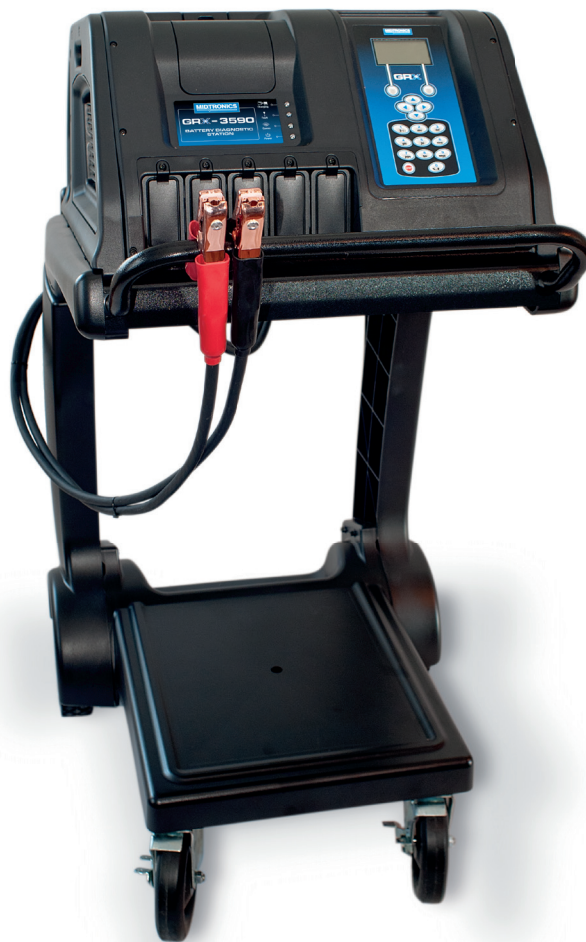

GRX-3590

Battery Diagnostic Station



INSTRUCTION MANUAL

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Safety Guidelines

General Safety Precautions

1. IMPORTANT SAFETY INSTRUCTIONS. **IT IS OF UTMOST IMPORTANCE THAT BEFORE USING YOUR CHARGER, YOU READ THIS MANUAL AND FOLLOW THE SAFETY AND OPERATING INSTRUCTIONS EXACTLY. SAVE THESE INSTRUCTIONS.**

CAUTION

Risk of explosive gases

Batteries generate explosive gases during normal operation, and when discharged or charged.

- 1.1 To reduce risk of battery explosion, follow these safety instructions and those published by the battery manufacturer and the manufacturer of any equipment you intend to use in the vicinity of a battery. Review cautionary marking on these products and on the engine, and on the vehicle or equipment containing the battery.

CAUTION

Charging a non-rechargeable battery may cause the battery to burst.

To reduce the risk of injury, only charge rechargeable lead-acid type batteries including maintenance-free, low-maintenance, or deep-cycle batteries.

If you are uncertain as to the type of battery you are attempting to charge, or the correct procedure for checking the battery's state of charge, contact the seller or battery manufacturer.

- 1.2 Use of an attachment not recommended or sold by the battery charger manufacturer may result in a risk of fire, electric shock, or injury to persons.
- 1.3 To reduce risk of damage to the electric plug and cord, pull by the plug rather than by the cord when disconnecting the charger.
- 1.4 Position the AC and DC leads to avoid tripping over them and to prevent damage by hood, doors, or moving engine parts; protect from heat, oil, and sharp edges.
- 1.5 Do not operate the charger if it has received a sharp blow, been dropped or otherwise damaged in any way; take it to a qualified service center.
- 1.6 Do not disassemble charger; take it to a qualified service center when repair is required. Incorrect reassembly may result in a risk of electric shock or fire.
- 1.7 To reduce risk of electric shock, unplug the charger from the AC outlet before attempting any maintenance or cleaning. Turning off the controls will not reduce this risk.

CAUTION

Remove marine "boat" batteries and charge them on shore.

Charging marine batteries on-board requires specially designed equipment for marine use.

- 1.8 Connect and disconnect the battery leads only when the AC supply cord is disconnected.
- 1.9 Do not overcharge the battery.
- 1.10 Charge the battery in a dry, well-ventilated area.
- 1.11 Never place articles on or around the charger, or locate the charger in a way that will restrict the flow of cooling air through the cabinet.
- 1.12 An extension cord should not be used unless absolutely necessary. (See paragraph 4.3.)
- 1.13 Have a damaged cord or plug replaced immediately.
- 1.14 Do not expose the charger to rain or snow.

Personal Precautions

- 2.1 Always have someone within range of your voice, or close enough to come to your aid, when working around lead acid batteries.
- 2.2 Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing or eyes.
- 2.3 Wear complete eye protection, clothing protection, and wear rubber soled shoes. Place damp cloth over battery to protect against acid spray. When ground is very wet or covered with snow, wear rubber boots. Avoid touching eyes while working near battery.
- 2.4 If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters the eye, immediately flush with cold running water for at least 10 minutes, and seek medical attention.
- 2.5 NEVER smoke or allow a spark or flame in vicinity of a battery or engine.
- 2.6 Be extra cautious to reduce risk of dropping a metal tool onto the battery. It might spark or short circuit the battery or other electrical part that may cause an explosion.
- 2.7 Before working with a lead-acid battery, remove personal metal items such as rings, bracelets, necklaces, watches, etc. A lead-acid battery can produce a short circuit current high enough to weld such items causing a severe burn.

⚠ CAUTION

Non-rechargeable batteries may burst when charging causing personal injury and damage.

To avoid electrical shock or burn, never alter the charger's original AC cord and plug. Disconnect plug from outlet when charger is idle.

The charger is not intended to supply power to a low-voltage electrical system other than applications using rechargeable, lead-acid type batteries. Do not use the battery charger for charging dry-cell batteries commonly used with home appliances. These batteries may burst and cause personal injury and property damage.

- 2.8 **NEVER** charge a frozen battery; thaw it out first.


Preparing to Charge the Battery

- 3.1 If it is necessary to remove the battery from vehicle to charge it, always remove the grounded terminal from the battery first. Make sure all accessories in the vehicle are off, so as not to cause an arc.
- 3.2 Be sure the area around the battery is well ventilated while the battery is being charged. Gas can be forcefully blown away by using a piece of cardboard or other non-metallic material as a fan.
- 3.3 Clean the battery terminals. Be careful to keep corrosion from coming into contact with your eyes.
- 3.4 Add distilled water in each cell until the battery acid reaches the level specified by the manufacturer. This helps purge excessive gas from the cells. Do not overfill. For a battery without caps, carefully follow the manufacturer's recharging instructions
- 3.5 Study all battery manufacturer's specific precautions such as removing or not removing cell caps while charging and recommended rates of charge.
- 3.6 Determine the voltage of the battery by referring to the car owner's manual and make sure that the output voltage selector switch is set at the correct voltage. If the charger has an adjustable charge rate, charge the battery initially at lowest rate. If the charger has only one voltage, verify that the battery voltage matches the voltage of charger.

