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**WARNING**

Study, understand and follow all instructions provided with this product. Read these instructions carefully before installing, operating, servicing or repairing this tool. Keep these instructions in a safe, accessible place.

Caution: To help prevent personal injury, follow the instructions below.

Handle device carefully. Do not drop, bend, puncture, insert foreign objects, or place heavy objects on the device. The fragile components inside the unit may be damaged.

Connect and disconnect properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Observe all terminal ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Use proper probe. To avoid shock hazard, use a properly rated probe for your measurement.

Avoid circuit or wire exposure. Do not touch exposed connections and components when

If suspected damage occurs with the device, have it inspected by qualified service personnel before further operations.

Do not operate in wet/damp conditions.

Do not operate in an explosive atmosphere.

Keep product surfaces clean and dry.

Do not disassemble or refit the device. The device is a sealed device and there are no

and user serviceable parts inside. All internal repairs must be carried out by authorized

Do not operate if the unit is, or suspected to be damaged. maintenance agencies or authorized technicians. Attempts to disassemble or refit the device will void the warranty.

- Do not try to replace the internal battery.** The internal rechargeable battery must be replaced by authorized maintenance agencies or authorized technicians.

FCC STATEMENT

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

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.

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.

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1 Overview

1.1 Product Profile





This EM101N is composed of hardware and software. Hardware includes EM101N module and connection wire. The Oscilloscope and Multimeter APP are installed on diagnostic tool.





Automotive oscilloscopes assist the auto repair technician with the ability to quickly identify faults on automotive electronic equipment and wiring. The oscilloscope sweep speed is far greater than the signal frequency of such vehicles, usually 5-10 times of the measured signal and quickly acquire the circuit signal while slowly displaying the waveform for observation and analysis.

The built-in multimeter provides simple measurements to test voltage, current and resistance to help determine faults.

1.2 Accessories Included

Common accessories are same, but for different destinations, the accessories may vary. Please consult from the seller or check the package list supplied with this tool together.

No.	Name	Description
1	EM101N	
2	BNC to 4mm test leads	 <p>Dedicated cable used to connect sensor and EM101N to test all types of vehicle signals.</p>
3	Multimeter test pen (black + red)	 <p>Connect to COM and V/Ω terminal of the sensor module when using multimeter.</p>
4	Multimeter probes (black + red)	 <p>The multimeter probes offer a quick and easy solution, where a permanent connection is not required. The 4 mm socket in the handle of the probe connects straight into the BNC to 4mm test leads.</p>

5	Crocodile clips	 <p>Designed to connect the bare terminals or leads.</p>
6	Back probe pins suite	 <p>Used to connect sensor and BNC to 4mm Test Leads, and can easily pierce the insulation of wires to allow for automotive electrical measurements without causing damage to the wires. Additionally, they can be used as pin-tip probes while working with small circuit boards.</p>
7	Type A-Type B USB cable	 <p>Used to connect EM101N and diagnostic tool, sending signal acquired by EM101N to diagnostic tool to display waveform.</p>
8	Power adaptor	 <p>Used to charge the EM101N with included USB cable.</p>
9	User manual	

1.3 Technical Parameters

1. When used as Oscilloscope

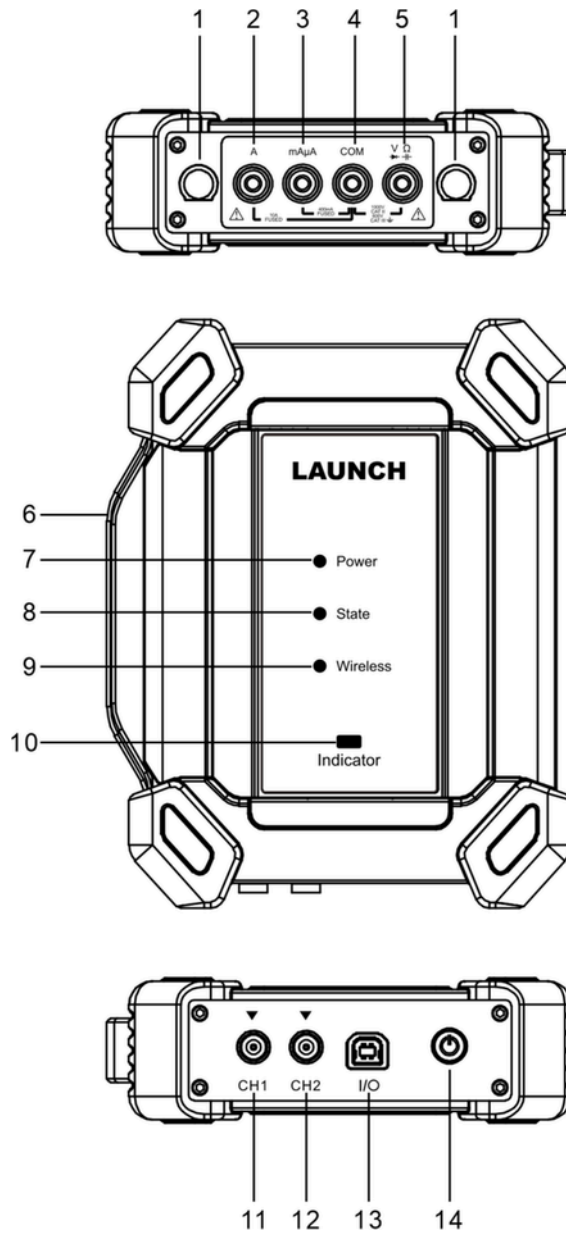
Name	Descriptions
Channels	2
Bandwidth	10MHz
Max. sample rate	50MHz/s
Timebase	200ns/div~10s/div
Acquisition mode	Normal sampling
Storage depth	240KB (for two channels)
Coupling	DC, AC

Input impedance	1M Ω ±2%, 15pF±5pF parallel
Vertical scale	10mV/div~10V/div
Sample bit	8 bits
Max. input voltage	40V peak value (DC + AC peak value)
Probe attenuation coefficient	1X, 10X,100X (need probe support)
Trigger type	Edge
Trigger mode	Auto, Single
Auto measurement items	Peak value, average value, max value, min value, frequency, cycle


