



*SOLAR Battery and System Tester
with Integrated Printer*

*Model No. BA227
User Manual*

⚠ WARNING



Failure to follow instructions may cause damage or explosion, always shield eyes. **Read entire instruction manual before use.**

⚠ WARNING



Read these instructions completely before using the tester and save them for future reference. Before using the tester near a car, truck or boat, read these instructions and the instruction manual/safety information provided by the car, truck, boat or equipment manufacturer. Following all manufacturers' instructions and safety procedures will reduce the risk of accident.



Working around lead-acid batteries may be dangerous. Lead-acid batteries release explosive gases during normal operation, charging and jump starting. Carefully read and follow these instructions for safe use. Always follow the specific instructions in this manual and on the tester each time you use it. All lead-acid batteries (car, truck and boat) produce hydrogen gas which may violently explode in the presence of fire or sparks. **Do not smoke, use matches or a cigarette lighter while near batteries.** Do not handle the battery while wearing vinyl clothing because static electricity sparks are generated when vinyl clothing is rubbed. Review all cautionary material on the tester and in the engine compartment.



Always wear eye protection, appropriate protective clothing and other safety equipment when working near lead-acid batteries. Do not touch eyes while working on or around lead-acid batteries.



Use extreme care while working within the engine compartment, because moving parts may cause severe injury. Read and follow all safety instructions published in the vehicle's Owner's Manual.



Batteries being tested with the tester likely contain liquid acids which are hazardous if spilled.

Personal Precautions

Someone should always be within range of your voice or close enough to come to your aid when you work near a lead-acid battery.

Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing or eyes. Protective eyewear should always be worn when working near lead-acid batteries.

If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 10 minutes and get medical attention immediately.

Be extra cautious to reduce risk of dropping a metal tool onto a battery. It might spark or short circuit the battery or another electrical part that may cause explosion.

Remove personal metal items such as rings, bracelets, necklaces and watches when working with a lead-acid battery. A lead-acid battery can produce a short-circuit current high enough to weld a ring or the like to metal, causing a severe burn.

Use the tester for testing lead-acid batteries only. Do not use for testing dry-cell batteries that are commonly used with home appliances.

NEVER test, charge or jump start a frozen battery.

Do not submerge in water.

Do not operate with flammables such as gasoline, etc.

If the tester receives a sharp blow or is otherwise damaged in any way, have it checked by a qualified service person.

Do not disassemble the tester. Have it checked by a qualified service person.

About Your SOLAR Battery and System Tester with Integrated Printer (Model No. BA227)

Battery Tester Model BA227 is designed to test 12 Volt batteries, starting and charging systems. It offers quick and accurate assessment of battery condition and starting and charging system performance. It features long 36" leads for convenient testing and a backlit display for easy viewing in bright or low light environments. Its integrated printer provides easy service documentation and uses standard thermal paper.

The tester is compatible with a wide range of battery types, including Conventional, Maintenance Free, AGM, Gel Cell, Marine Starting, Spiral Wound and Deep Cycle

(with starting rating) batteries. The tester can test these types of batteries against several battery capacity rating systems, including CCA, CA(MCA), EN, IEC, JIS and DIN. The tester's capacity in CCA terms is 100-1400 CCA. The tester has a recommended operating ambient temperature range of -4°F to 122°F.

Preparing Battery to Be Tested

Warning: Always wear eye protection, appropriate protective clothing and other safety equipment when working near lead-acid batteries. Do not touch eyes while working on or around lead-acid batteries.

1. Be sure area around battery is well ventilated while battery is being tested.
2. Clean battery terminals. Wire brush them if necessary. Be careful to keep corrosion from coming in contact with eyes.
3. Inspect the battery for cracked or broken case or cover. If the battery is damaged, do not use tester.
4. If the battery is not a sealed Maintenance Free battery, add distilled water in each cell until battery acid reaches level specified by the manufacturer. This helps purge excessive gas from cells. Be careful not to overfill.
5. Confirm that all vehicle accessories are turned OFF to ensure you do not cause any arcing and that the tested battery has a nominal voltage of 12 Volts.
6. If it is necessary to remove battery from vehicle to test, always remove ground terminal from battery first.

Tester Preparation and Set-up

Loading Printer Paper

Open paper chamber cover. Set the paper roll into the paper chamber, oriented such that the paper feeds off the bottom of the roll.

