

# MDX-500 SERIES

Battery Conductance and Electrical System Analyzer

## INSTRUCTION MANUAL



FOR 12-VOLT AUTOMOTIVE STARTING BATTERIES AND STARTING/CHARGING SYSTEMS

**MIDTRONICS**

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# CHAPTER 1: BEFORE YOU BEGIN

## STARTING THE TESTER FOR THE FIRST-TIME

When the tester is first used the operator is asked to enter a couple of items such as language, date and time. Changes can be made afterwards by going in to the Utility Menu and selecting CONFIG TESTER.

## SAFETY

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

## GENERAL PRECAUTIONS

- Battery acid is highly corrosive. If acid enters your eyes, immediately flush them thoroughly with running cold water for at least 15 minutes and seek medical attention. If battery acid gets on your skin or clothing, wash immediately with water and baking soda.
- Always wear proper safety glasses or face shield when working with or around batteries.
- Keep hair, hands, and clothing as well as the analyzer cords and cables away from moving engine parts.
- Remove any jewelry or watches before you start servicing the battery.
- Use caution when working with metallic tools to prevent sparks or short circuits.
- Never lean over a battery when testing, charging or jump starting it.


The tester is manufactured in line with the latest state of the art and according to recognised safety standards. If used incorrectly or misused, however, it can cause


- injury or death to the user or a third party,
- damage to the tester and other material assets belonging to the operator,
- inefficient operation of the tester.

All persons involved in commissioning, operating, maintaining and servicing the tester must

- be suitably qualified,
- have knowledge of and experience in dealing with testers and batteries and
- read and follow these operating instructions carefully.

## PERSONAL PRECAUTIONS


**DANGER**





**RISK OF EXPLOSIVE GASES. NEVER SMOKE OR ALLOW A SPARK OR FLAME IN THE VICINITY OF A BATTERY.**

Batteries can produce a highly explosive mix of hydrogen gas and oxygen, even when the battery is not in operation. Always work in a well-ventilated area.


**WARNING**

**WASH HANDS AFTER HANDLING.**

## SYMBOLS CONVENTIONS

Symbol	Description
	The safety symbol followed by the word <b>WARNING</b> or <b>CAUTION</b> indicates instructions for avoiding hazardous conditions and personal injury.
<b>CAUTION</b>	The word <b>CAUTION</b> indicates instructions for avoiding equipment damage.
	The wrench symbol indicates procedural notes and helpful information.
<b>UP ARROW</b>	The text for keypad buttons and soft-key functions are in bold capital letters.
CAPITAL LETTERS	The text for screen options are in regular capital letters

# CHAPTER 2: OVERVIEW

## CAPABILITIES

The tester tests 6 and 12-volt regular flooded, AGM flat plate, AGM spiral, and GEL batteries. 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 the Starting and Charging system
- test batteries from rated from 100 to 2000 CCA
- detect bad cells
- protect against reverse polarity
- test discharged batteries
- test multiple rating systems
- provide a multi-lingual user interface.

## REMOVING AND INSERTING THE DATA CARD

The analyzer ships with a plastic insert in the data card slot to protect it from dust and debris. To remove the plastic insert or a data card, push briefly on its edge to release it and pull it from the slot.

When inserting a card, push it into the slot until it locks. The card is correctly inserted when it is not protruding from the slot. To protect the card slot and enable the analyzer to read and write to the card, leave the card in the slot.

## DISPLAY AND KEYPAD

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

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

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.



### UP and DOWN ARROWS

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

### ENTER Button

Use this button to make selections.

### 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 using the built-in printer.

### MENU Button

Use the **MENU** button to access the Main Menu options of the tester. For information about the options, see "Options Menu".

## CONNECTIONS AND DATA PORTS



- 1 Integrated thermal printer
- 2 Release lever for the paper compartment
- 3 Paper slot
- 4 LCD screen
- 5 Keypad
- 6 Battery test cable
- 7 Spring-loaded data card slot for test data storage and software upgrades.
- 8 Infrared temperature sensor with a range of -28 °C to +93 °C (-20 °F to +200 °F)
- 9 Data transmitter: sends results to a PC using an optional hardware and software kit.

# CHAPTER 2: OVERVIEW

## DATA ENTRY METHODS

To perform a particular test or function, the tester will ask for different types of information. This means that the methods you use to enter information will change depending on the type of information requested. The four types of entry methods are described below.

Typically, the soft key below the right half of the screen confirms your choice, although the word above it may vary. In a similar fashion, the soft key below the left half of the screen cancels your choice or returns you to the previous screen, although the word above it may also vary.

