User Manuals

Professional Battery Diagnostic Device

Supports 6V/12V/24V Battery Detection

Contents

Note: Due to the different versions of the product, there are slight differences in the instructions, icon explanations, and diagrams of some parts of the manual.

Test Matters and Safety Measurements

This manual includes instructions for using the device, safe operation methods and how to maintain it. Failure to use the device in accordance with this manual may damage the device. This device has been designed and manufactured in accordance with the requirements of our corporate performance standards.

1) The Battery pole, terminals and other accessories may contain lead or lead compounds or other regenerative injuries. If you come into contact with chemicals, wash with water.

2) Batteries contain dangerous chemicals that may cause burns or explosions.

3) Do not use or store this device in hot, humid, flammable or explosive environments.

4) Before use, check that the test clamp insulation is intact - no tears, bare or broken wires. Please use it carefully!

5) If the device is malfunctioning （e.g. damaged, deformed, leaking substances, incomplete display, etc.）, it cannot be used further.

6) Although the car battery voltage is lower than the safe voltage, the measurement should be done as far as possible without touching the test clamp jaws to prevent the risk of electric shock.

7) Do not change the internal wiring or the connection of the clips ways in order to avoid damaging the device or causing your own insecurity.

8) Wear approved eye protection when testing or repairing your vehicle to prevent the engine from picking up foreign objects and flying them into your eyes.

9) Operate and maintain the vehicle in a properly vented environment to prevent breathing toxic gases.

10) Do not place testing equipment and accessories near the engine or exhaust pipe if the engine is running, as the heat may damage them.

11) Pay attention to warnings, precautions, and repair procedures from the car manufacturer when repairing your car.

12) When the battery is fully charged, the voltage will be slightly higher than the normal value. Please turn on the headlights for 2-3 minutes and wait for the voltage return to the normal value before measuring.

13) There is no internal battery in this device, and it is charged by the battery under test.

1. Overview

The professional battery analyzer is a tool for testing the working capacity and performance of automotive batteries, as well as the starting process, charging process and electrical load process of the car battery performance. The battery tester is well designed, easy to operate and fully functional. The device has a 2.8-inch high-resolution color screen and backlight display, the test process and the results can be displayed on the TFT screen clearly. The uses four-wire Kelvin test connection. The design has strengthened the protection measures for the wrong connection of the input signal line, reverse connection, high connection voltage, and poor contact of the test clamp, so as to be safer and more convenient during use. This product can be used in equipment systems involving various types of lead-acid batteries, such as automobile battery production, automobile battery distribution, and auto parts maintenance. It is an ideal tool for testing the performance of lead-acid batteries.

2. Technical Specifications and Battery Standards

2-1. Technical Indicators:

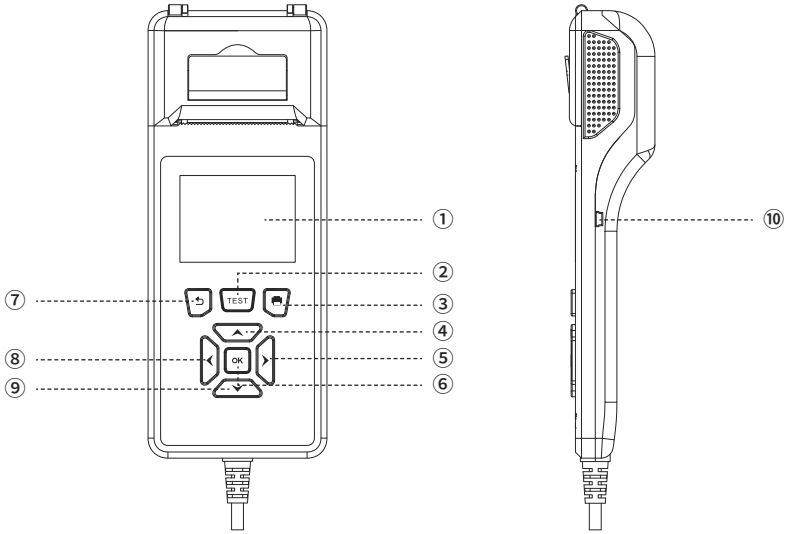
Products	6V / 12V Battery Test	24V Battery Test
Applications	Supports Regular Flooded / AGM Flat Plate / AGM Spiral / GEL / EFB batteries	Supports Regular Flooded / AGM Flat Plate / AGM Spiral / GEL / EFB batteries
Battery Capacity	2AH ~ 220AH	2AH ~ 220AH
CCA Measurements	100 ~ 2000	100 ~ 2000
Voltage Measurement	4.9V ~ 20V	4.9V ~ 32V
Working Temperature	-20°C ~ 50°C	-20°C ~ 50°C
Measurement Method	Four-line Kelvin Test	Four-line Kelvin Test

2-2. Cold Cranking Ampere（CCA）Measurement Range:

Standard	Description	Scope
CCA	CCA	100 ~ 2000
IEC	International Electrotechnical Commission Standards	100 ~ 1400
EN	European Industrial Standards	100 ~ 2000
DIN	German Industrial Standards	100 ~ 1400
JIS#（注）	Japanese Industrial Standards	From 26A17 to 245H52
SAE	Automotive Engineering Association Standards	100 ~ 2000

Note: JIS# needs to check the table to compare with CCA, SAE refer to CCA.

3. Product Structure and Panel Description



UP	Down	Left	Right	OK	Back	Test	Print

（1）Display —— Visual display, 320 x 240 resolution, TFT true color screen.

（2）Test Key —— One-click quick battery test.

（3）Print Key —— One-click print report.

（4）Up Key —— Use the up key to select between each screen for increasing and flipping functions.

（5）Right Key —— Use the right key to select between each screen to realize the page turning function.

（6）OK Key —— Confirm the selected content and enter the function.

（7）Back Key —— Cancel the selection, undo, or return to the previous screen.

（8）Left Key —— Use the left key to select between each screen to realize the page turning function.

（9）Down Key —— Use the down key to select between each screen for decreasing and flipping functions.

（10）USB Interface —— Connect the USB to the computer and the removable disk will be displayed. Simply copy and paste the upgrade file into the removable disk to complete the upgrade.

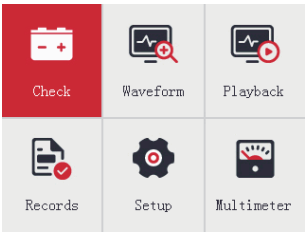
（11）Up + Down Keys —— Screen capture function.（The device stores up to 10 pictures.）

4. Function Usage and Description

4-1. Selection Of Battery Voltage Type:

Before testing, you need to set the test battery voltage according to the battery voltage type. Select 6V test item corresponding to 6V battery; select 12V test item for 12V battery; select 24V test item for 24V battery.

