

LGB “Porter” Battery Conversion with Loco Remote

by Paul Betts

I follow a handful of groups of what I’d call like-minded modellers online and repeatedly see queries regarding the conversion of various proprietary locomotives to battery and radio control.

The reasons for this are many but the favourites are:

1. to avoid needing to have electrical power outdoors
2. to avoid needing to clean the track if you do have live track
3. to avoid complex wiring for sections and reverse loops
4. to run with steam locomotives
5. to achieve true remote control
6. for true switch on and go running

I’ve converted several locomotives so far, from a Bachman Consolidation to an IP Punch – each using similar but increasingly modern equipment. The complexity ranges similarly, from full synchronised sound and smoke to simple (proportional) forwards and reverse.

For this project, I’m going for simple and using an LGB “Porter” locomotive that was picked up second hand at a show. It was in a fairly sorry state when I got it but did run using an old LGB power pack. The point of the exercise was to introduce my 5 years old grandson to his own engine - seeing how much fun he had with a circuit on the patio sealed the deal that he’d be allowed main line running rights. The line however is unpowered, with a reverse loop and doubtful electrical continuity. I’m using a “Loco Remote” receiver and controller for this conversion as it is small and self-contained.



To do this yourself, you will only need a cross-head screwdriver to dismantle the locomotive, a drill with 5mm bit, plus a small soldering iron, solder and flux. Some UHU type glue will be useful.

A full list of items to buy is at the end.

1. The Donor Loco

This is an LGB “Porter” 0-4-0. It is a derivative of the LGB Toy Train locomotives, so an Otto, Casey or Daisy are all very similar in construction. My locomotive came with a 4 wheel tender that appears to have once had a sound unit – it was long gone but reports are that the sound itself was uninspiring to say the least. Not to worry, the tender is a fallback if I can’t find enough space in the locomotive for batteries.

There was damage to the front end of the locomotive, it was missing the entire front buffer beam and left hand cylinder but the valve gear was intact and the motor ran. It was generally scruffy but with a bit of coaxing and cleaning the skates the mechanism was proven, eventually running so fast it wouldn’t negotiate R1 curves at full speed.

2. Strip Down

First job was to dismantle everything. The tender came apart with four screws underneath and the coal bunker clipped off the top. There was nothing else to do with the tender so it was scrubbed clean in warm soapy water, the action bringing off decals that had been added in a previous life.

Next the locomotive. Two screws between the cylinders released what was left of the front buffer beam, then another pair released the smoke box and boiler, along with the saddle tank. Carefully wiggling the various pieces of pipework separated the parts, then the wires for the headlamp and cab light are unplugged from the chassis. The chimney simply unscrews and the saddle tank is held on with four screws under the lower edge. The cab is released via another four screws under the floor.

To release the ballast weight from the saddle tank there is a single screw under the dummy water filler – it may need a firm pull to remove (mine was glued on).

The ballast in the boiler is in two pieces. I left the smaller piece in place but removed the larger part. I had to snip the wires to the cab lamp to free the ballast, the lamp then slid out. All the parts got the warm soapy water treatment as per the tender. The only part not submerged was the chassis as I wanted to keep the motor dry.



3. Maintenance and Repair

This was quite simple. Once everything was clean and dry, to screws opened the top of the motor block revealing the motor and gearboxes without dismantling anything else. All that was necessary here was to redistribute the grease onto the worms. The lid can go back on for now.

The internet found me a supplier for a replacement cylinder and front buffer beam. These came from a supplier in Germany and the postage cost was higher than the parts themselves but needs must.

The cylinder was glued onto the steam chest with high viscosity 'superglue'. This is the only glue I've found will hold LGB plastic parts together – usual mekpak doesn't work and epoxy is too hard.

For the front buffer beam I purchased an Otto unit rather than the Porter version as I wanted to modify it with a real wood beam – the Otto part has stronger mountings than the Porter. This will screw in place later once the boiler has been replaced – it hides the boiler retaining screws.

