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BATTERY, MOUNTING AND CABLES – VEHICLES WITH: NON-ELECTRIC VEHICLES

LOW BATTERY DIAGNOSTICS (G2401007)

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PRINCIPLES OF OPERATION

For a detailed description of the Charging System, refer to the relevant Description and Operation section in the workshop manual.

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 at fault or may be at fault and the vehicle remains under manufacturer warranty, refer to the Warranty Policy and Procedures manual, or determine if any prior approval program 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-to-date 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 ■ Accessory drive belt ■ Accessory drive belt tensioner ■ Generator pulley ■ Battery Monitoring System (BMS) ■ Battery module	■ Generator ■ Battery/battery connections ■ Starter motor ■ Harnesses and connectors ■ Fuses ■ Starter motor megafuse ■ Charge warning indicator function ■ Instrument Cluster (IC)

MECHANICAL	ELECTRICAL
	■ Gateway Module ■ LIN connections ■ BMS positive terminal connections ■ BMS fusible link ■ Quiescent drain ■ Modules remaining active after vehicle power down ■ CAN networks remaining active after vehicle power down

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 the Jaguar Land Rover claims submission system for open campaigns. Refer to the corresponding bulletins and SSMS which may be valid for the specific customer complaint and complete the recommendations as required

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSES	ACTION
Low battery warning indicator illuminated	■ Quiescent drain module remaining active after vehicle power down (iQ) ■ Quiescent drain CAN network remaining active after vehicle power down (iQ) ■ Poor electrical connections ■ Customer/end user interface or usage ■ Charging system fault ■ Battery fault	■ Complete the customer questionnaire (see below) and record/retain the information for later use if required ■ Follow the diagnostic procedures outlined in the Pinpoint Tests (below)

CUSTOMER QUESTIONNAIRE TO BE COMPLETED WHEN THE CUSTOMER PRESENTS A VEHICLE WITH THE COMPLAINT OF A LOW BATTERY

The following questions should be put to the customer on arrival at the service centre. The data gathered should be recorded and retained as the information may be needed to be added to a TA request for engineering evaluation if the vehicle's battery system fault. Select and record the appropriate response to each of the questions listed below:

- 1) Before the low battery was noted, had the vehicle doors been opened and closed multiple times while the vehicle had been unlocked and the engine off for over an hour or more (this may happen during loading and unloading of luggage, equipment, etc)? **YES / NO**
- 2) Has the Stop/Start function consistently been inhibited during the drive cycle? **YES / NO**
- 3) How often is the vehicle used? **Daily / Every Other Day / Weekly / Less Than One Use A Week**
- 4) What is the average length of journeys made? **Less Than 10 Miles / Between 10 and 50 Miles / Over 50 Miles**
- 5) How many engine starts (not including Stop/Start activations) does the vehicle typically undergo in one day? **Less Than 5 / Greater Than 5**
- 6) If applicable, has the rear tailgate failed to extend fully at any point leading up to the low battery issue? **YES (give details) / NO**
- 7) Are any accessories installed to the vehicle (either through the OBD port or hard wired ie: such as dash cameras)? **YES (give details) / NO**
- 8) Note any other information - ask the customer if they have any additional comments they feel may be relevant to the factors leading up to the fault

DIAGNOSTICS AND REPAIR ACTIONS IF LOW BATTERY WARNING INDICATOR ILLUMINATED

PINPOINT TEST A : INITIAL CONSULTATION - IMMEDIATE VEHICLE HISTORY PRIOR TO LOW BATTERY WARNINGS	
A1: HAS CUSTOMER BEHAVIOR CAUSED THE LOW BATTERY WARNING?	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Gather information from the customer about recent usage. Specifically, ask the customer the following:
	Before the low battery warning appeared, had the vehicle doors been opened and closed multiple times while the vehicle had been unlocked and the engine off for over an hour or more (this may happen during loading and unloading of luggage, equipment, etc)? Yes GO to A2. No GO to Pinpoint Test B.
A2: QUIESCENT DRAIN TEST (1)	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Refer to the relevant section of the workshop manual and test the battery quiescent drain REFER to: Quiescent Drain (414-00 Battery and Charging System - General Information, Description and Operation).
	Has the quiescent current drain test been passed? (ie: the vehicle's typical battery drain values are less than 30mA) Yes To confirm the state of battery health, refer to the appropriate Midtronics Battery Diagnostics/Battery Charger procedures and follow the on-screen instructions REFER to: (414-01A Battery, Mounting and Cables - Vehicles With: Non-Electric Vehicles) Battery Diagnostics - 12 Volt Midtronics EXP-1080 JLR Hand-Held Battery Diagnostic Tool (Diagnosis and Testing), Battery Diagnostics - 12 Volt Midtronics GRX-3080 JLR Diagnostic Battery Charger (Diagnosis and Testing), Battery Diagnostics - 12 Volt Midtronics GR8-1180 JLR Diagnostic Battery Charger (Diagnosis and Testing). When the Midtronics procedures have been successfully completed, the vehicle may be returned to the customer. Advise customer that pattern of usage has caused low battery warning and how to avoid reoccurrence

A2: QUIESCENT DRAIN TEST (1)	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	No GO to Pinpoint Test B.