After selecting the battery voltage, enter the next project test work. Take the selection of 12V as an example:



4-2. Battery Test:

The battery tester has two types of test settings: Quick Test and Accurate Test.

Quick Test: It is convenient to roughly determine the Cold Cranking Ampere （ CCA ） of the battery according to the battery capacity when the accurate CCA reference parameters of the battery cannot be obtained from the battery as the basis for judging the test results. This method has a certain range of reference significance.

Accurate Test: The user tests the battery by obtaining the exact CCA parameter from the battery and setting the benchmark accordingly.

Note: Because the CCA factory parameters of each battery are not the same, even if different series of batteries with the same brand and capacity have different CCA factory parameters, so if the user can get the accurate CCA parameters of the battery. It is recommended to use accurate test methods to test the battery.

4-2-1. Pre-test Preparation:

1 ） If the car is being started, turn off the engine and turn the car lock key to the "OFF" position.

2 ） After the vehicle has been running for a while, the voltage of the battery will be slightly higher than the normal value when it is fully charged. Please turn it on for 2 to 3 minutes and wait for the voltage return to the normal value before measuring.

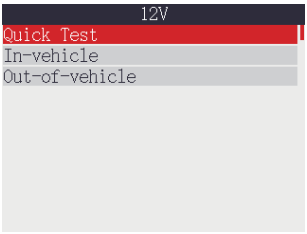
3 ） Observe the standard parameters of CCA on the battery under test and the CCA unit of the battery. If there is no relevant parameter on the battery under test, it can be measured by the local quick measuring method.

4-2-2. Operational Steps:

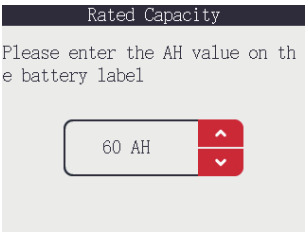
A）Quick Test（Note: Quick test is simulated AH battery capacity test, the accuracy of quick test is lower than accurate test, it is recommended to use accurate test for testing!）

1）The test clamp connects the positive and negative pole of the battery under test（the device test clamp has no positive and negative pole, can freely access）. Note: It is important to check for good contact and not to catch on the extension bars. If there is an iron hoop on the battery pole, please ensure that the iron hoop is in good contact with the battery pole or test after unloading the iron hoop.

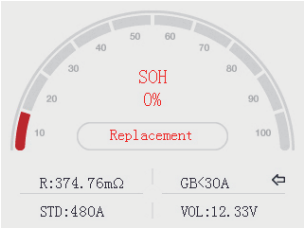
2）Press the〈▲〉〈▼〉key to select the quick test item and then press the〈OK〉key to enter the selection. As shown:

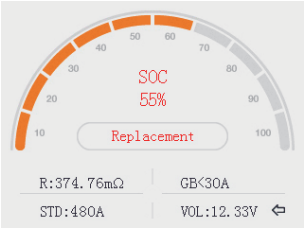


3）Press the〈▲〉〈▼〉key to adjust the AH battery capacity standard value of the battery under test（take a 60AH standard 580CCA battery as an example）, and long press the〈▲〉〈▼〉key to achieve continuous numerical adjustment. As shown:



4）After adjusting the standard value, press the〈OK〉button to start the test, and press the〈▲〉〈▼〉button to view the battery life（SOH）and battery power（SOC）of the battery. The test results are as follows:

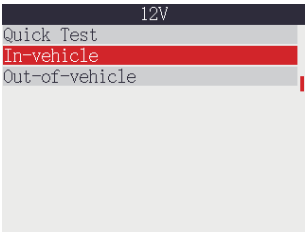




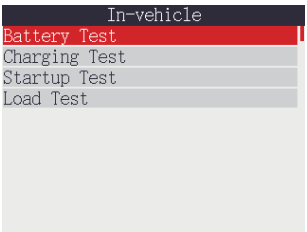
B) Accurate Test:

1) The test clamp connects the positive and negative pole of the battery under test (the device test clamp has no positive and negative pole, can freely access) . Note: It is important to check for good contact and not to catch on the extension bars. If there is an iron hoop on the battery pole, please ensure that the iron hoop is in good contact with the battery pole or test after unloading the iron hoop.

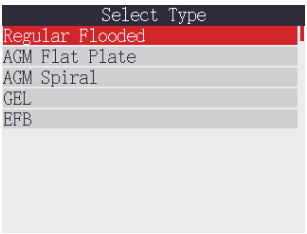
2) Press the 〈▲〉 〈▼〉 key to select the in-car test item and then press the 〈OK〉 key to enter the selection. As shown:



3) Press the 〈▲〉 〈▼〉 key to select the battery test item and then press the 〈OK〉 key to enter the selection. As shown:

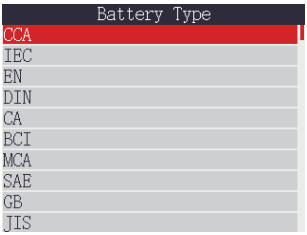


4）Select the tested battery type. Press〈▲〉〈▼〉key to select the corresponding type and then press〈OK〉key to enter the selection（take an ordinary battery as an example）. As shown:

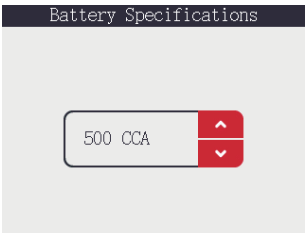


（This product has the line protection function, the wrong battery type test will not damage the device, feel free to use）.

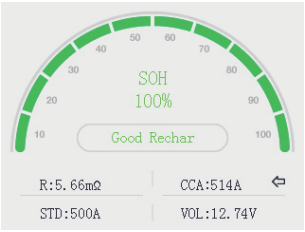
5）According to the standard of the battery, press〈▲〉〈▼〉key to choose the test standard, if the battery is "JIS" standard, you can directly input CCA（when CCA parameters are known）or select "CCA" after checking the table.（SAE）as a test standard（find the JIS setting operation item）selected test standard and press the〈OK〉key to enter the selection. As shown:

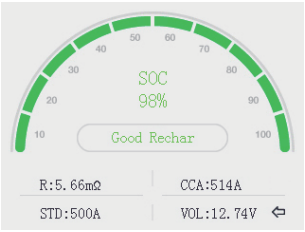


6）According to the standard value marked on the battery under test, press〈▲〉〈▼〉key to adjust the battery testing reference standard value（taking a standard 500CCA battery as an example）, long press〈▲〉〈▼〉key to achieve continuous adjustment of the value. As shown:



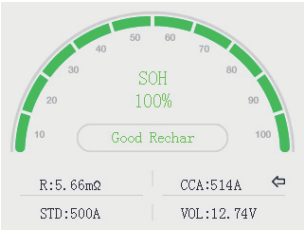
7）After adjusting the standard value, press the〈OK〉key to carry out the test, and press the〈▲〉〈▼〉keys to check the battery life（SOH）and battery capacity（SOC）respectively. The test results are as follows:





4-2-3. Description of battery test results:

★ **Normal test results, as shown:**



Battery Voltage: 12.74V, Normal Voltage.

