

EXP-1000 FHD

Expendable electrical diagnostic platform

INSTRUCTION MANUAL



FOR TESTING 12-VOLT TRUCK- AND AUTOMOTIVE BATTERIES AND 12 AND 24-VOLT 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.



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.

CONVENTIONS

Convention	Description
	The safety symbol followed by the word WARNING or CAUTION indicates instructions for avoiding hazardous conditions and personal injury.
CAUTION	The word CAUTION indicates instruction for avoiding equipment damage.
	The wrench symbol indicates procedural notes and helpful information.
UP ARROW	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.

REGISTERING YOUR ANALYZER

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, and order parts and accessories. In addition, you'll be alerted to any important information, like product updates and special offers.

To register, log on at 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 analyzer.



Serial number location

CHAPTER 2: DESCRIPTION

CONNECTIONS AND DATA PORTS



REMOVING AND INSERTING THE DATA CARD

The analyzer ships with a storage card slot to protect it from dust and debris. To remove the 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.

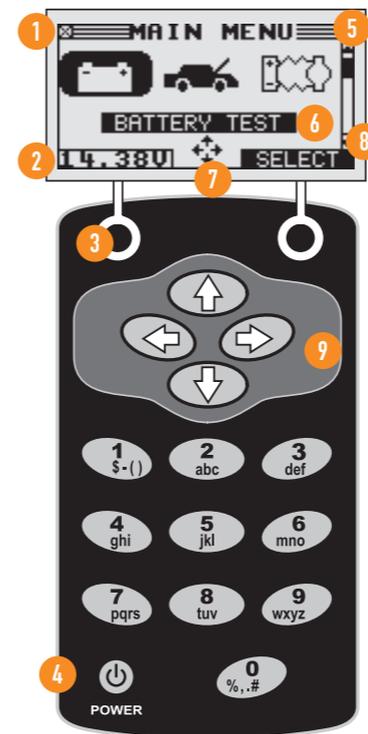
WARNING

CAUTION: TO PREVENT DAMAGE TO THE ANALYZER'S CIRCUITRY, DO NOT CONNECT THE ANALYZER TO A VOLTAGE SOURCE GREATER THAN 30 VDC.

1. Data transmitter: sends test results to a PC using an optional hardware and software kit.
2. Infrared temperature sensor with a range of -28 °C to +93 °C
3. 6-pin connector for the battery test cable.
4. Input for accessories. (optional)
5. Spring-loaded data card slot for test data storage and software upgrades.
6. DB-9 connector for future expandability.

DISPLAY AND KEYPAD

The keypad and display work together to help you quickly find and use the right tools at the right time. The display also keeps you on track with on-screen navigation aids, directions and messages.



1 INTERNAL BATTERIES STATUS INDICATOR

This indicator appears in the screen's top left corner, lets you know the status and charge level of the analyzer's six 1.5-volt batteries. The X in the top left corner of the screen shows that the analyzer is powered by the battery you're testing to conserve the analyzer's internal batteries.

2 VOLTMETER

When you first connect the analyzer to a battery it functions as a voltmeter. The voltage reading appears above the left soft key until you move to other menus or functions.

3 SOFT KEYS

Press the two Soft Keys linked to the bottom of the screen to perform the functions displayed above them. The functions change depending on the menu or test process. So it may be helpful to think of the words appearing above them as part of the keys. Some of the more common softkey functions are SELECT, BACK, and END.

4 POWER KEY

Press the POWER button to turn the analyzer on and off. The analyzer also turns on automatically when you connect its test leads to a battery.

5 TITLE BAR

The title bar shows you the name of the current menu, test tool, utility, or function.

6 SELECTION AREA

The selection area below the Title Bar contains selectable items or dialog boxes that display information or require a response.

7 MENU SCREEN ARROWS

When displayed in menu screens, the menu screen arrows show you which ARROW key on the keypad to press to display other icons or screens. The Up and Down Menu Screen Arrows, for example, indicate when to press the UP () and DOWN () ARROW keys to display the screens above and below the current screen. The Left and Right Menu Screen Arrows tell you when to use the LEFT () or RIGHT () ARROW keys to select an icon. When displayed under a list of options, the menu screen arrows show you which keypad arrow to press to highlight a character or item in a list.

8 SCROLL BAR

Another navigational aid is the scroll bar on the right side of the screen. The position of its scroll box shows you whether the screen is the top (or only screen), middle, or last in a series.

9 ARROW KEYS

Press the UP ARROW key to move up to the next selectable item or row. When entering text, use the UP ARROW key to move to the previous character.

CHAPTER 2: DESCRIPTION

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 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

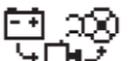
Even though the tester does not use an alphanumeric keypad it is possible to enter alphanumeric values. When applicable the alphanumeric values appear on the display. Use the UP/DOWN or LEFT/RIGHT ARROW keys to scroll and confirm this with the > key. To return one or more steps use the < key.

MENU STRUCTURE

This section will help you get to your destination while letting you know what test leads you may need when you arrive. The test leads are represented by symbols for their connectors.

MAIN MENU

The Main Menu is the starting point for all tools and utilities, which are depicted as icons. Some icons lead directly to the function they represent, while others are menu icons that lead to two or more functions. Menu icons are marked here with an asterisk (*) and are mapped on the following pages.

Icon	Description
	The BATTERY TEST tests a battery using the battery information you select in a series of screens.
	The SYSTEM TEST tests a battery, and the starting and charging system.
	CABLE DROP TEST tests both sides of a circuit simultaneously for voltage. Three preset tests and 1 user-defined.
	GENERATE PAIR allows you to check whether two batteries can be used together.
	QC TEST is used for testing stock or compound batteries.

