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2007.0 RANGE ROVER (LM), 414-00

BATTERY AND CHARGING SYSTEM - GENERAL INFORMATION

CHARGING SYSTEM (G953327)

DIAGNOSIS AND TESTING

OVERVIEW

For battery condition indicator information: REFER to: Battery and Cables (414-01 Battery, Mounting and Cables, Description and Operation). For battery charging and testing, refer to the instructions for the equipment in use in your own workshop.

The generator operates within a "smart" system, able to allow for temperature variations and optimize battery charging.

For information on the description and operation of the system: REFER to:

Generator (414-02 Generator and Regulator - V8 S/C 4.2L Petrol, Diagnosis and Testing),
Generator (414-02 Generator and Regulator - V8 4.4L Petrol, Description and Operation),
Generator (414-02 Generator and Regulator - TDV6 2.7L Diesel, Description and Operation),
Generator (414-02 Generator and Regulator - TDV8 3.6L Diesel, Description and Operation).

INSPECTION AND VERIFICATION

1. Verify the customer concern.
2. Visually inspect for obvious mechanical or electrical faults.

Visual inspection

MECHANICAL

ELECTRICAL

MECHANICAL	ELECTRICAL
<ul style="list-style-type: none"> ▪ Generator ▪ Drive belt ▪ Drive belt tensioner ▪ Generator pulley ▪ Check the security of the generator fittings 	<ul style="list-style-type: none"> ▪ Generator ▪ Battery ▪ Starter motor ▪ Harnesses and connectors ▪ Fuses <ul style="list-style-type: none"> ▪ Battery junction box (BJB) - fuse 20E ▪ Starter motor megafuse ▪ Charge warning light function ▪ Controller area network (CAN) circuits ▪ 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. Use the approved diagnostic system or a scan tool to retrieve any diagnostic trouble codes (DTCs) before moving onto the symptom chart or DTC index.
 - Make sure that all DTCs are cleared following rectification.

SYMPTOM CHART

SYMPTOM	POSSIBLE CAUSE	ACTION
Charge warning lamp does not illuminate	<ul style="list-style-type: none"> ▪ Warning lamp/circuit - fault ▪ Generator - internal fault ▪ CAN Bus - circuit fault ▪ Engine control module - internal fault 	<ul style="list-style-type: none"> ▪ Check the warning lamp function with the ignition on and the engine off ▪ Repair the circuit as necessary ▪ Check for DTCs indicating a generator, CAN or engine control module fault
Charge warning lamp stays on/battery discharges	<ul style="list-style-type: none"> ▪ Accessory drive belt - fault ▪ Generator pulley slipping on shaft ▪ Generator - internal fault ▪ Battery cable - fault ▪ CAN Bus - circuit fault ▪ Engine control module internal fault ▪ Central junction box 	<ul style="list-style-type: none"> ▪ Check the battery and generator cables ▪ Refer to the electrical guides ▪ Check for DTCs indicating a generator fault ▪ Check the accessory drive belt condition and tension ▪ Check that the pulley does not rotate independently of the generator ▪ Check for DTCs indicating a CAN, central junction box or engine control module fault

SYMPTOM	POSSIBLE CAUSE	ACTION
Charge warning lamp intermittent	<ul style="list-style-type: none"> ▪ Accessory drive belt slipping ▪ Battery cable - fault ▪ Generator - circuit fault ▪ Generator - internal fault ▪ CAN Bus - circuit fault 	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>NOTE: Use of a power pack or boost charger may bring the warning lamp on until disconnected</p> </div> <ul style="list-style-type: none"> ▪ Check the accessory drive belt condition and tension ▪ Check the battery and generator cables refer to the electrical guides ▪ Check for DTCs indicating a generator or CAN circuit fault
Battery discharges without the charge warning lamp staying on	<ul style="list-style-type: none"> ▪ Battery - fault ▪ Battery quiescent drain ▪ Intermittent generator - fault 	<ul style="list-style-type: none"> ▪ Check the battery condition ▪ Check for battery quiescent drain ▪ Check for DTCs indicating a generator fault ▪ If no other reason for discharge can be found, check the circuit. Refer to the electrical guides
Noise (mechanical)	<ul style="list-style-type: none"> ▪ Accessory drive belt slipping 	<ul style="list-style-type: none"> ▪ Check the accessory drive belt condition and tension ▪ Disconnect the accessory drive belt and check that the generator rotates freely

DTC INDEX

NOTE:

Generic scan tools may not read the codes listed, or may read only 5-digit codes. Match the 5 digits from the scan tool to the first 5 digits of the 7-digit code listed to identify the fault (the last 2 digits give extra information read by the manufacturer-approved diagnostic system).

