Электрооборудование — Батарея и система зарядки

Land Rover Discovery Sport (L550) · Руководство по ремонту
Источник: lrdisc.com · разделов: 15

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Батарея и система зарядки

Battery and Charging System

- Auxiliary Battery (G1913471) / Removal and Installation
- Battery (G1774714) / Removal and Installation
- Battery Diagnostics
- Battery, Mounting and Cables/ Description and Operation
- Battery, Mounting and Cables Diagnosis and Testing Battery
- General Information Battery Support Unit Connection Procedure
- General Information Battery Care Requirements
- General Information Charging System / Diagnosis and Testing
- Generator and Regulator

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ElectricalAuxiliary Battery (G1913471) / Removal and Installation

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Дополнительный аккумуляторная батарея / снятие и установка

REMOVAL

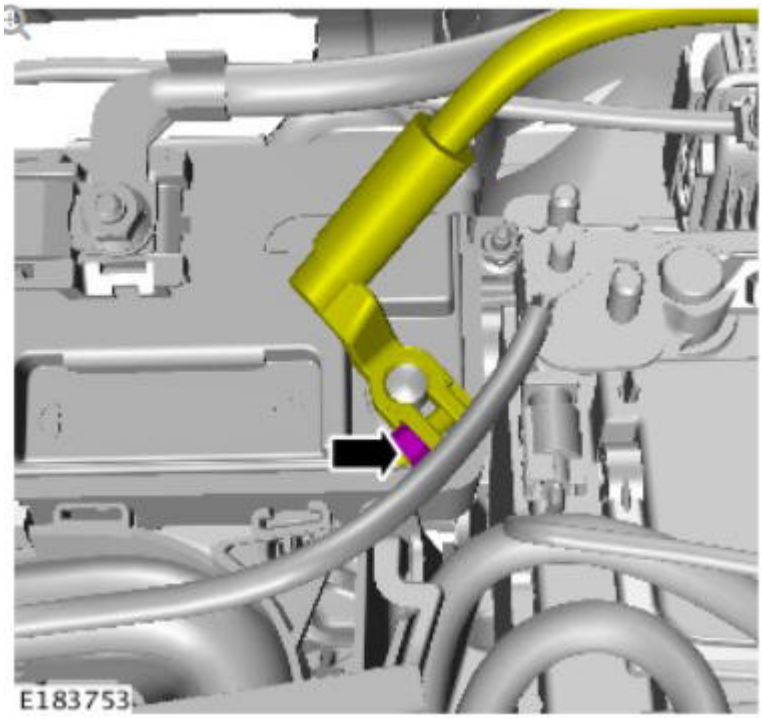
NOTE:

Removal steps in this procedure may contain installation details.

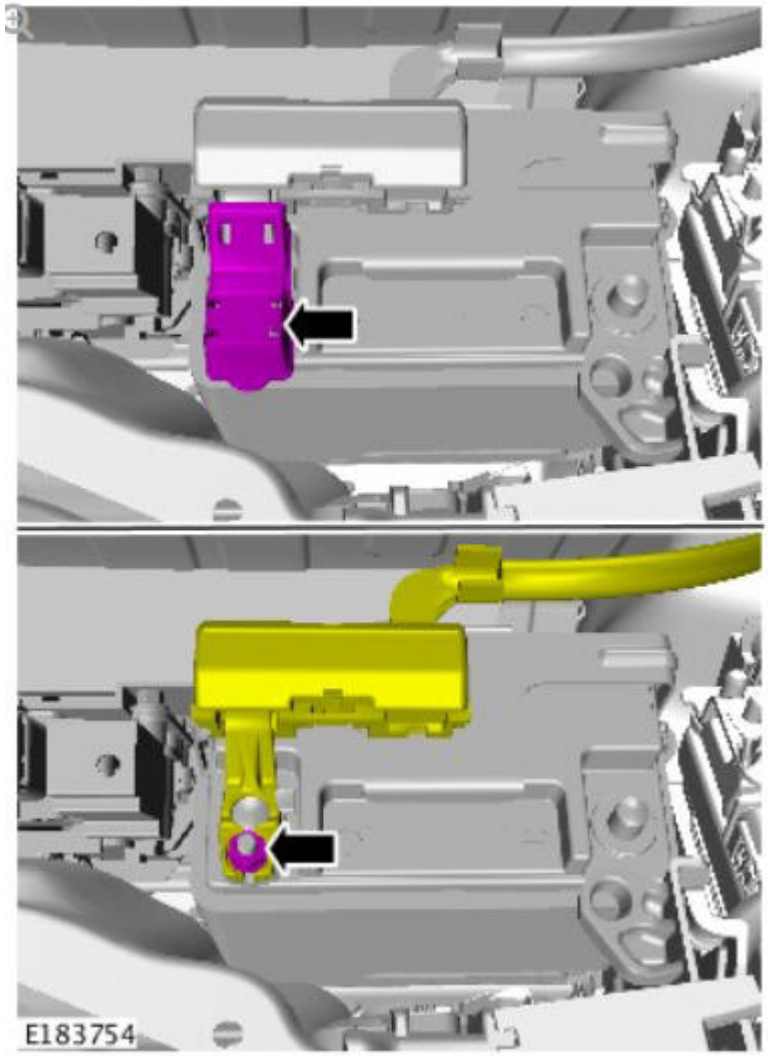
Disconnect the battery earth lead.

Refer to: Specifications (414-01 Battery, Mounting and Cables, Specifications).

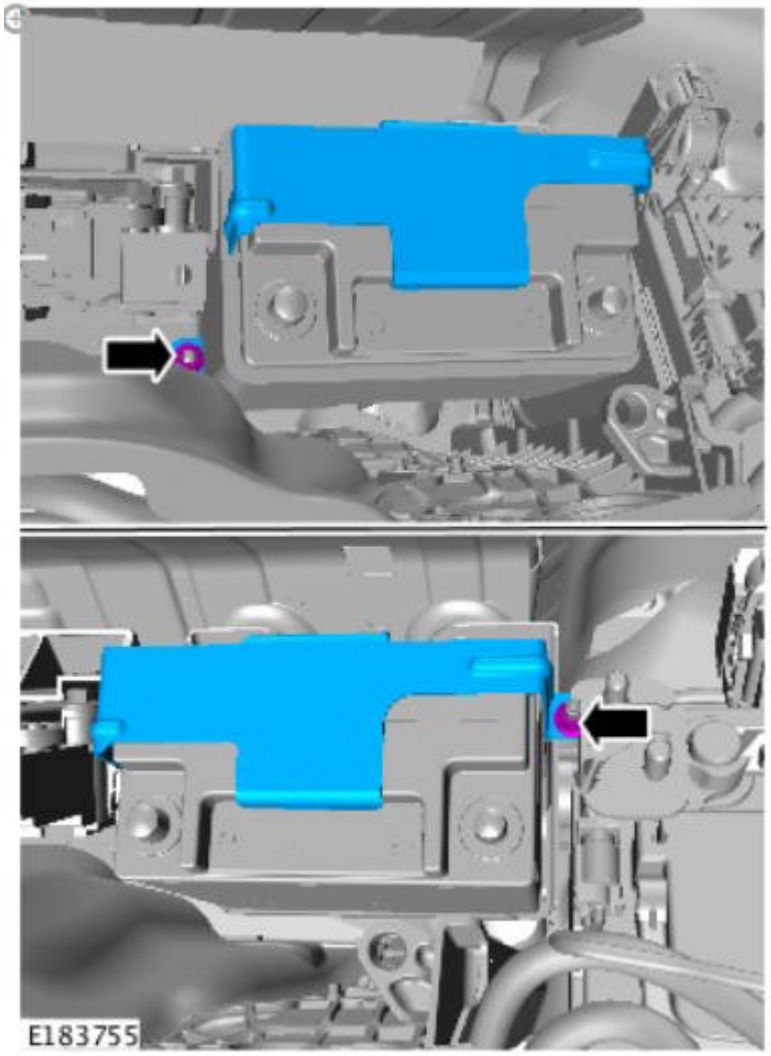
Refer to: Plenum Chamber (412-01 Climate Control, Removal and Installation).



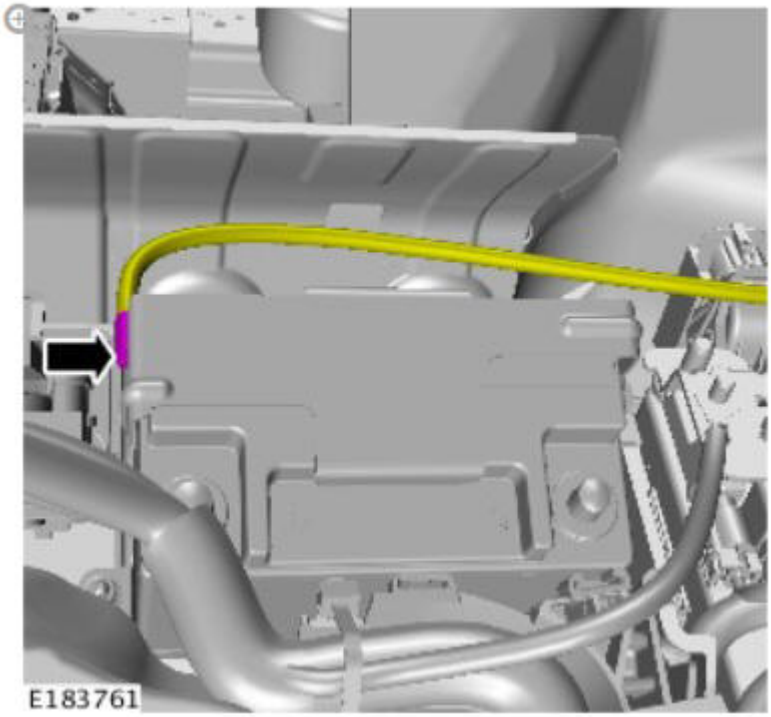
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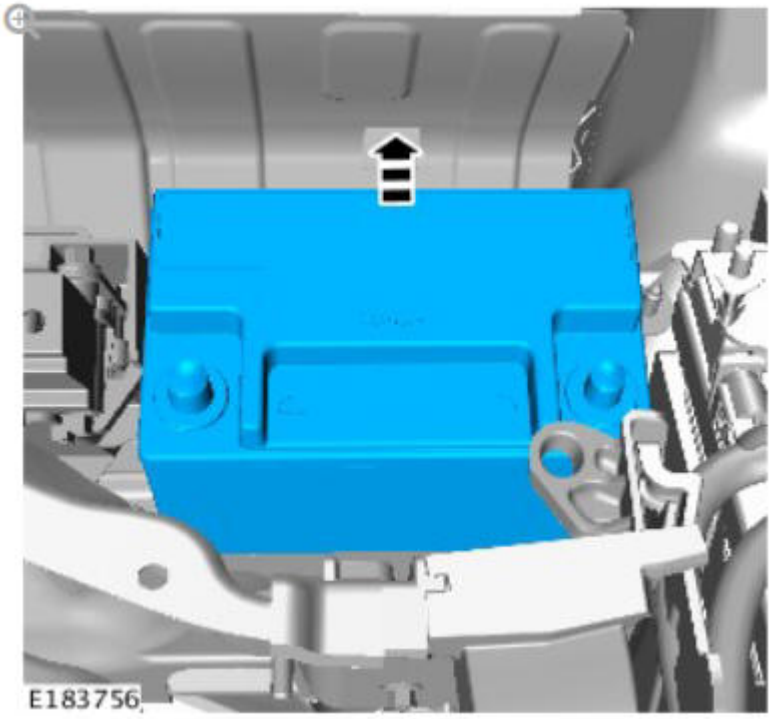


Torque: 10 Nm



Torque: 18 Nm





INSTALLATION

To install reverse the removal procedure.

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Battery and Charging SystemBattery (G1774714) / Removal and Installation

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Аккумуляторная батарея / снятие и установка

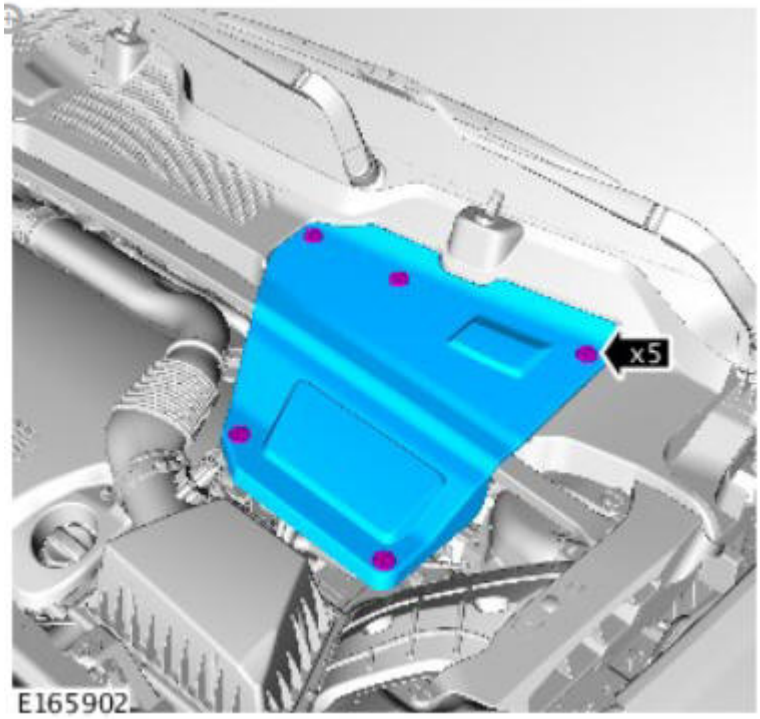
Battery (G1774714) / Removal and Installation

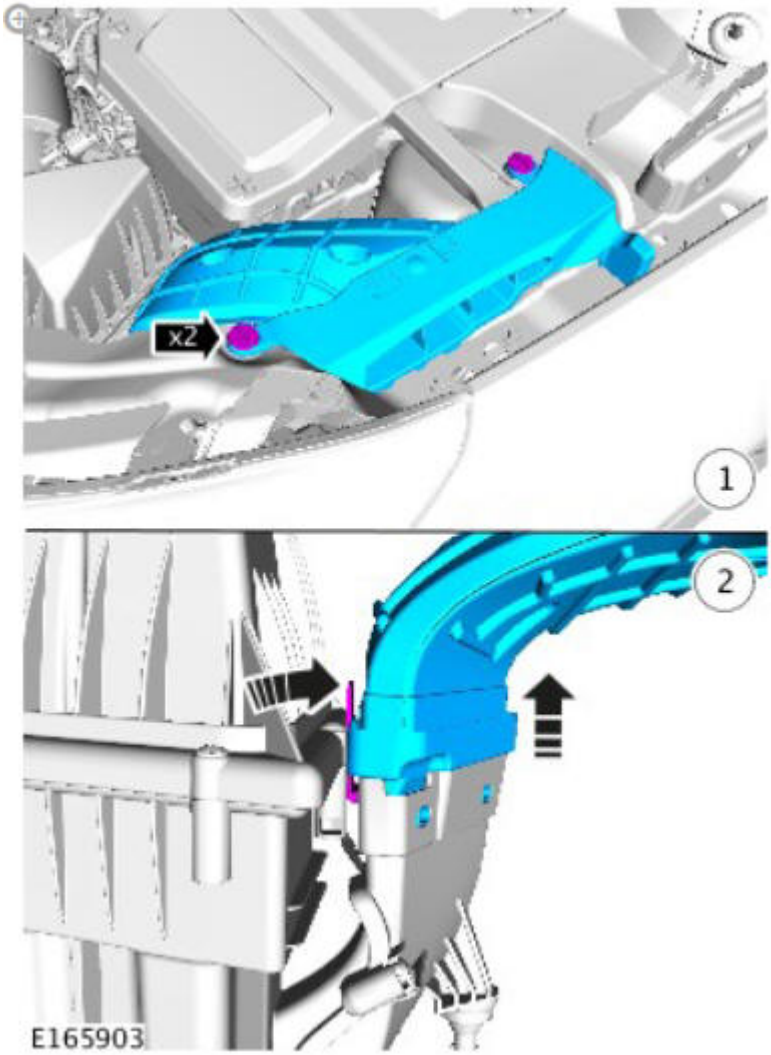
REMOVAL

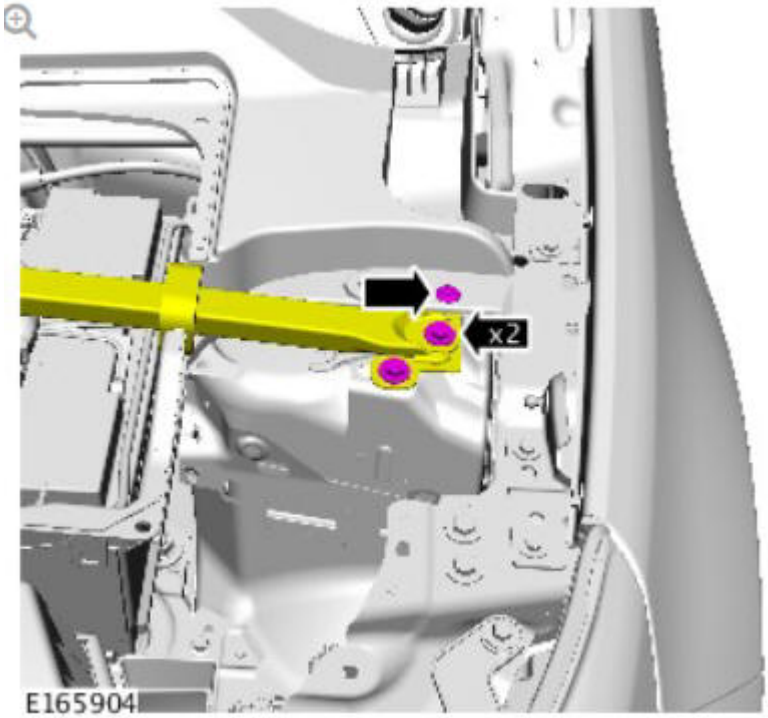
NOTES:

- *Removal steps in this procedure may contain installation details.*
- *Some variation in the illustrations may occur, but the essential information is always correct.*
- *If a new battery is installed, the battery monitoring system (BMS) must be reset using Land Rover approved diagnostic equipment*

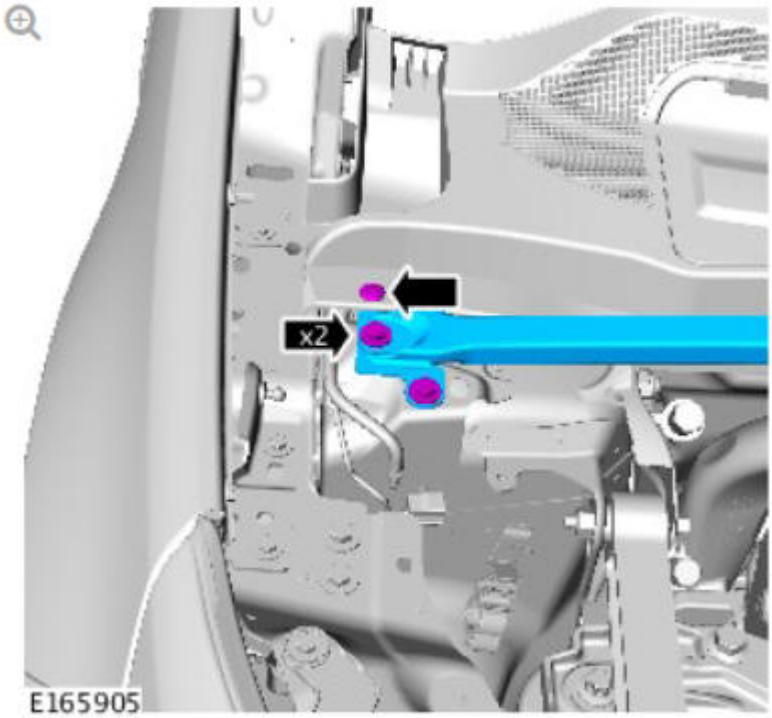
Refer to: Specifications (414-01 Battery, Mounting and Cables, Specifications).