Under normal circumstances, when the car battery has no load（not started）, the voltage should be 12.30V ~ 13.00V, which is the best, if it is lower than 12.30V, it will be a power loss or aging condition.

Battery Voltage	Volume Of Battery Voltage (SOC)	Description Of Remarks
12.78V	100%	Fully charged
12.54V	75%	
12.30V	50%	
12.12V	25%	
11.94V	0%	Discharged

CCA Value: 500 CCA

The test determines the actual output cold cranking ampere of the battery. Generally speaking, t-

here is a minimum CCA standard for cars （gasoline / diesel） when starting, and it is best if the output CCA of the battery is higher than the starting standard of the car.

★ When using 24V test, CCA is 1 / 2 of the series sum of two sets of 12V batteries.

Internal Resistance: 5.66mΩ

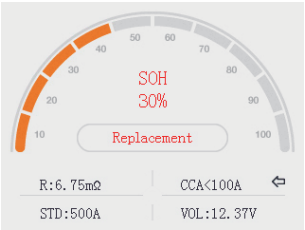
The higher the CCA value of the battery, the lower the internal resistance will generally be.

Notice: The standard of internal resistance varies depending on the battery made of different materials used by various manufacturers, so there is no certain standard. However, for batteries of the same model from the same manufacturer, the internal resistance values will not differ too much when leaving the factory.

★ When using 24V test, the internal resistance is the sum of two sets of 12V batteries in series.

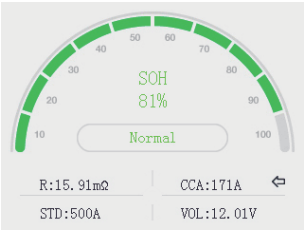
Life: The life measured and evaluated by the instrument is the use state of the battery under comprehensive operating conditions. It is recommended to replace the battery when the battery life is less than 45%.

★ **It is recommended to replace the test results:**



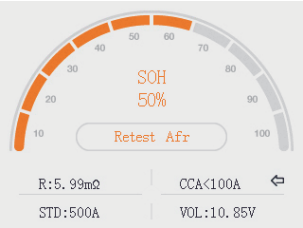
In the test result, the battery life is only 30%, and its performance is poor, so it is recommended to replace it.

★ **The life test is normal, and the battery voltage is low:**



Test results: In the test results, the battery life is 81%, but the battery voltage is only 12.01V, and it is performance is normal.

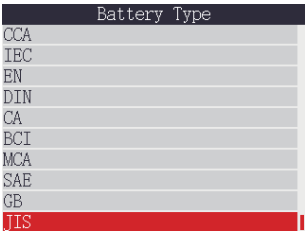
★ **The life test is normal, and the battery voltage is too low:**



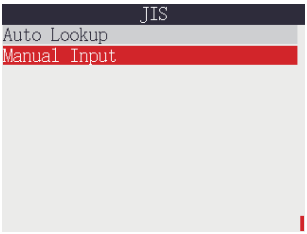
Test results: In the test result, the battery voltage is only 10.85V, and the voltage is too low, which may affect the test result. At this time, it is recommended to charge the battery before testing.

4-2-4. JIS# Standard naming battery starting current standard setting:

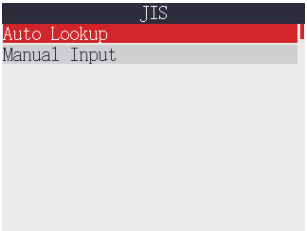
1) Regarding the battery named after the JIS# standard, if the value of the battery starting current can be found on the surface of the battery body, the value will be used as the test judgment standard during the test. In the battery test-operation steps-accurate Select "JIS" in step 5 of the test. As shown:



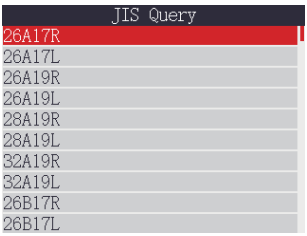
2) Then select the "Manual Input" item to manually adjust the reference standard value of the battery starting current for testing. As shown:



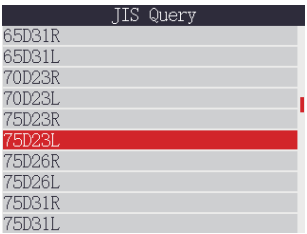
3) If the value is not marked on the battery body, the user can use the JIS model of the battery to call the reference standard value of the battery starting current according to the model, through the "Auto Lookup" item in the instrument, and press the 〈 OK 〉 key to enter the next step. As shown:



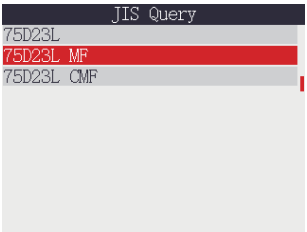
4 ）After entering the automatic table lookup interface, press the〈▲〉〈▼〉key to turn the page, and you can find the battery specification to be tested according to the sequence number. As shown:



5 ）After finding the corresponding model of the battery under test （take a model of "75D23L" battery as an example ）, press the〈OK〉key to enter the selection interface. As shown:



6 ）Press the〈▲〉〈▼〉key and the〈OK〉key to select the model marked on the last battery（take a model "75D23L MF" battery as an example ）. As shown:



7 ）At this time, press the〈OK〉key to start the battery test.

4-3. Charging System Test:

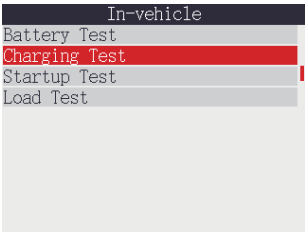
4-3-1. Preparation before the test:

★ If the car is in the flameout state, please start the car engine first.

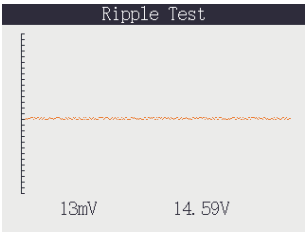
4-3-2. Operation steps:

1) When the car is in the starting state, the test clamp is connected to the positive and negative poles of the battery under test （ there is no difference between the positive and negative poles of the test clamp of this equipment, which can be connected at will ） . Attention must be paid to check whether there is good contact. Do not clamp it on the iron frame of the extended vehicle body. If there is iron hoop on the battery pole, please ensure that the iron hoop is in good contact with the battery pole, or test after unloading the iron hoop.

