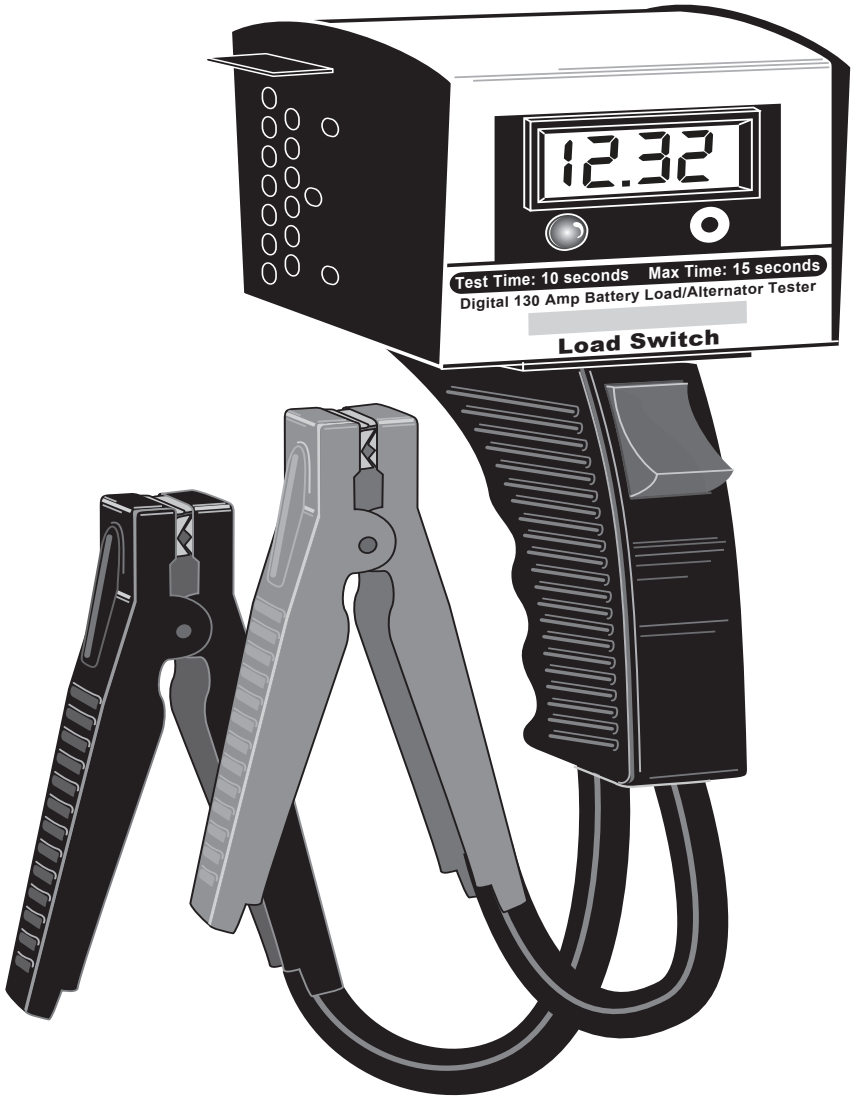


# 3182

## Digital Battery Load Tester



### OPERATING INSTRUCTIONS

# SAFETY PRECAUTIONS

## When Working on Vehicles

- Always wear approved eye protection.
- Always operate the vehicle in a well-ventilated area. **Do not inhale exhaust gases—they are very poisonous!**
- Never smoke or have open flames near vehicle. Vapors from gasoline and charging batteries are highly flammable and explosive. Always keep a fire extinguisher suitable for gasoline/electrical/chemical fires handy.
- Always keep yourself, tools, and test equipment away from all moving or hot engine parts.
- Never lay tools on vehicle battery. You may short the terminals together, causing harm to yourself, the tools, or the battery.
- Always turn ignition key OFF when connecting or disconnecting electrical components, unless otherwise instructed.
- Keep away from engine cooling fan. On some vehicles, the fan may start up unexpectedly.
- Never leave vehicle unattended while running tests.
- Always make sure the vehicle is in **Park** (automatic transmission) or **Neutral** (manual transmission) and that the **parking brake** is firmly set. Block the drive wheels.
- **Always** follow vehicle manufacturer's warnings, cautions, and service procedures.

