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2020.0 DEFENDER (LE), 501-10

SEATING

HEATER MATS (G2537936)

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PRINCIPLES OF OPERATION

For a detailed description of the Heater Mats, 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 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 that has the resolution ability to view 3 decimal places. For example, on the 2 volts range can measure 1mV or 2 K Ohm range can measure 1 Ohm. When testing resistance always take the resistance of the digital multimeter leads into account.
- Check and rectify basic faults before beginning diagnostic routines involving pinpoint tests.

1. Verify the customer concern
2. Check the operation of other seats in the row (if more than one seat in the row has failed, this could be a software related issue)
3. Visually inspect for obvious signs of damage and system integrity (damage to seat trims including cuts, damage to wiring harnesses).

Visual Inspection

MECHANICAL	ELECTRICAL
■ Seat heater switches	■ Fuses ■ Wiring harnesses and connectors

4. If an obvious cause for an observed or reported concern is found, correct the cause (if possible) before proceeding to the next step
5. Check the JLR 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.
6. If the cause is not visually evident, verify the symptom and refer to the Symptom Chart, alternatively check for Diagnostic Trouble Code(s) (DTC)s and refer to the DTC Index

SEAT HEATER MAT DIAGNOSTICS

Each seat has two heating elements: one in the base (the seat heater module, comprising the seat cushion heating element and an integral heat sensor), and one in the back (backrest heating element). The seat cushion and backrest seat heater elements connect to the HVAC Control Module, although the elements are electrically wired in series (each drawing proportion of battery voltage). As well as power and ground circuits, there is a Local Interconnect Network (LIN) circuit between the seat heater module and the HVAC Control Module. The seat heater module monitors the performance of both seat cushion and backrest heaters and reports the status of the seat heating system through the LIN connection to the HVAC Control Module. Any faults detected in the seat cushion and/or backrest heaters should trigger a DTC to be set by the HVAC Control Module. The table below lists the potential symptoms that may be exhibited by the seat heater system and the steps that should be taken to rectify the faults.

SEAT HEATER MAT DIAGNOSTICS AND ASSOCIATED SYMPTOMS

SEAT HEATER SYMPTOMS	SEAT HEATER MAT DTC PRESENT/DETAILS?	POSSIBLE CAUSES	ACTION
Seat cushion and backrest heater mats not generating heat although heating is switched on	 NOTE: DTCs that could be set - B1034-01/B1035-01/B1036-01/B1037-01/B1038-01/B1039-01/B103A-01/B103B-01 Yes / DTC text mentions "Heater Element - General electrical failure"	- ECO mode preventing seats from reaching maximum temperature - Over-current (short circuit /low resistance) on seat heater output detected - Short circuit to ground in wiring harness - Open circuit in wiring harness - Short circuit to ground/low resistance in seat cushion heater mat	 NOTE: Only replace the defective unit, DO NOT replace in sets. Make sure to record the DTC in the verbatim - If both seats are at fault, using the Jaguar Land Rover approved diagnostic equipment, make sure the HVAC Control Module (HVAC) is updated to the latest level software and retest the system - Check wiring harness for circuit faults including bent/backed out pins and rectify as required - Check backrest heater mat is securely connected - If no circuit faults are present and if backrest heater connection are secure, then replace either the seat cushion or the backrest heater mats as required

SEAT HEATER SYMPTOMS	SEAT HEATER MAT DTC PRESENT/DETAILS?	POSSIBLE CAUSES	ACTION
		- Open circuit in seat cushion heater mat - Short circuit to ground/low resistance in backrest heater mat - Open circuit in backrest heater mat - Backrest heater mat disconnected	(see guidance notes below for advice on pinpointing which heater mat is faulty)
Seat cushion and backrest heater mats not generating heat although heating is switched on	 NOTE: DTCs that could be set - B1038-01/B1039-01/B103A-01/B103B-01/B1030-87/B1031-87/B1032-87/B1033-87/B1DFB-87/B1DFC-87/B1DFD-87/B1DFE-87 Yes / DTC text mentions "Missing Message" or "Heater Sensor"	- LIN communication error - Wiring harness issue - HVAC Control Module LIN bus failure or failure of another component on the LIN bus - Internal seat heater module temperature too high - Seat cushion temperature sensor open circuit - Temperature sensor internal failure - Seat heater module self-test failure - Seat heater module internal failure	 NOTE: Only replace the defective unit, DO NOT replace in sets. Make sure to record the DTC in the verbatim - Check wiring harness for circuit faults including bent/backed out pins and rectify as required - Check for LIN bus faults (master and slave modules) and rectify as required - If fault persists, replace the seat cushion heater mat
Seat cushion and backrest heater mats not generating heat although heating is switched on	Yes	- Over-voltage on seat heater module power circuit - Battery voltage too high (above 16 volts)	Refer to the workshop manual and battery care manual and check the vehicle charging circuit performance