For a full list of Engine control module (ECM) DTCs: REFER to:

Electronic Engine Controls (303-14 Electronic Engine Controls - V8 S/C 4.2L Petrol, Diagnosis and Testing),
 Electronic Engine Controls (303-14 Electronic Engine Controls - V8 4.4L Petrol, Diagnosis and Testing),
 Electronic Engine Controls (303-14 Electronic Engine Controls - TDV6 2.7L Diesel, Diagnosis and Testing),
 Electronic Engine Controls (303-14 Electronic Engine Controls - TDV8 3.6L Diesel, Diagnosis and Testing).

PINPOINT TEST A : DENSO NON-BMS GENERATOR DIAGNOSTIC FLOW CHART

A1: MIDTRONICS BATTERY TEST

TEST
CONDITIONS

DETAILS/RESULTS/ACTIONS

PINPOINT TEST A : DENSO NON-BMS GENERATOR DIAGNOSTIC FLOW CHART

A1: MIDTRONICS BATTERY TEST

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTES:</p> <ul style="list-style-type: none"> ▪ The battery must be fully charged and any battery defects rectified before continuing with generator diagnosis ▪ The voltmeter must display readings to three decimal places (i.e. 0.001V) ▪ Ignition on is position 2 on a keyed ignition system 	
	<p>1 Using a Midtronics hand held tester or the Midtronics GR-1 diagnostic charger, carry out the "Midtronics battery test" as detailed in the battery care manual. REFER to: Battery Care Requirements (414-00 Battery and Charging System - General Information, Description and Operation).</p>
	<p>2 Record battery diagnostic result on the provided form</p>
	<p>Does the battery pass the "Midtronics battery test"?</p> <p>Yes GO to Pinpoint Test B.</p> <p>No Rectify any battery defects before continuing with generator diagnosis GO to Pinpoint Test B.</p>

PINPOINT TEST B : DENSO NON-BMS GENERATOR DIAGNOSTIC FLOW CHART

B1: GENERATOR DUTY CYCLE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE:</p> <p>The heated rear screen is timed to operate for 10 minutes, then cycle on and off dependent on external conditions. This test requires completion within this 10 minute period</p>	
	<p>1 Using the manufacturer approved diagnostic system, select Measurement Application. Select Complete Vehicle Data-logger. Select 303-00 Engine System. Select the data-logger parameter "Generator Command" to view the PWM duty %</p>
	<p>2 Connect a voltmeter to the vehicle battery</p>
	<p>3 Switch ignition state to on (engine off)</p>
	<p>4 Turn off all electrical loads e.g. (blower, radio, interior lights etc.)</p>
	<p>5 Start the engine, switch on the heated rear screen</p> <ul style="list-style-type: none"> ▪ Ensure the heated rear screen is on (see note above) and that the air conditioning system is off. ▪ Wait 90 seconds
	<p>6 Record battery voltage (V1) and generator regulator control PWM Duty %.. Using the graph, plot the battery voltage from your multi-meter (V1) and duty cycle readings from the manufacturer approved diagnostic system</p>
	<p>7 Switch off engine</p>

PINPOINT TEST B : DENSO NON-BMS GENERATOR DIAGNOSTIC FLOW CHART

B1: GENERATOR DUTY CYCLE

TEST
CONDITIONS

DETAILS/RESULTS/ACTIONS

Does the generator regulator control PWM duty alternate between 40.1% and 3% in 5 sec intervals?

Yes

GO to Pinpoint Test [C](#).

No

Use the comparison graph and instructions (below) to diagnose battery voltage (V1)

PINPOINT TEST C : CIRCUIT CHECK

C1: CIRCUIT CHECK

TEST
CONDITIONS

DETAILS/RESULTS/ACTIONS

1 Refer to the electrical circuit diagrams and check **ALT MON** and **ALT COM** circuit for short circuit to ground, short circuit to power, open circuit, high resistance

Did the circuit check pass?