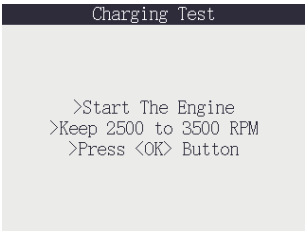
2) Press 〈▲〉 〈▼〉 key to select the charging test item, and then press 〈OK〉 to enter the test. As shown:



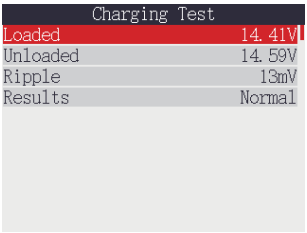
3) Enter the ripple test interface, the smaller the waveform float, the more stable the voltage. As shown:



4) After waiting for 10 seconds on the ripple test interface, the instrument will prompt the following interface:



5）After operating as prompted in step 4, press the〈OK〉key to obtain the charging test result. As shown:



The final charging test result shows: normal（indicating that the battery is charged normally）; output is high（indicating that the battery charging voltage is too high）; there is no output（indicating that the battery is not charging）.

4-3-3. Charging test instructions:

★ If the voltage reading is greater than 15.0V（for a 24V system, the reading is greater than 30.00-V）, please check the voltage regulator.

★ If the voltage reading is less than 13.3V（for a 24V system, the reading is less than 26.60V）, please check the connection points, wires and engine.

Data Reference Table（12V System）		
Status	**Battery Voltage**	**Engine Output**
（Need to step on the accelerator to check）	14.5V the above	High（need to enter the factory for inspection）
	13.6 ~ 14.5V	Normal
	13.6V the following	No output, battery may be damaged

4-4. Start Test Of Starter System:

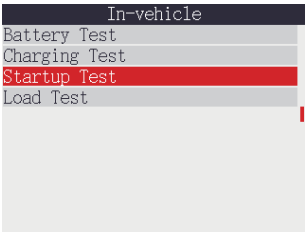
4-4-1. Preparation before test:

★ If the car is starting, please turn off the engine and turn the car lock key to the "OFF" position.

4-4-2. Operation steps:

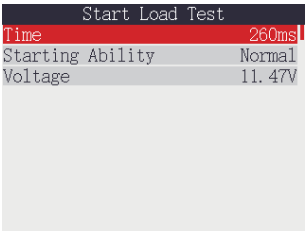
1) The test clamp is connected to the positive and negative poles of the battery under test （ the test clamp of this equipment has no positive and negative poles and can be connected at will ） . Note that you must check for good contact and do not clamp it on the extension body iron frame. If there is an iron hoop on the battery pole, please ensure that the iron hoop is in good contact with the battery pole or test after unloading the iron hoop.

2) Press the 〈▲〉 〈▼〉 key to select the start test item and then press the 〈OK〉 key to enter the test. As shown:



3) After entering the startup test, the instrument will prompt the following interface:

4) After completing the operation according to the prompt, you can get the start load test result. As shown:



The figure respectively shows that the starting voltage in the current starting process is 11.47V, the starting time is 260ms, and the final starting ability test result is normal.

4-4-3. Instructions for starting load test:

★ If the starting voltage reading is greater than 9.6V（for a 24V system, the reading is greater than 16V）, it means that the walking system is good.

★ If the starting voltage reading is less than 9.6V（for a 24V system, the reading is less than 16V）, it means there is a problem with the starting system.

Please check related parts such as connection points, wires and starters, and battery terminals for corrosion.

Data Reference Table（12V System）		
Start Meter Voltage	**Battery Starting Ability**	**Dispose Of Batteries**
13.5V the above	Low	Need to return to the factory for maintenance
9.6 ~ 13.5V	Normal	No need to replace
9.6V the following	Low	Need to return to the factory for maintenance

4-5. Load System Test:

4-5-1. Preparation before test:

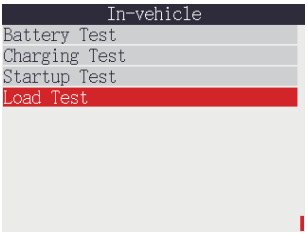
★ If the car is turned off, please start the car engine first.

4-5-2. Operation steps:

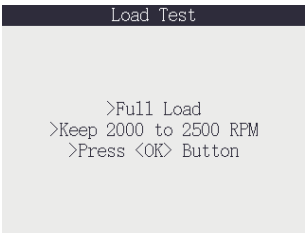
1）When the car is in the starting state, the test clamp is connected to the positive and negative poles of the testing battery（There is no difference between positive and negative electrodes in the test clamp of this equipment, which can be connected at will）. Note that you must check for good contact and do not clamp it on the extension body iron frame. If there is an iron hoop on the battery pole, please e-

nsure that the iron hoop is in good contact with the battery pole or test after unloading the iron hoop.

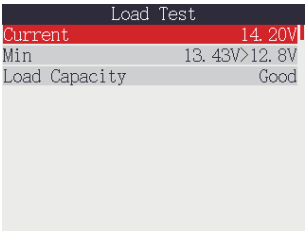
2）Press the〈▲〉〈▼〉key to select the load test item and then press the〈OK〉key to test. As shown:



3）After entering the load test, the instrument will prompt the following interface:



4）After operating as prompted in step 3, press〈OK〉to get the load test result, as shown in the figure:



The figure shows that the current test voltage is 14.20V, the standard voltage is 12.80V（for a 24V system, the standard voltage is 25.60V）, and the lowest voltage is 13.43V.

5 ）Read the lowest voltage value. If the voltage reading is greater than 12.80V （ for a 24V system, the voltage reading is greater than 25.60V ）, it means that the load system is normal.

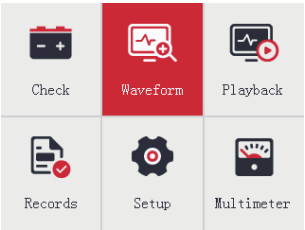
4-5-3. Description of load system:

★ If the voltage reading is less than 12.80V (for a 24V system, the reading is less than 25.60V), please check whether the generator belt is worn out and the wires are short-circuited.

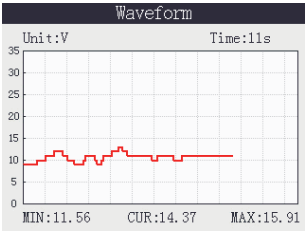
4-6. Waveform Monitoring Function:

1 ）The test clamp is connected to the positive and negative poles of the testing battery （ There is no difference between positive and negative electrodes in the test clamp of this equipment and can be connected at will ）. Note that you must check for good contact, and do not clamp it to the extension body iron frame. If there is an iron hoop on the battery pole, please ensure that the iron hoop is in good contact with the battery pole or test after unloading the iron hoop.

