

# MDX-650

## Battery Conductance and Electrical System Analyzer

*For 6 & 12-volt automotive starting batteries  
and 12 & 24-volt starting/charging systems*



# INSTRUCTION MANUAL



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## Safety Guidelines

Because of the possibility of personal injury, always use extreme caution when working with batteries. Follow all BCI (Battery Council International) safety recommendations.

Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.

**WARNING—REQUIRED BY CALIFORNIA PROP. 65:** Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer and birth defects or other reproductive harm. Wash hands after handling.

### *Capabilities*

The MDX-650 Battery Conductance and Electrical System Analyzer tests 6 & 12-volt regular flooded, AGM flat plate, AGM spiral, and gel batteries, as well as 12 & 24-volt starting and charging systems for passenger cars and light trucks. It displays the test results in seconds and features a built-in printer to provide customers with a copy of the results.

Additional features include the ability to:

- test batteries from rated from 100 to 2000 CCA
- detect bad cells
- protect against reverse polarity
- test discharged batteries
- test multiple rating systems (CCA, CA, MCA, JIS, EN, DIN, SAE, IEC)
- provide a multi-lingual user interface with English, Spanish, French-Canadian, and Portuguese as the selectable languages.

## Registering Your MDX-Series Tester

Before using your tester, we recommend that you register it online to activate your warranty. Registration will also make it faster and easier for you to obtain technical support and service.

To register, log on at [www.midtronics.com/warranty.html](http://www.midtronics.com/warranty.html) and have your serial number ready. The number is at the bottom of the label on the back of the tester.

If your tester needs repair, call Midtronics Customer Service at 800.776.1995. Servicing the tester yourself may void your warranty. Refer to "Patents, Limited Warranty, Service" on the back cover for additional warranty information.



Serial  
number

*Serial Number Label*

## Display and Keypad

When you first connect the MDX-650 to a battery, it functions as a voltmeter until you press the **ENTER** button.

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**IMPORTANT:** If you connect the tester to a voltage source greater than 30 Vdc, you may damage the tester's circuitry.

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The menu-driven display will then guide you step by step through the test process. Use the keypad buttons to scroll to and select options in the menu.

To turn off the tester when not connected to the battery, briefly press and hold the **MENU** button.

## User Interface



**MDX-650**

### 1 UP and DOWN Arrows

Use these keys to choose test parameters and scroll to menu options.

### 2 ENTER Button

Use this button to make selections.

### 3. BACK/PRINT Button

Use this button to move to the previous screen or move back one space when creating custom headers. You can also use this button to printout test results with the IR printer.

### 4 MENU Button

Use the MENU button to access the Main Menu options of the tester.

For information about the options, see "Options Menu".

## Options Menu

### Procedure

1. Press the MENU button to access the Options Menu.
2. Use the UP (▲) and DOWN (▼) arrows to move to the line you want to edit.
3. Press the ENTER button to make highlighted line editable.
4. Use the UP (▲) and DOWN (▼) arrows to select the character for that cursor location.
5. Press the ENTER button to move to the next location.
6. Press the MENU button to return to the Options Menu.

Option	Explanation
View/Print	Display the previous test result. Press the PRINT button to print the results.
QC Mode	A quick test to check battery inventory
Export Data	Export the last test result to an IR Reader program. (under development)
Perform Test	Begin the Battery Test procedure.
Language Selection	Select a language for the tester. (Default: English)
Set Address	Enter the address to display on the top of the printout. (Limit: 8 lines, 21 characters per line)
Time	Select 24-hour or AM/PM and set the time. (Default: AM/PM)
Date	Select the date format as well as set the correct date. (Default: MM/DD/YYYY)
Counter	Clear or display battery and system test by results.
Contrast	Adjust the contrast setting of the tester display. (Default: 10)
Temperature Units	Select the temperature units Degrees F or Degrees C (Default: Degrees F)
Voltmeter	Automatically test battery voltage when the clamps are first connected to the battery terminals. Press <b>ENTER</b> to continue testing the battery. Press <b>BACK</b> to return to the menu. (Default: ON)



## Preparations Before the Test

Before connecting the tester, clean the battery posts or side terminals with a wire brush and a mixture of baking soda and water. When testing side-post batteries, install and tighten lead terminal adapters. A set of adapters is included with the tester.