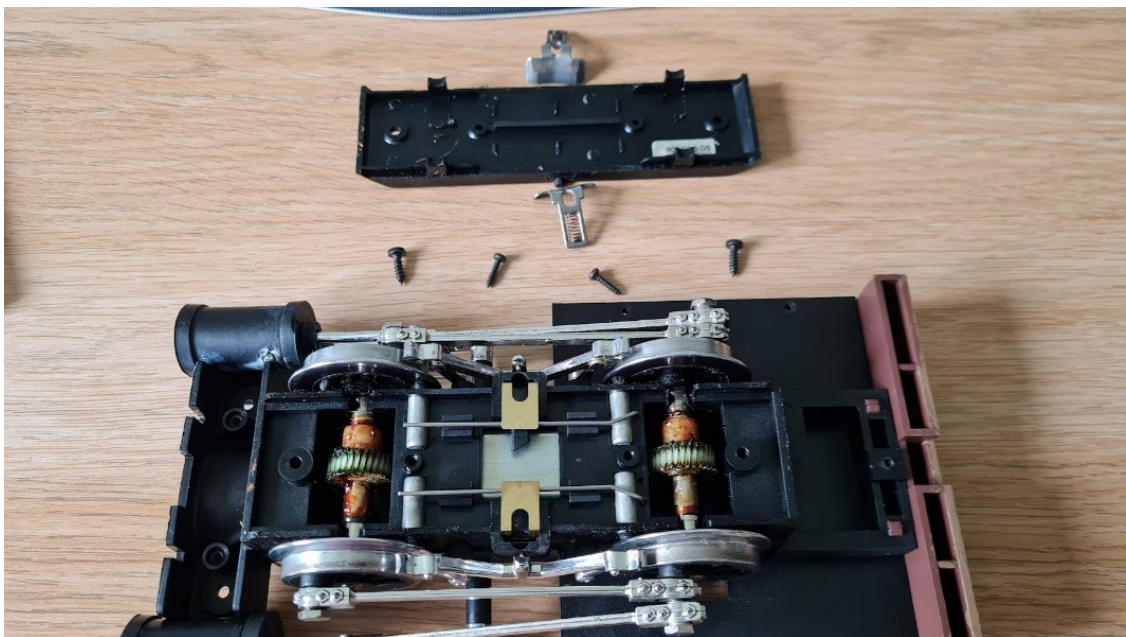
4. Preparatory Updates

To get the locomotive ready for conversion the first task is to remove the track pickups. On LGB locomotives there are usually skates between the wheels and plunger pickups on the backs of the driving wheels. On newer locomotives these can be simply disconnected if you don't want to further disassemble anything, but the Porter has a self-contained motor block so needs the bottom cover removing so the work can be done. I've removed the skates and plungers in all my conversions anyway, if only to reduce the drag they all impart on the locomotive.

For the Porter, lay the chassis on its back and remove the four screws holding the base on the motor block. There are two sizes of screw, larger ones at the ends with smaller towards the centre. Lift the base clear – the skates may come with it, else lift them clear. There is a small spring in each that should come along too. There are two brass angled pieces under each skate, these too can be lifted clear.

This leaves two rigid wires that are resting on the four wheel plungers. The wires can be rotated clear enough to extract the plungers, then the wires returned to their original positions and the base replaced and screwed down.

This method avoids disturbing the axles and their gears meshing with the worms – important as the quartering must remain correct or the valve gear will bind when you try to run later.

