

in the cell hole. A flashlight may be required to see the electrolyte level on this type of battery.



CAUTION: DO NOT overfill.

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

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

CHARGING SYSTEM TEST AND DIAGNOSIS

For all vehicles, refer to the Charging System - Diagnosis and Testing in section 414-00 of the Workshop Manual.

VEHICLE QUIESCENT CURRENT TESTING

NOTE: On vehicles fitted with a Battery Monitoring System (BMS), the diagnostic routine for quiescent drain testing in the approved diagnostic system should be utilized.

NOTE: 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.

NOTE: The battery drain should be measured using an approved diagnostic system or a Digital Multi-Meter (DVOM).

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 Quiescent Drain in section 414-00 of the Workshop Manual.

NOTE: 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 diagnostic system with current probe or Digital Multi-Meter (DVOM) with current probe.

METHOD OF MEASUREMENT

Using an Approved Diagnostic System

1. Switch off all electrical loads and ensure that the ignition is off.
2. Connect the current probe to the approved diagnostic system.
3. Calibrate the probe.
4. Install a clamp around the battery lead/junction box lead.
5. Go to the Quiescent Current Testing section.

Using a Digital Multi-Meter (DVOM)

NOTE: Do not use an in-line DVOM to measure the quiescent drain on vehicles fitted with an electronic throttle. The current exceeds the maximum amount the fuse in the DVOM is capable of handling.

1. Switch off all electrical loads and ensure that the ignition is off.
2. Connect the current probe to the DVOM.
3. Calibrate the probe.
4. Install a clamp around the battery lead/junction box lead.
5. Go to the following Quiescent Current Testing section.

QUIESCENT CURRENT TESTING

1. Switch ignition to 'on' or select ignition mode in keyless vehicles and switch to 'off' (do not crank).
2. Remove key from ignition switch (where applicable).
3. Open and latch all doors, hood and luggage compartment lid.
4. Lock the vehicle using the remote function on the remote handset. (Single lock only to avoid volumetric alarm arming).
5. Remove any other potential electrical drains such as accessories plugged into accessory sockets.
6. Record the amperage readings after the shutdown period. The model specific Amperage readings for quiescent drain are referenced in Quiescent Drain in section 414-00 of the Workshop Manual

7. Record the final reading on the battery report form Appendix B.

NOTE: 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:

- Many modules take a considerable time to power down. Each time a fuse is removed and re-fitted, the quiescent drain current may take an extended period of time to return to normal (typically up to 45 minutes).
- 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.

APPENDIX A 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 or if this time constraint is unacceptable due to circumstances, then conduct the charge strip removal process.

Part 1 - Surface Charge Removal

NOTE: Before carrying out a battery test you must ensure that there is no battery surface charge present.

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

- In the case of on-vehicle testing, the battery must be isolated from the vehicle by removal of the battery negative (-) cable from the battery terminal before the measurement is taken unless the vehicle has a transit relay fitted or is in transit mode.

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 using one of the following methods:

1. If 24 hours have passed since the last time the engine was run or the battery charged, proceed to 'Part 2 - Battery Test'.
2. Turn on the ignition. Switch on the headlamps on high beam for a minimum 3 minutes.
3. Switch off the headlamps. For vehicles tested after the transit relay has been removed, disconnect the battery by removal of the negative (-) cable. Vehicles with a transit relay fitted or with a low current transport mode enabled do not need to have the battery disconnected.
4. Wait a maximum of 5 minutes before recording test results for any battery measurements.

Part 2 - Battery Test

NOTE: The battery surface charge must be removed before this test in accordance with the procedure in Part 1 above. Ensure that the battery terminal connectors are clean. When connecting the Midtronics testing equipment, connect the RED clip to the positive (+) battery terminal first, and then connect the BLACK clip to the negative (-) battery terminal. Rock the clips backward and forward to ensure a good connection to the battery.

NOTE: Midtronics 393, 394, 493 and 494 testers must not be used to test AGM batteries as these testers are not capable of correctly testing AGM batteries and can give an incorrect result. For AGM battery testing use the EXP1080 tester or the GR1 Diagnostics charger.



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

1. Attach the Midtronics tester to the battery.
2. Follow the instructions on the tester to test the battery. Ensure the correct battery type and size is selected.
3. Perform the action based on the tester results (see table below).
4. Enter the readings and test code obtained on the Battery Report Form (Appendix B) or equivalent which records as a minimum the technician's name, Vehicle Identification Number (VIN), Date of check, Midtronics code and Battery Voltage from the Midtronics tester.

At the end of the test, the battery negative (-) cable should be re-attached to the battery terminal.

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.

APPENDIX B : BATTERY REPORT FORM - IN SERVICE BATTERIES ONLY

Battery and Charging System - General Information - Quiescent Drain

Description and Operation

QUIESCENT DRAIN - TYPICAL VALUES

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

Land Rover Quiescent Drain Values

MODEL	SHUT DOWN PERIOD (minutes)	TYPICAL VALUES BATTERY DRAIN (mA)
Range Rover (LM) - Up to 2009MY	30	16.0 - 18.0
Range Rover (LM) - From 2010MY	20 (after lock/arm condition) ²	<30
	33 (unlocked)	<30
Range Rover Sport (LS) - Up to 2007MY	20	<22
Range Rover Sport (LS) - From 2007MY to 2010MY	30	<25
Range Rover Sport (LS) - From 2010MY	3 (after lock/arm condition) ²	<30
	33 (unlocked)	<30
Range Rover Evoque (LV) - From 2012MY	20 (after lock and arm condition)	<20
Discovery 3/LR3 (LA) - Up to 2007MY	20	<22
Discovery 3/LR3 (LA) - From 2007MY to 2010MY	30	<25
Discovery 4/LR4 (LA) - From 2010MY	3 (after lock/arm condition) ²	<30
	33 (unlocked)	<30
Freelander 2/LR2 (LF) - From 2007MY	35 (single locked or unlocked)	<23.6
	12 (double locked)	<23.6
Freelander (LN) - Up to 2007MY	10	24-25 - without Becker Navigation system
	10	27-28 - with Becker Navigation system
Defender (LD) - 1998MY to 2007MY	30	<21
Defender (LD) - from 2007MY	<30	<30
Discovery Series 2 (LT)	30	<30

NOTE:

- The total current drain will be higher if certain approved accessories are fitted (for example: tracker, trailer module, etc.)
- Applies to vehicles without Tire Pressure Monitoring System (TPMS). Vehicle shut-down period with TPMS is approximately 15 minutes.