

# Owner's Manual & Safety Instructions

**Save This Manual** Keep this manual for the safety warnings and precautions, assembly, operating, inspection, maintenance and cleaning procedures. Write the product's serial number in the back of the manual (or month and year of purchase if product has no number). Keep this manual and the receipt in a safe and dry place for future reference.

22f



## 12V DIGITAL BATTERY & SYSTEM TESTER



Visit our website at: <http://www.harborfreight.com>  
Email our technical support at: [productsupport@harborfreight.com](mailto:productsupport@harborfreight.com)

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When unpacking, make sure that the product is intact and undamaged. If any parts are missing or broken, please call 1-888-866-5797 as soon as possible.

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No portion of this manual or any artwork contained herein may be reproduced in any shape or form without the express written consent of Harbor Freight Tools. Diagrams within this manual may not be drawn proportionally. Due to continuing improvements, actual product may differ slightly from the product described herein. Tools required for assembly and service may not be included.

### **⚠ WARNING**

**Read this material before using this product. Failure to do so can result in serious injury. SAVE THIS MANUAL.**

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### WARNING SYMBOLS AND DEFINITIONS

|                                                                                   |                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death. |
|  | Indicates a hazardous situation which, if not avoided, will result in death or serious injury.                                                                                     |
|  | Indicates a hazardous situation which, if not avoided, could result in death or serious injury.                                                                                    |
|  | Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.                                                                                   |
|  | Addresses practices not related to personal injury.                                                                                                                                |

|                                                                                   |                     |
|-----------------------------------------------------------------------------------|---------------------|
| <b>V</b>                                                                          | Volts               |
|  | Alternating Current |
| <b>A</b>                                                                          | Amperes             |
| <b>CCA</b>                                                                        | Cold Cranking Amps  |
| <b>RC</b>                                                                         | Reserve Capacity    |
| <b>Ah</b>                                                                         | Ampere-hours        |

|                                                                                   |                                                                                                    |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
|  | WARNING marking concerning Risk of Eye Injury. Wear ANSI-approved splash-resistant safety goggles. |
|  | Read the manual before set-up and/or use.                                                          |
|  | WARNING marking concerning Risk of Fire. Follow connection procedure.                              |



# IMPORTANT SAFETY INSTRUCTIONS

The warnings and precautions discussed in this manual cannot cover all possible conditions and situations that may occur. It must be understood by the operator that common sense and caution are factors which cannot be built into this product, but must be supplied by the operator.

1. Use only according to these instructions. Improper setup can create hazards.
2. Wear ANSI-approved safety goggles and heavy-duty work gloves during setup and use.
3. Be extra cautious to reduce risk of dropping a metal tool onto battery. It might spark or short-circuit battery or other electrical part that may cause explosion.
4. Keep work area clean and well lit.
5. Keep bystanders out of the area during setup and use.
6. Do not use when tired or when under the influence of drugs or medication.
7. This product is not a toy. Do not allow children to play with or near this item.
8. Inspect before every use; do not use if parts are loose or damaged.
9. Do not smoke or have open flames near the battery.
10. Do not connect the Tester to the battery while the engine is running. Turn the engine off before connecting.
11. If battery has just been charged, ventilate the area thoroughly before testing it. Be careful to avoid creating sparks.
12. Do not disassemble charger; take it to a qualified technician when service or repair is required.
13. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
14. 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.
15. Maintain product labels and nameplates. These carry important safety information. If unreadable or missing, contact Harbor Freight Tools for a replacement.

