

Battery and Charging System - General Information - Battery Care Requirements

Description and Operation

1. INTRODUCTION

This document sets out the requirements for care and maintenance of batteries and thereby the standard of battery care at dealers and 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 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 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: Dealers and 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.

2. GENERAL RULES FOR BATTERY CARE

2.1 Dealer Demonstration Vehicles

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

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 related work in the workshop, vehicles that are undergoing such activities MUST have a power supply capable of delivering 50 Amps or more.

2.3 Extended Vehicle Rework

For any extended vehicle rework that results in consuming vehicle power, either the battery should be disconnected or a suitable power supply connected.

2.4 Jump Starting New vehicles before they have been delivered to the customer

- It is the dealer / retailers responsibility to make sure the battery is not allowed to go flat 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 flat battery whilst the vehicle is in the dealer / retailers care, **the battery on this vehicle must be replaced with a new one** prior to delivery to the customer at the dealer / retailers liability.
- The vehicle should also undergo investigation as to why the battery went flat.
- 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 alternator 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 PRECAUTIONS

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 non-metallic 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.

4. BATTERY CARE REQUIREMENTS

4.1 RECEIPT OF A NEW VEHICLE

Within 24 hours of receipt of a new vehicle, a battery condition check must be carried out in accordance with the battery test process utilizing an appropriate tester as outlined in **the equipment section (Section 5) of this procedure.**

NOTE: The midtronics code 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, Description and Operation).

4.2 NEW VEHICLE STORAGE

If the vehicle is to be stored the transit relays MUST be refitted and / or the vehicle put into transport mode.

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 and/or re-charged every 30 days and MUST be re-charged after every 90 day period.

NOTE: The midtronics code 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, 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 an appropriate tester as outlined in **the equipment section (Section 5) of this procedure**.

NOTE: The midtronics code 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, Description and Operation).

4.4 REPLACEMENT BATTERIES FOR SERVICE

All service replacement batteries must have the battery condition checked within 24 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 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 condition must be checked every 30 days in accordance with the battery test process utilizing an appropriate 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, Description and Operation).

4.5 BATTERY MAINTENANCE

Any battery whether it is in a vehicle or a replacement part must be tested and/or re-charged every 30 days and MUST be re-charged after every 90 day period.

4.6 BATTERY TEST PROCESS

It is recommended that this test is conducted at least 24 hours after the vehicle engine has been run or the battery

charged to avoid the need of surface charge removal. If time constraints make this unacceptable then the surface charge must be removed.

Surface Charge Removal

A vehicle which has had its battery charged or been driven in a 24 hour period before the test, must have its surface charge removed.

- Turn on the ignition but do not start the vehicle
- Switch on the headlamps on high beam for a minimum 3 minutes
- Switch off the headlamps
- Wait a minimum of 5 minutes before recording test results for any battery measurements

Battery Test

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

The battery condition must be checked in accordance with the battery test process utilizing an appropriate tester as outlined in **the equipment section (Section 5) of this procedure**.

NOTE: The midtronics code 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, Description and Operation).



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

5. EQUIPMENT

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

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

Battery Type	Battery Tester	Battery Tester
	Jaguar	Land Rover
Flooded	Midtronics MCR 394 & 494 Midtronics EXP1080 & GR1/GRX	Midtronics MCR 393 & 493 Midtronics EXP1080 & GR1/GRX
AGM	Midtronics EXP1080, GR1/GRX	Midtronics EXP1080, GR1/GRX

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, Description and Operation).

NOTE: All equipment must be calibrated

6 DETERMINING BATTERY CONDITION

TESTER RESULTS	ACTION
GOOD BATTERY	Return to service.
GOOD RE-CHARGE	Fully charge battery and return to service.
CHARGE AND RE-TEST	Fully charge battery. Remove surface charge. 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 dealership / 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.

Batteries **MUST BE** tested and if necessary charged every 30 days and charged after 90 days irrespective of any test. It is recommended that dealers / 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 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 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, Description and Operation).

8 BATTERY REPLACEMENT

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 module must be reset following the installation of a new battery. The BMS module reset procedure must be performed using an approved diagnostic system.

9 CONFIRMING ELECTROLYTE LEVEL

WARNINGS:



BEFORE CHECKING AND TOPPING-UP THE BATTERY ELECTROLYTE, 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.

On certain types of battery the electrolyte level may need to be checked.

- 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.
- 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.
- 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.
- If the electrolyte level is low, top-up using distilled water.

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



CAUTION: DO NOT overfill.

Battery and Charging System - General Information - Quiescent Drain

Description and Operation

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 Multi-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, engine and luggage compartment lids 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 Digital Multi-Meter (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** Digital Multi-Meter (DVOM) with current probe.

METHOD OF MEASUREMENT

Using an Approved Jaguar or Land Rover Diagnostic System.

- Switch off all electrical loads and ensure that the ignition is off
- Connect the current probe to the approved Jaguar or Land Rover diagnostic system
- Calibrate the probe
- Install a clamp around the battery lead/junction box lead
- Go to the Quiescent Current Testing section in this procedure

Using a digital multimeter

Do not use an in-line DVOM to measure the quiescent drain on vehicles fitted with an electronic throttle (for example XK 2006 onwards). The current exceeds the maximum amount the fuse in the DVOM is capable of handling.

- Switch off all electrical loads and ensure that the ignition is off
- Connect the current probe to the digital multimeter
- Calibrate the probe
- Install a clamp around the battery lead/junction box lead
- Go to the Quiescent Current Testing section in this procedure

QUIESCENT CURRENT TESTING

- Switch ignition to 'on' or select ignition mode in keyless vehicles and switch to 'off' (do not crank)
- Remove key from ignition switch (if equipped)
- Open and latch all doors, hood and luggage compartment lid
- Lock the vehicle using the remote function on the remote handset. (Single lock only to avoid volumetric alarm arming)
- Remove any other potential electrical drains such as accessories plugged into accessory sockets
- Record the amperage readings after the shutdown period referenced in the Topix on line resource for details. Note all cars from 10MY onwards and XK from 07MY and XF from 08MY should be less than 30mA after 30 minutes
- 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 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 un-diagnosed

QUIESCENT DRAIN - TYPICAL VALUES

NOTE: The quiescent drain after the initial shutdown period should not exceed the value shown in the table.

Jaguar Quiescent Drain Values

MODEL	SHUT DOWN PERIOD (minutes)	TYPICAL VALUES BATTERY DRAIN (mA)
XJS 3.2	60	<30
Sovereign 3.2	60	<37.3
XJ6 4.0	60	<38.6
XJS	60	<43.9
XJ6 (X300) (1995MY)	60	<43
XJ8 (X300)	60	<30
XK8 (X100)	60	<30
S-Type (X200)	60	<30
X-Type (X400)	30	<30
XJ6 (X350)	40	<30
XJ8 (X350)	40	<30
XK (X150) - From 2006MY	<20 (after lock/arm condition) ²	<30
	33 (unlocked)	<30
XF (X250) - From 2008MY	<20 (after lock/arm condition) ²	<30
	33 (unlocked)	<30
XF (X250) - From 2013MY	<10 (after lock/arm condition) ²	<25
XF SportBrake (X250) - From 2013MY	<10 (after lock/arm condition) ²	<25
	<20 (unlocked)	<25
XJ (X351) - From 2010MY - 2012MY	10 (afterlock/arm condition) ²	<20
	30 (unlocked)	<20
XJ (X351) - From 2013MY	10 (afterlock/arm condition) ²	<20
	<20 (unlocked)	<20
F - Type (X152) - From 2013MY	10 (afterlock/arm condition) ²	<20
	<20 (unlocked)	<20

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.

Battery and Charging System - General Information - Charging System

Diagnosis and Testing

Principle of Operation

For a detailed description of the charging system, refer to the relevant Description and Operation section in the workshop manual. REFER to:

- Battery and Cables (414-01 Battery, Mounting and Cables, Description and Operation),
- Generator (414-02 Generator and Regulator, Description and Operation).

Inspection and Verification

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

NOTE: Check the vehicle battery condition and state of charge before condemning any of the charging system components. For additional information, refer to the battery care manual.

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> ● Generator ● Drive belt ● Drive belt tensioner ● Generator pulley ● Check the security of the generator fixings 	<ul style="list-style-type: none"> ● Generator ● Battery ● Fuse 5 Rear Junction Box (RJB) ● Engine/generator ground connection <ul style="list-style-type: none"> ● Circuit(s) ● Electrical connector(s) ● Engine Control Module (ECM)

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.

Symptom Chart

Symptom	Possible Cause	Action
Battery Not Charging warning displayed on message center	<ul style="list-style-type: none"> ● Fuse 5 RJB ● Front End Accessory Drive (FEAD) belt tension ● Generator fault <ul style="list-style-type: none"> ● ECM ● Instrument cluster fault ● Controller Area Network (CAN) fault 	<p>Check Fuse 5 RJB. Check the battery condition and state of charge. Refer to the battery care manual. Check the FEAD belt tension.</p> <p>REFER to: Accessory Drive (303-05 Accessory Drive, Diagnosis and Testing).</p> <p>Check ECM and instrument cluster for DTCs and refer to relevant DTC Index.</p> <p>REFER to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 5.0L Petrol, Diagnosis and Testing) / Instrument Cluster (413-01 Instrument Cluster, Diagnosis and Testing) / Communications Network (418-00 Module Communications Network, Diagnosis and Testing).</p>
Battery keeps discharging, no warning message displayed on message center	<ul style="list-style-type: none"> ● No ignition power from CJB ● Battery quiescent drain <ul style="list-style-type: none"> ● Battery fault ● FEAD belt tension ● Generator pulley fault ● Generator failure 	<p>For ignition power circuit tests. GO to Pinpoint Test B. Check the quiescent drain. Check the battery condition and state of charge, refer to the battery care manual.</p> <p>REFER to: Battery Charging (414-00 Battery and Charging System - General Information, General Procedures). Check the FEAD belt tension.</p> <p>REFER to: Accessory Drive (303-05 Accessory Drive, Diagnosis and Testing).</p> <p>Check RJB for DTCs B2A9016, B2A9116, Note: if battery requires replacing and these DTCs were logged, complete and return the battery report form listing the DTCs, see battery care manual.</p> <p>Check ECM for DTCs and refer to relevant DTC Index.</p> <p>REFER to: Electronic Engine Controls (303-14B Electronic Engine Controls - V8 5.0L Petrol, Diagnosis and Testing).</p> <p>Check the generator pulley does not turn independently of the generator</p>

Generator noisy	<ul style="list-style-type: none"> ● FEAD belt tension <ul style="list-style-type: none"> ● FEAD belt ● FEAD belt tensioner ● FEAD belt idler pulleys ● Generator failure 	For noisy generator tests. GO to Pinpoint Test <u>C.</u>
Radio interference	<ul style="list-style-type: none"> ● Generator ● Wiring harness 	For radio interference tests. GO to Pinpoint Test <u>D.</u>

DTC Index



CAUTION: When probing connectors to take measurements in the course of the pinpoint tests, use the adaptor kit, part number 3548-1358-00.

NOTE: If the control module or a component is suspect and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual (section B1.2), or determine if any prior approval programme is in operation, prior to the installation of a new module/component.

NOTE: 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 extra information read by the manufacturer-approved diagnostic system).

NOTE: When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

NOTE: 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.

