



How to INSTALL COACH LIGHTING

By Noel Leaver

I wanted to add lighting to two rakes of coaches, primarily for use with DC operated trains. I tried many different offerings before finding one I really liked and the solution I've ended up with also works well with DCC. The lights themselves were not a problem as light emitting diodes (LEDs) are readily and cheaply available in either bright white suitable for fluorescent lights, or warm white for earlier lighting, and surface mount ones are very small.



1
Above : Button battery holders. Below : One installed in the toilet section of a coach - a tight, but comfortable, fit - see later in the text for installation advice.



The problem is the power source as LEDs need a minimum of about 3V. With DC operation power is only available from the track when the train is moving and the voltage depends on the train speed. This makes it useless as a power supply for the lighting unless the train runs non-stop at a fairly constant speed. Some older locos need about 3V before they start moving so you have enough power even when 'stopped', but these days many modern locos run on close to 1V.

DCC would be better as it provides constant power from the track, but beware that different DCC systems give very different amounts of power. A train with five LED lit coaches powered by DCC had three coaches too bright and two about right on the first controller. Yet on a second controller (same make, different version) three were okay but two did not light and with a third none lit. So for DCC you really need to include a voltage regulator unless you will only ever use one DCC system.

But in either case the main problem is providing pick-ups on at least one bogie in



each coach. That is easy if you have a Dapol coach that is light-ready, but if not the only reliable way I've found is to fit wipers onto the wheels. Apart from the effort to install the pick-ups, it adds rolling resistance and the loco may not be able to pull long trains. Further, pick-up from the track is unreliable and often results in flickering unless you add some sort of anti-flicker device.

So batteries in the coach are preferred for DC, and often better for DCC. But you don't want to have to change batteries frequently because of cost, effort, and the chance of damage taking coaches apart every session to get at the batteries.

Rechargeable batteries would be a solution, but small 3V ones are difficult to find. Two 1.5V in series have issues recharging them in situ, and removing them for recharging largely negates the reason for their use. Further, recharging lots of coaches before each exhibition is quite a hassle.

Two AAA batteries will fit in an unlit coach, and you could use electrical connectors between coaches to supply the power. I had several attempts to make magnetic electrical connections between coaches but failed. They were either too rigid and tended to derail coaches, or too flimsy and broke after a few outings. I might have got this to work in time.

Train-Tech unit

I purchased one of these units which has five LEDs powered by a 1225 lithium button cell, and a motion sensor, so that the lights come on when the train moves and switches off if it stops moving for a few minutes.

However, our exhibition layout (which is free standing) was constantly getting small jolts that turned the lights on even when the train was stopped, so in practice they were on almost all the time. This is not disastrous as the batteries should last two days when constantly in use, meaning you will get several exhibition

sessions out of one set. But you need to be able to switch them off or remove the batteries between exhibitions and operating sessions, as they will switch on when transported and take some current even when meant to be 'off'.

The real drawback is cost. They are expensive at £20 per coach. Details of these strips can be found at : <http://www.train-tech.com/index.php/lighting/29-tail-and-coach-lights>

MERG Lighting Switch

I tried the MERG motion sensor (pocket money kit 819 at £1.33) that detects movement over the sleepers by infra-red. This worked better, not being sensitive to shock, but it is really



3

4



intended for OO/4mm scale models and awkward to fit in an N coach. To squeeze it in you have to omit the PCB, and even then you need to hack quite a bit of the coach and interior away to make sufficient space.

The kit is shown pictured on the previous page (photo #3) and with it assembled without the PCB (ringed top right) to be able to just fit in an N coach.

Easy Peasy Lighting strip

Then I came across the Rapido 'Easy Peasy' lighting strips which include a latching reed switch – a reed switch with a small bias magnet so it is stable in both on and off positions, and can be turned on and off by waving a magnet near it. Pictured above (see photo #4) showing the supplied wand with magnet and MK1 coach to demonstrate the length.

The battery holders occupy one end of the lighting strip so there is no light for the last several centimetres, but the strips are too long for most UK stock anyway so you need to cut off the battery section, reconnect it by soldering on a couple of wires, and put it low down in the coach. The switch works very well, but the supplied lights are a ghostly yellow-green and look very strange to my eyes. I replaced the LEDs

supplied with warm white ones, which looked a lot better and gave more light, but it still did not give as much light as LEDs positioned over the compartments shining down - it uses a clear plastic strip with bumps to spread the light from an LED at at each end along the coach.

As the latching switches are mechanical rather than electronic, there is no battery drain when off and are 2cm long by 3mm diameter (see photo #5). I tried to buy some of them from electronics suppliers, but the only one I could find was from a supplier in the USA and they would not sell individual switches.