Icon	Description
	* PRINT/VIEW for all statistical info and software version info.
	* INFO contains a test counter, data transfer utility, and the tester software version and serial number.
	* UTILITY includes functionality to setup the tester.

Print/View Menu

Icon	Description
	VIEW TEST displays the last test results
	VIEW CABLE TEST displays the last cable drop test results.
	VIEW QC TEST displays the last QC test result.

Info Menu

Icon	Description
	TOTALS displays the total battery tests performed since the tester was first used, the totals by decision, or allows you to clear the counters.
	An optional IR software and hardware package enables you to transfer test data to a PC.
	Displays the software version, total tests from first use, and serial number.

Utility Menu

Icon	Description
	The CONFIG TESTER menu allows you to set the following parameters: TIME, DATE, FORMAT, TEMPERATURE UNITS, WRITE FAIL, VEHICLE ID TYPE and DEPOT ID.
	Settings to adjust the contrast level and backlight time.

Icon	Description
	Enables you to configure the printer to IrDA.
	Create your own address details for printouts with the SHOP INFO icon.
	If you have created a coupon in the EDIT COUPON utility, use COUPON to enable or disable.
	EDIT COUPON allows you to create and store up to three separate coupons to be printed on test results.
	With the LANGUAGE menu you can select one of the 24 available languages.
	With FORMAT CARD you erase all information on the data card.
	With UPDATE you can install new software on the tester.
	VEHICLE DRAIN
	BATTERY ID

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 to 1/2 above the top of the plates 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

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

The preferred test position is at the battery posts. If you must test at a remote-post location, it should have both a positive and negative post.

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 THE BATTERY TEST CABLE

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

Connect the battery test cable to the tester by first aligning the cable connector's 6 pins with the holes on top of the tester. Firmly insert the connector and tighten the locking ring. 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 in the Utility Menu. The menu has settings for the display's date and time, the contrast and backlight time, a utility to customize printouts for the optional IR printer, 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. Type in the USER ID (consisting of two letters)

Press the NEXT soft key to continue. The BACK soft key returns you to the Main Menu at the start of the test and to the previous screen as you progress.

2. Select the BATTERY AGE.

- 1 NEW BATTERY
- 2 IN SERVICE

Press the NEXT soft key to continue.

In case of NEW BATTERY continue with step 6. BATTERY TYPE.

3. Select the BATTERY LOCATION.

- 1 OUT OF VEHICLE
- 2 IN VEHICLE

Press the NEXT soft key to continue.

4. If OUT OF VEHICLE was chosen go to step 6. If IN VEHICLE was chosen, please enter the FLEET ID/VIN.

Press the NEXT soft key to continue.

5. Select the VEHICLE TYPE.

- 1 BUS/TRUCK
- 2 CAR/LCV

Press the NEXT soft key to continue. If CAR/LCV was chosen go to step 6. If BUS/TRUCK was chosen, the tester will ask you to CONNECT TO BATTERY 1.

6. Enter the BATTERY ID (this function is only shown when enabled in the Utility menu). Press the NEXT soft key to continue.

7. Select the BATTERY TYPE.

- 1 REGULAR/FLOODED
- 2 AGM FLAT
- 3 AGM SPIRAL
- 4 EFB
- 5 GEL

Press the NEXT soft key to continue.

8. If you have chosen EFB the tester will give you a battery rating list to choose from. If other: select the battery's rating standard. The standard, and the rating units required are printed on the battery label. If the information is unreadable, contact the battery manufacturer.

- 1 EN
- 2 JIS
- 3 DIN
- 4 SAE
- 5 IEC
- 6 CCA

10. If you select JIS, the tester asks for the battery rating. Scroll to the correct rating. 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 NEXT soft key to continue.

11. Measure the TEMPERATURE by aiming the tester 5 cm from the sides or top of the battery case. As soon as the temperature reading is stable the operator can press NEXT.

The tester will now test the battery. For the next few seconds the tester will display the word TESTING and a stopwatch while it evaluates the battery.

ADDITIONAL TEST REQUIREMENTS

For a more decisive result the tester may ask for additional information or probe deeper into the battery's condition. The following messages and instructions may appear before the tester displays the results of your test. Also, if you are testing in vehicle on a bus/truck, you may be required to also connect the tester to the second battery. Follow the instructions on the tester.

SYSTEM NOISE

To perform a correct measurement the tester requires the vehicle to be in rest. After the car has been driven some vehicle specific systems might still be active in the background. The tester will detect this and displays the message SYSTEM NOISE. When this message appears switch off all consumers (radio, airconditioning) and remove the key from the ignition. As soon as there is no more activity in the vehicle the tester will continue testing and display the test result.

UNSTABLE BATTERY DETECTED

A battery that is weak or that has just been charged may retain enough electrical activity to be detected by the tester and will adversely affect the test results. A fully charged battery should stabilize quickly, after which the tester will automatically retest. Weak batteries should be charged and retested. If the battery is fully charged, check the clamp connections.

SURFACE CHARGE

The battery can hold a surface charge if the engine has been running or after the battery has been charged. The tester may prompt you to remove the surface charge before it displays a test result.

1. Follow the instructions indicating when to turn the headlights on and off (IN-VEHICLE)

2. The tester will resume testing after it detects that the surface charge is removed.

DEEP SCAN TEST

In some cases the tester may need to further analyze the battery to determine whether the battery should be replaced or it has a significant chance to be recovered. It will then conduct a Deep Scan Test of the battery for a few seconds. This test will typically be performed on batteries that are in a low state of charge.

