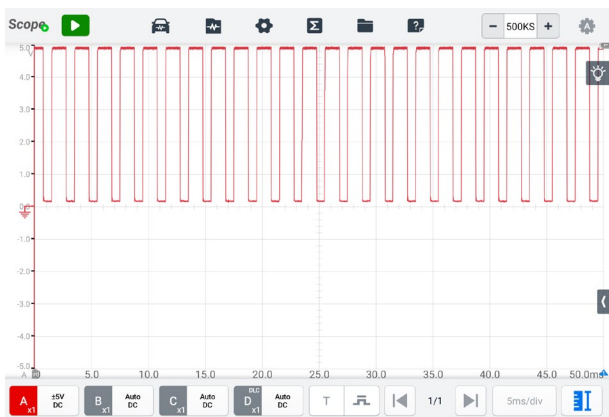


Figure 3-7 Reference Signal Waveform Display

NOTE

Parameter values, such as the ranges of voltage and time divisions, are automatically set for presets.

6. Tap the four-directional arrow icon in the lower right corner to display the preset guided information, including the general description, connection guidance, connection diagram, test guidance, real vehicle connection, waveform analysis, and related DTCs in full screen. Tap again to exit full screen.

NOTE

Images in the preset guided information can be displayed in full screen for viewing in detail.

7. Tap the **Start/Stop** button. The oscilloscope will perform waveform acquisition according to the preset parameters.

3.2.1.4 Waveform Library

Tap the waveform icon on the upper toolbar to open the Waveform Library Page. The waveform library includes an online waveform library and a local waveform library.

1) Online Waveform Library

The waveforms in the online waveform library are picked and uploaded by Autel users during the repair and test process using an oscilloscope. It allows you to search for the waveforms from the vehicle and component you want to test, or upload and share your own waveforms.

The search result displays information such as the waveform picture, waveform ID,

VIN code, vehicle code, etc. The waveform in the online library can also be loaded as a reference waveform for better waveform analysis.

There are two methods to search for waveforms: Condition-based search and keyword-based search.

❖ Condition-based Search

On the condition-based search page, the waveform(s) can be accurately searched after selecting the corresponding conditions, such as the vehicle model, test category, status, etc. Once you have searched a waveform, you can open, share the waveform ID to others, and follow as your favorite.

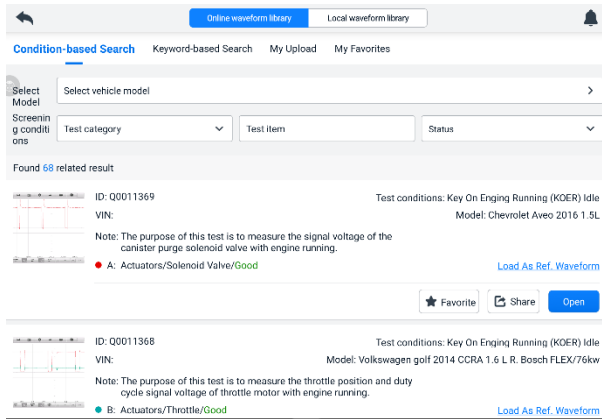


Figure 3-8 Conditional-based Search Screen

✓ Model

Tap the input field or the arrow icon on the right to select the vehicle model. The manufacturer and model should be selected from the column that displays.

✓ Screening conditions

Three screening conditions are available: Test category, test item, and status.

Tap the dropdown menu to select the test category, such as the actuators, battery charging, engine starting, or no selection.

Tap the dropdown menu to select the condition status: no selection, good, or bad.

✓ Search result

The search result will automatically display in the lower section of the page after selecting the model and conditions, showing the image of the waveform, waveform ID, VIN, or the screening conditions.

Tap the corresponding buttons on the lower right side to share, follow, or open the waveform. Tap the **Load As Ref. Waveform** to load the waveform as a reference waveform for better waveform analysis.

Button	Name	Description
	Share	Tap to display a waveform ID, then share it with Autel Cloud users.
	Favorite	Tap to add the waveform to your favorites.
	Open	Tap to open the waveform.

✧ Keyword-based Search

On the keyword-based search page, please input the waveform ID, VIN, vehicle code, or screening conditions, and then tap the "Search" button to roughly search the waveform(s) you want. You can also scan the waveform code or VIN by tapping the Scan icon in the input field to search the waveform.

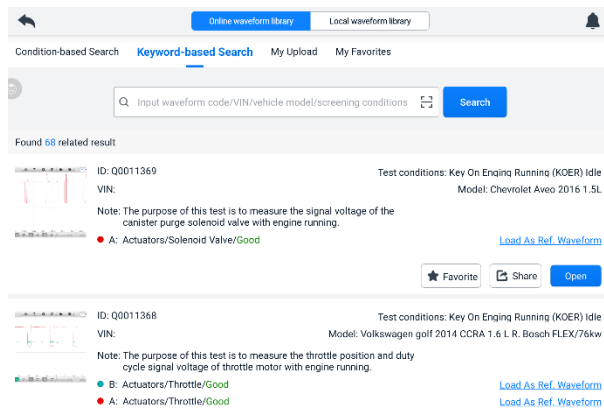


Figure 3-9 Keyword-based Search Screen

✧ My Upload

Your own waveforms can be saved and uploaded to the online server. The uploaded waveforms can be searched from the "My Upload" tab.

Please input the waveform code, VIN, vehicle code, or screening conditions, and then tap the **Search** button to search the waveform(s) you have uploaded. The waveform can be opened, shared, followed, reviewed, and loaded as a reference waveform once you have found it.

🔍 NOTE

Uploading waveforms requires you to log in to the Autel Cloud platform. The upload will fail if the storage capacity of Autel Cloud is full.

✧ My Favorites

All the waveforms you have searched in the Condition-based Search, Keyword-based Search, or My Upload tab can be followed as My Favorites by tapping the five-point star button. The waveform can also be opened, shared, followed and loaded as a reference waveform.

2) Local Waveform Library

The waveforms in the local waveform library are the ones saved in the tablet.

Input the waveform code, VIN, vehicle code, or screening conditions, and then tap the **Search** button to search the waveforms saved in the local library. The found result displays the picture of the waveform, waveform ID, screening conditions, vehicle model, etc. The waveforms can be opened, loaded as reference waveforms, shared waveform codes, uploaded, or batch uploaded.

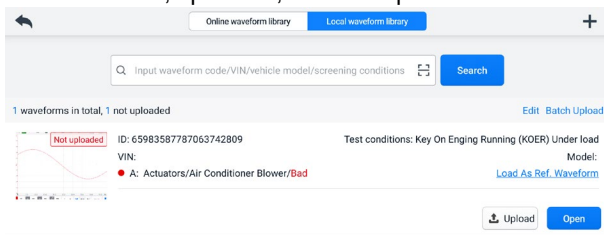


Figure 3-10 Local Waveform Library Screen

3.2.1.5 Settings Menu

Tap the gear icon button in the upper toolbar to open the **Settings** Menu. The **Mode**, **Window Function**, **Decoding Settings**, and **Startup Setting** can be manually configured in the menu.

A. Mode

Four views are available: oscilloscope view, record view, XY view, and spectrum view.

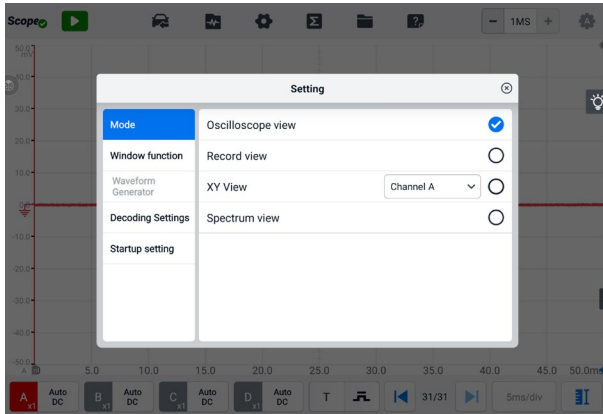


Figure 3-11 Mode Setting Screen

- ✓ **Oscilloscope View:** the waveform shows how a signal varies with time in a graphical way.
- ✓ **Record View:** the waveform records the signal and shows the signal record.
- ✓ **XY View:** the waveform shows the relationships between periodic signals, displaying a graph of one channel against another.

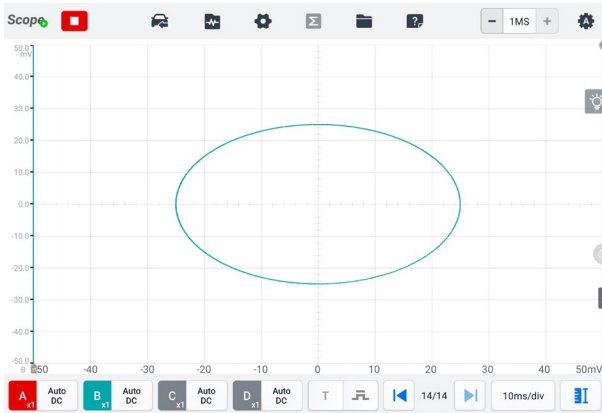


Figure 3-12 XY View Setting Screen

- ✓ **Spectrum View:** the waveform shows the signal level on a vertical axis against frequency on the horizontal axis in a graphical way. One or more spectra with a common frequency axis can be displayed in the spectrum view.

The spectrum-related analysis options display after selecting the spectrum view in the Mode setting screen. Select the desired spectrum bins and window functions for better spectrum analysis.

The amplitude over-range of the Y-axis can be adjusted by the amplitude level. When the sampling frequency is low, the current frequency can also be adjusted. The maximum frequency supports 20 M.

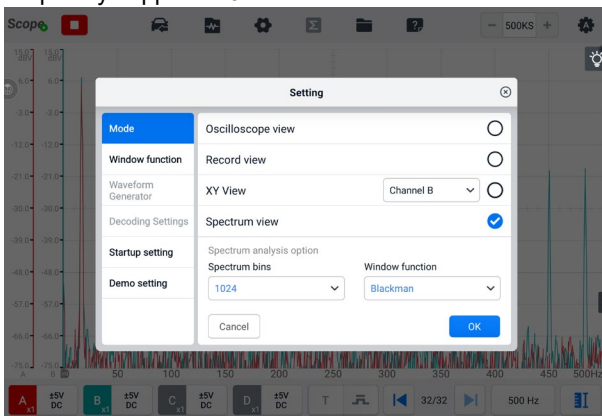


Figure 3-13 Spectrum View Setting Screen 1

- ✧ **Spectrum Analysis Option**

Spectrum Bins: it allows you to set the number of frequency bins into which the spectrum is divided.

Window Function: it allows you to select one of the standard window functions to reduce the impact of running on a time-limited waveform.