Layouts4u Kit

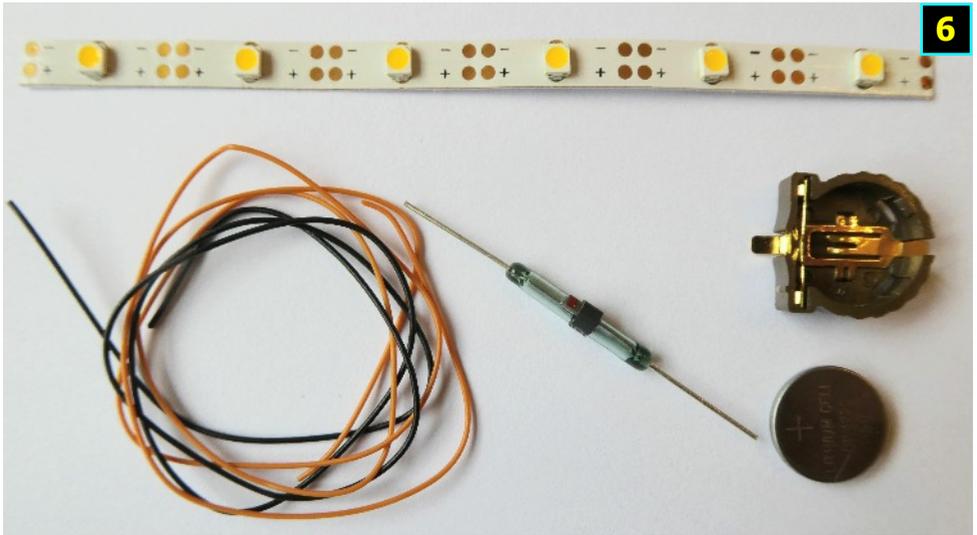
Some time later I noticed Layouts4u had introduced a lighting kit for N that included a latching reed switch (see photo #6) for £6. The kit includes:

- A latching reed switch
- A strip of 6 warm white (or optionally bright white) LEDs
- A battery holder
- A CR1220 lithium battery (slightly smaller than 1225)
- Some wire

If you are doing a lot of coaches it is much cheaper to buy individual components from Layouts4u rather than the kits as it works out at just over £4 per coach. No resistors are needed to limit the current as these batteries will only deliver a maximum of 1 mA. The battery lasts for over a day if the lights are on all the time (my test one was still lit but getting dim after two days). So a battery would last about four

5





exhibition days if only switched on while the layout is being used. Batteries are £3.40 for 20 post free on Amazon.

However, you can make the batteries last much longer. Whether the light goes on or off with the Layouts4u depends on the polarity of the magnet and which end of the reed switch it is over (the Easy Peasy ones operate differently and are no good for the system described below). If a magnet is mounted over the track then as a coach passes under it the lights either turn on (when over one end of the switch) then off (at the other end), or off then on, depending on the polarity of the magnet and which way round the coach switch is fitted.

With two magnets of different polarities over the track, as the train goes round one magnet reliably turns the lights on, the other reliably turns them off. So magnets of opposite polarities over each end of the scenic area will turn the lights on only when the coach is in the scenic section.

You just have to mount the reed switch the correct way round in the coach roof and put the coach on the track facing the correct way. The positioning of the magnet is not critical, I moved it 1 cm clear of the roof and it still worked fine (5mm diameter 3 mm thick neodymium magnet). Interestingly if you had a single line or a terminus they would still work fine in both directions provided you don't turn the coaches round. As our trains are only in the scenic area 1/3 the time and we run 12 trains in rotation a battery should last for 150 or more 8-hour

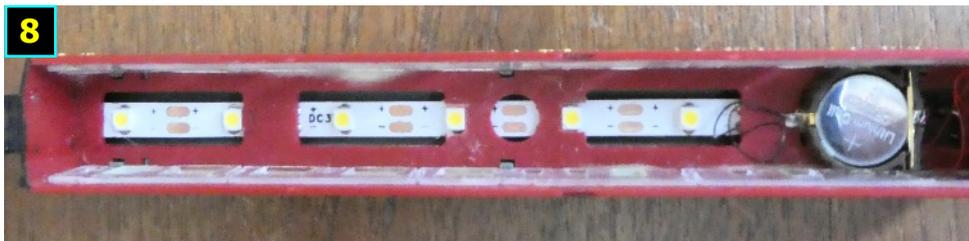
exhibition sessions - essentially forever. So all in all this is an excellent solution, and so far it is 100% reliable in operation.

The photo below (#7) shows a magnet positioned above the entry to the fiddle yard.

Installing the kit

Installation of the lighting kit in a coach is very easy with just three wires to solder. Soldering is best done near the end, after deciding where to fit the battery holder so you can make the wires the appropriate length and thread them through holes if necessary.





Most modern RTR coaches have a false roof as part of the body and a separate clip on roof above, with a gap between. Layouts4u suggest you stick the strip under the false roof. However, the lights are then visible when viewed from track level, so I prefer to put the strip above the false roof in the gap, and they light the coach better. If you fit the lights below the false roof you may have to cut away some of the interior.