CHAPTER 4: BATTERY TEST

BATTERY TEST RESULTS

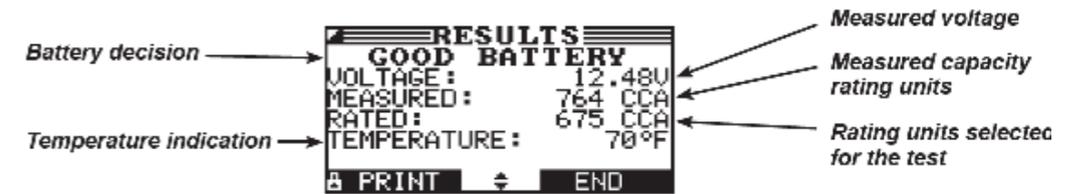
After the test the tester will display one of five battery decisions with the complete results in a series of screens as shown in the figure below. Use the UP/DOWN ARROW keys to scroll through each result. To send the results to an IR printer, press the PRINT soft key. To return to the Main Menu, press the END soft key, or to continue testing if you've selected the system text, press the NEXT soft key. You'll have the opportunity to print all the results at the end of the system test.

Decision	Recommended Action
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. Failure to fully charge the battery before retesting may cause false readings. If CHARGE & RETEST appears again after you fully charge the battery, replace the battery.
REPLACE ADVISED	Replace the battery and retest. A REPLACE ADVISED 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.
FROZEN BATTERY	Thaw the battery and retest. Do NOT charge the battery!

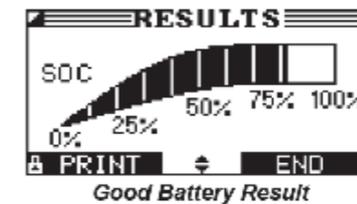
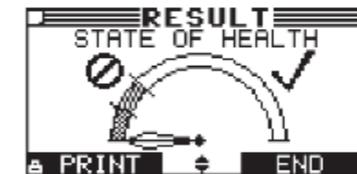
All battery, starting and charging test results are stored on the SD card. This data can be copied from the card and used to verify/compare results.

NEW BATTERY TEST RESULTS

Decision	Recommended Action
GOOD BATTERY	Return the battery to service.
CHARGE & RETEST	Fully charge the battery and retest. Failure to fully charge the battery before retesting may cause false readings. If CHARGE & RETEST appears again after you fully charge the battery, replace the battery.
REPLACE ADVISED	Replace the battery and retest. A REPLACE ADVISED 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.
FROZEN BATTERY	Thaw the battery and retest. Do NOT charge the battery!
CYCLE BATTERY	Battery needs to be cycled for optimal performance.
REST & RETEST	Battery could have a surface charge, because it has recently been charged.



General health of the battery and its ability to deliver its specified performance compared with a new battery



CHAPTER 5: SYSTEM TEST

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.

The System Test includes 3 tests that provide a complete diagnosis of the vehicle's electrical system:

- BATTERY TEST
- STARTER TEST
- ALTERNATOR TEST

BATTERY AND STARTER 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. Type in the USER ID (consisting of two letters)

Press the NEXT soft key to continue. The BACK soft key returns you to the Main Menu at the start of the test and to the previous screen as you progress.

2. Please enter the type of test.
3. Now enter the FLEET ID/VIN.

Press the NEXT soft key to continue.

4. Select the VEHICLE TYPE.

- 1 BUS/TRUCK
- 2 CAR/LCV

Press the NEXT soft key to continue. If CAR/LCV was chosen go to step 6. If BUS/TRUCK was chosen, the tester will ask you to CONNECT TO BATTERY 1.

5. Enter the BATTERY ID (this function is only shown when enabled in the Utility menu). Press the NEXT soft key to continue.

6. Select the BATTERY TYPE.

- 1 REGULAR/FLOODED
- 2 AGM FLAT
- 3 AGM SPIRAL

- 4 EFB

Press the NEXT soft key to continue.

7. If you have chosen EFB the tester will give you a battery rating list to choose from. If other: select the battery's rating standard. The standard, and the rating units required are printed on the battery label. If the information is unreadable, contact the battery manufacturer.

- 1 EN
- 2 JIS
- 3 DIN
- 4 SAE
- 5 IEC
- 6 CCA

10. If you select JIS, the tester asks for the battery rating. Scroll to the correct rating. 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 NEXT soft key to continue.

11. Measure the TEMPERATURE by aiming the tester 5 cm from the sides or top of the battery case. As soon as the temperature reading is stable the operator can press NEXT.

8. The tester will now test the battery. For the next few seconds the tester will display the word TESTING and a stopwatch while it evaluates the battery.

9. Have your amp clamp ready and select the AMP CLAMP availability. If the amp clamp is already configured the tester will skip this step.

- 1 INTEGRATED
- 2 OTHER
- 3 NONE

Press the NEXT soft key to continue.

10. Attached the Amp clamp to the tester, do not connect it around any wire. If you chose 'OTHER' the tester will request you to place the amp clamp around the negative cable and point the amp clamp away from the battery.

Press the NEXT soft key to continue.

11. Tester will zero out the Amp clamp.

12. Place Amp clamp around negative cable.

Press the NEXT soft key to continue.

13. Start the vehicle's engine when prompted. If after the vehicle started and the results do not appear after approximately 30 seconds, the tester will ask if the engine has started, with the options YES or NO. If you choose no the tester will give you the options to either end the test and return to the battery test, or use the arrow keys to go down and see the battery test results.

14. The analyzer displays one of the decisions and the results in a series of screens.



NOTE: In some cases, the tester may not detect the vehicle's starting profile. It will display the soft key options STARTED and NO START. If you select STARTED, the analyzer skips to the Alternator Test. If you select NO START, the test process ends.

