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**2017.0 XE (X760), 414-01**

## **BATTERY, MOUNTING AND CABLES**

### **DIAGNOSIS AND TESTING**

### **PRINCIPLES OF OPERATION**

For a detailed description of the battery system and operation, refer to the relevant Description and Operation section of the workshop manual REFER to: [Battery and Cables](#) (414-01 Battery, Mounting and Cables, Description and Operation).

### **INSPECTION AND VERIFICATION**

#### **CAUTION:**

Diagnosis by substitution from a donor vehicle is **NOT** acceptable. Substitution of control modules does not guarantee confirmation of a fault and may also cause additional faults in the vehicle being checked and/or the donor vehicle.

#### **NOTES:**

- Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer-approved diagnostic system).
- When performing voltage or resistance tests, always use a digital multimeter that has the resolution ability to view 3 decimal places. For example, on the 2 volts range can measure 1mV or 2 K Ohm range can measure 1 Ohm. When testing resistance always take the resistance of the digital multimeter leads into account.
- Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

- If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

1. Verify the customer concern
2. Visually inspect for obvious signs of mechanical or electrical damage

### Visual Inspection

MECHANICAL	ELECTRICAL
<ul style="list-style-type: none"> <li>▪ Generator</li> <li>▪ Drive belt</li> <li>▪ Drive belt tensioner</li> <li>▪ Generator pulley</li> <li>▪ Check the security of the generator fixings</li> </ul>	<ul style="list-style-type: none"> <li>▪ Generator</li> <li>▪ Battery</li> <li>▪ Battery connections</li> <li>▪ Starter motor</li> <li>▪ Harnesses and connectors</li> <li>▪ Fuses</li> <li>▪ Charge warning lamp function</li> <li>▪ Powertrain Control Module (PCM)</li> </ul>

3. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
4. If the cause is not visually evident check for Diagnostic Trouble Codes (DTCs) and refer to the DTC Index
5. Check DDW for open campaigns. Refer to the corresponding bulletins and SSMS which may be valid for the specific customer complaint and carry out the recommendations as required

12 VOLT MIDTRONICS GRX-3080 JLR DIAGNOSTIC BATTERY CHARGER USER GUIDE

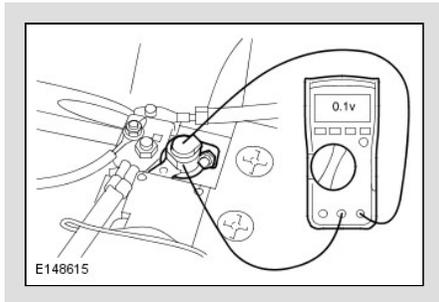
#### PINPOINT TEST A : VOLTAGE DROP ACROSS VEHICLE HARNESS AND BATTERY TERMINAL

TEST CONDITIONS

DETAILS/RESULTS/ACTIONS

A1: GROUND CIRCUIT

## PINPOINT TEST A : VOLTAGE DROP ACROSS VEHICLE HARNESS AND BATTERY TERMINAL



1 Start the engine, turn on the following:

- (1) Air conditioning
- (2) Blower fan on full speed
- (3) Headlights on main beam
- (4) Heated screen - rear
- (5) Heated screen - front (if installed)
- (6) Heated seats (if installed)

2 Connect the multimeter between the battery negative terminal and the battery clamp as shown in picture (do not disconnect the battery at this stage)

3 Set the multimeter to read DC voltage and record the reading

Is reading equal to or below 0.1 volts?

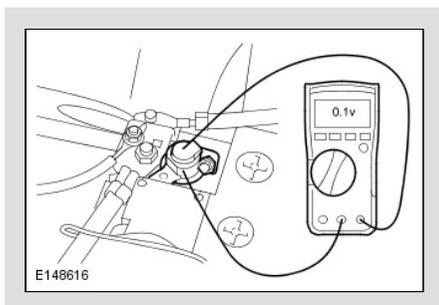
**Yes**

**GO to A2.**

**No**

Switch all electrical loads and engine off, return the vehicle to an ignition off condition. Disconnect the battery negative clamp, clean clamp and terminal then reconnect and repeat test

## A2: POWER CIRCUIT



1 Start the engine, turn on the following:

- (1) Air conditioning
- (2) Blower fan on full speed
- (3) Headlights on main beam
- (4) Heated screen - rear
- (5) Heated screen - front (if installed)
- (6) Heated seats (if installed)

2 Connect the multimeter between the battery positive terminal and the battery clamp as shown in picture (do not disconnect the battery at this stage)

**PINPOINT TEST A : VOLTAGE DROP ACROSS VEHICLE HARNESS AND BATTERY TERMINAL**

	<p>Is reading equal to or below 0.1 volts?</p> <p><b>Yes</b> Carry out Midtronics battery test procedure</p> <p><b>No</b> Switch all electrical loads and engine off, return the vehicle to an ignition off condition. Disconnect the battery power clamp, clean clamp and terminal then reconnect and repeat test</p>
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The following steps must be carried out to ensure correct operation of the GRX-3080 JLR diagnostic battery charger during the battery test procedure

