

Mark 1 conversion to leisure batteries

Introduction

“Original” type batteries for coaching stock are increasingly expensive (£1,250 per vehicle at 2014 prices), have high maintenance requirements (regular topping up), and use 12 individual cells with numerous connections to maintain.

They are found in two main types – “BRA1” and “BRA2” and equivalents, of nominally 235 amp-hour and 365 amp-hour capacity respectively. BRA1 types have two terminals, and BRA2 types have four.

“Leisure” type batteries are considerably cheaper (typically £300 per vehicle as of December 2016), are available from many suppliers, have minimal maintenance requirements, and can be changed in a few minutes if flat or faulty. Manual handling is safer as there are only one-sixth as many units to handle, and they include carrying handles. Their typical capacity is 190 amp-hours. Although the expected life is shorter, the overall cost per year is less, and the maintenance is also reduced.

This document describes the procedure to convert a vehicle from “Original” type BRA1 batteries to “Leisure” type batteries.

Materials

(correct as at 15/01/2017)

- 2 x Xplorer 190Ah batteries
<http://www.alpha-batteries.co.uk/leisure-batteries/190-ah-xplorer-leisure-battery/>
- 2 x pairs of battery terminals
<http://www.ssldieselparts.co.uk/battery-terminals-stud-type-terminal-p-386.html>
- 25mm² PVC insulated hi-flex cable, approx 1m each of red and black
<http://www.ebay.co.uk/itm/120783244707>
<http://www.ebay.co.uk/itm/120783244194>
- 4 x M8x30 stainless bolts to connect to existing battery straps; also to replace existing bolts in clamps
<http://www.ebay.co.uk/itm/160804543604>
- 8 x M8 stainless nylocs for above, plus battery terminals
<http://www.ebay.co.uk/itm/150869240033>
- 12 x M8 stainless washers
<http://www.ebay.co.uk/itm/150802639052>
- 8 x 25mm²/8mm copper lug tube terminals
http://www.crimpterminals.co.uk/copper-lug-terminals/copper-lug-tube-terminal-25mm/prod_416.html
or <https://www.ebay.co.uk/itm/311795950640>
- 8 x 10mm stainless EPDM rubber-lined P clips
<https://www.ebay.co.uk/itm/222425638139>
- 8 x #10x1" stainless flange-headed self-tappers to fix P-clips
<http://www.ebay.co.uk/itm/361063732473>
- Insulated 13mm spanners (two required):

<http://www.ebay.co.uk/itm/372044776639>

- Crimp tool

<https://www.ebay.co.uk/itm/182094102867>

Note ebay-sourced parts are liable to change. Alternative parts to be of equivalent specification. In particular, stainless fasteners to be used throughout.

Tools

- 13mm spanners and/or ratchet
- Crimp tool
- Load ('drop') tester

Removal of old batteries

Mark the positive and negative ends of the battery box clearly inside both battery boxes with a paint pen or other suitable marker.

Disconnect and remove all the old cells, leaving only the connections to each bank in place. Any cells believed scrap are to be marked with an "X" and placed for collection by an approved contractor. Serviceable cells are to be stored undercover until required. Retain the connecting links in case of future need.

Ensure that the battery box is sound and free from debris. Repaint the interior if necessary.

Fitting of new batteries

Fit one battery in each box. Mark both batteries with the date fitted using a paint pen or similar.

Fit one negative clamp and one positive clamp to each battery, discarding the original clamp securing nuts and bolts, replacing with the stainless bolts and nylocs. Grease all terminals, nuts, bolts and washers thoroughly before assembly.

Fabricate the connecting cables to suit (typically 500 mm long each) with crimp connectors on each end.

Secure one end of each cable to the battery clamps with the stainless nyloc nuts and stainless plain washers, using plenty of grease. Secure the other end of each to the remaining original main cable with the stainless nuts, bolts and washers. Use the penny washers either side of the original main cable lugs if they are the original lead type to spread the load.

