MIDTRONICS

Battery Management Innovation

VAS 6161

Vehicle Battery and Electrical Diagnostic Platform

For testing 6 and 12-volt automotive batteries and 12- and 24-volt charging systems

INSTRUCTION MANUAL

INNOVATION TECHNOLOGY QUALITY WORLDWIDE

Contents

Chapter 1: Before You Begin

Starting the tester for the first time

When the tester is first used the operator is asked to enter a couple of items. Items such as dealer ID and Region are used to set-up specific utilities such as date/time stamps and hour indication.

Changes can be made afterwards by going in to the Utility Menu and selecting CONFIG TESTER.

Safety

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

General Precautions

- **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.

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

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

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

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

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.

Utilisation in accordance with „intended purpose“

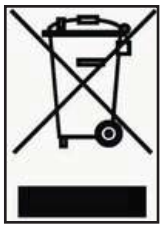
The tester is to be used exclusively for its intended purpose. Utilisation for any other purpose, or in any other manner, shall be deemed to be „not in accordance with the intended purpose“. The manufacturer is not liable for any damage, inadequate or incorrect results arising out of such misuse.

Utilisation in accordance with the “intended purpose” also comprises

- carefully reading and obeying all operating instructions and safety and danger notices
- performing all stipulated inspection and servicing work.
- following all instructions from the battery and vehicle manufacturers.

Disposal

Do not dispose of this device with normal domestic waste!



To comply with the European Directive 2002/96/EC on Waste Electrical and Electronic Equipment and its implementation as national law, electrical equipment that has reached the end of its life must be collected separately and returned to an approved recycling facility Any device that you no longer require must be returned to our agent, or find out about the approved collection and recycling facilities in your area. Ignoring this European Directive may have potentially adverse affects on the environment and your health!

Chapter 2: Description

Connections and Data Ports

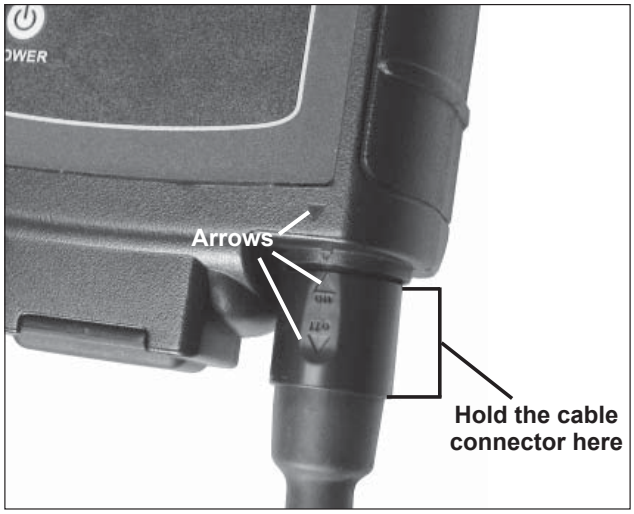
1. **I**ntegrated thermal printer
2. Release lever for door to paper compartment
3. Paper slot
4. LCD screen with Main Menu
5. Control Panel: keypad and power button
6. 6-pin connector for the battery test cable
7. Spring-loaded data card slot for test data storage and software upgrades.
8. Infrared temperature sensor with a range of -28 °C to +93 °C (-20 °F to +200 °F).
9. Data transmitter: sends test results to a PC using an optional hardware and software kit

Connecting the Battery Test Cable

⚠ **CAUTION:** To prevent damage to the analyzer's circuitry, do not connect the analyzer to a voltage source greater than 30 Vdc.

To connect the battery test cable to the analyzer align the arrow on the cable connector with the arrows on the analyzer's housing. Hold the part of the cable connector as shown and firmly insert the connector into analyzer's six-pin receptacle. **Do not twist.**

To avoid damaging the battery test cable, always hold the ridged part of the cable connector (as shown in the photo) when inserting and removing the cable.