2 ）In the main menu, press the〈▲〉〈▼〉key to select the waveform monitoring item and then press the〈OK〉key to enter the test. As shown:



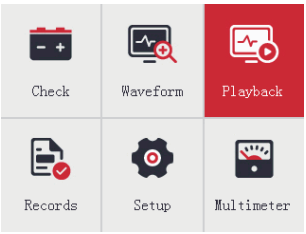
3 ）Enter the waveform monitoring interface, you can monitor voltage fluctuations in real time, and the device will automatically save the records. As shown in the figure:



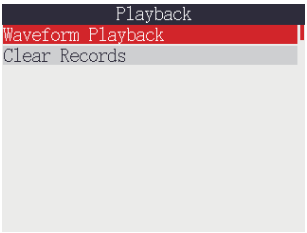
The figure shows that the current test voltage is 14.37V, the minimum voltage is 11.56V, and the maximum voltage is 15.91V.

4-7. Playback Function:

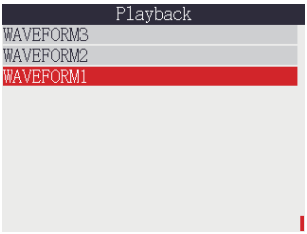
1）In the main menu, press the〈▲〉〈▼〉key to select the playback item and then press the〈OK〉key to enter the selection interface. As shown:



2）View the waveform playback. Press the〈▲〉〈▼〉key to select the waveform playback item and then press the〈OK〉key to enter the selection. As shown:

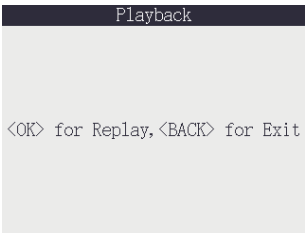


3）Press the〈▲〉〈▼〉key to choose to playback the saved waveform monitoring record（take WAVEFORM1 as an example）, and then press the〈OK〉key to view the playback. As shown:

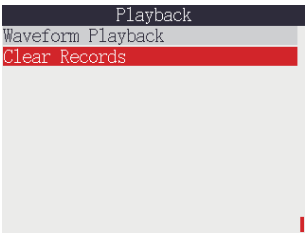


Note: The first saved waveform monitoring record is sequence 1, which is sorted in order. The device can save up to 10 records. After more than 10, the saved records will overwrite the previous saved records.

4) After entering the playback, the instrument will prompt the following interface, press the 〈 OK 〉 key to play again, and press 〈 Back 〉 to exit the playback. As shown:

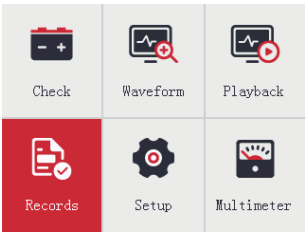


5) Clear the waveform record. Press the 〈▲〉 〈▼〉 key to select the clear record item and then press the 〈 OK 〉 key to delete all saved records. As shown:

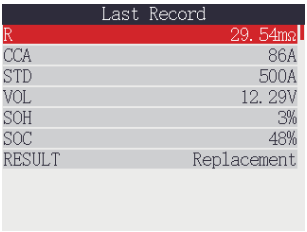


4-8. Record Management Function:

1) View records. In the main menu, press the 〈▲〉 〈▼〉 key to select the record management item and then press the 〈 OK 〉 key to enter the selection interface. As shown:



2) Press the 〈▲〉 〈▼〉 key to select the last test record item and then press the 〈 OK 〉 key to view the record. As shown:



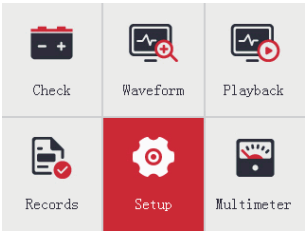
The test records in the figure respectively show R（resistance）29.54mΩ; standard CCA is 86A; rated CCA is 500A; VOL（voltage）is 12.29V; SOH（battery life）3%; SOC（battery power）48%; RESULT: Replacement.

Note: Record management can only record the test results of the battery test, and can only save one record（the most recent battery test result）.

3）Delete records. Press the〈▲〉〈▼〉key to select the delete record item and then press the〈OK〉key to delete.

4-9. Setting Function:

In the main menu, press the〈▲〉〈▼〉key to select the setting item and then press the〈OK〉key to enter the setting. As shown:



4-9-1. Language selection:

Enter the language selection interface, press the〈▲〉〈▼〉key to select the desired language and then press the〈OK〉key to confirm. As shown:

4-9-2. System self-check:

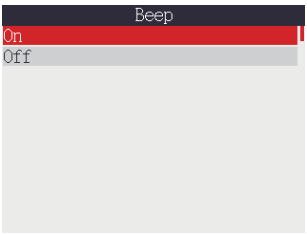
A ） LCD Self-Test: It is used to detect whether there are dead pixels on the display of the device, to avoid the incomplete display of the screen content;

B ）Keyboard Self-Test: It is used to detect whether the keys of the device are malfunctioning and unusable;

C ） Buzzer Self-Test: It is used to check whether the prompt tone and key tone of the device are n-ormal.

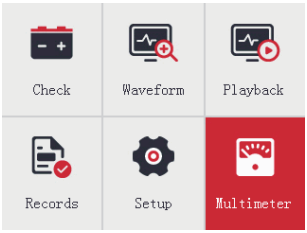
4-9-3. Buzzer:

Enter the buzzer interface, press the〈▲〉〈▼〉key to select the on/off the item, and then press the〈OK〉key to confirm. as the picture shows:

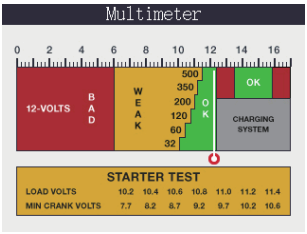


4-10. Test Table:

1 ）In the main menu, press the〈▲〉〈▼〉key to select the test table item and then press the〈OK〉key to enter the selection interface. As shown:



2）Press the〈▲〉〈▼〉keys to select different models for testing（take 12V as an example），and then press the〈OK〉key to complete the test. as the picture shows:



As shown in the test chart: the red, yellow, and green areas on the left are battery voltage tests; battery charging system tests are on the right.（The green area where the pointer is located indicates that the charging system is good, while the red area indicates that there is a problem with the charging system）