DTC	Description	Possible Cause	Action
P163200	Generator faults sensor/circuit	<ul style="list-style-type: none"> ● Charging system fault 	GO to Pinpoint Test <u>A.</u>
B2A9016	Battery low	<ul style="list-style-type: none"> ● Circuit voltage below threshold 	Check battery is in fully charged and serviceable condition (if battery requires replacing and this DTC is logged, complete and return battery report form listing this DTC), refer to the battery care manual
B2A9116	Battery discharged	<ul style="list-style-type: none"> ● Circuit voltage below threshold 	Check battery is in fully charged and serviceable condition (if battery requires replacing and this DTC is logged, complete and return battery report form listing this DTC), refer to the battery care manual

Pinpoint Tests

PINPOINT TEST A : P163200 CHARGING SYSTEM FAULT	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: CHECK THE BATTERY VOLTAGE WITH THE ENGINE RUNNING	
	1 Connect a suitable voltmeter across the battery terminals.
	2 Start the engine and allow to idle with no electrical loads applied.
	3 Measure the maximum voltage achieved at the battery after start.
	Is the voltage greater than 13 volts?
	Yes GO to <u>A2.</u>
	No INSTALL a fully charged battery. GO to <u>A5.</u>
A2: CHECK THE GENERATOR 'S' TERMINAL FOR BATTERY VOLTAGE	
	1 Set ignition status to OFF.
	2 DISCONNECT generator electrical connector PI048.
	3 MEASURE the voltage at generator electrical connector PI048 pin 3.
	Is the voltage greater than 10 volts?
	Yes GO to <u>A5.</u>
	No GO to <u>A3.</u>

A3: CHECK FUSE 5 IN REAR JUNCTION BOX (RJB)	
	<p>1 Check fuse 5 in the RJB.</p> <p>Is the fuse OK?</p> <p>Yes REPAIR the circuit between the generator electrical connector PI048 pin 3 and fuse 5 in the RJB. CLEAR the DTC, test the system for normal operation.</p> <p>No GO to A4.</p>
A4: CHECK THE GENERATOR 'S' TERMINAL FOR SHORT TO GROUND	
	<p>1 MEASURE the resistance between generator electrical connector PI048 pin 3 and ground.</p> <p>Is the resistance less than 10,000 ohms?</p> <p>Yes REPAIR the circuit between the generator electrical connector PI048 pin 3 and fuse 5 of the RJB. INSTALL a new fuse, CLEAR the DTC, test the system for normal operation.</p> <p>No INSTALL a new fuse, CLEAR the DTC, test the system for normal operation.</p>
A5: CHECK FOR BATTERY VOLTAGE AT THE GENERATOR 'L' TERMINAL	
	<p>1 Set ignition status to OFF.</p> <p>2 Disconnect generator electrical connector PI048.</p> <p>3 Set ignition status to ON.</p> <p>4 Measure the voltage at generator electrical connector PI048 pin 1.</p> <p>Is the voltage greater than 10 volts?</p> <p>Yes INSTALL a new generator. REFER to: Generator - Vehicles Without: Supercharger (414-02 Generator and Regulator, Removal and Installation). CLEAR the DTC, test the system for normal operation.</p> <p>No GO to A6.</p>
A6: CHECK THE GENERATOR 'L' LINE FOR SHORT TO GROUND	
	<p>1 Set ignition status to OFF.</p> <p>2 Disconnect battery.</p> <p>3 MEASURE the resistance between the generator electrical connector PI048 pin 1 and ground.</p> <p>Is the resistance less than 1,000 ohms?</p> <p>Yes REPAIR the circuit between the generator electrical connector PI048 pin 1 and the Engine Control Module (ECM). CLEAR the DTC, test the system for normal operation.</p> <p>No GO to A7.</p>
A7: CHECK THE GENERATOR 'L' LINE FOR SHORT TO POWER	
	<p>1 MEASURE the resistance between the generator electrical connector PI048 pin 1 and battery positive.</p> <p>Is the resistance less than 10,000 ohms?</p> <p>Yes REPAIR the circuit between the generator electrical connector PI048 pin 1 and the Engine Control Module (ECM). CLEAR the DTC, test the system for normal operation.</p> <p>No GO to A8.</p>
A8: CHECK THE GENERATOR 'L' LINE FOR OPEN CIRCUIT	
	<p>1 Disconnect the ECM electrical connector PI300.</p> <p>2 MEASURE the resistance between the generator electrical connector PI048 pin 1 and ECM electrical connector PI300 pin 16.</p> <p>Is the resistance less than 5 ohms?</p> <p>Yes Install a new generator. REFER to: Generator - Vehicles Without: Supercharger (414-02 Generator and Regulator, Removal and Installation). CLEAR the DTC, test the system for normal operation.</p> <p>No REPAIR the circuit between the generator electrical connector PI048 pin 1 and the ECM electrical connector PI300 pin 16. CLEAR the DTC, test the system for normal operation.</p>

PINPOINT TEST B : IGNITION POWER CIRCUIT TESTS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
B1: CHECK FOR IGNITION POWER AT GENERATOR	
	<p>1 Set ignition status to OFF.</p> <p>2 Disconnect generator electrical connector PI048.</p>

	3	Set ignition status to ON.
	4	Measure the voltage at generator electrical connector PI048 pin 2.
		Is the voltage greater than 10 volts?
	Yes	Check for quiescent current fault, check battery condition. Refer to the Battery Care Manual.
	No	GO to B2.
B2: CHECK THE IGNITION POWER CIRCUIT FOR SHORT TO GROUND		
	1	Set the ignition status to OFF.
	2	Disconnect the battery.
	3	Check the resistance between generator electrical connector PI048 pin 2 and GROUND.
		Is the resistance less than 400 ohms?
	Yes	REPAIR the circuit between the generator electrical connector PI048 pin 2 and the CJB. CLEAR the DTC, test the system for normal operation.
	No	GO to B3.
B3: CHECK THE IGNITION POWER CIRCUIT FOR SHORT TO POWER		
	1	Check the resistance between generator electrical connector PI048 pin 2 and battery positive.
		Is the resistance less than 10,000 ohms?
	Yes	REPAIR the circuit between the generator electrical connector PI048 pin 2 and the CJB. CLEAR the DTC, test the system for normal operation.
	No	GO to B4.
B4: CHECK THE IGNITION POWER CIRCUIT FOR OPEN CIRCUIT		
	1	Disconnect CJB electrical connector FL048.
	2	Check the resistance between CJB electrical connector FL048 pin 12 and generator electrical connector PI048 pin 2.
		Is the resistance greater than 5 ohms?
	Yes	REPAIR the circuit between CJB electrical connector FL048 pin 12 and generator electrical connector PI048 pin 2. CLEAR the DTC, test the system for normal operation.
	No	GO to B5.
B5: CHECK CJB IGNITION POWER OUTPUT DRIVE		
	1	Connect the battery.
	2	Set ignition status to ON.
	3	Check the voltage at CJB electrical connector FL048, component side, pin 12.
		Is the voltage greater than 10 volts?
	Yes	Check no other modules connected to this circuit are pulling to GROUND. Clear the DTC, test the system for normal operation.
	No	Install a new generator. REFER to: Generator - Vehicles Without: Supercharger (414-02 Generator and Regulator, Removal and Installation).

PINPOINT TEST C : GENERATOR NOISY	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
C1: CHECK THE GENERATOR FOR SECURITY	
	1 Inspect the generator fixings.
	Is the generator secure?
	Yes GO to C2.
	No SECURE the generator. TEST the system for normal operation.
C2: CHECK THE FEAD BELT	
	1 Remove and inspect the FEAD belt. REFER to: Accessory Drive Belt - Vehicles Without: Supercharger (303-05 Accessory Drive, Removal and Installation).
	Is the FEAD belt in good condition?
	Yes GO to C3.
	No INSTALL a new FEAD belt. TEST the system for normal operation.
C3: CHECK THE FEAD BELT TENSIONER	

	<p>1 Remove and inspect the FEAD belt tensioner. REFER to: Accessory Drive Belt Tensioner - Vehicles Without: Supercharger (303-05 Accessory Drive, Removal and Installation).</p>
	<p>Is the FEAD belt tensioner in good condition? Yes GO to C4. No INSTALL a new FEAD belt tensioner. TEST the system for normal operation.</p>
C4: CHECK THE GENERATOR FOR MECHANICAL NOISE	
	<p>1 Rotate the generator pulley by hand.</p>
	<p>Does the generator rotor shaft rotate smoothly and quietly? Yes GO to C5. No INSTALL a new generator. REFER to: Generator - Vehicles Without: Supercharger (414-02 Generator and Regulator, Removal and Installation). TEST the system for normal operation.</p>
C5: CHECK THE FEAD BELT IDLER PULLEYS	
	<p>1 Rotate the FEAD belt idler pulleys by hand.</p>
	<p>Do the FEAD belt idler pulleys rotate smoothly and quietly? Yes GO to C6. No INSTALL new FEAD belt idler pulleys as necessary. REFER to: Accessory Drive Belt Idler Pulley - Vehicles Without: Supercharger (303-05 Accessory Drive, Removal and Installation). TEST the system for normal operation.</p>
C6: CHECK THE GENERATOR FOR ELECTRICAL NOISE	
	<p>1 Install the FEAD belt pulleys and belt.</p>
	<p>2 Start and run the engine at 1500 rpm. Apply a high electrical load to the battery.</p>
	<p>Is the noise only heard with the high electrical load applied? Yes GO to C7. No CHECK the air conditioning compressor. REFER to: Air Conditioning (A/C) Compressor - Vehicles Without: Supercharger (412-03 Air Conditioning, Removal and Installation). CHECK the power steering pump. REFER to: Power Steering Pump - Vehicles Without: Supercharger (211-02 Power Steering, Removal and Installation). TEST the system for normal operation.</p>
C7: ELIMINATE THE GENERATOR AS THE CAUSE OF ELECTRICAL NOISE	
	<p>1 Disconnect generator electrical connector PI048.</p>
	<p>2 Start and run the engine at 1500 rpm.</p>
	<p>Is the noise still present? Yes CHECK the air conditioning compressor. REFER to: Air Conditioning (A/C) Compressor - Vehicles Without: Supercharger (412-03 Air Conditioning, Removal and Installation). CHECK the power steering pump. REFER to: Power Steering Pump - Vehicles Without: Supercharger (211-02 Power Steering, Removal and Installation). TEST the system for normal operation. No INSTALL a new generator. REFER to: Generator - Vehicles Without: Supercharger (414-02 Generator and Regulator, Removal and Installation). TEST the system for normal operation.</p>

PINPOINT TEST D : RADIO INTERFERENCE	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
D1: CHECK IF THE GENERATOR IS THE CAUSE OF THE RADIO INTERFERENCE	
	<p>1 Start and run the engine at 1500 rpm.</p>
	<p>2 Turn the radio to the ON position, and select the affected station.</p>
	<p>Is the radio interference present? Yes GO to D3. No</p>

GO to D2.

D2: CHECK IF THE GENERATOR IS THE CAUSE OF THE RADIO INTERFERENCE WITH A HIGH ELECTRICAL LOAD APPLIED TO THE BATTERY

1	Start and run the engine at 1500 rpm.
2	Apply a high electrical load to the battery.
3	Turn the radio to the ON position, and select the affected station.
Is the radio interference present?	
Yes GO to D3. GO to D3.	
No DIAGNOSE the entertainment system. REFER to: Audio System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).	

D3: ELIMINATE THE GENERATOR AS THE CAUSE OF RADIO INTERFERENCE

1	Disconnect generator electrical connector PI048.
2	Start and run the engine at 1500 rpm.
3	Turn the radio to the ON position, and select the affected station.
Is the radio interference present?	
Yes DIAGNOSE the entertainment system. REFER to: Audio System (415-00 Information and Entertainment System - General Information, Diagnosis and Testing).	
No CLEAN and tighten all mounting points, positive and negative cable connections (including the hood, luggage compartment lid and engine GROUND straps). INSTALL fuse 5 to the RJB. TEST the system for normal operation. If interference is still present, INSTALL a new generator. REFER to: Generator - Vehicles Without: Supercharger (414-02 Generator and Regulator, Removal and Installation).	