For a charger not having an output voltage selector switch, determine the voltage of the battery by referring to car owner's manual and make sure it matches the output rating of the battery charger.


Grounding & Power Cord Connections

- 4.1 The **charger must be grounded** to reduce risk of electric shock. The charger is equipped with an electric cord having an equipment grounding conductor and a grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

⚠ DANGER	
	<p>Hazardous voltage. An improper connection can result in electric shock</p> <p>To avoid electrical shock or burn, never alter the charger's original AC cord and plug. Disconnect plug from outlet when charger is idle.</p>

IF THE PLUG DOES NOT FIT THE OUTLET, HAVE A PROPER OUTLET INSTALLED BY A QUALIFIED ELECTRICIAN.

- 4.2 This battery charger is for use on a nominal 220-volt circuit.

⚠ DANGER	
	<p>Hazardous voltage. An improper connection can result in electric shock</p> <p>Before using an adapter be certain the center screw of the outlet plate is grounded. The rigid ear or lug extending from the adapter must be connected to a properly grounded outlet. Make certain it is grounded. If necessary, replace the original screw that secures the adapter ear or lug to the cover plate and make the ground connection to the grounded outlet.</p>

- 4.3 An extension cord should not be used unless absolutely necessary. Use of an improper extension cord could result in a risk of fire and electric shock. If an extension cord must be used, make sure:
- that the pins on plugs of the extension cord are the same number, size, and shape as those of the plug on the charger;
 - that the extension cord is properly wired and in good electrical condition;
 - that the wire size is large enough for the AC ampere rating of charger.

Recommended minimum AWG* size for extension cords for battery chargers					
AC input rating amperes		AWG* size of cord			
Equal or greater than:	But less than:	Length of cord, feet (m)			
		25 (7.6)	50 (15.2)	100 (30.5)	150 (45.6)
8	10	18	14	12	10
10	12	16	14	10	8
12	14	16	12	10	8
14	16	16	12	10	8
16	18	14	12	8	8

*American Wire Gauge

Charger Location

- 5.1 Locate the charger as far away from the battery as the charger cables permit.
- 5.2 Never place the charger directly above the battery being charged; gases from the battery will corrode and damage the charger.
- 5.3 Never allow battery acid to drip on the charger when taking gravity readings or filling a battery.
- 5.4 Operate the charger only in a well-ventilated area that is free of dangerous vapors.
- 5.5 Store the charger in safe, dry location and maintain it in perfect condition.
- 5.6 Do not set the battery on top of the charger or where its acid might drip onto the charger.

DC Connection Precautions

- 6.1 All switches should be set in the OFF position and AC cord should be DISCONNECTED from electrical outlet before you connect and disconnect the charger clamps. Never allow the clamps to touch each other.
- 6.2 When attaching the charger clamps, be certain to make the best possible mechanical as well as electrical connection. This will tend to prevent the clamps from slipping off the connections, avoid dangerous sparking, and assure safer and more efficient charging. The clamps should be kept clean.

DANGER

Hazardous voltage.
Can cause death or serious personal injury.

Setting the switches to "OFF" does not always disconnect the charger electrical circuit from the AC power cord or the DC charger clamps.

Installing the Battery

CAUTION

Risk of explosive gases.

A spark near the battery may cause a battery explosion. Follow these steps when the battery is installed in the vehicle to reduce the risk of explosion.

- 7.1 Before working on the vehicle, firmly apply the emergency brake and place the gear shift to NEUTRAL—shift an automatic transmission to PARK.
- 7.2 Locate the charger as far away from the battery as the charger cords permit and position the AC and DC cords to avoid stepping on or tripping over them and to prevent damage by hood, doors, or moving engine parts.
- 7.3 Stay clear of fan blades, belts, pulleys, and any other parts that can cause physical injury.
- 7.4 Turn **OFF** all vehicle loads, including door lights, and correct any defects in the vehicle's electrical system that may have caused low battery.
- 7.5 Check the polarity of the battery posts. The **POSITIVE (POS., P, +)** post usually has a larger diameter than the **NEGATIVE (NEG., N,-)** post.
- 7.6 Determine which post of the battery is grounded (connected) to the chassis. If the negative post is grounded (as in most vehicles), see paragraph 7.7. If the positive post is grounded, see paragraph 7.8.
- 7.7 For a negative-grounded vehicle, first connect the **POSITIVE (RED)** clamp from the charger to the **POSITIVE (POS., P, +)** ungrounded post of the battery. Then connect the **NEGATIVE (BLACK)** clamp to the **NEGATIVE (NEG., N,-)** post of the battery. Do not connect the clamp to the carburetor, fuel lines, or sheet-metal body parts. When disconnecting the charger, turn all switches to **OFF**, disconnect the AC cord, remove the clamp from the **NEGATIVE** battery terminal, and then remove the clamp from the **POSITIVE** battery terminal.

- 7.8 For positive-grounded vehicle, connect the **NEGATIVE (BLACK)** clamp from the charger to the **NEGATIVE (NEG., N, -)** ungrounded post of battery. Then connect the **POSITIVE (RED)** clamp to the **POSITIVE (POS., P, +)** post of the battery. Do not connect clamp to carburetor, fuel lines, or sheet-metal body parts.

When disconnecting the charger, turn the switches to **OFF**, disconnect the AC cord, remove the clamp from the **POSITIVE** battery terminal, and then remove the clamp from the **NEGATIVE** battery terminal.

CAUTION: WHEN POSITIVE (+) POST OF VEHICLE BATTERY IS GROUNDED, DOUBLE CHECK POLARITY.

Removing the Battery

8. If it is necessary to remove the battery from the vehicle or equipment, always remove the grounded terminal from the battery first.

CAUTION

Risk of explosive gases.

A spark near the battery may cause a battery explosion. Follow these steps when the battery is installed in the vehicle to reduce the risk of explosion.

CAUTION

Risk of explosive gases.

Make sure all vehicle loads are **OFF** to prevent a possible arc.

- 8.1 Check the polarity of battery posts. **POSITIVE (POS., P, +)** post usually has larger diameter than **NEGATIVE (NEG., N, -)** post.
- 8.2 Attach at least a 60 cm (24-inch), 6-gauge insulated battery cable to the negative (-) battery terminal.
- 8.3 Connect the **POSITIVE (RED)** charger clamp to the **POSITIVE (POS., P, +)** post of battery.
- 8.4 Position yourself and the free end of cable as far away from the battery as possible—do not face the battery when making the final connection—then connect the **NEGATIVE (BLACK)** charger clamp to the free end of the cable.
- 8.5 When disconnecting the charger, always do so in the reverse sequence of the connecting procedure; break the first connection while staying as far away from the battery as practical.