2. When used as Multimeter


Name	Descriptions
DC Voltage	Automatic range, measurement range: ±600V
AC voltage	Automatic range, measurement range: ±600V
DC current	Automatic range, measurement range: ±10A (external sensor should be connected for large range current).
AC current	Automatic range, measurement range: ±10A. Average value measurement (external sensor should be connected for large range current).
Resistance	Automatic range, measurement range: 0 Ω ~60M Ω
Diode	0V~2.0V
Make-and-break detection	Make a sound when below 50 Ω

2 Component and Controls



Number	Name	Description
2*	Fuse	
3*	A	10A current input port
4*	mA/μA	mA/ 400mA current input port
5*	COM	Negative public port
	V/Ω	Voltage/resistance input terminal

 * Note: The ports listed above are measurement ports for multimeter.


6	Handle	
7	Power LED	Solid Green: Battery level normal. Solid Red: Charging. Red Flashes: Battery level low, indicating the battery level is below 20%.
8	State LED	Solid Green: Working normally. Red Flashes: Working abnormally.
9	Wireless LED	Solid Green: Normally connected. Red Flashes: Connecting in progress. Not ON: Disconnected.
10	Indicator LED	Green Flashes: Wrong connection or poor contact. Solid Green: Working normally.
11	CH1	Channel 1
12	CH2	Channel 2
13	I/O Port	1. Charge the EM101N with power adaptor and USB cable. 2. Connect EM101N and diagnostic tool with USB cable to transmit data.  Note: The diagnostic tool is not able to provide power supply to EM101N. Please charge the EM101N properly.
14	Power button	Press to turn on/off the EM101N.

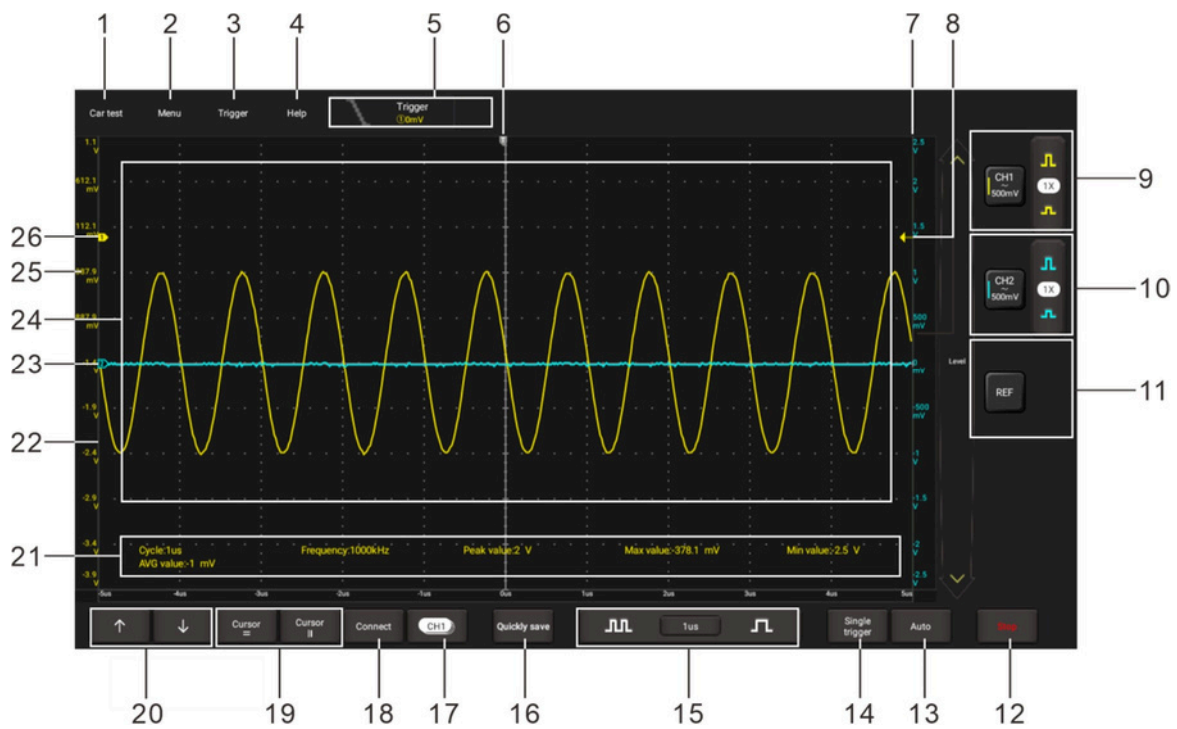
3 Oscilloscope Operations

3.1 Initial Use






3.1.1 Getting Started













Tap the Oscilloscope app icon and the following screen will appear:

 Note: If no proper connection is made, no waveforms will be displayed on the screen and most functions become disabled.



No.	Description	Operation tips
1	<p>Car Test</p> <p>Provides all kinds of the testing applications on the automotive parts (including circuits, sensors, actuators, ignition etc.).</p>	<p>Tap this button once to expand the submenu. Tap it again to fold the submenu.</p>
2	<p>Menu</p> <p>Includes the following options:</p> <ul style="list-style-type: none"> • Measure: 6 parametric measurement items. • Save: Save format and path of channel waveform. • Display: Set the display mode of the waveform. • User Settings: Clear data, access oscilloscope settings and automatic calibration. • About: Display the detailed information of the app. 	<p>Tap this button once to expand the submenu. Tap it again to fold the submenu.</p> <p>For detailed operations on the submenus, refer to section 4.4.</p>
3	<p>Trigger</p> <p>Use to setup trigger condition and trigger type.</p>	