Table 3-2 Window Function Table

Window	Main peak width (bins @ -3 dB)	Highest side lobe (dB)	Side lobe roll-off (dB/octave)	Description
Rectangle	0.89	-13.2	6	No fading; maximal sharpness; used for short transients.
Blackman	1.68	-58	18	Often used for audio work.
Blackman-Harris	1.90	-92	6	Used for general purposes.
Flattop	2.94	-44	6	Negligible pass-band ripple; mainly used for calibration.
Gauss	1.33 to 1.79	-42 to -69	6	Gives minimal time and frequency errors.
Hann	1.20 to 1.86	-23 to -47	12 to 30	Used for audio and vibration work.
Hamming	1.30	-41.9	6	Also called raised sine-squared; used for speech analysis.
Triangle	1.28	-27	12	Also called the Bartlett window.

✧ **Y-axis**

Display Mode: Magnitude Mode displays the frequency spectrum of the last waveform.

Scale: the scaling of the vertical axis.

Logarithm: the vertical axis is scaled in decibels.

Linear: the axis is scaled in equal intervals from DC to the frequency.

Logarithmic Unit: the reference quantity used for the logarithm scale.

Table 3-3 Logarithm Unit Specifications

Logarithmic Unit	Description
dBV	Reference level is 1 V.
dBu	Reference level is 1 mW with a load resistance of 600 Ω .
dBm	Reference level is 1 mW into the specified load impedance.
Any dB	Reference level is an arbitrary voltage.

✧ **X-axis**

Scale: the scale of the frequency axis.

Linear: the axis is scaled in equal intervals from DC to the frequency.

➤ **To set the Spectrum View**

1. Tap the **Settings** button on the upper toolbar. A dialog box opens.
2. Select the **Mode** option in the dialog box, and then tap to select **Spectrum View**.
3. Tap the input field or the dropdown arrow icon to select the desired options from the column. Tap **OK** to confirm.

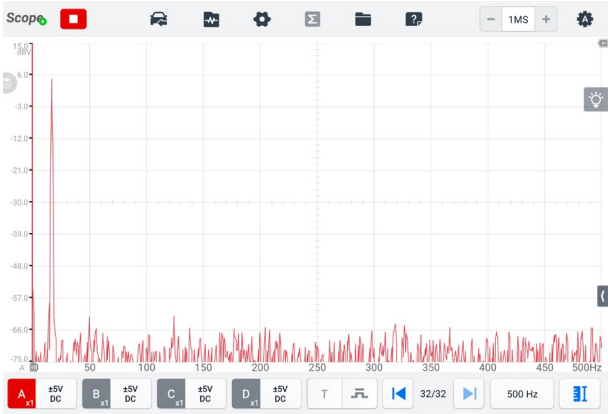


Figure 3-14 Spectrum View Setting Screen 2

B. Window Function

A display window with a grid displays the data captured by the oscilloscope. By default, a single trace is displayed. Additional traces can be added via the window display menu.

✧ **Display Mode**

The Window Function menu allows you to configure up to four traces.

Single Window — displays a single trace.

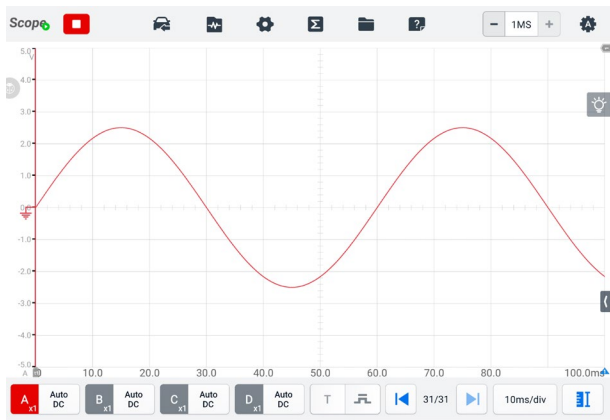


Figure 3-15 Single Window Screen

Double Window — displays two separate traces horizontally, one below the other.

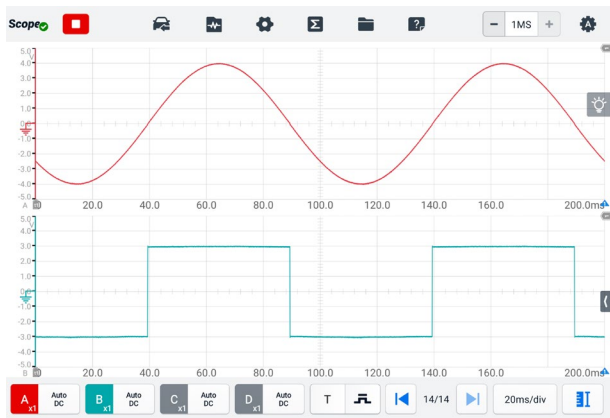


Figure 3-16 Double Window Screen

Triple Window — displays three separate traces horizontally, one below the other.

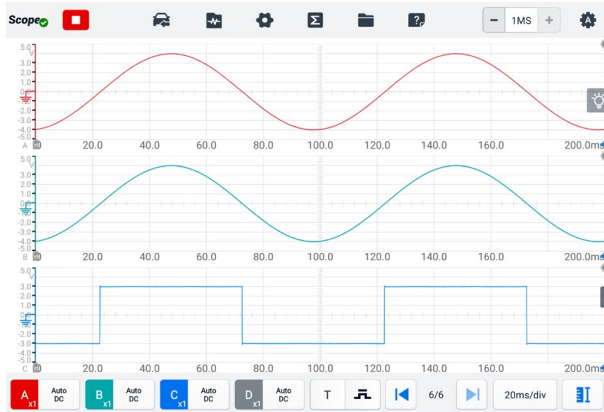


Figure 3-17 Triple Window Screen

Quadruple Window — displays four separate traces, two horizontally, two vertically.

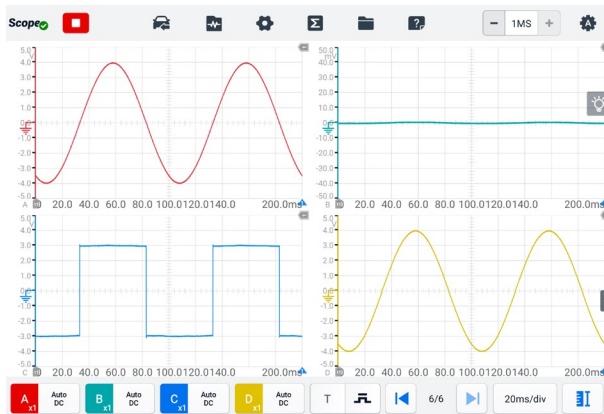


Figure 3-18 Quadruple Windows Screen

➤ **To set the display mode**

1. Tap the **Settings** button in the upper toolbar. A dialog box opens.
2. Select the **Window Function** in the dialog box.
3. Tap the appropriate number icon to display the corresponding number of traces onscreen.

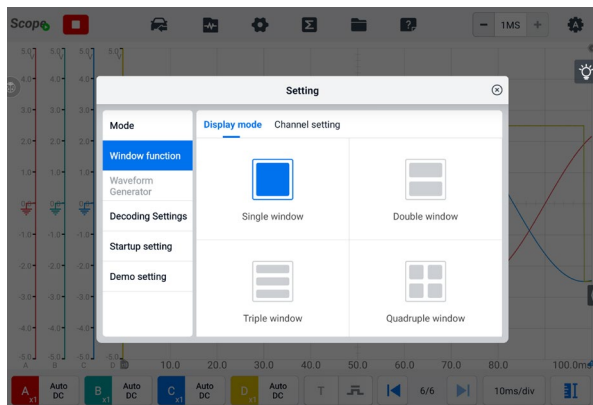


Figure 3-19 Display Mode Selection Screen

4. Close the dialog box. The window is displayed as selected.

✧ **Channel Setting**

The Channel Setting allows you to arrange the display position of the activated channels. Select which channels are visible in the display window. The display status is set to **ON**, the input channels are enabled; otherwise, the input channels (set to OFF status) are not available for viewing.

➤ **To set the channel setting**

1. Tap the **Settings** button in the upper toolbar. A dialog box opens.
2. Select the **Window Function** in the dialog box, then select **Channel Setting**.
3. Swipe the display status icon to **ON**. Select the position for each channel from the dropdown menu.

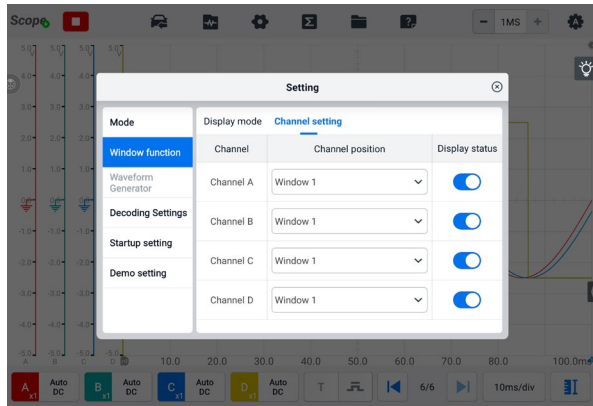


Figure 3-20 Channel Setting Screen

4. Close the dialog box, and the activated channel is displayed in the selected window.

C. Decoding Settings

When the oscilloscope mode is selected, the decoding settings are available.

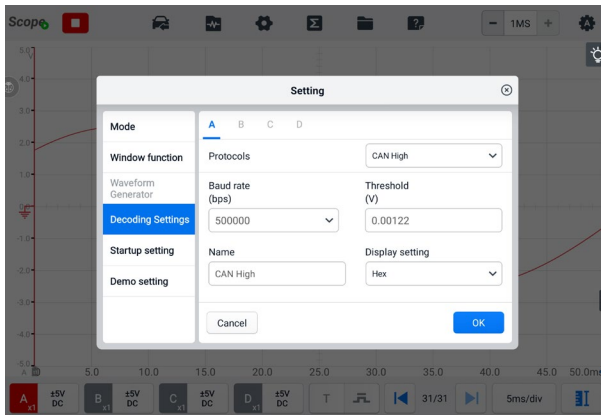


Figure 3-21 Decoding Settings Screen 1

9 Protocols are available: CAN High, CAN Low, LIN, FlexRay, RS232/UART, I2S, I2C, USB (1.0/1.1), and CAN FD. The detailed setting options vary according to each protocol.

- ✧ **CAN High/CAN Low:** Controller Area Network (CAN) is a serial protocol used in automotive to allow microcontrollers to communicate with each other. It typically uses differential signaling (with signals named CAN High and CAN Low)

to increase noise immunity.

- ✧ **LIN:** Local Interconnect Network (LIN) is a serial protocol used in automotive electronics to allow microcontrollers to communicate with low-speed peripherals.
- ✧ **FlexRay:** It is an automotive network communications protocol for high-speed data.
- ✧ **RS232/UART:** Universal Asynchronous Receiver/Transmitter (UART) is the communication interface found in the serial or COM ports once commonly found on computers. Each channel of data is transmitted on a single wire pair using an electrical standard such as RS232.
- ✧ **I2S:** Inter-IC Sound (I2S) is a serial protocol used in digital audio devices for communications between circuits such as CD transports and audio DACs.
- ✧ **I2C:** Inter-Integrated Circuit (I2C) is a way to connect peripheral chips in consumer electronics products and is widely used in embedded systems.
- ✧ **USB (1.0/1.1):** Universal Serial Bus (USB) is widely used in personal computers and tablets for communication.
- ✧ **CAN FD:** The CAN FD serial protocol is an extended version of the Controller Area Network (CAN), which allows electronic controllers to receive sensor messages and transmit control messages faster than traditional CAN communication.