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**IMPORTANT:** Do not test at steel bolts. Failure to install terminal adapters or installing terminal adapters that are worn or dirty may result in inaccurate test results. To avoid damage, never use a wrench to tighten the adapters more than 1/4 turn.

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If you are testing in the vehicle, make sure all accessory loads are off, the key is not in the ignition, and the doors are closed.

### *Connecting the Tester*

- Connect the red clamp to the positive (+) terminal and the black clamp to the negative (-) terminal.
- For a proper connection, rock the clamps back and forth. The tester requires that both sides of each clamp be firmly connected before testing. A poor connection will produce a CHECK CONNECTION or WIGGLE CLAMPS message. If the message appears, clean the terminals and reconnect the clamps.
- The preferred test position is at the battery terminals. If the battery is not accessible, you may test at the jumper post; however, the available power measurement may be lower than the actual value.

## Battery Test

When you first connect the tester to the battery, it functions as a voltmeter until you press the **ENTER** button to start the test. This function can be turned off through the Options Menu

After you press **ENTER**, scroll to each parameter using the **UP** or **DOWN ARROW** button and press **ENTER** to select. If any messages appear during the test, see "Test Messages" on page 17.

1. **BAT. LOCATION:** Scroll to and select **IN VEHICLE** or **OUT OF VEHICLE** for a battery not connected to a vehicle. Following an **IN VEHICLE** test you will be prompted to test the starting and charging systems.

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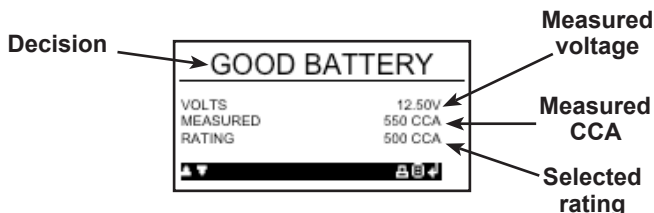
**IMPORTANT:** The performance of the starting and charging systems depends on the battery's condition. It is important that the battery is good and fully charged before any further system testing.

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2. **POST TYPE:** (In-Vehicle only) Scroll to **TOP POST**, **SIDE POST** or **JUMP START POST** where applicable.
3. **APPLICATION:** Scroll to and select **AUTOMOTIVE**, **MOTORCYCLE**, **MARINE**, **LAWN & GARDEN**, **GROUP 31**, or **COMMERCIAL -4D/8D**.
4. **BATTERY TYPE:** Scroll to and select **REGULAR FLOODED**, **AGM FLAT PLATE**, **AGM SPIRAL**, or **GEL** where applicable.
5. **BATTERY STANDARD:** Scroll to and select the battery's rating system. Not all rating systems are available for each application.

Standard	Description	Range
CCA	Cold Cranking Amps, as specified by SAE. The most common rating for cranking batteries at 0 °F (-17.8 °C).	100-2000
CA	Cranking Amps: Current available at 32 °F (0 °C)	100-2000
MCA	Marine Cranking Amps: Amount of current available at 32 °F (0 °C)	100-2000
JIS#	Japanese Industrial Standard, shown on a battery as a combination of numbers and letters.	26A17 thru 245H52
EN	Europa-Norm	100-2000
DIN	Deutsche Industrie-Norm	100-1200
SAE	Society of Automotive Engineers, the European labeling of CCA	100-2000
IEC	International Electrotechnical Commission	100-1200

6. BATTERY RATING: Scroll to and select the rating units. Hold down the **UP** or **DOWN ARROW** button to increase the scrolling speed.
7. Press **ENTER** to start test. After several seconds the tester displays the decision on the battery's condition and the measured voltage. The tester also displays your selected battery rating and the rating units.