## Additional Precautions When Testing

- Discharged batteries will freeze. Store batteries above 32°F (0°C) or maintain batteries in a charged condition.
- The Battery Load Tester becomes hot during test. Allow it to cool between tests. The display begins dimming when the tester is not allowed to cool. Repeated use in the overheated condition can damage the tester's electronics.
- Lead-acid batteries contain sulfuric-acid as the electrolyte. The electrolyte is extremely corrosive and evolves oxygen and hydrogen during charging, which can ignite and cause an explosion. Have ventilation and keep flames and sparks away from charging battery. Follow the manufacturer's charging procedures.
- If electrolyte contacts skin, immediately rinse with water. If electrolyte contacts eyes, flush eyes with water and contact physician. When handling batteries, wear eye protection, chemical resistant gloves and protective clothing.

### DISCLAIMER!

Due to inherent dangers associated with automotive maintenance procedures, the manufacturer and all parties involved with the distribution and/or sale of this equipment will not be held liable or responsible, either wholly or in part, for any injury, damage or claims resulting in its performance or the use of the instructions contained in this manual.

# Battery Load Tester

The 3182 Digital Battery Load Tester is a hand-held, diagnostic tool used to test 12V (volt) and 6V lead-acid type automotive batteries. A 10-second test determines the condition of the battery: Good, Weak or Bad. Further testing will identify possible problems in the charging and starting systems. Tests can be performed on fully or partially charged batteries by inspecting the electrolyte or open-circuit voltage and adjusting the values for temperatures other than 70°F (21.1°C).

- If the electrolyte is accessible, measure its specific gravity with a hydrometer. The specific gravity reading should be 1.225 or higher at 70°F (21.1°C). For every 10°F (5.6°C) above/below 70°F (21.1°C), add/subtract 0.004 to/from the reading.
- The open-circuit voltage should be at least 12.45V at 70°F (21.1°C).

The Battery Load Tester contains a four-character LCD (liquid crystal display) to display battery voltage, a switch to apply the test load and a red LED that is used to indicate the condition of the alternator. The tester is powered by the battery under test.

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## **CAUTION!**

- ***Test procedures and information provided in this manual are intended as general guidelines for engine tune-up and adjustments only. Consult the applicable vehicle service manuals for all specific tests.***
  - ***Before testing, read and follow all safety precautions.***
  - ***Do not activate and hold the load switch for more than 15 seconds. This will overload the tester resulting in damage and void the warranty.***
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## Test Preparation

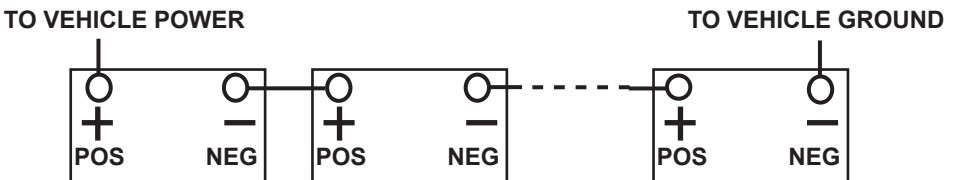
### Multi-Battery Systems

In all multiple battery systems, all batteries must be tested separately. Batteries may be connected in series, parallel or a combination of both. *Only* batteries connected in series may remain connected during test. See **Figure 1**.

For series connections, all batteries are connected from the negative (-) terminal of one battery, to the positive (+) terminal of the other. Only the negative terminal of the first battery and the positive terminal of the last battery are to be connected to the vehicle. Any number of batteries may be connected in a series. However, each battery **must** be tested separately.

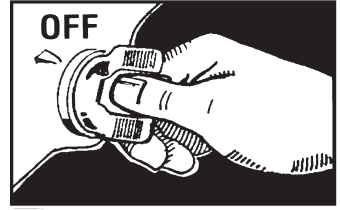
For all other connections (parallel or a combination of parallel and series), the batteries **must** be disconnected and electrically isolated from each other.

**Figure 1** Multi-Battery Test Configuration



## Vehicle Battery

1. Turn ignition key OFF; not in the ACCESSORIES position (**Figure 2**). Engine needs to be OFF and all electrical loads must be removed from the battery for proper testing. If loads still exist, refer to the vehicles operator and service manual.
2. If battery is being charged, then stop, turn charger OFF and disconnect clamps or leads. The battery cannot be tested while being charged.
3. The connections must be clean and must make good contact to achieve correct test results.
4. On **side-post type** batteries, install terminal stud adapters. These are not included, but are available at most automotive parts stores.