4	Help	Check detailed operation instructions of application.
5	Trigger information of current channel Readouts represent storage depth, sample rate and trigger information respectively.	Displays working status.
6	 Horizontal trigger position marker	
7	Level scale of the Channel 2	
8	Edge trigger level marker	
9	Channel 1 vertical settings panel Controls the amplitude of displayed signal. User can change Invert, coupling and probe attenuation coefficient.	Tap  once - Turns on the channel and sets it as the current channel. Tap  twice - Calls out the channel vertical settings.
10	Channel 2 vertical settings panel Controls the amplitude of displayed signal. User can change Invert, coupling and probe attenuation coefficient.	Tap  three times - Turns off the channel.
11	Reference channel settings panel Setup reference channel.	
12	RUN/STOP/WAIT WAIT : All pre-triggered data has been acquired and the EM101N is ready to accept a trigger. STOP : The EM101N has stopped acquiring waveform data. RUN : The EM101N is running.	
13	Auto Automatically adjusts the vertical scale, horizontal scale and trigger settings.	Tap this button to start auto setup function.
14	Single trigger Capture one single trigger, complete acquisition, and then stop.	
15	Horizontal setting Control the time base.	
16	Quick save Quickly saves the measured waveform of current channel. To modify save path and file type, go into Menu-> Save.	
17	 Channel selection button	Tap this button once, the

	Tap it to select the target channel.	channel (only the channels that have been turned on) selection pop-up will appear. Tap it again to fold the submenu.
18	Connection status button	Tap this button to search and connect EM101N. It will display "Connected" when successfully connected.
19	 Cursor position Turn on/off the horizontal/vertical cursor measurement function. When set to ON, two horizontal/vertical reference lines named with Y1 & Y2/X1 & X2 will be displayed on the waveform display area. The user can use  or  to fine tune the line or drag the line directly to move it.	Tap this button once to start the cursor calculation function. Tap it again to disable it.
20	 or  Fine-tuning button Fine tunes the vertical/horizontal reference line.	When the horizontal cursor is ON, the fine tuning buttons display  and  . If the vertical cursor is ON, the fine tuning buttons will change into  and  .
21	Measurement value area	Go to Menu -> Measure to expand it.
22	Level scale of the Channel 1	
23	Channel 2 marker Shows the reference points of the displayed waveforms. If there is no marker, the channel is not displayed.	If the marker is displayed as  , it indicates the channel is not the current channel. Tap the marker  , it will change into  indicating the channel is the current channel.
24	Waveform display area	
25	Channel 1 marker Shows the reference points of the displayed waveforms. If there is no marker, the channel is not displayed.	Same with "Channel 2 marker."

3.1.2 Automatic Calibration

The automatic calibration routine lets you optimize the oscilloscope signal path for maximum measurement accuracy. You can run the routine at any time but you should always run the routine if the ambient temperature changes by 10°C or more.


For accurate calibration, power on the EM101N and wait twenty minutes to ensure it is warmed up. Calibration mainly includes simulation channel calibration, trigger voltage of trigger circuit calibration and non-linear calibration of horizontal base line deviation.

 Note: During auto calibration, please make sure no signal in input terminal of CH1 / CH2, otherwise it may damage device.

Tap **Menu** -> **User Settings**, then tap **Automatic Calibration**.



Tap **OK** on the pop-up message box to start calibration. The LED on the EM101N starts flashing and the prompt message “Calibrating, please wait” will appear on the upper left corner of the screen.

 Note: While calibrating, no operations are allowed to perform until the calibration process is successfully finished.

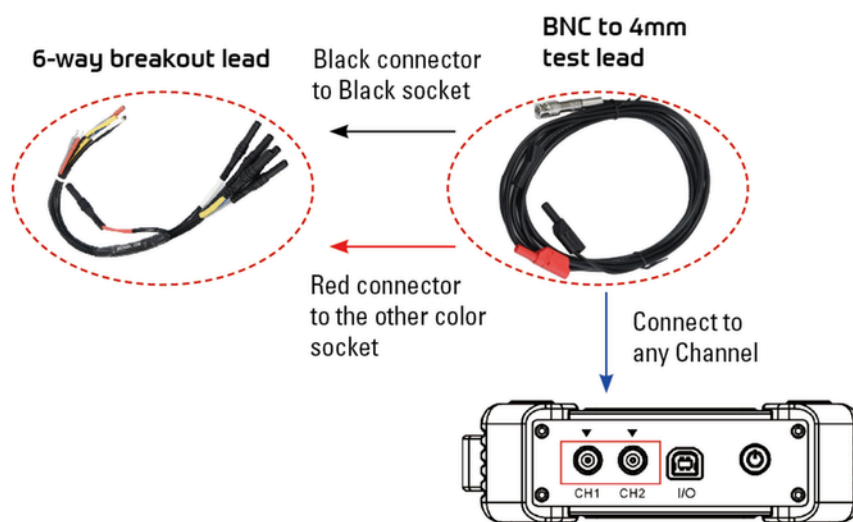
The self-calibration routine takes several minutes. After calibration is complete, the prompt message “Correction successful” will pop up on the screen.

Tap **OK** to complete automatic calibration.

3.1.3 Connection

Testing Sensor:

1. Connect the BNC connector of the BNC to 4mm test lead to the CH1/CH2 (select number of channel and channel No. according to actual situations), and plug the black (GND) and red (SIGNAL) 4mm connectors into the Black (GND) and other color (SIGNAL) banana sockets of the 6-way breakout leads (optional) respectively.



2. Connect the black terminal and signal wire (its other end connected to the red 4mm connector) of the 6-way breakout lead to the GND and signal terminal of the vehicle sensor.

3.2 Operations

3.2.1 Channel Selection

A total of 3 channels are available: CH1, CH2 and REF (reference channel). Follow the methods to select a channel:

A. Tap the channel tab shown on the right edge of the screen.



B. Tap **CH1** to select the target channel. This method is only applicable to the channel that is turned on.

Note: For better comparison and identification, each channel and waveform is marked in different color.

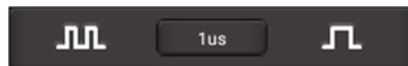
The EM101N can display multiple waveforms simultaneously, but only one waveform is allowed to display at top. The top channel is called current channel displayed as .