Battery and Charging System - General Information - Battery Charging

General Procedures

1. Before charging a discharged battery inspect and repair the following conditions, if necessary:
 - Loose accessory drive belt.
 - Pinched or grounded wiring harness to the generator or voltage regulator.
 - Loose wiring harness connections at the generator or voltage regulator.
 - Loose or corroded connections at battery, headlamp panel junction wire or engine ground.
 - Carry out generator charging checks.
 - Excessive battery quiescent drain due to:
 1. engine compartment, load space, glove compartment and courtesy lamps remaining on (switch damaged or out of adjustment, glove compartment left open).

Battery Charging - Maintenance-Free Batteries

WARNINGS:



KEEP BATTERIES OUT OF REACH OF CHILDREN. BATTERIES CONTAIN SULPHURIC ACID, AVOID CONTACT WITH SKIN, EYES OR CLOTHING. SHIELD YOUR EYES WHEN WORKING NEAR THE BATTERY TO PROTECT AGAINST POSSIBLE SPLASHING OF THE ACID SOLUTION. IN CASE OF ACID CONTACT WITH SKIN OR EYES, FLUSH IMMEDIATELY WITH WATER FOR A MINIMUM OF 15 MINUTES AND SEEK PROMPT MEDICAL ATTENTION. IF ACID IS SWALLOWED, CALL A PHYSICIAN IMMEDIATELY. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.



BATTERIES NORMALLY PRODUCE EXPLOSIVE GASES WHICH CAN CAUSE PERSONAL INJURY, THEREFORE DO NOT ALLOW FLAMES, SPARKS, OR LIGHTED SUBSTANCES TO COME NEAR THE BATTERY. WHEN CHARGING OR WORKING NEAR A BATTERY ALWAYS SHIELD YOUR FACE AND PROTECT YOUR EYES. ALWAYS PROVIDE ADEQUATE VENTILATION. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.

1. Cold batteries will not readily accept a charge. Therefore, batteries should be allowed to warm up approximately to 15 degrees centigrade (59 degrees Fahrenheit) before charging. This may require 12 hours at room temperature depending on the initial temperature and battery size.
2. A battery which has been completely discharged may be slow to accept a charge initially, and in some cases may not accept a charge at the normal charger setting. When batteries are in this condition, charging can be started by use of the 'dead battery' switch which is fitted to certain types of battery chargers. Follow the manufacturer's instructions when carrying out this procedure.
3. To determine whether a battery is accepting a charge, follow the manufacturer's instructions for the charger.
4. After releasing dead battery switch and with the charger still operating, measure battery voltage. If the voltage is 12 volts or higher, the battery may be accepting a charge and may be capable of being recharged. If the temperature of the battery is below 15 degrees centigrade (59 degrees Fahrenheit) the battery may require charging for up to two hours before the charge rate is high enough to show on the charger ammeter. It has been found that all un-damaged batteries can be charged by this procedure. If a battery cannot be charged by this procedure, it should be replaced.
5. A rapid recharge procedure has been developed for recharging batteries that have passed the 'No-Load Test' and only need a recharge. This can be due to non start battery failures or battery discharged in vehicle due to key-off loads.
6. The battery can be rapidly recharged by using either of the following methods:
 1. Perform a two hour charge using a constant current of 20 amps (manual setting on the charger).
 2. Perform a two hour charge using a constant voltage

(automatic setting on the charger).

Quiescent Current Measurement

1. NOTE: The following quiescent current measurement does not apply to vehicles with the Tracker system installed. If the vehicle is installed with the tracker system the quiescent current may be up to 14 milliamps higher. If non-jaguar approved accessories are installed the following measurements may not apply.

Disconnect the battery ground cable.

For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2. Check the vehicle off-load battery voltage. If below 12.5 volts, install a fully charged slave battery for the tests and recharge the vehicle battery.
3. Connect a 'shorting' link lead between the negative battery terminal and the negative battery lead, before connecting a suitable ammeter to the battery (with the negative test lead clip to the negative battery terminal, and the positive test lead clip to the battery negative lead).
4. NOTE: Make sure that all electrical accessories are switched off.

Operate the key fob unlock button to disarm the vehicle security system.

- Select ignition mode (without starting the engine) for around 10 seconds.
 - Deselect ignition mode, close doors, hood & luggage compartment lid latch.
 - Lock vehicle.
 - After 15 minutes on vehicles with TPMS installed or 4 minutes on vehicles without TPMS installed, remove shorting link & note ammeter reading.
 - The quiescent current should be less than 35mA.
 - Replace Shorting link.
 - Unlock the vehicle.
 - Superlock the vehicle.
 - After 15 minutes, on vehicles with TPMS installed, or 4 minutes, on vehicles without TPMS installed, remove shorting link & note ammeter reading.
 - The quiescent current should be less than 35mA.
5. NOTE: In the unlocked state, the vehicle will take 30mins to shut down to its min quiescent current.

If intermittent wake-ups are suspected, monitor battery current continuously

6. Disconnect the ammeter. Reconnect the battery ground cable. For additional information, refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

Battery, Mounting and Cables -

Battery Specification

WARNINGS:



Batteries produce explosive gases which may cause personal injury. Do not expose the battery to a naked flame. When charging or working near a battery wear protective clothing and eye protectors. Always provide adequate ventilation. Failure to follow these instructions may result in personal injury.



Batteries contain sulphuric acid, avoid contact with skin, eyes and clothing. Shield your eyes when working near the battery to protect against possible contact of the acid solution. In case of contact with the skin or eyes, flush immediately for a minimum of 15 minutes and seek prompt medical attention. If swallowed call a physician immediately. Failure to follow these instructions may result in personal injury.



CAUTION: Make sure all electrical systems are off before connecting the battery ground cable. Failure to follow these instructions may result in damage to the electrical system.

Engine Specification	Battery	
	Battery type	Battery Information
		Specification
All	Varta T8	90 Ah

Battery Cold Cranking Specification

Item	Specification
90 Ah Battery Cold Cranking	800 Amps

Battery Disconnect/Connect Procedures



WARNING: The backup power supply energy must be depleted before any supplementary restraint system repairs are carried out. To deplete the backup supply energy, first disconnect the battery ground cable, then disconnect the battery positive cable and wait ten minutes to avoid accidental deployment and personal injury. Failure to follow this instruction may result in personal injury.



CAUTION: Disconnecting the battery cables will cause all of the electronic control modules to lose all stored data/fault codes.

NOTE: Following reconnecting of the battery, the engine should be allowed to idle as the stored idle and drive values contained within the engine control module (ECM) will have been lost. This may cause driveability concern if the following procedure is not carried out.

Battery disconnect procedure	Battery connect procedure
1. If possible, apply parking brake or alternatively, chock wheels.	1. Connect the battery cables and tighten to 5 Nm. Ground cable must be connected last
2. If required, record any customer audio and climate control settings. This also applies to all electronic control module stored information.	2. Install the battery cover and close the luggage compartment lid.
3. Switch off ignition.	3. Start the engine and allow to idle until the engine reaches normal operating temperature.
4. Open the luggage compartment lid.	4. Switch the engine off.
5. Release the cover and disconnect the battery ground cable.	5. Restart the engine and allow to idle for approximately two minutes (this will allow the ECM to learn the idle values).
6. If required, disconnect the battery positive cable.	6. Apply and hold the brake pedal, select drive and allow the engine to idle for a further two minutes.
	7. Drive the vehicle for approximately five miles/eight kilometers of varied driving to enable the ECM to complete it's learning strategy.
	8. Reset the audio unit and climate control assembly to original customer settings.
	9. Reset the door window motors. For additional information, refer to: Door Window Motor Initialization (501-11 Glass, Frames and Mechanisms, General Procedures).

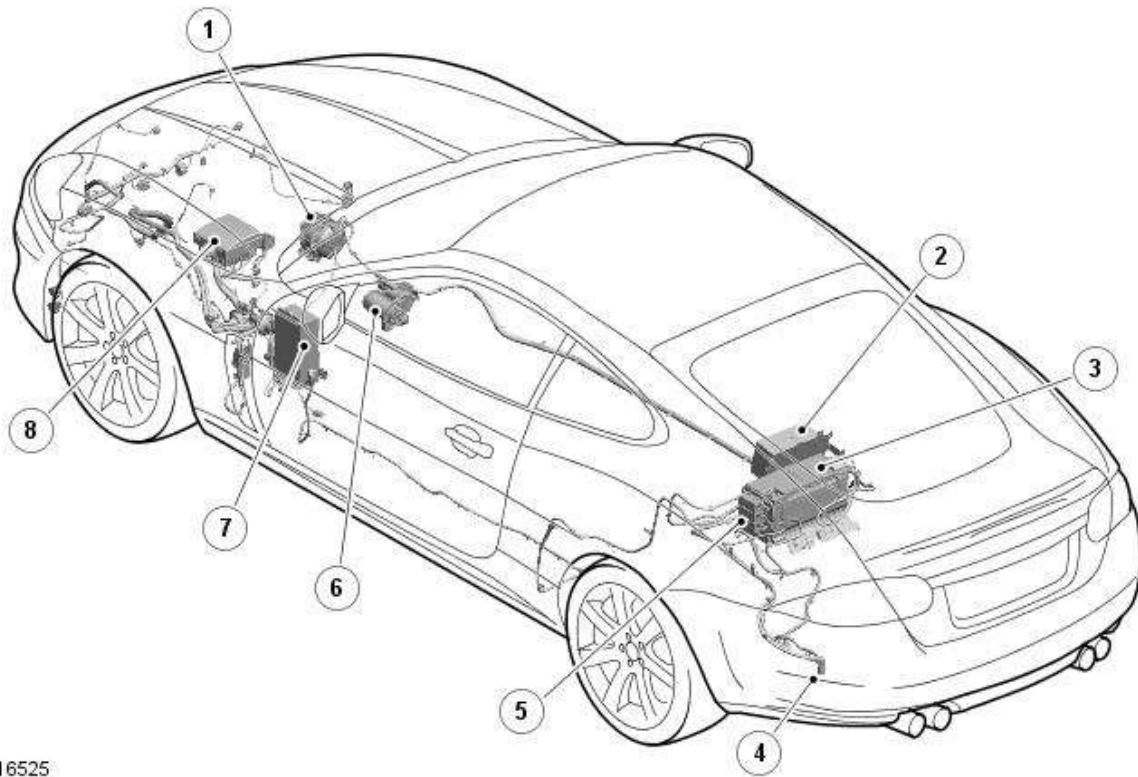
Torque Specifications

Description	Nm	lb-ft	lb-in
Battery positive cable terminal retaining nut	5	4	-
Battery negative cable terminal retaining nut	5	4	-
Battery clamp nuts	9	7	-

Battery, Mounting and Cables - Battery and Cables

Description and Operation

COMPONENT LOCATION



E116525

Item	Part Number	Description
1	-	Generator
2	-	AJB (auxiliary junction box)
3	-	Battery
4	-	Remote jump start terminal
5	-	BJB (battery junction box)
6	-	Starter motor
7	-	CJB (central junction box)
8	-	Power distribution box

INTRODUCTION

Electrical power from the battery and generator is distributed throughout the vehicle through a series of junction boxes.

IGNITION MODES

The vehicle has a possible four ignition modes. The modes and systems that are active in each mode are detailed in the following table:

Ignition Mode			
Off	Accessory (Convenience)	On	Crank
Exterior lamps headlamps – Dip only approach lamps	Memory functions seat, column etc	Exterior lamps fog lamps directional Indicators	Stability controls
Interior lighting	Manual adjust seat column etc.	Convertible hood	Heated/Cooled seat
Preheat - timed in	Interior lighting	Wash/Wipe	Adaptive speed control

Electric park brake - On	Brake lights	HVAC	Adaptive damping
Instrument cluster - stand by, clock, odometer	Exterior lighting auto headlamps, reversing lamps, side lamps, tail lamps	EMS	TPMS
Hazard warning lamps	Auto infotainment previous condition (preset volume), radio standby, phone standby, steering wheel switches	Instrument cluster – dials and warnings fuel gauge temperature gauge lamp check	Pedestrian Protection system
Locking and unlocking	Instrument cluster –message center, trip computer	Windows	Gearshift control and TCM
Security	Horn	EPB – power to disengage (foot on break)	EPB – power to disengage
-	Cigar lighter/power socket	Restraints check	-

BATTERY



E116526

The battery is located behind a cover at the front of the luggage compartment. The cover is held in place by four retainers. The battery sits in a tray and is secured with a clamp plate and two nuts.