Baud Rate: The baud rate will display a default value, which needs to be manually set according to the actual signal to get the correct decoding result.

Threshold: The voltage that defines the transition in either direction between high logic state and low logic state.

Name: The name of the protocol that you have selected above. The channel and the corresponding protocol name will display in the scope view after selection.

Display Setting: You can also choose a display mode for the decoded data: Hex or Binary.

➤ To make the decoding settings

Using **CAN High** as an example.

1. Tap the **Settings** button in the upper toolbar. A dialog box opens.
2. Select the **Mode** option in the dialog box and tap the **Oscilloscope Mode**.
3. Select the **Decoding Settings** in the dialog box.
4. Select the channel(s) that you want to set, and then select the **CAN High** protocol from the dropdown list.
5. For the baud rate and threshold, you can keep the displayed values or manually

enter a value according to the actual signal.

6. Select the **Hex or Binary** display mode from the dropdown list.
7. Tap **OK** to confirm. The decoding settings are displayed on the screen.



Figure 3-22 Decoding Settings Screen 2

D. Startup Setting

This function allows the user to choose the startup configuration when launching the oscilloscope application.

On the Startup Setting screen, there are three options: **Load user default configuration at startup**, **Load last session configuration at startup**, and **Load factory configuration at startup**. Select one option according to the specific need.

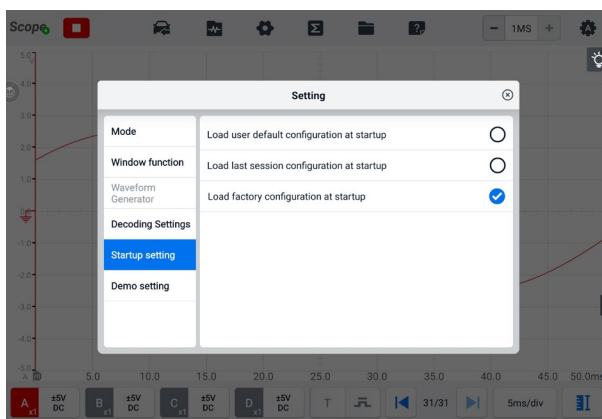


Figure 3-23 Startup Settings Screen

3.2.1.6 Math Channel

A math channel is a virtual channel generated by a mathematical function of the input channel. It can be displayed in an oscilloscope in the same way as an input signal, and like an input signal it has its own measure axis, scale, and color.

The oscilloscope has a set of built-in math channels:

- ✓ **Turnover:** reverses the signal polarity to turn the waveform upside down on the screen
- ✓ **A+B:** channel A plus channel B
- ✓ **A-B:** channel A minus channel B
- ✓ **A*B:** multiply channel A by channel B
- ✓ **A/B:** channel A divided by channel B
- ✓ **Frequency:** the frequency of the signal
- ✓ **Pulse Width (+):** the positive pulse width
- ✓ **Pulse Width (-):** the negative pulse width
- ✓ **Duty Cycle (+):** the positive duty cycle
- ✓ **Duty Cycle (-):** the negative duty cycle

➤ To set the math channel

Using **Invert A** as an example.

1. Tap the **Math Channels** icon in the upper toolbar. A dialog box opens.
2. Select **Existing**.
3. Select **Invert A**, and tap **OK** to continue.

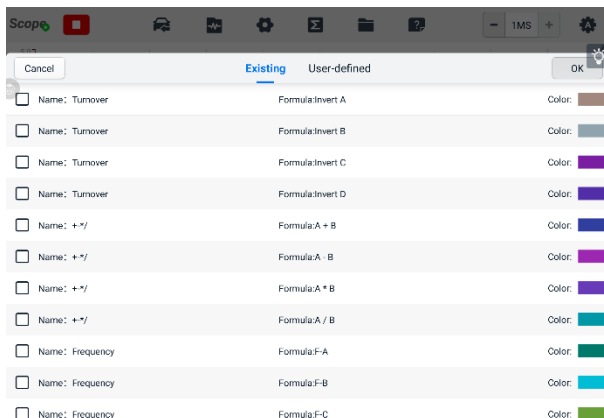


Figure 3-24 Math Channel Setting Screen

4. The waveforms are displayed on the screen.

3.2.1.7 File Menu

The File Menu allows you to print, open, save, and delete the waveform data. The File Menu supports the following functions.

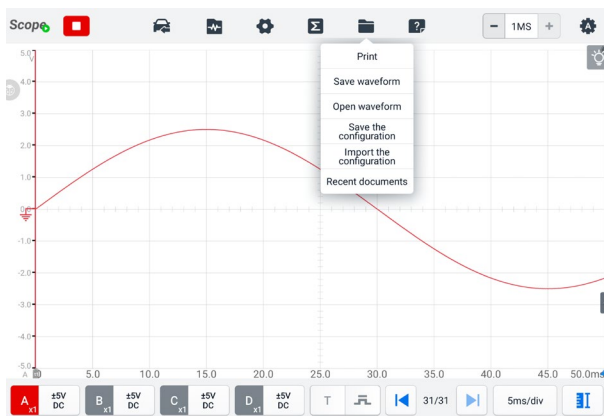


Figure 3-25 File Menu Screen

- ✓ **Print** — tap to create and print a temporary PNG picture of the current waveforms.

NOTE

1. Make sure the tablet is properly set up to print and is connected to the printer.
2. Make sure the network is available.

✓ **Waveform Operation**

This section allows you to save and open the waveforms.

Save waveform — tap to save the waveform on the current screen. Three types of file saving are available in the dropdown list: **Oscilloscope data file**, **Text file**, and **Excel file**. Select one of the file saving ranges from **save current page**, **save last 5 pages**, and **save all pages**. Finally, tap the **Save** button to save the waveform.

Select the Text File option to save the current waveform data to a text file. Use the ES File Explorer app on the Android home screen to review the file: **Home > ES File Explorer > Local > Internal Storage > Scan > Data > Scope > txt**.

Open waveform — tap to retrieve the saved waveforms.

✓ **Configuration Operation**

The configurations can be saved and imported, or set to default.

Save the configuration — tap to save the configuration values of waveforms on the current screen, including the amplitude, the time base, the number of samples, etc.

Import the configuration — tap to import the saved configuration values of waveforms. Tap the System Default Configuration option to cancel the current setting values and refresh the screen to retrieve the default setting values.

- ✓ **Recent documents** — tap to open the recent documents in order to view the waveforms currently opened in the waveform library.

3.2.1.8 *Help Menu*

The Help Menu displays the user manual, updates the APK and firmware, and views version numbers of the installed APK and firmware.

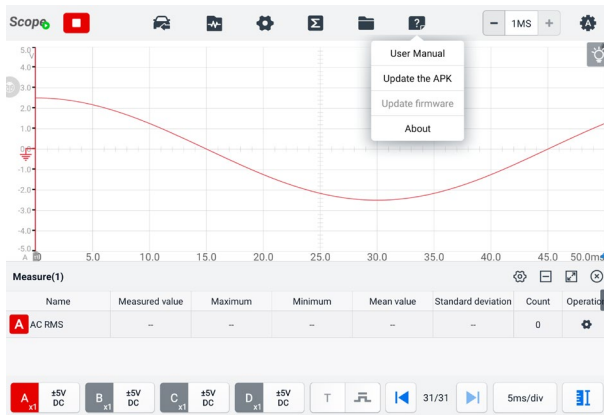


Figure 3-26 Help Menu Screen

- ✓ **User Manual** — displays instructions for the proper use of the oscilloscope.
- ✓ **Update the APK** — connects to the Autel server to get the latest application software version.
- ✓ **Update Firmware** — connects to the Autel server to get the latest firmware version.
- ✓ **About** — displays the model number and the installed versions of the software and firmware.

3.2.1.9 Number of Samples

This button allows you to set the maximum number of samples that will be captured by each channel. The sampling rate of the current time base can be adjusted by changing the number of samples. Tap the minus or plus icon to adjust the number of samples.

3.2.1.10 Auto Scale

Use the **Auto Scale** button to trigger the device to automatically analyze the signal of the opened channel and automatically set the appropriate amplitude and time base range to display the signal correctly. In auto scale setting, the time base is only valid for periodic signals.

3.2.2 Main Section

Up to four traces, along with digital readouts of current signal values, signal status, and triggering conditions, can be displayed simultaneously on the main view section screen.

Each trace has two control features, **X-axis** and **Y-axis**, which enable you to adjust the

oscilloscope settings to suit the particular test measurement. If multiple traces are displayed at the same time, the **Y-axis** for each trace is adjusted separately while the **X-axis** is the same for all traces.

- ✓ **Y-axis** — the voltage level is recorded on the vertical. It displays on the left side of the screen.
- ✓ **X-axis** — time is presented on the horizontal line. It is shown along the bottom of the screen.

3.2.2.1 Measurement Overrange Indicator

When the amplitude exceeds the measurement input range, a **red overrange indicator** with the message "overrange" is displayed in the top left corner of the screen. Exceeding the common-mode input range may result in inaccurate measurements and can lead to severe signal distortion.

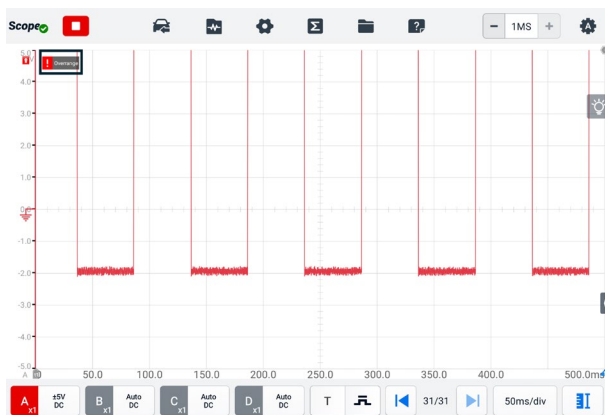


Figure 3-27 Overrange Indicator Screen

Select an appropriate scale setting for the signal being sampled to avoid an overrange condition.

! IMPORTANT

To prevent electric shock, do not exceed the voltage limits between inputs.

3.2.2.2 Channel Selection

In the main view section, a channel has two conditions: selected and unselected. A channel can be selected in order for waveform movement, to use the zoom-in function or to add measurement rulers.

Tap the Zero Baseline marker or the Y-axis (the line thickens when selected). After

the channel is selected, the waveform can be zoomed. Tap the counterclockwise arrow button at the right corner to recover after zooming.