### MENU ICONS

A menu icon is a graphical representation of a function you can select. To select an icon, use the **LEFT** or **RIGHT ARROW** key to highlight it. Highlighting changes the icon to a white picture on a black background. To confirm your selection, press the appropriate soft key.

### OPTION BUTTONS

Some lists have option buttons before each item. To select an item, use the **UP/DOWN ARROW** keys to move the dot into the button next to the item you want. You can also use the alphanumeric keypad to enter the number preceding the option button. To confirm your selection, press the appropriate soft key.

### SCROLLING LISTS

Scrolling lists contain items that extend above and below the screen or the selection box that contains them. To indicate that there are more items, the symbols **UP/DOWN** appear to the right of the first visible or highlighted item on the list.

To select from this type of list, use the **UP/DOWN ARROW** keys to scroll to the item, or use the keypad to enter your choice, and press the appropriate soft key.

## ALPHANUMERIC ENTRIES

Even though the tester does not use an alphanumeric keypad it is possible to enter alphanumeric values. When applicable the alphanumeric values appear on the display. Use the **UP/DOWN** or **LEFT/RIGHT ARROW** keys to scroll and confirm this with the > key. To return one or more steps use the < key.

## MENU



Press the **MENU** button to access the Options Menu.



Use the **UP** and **DOWN** arrows to move to the line you want to edit.



Press the **ENTER** button to make highlighted line editable.



Use the **UP** and **DOWN** arrows to select the character for that cursor location.



Press the **ENTER** button to move to the next location.



Press the **MENU** button to return to the Options Menu.

Option	Explanation
<b>VIEW/PRINT</b>	Display the previous test result. Press the <b>PRINT</b> button to print the results.
<b>PERFORM TEST</b>	Begin the Battery Test procedure.
<b>LANGUAGE</b>	Select a language for the tester.
<b>SET ADDRESS</b>	Enter the address to display on the top of the printout. (Limit: 8 lines, 21 characters per line)
<b>SET TIME</b>	Select 24-hour or AM/PM and set the time.
<b>SET DATE</b>	Select the date format as well as set the correct date.
<b>COUNTER</b>	Clear or display battery and system test by results.
<b>CONTRAST</b>	Adjust the contrast setting of the tester display.
<b>TEMP. UNITS</b>	Select the temperature units Degrees F or Degrees C
<b>VOLTMETER</b>	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 return oto the menu.

# CHAPTER 3:

# TEST PREPARATION

## INSPECTING THE BATTERY

Before starting the test visually inspect the battery for:

- Cracked, buckled, or leaking case. If you see any of these defects, replace the battery.
- Corroded, loose, or damaged cables and connections. Repair or replace them as needed.
- Corrosion on the battery terminals, and dirt or acid on the case top. Clean the case and terminals using a wire brush and a mixture of water and baking soda.
- Low electrolyte level. If the electrolyte level is too low, add distilled water to fill up and fully charge the battery. Do not overfill.
- Corroded or loose battery tray and hold-down fixture. Tighten or replace as needed.

## TESTING OUT-OF-VEHICLE (BATTERY TEST)

The preferred battery test location is in the vehicle. However, if you plan to test out of the vehicle:

- Always disconnect the negative cable from the battery first and reconnect it last.
- Always use a carry tool or strap to lift and transport the battery.

## TESTING IN-VEHICLE (SYSTEM TEST)

The preferred test position is at the battery posts.

**AT THE START OF THE TEST, MAKE SURE ALL VEHICLE ACCESSORY LOADS ARE OFF, THE KEY IS NOT IN THE IGNITION, AND THE DOORS ARE CLOSED.**

## CONNECTING TO THE BATTERY

**CAUTION: DO NOT CONNECT THE TESTER TO A VOLTAGE SOURCE GREATER THAN 30 VDC.**

Connect the clamps to the battery: the red clamp to the positive (+) terminal and the black clamp to the negative (-) terminal.

If you connect the clamps in the wrong polarity (positive to negative or negative to positive), the tester displays CLAMPS REVERSED! Reconnect the clamps correctly.

To make sure both sides of the clamps are gripping the terminals, rock the each clamp back and forth. A poor connection will prevent testing, and the tester will display the message CHECK CONNECTION. If the message reappears after you have correctly reconnected the clamps, clean the terminals and reconnect.

## SETTING USER PREFERENCES

Before starting your test you may want to customize the use of your analyzer by setting preferences. The menu has settings for the display's date, time and contrast, among others.