Safety Reminder

For safe, efficient, and accurate charging and testing, review the safety and operating instructions in this manual before using the analyzer. In addition, follow all manufacturers' instructions and BCI (Battery Council International) safety recommendations.

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.

- ⇒ Battery acid is highly corrosive. If acid enters your eyes, immediately flush them thoroughly with cold running water for at least 15 minutes and seek medical attention. If battery acid gets on your skin or clothing, wash immediately with a mixture of 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.
- ⇒ Never charge a frozen battery. Gases may form, cracking the case, and spray out battery acid.

Chapter 1: Before You Begin




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 effects on the environment and your health!

Conventions used in this manual

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

Convention	Description
	The safety symbol indicates instructions for avoiding hazardous conditions and personal injury.
	The safety symbol with the words CAUTION , WARNING , or DANGER indicates instructions for avoiding hazardous conditions and personal injury.
CAUTION	The word CAUTION indicates instructions for avoiding equipment damage.
	The wrench symbol indicates procedural notes and helpful information.
UP ARROW	The text for keypad buttons are in Bold capital letters.
CAPITAL LETTERS	The text for screen options are in regular capital letters.
BACK ARROW	The text for soft keys are in Bold capital letters.

Assembly of the GRX-3590

The GRX Battery Diagnostic Station is shipped in two pieces: The cart and the charge engine.

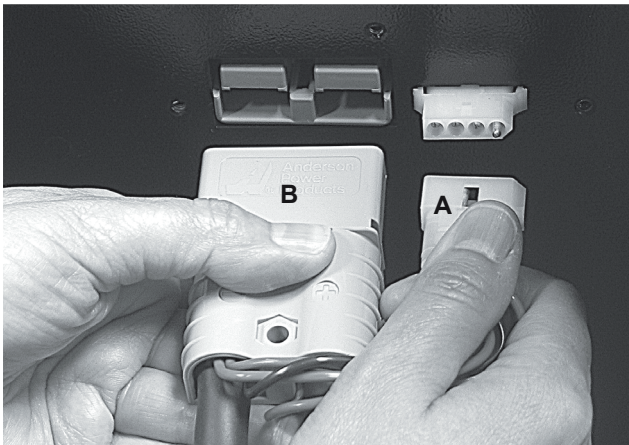
Assemble the Cart

1. For easy shipping the cart is shipped in a partial assembled way. Please refer to the instruction sheet that comes with the package on how to safely assemble.
2. Mount the charge engine on the cart and fix it with a bolt at the back. Tighten the bolt securely.

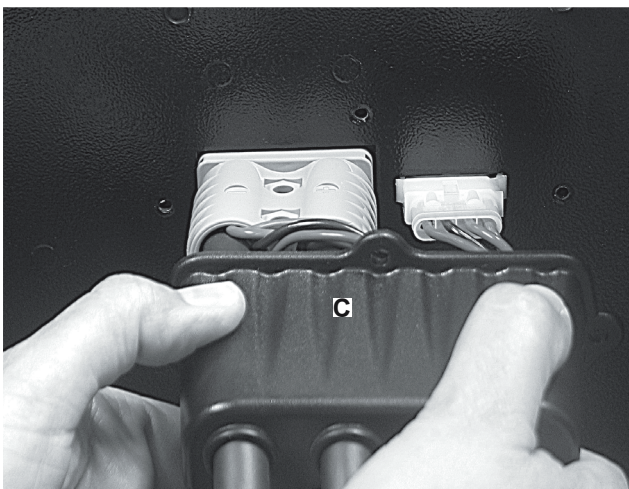
Attaching the Charger Cables

The two connectors for the charger cables are located on the back of the unit. Three screws are included to secure the cables. To attach the cables:

1. Plug the small connector into the small socket (**A**) on the back of the unit.

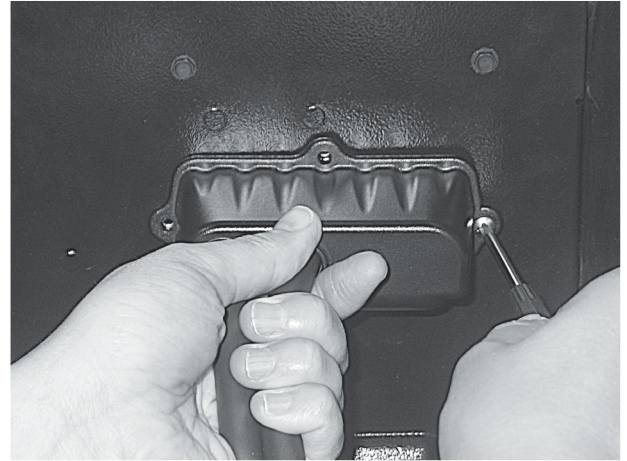


2. Plug the large connector (**B**) into the large socket while placing the protective cover (**C**) against the back of the unit.



3. Center the three holes in mounting bracket over the bolts, and lower the bracket onto the charger. Reinstall the hardware in this order: the flat washer first, the lock washer next, and the hex nut last. Tighten the nuts securely.

4. Insert the screws through the holes in the cover and and securely tighten the screws.



The installation is now complete.

Attaching the Power Cord

Plug in the power cord on the back of the unit.

Connecting to AC Power

Plug the charger into a dedicated, grounded nominal 16-amp or higher AC outlet. Press the power switch to the **ON** position.

Chapter 2: Overview

GRX Battery Diagnostic Station: Front View

The controls to the GRX Battery Diagnostic Station are accessible on the front panel.



① **Optional slide-in thermal printer**

Allows you to print results after the charge cycle.

② **Status indicator lights**

Lights in conjunction with beeping alarm to indicate transitions and warnings.

③ **Expansion plug-in module bay**

Room for 5 expansion modules. Available are: Amp clamp, DMM probes, Zigbee, WIFI, Bluetooth, Serial connection, extra USB connection.

④ **Display**

Backlit graphical display and keypad for data entry.

⑤ **Alphanumeric keypad**

Keypad for data entry and selections in the various menus.

GRX Battery Diagnostic Station: Side View

On the right side of the unit you can find an SD card slot and mini USB connection.

- ① **Data card slot**
Available for future software updates and data storage.
- ② **USB slot**
Hardware prepared, functionality to be defined.