There are lots of holes in the false roof for lights to shine through, but you will probably need to remove some parts of the cross-struts to clear all the lights (this is equally a problem with fitting other RTR light strips). See photo #8 showing parts of central struts filed away to make space for the LEDs

The reed switch should be mounted close to the roof with the magnet (the thin strip on one side) either at the top or bottom. The north pole is marked by a red dot, so all your coaches should have the red dot at the same end. I secured it to the false roof with super-glue after soldered the wires on.

I found the best place to fit it was alongside the lighting strip in one of the larger holes, you need to file away the plastic on one side to make space for the switch (see photo #9) while still allowing the lighting strip to be central. Sometimes one end of the switch can be soldered directly to the lighting strip, then you

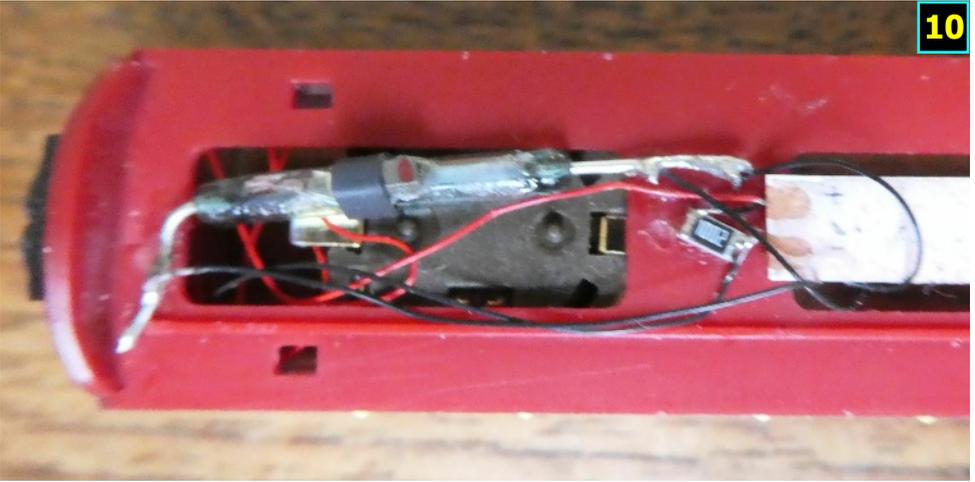
only need to solder two wires to the battery. Solder the wires that will go to the battery holder on before mounting the strip, it is easier to tin the solder pads you intend using on the lighting strip before soldering the wires to them. After soldering the wires on I then glued the strip in place with superglue

The battery holder needs the ribs on the sides filed flat to allow it to fit between the glazing strips in most coaches (as on right in photo #1). You may need to bend the solder tabs up as well. Put it in the end of the coach, in the brake or toilet section where it will be inconspicuous. You will also need to cut off that part of the coach interior (see photo #2). After soldering it to the wires from the lighting strip glue it in place with superglue, this makes it easier to prise the battery out for replacement.

You can cut the light strips in the kit into individual lights if you want to alter the spacing - you just need to solder two wires across each cut. This allows you to centre the lights over each compartment, though you may need to add one or two more LEDs.

The light strips are available separately at £1.50 for a 30 cm strip with 18 lights; I tried making my own strips from thin PCB and 0603 warm white SMD LEDs but it cost about the same and was more work. Whether you think the improvement from having the lights correctly





positioned is worth the effort is a down to you, I'm undecided. The main article title photo (see pages 62 and 63) shows the coach on left with an LED per compartment while the one on right uses the original LED spacing.

On the rear coach of the rake I wired a red 0603 SMD LED as a tail light – Layouts4u sell these pre-wired. They are much too bright (in my view) if connected directly and I included a 10k SMD resistor (an ordinary resistor will fit if preferred) to reduce them to a dim but still perfectly visible light (see photo #10).

The lights, when powered by the single cell, are bright enough and not too garish. They look fine in low level lighting, but you will not be able to tell that they are on in really bright light. And that is pretty realistic, as you wouldn't notice real coach interior lights on a sunny day. You might want to paint the insides of the coach sides white to make them show up better and this also has the advantage of stopping light

shining through the coloured plastic sides which are slightly translucent (as can be seen in the picture of the two lit coaches. I have not done this yet but will probably undertake that in time.

The switches remain on or off even if shaken or banged, but when transporting them one or two switched on in transit. I think it was when taken on the Underground, and I assume stray magnetic fields can switch them on. So I have added small magnets in the carrying cases to ensure they stay off.

The lighting strips and batteries add a fair bit of weight to the coach and as a result your locomotives not be able to haul quite as long a train after fitting them.

Finally, you can see the interior much better when lit (see photo #11), so you will probably want to paint details such as the seats and add a few passengers, although you need to chop them off at the hips to get them to fit.