### Battery Test Results

Decision	Interpretation
GOOD BATTERY	Return the battery to service.
GOOD-RECHARGE	Fully charge the battery and return it to service.
CHARGE & RETEST	Fully charge the battery and retest. <b>Failure to fully charge the battery before retesting may cause inaccurate results.</b> If CHARGE & RETEST appears again after you fully charge the battery, replace the battery.
REPLACE BATTERY	Replace the battery and retest. A REPLACE BATTERY result may also mean a poor connection between the battery cables and the battery. After disconnecting the battery cables, retest the battery using the out-of-vehicle test before replacing it.
BAD CELL-REPLACE	Replace the battery and retest.
24 VOLT SYSTEM	24-volt system detected. Disconnect batteries and test individually.
READY TO INSTALL	Battery has just been activated and is ready to install in vehicle (Motorcycle only)
NEEDS CHARGE	Fully charge battery and retest using BEFORE DELIVERY. (Motorcycle only) <b>Failure to fully charge the battery before retesting may cause false readings.</b>

8. Press the ENTER (↵) button to proceed with the starter test, BACK/PRINT to print the test results or MENU to return to the Options Menu.

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**NOTE:** For an in-vehicle test, the display alternates between the test results and the message "PRESS ↵ FOR STARTER TEST."

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See "Maintenance & Troubleshooting" in this manual for more information about the printer.

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**IMPORTANT:** The MDX-650 retains the results of the last test only. When you start a new test, the last results are overwritten.

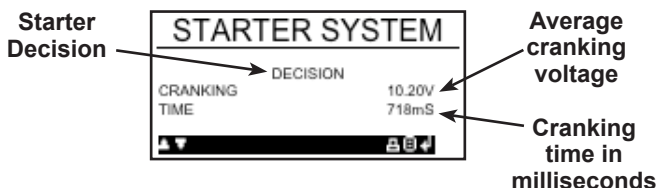
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## Starter System Test

**IMPORTANT:** Before starting the test, inspect the alternator drive belt. A belt that is glazed or worn, or lacks the proper tension, will prevent the engine from achieving the rpm levels needed for the test.

Once you have completed an in-vehicle test, the display alternates between the battery test results and the message PRESS ← FOR STARTER TEST.

1. Press the ENTER (↵) button to proceed with the starter test.
2. Start the engine when prompted.
3. The tester displays the decision on the starter system, cranking voltage, and cranking time in milliseconds.



### Starter System Test Results

Decision	Interpretation
CRANKING NORMAL	The starter voltage is normal and the battery is fully charged.
LOW VOLTAGE	The starter voltage is low and the battery is fully charged.
CHARGE BATTERY	The starter voltage is low and the battery is discharged. Fully charge the battery and repeat the starter system test.
REPLACE BATTERY	Battery must be replaced before the starting system can be tested.
NO START	No vehicle start detected.
CRANKING SKIPPED	A start was not detected.

4. Press the ENTER (↵) button to proceed with the charging system test, BACK/PRINT button to print the test results, MENU to return to the Options Menu.

**NOTE:** For an in-vehicle test, the display alternates between the test results and the message “PRESS ← FOR CHARGING TEST.”

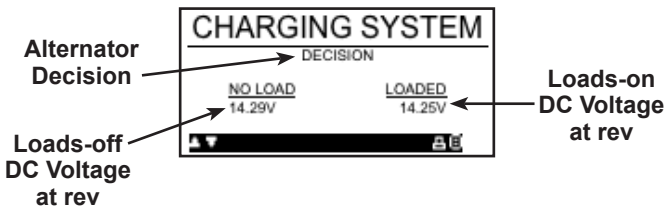
See “Maintenance & Troubleshooting” in this manual for more information about the printer.

## Charging System Test

Once you have completed an in-vehicle test, the display alternates between the battery test results and the message PRESS ← FOR CHARGING TEST. Press the ENTER (↵) button to proceed with the charging test.

