



*Battery Management Innovation*



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**EXP**  
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**Expandable Electrical  
Diagnostic Platform**

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*For testing 12-volt automotive batteries*

**INSTRUCTION MANUAL  
EXP-717**



# Contents

<b>Chapter 1: Before You Begin</b> .....	<b>7</b>
Safety .....	7
General Precautions .....	7
Conventions Used in This Manual.....	7
Note: Truck info .....	8
Registering Your Analyzer .....	8
<b>Chapter 2: Description</b> .....	<b>9</b>
Test Leads, Connectors, and Data Ports .....	9
Display and Keypad .....	10
Data Entry Methods.....	11
Menu icons.....	11
Option Buttons .....	11
Scrolling Lists .....	11
Alphanumeric Entry .....	11
Menu Maps.....	12
Main Menu .....	12
Print/View Menu .....	13
Info Menu .....	13
Utilities Menu.....	14
<b>Chapter 3: Test Preparation</b> .....	<b>15</b>
Inspecting the Battery.....	15
Testing Out-of-Vehicle .....	15
Testing In-Vehicle .....	15
Connecting the Battery Test Cable.....	15
Setting User Preferences .....	16

**Chapter 4: Battery Test ..... 17**

- Additional Test Requirements..... 18
  - Vehicle Type / Taxi test..... 18
  - Surface Charge ..... 18
  - Select the Temperature (not always)..... 18
  - Before / After Charge ..... 19
  - Deep Scan Test..... 19
- Battery Test Results ..... 20

**Chapter 5: QC Test ..... 21**

**Chapter 6: Utilities..... 22**

- Config Tester ..... 22
- Display..... 23
- Shop ..... 24
- Coupon..... 25
- Edit Coupon..... 25
- Language ..... 25
- Format Disk ..... 25
- Update..... 25
- Battery Menu (only for the Quality Control Test) ..... 26

**Chapter 7: Info Menu..... 27**

Totals .....27

Transfer .....27

Version info.....27

**Chapter 8: Print/View ..... 28**

View Test .....28

View QC Test.....28

**Chapter 9: Truck info..... 29**

**Chapter 10: Troubleshooting..... 30**

The Display Does Not Turn On .....30

The STATUS LED Flashes (Midtronics Printer) .....30

Data Will Not Print.....30

**Chapter 11: Tester Internal Batteries ..... 32**

Battery Power Indicator .....32

Replacing the Tester Batteries .....32



# Chapter 1: Before You Begin

## 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

- **DANGER—RISK OF EXPLOSIVE GASES:** 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. Never smoke or allow a spark or flame in the vicinity of a battery.
- **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.**
- 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.

## Conventions Used in This Manual

To help you learn how to use your analyzer, the manual uses these symbols and typographical conventions:



The safety symbol followed by the word **WARNING** or **CAUTION** indicates instructions for avoiding hazardous conditions and personal injury.

### **CAUTION**

The word **CAUTION** without the safety symbol indicates instructions 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.

### POST TYPE

The text for screen options are in regular capital letters.

## Note: Truck info

In the following chapters we will describe the menu structure and functionality of the passenger car software. In many of the cases this will also serve the Truck tester version. More info can be found in chapter 9.

## 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](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 analyzer (*Figure 1*).



Figure 1:  
Serial Number Location



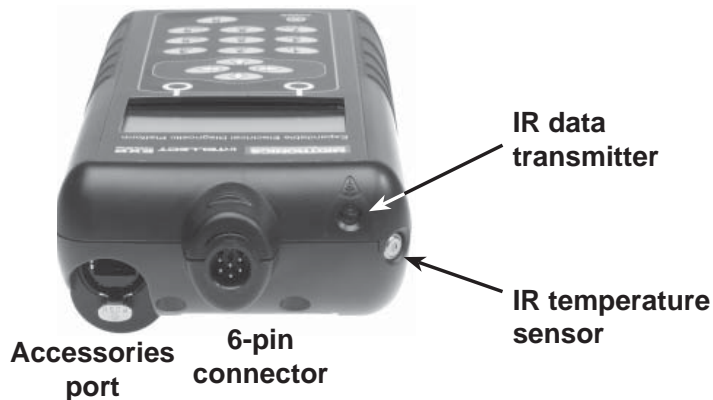
## Chapter 2: Description

### Test Leads, Connectors, and Data Ports

For the cable test leads, there are two connectors on the top of the tester (*Figure 3*).