x5
E165902

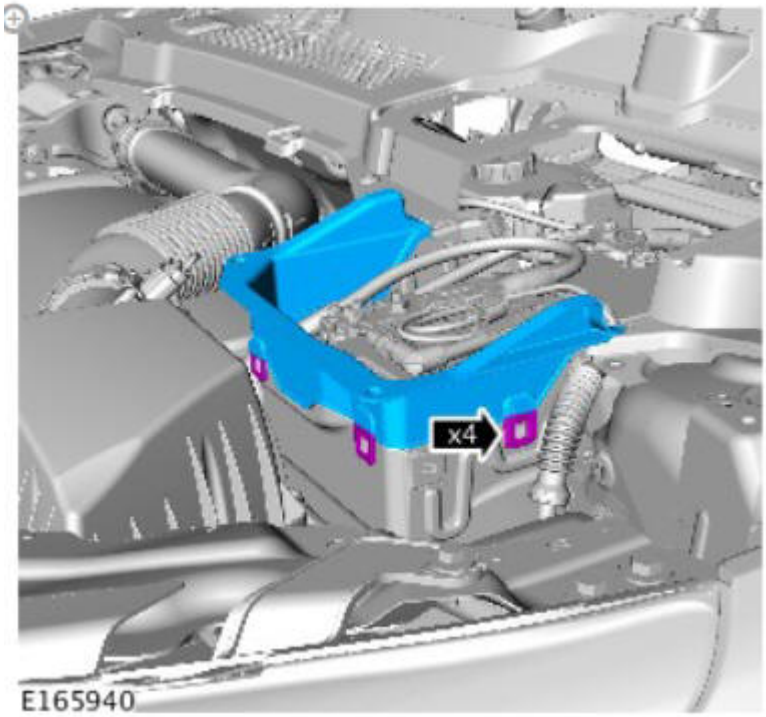

x2
1
2
E165903

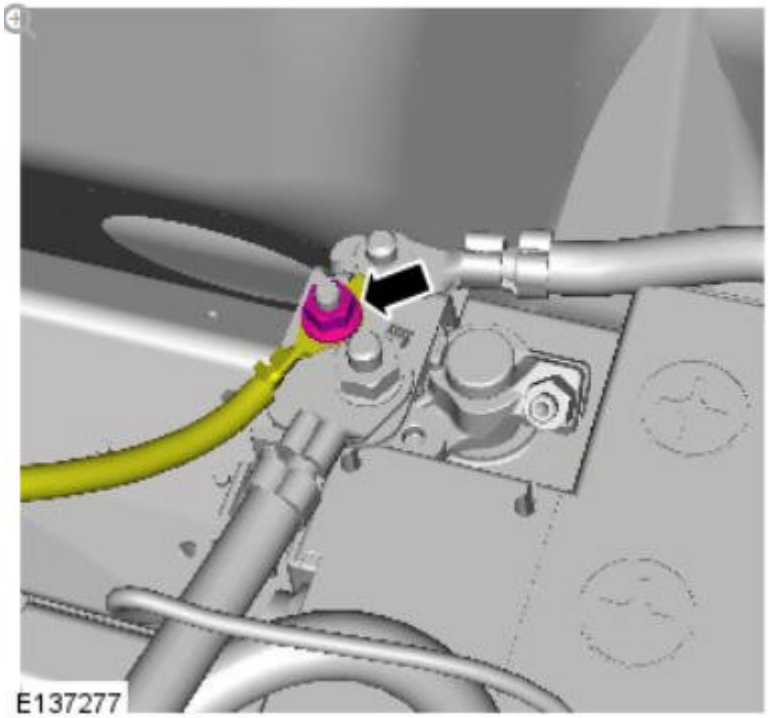


Torque: 25 Nm



Torque: 25 Nm

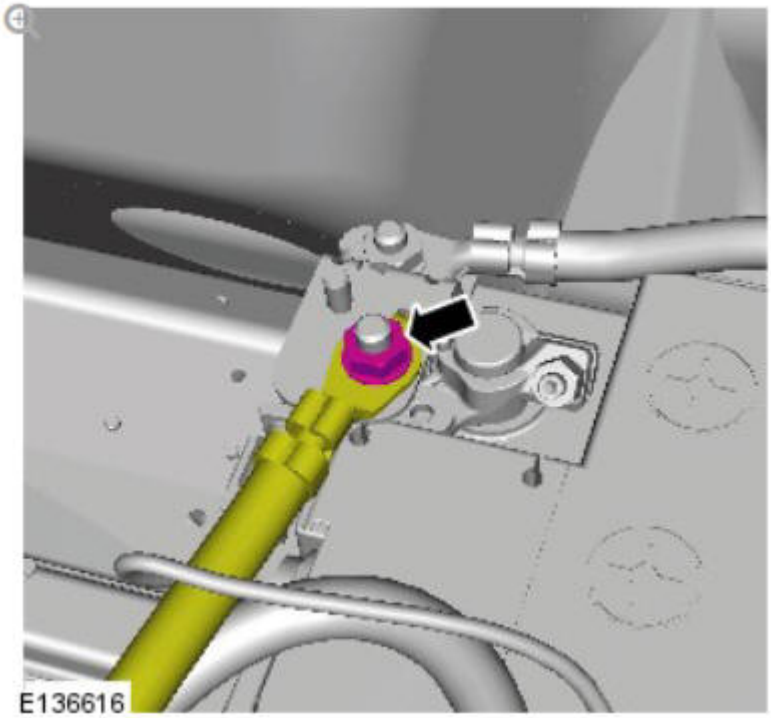




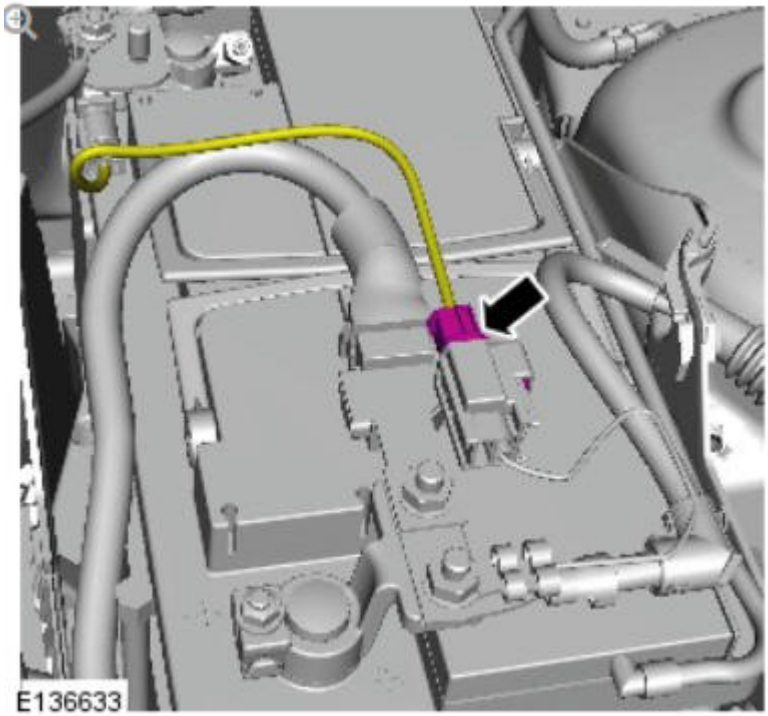
Torque: 6 Nm

NOTE:

If equipped.

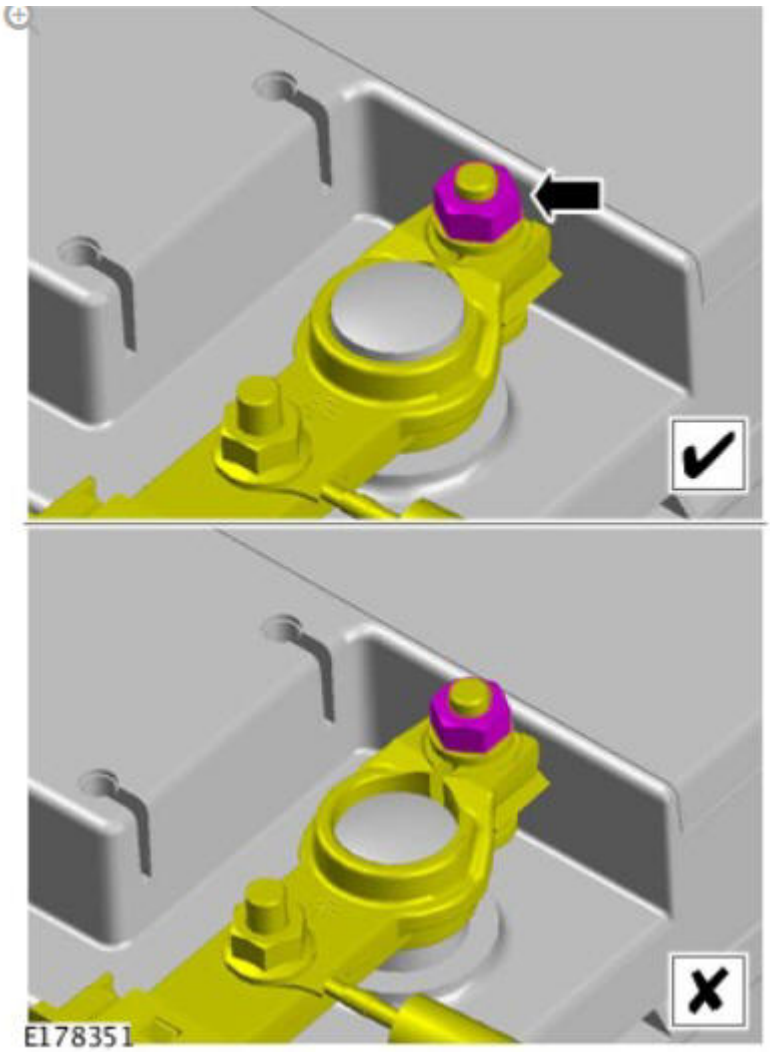


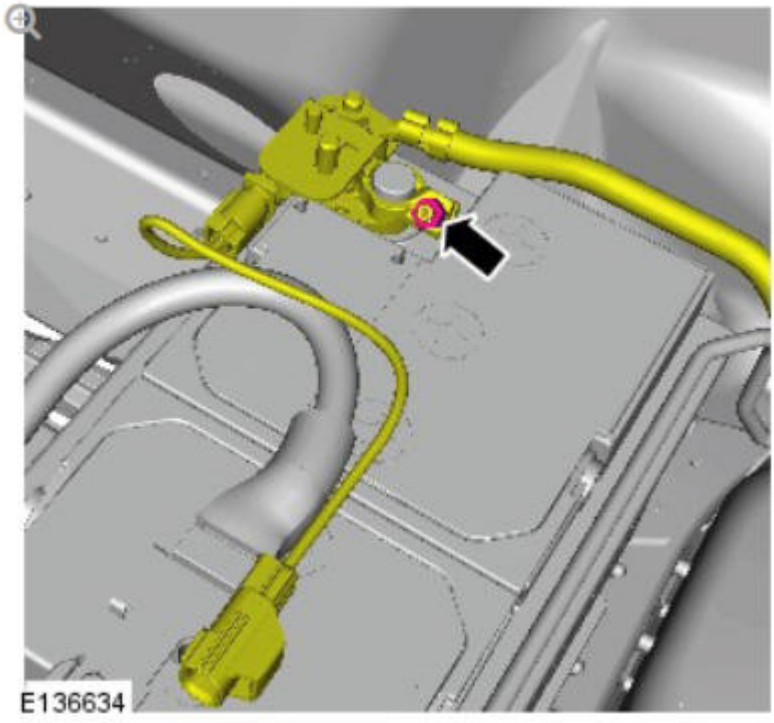
Torque: 10 Nm



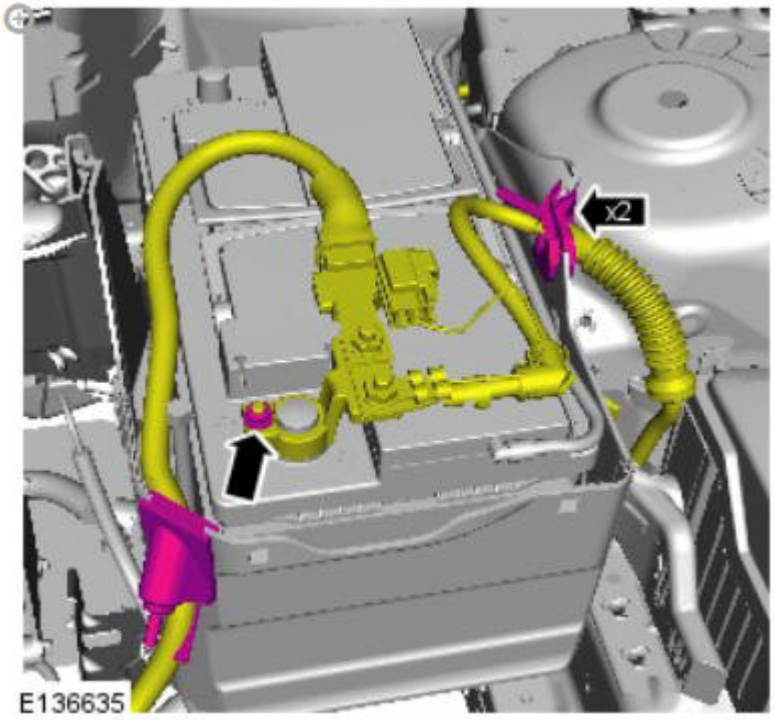
CAUTION:

Ensure the clamping lug on the BMS is below the top of the negative terminal post as shown.

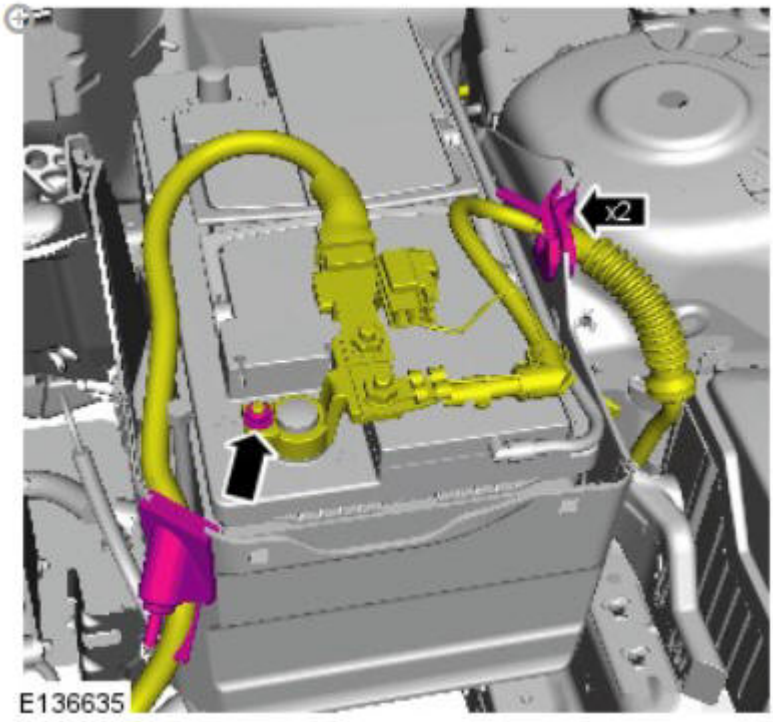




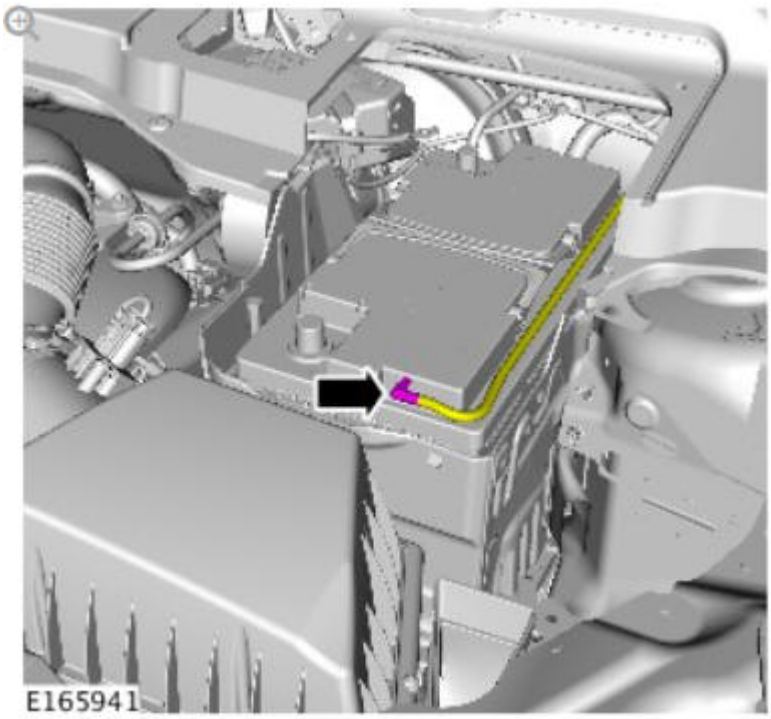
Torque: 6 Nm

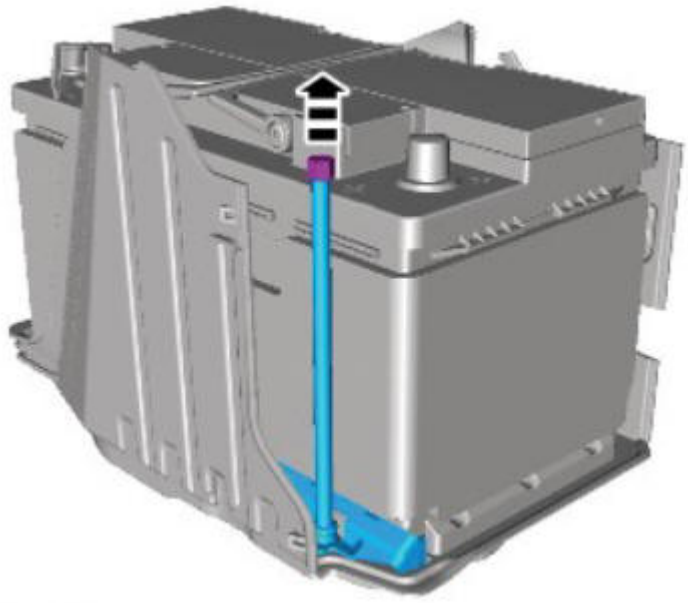


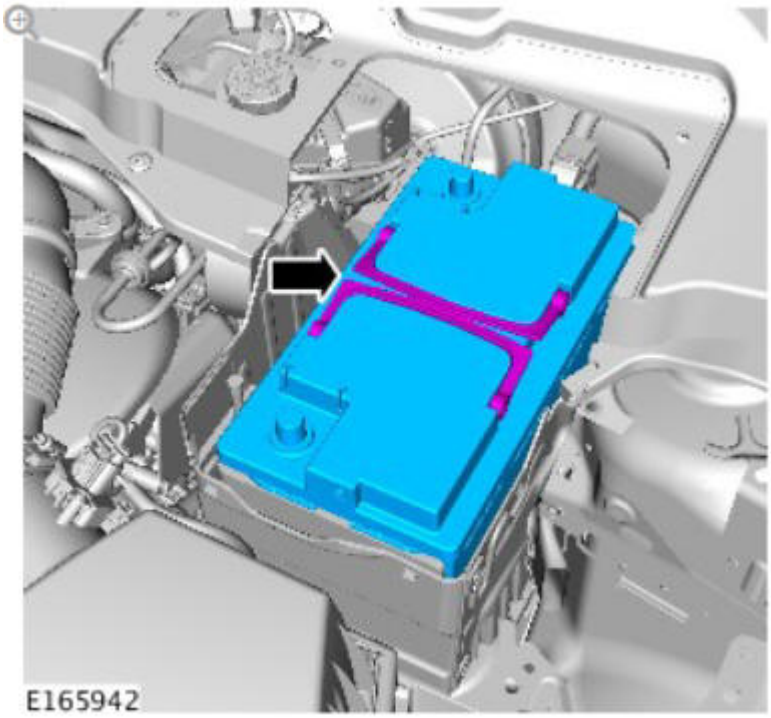
Torque: 6 Nm



Torque: 6 Nm


E165941





INSTALLATION

CAUTION:

Make sure the battery monitoring system (BMS) electrical connector is connected to the module, before installing the BMS on to the battery terminal.

To install, reverse the removal procedure.

NOTE:

This step is only necessary when installing a new battery.

Using Land Rover approved diagnostic equipment, reset the battery monitoring system (BMS).

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Auxiliary Battery (G1913471) / Removal and InstallationBattery Diagnostics

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Аккумуляторная батарея диагностика

Battery Diagnostics

- 12 Volt Midtronics EXP-1080 JLR Diagnostic Battery Charger
- 12 Volt Midtronics GR8-1180 JLR Diagnostic Battery Charger
- 12 Volt Midtronics GRX-3080 JLR Diagnostic Battery Charger

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Battery (G1774714) / Removal and Installation12 Volt Midtronics EXP-1080 JLR Diagnostic Battery Charger

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12 В Midtronics EXP-1080 JLR диагностический аккумуляторная батарея зарядное устройство

12 Volt Midtronics EXP-1080 JLR Diagnostic Battery Charger

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 manufacturerapproved 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
▪ Generator ▪ Drive belt ▪ Drive belt tensioner ▪ Generator pulley ▪ Check the security of the generator fixings	▪ Generator ▪ Battery ▪ Battery connections ▪ Starter motor ▪ Harnesses and connectors ▪ Fuses ▪ Charge warning lamp function ▪ Powertrain Control Module (PCM)

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

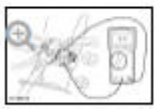
12 VOLT MIDTRONICS EXP - 1080 JLR DIAGNOSTIC BATTERY CHARGER USER GUIDE

NOTE:

This test checks for high resistance between the battery terminal and the battery clamp.

