



Battery Management Innovation



inTELLECT EXP HD

Expandable Electrical
Diagnostic Platform

For testing 6- and 12-volt heavy-duty, automotive, and commercial batteries, and 12-volt and 24-volt charging systems.

INSTRUCTION MANUAL

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Chapter 1: Before You Begin

For safe, efficient, and accurate testing, review the safety and operating instructions in this manual before using the analyzer.

We also recommend that you register the analyzer to activate your warranty. See “Registering Your Analyzer” on the next page.



Safety Precautions

Inspect the battery for damages and check the electrolyte level. If the electrolyte level is too low, replenish it and fully charge the battery. Always use the necessary safety precautions when working with batteries to prevent severe injury or death. Follow all manufacturers' instructions and BCI (Battery Council International) safety recommendations, which include the following 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.

Registering Your Analyzer

Registration your analyzer will make it faster and easier for you to obtain technical support and service, and order parts and accessories.

To register, log on at:

<http://www.midtronics.com/home/support/support.aspx>

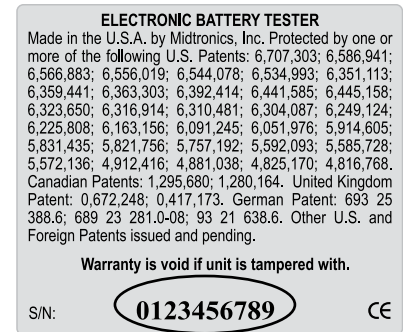
Click **Warranty Registration** and have your serial number ready. The number, which is unique to each EXP, is at the bottom of the label on the back of the analyzer.

If the analyzer needs repair, call Midtronics Customer Service at 800-776-1995. Servicing the analyzer yourself may void your warranty. Refer to the Limited Warranty section on page 53.

Creating a User ID and Setting Preferences

When you press the **POWER** button, the analyzer takes a few seconds to boot up while testing the integrity of its software. It then displays a list of default User IDs, which are placeholders for adding technicians to the test database. To edit the default IDs and add up to 24 technicians, see “3. Utility Menu: Users.”

Before starting a test you may want to customize the use of your EXP by setting preferences in the Utility Menu. The menu has settings for the date and time, the display contrast and backlight time, customer coupons, languages, and more.



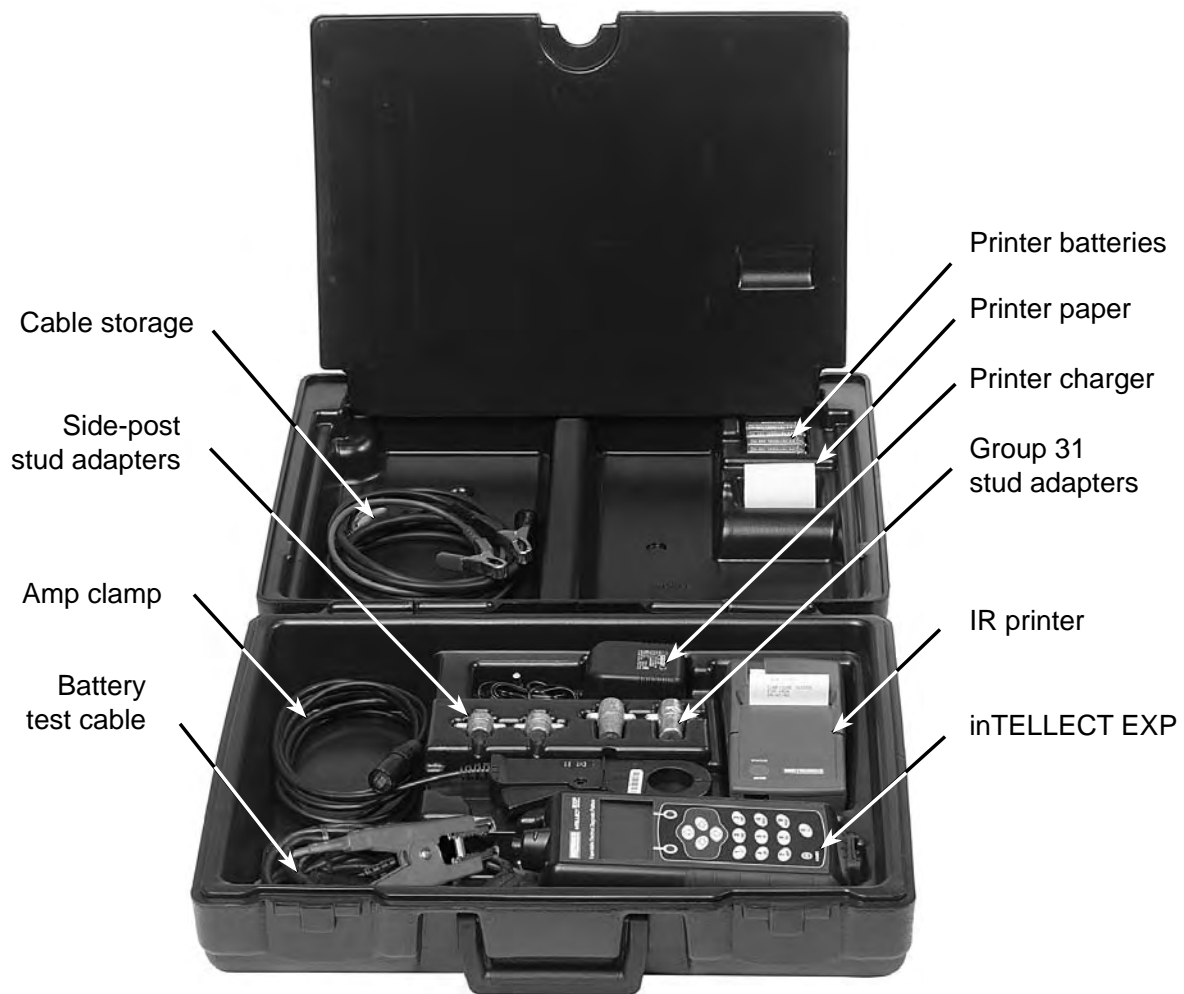
Chapter 2: Overview

The inTELLECT EXP-1000 HD tests 6- and 12-volt heavy-duty automotive and commercial batteries, and 12-volt and 24-volt charging systems. In addition to a standard single-battery test, the EXP has a test routine designed for multiple-battery vehicles and a specialized heavy-duty battery algorithm for larger batteries. Other tools in the EXP include a digital multimeter with a scope, and a conductance cable drop test.

The large backlit graphical screen and icon-based user interface make diagnostics simple for the novice and experienced electrical technician. An alphanumeric keypad with selection scrolling and soft (multifunction) keys make the EXP as easy to use as a remote control or cell phone. A memory card system allows for upgrades, quick storage, and transfer of test data.

Case Layout

The EXP-1000 HD kit includes a hard-sided, molded carrying case. The case holds all accessories, with room for future options.



Test Leads, Connections, and Data Ports

The top of the EXP has two connectors for test cables:

- ❶ RJ45 connector (Accessories Port) with a release lever for accessory test cable.
- ❷ 6-pin connector, with a locking ring, for the battery test leads.

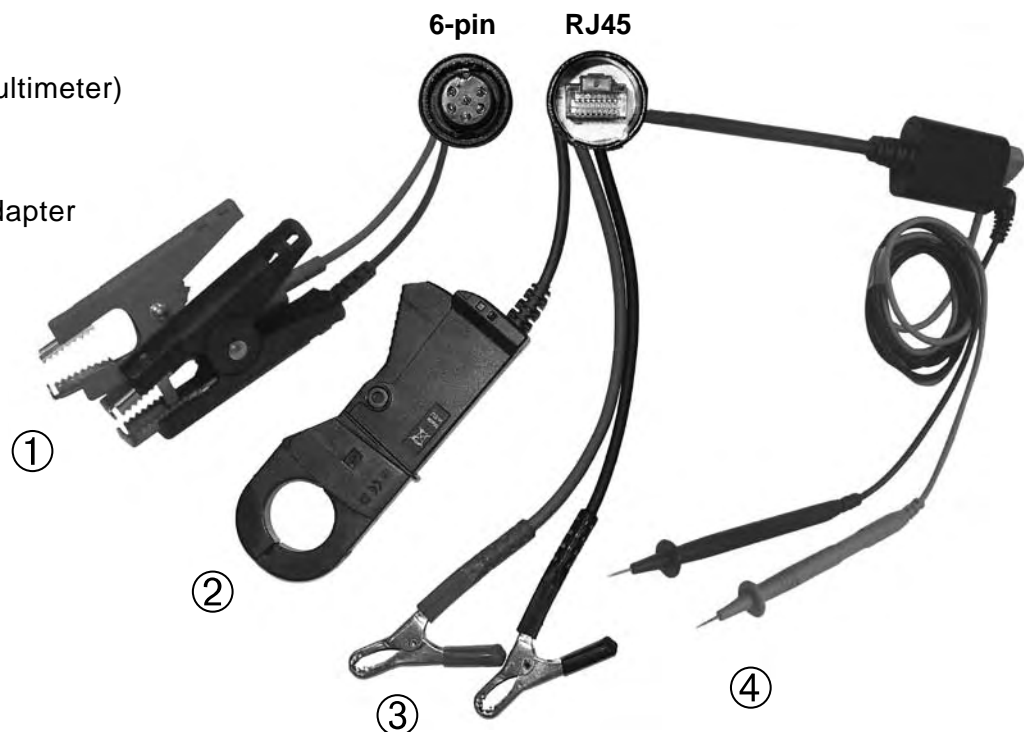
In addition, the top-left corner of the EXP has two IR data ports:

- ❸ Temperature measurement sensor.
- ❹ Data transmitter, which transmits test results to an IR printer



Standard and optional test cables include:

- ❶ Heavy duty battery test cable (15-foot)
- ❷ Amp clamp
- ❸ DMM (Digital Multimeter) cable
- ❹ Banana Jack adapter and probes



The bottom and right side of the EXP have two data ports:

- ① DB-9 connector for future expandability.
- ② Spring-loaded SD card slot for test data storage and software upgrades.



Connecting the Battery Test Cable

Connect the battery test cable to the EXP by first aligning the cable connector's 6 holes with the 6 pins on top of the EXP. Firmly insert the connector and finger-tighten the locking ring.

Connecting an Accessory Cable

If you are using an accessory cable, plug it into the accessories port on top of the EXP as you would a phone jack. To remove it, press the lever and pull out the cable connector.