- For the battery test cable, there is a 6-pin connector with a locking ring.

*Figure 3: Top of EXP*



*Figure 4: Bottom of EXP*



There are two IR data ports on the top of the Tester (*Figure 3*).

- An IR data transmitter, which transmits test results to the optional IR printer.
- An IR temperature measurement sensor.

The tester also has a DB-9 connector for future expandability and an SD card slot for future software upgrades or data logging. (*Figure 4*).

## 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. *Figure 6* shows how the elements on the screen relate to the keypad.

The **Internal Batteries Status Indicator**, which appears in the screen's top left corner, lets you know the status and charge level of the analyzer's 6 1.5 V batteries. The X shown in the figure shows that the tester is powered by the battery you're testing to conserve the internal batteries.

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 soft-key functions are SELECT, BACK, and END.

When you connect the tester 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.

In some cases, you can use the **Alphanumeric Keypad** to enter numerical test parameters instead of scrolling to them with the **ARROW** keys.

You'll also use the Alphanumeric Keys to create and edit customer coupons. The keypad includes characters for punctuation. To add a space, press the **RIGHT** and **LEFT ARROW** keys simultaneously.

The **Title Bar** shows you the name of the current menu, test tool, utility, or function.

The **Selection Area** below the **Title Bar** contains items you select or into which you enter information. The area also displays instructions and warnings.

The **Directional Arrows** on the display show you which **Arrow Keys** to press to move to other icons or screens. The Up and Down Directional Arrows, for example, let you know to press the **UP** and **DOWN ARROW** keys to display the screens that are above and below the current screen.

The Left and Right Directional Arrows let you know to use the **LEFT** or **RIGHT ARROW** keys to highlight an icon for selection.

Another navigational aid is the **Scroll Bar** along the right side of the screen. The position of its scroll box tells you which menu screen you're viewing.

**Scroll Bar**

**Top or only screen**

**Middle screen**

**Last screen**

Figure 6: Main Menu and Keypad

## **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.


### Menu icons

A menu icon is a graphical representation of a function you can select, such as the Diode Icon in the DMM Menu. To select an icon, use the **LEFT** or **RIGHT ARROW** key to highlight it. 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 Entry

Some selections require you to use the alphanumeric keypad. These “user-defined” selections have a cursor to the right of the last character.