CHECKS	ACTION
Battery fluid leakage, check for battery fluid leaks or damage to the battery casing	<div style="background-color: #ADD8E6; padding: 5px; border: 1px solid #ADD8E6; margin-bottom: 5px;"><b>NOTE:</b></div> <div style="border: 1px solid #ADD8E6; padding: 5px; margin-bottom: 5px;">If visible damage to the case is evident do not return battery under warranty.</div> <p>Replace the battery if there is any battery fluid leaks evident</p>
Battery vent pipe routing	Check for routing, ensure there are no kinks
GRX-3080 fly lead, condition of clamps	Clean or replace as required
GRX-3080 fly lead connection	Confirm secure connection

<b>NOTE:</b>
The GRX-3080 JLR diagnostic battery charger is suitable for testing flooded and absorbed glass mat (AGM) type batteries including Primary and Secondary batteries

**Testing a Battery**

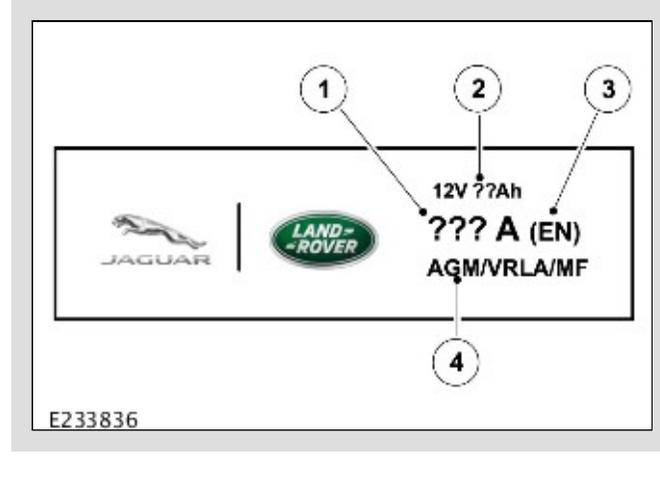
Using the GRX-3080 JLR diagnostic battery charger, the following test procedure will confirm the serviceability of the battery (see Completing a Battery Test)

**Battery Label Example**

<b>NOTE:</b>	
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All AGM batteries are marked with AGM. Flooded batteries have no reference to being Flooded.

- 1. Battery Rating Units CCA (Cold Cranking Amps)
- 2. Battery voltage and Battery Ah rating
- 3. Battery rated units (battery standard EN or SAE)
- 4. Battery type (battery technology, AGM or Flooded)



### GRX-3080 JLR Diagnostic Battery Charger Display Keypad

The GRX-3080 JLR diagnostic battery charger has an integrated display and keypad, the display guides the user via onscreen navigation aids, directions and messages. The illustration (below) shows how the elements on the screen relate to the keypad and details the functions of the various keys:

KEY	DESCRIPTION	GRX-3080 USER INTERFACE
1	<ul style="list-style-type: none"> <li>■ <b>VOLTAGE</b> – Battery voltage displayed when first connected</li> </ul>	
2	<ul style="list-style-type: none"> <li>■ <b>SOFT KEYS</b> - 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</li> </ul>	
3	<ul style="list-style-type: none"> <li>■ <b>ARROW KEYS</b> - Press the ARROW keys to scroll through numerical values and navigate through menus and icons</li> </ul>	
4	<ul style="list-style-type: none"> <li>■ <b>STOP BUTTON</b> – Press STOP key anytime to stop the active mode</li> </ul>	
5	<ul style="list-style-type: none"> <li>■ <b>Title Bar</b> – The title bar shows the name of the current menu</li> </ul>	
6	<ul style="list-style-type: none"> <li>■ <b>Selection Area</b> – Contains selectable icons or dialogue boxes that display information and required response</li> </ul>	

KEY	DESCRIPTION	GRX-3080 USER INTERFACE
7	<ul style="list-style-type: none"> <li>■ <b>Menu Screen Arrows</b> - When displayed in menu screens, the menu screen arrows shows which ARROW key on the keypad to press to display other icons or screens. The Up/Down Menu Screen Arrows indicate when to press the UP or DOWN keys to display the screens above and below the current screen</li> <li>■ The left/right menu screen arrows tell you when to use the LEFT or RIGHT keys to select an icon</li> <li>■ 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</li> </ul>	
8	<ul style="list-style-type: none"> <li>■ <b>Alphanumeric Keypad</b> - The alphanumeric keypad enters letters and numbers for the PAG code, VIN and Battery storage entry. It also can be used to customise personnel settings</li> </ul>	

## Battery Test Types

Before performing any battery diagnostic on a vehicle, make sure the ignition is OFF and the vehicle is powered down, with the modules entering 'sleep mode' before commencing and with the hazard switch illumination extinguished

The Midtronics GRX-3080 JLR diagnostic battery charger has three types of battery test (Diagnostic Charging, PDI / Storage and Battery Storage), one battery support function (Battery Support Power Supply) and one manual charging option available (Recovery Charging) for the technician to select:

### DIAGNOSTIC CHARGING

- 1. The DIAGNOSTIC CHARGING test needs to be used on any battery that has started its warranty life cycle. The battery is in use and fitted to a vehicle registered to an owner. The GRX-3080 JLR diagnostic battery charger will determine the internal condition of a battery before attempting to apply a charge to it. If required, it will then charge and assess the battery until the battery condition is established and a test result is given