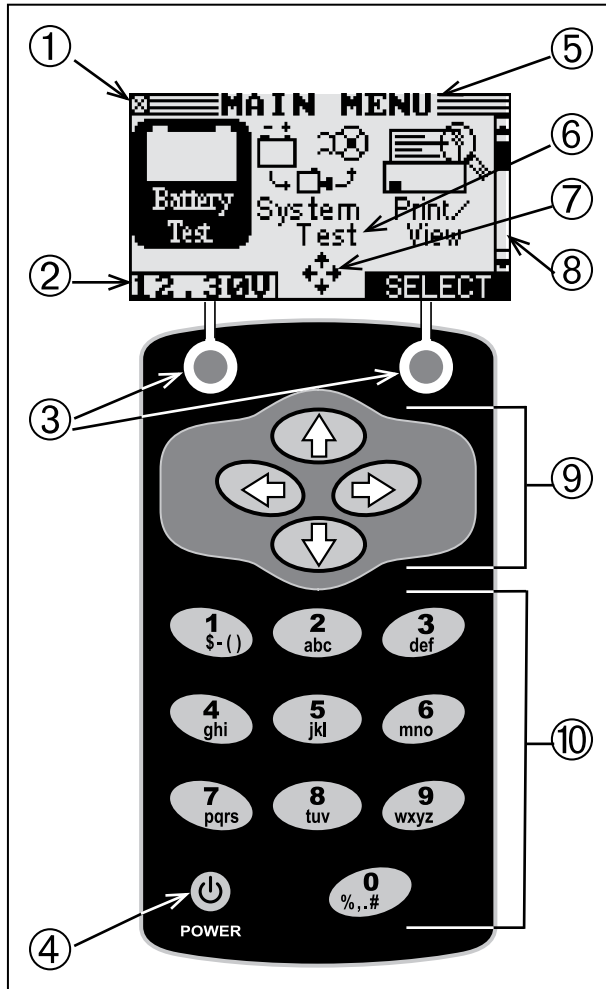
Inserting an SD Card

The SD card slot contains a plastic filler card for protection. The EXP can store test results on an SD card. To remove the filler card, push briefly on its edge to release it and pull it from the slot.

When inserting an card, push it into the slot until it locks. The card is correctly inserted when it is not protruding from the slot.

Display and Keypad

The analyzer 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. The illustration below shows how the elements on the screen relate to the keypad.



1 Status Indicator: EXP Internal Batteries

This indicator appears in the screen's top left corner. It lets you know the status and charge level of the analyzer's six 1.5 volt batteries. The X in the indicator shows that the EXP is powered by the battery you are testing, a feature which conserves the 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 soft-key functions are **SELECT**, **BACK**, and **EXIT**.

4 POWER Button

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 items you select or into which you enter information. The area also displays instructions and warnings.

7 Directional Arrows

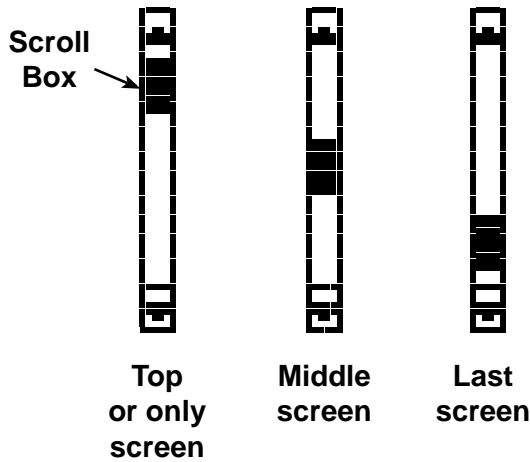
When displayed in menu screens, the Directional Arrows show you which **ARROW** key on the keypad to press to display other icons or screens. The Up and Down Directional Arrows, for example, let you know when to press the **UP** and **DOWN ARROW** keys to display the screens above and below the current screen.

The Left and Right Directional Arrows tell you when to use the **LEFT** or **RIGHT ARROW** keys to select an icon.

When displayed under a list of options, the Directional Arrows show you which keypad arrow to press to highlight a character or an 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 Keypad Arrows

While the Directional Arrows serve as road signs, the Keypad Arrows are the vehicle to its functions and features. You use the keypad to log on, navigate to menus and options, customize settings, and perform tests.

10 Alphanumeric Keypad

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

You also use the Alphanumeric Keys to create and edit customer coupons and your shop contact information on printed test results, and manage technician IDs.

To add a space, press the **RIGHT ARROW** key. To erase a space and insert a character, press the **LEFT ARROW** key.

Refer to the table below for the characters associated with each alphanumeric key.

Keypad Character Assignment

Key	Character
①	\$ - () 1
②	a b c 2
③	d e f 3
④	g h i 4
⑤	j k l 5
⑥	m n o 6
⑦	p q r s 7
⑧	t u v 8
⑨	w x y z 9
⑩	% , . # 0
⬅	Backspace
➡	Space

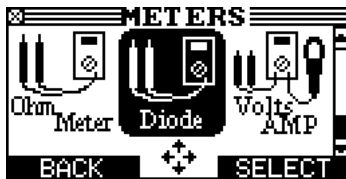
Data Entry Methods

To perform a particular test or function, the EXP 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 left half of the screen cancels your choice or returns you to the previous screen, although the command above it may vary. (Examples: **BACK** and **PRINT**.) In a similar fashion, the soft key below the right half of the screen confirms your choice, although the word above it may also vary (examples: **SELECT** and **NEXT**).

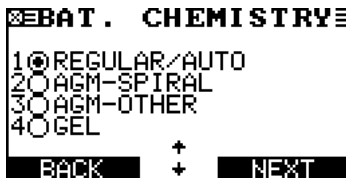
Menu icons

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. 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 to the button next to the item. 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 \blacktriangle appear to the right of the first visible or highlighted item on the list.

To select from the 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. Scrolling increases and decreases the units by five. To increase your scrolling speed, hold the **UP** or **DOWN ARROW** key.



Alphanumeric Entry

Some selections require you to use the alphanumeric keypad. These “user-defined” selections have a blinking horizontal line (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.

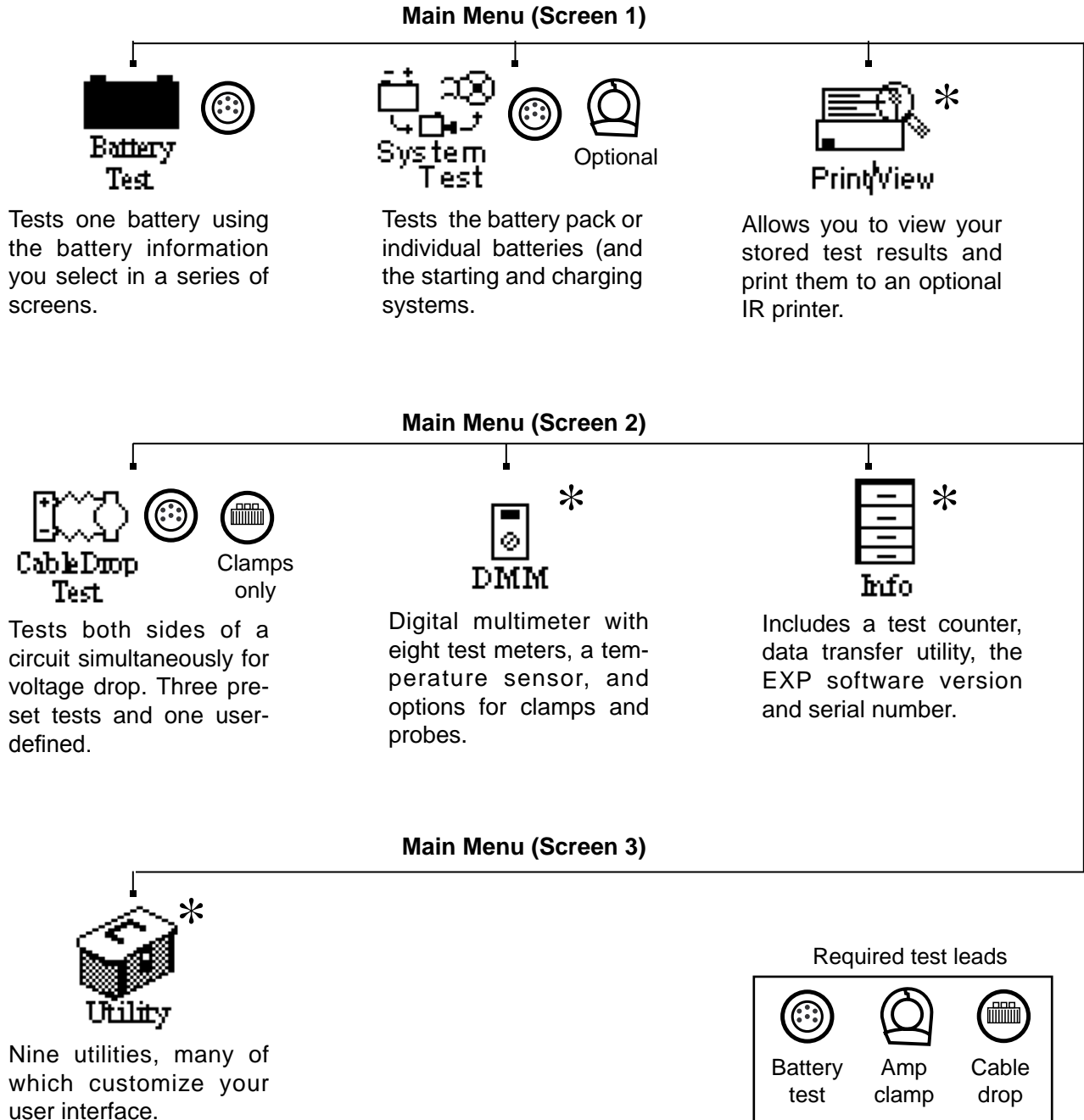


Menu Maps

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.