3.2.2 Channel Attributes & Trigger Setting

Channel attributes can be set via horizontal settings and vertical settings.

1. Horizontal Settings

User can change the horizontal time/division scale by tapping or directly or by tapping the time/division value from the pull-down list.

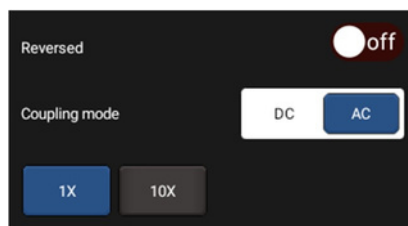


If the waveform acquisition is stopped, the time/division selector (/) expands or compresses the waveform.

2. Vertical Setup

This option allows you to adjust vertical scale and position, and other channel setup. Each channel has one separate vertical menu, you can set individually.

Tap the target channel to call out the vertical setting option.



Option descriptions:

Menu	Comments/Settings
------	-------------------

<p>Reversed</p>	<p>This option will affect how channel is displayed. <u>ON</u>: Turn on the invert function. When Invert is set as On, voltage value of displayed wave is reversed (upside down). When using basic trigger, it is necessary to adjust the trigger level to keep waveform triggered steadily. <u>OFF</u>: Restore to the original display of the waveform.</p>
<p>Coupling mode</p>	<p>Trigger coupling determines what part of the signal passes to the trigger circuit. AC and DC are included: DC: Both DC and AC current can pass through, and can be used to view waveform as low as 0Hz without large DC offset. AC: The DC signal of the tested signal is blocked, and only AC current is allowed to pass through, and can be used to view waveform with large DC offset. Choose the probe attenuation coefficient.</p>
<p>Probe type</p>	<p>Attenuation coefficient changes the vertical ratio of EM101N so that the measurement results reflect the true voltage at the probe.</p>

3. Trigger setting

The trigger determines when the Oscilloscope starts to acquire data and display a waveform. When a trigger is set up properly, it can convert unstable displays or blank screens into meaningful waveforms.

When the Oscilloscope starts to acquire a waveform, it collects enough data so that it can draw the waveform to the left of the trigger point. The Oscilloscope continues to acquire data while waiting for the trigger condition to occur. After it detects a trigger, the Oscilloscope continues to acquire enough data so that it can draw the waveform to the right of the trigger point.

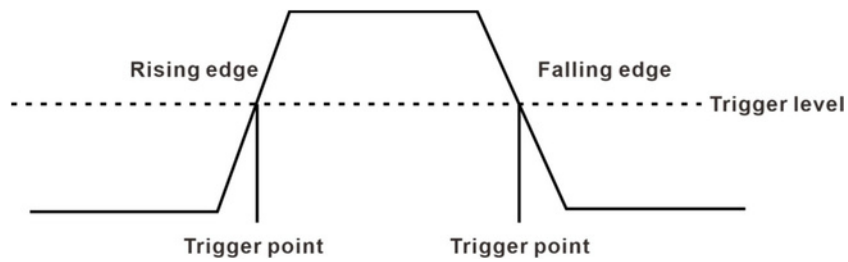
Trigger indicates when a certain waveform meets the conditions that are predefined according to the requirements, the Oscilloscope presents the acquired data on the screen.

Go to **Trigger**, the following screen will appear:



The EM101N applies edge trigger, which is the most commonly used and effective trigger method. A clear majority of applications apply this trigger method to trigger waveform. An edge trigger determines whether the Oscilloscope finds the trigger point on the rising/falling/dual edge of a signal. When the

tested signal voltage direction is consistent with preset direction, and the value reaches trigger voltage, the EM101N will be triggered and capture waveform.



Menu	Comments/Settings
Source	Select channel source of triggered signal.
Trigger	<p><u>Level</u>: The electrical level that signals shall exceed when capturing waveform.</p> <p><u>Rise</u>: Trigger on rising edge.</p> <p><u>Drop</u>: Trigger on falling edge.</p> <p><u>Close</u>: Turning off trigger mode.</p>

In this mode, the user can set the trigger level by directly dragging the Level scroll bar or the icon ← on the right side of the waveform display area.

3.2.3 Auto-Set

The Oscilloscope has an auto-set feature that sets up the Oscilloscope automatically to display the input signal in a best fit.

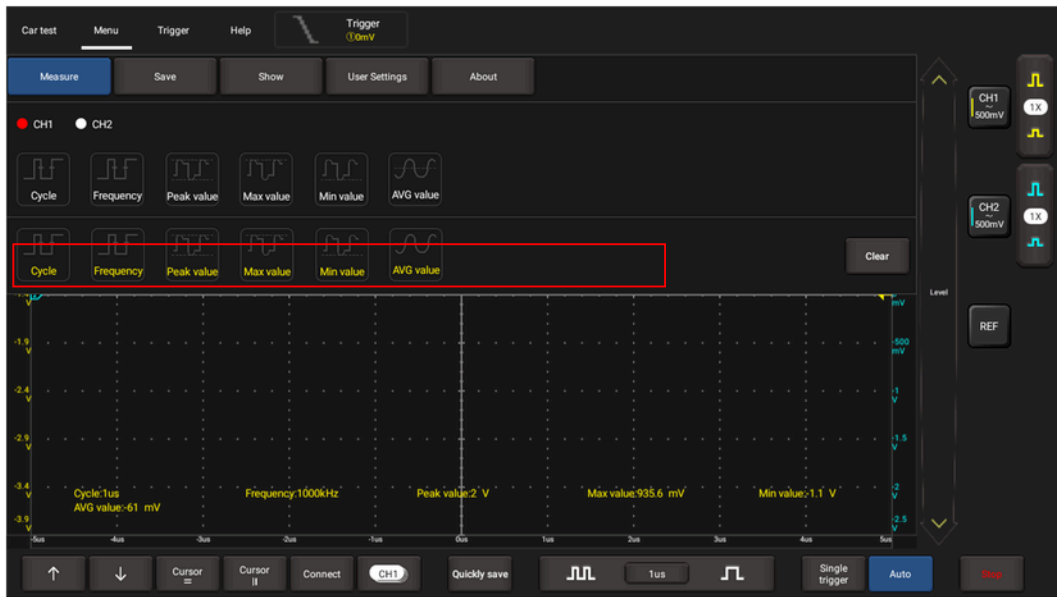
Tap **Auto**, the EM101N may change the current settings to display the signal. It automatically adjusts the vertical and horizontal scaling, as well as the trigger coupling and position.