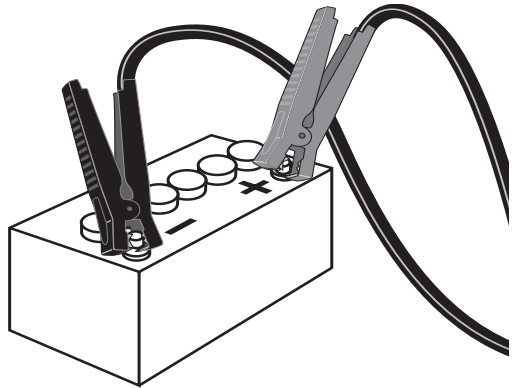
**Figure 2** Engine OFF

## Battery Temperature

The most accurate test results will be obtained when battery temperature is at approximately 70°F (21.1°C). If testing battery between 70°F (21.1°C) and 40°F (4.4°C), add 0.1 volt for every 10°F (5.6°C) below 70°F. If testing a battery between 70°F (21.1°C) and 100°F (37.8°C), subtract 0.1V for every 10°F (5.6°C) above 70°F (21.1°C).

## Load Test

1. Connect the tester's Black clamp to the negative (-) battery terminal and the Red clamp to the positive (+) battery terminal (**Figure 3**). Make sure both jaws make good contact. If required, rock clamps back and forth to improve connection.



**Figure 3** Battery Connections

2. The LCD display will turn on and display the battery voltage. The battery must be at least 75% charged before conducting the Load Test. At 70°F (21.1°C), the voltage should be at least 12.45V (or 6.23V for a 6V battery). Remember to adjust voltage for temperatures other than 70°F (21.1°C).

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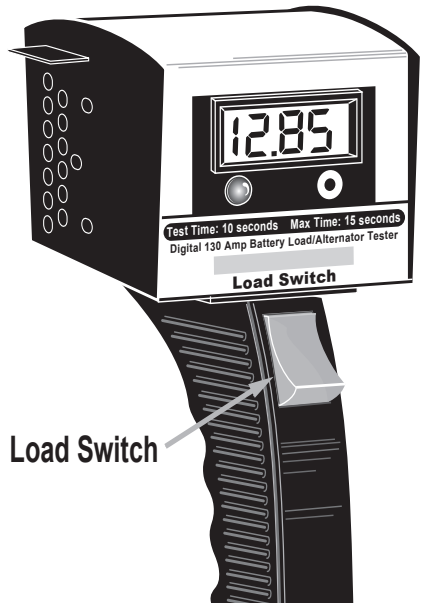
### **CAUTION!**

- **The Battery Load Tester becomes hot when applying the load. Allow tester to cool between discharges; about 2 minutes. In warm temperatures, allow more time to cool. If overheating occurs, the LCD might temporarily become dim. After cooling down, the tester's LCD will return to normal.**
  - **Do not activate and hold the load switch for more than 15 seconds. This will overload the tester resulting in damage and void the warranty.**
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3. Press and hold the **LOAD SWITCH** for 10 seconds. Refer to **Figure 4**.
4. Observe the voltage on the LCD and note the value. Release the **LOAD SWITCH** immediately after reading the display.
5. Disconnect the Red clamp from the battery and then the Black clamp.
6. **Figure 5** shows the range for a 500 CCA (Cold-Cranking Amperage) battery tested at 70°F (21.1°C). For batteries rated at other CCA values, subtract 0.1V for every 100 CCA below 500 CCA from the values shown in **Figure 5**. Add 0.1V for every 100 CCA above 500 CCA.

If the voltage is in the WEAK region, then the battery is probably discharged and needs to be charged before testing.

- Disconnect tester and charge battery; follow battery charger manufacturer's instructions for charging procedures.



**Figure 4** Load Switch and Display

### **WARNING!**

***Charging a battery with a bad cell may cause severe personal injury and damage to vehicle and/or equipment.***

- Disconnect charger, reconnect tester and retest. If the voltage remains low, then the battery is not accepting a charge and should be replaced.

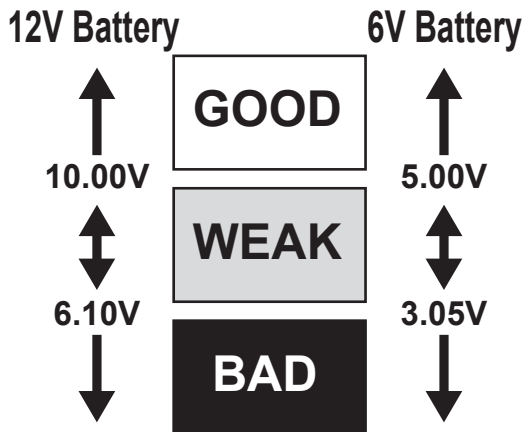
### **Test Results**

**GOOD** - means the battery is in good condition and should start the vehicle in any environment.

**WEAK** - Indicates the battery is discharged and requires charging. Charge battery and then retest.

- If battery tests WEAK a second time, this could indicate one or more cells are bad and battery must be replaced.
- If battery reads GOOD, the battery was not sufficiently charged during the first test.