### PDI / STORAGE

- 2. The PDI / STORAGE test needs to be used on any battery that has not yet been entered into the warranty life cycle. The battery is fitted to a NEW vehicle, but the vehicle has not yet been sold/registered to an owner. The GRX-3080 JLR diagnostic battery charger will determine the internal condition of a battery before attempting to apply a charge to it. If required, it will then charge and assess the battery until the battery condition is established and a test result is given

### BATTERY STORAGE

- 3. The BATT. STORAGE test should be used on any battery that has not yet been entered into the warranty life cycle. The battery is not in use and is a Parts Stock battery and has not yet been fitted to a vehicle. The GRX-3080 JLR diagnostic battery charger will determine the internal condition of a battery before attempting to apply a charge to it. If required, it will then charge and assess the battery until the battery condition is established and a test result is given

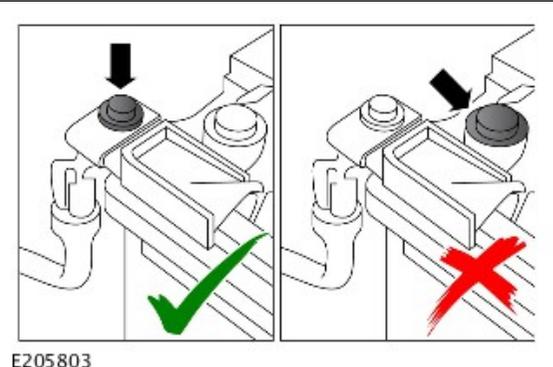
## BATTERY SUPPORT Power Supply

- 4. The BATTERY SUPPORT Power Supply function needs to be used whenever the vehicle comes in to the workshop for regular maintenance or vehicle module updates. Updating modules can take up to several hours and during that period a lot of current will be depleted from the battery. To support the battery during this process use the BATTERY SUPPORT function. When working on a vehicle, it is recommended that the GRX-3080 is connected and switched to the BATTERY SUPPORT function to ensure that, when the work is completed, the battery's state of charge is maintained at a healthy level

## RECOVERY CHARGING

- 5. The RECOVERY CHARGING mode should only be used when the battery voltage is below nine volts. The current should be set to 50 amps for a flooded battery or 40 amps for an AGM battery. The timer for the duration of the RECOVERY CHARGING cycle should be set for one hour. Once RECOVERY CHARGING is complete, the DIAGNOSTIC CHARGING (see above) mode may be used to assess the battery

## Completing a Battery Test

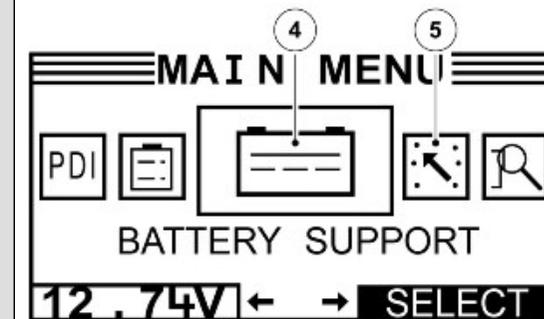
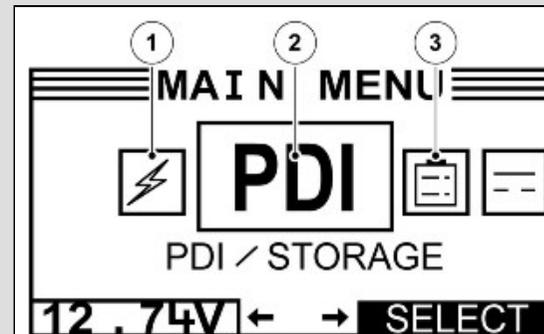
1	Connect the fly-lead to the Midtronics GRX-3080 JLR battery charger		
2	Connect the fly-leads to the battery terminals, black lead to the negative battery monitoring system (BMS) terminal (where fitted - see illustration), red lead to the positive terminal and confirm the connections are secure	<p><b>NOTE:</b></p> <p>This illustration shows the battery monitoring system (BMS) configuration in D7u and D7a vehicles. The BMS may be arranged differently in other vehicles</p>  <p>E205803</p>	
	Make sure the negative clamp is connected as in the picture on top of the JLR approved diagnostic battery charger (also reproduced in this manual)		
	The image with the TICK shows a BMS fitted to the vehicle and indicates (with an arrow) where the negative clamp must be connected. NOTE: In order for the BMS to be able to accurately monitor the battery state, the negative clamp needs to be connected to BMS terminal and NOT directly to the battery's negative terminal		
	If a BMS is NOT fitted to the vehicle, the negative clamp must be connected directly to the negative terminal of the battery - see the image with the CROSS which indicates (with an arrow) the correct location for placement of the negative clamp directly to the negative terminal of the battery		
3	The Midtronics GRX-3080 JLR battery charger needs to be plugged into the mains and the power switch on		
4	MAIN MENU		

- Select the correct BATTERY TEST using the arrow keys on the battery tester panel (see Battery Test Types above)
- 1. DIAGNOSTIC CHARGING. Go to step 5
- 2. PDI / STORAGE. Go to step 5
- 3. BATT. STORAGE. Go to step 5
- 4. BATTERY SUPPORT. Go to step 17
- 5. RECOVERY CHARGING. Go to step 18