STARTER SYSTEM TEST RESULTS

Decision	Action
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 retest the starter system.
REPLACE BATTERY	Replace the battery and retest before testing the alternator test.
NO START	The engine did not start and the test was aborted.
LOW CRANKING AMPS	The tester didn't detect the vehicle's starting profile and skipped the Starter Test.

5 MINUTE DISCHARGED BATTERY TEST

In some cases, when dealing with a discharged battery, the dynamic response test will be prompted. Usually it is hard to determine the condition of a discharged battery, but in this way we can base the condition on how the battery responds to this test.

1. The tester starts checking for alternator output.

NOTE: If necessary the analyzer will ask if you are testing a diesel engine. It will resume testing after you make your selection.

2. Depending on whether you are working with an integrated Amp clamp, you will be either prompted to TURN OFF LOADS AND ENGINE or asked to CHECK IF CLAMP POINTS AWAY FROM THE NEGATIVE BATTERY POST. In case of the former, turn off vehicle loads (blowers, interior light, radio, etc.) and the engine. Press the NEXT soft key to continue.

3. TURN ALL VEHICLE LOADS OFF, IDLE ENGINE: Turn off vehicle loads (blowers, interior light, radio, etc.) and idle the engine. Press the NEXT soft key to continue.

4. Enter the charge current taken by the battery using the UP and DOWN ARROW keys. Press the NEXT soft key to continue. After a few minutes this is asked again to determine the battery's condition.

5. Enter the charge current taken by the battery using the UP and DOWN ARROW keys. Press the NEXT soft key to continue.

ALTERNATOR TEST

1. The tester starts checking for alternator output.

NOTE: If necessary the tester will ask if you are testing a diesel or gasoline engine. It will resume testing after you make your selection.

2. Depending on whether you are working with an integrated Amp clamp, you will be either prompted to TURN ALL VEHICLE LOADS OFF, IDLE ENGINE or asked to CHECK IF CLAMP POINTS AWAY FROM THE NEGATIVE BATTERY POST. In case of the former, turn off vehicle loads (blowers, interior light, radio, etc.) and keep the engine running. Press the NEXT soft key to continue.

CHAPTER 5: SYSTEM TEST

3. Now REV ENGINE WITH LOADS OFF FOR 5 SECONDS. If the rev is detected the analyzer will show: ACQUIRING DATA...HOLD ENGINE RPM until the data are acquired. Tester now shows: ENGINE REV DETECTED, IDLE ENGINE.
4. TESTING ALTERNATOR AT IDLE, LOADS OFF: The analyzer will next test the engine at idle for comparison to other readings, and then test the diode ripple. Excessive ripple usually means one or more diodes have failed in the alternator or there is stator damage.
5. TURN HIGH BEAMS AND BLOWER MOTOR ON, IDLE ENGINE: After a few seconds, the Tester will ask you to turn on the accessory loads. It will determine if the charging system is able to provide enough current for the demands of the electrical system.

IMPORTANT: Turn on the high-beam headlights, the blower to high and the rear defogger. Do not use cyclical loads such as air conditioning or windshield wipers.
6. TESTING ALTERNATOR AT IDLE, LOADS ON: The analyzer will determine if the charging system is able to provide sufficient current for the demands of the vehicle's electrical system.
7. Now once more you are requested to REV ENGINE WITH LOADS ON, if the rev is detected again, the tester will show: ACQUIRING DATA...HOLD ENGINE RPM until the analyzer shows ENGINE REV DETECTED, IDLE ENGINE.
8. ANALYZING CHARGING SYSTEM DATA: The Tester is completing its final analysis of the charging system data.
9. TURN OFF LOADS AND ENGINE: Press the NEXT soft key to display the results. In case you are using an Amp clamp
10. DRAIN TEST or DRAIN CURRENT: This will be asked ONLY when the Amp clamp is in use. Depending on whether or not using the integrated clamp, press NEXT to proceed drain test or fill in the current as displayed on the Amp clamp.

ALTERNATOR TEST RESULTS

Decision	Action
NO PROBLEMS	The system is showing normal output from the alternator. No problem detected.
NO VOLTAGE	<p>The alternator is not providing charging current to the battery.</p> <ul style="list-style-type: none"> • Check the belts to ensure the alternator is rotating with the engine running. Replace broken or slipping belts and retest. • 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. • 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.)
LOW VOLTAGE	<p>The alternator is not providing enough current to power the system's electrical loads and charge the battery.</p> <ul style="list-style-type: none"> • Check the belts to ensure the alternator is rotating with the engine running. Replace broken or slipping belts and retest. • Check the connections from the alternator to the battery. If the connection is loose or heavily corroded, clean or replace the cable and retest.

HIGH VOLTAGE

The voltage output from the alternator to the battery exceeds the normal limits of a functioning regulator.

- Check to ensure there are no loose connections and that the ground connection is normal. If there are no connection problems, replace the regulator. (Most alternators have a built-in regulator requiring you to replace the alternator. In older vehicles that use external voltage regulators, you may need to replace only the voltage regulator.)

DIODE DECISIONS

Decision	Action
EXCESSIVE RIPPLE	<p>One or more diodes in the alternator aren't functioning or there's stator damage, which is shown by an excessive amount of AC ripple current supplied to the battery.</p> <ul style="list-style-type: none"> • Make sure the alternator mounting is sturdy and that the belts are in good shape and functioning properly. If the mounting and belts are good, replace the alternator.
PHASE OPEN	The Tester has detected an open phase within the alternator. Replace the alternator.
DIODE OPEN	The Tester has detected a open diode within the alternator. Replace the alternator.
DIODE SHORT	The Tester has detected an shorted diode within the alternator. Replace the alternator.

CHAPTER 6:

GENERATE PAIR

This function checks whether two batteries can be used together and is always considered to be performed outside the vehicle. The batteries are NOT connected in the vehicle.