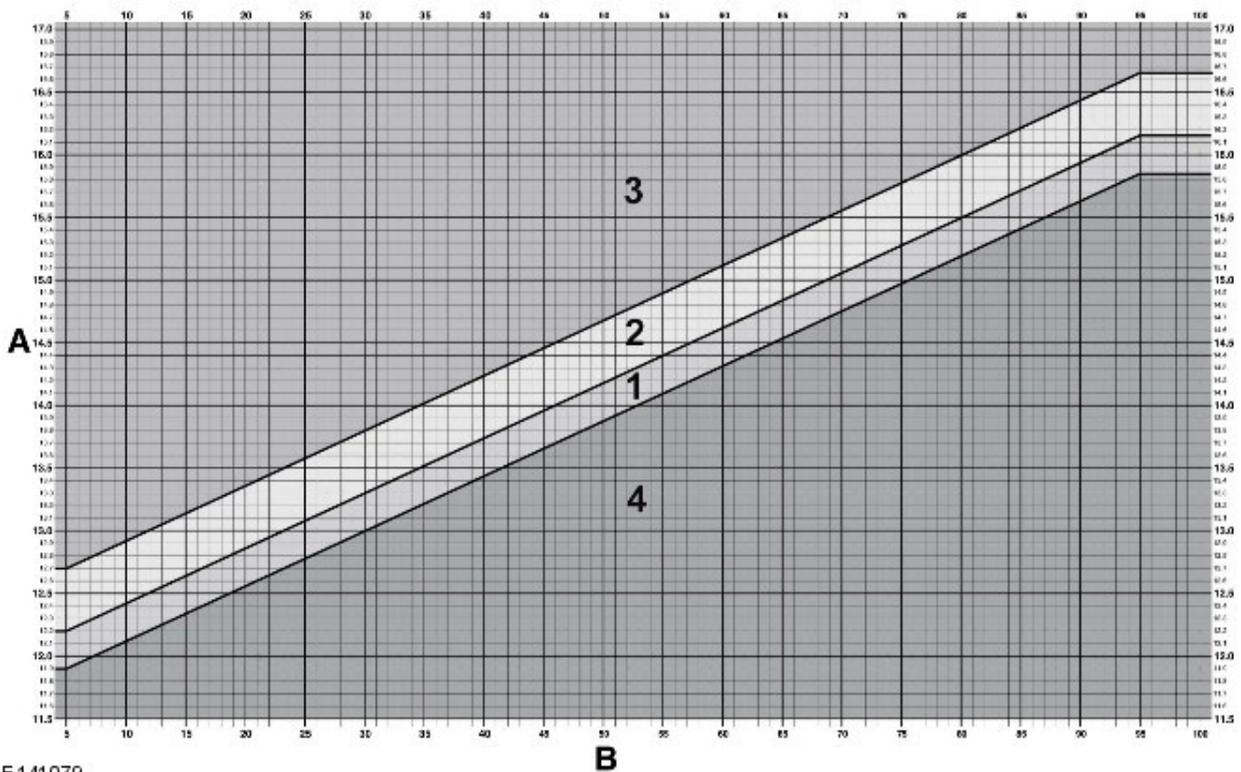
Yes

Install a new generator. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component

No

Repair the circuit as required REFER to: Wiring Harness (418-02, Description and Operation).GO to Pinpoint Test [B](#).

BATTERY VOLTAGE V1 GRAPH COMPARISON



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B

Plot on the graph the band to which battery voltage reading (**V1**) relates

To which band did the battery voltage (**V1**) apply?

Use the table below to continue diagnosis

VOLTAGE	GRAPH BAND	LINK TO TEST PROCEDURE
Voltage (V1) plotted during pinpoint test B1	Area 1 of the graph	GO to Pinpoint Test D .
Voltage (V1) plotted during pinpoint test B1	Area 2 of the graph	GO to Pinpoint Test E .
Voltage (V1) plotted during pinpoint test B1	Area 3 of the graph	GO to Pinpoint Test F .
Voltage (V1) plotted during pinpoint test B1	Area 4 of the graph	GO to Pinpoint Test G .