3.2.4 Menu Operations

1. Measure

The EM101N provides 6 parametric auto measurements. Tap **Measure** and the following screen will appear:

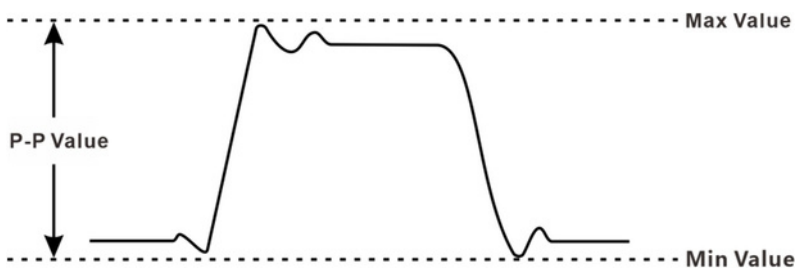
Tap to select the desired measurement item. All selected items will be shown on the left side of the **Clear** button.

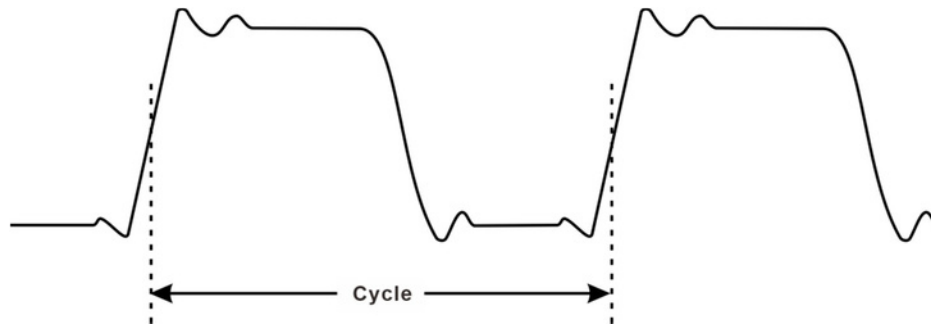


Tap it to remove the measurement item. The values corresponding to the selected items will be displayed on the bottom of the screen.

Parameter type	Description
Cycle	Time for the first signal cycle to complete in the waveform.
Frequency	Reciprocal of the period of the first cycle in the waveform.
Peak value	Peak-to-peak = Max-Min, measured over the entire waveform.
Max value	Voltage of the absolute maximum level, measured over the entire waveform.
Min value	Voltage of the absolute minimum level, measured over the entire waveform.
AVG value	The arithmetic mean over the entire waveform.

The following illustrations explain some common measurement items for your reference.





Tap **Clear** to turn off all measurement items.

2. Save

This function allows you to save the waveforms of the channels.

Tap **Save** and the following screen will appear:



Select the desired measurement channel, select file type (.WAV or .CSV), tap the default file name to change the file name and select save. Alternatively, the user can save the waveform files to the designated folder (R1, R2). If the files are saved under this folder, the user can recall the saved files for reference and play back through REF channel.

3. Display

This function enables you to setup waveform brightness and coordinate axis display level. Coordinate axis comes with Full, Grid, Crosshairs and Frame.

Tap **Display** and the following screen will appear:



4. User Settings

This option provides access to data clearing, waveform display, auto calibration and oscilloscope parameter save and recovery.

Tap **User Settings** and the following screen will appear:



Item description:

Clear Data: Clear saved data and user setup.

Oscilloscope settings: User can save system setup parameter using **Save** function. **Restore** function can enable user to use system setup saved previously to avoid repeated setup.

Automatic calibration: The self-calibration routine lets you optimize the oscilloscope signal path for maximum measurement accuracy. Refer to section 3.1.2 for detailed operations.

5. About

Displays basic information of the APP.

3.2.5 Car Test Operations

This function provides all kinds of the testing applications on the automotive parts (including circuits, sensors, actuators, ignition etc.) and detailed connection methods.

Tap **Car test** and the following screen will appear:



Tap to select the desired automotive part, the system will automatically configure the option to the preset parameters. The user does not need to make any settings. Just follow the on-screen instructions to make connections and proceed.

3.2.6 Cursor Measurement

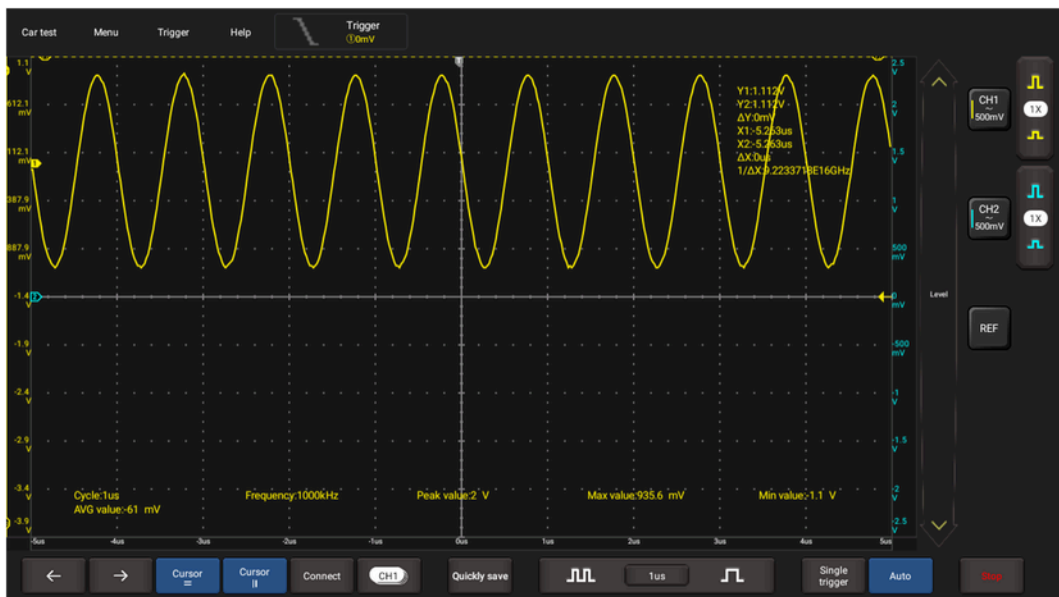
The Cursor function can be used for assisting in measurement.