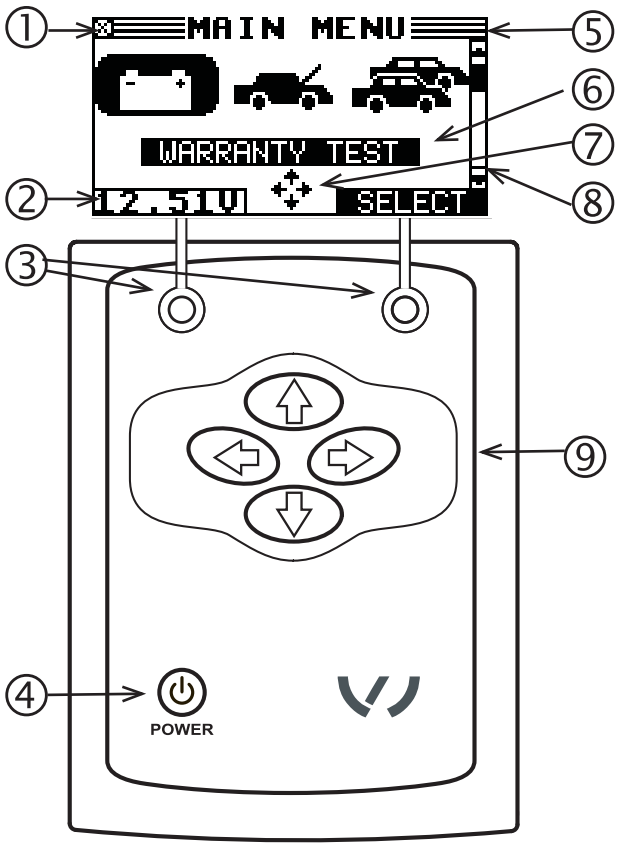
Removing and Inserting the Data Card

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

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

Display and Keypad

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.



❶ Internal Batteries Status Indicator

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

❷ 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.

❸ 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 **END**.

❹ POWER Key

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

❺ Title Bar

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

❻ Selection Area

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

❼ Menu Screen Arrows

When displayed in menu screens, the menu screen arrows show you which **ARROW** key on the keypad to press to display other icons or screens. The Up and Down Menu Screen Arrows, for example, indicate when to press the **UP** (▲) and **DOWN** (▼) **ARROW** keys to display the screens above and below the current screen.

The Left and Right Menu Screen Arrows tell you when to use the **LEFT** (◀) or **RIGHT** (▶) **ARROW** keys to select an icon.

When displayed under a list of options, the menu screen arrows show you which keypad arrow to press to highlight a character or item in a list.

❽ 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.

❾ ARROW keys

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

Data Entry Methods

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

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

Menu icons

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

Option Buttons

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

Scrolling Lists

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

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

Alphanumeric Entries

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

Menu 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.

MAIN MENU (Screen 1)

Tests a battery for Warranty purposes using the battery information you select in a series of screens.

Tests a battery in regular Service, this includes the possibility to perform the starting and charging systems.

Tests vehicles on compound/ports or at dealer before delivery to the customer.

MAIN MENU (Screen 2)

Enables you to view your stored test results and print them to the internal printer.

Quality Control Mode for testing Stock batteries or compound batteries.

Includes a test counter, data transfer utility and displays the tester software versions.

MAIN MENU (Screen 3)

Utilities, many of which customize your user interface in the tester.

Info Menu

Displays the total number of Tests performed since the tester was first used.

An optional IR software and hardware package enables you to transfer test data to a PC.

Displays the software version, total tests from first use, and the serial number.

BACK to Main Menu

SELECT an icon

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.

Displays the last Test results. The results can be printed to the integrated printer.

Displays the last Quality Control Test result. Sends the result to the integrated printer.

BACK to Main Menu

NEXT an icon

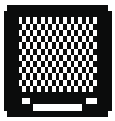
Utilities Menu

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

SETUP (Screen 1)

Configur the tester by selecting several specific functions

BACK
to Main Menu



Settings to adjust the screen contrast and back-light time.