	PRESENT/DETAILS?		
		- Under-voltage on seat heater module power circuit - Battery voltage too low (below 8 volts)	
- Seat cushion and backrest heater mats are heating at full power when first switched on, but power is automatically reduced after 40 minutes - Heating controls (switches /touchscreen) show seat heating is active	 NOTE: DTCs that could be set - B1030-87/B1031-87/B1032-87/B1033-87/B1034-01/B1035-01/B1036-01/B1037-01/B1038-01/B14E0-87/B14E1-87/B151D-01/B151E-01 Yes	- Seat cushion temperature failsafe timer expired - Temperature sensor not correctly positioned within heater mat - High resistance in seat cushion or backrest heater mats due to damaged heating elements	 NOTE: Only replace the defective unit, DO NOT replace in sets. Make sure to record the DTC in the verbatim - Using the Jaguar Land Rover approved diagnostic equipment, make sure the HVAC is updated with the latest level software and retest the system before replacing any parts - Replace either the seat cushion or the backrest heater mats as required (see guidance notes below for advice on pinpointing which heater mat is faulty)
Only backrest heater mat is generating heat continuously although heating is switched off	 NOTE: DTCs that could be set - B1030-87/B1031-87/B1032-87/B1033-87/B14E0-87/B14E1-87 Yes	- Seat heater module heater output short circuited to power - Short circuit of backrest heater mat to power circuit in wire harness	 NOTE: Only replace the defective unit, DO NOT replace in sets. Make sure to record the DTC in the verbatim Check wiring harness for circuit faults including bent/backed out pins and rectify as required AND replace backrest heater mats
Both seat cushion and backrest heater mats are generating heat continuously although heating is switched off	 NOTE: DTCs that could be set - B1030-87/B1031-87/B1032-87/B1033-87/B14E0-87/B14E1-87 Yes	- Seat heater module heater output short circuited to power - Short circuit to power in seat cushion heater mat	 NOTE: Only replace the defective unit, DO NOT replace in sets. Make sure to record the DTC in the verbatim Replace the seat cushion heater mat
Both seat cushion and backrest heater mats	No	Power and ground circuits have reversed voltage	Check wiring harness for circuit faults including bent/backed out pins and rectify as required

SEAT HEATER SYMPTOMS	SEAT HEATER MAT DTC PRESENT/DETAILS?	POSSIBLE CAUSES	ACTION
are generating heat continuously although heating is switched off			
Seat cushion and backrest heater mats not generating heat although heating is switched on	No	- Wiring harness issue - Seat heater module LIN bus failure	- Check wiring harness for circuit faults including bent/backed out pins and rectify as required - Replace the seat cushion heater mat