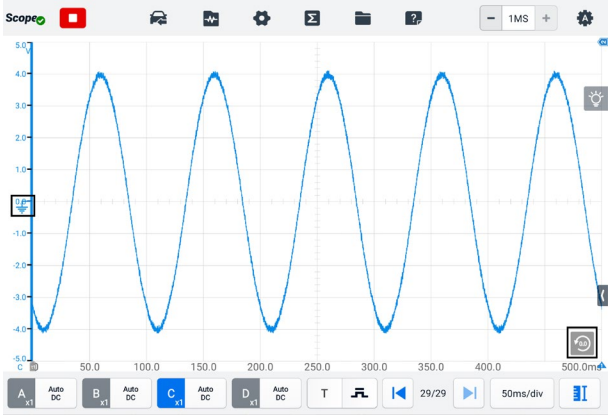


Figure 3-28 Channel Selection 1 (Selected)

Tap the Zero Baseline marker or the Y-axis again to exit the channel selection.

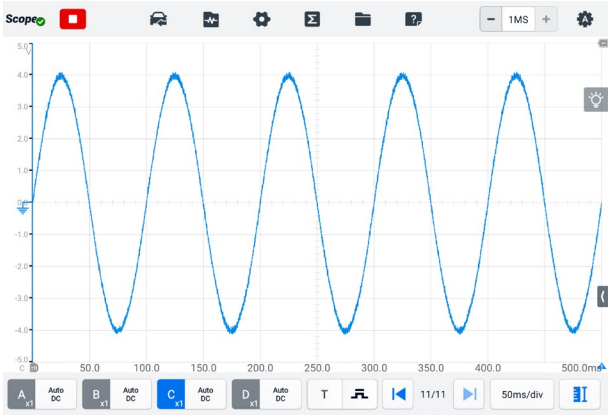


Figure 3-29 Channel Selection 1 (Unselected)

3.2.2.3 Waveform Zooming

The zooming function allows you to change the size and position of a signal during or after capturing a waveform to examine it in greater detail. It does not change the stored data, but the way it displays.

The X-axis and Y-axis can be zoomed using your fingertips. The waveform can be zoomed during or after capturing the signal.

3.2.2.4 Measurement Rulers

The coordinate Rulers allow the amplitude and time duration of a waveform to be measured precisely. They are useful when determining signal characteristics such as amplitude at specific points, the cycle time (duration), and frequency.

There are three types of measurement rulers: the vertical **Time Ruler**, the horizontal **Signal Ruler**, and the vertical **Angle Ruler**.

Tap the **Ruler Activator** in the lower left corner of the grid and drag it across the screen to the desired position. A **Time Ruler** is generated.

Tap the **Ruler Activator** in the lower right corner of the grid and drag it across the screen to the desired position. An **Angle Ruler** is generated.

The two-angle rulers are positioned to mark the start and end of a cycle. By default, the start and end angle values are 0° and 720°, which can be configured in the Phase Setting box.

The **Signal Ruler** can be generated in a similar way by tapping the **Ruler Activator** in the upper right corner and dragging it downwards.

When dragging the Measurement Rulers, a **Ruler Table** showing time and voltage values for the corresponding channels will be displayed. The **Delta** icon refers to the absolute difference between the values of the rulers, which can be locked by tapping the **Lock** icon. Tap the **X** button in the upper-right corner of the ruler table to delete all rulers.

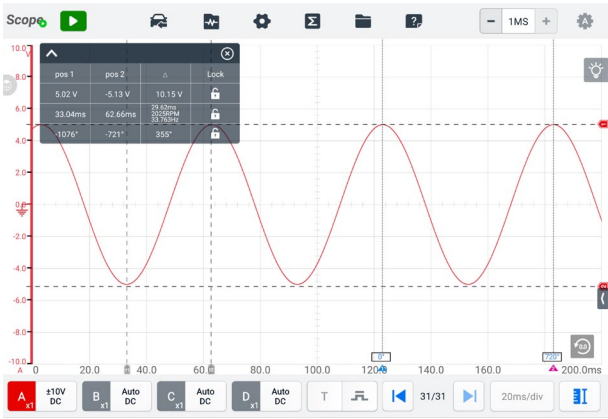


Figure 3-30 Rulers Display Screen

- To configure angle settings
1. Drag Angle Activator to generate the angle rulers.

2. Tap the start or end angle value to open the Phase Setting box.
3. Input the desired phase value and the ruler value in the field.

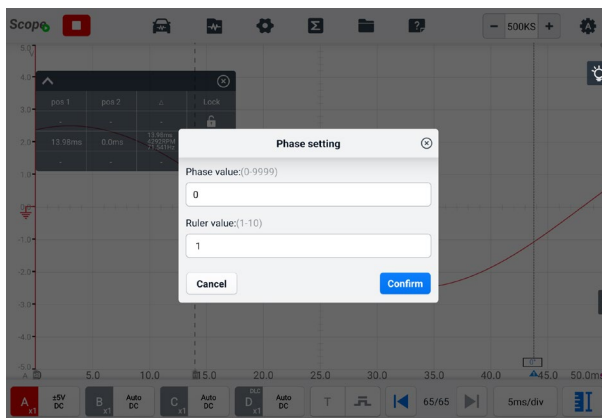


Figure 3-31 Phase Setting Screen

4. Tap **Confirm** in the upper-right corner to save the settings, or tap **Cancel** to exit without saving.

3.2.2.5 Zero Baseline

The zero baseline is marked as the 0 value on the Y-axis, showing the ground level of each channel waveform.

After the channel is selected, the Zero Baseline can be adjusted by dragging the Zero Baseline marker up/down along the Y-axis, or dragging the waveform up/down, or moving the screen up/down in the grid.

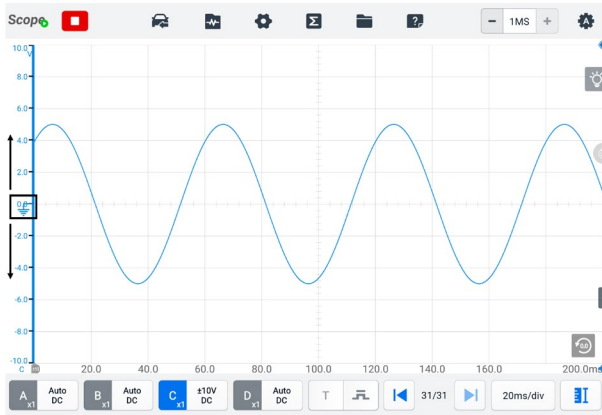


Figure 3-32 Dragging Zero Baseline Marker Screen

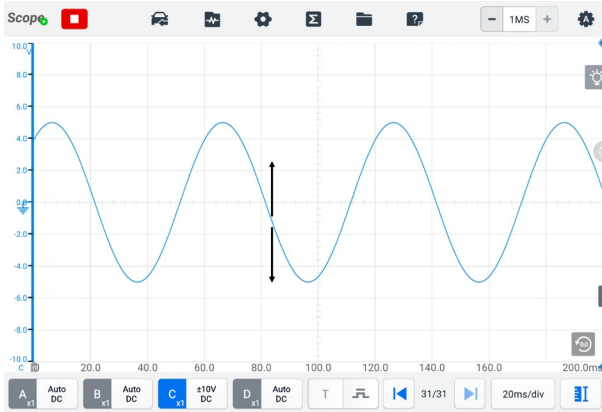


Figure 3-33 Dragging Waveform or Moving Screen

NOTE

To reposition the waveform or to move the screen, tap the Zero Baseline marker to select. The line will display thicker when selected.

3.2.2.6 Parameter and Help

Tap the arrow button in the lower-right corner of the screen to open the Parameter and Help windows.

The **Parameter** function allows you to view the values of parameters, including sampling interval, sampling rate, sample size, channel, range, and coupling mode.

The **Help** function displays the user manual of the oscilloscope. The Help page also displays when selecting the Help and User Manual buttons on the upper toolbar. The

help information can be shown full-page by tapping the four-directional arrow icon in the lower right corner.

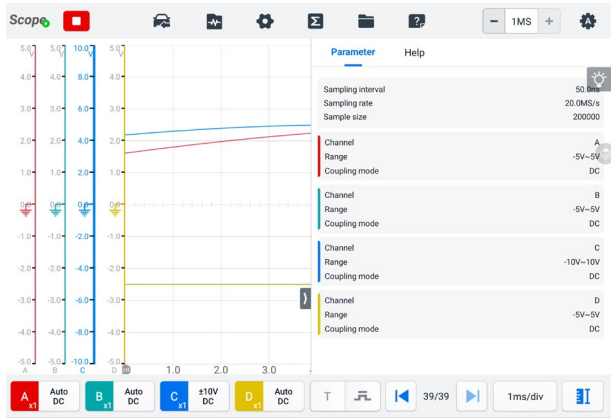


Figure 3-34 Parameter Screen

- To open or close the parameter and help window
1. Tap the arrow button on the right-hand side of the screen.

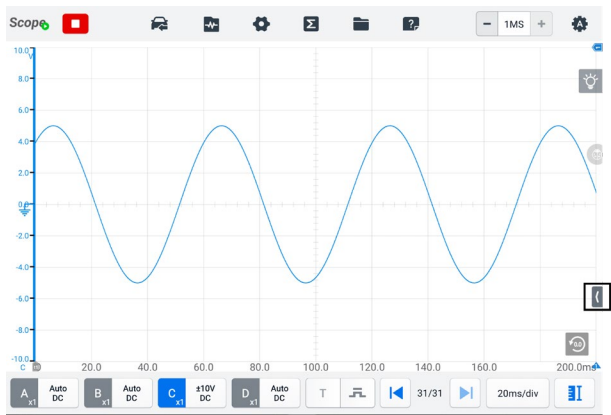


Figure 3-35 Arrow Button Position Screen

2. The parameter and help window appear.
3. To close, tap the arrow button again or tap any space outside of the window.

NOTE

The preset guided information is also displayed on the right side of the screen when the specific options and test components have been selected from the Presets menu.

3.2.2.7 Real-time Help

The real-time help button is a bulb-shaped button that can be dragged and moved on the screen.

Tap this real-time help button to directly switch to display all the relevant introduction and test procedure information after you tap any function on the oscilloscope screen, for better understanding of the selected function.

➤ To view the real-time help information

Take the Presets function as an example.

- 1. Tap the **Presets** button on the upper toolbar to open the preset menu.
- 2. Tap the bulb-shaped real-time help button. All the information about the Presets Menu is displayed on the right side of the screen.
- 3. View the information by dragging it up and down using your fingertips. The real-time help information can be displayed in full screen by tapping the four-directional arrow icon in the lower right corner. Tap it again to recover the half-screen display.