Sets the language of the display and printouts.

SELECT
an icon

SETUP (Screen 2)

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

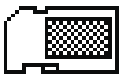
BACK
to Main Menu

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)



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

BACK
to Main Menu

Enable you to Update the software in the tester with a specific SD Card

Setup Quality Control Mode specific items

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 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.

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**. If systems in the vehicle are still active it might lead to a **SYSTEM NOISE** message, the tester will automatically continue to test the battery until the noise is gone.

Connecting the Battery Test Cable

CAUTION: Do not connect the tester to a voltage source greater than 30 Vdc.

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

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

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

Setting User Preferences

Before starting your test you may want to customize the use of your analyzer by setting preferences 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, among others.

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

Chapter 4: Battery Testing

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*.

Warranty mode

This test mode is specifically designed for warranty claims. At the end of the test the tester can create a testcode that is needed when the claim is issued.

1. Select the battery LOCATION.
   - ⦿ OUT OF VEHICLE
   - ◯ IN VEHICLE

   Press the **NEXT** soft key to continue. The **BACK** soft key returns you to the Main Menu.
2. Select the POST TYPE. (IN-VEHICLE)
   - ⦿ TOP POST
   - ◯ JUMP START POST

   Press the **NEXT** soft key to continue.
3. Select the VEHICLE (JUMP START POST)
   - ⦿ TOUAREG
   - ◯ TOUAREG V10 TDI

   By selecting a vehicle the tester will use a pre-defined compensation factor to overcome the extra resistance caused by the JUMP START POST cable. Selecting the wrong vehicle can lead to incorrect measurements.

   Press the **NEXT** soft key to continue.
4. Select the TEMPERATURE.

   Aim the tester 2 inches (5 cm) from the sides or top of the battery case. As soon as the temperature reading is stable the operator can press **NEXT**
5. Select the BATTERY TYPE
   - ⦿ REGULAR
   - ◯ AGM
   - ◯ 2 * 6V SPIRAL
   - ◯ GEL

   Press the **NEXT** soft key to continue.
6. Press the **UP/DOWN ARROW** keys to select the battery rating or in the case of JIS, the part number.

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

Service mode

This test mode is specifically designed for vehicles that are in service.

1. Select the TEST LOCATION
   - ◉ TOP POST
   - ○ JUMP START POST

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

2. Select the VEHICLE (JUMP START POST)
   - ◉ TOUAREG
   - ○ TOUAREG V10 TDI

   By selecting a vehicle the tester will use a pre-defined compensation factor to overcome the extra resistance caused by the JUMP START POST cable. Selecting the wrong vehicle can lead to incorrect measurements.

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

3. Select the TEMPERATURE.

   Aim the tester 2 inches (5 cm) from the sides or top of the battery case. As soon as the temperature reading is stable the operator can press **NEXT**

4. Select the BATTERY TYPE
   - ◉ REGULAR
   - ○ AGM
   - ○ 2 * 6V SPIRAL
   - ○ GEL

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

5. Select the RATING UNITS
   - ◉ CCA
   - ○ JIS
   - ○ DIN
   - ○ SAE
   - ○ IEC
   - ○ EN

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

6. Press the **UP/DOWN ARROW** keys to select the battery rating or in the case of JIS, the part number.

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.

Maintenance mode

This test mode is specifically designed for new vehicles that are stored on a compound, in a port or at the dealer storage before delivery to the customer.

1. POWERING UP SCANNER....
2. Scan the VIN bar code

   When it's impossible to scan the VIN code press the **NEXT** soft key to enter it manually.

3. Select the TEST LOCATION

   ◉ TOP POST

   ○ JUMP START POST

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

4. Select the VEHICLE (JUMP START POST)

   ◉ TOUAREG

   ○ TOUAREG V10 TDI

   By selecting a vehicle the tester will use a pre-defined compensation factor to overcome the extra resistance caused by the JUMP START POST cable. Selecting the wrong vehicle can lead to incorrect measurements.