Tap **≡/||** to turn on the cursor function and place the cursor on the measurement point to read the waveform measurement value.

There are two types of cursors: horizontal cursor and vertical cursor. The horizontal cursor measures the value in the vertical direction, and the vertical cursor can measure the value in the horizontal direction.

When set to ON, two horizontal/vertical reference lines named with Y1 & Y2/X1 & X2 will be displayed on the waveform display area. The user can use **↑/↓** or **←/→** to fine tune the line or drag the line directly to move it.

Tap **≡/||** again to turn it off.



Note:

Δ Reading: indicates the difference between the two cursor positions.
the zero level.

The time reading after X1, X2: indicates the position of the activated cursor in the vertical cursor relative to the trigger point.

1/ X: Frequency.

3.2.7 Quick Save

This function is used to quickly save the currently running measurement waveform. The EM101N can save waveform of analog channel or mathematical channel to the local. Saved file format can be WAV or CSV.

EM101N has two reference channels. WAV file can be uploaded to reference channel for waveform reference. Relevant setup can be found in "Menu".

3.2.8 REF (reference) Waveform

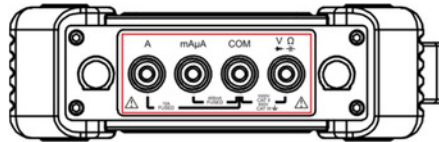
EM101N has reference channel to display reference waveform. User can upload previously saved WAV file to reference channel and compare it with actual waveform to identify difference.

4 Multimeter Operations

Multimeter is mainly used to test voltage, current, resistance, diode and Make-and-break. The unit will determine if the device is operating normally, a fault is detected and if the circuit is complete.

4.1 Operations

1. First connect the EM101N to power supply.

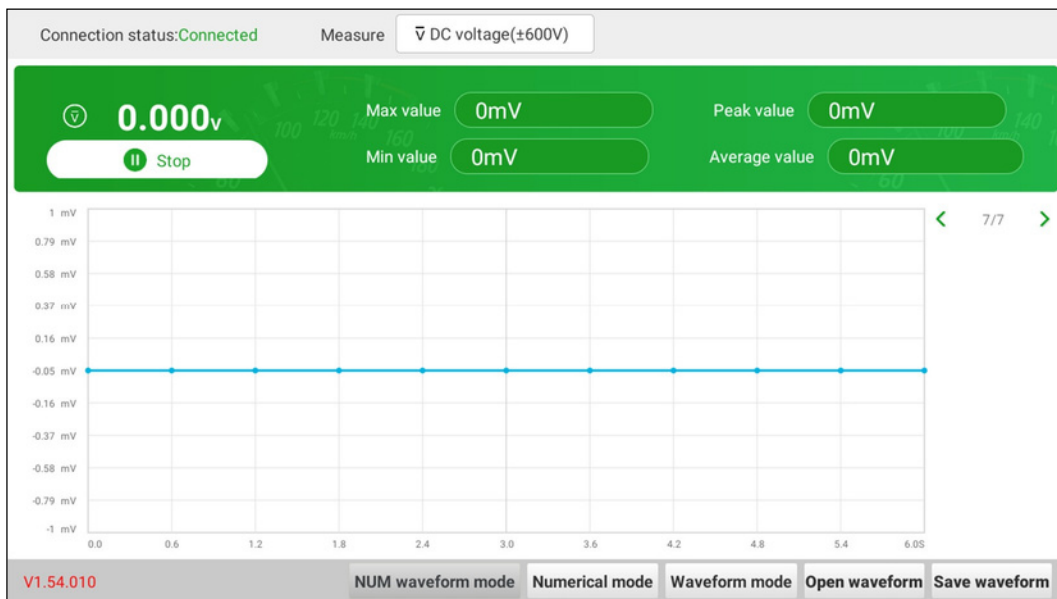


2. Connection method varies with tested object. Please refer to the following method to test:

4.1.1 Voltage Measurement

DC voltage and AC voltage measurement apply the same connection method.

1. Tap **Toolbox -> Multimeter** on the diagnostic tool to enter the following screen.



2. Select **DC voltage/AC voltage** and corresponding range. Tap **Not connected** to search for EM101N. When it is successfully connected, the diagnostic tool will display connection status.
3. Insert one end of black test pen into **COM** terminal of EM101N, insert one end of red test pen into **V/Ω** terminal of EM101N.
4. Attach black and red test pen tip to tested point. Keep test pen attached to it firmly.

Option descriptions:

Menu	Comments/Settings
Numerical waveform mode	Displays the measurement result in both numerical and waveform form.
Numerical mode	Displays the measurement result in numerical form.
Waveform mode	Displays the measurement result in waveform form.

Open waveform	Open saved waveform file.
Save waveform	Save measurement result as a waveform file.