**BAD** - Indicates the battery is deeply discharged and requires a complete charge or the battery is bad and requires replacement. Check the following (on page 6) and retest.



**Figure 5** 500 CCA Test Results at 70°F (21.1°C)

- Battery clamps are securely fastened to the terminals.
- Terminals are clean and free of debris for a good electrical continuity.
- If a side-post type battery is being tested, verify the terminal stud adapters are screwed in tightly.

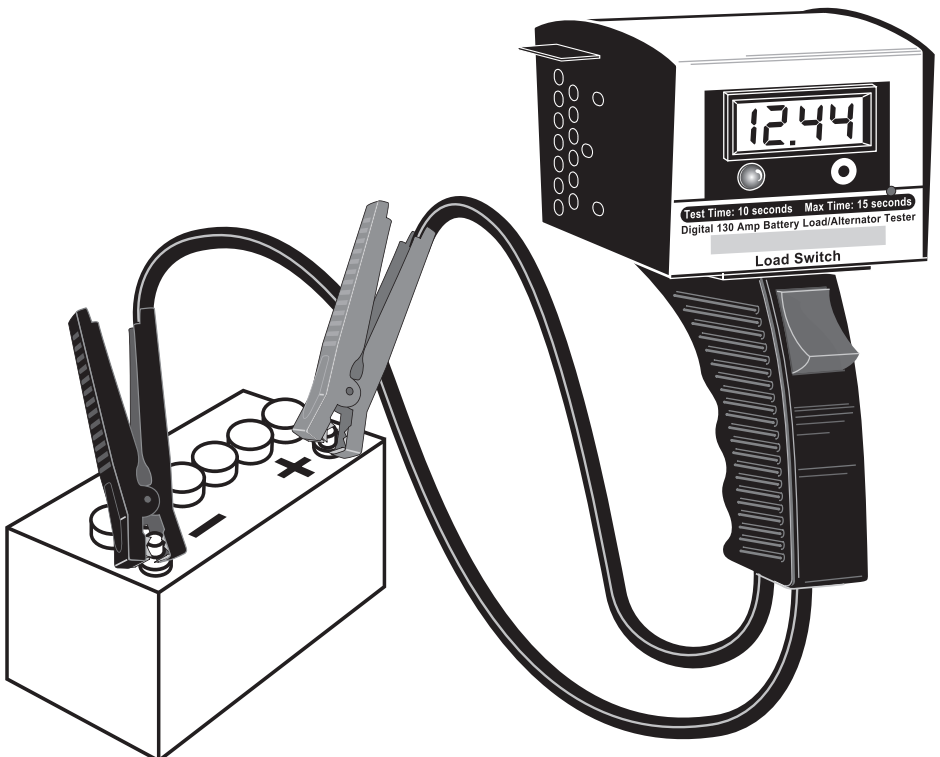
If no fault is detected, then charge battery and retest before replacing the battery. If tester still indicates a bad battery, then replacement is required.

**NOTE:** A WEAK or BAD indication may be due to excessive resistance caused by a bad connection or corrosion between battery cables and the battery posts. Remove battery cables from battery, connect the tester directly to the posts and retest.

## Starting Test

This test evaluates the vehicle's starting system by measuring the battery voltage while cranking the engine.

1. While observing polarity, connect the tester across the vehicle's battery posts: Red to positive (+), Black to negative (-). Refer to **Figure 6**.
2. Disable the ignition system to prevent the vehicle from starting. Refer to a vehicle service manual if necessary.



**Figure 6** Starting Test and Charging Test Setup

3. Have an assistant turn the ignition switch to the Start Position and crank engine for 15 seconds. If working alone, use a remote starter switch. **Do not** press the **Load Switch**. Observe the battery voltage indicated on the display.
4. A healthy starting system, *with a good, fully charged battery*, should read above 9.0V during this test.
5. Readings below 9.0V **may** indicate a problem in the starting system. Recharge battery and repeat this test. If voltage readings still remain below 9.0V, then probably either the battery is bad (perform the Load Test), the starter is defective or the cables are loose or corroded.

## Charging Test

This test measures the battery voltage while the engine is running to determine if the charging system is operating properly.