NOTE:

This test checks for high resistance between the battery terminal and the battery clamp.

PINPOINT TEST A : VOLTAGE DROP	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: GROUND 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 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 GO to A1.

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)
	3 Set the multimeter to read DC voltage and record the reading
	Is reading equal to or below 0.1 volts? **Yes** Carry out Midtronics battery test procedure **No** 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 GO to A2.

The following steps must be carried out to ensure correct operation of the EXP-1080 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	**NOTE:** If visible damage to the case is evident do not return battery under warranty. Replace the battery if there is any battery fluid leaks evident
Battery vent pipe routing	Check for routing, ensure there are no kinks
EXP-1080 fly lead, condition of clamps	Clean or replace as required
EXP-1080 fly lead connection	Confirm secure connection

NOTE:

The Midtronics EXP-1080 JLR diagnostic battery charger is suitable for testing flooded and absorbed glass mat (AGM) type batteries including Primary and Secondary batteries.

Testing a Battery

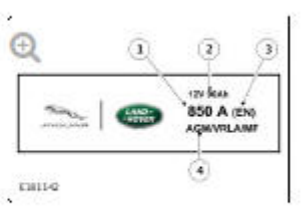
Using the Midtronics EXP-1080 JLR diagnostic battery charger, the following test procedure will confirm the serviceability of the battery (see Completing a Battery Test)

Battery Label Example

NOTE:

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)



Battery Test Types

The Midtronics EXP-1080 JLR diagnostic battery charger has three types of battery test available to the technician to select:

Battery Test

1.The BATTERY TEST should 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

PDI / Storage

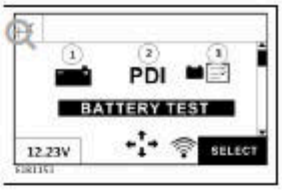
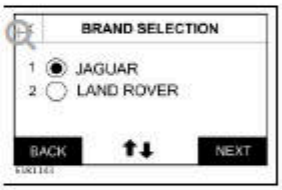
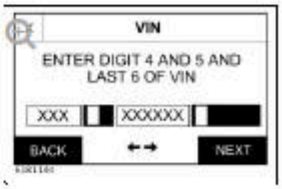
2.The PDI / STORAGE test should be used on any battery that has not yet been entered into the warranty life cycle. The battery is fitted to a NEW vehicle, but the vehicle has not yet been sold/registered to an owner

Battery Storage

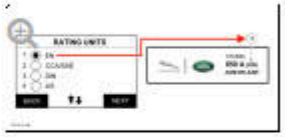
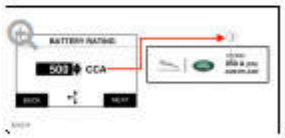
3. This BATT. STORAGE test should be used on any battery that has not yet been entered into the warranty life cycle. The battery is not in use and is a Parts Stock battery and has not yet been fitted to a vehicle

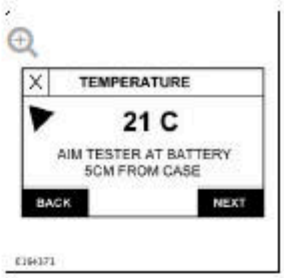
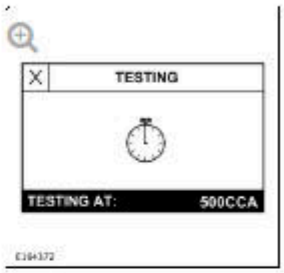
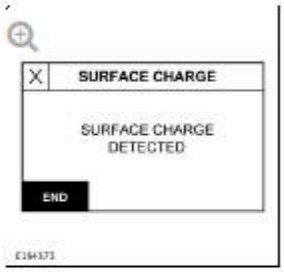
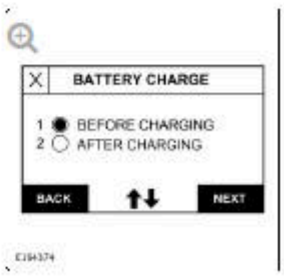
Completing a Battery Test

1	Connect the fly-lead to the Midtronics EXP-1080 JLR diagnostic battery charger	
2	Connect the fly-leads to the battery terminals, black lead to the negative terminal, red lead to the positive terminal and confirm the connections are secure	

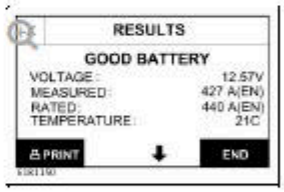
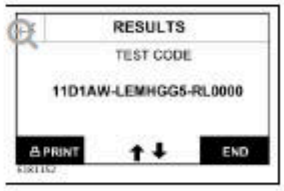
3	The battery tester will power ON automatically when connected to a battery	
4	MAIN MENU - Select the correct BATTERY TEST using the arrow keys on the battery tester panel (see Battery Test Types) - 1. BATTERY TEST - 2. PDI / STORAGE - 3. BATT. STORAGE **NOTE:** When BATT. STORAGE is selected, the technician 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 8). Select NEXT to continue	
5	BRAND SELECTION **NOTE:** This step is required for BATTERY TEST 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	

	NOTES: ▪ This step is required for BATTERY TEST and PDI/STORAGE only. ▪ Letters SAL or SAJ may be different than displayed on the EXP-1080 if the vehicle is manufactured outside the United Kingdom, this will not effect the battery testing. Enter the 4th and 5th digit followed by the last 6 of the VIN using the alphanumeric key pad on the battery tester panel	
	Select NEXT to continue	
7	BATTERY LOCATION	
	NOTES: ▪ This step is required for BATTERY TEST 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	
	NOTE: 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 TYPE	

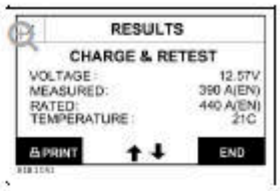
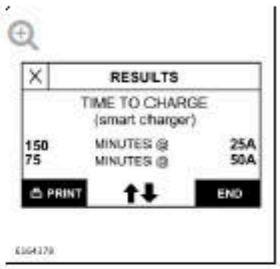
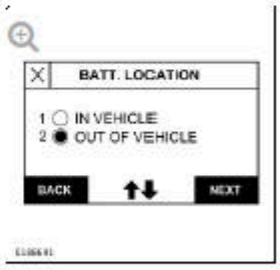
	NOTES: ▪ All AGM batteries are marked with AGM. Flooded batteries have no reference to being Flooded. ▪ Selecting the correct battery details at this point is critical to getting the correct Battery Test Results. Select the correct battery type (see Battery Label Example, Label 4) using the scroll arrow keys on the battery tester panel	
	Select NEXT to continue	
9	RATING UNITS	
	NOTE: Selecting the correct battery details at this point is critical to getting accurate 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	
10	BATTERY RATING	
	NOTE: Selecting the correct battery details at this point is critical to getting accurate 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	
11	TEMPERATURE	

	Aim the temperature sensor towards the battery casing (maintain a distance of 5 cm Select NEXT to continue	
12	TESTING The battery tester screen will now display clock hands rotating, the battery tester will automatically advance when the test has completed	
13	SURFACE CHARGE **NOTE:** This step will take place automatically only when required. The SURFACE CHARGE test is an additional step required if the battery voltage is above 12.55v with a low CCA measured ▪ Follow the battery tester on screen instructions ▪ 1. Turn the ignition ON (position 2) ▪ 2. Turn ON the headlights (high beam) until the battery tester shows- Turn OFF headlights ▪ 3. Turn the ignition OFF (position 0)	
14	BATTERY CHARGE	

	NOTES: ▪ This step will take place automatically only when required. ▪ To support a Warranty Claim, TEST CODE details for BEFORE CHARGING and AFTER CHARGING must be supplied in the technical comments box of the Warranty Claim. Using the scroll arrow keys on the battery tester panel: Select BEFORE CHARGING if the battery has not been connected to a recommended mains charger Select AFTER CHARGING if the battery has been connected to a recommended mains charger for the recommended time shown on the result screen Select NEXT to continue	
15	DEEP SCAN **NOTE:** This step will take place automatically only when required. 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	
16	CONNECTING to Wi-Fi **NOTES:** ▪ A warning message is displayed if the battery tester is unable to connect to a Wi-Fi network. Locate WIFI SETTINGS in the UTILITY MENU and follow the on screen instructions. ▪ If the battery tester is not fitted with a Wi-Fi pod, the battery tester will move on to RESULTS (Step 19). The battery tester will now use the A331 Wi-Fi pod (if installed) to connect to the local Wi-Fi network and	

	connect to the Battery Management Information Service (BMIS) server	
17	SENDING BMIS DATA **NOTE:** A warning message is displayed if the battery tester is unable to connect to the BMIS server. Your dedicated IT department may be required to complete all or some of the set up procedure. The battery test result data is now being transferred to the BMIS server	
18	BMIS DATA PASSED to SERVER The battery test result data has been successfully saved to the BMIS server	
19	RESULTS Review the battery test results and complete the appropriate actions (see Battery Tester Results Table)	
20	TEST CODE **NOTE:** To support a Warranty Claim, TEST CODE details for BEFORE CHARGING and AFTER CHARGING must be supplied in the technical comments box of the Warranty Claim. From the RESULTS display, view the TEST CODE using the scroll arrow keys on the battery tester panel	

Battery Tester Results Table

RESULTS	ACTION	
GOOD BATTERY	Return the battery to service	
CHARGE AND RETEST	**NOTE:** To support a Warranty Claim, TEST CODE details for Before Charging and After Charging must be supplied in the technical comments box of the Warranty Claim. When the battery test result equals CHARGE & RETEST, view the TIME TO CHARGE screen using the scroll arrow keys on the Battery Tester panel	 
	Follow the 50AMP charge time for all vehicles, except Defender which can be charged with a 25 Amp charger	
	Follow the recommended action in the test results	
	If the second battery test result equals CHARGE & RETEST the battery must be replaced	
REPLACE BATTERY OR BAD CELL-REPLACE	▪ 1. Repeat the test with the battery disconnected from the vehicle. Ensure OUT OF VEHICLE is selected as the Battery Location for the repeat test ▪ 2. Follow the instructions as per the test result ▪ For a repeat REPLACE BATTERY or BAD-CELL test result, DO NOT ATTEMPT TO RECHARGE THE BATTERY, REPLACE THE BATTERY	
FROZEN BATTERY	Allow the battery to thaw naturally in workshop conditions and retest	
UNABLE TO DO TEST	Disconnect the battery from the vehicle and retest	

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

DTC INDEX

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

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Battery Diagnostics12 Volt Midtronics GR8-1180 JLR Diagnostic Battery Charger

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12 В Midtronics GR8-1180 JLR диагностический аккумуляторная батарея зарядное устройство

12 Volt Midtronics GR8-1180 JLR Diagnostic Battery Charger

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 manufacturerapproved 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.

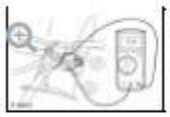
1. Verify the customer concern
2. Visually inspect for obvious signs of mechanical or electrical damage

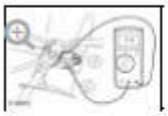
Visual Inspection

MECHANICAL	ELECTRICAL
▪ Generator ▪ Drive belt ▪ Drive belt tensioner ▪ Generator pulley ▪ Check the security of the generator fixings	▪ Generator ▪ Battery ▪ Battery connections ▪ Starter motor ▪ Harnesses and connectors ▪ Fuses ▪ Charge warning lamp function ▪ Powertrain Control Module (PCM)

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 GR 8 - 1180 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
	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)
	Is reading equal to or below 0.1 volts? **Yes** Carry out Midtronics battery test procedure **No** 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

The following steps must be carried out to ensure correct operation of the GR8-1180 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	**NOTE:** If visible damage to the case is evident do not return battery under warranty. Replace the battery if there is any battery fluid leaks evident

Battery vent pipe routing	Check for routing, ensure there are no kinks
GR8-1180 fly lead, condition of clamps	Clean or replace as required
GR8-1180 fly lead connection	Confirm secure connection

NOTE:

The GR8-1180 JLR diagnostic battery charger is suitable for testing flooded and absorbed glass mat (AGM) type batteries including Primary and Secondary batteries

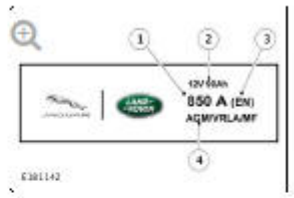
Testing a Battery

Using the GR8-1180 JLR diagnostic battery charger, the following test procedure will confirm the serviceability of the battery (see Completing a Battery Test)

Battery Label Example

NOTE:

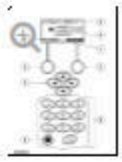
All AGM batteries are marked with AGM. Flooded batteries have no reference to being Flooded.



- 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)

GR8-1180 JLR Diagnostic Battery Charger Display Keypad

The GR8-1180 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	GR8-1180 JLR USER INTERFACE
1	▪ **VOLTAGE** – Battery voltage displayed when first connected	
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 BUTTON** – Press STOP key anytime to stop the active mode	
5	▪ **Title Bar** – The title bar shows the name of the current menu	
6	▪ **Selection Area** – Contains selectable icons or dialogue boxes that display information and required response	
7	▪ **Menu Screen Arrows** - 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 ▪ The left/right menu screen arrows tell you when to use the LEFT or RIGHT 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	▪ **Alphanumeric Keypad** - 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	

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 GR8-1180 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 GR8-1180 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 GR8-1180 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 GR8- 1180 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

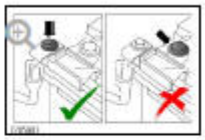
4. The BATTERY SUPPORT Power Supply function needs to be used whenever the vehicle comes in to the workshop for regular maintenance or vehicle module updates. Updating modules can take up to several hours and during that period a lot of current will be depleted from the battery. To support the battery during this process use the BATTERY SUPPORT function. When working on a vehicle, it is recommended that the GR8-1180 JLR diagnostic battery charger 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

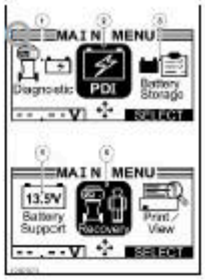
RECOVERY CHARGING

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.

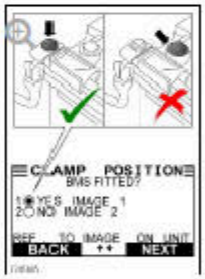
Once RECOVERY CHARGING is complete, the DIAGNOSTIC CHARGING (see above) mode may be used to assess the battery

Completing a Battery Test

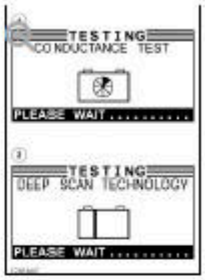
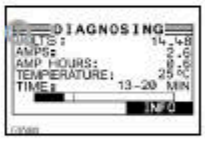
1	Connect the fly-lead to the Midtronics GR8-1180 JLR diagnostic battery charger	
2	Connect the fly-leads to the battery terminals, black lead to the negative terminal battery monitoring system (BMS) terminal (see illustration) , red lead to the positive terminal and confirm the connections are secure	
3	The Midtronics GR8-1180 JLR diagnostic 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)	

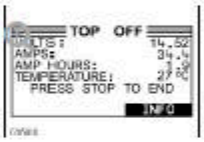
	▪ 1. DIAGNOSTIC CHARGING. Go to step 5 ▪ 2. PDI / STORAGE. Go to step 5 ▪ 3. BATT. STORAGE. Go to step 5 ▪ 4. BATTERY SUPPORT. Go to step 20 ▪ 5. RECOVERY CHARGING. Go to step 21	
	NOTE: When BATT. STORAGE is selected, the technician must enter IDENTIFICATION data or a purchase order reference number for the battery being tested. The battery tester will then move on to BATTERY TYPE (Step 9)	
	Select NEXT to continue	
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	

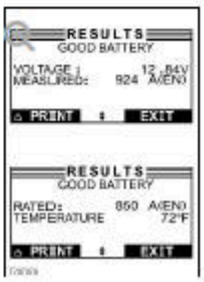
	Select NEXT to continue	

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 **NOTE:** 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 GRX-3080 JLR diagnostic battery charger Check to make sure the negative clamp is connected as in the picture on top of the GR8-1180 JLR diagnostic battery charger with a tick and, if so, select YES Select NEXT to continue	
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	
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 GR8-1180 JLR diagnostic battery charger will automatically advance when the test has completed	
14	DIAGNOSING	
	▪ Once the GR8-1180 JLR diagnostic battery charger determines that the battery is healthy, needs charging and is safe to charge, it proceeds ▪ During the charging session, the GR8-1180 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 GR8-1180 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 GR8-1180 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	CONNECTING TO WIFI ▪ This mode occurs automatically at the end of the TOP OFF mode	

	NOTES: ▪ A warning message is displayed if the battery tester is unable to connect to a Wi-Fi network. Locate WIFI SETTINGS in the UTILITY MENU and follow the on screen instructions ▪ If the battery tester is not fitted with a Wi-Fi pod, the battery tester will move on to RESULTS (Step 19) The Wi-Fi pod will connect to the local Wi-Fi network to access and upload information to the Battery Management Information Service (BMIS) server CONNECTING TO WIFI mode will automatically move to the result screen	
17	SENDING BMIS DATA ▪ This mode occurs automatically at the end of the CONNECTING TO WIFI mode **NOTE:** A warning message is displayed if the battery tester is unable to connect to the BMIS server. Your local IT department may be required to complete all or some of the set up procedure The battery test result data is transferred to the BMIS server	
18	BMIS DATA PASSED to SERVER The battery test result data has been successfully saved to the BMIS server	
19	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 GR8-1180 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 RATED and TEMPERATURE details and to view 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	▪ Return the battery to service
REPLACE BATTERY	NOTE: 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 ▪ Ensure the volt drop test has been completed (see PINPOINT TEST A: VOLTAGE DROP ACROSS VEHICLE HARNESS AND BATTERY TERMINAL above) ▪ REPLACE THE BATTERY
FROZEN BATTERY	▪ Allow the battery to thaw naturally in workshop conditions and retest
UNABLE TO DO TEST	▪ Disconnect the battery from the vehicle and retest

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

20	BATTERY SUPPORT ▪ The Battery Support function is used whenever the vehicle comes in to the workshop for regular maintenance or module downloads ▪ 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 ▪ When working on a vehicle, it is recommended that the GR8-1180 JLR diagnostic battery charger 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 GR8-1180 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 GR8-1180 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

21 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 GR8-1180 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 GR8-1180 JLR diagnostic battery charger will not continue to test the battery throughout the Recovery Charge ▪ When the hour has finished the GR8-1180 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

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12 Volt Midtronics EXP-1080 JLR Diagnostic Battery Charger12 Volt Midtronics GRX-3080 JLR Diagnostic Battery Charger

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12 В Midtronics GRX-3080 JLR диагностический аккумуляторная батарея зарядное устройство

12 Volt Midtronics GRX-3080 JLR Diagnostic Battery Charger

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 manufacturerapproved 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

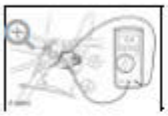
Visual Inspection

MECHANICAL	ELECTRICAL
▪ Generator	▪ Generator
▪ Drive belt	▪ Battery
▪ Drive belt tensioner	▪ Battery connections
▪ Generator pulley	▪ Starter motor
▪ Check the security of the generator fixings	▪ Harnesses and connectors
	▪ Fuses
	▪ Charge warning lamp function
	▪ Powertrain Control Module (PCM)

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
	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)
	Is reading equal to or below 0.1 volts? **Yes** Carry out Midtronics battery test procedure **No** 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

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	**NOTE:** If visible damage to the case is evident do not return battery under warranty. Replace the battery if there is any battery fluid leaks evident

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

NOTE:

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

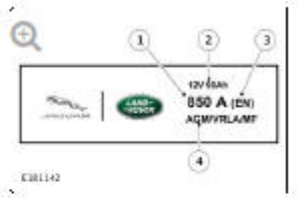
Using the GRX-3080 JLR diagnostic battery charger, the following test procedure will confirm the serviceability of the battery (see Completing a Battery Test)

Battery Label Example

NOTE:

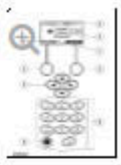
All AGM batteries are marked with AGM. Flooded batteries have no reference to being Flooded.