**NOTE:**

When BATT. STORAGE is selected, the technician must enter IDENTIFICATION data or a purchase order reference number for the battery being tested. The battery tester will then move on to BATTERY TYPE (Step 9)

Select NEXT to continue



E205804

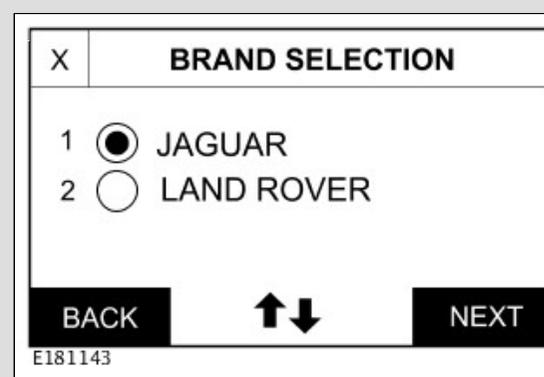
5 BRAND SELECTION

**NOTE:**

This step is required for DIAGNOSTIC CHARGING and PDI/STORAGE only

Select the correct brand of the vehicle battery being tested using the scroll arrow keys on the battery tester panel

Select NEXT to continue



6 VIN

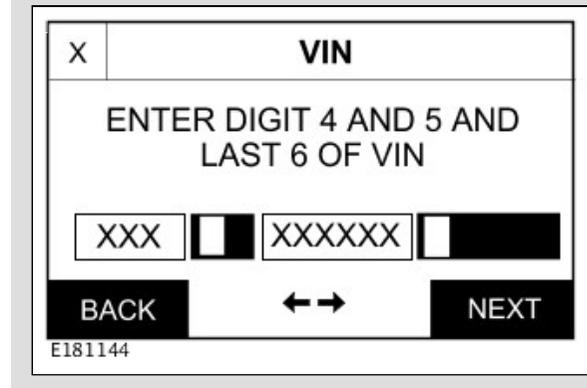
**NOTE:**

This step is required for DIAGNOSTIC CHARGING and PDI/STORAGE only

Enter the 4th and 5th digit followed by the last 6 of the VIN using the alphanumeric key pad on the battery tester panel

When BATT. STORAGE is selected, the technician must enter IDENTIFICATION data or a purchase order reference number for the battery being tested

Select NEXT to continue



## 7 BATTERY LOCATION

### NOTES:

- This step is required for DIAGNOSTIC CHARGING and PDI/STORAGE only
- Selecting the correct battery details at this point is critical to getting the correct Battery Test results

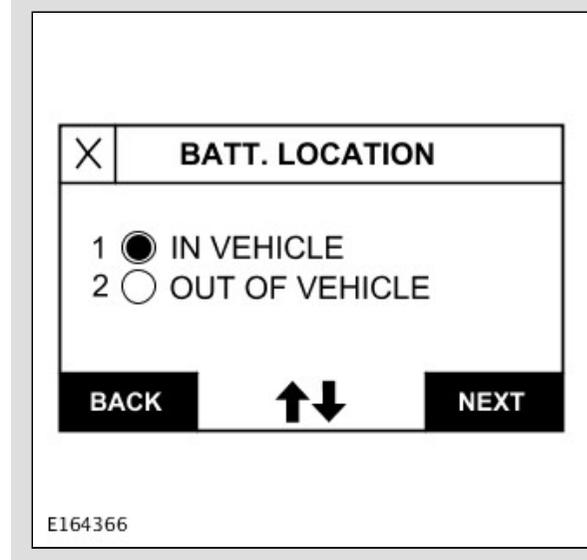
Select IN VEHICLE if the battery is tested connected to the vehicle

### NOTES:

- When disconnecting the 12 volt battery, customer pre-sets will be lost and there may be additional disruptions to vehicle features for a short period of time. To prevent customer dissatisfaction, only disconnect the battery if no other option is available.
- Make sure the ignition is OFF and the vehicle is powered down with the modules entering 'sleep mode' before commencing with the battery test

Select OUT OF VEHICLE only if the battery is electrically disconnected from the vehicle or on a bench

Select NEXT to continue



## 8 BATTERY MONITORING SYSTEM (BMS) INFORMATION (Required if 'IN VEHICLE' has been selected)

### NOTE:

'IMAGE' refers to the sticker that is located on top of the JLR approved diagnostic battery charger

Make sure the negative clamp is connected as in the picture on top of the JLR approved diagnostic battery charger (also reproduced in this manual)

### NOTE:

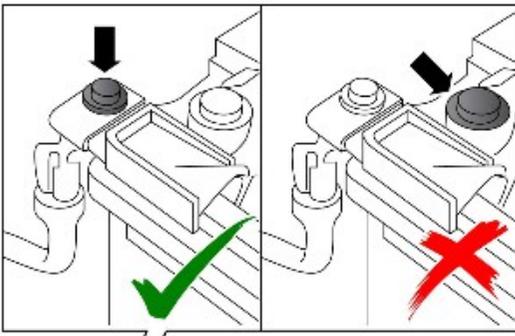
This illustration shows the battery monitoring system (BMS) configuration in D7u and D7a vehicles. The BMS may be arranged differently in other vehicles