Feed the paper from the roll until the paper begins to feed past the cutter. Close the paper chamber.

Note: The tester uses standard thermal paper, available from most office supply stores.

Tester Configuration

Note: At any point in the set-up or battery test operation of the tester, if you wish

to go backwards, you can press and hold the ENTER button for 2 seconds to return to the previous screen.

You must be properly connected to a battery (See *Battery Tester Operation: Battery Testing, steps 1-3*) to configure the tester.

Upon proper battery connection, the tester display will splash the **SOLAR** logo for one second and then proceed to the Home Screen. The Home Screen shows the battery status by providing the Open Circuit Voltage of the connected battery. Press “ENTER” to enter the Function Screen, which offers three options: BATTERY TEST, SYSTEM TEST or CONFIGURATION. Using the Arrow Keys, scroll down to CONFIGURATION and press “ENTER” (center button) to go to the CONFIGURATION Screen.

The CONFIGURATION Screen provides five options: PRINT LAST RESULT, LANGUAGE, COUNTER, SET DATE, BRIGHTNESS AND CUSTOMIZE. Each of these configuration steps are reached by scrolling through the screens by hitting the right arrow button.

To print the last test result, scroll to PRINT LAST RESULT and hit enter. To set the default language for the tester, scroll to LANGUAGE and press “ENTER”. Using the Arrow Keys, toggle to your preferred language (English, Spanish or French) and Press “ENTER”. You will return to the Function Screen.

To learn more about the counter operation, see *Counter Function* section of this manual.

To set the date and time, scroll to SET DATE and press “ENTER”. The tester will display the date and time currently set for the tester. The indicator arrow should be on the date line. Press “ENTER”. ADJUST: YEAR will appear on the display. Using the Arrow Keys, toggle to the correct year and press “ENTER”. Repeat this process as the tester advances through the MONTH, DAY, HOUR, MINUTE and SECOND settings. Upon pressing “ENTER” after making the SECOND setting adjustment, you will return to the Function Screen.

Using the arrow keys, scroll to CONFIGURATION and press “Enter” to go to the CONFIGURATION screen. To adjust the display brightness, scroll to BRIGHTNESS and press “ENTER”. Using the Arrow Keys, adjust to your preferred level of brightness and press “ENTER”.

To customize your printout information, scroll to CUSTOMIZE and press “Enter”. Follow the prompts to enter your information to be printed on test strips.

Battery Tester Operation

Note: Each time you connect the tester to a battery, the tester will run a quick cable verification to ensure a proper connection through the output cables to sensors in the clamp jaws. If the connection checks out OK, the display will momentarily flash “Output Cable Check Complete” and proceed to the Home Screen. If the connection is poor, the display will show “Check Clamp.” In this case, check cable connections for visible signs of damage, as you may need to replace the cable ends. Call Technical Service at 800.328.2921 with any questions.

Battery Testing

1. Before you test a battery in a vehicle, turn off the ignition, all accessories and loads. Close all the vehicle doors and the trunk lid.
2. Make sure the battery terminals are clean. See *Preparing Battery to Be Tested*.
3. Connect tester leads to the battery, clamping the red clamp to the vehicle positive battery terminal first. Then, clamp the black clamp to the vehicle negative battery terminal second.

Note: Whenever possible, connect directly to the terminals/posts of the battery.

4. Upon completing a proper battery connection, the tester display will show the Home Screen. Select BATTERY TEST, scrolling as needed to bring the indicator in line with BATTERY TEST, and press “ENTER” (center button).
5. Press Arrow Keys to select type of battery to be tested: Flooded, AGM Flat Plate, AGM/Spiral, VRLA/GEL or START/STOP. Flooded refers to standard Starting/Lighting/Ignition flooded batteries, AGM/Flat Plate refers specifically to traditionally shaped AGM batteries, AGM/Spiral refers specifically to AGM-designated Spiral Wound batteries, VRLA/GEL specifically refers to Gel Cell batteries and START/STOP specifically refers to starting batteries installed in vehicles utilizing START/STOP technology. Press “ENTER”.
- 5a. Additional sequence when START/STOP battery type is chosen. Tester will ask what type of battery is being used in the START/STOP application, EFB or AGM. EFB refers to Enhanced Flooded Battery constructions and AGM refers to AGM battery constructions. Choose correct battery type and Press “ENTER”.
6. Press Arrow Keys to select the applicable battery rating that you plan to test against. Options include CCA, EN, IEC, DIN, JIS, MCA(CA). Press “ENTER”.