SEAT HEATER MAT FAULTS - FURTHER DIAGNOSTIC GUIDANCE

- Advice On Pinpointing Which Heater Mat Is Faulty - Diagnosis Of Seat Heater Elements Using Resistance Measurements Of Backrest Heater Mat** - In the case of suspected seat heater element failures, the exact location of the failure (seat cushion or backrest heater element) should always be confirmed by electrical resistance tests before replacement. Do not replace components based only on temperature performance. Heater mat failures can be located through resistance measurements of the backrest heater mat (Note: the resistance of the seat cushion heater mat cannot be measured directly because one pin is hid by the seat cushion cover over the unit). Use the following procedure to check the resistance of the backrest heater mat:
 - Disconnect the backrest heater mat.
 - Use a digital multimeter to measure the backrest heater mat resistance @ 20°C (note: this should not be done when the seat heaters have been used recently, as a previous heating cycle can increase the resistance leading to an inaccurate reading).
 - Refer to the table below for expected resistance values. If the measured resistance is outside this tolerance, then replace the backrest seat heater mat. If the resistance is within the specified tolerance, the seat cushion heater mat should be replaced.
- Seat Heater Sensor Faults** - Each seat has two heating elements: one in the base (seat cushion), and one in the back (backrest). There is only one heater sensor in each seat, which is located in the base. This sensor controls both heating elements. If there is a fault with the sensor signal, neither element will operate. If the signal fault is traced to the sensor itself (in the seat cushion heater mat), there is no need to replace the backrest heater mat.
- Simultaneous Failure of Both Seat Heater Mats Is Unlikely** - The seat cushion and backrest seat heater elements connect to the HVAC Control Module, but the control module only acts as a splice box and the elements are electrically wired in series (each drawing proportion of battery voltage). The only way for one element to operate while the other is faulty is if one of the elements has a short-circuit fault. Under normal circumstances, where short-circuit faults are present these will be detected by the HVAC Control Module which will switch off both elements. Similarly, if the sensor (in the seat cushion element) is faulty, the HVAC Control Module will not apply voltage to the elements and, if one element is open-circuit, then no voltage can be supplied to the other element. Given this, while it may often be the case that both elements cease to operate, it is extremely unlikely that both heater mats are faulty. Consequently, if a fault is confirmed with one of the seat heater mats, do not also replace the other.

VEHICLE/MY	SEAT ROW	CUSHION ELEMENT PART NUMBER	SEAT BACK ELEMENT PART NUMBER	HEATER MAT RESISTANCE		HEATER MAT OPERATING CURRENT DRAW AT 13.5 VOLTS	
				CUSHION CIRCUIT Ω /°C	SEAT BACK CIRCUIT Ω /°C	CUSHION CIRCUIT AMPS/°C	SEAT BACK CIRCUIT AMPS/°C
XJ / X351 15-19MY	Row 1	7W93-F603B26-A	7W93-F648A40-A	2.51 Ω +/- 10% @ 20°C	1.62 Ω +/- 10% @ 20°C	3.24 A @ 20°C	3.24 A @ 20°C
	Row 2	FW93-F638B34-A	FW93-F668A80-A	1.32 Ω +/- 10% @ 20°C	1.10 Ω +/- 10% @ 20°C	5.49 A @ 20°C	5.49 A @ 20°C
F-TYPE / X152 15-17MY	Row 1 RH	EX53-603B26-B	EX53-648A40-A	1.37 Ω +/- 10% @ 20°C	0.54 Ω +/- 10% @ 20°C	6.92 A @ 20°C	6.92 A @ 20°C
	Row 1 LH	EX53-603B27-B	EX53-648A40-A	1.37 Ω +/- 10% @ 20°C	0.54 Ω +/- 10% @ 20°C	6.92 A @ 20°C	6.92 A @ 20°C
	Row 1 RH SSSS	EX53-603B26-B	CW8M-C648A22-A	1.37 Ω +/- 10% @ 20°C	0.54 Ω +/- 10% @ 20°C	6.92 A @ 20°C	6.92 A @ 20°C
	Row 1 LH SSSS	EX53-603B27-B	CW8M-C648A22-A	1.37 Ω +/- 10% @ 20°C	0.54 Ω +/- 10% @ 20°C	6.92 A @ 20°C	6.92 A @ 20°C
F-TYPE / X152 18-21MY	Row 1	JX53-603B26-A	JX53-648A40-A	1.31 Ω +/- 10% @ 20°C	0.77 Ω +/- 10% @ 20°C	6.37 A @ 20°C	6.37 A @ 20°C
XF / X260 16-20MY	Row 1	GX73-603B26-A	GX73-648A40-A	0.86 Ω +/- 10% @ 20°C	0.70 Ω +/- 10% @ 20°C	8.65 A @ 20°C	8.65 A @ 20°C
	Row 2	GX73-600D76-A	GX73-601C30-A	1.76 Ω +/- 10% @ 20°C	1.12 Ω +/- 10% @ 20°C	4.69 A @ 20°C	4.69 A @ 20°C
XE / X760 16-20MY	Row 1	GX73-603B26-A	GX73-648A40-A	0.86 Ω +/- 10% @ 20°C	0.70 Ω +/- 10% @ 20°C	8.65 A @ 20°C	8.65 A @ 20°C
	Row 2	GX73-600D76-A	GX73-601C30-A	1.76 Ω +/- 10% @ 20°C	1.12 Ω +/- 10% @ 20°C	4.69 A @ 20°C	4.69 A @ 20°C
F-PACE / X761 17-20MY	Row 1	GX73-603B26-A	GX73-648A40-A	0.86 Ω +/- 10% @ 20°C	0.70 Ω +/- 10% @ 20°C	8.65 A @ 20°C	8.65 A @ 20°C
	Row 2	HK83-600D76-A	HK83-601C30-A	1.57 Ω +/- 10% @ 20°C	0.97 Ω +/- 10% @ 20°C	5.31 A @ 20°C	5.31 A @ 20°C
Range Rover Velar / L560 18-22MY	Row 1	J8A2-603B26-A	J8A2-648A40-A	1.38 Ω +/- 10% @ 23°C	0.95 Ω +/- 10% @ 23°C	5.79 A @ 23°C	5.79 A @ 23°C