- 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	▪ **VOLTAGE** – Battery voltage displayed when first connected	
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 BUTTON** – Press STOP key anytime to stop the active mode	
5	▪ **Title Bar** – The title bar shows the name of the current menu	
6	▪ **Selection Area** – Contains selectable icons or dialogue boxes that display information and required response	
7	▪ **Menu Screen Arrows** - 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 ▪ The left/right menu screen arrows tell you when to use the LEFT or RIGHT 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	▪ **Alphanumeric Keypad** - 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	

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

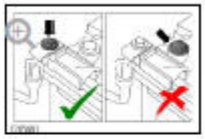
4. The BATTERY SUPPORT Power Supply function needs to be used whenever the vehicle comes in to the workshop for regular maintenance or vehicle module updates. Updating modules can take up to several hours and during that period a lot of current will be depleted from the battery. To support the battery 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.

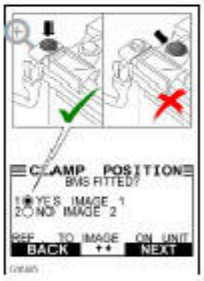
Once RECOVERY CHARGING is complete, the DIAGNOSTIC CHARGING (see above) mode may be used to assess the battery

Completing a Battery Test

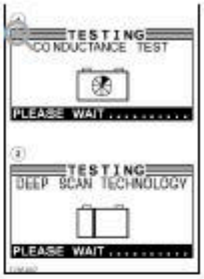
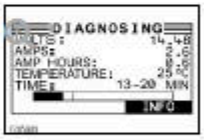
1	Connect the fly-lead to the Midtronics GRX-3080 JLR battery charger	
2	Connect the fly-leads to the battery terminals, black lead to the negative terminal battery monitoring system (BMS) terminal (see illustration) , red lead to the positive terminal and confirm the connections are secure	
3	The Midtronics 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)	

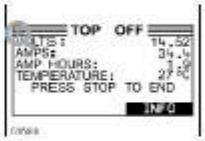
	▪ 1. DIAGNOSTIC CHARGING. Go to step 5 ▪ 2. PDI / STORAGE. Go to step 5 ▪ 3. BATT. STORAGE. Go to step 5 ▪ 4. BATTERY SUPPORT. Go to step 20 ▪ 5. RECOVERY CHARGING. Go to step 21	
	NOTE: When BATT. STORAGE is selected, the technician must enter IDENTIFICATION data or a purchase order reference number for the battery being tested. The battery tester will then move on to BATTERY TYPE (Step 9) Select NEXT to continue	
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	

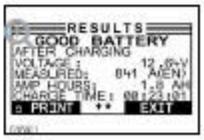


7	BATTERY LOCATION **NOTES:** ▪ This step is required for DIAGNOSTIC CHARGING and PDI/STORAGE only ▪ Selecting the correct battery details at this point is critical to getting the correct Battery Test results Select IN VEHICLE if the battery is tested connected to the vehicle **NOTE:** Make sure the 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 GRX-3080 JLR Check to make sure the negative clamp is connected as in the picture on top of the GRX-3080 JLR diagnostic battery charger with a tick and, if so, select YES Select NEXT to continue	
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	
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	CONNECTING TO WIFI ▪ This mode occurs automatically at the end of the TOP OFF mode	

	NOTES: ▪ A warning message is displayed if the battery tester is unable to connect to a Wi-Fi network. Locate WIFI SETTINGS in the UTILITY MENU and follow the on screen instructions ▪ If the battery tester is not fitted with a Wi-Fi pod, the battery tester will move on to RESULTS (Step 19) The Wi-Fi pod will connect to the local Wi-Fi network to access and upload information to the Battery Management Information Service (BMIS) server CONNECTING TO WIFI mode will automatically move to the result screen	
17	SENDING BMIS DATA ▪ This mode occurs automatically at the end of the CONNECTING TO WIFI mode **NOTE:** A warning message is displayed if the battery tester is unable to connect to the BMIS server. Your local IT department may be required to complete all or some of the set up procedure The battery test result data is transferred to the BMIS server	
18	BMIS DATA PASSED to SERVER The battery test result data has been successfully saved to the BMIS server	
19	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

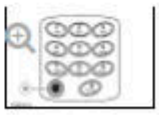
RESULTS	ACTION
GOOD BATTERY	▪ Return the battery to service
REPLACE BATTERY	NOTE: A 'REPLACE BATTERY' result may also mean a poor connection between the battery cables on the vehicle and the battery. Check connections and rectify as required ▪ Ensure the volt drop test has been completed (see PINPOINT TEST A: VOLTAGE DROP ACROSS VEHICLE HARNESS AND BATTERY TERMINAL above) ▪ REPLACE THE BATTERY
FROZEN BATTERY	▪ Allow the battery to thaw naturally in workshop conditions and retest
UNABLE TO DO TEST	▪ Disconnect the battery from the vehicle and retest

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

20	BATTERY SUPPORT ▪ The Battery Support function is used whenever the vehicle comes in to the workshop for regular maintenance or module downloads ▪ 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 ▪ 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	
21	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

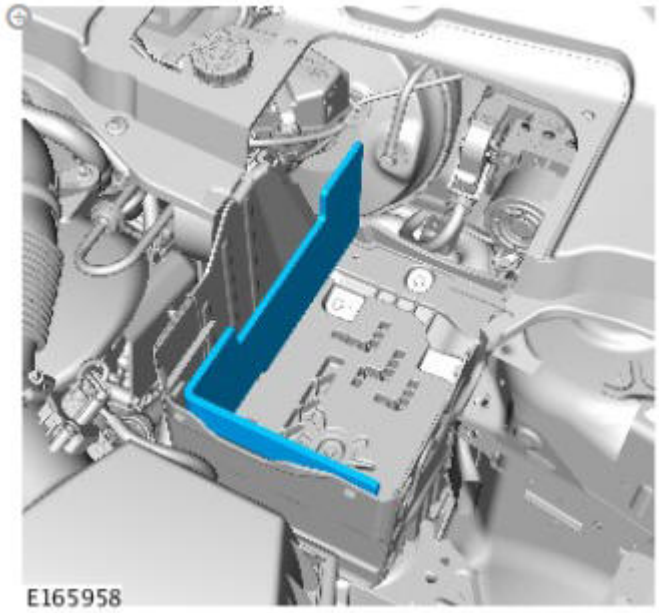
Battery tray (G1774741) removal and installation

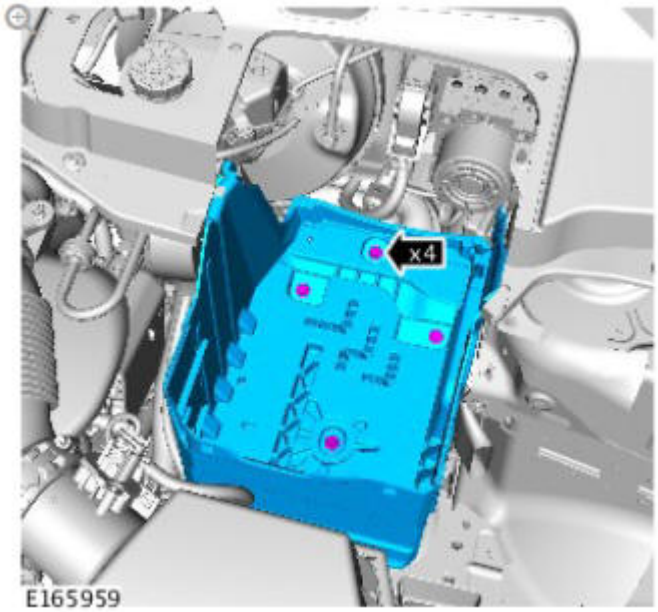
REMOVAL

NOTES:

- *Removal steps in this procedure may contain installation details.*
- *Some variation in the illustrations may occur, but the essential information is always correct.*

Refer to: Battery (414-01, Removal and Installation).

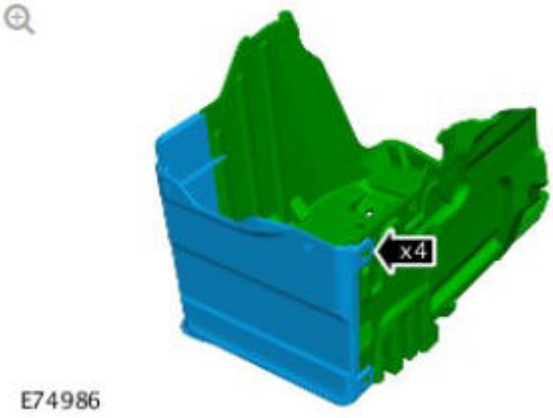




Torque: 10 Nm

NOTE:

Do not disassemble further if the component is removed for access only.



INSTALLATION

To install, reverse the removal procedure.

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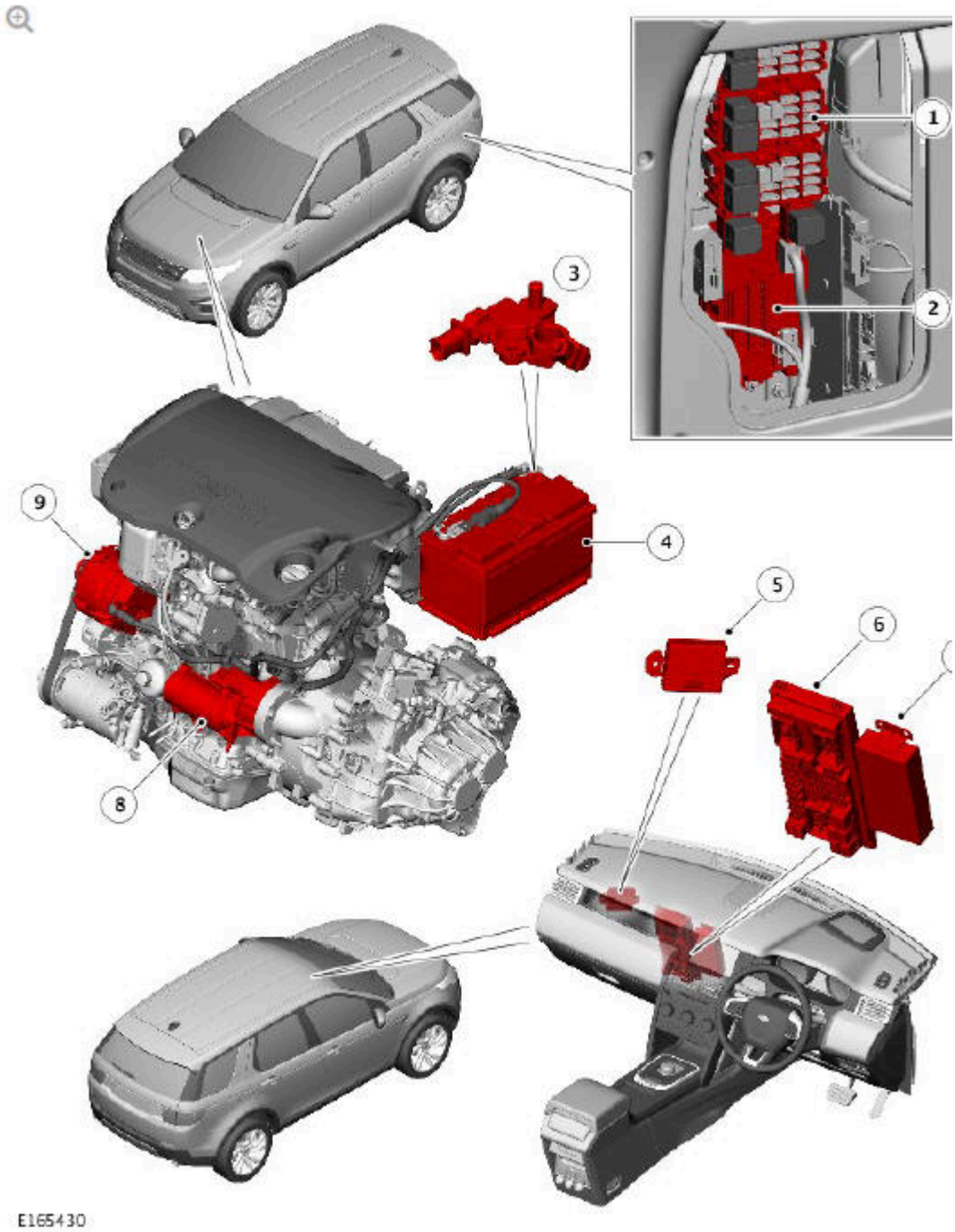
12 Volt Midtronics GR8-1180 JLR Diagnostic Battery ChargerBattery, Mounting and Cables/ Description and Operation

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Аккумуляторная батарея, крепление и кабели / описание и работа

Battery, Mounting and Cables/ Description and Operation

COMPONENT LOCATION



1. Rear Junction Box (RJB)
2. Quiescent Current Control Module (QCCM)
3. Battery Monitoring System (BMS) control module
4. Primary battery
5. Gateway Module (GWM)
6. Central Junction Box (CJB)
7. Voltage Quality Module (VQM) - vehicles with auto stop/start system only
8. Starter motor or Tandem Solenoid Starter (TSS) motor on vehicles with auto stop/start system
9. Generator

OVERVIEW

The single primary battery is positioned on the left side of the engine compartment in a tray and is secured in position with a clamp plate and bolt assembly. The battery supplies electrical power to the starter motor, generator, Battery Junction Box (BJB), Central Junction Box (CJB) and Rear Junction Box (RJB).

The primary battery is an H7 80 Ah, 800 CCA Absorbed Glass Mat (AGM) Valve Regulated Lead-Acid (VRLA) battery on:

- TD4 2.0L Diesel engine vehicles
- All vehicles with auto stop/start system
- All vehicles with Fuel Fired Booster Heater (FFBH) with Cabin Heat Function.

The primary battery is an H7 80 Ah 700 CCA Flooded type battery on:

- TD4 2.2L Diesel engine vehicles without auto stop/start system
- GTDi 2.0L Petrol engine vehicles without auto stop/start system.

The primary battery is an H6 70Ahr 760CCA AGM Valve Regulated Lead- Acid (VRLA) battery on:

- TD4 2.2L Diesel engine vehicles with no fuel heater (temperate climates).

A Battery Monitoring System (BMS) control module is mounted on the primary battery negative terminal. The BMS control module is integral with the primary battery negative cable and is controlled by the Gateway Module (GWM).

CAUTION:

When connecting a slave power supply to the vehicle, to avoid damaging the BMS control module, always use the ground (negative (-)) terminal stud point on the right side top mount in the engine compartment. Never connect directly to the primary battery negative terminal when connecting a slave power supply to the vehicle, the BMS control module can be damaged.

The BJB is mounted adjacent the left front suspension top mount. The RJB is located on the left side of the luggage compartment behind the trim panel. The BJB and RJB contain fusible links, fuses, and relays to distribute electrical power to various vehicle systems.

NOTE:

The fusible links are mounted on the inboard side of the BJB behind removable covers.

The CJB is located behind the glovebox and receives its main power supply from the BJB. In addition to containing blade fuses, the CJB is the main controller for a number of vehicle systems. These functions are outlined in the relevant sections of this manual.

On vehicles with the auto stop/start system, the Voltage Quality Module (VQM) maintains the power supply of the several electrical systems during an auto stop/start engine start. This allows crucial vehicle systems to continue uninterrupted when there is a sudden draw of current from the primary battery. The VQM is located adjacent to the CJB.

TRANSIT MODE

All new vehicles will be delivered from the factory in transit mode. Transit mode replaces the traditional transit relay and inhibits a number of electrical systems and features to eliminate quiescent drain from the battery during delivery. Transit mode also inhibits some electrical loads when the engine is running to ensure that the battery is never discharged while the engine is running.

When the vehicle is in transit mode 'TRANSP' will be displayed in the Instrument Cluster (IC).

To remove the vehicle from transit mode, the Land Rover approved diagnostic system must be connected during the Pre-Delivery Inspection (PDI). For more information, refer to the PDI manual.

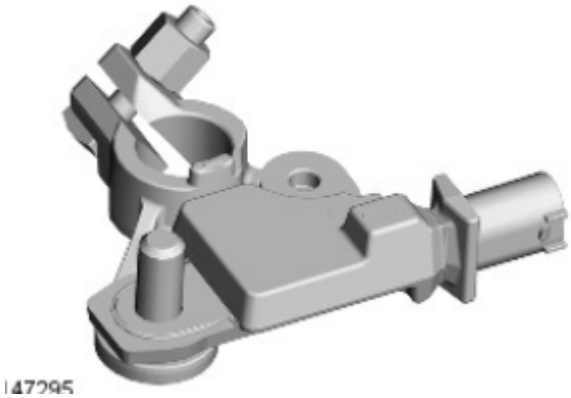
POWER MODES

The CJB (Central Junction Box) controls the power supplies for the various vehicle functions. There are 9 power modes available which are used by various systems to determine the operating condition of the vehicle. Only five of these modes will be noticeable to the driver and technicians as follows:

- Power mode 0 - Ignition off
- Power mode 4 - Accessory
- Power mode 6 - Ignition
- Power mode 7 - Engine running
- Power mode 9 - Crank.

DESCRIPTION

BATTERY MONITORING SYSTEM (BMS) CONTROL MODULE



A Battery Monitoring System (BMS) control module is located on the primary battery negative (-) terminal and is clamped to the terminal with a bolt and nut.

The primary battery negative ground cable is connected to the BMS control module and is attached to a ground stud on the vehicle body.

The BMS control module is connected into the vehicle wiring harness via a multiplug. The BMS control module receives a 12V power supply direct from the primary battery positive terminal. A Local Interconnect Network (LIN) bus connection provides communication between the BMS control module, the Gateway Module (GWM) and the Quiescent Current Control Module (QCCM) for control and monitoring of the primary battery current drain and state of charge.

The BMS control module measures the primary battery current and voltage, which it communicates to the GWM over the LIN bus connection. The GWM also receives generator output information on a LIN bus connection. The GWM transmits the primary battery and generator information over the High Speed (HS) Controller Area Network (CAN) powertrain and chassis system busses and the Medium Speed (MS) CAN body and comfort system busses to other vehicle systems. Based on the information received from the BMS

control module, the GWM and the Engine Control Module (ECM) will control the output from the generator and request the switching off of electrical loads if necessary.

CAUTION:

Due to the self-calibration routine, it is recommended that all power supply diagnostic testing is carried out using the Land Rover approved diagnostic system rather than a digital multimeter.

The BMS control module is able to generate Diagnostic Trouble Codes (DTC)s to help diagnose BMS related issues. These DTCs can be read using the Land Rover approved diagnostic system. The Land Rover approved diagnostic system can also be used to implement a primary battery and generator self-test routine.

For additional information, refer to: Battery (414-01 Battery, Mounting and Cables, Diagnosis and Testing).

If a fault is detected, the GWM and the ECM will override the BMS control module.

The BMS control module DTC's can be used to help diagnose BMS hardware or communication faults. The DTC's are stored in GWM. The Land Rover approved diagnostic system has a process for an automated power supply diagnostic procedure. The procedure provides a menu driven process to locate a fault in a logical sequence. The procedure uses the capability of the BMS control module and generator LIN bus controlled functions to provide current flow information and will detect if the BMS control module or generator is not functioning correctly.

BMS Low Battery Warning and Energy Management Messages

The BMS continuously monitors the condition of the primary battery. If excessive battery discharge occurs, the system will begin to shut down nonessential electrical systems in order to protect the primary battery.

If the BMS calculates that primary battery condition is not within set parameters, there are 3 messages that can be displayed; two on the Touch Screen (TS) and one on the Instrument Cluster (IC) message center. These inform the user that the primary battery is either at a low level of charge or the engine-off power consumption limit has been exceeded.

- Low Battery - Please switch engine on or system will shutdown in 3 minutes: is displayed as a warning on the TS if the engine is not running.

  This indicates that the primary battery charge has fallen below a predefined threshold. As soon as the primary battery is charged above this threshold, the message will be removed.

- Low Battery - Please start your engine: is displayed on the IC message center if the engine is not running. This indicates that the primary battery charge has fallen below a predefined threshold. As soon as the battery is charged above this threshold, the message will be removed or it can be manually removed by pressing the 'OK switch on the steering wheel switchpack'.
- System will shut down in 3 minutes: is displayed as an energy management on the TS if the engine is not running, and system features are causing excessive primary battery discharge. After 3 minutes the BMS will begin shutting down vehicle systems. Normal system operation will resume when the engine is started.

This is based on a percentage of primary battery capacity available for the customer to use with the engine off. The percentage can change based upon several factors.