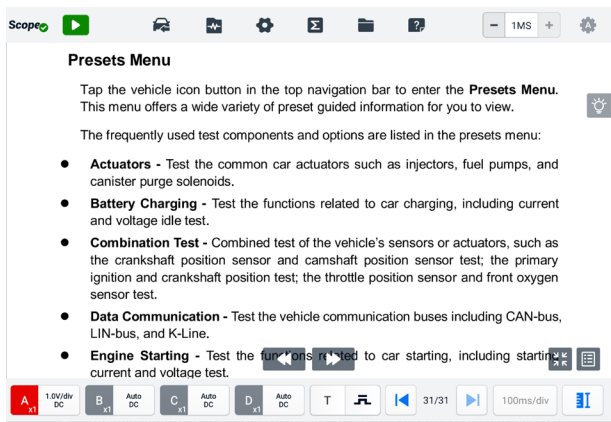
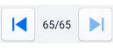
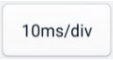


Figure 3-36 Real-time Help Screen (Full Screen)

3.2.3 Lower Toolbar

The buttons in the lower toolbar include the channel control buttons, trigger setting buttons, buffer button, time base button, and measurement button. The following table provides a brief description of each button.

Table 3-4 Lower Toolbar

Button	Name	Description
	Channel Control	Tap to configure the settings of each channel. Active channel icons display in color; inactive icons display in gray.
	Trigger	Tap to open the trigger setting menu.
	Buffer	Tap the Back or Next button to scroll to the previous or the next frame in the waveform.
	Time Base	Tap to select an appropriate time per division.
	Measurement	Tap to select an appropriate measurement.

3.2.3.1 Channel Control

There are four input channels: **input channel A**, **input channel B**, **input channel C**, and **input channel D**. The four channel buttons display on the lower left side of the screen. Set the input channel(s) through the corresponding channel control button(s).

Each **Channel Control** button includes Amplitude Setting, Probe Setting, Probe Edit, and Low-pass Filtering. The probe name is displayed in the lower-right corner of the left column of the channel control button. The amplitude is displayed in the right column of the channel control button.

➤ To activate and close the channel

1. Tap the left column of the channel control button to activate the channel. The button color changes from gray to the corresponding color of the channel.
2. Tap the right column of the channel control button to open the settings dialog box.

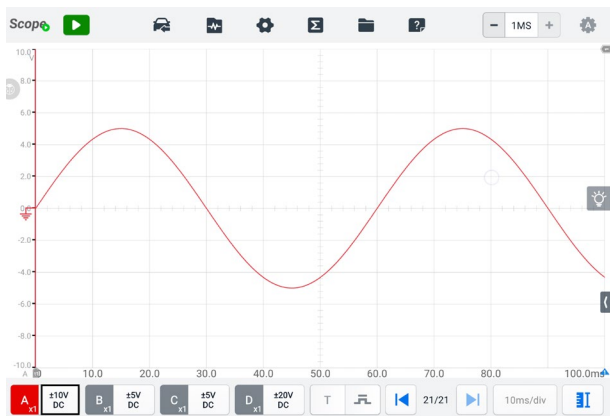


Figure 3-37 Activate Channel Screen

3. Tap the left column of the channel control button again to close the channel. The closed channel button displays gray.

✧ Channel Color

Identify each channel waveform by color.

Table 3-5 Channel Color Table

Input Channel	Color
A	Red
B	Green
C	Blue
D	Yellow

✧ Amplitude Setting

The amplitude, probe, and low-pass filtering settings can be configured in the Channel control dialog box.

The amplitude setting allows you to set up the oscilloscope to capture signals with the specified range. If the input signal exceeds the selected range, an over-range indicator will be displayed. Select **Auto** to enable the device to adjust the vertical scale automatically.

The vertical scale will be changed, while the horizontal scale will not be changed. AC and DC voltage can be toggled to set up the input circuitry.

NOTE

The vertical scale is ALWAYS divided into 10 major divisions, and all scale settings are reflected in these 10 divisions. The division set of 10 cannot be changed.

There are two modes available to set the amplitude value.

Mode 1: For example, selecting **DC 5 V** sets the channel amplitude to $\pm 5\text{V}$ DC (displayed on the right side of the channel control button), and the vertical scale range is from -5 V to $+5\text{ V}$. The vertical scale is divided into 10 segments, each segment increases by 1 V .

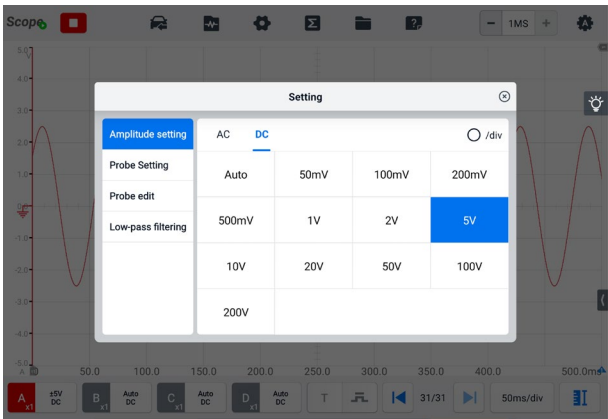


Figure 3-38 Amplitude Setting Screen (DC 5 V)

Mode 2: Select the **## /div** button to adjust value incremented by each division. For example, selecting **DC 1.0 V/div**, sets the channel amplitude to 1.0 V/div DC (seen at the right side of the channel control button). Each segment increases by 1 V . As the vertical scale is divided into 10 segments, the entire vertical scale range is from -5 V to $+5\text{ V}$.

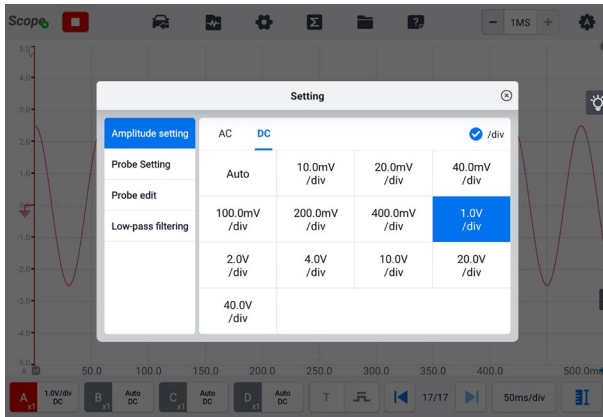


Figure 3-39 Amplitude Setting Screen (DC 1.0 V/div)

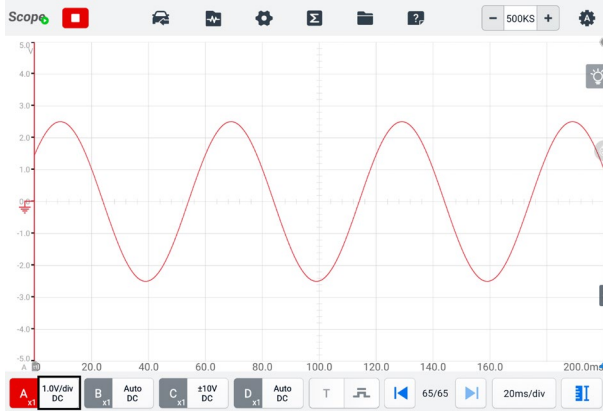


Figure 3-40 Amplitude Setting Screen (DC 1.0 V/div)

✧ Probe Setting

A probe is an accessory that connects to your oscilloscope to detect signals to be measured.

This oscilloscope has built-in definitions of standard probes. By default, the probe is set to be x1, which means 1V signal at the input to the probe will display as 1V.

The inner probes (built-in probes) include:

- ✓ **X1:** no attenuation
- ✓ **10 : 1 Attenuator:** select when using a 10-fold attenuation probe
- ✓ **20 : 1 Attenuator:** select when using a 20-fold attenuation probe (SA020)

- ✓ **X1000**: select when using a 1,000-fold attenuation probe
- ✓ **65 A Current Clamp (1 mV/10 mA mode, Max: 20 A)**: 1 mV/10 mA mode on 65 A current clamp, the max. current is 20 A
- ✓ **65 A Current Clamp (1 mV/100 mA mode, Max: 65 A)**: 1 mV/100 mA mode on 65 A current clamp, the max. current is 65 A
- ✓ **650 A Current Clamp (1 mV/100 mA mode, Max: 200 A)**: 1 mV/100 mA mode on 650 A current clamp, the max. current is 200 A
- ✓ **650 A Current Clamp (1 mV/1 A mode, Max: 650 A)**: 1 mV/1 A mode on 650 A current clamp, the max. current is 650 A
- ✓ **Coil-On-Plug Ignition Probe [COP]**: select when using the COP ignition probe (SA271)
- ✓ **Secondary Ignition Probe [ignition]**: select when using the secondary ignition probe (SA273)
- ✓ **Secondary Ignition Probe (inverted) [R_ignition]**: select when using the secondary ignition probe (SA273) and inverting the secondary ignition signal

You can select the inner standard probes in the probe settings. After selecting a correct probe, the settings can be seen in the lower right corner of the left column of the channel control button, indicating the probe is in use.

Tap the question mark icon to view the image of the corresponding current clamp in full screen.

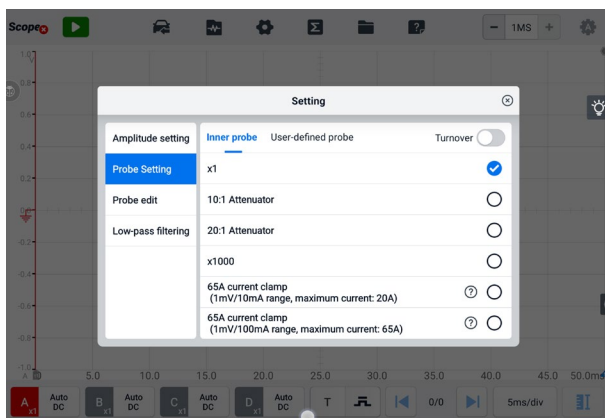


Figure 3-41 Inner Probe Setting Screen

✧ **Probe Edit**

Add custom probes not included in the built-in standard probe menu.

NOTE

Please refer to the probe's instruction manual or consult the corresponding manufacturer for the linear equation ($y=mx+c$).

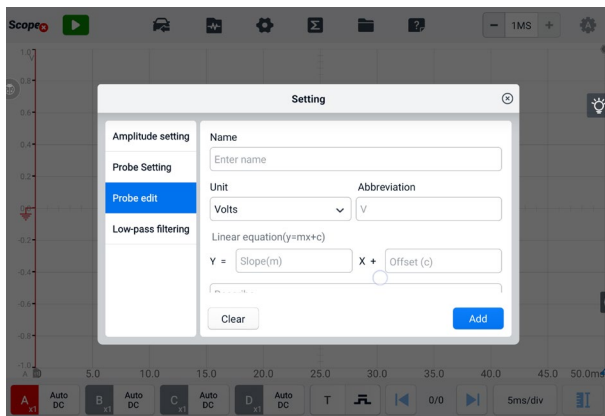


Figure 3-42 Probe Edit Screen

➤ To add custom probes

Add a 20 : 1 Attenuator as an example:

1. Tap the right column of the channel control button at the bottom of the screen to open the settings dialog box.
2. Select the **Probe Edit** option in the left column of the dialog box.
3. Tap each field to open the virtual keyboard and input the required information.
4. Tap **Add** to save the settings, or tap **Clear** to exit without saving.
5. The added probe will be listed in the Probe Setting window.