The positive and negative battery cables are fitted with service loops. The service loops add extra length to the cables and allow the battery to be slid rearward in the luggage compartment without disconnection.

Remote Jump Start Terminal

The positive battery cable is also connected to a remote jump start terminal. The remote jump start terminal is located in the LH (left-hand) rear corner of the luggage compartment and can be accessed by removing the air vent trim. Although also fitted to coupe vehicles, the terminal has been specifically designed to allow a convertible vehicle to be jump started if a drained battery is experienced when the top is in the stowed condition.

The starter motor power lead is also connected to the remote jump start terminal and is insulated from the battery jump start cable and the vehicle body by a nylon washer.

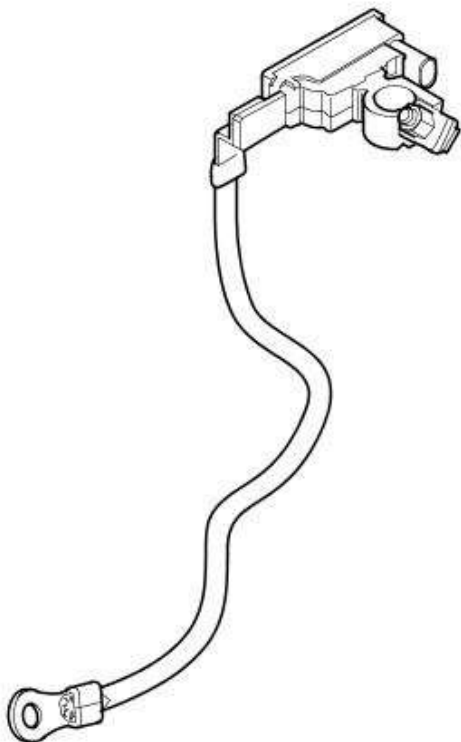
The negative jump start connection is a stud located in the spare wheel well. For more information on jump start procedure, refer to the Owner's Handbook.

Transit Relay

The vehicle is also fitted with a transit relay. This is a disposable device and not for use by the customer. This relay is fitted in series with the battery and ground. It disconnects the battery from the vehicles ground and thus eliminates quiescent

current drain during delivery. The relay must be removed before delivery to the customer. For more information, refer to the PDI (pre-delivery inspection) manual.

Battery Monitoring System



E98130

The battery monitoring system module measures battery current and voltage, which it communicates to the CJB (central junction box) over a LIN (local interconnect network) bus connection. The CJB transmits the battery information to the instrument cluster over the medium speed CAN (controller area network) bus. The instrument cluster acts as a gateway between the medium and high speed CAN bus networks, and transmits the battery condition information to the ECM (engine control module) over the high speed CAN bus. Based on the information received from the battery monitoring system module, the ECM will control the output from the generator and request the switching off of electrical loads if necessary. For additional information, refer to: [Generator](#) (414-02 Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Description and Operation).



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

The battery monitoring system module is able to generate DTC (diagnostic trouble code)'s to help diagnose battery or generator power supply issues. These DTC's can be read using the Jaguar approved diagnostic system. The Jaguar approved diagnostic system can also be used to implement a battery and generator self test routine. For additional information, refer to: [Battery](#) (414-01, Diagnosis and Testing).

If a fault is detected, the ECM will override the battery monitoring system module.

The battery monitoring system module DTC's can be used to help diagnose battery or generator power supply faults. The DTC's are stored in both the CJB and the ECM. The Jaguar 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 battery monitoring system and generator LIN bus controlled functions to provide current flow information and will detect if the battery monitoring system or generator are functioning correctly.

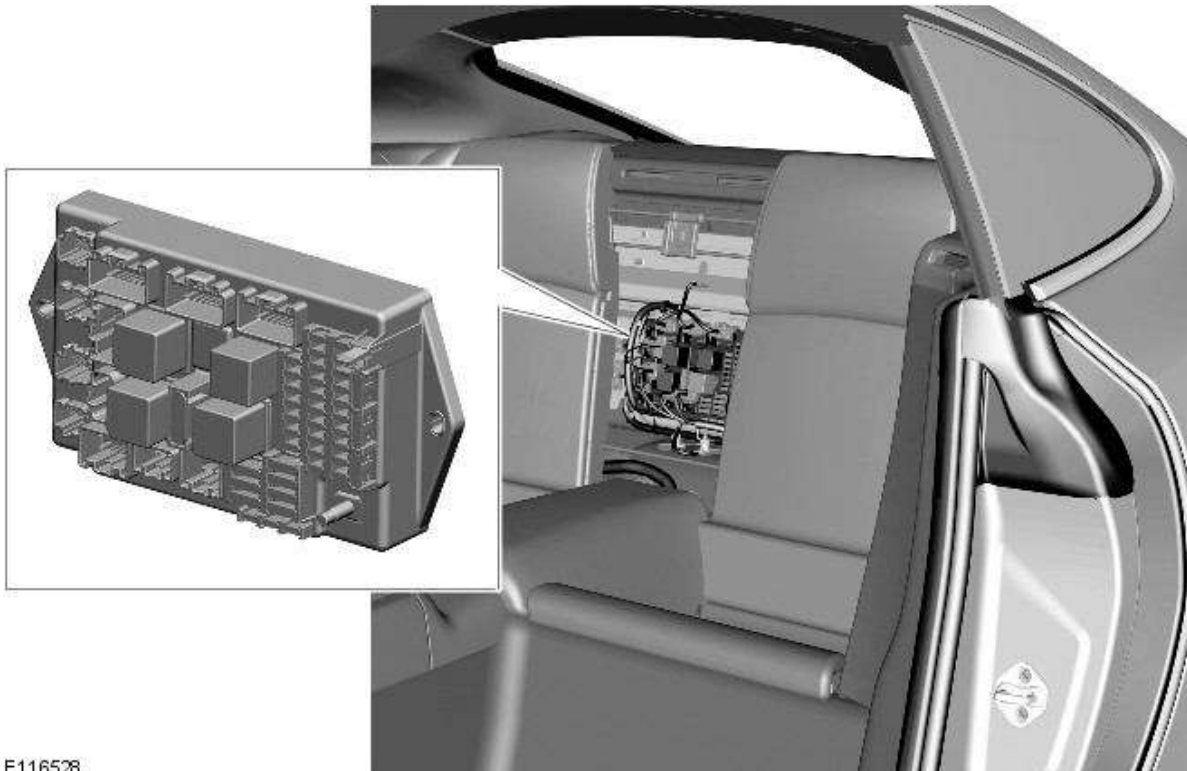
BATTERY JUNCTION BOX



E116527

Mounted on the LH side of the battery is the BJB (battery junction box). The BJB contains three megafuses delivering battery power to: the starter motor (400 A); the AJB (auxiliary junction box) (175 A) and the CJB (175 A). For more information, refer to the Electrical Guide.

AUXILIARY JUNCTION BOX

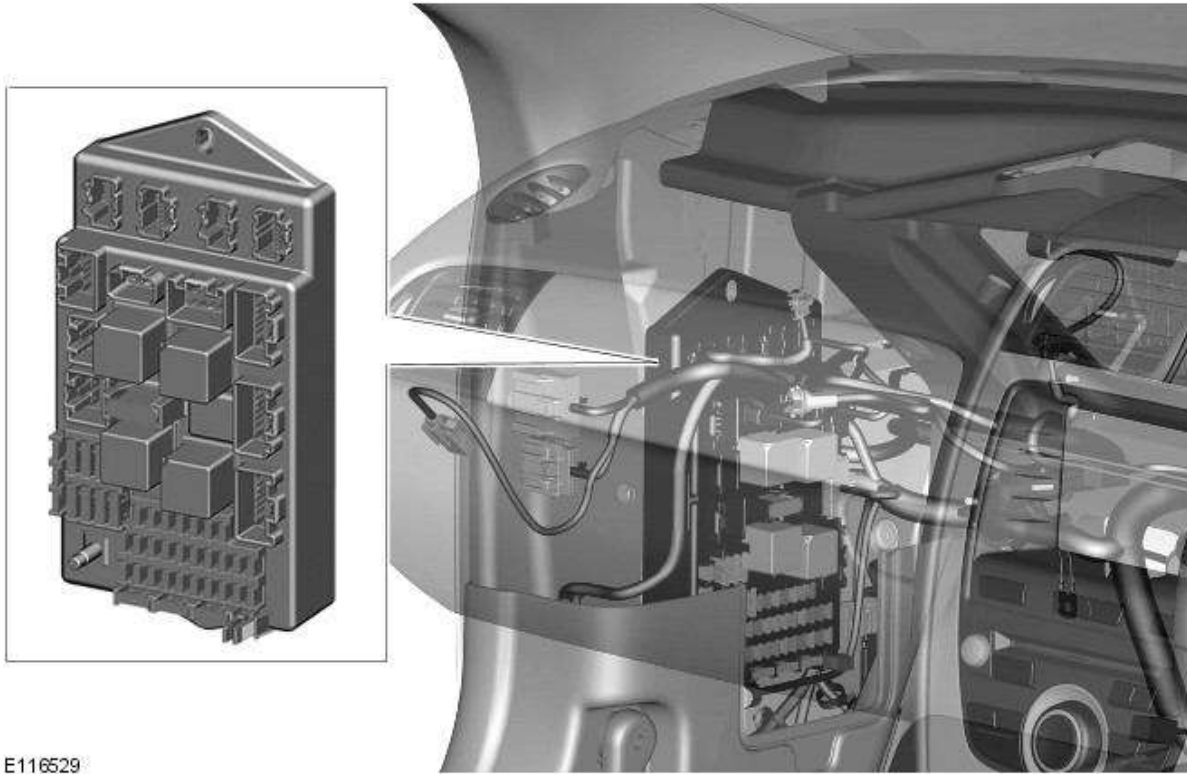


E116528

The AJB is mounted on the passenger compartment rear bulkhead and secured by two nuts/studs. The junction box can be accessed by opening the center panel of the rear seat back. The center panel is secured in position by a single stud at the top, and hinged at the bottom.

The auxiliary junction box receives electrical power from the BJB via a 175 A megafuse. For more information on the circuits and systems served by the auxiliary junction box, refer to the Electrical Guide.

CENTRAL JUNCTION BOX



E116529

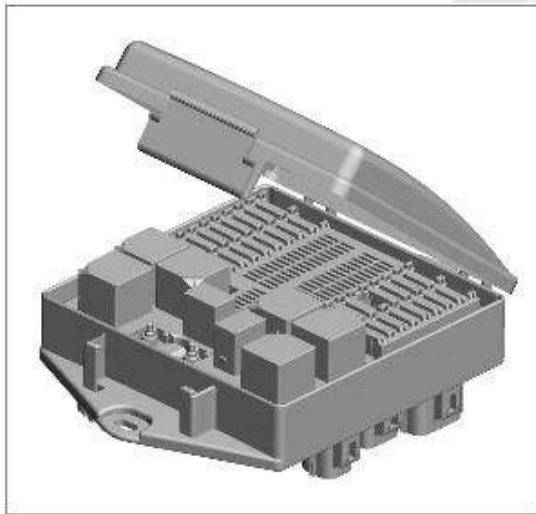
The CJB is mounted at the base of the LH A pillar and secured by two nuts/studs. Access to the CJB can be gained through a removable panel located below the LH side of the instrument panel.