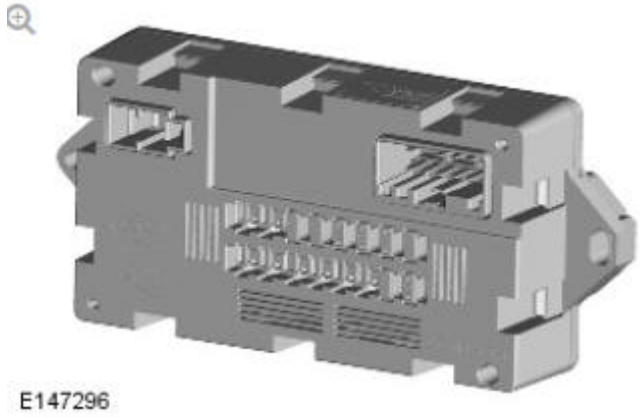
Once activated, the resetting of this message will not occur until the vehicle is driven for 10 minutes with the engine running (to allow the primary battery to replace any lost charge). However, if the engine is run for less than 10 minutes, the message will only be displayed after an additional 5 minutes with the ignition on (power mode 6) but the engine off.

VOLTAGE QUALITY MODULE (VQM) - VEHICLES WITH AUTO STOP/START SYSTEM ONLY



A Voltage Quality Module (VQM) is fitted to vehicles with the auto stop/start system. The VQM is located adjacent to the CJB, behind the glovebox. During an auto stop/start engine start cycle the VQM maintains some of the vehicle's electrical systems by supplying a support voltage around the vehicle's electronic components during an engine restart. This allows crucial vehicle systems to continue uninterrupted when there is a sudden draw of current from the primary battery.

QUIESCENT CURRENT CONTROL MODULE (QCCM)



The Quiescent Current Control Module (QCCM) is located in the rear left of the luggage compartment, behind the trim panel.

An addition to the Battery Monitoring System (BMS), and using signals already transmitted by the BMS control module, the QCCM cuts the power supply to other non-essential control modules to avoid excessive discharge of the primary battery. The power supplies are cut by opening the contacts of relays integral with the QCCM. The systems supplied via the QCCM are the audio/entertainment systems and the climate control systems.

Some control modules can cause unnecessary primary battery drain due to the control module staying awake after the vehicle electrical system has been shut down. The QCCM in conjunction with the Gateway Module (GWM), monitor and control the systems to prevent primary battery discharge.

The system comprises three components:

- BMS control module
- GWM
- QCCM.

The battery monitoring system checks primary battery health by analyzing battery quiescent current, battery current drain or state of charge, and determines if any action is required to protect the primary battery. If action is required this is communicated to the GWM.

The GWM software uses this information to determine if action is required to assist primary battery protection. The QCCM receives relay open and close commands from the GWM and reacts accordingly.

The software that controls the QCCM is contained within the GWM.

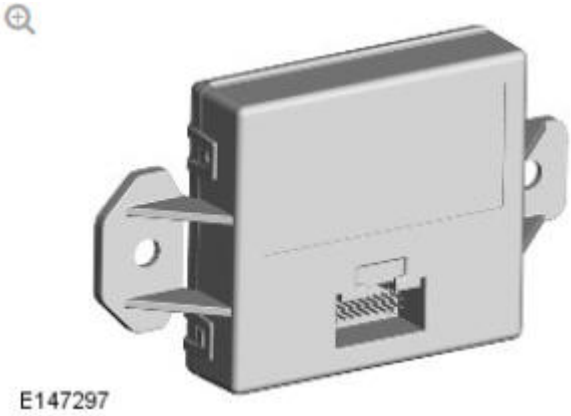
The system will be set in transit mode on delivery. Transit mode has no QCCM operation and the relays remain closed. Therefore primary battery drain could occur and the system will not react to it.

A Pre-Delivery Inspection (PDI) process requires the system to be taken out of transit mode and put into normal mode, which enables the QCCM, before handing over to the customer.

The QCCM has a routine to clean the integral relay contacts if required. This routine is performed using the Land Rover approved diagnostic system and, if unsuccessful, the QCCM will require replacement.

The QCCM contains a number of fuses which supply and protect the audio/entertainment systems, the climate systems, and the GWM.

GATEWAY MODULE (GWM)



The GWM is attached to a bracket, which is attached to the passenger side of the instrument panel cross-car beam, behind the instrument panel.

The GWM contains software to control the following functions:

- Determine the condition of primary battery
- Control the output from the generator using load management software
- Controls the auto stop/start system using power management to inhibit unnecessary electrical loads.

The GWM communicates with other system control modules on the High Speed (HS) CAN powertrain and chassis systems busses and the Medium Speed (MS) CAN body and comfort systems busses.

The GWM communicates with the BMS control module, the QCCM, and the generator via a LIN bus.

PRIMARY BATTERY STARTER MOTOR FUSE

A fuse to protect the starter motor and generator is located in the power cable from the primary battery positive terminal to the starter motor and generator.

The fuse is integral to the cable and cannot be replaced separately. In the event of fuse failure, the cable assembly must be replaced.

OPERATION

BATTERY MONITORING SYSTEM (BMS)

When the ignition is off (power mode 0), the BMS control module records the primary battery state of charge and begins to monitor the battery condition from this point.

If the primary battery state of charge falls by 7%, the BMS control module will monitor the primary battery for 5 minutes. The BMS control module sends a 'warning' message on the LIN bus to the GWM. If after the 5 minute monitoring period, the primary battery charge has continued to fall or is below 50% due to the quiescent drain current being too high, the BMS control module will determine that some control modules are still 'awake'.

The BMS control module sends a shutdown message on the LIN bus to the GWM. The GWM sends a CAN bus message on the Medium Speed (MS) CAN body and comfort systems bus, and High Speed (HS) CAN powertrain and chassis systems bus to all control modules, requesting them to shutdown.

The BMS control module will monitor the primary battery state of charge for a further 15 minutes and determine if the battery state of charge is still dropping.

The BMS control module sends a 'Power Disconnect' signal to the GWM on the LIN bus. The GWM then sends a signal to the Quiescent Current Control Module (QCCM) on the LIN bus to open its internal relays. When the QCCM relays are open, the power supply from the primary battery to non-critical control modules is removed. The non-critical control modules are any modules associated with the audio/infotainment system and also the climate control system.

The use of a LIN bus communication ensures that no other control modules are 'woken' during this process. If CAN bus communication was used, all modules on the CAN bus would be woken by the message.

BMS CONTROL MODULE SELF CALIBRATION

Periodically the BMS control module will initiate a self-calibration routine.

Before making the self-calibration, the battery monitoring system first charges the primary battery to its full condition.

NOTE:

If the vehicle is only driven for short periods the charging process could take a number of days to complete.

Once the primary battery is fully charged, the BMS control module will discharge the primary battery to approximately 75% of its full state of charge, but never lower than 12.2 V. The time taken to complete this part of the routine is dependent on the electrical load on the vehicle.

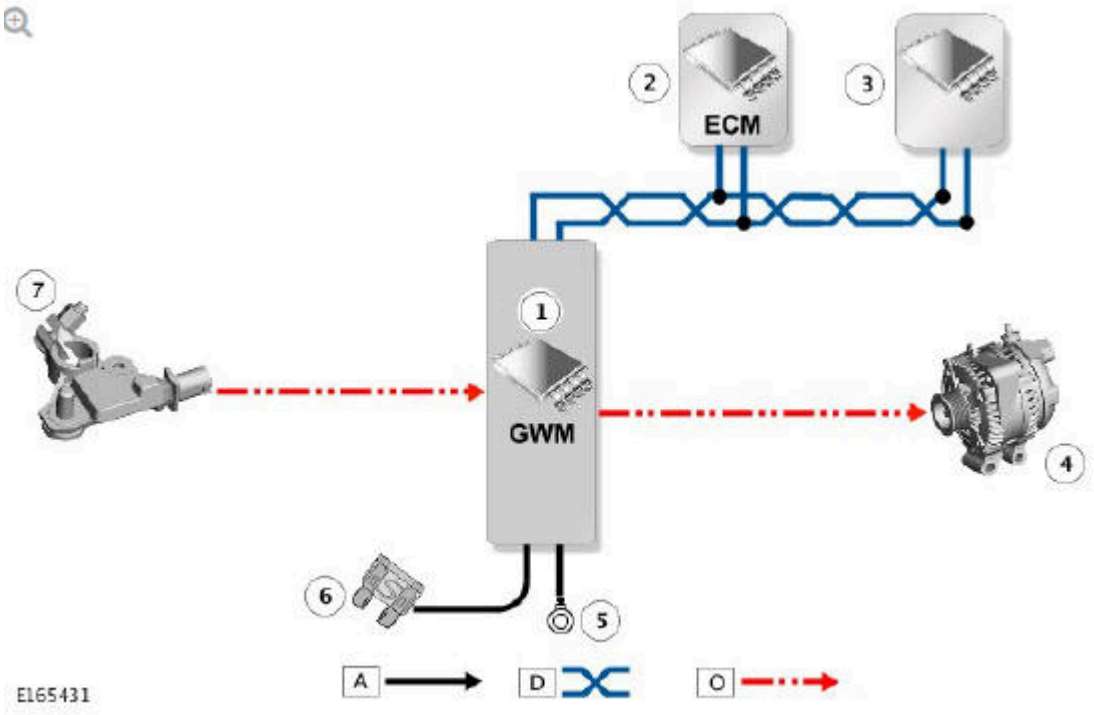
When the second part of the routine has been successfully completed, the BMS control module will return the primary battery to its optimum level of charge. The optimum level of charge will be between 12.6 V and 15 V, depending on primary battery condition, temperature and loading.

The BMS control module also monitors the primary battery condition with the engine switched off. If a low voltage condition is detected the BMS control module can request the infotainment system to switch off to protect battery voltage.

CONTROL DIAGRAM

NOTE:

A = Hardwired; D = High speed CAN powertrain systems; O = LIN bus



1. Gateway Module (GWM)
2. Engine Control Module (ECM)
3. High Speed (HS) CAN powertrain system bus to other system control modules
4. Generator
5. Ground
6. Fused power supply from Central Junction Box (CJB)
7. Battery Monitoring System (BMS) control module

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12 Volt Midtronics GRX-3080 JLR Diagnostic Battery ChargerBattery, Mounting and Cables Diagnosis and Testing Battery

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Аккумуляторная батарея, крепление и кабели диагностика и проверка аккумуляторная батарея

Battery, Mounting and Cables Diagnosis and Testing Battery

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 manufacturerapproved 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
▪ Generator	▪ Generator
▪ Drive belt	▪ Battery
▪ Drive belt tensioner	▪ Battery connections
▪ Generator pulley	▪ Starter motor
▪ Check the security of the generator fixings	▪ Harnesses and connectors
	▪ Fuses
	▪ Charge warning lamp function

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

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
▪ DTC B11DB-87 logged in Gateway Module	▪ Gateway Module connections insecure ▪ Battery Monitoring System Control Module connections insecure ▪ Battery Monitoring System Control Module fault	▪ GO to Pinpoint Test A.
▪ Battery power to vehicle interrupted	▪ High resistance between battery terminals and clamps	▪ Refer to the Battery Diagnostics instructions for the Midtronics GRX-3080 / EXP-1080 / GR8-1180 Diagnostic Battery Chargers in this Section

DIAGNOSTIC PROCEDURES FOR DTC B11 DB - 87 (BATTERY MONITORING MODULE " A " - MISSING MESSAGE)

NOTES:

- *These diagnostics only apply to vehicles fitted with a Gateway Module.*
- *If DTC B11DB-87 is flagged but a "charge system fault" warning / light is not present on the instrument cluster, then the likelihood is that the Battery Monitoring System Control Module is NOT the faulty part.*

If a vehicle is presented with DTC B11DB-87 logged, follow the diagnostic routine below BEFORE replacing the Battery Monitoring System Control Module:

PINPOINT TEST A : BATTERY MONITORING SYSTEM CONTROL MODULE - FURTHER DIAGNOSTICS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	A1: CHECK FOR RELATED DTCS (B1412-87)
	1 Using JLR approved diagnostic equipment, check the Gateway Module for related DTCs
	In addition to DTC B11DB-87, is DTC B1412-87 (Quiescent Current Control Module - Missing Message) also logged? **Yes** Check the continuity of Gateway Module LIN_1 circuit and rectify as required. Then, GO to A2. **No** GO to A3.
	A2: CLEAR DTCS AND RETEST. CHECK GATEWAY MODULE AND QUIESCENT CURRENT CONTROL MODULE
	1 Using JLR approved diagnostic equipment, clear DTCs and retest the vehicle (vehicle must have the ignition on or engine running for a minimum of 20 seconds before retesting)
	Are DTCs still logged? **Yes** If ONLY B11DB-87 is logged, GO to A3. If ONLY B1412-87 is logged, check the connections and operation of the Quiescent Current Control Module and rectify as required If BOTH DTCs are still present, check the connections and operation of the Gateway Module and rectify as required

	No No further action
A3: CHECK BATTERY MONITORING SYSTEM CONTROL MODULE INSTALLATION AND CONNECTIONS	
	1 Check that the Battery Monitoring System Control Module is seated correctly on battery post (the battery post should slightly protrude from the mounting ring). Adjust as required
	2 Check that the Battery Monitoring System Control Module power cable (thin wire from positive terminal) is securely connected to positive terminal and that the wiring is undamaged. Rectify as required
	3 Check the installation of the Battery Monitoring System Control Module connector for security and check the security of the cables into the connector. Rectify as required
	4 Disconnect the Battery Monitoring System Control Module and LIN circuit connectors and visually inspect the pins in both ends for damage. Rectify as required and resecure connectors
	5 NOTE: this step only applies to X250. Ensure that the earth cable fixing at location G4D178 is secure and torqued to 13.5Nm
	6 Using JLR approved diagnostic equipment, clear DTCs and retest the vehicle (vehicle must have the ignition on or engine running for a minimum of 20 seconds before retesting)
	Is DTC B11DB-87 still logged? **Yes** Replace the Battery Monitoring System Control Module **No** No further action

FURTHER BATTERY DIAGNOSTICS

For further guidance in diagnosing battery issues, refer to the battery diagnostics instructions for the Midtronics GRX-3080 / EXP-1080 / GR8- 1180 Diagnostic Battery Chargers in this section

DTC INDEX

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

Battery, mounting and cables specifications

General Specification - Stop-start and timed climate models:

ITEM	SPECIFICATION
Battery:	
Type	H7 AGM (VRLA)
Capacity	80Ah/800CCA

General Specification - All except stop-start and timed climate models

ITEM	SPECIFICATION
Battery:	
Type	H7 Flooded
Capacity	80Ah/700CCA

Battery Disconnect/Connect

CAUTION:

The vehicle status must be established before attempting battery disconnect/connect. Reference must be then made to the following table to establish the relevant procedure to be followed.

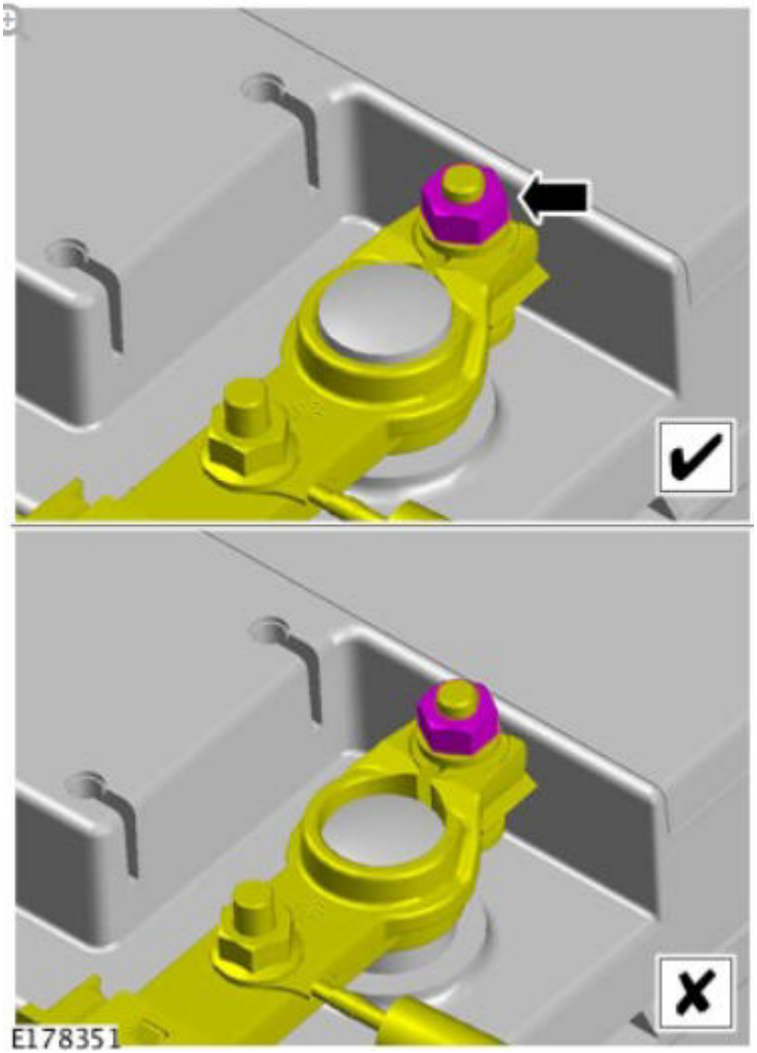
NOTE:

Make a note of the customers radio preset stations.

VEHICLE STATUS	PROCEDURE
Vehicle without Telematics	1
Vehicle with Telematics	2

CAUTION:

ENSURE THE CLAMPING LUG ON THE BMS IS BELOW THE TOP OF THE NEGATIVE TERMINAL POST AS SHOWN.



Procedure 1

NOTE:

If a new battery is installed, the battery monitoring system (BMS) must be reset using Land Rover approved diagnostic equipment

Disconnect battery	Connect battery
1. Chock the wheels	**1.**Make sure that all electrical loads are switched **OFF**
2. Open the hood	**2.** Connect battery ground cable to the battery - 6Nm
3. Remove the battery cover	**3.**Connect the BMS electrical connector
4. Disconnect the engine wiring harness ground	**4.**Connect the battery ground to starter motor connector/terminal (if equipped) - 10Nm

connector/terminal	
5. Disconnect the battery ground to starter motor connector/terminal (if equipped)	**5.** Connect the engine wiring harness ground connector/terminal - 6Nm
6. Disconnect the battery monitoring system (BMS) module electrical connector	**6.** Install the battery cover
7. Disconnect the battery ground cable from the battery	**7.**Close the hood
	8. Switch the ignition on
	9.Reset radio station preset stations
	10. Reset the clock
	11. Reset electric window one-touch facility. Power window up to hard stop, release switch, reapply and hold for 1 second (relay in door will click). One touch should now work

Procedure 2

NOTE:

If a new battery is installed, the battery monitoring system (BMS) must be reset using Land Rover approved diagnostic equipment.

Disconnect battery	**Connect battery**
1. Make sure the customer has placed stolen vehicle tracking into **Service Mode** (if equipped)	**1.**Make sure that all electrical loads are switched **OFF**
2. Chock the wheels	**2.** Connect battery ground cable to the battery - 6Nm
3. Open the hood	**3.**Connect the BMS electrical connector
4. Remove the battery cover	**4.**Connect the battery ground to starter motor connector/terminal (if equipped) - 10Nm
5. Disconnect the engine	**5.** Connect the engine wiring harness ground

wiring harness ground connector/terminal	connector/terminal - 6Nm
6. Disconnect the battery ground to starter motor connector/terminal (if equipped)	**6.** Install the battery cover
7.Disconnect the battery monitoring system (BMS) module electrical connector	**7.**Close the hood
8. Disconnect the battery ground cable from the battery	**8.** Switch the ignition on
	9.Reset radio station preset stations
	10. Reset the clock
	11. Reset electric window one-touch facility. Power window up to hard stop, release switch, reapply and hold for 1 second (relay in door will click). One touch should now work
	12. Request stolen vehicle tracking removed from **Service Mode** (if equipped)

Torque Specifications

ITEM	NM	LB-FT	LB-IN
Vehicle body brace retaining bolts	25	18	-
Battery terminal nuts	6	-	53
Battery ground terminal nut - battery to starter motor retaining stud (if equipped)	10	7	-
Battery tray retaining bolts	10	7	-

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Battery, Mounting and Cables/ Description and OperationGeneral Information Battery Support Unit Connection Procedure

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Общая информация аккумуляторная батарея кронштейн узел Connection Procedure

General Information Battery Support Unit Connection Procedure

CONNECT

WARNINGS:

- ***Do not smoke or carry lighted tobacco or open flame of any type when working on or near the vehicles battery. Highly flammable vapors may be present and ignite. Failure to follow these instructions may result in personal injury.***
- ***Avoid flames, sparks or lighted substances.***
- ***Make sure that the battery is well ventilated while the battery support unit is connected.***
- ***Switch off the current from the battery support unit before making any electrical connections or disconnections.***
- ***The battery support unit must never be connected to both battery terminals. Always follow the safety warnings and documentation of the device that is being used.***
- ***The battery support unit ground cable must always be connected to the vehicle last and disconnected first.***

CAUTION:

Do not carry out any software downloads with the vehicle in transit mode or with the transit relay installed.