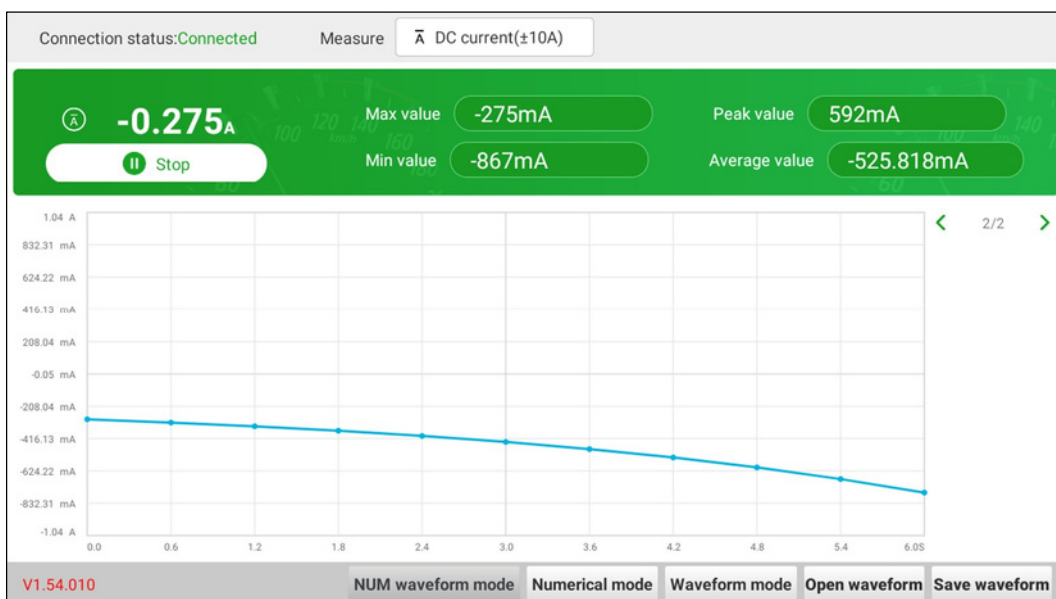
5. Tap **Start**, a numerical value will be displayed directly on the diagnostic tool.

⚠ Warning: the tip of the test pen is metal, do not touch it with hands during measurement, otherwise it might cause electricity shock and affect measurement results.

4.1.2 Current Measurement

DC current and AC current measurement apply the same connection method.

1. Tap **Toolbox -> Multimeter** on the diagnostic tool to enter the following screen.



2. Select **DC current/AC current** and corresponding range. Tap **Not connected** to search for EM101N.

When it is successfully connected, the diagnostic tool will display connection status.

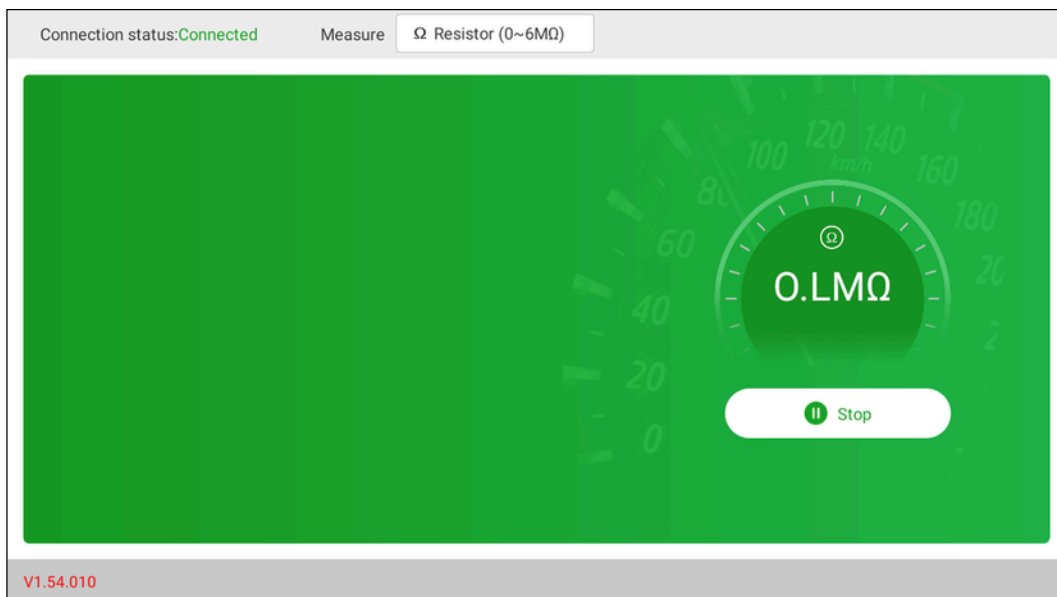
3. Insert black test pen into **COM** terminal of EM101N. If measured current is above 400mA, insert red test pen into **A** terminal of EM101N. If measured current is below 400mA, insert red test pen into **mA μ A** terminal of EM101N.

4. Connect black and red test pen to tested point. Keep test pen attached to it firmly.


5. Tap **Start**, numerical value will be displayed directly on diagnostic tool.

4.1.3 Resistance Measurement

1. Tap **Toolbox -> Multimeter** on the diagnostic tool to enter the following screen.



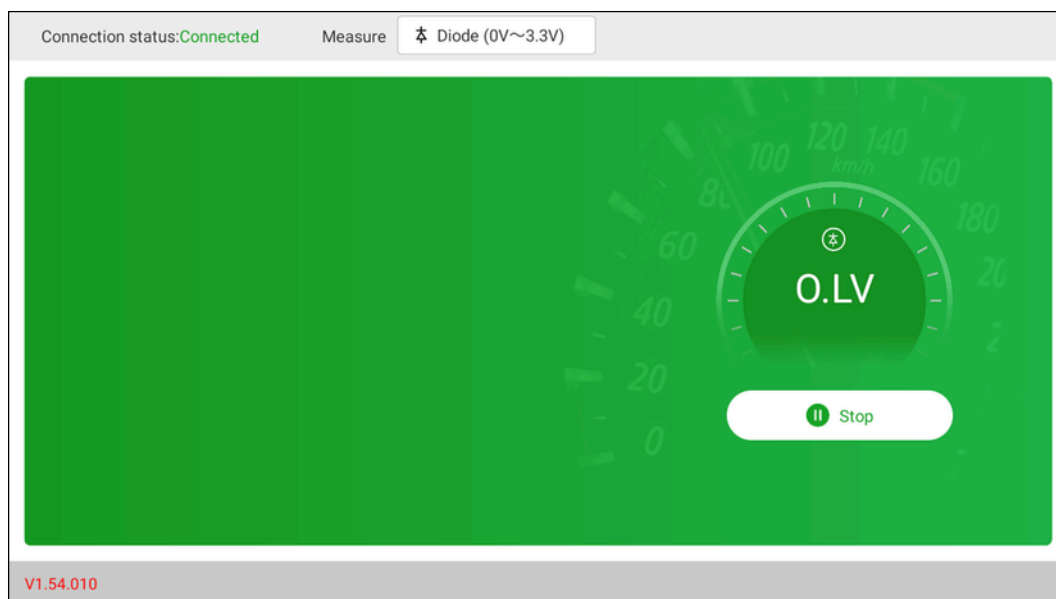
2. Select **Resistance**, tap **Not connected** to search for EM101N. When it is successfully connected, the diagnostic tool will display connection status.
3. Insert black test pen into **COM** terminal of EM101N, insert red test pen into **V/Ω** terminal of EM101N.
4. Attach black and red test pen to metal part of resistance ends. Keep test pen firmly attached to resistance.
5. Numerical value will be displayed directly on the diagnostic tool.