PINPOINT TEST D : GRAPH COMPARISON AREA 1

D1: GRAPH COMPARISON AREA 1

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	<p>1 When the voltage (V1) was compared to the graph above</p>
	<p>Did the voltage (V1) = area 1 of the graph?</p> <p>Yes The output is within the expected range. Do not replace the alternator. If customer concern is still evident contact dealer technical support</p> <p>No No further action required</p>

PINPOINT TEST E : CIRCUIT CHECKS

E1: CIRCUIT CHECKS

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	<p>1 Refer to the electrical circuit diagrams and check BATT SENSE circuit for short circuit to ground, short circuit to power, open circuit, high resistance between:</p> <ul style="list-style-type: none"> ▪ RR Sport & Discovery = generator connector C0053 and the engine junction box ▪ Range Rover = generator connector C0053 and central junction box
	<p>Did the circuit check pass?</p> <p>Yes Install a new generator. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component</p> <p>No Repair the circuit as required REFER to: Wiring Harness (418-02, Description and Operation).GO to Pinpoint Test B.</p>

PINPOINT TEST F : GRAPH COMPARISON AREA 3

F1: GRAPH COMPARISON AREA 3

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
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PINPOINT TEST F : GRAPH COMPARISON AREA 3

F1: GRAPH COMPARISON AREA 3

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 When the voltage (V1) was compared to the graph above
	<p>Did the voltage (V1) = area 3 of the graph?</p> <p>Yes</p> <p>Install a new generator. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component</p> <p>No</p> <p>No further action required</p>

PINPOINT TEST G : GRAPH COMPARISON AREA 4

G1: GRAPH COMPARISON AREA 4

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 When the voltage (V1) was compared to the graph above
	<p>Did the voltage (V1) = area 4 of the graph?</p> <p>Yes</p> <p>GO to Pinpoint Test H.</p> <p>No</p> <p>Carry out the diagnostic once more GO to Pinpoint Test B . If customer concern is still evident contact dealer technical support</p>

PINPOINT TEST H : REGULATOR CONTROL DUTY CYCLE

H1: REGULATOR CONTROL DUTY CYCLE

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Using the generator regulator control duty cycle reading PWM Duty %
	<p>Is the generator regulator control PWM duty cycle stuck at 100%?</p> <p>Yes</p> <p>GO to Pinpoint Test I.</p> <p>No</p> <p>GO to Pinpoint Test J.</p>

PINPOINT TEST I : CIRCUIT CHECKS 1

I1: CIRCUIT CHECKS 1

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
	1 Refer to the electrical circuit diagrams and check ALT MON and ALT COM circuits for short circuit to ground, short circuit to power, open circuit, high resistance
	<p>Did the circuit checks pass?</p> <p>Yes</p> <p>Install a new generator. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component</p> <p>No</p> <p>Repair the circuit as required REFER to: Wiring Harness (418-02, Description and Operation).GO to Pinpoint Test B.</p>

PINPOINT TEST J : CIRCUIT CHECKS 2

J1: CIRCUIT CHECKS 2

TEST CONDITIONS	DETAILS/RESULTS/ACTIONS
<p>NOTE:</p> <p>The heated rear screen is timed to operate for 10 minutes, then cycle on and off dependent on external conditions. This test requires completion within this 10 minute period</p>	
	<p>1 Connect a voltmeter to the vehicle battery</p>
	<p>2 Switch ignition state to on (engine off)</p>
	<p>3 Turn off all electrical loads e.g. (blower, radio, interior lights etc.)</p>
	<p>4 Start the engine, switch on the heated rear screen</p> <ul style="list-style-type: none"> ▪ Ensure the heated rear screen is on (see note above) and that the air conditioning system is off.
	<p>5 Voltage measurement</p> <ul style="list-style-type: none"> ▪ Measure the voltage drop between the generator body and battery negative terminal and record the value (V2)
	<p>6 Voltage measurement</p> <ul style="list-style-type: none"> ▪ Refer to the electrical circuit diagrams and measure the voltage drop between the generator B+ and battery positive terminal and record the value (V3)
	<p>Does the voltage drop value (V2) or (V3) = less than 0.3 Volts ?</p> <p>Yes</p> <p>Install a new generator. Refer to the warranty policy and procedures manual, or determine if any prior approval programme is in operation, prior to the installation of a new module/component</p> <p>No</p> <p>Switch off Engine. Refer to the electrical circuit diagrams and check the generator, battery and engine, power and ground circuits for loose or corroded connections. Repair the circuit as required REFER to: Wiring Harness (418-02, Description and Operation).GO to Pinpoint Test B.</p>

Y11YXRvbjM7MjAyMDwNS0wOVQxODc1ODo1Ml44NTIwOzg2LjE2My41NS4yODR0QUxMTUFNMjM4OTI3NTUSNQ==