PINPOINT TEST B : REFLASH MODULES	
B1: REFLASH MODULES AND QUIESCENT RELAY BOX RELAY CHECKS (1)	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Using the manufacturer approved diagnostic system, reflash the: ■ 1.1 Telematics Control Module (TCU) ■ 1.2 Body Control Module (BCM) ■ 1.3 Gateway Module (GWM)
	2 Using the manufacturer approved diagnostic system, check the Gateway Module (GWM) datalogger signals: Quiescent Relay Box - Relay 1 Open Event Count (0x41EF) and Quiescent Relay Box - Relay 2 Open Event Count (0x41F3). To access the signals using Pathfinder, select ECU Diagnostics > Gateway Control Module > Live Data, then use the Search function to locate the required signals. To access the signals using SDD, select Datalogger and then use the Search function to locate the required signals
	Are the recorded Quiescent Relay Box - Relay 1 and 2 Open Event Counters greater than or equal to 1? Yes GO toB3. No GO toB2.
B2: BATTERY TESTING	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 To confirm the state of battery health, refer to the appropriate Midtronics Battery Diagnostics/Battery Charger procedures and follow the on-screen instructions REFER to:(414-01A Battery, Mounting and Cables - Vehicles With: Non-Electric Vehicles) Battery Diagnostics - 12 Volt Midtronics EXP-1080 JLR Hand-Held Battery Diagnostic Tool (Diagnosis and Testing), Battery Diagnostics - 12 Volt Midtronics GRX-3080 JLR Diagnostic Battery Charger (Diagnosis and Testing), Battery Diagnostics - 12 Volt Midtronics GR8-1180 JLR Diagnostic Battery Charger (Diagnosis and Testing).
	Is the battery test passed? Yes Raise a Technical Assistance (TA) request to log service actions. Using the manufacturer approved diagnostic system, reset the Battery Monitoring System (BMS) and return the vehicle to the customer No If battery diagnostics suggest a battery replacement is warranted, replace battery. Using the manufacturer approved diagnostic system, reset the Battery Monitoring System (BMS) and return the vehicle to the customer. If the battery in not replaced, raise a TA to log service actions. Using the manufacturer approved diagnostic system, reset the Battery Monitoring System (BMS) and return the vehicle to the customer
B3: QUIESCENT DRAIN TEST (2)	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Refer to the relevant section of the workshop manual and test the battery quiescent drain REFER to:Quiescent Drain (414-00 Battery and Charging System - General Information, Description and Operation).

B3: QUIESCENT DRAIN TEST (2)	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	Has the quiescent current drain test been passed? (ie: the vehicle's typical battery drain values are less than 30mA) Yes GO toB4. No GO toB5.
B4: IQ/BATTERY DRAIN INVESTIGATION TESTS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Refer to the relevant section of the workshop manual and complete the battery drain investigation test procedure (see below)
	Have the battery drain investigation tests resulted in the illumination of the Hazard Warning light? Yes GO toB5. No GO toB2.
B5: BATTERY SUPPORT/CONSULT CAN LOGS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Attach a manufacturer approved battery support unit to prevent the battery going flat
	2 Raise a Technical Assistance (TA) request and add the information gathered from the customer questionnaire completed when the vehicle was initially brought in to the service centre
	3 Contact the Technical Assistance team to request access to a CAN logging device with breakout harness (to facilitate access to vehicle CAN logs). Download CAN logs as required
	4 Consult with Technical Assistance team and examine the CAN logs to ascertain module/systems causing battery drain and rectify as required
	5 To confirm the state of battery health, refer to the appropriate Midtronics Battery Diagnostics/Battery Charger procedures and follow the on-screen instructions REFER to:(414-01A Battery, Mounting and Cables - Vehicles With: Non-Electric Vehicles) Battery Diagnostics - 12 Volt Midtronics EXP-1080 JLR Hand-Held Battery Diagnostic Tool (Diagnosis and Testing), Battery Diagnostics - 12 Volt Midtronics GRX-3080 JLR Diagnostic Battery Charger (Diagnosis and Testing), Battery Diagnostics - 12 Volt Midtronics GR8-1180 JLR Diagnostic Battery Charger (Diagnosis and Testing).
	Is the battery test passed? Yes Using the manufacturer approved diagnostic system, reset the Battery Monitoring System (BMS) and return the vehicle to the customer No If battery diagnostics suggest a battery replacement is required, replace battery. Using the manufacturer approved diagnostic system, reset the Battery Monitoring System (BMS) and return the vehicle to the customer

IQ/BATTERY DRAIN INVESTIGATION TESTS

In cases where the customer reports a low battery warning on a vehicle indicating a drain on the battery (and where the battery drain has NOT been detected by the quiescent drain test REFER to: Quiescent Drain (414-00 Battery and Charging System - General Information, Description and Operation).), a more thorough investigation may be required to identify the root cause of the battery drain