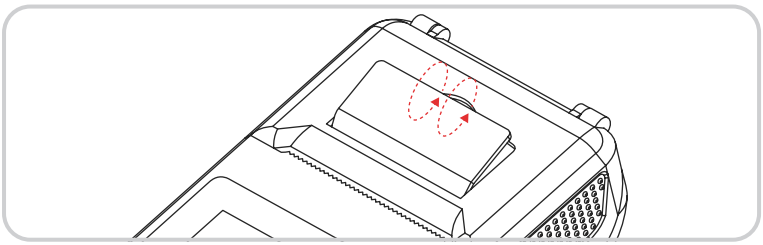
★ **Description of test results:**

Test Results	Battery status
Good （green zone）	The battery is in good condition, the condition of the vehicle charging system needs to be checked
General （yellow area）	The battery capacity is insufficient, which may be: 1. The battery is defective; 2. Part of the battery is in short supply and needs to be charged
Poor （red area）	The battery may be defective or over-discharged

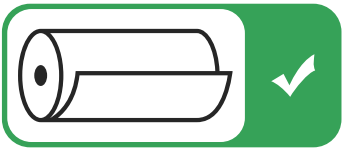
5. Thermal Paper Installation Instructions

★ **In order to ensure that your device printer can be used normally, please pay attention to installation matters!**

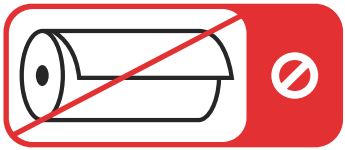
1 ）Open the printer cover above the fuselage.



2 ）Please put the thermal paper properly. As shown in （Left Picture ）：

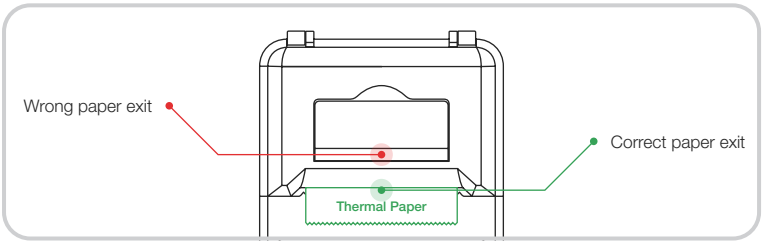


（Paper out direction——Down ）



（Paper out direction——On ）

3 ）The printing function can be performed by closing the printer cover.



Note: Before printing, please confirm whether the thermal paper exit position is correct, otherwise the device cannot print normally.

6. Frequently Asked Questions

6-1. The measuring principle of this tester?

As time goes by, the battery will gradually age. The main reason is that the surface of the battery plate is aging and can no longer carry out effective chemical reactions. This is the main reason why most batteries cannot continue to be used. The International Institute of Electrical and Electronics Engineers （IEEE）formally adopted the conductance test method as one of the testing standards for the detection of lead-acid batteries. The IEEE standard 1118-1996 clearly pointed out: "The measurement of battery conductance is to use an AC signal of known frequency and amplitude Add it to both ends of the battery, and then measure the generated alternating current. The alternating current conductance value is the ratio of the alternating current signal that is in phase with the alternating voltage to the alternating voltage. "This product is developed based on this judgment.

6-2. If the reverse current is installed on the car, will it affect the result?

All reverse currents will affect the test results of the instrument, so please remove the reverse current before measuring to ensure the accuracy of the test.

6-3. Can this product accurately predict when the battery will expire?

The internal resistance of a sealed lead-acid battery is complicated, which includes the ohmic internal resistance of the battery, the internal resistance of the concentration difference polarization, the internal resistance of the electrochemical reaction, and the interference effect during charging of the double-layer capacitor. The components contained in the internal resistance values are measured with different test methods, at different times and their relative contents are different, so the measured internal resistance values are also different. There is no strict mathematical relationship between the internal resistance （or conductance）of the sealed lead battery and the battery capacity, and it is impossible to predict the battery life based on the internal resistance （or conductance）of a single battery. But when the internal resistance of the battery suddenly increases or the conductance decreases suddenly, it indicates that the battery life is about to end.

6-4. Is the CCA value measured by this product correct?

CCA is a control standard during battery production. According to the accumulated results, the new battery measured value will be higher than the label value （10% ~ 15%）. As the change of user's use condition, it will be closer to the label value and then lower than the label value.

6-5. The difference between this product test method and the load test method?

★ **Load test method:**

According to the physical formula R=V/1, the test equipment forces the battery to pass a large constant

direct-current in a short period of time（usually 2 ~ 3 seconds）（currently, a large current of 40A ~ 80 A is generally used）. Measure the voltage across the battery at this time, and calculate the current battery internal resistance according to the formula. This method has obvious shortcomings:

1）Only large-capacity batteries or batteries accumulators can be measured. Small-capacity batteries cannot load a large current of 40A ~ 80A within 2 to 3 seconds.

2）When the battery passes a large current, the electrodes inside the battery will be polarized, resulting in polarized internal resistance. Therefore, the measurement time must be very short, otherwise, the measured internal resistance has a large error.

3）High current passing through the battery will damage the internal electrodes of the battery.

★ **Test method of this product:**

The battery is actually equivalent to an active resistance because we apply a fixed frequency and a fixed current（small current）to the battery, then sample its voltage and calculate the internal resistance of the battery through the arithmetic circuit after a series of processing such as rectification and filtering. The advantages of this method:

1）This method can be used to measure almost batteries, including small-capacity batteries. It is generally used to measure the internal resistance of laptop batteries.

2）This method will not cause much damage to the battery itself.

6-6. Other Instructions

A）Quick Test

The quick test is to use the capacity（AH）marked by the battery to detect the life of the battery. The amount of charge that a battery can hold is the "capacity" of the battery, which is characterized by "Ah" and the symbol "Ah".

For example 120Ah. According to national standards, the battery capacity is specified as a 20-hour discharge rate. For a 120Ah battery, it is discharged with a current of 6A and can be discharged for 20 hours. The battery capacity（AH）is always constant, and AH can only be used to roughly determine the battery life. This meter does not have a discharge function. It uses analog methods to measure AH. The measured parameters are voltage, internal resistance, and actual CCA. Other data are only for reference.

B）Accurate Test

The accurate test is to use the Cold Cranking Ampere（CCA）marked by the battery to detect the life of the battery. The CCA value refers to: under a certain low-temperature state（usually specified at 0°F or - 17.8°C）The amount currently released by the battery for consecutive 30 seconds before the voltage drops to the limit depletion voltage.

1）CCA has nothing to do with battery capacity.

For example, there is a 12-volt battery casing marked with a CCA value of 600, which means that at 0°F, before the voltage drops to 7.2 volts, it can provide 600 amperes for 30 seconds.

The CCA test focuses on assessing the discharge capacity of the battery, so as to ensure true energy for the use of the starter.

2) For a 600CCA battery, if it is detected as 480CCA by the device that does not mean the battery capacity has become 80% of the original.