GRX Battery Diagnostic Station: Rear View

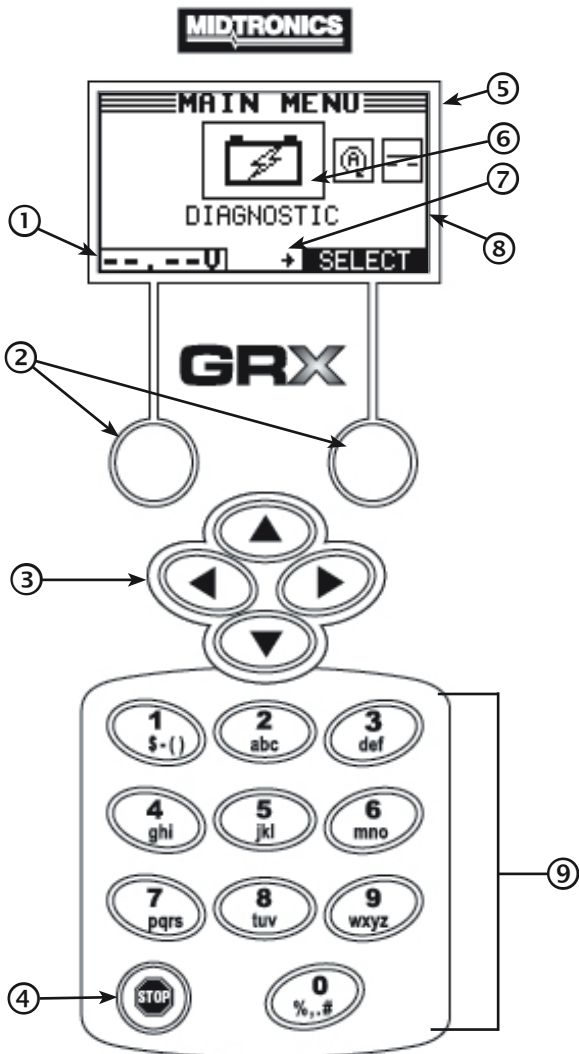
In addition to containing the outlet for the charger cables and power cord, the back of the unit is the location for the serial number label and the ON/OFF switch.

- ① **Serial number label**
The serial number of the unit.
- ② **ON/OFF switch**
Switch the unit on or off.
- ③ **AC power cord**
Connection for a grounded nominal 220 VAC outlet power cord. (2.4 meter in length)
- ④ **Charger cable with Kelvin connection**
Connection to the battery under charge.



Display and Keypad

The GRX Battery Diagnostic Station can be controlled with an integrated display and keypad or with an external tester (special software version needed). The display also keeps you on track with onscreen navigation aids, directions and messages. The illustration shows how the elements on the screen relate to the keypad.



① Voltmeter

When you first connect the GRX 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.

② Soft keys

Pressing the two soft keys linked to the bottom of the screen will perform the functions displayed above them. The functions change depending on the menu and test process.

③ ARROW keys

Press the **ARROW** keys to scroll through numerical values and navigate through menus and icons.

④ STOP key

Press the STOP key at any time to stop the active mode.

⑤ Title bar

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

⑥ Selection area

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

⑦ Menu screen arrows

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

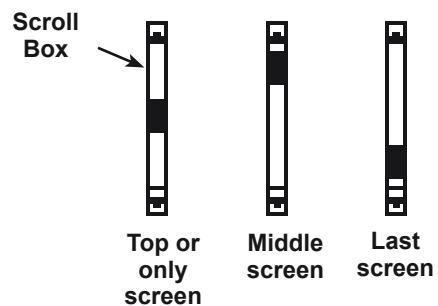
The left and right menu screen arrows tell you when to use the **LEFT (◀)** or **RIGHT (▶) ARROW** keys to select an icon.

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

⑧ Scroll bar

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

Some screens also indicate the page order with a notation such as P1/3 (page 1 of 3).



⑨ 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 can also use the alphanumeric keys to create and edit customer coupons and your shop contact information on printed test results. (printer is optional)

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

Data Entry Methods

To perform a particular test or function, the GRX Battery Diagnostic Station requires different types of information. This means that the methods you use to enter information will change depending on the type of information that is requested. The types of entry methods are described below.

Typically, the soft key below the right half of the screen confirms your choice, although the command above it may vary. (Examples: **SELECT**, **NEXT**, and **SAVE**.) 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. (Examples: **BACK** and **CLEAR**)

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** to highlight it.

Highlighting changes the icon to a white picture on a black background. To confirm your selection, press the **SELECT** soft key.

Option Buttons

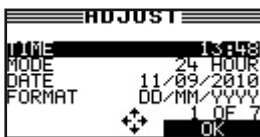


Some lists have option buttons before each item. To select an item, use the **UP (▲)** or **DOWN (▼) ARROW** keys to move the dot to the button next to the item.

To confirm your selection, press the appropriate soft key.

You can also use the alphanumeric keypad to enter the number preceding the option button of your choice. No additional key press is needed to proceed.

Scrolling Lists



A scrolling list contains items that extend above and below the screen. The first number above the right soft key indicates the position in the list of the highlighted

item. The second number above the right soft key indicates the total number of items in the list.

To select an item, press the **UP (▲)** or **DOWN (▼) ARROW** key to highlight the item, and press the appropriate soft 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 (▲)** or **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. For example: the key number 2 on the keypad represents the digit 2 and letters A,B and C.

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 (▲)** or **DOWN (▼) ARROW** keys to highlight a line for editing.

When finished, press the appropriate soft key to save your settings.

Main Menu









The starting point for all functions in the charger. Some icons lead directly to the function while others lead to two or more options underneath it.

Menu Icon	Description
	Diagnostic Mode automatically tests, charges, and provides battery decision using the information you select in a series of screens. This is considered the main function of the Battery Diagnostic Station.
	Power Supply Mode used to maintain the system at a fixed voltage to support the battery during vehicle maintenance. (programming)
	Manual Charging can be used with operator entered values such as voltage, current and time.
 *	Print/View for all statistical and printer info.
 *	Utility Menu includes functionality to setup the charger.

Menu icons marked with an asterisk () have more functions behind it.

Utility Menu

This menu allows you to set certain preferences and view options.

Menu Icon	Description
	The CONFIG CHARGER menu allows you to set the following parameters: DATE AND TIME, WRITE FAIL, TEMPERATURE UNITS, POWER SUPPLY VOLTAGE, BUZZER, DIAGNOSTIC VOLTAGE LIMIT, and DIAGNOSTIC CURRENT LIMIT
	The DISPLAY allows you to set the contrast of the LCD
	With the LANGUAGE menu you can select one of the 24 available languages
	Create your own address details for printouts with the SHOP INFO icon
	Create advertisement text with the COUPON icon that can be printed at the bottom of the printout
	With FORMAT CARD you erase all information on the data card
	With UPDATE you can install new software on the charger
	VERSION INFO displays the software version and serial number

More details on both the menu's can be found in the chapter: **UTILITY**

Chapter 3: Getting Started

The instructions in this section will help you quickly put your GRX to work.