1. Type in the USER ID (consisting of two letters).

Press the NEXT soft key to continue. The BACK soft key returns you to the Main Menu at the start of the test and to the previous screen as you progress.

2. Select the BATTERY TYPE.

- 1 REGULAR
- 2 AGM
- 3 SPIRAL
- 4 GEL
- 5 EFB

Press the NEXT soft key to continue.

3. 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. If EFB was chosen, this step will be skipped.

- 1 EN
- 2 JIS
- 3 DIN
- 4 SAE
- 5 IEC
- 6 CCA

4. If you select JIS, the tester asks for the Battery Rating. 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 NEXT soft key to continue.

4. Press an UP or DOWN ARROW key or use the numeric keys to select the BATTERY RATING, or in the case of JIS, the part number. To increase your scrolling speed, hold down the UP or DOWN ARROW key. JIS????????????

Press the NEXT soft key to start the test.

5. Measure the TEMPERATURE.

Aim the tester 5 cm from the sides or top of the battery

case. As soon as the temperature reading is stable the operator can press NEXT.

For the next few seconds the tester will display the word TESTING and a stopwatch while it evaluates the battery.

6. Connect to another battery.

For the next few seconds the tester will display the word TESTING and a stopwatch while it evaluates the battery.

TEST RESULTS

BATTERY PAIR IN BALANCE

The batteries are working correctly and are balanced.

BATTERY PAIR OUT OF BALANCE: CHARGE BATTERY, REPLACE BATTERY

The batteries are not balanced with each other and should not be used together.

CHAPTER 7: CABLE DROP TEST

If the test results for the starter or charging systems indicate that there may be a problem, you may want to perform the Cable Drop Test to determine if it is due to worn cables or bad connections between the battery and the alternator or starter. Worn cables or bad connections create higher resistance, which causes a drop across the circuit. The voltage drop reduces current carrying capability that displays the same symptoms as a weak alternator or starter and causes premature battery failure.

There's no need to run the engine. The Cable Drop Test uses Midtronics' conductance technology to send a signal through the circuit at the component under test. The tester then simultaneously calculates voltage drop on the positive (+) and negative (-) sides of any circuit as well as the total voltage drop. The amperage range for each of the four tests is 0 to 1000 A. When you change the setting from the factory defaults, the tester will store your setting in memory for your next test.

There are three preset tests:

- **BATTERY/CHASSIS GROUND**
- **STARTER CIRCUIT**
- **ALTERNATOR CIRCUIT**

A fourth test, OTHER CIRCUIT, tests other grounds and circuits against your specified amperage capacity.

The test requires two test lead connections:

- Battery test leads at the component's output lead (the B+ or output screw on the alternator) and the component's housing as ground
- DMM test leads at the battery terminals

NOTE: The test requires a complete circuit. If you're testing a system with a remote solenoid, you can test from the battery to the solenoid, but not from the battery to the starter.

To begin, select the Cable Drop Test icon in the Main Menu and follow the instructions on the display.



IMPORTANT: For accurate results the battery should be good and fully charged before you perform a test.

1. Type in the USER ID (consisting of two letters).
2. Select the VEHICLE TYPE.
 - 1 BUS/TRUCK
 - 2 CAR/LCV

Press the NEXT soft key to continue.
3. Select CIRCUIT: Use the UP/DOWN ARROWS or the numerical keypad to select the Battery Ground Test (if BUS/TRUCK was chosen this will be Chassis Ground Test).
 - 1 BATTERY GROUND
 - 2 STARTER CIRCUIT
 - 3 ALT CIRCUIT
 - 4 OTHER CIRCUIT

Press the NEXT soft key to continue.

BATTERY/CHASSIS GROUND TEST

The Battery Ground Test measures the voltage drop for the ground strap.

4. SET AMPS: Use the UP/DOWN ARROWS or the keypad to select the rated amperage of the circuit you are testing. The default is 80 A.

80 A

Press the NEXT soft key to continue.

5. Connect the main clamps (battery test leads) to the battery and ground: positive (+) clamp to the battery's positive post; negative (-) clamp to the vehicle chassis.

6. Connect the DMM cable to the battery posts: positive (+) clamp to the positive post; negative clamp (-) to the negative post.

For the next few seconds the Tester will display the word TESTING and a stopwatch while it evaluates the battery ground.

BATTERY GROUND TEST RESULTS

```

BATTERY GROUND
CIRCUIT DROP: 0.08V
PASS
+ DROP: 0.00V
- DROP: 0.08V
PRINT END
    
```

Battery Ground Test PASS Result

If there is a problem, the decision is CLEAN AND RETEST OR REPLACE. To print the results, align the Tester's IR transmitter with the printer's receiver, and select the PRINT soft key. To return to the Main Menu, press the END key.

STARTER CIRCUIT

The Starter Circuit Test measures the voltage drop of the starter circuit.

3. SET AMPS: Use the UP/DOWN ARROWS or the keypad to select the rated amperage of the starter circuit. The default is 150 A.

150 A

Press the NEXT soft key to continue.

4. Connect the positive (+) clamp of the battery test leads to the starter's battery terminal stud. Connect the negative (-) clamp to the starter's housing.

5. Connect the positive (+) DMM clamp to the battery's positive (+) post. Connect the negative clamp (-) to the battery's (-) negative post.

For the next few seconds the Tester will display the word TESTING and a stopwatch while it evaluates the battery ground.

STARTER CIRCUIT TEST RESULTS

```

STARTER CIRCUIT
CIRCUIT DROP: 0.30V
PASS
+ DROP: 0.15V
- DROP: 0.15V
PRINT END
    
```

Starter Circuit PASS Result

If there is a problem, the decision is CLEAN AND RETEST OR REPLACE. To print the results, align the Tester's IR transmitter with the printer's receiver, and select the PRINT soft key. To return to the Main Menu, press the END key.