The image with the TICK shows a BMS fitted to the vehicle and indicates (with an arrow) where the negative clamp must be connected. NOTE: In order for the BMS to be able to accurately monitor the battery state, the negative clamp needs to be connected to BMS terminal and NOT directly to the battery's negative terminal

If a BMS is NOT fitted to the vehicle, the negative clamp must be connected directly to the negative terminal of the battery - see the image with the CROSS which indicates (with an arrow) the correct location for placement of the negative clamp directly to the negative terminal of the battery

Select the correct orientation (YES/NO) as required

Select NEXT to continue



**CLAMP POSITION**  
BMS FITTED?

1  YES IMAGE 1  
2  NO IMAGE 2

REF TO IMAGE ON UNIT  
**BACK** ↑↓ **NEXT**

E205805

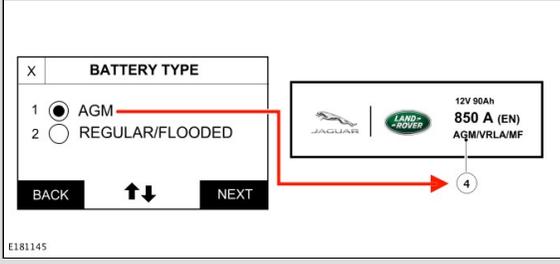
9 BATTERY TYPE

**NOTES:**

- All AGM batteries are marked with AGM. Flooded batteries have no reference to being Flooded
- Selecting the correct battery details at this point is critical to getting the correct Battery Test results

Select the correct battery type (see Battery Label example, Label 4) using the scroll arrow keys on the battery tester panel

Select NEXT to continue



**BATTERY TYPE**

1  AGM  
2  REGULAR/FLOODED

**BACK** ↑↓ **NEXT**

12V 90Ah  
850 A (EN)  
AGM/VRLA/MF

E181145

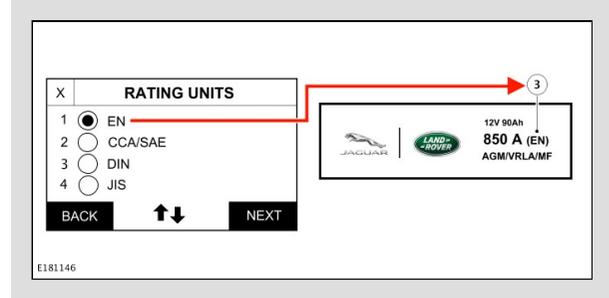
10 RATING UNITS

**NOTE:**

Selecting the correct battery details at this point is critical to getting the correct Battery Test results

Select the correct battery rating from the battery label in brackets (see Battery Label Example, Label 3) using the scroll arrow keys on the battery tester panel

Select NEXT to continue



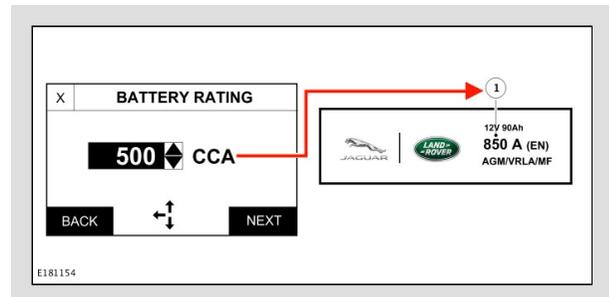
## 11 BATTERY RATING

### NOTE:

Selecting the correct battery details at this point is critical to getting the correct Battery Test results

Select the correct CCA rating (see Battery Label Example, Label 1) using the scroll arrow keys, or enter the rating with the numeric key pad on the battery tester panel

Select NEXT to continue



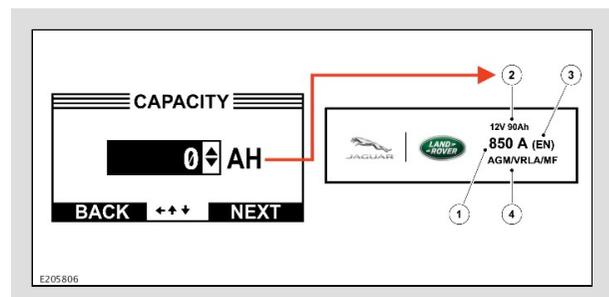
## 12 CAPACITY

### NOTE:

Selecting the correct battery details at this point is critical to getting the correct Battery Test results

Select the correct CAPACITY rating (see Battery Label Example, Label 2) using the scroll arrow keys, or enter the rating with the numeric key pad on the battery tester panel