Starting Up for the First Time

When you start the GRX for the first time you are asked to enter a number of settings so you can already adapt the charger to your personal settings. Among these settings are the language and date and time. This only needs to be done once, it can be changed afterwards in the **UTILITY MENU (CONFIG CHARGER)**

Language

After the logo appears, the first selection enables you to set the charger language.

Use the **UP** or **DOWN ARROW**, or press the corresponding numerical key to move the dot to the option button of your choice to select the Language.

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

Date Format

Use the **UP (▲)** or **DOWN (▼) ARROW** or press the corresponding numerical keys to move the dot to the option button of your choice.

- Select the format of the date.
 - DD/MM/YYYY (Day/Month/Year)
 - MM/DD/YYYY (Month/Day/Year)
- Press the **NEXT** soft key to save your setting or the **BACK** soft key to return without saving the changes.

Date

- Use the **ARROW** keys to highlight the month, day, or year.

1 / 1 / 2016

- Press the **NEXT** soft key to save your setting or the **BACK** soft key to return to the previous page without saving the changes.

Time Format

Use the **UP (▲)** or **DOWN (▼) ARROW** key, or press the matching numerical keys to move the dot to the option button of your choice.

- Select the 24-hour or 12-hour (AM/PM) clock.
 - 24 HOUR
 - AM/PM
- If you used the **ARROW** keys, press the **NEXT** soft key to save your setting or the **BACK** soft key to return to the previous screen without saving the changes.

Time

- Use the **LEFT (◀)** or **RIGHT (▶) ARROW** keys to highlight the hour, minutes, or AM or PM.

9 : 19 PM

- Press the **NEXT** soft key to save your setting, or press the **BACK** soft key to return to the previous page.

Set User Preferences

Later in the process you may want to customize the use of your GRX by setting your preferences in the **UTILITY MENU**. The menu has settings for the Time, Contrast and Backlight time and a utility to customize printouts for the optional printer.

Chapter 4: Preparing to Charge

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. **DO NOT CHARGE THE BATTERY.**
- Corroded, loose, or damaged cables and connections. Repair or replace as needed.
- Corrosion on the battery terminals, 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 indicated by the battery manufacturer. Do not overfill.
- Corroded or loose battery terminals, tray and hold-down fixture. Tighten or replace as needed.

Connecting the Clamps

Connect the charging clamps to the battery in accordance with all precautions and safety instructions. **Do not connect either clamp to the vehicle's chassis.**

Connect the clamps to the battery posts: negative (-) black clamp to the negative (-) post; positive (+) red clamp to the positive (+) post.

If the clamps are not making good contact with the battery posts, the screen displays **CHECK CLAMP CONNECTIONS**. Make sure that both jaws of each charging clamp come in good contact with the battery posts. If you accidentally reverse the clamp connections, the charger sounds an alarm and displays **REVERSE CLAMPS**.

Chapter 5: Diagnostic Charging

The GRX Battery Diagnostic Station will determine the internal condition of a battery before attempting to apply a charge to it.

Before performing a diagnostic charge on a battery installed in a vehicle, make sure all vehicle accessory loads are off, the key is not in the ignition, and the doors are closed.

- From the **MAIN** Menu, highlight the **DIAGNOSTIC** icon and press the **SELECT** key.



- Use the **UP (▲)** or **DOWN (▼) ARROW** key to select the battery **LOCATION**, or press the corresponding numerical keys to move the dot to the option button of your choice.

- UNDER HOOD
- UNDER SEAT
- OUT OF VEHICLE

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

Under Hood

- Use the **UP (▲)** or **DOWN (▼) ARROW** key to select the battery **TEST LOCATION**, or press the corresponding numerical keys to move the dot to the option button of your choice.

- BATTERY POST
- JUMP START POST
- JUMP START POST (BMS)

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

- Use the **UP (▲)** or **DOWN (▼) ARROW** key to select the **BATTERY RATING**.

300 A(SAE/EN) 40 AH (*only BATTERY POST*)

350 A(SAE/EN) 50 AH

360 A(SAE/EN) 50 AH

390 A(SAE/EN) 43 AH

500 A(SAE/EN) 52 AH

... (*followed by more options to select from*)

MANUAL ENTRY (*only in case of BATTERY POST*)

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

Under Seat

- Use the **UP (▲)** or **DOWN (▼) ARROW** key to select the battery **TEST LOCATION**, or press the corresponding numerical keys to move the dot to the option button of your choice.

- BATTERY POST
- JUMP START POST
- JUMP START POST (BMS)

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

- Use the **UP (▲)** or **DOWN (▼) ARROW** key to select the **BATTERY RATING**.

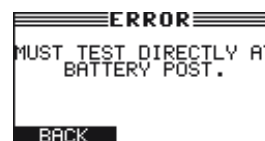
590 A(SAE/EN) 60 AH

700 A(SAE/EN) 80 AH

MANUAL ENTRY (*only in case of BATTERY POST*)

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

NOTE: the selectable BATTERY RATING depends on the TEST LOCATION. When you choose a BATTERY RATING that is only possible with BATTERY POST you will get the following ERROR message:



Out of Vehicle

- Use the **UP (▲)** or **DOWN (▼) ARROW** key to select the **BATTERY RATING**.

300 A(SAE/EN) 40 AH

350 A(SAE/EN) 50 AH

360 A(SAE/EN) 50 AH

390 A(SAE/EN) 43 AH

500 A(SAE/EN) 52 AH

... (*followed by more options to select from*)

MANUAL ENTRY

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

Manual Entry

1. Use the **UP (▲)** or **DOWN (▼) ARROW** key to select the **BATTERY TYPE**, or press the corresponding numerical keys to move the dot to the option button of your choice.

- 1 SLI
- 2 AGM
- 3 EFB

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

2. Use the **UP (▲)** or **DOWN (▼) ARROW** key to select the **RATING UNITS (TEST STANDARD)**, or press the corresponding numerical keys to move the dot to the option button of your choice.

- 1 SAE
- 2 EN
- 3 EN2
- 4 JIS
- 5 DIN
- 6 IEC

If you select JIS, the analyzer will ask for the JIS part number. Scroll to the part number or type in the JIS part number with the alphanumeric keypad.

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

Battery Standards

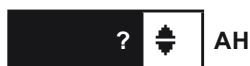
Rating System	Description	Range
SAE	Cold Cranking Amps (specified by SAE): The amount of current a battery can provide at 0 °F (-17.8 °C).	100 to 3000
EN (2)	European Norm	100 to 3000
JIS	Japanese Industrial Standard: embossed on the battery as a combination of numbers and letters	74 numbers from 26A17 to 245H52
DIN	Deutsche Industrie-Norm	100 to 1000
IEC	International Electrotechnical Commission	100 to 1000

3. Press the **UP (▲)** or **DOWN (▼) ARROW** key, or use the numeric keys to enter the **BATTERY RATING** in CCA.



Press **NEXT**.