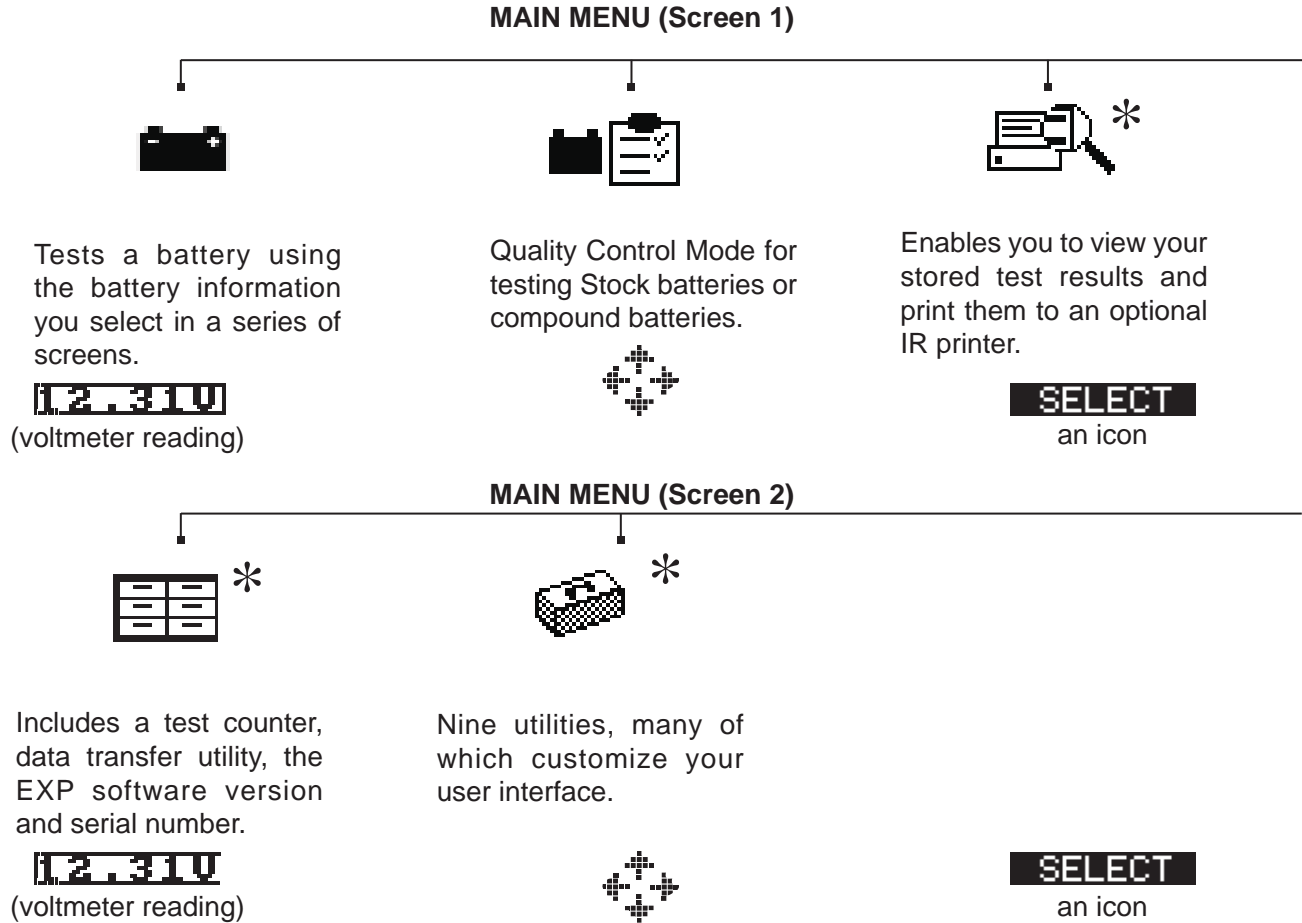
Use the **UP/DOWN ARROW** keys to highlight a line for editing. Display the character, symbol, or number you want by rapidly pressing its key as many times as needed. If you pause, the cursor moves to the right. To backspace, press the **LEFT ARROW** key. Use the **RIGHT ARROW** key to add a space. Use the **UP/DOWN ARROW** keys to highlight a line for editing. When finished, press the appropriate soft key to save your settings.

## Menu Maps

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.



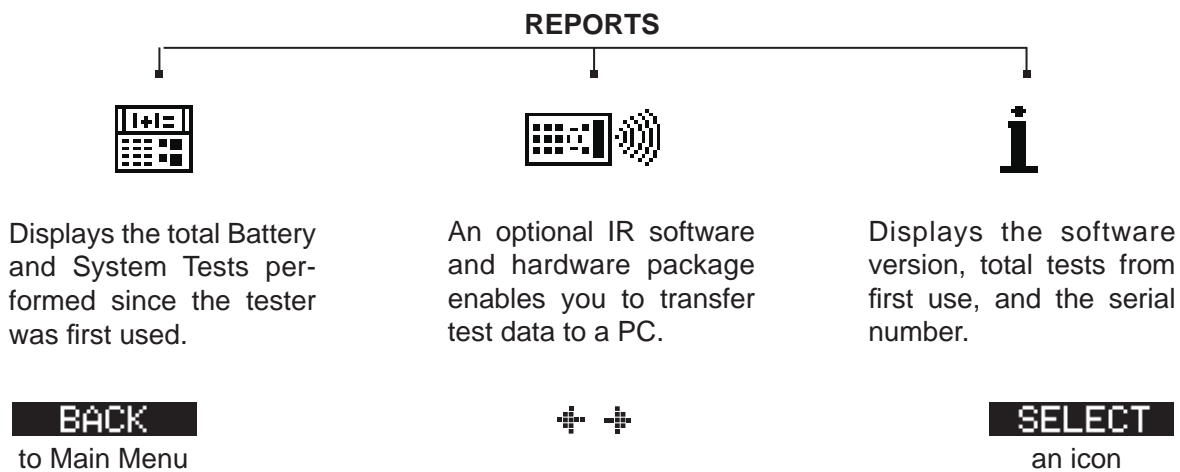
Print/View Menu

The tester stores the last test results in its memory until you perform another test. To review or print results before you retest, select a test type in the Print/View Menu.