Following the on-screen prompts:

1. Rev the engine.
2. Turn on high beams headlights and the blower fan.
3. Rev engine with loads on.
4. Idle engine and turn off loads.
5. The Charging System decision is displayed at the end of the procedure.



### Charging System Test Results

Decision	Interpretation
NO PROBLEMS	System is showing normal output from the alternator.
NO OUTPUT	<p>No alternator output detected.</p> <ul style="list-style-type: none"> <li>√ Check all connections to and from the alternator, especially the connection to the battery. If the connection is loose or heavily corroded, clean or replace the cable and retest.</li> <li>√ If the belts and connections are in good working condition, replace the alternator. (Older vehicles use external voltage regulators, which may require only replacement of the voltage regulator.)</li> </ul>

*continued*

Decision	Interpretation
LOW OUTPUT	Alternator not providing sufficient current to power the system's electrical loads and charge the battery. <ul style="list-style-type: none"> <li>√ Check the belts to ensure the alternator is rotating with the engine running. Replace broken or slipping belts and retest.</li> <li>√ Check the connections from the alternator to the battery. If the connection is loose or heavily corroded, clean or replace the cable and retest.</li> </ul>
HIGH OUTPUT	Alternator voltage output exceeds the normal limits. <ul style="list-style-type: none"> <li>√ Make sure there are no loose connections and the ground connection is normal. If there are no connection problems, replace the regulator. Most alternators have a built-in regulator that requires replacing the alternator. In older vehicles that use external voltage regulators, you may need to replace only the voltage regulator.</li> </ul>
EXCESSIVE RIPPLE	Excessive AC ripple detected. <ul style="list-style-type: none"> <li>√ One or more diodes in the alternator is not functioning or there is stator damage.</li> </ul>

6. Press the BACK/PRINT button to print the test results or MENU to return to the Options Menu.

See "Maintenance & Troubleshooting" in this manual for more information about the printer.

## Test Messages

For a more decisive result, the tester may prompt you for additional information. The messages in the following table may appear before the tester can display a result.

Test Message	Interpretation
BAT. TEMPERATURE	Select ambient temperature above or below 32 °F (0 °C)
CHARGE STATE	Select before or after battery has been charged.
SURFACE CHARGE DETECTED	Remove the surface charge before it begins testing. Testing will resume after charge has been removed.
CHECK CONNECTION	One or both clamps are not making proper contact with the battery terminals.
ENGINE REV NOT DETECTED PRESS ← WHILE REVVING	Tester has not detected an increase in engine rpm
REVERSE CONNECTION	Clamps are connected in the wrong polarity: positive to negative or negative to positive.
SYSTEM NOISE CHECK LOADS	In-vehicle testing. Tester has detected computer, ignition noise or parasitic drain. Make sure all vehicle loads are off including open doors and ignition switch.
UNSTABLE BATTERY	Out-of-vehicle. Weak battery, should be charged and retested.
WIGGLE CLAMPS	Clamps are not making good contact with battery terminals



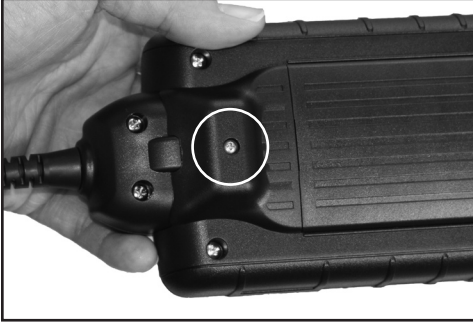
## Error Messages

Error Message	Interpretation
CONNECT TO 12V BATTERY	Tester is not connected to the battery
LOW INTERNAL AA BATTERIES. REPLACE AA BATTERIES SOON!	Internal AA batteries are low and need to be replaced. See "Maintenance & Troubleshooting" section.
NON 12 VOLT SYSTEM DETECTED	System being tested is not 12-volts.
QC DATA MEMORY FULL PRINT RESULTS OR CLEAR MEMORY.	QC mode memory is full. Select QC mode from the Options Menu to clear the memory.