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

5. Scan the BATTERY VIN bar code

   When it's impossible to scan the VIN code press the **NEXT** soft key to select it from a pre-defined list.

6. Select the TEMPERATURE.

   Aim the tester 2 inches (5 cm) from the sides or top of the battery case. As soon as the temperature reading is stable the operator can press **NEXT**

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

Additional tester messages

Surface Charge

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

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

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

System Noise

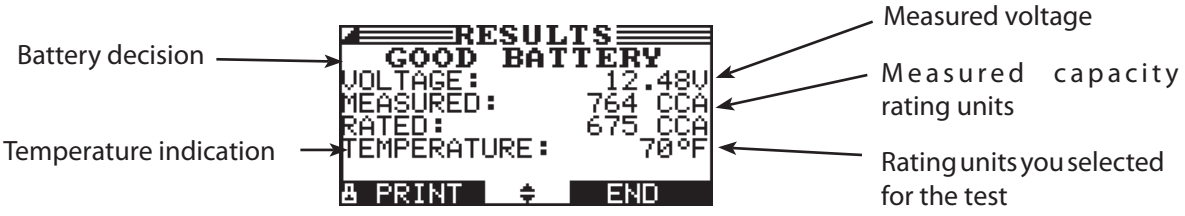
To perform a correct measurement the tester requires the vehicle to be in rest. After the car has been driven some vehicle specific systems might still be active in the background. The tester will detect this and displays the message **SYSTEM NOISE**. When this message appears switch off all consumers(radio,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

Deep Scan Test

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

Battery Test Results for Warranty test and Service Mode

After the test the tester will display the battery decisions with the complete results in a series of screens. Use the **UP/DOWN ARROW** keys to scroll through each result. To print the results press the **PRINT** soft key. To return to the Main Menu, press the **END** soft key.



Battery Decisions and Recommendations

Decision	Recommended Action
GOOD BATTERY	Return the battery to service
GOOD–RECHARGE	Fully charge the battery and return it to service
CHARGE & RETEST	Fully charge the battery and retest. ***Failure to fully charge the battery before retesting may cause false readings.*** If CHARGE & RETEST appears again after you fully charge the battery, replace the battery
REPLACE BATTERY	Replace the battery. A REPLACE BATTERY result may also mean a poor connection between the battery cables and the battery. After disconnecting the battery cables, retest the battery using the out-of-vehicle test before replacing it
BAD CELL–REPLACE	Replace the battery and retest
FROZEN BATTERY	Thaw the battery and retest
REMOTE POST	The decision is based on a measurement on the JUMP START POST. Advise is to retest directly on battery post

Battery Test Results for Maintenance Mode

Decision	Recommended Action
GOOD BATTERY	Return the battery to service
CHARGE BATTERY	Fully charge the battery and return it to service
CHARGE INSTANTLY	Immediately fully charge the battery and retest.
MARK AS DEFECT	Mark this battery as DEFECT and replace it from the vehicle
REMOTE POST	Replace the battery and retest
FROZEN BATTERY	Thaw the battery and retest
REMOTE POST	The decision is based on a measurement on the JUMP START POST. Advise is to retest directly on battery post

Chapter 5: Dynamic Response Test

This test is an in-vehicle test in which a deeply-discharged battery can be diagnosed in minutes instead of the hours needed to charge it. The tester displays the option to perform the test after a deep scan and before it arrives at the battery decision.

The test requires an:

- Amp clamp

Test Routine

1. AMP clamp available
   ◉ YES
   ○ NO
   Press the **NEXT** soft key to continue.

2. Place the Amp clamp around the negative wire.
   Press the **NEXT** soft key to continue.

3. Start vehicle.
4. Tester is checking alternator for output.
5. Turn all vehicles loads off, idle engine.
6. Enter the charge current coming from the alternator (See Amp clamp display).
   Press the **NEXT** soft key to continue.
7. Alternator voltage and current is checked and 5 minute procedure starts.
8. At the end of the 5 minute procedure enter the final charge current from the alternator (See Amp clamp display).