Info Menu

The Info Menu has three utilities to help you manage your test data, and track the usage and history of your tester.



Utilities Menu

The Utilities Menu lets you customize your analyzer to suit your needs.

SETUP (Screen 1)



Settings to adjust the date and time etc.

**BACK**

to Main Menu



Settings to adjust the screen contrast and backlight time.



Enables you to configure the printer to IrDA.

**SELECT**

an icon

SETUP (Screen 2)



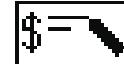
Enables you to add a custom header to printed test results.

**BACK**

to Main Menu



If you've created a coupon in the Edit Coupon utility, use Coupon to turn it on and off.



Enables you to create a coupon at the bottom of printed test results.

**SELECT**

an icon

SETUP (Screen 3)



Sets the language of the display and printouts.

**BACK**

to Main Menu



Formats the SD card to receive data. Also erases all data on the card.



Updates the software using files on an SD card.

**SELECT**

an icon

SETUP (Screen 4)



Change, add or delete batteries for Compound/Stock mode

**BACK**

to Main Menu



**SELECT**

an icon

## 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.

## Chapter 3: Test Preparation

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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.

The message **WIGGLE CLAMPS** can indicate that there is no good connection between the clamps and the battery posts. This could be because of corrosion on the posts. Wiggle the clamps and retest.

If there is a problem with the cable resistance the same message can appear. Contact Midtronics for further action.

Note: When the battery voltage is below 0.5 Volt the message **CHECK CONNECTION** can appear. Fully charge the battery and retest.

### 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.



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## Chapter 4: Battery Test

The tester will guide 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. Select the battery LOCATION.

- 1  OUT OF VEHICLE
- 2  IN VEHICLE

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 Ah value



Read the value from the battery and confirm with **ENTER**. Press the UP/DOWN ARROW or enter the value with the keypad.

3. Select the BATTERY TYPE.

- 1  REGULAR
- 2  VRLA
- 3  SPIRAL
- 4  GEL

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

4. Select the BATTERY STANDARD

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

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

5. Enter the CCA value of the battery



Press the **UP/DOWN ARROW** keys 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.

Press the **NEXT** soft key to start the test.



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

6. Vehicle ID

For further vehicle identification you can add a 17 digit text. This text will also appear on the print-out.

### **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 analyzer displays the results of your test.

#### Vehicle Type / Taxi test

The Taxi test is used to perform an extra test.

1. Follow the instructions on the screen.

#### Surface Charge

The battery will 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 begins testing.

1. Follow the instructions indicating when to turn the headlights on and off.
2. The tester will resume testing after it detects that the surface charge is removed.

#### Select the Temperature (not always)

Point the tester at the battery, make sure the tester is within a 5 cm reach of the battery to capture the correct temperature.

Before / After Charge

In some cases the tester may ask you whether the battery was charged prior to the test. When the vehicle has been driven just prior to the test answer the question with BEFORE CHARGE. Press **NEXT** to continue.

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.



After the Deep Scan Test the tester will display the results.

The next section describes the battery test decisions and suggests actions to take.

## 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 *Figure 14*. 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.

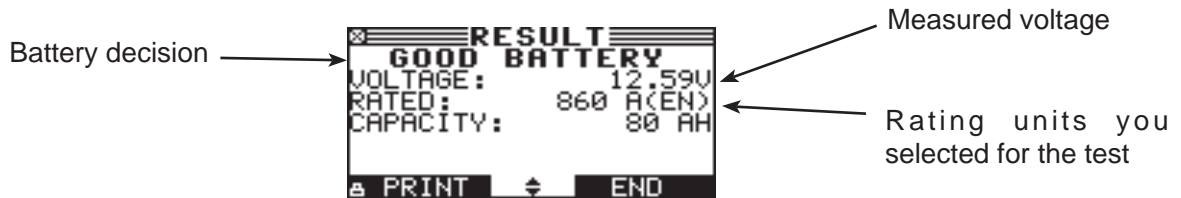


Figure 14

Table 1: Battery Decisions and Recommendations

Decision	Recommended Action
GOOD BATTERY	Return the battery to service.
CHARGE & RETEST	Fully charge the battery. Allow the battery to rest before retesting. <b>Failure to fully charge the battery before retesting may cause false readings.</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.