The CJB receives electrical power from the BJB via a 175 A megafuse. A second power supply lead 'daisy chains' off the CJB, providing electrical power to the power distribution box. For more information on the circuits and systems served by the CJB, refer to the Electrical Guide.

The CJB also controls the functionality of a number of vehicle systems. These include:

- Electric steering column lock.
For additional information, refer to: [Steering Column](#) (211-04 Steering Column, Description and Operation).
- Instrument cluster and panel illumination.
For additional information, refer to: [Instrument Cluster and Panel Illumination](#) (413-00 Instrument Cluster and Panel Illumination, Description and Operation).
- Exterior lighting systems.
For additional information, refer to: [Exterior Lighting](#) (417-01, Description and Operation).
- Interior lighting systems. For additional information, refer to: [Interior Lighting](#) (417-02 Interior Lighting, Description and Operation).
- Active anti-theft alarm system.
For additional information, refer to: [Anti-Theft - Active](#) (419-01A Anti-Theft - Active, Description and Operation).
- Passive anti-theft alarm system.
For additional information, refer to: [Anti-Theft - Passive](#) (419-01B Anti-Theft - Passive, Description and Operation).
- Electric seats.
For additional information, refer to: [Seats](#) (501-10 Seating, Description and Operation).
- Electric windows. For additional information, refer to: [Glass, Frames and Mechanisms](#) (501-11 Glass, Frames and Mechanisms, Description and Operation).
- Wipers and washers. For additional information, refer to: [Wipers and Washers](#) (501-16 Wipers and Washers, Description and Operation).

POWER DISTRIBUTION BOX



E116530

The power distribution box is located in the LH rear of the engine compartment, beneath a closing panel. The power distribution box is supplied electrical power from the BJB, via the CJB. For more information on the circuits and systems served by the power distribution box, refer to the Electrical Guide.

Battery, Mounting and Cables - Battery

Diagnosis and Testing

Principles of Operation

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

[Battery and Cables](#) (Description and Operation),
[Battery and Cables](#) (Description and Operation),
[Battery 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.

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

Visual Inspection

Mechanical	Electrical
<ul style="list-style-type: none"> ● Generator ● Drive belt ● Drive belt tensioner ● Generator pulley ● Check the security of the generator fixings 	<ul style="list-style-type: none"> ● Generator ● Battery ● Battery connections ● Starter motor ● Harnesses and connectors <ul style="list-style-type: none"> ● Fuses ● Charge warning lamp function ● Engine Control Module (ECM)

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.

DTC Index

NOTE: Generic scan tools may not read the codes listed, or may read only five digit codes. Match the five digits from the scan tool to the first five digits of the seven digit code listed to identify the fault (the last two digits give additional information read by the manufacturer-approved diagnostic system).

NOTE: When performing electrical voltage or resistance tests, always use a digital multimeter (DMM) accurate to three decimal places, and with an up-to-date calibration certificate. When testing resistance, always take the resistance of the DMM leads into account.

NOTE: Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

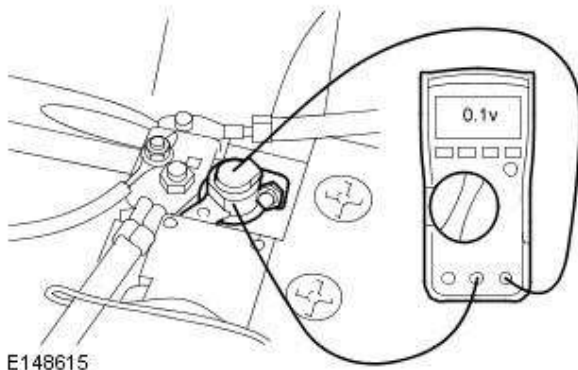
NOTE: If DTCs are recorded and, after performing the pinpoint tests, a fault is not present, an intermittent concern may be the cause. Always check for loose connections and corroded terminals.

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

Midtronics EXP-1080 User Guide

Carry out the following: -

PINPOINT TEST A : VOLTAGE DROP	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
A1: GROUND CIRCUIT	
NOTE: This test checks for high resistance between the battery terminal and the battery clamp	



E148615

- 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 below (do not disconnect the battery at this stage)

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

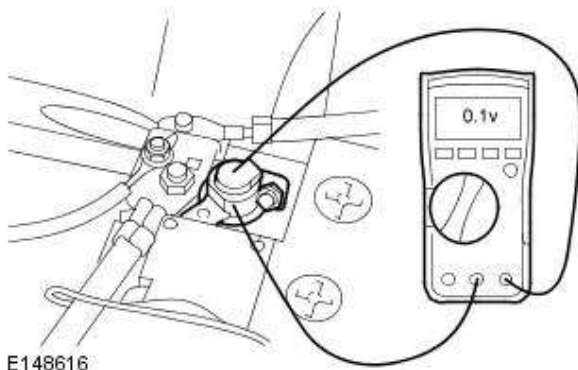
Is reading equal to or below 0.1 volts?

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

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



E148616

- 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 below (do not disconnect the battery at this stage)

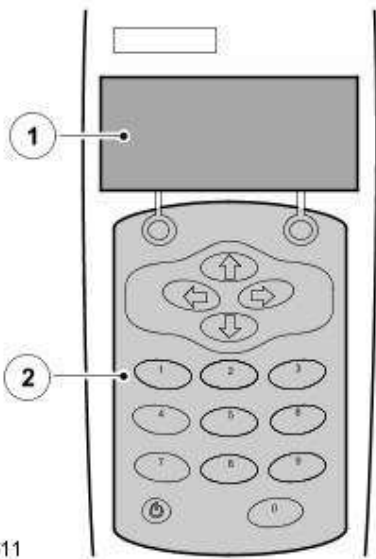
3 Set the multimeter to read DC voltage and record the reading

Is reading equal to or below 0.1 volts?

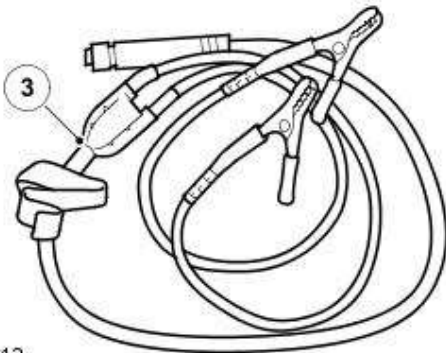
Yes
Carry out midtronics battery test procedure

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.

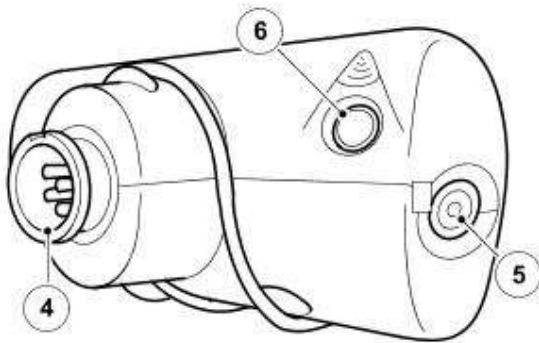
Reference	Description
1	LCD screen with main menu
2	Control panel (key board and power button)
3	Positive and negative fly leads
4	Fly leads connection
5	Temperature sensor
6	Infra-red sensor (data transfer for printer)
7	Amp hour
8	Battery rating (CCA)
9	Rating units
10	Battery type



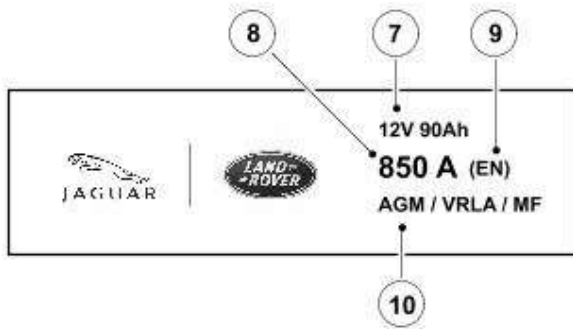
E148611



E148612



E148613



E148614

The following steps must be carried out to ensure correct operation of the EXP-1080 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 is suitable for testing flooded and absorbed glass mat (AGM) type batteries

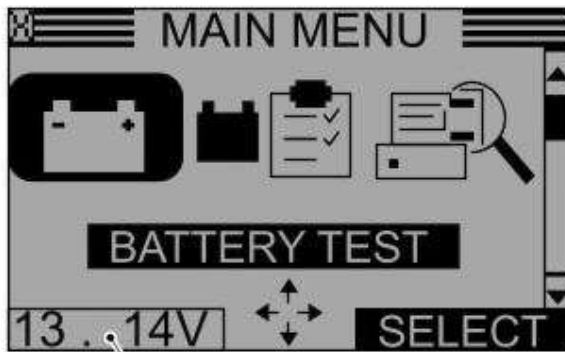
Typical Values

Amp Hour	CCA (Cold Cranking Amps)	Rating Units
12	200	EN
70	760	SAE
80	700	SAE
80	800	SAE
90	800	SAE
95	850	SAE
90	950	SAE
105	950	SAE

Midtronics Battery Test Procedure

This midtronics battery test procedure will confirm the serviceability of the battery

- 1. Connect the fly-lead to the midtronics EXP-1080
- 2. Connect the fly-leads to the battery terminals
- **Black lead to negative terminal**
- **Red lead to positive terminal**
- Confirm the connections are secure
- 3. The EXP-1080 will power on automatically when connected to a battery, screen below is displayed



E148617

11

NOTE: MAIN MENU SCREEN

- 4. **Main Menu.** Select **Battery test** and press **SELECT**



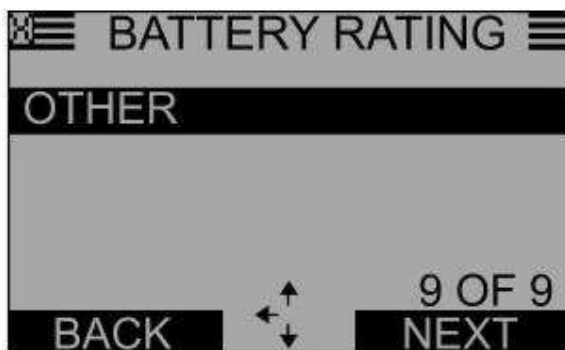
E148618

NOTE: BATTERY LOCATION

- 5. **Battery Location.** Select either, **Out of vehicle** or **In Vehicle** as appropriate
- Select **Next**



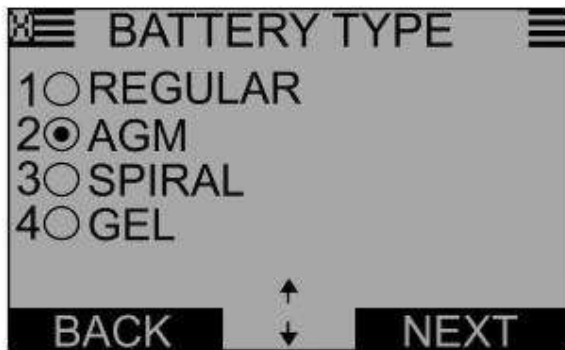
E148619



E148620

NOTE: BATTERY RATING

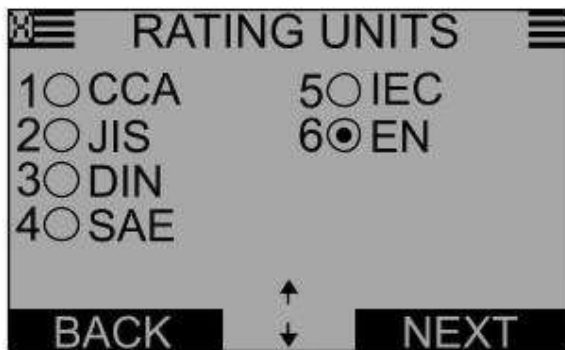
- 6. **BATTERY RATING**. Select the correct battery rating from the pre-installed list, **(Goto step 10)**. **Or**,
- To manually enter the correct battery type, specification and CCA rate. Scroll using the arrow keys on the midtronics panel and select **Other** from the menu
- Select **Next**