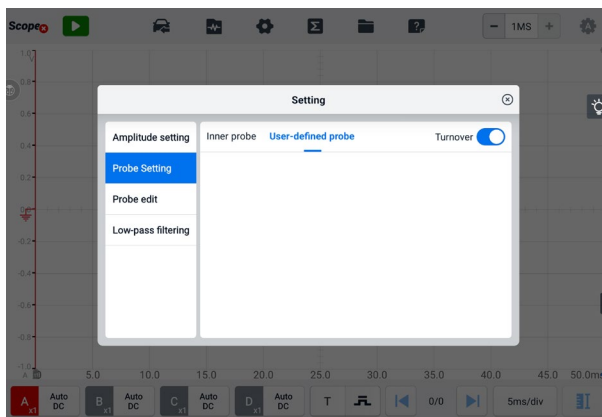


Figure 3-43 Probe Setting Screen (User-defined Probe)

✧ LPF (Low-pass Filtering)

The Low-pass Filtering (LPF) is an independent digital low-pass filter for each input channel used to remove noise from the signal.

This function is used to filter the high-frequency signal of the selected input channel for more accurate measurements. Take the two screenshots below as an example to show the comparison with or without setting the low-pass filtering. The following screenshots show the difference between waveforms with the low-pass filtering and waveforms without the low-pass filtering.

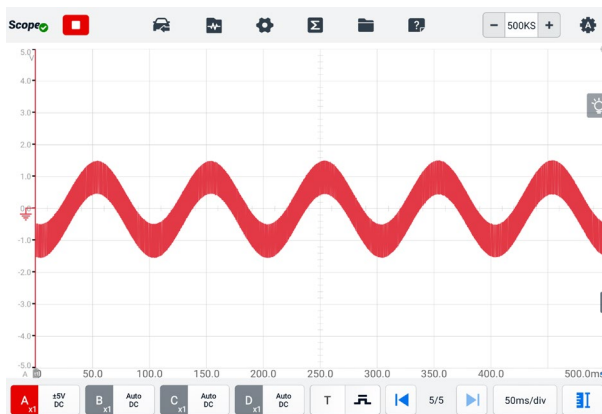


Figure 3-44 Before Setting Low-pass Filtering Screen

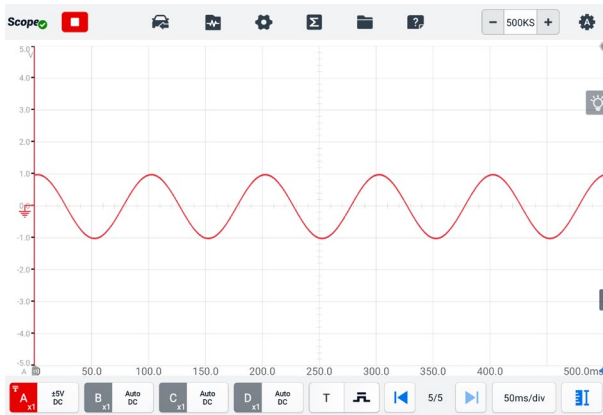


Figure 3-45 After Setting Low-pass Filtering Screen

➤ **To configure the low-pass filtering settings**

1. Tap the right column of the channel control button to open the setting dialog box.
2. Select the **Low-pass Filtering** option from the left column of the dialog box.
3. Tap the checkbox of the appropriate channel and adjust the frequency by tapping the minus or plus. The unit can be switched to **Hz**, **KHz** or **MHz** from the dropdown list.

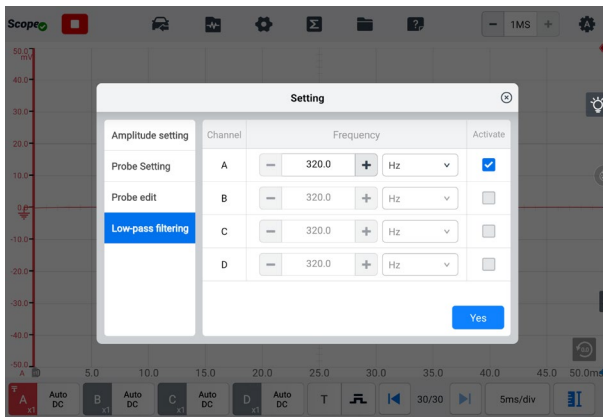


Figure 3-46 Low-pass Filtering Screen

4. Close the dialog box directly to exit without saving.

3.2.3.2 Trigger

The trigger feature is used to filter and capture specified waveform data.

According to the trigger setting condition, the trigger waveform will be captured when the

signal meets the trigger condition. When capturing waveforms, you can manually set the trigger conditions.

When the oscilloscope is capturing the signal, tap the left column of the **Trigger** button to activate the trigger function. A **trigger point** will be shown as a blue point.

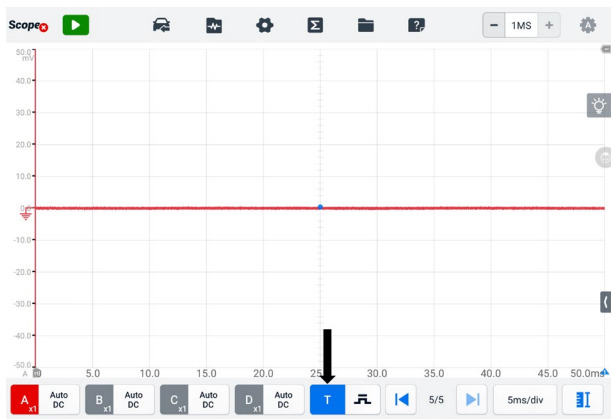


Figure 3-47 Trigger Point Screen

When the oscilloscope is capturing the signal, tap the  icon to open the trigger settings dialog box.

✧ **Edge Triggering**

The edge trigger is one of the most common trigger modes and is activated when the voltage rises above or falls below a preset threshold. This trigger type allows you to configure the trigger mode, threshold, trigger channel, and pulse direction settings. Tap **OK** to save the settings or tap **Cancel** to exit without saving.

 NOTE

The oscilloscope switches to the continuous mode if the time base is set to more than or equal to 200 ms/div. Edge Triggering is supported in the continuous mode.

- **Trigger Mode**

Four trigger modes are available: **None**, **Auto**, **Repeat**, and **Single**.

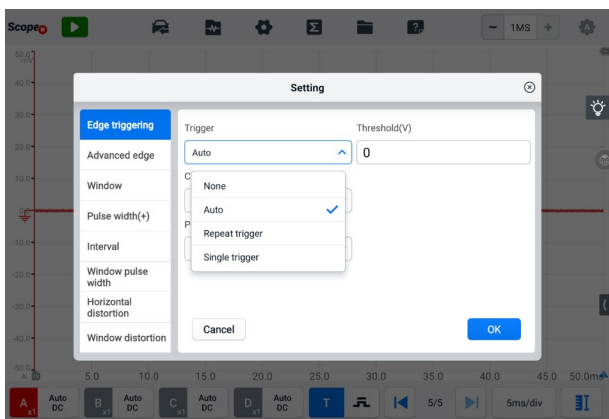


Figure 3-48 Trigger Mode Screen

The table below offers brief descriptions for each trigger mode.

Table 3-6 Trigger Mode Table

Trigger Mode	Description
None	In this trigger mode, the oscilloscope can continuously capture data without waiting for a trigger event.
Auto	In this trigger mode, the oscilloscope will wait for a trigger before capturing data. It can automatically update after a short period, even if the signal does not cross the trigger point.
Repeat	In this trigger mode, the oscilloscope waits until a trigger event occurs. If there is no trigger event, nothing will be displayed on the screen.
Single	In this trigger mode, the oscilloscope stops capturing data once a trigger event occurs.

- **Channel**

Select the applicable trigger channel from the dropdown menu. The selected channel is the one that the oscilloscope monitors for the trigger condition.

- **Pulse Direction**

Two pulse direction settings are available: **Rise** and **Fall**.

Rise Edge Trigger — indicates trigger is turned on to start the trace on the rising edge of the waveform.

Fall Edge Trigger — indicates trigger is turned on to start the trace on the falling edge of the waveform

- **Threshold**

The **Threshold** allows you to set the voltage threshold for the trigger.

- ✓ To precisely position the trigger point, input the value in the Threshold field in the trigger settings dialog box.
- ✓ To roughly position the trigger point, drag the trigger point to a desired position.

➤ **To configure the trigger settings**

1. Tap the right column of the **Trigger** button to open the trigger settings dialog box.
2. Select the trigger mode, trigger channel, and pulse direction in the dropdown list.
3. Input the value in the Threshold field in the trigger settings dialog box.
4. Tap **OK** to save settings or tap **Cancel** to exit without saving.

✧ **Advanced Edge**

This trigger type includes all the functions of the edge trigger type, plus two additional options: **the Rising or Falling option** and **the hysteresis option**.

Rising or Falling option in the dropdown menu of the pulse direction: Dual edges of a waveform can be triggered. This mode is especially useful for monitoring pulses of both polarities at once.

Hysteresis option: It is used to reduce false triggering on noisy signals. When hysteresis is enabled, a second trigger threshold voltage is used in addition to the main trigger threshold. The trigger fires only when the signal crosses the two thresholds in the correct order. The first threshold arms the trigger, and the second causes it to fire.

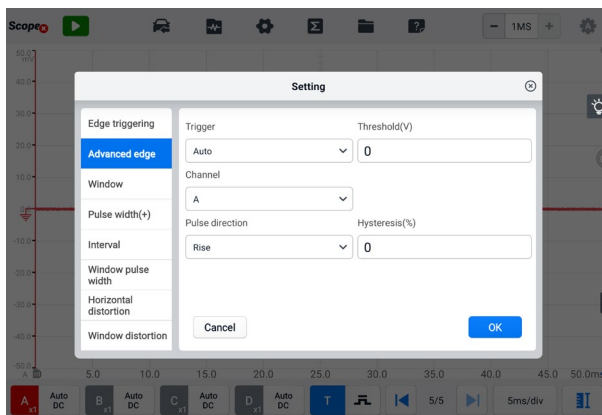


Figure 3-49 Advanced Edge Settings Screen

✧ Window

This trigger type is used to monitor when the signal enters or exits a specified voltage window.

Three options are available for the pulse direction: **Entering**, **Exiting**, **Entering or Exiting**. The **Threshold 1** and **Threshold 2** are the upper and lower voltage limits of the window.