VEHICLE/MY	SEAT ROW	CUSHION ELEMENT PART NUMBER	SEAT BACK ELEMENT PART NUMBER	HEATER MAT RESISTANCE		HEATER MAT OPERATING CURRENT DRAW AT 13.5 VOLTS	
				CUSHION CIRCUIT Ω /°C	SEAT BACK CIRCUIT Ω /°C	CUSHION CIRCUIT AMPS/°C	SEAT BACK CIRCUIT AMPS/°C
	Row 2	J8A2-600D76-A	J8A2-601C30-A	1.64 Ω +/- 10% @ 23°C	1.21 Ω +/- 10% @ 23°C	4.74 A @ 23°C	4.74 A @ 23°C
I-PACE / X590 18-20MY	Row 1	GX73-603B26-A	GX73-648A40-A	0.86 Ω +/- 10% @ 20°C	0.70 Ω +/- 10% @ 20°C	8.65 A @ 20°C	8.65 A @ 20°C
	Row 2	J9C3-600D76-A	J9C3-601C30-A	1.48 Ω +/- 10% @ 20°C	1.02 Ω +/- 10% @ 20°C	5.40 A @ 20°C	5.40 A @ 20°C
I-PACE / X590 21MY	Row 1	GX73-603B26-A	GX73-648A40-A	0.86 Ω +/- 10% @ 20°C	0.70 Ω +/- 10% @ 20°C	8.65 A @ 20°C	8.65 A @ 20°C
	Row 2	M9D3-600D76-A	J9C3-601C30-A	1.48 Ω +/- 10% @ 20°C	1.02 Ω +/- 10% @ 20°C	5.40 A @ 20°C	5.40 A @ 20°C
Range Rover Sport / L494 18-20MY	Row 1	JK62-603B26-A	JK62-648A40-A	1.11 Ω +/- 10% @ 20°C	0.95 Ω +/- 10% @ 20°C	6.43 A @ 20°C	6.43 A @ 20°C
	Row 2	JK62-600D76-A	JK62-601C30-A	3.40 Ω +/- 10% @ 20°C	0.95 Ω +/- 10% @ 20°C	3.08 A @ 20°C	3.08 A @ 20°C
Discovery / L462 17-20MY	Row 1	HY32-603B26-A	HY32-648A40-A	0.94 Ω +/- 10% @ 20°C	0.69 Ω +/- 10% @ 20°C	8.08 A @ 20°C	8.08 A @ 20°C
	Row 2	HY32-600D76-B	HY32-601C30-B	1.81 Ω +/- 10% @ 20°C	1.04 Ω +/- 10% @ 20°C	4.67 A @ 20°C	4.67 A @ 20°C
	Row 3	HY32-600D76-A	HY32-601C30-A	1.58 Ω +/- 10% @ 20°C	0.97 Ω +/- 10% @ 20°C	5.21 A @ 20°C	5.21 A @ 20°C
Defender / L663 20MY	Row 1	L8B2-603B26-A	L8B2-648A40-A	1.38 Ω +/- 10% @ 23°C	1.06 Ω +/- 10% @ 23°C	5.57 A @ 23°C	5.57 A @ 23°C
	Row 2 Fixed	L8B2-600D76-C	L8B2-601C30-C	1.50 Ω +/- 10% @ 23°C	1.87 Ω +/- 10% @ 23°C	4.00 A @ 23°C	4.00 A @ 23°C
	Row 2 TAS	L8B2-600D76-A	L8B2-601C30-A	2.06 Ω +/- 10% @ 23°C	1.36 Ω +/- 10% @ 23°C	4.03 A @ 23°C	4.03 A @ 23°C
	Row 3	L8B2-600D76-B	L8B2-601C30-B	1.90 Ω +/- 10% @ 23°C	2.85 Ω +/- 10% @ 23°C	2.92 A @ 23°C	2.92 A @ 23°C