Select NEXT to continue



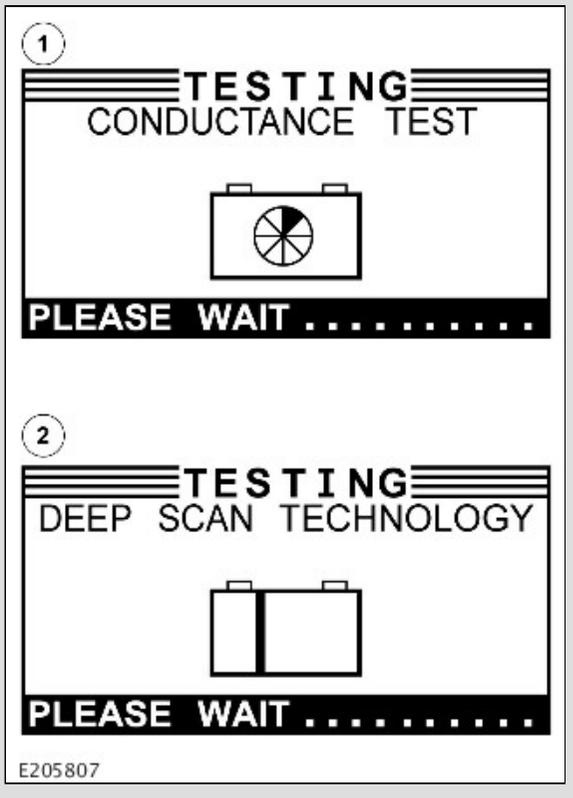
## 13 TESTING

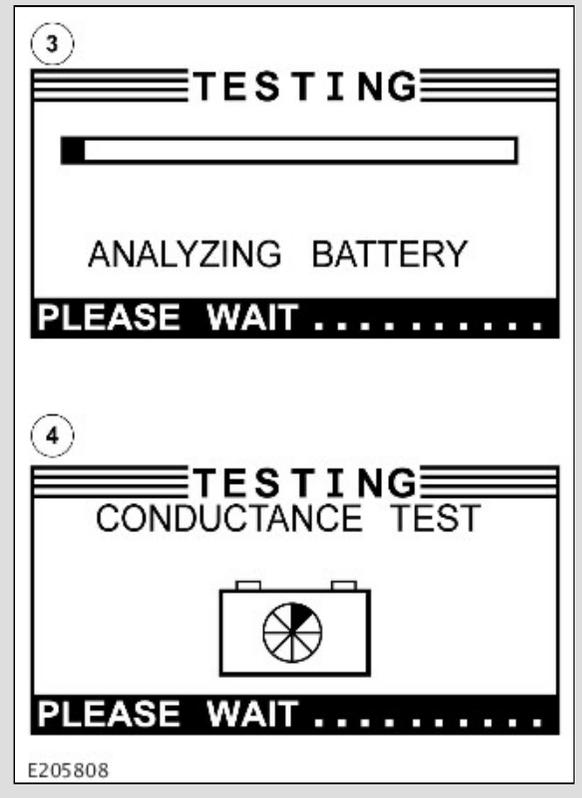
- There are four automated screens within the testing, they will display sequentially with no user input required:
- 1. Conductance
- 2. Deep Scan Technology (If required, see note below)
- 3. Analysis
- 4. Conductance

### NOTE:

The battery tester will display and complete an automated DEEP SCAN test only if required, then automatically advance when the DEEP SCAN test has completed

The GRX-3080 JLR diagnostic battery charger will automatically advance when the test has completed





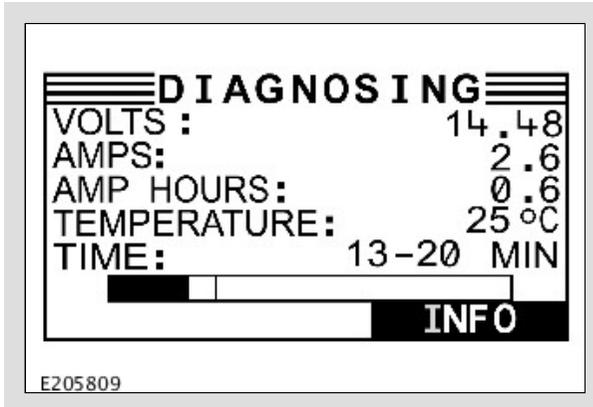
14 DIAGNOSING

- Once the GRX-3080 JLR diagnostic battery charger determines that the battery is healthy, needs charging and is safe to charge, it proceeds
- During the charging session, the GRX-3080 JLR diagnostic battery charger 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-3080 JLR diagnostic battery charger 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 completed

**NOTE:**

The actual time needed to charge the battery might 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
- The GRX-3080 JLR diagnostic battery charger uses the first portion of the total charge cycle to closely monitor the acceptance of charge current and the energy going in to the battery. During this mode, the charger continuously analyses



the battery to make a decision as quickly as possible

Diagnostic mode will automatically move to next steps

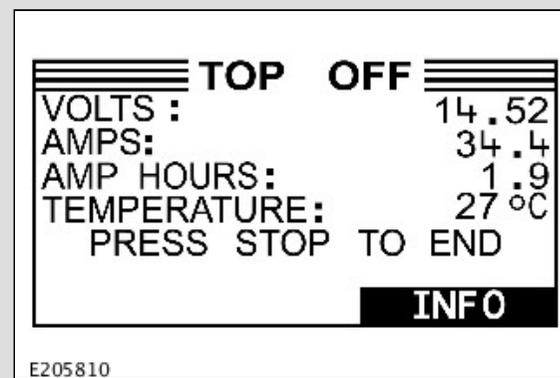
15 TOP OFF

- This mode occurs automatically at the end of the diagnostic charge cycle to allow the battery to reach 100% state of charge. TOP OFF mode ends when the battery's acceptance of the charge has reached its limit