3) The high or low value of CCA is the main factor that really affects battery life. The battery with too low CCA value is difficult to start after ignition, which has a great relationship with the quality and uses the time of the battery! And it has nothing to do with the battery capacity (AH) .

7. Battery Specifications

(The following table is the reference data, the actual value is subject to the manufacturer's factory data.)

7-1. JIS code conversion table

Specification		Cold Cranking Ampere			Specification		Cold Cranking Ampere		
JIS (New)	JIS (Old)		MF	CMF	JIS (New)	JIS (Old)		MF	CMF
26A17R		200			55B24RS	NT80-S6S	430	420	500
26A17L		200			55B24LS	NT80-S6LS	430	420	500
26A19R	12N24-4	200	220	264	55D26R	N50Z	350	440	525
26A19L	12N24-3	200	220	264	55D26L	N50ZL	350	440	525
28A19R	NT50-N24	250			60D23R		520		
28A19L	NT50-N24L	250			60D23L		520		
32A19R	NX60-N24	270	295		65D23R		420	540	580
32A19L	NX60-N24L	270	295		65D23L		420	540	580
26B17R		200	220	265	65D26R	NS70	415	520	625
26B17L		200	220	265	65D26L	NS70L	415	520	625
28B17R		245			65D31R	N70	390	520	625
28B17L		245			65D31L	N70L	390	520	625
28B19R	NS40S	245			70D23R	35-60	490	540	580
28B19L	NS40LS	245			70D23L	25-60	490	540	580
32B20R	NS40	270			75D23R		500	520	580
32B20L	NS40L	270			75D23L		500	520	580
32C24R	N40	240	325	400	75D26R	F100-5	490		

32C24L	N40L	240	325	400	75D26L	F100-5L	490		
34B17R		280			75D31R	N70Z	450	540	735
34B17L		280			75D31L	N70ZL	450	540	735
34B19R	NS40ZA	270	325	400	80D26R		580	580	630
34B19L	NS40ZAL	270	325	400	80D26L		580	580	630
36B20R	NS40Z	275	300	360	85B60K				500
36B20L	NS40ZL	275	300	360	85BR60K				500
36B20RS	NS40ZS	275	300	360	95D31R	NX120-7	620	660	850
36B20LS	NS40ZLS	275	300	360	95D31L	NX120-7L	620	660	850
38B20R	NX60-N24	330	340	410	95E41R	N100	515	640	770
38B20RS	NT60-N24S	330	340	410	95E41L	N100L	515	640	770
38B20L	NX60-24L	330	340	410	105E41R	N100Z	580	720	880
38B20LS	NX60-24LS	330	340	410	105E41L	N100ZL	580	720	880
40B20L		330			105F51R	N100Z	580		
40B20R		330			105F51L	N100ZL	580		
42B20R		330			115E41R	NS120	650	800	960
42B20L		330			115E41L	NS120L	650	800	960
42B20RS		330			115F51R	N120	650	800	960
42B20LS		330			115F51L	N120L	650	800	960
46B24R	NS60	325	360	420	130E41R	NX200-10	800		
46B24L	NS60L	352	360	420	130E41L	NX200-10L	800		
46B24RS	NS60S	325	360	420	130F51R		800		
46B24LS	NS60LS	325	360	420	130F51L		800		
46B26R		360			145F51R	NS150	780	920	
46B26L		360			145F51L	NS150L	780	920	
46B26RS		360			145G51R	N150	780	900	1100
34B19RS	NS40ZAS	270	325	400	80D26R	NX110-5	580	580	630
34B19LS	NS40ZALS	270	325	400	80D26L	NX110-5L	580	580	630
46B26LS		360			145G51L	N150L	780	900	1100
48D26R	N50	280	360	420	150F51R	NT200-12	640		
48D26L	N50L	280	360	420	150F51L	NT200-12L	640		
50D20R		310	380	480	165G51R	NS200	935	980	
50D20L		310	380	480	165G51L	NS200L	935	980	
50D23R	85BR60K	500			170F51R	NX250-12	1045		
50D23L	85B60K	500			170F51L	NX250-12L	1045		

50B24R	NT80-S6	390			180G51R	NT250-15	1090		
50B24L	NT80-S6L	390			180G51L	NT250-15L	1090		
50D26R	50D20R		370		195G52R	NX300-51	1145		
50D26L	50D20L		370		195G52L	NX300-51L	1145		
55D23R		355	480	500	190H52R	N200	925	1100	1300
55D23L		355	480	500	190H52L	N200L	925	1100	1300
55B24R	NX100-S6	435	420	500	245H52R	NX400-20	1530	1250	
55B24L	NX100-S6L	435	420	500	245H52L	NX400-20L	1530	1250	

7-2. Comparison table of DIN and EN models

Model	Same Model	DIN	EN	Model	Same Model	DIN	EN
52805	52815	180	240	56420	56322 88066	300	510
53517		175	300	56530	56618 56638	300	510
53520	53521 53522	150	240	56618	56619 56620	300	510
53625	53638 53836	175	300	56633	56647 56641	300	510
53646	53621 88038	175	300	56820	56821 56828	315	540
53653	53624 53890	175	300	57024	57029	315	540
54038	54039	175	300	57113	57539	400	680
54232		175	300	57114	56821 88074	400	680
54313	54324 54464	220	330	57218	57219	420	720
54317	54312 88146	210	360	57220	57217	420	720
54437	54466 54459L	210	360	57230		380	640
54459	54434 88046	210	360	57412	57413 57412L	400	680
54469	54449 54465	210	360	57512	57513 57513	350	570
54519	54533 54612	210	360	58515	58424	450	760
54523	54524	220	300	58521	58513	320	540
54537	54545 54801	190	300	58522	58514	320	540
54551	54580	220	300	58815	58821	395	640
54533	54577 54579	220	300	58820	58515 58527	395	640
54584	54578	220	300	58827		400	640
54590		210	330	58838	58833 88092	400	680
54827		240	360	59040	59017 59018	360	600
55040	88056	265	450	59218	59219	290	480

55041	55042	220	360	59226	59215	450	760
55044	55414 88056	265	450	59515		320	540
55046		300	510	59518	59519	395	640
55056		320	540	59615	59616	360	600
55057	54827 88156	320	540	60018	60019	250	410
55068	55069 55548	220	390	60026	58811	440	720
55218		255	420	60044	60038	500	760
55414	55415 55421	265	450	60527	60528	410	680
55422	55566 55040	265	450	61017	61018	400	680
55428	55423 55427	300	510	61023	62529	450	760
55457		265	450	61047	61048	450	760
55529		220	360	62034	62038 62045	420	680
55531	55545 55559L	255	420	63013		470	680
55559	55530 88056	255	420	63545	63549	420	680
55564	55552 55563	255	420	64020	64317 64318	325	550
55564	55565 55548	255	420	64028	64035	520	760
55570	55567 55565L	255	420	64036		460	760
56012		230	390	64317	64318 64323	540	900
56048	56068 56069	250	390	65513		540	900
56049	56069 56073	250	390	65514	65515	570	900
56077	56030	300	510	67043	67045	600	1000
56091	55811	360	540	68032	68034	600	1000
56111	55048	300	540	70029	70038 70027	630	1050
56218	56092	300	510	70036	68040 68021	570	950
56219	56216	300	510	71014	71015	700	1150
56220		280	510	72512		680	1150
56225	56323	300	510	73011		740	1200
56318	56312 56311	300	510				