**▲SAVE THESE INSTRUCTIONS.**

## Specifications

|                               |                                                                                                     |
|-------------------------------|-----------------------------------------------------------------------------------------------------|
| Display                       | LCD                                                                                                 |
| Battery Voltage Application   | 12V                                                                                                 |
| Tester Voltage Range Capacity | 5V-17V                                                                                              |
| Battery Type                  | Standard, AGM, GEL, EFB                                                                             |
| Battery CCA Range             | 40~2000 CCA                                                                                         |
| Battery AH Range              | 7-250 Ah                                                                                            |
| Lowest Operating Voltage      | >5V (Between 4-5, if the orange LED indicator is lit, this means alerting voltage is out of range). |
| Test Record Storage           | 10 records                                                                                          |
| Operating Temperature         | 0°C to 50°C (32°F to 122°F)                                                                         |
| Storage Temperature           | -20 °C to 70°C (-4°F to 158°F)                                                                      |
| Power                         | Provided via cable from car battery                                                                 |

## Operating Instructions



Read the **ENTIRE IMPORTANT SAFETY INFORMATION** section at the beginning of this manual including all text under subheadings therein before set up or use of this product.

**Note:** This Tester is powered by the battery being tested. No additional battery is required.

1. The battery should be rested 30 minutes before testing. Vehicle should be turned off with no accessories operating.
2. Attach clamps securely to the battery terminals, red to positive (+), black to negative (-). Terminals should be cleaned prior to testing.
3. Test a single 12V battery only. Do not connect this Tester to a series of batteries or an electrical system containing more than one 12V battery. Do not connect to any other electrical system; damage to the Tester will result.
4. Be careful not to damage the Tester. Avoid dropping it or dropping items onto it. Do not expose to moisture or chemicals.
5. The Tester may be used continuously without overheating.

## Controls

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**UP / DOWN Button:** Select menu items.

**ESC Button:** Return to Main menu.

**ENTER Button:** Confirm menu selection.

## Product Function

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Main functions of battery tester include: battery test, cranking test, charging test and other additional functions.

**Battery test** - Analyzes the battery State of Charge, State of Health, CCA, Current Voltage, and Internal Resistance. This provides reliable analysis data for the test and maintenance of the battery. User is notified in advance to replace the battery once it has aged.

**Cranking test** - Tests and analyzes the ability of the battery to supply starting power to the vehicle engine by evaluating the battery ability to hold up the required voltage when applied to a load.

**Note:** There are several reasons why the starting motor could operate abnormally. For example: Poor lubrication can cause the loaded torque of the starter to increase, it can also cause rotor friction of the starting motor.

**Charging test** - Checks and analyzes the charging system to determine if the output voltage of the alternator is normal.

**Note:** If one of the above functions is working improperly, it can lead to over charge or incomplete charge of the battery. This can damage the battery, leading to a greatly shortened life cycle.

## Product / System Setup

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Adjustments and settings:

### Enter the System Setup menu:

From the second startup screen, press ESC button to enter Main menu. Press DOWN button to select the System Setup function.

**Contrast:** Adjusts the contrast of the LCD display.

1. From System Setup menu, use UP and DOWN buttons to highlight Contrast, then press ENTER button.

2. From Contrast menu, Use UP and DOWN buttons to select the desired contrast value, then press ENTER button to save your selection and return to previous menu.

**Tool Information:** Shows the product version and date produced.

1. From System Setup menu, use Enter button to select Tool Information. Press ESC to return to the Main menu.

## Technical Parameters

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1. Cold Cranking Amps Measure Range: Refer to Specifications section on page 4.
2. Voltage Measure Range: 5V-17V DC.

**Note:** There are four primary functions of a vehicle battery. It is important to test and maintain your battery to ensure it properly performs these functions:

1. Supplies energy to the starter and other vehicle functions during starting.
2. Makes up for deficiencies of energy supplied by the generator or alternator during operation.
3. Stores excess energy created by the generator or alternator during operation.
4. Buffers the voltage in the vehicle electrical system, protecting components from damage.

## Understanding CCA

1. CCA (Cold Cranking Amp) values are marked on the battery casing. The CCA rating defines how many amps the battery can deliver at 0° F continuously for 30 seconds before the voltage drops to 7.2 VDC.
2. Temperature strongly affects battery performance. As temperature goes down, the energy production of the battery is reduced, and the amount of energy required to start a vehicle is increased.

| ° F    | ° C      | Available Battery Energy | Drain on Battery |
|--------|----------|--------------------------|------------------|
| 80° F  | 26.7° C  | 100%                     | 100%             |
| 32° F  | 0.0° C   | 65%                      | 165%             |
| 0° F   | -17.8° C | 40%                      | 250%             |
| -20° F | -28.9° C | 25%                      | 350%             |

3. A higher CCA rated battery is desirable in colder climates.

## Battery Test

Tester is designed with an intuitive step-by step walk through menu and selection to perform the preferred testing criteria. Follow instructions on screen to complete the test.