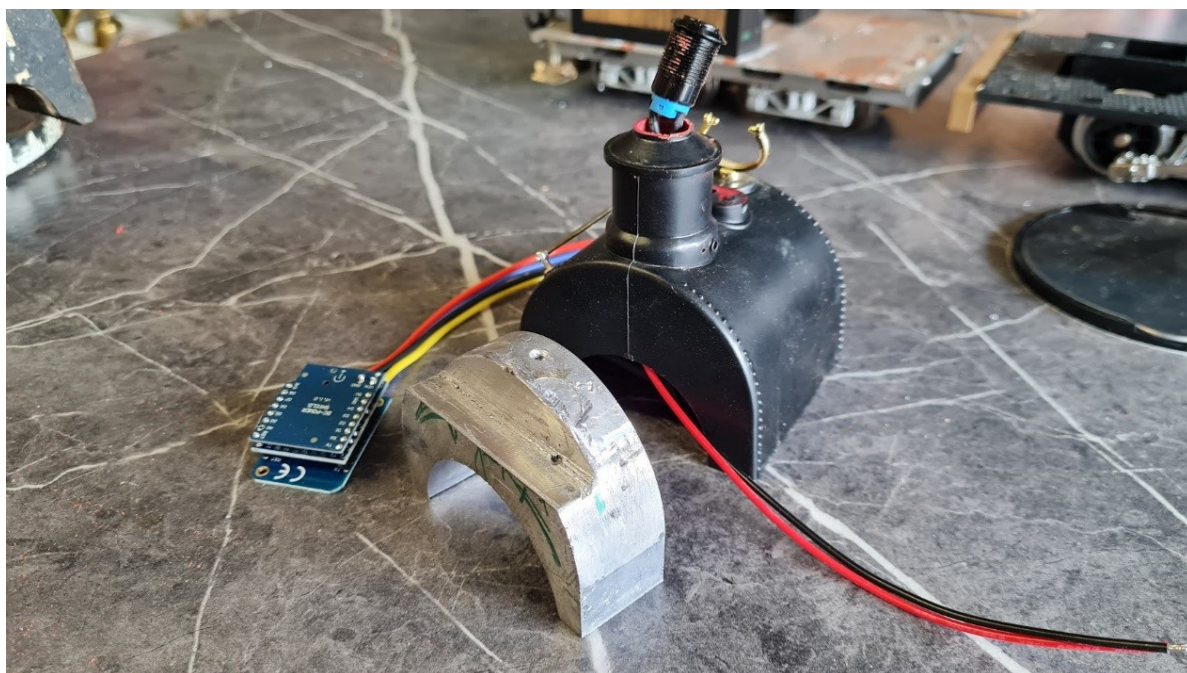


The cables for the lighting and auxiliary power socket are retained by two screws on posts within the boiler barrel. I removed the screws to free the wiring. Snip off the two plugs for reuse later. I also disconnected the auxiliary power socket cables as I won't be needing them.

There is no going back from this point. I drilled a hole in the top of the boiler barrel under where the saddle tanks fits, large enough to pass the wires from the battery pack to the control gear. As I had removed the boiler barrel ballast weight the cables will come through into that space.

I removed the very top of the sand dome, leaving a hole large enough to take an on/off switch. This is a 12mm diameter latching push button. Selecting a suitable item in black from the internet was simple enough: it will blend in nicely with the locomotive. The switch has fly leads pre-attached so a drop of UHU secures the switch into the hole.

I then modified the saddle tank ballast by sawing and filing a slot in the top rear, large enough for the control unit to sit. This was by far the hardest task – LGB ballast material is resilient stuff. I insulated the Loco Remote by placing it into some heat-shrink (tape will do), then refitted the ballast to the tank so holding the unit in place.



The saddle tank is replaced on the boiler barrel with the cables for the Loco Remote and on/off switch being passed through the hole drilled earlier. The four retaining screws can be refitted. Feed the wires for the cab lamp back through into the boiler barrel.

5. Battery Pack

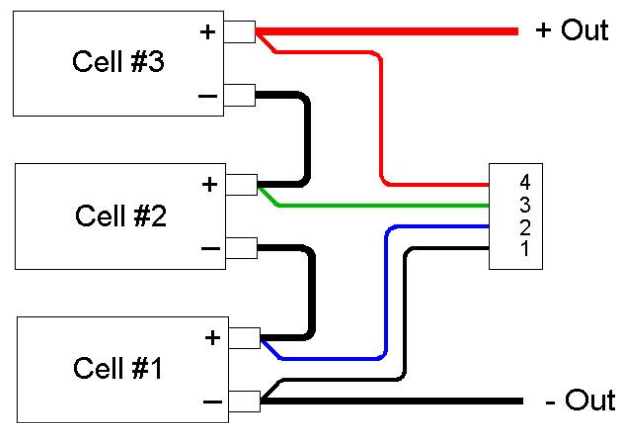
LGB (and Bachmann) locomotives running on analogue track power have up to 22V DC available to them. For DCC, this is a constant voltage applied to the track with the electronics controlling how much the motor gets, up to that voltage. First of all, unless your donor loco has a huge empty tender or is a diesel/electric 'box', we are not going to get 22V worth of batteries on board. Secondly, once over about 12V the control gear we need gets bulky and expensive.

Luckily, unless you do need to replicate an HST about half that voltage is sufficient. Note that the haulage capacity is determined more by the current (Amps) not the voltage (Volts) so there is no loss in power by running at 12V or less.