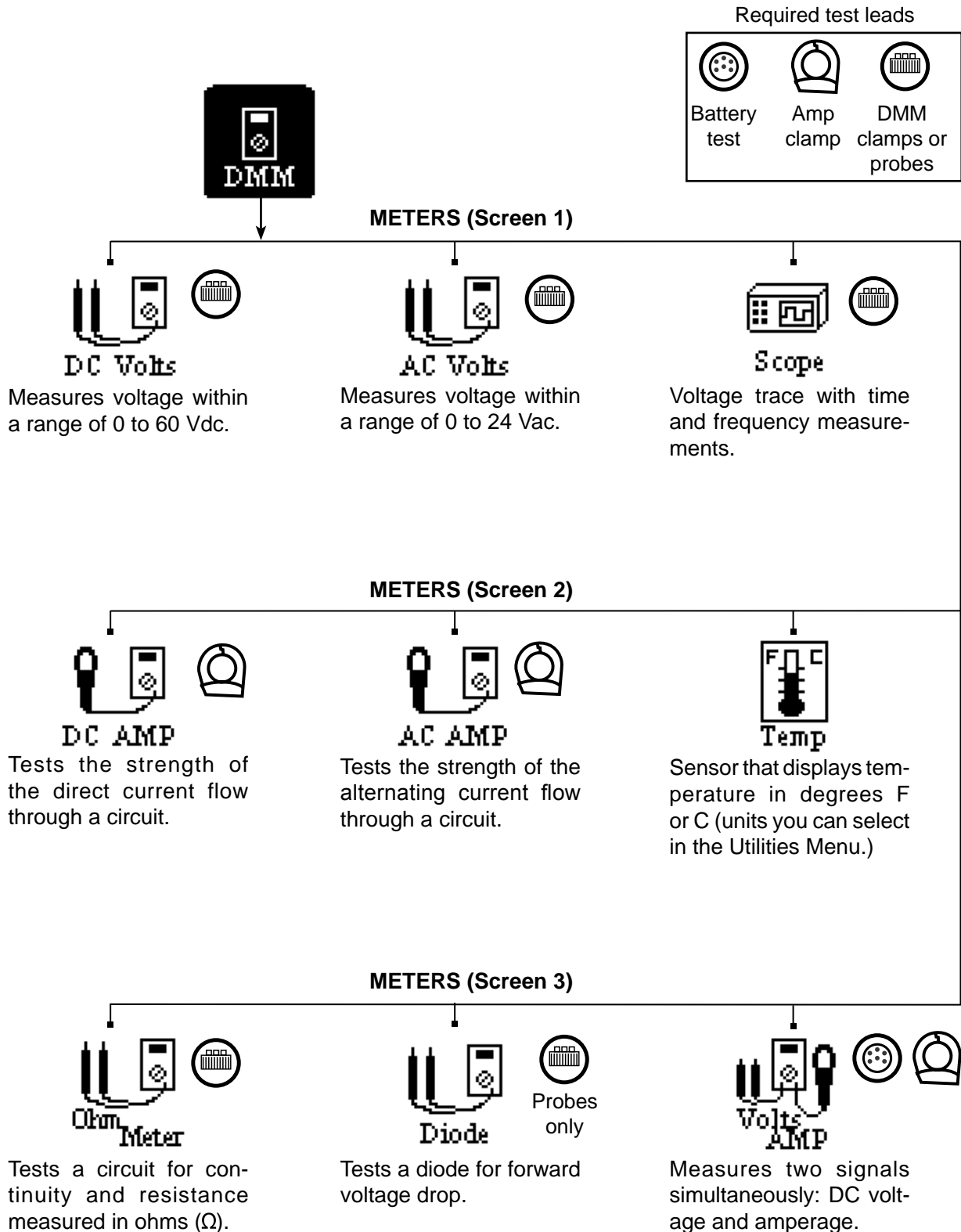
Main Menu

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.



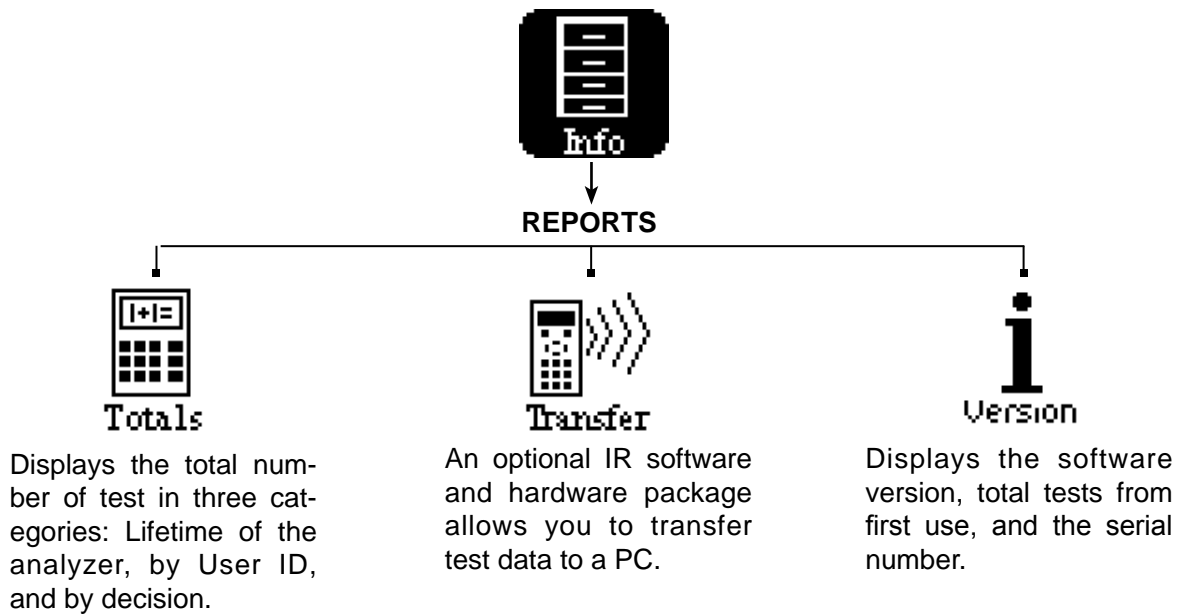
DMM Menu

The DMM Menu has icons for a temperature sensor and 8 test meters, some of which require different test leads. The available leads depend on the EXP model purchased.



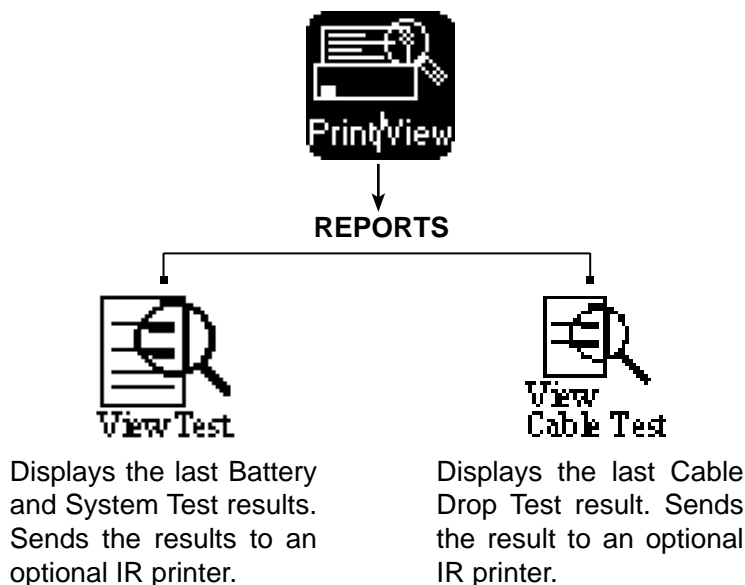
Info Menu

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



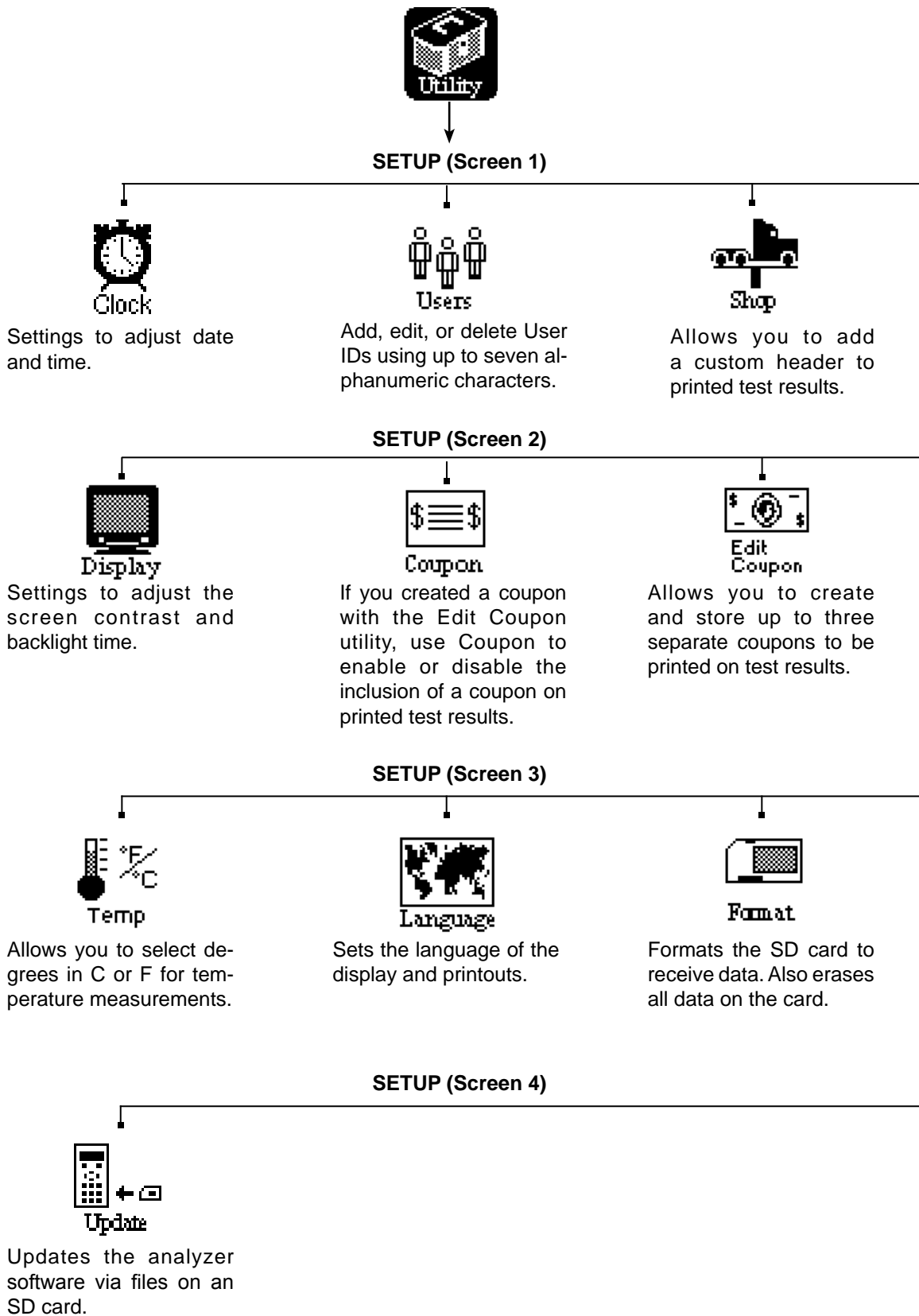
Print/View Menu

The EXP stores the last battery, system, and cable 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.