To conserve the analyzer's internal batteries, the tester will turn off after 30 seconds of inactivity.

# CHAPTER 4: BATTERY TEST

The tester guides you through the steps of selecting your battery test parameters and interpreting the results. Before you start the test, review the instructions in Chapter 3: Test Preparation.

1. In the Main Menu select the **PERFORM TEST**.

Press the **ENTER** soft key to continue.

2. Select **BATTERY TEST**.

- BATTERY TEST**
- NEW BATTERY TEST**
- START-STOP TEST**

Press the **ENTER** soft key to continue.

3. Select the **BATTERY LOCATION**.

- IN VEHICLE**
- OUT OF VEHICLE**

Press the **ENTER** soft key to continue.

4. Select the **BATTERY TYPE**.

- REGULAR FLOODED**
- AGM FLAT PLATE**
- AGM SPIRAL**
- GEL**

Press the **ENTER** soft key to continue.

5. Select the battery's capacity rating standard. The standard, and the rating units required are printed on the battery label. If the information is unreadable, contact the battery manufacturer.

- EN**
- DIN**
- SAE**
- IEC**
- JIS**

## BATTERY STANDARDS

Rating System	Description	Range
JIS	Japanese Industrial Standard: (shown on a battery as a combination of numbers and letters.)	from 26A17 to 245H52
EN (A)	European Norm	100 to 1200
DIN (A)	Deutsche Industrie-Norm	100 to 750
SAE (A)	European labeling of CCA	100 to 1200
IEC (A)	International Electrotechnical Commission	100 to 750

If you select JIS, the analyzer asks for the JIS part number. Scroll to the part number. To increase your scrolling speed, hold the **UP** or **DOWN ARROW** key, or use the **LEFT** or **RIGHT ARROW** key to move up or down four part numbers at a time.

Press the **ENTER** soft key to continue.

6. Press an **UP** or **DOWN ARROW** key to select the **BATTERY RATING**.



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.

8. The temperature question is asked only if it can impact the test result.

## BATTERY TEST RESULTS

Decision	Interpretation
<b>GOOD BATTERY</b>	Return the battery to service.
<b>GOOD-RECHARGE</b>	Fully charge the battery and return it to service.
<b>CHARGE &amp; RETEST</b>	Fully charge the battery and retest. Failure to fully charge the battery before retesting may cause inaccurate results. If <b>CHARGE &amp; RETEST</b> appears again after you fully charge the battery, replace the battery.
<b>REPLACE BATTERY</b>	Replace the battery and retest. A <b>REPLACE BATTERY</b> 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.
<b>BAD CELL-REPLACE</b>	Replace the battery and retest.

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.

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

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

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



# CHAPTER 5: NEW BATTERY TEST

The tester guides you through the steps of selecting your battery test parameters and interpreting the results. Before you start the test, review the instructions in Chapter 3: Test Preparation.

1. In the Main Menu select the **PERFORM TEST**.

Press the **ENTER** soft key to continue.

2. Select **NEW BATTERY TEST**.

- BATTERY TEST
- NEW BATTERY TEST**
- START-STOP TEST

Press the **ENTER** soft key to continue.

3. Select the **BATTERY LOCATION**.

- IN VEHICLE**
- OUT OF VEHICLE

Press the **ENTER** soft key to continue.

4. Select the **BATTERY TYPE**.

- REGULAR FLOODED**
- AGM FLAT PLATE
- AGM SPIRAL
- GEL

Press the **ENTER** soft key to continue.

5. Select the battery's capacity rating standard. The standard, and the rating units required are printed on the battery label. If the information is unreadable, contact the battery manufacturer.

- EN**
- DIN
- SAE
- IEC
- JIS

## BATTERY STANDARDS

Rating System	Description	Range
JIS	Japanese Industrial Standard: (shown on a battery as a combination of numbers and letters.	from 26A17 to 245H52
EN (A)	European Norm	100 to 1200
DIN (A)	Deutsche Industrie-Norm	100 to 750
SAE (A)	European labeling of CCA	100 to 1200
IEC (A)	International Electrotechnical Commission	100 to 750

If you select JIS, the analyzer asks for the JIS part number. Scroll to the part number. To increase your scrolling speed, hold the **UP** or **DOWN ARROW** key, or use the **LEFT** or **RIGHT ARROW** key to move up or down four part numbers at a time.

Press the **ENTER** soft key to continue.

6. Press an **UP** or **DOWN ARROW** key to select the BATTERY RATING.

500  EN (A)

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.