7. Scroll Arrow Keys to input the battery rating/capacity. Note that the Arrow Keys will scroll, such that you do not have to continually repeat pressing each key. Once proper battery rating is shown on the display, press “ENTER” to perform the battery test (lasts 1-2 seconds).
8. The tester will ask about the current ambient temperature environment of the battery, “Above 32°F/0°C? Yes/No.” Chose the correct answer and hit ENTER.
9. *Optional sequence determined by the tester.* At this point, the tester may display a question to more accurately provide an assessment of the tested battery. If the display shows “Is battery charged?”, toggle Arrow Keys to indicate YES or NO as applicable and press “ENTER”. If NO is selected, the display will show the Open Circuit Voltage of the Battery and the instruction RECHARGE RETEST. If YES is selected, see Step 10 below.
10. When the test is complete, the display shows the determined voltage of the battery and the determined rating of the battery.

GOOD & PASS The tested battery is good and capable of holding a charge.

GOOD & RECHARGE The tested battery is good but needs to be charged.

RECHARGE & RETEST The tested battery is discharged. The battery condition cannot be determined until it is fully charged. Recharge and retest the battery.

BAD & REPLACE The tested battery cannot hold a charge. It should be replaced immediately.

BAD CELL & REPLACE The tested battery has at least one short-circuited cell. It should be replaced immediately.

LOAD ERROR The tested battery is larger than 2000 CCA or 200 AH. Or, the clamps are not connected properly. Check battery connection. If connection is incorrect, reconnect and retest. If connection is correct, charge the tested battery to full charge and retest, ensuring that a proper connection is made. If the reading is still the same, the battery should be replaced immediately.

Note: If this outcome is displayed, the operator is asked if any accessories have been left on as a possible cause. If it is found that accessories were left on, charge the tested battery and retest. If it is determined that no accessories were left on, the battery should be replaced.

11. Press “ENTER” to go to the Print Option Screen. The tester will ask if you would like to PRINT RESULT? Scroll to your preferred choice and press “ENTER”. If

you chose YES, the printer will print results. If you chose NO, the tester will once again return you to the Home Screen and once again display the battery's open circuit voltage.

12. Remove the test leads from the battery posts after completion of testing, always removing the negative (black) clamp first and then the positive (red) clamp.

System Testing: Starting and Charging System Tests

During this portion of the testing process, the tester will perform the following tests in order:

- Starting System Cranking Test
- Charging System Test without Loads
- Charging System Test under Loads – Ripple Detect
- Charging System Test under Loads

Please follow the instructions below to run through the above testing steps.

1. Make sure the battery terminals are clean. See *Preparing Battery to be Tested*.
2. Connect tester leads to the battery, clamping the red clamp to the vehicle positive battery terminal first. Then, clamp the black clamp to the vehicle negative battery terminal second.

Note: Whenever possible, connect directly to the terminals/posts of the battery.

3. Upon completing a proper battery connection, the tester display will show the Home Screen. Select SYSTEM TEST, scrolling as needed to bring the indicator in line with SYSTEM TEST. Press “ENTER” (center button).
4. The display will confirm that the operator has chosen SYSTEM TEST. Press “ENTER”.
5. Turn off all vehicle accessory loads such as lighting, air conditioning, radio, etc.
6. Start the engine. The display will show the minimum voltage reached by the battery and provide an assessment of starting system condition. Assessment corresponds as follows:

CRANKING VOLTS NORMAL – Starting System is showing normal draw.

CRANKING VOLTS LOW – Starting System is Weak – troubleshoot starter as per manufacturer's recommended procedure.

CRANKING VOLTS NOT DETECTED – Check connections, wiring, and starter

immediately.

7. After Starting System Test, press “ENTER” to go to Charging System Test, beginning with the Charging System without Loads Test. The display will remind you to ensure all loads are off – after making sure there are no loads on the system, press “ENTER”.
8. The tester will display the charging system voltage without loads and provide an assessment of that reading.