NOTES:

This procedure covers connection instructions for the following vehicles;

- *LY / L560*
- *LR / L462*
- *LG / L405*
- *LW / L494*
- *LF / L359*
- *LA / L319*
- *LS / L320*
- *LM / L322*
- *LC / L550*
- *LV / L538*

This procedure covers operating instructions for the following battery support units;

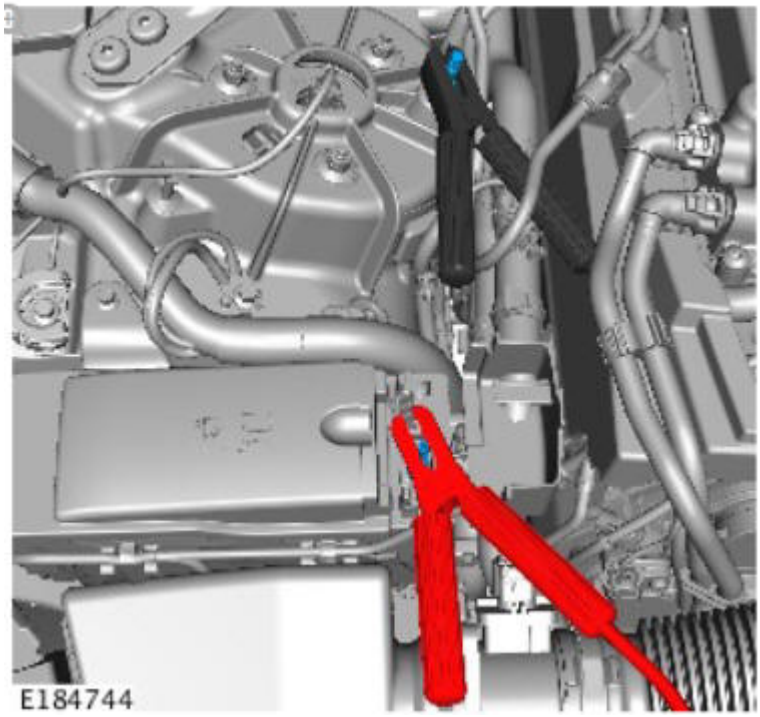
- *Traction BSU2-50 / 125*
- *Fronius ACCTIVA Professional Flash*
- *MIdtronics CX-Pro 50*
- *Traction MPL-50*
- *Midtronics PSC 700S*

WARNING:

Make sure that the cables are connected in the correct order.

NOTES:

- *This Step contains connection instructions for the following vehicles;*
- *LY / L560*



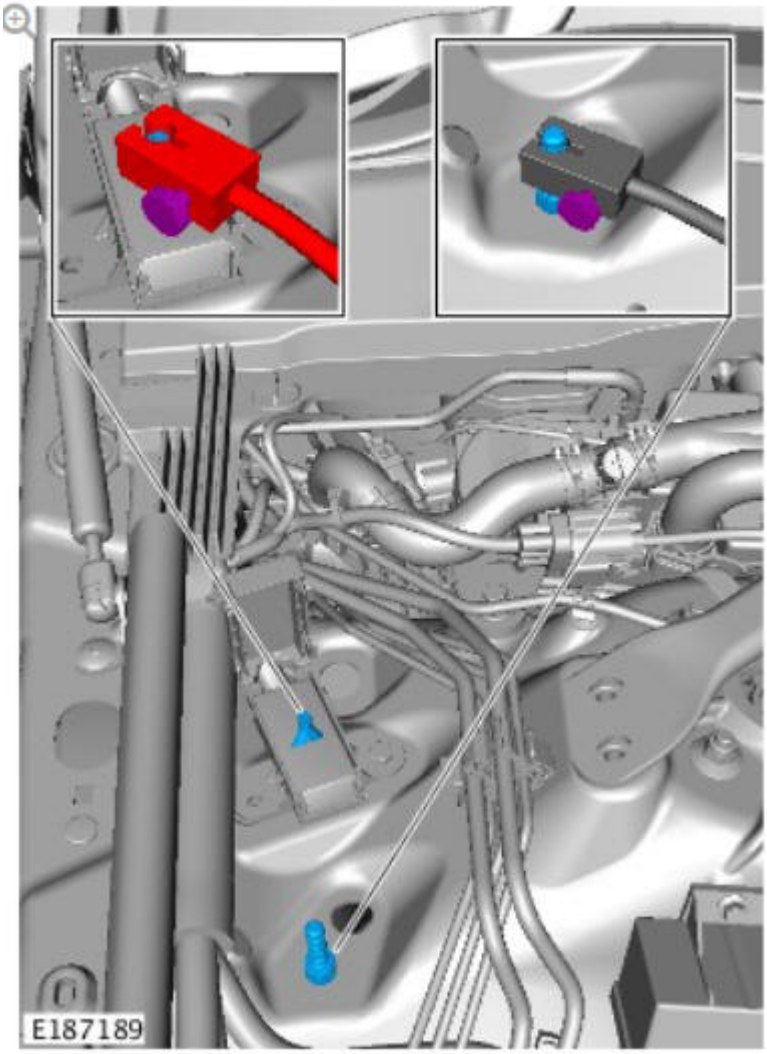
1. Connect the battery support unit positive cable to the jump start positive terminal.
2. Connect the battery support unit ground cable to the jump start ground terminal.

WARNING:

Make sure that the cables are connected in the correct order.

NOTES:

- *This Step contains connection instructions for the following vehicles;*
- *LR / L462*



1. Connect the battery support unit positive cable to the jump start positive terminal.
2. Connect the battery support unit ground cable to the jump start ground terminal.

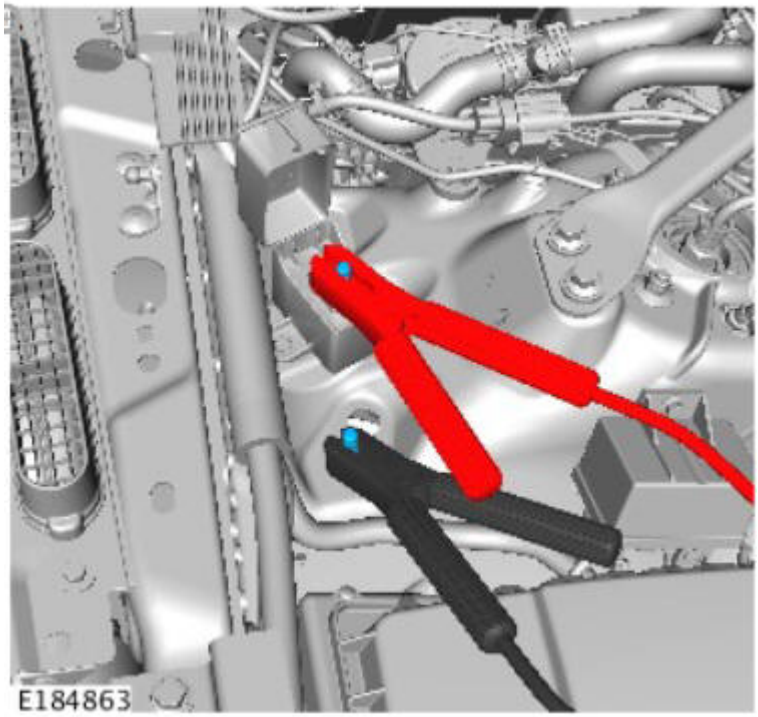
WARNING:

Make sure that the cables are connected in the correct order.

NOTES:

This Step contains connection instructions for the following vehicles;

- *LG / L405*
- LW / L494



1. Connect the battery support unit positive cable to the jump start positive terminal.
2. Connect the battery support unit ground cable to the jump start ground terminal.

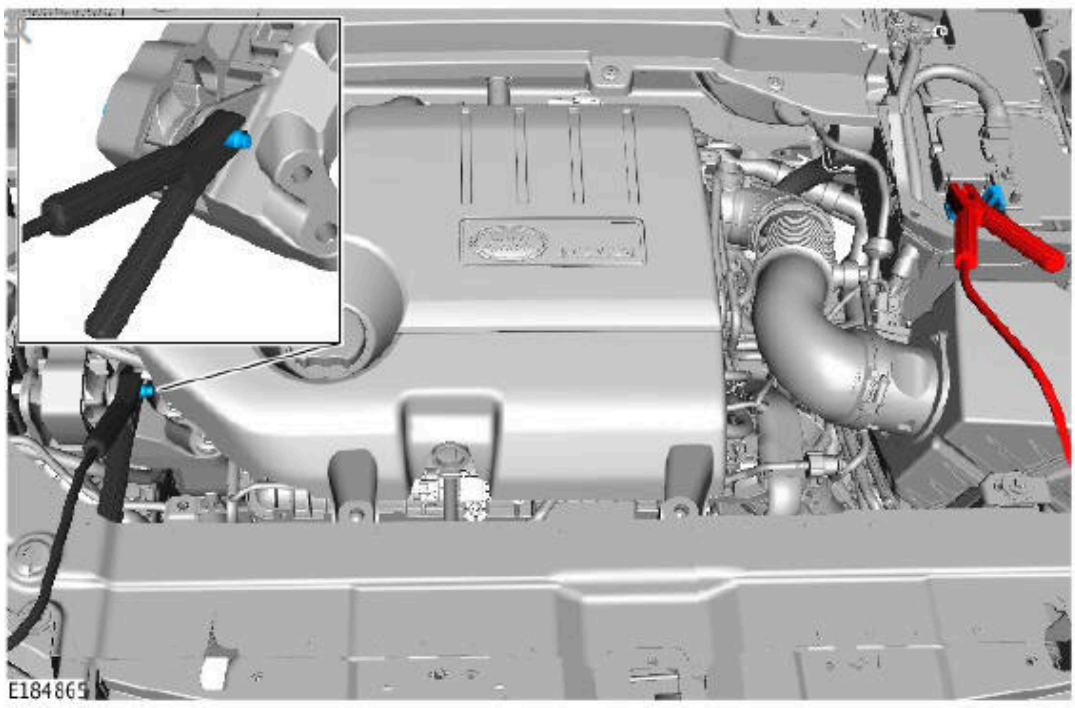
WARNING:

Make sure that the cables are connected in the correct order.

NOTES:

This Step contains connection instructions for the following vehicles;

- *LV / L538*
- *LC / L550*
- *LF / L359*



1. Connect the battery support unit positive cable to the primary battery positive terminal.

2. Connect the battery support unit ground cable to the ground point, as illustrated.

WARNING:

Make sure that the cables are connected in the correct order.

CAUTION:

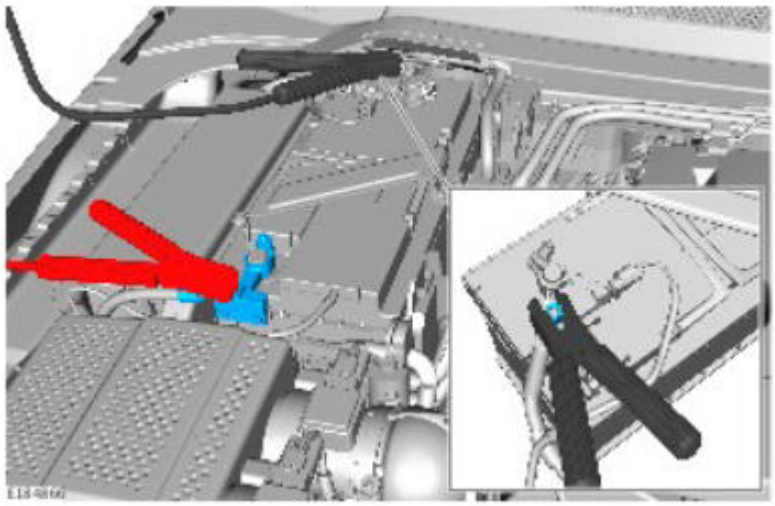
Do not connect the battery support unit ground cable directly to the battery ground terminal. The battery monitoring system (BMS) must be between the battery support unit ground cable clamp and the battery ground terminal.

NOTES:

This Step contains connection instructions for the following vehicles;

- *LA / L319*
- *LS / L320*

Left hand drive shown, right hand drive is similar.



1. Connect the battery support unit positive cable to the primary battery positive terminal.
2. Connect the battery support unit ground cable to the primary battery ground cable, as illustrated.

WARNING:

Make sure that the cables are connected in the correct order.

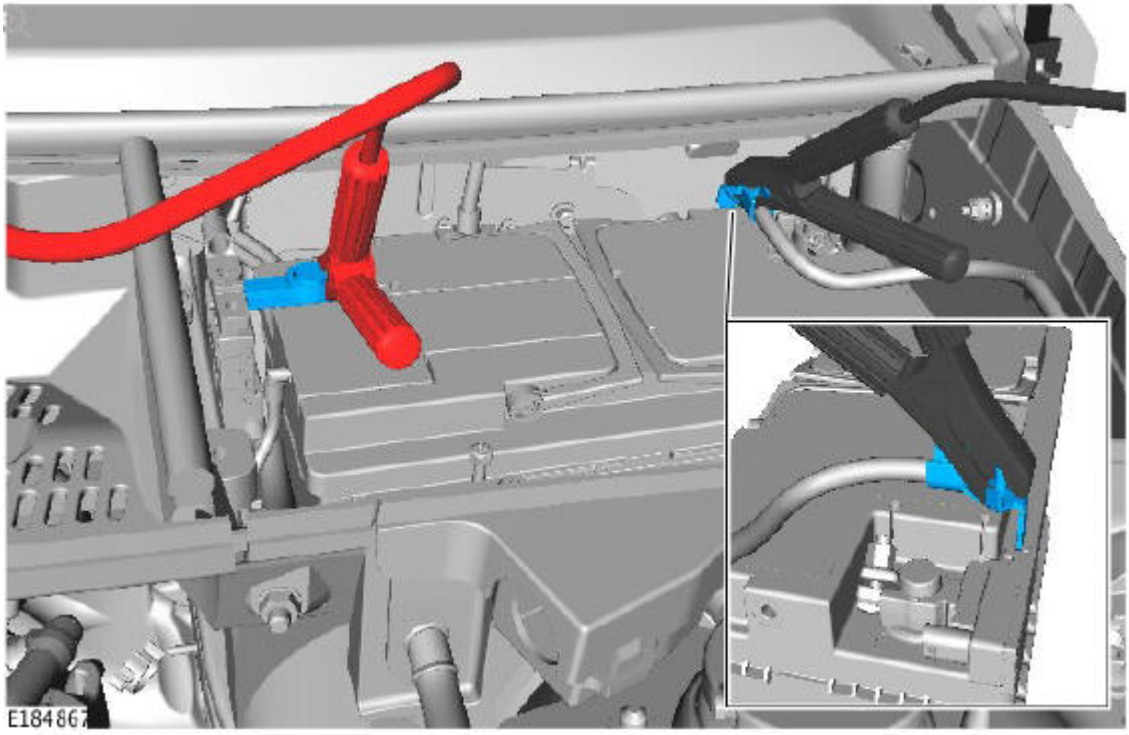
CAUTION:

Do not connect the battery support unit ground cable directly to the battery ground terminal. The battery monitoring system (BMS) must be between the battery support unit ground cable clamp and the battery ground terminal.

NOTES:

This Step contains connection instructions for the following vehicle;

- *LM / L322*



1. Connect the battery support unit positive cable to the primary battery positive terminal.
2. Connect the battery support unit ground cable to the primary battery ground cable, as illustrated.

CAUTION:

<u>The Midtronics CX-Pro 50 can only support one vehicle at a time. It should not be used to support 2 vehicles at the same time.</u>

NOTE:

This Step contains operating instructions for the Midtronics CX-Pro 50 battery support unit.



1. Connect the vehicle link cable to port 1 on the base of the battery support unit.

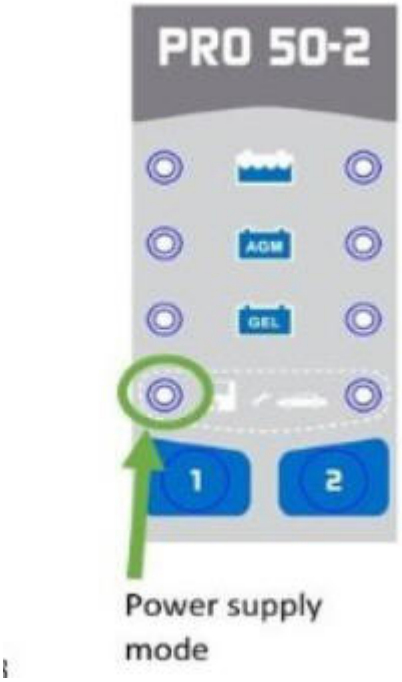
NOTE:

Switch off any auxiliary systems, for example: headlamps, to reduce the electrical load on the battery support unit.

Switch the ignition ON, but do not start the engine.

NOTE:

This Step contains operating instructions for the Midtronics CX-Pro 50 battery support unit.



NOTE:

A green light will confirm the battery support unit is switched ON

Switch ON the battery support unit.

NOTE:

An orange light indicates that power is being supplied to the vehicle.

Use button 1 to select power supply mode.

3. The battery support unit is now ready for a diagnostic session.

CAUTION:

The Traction Showroom Support Unit (SSU2) must not be used during diagnostic sessions. Only the Traction Battery Support Unit (BSU) / (BSU2) can be used.

NOTE:

This Step contains operating instructions for the Traction BSU2-50 / 125 battery support unit.



NOTE:

Switch off any auxiliary systems, for example: headlamps, to reduce the electrical load on the battery support unit.

Switch the ignition ON, but do not start the engine.

NOTE:

Confirm that all 3 lights are illuminated green before starting a diagnostic session.

Switch ON the battery support unit.

The battery support unit is now ready for a diagnostic session.

NOTE:

This Step contains operating instructions for the Fronius ACCTIVA Professional Flash battery support unit.



NOTE:

Switch off any auxiliary systems, for example: headlamps, to reduce the electrical load on the battery support unit.

Switch the ignition ON, but do not start the engine.

NOTE:

The unit will indicate on screen that it is supplying current.

Switch ON the battery support unit and select external power supply mode (FSV / SPLY).

The battery support unit is now ready for a diagnostic session.

NOTE:

This Step contains operating instructions for the Traction MPL-50 battery support unit.



CAUTIONS:

- **<u>The battery support unit must NOT be connected to an power supply at this stage.</u>**
- **<u>Charging mode must not be selected.</u>**

Select battery support mode.

NOTES:

If the orange CHARGE lamp is illuminated for more than a few seconds;

- *disconnect the battery support unit from the power supply*
- *disconnect the cables from the vehicle*
- *make sure the battery support mode is selected*
- *reconnect the cables to the vehicle*
- *reconnect the battery support unit to the power supply and confirm the green READY lamp is illuminated.*

Connect the battery support unit to the power supply, the green READY lamp should now be illuminated

The battery support unit is now ready for a diagnostic session.

CAUTION:

The Midtronics PSC 700S is only to be used in markets with 120V power supply.

NOTE:

This Step contains operating instructions for the Midtronics PSC 700S battery support unit.



1. Connect the battery support unit to the power supply and switch the battery support unit ON.
2. The battery support unit is now ready for a diagnostic session.

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General Information Battery Care Requirements

1. **INTRODUCTION**

This document defines the requirements for care and maintenance of batteries, and the standard of battery care at retailers for new vehicles.

This applies to all types of 12 Volt Lead Acid Batteries used in Jaguar and Land Rover vehicles whether they are conventional flooded technology or Absorbed Glass Mat (AGM - also known as Valve Regulated Lead Acid (VRLA)) technology and also applies to both Primary, Secondary and Auxiliary Batteries. AGM batteries offer improved resistance to cycling as seen in stop start applications.

In order to prevent damage to the battery and ensure a satisfactory service life, all processes detailed within this document must be rigorously adhered to.

It is equally important therefore to note the following key points:

- All new vehicles leave the factory with either a transit relay installed and/or have a transit mode programmed into the vehicle control modules.

  The transit relay must be removed and the transit mode disabled (where applicable) using an approved diagnostic system, NOT MORE THAN 72 HOURS before the customer takes delivery.

The battery can be discharged by the following mechanisms:

- Self Discharge: - A lead acid battery will very slowly discharge itself due to its own internal chemical processes whether it is connected to a vehicle or not.
- Quiescent Discharge: - The vehicle electrical systems when connected to the battery will draw charge from the battery.

12 Volt Lead Acid Batteries rely on internal chemical processes to create a voltage and deliver current. These processes and the internal chemical structure of the battery can be damaged if the battery is allowed to discharge over a number of weeks / months, or is left in a discharged state for a lengthy time period.