4. Press the **UP (▲)** or **DOWN (▼) ARROW** key, or use the numeric keys to enter the **CAPACITY** in Ah.



Press **NEXT** after entering or **SKIP** if value is unknown.

If you do not change the default Ah value (indicated by a ?)

the charger will use the default Ah rating that comes closest to the entered CCA value.

There can be a difference between the entered CCA value and the default Ah value since there is no direct one to one relation between the two. The default Ah value will come close but there can be differences found in the field. The advise is to always enter the true Ah value of the battery.

Charging Modes

The Diagnostic Charging mode knows several individual charge cycles such as; Hard To Charge, Bulk Charge, Top-Off Mode and Extended Charge. All these modes will be performed automatically with one intention; determine the State-of-Health of the battery and bringing it to a full State-of-Charge.

Initial Analysis

The GRX first analyzes the battery to find out its original state. Based on this the charger really starts charging. This initial test is done with both Conductance and a Load cycle and depending of the condition we also use a Deep Scan procedure.

Step 1:

The GRX tests the battery with conductance.



Step 2: If needed!

The GRX tests the battery with a Deep Scan.



Step 3:

The GRX applies a load and monitor the battery's response



Step 4:

The GRX performs a final conductance test.



Once the GRX determines that the battery is healthy, needs charging, and is safe to charge, it proceeds.

During the charging session, the GRX provides updates of the charging voltage, charging current, remaining time to charge and the amount of charge replenished into the battery in amp-hours.

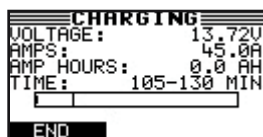
The GRX continues to test the battery throughout the charge cycle and may determine at some point that the battery needs to be replaced even though the remaining time to charge is not up yet.

NOTE: The actual time needed to charge the battery may be less than the estimated time depending on the battery's charge acceptance and condition during the charge.

Before and during the charge cycle the battery is tested with both Conductance and a Load bounce.

Hard to Charge Mode (HTC Mode)

The GRX uses the first portion of the total charge cycle to closely monitor the acceptance of charge current and energy going in to the battery.



During this mode the charger continuously analyzes the battery to make a decision as quickly as possible.

Bulk Charge Mode / Fill Mode

Following this HTC Mode process the GRX will continue charging in the Bulk Mode. During this charge cycle the clock will indicate how much more charge time is needed.

Extended Charge Mode

In some cases the battery's acceptance of charge current is still high even when the charge time has elapsed. In this case the charger will automatically start the Extended Charge cycle and will continue charging until the charge current drops below 7 Amps. This Extended mode makes sure that the battery is sufficiently charged before going in the Top Off Mode.

Top-Off Mode

When the battery is sufficiently charged to be returned to the vehicle it will indicate this with an audible signal as well as text on the display. If the STOP key is not pressed the charger will continue to charge to fill the battery even more.

This mode occurs automatically at the end of the charge cycle to allow the charger to fill a good battery to capacity. Top-Off Mode ends when the battery's acceptance of the charge current goes below 2 amps, or when you press the STOP button.

Aborting a Charge Session

If you need to abort the charging session, press the **STOP** key until the charge session is aborted. After aborting, the charge data is displayed. Press **END** to return to the **MAIN** Menu.

Completing a Charge Session

The charge session is complete when the proper amount of charge is put back into the battery or the remaining estimated time to charge counts down to zero.



IMPORTANT: When you start a new test, the last battery test in memory will be overwritten. Remember to record or print the results if you need to retain them.

Diagnostic Charging Results

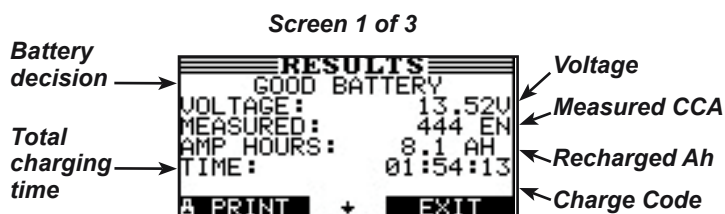
Use the **UP (▲)** or **DOWN (▼) ARROW** keys to scroll to each screen. To print, press the **PRINT** soft key.

State-of-Health (SOH)

A factor that affects a battery's ability to crank an engine is its actual condition or State-of-Health (SOH). It is a measure of the battery's condition relative to a fresh battery.

A State-of-Health problem is most often the result of normal wear-out mechanisms, which are dependant on vehicle needs, climate, and operating conditions. This results in irreversible physical and chemical changes until eventually the battery can no longer hold a charge and supply the power necessary to start the car and provide auxiliary power to the electrical system.

As the battery approaches end of life, its deterioration accelerates, until it finally fails to start the vehicle. Before failing, the battery may start the vehicle under normal conditions but may not be able to operate in more extreme conditions. Extreme heat or cold could expose a weak battery and cause it to fail.



Screen 2 of 3



Screen 3 of 3



Battery Decisions: Diagnostic Charge

Battery Decision	Recommended Action
GOOD BATTERY	Return the battery to service.
REPLACE 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.

Chapter 7: Power Supply

The Power Supply function should be used when ever the vehicle comes in to the workshop for regular maintenance or ECU re-flashing.

Re-flashing an ECU can take up to several hours and during that period a lot of current can be drawn from the battery. To support the battery during this process you use the power supply function.

Always make sure that when you work on the vehicle the charger is switched in to the Power Supply function so that you ensure that when the work is done the battery's state of charge is maintained at a healthy level.

1. From the **MAIN** Menu, highlight the **POWER SUPPLY** icon and press the **SELECT** key.



2. Use the **UP (▲)** or **DOWN (▼) ARROW** key to select the **BATTERY TYPE**, or press the corresponding numerical keys to move the dot to the option button of your choice.

- 1 SLI
- 2 AGM
- 3 EFB

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

3. Use the **UP (▲)** or **DOWN (▼) ARROW** key to select the **RATING UNIT (TEST STANDARD)**, or press the corresponding numerical keys to move the dot to the option button of your choice.

- 1 SAE
- 2 EN
- 3 EN2
- 4 JIS
- 5 DIN
- 6 IEC

If you select JIS, the analyzer will ask for the JIS part number. Scroll to the part number or type in the JIS part number with the alphanumeric keypad.

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

4. Press the **UP (▲)** or **DOWN (▼) ARROW** key, or use the numeric keys to enter the **BATTERY RATING** in CCA.

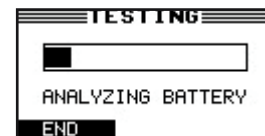


Press **ENTER**.

The GRX will test the battery with conductance.



The next step is to apply an electrical load and test the response.



When the battery has a low state of charge the charger will ask you if you want to charge the battery first prior to starting the power supply function. It is advised to do this because ECU programming with a battery in a low state of charge can cause damage to the ECU when the battery voltage drops below a certain limit.