**All test results are stored on the SD Card. This data can be copied from the card and used to verify / compare results.**

## Chapter 5: 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 two types of QC tests: the STOCK CONTROL or the COMPOUND TEST. (New vehicles)

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

1. Select the QC MODE.
2. 1  STOCK CONTROL  
2  COMPOUND TEST

On the following page you can see the amount of previously performed tests (x of 100). Pressing the left and right arrow keys simultaneously will erase all the tests.

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

3. Select the type of battery selection. When you select the MANUAL ENTRY you will be asked to enter all relevant battery data. When you select PRE SELECTION you can select from a number of batteries that are already in the tester. In the UTILITY menu you can add or delete batteries.
4. 1  MANUAL ENTRY  
2  PRE SELECTION

Press the **NEXT** soft key to continue. The MANUAL ENTRY is analogue to the battery test as described in chapter 4.

5. Select the minimum voltage



With new batteries you can look at the open circuit voltage to determine the state of charge. The minimum voltage can be set according to your own quality standard.

6. Select the temperature.  
Point the tester at the battery under test and store the temperature.

### Print-out

When you print the screen information you will have less information then when you print from the PRINT/VIEW menu.

## Chapter 6: Utilities

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

### Config Tester

<b>TIME :</b>	<b>AM/PM</b>
<b>MODE :</b>	<b>9:07 PM</b>
<b>DATE :</b>	<b>MM/DD/YYYY</b>
<b>FORMAT :</b>	<b>1/29/2009</b>
<b>TEMP. UNITS</b>	<b>C</b>
<b>WRITE FAIL</b>	<b>ASK</b>

### Time

1. Use the **LEFT/RIGHT ARROWS** to highlight the hour, minutes. To rapidly scroll, hold down an **ARROW** key.

**9** : 19 PM

2. Press the **SAVE** soft key to save your setting or **BACK** to return to the ADJUST screen.

### Mode

Use the **LEFT/RIGHT ARROWS** to select the option of your choice. You can select the 24-hour or AM/PM mode.

### Date

Use the arrow keys to select the desired value.

### Format

Use the **UP/DOWN ARROWS** or press the corresponding numerical key to move the dot to the option button of your choice or enter its number. M/DD/YYYY (month/day/year) or DD/MM/YYYY (day/month/year) is available.

### Temp. Units

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

## 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:

1. Press the **UP** or **DOWN ARROW** to highlight the option.

<b>CONTRAST LEVEL</b>	<b>10</b>
<b>BACKLIGHT TIME</b>	<b>60</b>

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

<b>10</b>		<b>(1-10)</b>
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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 **CONTRAST LEVEL** screen without saving the changes.

### Backlight Time

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

1. Press the **UP** or **DOWN ARROW** to highlight the option.

<b>CONTRAST LEVEL</b>	<b>10</b>
<b>BACKLIGHT TIME</b>	<b>60</b>

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

<b>60</b>		<b>SEC</b>
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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.

## Config printer

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

## 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  
  
**5-YOUR COUNTRY** \_  
6-YOUR PHONE NUMBER  
7-WWW.WEBSITE.COM  
8-YOUR SHOP ID NUMBER

To create or overwrite a header:

1. 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.
2. To move the cursor backward to erase a character, press the **LEFT ARROW** key; to move the cursor forward, press the **RIGHT ARROW** key.
3. Insert a character by pressing the key associated with the character as many times as needed.
4. 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.



## **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.

## **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 24 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.

## Battery Menu (only for the Quality Control Test)

Use this option to ADD BATTERY, DELETE BATTERY, IMPORT LIST or EXPORT LIST.

- 1  BATTERY LIST
- 2  IMPORT LIST
- 3  EXPORT LIST

When you use the IMPORT or EXPORT function you can use the SD card to store the data.

