



BATTERY CARE MANUAL

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INTRODUCTION

This publication sets out, for the benefit of importers and dealers / retailers worldwide, requirements for the care and maintenance of batteries, from the vehicle's dispatch from the factory to its hand-over to the customer.

The clearly laid out and illustrated sections guide importers and dealers / retailers through each stage of the vehicle's receipt, storage, pre-delivery and customer hand-over. This publication can be used as a guide to the handling and care of batteries in service. It is vital to appreciate that unless each process is rigorously applied on all vehicles, the customer will receive a vehicle with a battery which will not provide a satisfactory service life.

It is very important that test results quoted throughout this publication are adhered to. If they are applied incorrectly batteries could be scrapped unnecessarily. Refer to the battery testing section for detailed information.

It is equally important therefore to note the following key points:

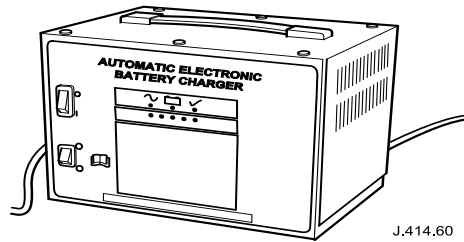
- All new vehicles leave the factory with either a transit relay installed and/or, on certain models, have a transit mode programmed into the vehicle control modules. The transit relay must be removed and the transit mode disabled (where applicable) using an approved diagnostic system, **NOT MORE THAN 24 HOURS** before the customer takes delivery.
- The battery will be damaged if it is allowed to discharge over a number of weeks / months, or is left in a discharged state for a lengthy time period. For this reason the battery must be tested / re-charged if necessary every month, and **MUST BE** re-charged after every three month period of storage. Refer to the vehicle storage manual and update the vehicle history sheet.
- Under no circumstances should the battery be disconnected with the engine running because under these conditions the alternator can give a very high output voltage. This high transient voltage will damage the electronic components in the vehicle. Loose or incomplete battery connections may also cause high transient voltage.
- On vehicles with conventional ignition keys, these must not be left in the ignition lock barrel when the transit relay has been removed, otherwise quiescent current will increase and the battery will discharge more rapidly.
- On vehicles with Smart Keys:
 - Vehicles with a Smart Key docking station: Do not leave the smart key in the docking station. This applies to vehicles with or without a transit relay fitted.
 - Vehicles without a Smart Key docking station: Smart keys must not be left in the vehicle once the transit relay has been removed. Leaving the smart key in the vehicle will keep the systems awake and drain the battery.

Both importers and dealers have a responsibility to ensure that only vehicles having a fully satisfactory battery may be processed further through the distribution selling chain.

EQUIPMENT (MINIMUM STANDARD)

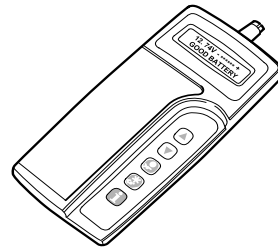
Existing minimum standards requirements are presently specified as follows:

Traction Battery Charger (or similar stand alone charger)



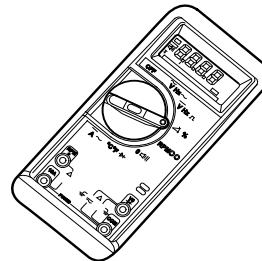
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Midtronics Tester 3.5 Digit



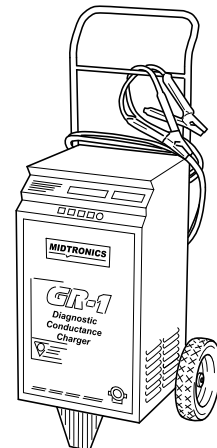
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Digital Multi-Meter or Digital Volt-Ohm Meter (DVOM)



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Midtronics Diagnostic Charger



M010363

HEALTH AND SAFETY PRECAUTIONS

WARNING: BATTERY CELLS CONTAIN SULPHURIC ACID AND EXPLOSIVE MIXTURES OF HYDROGEN AND OXYGEN GASES. IT IS THEREFORE ESSENTIAL THAT THE FOLLOWING SAFETY PRECAUTIONS ARE OBSERVED.