For my Porter, I can get three AA sized cells comfortably into the space between where the boiler barrel ballast was and the chassis top.

I am using Lithium "14500" cells. These are rechargeable and have a 3.7V output each so connected in series, $3 \times 3.7 = 11.1\text{V}$. Experimentation shows this runs the locomotive at a reasonable top speed and remains compatible with the control gear. I have found that all of my LGB locomotives, including a twin motor Mallet run happily on this voltage.

Although connected in series, Lithium cells behave best when charged individually. Using a charging extension lead for a three cell (3S) charger (with the socket snipped off) I can hard-wire the cells into a pack following the wiring as in the diagram below:

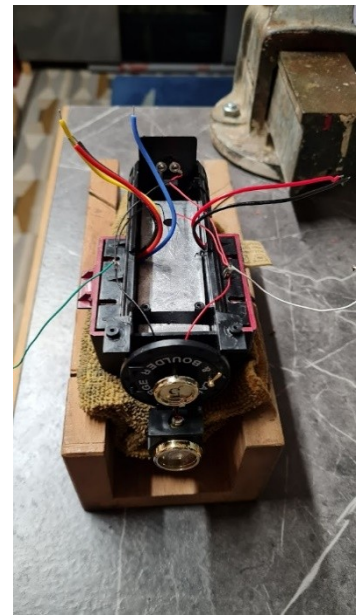


By purchasing such a lead I get a wired plug and coloured harness, allowing me to use an off-the-shelf balance charger to correctly charge the pack easily.

Paying particular attention to the order of wires in the charging plug, follow the wiring diagram to ensure you don't inadvertently build a single use smoke unit, and do take care not to short anything out.

Add a 2A resettable Polyfuse into the red (+ Out) lead for safety. This little device shuts off the power in case of any overload, then resets itself once the load reduces.

Lay the cells in the boiler barrel slot whilst working to ensure the connecting cables are just long enough. I've not removed the boiler barrel ballast in this image – I checked first to see how much space was there with it in place.



Note: if you want to use AA rechargeable NiCd or NiMH cells, this is where the space in the tender will be useful, but the tender will need to become permanently coupled to the loco. You won't need the balance charger or lead so can just wire the cells in series, but including the polyfuse is still a good idea. Be sure not to exceed the 12V rating for the Loco Remote.

6. Control Gear

The Loco Remote unit, a Maxi version to handle the 11.1V, has to be the absolute simplest equipment for fitting available. I requested the unit with flying leads soldered to the board to save space. The Maxi arrives with four wires protruding which should now be coming through the hole drilled in the boiler barrel, along with two wires from the on/off switch.

The Loco Remote blue and yellow wires are soldered to the two plugs taken from the locomotive wiring. These will be plugged back onto the motor later.

The Loco Remote black wire is connected to the black wire from the battery pack (- Out) and the black wire(s) from the loco lighting circuit.

The Loco Remote red wire is connected to one of the on/off switch wires and the red wire(s) from the loco lighting circuit. Connect the red wire with the polyfuse from the battery pack (+ Out) to the remaining on/off switch wire. That's it – wiring complete.