7-3. Yuasa battery specification table

Yuasa Battery Model	CCA Value	Yuasa Battery Model	CCA Value
GT50L-MF	356CCA	75A-72	630CCA
GTH55DL-MF	356CCA	78A72	670CCA

GTH60DL-MF	325CCA	34-610MF	610CCA
GTH75DL-MF	520CCA	75-6MF	615CCA
GTH40S	275CCA	58-6MF	530CCA
GTH40L	276CCA	34-6MF	500CCA
GTH40	277CCA	24-500	500CCA
GTH60L	325CCA	34-710	710CCA
GTH75DL-MF（競技版）	520CCA	41-580	580CCA
GTH75D-MF（競技版）	521CCA	58-530	530CCA
55D23R-MF	522CCA	65-730	730CCA
34-60	525CCA	75-660	660CCA
58-60	525CCA	78-710	710CCA
65-70	700CCA	GR40R-MF	700CCA
74-60	525CCA	GR40R-CMF	820CCA
75-72	500CCA	GR96R-MF	500CCA
35-580	580CCA	GR96R-CMF	580CCA
65-900	580CCA		

8. Analysis of Car Battery

8-1. Different types of batteries have different internal resistances:

The same type of battery has different internal resistance due to inconsistent internal chemical characteristics. The internal resistance of the battery is very small, we generally use the unit of milliohm to define it. Internal resistance is an important technical indicator to measure battery performance. Under normal circumstances, a battery with a small internal resistance has a strong high-current discharge performance, and a battery with a large internal resistance has a weak discharge capacity.

8-2. The battery's capacity can't be measured by feeling:

You can use a hydrometer to measure the working status of the battery. The battery water is prepared with the specific gravity of distilled water + pure sulfuric acid at 1.260 / 20°C. For the new battery, if the battery water volume is within the normal range, the acidity is fixed. If the battery water is less, add distilled water, except for maintenance In addition to a certain amount of water, the pH value can also be maintained. If the battery is working normally, in addition to the fixed pH value, the specific gravity value will also be in a certain range.

Battery For A Small Car		
Voltage（V）	Electricity（%）	Proportion
12.7 the above	100%	1.26~1.28
12.6	90%	1.24
12.4	70~80%	1.22
12.1	50%	1.16
12 the following	25%	1.13 the following

If the specific gravity value of the battery water cannot reach 1.26~1.28 after being fully charged, and the measured voltage cannot reach 12.7V or more, it means that the battery's capacity has dropped. At this time, If you deliberately adjust the specific gravity of the battery water to 1.26（increasing the ratio of sulfuric acid to water）, not only the battery cannot be repaired, but it will also speed up the scrapping of the battery, because the acidity of the bottled water will also increase, therefore this method can't increase the voltage.

8-3. The meaning of common battery standard abbreviations:

★ **RC—Reserve Capacity:**

At 80°F（27°C）, each battery has an average load of 25 amperes of electricity per minute and can maintain a minimum voltage of about 10.5 volts.

★ **CCA—Cold Cranking Ampere:**

Under the solid current intensity, each battery that is cooled and immersed in 0°F（-18°C）~ -20°F（-29°C）can last 30 seconds and maintain a minimum voltage of 7.2 volts. The unit of cold start current is ampere. General vehicles, especially those that are too old, often fail to start the engine smoothly when the motor is turned on and must be maintained for more than a few seconds or start for the second time. In fact, the battery consumes the most power when starting the engine, the voltage of the battery can drop from the normal 12.5V to 10.5V or even below at the moment of high current output in a short time. The greater the Cold Cranking Ampere, the greater the effect on improving the start-up irregularity.

★ **CA—Cranking Ampere:**

Its main meaning is similar to CCA, and the unit is also ampere. The only difference from CCA is the temperature at the time of measurement. CCA is the result obtained in an environment of minus 17.8°C, and CA is the result obtained in an environment of zero Celsius. If both CCA and CA are marked on the same battery, the value of CCA will be lower than that of CA, because of the lower the temperature, the worse the performance of the battery.

★ **AH—Ampere Hour:**

It is a standard established by the Japanese Industrial Standards（JIS）. Simply put, the battery can last for 20 hours when discharged at a fixed amperage and the voltage is maintained above 10.5 volts. This fixed amperage is multiplied by the number of hours, which is the ampere-hour. For example, if the battery is discharged at 20 amperes for 20 hours, the ampere-hours of the battery are 400 AH.

★ **DIN—German System Standard:**

At a cold temperature of 0°F（-18°C）, the battery's reachable amperage is 9.0 volts for 30 seconds, and maintains the minimum voltage, while at 8.0 volts for 150 seconds.

★ **IEC—International Electronic Technology Association:**

At the average current intensity, each battery that is cooled and immersed at 0°F（-18°C）can carry a minimum voltage of 8.4 volts for 60 seconds.

★ **BSR—British Verification Standard:**

At the average current intensity, each battery that is cooled and immersed at 0°F（-18°C）can be loaded with a minimum voltage of 6.0 volts for 180 seconds.

★ **BCI—International Battery Association:**

At the average current intensity, each battery that is cooled and immersed in 0°F（-18°C）~ -20°F（-29°C）can carry a minimum voltage of 7.2 volts for 30 seconds.

9. Guarantee Card

Hello! Thank you for purchasing the products in order to better serve you, please read carefully, fill in and properly keep this guarantee card after purchasing the products.

<table>
<tr><td>Name</td><td></td><td>Email</td><td></td></tr>
<tr><td>Purchase Date</td><td></td><td>Cotact Number</td><td></td></tr>
<tr><td>Address</td><td></td><td>Product Name</td><td></td></tr>
<tr><td>Order Number</td><td colspan="3"></td></tr>
<tr><td rowspan="4">Repair Records</td><td>Date</td><td colspan="2">Cause of failure and solution</td></tr>
<tr><td></td><td colspan="2"></td></tr>
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Warranty Statement:

If there is any quality problem of the product that needs to be repaired, please send this warranty card together with the purchased product back to our company to provide after-sales service.

Version Number: A01