WARNING: Batteries emit highly explosive hydrogen at all times, particularly during charging. To prevent any potential form of ignition occurring when working in the vicinity of a battery:

- *Do not smoke when working near batteries.*
- *Avoid sparks, short circuits or other sources of ignition in the battery vicinity.*
- *Switch off current before making or breaking electrical connections.*
- *Ensure battery charging area is well ventilated.*
- *Ensure the charger is switched off when: a) connecting to a battery; b) disconnecting from the battery.*
- *Always disconnect the ground cable from the battery terminal first and reconnect it last.*

WARNING: Batteries contain poisonous and highly corrosive acid. To prevent personal injury, or damage to clothing or the vehicle, the following working practices should be followed when topping up, checking electrolyte specific gravity, removal, refitting or carrying batteries:

- *Always wear suitable protective clothing (an apron or similar), safety glasses, a face mask and suitable gloves.*
- *If acid is spilled or splashed onto clothing or the body, it must be neutralized immediately and then rinsed with clean water. A solution of baking soda or household ammonia and water may be used as a neutralizer.*
- *In the event of contact with the skin, drench the affected area with water. In the case of contact with the eyes, bathe the affected area with cool clean water for approximately 15 minutes and seek urgent medical attention.*
- *If battery acid is spilled or splashed on any surface of a vehicle, it should be neutralized and rinsed with clean water.*
- *Heat is generated when acid is mixed with water. If it becomes necessary to prepare electrolyte of a desired specific gravity, SLOWLY pour the concentrated acid into water (not water into acid), adding small amounts of acid while stirring. Allow the electrolyte to cool if noticeable heat develops. With the exception of lead or lead-lined containers, always use non-metallic receptacles or funnels. Do not store acid in excessively warm locations or in direct sunlight.*

WARNING: Due to their hazardous contents, the disposal of batteries is strictly controlled.

- *When a battery is scrapped, ensure it is disposed of safely, complying with local environmental regulations. If in doubt, contact your local authority for advice on disposal facilities.*

DETERMINING BATTERY CONDITION

The Midtronics hand-held tester or the Midtronics GR-1 Diagnostic Charger are the preferred tools to assess battery condition for vehicles in service. The test results should be recorded on the In-Service Battery Report Form (See page 10).

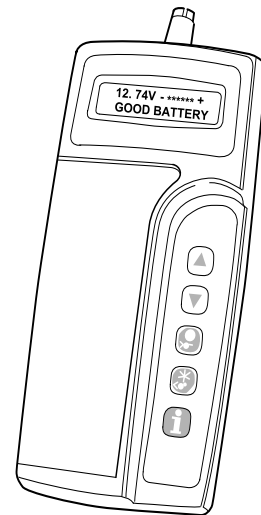
Midtronics Testing

NOTE: 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: When connecting to the battery negative terminal, take care not to damage the Battery Monitoring System (BMS) wires (where fitted).

CAUTION: DO NOT connect the tester to any other circuit or chassis point.

- 1 Turn off the ignition, remove the ignition key or smart key from the vehicle and close all doors.
- 2 Attach the Midtronics tester to the battery.
- 3 Use the 'arrow' buttons to scroll to the battery's labelled Cold Cranking Amps (CCA) rating.
- 4 Press the 'Test' button that corresponds to the correct battery temperature. For example:
 - If the temperature is above 0°C (32°F) press the 'Sun' button.
 - If the battery temperature is below 0°C (32°F) press the 'Ice crystal' button. Perform the action based on the tester results (see table below).
 - If the result is 'Replace Battery', 'Bad Cell Battery' or 'Unable To Do Test', remove the battery negative lead and repeat the test.
- 5 Press the 'Information' button to view the test code.
 - Enter the readings and test code obtained on the In Service Battery Report Form.