ALTERNATOR CIRCUIT

The Alternator Circuit Test measures the voltage drop of the alternator circuit.

3. SET AMPS: Use the UP/DOWN ARROWS or the keypad to select the rated amperage of the alternator circuit. The default is 80 A.

80 A

Press the NEXT soft key to continue.

4. Connect the positive (+) clamp of the battery test leads to the alternator's output stud (B+). Connect the negative (-) clamp to the alternator's housing.

CHAPTER 7:

CABLE DROP TEST

5. Connect the positive (+) DMM clamp to the battery's positive (+) post. Connect the negative clamp (-) to the battery's (-) negative post.

For the next few seconds the Tester will display the word TESTING and a stopwatch while it evaluates the battery ground.

4. Connect the positive (+) clamp of the battery test leads to the component's positive terminal (+). Connect the negative (-) clamp to the component's negative (-) terminal.

5. Connect the positive (+) DMM clamp to the battery's positive (+) post. Connect the negative clamp (-) to the battery's (-) negative post.

For the next few seconds the Tester will display the word TESTING and a stopwatch while it evaluates the battery ground.

ALTERNATOR CIRCUIT TEST RESULTS

```
ALT CIRCUIT
CIRCUIT DROP: 0.30V
PASS
+ DROP: 0.15V
- DROP: 0.15V
PRINT END
```

Alternator Circuit PASS Result

OTHER CIRCUIT TEST RESULTS

```
OTHER CIRCUIT
CIRCUIT DROP: 0.08V
PASS
+ DROP: 0.00V
- DROP: 0.08V
PRINT END
```

Other Circuit PASS Result

If there is a problem, the decision is CLEAN AND RETEST OR REPLACE. To print the results, align the Tester's IR transmitter with the printer's receiver, and select the PRINT soft key. To return to the Main Menu, press the END key.

If there is a problem, the decision is CLEAN AND RETEST OR REPLACE. To print the results, align the Tester's IR transmitter with the printer's receiver, and select the PRINT soft key. To return to the Main Menu, press the END key.

OTHER CIRCUIT

CHASSIS GROUND

Testing at 135A connect main clamps to battery positive post and negative clamp to vehicle chassis.

This test enables you to measure voltage drop across other components.

3. SET AMPS: Use the UP/DOWN ARROWS or the keypad to select the rated amperage of the circuit you are testing. The default is 10 A.

```
10 A
```

Press the NEXT soft key to continue.

CHAPTER 8:

QC TEST

The tester has the ability to test multiple batteries one after the other without having to input the battery rating / settings.

There are three ways to perform a QC-test. When the qc mode is selected from the utility menu you will get two options: STOCK CONTROL or COMPOUND TEST. Also there is the battery menu option.

STOCK CONTROL is meant for batteries standing in a warehouse or on a pallet where as COMPOUND TESTING is done when the battery is in the vehicle.

1. Go to the UTILITY MENU and select the QC MODE icon.
 - 1 STOCK CONTROL
 - 2 COMPOUND TEST

Press the NEXT soft key to continue.

STOCK CONTROL

2. The first screen shows you the amount of tests performed. Once you press both the arrow keys you reset the test counter. Press NEXT if you want to continue without clearing the tests.
3. Select the BATTERY TYPE
 - 1 REGULAR
 - 2 AGM
 - 3 SPIRAL
 - 4 EFB
4. Select the RATING UNITS
 - 1 EN
 - 2 JIS
 - 3 DIN
 - 4 SAE
 - 5 IEC
 - 6 CCA

Press the NEXT soft key to continue.

5. Select the BATTERY RATING
Press the UP and DOWN ARROW keys to select the rating. In case of a JIS battery type the part number.
6. Enter the MINIMUM VOLTAGE.
7. Select the TEMPERATURE.
Aim the tester 5 cm from the sides or top of the battery case. As soon as the temperature reading is stable the operator can press NEXT.
The tester will now test the battery.

COMPOUND TEST

2. The first screen shows you the amount of tests performed. Once you press both the arrow keys you reset the test counter. Press NEXT if you want to continue without clearing the tests.
3. Select the BATTERY MENU
 - 1 MANUAL
 - 2 PRE-SELECTION

MANUAL input is selecting the different battery parameters that can be found on the battery. the PRE-SELECTION is what is entered in the tester memory. This is initially empty but can be filled in from the UTILITY menu.

Press the NEXT soft key to continue. The BACK soft key returns you to the previous screen.

For selection of the MANUAL input see the previous explanations and screens.

CHAPTER 10:

PRINT/VIEW

The Print/View Menu enables you to view and print the results of the Battery, System, and Cable Drop Tests before you perform another test and overwrite the results in memory.

VIEW TEST

VIEW TEST gives you the option of viewing and printing the results of the Battery and System Tests. To print the results, align the analyzer's IR transmitter with the printer's receiver, and select the PRINT soft key.

To return to the Main Menu, press the END key.

VIEW CABLE TEST

VIEW TEST gives you the option of viewing and printing the results of the Cable Drop Test. To print the results, align the analyzer's IR transmitter with the printer's receiver, and select the PRINT soft key.

To return to the Main Menu, press the END key.

VIEW QC TEST

VIEW QC TEST gives you the option of viewing and printing all results of the Quality Control Test. To print the results, align the analyzer's IR transmitter with the printer's receiver, and select the PRINT soft key.

To return to the Main Menu, press the END key.

CHAPTER 10: INFO MENU

The Info Menu has 3 utilities to help you manage your test data and track the usage and history of your analyzer.