**IMPORTANT:** For testing 12 volt batteries only. Suggested operational range 32°F (0°C) to 122°F (50°C) ambient air temperature.

## Save Test Data

The tester is capable of storing up to 10 test records. User can choose to save the test data for later review. User can access and manage the test records from the tester Main Menu.



## Battery In-Vehicle or Out-Of-Vehicle

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Press UP/DOWN key to select the battery location, in vehicle or out of vehicle, then press ENTER key to confirm. Battery in vehicle means battery is connected with vehicle alternator or vehicle electrical appliance.

### Battery in vehicle:

Battery is sitting in the battery compartment of the vehicle and is properly connected to the vehicle power system.

### Battery test in vehicle:

When surface charge is detected by the tester, it prompts "SURFACE CHARGE, TURN LIGHTS ON" Turn lights on as prompted to eliminate battery surface charge. Once the tester detects the surface charge has been eliminated, turn lights off as prompted, then press ENTER key. The tester will return to automatic test.

**OUT-OF-VEHICLE:** User may remove the battery from the vehicle to maintain.

### Select Battery Type:

After selecting the battery charge status, tester will prompt to select battery type, i.e. Standard Flooded, AGM Flat Plate (Most commonly used in automotive), AGM Spiral (Sometimes used in automotive), VRLA/ Gel, EFB battery. Press UP/DOWN key to select battery type, then press ENTER key to confirm.

### Battery Rating:

CCA/SAE (Commonly used in automotive), AH (Amp-Hour, commonly used in Deep Cycle battery and Standard type battery), CA (Crank Amps, commonly used in automotive), MCA (Marine Crank Amp, commonly used in boats).

Press ENTER key. It takes around 8 seconds to display the battery test result.

Battery test result includes 5 results as follows:

1. **Good Battery:** Battery has no issues and is okay to use.
2. **Good, Recharge:** Battery is in good health, State of Charge is low, recharge before using.
3. **Replace:** Battery is near or has already reached end of life, replace battery.
4. **Bad Cell, Replace:** Battery interior damaged, bad cell or short circuit, replace battery.
5. **Charge, Retest:** Battery is unstable, recharge/test it. If same test result appears after recharge and retest, the battery is damaged, replace the battery.

**Note:** To exit after testing, press ESC key to Exit to the Main menu.

## Starting/Cranking Test

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Start the engine as prompted, tester will automatically complete the cranking test and display the result.

The tester analyzes the ripple voltages when starting the engine to determine the conditions of the starting system of the vehicle.

**PASS:** When battery voltage is greater than 9.6V the battery is in good condition and can support the starting system.

**FAIL:** When battery voltage is below 9.6V the battery needs attention such as recharge or possibly needs replaced to be able to support the starting system.

## Charging Test and Ripple Test

To enter the charging test, select "Charging Test".

Charging Test will immediately follow right after Starting/Cranking test. Follow on screen instructions to proceed.

1. Press ENTER key to start the Charging Test.

**NOTE:** Do not shut down the engine during the test. Turn OFF any electrical appliances or devices in the vehicle during the test as they will affect the accuracy of the test result.

2. The tester performs the ripple test within 6 seconds and displays the result on screen.
3. After the Ripple Test, tester will automatically start the Loaded Volt Test.
4. Follow on-screen instructions to perform the Load Voltage Test. This test requires turning on loads (radio, heater, light), and revving, then holding engine to a desired RPM of 2000 -2500.
5. The tester initiates a 15 second countdown on screen to allow the user to rev up the engine to 2000-2500 RPM.
6. Charging Test result is displayed on screen. Follow on-screen instruction to obtain the full comprehensive Starting and Charging Test results.