Utility Menu

The Utilities Menu allows you customize your analyzer. Before testing, check the default values to see which options you may want to change.



Chapter 3: Utility Menu

The Utility Menu has several utilities that customize the EXP—from the language of the user interface to the contrast of the text on the display. The utilities have default settings that you can change, depending on your requirements.

Setup Function	Default Settings
CLOCK TIME MODE DATE FORMAT	The current Central Standard Time AM Current MM/DD/YYYY (month/day/year)
SHOP	Generic header for printouts with 12 lines of text and a maximum of 17 characters per line
USERS	USER01 through USER24 are placeholder IDs used to create user names.
DISPLAY CONTRAST LEVEL BACKLIGHT TIME	Range: 0 (lightest) to 10 (darkest). The default is set at 9. Range: 0 to 60 seconds. The default is set at 15 seconds.
COUPON	Disabled (NO COUPON PRINTED)
EDIT COUPON	Eight lines of text with 17 characters per line. Default: USER COUPON LINE 1 through USER COUPON LINE 8
TEMPERATURE	DEGREES F (Fahrenheit)
LANGUAGE	English is the default language. French-Canadian and Spanish are also available.

1. In the Main Menu, select the Utility icon.



2. Select the icon of the utility you want to adjust.

The Utility Menu has nine utilities to customize your analyzer. Each utility described in this section is listed in order by its icon title.

If you use the alphanumeric keypad to enter the number preceding the option button, no additional keypress is needed to save or continue to the next step.



Clock

The CLOCK ADJUST utility has four settings. Use the **UP/DOWN ARROW** keys to highlight the setting you want to change.

MODE :	AM/PM
TIME :	9:07 PM
FORMAT :	MM/DD/YYYY
DATE :	6/17/2005

Mode

Use the **UP/DOWN ARROW keys** or press the corresponding numerical key to move the dot to the option button of your choice or enter its number.

1. Select the 24-hour or AM/PM mode
 - 1 24 HOUR
 - 2 AM/PM
2. If you used the **ARROW** keys, press the **SAVE** soft key to save your setting or the **BACK** soft key to return to the CLOCK ADJUST screen without saving the changes.

Time

1. Use the **LEFT/RIGHT ARROWS** to highlight the hour, minutes, or AM or PM. 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 CLOCK ADJUST screen.

Format

Use the **UP/DOWN ARROW keys** or press the corresponding numerical key to move the dot to the option button of your choice or enter its number.

1. Select the 24-hour or AM/PM mode
 - 1 MM/DD/YYYY (month/day/year)
 - 2 DD/MM/YYYY (day/month/year)

2. If you used the **ARROW** keys, press the **SAVE** soft key to save your setting or the **BACK** soft key to return to the CLOCK ADJUST screen without saving the changes.

Date

1. Use the **LEFT/RIGHT ARROWS** to highlight the month, day, or year. To rapidly scroll, hold down an **ARROW** key.

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2. Press the **SAVE** soft key to save your setting or the **BACK** soft key to return to the CLOCK ADJUST screen without saving the changes.



Users

The USERS utility allows you to create and edit a USER ID with one to seven alphanumeric characters and link it to a test counter. It also allows you to delete a USER ID and its associated test total.

Entering a New User ID

1. To create a USER ID, select:
 - 1 ENTER NEW
 - 2 DELETE
 - 3 EDIT

Press the **NEXT** soft key to display the list of available IDs.

2. Use the **UP** or **DOWN ARROW** keys to scroll to the ID placeholder you want to use. Scrolling past the first line will go to the previous page. Scrolling past the fourth line will go to the next page. To display more placeholders, continue scrolling or use the **LEFT** or **RIGHT ARROW** key to jump up or down through the list four lines at a time.

1 USER01

2 USER02

3 USER03

4 USER04

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

3. To clear the default characters, press the **LEFT ARROW** key. To add a space, move the cursor forward by pressing the **RIGHT ARROW** key.

ENTER USER ID

USER01 —

← Blinking cursor shows the starting location for editing

4. Insert a character by pressing the alphanumeric key associated with the character as many times as needed. Press the **SAVE** soft key to store the new user ID in memory.

ENTER USER ID

BOB R

Deleting a User ID

1. To delete a USER ID, select:

1 ENTER NEW

2 DELETE

3 EDIT

Press the **NEXT** soft key to display the list of IDs.

2. Use the **ARROW** keys to select a USER ID as described in step 2 in *Entering a New User ID*. (You cannot delete placeholder USER IDs, i.e., USER03).

1 BOB R

2 JIM F

3 PETER

4 USER04

Press the **DELETE** soft key.

Edit (Editing a User ID)

1. To edit a USER ID, select:

1 ENTER NEW

2 DELETE

3 EDIT

Press the **NEXT** soft key to display the list of IDs.

2. Follow steps 2, 3, and 4 in “Entering a New User ID” above.



Shop

The SHOP INFO utility allows you to create a header for your printed test results showing your business location information. The utility’s two information screens contain eight lines of text with a maximum of 17 characters per line.

Screen 1	Screen 2
1–YOUR SHOP NAME —	5–YOUR COUNTRY —
2–1000 ANY STREET	6–YOUR PHONE NUMBER
3–YOUR TOWN, STATE	7–WWW.WEBSITE.CO
4–YOUR POSTAL CODE	8–SHOP ID NUMBER

To help you edit and center your header, use a pencil to write the information in the template below before entering it into the analyzer.

Header and Coupon Template

Line 1																	
Line 2																	
Line 3																	
Line 4																	
Line 5																	
Line 6																	
Line 7																	
Line 8																	

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. Press the **LEFT ARROW** key to move the cursor backward to erase a character. 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. You can center text by selecting blank spaces before and after lines of text or insert spaces between words.
5. 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 Display

The LCD OPTIONS utility allows 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** key to highlight the option.

```

CONTRAST LEVEL      10
BACKLIGHT TIME    60
    
```

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

```

10  (1-10)
    
```

3. Press the **UP** or **DOWN ARROW** key 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** key to highlight the option.

```

CONTRAST LEVEL      10
BACKLIGHT TIME    60
    
```

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

```

60  SEC
    
```

3. Press the **UP** or **DOWN ARROW** key or the corresponding numerical key to select your preference. To erase a character, press the **LEFT ARROW** key.
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

Coupon

The COUPON SELECT utility allows you to print one of the three custom coupons or messages created in the EDIT COUPON utility.

1. Use the **UP** or **DOWN ARROW** key, or press the corresponding numerical key (1, 2) to move the dot to the option button of your choice.
 - 1 NO COUPON PRINTED
 - 2 USER COUPON
2. Press the **SAVE** soft key to save your setting or the **BACK** soft key to return to the Utility Menu without saving the changes.



Edit Coupon

Edit
Coupon

The EDIT COUPON utility allows you to create a promotional coupon or message for your customers that prints at the bottom of every test result. Its two information screens contain eight lines of text with a maximum of 17 characters per line.

To create and edit a coupon, see the procedure under *Shop* in this chapter for using the keypad to enter and backspace over characters. Use the template to plan and center your text.



Temp

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 Language

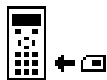
The LANGUAGE utility enables you to select a language for the display and printouts. To set your preference:

1. Use the **UP/DOWN ARROWS** or press the corresponding numerical key to move the dot to the option button of your choice.
 - 1 ENGLISH
 - 2 ESPAÑOL
 - 3 FRANÇAIS
2. Press the **SAVE** soft key to save your setting.



Format Format

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



Update Update

When software updates are released, this utility enables you to update the analyzer's software using files on an SD card.

Chapter 4: 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 the level specified by the battery manufacturer, and fully charge the battery. Do not overfill.
- Corroded or loose battery tray and hold-down fixture. Tighten or replace as needed.

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.

CAUTION: To ensure accurate test results for Group 31 batteries, the clamps are designed to connect to lead stud adapters or to the lead bases of threaded studs. Never connect the clamps directly onto the threaded studs. When testing at side posts, always use lead terminal adapters. Do not use steel bolts. To avoid damage, never use a wrench to tighten the adapters more than 1/4 turn. Failure to properly install lead terminal adapters, or using adapters that are dirty or worn, may cause false test results.

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.

Logging In

Scroll to your User ID and press the **NEXT** soft key.

- 1 DAN
- 2 RICK J
- 3 JOHN G
- 4 USER04

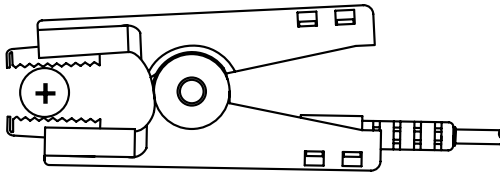
To create a new User ID, scroll to a placeholder (USER01, USER02, etc.), press **NEXT** and select the Users function in the Utility Menu. See “Users” on page 16 for instructions.

Connecting to a battery

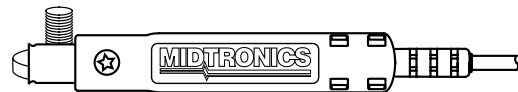
CAUTION: Do not connect the EXP to a voltage source greater than 60 Vdc.

Testing Individual Batteries

1. If the batteries have threaded studs, screw the negative (-) stud adapter onto the negative terminal, and the positive (+) adapter onto the positive terminal.
2. Connect the red clamp to the positive (+) terminal or adapter.
3. Connect the black clamp to the negative (-) terminal or adapter.
4. For a proper connection, rock the clamps back and forth. Both sides of the clamp must be firmly connected before testing. If the message CHECK CONNECTION appears, clean the terminals and/or reconnect the clamps



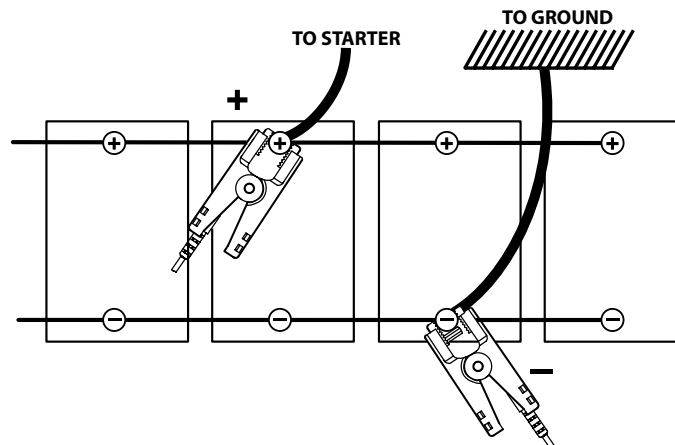
Clamp connection to stud adapter



Clamp connection to stud pad

Testing the Battery Pack

1. 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.
2. Connect the clamps to the positive (+) and negative (-) cables that lead to the starter and chassis ground as shown. If there are multiple cables, re-test for each cable connection.
3. For a proper connection, rock the clamps back and forth. Both sides of each clamp must be firmly connected before testing. If the message CHECK CONNECTION appears, clean the terminals and/or reconnect the clamps.

