

PUBLISHED: 04-OCT-2019
2020.0 DEFENDER (LE), 414-01A

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

FLAT BATTERY DIAGNOSTICS (G2401008)

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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
■ Battery Monitoring System (BMS) ■ Check historical customer usage	■ Water ingress to one or more control modules ■ Damage to harnesses and/or connectors ■ Generator ■ Instrument Cluster (IC) ■ Gateway Module ■ LIN connections ■ BMS positive terminal connections ■ BMS fusible link

MECHANICAL	ELECTRICAL
	■ 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
Customer complains of flat battery	■ 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 ■ Harness short circuit to ground ■ Water ingress into control module(s) ■ 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 FLAT 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) Has the battery gone flat within the past 36 hours? **YES / NO**
- 2) How long has the vehicle stood prior to discovering the flat battery? **Less Than 3 Days / Between 3 And 7 Days / Between 7 And 14 Days/ Longer Than 14 Days**

- 3) Before the flat 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**
- 4) How did you gain access to the vehicle? **Through the Key Fob / Use of Manual Key / Through the Handle Pull**
- 5) Have you required assistance for battery issues previously? **YES (give details) / NO**
- 6) Has the Stop/Start function consistently been inhibited during the drive cycle? **YES / NO**
- 7) How often is the vehicle used? **Daily / Every Other Day / Weekly / Less Than One Use A Week**
- 8) What is the average length of journeys made? **Less Than 10 Miles / Between 10 and 50 Miles / Over 50 Miles**
- 9) How many engine starts (not including Stop/Start activations) does the vehicle typically undergo in one day? **Less Than 5 / Greater Than 5**
- 10) Have any instrument pack warnings been observed leading up to the flat battery issue? **YES (give details) / NO**
- 11) If applicable, has the rear tailgate failed to extend fully at any point leading up to the flat battery issue? **YES (give details) / NO**
- 12) Are any accessories installed to the vehicle (either through the OBD port or hard wired ie: such as dash cameras)? **YES (give details) / NO**
- 13) 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 A FLAT BATTERY IS SUSPECTED

PINPOINT TEST A :	
A1: RECORD BATTERY VOLTAGE AND ATTEMPT ENGINE START	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 If the vehicle has been recovered to the retailer, then, using a Digital Multi Meter (DMM), record the battery open circuit voltage and make a note of the voltage
	2 Attempt to start the engine
	Does the engine start unaided? Yes GO to A2. No Complete the RECOVERY CHARGING process using a manufacturer approved battery charger. If either a Midtronics GRX-3080 or GR8-1180 Diagnostic Battery Charger is available, then follow the Recovery Charging procedures as described elsewhere in this manual REFER to: (414-01A Battery, Mounting and Cables - Vehicles With: Non-Electric Vehicles) 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). If no suitable tools (ie: with access to Recovery Charging procedures) are available, then charge the battery for 1 hour. When charging/recovery charging has been completed, then GO to A2.

A2: POWER SUPPLY SYSTEMS TEST	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Using the manufacturer approved diagnostic system (SDD), connect the diagnostic tool to the vehicle. If SDD is not available, then proceed to the next step (A3)
	2 Complete the Power Supply Systems test (72020). Using SDD, select Electrical - Warning Lights - Power Supply System Test
	If SDD has been used, has the vehicle passed the power supply system test? Yes GO to A3. No Follow the on-screen instructions to identify the root cause of the power supply system fault and rectify as required, then GO to A3.
A3: 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).
	After completion of the battery testing procedures as above, do the results indicate "Good Battery"? Yes GO to Pinpoint Test B. No If using the Midtronics EXP-1080 JLR Hand-Held Battery Diagnostic Tool, the process flow may result in a "REPLACE BATTERY" decision. In this case, with reference to the relevant section of the workshop manual, replace the battery taking care to complete the battery replacement process in order to appropriately clear/reset the battery monitoring system (BMS), then 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 to B2.

PINPOINT TEST B : REFLASH MODULES	
B1: REFLASH MODULES AND QUIESCENT RELAY BOX RELAY CHECKS (1)	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	No GO toB3.
B2: QUIESCENT DRAIN TEST (QRB - RELAY 1 AND 2 OPEN EVENT COUNTERS GREATER THAN OR EQUAL TO 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 GO toB4. No GO toB5.
B3: QUIESCENT DRAIN TEST (QRB - RELAY 1 AND 2 OPEN EVENT COUNTERS LESS THAN 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 Using the manufacturer approved diagnostic system, check for related DTCs and refer to the relevant DTC index for diagnosis and repairs as appropriate. When repairs (if required) have been completed, return the vehicle to the customer 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 toB7.
B5: RAISE TA/CONSULT CAN LOGS	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 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
	Is the Hazard Warning light illuminated? Yes GO toB6. No Module level quiescent suspected. Consult with Technical Assistance team to ascertain module/systems causing battery drain and rectify as required. Then, GO toB7.

B6: HAZARD ILLUMINATION ON AND BATTERY DRAIN GREATER THAN 2 AMPS?	
TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Using a manufacturer approved Picoscope or Digital Multi Meter (DMM), measure the battery drain
	Is the battery drain greater than 2 amps? Yes 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. Consult with Technical Assistance team and examine the CAN logs to ascertain module/systems causing battery drain and rectify as required. Then, GO to B7. No Consult with Technical Assistance team to ascertain module/systems causing battery drain and rectify as required. Then, GO to B7.
B7: FINAL BATTERY CHECKS	
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).
	After completion of the battery testing procedures as above, do the results indicate "Good Battery"? Yes Return the vehicle to the customer No If using the Midtronics EXP-1080 JLR Hand-Held Battery Diagnostic Tool, the process flow may result in a "REPLACE BATTERY" decision. In this case, with reference to the relevant section of the workshop manual, replace the battery taking care to complete the battery replacement process in order to appropriately clear/reset the battery monitoring system (BMS), then return the vehicle to the customer

IQ/BATTERY DRAIN INVESTIGATION TESTS

In cases where the customer reports a flat 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 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, 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

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 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	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)						

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