**NOTE:** If no increased RPM detected, it shall be due to a fault of generator regulator, or connection with battery has failed. Tester will try 3 times to further detect. If it still fails, it will skip the increase rev detect and the test result displays "No Volt Output". See below:

Check the connection between generator and battery, then retest.

### Charging Test Result:

1. **PASS** - Alternator output is normal, no problem detected.
2. **FAIL** - Charging volt of the charging system is low. Check the drive belt to see if it's slipping or running off. Check if the connection between alternator and battery is normal or not. If both of the drive belts and the connections are in good condition, follow the manufacturer's suggestion to eliminate alternator fault.
3. **FAIL**- Alternator output volt is high. An internal regulator is used by the majority of car alternators. The alternator assembly must be replaced.(Some older vehicles use external regulators, in this case directly replace the regulator.) The normal high volt of the voltage regulator is maximum  $14.7 \pm 0.5V$ . If charging volt is too high, it will overcharge the battery and shorten the battery life.
4. **No Volt Output** - No alternator volt output is detected. Check the alternator connection cable and the belt to verify whether they are normal.
5. **Diode Test** - The ripple test will determine whether the diode is normal or not. When ripple volt is too high, it proves at least one diode is damaged. Check and replace the diode.



## Battery Capacity

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Battery Capacity can be indicated as Amp Hours (Ah) or Watt Hours (WH).

1. An Amp Hour is measured by continuous discharge for 20 hours. For example, if a battery discharges 6 amps continuously for 20 hours before dropping to 10.5 VDC, the Ah rating is 6 amps X 20 hours = 120 Ah.
2. A Watt Hour is simply Voltage times Ah. For example, a 12 volt battery rated at 120 Ah is 1440 WH. (12 VDC X 120 Ah = 1440 WH).

## Battery Resistance

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1. Resistance (also called "impedance") is a measure of the resistance of free flow of electrons within the battery. Lower resistance is better.
2. In a 12V lead-acid battery, 5-10 mOhms (milliOhms) is a good range. Resistance levels over 20 mOhms may indicate a problem.

## Battery Faults

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### **Sulfate accumulation:**

Over the life of the battery the chemical reactions on the surface of the plates which store and release energy cause sulfates to build up. This slowly degrades battery performance until the battery must be replaced.

### **Insufficient electrolyte:**

If exposed to air, the battery plates will accumulate sulfates rapidly. Also with low electrolyte, only the portion of the plates in the electrolyte can function.

### **Short circuit of the battery plates:**

If the plate insulators are damaged or lead sludge builds up on the bottom of the battery, the plates can short circuit and stop working.

### **Over discharge of the battery:**

Lead acid batteries should not be fully discharged. If the battery becomes fully discharged, it may be damaged. A fully discharged battery may be restored by trickle charging over a 36 hour period.



**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.



**Note:** Replacement parts are not available. Reference UPC 193175446282  
Do not open housing; no user-serviceable parts inside.

**Record Product's Serial Number Here:** \_\_\_\_\_

**Note:** If product has no serial number, record month and year of purchase instead.



## Limited 90 Day Warranty

Harbor Freight Tools Co. makes every effort to assure that its products meet high quality and durability standards, and warrants to the original purchaser that this product is free from defects in materials and workmanship for the period of 90 days from the date of purchase. This warranty does not apply to damage due directly or indirectly, to misuse, abuse, negligence or accidents, repairs or alterations outside our facilities, criminal activity, improper installation, normal wear and tear, or to lack of maintenance. We shall in no event be liable for death, injuries to persons or property, or for incidental, contingent, special or consequential damages arising from the use of our product. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation of exclusion may not apply to you. **THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.**

To take advantage of this warranty, the product or part must be returned to us with transportation charges prepaid. Proof of purchase date and an explanation of the complaint must accompany the merchandise. If our inspection verifies the defect, we will either repair or replace the product at our election or we may elect to refund the purchase price if we cannot readily and quickly provide you with a replacement. We will return repaired products at our expense, but if we determine there is no defect, or that the defect resulted from causes not within the scope of our warranty, then you must bear the cost of returning the product.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