1. Start the vehicle and allow it to warm-up. This may take 10 to 15 minutes.
2. Turn engine OFF.
3. When performing the Charging Test, the battery should be partially discharged. Turn the ignition switch to the ACCESSORIES position and turn headlights ON and fan to HIGH for 1 minute.
4. When done, turn headlights and fan OFF and then turn ignition switch to the OFF position.
5. While observing polarity, connect the tester across the battery posts: Red to positive (+), Black to negative (-). Refer to **Figure 6**.
6. Start engine and run at fast-idle (1200-1500 RPM). A healthy 12V charging system should maintain readings between **13.5V** and **15.5V**.

### Proper Charging System Operation

Within several minutes, the voltage will gradually increase to the regulated voltage range of 13.5V to 15.5V. In a 6V system, the voltage should gradually rise to the regulated voltage range of 6.7V to 7.4V.

### Incorrect Charging System Operation

**Low Regulated Voltage:** If after several minutes, the voltage is below 13.5V for a 12V system (6.7V for a 6V system), then a problem exists with either the charging system or battery. Perform the Load Test on the battery and then repeat the Charging Test.

**High Regulated Voltage:** If the voltage is above the regulated voltage limit (15.5V for a 12V system, 7.4V for a 6V system), then a problem exists in the charging system. Damage to the vehicle electrical system may result from the excessively high voltage.

A decision to REPLACE the alternator or other electrical system components should not be based solely on these test results. Refer to the applicable vehicle service manual for additional test and troubleshooting procedures.

# Alternator Test

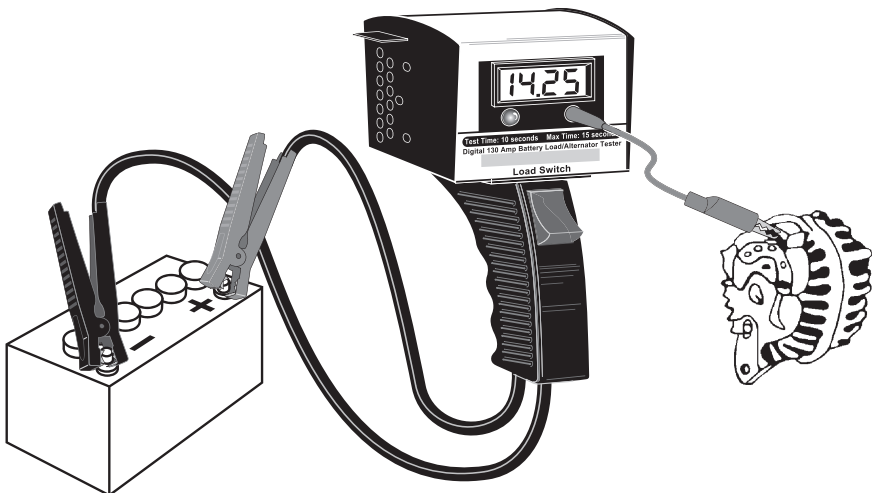
This test identifies problems associated with the alternator.

1. As shown in **Figure 7**, connect the tester's clamps to the vehicle's battery posts: Red to positive (+), Black to negative (-). Connect the test lead to the tester and positive terminal on alternator. On GM alternators, attach the test lead to terminal N° 1 without disconnecting the plug.
2. Start engine and allow it to idle.
3. If a GM alternator is being tested, observe the tester's Red LED and **do not** press the **LOAD SWITCH**. Otherwise, continue with Step 4.
  - If the LED flashes On and goes OFF, or never comes ON, then the Diode Trio is functioning properly.
  - If the LED stays ON, then the Diode Trio might be defective. The alternator needs repair or replacement.
4. Rev the engine to a fast idle (1200-1500 RPM).

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## **CAUTION!**

- **The Battery Load Tester becomes hot when applying the load. Allow tester to cool between discharges; about 2 minutes. In warm temperatures, allow more time to cool. If overheating occurs, the LCD might temporarily become dim. After cooling down, the tester's LCD will return to normal.**
  - **Do not activate and hold the load switch for more than 15 seconds. This will overload the tester resulting in damage and void the warranty.**
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5. Press and hold **LOAD SWITCH** on tester for 5 seconds and observe the tester's Red LED. When done, turn engine OFF and disconnect the test leads.
    - If the LED flashes ON and then goes OFF, or never comes ON, then the diodes (rectifiers) are functioning properly.
    - If the LED stays ON or flashes continuously, then one or more diodes (rectifiers) are defective. Repair or replace the alternator and/or voltage regulator.



**Figure 7** Alternator Test Setup