TOTALS

The TOTALS report displays the total number of battery tests performed since the Tester was first used. Press the LEFT and RIGHT ARROW keys simultaneously to clear the total and reset the starting date.

TRANSFER

The TRANSFER utility lets you transfer test data to a PC using an optional IR receiver/software package.

VERSION INFO

Version info displays the software version, the date the software was released, and the serial number of the analyzer. The utility keeps a permanent count of the number of battery tests performed since the analyzer was first used.

CHAPTER 11: UTILITY

The Utility Menu allows you to easily set up your analyzer:

CONFIG. TESTER

The CONFIG. TESTER. Use the UP/DOWN ARROW keys to highlight the setting you want to change.

TIME : 14:08
FORMAT : MM/DD/YYYY
DATE : 09/17/2005
TEMP. UNITS : C
WRITE FAIL : ASK
DEPOT ID : AB1234
VEHICLE ID TYPE: FLEET ID

TIME

- Use the UP or DOWN ARROW to change the hour, minutes..
- Press the SAVE soft key to save your setting or the BACK soft key to return to the menu screen without saving the changes.

FORMAT

- Use the UP or DOWN ARROW or press the corresponding numerical key (1 or 2) to move the dot to the option button of your choice.
 - MM/DD/YYYY (month/day/year)
 - DD/MM/YYYY (day/month/year)
- If you used the ARROW keys, press the SAVE soft key to save your setting or the BACK soft key to return to the menu. If you use the alphanumeric keypad to enter the number preceding the option button, no additional key-press is needed to save your selection.

DATE

- Use the ARROW keys to highlight the month, day, or year. To rapidly scroll, hold down an UP or DOWN ARROW key.
- Press the SAVE soft key to save your setting or the BACK soft key to return to the menu screen without saving the changes.

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TEMP. UNITS

- Use the ARROW keys to select Celsius or Fahrenheit.
- Press the SAVE soft key to save your setting or the BACK soft key to return to the menu screen without saving the changes.

WRITE FAIL

- Use the ARROW keys to select ASK, IGNORE or FORCE.
- Press the SAVE soft key to save your setting or the BACK soft key to return to the menu screen without saving the changes.

DEPOT ID

- Enter 6 digits.
- Press the SAVE soft key to save your setting or the BACK soft key to return to the menu screen without saving the changes.

VEHICLE ID TYPE

- Enter FLEET ID or VIN.
- Press the SAVE soft key to save your setting or the BACK soft key to return to the menu screen without saving the changes.

SHOP

The SHOP INFO utility enables you to create a header for your printed test results showing your business location information. Its two information screens contain eight lines of text with up to 16 characters on each line.

Screen 1

1-YOUR SHOP NAME —
 2-1000 ANY STREET
 3-YOUR TOWN, STATE
 4-YOUR POSTAL CODE

Screen 2

5-YOUR COUNTRY —
 6-YOUR PHONE NUMBER
 7-WWW.WEBSITE.COM
 8-YOUR SHOP ID NUMBER

To create or overwrite a header:

- Press the UP or DOWN ARROW to highlight the line you want to change. The cursor will be blinking to the right of the last character in the line.
- To move the cursor backward to erase a character, press the LEFT ARROW key; to move the cursor forward, press the RIGHT ARROW key.
- Insert a character by pressing the key associated with the character as many times as needed.
- You can center text by selecting blank spaces before and after lines of text or insert spaces between words.
- Press the SAVE soft key to save your setting or the BACK soft key to return to the SHOP INFO screen without saving the changes.

DISPLAY

The LCD OPTIONS utility enables you to adjust the contrast of the text on the display and the backlight time.

CONTRAST LEVEL

The contrast level is 0 (lightest) to 10 (darkest). To change it:

- Press the UP or DOWN ARROW to highlight the option.

CONTRAST LEVEL 10
 BACKLIGHT TIME 60

- Press the ADJUST soft key to display the option's numerical scroll box.

10 (1-10)

- Press the UP/DOWN ARROW keys or the corresponding numerical key to select your preference.
- Press the SAVE soft key to save your setting or the BACK soft key to return to the CONTRAST LEVEL screen without saving the changes.

BACKLIGHT TIME

Backlight time is from 0 to 60 seconds. To change it:

- Press the UP or DOWN ARROW to highlight the option.

CONTRAST LEVEL 10
 BACKLIGHT TIME 60

CHAPTER 11: UTILITY

2. Press the ADJUST soft key to display the option's numerical scroll box.

60  SEC

3. Press the UP/DOWN ARROW keys or the corresponding numerical key to select your preference.
4. Press the SAVE soft key to save your setting or the BACK soft key to return to the BACKLIGHT screen without saving the changes.

COUPON

The COUPON SELECT utility enables and disables the printing of the custom coupon you've created in the EDIT COUPON utility.

1. Use the UP/DOWN ARROWS or press the corresponding numerical key to move the dot to the option button of your choice.
 - 1 NO USER COUPON PRINTED
 - 2 USER COUPON
2. Press the SAVE soft key to save your setting or the BACK soft key to return to the COUPON SELECT screen without saving the changes.

EDIT COUPON

The EDIT COUPON utility enables you to create a promotional coupon for your customers that prints at the bottom of every test result. Its two information screens contain eight lines of text with up to 16 characters each.

The editing process is the same as when you create a header for your test results printouts. See the SHOP utility for more information.

TEMP

The TEMP. UNITS utility enables you to set the units of measure to either Celsius or Fahrenheit.

To set your preference:

1. Use the UP/DOWN ARROWS or press the corresponding numerical key to move the dot to the option button of your choice.
 - 1 DEGREES F
 - 2 DEGREES C
2. Press the SAVE soft key to save your setting.