As of this point onwards the tester will perform the alternator test. For more detail please see the chapter SYSTEM TEST

Chapter 6: System Test

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

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

- BATTERY TEST
- STARTER TEST
- ALTERNATOR TEST

Battery Test

The System Test includes a test of the battery to eliminate it as the cause of starting or charging problems.

Starter Test

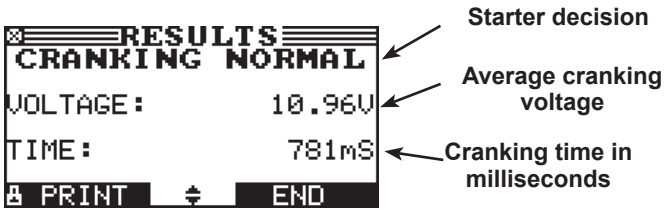
1. Start the engine at the prompt.

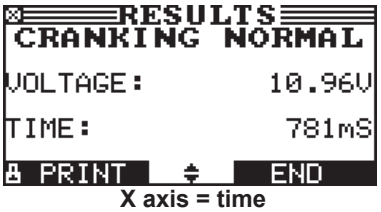
2. The tester will display one of the starter decisions with the complete results in a series of screens. Use the **UP/DOWN ARROW** keys to scroll to each screen.

   To continue testing, press the **NEXT** soft key.

NOTE: In some cases, the tester may not detect the vehicle's starting profile. It will display the soft key options **STARTED** and **NO START**. If you select **STARTED**, the alternator test will be skipped. If you select **NO START**, the test process ends.

Decision	Action
CRANKING NORMAL	The starter voltage is normal and the battery is fully charged.
LOW VOLTAGE	The starter voltage is low and the battery is fully charged.
CHARGE BATTERY	The starter voltage is low and the battery is discharged. Fully charge the battery and 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 didn't start and the test was aborted.
CRANKING SKIPPED	The Tester didn't detect the vehicle's starting profile and skipped the Starter Test.





X axis = time

Alternator Test

1. ANALYZING CHARGING SYSTEM DATA: After you press the **NEXT** soft key to begin the alternator test, the Tester 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.

3. 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 crosses the rpm target line.

4. ACQUIRING DATA....HOLD ENGINE RPM: Continue to hold the rpm while the Tester takes system measurements.

5. ENGINE REV DETECTED, IDLE ENGINE: The Tester has detected the rev. Press the **NEXT** soft key to continue.

6. 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.

7. TURN HIGH BEAMS AND BLOWER MOTOR ON, IDLE ENGINE: After a few seconds, the Tester will ask you to turn on the accessory loads. It will determine if the charging system is able to provide enough current for the demands of the electrical system.

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

8. 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.

9. REV ENGINE WITH LOADS ON FOR 5 SECONDS: The Tester 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 crosses the rpm target line.

10. ACQUIRING DATA....HOLD ENGINE RPM: Continue to hold the rpm while the Tester takes system measurements.
11. ENGINE REV DETECTED, IDLE ENGINE: The Tester has detected the rev. Press the **NEXT** soft key to continue.