8. The temperature question is asked only if it can impact the test result.

## NEW BATTERY TEST RESULTS

Decision	Interpretation
<b>GOOD BATTERY</b>	Return the battery to service.
<b>GOOD-RECHARGE</b>	Fully charge the battery and return it to service.
<b>CHARGE &amp; RETEST</b>	Fully charge the battery and retest. Failure to fully charge the battery before retesting may cause inaccurate results. If CHARGE & RETEST appears again after you fully charge the battery, replace the battery.
<b>REPLACE BATTERY</b>	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.
<b>BAD CELL-REPLACE</b>	Replace the battery and retest.
<b>CYCLING REQUIRED</b>	Battery needs to be cycled for optimal performance.
<b>REST &amp; RETEST</b>	Battery could have a surface charge, because it has recently been charged.

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.

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

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

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



# CHAPTER 6: START-STOP TEST

The tester guides you through the steps of selecting your battery test parameters and interpreting the results. Before you start the test, review the instructions in Chapter 3: Test Preparation.

- In the Main Menu select **PERFORM TEST**.  
Press the **ENTER** soft key to continue.
- Select **START-STOP TEST**.
  - BATTERY TEST
  - NEW BATTERY TEST
  - START-STOP TEST
 Press the **ENTER** soft key to continue.
- Select the **BATTERY LOCATION**.
  - IN VEHICLE
  - OUT OF VEHICLE
 Press the **ENTER** soft key to continue.
- Select the **BATTERY TYPE**.
  - REGULAR FLOODED
  - AGM FLAT PLATE
  - AGM SPIRAL
  - GEL
 Press the **ENTER** soft key to continue.
- Select the **BATTERY NUMBER**. The options depend on the battery type under test. In case of 'OTHER' you have to manually input the battery standard and rating.  
Press the **ENTER** soft key to continue.
- 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.

## START-STOP TEST RESULTS

Decision	Interpretation
<b>GOOD BATTERY</b>	Return the battery to service.
<b>GOOD-RECHARGE</b>	Fully charge the battery and return it to service.
<b>CHARGE &amp; RETEST</b>	Fully charge the battery and retest. Failure to fully charge the battery before retesting may cause inaccurate results. If CHARGE & RETEST appears again after you fully charge the battery, replace the battery.
<b>REPLACE BATTERY</b>	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.
<b>BAD CELL-REPLACE</b>	Replace the battery and retest.

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.

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

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

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

# CHAPTER 7: SYSTEM TEST

## 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 display alternates between the decision on the starter system and the measured voltage drop.

## STARTER SYSTEM TEST RESULTS

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

## CHARGING SYSTEM TEST

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

## CHARGING SYSTEM TEST RESULTS

Decision	Interpretation
<b>NO PROBLEMS</b>	System is showing normal output from the alternator.
<b>NO OUTPUT</b>	No alternator output detected. <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 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>
<b>LOW OUTPUT</b>	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.

- 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.
- The regulator controls voltage output based on the battery voltage, under-hood temperature, and vehicle loads used. In other words, it controls the maximum voltage the system can produce based on the current needs and amount of current that can be produced by the spinning of the rotor in the alternator. The normal high limit of a typical automotive regulator is 15.0 volts +/-0.5. Refer to the manufacturer specifications for the correct limit, which may vary by vehicle type.
- A high charging rate will overcharge the battery and may decrease its life and cause it to fail. If the battery test decision is **REPLACE** and the charging system test shows **CHARGING VOLTAGE HIGH**, check the battery's electrolyte levels. A symptom of overcharging is battery fluid spewing through the vent caps, which causes low electrolyte levels and harms the battery.

# CHAPTER 8:

# 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
<b>BAT. TEMPERATURE</b>	Select ambient temperature above or below 0 degrees Celsius.
<b>CHARGE STATE</b>	Select before or after battery has been charged.
<b>SURFACE CHARGE DETECTED</b>	Remove the surface charge before it begins testing. Testing will resume after charge has been removed.
<b>CHECK CONNECTION</b>	One or both clamps are not making proper contact with the battery terminals.
<b>ENGINE REV NOT DETECTED PRESS ENTER WHILE REVVING</b>	Tester has not detected an increase in engine r.p.m.
<b>REVERSE CONNECTION</b>	Clamps are connected in the wrong polarity: positive to negative or negative to positive.
<b>UNSTABLE BATTERY</b>	Out-of-vehicle. Weak battery, should be charged and retested.
<b>WIGGLE CLAMPS</b>	Clamps are not making good contact with battery terminals.