## Maintenance & Troubleshooting

### *Changing The Cable Assembly*

1. Identify the circled screw.



2. Remove the screw.



3. Grasp the housing and firmly pull the cable assembly from housing.



4. To attach a new cable, align the cable and tester housings and push together. Insert the screw and tighten.

## ***Troubleshooting the Display***

If the display does not turn on:

- Check the connection to the vehicle battery.
- The vehicle battery may be too low (below 1 volt) to power the analyzer. Fully charge the battery and retest.
- The analyzer's AA batteries may need to be replaced. (alkaline recommended).
- If the analyzer does not power on when you press and hold the **MENU** button, replace the AA batteries.

## ***Replacing the Battery***

The MDX-650 can test down to 5.5 volts when the unit's internal batteries are not functioning. The tester displays LOW INTERNAL AA BATTERIES, REPLACE AA BATTERIES SOON! when the internal AA batteries need to be replaced.

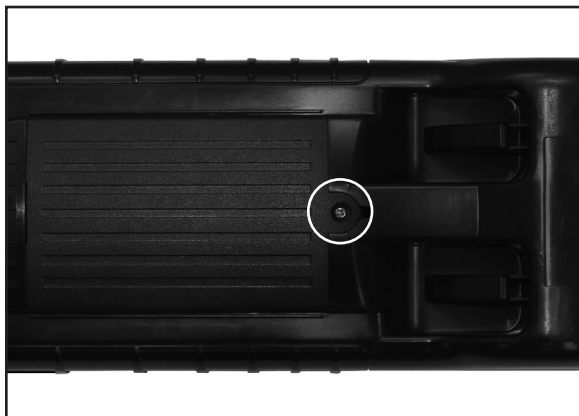
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**NOTE:** Setup information will be retained while you change the internal batteries.

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Use the following procedure to remove and replace the internal AA batteries.

1. Turn the tester face down.
2. Remove the screw securing the battery compartment cover using a small Phillips screwdriver.



3. Lift the door off and remove the discharged battery.
4. Insert fresh AA batteries making sure the positive and negative terminals are positioned correctly.
5. Reposition the cover and tighten the screw..

## Patents

The MDX-650 is made in the U.S.A. by MIDTRONICS, INC. and is protected by one or more of the following U.S. Patents: 6,323,650; 6,316,914; 6,304,087; 6,249,124; 6,163,156; 6,091,245; 6,051,976; 5,831,435; 5,821,756; 5,757,192; 5,592,093; 5,585,728; 5,572,136; 4,912,416; 4,881,038; 4,825,170; 4,816,768; 4,322,685; Canadian patents: 1,280,164; 1,295,680; United Kingdom patents: 0,417,173; 0,672,248; German patents: 689 23 281.0-08; 693 25 388.6; 93 21 638.6; and other U.S. and Foreign patents issued and pending. This product may utilize technology exclusively licensed to Midtronics, Inc. by Johnson Controls, Inc. and/or Motorola, Inc.

## Limited Warranty

This battery tester is warranted to be free of defects in materials and workmanship for a period of one year from the date of purchase. Midtronics will, at our option, repair the unit or replace the unit with a remanufactured tester. This limited warranty applies only to Midtronics battery testers and does not cover any other equipment, static damage, water damage, overvoltage, dropping unit or damage resulting from extraneous causes including owner misuse. Midtronics is not liable for any incidental or consequential damages for breach of this warranty. The warranty is void if owner attempts to disassemble the unit or modify the cable assembly.

## Service

For service, contact Midtronics at 800-776-1995 (630-323-2800) for a Return Authorization number, and return the unit to Midtronics freight prepaid, Attention: RA#. Midtronics will repair or replace the tester and reship, the next scheduled business day following receipt, using the same type carrier and service as received. If Midtronics determines that the failure was caused by misuse, alteration, accident, or abnormal condition of operation or handling, purchaser will have the option of purchasing a replacement tester or the unit will be returned freight collect. Battery testers beyond the warranty period are subject to the repair charges in effect at that time.



[www.midtronics.com](http://www.midtronics.com)

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