NORMAL – Charging System OK

LOW – Charging Voltage is Low – Alternator is not providing sufficient current to the battery. Check belts and connection from alternator to battery.

HIGH – Charging Voltage is High – Voltage output from alternator to battery exceeds the normal limit. Check alternator connections, including ground connection. Also, check manufacturer specifications, as output requirement may vary by vehicle type and manufacturer (confirm range is, in fact, too high for vehicle).

9. Next, the tester will perform the Charging System Under Load Test, starting with a Ripple Detect assessment. Press “ENTER” to begin this test sequence.
10. Turn on the following accessories: blower to high (heat), high beam headlights, and rear defroster.

Note: Do not use cyclical loads such as air conditioning or windshield wipers.

11. *Optional Step determined by the Tester:* When testing older model vehicles with diesel engines, the tester may prompt the operator to run the engine at 2500 RPM for 15 seconds. Display will read: “RUN ENGINE UP TO 2500 RPM 15 SEC.”
12. Press “ENTER”. The tester will display the ripple detected from the charging system to the battery and provide an assessment of that reading.
NORMAL RIPPLE DETECT– Charging System OK
HIGH – Excess Ripple Detected – One or more of the alternator diodes are not functioning properly or there is other damage to the charging system. Check to ensure alternator mounting is sturdy and that belts are in good condition and functioning properly.
13. Press “ENTER” to proceed to the Charging System Under Loads Test. One of three results will be displayed, along with the actual voltage reading.

NORMAL – Charging System OK

LOW – Charging Voltage is Low – Alternator is not providing sufficient current for the system’s electrical loads and to charge the battery. Check belts and connection from alternator to battery.

HIGH – Charging Voltage is High – Voltage output from alternator to battery exceeds the normal limit. Check alternator connections, including ground connection. Also, check manufacturer specifications, as output may vary by vehicle type and manufacturer.

14. Press “ENTER” to go to the Print Option Screen. The tester will ask if you would like to PRINT RESULT? Scroll to your preferred choice and press “ENTER”. If you chose YES, the printer will print results. If you chose NO, the tester will once again return you to the Home Screen and once again display the battery’s open circuit voltage.
15. Turn engine OFF and remove the test leads from the battery posts after completion of testing, always removing the negative clamp first and then the positive clamp.

Counter Function

The tester is equipped with a counter function that allows you to track the number of tests performed over time. The counter can be accessed through the Configuration Screen. From the Home Screen, scroll to CONFIGURATION and press “ENTER” to go to the Configuration Screen. To access the counter, scroll to COUNTER and press “ENTER”. The tester will show the counter display, listing the number of battery tests and the number of system tests that have been performed since the unit was first configured or last reset.

From the counter display, press “ENTER” to achieve the following next steps: return to the Home Screen, reset the counter or print the counter result. The first choice shown will be RETURN TO BATTERY TEST. Selecting this option will return you to the Home Screen.

Scrolling forward once will bring you to RESET. Press “ENTER” to see your reset options, NO or YES. Scroll to your desired outcome and press “ENTER”. If you chose to reset the counter, the display will return to the counter display and show zero tests performed. If you choose NO, the display will proceed to the Home Screen.

Scrolling forward twice will bring you to the print screen for the counter display.

Maintenance and Care

A basic amount of care and maintenance will allow your tester to provide years of valuable service.

- After each use, ensure that there is no corrosion on clamps. If there is corrosion on clamps, use a damp cloth to wipe corrosion off of the clamps.
- After each use, ensure that leads have not been damaged or have come into contact with aggressive fluids, such as grease, engine oil, ATF or battery corrosion. If leads are damaged, call Technical Service at 913.310.1053 immediately. NEVER use tester if leads show signs of damage. If leads have come into contact with aggressive fluids, use a damp cloth to wipe the leads clean.
- After each use, return the tester to its storage case to protect the tester when not in use.
- If tester body becomes dirty or soiled, use a damp cloth to wipe it clean.
- If tester display becomes dirty, use a screen cleaning product, such as those used to clean glasses or computer monitors, to wipe the display clean. When cleaning the display, take care not to scratch or otherwise damage it.
- Periodically replace onboard batteries (rear compartment) to avoid a situation where the batteries run down at a critical moment.
- When storing tester for extended periods of inactivity, remove onboard batteries.