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TESTER RESULTS

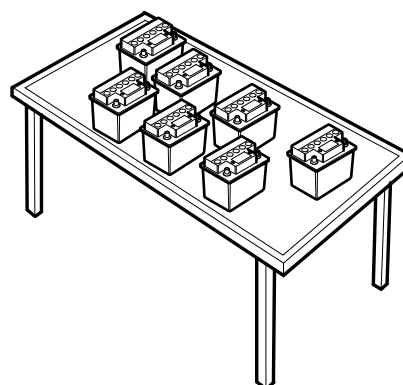
TESTER RESULTS	ACTION
GOOD BATTERY	Return to service.
GOOD RE-CHARGE	Fully charge battery and return to service.
CHARGE AND RE-TEST	Fully charge battery. Remove surface charge. Re-test battery. If same result replace battery.
REPLACE BATTERY OR BAD CELL BATTERY	Verify surface charge removed. Disconnect 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.

BATTERY CHARGING AND MAINTENANCE

BATTERY CHARGING

It is essential that a suitably ventilated defined area exists in each dealership / retailer for battery charging. Likewise, an area should be allotted for scrap batteries, and clearly indicated as such. It is recommended that dealers / retailers always have fully charged batteries ready for use. However the battery **MUST BE** tested and charged if necessary every month, and charged after three months irrespective of any test.

CAUTION: Batteries must be re-charged after a maximum of 3 months storage (see Storage History sheet in the New Vehicle Storage Manual).



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CAUTION: It is very important that when charging batteries using the traction charger or other stand-alone chargers that the switch selector on the charger is selected for the correct type of battery. If the wrong switch is selected the result would be a battery that is not charged fully and / or overheating can occur. Follow the manufacturers operating instructions.

- 1 To bring a serviceable but discharged battery back to a fully charged condition proceed as follows:
 - Check and if necessary top-up the battery electrolyte level (see page 6)
 - Charge the battery using the Midtronics GR-1 Diagnostic Charger (USA) or Traction Charger (all other markets).

NOTE: When using the Midtronics GR-1 Diagnostic Charger, automatic mode must always be used. After charging and analysis, the GR-1 charger may display 'Top-Off Charging', Hit STOP To End. Do not stop charging until the current falls to to 5A or less, otherwise the battery will not be fully charged.

Example of GR-1 display:

13.3V	9.4A	Top-Off
Hit STOP To End		AH: 23.1

BATTERY REPLACEMENT

If it is determined that a battery requires replacement, always refer to the appropriate section of the workshop manual for instructions on removing the battery from the vehicle.

On vehicles fitted with a Battery Monitoring System (BMS), the BMS module must be reset following the installation of a new battery. The BMS module reset procedure must be performed using an approved diagnostic system.

CHECK/TOP-UP BATTERY ELECTROLYTE

WARNING: BEFORE CHECKING AND TOPPING-UP THE BATTERY ELECTROLYTE, REFER TO THE HEALTH AND SAFETY PRECAUTIONS ON PAGE 3.

Check to ensure the battery is of a type suitable for topping up. These type of batteries will have cell plugs visible on the top face of the battery or a removable access panel to allow access to the cells.

On batteries with a clear or opaque case and level marks, check the electrolyte level by visual inspection of the maximum level indicator mark on the battery casing indicating adequate level above the battery separators.

On batteries with black cases, remove the cell plugs or access panel and ensure the electrolyte level is level with the indicator 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 batteries are sealed and therefore cannot be topped up.

CHARGING SYSTEM TEST AND DIAGNOSIS

NOTE: On vehicles fitted with a Battery Monitoring System (BMS), the 'Voltage Reading Under Load' test below is not applicable and may give misleading results.

On vehicles with a BMS, run the automated diagnostic routine using an approved Jaguar diagnostic system to test the power supply components.