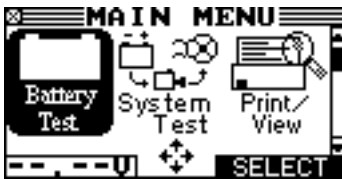


Chapter 5: Battery Test

The Battery Test function tests one battery in or out of the vehicle. To test the battery pack the analyzer 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 “Test Preparation.”

If you use the **ARROW** keys to select option buttons, press the **NEXT** soft key to continue to the next step. If you use the alphanumeric keypad to enter the number preceding the option button, no additional key-press is needed to save your selection. The **BACK** soft key returns you to the Main Menu at the start of the test and to the previous screen as you progress.

1. In the Main Menu, select the Battery Test icon.



2. Select the POST TYPE.
 - 1 TOP
 - 2 SIDE
 - 3 REMOTE (appears only for the Automotive System Test)

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

3. Select the BATTERY TYPE.
 - 1 GROUP 31 (BCI heavy-duty battery size)
 - 2 4D, 8D (heavy-duty commercial batteries)
 - 3 AUTOMOTIVE (car, van, light truck, etc.)

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

4. Select the BATTERY CHEMISTRY.
 - 1 REGULAR/AUTO (flooded lead-acid)
 - 2 AGM-SPIRAL (Absorbed Glass Mat: non-spillable, shaped like a six-pack)
 - 3 AGM-OTHER (non-spillable, standard shape)
 - 4 GEL (VRLA with gelified electrolyte)

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

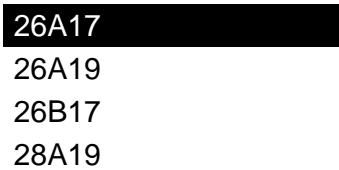
5. Select the battery's RATING UNITS. The units and the rating required in step 6 are printed on the battery label. If the information is unreadable, contact the battery manufacturer.
 - 1 CCA (Cold Cranking Amps)
 - 2 CA (Cranking Amps)
 - 3 MCA (Marine Cranking Amps)
 - 4 JIS (Japanese Industrial Standard)
 - 5 DIN (Deutsch Industry Norm)
 - 6 SAE (Society of Automotive Engineers)
 - 7 IEC (International Electrotechnical Commission)
 - 8 EN (European Norm)

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

6. Press the **UP** or **DOWN ARROW** key or use the numeric keys to select the BATTERY RATING.
 - a) If CCA, scroll to the rating and press **SELECT**. The entry range is 100 to 3000, except for DIN and IEC, which have a range of 100 to 1000.

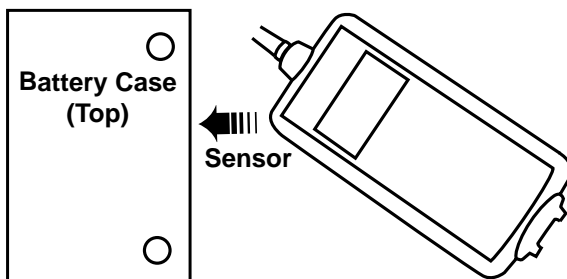


- b) If JIS, scroll to the JIS number.



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

7. Aim the IR temperature sensor at the battery as instructed for an accurate temperature measurement.



When the temperature stabilizes, press the **NEXT** soft key to start the test. The analyzer takes a few seconds to evaluate the battery before displaying the results.

In some cases the EXP may ask for additional information before it makes a decision on the battery. See “Additional Test Requirements” on page 28 for more information.

- If the battery decision is REPLACE or BAD CELL, the EXP-1000 HD BMP asks you to enter the battery serial number. The number, which is located on the battery case, is needed to generate a test code for warranty purposes. To backspace, use the **LEFT ARROW** key. When finished, press the **NEXT** soft key to continue.

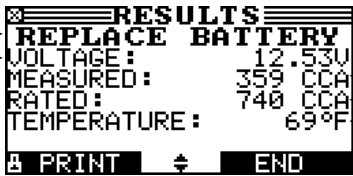
Battery Test Results

The EXP displays the complete results on multiple screens. The EXP-1000 HD BMP generates a test code for REPLACE decisions. To view the code, press the **UP** or **DOWN ARROW** key.

To send the results to the IR printer, align the analyzer’s IR transmitter with the printer’s receiver, and press the **PRINT** soft key. To return to the Main Menu, press the **END** soft key.

Battery decision →

Measured voltage →

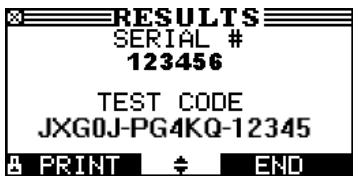


Measured CCA ←

Selected rating ←


Battery temperature ←

END becomes **NEXT** in the Automotive System Test

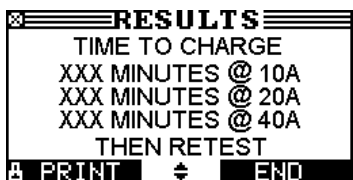


Battery serial number

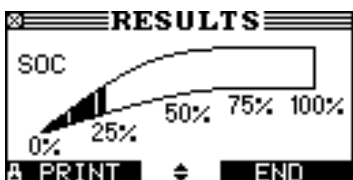
Test code generated for REPLACE decisions for warranty purposes (BMP version only.)




Battery state-of-health



Estimated charge time if charging needed



Battery state-of-charge

Battery 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 using a Midtronics Diagnostic Charger 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 BATTERY	A REPLACE BATTERY result may also mean a poor connection between the battery and the vehicle. If you tested the battery using the SYSTEM Test, disconnect the battery cables and retest using the BATTERY Test before replacing it.
BAD CELL-REPLACE	Replace the battery.  WARNING: Do not charge the battery. Charging a battery with one or more bad cells could cause an explosion and serious harm to the user.

NOTES:

If the EXP displays 24 VOLT BATTERY after the Automotive System Test, you are attempting to test in-vehicle both batteries in a 24-volt system. Disconnect the batteries and test them individually.

When testing at REMOTE POSTS, the EXP may need to verify a possible REPLACE result. It will give you the option of retesting at the battery posts.

When testing at SIDE POSTS, the EXP may find that the data is inconclusive and ask you to test with side post adapters.

Additional Test Requirements

For a more decisive result the analyzer may ask for additional information or further explore the battery's condition. The following messages and instructions may appear before the analyzer displays the results of your test.

System Noise Detected

The analyzer has detected computer, ignition noise, or parasitic drain, and will attempt to retest. Make sure all vehicle loads are off, doors are closed, and the ignition is in the off position. The analyzer will automatically retest when it no longer detects system noise. If the message reappears:

- You may be testing too close to a noise source, such as a charger or other high-current device. If so, move away and retest.
- If you are unable to find the source of the noise, fully charge the battery and retest. If the message appears after recharging, test the battery out of the vehicle.
- Disconnect the battery cables and retest.

Unstable Battery Detected

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

Deep Scan Test

In some cases the analyzer may need to further analyze a deeply discharged battery to determine whether the battery should be replaced or if it has a chance to be recovered. It then briefly conducts a Deep Scan Test of the battery.

The EXP may also ask you to enter the battery's six-digit serial number, which is located on the battery case.

After the Deep Scan Test the EXP either displays the results or gives you the option to perform the 5-Minute Discharged Battery Test. Although this test takes five minutes, it gives a more precise result for difficult-to-diagnose batteries.

5-Minute Discharged Battery Test

During this test a deeply discharged battery is diagnosed in minutes, eliminating the need to charge the battery for hours in advance. The EXP displays this test option after the Deep Scan Test and before it arrives at the battery decision.

The test requires an external high-current charger. The use of an amp clamp is preferred but not required.

1. If you are using an amp clamp, connect it to the analyzer's accessories port and select AMP CLAMP AVAILABLE.

- 1 AVAILABLE
- 2 NOT AVAILABLE

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

2. Select charge current rate of the battery charger you will use for this test.

15  **(10-60)**

Press the **NEXT** soft key.

3. Disconnect the analyzer's clamps from the battery posts.
4. Make sure the charger's power cord is disconnected and the power switch in the OFF position.
5. Connect the charger's clamps to the battery posts: red lead to the positive (+) terminal, black lead to the negative (-) terminal.
6. Reconnect the analyzer's clamps to the battery posts. Rock them back and forth so they make good contact.
7. Connect the amp clamp to the EXP, and remove the clamp from any cables or wires.
8. Press the **NEXT** soft key to zero out the clamp.
9. Place the amp clamp around the negative (-) battery cable of the charger.
10. Plug in the charger's power cord and turn on the charger.

The EXP begins testing while the charger applies the charge current to the battery. After the initial boost charge, the EXP will count down the test time in minutes and seconds.



CAUTION: Do not leave the battery unattended while the charger is in operation.

11. When the test is finished, the EXP will ask you to turn off the charger and disconnect the charger and analyzer clamps.
12. Reconnect the EXP clamps to the battery posts and press the **NEXT** soft key to display the battery results.

Chapter 6: Battery and Starter System Test—Auto/Van

The System test evaluates the battery, starting and charging systems. Before 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.

1. In the Main Menu, select the System Test icon.



2. Select AUTO/VAN.
 - 1 AUTO/VAN
 - 2 TRUCK

Battery Test

The System Test includes a test of the battery to eliminate it as the cause of starting or charging problems. See Chapter 5 on page 24 for the Battery Test procedure and an example of the test results.

If you are using the amp clamp (AMP CLAMP AVAILABLE), keep it clamped around the negative (-) battery cable.

Starter System Test

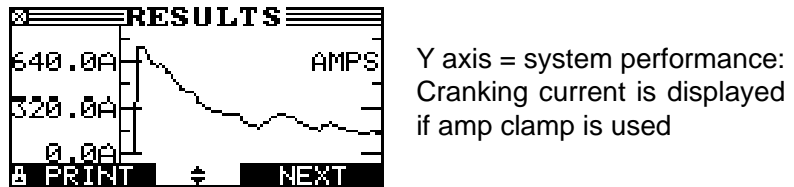
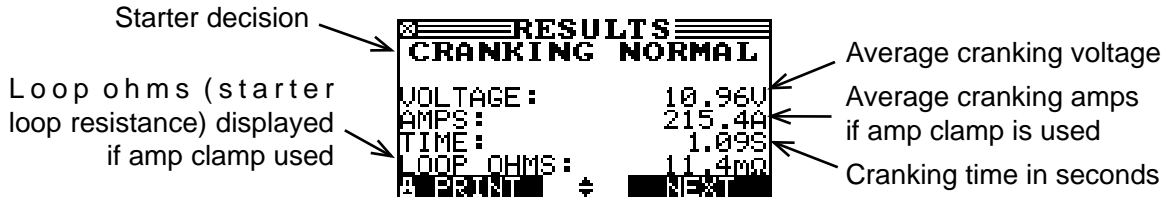
1. Start the engine at the prompt.
2. The EXP displays a decision on the starter system with the complete results in a series of screens. Use the **UP/DOWN ARROW** keys to scroll to each screen.