# CHAPTER 9: ERROR MESSAGES

Error Message	Interpretation
<b>BATTERY POWER TOO LOW TO USE PRINTER. CONNECT TO FULLY CHARGED BATTERY 11.50 TO 16.00V</b>	Battery being tested has fallen below 9 volts. Connect to a fully charged battery to use the printer.
<b>CONNECT TO 12V BATTERY</b>	Tester is not connected to the battery.
<b>LOW INTERNAL AA BATTERIES. REPLACE AA BATTERIES SOON!</b>	Internal AA batteries are low and need to be replaced. See "Maintenance & Troubleshooting" section.
<b>NON 12 VOLT SYSTEM DETECTED</b>	System being tested is not 12-volts.
<b>PRINTER DOOR OPEN. CLOSE DOOR AND TRY TO PRINT AGAIN</b>	Door covering printer paper is not secure.
<b>PRINTER OUT OF PAPER REPLACE WITH THERMAL PRINTER PAPER. 2.5 IN. DIA. MAX. 2.23 IN. WIDE MAX.</b>	Printer is out of thermal paper. Replace with new roll. See "Maintenance & Troubleshooting" section.

# CHAPTER 10: 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.



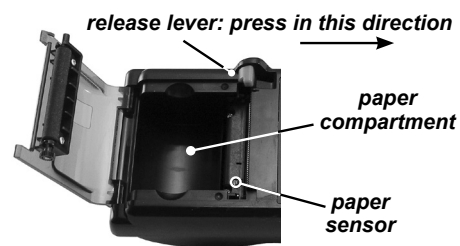
4. To attach a new cable, align the cable and tester housings and push together. Insert the screw and tighten.

## CHANGING THE PRINTER PAPER

1. The IR printer only uses thermal paper in a roll with the dimensions 2.25 in x 85 ft (57 mm x 25.9 m). You can purchase replacement rolls at most office supply stores.

2. To replace the paper roll:

Unlock the printer door by gently pressing on the red lever. Remove the spent roll.



3. Place a new roll of paper in the compartment, and pull the paper forward so that it extends past the serrated edge of the paper slot.



4. Close the door and make sure the lever locks securely.

## PRINTER TROUBLESHOOTING

If the tester is not connected to a 12-volt battery with at least 11.5 volts of power or the paper sensor does not detect paper in the compartment during the print process, the tester displays one of error messages described in the table:

Error Message	Interpretation
<b>PRINTER OUT OF PAPER REPLACE WITH THERMAL PRINTER PAPER. 2.5 IN. DIA. MAX 2.25 IN. WIDE MAX</b>	<ul style="list-style-type: none"> <li>• Verify that the paper is inserted correctly.</li> <li>• Insert a new roll of paper.</li> <li>• Verify that the paper sensor is clean and undamaged</li> </ul>
<b>BATTERY POWER TOO LOW TO USE PRINTER. CONNECT TO FULLY CHARGED BATTERY. 11.50V TO 16.00V</b>	<p>To print, the tester must be properly connected to a vehicle battery having at least 9 volts.</p> <ul style="list-style-type: none"> <li>• Connect to a vehicle battery with enough voltage to enable printing.</li> <li>• Make sure that the clamps are connected properly: red clamp to the positive (+) terminal and the black clamp to the negative (-) terminal.</li> <li>• Check that both sides of the clamps are making contact with the terminals.</li> </ul>
<b>PRINTER DOOR OPEN CLOSE DOOR AND TRY TO PRINT AGAIN</b>	<ul style="list-style-type: none"> <li>• Check that the door covering the printer paper is properly closed and latched.</li> </ul>

## 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.

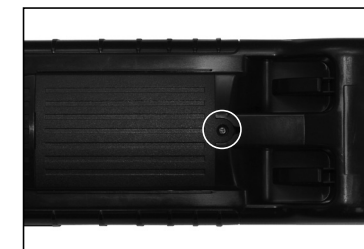
## REPLACING THE BATTERY

The tester 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.

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

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 series is made by Midtronics, Inc., and is protected by one or more U.S. and foreign patents. For specific patent information, contact Midtronics, Inc. at +1 630 323-2800.

## LIMITED WARRANTY

Midtronics products are warranted to be free of defects in materials and workmanship for a period of one (1) year from date of purchase. Midtronics will, at our option, repair or replace the unit with a re-manufactured unit. This limited warranty applies only to Midtronics battery testers and does not cover any other equipment, static damage, water damage, overvoltage, dropping the 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 to modify the cable assembly.

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