E148621

NOTE: BATTERY TYPE

- 7. **Battery Type.** Select the correct battery type (**Regular** or **AGM**)
- NOTE: All **AGM** batteries are marked (Refer to battery label)
- Select **Next**



E148622

NOTE: RATING UNITS

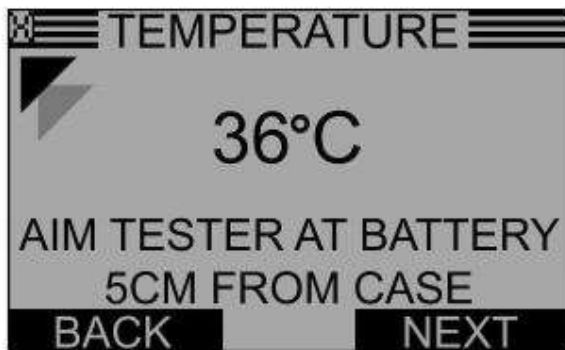
- 8. **Rating Units.** Select the correct rating units. Refer to the battery label for correct specification. Options **EN**, **DIN**, **SAE**
- Select **Next**



E148623

NOTE: BATTERY RATING

- 9. **BATTERY RATING**. Scroll using the arrow keys on the midtronics panel, select the correct **CCA** rating (For CCA refer to battery label)
- Select **Next**

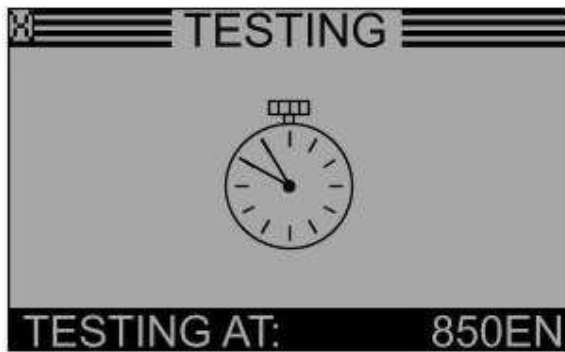


E148624

NOTE: TEMPERATURE

NOTE: Ensure that the temperature sensor does not touch any part of the battery or vehicle, this will cause damage not be covered under the midtronics warranty and will require the unit to be returned to a service center

- 10. **Temperature**. Aim the temperature sensor towards the battery casing (Maintain distance of 5cm)
- Select **Next**



E148625

NOTE: TESTING

- 11. **Testing.** The screen displays clock hand's rotating, the EXP-1080 will automatically advance when test has completed

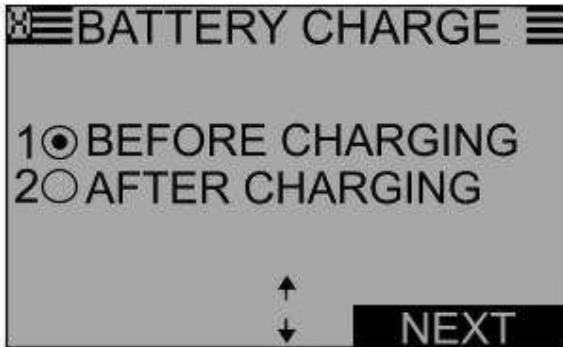


E148626

NOTE: SURFACE CHARGE

NOTE: If there is no surface charge this step will not show. **Go to next step**

- 11a. **Surface Charge.** Ensure the **ignition state is on**. Switch on the headlights (high beam) until EXP-1080 shows **Turn off headlights** then return ignition state to off



E148627

NOTE: BATTERY CHARGE

NOTE: If the state of charge is sufficient this step will not show. **Go to next step**

- 11b. **Battery Charge.** Select **Before Charging** if battery has not been on a recommended mains charger for a minimum of 6 hours
- Select **After Charging** if battery has been on a recommended mains charger for a minimum of 6 hours



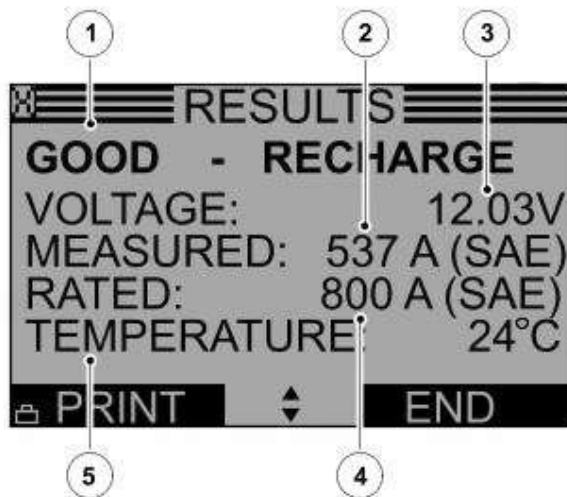
E148628

NOTE: DEEP SCAN TECHNOLOGY

NOTE: This test is automated and will show if required. **Go to next step**

- 12. **Testing.** The EXP-1080 will carry out the deep scan test, then automatically advance when test has completed

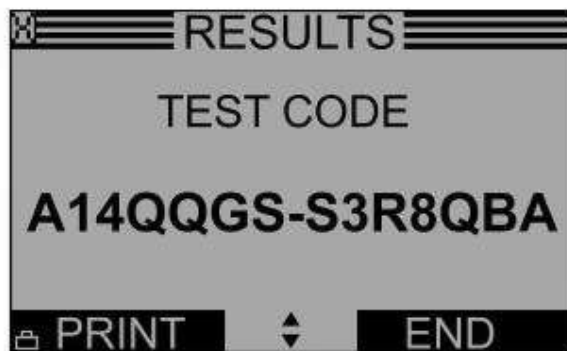
Number	Description
1	Battery test result
2	CCA (Measured capacity rating)
3	Voltage
4	CCA (Manually entered)
5	Temperature



E148629

NOTE: RESULTS

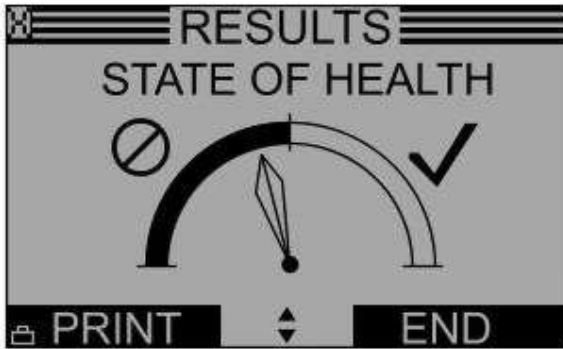
Test Result	Action
GOOD BATTERY	Test complete no action required
GOOD - RE-CHARGE	Charge battery using a recommended mains charger (minimum 50 amp) until charging complete
CHARGE AND RE-TEST	Charge battery using a recommended mains charger (minimum 50 amp) until charging complete. Retest. If the result is the same replace battery
REPLACE BATTERY / BAD CELL BATTERY	Replace battery. Do Not Recharge
UNABLE TO COMPLETE TEST	Disconnect battery from vehicle and re-test



E148630

NOTE: TEST CODE

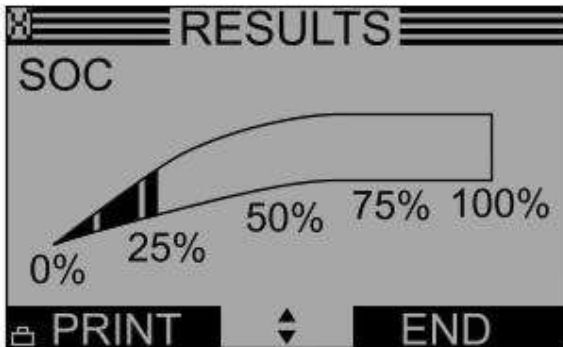
NOTE: Battery test code, must be given if a battery, starter motor or generator is exchanged under warranty



E148631

NOTE: STATE OF HEALTH

NOTE: General health of the battery and its ability to deliver its specified performance compared with a new battery



E148632

NOTE: SOC (State Of Charge)

NOTE: BATTERY STATE OF CHARGE

- **Results.** From the result display use the arrow keys on the control panel to view the test code
- The test code **must** be quoted with every battery claim under warranty

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) / 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) / amp hour rating (Ah)) as the original battery, unless formally instructed by Jaguar/Land Rover

Battery, Mounting and Cables - Battery Disconnect and Connect

General Procedures

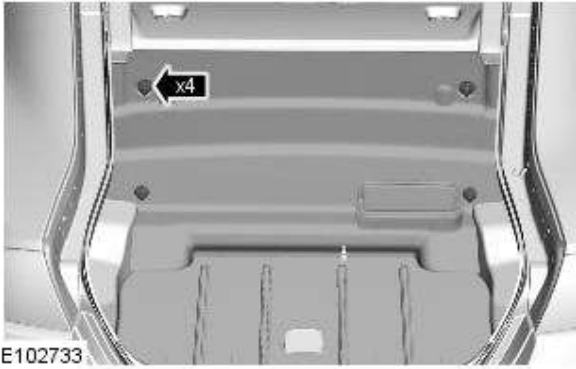
Disconnection

All vehicles

1. Obtain and record the audio unit preset radio frequencies.

Coupe

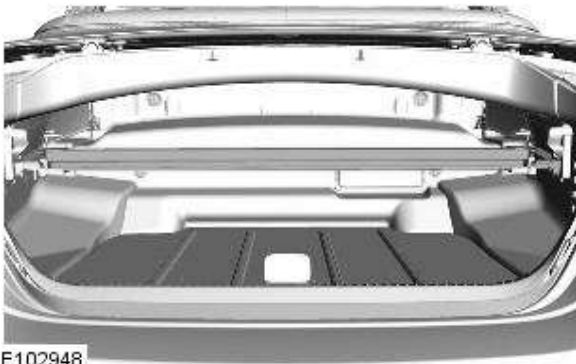
2.



E102733

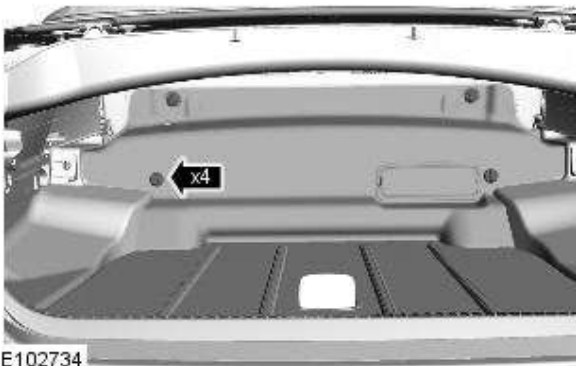
Convertible

3.



E102948

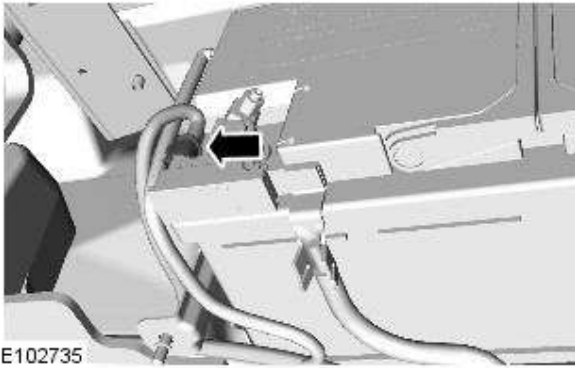
4.