12. ANALYZING CHARGING SYSTEM DATA: The Tester is completing its final analysis of the charging system data.

13. TURN OFF LOADS AND ENGINE: Press the **NEXT** soft key to display the results.

Alternator Test Results

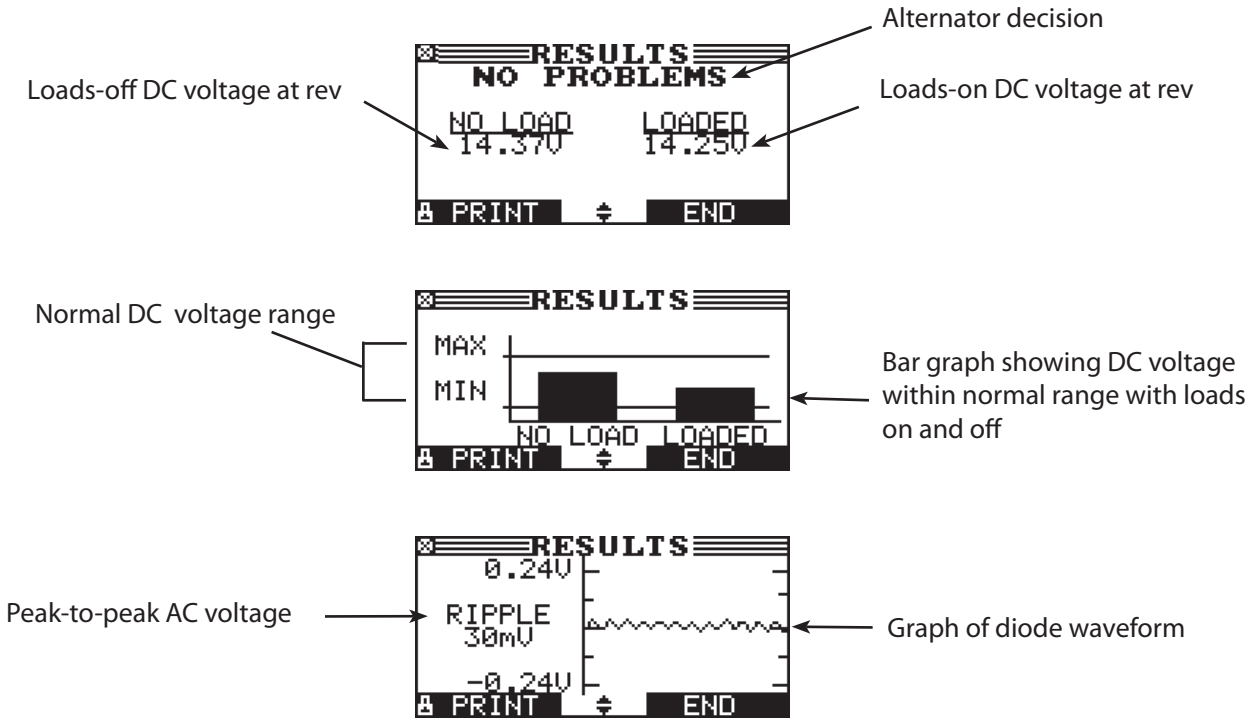


Figure 16: NO PROBLEMS Alternator Result

Table 3: Alternator Decisions and Recommendations

Decision	Action
NO PROBLEMS	The system is showing normal output from the alternator. No problem detected.
NO OUTPUT	The alternator is not providing charging current to the battery. √ 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 OUTPUT	The alternator is not providing enough current to power the system's electrical loads and charge the battery. √ 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 OUTPUT	The voltage output from the alternator to the battery exceeds the normal limits of a functioning regulator. √ Check to ensure there are no loose connections and that the ground connection is normal. If there are no connection problems, replace the regulator. (Most alternators have a built-in regulator requiring you to replace the alternator. In older vehicles that use external voltage regulators, you may need to replace only the voltage regulator.)

Table 4: Diode Decisions and Recommendations

Decision	Action
EXCESSIVE RIPPLE	One or more diodes in the alternator aren't functioning or there's stator damage, which is shown by an excessive amount of AC ripple current supplied to the battery. √ 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.
OPEN PHASE	The Tester has detected an open phase within the alternator. Replace the alternator.
OPEN DIODE	The Tester has detected a open diode within the alternator. Replace the alternator.
SHORTED DIODE	The Tester has detected an shorted diode within the alternator. Replace the alternator.

Chapter 7: 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.

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

STOCK CONTROL

1. The first screen shows you the amount of tests performed. Once you press both the arrow keys you reset the test counter.