To send the results to the IR printer, press the **PRINT** soft key. To continue testing, press the **NEXT** soft key. For an example of the test results see the next page.

Auto/Van Starter System Test Results

To send the results to the IR printer, align the analyzer's IR transmitter with the printer's receiver, and press the **PRINT** soft key. To continue testing, press the **NEXT** soft key.

NOTE: In some cases, the EXP may not detect the vehicle's starting profile and display the soft key options **STARTED** and **NO START**. If you select **STARTED**, the EXP skips to the Charging System Test. If you select **NO START**, the test process ends.



Starter System Decision	Recommended 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 repeat the starter system test.
REPLACE BATTERY	The battery must be replaced before testing the starter.
LOW CRANKING AMPS	The cranking voltage is high, but the cranking amps are low.
NO START	The engine did not start and the test was aborted.
CRANKING SKIPPED	The EXP did not detect the vehicle's starting profile and skipped the Starter Test.

Refer to page 36 for the Charging System Test.

Chapter 7: Battery and Starter System Test—Truck

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 first evaluates the battery pack (with up to 6 batteries), then the starter and charging systems. The Charging System Test has the option of using the amp clamp to measure charging current.

Battery Pack Test

The test is designed to give you a quick approximation of the pack's state of health and its capability to deliver current. If the analyzer determines that the pack has a low state of charge, it will provide the option of testing the batteries individually or skipping to the System Test.

1. In the Main Menu, select the System Test icon.



2. Select AUTO/VAN.
 - 1 AUTO/VAN
 - 2 TRUCK
3. Enter the number of batteries in the pack (up to six).



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.

4. Follow steps 3 to 8 in the Battery Test section starting on page 24.
5. When prompted, enter the vehicle VIN.

The EXP evaluates the battery and displays the results (page 34).

If the decision is CHECK BATTERY PACK or you selected more than one battery to test, the EXP provides the option of testing each battery in the pack (BREAK PACK DOWN) or continuing with the Starter Test.

Break Pack Down

If you choose to test individual batteries, the EXP uses the parameters from the pack test and prompts you through the steps of disconnecting the pack, testing each battery, and reconnecting.

To test individual batteries after a CHECK BATTERY PACK decision:

1. Select BREAK PACK DOWN and press the **NEXT** soft key to continue.
2. Disconnect the EXP from the battery posts.
3. Disconnect the battery pack, and press the **NEXT** soft key.
4. When prompted, connect to the first battery and press the **NEXT** soft key.
5. The EXP takes a few seconds to evaluate the battery. If any messages appear before the EXP displays the results, refer to “Battery Test: Additional Test Requirements.”
6. If the battery decision is REPLACE or BAD CELL, the EXP asks you to use the alphanumeric keypad to enter the battery’s serial number. The number, which is located on the battery case. To backspace, use the **LEFT ARROW** key. When finished, press the **NEXT** soft key to continue.
7. When you test the last battery, the EXP displays the results. Press the **DOWN ARROW** key to view the individual battery results. See an example of the results on the next page.

Battery Pack Test Results

If the result is GOOD PACK, the EXP continues to the Starter System Test. The EXP generates a Pack Code for all decisions.

If you tested individual batteries, the EXP displays the results for each battery with a test code for REPLACE decisions.

To view the complete results, press the **UP** or **DOWN ARROW** key.

To send the results to the IR printer, align the analyzer's IR transmitter with the printer's receiver, and press the **PRINT** soft key.

To continue to the Stater System Test, press the **NEXT** soft key.

Pack decision →

Selected number of batteries in the pack →

Selected rating ←

Battery temperature ←

Pack Code for REPLACE decisions

Results for a test of two batteries, with serial numbers and test codes for REPLACE decisions

```

RESULTS
=====
CHECK BATTERY PACK
VOLTAGE:          12.10V
RATED:           900CCA
# OF BATTERIES:  2
TEMPERATURE:     88°F
=====
PRINT  NEXT

RESULTS
=====
VIN
123456
PACK CODE
SMC087-84554B-FE6UGF
=====
PRINT  NEXT

RESULTS
=====
BATTERY 1
12.10V  81 CCA
REPLACE BATTERY
SERIAL # 123456
SMC08-80554-FE6UG
=====
PRINT  NEXT

RESULTS
=====
BATTERY 2
12.10V  81 CCA
REPLACE BATTERY
SERIAL # 235678
SMC08-80554-VE7AC
=====
PRINT  NEXT

RESULTS
=====
1 |
2 |
=====
PRINT  NEXT
    
```

Truck Starter System Test

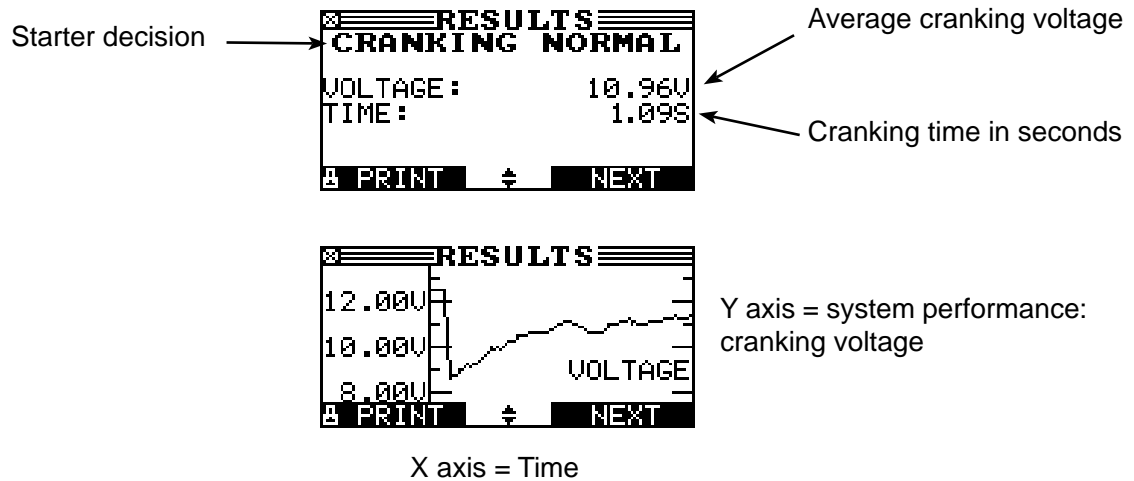
The performance of the starting and charging systems depends on the battery’s condition. It is important that the battery or pack is good and fully charged before any further system testing.

1. Start the engine at the prompt.
2. The EXP will display one of six decisions and the results in a series of screens. Use the **UP/DOWN ARROW** keys to scroll to each screen.

Starter System Test Results

To send the results to the IR printer, align the analyzer’s IR transmitter with the printer’s receiver, and press the **PRINT** soft key. To continue testing, press the **NEXT** soft key.

NOTE: In some cases, the EXP may not detect the vehicle’s starting profile and display the soft key options **STARTED** and **NO START**. If you select **STARTED**, the EXP skips to the Charging System Test. If you select **NO START**, the test process ends.



Starting System Decision	Recommended 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 repeat the starter system test.
REPLACE BATTERY	(If the battery test result was (REPLACE or BAD CELL.) The battery must be replaced before testing the starter.
NO START	The engine did not start and the test was aborted.
CRANKING SKIPPED	The EXP did not detect the vehicle’s starting profile and skipped the Starter Test.

Chapter 8: Charging System Test—Auto/Van and Truck

If you are using the amp clamp (AMP CLAMP AVAILABLE) in the AUTO/VAN Charging System Test, keep it clamped around the negative (–) battery cable.

If you are using the amp clamp (AMP CLAMP AVAILABLE) in the TRUCK Charging System Test, keep it clamped around the positive (+) alternator cable.

1. CHECKING FOR ALTERNATOR OUTPUT: The EXP will immediately begin testing for alternator voltage.
2. 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.

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

4. REV ENGINE WITH LOADS OFF FOR 5 SECONDS: Rev the engine with the loads off. Gradually increase the rpm until the analyzer tells you to HOLD the rev level as the bar on the display moves to the right.

NOTE: Some 8-cylinder and older vehicles idle at a high level after starting, allowing the analyzer to detect the rev automatically.

5. ACQUIRING DATA....HOLD ENGINE RPM: Continue to hold the rpm while the EXP takes system measurements.
6. ENGINE REV DETECTED, IDLE ENGINE: The EXP has detected the rev. Press the **NEXT** soft key.
7. 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.
8. TURN HIGH BEAMS AND BLOWER MOTOR ON, IDLE ENGINE: After a few seconds, the EXP 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.

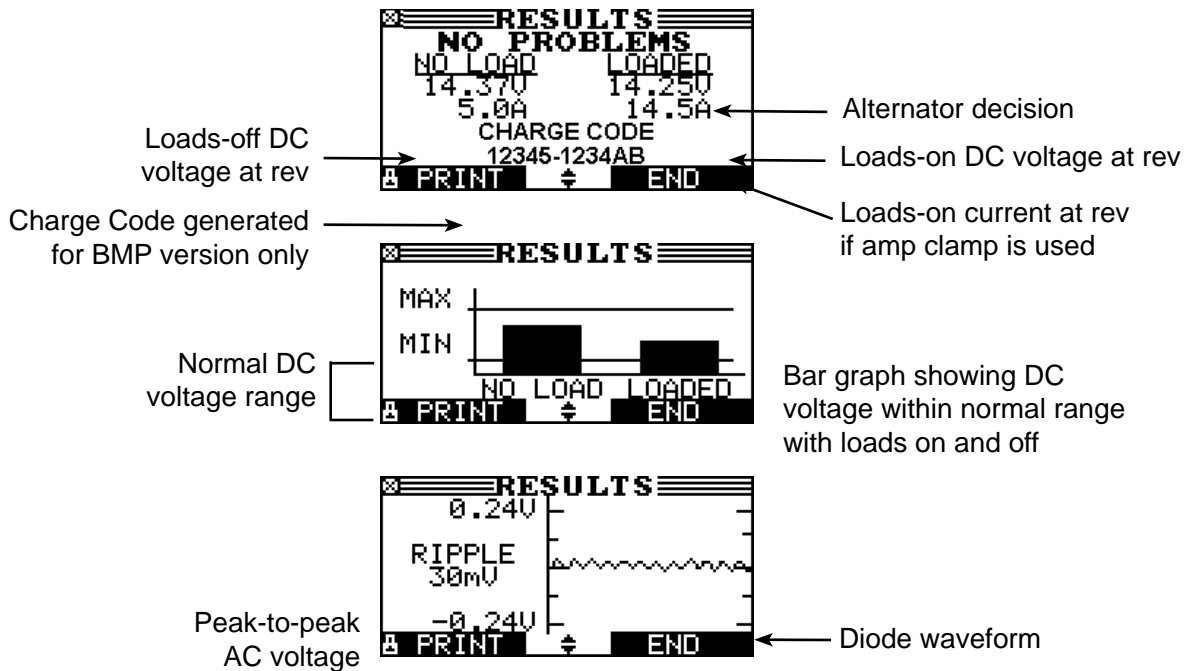
IMPORTANT: Turn on the high-beam headlights and the blower to high. Don't use cyclical loads such as air conditioning or windshield wipers.