**NOTE:**

Do not stop the TOP OFF charge cycle as this will reduce the amount of charge the battery has received

- TOP OFF mode will automatically move to the result screen



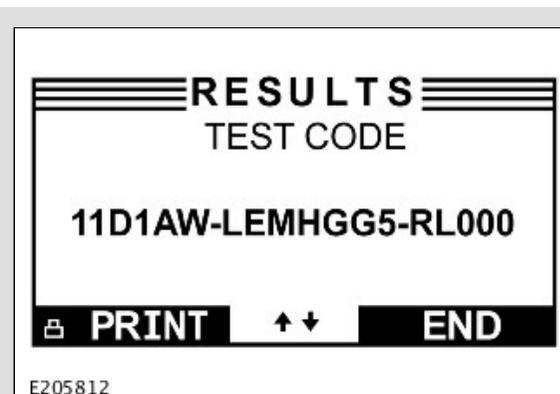
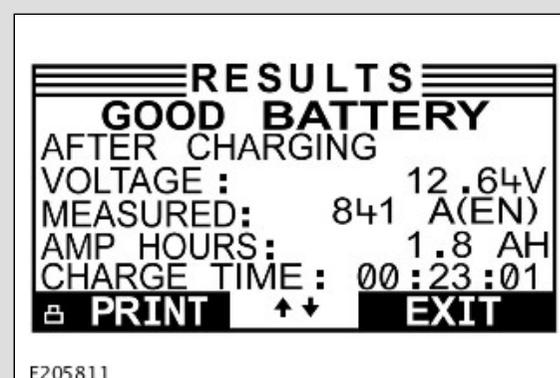
16 RESULTS

**NOTE:**

If the Measured CCA shows as blank bars ( ---- ) instead of a numeric CCA value, this is not a fault on the unit. This occurs when the GRX-3080 has read a low CCA during the diagnostic charge of the battery and a replace decision has been determined. Under these circumstances, the battery should be replaced

The RESULTS display shows the battery voltage and the measured CCA (Cold Cranking Amps), use the scroll arrow keys on the battery tester panel to access the TEST CODE

Select PRINT for your records or exit to go back to the main menu screen



## Battery Tester Results Table

RESULTS	ACTION
GOOD BATTERY	<ul style="list-style-type: none"> <li>Return the battery to service</li> </ul>
REPLACE BATTERY	<p><b>NOTE:</b></p> <p>A 'REPLACE BATTERY' result may also mean a poor connection between the battery cables on the vehicle and the battery. Check connections and rectify as required</p> <ul style="list-style-type: none"> <li>Ensure the volt drop test has been completed (see PINPOINT TEST A: VOLTAGE DROP ACROSS VEHICLE HARNESS AND BATTERY TERMINAL above)</li> <li>REPLACE THE BATTERY</li> </ul>
FROZEN BATTERY	<ul style="list-style-type: none"> <li>Allow the battery to thaw naturally in workshop conditions and retest</li> </ul>
UNABLE TO DO TEST	<ul style="list-style-type: none"> <li>Disconnect the battery from the vehicle and retest</li> </ul>

### Flooded Battery Care Point

If the vehicle is equipped with a flooded battery, ensure the replacement battery is a flooded battery of the same specification (cold cranking amperage (CCA), battery standard (EN/SAE) / amp hour rating (Ah)) as the original battery

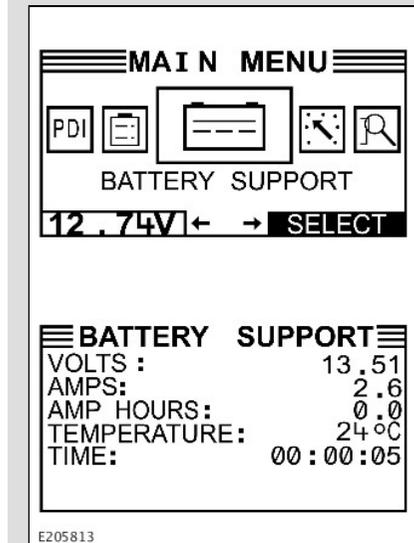
Under no circumstances should you fit a flooded battery to a vehicle that originally had an AGM battery, unless formally instructed by Jaguar/Land Rover

### AGM Battery Care Point

If the vehicle is equipped with an absorbed glass mat (AGM) battery, ensure the replacement battery is a AGM battery of the same specification (cold cranking amperage (CCA), battery standard (EN/SAE) / amp hour rating (Ah)) as the original battery, unless formally instructed by Jaguar/Land Rover

17	BATTERY SUPPORT	
	<ul style="list-style-type: none"> <li>The Battery Support function is used whenever the vehicle comes in to the workshop for regular maintenance or module downloads</li> <li>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, use the Battery Support function</li> </ul>	

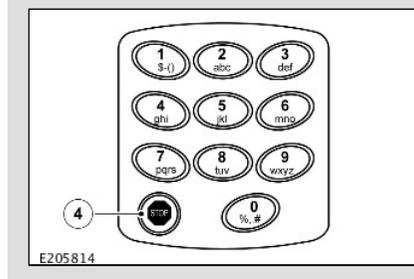
- When working on a vehicle, it is recommended that the GRX-3080 is connected and switched to the BATTERY SUPPORT function to ensure that, when the work is completed, the battery's state of charge is maintained at a healthy level
- Make sure the GRX-3080 JLR diagnostic battery charger is connected (as in steps 1 and 2 from the MAIN Menu above), highlight the Battery Support icon and press the SELECT key
- The GRX-3080 JLR diagnostic battery charger will immediately begin to supply power and the BATTERY SUPPORT screen will display a list of real-time battery data