2. Select the BATTERY TYPE
   - ◉ REGULAR
   - ◯ AGM
   - ◯ 2 * 6V SPIRAL
   - ◯ GEL

   Press the **NEXT** soft key to continue.
3. Select the RATING UNITS
   - ◉ CCA
   - ◯ JIS
   - ◯ DIN
   - ◯ SAE
   - ◯ IEC
   - ◯ EN

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

4. Press the **UP/DOWN ARROW** keys to select the battery rating or in the case of JIS, the part number.

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

5. Enter the minimum voltage.

6. Select the TEMPERATURE.

   Aim the tester 2 inches (5 cm) from the sides or top of the battery case. As soon as the temperature reading is stable the operator can press **NEXT**

The tester will now test the battery.

COMPOUND MODE

1. The first screen shows you the amount of tests performed. Once you press both the arrow keys you reset the test counter. At the same time you have the possibility to enter a batch name for the coming measurements. This can be useful when you measure multiple vehicles that belong to a specific batch.

   All the battery information is stored on the data card linked to the entered batch name.

2. Select the TEST LOCATION

   ◉ TOP POST

   ◯ JUMP START POST

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

   Select the BATTERY TYPE

3. Select the SELECTION

   ◉ MANUAL

   ◯ PRE-SELECTION

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

4. Select the BATTERY TYPE

   ◉ REGULAR

   ◯ AGM

   ◯ 2 * 6V SPIRAL

   ◯ GEL

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

5. Select the RATING UNITS

   ◉ CCA

   ◯ JIS

   ◯ DIN

   ◯ SAE

   ◯ IEC

   ◯ EN

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

6. Press the **UP/DOWN ARROW** keys to select the battery rating or in the case of JIS, the part number.

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

5. Enter the minimum voltage.

6. Select the TEMPERATURE.

   Aim the tester 2 inches (5 cm) from the sides or top of the battery case. As soon as the temperature reading is stable the operator can press **NEXT**

The tester will now test the battery.

After the test you can save the test result accompanied by VIN code information either by using the barcode reader or manual input.

Chapter 8: Utilities

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

Config Tester

TIME :	**15:23**
MODE :	**24 HOUR**
DATE :	**23/02/2009**
FORMAT :	**DD/MM/YYYY**
TEMP. UNITS	**C**
WRITE FAIL	**ASK**
BARCODE READER	**YES**
REGION	**OTHER**
DEALER-ID	**12345678**

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.

1. Select the 24-hour or AM/PM mode
2. Press the **OK** soft key to save your setting

Date

Date cannot be changed.

Format

Use the **UP/DOWN ARROWS** to select the desired option.

1. MM/DD/YYY (month/day/year) or DD/MM/YYY (day/month/year)
2. Press the **OK** soft key to save your setting.

Temp. units

1. Use the **LEFT/RIGHT ARROWS** to select either Celsius or Fahrenheit as temperature indication.

Write fail

After each measurement the test results are stored on the data card. In case the data cannot be stored on to the card you can select the way this is notified to the operator.

ASK (operator is asked if it is ok to continue even when results are not stored)

FORCE (measurements can only continue when data card is entered)

IGNORE (measurement is not stored and operator not notified)

Barcode reader

Switch barcode reader use ON or OFF. When set to off the tester will not ask for the reader.

Region

Indicate where the tester is being used. USA, CANADA or OTHER

Dealer-Id

Depending where the tester is used there is a pre-defined format for the dealer-id.

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.

2. Press the **LEFT/RIGHT ARROW** key to display the option's numerical scroll box.

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

2. Press the **LEFT/RIGHT ARROW** key to display the option's numerical scroll box.

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

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** to move the dot to the option button of your choice. There is a selection of 24 languages.
2. Press the **NEXT** soft key to save your setting.