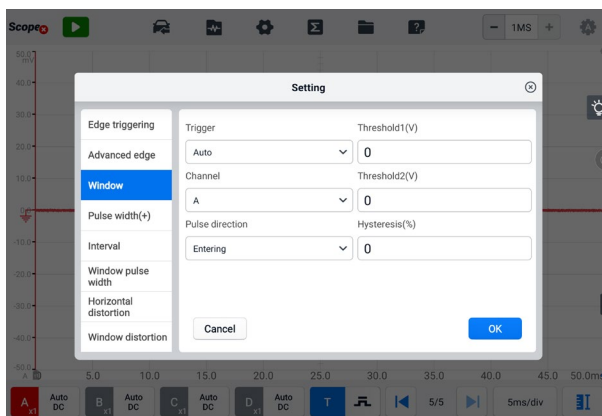


Figure 3-50 Window Settings Screen

✧ Pulse Width (+)

This trigger type allows you to monitor pulses of a specified width.

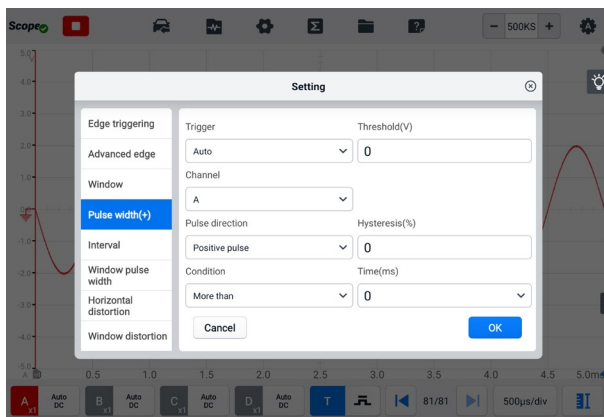


Figure 3-51 Pulse Width Settings Screen

➤ **To set the pulse width (+)**

1. Tap the **Trigger** button at the bottom of the screen to open the Trigger Settings dialog box.
2. Select the **Pulse Width (+)** in the left column of the dialog box.
3. Select the desired trigger mode and channel mode.
4. Set the pulse direction to either Positive pulse or Negative pulse according to the polarity of the pulse.
5. Select one of the four Conditions:
 - **More than:** triggers on pulses wider than the specified time.
 - **Less than:** triggers on pulses narrower than the specified time.
 - **In the time range:** triggers on pulses wider than Time 1 and narrower than Time 2.
 - **Out of the time range:** triggers on pulses narrower than Time 1 or wider than Time 2.
6. Set the trigger **Threshold** and **Hysteresis**.
7. Set the **Time 1** or **Time 2** in minutes (if available) to define the pulse width.
8. Tap **OK** to save settings or tap **Cancel** to exit without saving.

✧ **Interval**

This trigger type allows you to search for two consecutive edges of the same polarity separated by a specified time interval.

For the setting operation, please refer to the operation steps of Pulse Width, but the pulse direction with Rise or Fall selection instead of Positive or Negative.

✧ **Window Pulse Width**

This trigger type combines with the window trigger and the pulse width trigger. It detects when a signal enters or exits an input range and stays for a specified period of time. Two **Region** options can be selected: **In range** and **Out of range**.

✧ **Horizontal Distortion**

This trigger type can be monitored when the signal goes high or low for longer than the specified time.

✧ **Window Distortion**

This trigger type monitors when a signal enters a specified voltage range and stays within that range for a specified period of time.

✧ **Underthrow**

This trigger type monitors a pulse that exceeds one threshold and then drops below the threshold without exceeding the second threshold. This type of trigger is typically used to find pulses that do not reach a valid logic level.

3.2.3.3 *Buffer*

The buffer is used to store the captured waveform data for real-time and playback display.

The oscilloscope can capture and store waveforms. Select a waveform from the waveform buffer by tapping the **Previous** or **Next** button.

The waveform buffer displays the current waveform number and the total number of stored waveforms.

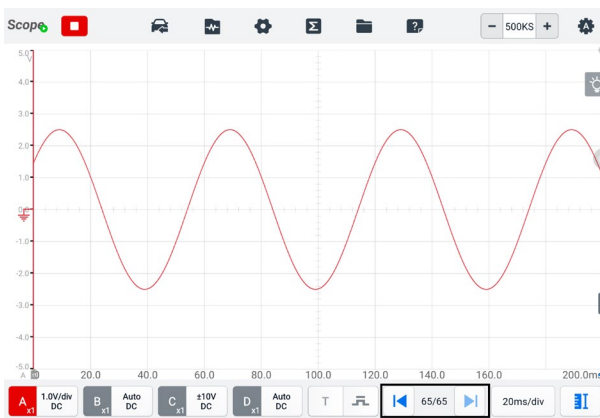


Figure 3-52 Buffer Screen

Button	Name	Description
	Previous	Tap to display the previous waveform in the buffer.
	Buffer Index	Displays the number of the waveform currently displayed onscreen out of the total number of buffered waveforms.
	Next	Tap to display the next waveform in the buffer.

3.2.3.4 Time Base

The Time Base controls the oscilloscope data sampling display time. Tap the **Time Base** button at the bottom to open the setting dialog box.

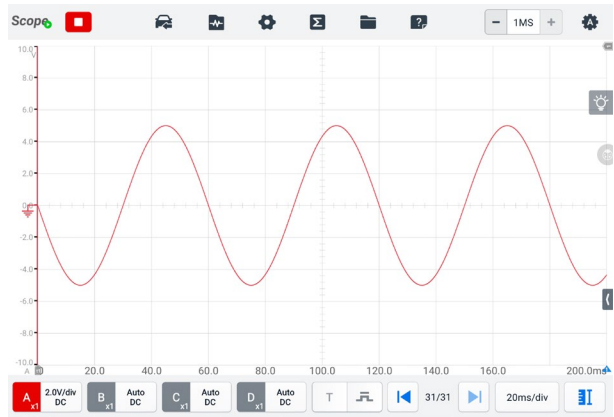


Figure 3-53 Time Base Screen 1 (Normal Mode)

Continuous Mode: if the time base is set to more than or equal to 200ms/div, the oscilloscope switches to the continuous mode. In this mode, the oscilloscope updates the trace continuously as each capture progresses, rather than waiting for a complete capture before updating the trace.

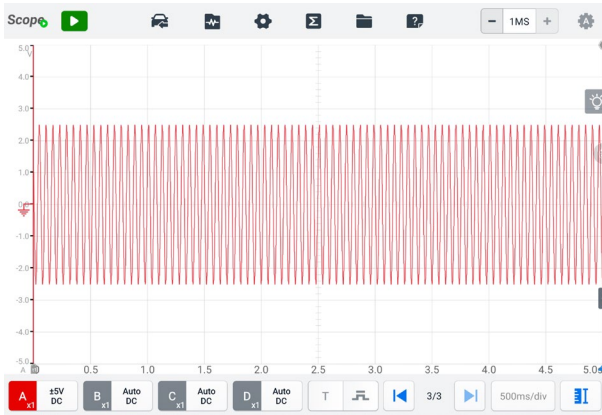


Figure 3-54 Time Base Screen 2 (Continuous Mode)

3.2.3.5 Measurement

The available measurements for each channel are (from left to right):

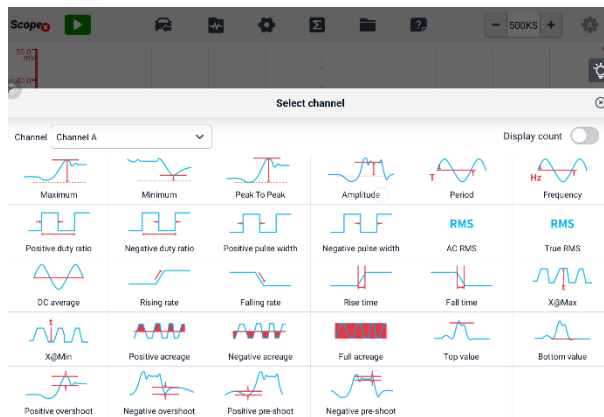


Figure 3-55 Measurement Screen

- ✧ **Maximum** — the highest level that the signal reaches
- ✧ **Minimum** — the lowest level that the signal reaches
- ✧ **Peak To Peak** — the difference between maximum and minimum
- ✧ **Amplitude** — the top value minus the bottom value
- ✧ **Period** — the duration of one cycle in a repeated pattern in the waveform
- ✧ **Frequency** — the number of signal occurrences per second
- ✧ **Positive Duty Ratio** — the ratio of positive pulse width to period width

- ✧ **Negative Duty Ratio** — the ratio of negative pulse width to period width
- ✧ **Positive Pulse Width** — the amount of time that the signal spends above its average value
- ✧ **Negative Pulse Width** — the amount of time that the signal spends below its average value
- ✧ **AC RMS** — the root mean square (RMS) value of the waveform minus the DC Average
- ✧ **True RMS** — the root mean square (RMS) value of the waveform, including the DC component
- ✧ **DC Average** — the average value of the waveform
- ✧ **Rising Rate** — the rate at which the signal level rises
- ✧ **Falling Rate** — the rate at which the signal level falls
- ✧ **Rise Time** — the time the signal takes to rise from the lower threshold to the upper threshold
- ✧ **Fall Time** — the time the signal takes to fall from the upper threshold to the lower threshold
- ✧ **X@Max** — the corresponding value of X axis when the amplitude is the maximum
- ✧ **X@Min** — the corresponding value of X axis when the amplitude is the minimum
- ✧ **Positive Acreage** — the waveform acreage measured above the zero baseline
- ✧ **Negative Acreage** — the waveform acreage measured below the zero baseline
- ✧ **Full Acreage** — the positive acreage plus negative acreage
- ✧ **Top Value** — 90% of the waveform maximum value
- ✧ **Bottom Value** — 10% of the waveform minimum value
- ✧ **Positive Overshoot** — the ratio of the difference between the maximum value and the top value and the amplitude
- ✧ **Negative Overshoot** — the ratio of the difference between the bottom value and the minimum value and the amplitude
- ✧ **Positive Pre-shoot** — the ratio of the difference between the bottom value and the minimum value and the amplitude
- ✧ **Negative Pre-shoot** — the ratio of the difference between the maximum value and the top value and the amplitude

In the **Spectrum View**, the available measurements are as follows.