9. 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.
10. REV ENGINE WITH LOADS ON FOR 5 SECONDS: The EXP will test the charging system with the loads on and prompt you to rev the engine. Gradually increase the rev until the

analyzer tells you to HOLD the rev level as the bar on the display moves to the right.

11. ACQUIRING DATA....HOLD ENGINE RPM: Continue to hold the rpm while the EXP takes system measurements.
12. ENGINE REV DETECTED, IDLE ENGINE: The EXP has detected the rev. Press the **NEXT** soft key.
13. ANALYZING CHARGING SYSTEM DATA: The EXP is completing its final analysis of the charging system data.
14. TURN OFF LOADS AND ENGINE: Press the **NEXT** soft key to display the results.

Charging System Test Results—Auto/Van and Truck



Charging System 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	<p>The voltage output from the alternator to the battery exceeds the normal limits of a functioning regulator.</p> <ul style="list-style-type: none"> √ 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.) <p>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 14.5 volts +/-0.5. Refer to the manufacturer specifications for the correct limit, which may vary by vehicle type.</p> <p>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 a HIGH OUTPUT, check the battery's electrolyte levels. A symptom of overcharging is battery fluid spewing through the vent caps, which causes low electrolyte levels and will harm the battery.</p>

Diode Decision	Action
EXCESSIVE RIPPLE	<p>One or more diodes in the alternator are not functioning or there is stator damage, which is shown by an excessive amount of AC ripple current supplied to the battery.</p> <p>√ 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.</p>
OPEN PHASE	The analyzer has detected an open phase within the alternator. Replace the alternator.
DIODE OPEN	The analyzer has detected a open diode within the alternator. Replace the alternator.
DIODE SHORT	The analyzer has detected an shorted diode within the alternator. Replace the alternator.

Chapter 9: 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 is no need to run the engine. The Cable Drop Test uses Midtronics' conductance technology to send a signal through the circuit to the component under test. The EXP then simultaneously calculates voltage drop on the positive (+) and negative (-) sides of the 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 EXP will store your setting in memory for your next test.

There are four preset tests for components up to 1000 amps:

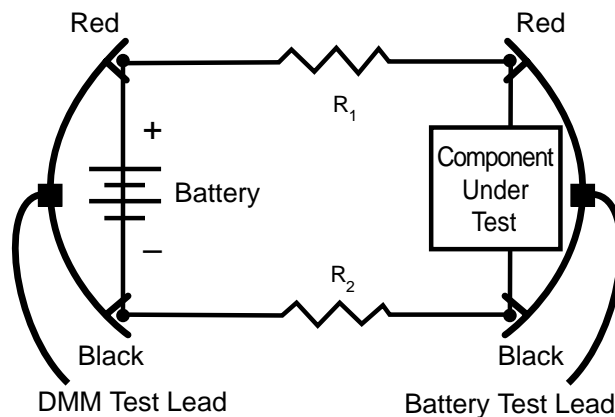
Component	Default Settings	
	Auto Van	Truck
Battery Ground	80 A	—
Starter Circuit	150 A	500 A
Alternator Circuit	80 A	135 A
Chassis Ground	—	135 A
Other Circuit (a circuit of your choice)	10 A	10 A

The test requires two test lead connections, as shown in the illustration below.

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

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

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



- To start a test, select the Cable Drop icon in the Main Menu.



- Select AUTO/VAN.
 - AUTO/VAN
 - TRUCK
- Use the **UP/DOWN ARROWS** or the numerical keypad to select a circuit.
 - STARTER CIRCUIT
 - ALT CIRCUIT
 - CHASSIS GROUND
 - OTHER

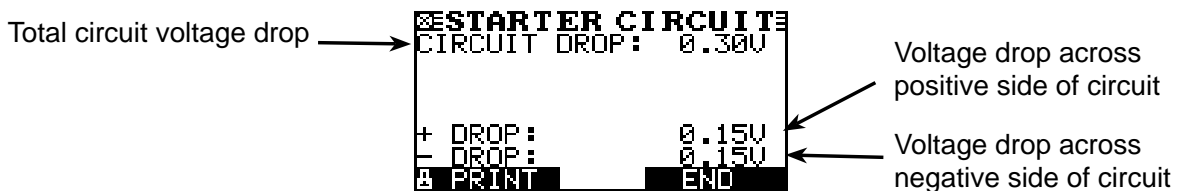
Press the **NEXT** soft key to continue.

- Use the **UP/DOWN ARROWS** or the keypad to select the rated amperage or output of the circuit.



Press the **NEXT** soft key.

- Follow the instructions on the display for connecting the test cables.
- The EXP tests the circuit and displays the results. The format for the Starter Circuit results are typical for 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** soft key.

Chapter 10: DMM (Digital Multimeter)

The DMM's infrared temperature sensor also allows you to determine the surface temperature of components before you service them or as a diagnostic aid. Specifications for each tool are listed at the table at the end of this chapter.

A measurement that is out of the limit displays as *OL*. Refer to the manufacturer specifications for the correct limits, which may vary by component or vehicle type.

1. In the Main Menu, select the DMM icon.



2. Select the icon of the meter you want to use.



DC Voltmeter DC Volts



AC Voltmeter AC Volts

The DC and AC voltmeters measure voltage between two points in a circuit. The voltmeter is connected in parallel with the circuit.

1. Connect the DMM test lead to the analyzer's accessories port.
2. Select the DC Volts or AC Volts icon.
3. Connect the clamps or probes in the correct polarity: red clamp or probe to positive (+); black to negative (-).
4. The meter autoranges and displays the measurement.
5. To return to the METERS menu, press the **END** soft key.



Scope Scope

The scope is a voltmeter that provides a graph of voltage difference as it varies over time. After you select the scope icon, note the instructions in the next screen before proceeding. You will need them after you press the **SELECT** soft key to continue:

- Press 1 on the keypad to autoscale the scope.
- Press 3 on the keypad for the time display.
- Press 4 on the keypad for the FFT (frequency) display.

Press the **SELECT** soft key.

In the time display the horizontal axis is in seconds and the vertical axis is in volts.

In the frequency display the horizontal axis is in hertz and the vertical axis is in volts.

Press the right soft key to alternate between the options to **RUN** (measure and display the signal) and **HOLD** (freeze the signal).

The scope allows you to print the voltage trace to the optional IR printer when you freeze the signal. Align the analyzer's IR transmitter with the printer's receiver, and select the **PRINT** soft key.

To return to the METERS menu, press **END**.



DC Ammeter DC AMP



AC Ammeter AC AMP



Volts/Ammeter Volts AMP

The DC ammeter measures DC magnitude and flow of the DC current in a circuit. The volts/amp meter simultaneously measures charging voltage and charging current.

1. Connect the amp clamp lead to the analyzer's accessories port.
2. Select the DC Volts, AC Volts, or Volts/Amps icon.
3. Select the amp clamp range.
 - 1 70 AMP MAX.
 - 2 700 AMP MAX.

Press the **NEXT** soft key to continue.
4. The meter zeros itself.
5. Place the clamp's jaws around the negative (-) cable.
6. The EXP displays the measurement.
7. To return to the METERS menu, press the **END** soft key.



Temp

The IR temperature sensor measures surface temperature within a range of -20 to 200 °F. The tool can be used for checking the transmission for overheating, and the temperature levels of the heater and air conditioner.



Ohmmeter

The meter is connected in parallel with the circuit under test and uses the power supplied by the analyzer's internal batteries to detect open or excessive resistance.

CAUTION: Always remove power from the circuit before connecting the ohmmeter to avoid damaging the analyzer.

1. Connect the DMM test lead to the analyzer's accessories port.
2. Select the Ohm Meter icon.
3. Connect the clamps or probes in the correct polarity: red probe to positive (+); black to negative (-).
4. The meter will autorange and display the measurement.
5. When finished, press the **END** soft key.
6. To return to the Meters menu, press the **END** soft key.



Diode

This test measures the voltage drop across components, such as diodes.

1. Connect the probes test lead to the EXP's accessories port.
2. Select the meter's icon.
3. Connect the probes in the correct polarity: red probe to positive (+); black to negative (-).
4. The meter will autorange and display the measurement.
5. When finished, press the **END** soft key.

The accuracy specification is defined as $\pm (n\% \text{ reading} + [\text{count} * \text{resolution}])$ at 77 °F.

Vdc

Range	Resolution	Accuracy	Overload Protection
0–60 V	0.01 V	0.05% + 2	120 Vrms

Accuracies are specified from 2% to 100% of range.

Vac

Range	Resolution	Accuracy	Overload Protection
0–24 Vac rms	0.01 Vac	0.1% + 3	120 Vrms

Accuracies are specified from 2% to 100% of range.

Adc

Range	Resolution	Accuracy	Overload Protection
0–70 A	0.01 A	$\pm 3\%$ of reading ± 1 A	1000 Arms
0–700 A	0.1 A	$\pm 3\%$ of reading ± 1 A	1000 Arms

Accuracies are specified from 2% to 100% of range.

Aac

Range	Resolution	Accuracy	Overload Protection
0–70 A	0.01 A	$\pm 3\%$ of reading ± 1 A	1000 Arms
0–700 A	0.1A	$\pm 3\%$ of reading ± 1 A	1000 Arms

Accuracies are specified from 2% to 100% of range.