Shop

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

Screen 1

1–YOUR SHOP NAME _
2–1000 ANY STREET
3–YOUR TOWN, STATE
4–YOUR POSTAL CODE

Screen 2

5–YOUR COUNTRY _
6–YOUR PHONE NUMBER
7–WWW.WEBSITE.COM
8–YOUR SHOP ID NUMBER

To create or overwrite a header:

1. Press the **UP** or **DOWN ARROW** to highlight the line you want to change.

2. Press SELECT to activate the line for editing, 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. 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.

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** to move the dot to the option button of your choice.

2. Press the **NEXT** 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.

Format Disk

Select this utility to format a data 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. When a new blank data card is used you always have to use this function before the tester can write to the card.

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. The use of a special formatted disk is required for this action.

FIRMWARE (use this option when new software becomes available from Midtronics)

SAVE CONFIG (the tester will store the workshop address to the data card, file name is CONFIG.CSV)

LOAD CONFIG (after new software is uploaded you can reload the workshop details to the tester)

1. Connect the tester to a 12V battery to ensure the tester does not switch off during the proces
2. Insert the disc in the tester
3. Select one of the options and follow the instructions on the screen
4. When finished the tester will prompt you to remove the card and reboot the tester

Battery List (for QC Mode)

In this function you can add, delete battery information that is used for the various battery tests.

BATTERY LIST

From this menu you can add or delete batteries that you can select in the MAINTENANCE MODE or QC mode. When you add a battery you must have the BATTERY PRODUCER, BATTERY TYPE, BATTERY RATING, BATTERY CCA, BATTERY CAPACITY, GOOD LIMIT, CHARGE&RETEST LIMIT, REPLACE LIMIT

VW PARTNUMBER

From this menu you can add or delete VW partnumbers that correspond to the VW batteries.

IMPORT LIST

When VW delivers new battery information it can be uploaded with this function. It will have the same effect as the above mentioned steps but than in a more simple way.

EXPORT LIST

To view the current battery and partnumber information use the EXPORT function to send the information to the data card.

Chapter 9: 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 by decision performed since the Tester was first used. The other option is to clear all the counters from the tester.

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 database version, the total tests performed and the serial number. The utility keeps a permant count of the number of battery tests performed since the analyzer was first used.

Chapter 10: Print/View

The Print/View Menu enables you to view and print the results of the tests performed before you perform another test and overwrite the results in memory.

View Test

VIEW TEST gives you the option of viewing and printing all available test results. To return to the Main Menu, press the **END** key. To print the results press the **PRINT** 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 press the **PRINT** soft key.
To return to the Main Menu, press the **END** key.

Chapter 11: Troubleshooting

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

Problems with the display

The display does not turn on:

- Check the connection to the battery.
- The analyzer's internal batteries may need to be replaced.

The display flickers or is dim:

- The contrast may need to be adjusted in the Utility menu.
- The analyzer's internal batteries may need to be replaced.

Data Will Not Print

The internal printer will not print

- The analyzer must be connected to the vehicle battery to print to the internal printer.
- The vehicle battery may be too low to power the printer. (Battery with at least 11.5 volts)
- Verify that the paper is properly installed
- Verify that the paper sensor is clean and undamaged

Chapter 12: 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.

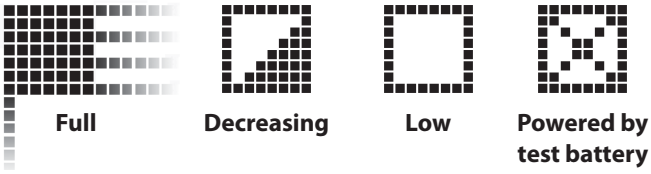


Figure 7: Power Level Indicator for AA Batteries

Replacing the Tester Batteries

1. Turn the Tester face down.
2. Use a Philips screwdriver to remove the screw securing the door to the battery compartment.
3. Lift the door at the tab and place it aside.
4. Remove the discharged batteries.
5. Insert new batteries as shown, make sure the positive and negative terminals are positioned correctly.
6. Reposition the door on the battery compartment.
7. Reinsert and tighten the screw.

PATENTS

The 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 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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