Print out the test plan and user guide form (below) and follow the battery drain investigation procedures. There are seven sets of tests, each set comprises three task lists. Not all seven sets of tests need to be completed on every vehicle, this is a list of actions designed to prompt a vehicle failure. If a failure is detected, do not continue with the remaining sets, connect a manufacturer approved battery support unit to prevent the battery going flat and raise a Technical Assistance (TA) request immediately. If the vehicle is only available for a reduced amount of time, complete as many sets as possible before the return of the vehicle

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iq / Battery Drain Investigation Test Plan

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Set	Set 1		Set 2		Set 3		Set 4	
	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2
Task List								
Hazard Switch Illuminated? (Y/N)	Unlock via Key Fob Button	Unlock via Key Fob Button	Unlock via Door Switch	Unlock via Key Fob Button	Unlock via Key Fob Button	Unlock via Key Fob Button	Unlock via Key Fob Button	Unlock via Key Fob Button
	Door Handle Pull	Door Handle pull	Door Handle pull	Door Handle pull	Door Handle pull	Door Handle pull	Door Handle pull	Door Handle pull
	Tailgate Open / Close via Tailgate Switch	Tailgate Open / Close via Tailgate Switch	Tailgate Open / Close via Tailgate Switch	Tailgate Open / Close via Tailgate Switch	Tailgate Open / Close via Tailgate Switch	Tailgate Open / Close via Tailgate Switch	Tailgate Open / Close via Tailgate Switch	Tailgate Open / Close via Tailgate Switch
	Ignition ON	Ignition ON	Ignition ON	Ignition ON	Ignition ON	Ignition ON	Ignition ON	Ignition ON
	Engine Run	Engine Run	Engine Run	Engine Run	Engine Run	Engine Run	Engine Run	Engine Run
	Ignition OFF / Close All Apertures	Ignition OFF / Close All Apertures	Ignition OFF / Close All Apertures	Ignition OFF / Close All Apertures	Ignition OFF / Close All Apertures	Ignition OFF / Close All Apertures	Ignition OFF / Close All Apertures	Ignition OFF / Close All Apertures
	Lock via Door	Lock via Door	Lock via Door	Lock via Key Fob Button	Lock via Door	Lock via Door	Lock via Key Fob Button	Lock via Door
	Double Lock via Door	Double Lock via Door	Double Lock via Door	Double Lock via Door	Double Lock via Door	Double Lock via Door	Double Lock via Door	Double Lock via Door
Hazard Switch Illuminated after 20 mins? (Y/N)								

There are seven sets of tests, each set comprises three task lists. Not all seven sets of tests needs to be completed on every vehicle, this is a list of actions designed to prompt a vehicle failure. If a failure is detected, do not continue with the remaining sets, contact a manufacturer approved battery support unit to prevent the battery going flat and raise a Technical Assistance (TA) request immediately. If the vehicle is only available for a reduced amount of time, carry out as many sets as possible before the return of the vehicle. For each set/task list, the following actions should be performed:

1. Approach the vehicle and observe the state of hazard switch illumination before interacting with the vehicle in any way. Record status on the first line.
2. Perform the specific task list for that day / time slot in order from top to bottom crossing off each as they are completed.
3. Wait for 20 minutes, then observe the hazard switch illumination status and record on the last line.
4. If at any time the hazard light illumination is still on after 20 minutes, support the battery with approved support unit and raise a TA immediately.

Set	Set 5		Set 6		Set 7	
	Test 1	Test 2	Test 1	Test 2	Test 1	Test 2
Task List						
Hazard Switch Illuminated? (Y/N)	Unlock via Key Fob Button	Unlock via Key Fob Button	Unlock via Key Fob Button	Unlock via Key Fob Button	Unlock via Key Fob Button	Unlock via Key Fob Button
	Door Handle pull	Door Handle pull	Door Handle pull	Door Handle pull	Door Handle pull	Door Handle pull
	Tailgate Open / Close via Tailgate Switch	Tailgate Open / Close via Tailgate Switch	Tailgate Open / Close via Tailgate Switch	Tailgate Open / Close via Tailgate Switch	Tailgate Open / Close via Tailgate Switch	Tailgate Open / Close via Tailgate Switch
	Ignition ON	Ignition ON	Ignition ON	Ignition ON	Ignition ON	Ignition ON
	Engine Run	Engine Run	Engine Run	Engine Run	Engine Run	Engine Run
	Ignition OFF / Close All Apertures	Ignition OFF / Close All Apertures	Ignition OFF / Close All Apertures	Ignition OFF / Close All Apertures	Ignition OFF / Close All Apertures	Ignition OFF / Close All Apertures
	Lock via Door	Lock via Door	Lock via Door	Lock via Door	Lock via Door	Lock via Door
	Double Lock via Door	Double Lock via Door	Double Lock via Door	Double Lock via Door	Double Lock via Door	Double Lock via Door
Hazard Switch Illuminated after 20 mins? (Y/N)						

cmjjaGFyZG1vcnRvbjsyMDIwLTASLTE4VDA5OjExOjMyLjY4NFo7OTluNDAmTg5LjUzOw==

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