 **Note:** You can touch resistance with hands during measurement, but do not touch both ends of resistance simultaneously, as it will affect measurement accuracy.

4.1.4 Diode Measurement

This EM101N can measure light-emitting diode and rectifier diode. The way test pen is placed is the same with voltage measurement.

1. Tap **Toolbox -> Multimeter** on the diagnostic tool to enter.
2. Select **Diode**, tap **Not connected** to search for EM101N. When it is successfully connected, the diagnostic tool will display connection status.



3. Insert black test pen into **COM** terminal of EM101N, insert red test pen into **V Ω** terminal of EM101N.
4. Attach red test pen to positive end of diode, black test pen to negative end of diode. Keep test pen firmly attached to diode.
5. Diode forward conduction current will be displayed directly on the diagnostic tool.

4.1.5 Make-and-break Measurement

1. Tap **Toolbox** -> **Multimeter** on the diagnostic tool to enter.
2. Select **On/Off**, tap **Not connected** to search for EM101N. When it is successfully connected, the diagnostic tool will display connection status.
3. Insert black test pen into **COM** terminal of EM101N, insert red test pen into **V Ω** terminal of EM101N.
4. Attach red and black test pen to tested point.
5. Readings will be displayed directly on the diagnostic tool.

4.2 Test Example

Knock sensor test

(1) Detect knock sensor resistance

Turn off the ignition switch, disconnect the knock sensor wire connector, and use **Resistance** to detect the resistance between the knock sensor wire terminal and the housing. The resistance should be ∞ (disconnected). If the resistance is 0Ω (connected), the knock sensor must be replaced. For the magnetostrictive knock sensor, "Resistance" can also be used to detect the coil resistance. The resistance should be consistent with the specified value (Refer to the service manual for the specific data). Otherwise, the knock sensor must be replaced.

(2) Check knock sensor output signal

Remove the knock sensor plug. Use **AC Voltage** to check the voltage between the knock sensor wire terminal and ground when the engine is idling. There should be a pulse voltage output. If there is no voltage output, replace the knock sensor.

Cooling water temperature sensor test

(1) Detect coolant temperature sensor resistance

Check on the vehicle: Turn off the ignition switch, disconnect the coolant temperature sensor wire

connector, and use **Resistance** to test the resistance between the two terminals of the sensor. Its resistance value is inversely proportional to the temperature (negative temperature coefficient) and should be less than 1k Ω during warm-up.

Single piece check: disconnect the coolant temperature sensor wire connector, remove the sensor from the engine, place the sensor into the water in the beaker, heat the water in the beaker, and use **Resistance** to test the resistance between the two terminals of the sensor under different water temperature conditions. Compare the measured value with the standard value. If the standard value is not met, the coolant temperature sensor should be replaced.

(2) Detect coolant temperature sensor output signal voltage

Install the coolant temperature sensor, insert the sensor wire connector, turn on the ignition switch, and test the sensor output voltage signal between the two terminals of the coolant temperature sensor wire connector. The measured voltage value should vary inversely with the coolant temperature. When the coolant temperature sensor harness is disconnected and the ignition switch is on, the voltage should be about 5V.

4.3 Attention

1. Before usage, please reset APP value on the multimeter to zero.
2. The tip of the test pen is metal, do not touch it with hands during measurement, otherwise it might cause electric shock and affect measurement results.
3. Before test, please check measurement range and socket into which the test pen is inserted, perform test after checked with no error.
4. If it is unable to estimate measured value, choose max measurement range, and shift to suitable range based on measured results.
5. **It is strictly forbidden to shift measurement range when measuring high voltage or large current, as it can cause electric arc to burn switch contact. If you want to change range, please disconnect metal contact tip first.**
6. **To avoid instrument damage, it is strictly forbidden to measure resistance when tested circuit is powered on.**
7. When you want to measure DC current with multimeter, please reset it to zero first, then select suitable measurement range. Current varies in different modules, please refer to module mark to shift measurement range. During measurement, connect the multimeter in series, and measure circuit one by one. The bypass voltage can be disconnected. Please be aware that parallel connection of multimeter is forbidden, as it can cause multimeter damage and personnel injury.

5 Care & Maintenance

General Care

Do not store or leave the EM101N where the device will be exposed to direct sunlight for long periods of time.

Caution Cleaning

To avoid damages to the device or probes, do not expose them to sprays, liquids or solvents. Inspect the device and probes as often as operating conditions require. Make sure the device is disconnected from all power sources.

To clean the exterior surface, perform the following steps:

1. Remove loose dust on the outside of the EM101N and probes with a lint-free cloth. Use care to avoid

scratching the clear glass display filter.

2. Use a soft cloth dampened with water to clean the device.

Caution

To avoid damages to the surface of the device or probes, do not use any abrasive or chemical cleaning agents.