## Chapter 7: 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.

- 1  TOTAL TESTS
- 2  TOTALS BY DECISION
- 3  CLEAR COUNTERS

### 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 permant count of the number of battery tests performed since the analyzer was first used.

Software version:

Total tests since first use

Serial number of the tester

BUILD:

EEPROM:

## Chapter 8: Print/View

The Print/View Menu enables you to view and print the results of the Battery 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 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 9: Truck info

With update software it is possible to turn the Passenger car software into a combined Passenger car / Truck version. You can contact Midtronics for further information.

Specifics for the Truck version:

This software is capable of testing batteries > 115Ah. At the same time it's possible to test the 2 batteries in the 24V system one after the other.

### **Battery test**

In our case the batteries >115Ah are always of the flooded type and therefore you will not be asked to enter the battery technology.

When testing in vehicle you will get the question if you are testing a single battery or the complete set of two. When you test two batteries it's only necessary to enter the parameters once. After testing the first battery you will be asked to connect to the second battery. All the previous data is stored and at the end compared as a total set.

### **Balance test**

In the balance test both batteries are tested and compared to each other. When you select the GENERATE PAIR option it's always important to test the first battery as GOOD BATTERY. The tester will indicate what to do further.

## Chapter 10: 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.
- If troubleshooting does not solve the problem, contact Midtronics. For more info see page 33

### 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.

- Direct sunlight interferes with infrared data transmission and receiving. If the printer is not receiving data, remove the printer and EXP from direct sunlight. If the printed characters are not clear or are partially missing, recharge the battery and reprint.

## Chapter 11: 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.

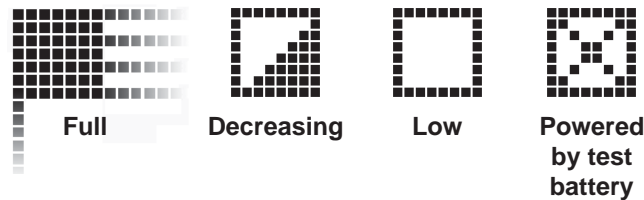


Figure 7: Power Level Indicator for AA Batteries

### Replacing the Tester Batteries

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

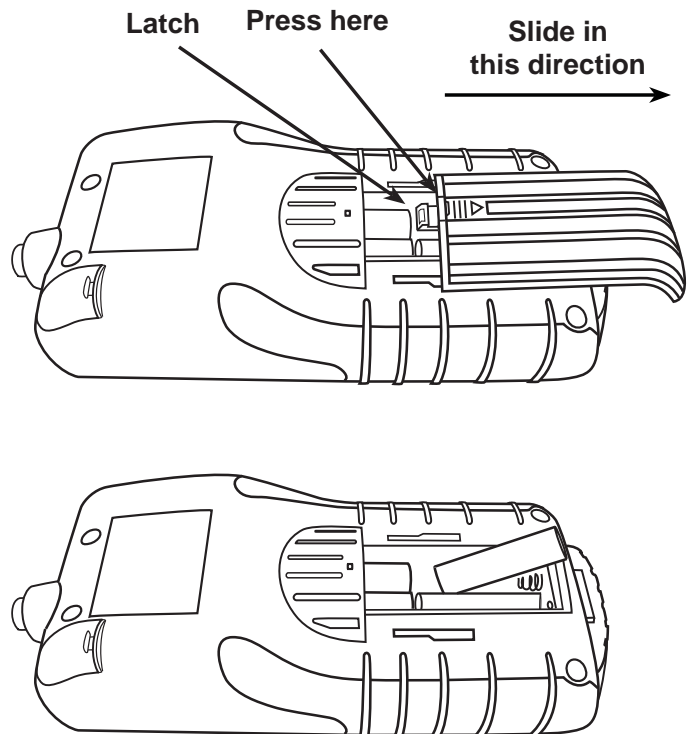


Figure 22: Battery Replacement



## PATENTS

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## LIMITED WARRANTY

This analyzer is warranted to be free of defects in materials and workmanship for a period of two years from date of purchase. Midtronics will, at our option, repair or replace the unit with a remanufactured unit. This limited warranty applies only to the analyzer, and does not cover any other equipment, static damage, water damage, overvoltage damage, 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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