- ✓ **Frequency Peak Value** — the frequency of the peak signal value
- ✓ **Amplitude Peak Value** — the amplitude of the peak signal value

- ✓ **Average Amplitude Peak Value** — the amplitude of the peak signal value captured over multiple times
- ✓ **Total Power** — the power of the entire signal captured in the spectrum view
- ✓ **Total Harmonic Distortion Percentage (THD)** — the ratio of the sum of harmonic powers to the power of fundamental frequency

$$\text{THD} = \frac{\sqrt{V_1^2 + V_2^2 + V_3^2 + V_4^2 + V_5^2}}{V_f}$$

- ✓ **Total Harmonic Distortion (THD) dB**: the ratio of the sum of harmonic powers to the power of the fundamental frequency

$$\text{THD} = 10\log_{10} \left(\frac{\sqrt{V_1^2 + V_2^2 + V_3^2 + V_4^2 + V_5^2}}{V_f} \right)$$

- ✓ **Total Harmonic Distortion and Noise (THD + N)** — the ratio of the harmonic power plus noise to the fundamental power

$$\text{THD} + \text{N} = 10\log_{10} \left(\frac{\text{THD} + \text{N}}{V_f} \right)$$

- ✓ **Spurious-free Dynamic Range (SFDR)** - the ratio of the amplitude of the highest peak in the spectrum to that of the second-highest peak
- ✓ **SINAD** — signal to noise and distortion ratio. The ratio (in decibels) of the signal-plus-noise-plus-distortion to noise-plus-distortion

$$\text{SINAD} = 10\log_{10} \left(\frac{\text{Signal}}{\text{Noise} + \text{noise}} \right)$$

- ✓ **Signal Noise Ratio (SNR)** — the ratio (in decibels) of average signal power to average noise power

$$\text{SINAD} = 10\log_{10} \left(\frac{\text{Signal}}{\text{Noise}} \right)$$

- ✓ **Inter-modulation Distortion (IMD)** — a measure of distortion due to non-linear mixing of two tones

$$\text{IMD} = \sqrt{\frac{F_3^2 + F_4^2}{F_1^2 + F_2^2}}$$

➤ **To set the measurement**

1. Tap the **Measurement** button at the bottom of the screen to open the measurement dialog box.
2. Select the channel to be measured.

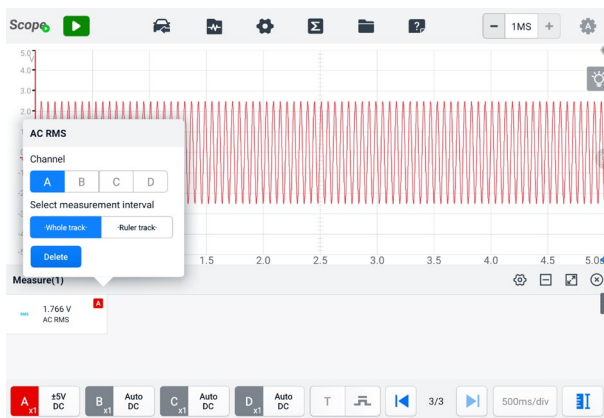


Figure 3-56 Measurement Setting Screen

3. Close the dialog box, and the corresponding measurement readings are displayed on the lower side of the screen. The Whole Track and Ruler Track can be toggled by tapping the reading. Adjust the whole track or ruler track on the displayed screen, or tap **Delete** to delete the measurement.

➤ **To set the measurements in Spectrum View**

1. Tap the **Settings** button in the upper toolbar. A dialog box opens. Select the **Mode** option in the dialog box, and then tap to select **Spectrum View**.
2. Tap the **Measurement** button at the bottom of the screen to open the measurement dialog box.
3. Select the channel to be measured.
4. Select the appropriate measurement options.

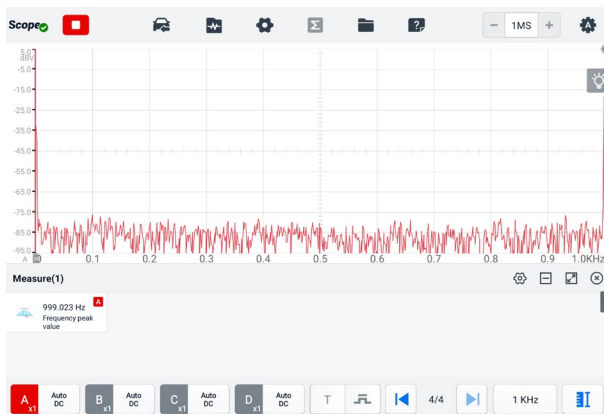


Figure 3-57 Measurement Setting Screen (Spectrum View)

5. Close the dialog box, and the corresponding measurement readings are displayed on the lower side of the screen. Tap **Delete** to delete the measurement.

3.2.4 Troubleshooting

- A. If the oscilloscope cannot communicate with the MaxiSys tablet:
 - Ensure the oscilloscope is properly connected to the MaxiSys tablet with the supplied USB cable.
 - Restart the MaxiSys tablet and reconnect the oscilloscope if communication between the two continues to fail.
- B. If unwanted signals are displayed or signals are distorted:
 - Use only the supplied test leads or probes to connect to the input channels.
 - Check the test leads or probes for damage.
 - Ensure the polarity of the test lead connections is correct.
 - Ensure the signal and ground connections are clean and secure.
 - Ensure that the ground lead provides a direct connection between the circuit ground and the oscilloscope ground.
 - Isolate the test leads from other components, leads, or systems that may induce unwanted noise into the signal being tested, including the electric motors, secondary ignition components, relays, and alternators.

3.2.5 Glossary

AC/DC Control

Each channel can be set to either AC coupling or DC coupling. With DC coupling, the voltage displayed onscreen is equal to the true voltage of the signal with respect to ground. With AC coupling, any DC component of the signal is filtered out, leaving only the variations in the signal for the AC component.

Aliasing

When the signal frequency gets higher than half the scope's maximum sampling rate and exceeds the limit, a distorted waveform displays. This distortion is called aliasing.

Amplitude

The maximum voltage generated from the zero volts line of the oscilloscope.

Analog Bandwidth

The frequency at which a displayed sine wave has half the power of the input sine wave (about 71% of the amplitude).

Buffer Size/Cache Size

The size of the oscilloscope's buffer memory. The buffer memory is used by the oscilloscope to temporarily store data. This helps to compensate for the differences in data transfer rate from one device to another.

Frequency

The number of signal occurrences per second. Frequency is measured in Hz (hertz).

Peak to peak voltage

The difference in voltage between the minimum and maximum voltages occurring in the waveform.

Time Base

The time interval across the scope display.

Voltage Range

The range between the maximum and minimum voltages that can be accurately captured by the oscilloscope.

Sampling Rate

The number of samples per second captured by the oscilloscope. The faster the sampling rate of the scope, the more frequently it measures the signal voltage, and so the more detailed waveforms are displayed on the scope screen.

4 Service

4.1 Technical Support

If you have any questions or problems with the operation of the product, please contact us (see the following contact info) or your local distributor.

Autel China Headquarters

- **Phone:** +86 (0755) 8614-7779 (Monday-Friday, 9AM-6PM Beijing Time)
- **Email:** support@autel.com
- **Address:** Floor 2, Caihong Keji Building, 36 Hi-tech North Six Road, Songpingshan Community, Xili Sub-district, Nanshan District, Shenzhen City, China
- **Web:** www.autel.com

Autel North America

- **Phone:** 1-855-288-3587 (Monday-Friday, 9AM-6PM Eastern Time)
- **Email:** ussupport@autel.com
- **Address:** 36 Harbor Park Drive, Port Washington, New York, USA 11050
- **Web:** www.autel.com/us

Autel Europe

- **Phone:** +49(0)89 540299608 (Monday-Friday, 9AM-6PM Berlin Time)
- **Email:** support.eu@autel.com
- **Address:** Landsberger Str. 408, 81241 München, Germany
- **Web:** www.autel.eu

Autel APAC

Japan:

- **Phone:** +81-045-548-6282
- **Email:** support.jp@autel.com
- **Address:** 6th Floor, Ari-nadoribiru 3-7-7, Shinyokohama, Kohoku-ku, Yokohama-shi, Kanagawa-ken, 222-0033 Japan
- **Web:** www.autel.com/jp

Australia:

- **Email:** ausupport@autel.com
- **Address:** Unit 5, 25 Veronica Street, Capalaba

Autel IMEA

- **Phone:** +971 585 002709 (in UAE)
- **Email:** imea-support@autel.com
- **Address:** 906-17, Preatoni Tower (Cluster L), Jumeirah Lakes Tower, DMCC, Dubai, UAE
- **Web:** www.autel.com

Autel Latin America**Mexico:**

- **Phone:** +52 33 1001 7880 (Spanish in Mexico)
- **Email:** latsupport@autel.com
- **Address:** Avenida Americas 1905, 6B, Colonia Aldrete, Guadalajara, Jalisco, Mexico

Brazil:

- **Email:** brsupport@autel.com
- **Address:** Avenida José de Souza Campos n° 900, sala 32 Nova Campinas Campinas – SP, Brazil
- **Web:** www.autel.com/br

4.2 Repair Service

If it becomes necessary to return your device for repair, please download the repair service form from www.autel.com, and fill it in. The following information must be included:

- Contact name
- Return address
- Telephone number
- Product name
- Complete description of the problem
- Proof-of-purchase for warranty repairs
- Preferred method of payment for non-warranty repairs

NOTE

For non-warranty repairs, payment can be made with Visa, Master Card, or with approved credit terms.

Send the device to your local agent, or to the address below:

Floor 2, Caihong Keji Building, 36 Hi-tech North Six Road, Songpingshan Community, Xili Sub-district, Nanshan District, Shenzhen City, China

4.3 Other Services

You can purchase the optional accessories directly from Autel's authorized tool suppliers, and/or your local distributor or agent.

Your purchase order should include the following information:

- Contact information
- Product or part name
- Item description
- Purchase quantity

5 Compliance Information

5.1 FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

WARNING

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

5.2 ICES Statement

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

5.3 CE Compliance

2014/35/EU Low Voltage and 2014/30/EU Electromagnetic Compatibility.

5.4 RoHS Compliance

This device is declared to be in compliance with the European RoHS Directive 2011/65/EU and Commission Delegated Directive (EU) 2015/863 and all subsequent amendments, restricting the use of hazardous substances in electrical and electronic equipment.

6 Warranty

6.1 Limited One Year Warranty

Autel Intelligent Technology Corp., Ltd. (the Company) warrants to the original retail purchaser of this Autel MaxiScope MP608, that should this product or any part thereof during normal consumer usage and conditions, be proven defective in material or workmanship that results in product failure within one (1) year period from the date of purchase, such defect(s) will be repaired, or replaced (with new or rebuilt parts) with Proof of Purchase, at the Company's option, without charge for parts or labor directly related to the defect(s).

NOTE

If the warranty period is inconsistent with local laws and regulations, please comply with the relevant local laws and regulations.

The Company shall not be liable for any incidental or consequential damages arising from the use, misuse, or mounting of the device. Some states do not allow limitation on how long an implied warranty lasts, so the above limitations may not apply to you.

This warranty does not apply to:

- a) Products subjected to abnormal use or conditions, accident, mishandling, neglect, unauthorized alteration, misuse, improper installation or repair or improper storage;
- b) Products whose mechanical serial number or electronic serial number has been removed, altered or defaced;
- c) Damage from exposure to excessive temperatures or extreme environmental conditions;
- d) Damage resulting from connection to, or use of any accessory or other product not approved or authorized by the Company;
- e) Defects in appearance, cosmetic, decorative or structural items such as framing and non-operative parts.
- f) Products damaged from external causes such as fire, dirt, sand, battery leakage, blown fuse, theft or improper usage of any electrical source.

IMPORTANT

All contents of the product may be deleted during the process of repair. You should create a backup copy of any content of your product before delivering the product for warranty service.