VOLTAGE READING UNDER LOAD @ 2000 RPM

- 1 Set a Digital Multi-Meter (DVOM) to 0 - 20 DCV range.
- 2 Connect the RED positive (+) meter lead to the battery positive (+) terminal post.
- 3 Connect the BLACK negative (-) meter lead to the battery negative (-) terminal post.
- 4 Start the vehicle's engine and leave to idle for 3 minutes.
- 5 Switch on electrical loads:
 - Heated front and rear screens.
 - Headlamps on high beam.
 - Climate control fan on full speed.
- 6 Increase the engine speed to 2000 RPM.
- 7 When the RPM has remained stable for a few minutes, read the voltage on the DVOM.
- 8 Enter the reading obtained on the applicable Battery Report Form.

VEHICLE QUIESCENT CURRENT TESTING

NOTE: On vehicles fitted with a Battery Monitoring System (BMS), the diagnostic routine for quiescent drain testing in the approved Jaguar 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 the approved Jaguar diagnostic system or a Digital Multi-Meter (DVOM). A procedure for quiescent drain measurement using the diagnostic system is available in the Diagnosis and Testing section of the Workshop Manual. The vehicle should be in the locked/armed state (for example vehicle alarm fully armed), all doors, engine and luggage compartment lids are closed or 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 Appendix A).

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 Jaguar diagnostic system with current probe
- Digital Multi-Meter (DVOM) with current probe.

METHOD OF MEASUREMENT

Using an Approved Jaguar Diagnostic System

- 1 Switch off all electrical loads and ensure that the ignition is off.
- 2 Connect the current probe to the approved Jaguar 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 (for example XK8 1997MY onwards). 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 Close or latch all doors, hood and luggage compartment lid.
- 4 Lock the vehicle using the remote function on the remote handset.
- 5 Remove any other potential electrical consumers.
- 6 Record the amperage readings after the shutdown period referenced in Appendix A.
- 7 Record the final reading on the applicable battery report form.

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.*

BATTERY REPORT FORM

GENERAL INFORMATION (Note: Mandatory fields are shown as shaded and must be filled in)									
Customer's Name:				Dealer/Retailer Code:					
Repair Order Number:					Customer Signature:				
Repair Order Date:					Battery Date Code:				
Technician's Name:				No. of Battery Charges:					
Vehicle Model:				Technicians Name:					
VIN (last 6/8 digits):								Technicians Signature:	
Give a detailed description of the symptoms experienced by the customer (attach a separate sheet if necessary)									
DIAGNOSTICS (Battery Testing)									
1. Loose battery clamps	YES			NO		8. Quiescent drain (page 8)			mA
2. Loose hold down clamps	YES			NO		9. Voltage reading under load @ 2000 rpm HFS/HRW on, - High beam on, - Heater fan on full speed (See page 7)			V
3. Corroded terminal/posts	YES			NO					
4. Physical damage/leaks	YES			NO					
5. Low electrolyte	YES			NO		11. Vent tube fitted correctly:	YES	NO	
6. FEAD belt tension	OK			NOT OK		Comments:			
7. Midtronics Test									
Code before charge									
Code after charge									
- If 'good & re-charge', charge for an additional 24 hours and re-test									
- If 'charge & re-test' for both before and after 24 hour charge, replace battery									
- Replace battery only if 'replace battery', 'bad cell' or 'charge & re-test' has been displayed twice.									

APPENDIX A

QUIESCENT DRAIN - TYPICAL VALUES

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

Jaguar Values

Model	Shutdown Period (minutes)	Typical Values Battery Drain (mA)
XJS 3.2	60	<30.0
Sovereign 3.2	60	<37.3
XJ6 4.0	60	<38.6
XJS	60	<43.9
XJ6 (X300)(95 MY)	60	<43.0
XJ8 (X300)	60	<30.0
XK8 (X100)	60	<30.0
S-Type (X200)	60	<30.0
X-Type (X400)	30	<30.0
XJ6 (X350)	40	<30.0
XJ8 (X350)	40	<30.0
XK (X150)	3 (after lock/arm condition) ²	<30.0
	33 (unlocked)	<30.0
XF(X250)	3 (after lock/arm condition) ²	<30.0
	33 (unlocked)	<30.0
XJ (X351)	3 (after lock/arm condition) ²	<30.0
	33 (unlocked)	<30.0

NOTE:

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