Secure the cables to the rear of the battery box using one P clip and self-tapper near to each end of each cable. Ensure that the cables are secured without being under tension.

Checking

Ensure that all nuts and bolts are tight.

Measure the voltage at the main fusebox, and ensure that the polarity is correct according to the '+' and '-' markings. The voltage should be approximately 25 volts. If not, check whether one battery is reversed (the voltage will be approximately zero) or both are reversed (the voltage will be approximately -25 volts).

Perform a load test for 5 seconds across each battery, clamping the tester to the original cables. The battery voltage should drop by approximately 1 volt using a 100 amp load tester. This will prove that the electrical connections are sound.

Refit the battery box covers. It will probably be necessary to remove the thin wooden strip running across the lower battery box cover. Ensure that no screws are left protruding which could puncture the battery.

Maintenance

This type of battery should never need topping up. The most important maintenance is to ensure that they are never run completely flat.

The only maintenance required on exam is a 'load' test, and a visual check that the green indicator ball is visible.

Use a 'load' tester to diagnose faulty batteries. If in doubt, swap both batteries on the vehicle, and recovering the two for recharge and testing. Avoid mixing batteries of different ages wherever possible.

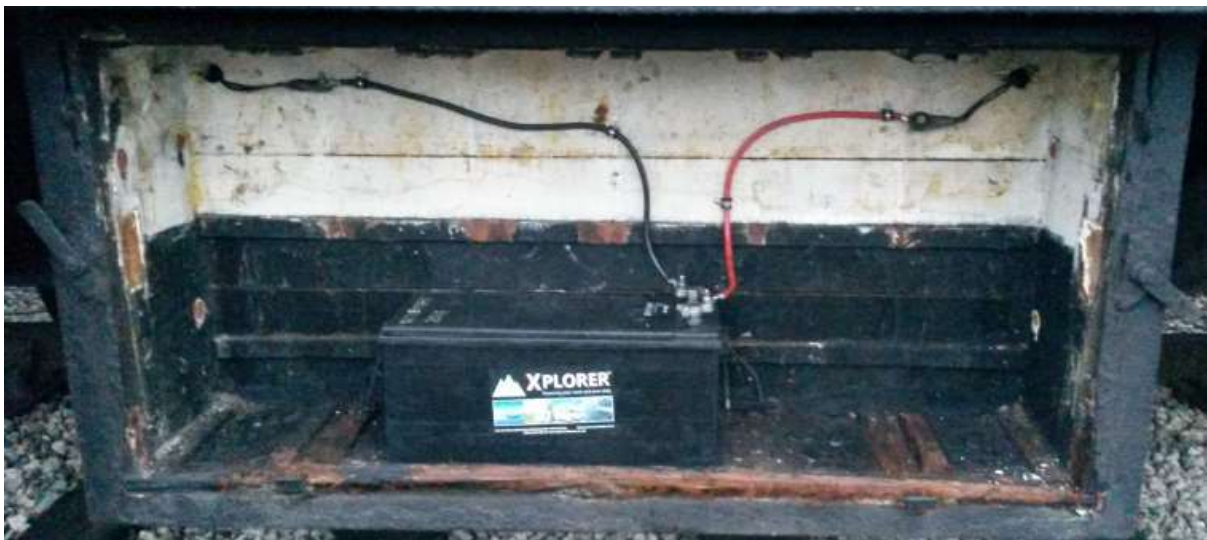
BRA2 ("four post") type batteries

These may also be converted to leisure batteries, using a pair of leisure batteries in each battery box to achieve a comparable capacity. Connect both battery negative terminals to the main negative terminal, and both battery positive terminals to the main positive terminal. i.e. each battery box contains two batteries in parallel.

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Below: end result. Note cables are secured to the rear of the battery box.



14/11/2017. Updated P clip part number; extra crimp terminal part number; added crimp tool (not tried)