LANGUAGE

The LANGUAGE utility enables you to select a language for the display and printouts. To set your preference:

1. Use the UP/DOWN ARROWS or press the corresponding numerical key to move the dot to the option button of your choice. There is a selection of 23 languages.
2. Press the SAVE soft key to save your setting.

FORMAT DISK

Select this utility to format an SD card to receive data or erase all data on the card. The Tester will warn you before formatting the disk and ask you if you want to continue.

UPDATE

As software updates become available you'll be able to use this utility to update the Tester software using files on an SD card.

CONFIG PRINTER

Use this option to configure your printer. It's easy to switch your IrDA printer in to the correct protocol.

QC MODE

Use this option to configure your way of quality control measurements. Select either the Compound mode or Stock control mode.

CHAPTER 12: TROUBLESHOOTING

If you have problems with the display or the Midtronics printer, try these troubleshooting suggestions:

THE DISPLAY DOES NOT TURN ON

- Check the connection to the vehicle battery.
- Press the POWER button.
- The vehicle's battery may be too low to power the analyzer (below 1 volt). Fully charge the battery and retest.
- The analyzer's 6 AA batteries may need to be replaced. Follow the directions in CHAPTER 14: EXP Internal Batteries and replace the batteries (alkaline recommended).
- If troubleshooting does not solve the problem, contact Midtronics at 1-800-776-1995 to obtain service. See "Patents, Limited Warranty, Service" for more information.

THE STATUS LED FLASHES (MIDTRONICS PRINTER)

When a printer fault occurs, the STATUS LED flashes. You can identify the fault by the number of sequential flashes:

Table 6: Printer STATUS LED

Sequence	Condition	Solution
* * *	No paper	Insert new paper
** ** **	Thermal head too hot	Allow head to cool
*** *** ***	Batteries weak	Recharge printer batteries for 16 hours

DATA WILL NOT PRINT

- If the IR transmitter and receiver are not aligned, all the data may not print. The infrared ports on the top of the analyzer and on the printer below the MODE button should be pointed directly at each other. The maximum distance for reliable transmission between the ports is 17 in (45 cm).

To realign, press the END button to cancel the print job. Verify alignment between the analyzer and printer; then try to print the test results again.

- Make sure the printer is on. The printer shuts off after 2 minutes of inactivity to conserve the batteries. To turn the printer on, briefly press the MODE button. The green STATUS light should turn on. Make sure you are using the Midtronics printer. Other printers may not be compatible.

CHAPTER 13:

TESTER INTERNAL BATTERIES

The Tester uses 6 AA, 1.5-volt batteries (alkaline recommended) to allow testing of batteries down to 1 volt and supply power while the menu is active. The analyzer can test batteries down to 5.5 volts when the internal batteries are not functioning.

BATTERY POWER INDICATOR

The square in the upper left corner of the display indicates the charge level of the battery pack. The square is black when the battery pack is fully charged. It gradually changes to white as the charge level declines. The Tester will display a warning message when the batteries need replacing.

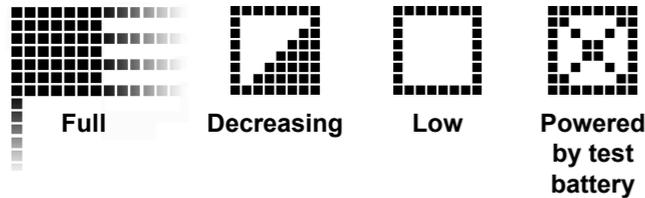


Figure 7: Power Level Indicator for AA Batteries

REPLACING THE TESTER BATTERIES

1. Turn the Tester face down.
2. Press gently on the ridges above the arrow on the battery compartment cover.
3. Slide the cover in the direction of the arrow and remove the cover.
4. Remove the discharged batteries.
5. Insert new batteries as shown in Figure 22. Make sure the positive and negative terminals are positioned correctly.
6. Insert the door's tabs into the slots on the analyzer and slide the door closed, making sure the latch locks.

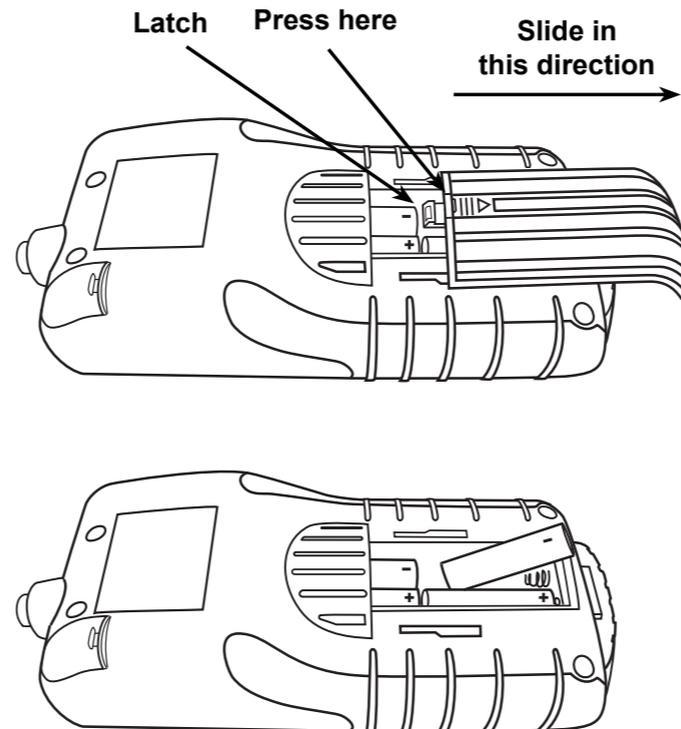


Figure 22: Battery Replacement

PATENTS

The EXP 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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