- On vehicles with conventional ignition keys, these must not be left in the ignition lock barrel when the transit relay has been removed, otherwise quiescent current will increase and the battery will discharge more rapidly.
- For keyless vehicles, the Smart Key must be stored at least 5m (16 ft) away from the vehicle when the vehicle is parked or stored.
- AGM Batteries are fully sealed and cannot have the electrolyte level topped up.

NOTE:

Retailers involved in the storage / handling of vehicles and replacement batteries have a responsibility to ensure that only a fully charged battery may be processed through the distribution selling chain.

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General Rules for Battery Care

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2. **GENERAL RULES FOR BATTERY CARE**

2.1 RETAILER SHOWROOM/DEMONSTRATION VEHICLES

Vehicles used as retailer demonstrator(s), in a showroom, must be connected to a JLR approved showroom conditioner capable of delivering 50 Amps. This will prevent the battery from being damaged.

Vehicles used as retailer demonstrator(s), in a showroom, must be taken out of transit mode or have the transit relay removed. For additional information on the transit relay installation, refer to the Transit Relay Installation Summary table.

Vehicles used as retailer demonstrator(s), in a showroom, must have the starter motor, horn and wiper fuses removed as a minimum.

For additional information, refer to: Showroom Preparation (101-02 Showroom Preparation, Description and Operation).

WARNING:

Showroom conditioners are only required to be turned on during showroom opening hours, outside these hours switch off all showroom conditioners.

NOTE:

For retailers who do not have floor sockets installed in the showroom a slave battery process has been outlined below. The slave battery process is only a TEMPORARY process until floor sockets are installed into the showroom. The retailer is responsible for making sure the process is set up and is also responsible for the procurement of slave batteries and other supporting equipment. The retailer is also responsible for developing a conformance plan to install floor sockets.

2.1.1 RECOMMENDED SLAVE BATTERY RESPONSIBILITIES/PROCESS

Showroom Representative Responsibilities

1. All vehicles in the retailer showroom that are being used for display purposes MUST be fitted with a slave battery if the JLR approved battery conditioner cannot be installed.
2. All vehicles fitted with a slave battery must be logged and tracked by a nominated showroom representative who has been trained in the Battery Care Requirements process. For additional information, Refer to the following Excellence training courses Battery Care Requirements EDASS00025_0814 and Good Battery Care EDAS400059_1114
3. A list of the vehicle VIN details must be provided to the department where the original vehicle battery will be stored and maintained
4. Make sure the installation of the slave battery is coordinated with the workshop department and installed in a timely manner
5. Check on a daily basis for a low battery warning display on the vehicle information display. If required, contact the workshop department to charge the slave battery.
6. Make sure that the slave battery condition is checked on a weekly basis using the Midtronics EXP-1080. If required, contact the workshop department to charge the slave battery
7. When the display vehicle has been sold, notify the workshop department to install the original battery (in a fully charged state) within 72 hours of vehicle handover to the customer
8. When the display vehicle is being returned to the vehicle storage compound, notify the workshop department to install the original battery (in a fully charged state), refit the transit relay (if required) and put the vehicle into transportation mode
9. Record all battery inspections and battery charging dates and supporting information on the showroom and slave battery report form.

For additional information, refer to: Showroom and Slave Battery Condition Report Form (414-00 Battery and Charging System - General Information, Description and Operation).

WORKSHOP REPRESENTATIVE RESPONSIBILITIES

1. Removal of the original vehicle battery from the vehicle
2. Installation of the slave battery to the display vehicle
3. Clearly label and identify a slave battery
4. Attach the slave battery identification tag JLR-415-010 (Available from the Jaguar Landrover equipment website) onto the vehicle keys identifying that the vehicle is fitted with a slave battery
5. Check, maintain and record the original battery condition information in accordance with the JLR storage procedure and policy.

   For additional information, refer to: Showroom and Slave Battery Condition Report Form (414-00 Battery and Charging System - General Information, Description and Operation).
6. Make sure the slave battery has the same part number as the original battery fitted to the display vehicle.
7. Make sure the TOPIx procedure is followed for the removal and replacement of the original vehicle battery
8. Install the original vehicle battery within 72 hours of vehicle handover to the customer
9. Make sure if the display vehicle is being returned to the vehicle storage compound the original battery is installed (in a fully charged state), refit the transit relay (if required) and put the vehicle into transportation mode
10. Remove the slave battery identification tag JLR-415-010 from the vehicle keys once the original battery has been refitted
11. The original battery should be stored separately and clearly identified with the VIN from the vehicle from which it was removed.

TRANSIT RELAY INSTALLATION SUMMARY

	JAGUAR	LAND ROVER
Vehicles with Transit Relay installed	X152, X250 and X351	L319, up to 16 MY L405 and L494
Vehicles without Transit Relay installed	X760, X260 and X761	L538, L550, from 17 MY L405, L494, L462 and L560

2.2 SOFTWARE REFLASH, SDD WORK OR IGNITION ON RELATED WORKSHOP ACTIVITIES

Due to the high electrical current demand and high depth of discharge that can occur during vehicle software re-flash activities, SDD work or ignition on (power mode 6) related work in the workshop, vehicles that are undergoing such activities MUST have a JLR approved power supply capable of delivering 50 Amps or more. Approved showroom conditioners can be found on the JLR tooling website.

CAUTION:

Do Not carry out any Software downloads with either or both the transit mode on or the transit relay fitted, this could damage vehicle modules.

2.3 EXTENDED VEHICLE REWORK

For any extended vehicle rework that results in consuming vehicle battery power a JLR approved power supply should be connected, refer to : Battery Support Unit connection procedure (414-00 battery and charging system - General information, General procedures).

2.4 JUMP STARTING NEW VEHICLES BEFORE THEY HAVE BEEN DELIVERED TO THE CUSTOMER

- It is the retailers responsibility to make sure the battery is not allowed to discharge by following the instructions and processes defined in this manual.

- However, if circumstances dictate that a new vehicle must be jump started due to a discharged battery whilst the vehicle is in the retailers care, the battery on this vehicle must be replaced with a new one prior to delivery to the customer at the retailers liability.
- The vehicle should also undergo investigation as to why the battery became discharged.
- Do not connect the jump starting cable to the negative (-) terminal of the battery. Always connect to the recommended earth point. As defined in the owners handbook or service documentation for that vehicle.

2.5 AGM BATTERIES

- AGM batteries must not be charged above 14.8 Volts. Doing so will damage them.
- AGM Batteries must be tested with a capable battery tester as detailed in the Equipment section (Section 5) of this procedure.

NOTE:

Under no circumstances should the battery be disconnected with the engine running because under these conditions the generator can give a very high output voltage. This high transient voltage will damage the electronic components in the vehicle. Loose or incomplete battery connections may also cause high transient voltage.

3. **HEALTH AND SAFETY PRECAUIONS**

WARNINGS:

BATTERY CELLS CONTAIN SULPHURIC ACID AND EXPLOSIVE MIXTURES OF HYDROGEN AND OXYGEN GASES. IT IS THEREFORE ESSENTIAL THAT THE FOLLOWING SAFETY PRECAUTIONS ARE OBSERVED.

Batteries emit highly explosive hydrogen at all times, particularly during charging. To prevent any potential form of ignition occurring when working in the vicinity of a battery:

- **Do not smoke when working near batteries.**
- **Avoid sparks, short circuits or other sources of ignition in the battery vicinity.**
- **Switch off current before making or breaking electrical connections.**
- **Ensure battery charging area is well ventilated.**
- **Ensure the charger is switched off when: a) connecting to a battery; b) disconnecting from the battery.**
- **Always disconnect the ground cable from the battery terminal first and reconnect it last.**

Batteries contain poisonous and highly corrosive acid. To prevent personal injury, or damage to clothing or the vehicle, the following working practices should be followed when topping up, checking electrolyte specific gravity, removal, refitting or carrying batteries:

- **Always wear suitable protective clothing (an apron or similar), safety glasses, a face mask and suitable gloves.**
- **If acid is spilled or splashed onto clothing or the body, it must be neutralized immediately and then rinsed with clean water. A solution of baking soda or household ammonia and water may be used as a neutralizer.**
- **In the event of contact with the skin, drench the affected area with water. In the case of contact with the eyes, bathe the affected area with cool clean water for approximately 15 minutes and seek urgent medical attention.**
- **If battery acid is spilled or splashed on any surface of a vehicle, it should be neutralized and rinsed with clean water.**
- **Heat is generated when acid is mixed with water. If it becomes necessary to prepare electrolyte of a desired specific gravity, SLOWLY pour the concentrated acid into water (not water into acid), adding small amounts of acid while stirring. Allow the electrolyte to cool if noticeable**

heat develops. With the exception of lead or lead-lined containers, always use nonmetallic receptacles or funnels. Do not store acid in excessively warm locations or in direct sunlight.

Due to their hazardous contents, the disposal of batteries is strictly controlled. When a battery is scrapped, ensure it is disposed of safely, complying with local environmental regulations. If in doubt, contact your local authority for advice on disposal facilities.

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Battery Care Requirements

4. **BATTERY CARE REQUIREMENTS**

4 . 1 RECEIPT OF A NEW VEHICLE

Within 72 hours of receipt of a new vehicle, a battery condition check must be carried out in accordance with the battery test process utilizing a JLR approved tester as outlined in the Equipment section (Section 5) of this procedure.

NOTES:

- *The Midtronics software can be updated; refer to Administration bulletins to ensure the EXP-1080, GRX-3080 and GR1-3080 are upto- date.*
- *Midtronics WiFi dongles are mandated; refer to special tool release notes titled "Wi-Fi pod upgrade to the EXP-1080 battery tester".*

  Ensure dongles are fitted at all times for the system to work correctly.
- *The Midtronics code from the tester must be recorded on the form.*

Any actions must be carried out in accordance with the table shown in the Determining Battery Condition section (Section 6) of this procedure. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4 . 2 NEW VEHICLE STORAGE

If the vehicle is to be stored, transport mode MUST be programmed into the vehicle with the transit relay fitted as delivered. Certain vehicles do not have a transit relay fitted, these vehicles only need transport mode installed, For additional information, refer to the Transit Relay Installation Summary table for transit relay installation.

Transit relay removal / vehicle placed in normal mode should only be completed a maximum of 72 hours prior to handover to customer For vehicles without either a transit mode or transit relay the battery negative cable must be DISCONNECTED from the battery.

The battery must be tested every 60 days and re-charged if required, in accordance with the battery test process utilizing a JLR approved tester as outlined in the Equipment section (Section 5) of this procedure.

NOTES:

- *Transport mode is required to be set when a transit relay is installed to a vehicle to prevent damage to vehicle electrical modules.*
- *The Midtronics code from the tester must be recorded on the form.*

Any actions must be carried out in accordance with the table shown in the Determining Battery Condition section (Section 6) of this procedure. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4 . 3 PDI / DELIVERY TO CUSTOMER

Before the vehicle is handed over to the customer and as part of the PDI, the condition of the battery needs to be confirmed. The battery condition must be checked in accordance with the battery test process utilizing a JLR approved tester as outlined in the Equipment section (Section 5) of this procedure.

NOTE:

The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the Determining Battery Condition section (Section 6) of this procedure. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4 . 4 REPLACEMENT BATTERIES FOR SERVICE

All service replacement batteries must have the battery condition checked within 72 hours of receipt and controlled on a 'First In First Out' basis to ensure batteries are not allowed to age unnecessarily.

For batteries in storage and not yet fitted to a vehicle, they must be stored in a cool/dry environment, not in direct sunlight or under any direct heat source. Any batteries exhibiting any forms of damage or corrosion must not be fitted to any vehicle. Any batteries which are dropped must be scrapped, this applies even if no external damage is apparent.

The battery must be tested every 60 days and re-charged if required, in accordance with the battery test process utilizing a JLR approved tester as outlined in the Equipment section (Section 5) of this procedure.

Any actions must be carried out in accordance with the table shown in the Determining Battery Condition section (Section 6) of this procedure.The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

4 . 5 BATTERY INSTALLED IN VEHICLE MAINTENANCE

- The battery must be tested every 60 days and re-charged if required, in accordance with the battery test process utilizing a JLR approved tester as outlined in the Equipment section (Section 5) of this procedure
- The battery must always be connected to a battery support unit during any diagnostic sessions, including software updates.

  For additional information, refer to: Battery Support Unit Connection Procedure (414-00 Battery and Charging System - General Information, General Procedures).

4 . 6 BATTERY TEST

Enhancement to the recommended battery test equipment software, has removed the need to physically remove battery surface charge before completing a Battery Test.

The battery may be tested either on a bench or on the vehicle.

NOTE:

Make sure the Ignition is OFF and the vehicle is powered down with the modules entering 'sleep mode' before commencing with the battery test.

Battery Test Types

Flooded Battery Testing

In some markets serviceable flooded Batteries are still in use, to test these correctly check the electrolyte level as outlined in the CONFIRMING ELECTROLYTE LEVEL section 9 in this procedure before any further testing.

These batteries are identified with cell plugs on top of the battery.

All AGM and Flooded Battery Testing

The recommended Battery Tester has three types of Battery Test available for the technician to select:

1. Battery Test - The BATTERY TEST should 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

2. PDI / Storage - The PDI / STORAGE test should 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

3. Battery Storage - 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

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 condition must be checked in accordance with the battery test process utilizing a JLR approved tester as outlined in the Equipment section (Section 5) of this procedure.

NOTE:

The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the Determining Battery Condition section (Section 6) of this procedure. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

CAUTION:

DO NOT connect the tester to any other circuit or chassis point other than the battery negative terminal.

Equipment

5. **EQUIPMENT**

All equipment used must be functionally capable of meeting the compliance requirements. Please refer to the approved equipment document (JLR 000015).

In the case of batteries fitted to a new vehicle at the retailer, battery condition should be measured using the appropriate hand-held Midtronics tester as follows:

BATTERY TYPE	BATTERY TESTER	BATTERY TESTER
	Jaguar	**Land Rover**
AGM & Flooded	Midtronics EXP1080, GRX-3080 & GR8-1180	Midtronics EXP1080, GRX-3080 & GR8-1180

The test results must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

NOTE:

All equipment must be calibrated

6. **DETERMINING BATTERY CONDITION**

TESTER RESULTS	ACTION
GOOD BATTERY	Return to service.
CHARGE AND RE-TEST	Fully charge battery as per the time to charge table on the EPX-1080. Re-test battery. If same result replace battery.
REPLACE BATTERY OR BAD CELL BATTERY	Verify surface charge removed. Disconnect battery from vehicle and re-test. If result repeats after surface charge removal, replace battery. **DO NOT RECHARGE.**
UNABLE TO DO TEST	Disconnect battery from vehicle and re-test.

7. **BATTERY CHARGING**

It is essential that a suitably ventilated defined area exists in each retailer for battery charging.

CAUTION:

It is very important that when charging batteries using the traction charger or other stand-alone chargers that the charger is set for the correct type of battery before charging commences. If the wrong switch is selected the result would be a battery that is not charged fully and / or overheating can occur. Follow the manufacturers operating instructions.

The battery must be tested every 60 days and re-charged if required, in accordance with the battery test process utilizing a JLR approved tester as outlined in the Equipment section (Section 5) of this procedure. It is recommended that retailers always have fully charged batteries ready for use.

CAUTION:

Do not charge AGM batteries with voltages over 14.8 Volts as this will damage the battery.

A designated controlled area must be allocated for scrap batteries and clearly controlled as such.

To bring a discharged but serviceable battery back to a fully charged condition proceed as follows:

- Check and if necessary top-up the battery electrolyte level. (Flooded maintainable batteries only)
- Charge the battery using a JLR approved charger as detailed in the approved equipment document following the manufacturers operating instructions.

NOTE:

When using the Midtronics Diagnostic Charger, automatic mode must always be used. After charging and analysis, the charger may display 'Top-Off Charging', Hit STOP To End. Do not stop charging until the current falls to 5A or less, otherwise the battery will not be fully charged.

Following charging, a post charge battery condition test must be carried out in accordance with the table shown in the Determining Battery Condition section (Section 6) of this procedure.

NOTE:

The Midtronics code from the tester must be recorded on the form.

Any actions must be carried out in accordance with the table shown in the Determining Battery Condition section (Section 6) of this procedure. The details must be recorded on the New Vehicle Storage Form which is part of the new vehicle storage document.

For additional information, refer to: New Vehicle Storage Form (100-11 Vehicle Transportation Aids and Vehicle Storage, Description and Operation).

8. **BATTERY REPLACEMENT**

CAUTION:

AGM and Flooded batteries are NOT interchangeable, only specified batteries must be must. Failure to follow this instruction will result in early battery failure.

If it is determined that a battery requires replacement, always refer to the appropriate section of the workshop manual for instructions on removing and installing the battery from the vehicle.

On in service vehicles fitted with a Battery Monitoring System (BMS), the BMS control module must be reset following the installation of a new battery. The BMS control module reset procedure must be performed using an approved diagnostic system.

9. **CONFIRMING ELECTROLYTE LEVEL**

WARNINGS:

- **BEFORE CHECKING THE ELECTROLYTE LEVEL AND TOPPING-UP THE BATTERY WITH DISTILLED WATER, REFER TO THE HEALTH AND SAFETY PRECAUTIONS SECTION.**
- **AGM TECHNOLOGY BATTERIES ARE FULLY SEALED FOR LIFE AND NO ATTEMPT SHOULD BE MADE TO CHECK OR TOP UP THE ELECTROLYTE LEVEL.**

NOTES:

- In hot climates more frequent checks of the battery electrolyte level and condition are required. If necessary, the battery cells can be topped up using distilled water.
- Only flooded batteries can have the electrolyte level topped up.

On certain flooded battery types the electrolyte level will need to be checked.

1. Make sure the battery is of a type suitable for topping up. These types of batteries will have cell plugs visible on the top face of the battery or a removable access panel to allow access to the cells.

2. On batteries with a clear or opaque case and level marks, check the electrolyte level by visual inspection of the maximum level indicator mark on the battery casing, indicating adequate level above the battery separators.
3. On batteries with black cases, remove the cell plugs or access panel and ensure the electrolyte level is level with the indicator in the cell hole. A flashlight may be required to see the electrolyte level on this type of battery.
4. f the electrolyte level is low, top-up using distilled water only.
5. Refit the battery cell plugs.
6. Charge the battery for 1 hour using a recommended charger, if a GRX- 3080 is used select manual charging for an hour.
7. Carry out a battery test using the recommended test equipment in line with 4.6 Battery Test & 5 Equipment.

NOTE:

Maintenance free and Valve Regulated (AGM) batteries are sealed and therefore cannot be topped up.

CAUTION:

DO NOT overfill.

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Общая информация зарядка система / диагностика и проверка

General Information Charging System / Diagnosis and Testing

PRINCIPLES OF OPERATION

For a detailed description of the Charging System, refer to the relevant Description and Operation section in the workshop manual. REFER to: Generator (414-02A Generator and Regulator - TD4 2.2L Diesel, Description and Operation), Generator (414-02B Generator and Regulator - GTDi 2.0L Petrol/GTDi 2.0L Petrol - SULEV, 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 tested and/or the donor vehicle.

NOTES:

- *If a control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component.*
- *When performing voltage or resistance tests, always use a digital multimeter accurate to three decimal places, and with an up-todate calibration certificate. 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.*

1. Verify the customer concern
2. Visually inspect for obvious signs of damage and system integrity

Visual Inspection

MECHANICAL	ELECTRICAL
▪ Generator ▪ Primary drive belt ▪ Primary drive belt tensioner ▪ Generator pulley	▪ Generator ▪ Battery/battery connections ▪ Starter motor ▪ Harnesses and connectors ▪ Fuses ▪ Starter motor megafuse ▪ Charge warning indicator function ▪ Instrument Cluster (IC) ▪ Engine Control Module (up to 13my) ▪ Gateway Module (14my onwards)

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, verify the symptom and refer to the Symptom Chart, alternatively 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

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Charge warning indicator does not illuminate (ignition on, engine not running)	▪ Instrument cluster fault ▪ Engine Control Module fault (up to 13my) ▪ Gateway Module fault (14my onwards)	▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Instrument Cluster (IC) for related DTCs and refer to the relevant DTC index ▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Engine Control Module (ECM) for related DTCs and refer to the relevant DTC index ▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Gateway Module (GWM) for related DTCs and refer to the relevant DTC index
Charge warning indicator illuminates and the battery discharges (engine running)	▪ Auxiliary drive belt broken ▪ Generator pulley slipping on shaft ▪ Generator fault ▪ Battery cable fault ▪ LIN bus circuit fault ▪ Engine	▪ Check the auxiliary drive belt condition and tension ▪ Check that the pulley does not rotate independently of the generator ▪ Refer to the electrical circuit diagrams and test the generator circuit for short circuit to ground, short circuit to power, open circuit, high resistance ▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Engine Control Module (ECM) for related DTCs and refer to the relevant DTC index ▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Gateway

	Control Module (up to 13my) fault ▪ Gateway Module fault (14my onwards)	Module (GWM) for related DTCs and refer to the relevant DTC index
Charge warning indicator illuminates intermittently (engine running)	▪ Auxiliary drive belt slipping ▪ Generator pulley slipping on shaft ▪ Battery cable fault ▪ Generator wiring fault ▪ Generator fault ▪ LIN bus circuit fault	▪ Check the auxiliary drive belt condition and tension ▪ Check that the pulley does not rotate independently of the generator ▪ Refer to the electrical circuit diagrams and test the generator circuit for short circuit to ground, short circuit to power, open circuit, high resistance ▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Engine Control Module (ECM) for related DTCs and refer to the relevant DTC index ▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Gateway Module (GWM) for related DTCs and refer to the relevant DTC index
Battery discharges without the charge warning indicator staying on	▪ Battery fault ▪ Battery quiescent drain ▪ Intermittent generator fault	▪ Refer to the relevant section of the workshop manual and test the battery ▪ Refer to the relevant section of the workshop manual and test the battery quiescent drain ▪ Using the manufacturer approved diagnostic system, check the Engine Control Module (ECM) for related DTCs and refer to the relevant DTC index ▪ Using the Jaguar Land Rover Approved Diagnostic Equipment, check the Gateway Module (GWM) for related DTCs and refer to the relevant DTC index
Noise (mechanical)	▪ Auxiliary drive belt slipping ▪ Generator fault	▪ Check the auxiliary drive belt condition and tension ▪ Remove the auxiliary drive belt and check that the generator rotates freely

DTC INDEX

For a list of Diagnostic Trouble Codes (DTCs) that could be logged on this vehicle, please refer to Section 100-00. REFER to: Diagnostic Trouble Code Index - DTC: Central Junction Box (CJB) (100-00 General Information, Description and Operation).