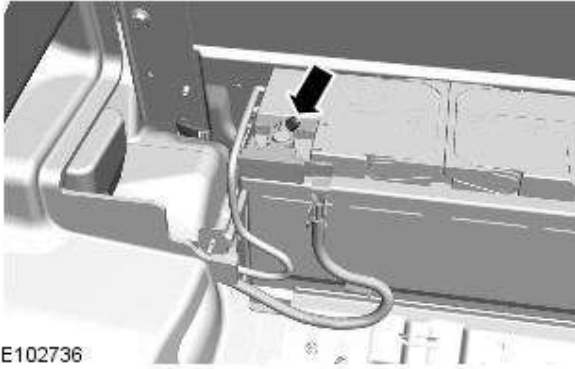
E102734

All vehicles

5.



6.

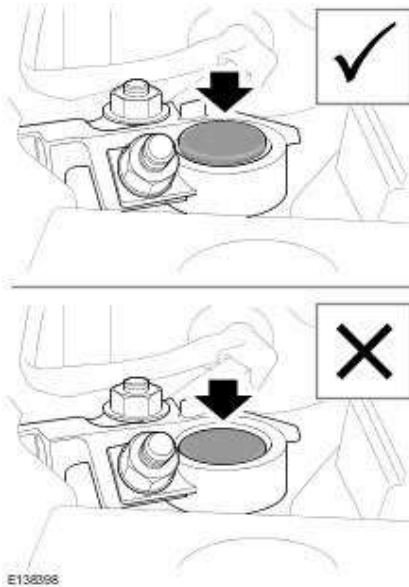


Connect

1. NOTE: Make sure that both the positive and negative battery terminals are correctly located when installed.

To install, reverse the removal procedure.

Torque: 6 Nm



2. NOTE: This step is only required when installing a new component.

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

3. Door Window Motor Initialization

Refer to: [Door Window Motor Initialization](#) (501-11 Glass, Frames and Mechanisms, General Procedures).

4. Enter the audio unit preset radio frequencies.
5. Reset the clock to the correct time.
6. Start the engine and allow to idle until the engine reaches normal operating temperature.
7. Switch the engine off.

Battery, Mounting and Cables - Battery

Removal and Installation

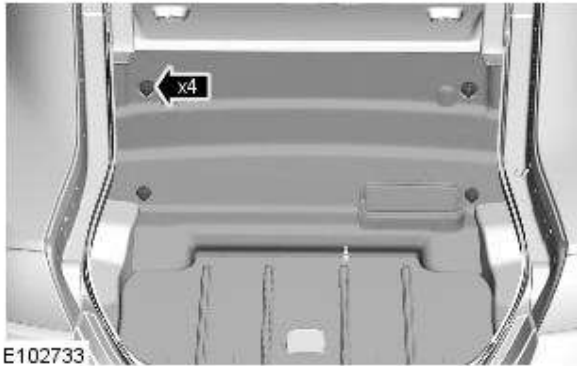
Removal

All vehicles

1. Obtain and record the audio unit preset radio frequencies.

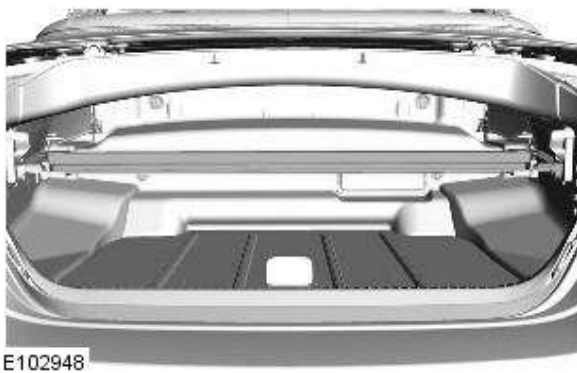
Vehicles without convertible top

2. NOTE: Where fitted.

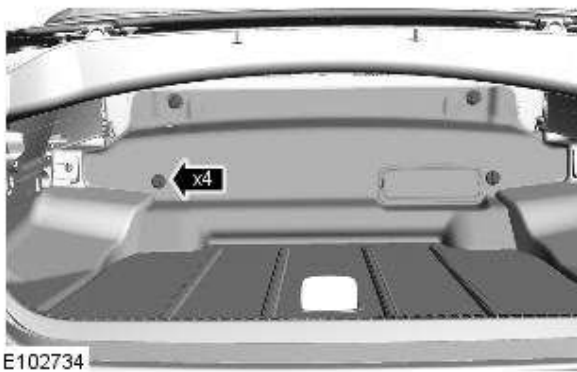


Vehicles with convertible top

- 3.

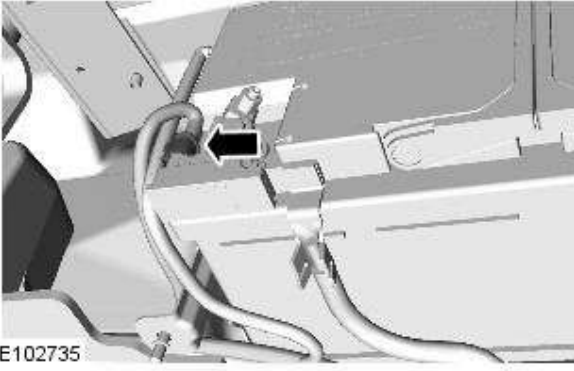


- 4.

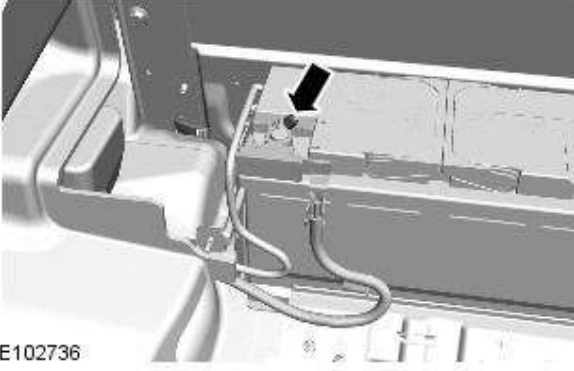


All vehicles

5.

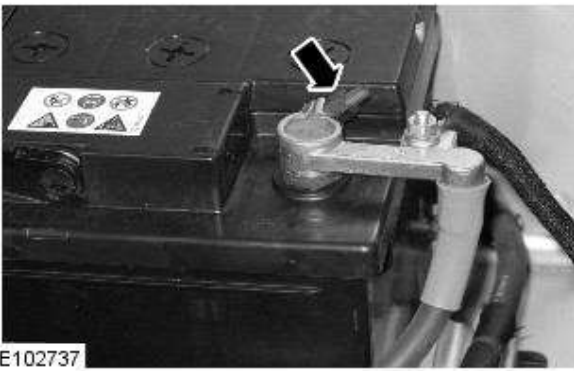


6. Torque: 5 Nm

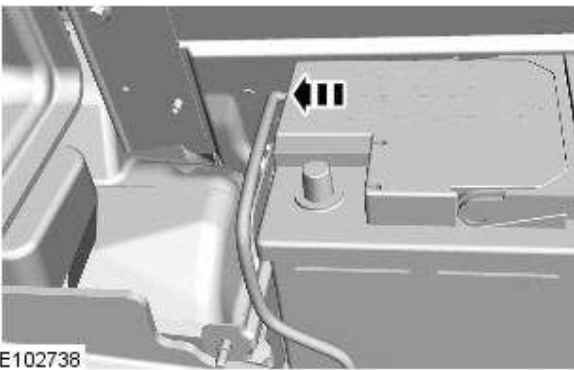


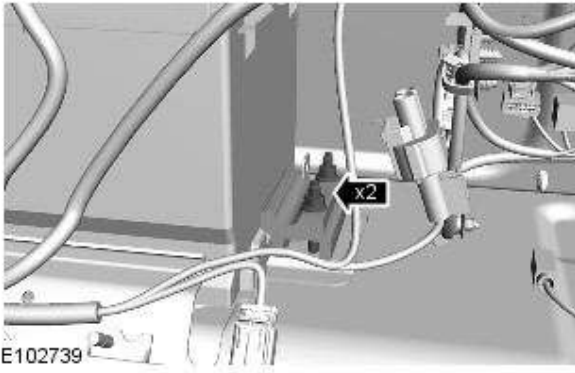
7. NOTE: Some variation in the illustrations may occur, but the essential information is always correct.

Torque: 5 Nm

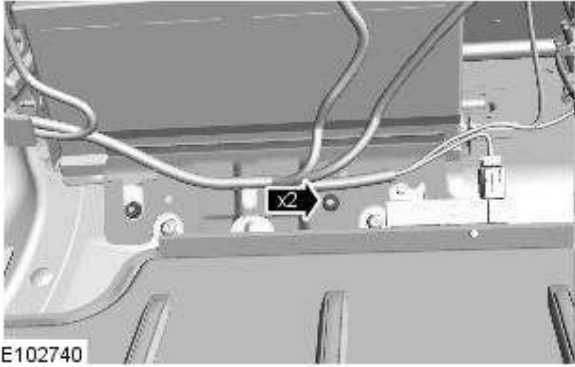


8.

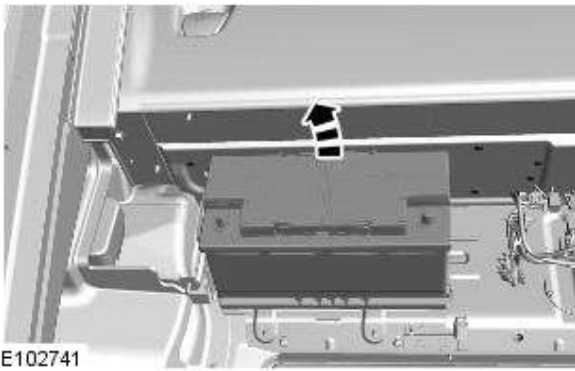




9. Torque: 6 Nm



10. Torque: 6 Nm



11.

Installation

1. To install, reverse the removal procedure.
2. NOTE: This step is only necessary when installing a new component.

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

3. Door Window Motor Initialization
4. Enter the audio unit preset radio frequencies.
5. Reset the clock to the correct time.
6. Start the engine and allow to idle until the engine reaches normal operating temperature.
7. Switch the engine off.

Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol -

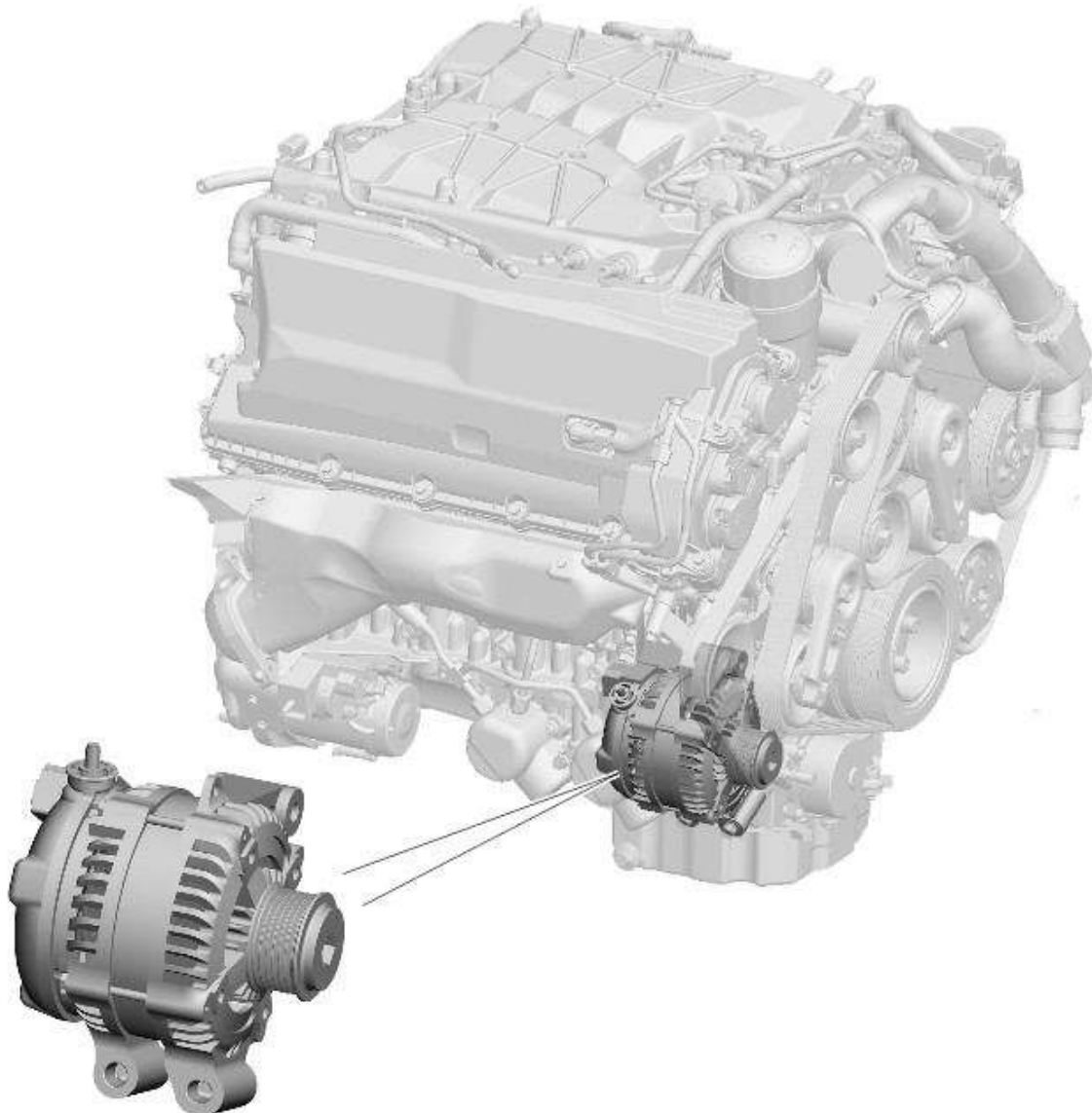
Description	Nm	lb-ft	lb-in
Generator retaining bolts	47	35	-
Battery positive cable retaining nut	12	9	-

Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Generator

Description and Operation

COMPONENT LOCATION

NOTE: Installation on supercharged engine shown, installation on naturally aspirated engine similar.



E116462

INTRODUCTION

On 5.0L vehicles (naturally aspirated and supercharged), the electrical charging system consists of a 150 A output generator with an integral voltage regulator. The output from the generator is set by the voltage regulator under the control of the ECM (engine control module).

GENERATOR

The generator produces power for the vehicle electrical system and maintains the battery in a charged state.

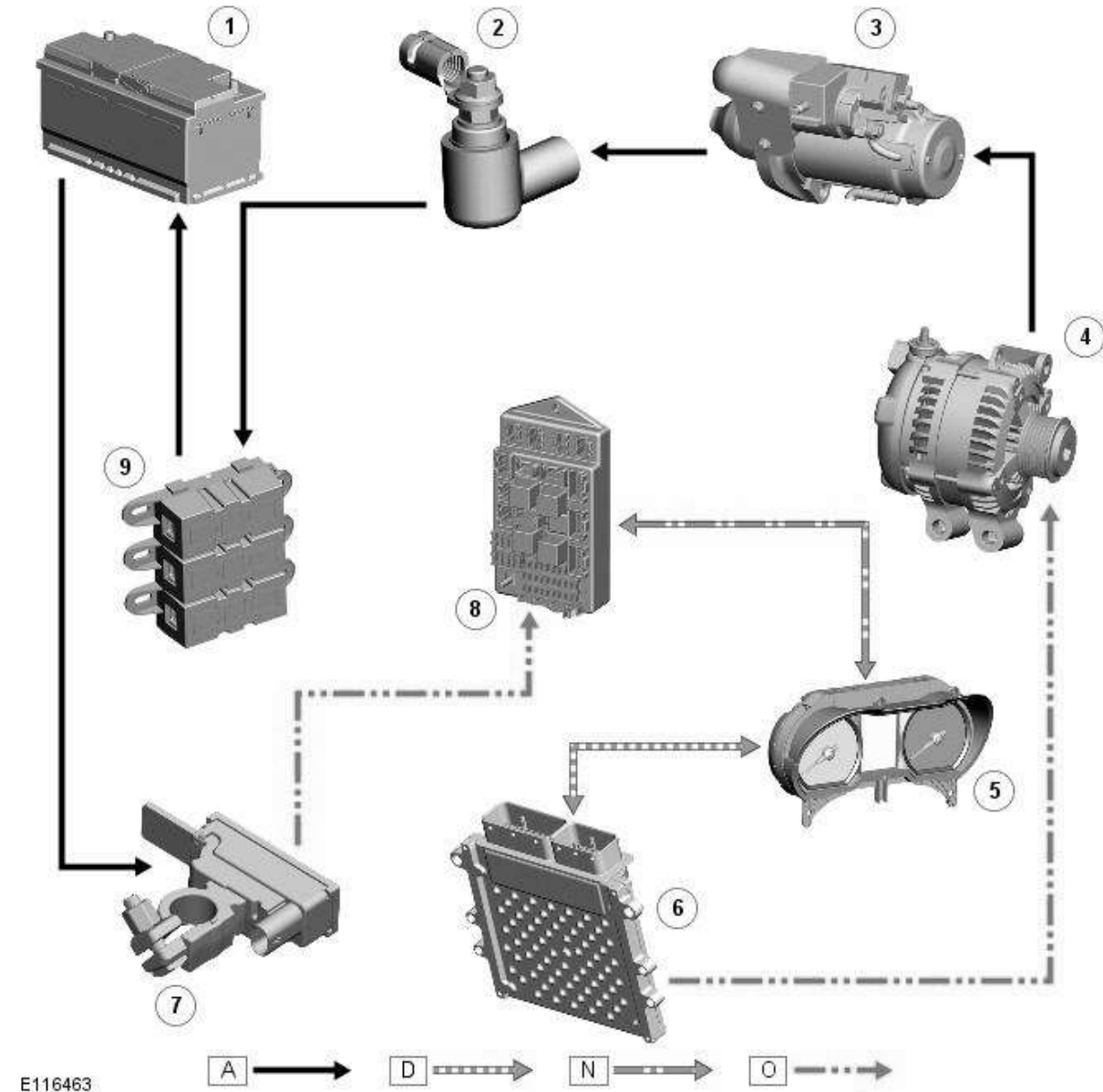
The generator is located at the front right side of the engine and attached directly to the cylinder block and the sump body. A terminal post on the generator provides the connection point for the battery positive cable. A single pin electrical connector

on the rear cover provides the interface for a LIN (local interconnect network) bus connection with the ECM. A pulley on the front of the generator is driven at approximately three times engine speed by the accessory drive belt. For additional information, refer to: [Accessory Drive \(303-05 Accessory Drive - V8 5.0L Petrol/V8 S/C 5.0L Petrol, Description and Operation\)](#).

When the engine is running the generator produces an alternating current, which is converted to a direct current internally.

CONTROL DIAGRAM

NOTE: A = Hardwired; D = High speed CAN (controller area network); N = Medium speed CAN; O = LIN bus



Item	Part Number	Description
1	-	Battery
2	-	Positive remote charge terminal
3	-	Starter motor
4	-	Generator
5	-	Instrument cluster
6	-	ECM (engine control module)
7	-	Battery monitoring sensor
8	-	CJB (central junction box)
9	-	BJB (battery junction box) (400 A megafuse)

PRINCIPLES OF OPERATION

The output voltage required from the generator is calculated by the battery monitoring system. For additional information, refer to Battery, Mounting and Cables (414-01 Battery, Mounting and Cables, Description and Operation).

The battery monitoring system signals the required voltage to the ECM via the CJB (central junction box) and the instrument cluster. The ECM then transmits the required voltage on the LIN bus connection with the voltage regulator in the generator. The output from the generator is supplied to the battery through the main battery positive cable.

The ECM will over-ride the voltage value requested by the battery monitoring system if it detects a fault in the generator. The ECM also signals the instrument cluster to display a warning message if it detects a fault with the generator. For additional information, refer to: [Instrument Cluster](#) (413-01 Instrument Cluster, Description and Operation).


Generator and Regulator - V8 5.0L Petrol/V8 S/C 5.0L Petrol - Generator

Removal and Installation

Removal

NOTE: Removal steps in this procedure may contain installation details.

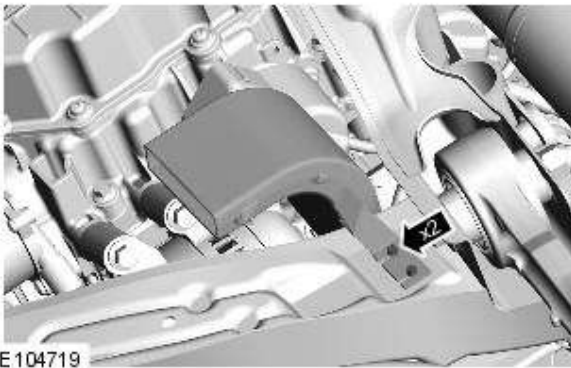
1. Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

2.  **WARNING:** Make sure to support the vehicle with axle stands.

Raise and support the vehicle.

3. Refer to: [Air Deflector](#) (501-02 Front End Body Panels, Removal and Installation).

4. Torque: 10 Nm

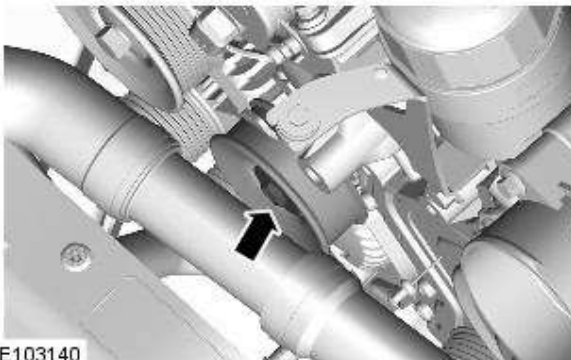


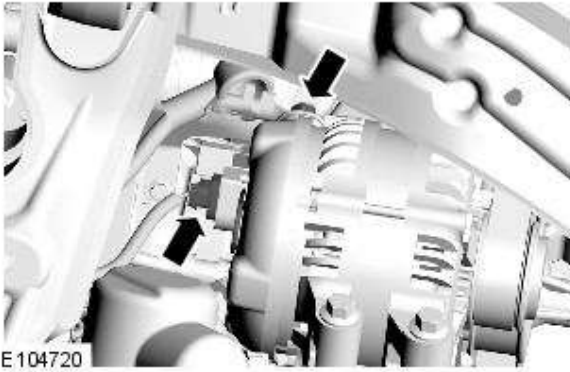
- 5.



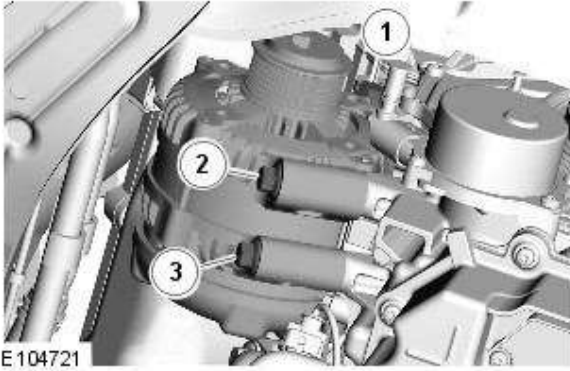
- 6.


- Torque: 40 Nm





7. Torque: 12 Nm




8.  CAUTION: Install all the bolts finger tight before final tightening.


NOTE: Tighten the bolts in the indicated sequence.

- Torque: 48 Nm

Installation

1. CAUTIONS:

 Make sure that the accessory drive belt is correctly located on each pulley.

 Clean and inspect the accessory drive belt pulleys for damage.

To install, reverse the removal procedure.