7. Reassembly

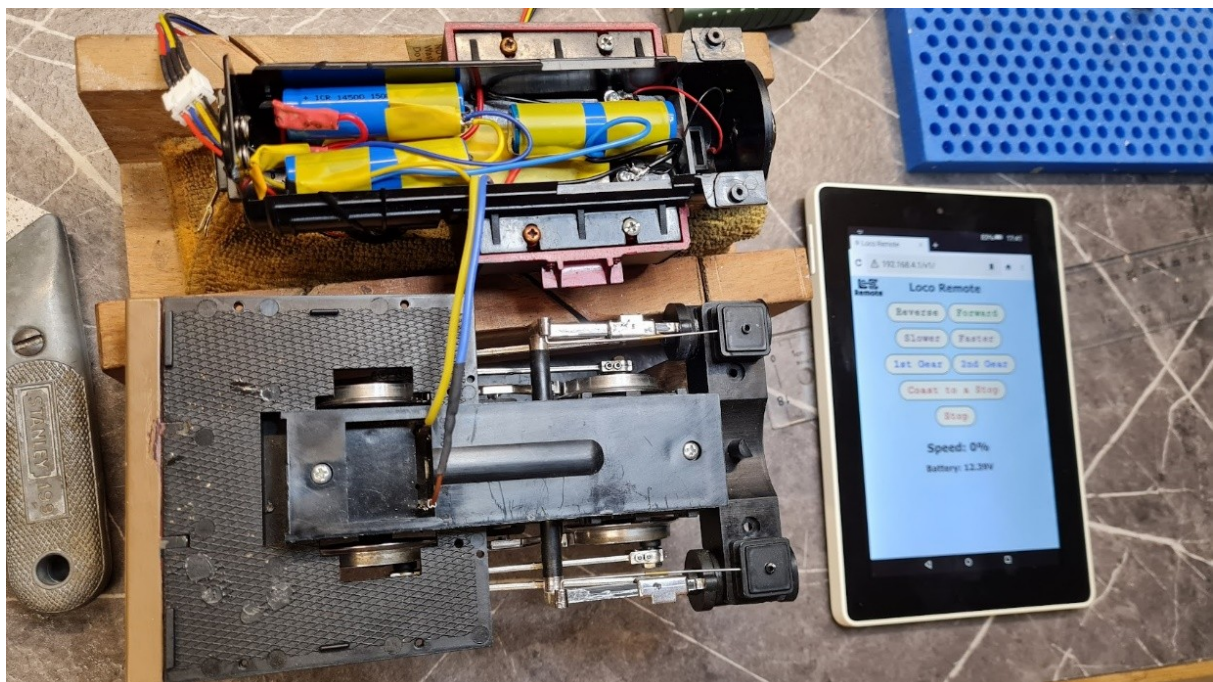
Replace the two plugs onto the motor block.

The Maxi can now be switched on and paired with the tablet/mobile phone of your choice -best to refer to Loco Remote instructions for this part <https://locoremote.co.uk/>

The loco lights will illuminate showing the battery is connected.

The loco can then be tested with the chassis on blocks. If the wheels turn in the wrong direction for the commands, simply reverse the plugs on the motor block.

When all is well, carefully tuck in the wires and re-attach the boiler and tank to the chassis. Ensure you can still get to the charging socket (I have this protruding through the firebox hole) and one more test is good here, to confirm nothing has been dislodged.



Next, the front buffer beam and cab can be attached as a reversal of the disassembly process, refitting the pipework as you go and we're all done. You can see in the pictures I've added an obeche buffer beam by sacrificing the front LGB loop. I needed to take a Dremel to the Otto part so that it would fit the Porter snugly but a very simple change.

Items to buy.

1. Donor Loco of your choice.
The LGB "Porter" has Toy Train roots so covers a few variations.
2. Loco Remote Maxi, with soldered fly leads.
Chris Rennie of Loco Remote has lots of advice on his website if you have a different locomotive.
3. 3 off 14500 Rechargeable Lithium cells, with tags.
The number denotes the physical size, in this case 14mm diameter by 50mm long. I chose 1500mAh capacity cells. They are all 3.7V but the higher the capacity the longer you can run between charges. The tags give you a place to solder wires on without damaging the cells.
4. A 3S balance charge extension lead.
3S denotes that it is suitable for 3 cells. I used a 200mm long extension.

5. If you don't already own one, a balance charger suitable for LiPo or Lithium batteries.
These can run from anything over 5V as they charge each cell individually but typically they require a 12V input. They have protection circuits built in to shut off when the cells are full.
6. A small amount of red and black cable and various sizes of heat-shrink tubing to suit.
Current for a "Porter" is less than 1 amp so these do not need to be massive for example like r/c car wiring.
7. A 2A resettable Polyfuse.
Search online – these are a very cheap and convenient self-resetting safety trip, it will protect everything if there is damage.
8. One latching push button on/off switch.
I chose this one to fit into the locomotive dome, a lever switch could also be used if you wanted to place it elsewhere, in the cab for example.

Testing in the Garden



The loco is quite happy with tender and four bogie wagons in tow, or three 4-wheel coaches. Any more that that and traction is an issue, probably because of the missing ballast. The range of the radio control is way beyond my garden, so must be good for 15m at least.

For IT techies, I'm using an elderly Kindle Fire HD7 with its built in Silk browser for the control which has had its Wi-Fi settings cleared apart from the Loco Remote, so it reconnects automatically at switch on. I've turned off the auto-rotate on the display. There were no issues pairing with or running the Loco Remote software, settings update included.