**NOTE:**

BATTERY SUPPORT mode will not automatically move to next step. When battery support is no longer required, press the STOP button on the display panel (see Label 4)

Select STOP when battery support is not required

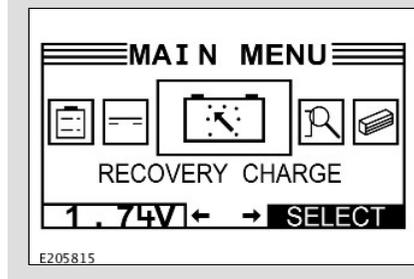


18 RECOVERY CHARGE

**NOTE:**

Only use the RECOVERY CHARGE mode when the battery voltage is 9 volts or below. This will charge the battery for 1 hour. When the time has elapsed, use either DIAGNOSTIC CHARGING or PDI/STORAGE mode to complete the analysis of the battery (see the section on Battery Test Types (above) for guidance on when to use which mode)

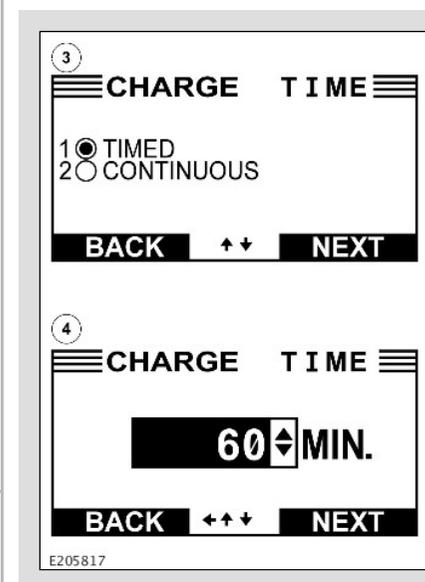
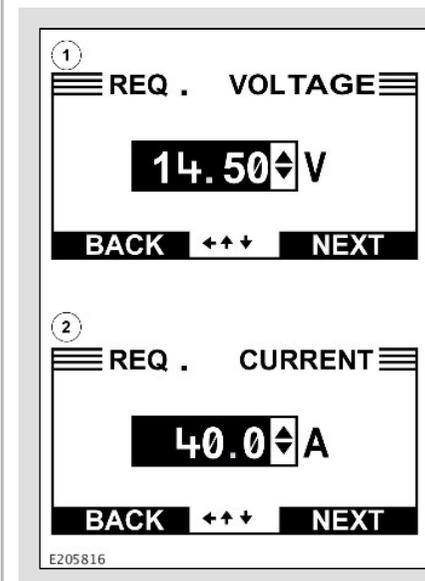
- **Follow steps 7 to 11 (as detailed above) to enter battery details, including:**
- BATTERY LOCATION (Step 7)
- BMS INFORMATION (If "IN VEHICLE" selected ) (Step 8)
- BATTERY TYPE (Step 9)
- RATING UNITS (Step 10)



- BATTERY RATING (Step 11)

▪ **Next, enter the following settings:**

- **1. REQ. VOLTAGE -**
  - For both AGM and Flooded Batteries, use the numeric keypad to enter 14.5 volts
- **2. REQ. CURRENT**
  - For AGM Batteries, use the numeric keys to enter 40.0 amps
  - For Flooded Batteries, use the numeric keys to enter 50.0 amps
- **3. CHARGE TIME (1)**
  - Select the "Timed" option
- **4. CHARGE TIME (2)**
  - Use the alphanumeric keypad and type 60 MIN

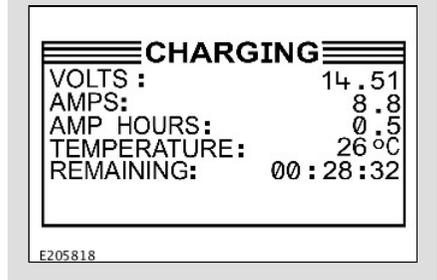


Select NEXT to continue

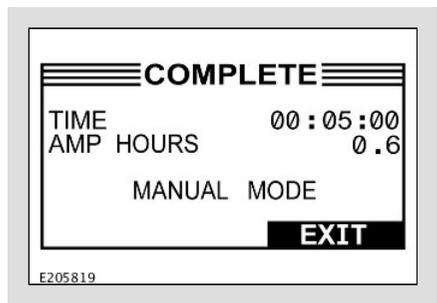
**NOTE:**

During the charging session, the GRX-3080 JLR diagnostic battery charger provides updates of the charging voltage, current, remaining time to charge and the amount of amp hours the battery received

- The GRX-3080 JLR diagnostic battery charger will not continue to test the battery throughout the Recovery Charge
- When the hour has finished the GRX-3080 JLR diagnostic battery charger will give 4 audible beeps to confirm the mode has completed



Select EXIT to complete Recovery Charging



## DTC INDEX

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00