VEHICLE/MY	SEAT ROW	CUSHION ELEMENT PART NUMBER	SEAT BACK ELEMENT PART NUMBER	HEATER MAT RESISTANCE		HEATER MAT OPERATING CURRENT DRAW AT 13.5 VOLTS	
				CUSHION CIRCUIT Ω /°C	SEAT BACK CIRCUIT Ω /°C	CUSHION CIRCUIT AMPS/°C	SEAT BACK CIRCUIT AMPS/°C
Range Rover Evoque / L538 16-19MY	Row 1	GJ32-603B26-A	GJ32-648A40-A	1.12 Ω +/- 10% @ 20°C	0.81 Ω +/- 10% @ 20°C	6.99 A @ 20°C	6.99 A @ 20°C
	Row 2	GJ32-600D76-A	GJ32-601C30-A	1.58 Ω +/- 10% @ 20°C	1.14 Ω +/- 10% @ 20°C	4.96 A @ 20°C	4.96 A @ 20°C
E-PACE / X540 18-20MY	Row 1	GX73-603B26-A	GX73-648A40-A	0.86 Ω +/- 10% @ 20°C	0.70 Ω +/- 10% @ 20°C	8.65 A @ 20°C	8.65 A @ 20°C
	Row 2	J9C3-600D76-A	J9C3-601C30-A	1.48 Ω +/- 10% @ 20°C	1.02 Ω +/- 10% @ 20°C	5.40 A @ 20°C	5.40 A @ 20°C
Discovery Sport / L550 15-17MY	Row 1	FK72-603B26-A	FK72-648A40-A	1.25 Ω +/- 10% @ 20°C	0.96 Ω +/- 10% @ 20°C	6.00 A @ 20°C	6.00 A @ 20°C
	Row 2	FK72-600D76-A	FK72-601C30-A	1.86 Ω +/- 10% @ 20°C	1.24 Ω +/- 10% @ 20°C	4.30 A @ 20°C	4.30 A @ 20°C
Discovery Sport / L550 18-19MY	Row 1	JK72-603B26-A	JK72-648A40-A	1.25 Ω +/- 10% @ 20°C	0.96 Ω +/- 10% @ 20°C	6.00 A @ 20°C	6.00 A @ 20°C
	Row 2	JK72-600D76-A	JK72-601C30-A	1.86 Ω +/- 10% @ 20°C	1.24 Ω +/- 10% @ 20°C	4.30 A @ 20°C	4.30 A @ 20°C
Discovery Sport / L550 20MY	Row 1	K8D2-603B26-A	K8D2-648A40-A	1.13 Ω +/- 10% @ 20°C	0.81 Ω +/- 10% @ 20°C	6.96 A @ 20°C	6.96 A @ 20°C
	Row 2	JK72-600D76-A	JK72-601C30-A	1.86 Ω +/- 10% @ 20°C	1.24 Ω +/- 10% @ 20°C	4.30 A @ 20°C	4.30 A @ 20°C
New Range Rover Evoque / L551 19-20MY	Row 1	K8D2-603B26-A	K8D2-648A40-A	1.13 Ω +/- 10% @ 20°C	0.81 Ω +/- 10% @ 20°C	6.96 A @ 20°C	6.96 A @ 20°C
	Row 2	K8D2-600D76-A	K8D2-601C30-A	1.14 Ω +/- 10% @ 20°C	0.75 Ω +/- 10% @ 20°C	7.14 A @ 20°C	7.14 A @ 20°C

DTC INDEX

For a list of DTCs that could be set on this vehicle, please refer to Section 100-00. REFER to: [Diagnostic Trouble Code Index - DTC: HVAC Control Module \(HVAC\)](#) (100-00 General Information, Description and Operation).

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