Ohm

Range	Resolution	Accuracy	Overload Protection
10 Ω –2 M Ω	1 Ω	2.0% + 4	120 Vrms

Continuity

Range	Resolution	Accuracy	Overload Protection
< 10 Ω	1 Ω	2.0% + 4	120 Vrms

Diode

Range	Resolution	Accuracy	Overload Protection
0–1.5 V	0.01 V	0.05% + 2	120 Vrms

Temperature

Range	Resolution	Accuracy	Overload Protection
-20–200 °F -28–93 °C	1 °F 1 °C	1.0% + 5	-----

Chapter 11: Info Menu

The Info Menu has three 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 in three categories. Use the **UP/DOWN ARROW keys** or press the corresponding numerical key to move the dot to the option button of your choice or enter its number.

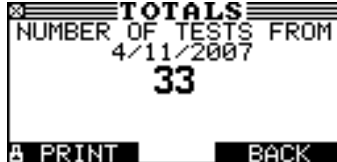
1. In the Main Menu, select the Totals icon.



2. Select the icon of the report or function you want to use.

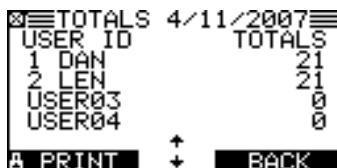
Lifetime

LIFETIME displays the total tests performed since the EXP was first used.



User Totals

USER TOTALS displays the total tests performed by User ID, four IDs per screen.



Totals by Decision

The first screen displays the number of battery tests by decision. The second screen displays the number of packs tests by decision.



```

=====
TOTALS 4/11/2007
=====
PACK TEST
GOOD PACK          2
CHECK PACK         7
24-VOLT PACK       0
TOTALS             9
=====
PRINT  +  BACK
    
```

Clear Counters

To reset a total to 0, press the numerical key that corresponds to the number preceding a check box, and press the **NEXT** soft key.

```

=====
TOTALS
=====
CHECK TO CLEAR
1  LIFETIME
2  USER TOTALS
3  TOTALS BY DECISION
=====
BACK  NEXT
    
```



Transfer Transfer

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



Version Version

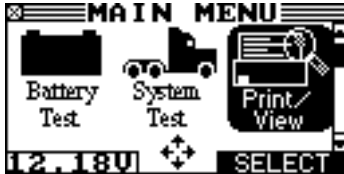
Version displays the analyzer’s software version, the date the software was released, and the serial number of the analyzer. The utility keeps a permanent count of the number of battery tests performed since the analyzer was first used.

Chapter 12: Print/View

The Print/View Menu allows you to view and print the results of the Battery, System, and Cable Drop Tests. The results of the last test are stored in memory until the next test is performed.

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.

1. In the Main Menu, select the Print/View icon.



2. Select the icon of the report or function you want to use.



View Test ViewTest

VIEW TEST allows you to view and print the results of the Battery and System Tests.



View Cable Test View Cable Test

VIEW CABLE TEST allows you to view and print the results of the Cable Drop Test.

Chapter 13: 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 15: EXP Internal Batteries” on page 52, 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” on page 53 for more information.

The STATUS LED Flashes

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

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 two 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 batteries and reprint.
- If you are unable to print after ensuring the analyzer is functioning, the printer is on, the batteries are good, and the IR transmitter and receiver are aligned, check the printer manual for further instructions or call Midtronics at 800-776-1995 for assistance. (See “Patents, Limited Warranty, Service” on page 53 for more information.)

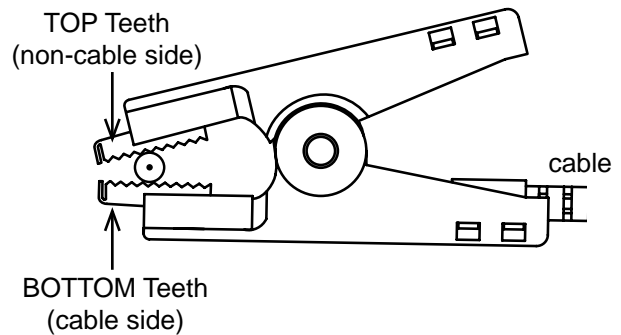
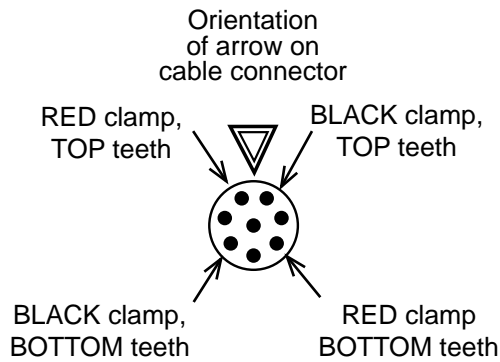
Chapter 14: Testing the Cable Set

If the analyzer frequently displays CHECK CLAMP CONNECTION! you may have an intermittent open circuit along one or both of the battery test cables. You can check the circuit with a simple test. The test requires an ohmmeter and a wire or paper clip if the ohmmeter probes are too large to insert into the pin holes. You will also need to a pencil or plastic marker to keep the clamp jaws apart. The test is the same for cable sets with clamps having two or one set of teeth.

Test Procedure for Heavy Duty Clamps

You are testing the continuity of the following end points on the test cable:

- The top teeth on the positive (RED) clamp jaw (non-cable side) and the corresponding pin hole on the connector.
- The bottom teeth on the positive (RED) clamp jaw (cable side) and the corresponding pin hole on the connector.
- The top teeth on the negative (BLACK) clamp jaw (non-cable side) and the corresponding pin hole on the connector.
- The bottom teeth on the negative (BLACK) clamp jaw (cable side) and the corresponding pin hole on the connector.



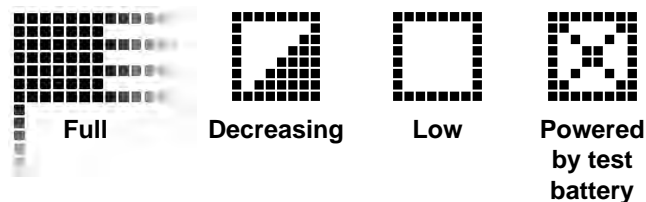
1. Grip a pencil with the clamp as shown in the figure above. Do not grip the metal part of the eraser or any area that may conduct current.
2. To test the connection between the TOP teeth in the RED clamp, insert a probe tip into the connector hole designated "RED clamp, TOP teeth."
3. On the RED clamp touch the TOP teeth (non-cable side) with the probe tip. Wiggle the battery test cables. The resistance reading should be less than 1 Ω .
4. Repeat the test for the BOTTOM teeth in the RED clamp (cable side). Insert a probe tip into the connector hole designated "RED clamp, BOTTOM teeth." Touch the teeth on the cable side of the jaw with the other probe tip. Wiggle the battery test cables. The resistance reading should be less than 1 Ω .
5. Repeat the test procedure for the BLACK clamp by testing the wire circuits between the connector and TOP and BOTTOM clamp teeth. Both readings should be less than 1 Ω .

Chapter 15: EXP Internal Batteries

The EXP uses six 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.

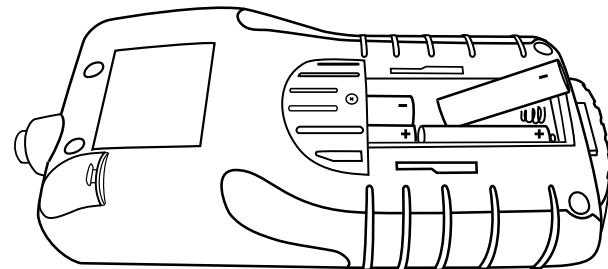
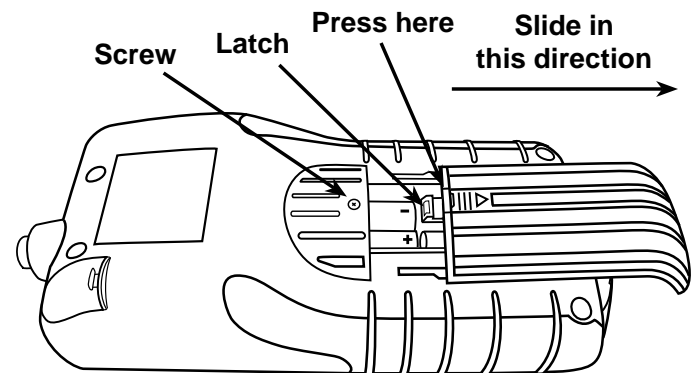
Battery Power Indicator

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 EXP will display a warning message when the batteries need replacing.



Replacing the EXP Batteries

1. Turn the EXP 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 the figure (right). Make sure the positive and negative terminals are positioned correctly.
7. Insert the battery door tabs into the slots on the analyzer and slide the door closed, making sure the latch locks.
8. Insert and tighten the screw.



PATENTS

The inTELLECT™ EXP Expandable Electrical Diagnostic Platform is made in the U.S.A. by Midtronics, Inc. and is protected by one or more of the following U.S. Patents: 4,816,768; 4,825,170; 4,881,038; 4,912,416; 5,572,136; 5,585,728; 5,592,093; 5,757,192; 5,821,756; 5,831,435; 5,914,605; 6,051,976; 6,091,245; 6,163,156; 6,249,124; 6,304,087; 6,310,481; 6,316,914; 6,323,650; 6,351,102; 6,359,441; 6,363,303; 6,392,414; 6,441,585; 6,445,158; 6,456,045; 6,469,511; 6,534,993; 6,544,078; 6,556,019; 6,566,883; 6,586,941; 6,707,303. Canadian Patents: 1,295,680; 1,280,164. United Kingdom Patent: 0,672,248; 0,417,173. German Patent: 693 25 388.6; 689 23 281.0-08; 93 21 638.6. And other U.S. and Foreign patents issued and pending. This product may utilize technology exclusively licensed to Midtronics, Inc. by Johnson Controls, Inc. and/or Motorola, Inc.

LIMITED WARRANTY

This analyzer is warranted to be free of defects in materials and workmanship for a period of one year from date of purchase. The analyzer test cables and Midtronics printer are warranted to be free of defects in materials and workmanship for a period of 90 days 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 EXP 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.

SERVICE

To obtain service, contact Midtronics for a Return Authorization number, and return the unit to Midtronics freight prepaid, Attention: RA# _____. Midtronics will service the analyzer and reship the next scheduled business day following receipt, using the same type carrier and service as received. If Midtronics determines that the failure was caused by misuse, alteration, accident, or abnormal condition of operation or handling, purchaser will be billed for the repaired product and it will be returned freight prepaid with freight charges added to the invoice. Battery analyzers beyond the warranty period are subject to the repair charges in effect at that time. Optional remanufacturing service is available to return the tester to like-new condition. Out-of-warranty repairs will carry a 3-month warranty. Remanufactured units purchased from Midtronics are covered by a 6-month warranty.



Battery Management Innovation

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