If **YES** is selected the battery will be charged in the Diagnostic Charge mode until it is ready. It will automatically jump back to the Power Supply screen and maintains the battery with the selected voltage threshold.

If **NO** is selected you will jump back to the **MAIN** menu.

In case of a defective battery the following message will appear.



Settings in UTILITY menu for Power Supply

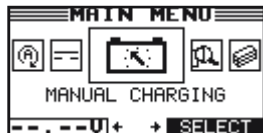
Go to the **UTILITY** menu and select **CONFIG CHARGER**, use the **UP (▲)** or **DOWN (▼) ARROW** to select **PS VOLTAGE**.

Set the voltage to your requirement.

Chapter 8: Manual Charging

The GRX guides you through the steps of selecting your battery test parameters and interpreting the results. Before performing a manual charge cycle on a battery installed in a vehicle, make sure all vehicle accessory loads are off, the key is not in the ignition, and the doors are closed. With the manual mode you can select your own voltage and current settings.

- From the **MAIN** Menu, highlight the **MANUAL CHARGING** icon and press the **SELECT** key.



- Use the **UP (▲)** or **DOWN (▼) ARROW** key to select the **BATTERY TYPE**, or press the corresponding numerical keys to move the dot to the option button of your choice.

- SLI
- AGM
- EFB

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

- Use the **UP (▲)** or **DOWN (▼) ARROW** key to select the **RATING UNIT (TEST STANDARD)**, or press the corresponding numerical keys to move the dot to the option button of your choice.

- SAE
- EN
- EN2
- JIS
- DIN
- IEC

If you select JIS, the analyzer will ask for the JIS part number. Scroll to the part number or type in the JIS part number with the alphanumeric keypad.

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

- Press the **UP (▲)** or **DOWN (▼) ARROW** key, or use the numeric keys to enter the **BATTERY RATING** in CCA.



Press **ENTER**.

- Press the **UP (▲)** or **DOWN (▼) ARROW** key, or use the numeric keys to enter the **CHARGING VOLTAGE**. You can enter a value between 12,70 Volt and 14,50 Volt
Press the **NEXT** soft key to continue.
- Press the **UP (▲)** or **DOWN (▼) ARROW** key, or use the numeric keys to enter the **CHARGING CURRENT**. You can enter a value between 1,0 Amp and 50,0 Amp
Press the **NEXT** soft key to continue.
- Press the **UP (▲)** or **DOWN (▼) ARROW** key, or use the corresponding numerical keys to select the **CHARGING TIME**.
Press the **NEXT** soft key to continue.
- When you selected **TIMED** you are requested to enter the charge time in minutes. This can be a time between 5 and 120 minutes.

Chapter 9: Printing / View Menu

The Print/View Menu enables you to view and print the results of the charge cycles before you perform another cycle and overwrite the results in memory.

View Test

VIEW TEST gives you the option of viewing and printing the last results. To print the results, select the **PRINT** soft key.

To return to the **MAIN** Menu, press the **END** key.

Statistics

This gives you the option of viewing the statistical data collected for all the charge cycles by battery decision since the last time the totals were reset to 0 or to reset the counters.

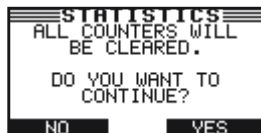
Use the **UP (▲)** or **DOWN (▼) ARROW** key to select one of the options.



Press **EXIT** to return to the **TOTALS** menu.

Clear counters

This allows you to reset the counters completely.



Press the **YES** soft key to clear the counters or the **NO** soft key to cancel.

Problems with the Internal Printer

The internal printer will not print

- Make sure the Battery Diagnostic Station is connected to AC power and the **POWER** switch is pressed to the **ON** position.
- Verify that the paper is properly installed.

Changing the Paper in the Internal Printer

The internal printer is shipped with a roll of thermal printing paper installed in the paper compartment. The roll size is 2¼ inches wide by 1⁷/₈ inch in diameter. Replacement rolls are available at most office supply stores.

The Battery Diagnostic Station uses only thermal printing paper.

To replace the paper roll:

1. Unlock the printer door by gently lifting the latch on the printer.
2. Lift the printer door and remove the spent roll.
3. Place a new roll of paper in the compartment. The paper feeds from the bottom of the roll.
4. Pull the paper forward so that it extends past the serrated edge of the paper slot.
5. Close the door and make sure the lever locks securely. For a clean tear, pull the paper along the serrated edge.

Do not pull the paper straight out of the printer.

Chapter 10: Utility Menu

- From the **MAIN** Menu, highlight the **UTILITY** icon and press the **SELECT** key.



- Use the **RIGHT (▶) ARROW** to select one of the following icons:

CONFIG CHARGER, DISPLAY, LANGUAGE, SHOP INFO, COUPON, FORMAT CARD, UPDATE, and VERSION INFO

Config Charger

DATE AND TIME

WRITE FAIL

TEMPERATURE UNITS

POWER SUPPLY VOLTAGE

BUZZER

DIAGNOSTIC VOLTAGE LIMIT

DIAGNOSTIC CURRENT LIMIT

Date and Time Menu



Use the **ARROW** keys to select one of the following items followed by **ADJUST**

Mode

- Press the **UP (▲) or DOWN (▼) ARROW** or press the corresponding numerical key (1 or 2) to move the dot to the option button of your choice. Select the 24-hour or AM/PM mode.
- Press the **SAVE** soft key to save your setting or the **BACK** soft key to return to the menu.

If you use the alphanumeric keypad to enter the number preceding the option button, no additional keypress is needed to save your selection.

Time

- Use the **UP (▲) or DOWN (▼) ARROW** to change the hour, minutes, or AM/PM.

9 : 19 PM

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

Format

- Use the **UP (▲) or DOWN (▼) ARROW** or press the corresponding numerical key (1 or 2) to move the dot to the option button of your choice.
 - MM/DD/YYYY (month/day/year)
 - DD/MM/YYYY (day/month/year)
- If you used the **ARROW** keys, press the **SAVE** soft key to save your setting or the **BACK** soft key to return to the menu.

If you use the alphanumeric keypad to enter the number preceding the option button, no additional keypress is needed to save your selection.

Date

- Use the **ARROW** keys to highlight the month, day, or year. To rapidly scroll, hold down an **UP (▲) or DOWN (▼) ARROW** key.

1 / 1 / 2016
- Press the **SAVE** soft key to save your setting or the **BACK** soft key to return to the menu screen without saving the changes.

Write fail

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.

- Press the **UP (▲) or DOWN (▼) ARROW** or press the corresponding numerical key (1,2 or 3) to move the dot to the option button of your choice.
 - ASK (operator is asked if it is ok to continue even when results are not stored)
 - IGNORE (measurement is not stored and operator not notified)
 - FORCE (measurements can only continue when data card is entered)
- Press the **SAVE** soft key to save your setting or the **BACK** soft key to return to the menu screen without saving the changes.