General information quiescent drain

VEHICLE QUIESCENT CURRENT TESTING

On vehicles fitted with a Battery Monitoring System (BMS), the diagnostic routine for quiescent drain testing in the approved Jaguar or Land Rover diagnostic system should be utilized.

If a customer complains of a vehicle battery that discharges continuously or when left for a prolonged period of time, it is recommended that a quiescent drain test is performed as described below.

The battery drain should be measured using the approved Jaguar or Land Rover diagnostic system or a Digital Volt Ohm Meter (DVOM). A procedure for quiescent drain measurement using the diagnostic system is available in the Diagnosis and Testing section of the Workshop Manual. The vehicle should be in the locked/armed state (for example vehicle alarm fully armed), all doors, hood and luggage compartment lid/tailgate are open and latched (so as to appear closed from an electrical point of view). The test should take place after the vehicle has entered shutdown mode. The time taken for this to occur after the ignition is switched off varies according to model (Refer to the Topix On line resource for details).

When the vehicle is armed, the effect of the security system Light Emitting Diode (LED) flashing is to cause a pulsation in the measured current drain. In this case, either the average current should be taken (using a DVOM with an averaging system) or the current reading taken, ignoring the brief high current peaks.

EQUIPMENT

Approved Jaguar or Land Rover diagnostic system with current probe OR DVOM with current probe.

METHOD OF MEASUREMENT

Using an Approved Jaguar or Land Rover Diagnostic System.

1. Switch off all electrical loads and ensure that the ignition is off (power mode 0)
2. Connect the current probe to the approved Jaguar or Land Rover diagnostic system
3. Calibrate the probe
4. Install a clamp around the battery lead/junction box lead
5. Go to the Quiescent Current Testing section in this procedure

Using a Digital Volt Ohm Meter (DVOM)

Do not use an in-line DVOM to measure the quiescent drain on vehicles fitted with an electronic throttle (for example Range Rover 2002MY onwards). The current exceeds the maximum amount the fuse in the DVOM is capable of handling.

1. Switch off all electrical loads and ensure that the ignition is off (power mode 0)
2. Connect the current probe to the DVOM
3. Calibrate the probe
4. Install a clamp around the battery lead/junction box lead
5. Go to the Quiescent Current Testing section in this procedure

QUIESCENT CURRENT TESTING

1. Switch ignition to 'on' or select ignition power mode 6 in keyless vehicles and switch to 'off' (power mode 0) (do not crank)
2. Remove key from ignition switch (if equipped)
3. Open and latch all doors, hood and luggage compartment lid or tailgate
4. Lock the vehicle using the remote function on the remote handset or smart key. (Single lock only to avoid volumetric alarm arming)
5. Remove any other potential electrical drains such as accessories plugged into accessory sockets
6. Record the amperage readings after the shutdown period referenced in the Topix on line resource for details. Note: all cars from 10MY onwards should be less than 30mA after 30 minutes (for exceptions see Land Rover Quiescent Drain Values table).
7. Record the final reading on the battery report form.

The preferred method of testing following an excessive current consumption figure is to use a current probe around individual junction box leads to the various suspected circuits to identify a potential cause. This is in preference to the old method of removing fuses for the following reasons:

- The drain may be caused by a control module remaining active and preventing the quiescent drain from reducing to normal levels
- The drain may be caused by a relay winding that is activated. Pulling the fuse can allow this to 'reset' and the drain will be lost and go undiagnosed.

LAND ROVER QUIESCENT DRAIN VALUES

MODEL	SHUT DOWN PERIOD (MINUTES)	TYPICAL VALUES BATTERY DRAIN (MA)
Range Rover (LM) - Up to 2009MY	30	<30
Range Rover (LM) - From 2010MY	20 (after lock/arm condition) [2]	<30
	33 (unlocked)	<30
Range Rover (LG) From 2013MY	<10 (after lock/arm condition) [2]	<20
	<20 (unlocked)	<20
Range Rover Sport (LS) - Up to 2007MY	30	<30
Range Rover Sport (LS) - From 2007MY to 2010MY	30	<30
	33 (unlocked)	<30
Range Rover Sport (LS) - From 2010MY	10 (after lock/arm condition) [2]	<20
	30 (unlocked)	<20
Range Rover Sport (LW) - From 2014MY	10 (after lock/arm condition) [2]	<20
	<20 (unlocked)	<20
Range Rover Evoque (LV) - From 2012MY	20 (after lock and arm condition) [2]	<20
	<20 (unlocked)	<20
Discovery Series 2 (LT)	30	<30
Discovery 3/LR3 (LA) - Up to 2007MY	30	<30
Discovery 3/LR3 (LA) - From 2007MY to 2010MY	30	<30
	33 (unlocked)	<30
Discovery 4/LR4 (LA) - From	<20 (after lock/arm	<20

2010MY	condition) [2]	
	<20 (unlocked)	<20
	<20 (unlocked)	<20
Discovery Sport (LC) - From 2015MY	10 (after lock/arm condition) [2]	<20
	<20 (unlocked)	<20
Freelander (LN) - Up to 2007MY	30	<30
Freelander 2/LR2 (LF) - From 2007MY	35 (single locked or unlocked)	<25
	15 (double locked)	<25
Defender (LD) - 1998MY to 2007MY	30	<25
Defender (LD) - from 2007MY	<30	<30

NOTE:

1. *The total current drain will be higher if certain approved accessories are fitted (for example: tracker, trailer module, etc.)*
2. *Applies to vehicles without Tire Pressure Monitoring System (TPMS). Vehicle shut-down period with TPMS is approximately 15 minutes.*

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Battery Care RequirementsGenerator and Regulator

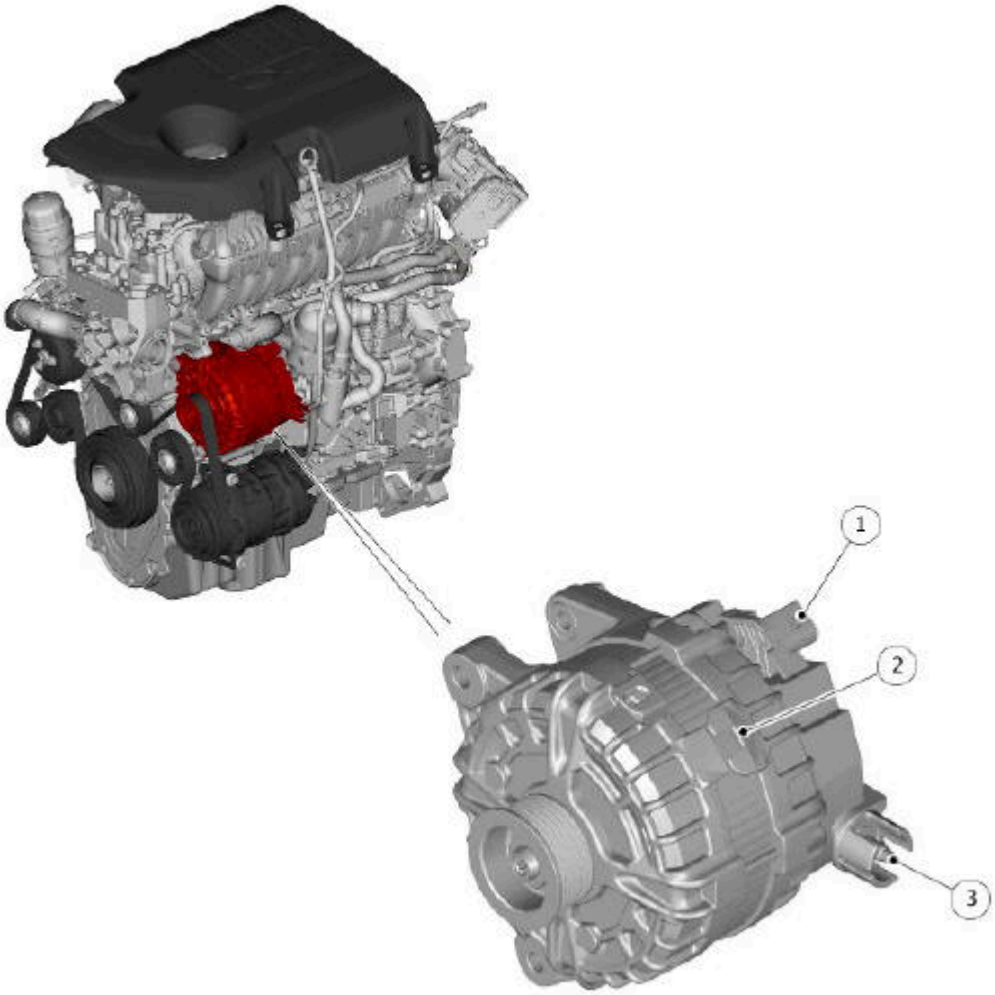
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Generator и регулятор

Generator and Regulator

Generator and regulator - ingenium I4 2.0l diesel description and operation

COMPON ENT LOCATION



1. Local Interconnect Network (LIN) bus connection
2. Generator
3. Battery positive connection

OVERVIEW

A single self-exciting generator is located at the front of the engine on the left side of the cylinder block, and is driven at approximately three times engine speed by the primary drive belt.

When the engine is running the generator produces an Alternating Current (AC), which is converted to a Direct Current (DC) internally by the rectifier pack. The output from the generator is controlled by the voltage regulator (located inside the generator) and then supplied to the battery positive cable through the Battery Junction Box (BJB).

The following variants of generator are fitted, depending of the available features:

- 150A - for all vehicles, without heated windshield and climate seats
- 180A - for vehicles with climate seats
- 230A - for vehicles with heated windshield

DESCRIPTION

GENERATOR AND REGULATOR

The generator comprises the following major components:

- Stator
- Rotor

- Rectifier pack
- Regulator.

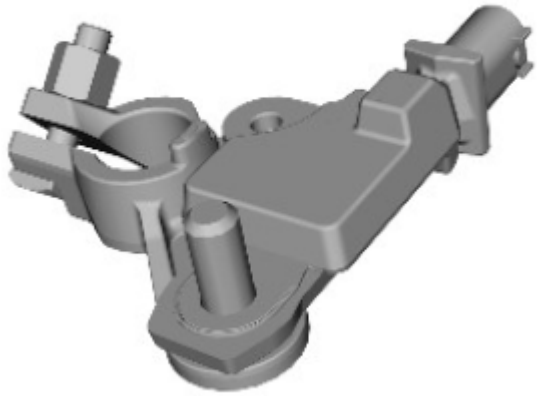
The stator consists of a flat core pack into which the stator wires are pressed.

The rotor comprises a field winding, wound around an iron core and mounted on a shaft. The rotor is housed within the stator and mounted on bearings to provide smooth running and support, due to the side loading applied by the drive belt tension.

The rectifier contains 6 pairs of diodes (six on the positive plate and six on the negative plate) mounted on a heat sink. The heat sink dissipates the resultant heat created in the electrical conversion process. The rectifier converts the AC produced in the stator coils into DC that is required by the vehicle electrical system.

The regulators function is to provide a controlled variable voltage output from the generator by controlling the excitation current in the rotor. Two electrical terminals are provided on the outer casing of the generator. B+ terminal supplies the rectified and regulated DC from the generator via a large diameter cable to the battery positive terminal. The second terminal provides the Local Interconnect Network (LIN) bus connection between the regulator and the Body Control Module/Gateway Module (BCM/GWM) assembly.

BATTERY MONITORING SYSTEM (BMS)



The BMS (Battery Monitoring System) control module is located on the battery negative terminal, and connected to the BCM/GWM assembly via a LIN bus connection. The BMS module contains software maps that provide a mathematical model of battery conditions, and constantly receives information from the BCM/GWM assembly regarding the vehicle state and electrical loading.

The BMS control module monitors various battery parameters, which are directly measured and predictive values:

- Battery current and voltage are the result of direct measurement;
- while State of Charge (SoC), State of Function (SoF) and electrolyte temperature are predicted values.

These signals are used by both the charging system and the stop/start system to ensure the vehicle functions are optimized. The measurement is autonomous and happens in all states to enable an accurate condition of the battery to be assessed at all times. Software based values are calculated and used as a backup in the event of a system fault condition. If any of the measured/predicted values do not meet the necessary thresholds, the stop/start feature will be suspended until the thresholds are met. In the case of a fault condition, the stop/start system will be disabled for the duration of the particular drive cycle. Diagnostic Trouble Code (DTC)'s relating to faults will be stored in the BCM/GWM assembly.

The BMS control module also has a hardwired connection to the battery positive terminal. This connection is used to avoid any potential voltage drop in the circuit which results incorrect information received by the BMS control module. If this connection becomes open, the BCM/GWM assembly detects a communication loss with the BMS control module. Then the BCM/GWM assembly default to a fail-safe fixed charging voltage of 14 Volts, stores a related DTC, and sends a message to the Instrument Cluster (IC) via the MS Medium Speed (MS) Controller Area Network (CAN) comfort systems bus to illuminate the charge warning indicator.

For additional information, refer to: Instrument Cluster (413-01 Instrument Cluster, Description and Operation).

OPERATION

The charging system consists of a generator and regulator assembly and the BCM/GWM assembly. The generator and regulator assembly generates electrical power for the vehicle electrical system and maintains the battery in a charged state. The rate of charge for the battery is controlled by the BCM/GWM assembly.

For additional information, refer to: Battery and Cables (414-01 Battery, Mounting and Cables, Description and Operation).

The regulator is connected via the LIN bus to the BCM/GWM assembly, the BMS control module is also connected via the LIN bus to the BCM/GWM assembly. The BCM/GWM assembly receives information from the BMS regarding battery conditions. The BCM/GWM assembly uses the information from the BMS control module to set the target voltage via the LIN bus then the BCM/GWM assembly sends it via the LIN bus to the generator. The charging voltage range is 12.3V to 14.8V (at the battery).

The LIN bus is also used to communicate a mechanical failure, or fault in the wiring and connections from the generator to the BCM/GWM assembly. A DTC is stored in the GWM and if necessary, the charge warning indicator lamp is illuminated in the IC after a short delay.

During engine starting the charge warning indicator lamp is illuminated in the IC when the ignition is energized, and is extinguished when the engine starts and the BCM/GWM assembly detects a generator output voltage.

SMART REGENERATIVE CHARGING

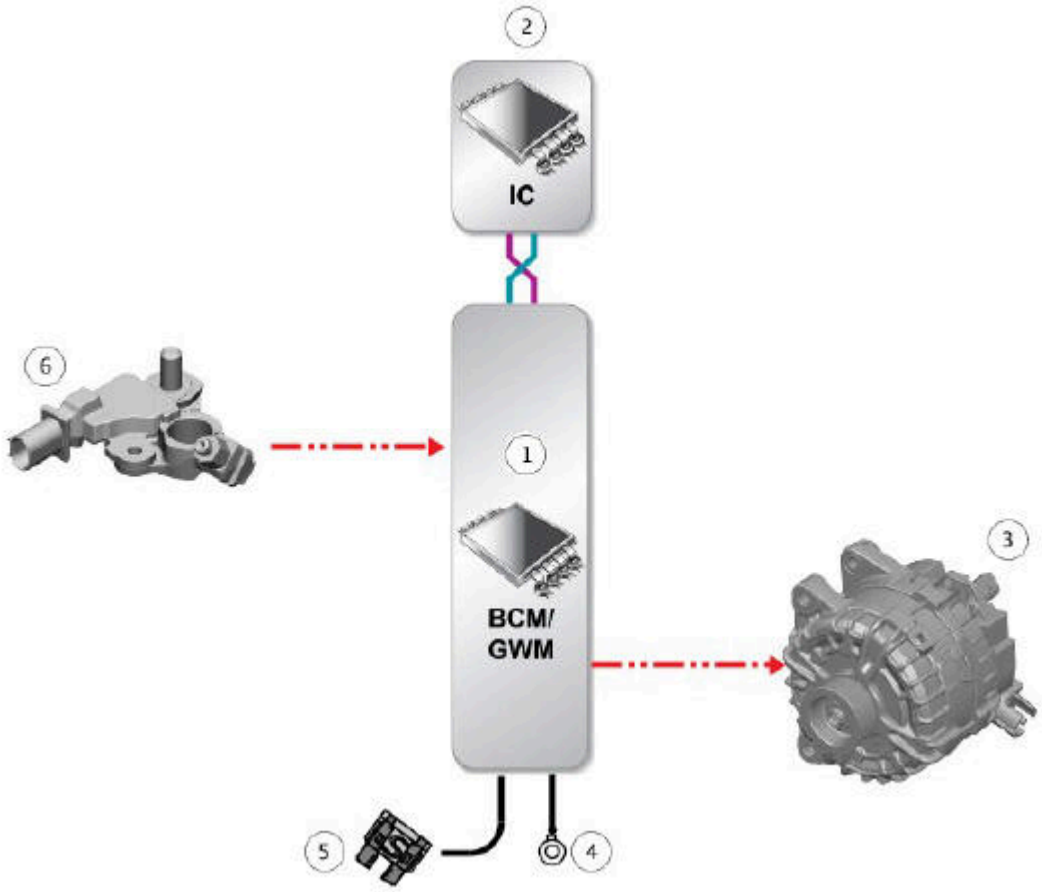
A smart regenerative charging system increases the alternator output when the vehicle brakes or decelerates. This converts the kinetic energy of the vehicle into electric energy without having to use additional fuel.

The smart regenerative feature is allowed to operate within certain environmental constraints to ensure the feature delivers the greatest benefit possible whilst maintaining system integrity.

The 'free' electric energy is captured by charging the battery above the target level. This energy can be used by the electrical systems at a later stage. This could be when the engine is switched off during a stop-phase, but can also be when the generator is operating in a less efficient mode.

The battery state of charge can be corrected both up and down to achieve the most appropriate level to maximize the benefit of the smart regenerative charging feature. If the BCM/GWM assembly decides there is recoverable energy available, then the alternator charge setpoint will be overridden and the extra system voltage will allow the battery to consume a proportion of the recoverable energy. If the battery is at a high state of charge, then some of the additional energy can be used to contribute by means of load reduction when there is a significant torque demand on the engine. By monitoring which loads are active and altering both the ultimate voltage levels and the rate at which they are changed any visible effects of the feature operating are minimized.

INPUT/OUTPUT DIAGRAM



A = HARDWIRED; O = LIN (LOCAL INTERCONNECT NETWORK) BUS; AP = MS (MEDIUM SPEED) CAN (CONTROLLER AREA NETWORK) COMFORT SYSTEMS BUS.

1. Body Control Module / Gateway Module (BCM/GWM) assembly
2. Instrument Cluster (IC)
3. Generator
4. Ground
5. Fuse
6. Battery Monitoring System (BMS) control module

Generator and regulator - ingenium I4 2.0l diesel specifications

Torque Specifications

ITEM	NM	LB-FT	LB-IN
Battery positive cable to generator retaining nut	12	9	
Accessory drive belt idler pulley retaining bolt	47	35	-
Generator retaining bolts	47	35	-
Charge air cooler mounting bracket nuts	10	7	86
Charge air cooler mounting bracket bolts	47	35	-

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