If you use the alphanumeric keypad to enter the number preceding the option button, no additional keypress is needed to save your selection.

Temperature units

- Press the **UP (▲)** or **DOWN (▼) ARROW** or press the corresponding numerical key (1 or 2) to move the dot to the option button of your choice.
 - DEGREES C
 - DEGREES F
- Press the **SAVE** soft key to save your setting or the **BACK** soft key to return to the menu screen without saving the changes.

If you use the alphanumeric keypad to enter the number preceding the option button, no additional keypress is needed to save your selection.

Power Supply Voltage

- Use the **UP (▲)** or **DOWN (▼) ARROW** to select the required **POWER SUPPLY VOLTAGE**.



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

Buzzer

- Press the **UP (▲)** or **DOWN (▼) ARROW** or press the corresponding numerical key (1 or 2) to move the dot to the option button of your choice.
 - NO
 - YES
- Press the **NEXT** soft key to save your setting or the **BACK** soft key to return to the menu screen without saving the changes.

If you use the alphanumeric keypad to enter the number preceding the option button, no additional keypress is needed to save your selection.

Diagnostic Voltage Limit

- Use the **UP (▲)** or **DOWN (▼) ARROW** to select the required **DIAGNOSTIC VOLTAGE LIMIT**.



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

Diagnostic Current Limit

- Use the **UP (▲)** or **DOWN (▼) ARROW** to select the required **DIAGNOSTIC CURRENT LIMIT**.



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

Display

The **DISPLAY** option allows you to adjust the contrast of the text on the display.

Contrast Level

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

- Press the **UP (▲)** or **DOWN (▼) ARROW** key to change the contrast.



- Press the **SAVE** soft key to save your setting or the **BACK** soft key to return to the menu without saving the changes.

Problems with the Display

The display does not turn on

- Make sure that the power cord is plugged in and the **ON/OFF** switch is set to **ON**.

The display is dim

- The contrast may need to be adjusted in the **UTILITY** Menu. Highlight the **DISPLAY** icon and press **ENTER**. Use the **UP (▲)** or **DOWN (▼) ARROW** key to change the contrast.

Language

The **LANGUAGE** utility enables you to select a language for the display and printouts. You can select one of the 24 available languages.

- Press the **UP (▲)** or **DOWN (▼) ARROW** key, or use the numeric keys to select your language.
- Press **SAVE** to save your setting.

If you use the alphanumeric keypad to enter the number preceding the option button, no additional keypress is needed to save your selection.

Shop Info

The **SHOP INFO** utility enables you to create a header for your printed test results showing your business location information.

Screen 1

1-WORKSHOP NAME —
2-STREET NAME
3-CITY
4-ZIP CODE

Screen 2

5-COUNTRY —
6-PHONE NUMBER
7-FAX NUMBER
8-WEBSITE.COM

Screen 3

9- —
10-
11-
12-

To create or overwrite a header:

Use the **UP (▲)**, **DOWN (▼)**, **LEFT (◀)** or **RIGHT (▶)** **ARROW** to navigate through the available space. Select the character by pressing the key associated with the character as many times as needed.

Press **SAVE** to store the text.

This template might help you filling out the information for the Coupon and Shop info. 8 Lines are available for the **COUPON** mode and 12 lines are available for the **SHOP INFO**.

Coupon

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

1. Press the **UP (▲)** or **DOWN (▼)** **ARROW** key, or use the numeric keys to select your choice
2. If you selected the USER COUPON mode you can enter your text on 8 lines.

Use the **UP (▲)**, **DOWN (▼)**, **LEFT (◀)** or **RIGHT (▶)** **ARROW** to navigate through the available space. Select the character by pressing the key associated with the character as many times as needed.

Press **SAVE** to store the text.

Format Card

Select this utility to format a data card to receive data or erase all data on the card. The charger 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 charger software using files on an SD card. The use of a special formatted disk is required for this action.

The software needs to be placed on the SD card and the card needs to be inserted in the dedicated slot.

When finished the charger will prompt you to remove the card and reboot.

Version Info

The **VERSION** utility displays the current software version, the software release date and the serial number of the charger.

```

=====VERSION INFO=====
GRX-3590 FORD
V2.4 BUILD 1
VERSION 192-210353C
EEPROM 192-230317C
ALG VER 271-200096A
+ EXIT

=====VERSION INFO=====
GRX-3590 FORD
V2.4 BUILD 1
POWER SUPPLY 0.0.1.0
CCA 192-120094D
++ EXIT

=====VERSION INFO=====
GRX-3590 FORD
V2.4 BUILD 1
DMM NO HW
WIFI NO HW
SERIAL NO HW
++ EXIT

=====VERSION INFO=====
GRX-3590 FORD
V2.4 BUILD 1
ZIGBEE NO HW
ETHERNET NO HW
BLUETOOTH NO HW
+ EXIT

```

The above is an example of the screen

Chapter 11: Errors and warnings

During a charge cycle there might be messages coming from the charger indicating something is wrong.

Below is a summary of possible messages and explanations.

Reverse Connection



If you connect the clamps in the wrong polarity (positive to negative or negative to positive), the charger displays **REVERSE CONNECTION!**



Reconnect the clamps correctly.

Check Clamp Connection



To make sure both sides of the clamps are gripping the terminals, rock the each clamp back and forth. A poor connection will prevent charging.

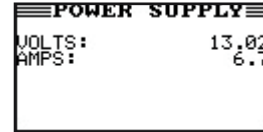
If the message reappears after you have correctly reconnected the clamps, clean the terminals and battery posts and reconnect.

Frozen Battery

A warning from the charger that the battery under charge shows signs of being frozen. Thaw the battery and try to charge it later.

Charging a frozen battery is dangerous and should never be done.

Battery Temperature Above Limit



The charger has two temperature sensors that monitor the temperature in the clamps during any process. If the temperature goes above a certain limit there will be a warning. The process needs to be stopped to prevent any unsafe condition.



PATENTS

The GRX-3000 Battery Diagnostic Station is made by Midtronics, Inc., and is protected by one or more U.S. and foreign patents. For specific patent information, contact Midtronics, Inc. at +1 630 323-2800.

LIMITED WARRANTY

The GRX-3000 Battery Diagnostic Station is warranted to be free of defects in materials and workmanship for a period of two years from date of purchase. The charger cables are excluded from this warranty.

Midtronics will, at our option, repair or replace the equipment with a remanufactured equipment. This limited warranty applies only to the specified equipment, and does not cover any other equipment, static damage, water damage, over-voltage damage, dropping the units, 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 Battery Diagnostic Station assembly.



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