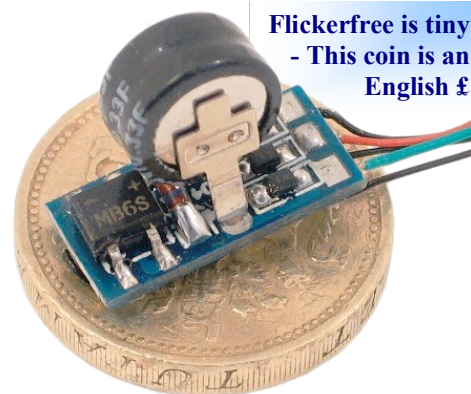


## Flickerfree<sup>2</sup>

**An easily installed and effective AC, DC and DCC compatible constant lighting system for N, TT, HO, OO, S, O and all related scale/gauge combinations**



### Thank you for purchasing the DCCconcepts "Flickerfree<sup>2</sup>"

**Flickerfree<sup>2</sup>** is the second generation of our highly respected "Flickerfree" constant lighting system.

**Why did we change "Flickerfree"?** Well, whilst our customers have all been really happy with the excellent lighting abilities and huge power storage which allows AC & DC users to also have coach lighting on while the power is off and the train is stopped, we became aware that many modelers who use DCC control systems were also now wanting to add the extra dimension of simple on/off control of lighting via function switches. This also added a directional control ability for DC modellers as a bonus! At the same time we made a physical change, moving all large parts to one side of the PCB so it is now easier for you to fix it in place with foam tape.

**How does the DCC switching work and how do you connect it?** Because Flickerfree has such prodigious power storage, it wasn't possible to use the simple approach of switching the power off... that would still have left Flickerfree supplying power to the LEDs for between ten and thirty minutes! Therefore, we incorporated an electronic switch in the Flickerfree outputs. Connection couldn't be easier - simply connect any negative function wire from your decoder (You could use white, yellow, green, purple etc) and that's it! Of course there is an added advantage to this approach - your Flickerfree will remain fully charged at all times, so when you turn the lights back on they will respond immediately at full brightness, just like the real thing.

**What happens to my coach or other lighting if my lighting decoder fails?** We thought about this too... Should your accessory decoder not work for any reason, or in the very unlikely event that the inbuilt electronic switch is damaged, then the lights will default to "on", so your railways staff & passengers need never be in the dark as the lights will then remain lit until you remedy the problem.

### What do I get in my pack of Flickerfree<sup>2</sup>?

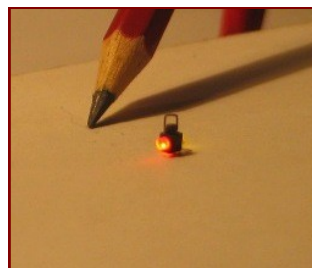
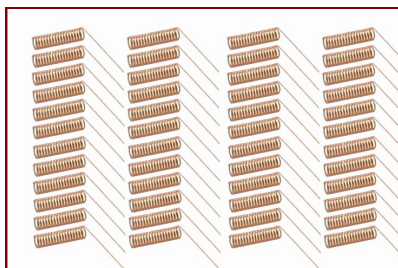
**Pretty well all the items that you will need to do a professional job of installing realistic lighting in just a few minutes! For example, a Flickerfree<sup>2</sup> 6-Pack contains the following items.. There's a LOT in each pack! (3-packs contain pro-rata quantities)**

*(Please note that pack contents have changed to increase value to you since we introduced Flickerfree<sup>2</sup>)*

- **6x** Flickerfree<sup>2</sup> light control/power storage units, each small enough for N, perfect for OO/HO & powerful enough for large scale.
- **36x** White LEDs - the actual tint and size of these may vary depending on the specification ordered, however the standard Flickerfree<sup>2</sup> pack includes our Prototype white 1.8mm Microdot LEDs for realistic light levels.
- **4x** Red 1.8mm Microdot LEDs for use as rear of train lamps etc. (We do however recommend that you take a look at our dead scale 4mm scale lamps for this purpose - they're available in red only and there is a red & white version for use as side lamps)
- **10x** 1000 ohm resistors - more than enough for any combination of lighting of the six Flickerfree<sup>2</sup> units.
- **10x** Specially created double sided through-hole plated PCB strips, which hold LEDs and resistors. (& foam tape to mount them)
- **12x** Pickup springs for easy addition of pickups to your axles. (The standard size supplied is for 4mm scale - please specify if you will be using Flickerfree<sup>2</sup> in N scale stock, as N scale pickup springs are available)

**You can also buy the following items separately so you can expand your use of flickerfree easily.**

- Pack of 10 PCB strips (DCF-FFPCB) \* Pickup springs for N & OO/HO \* Working Loco lamps \* LEDs



## **(1) Connection and Electronics.**

Flickerfree<sup>2</sup> is a tiny Device which fits between the track pickups and LED lighting in passenger stock or goods brake vans etc. It has huge power storage which keeps lights bright with zero flicker on AC, DC or DCC control systems. Its connection is very simple...

- The two black wires at one end of Flickerfree<sup>2</sup> connect to the track pickups. It does not matter at all which black wire goes to which rail. The power to the track can be from 5 to 20 volts from an AC, DC or DCC control system. Flickerfree<sup>2</sup> is current limited to control the rate of charge so it has very low current draw and will not add to the power supply needs of your model railway.
- The red and black wires at the other end connect to the printed circuit board into which the LEDs and resistor are mounted. The red wire is positive and the black wire is negative.
- For DCC controlled layouts the green wire can be connected to whichever function wire you wish to use for control of the lights. It does not always need connecting on analog AC or DC layouts however it can if you wish be used for directional lighting. (AC/DC users please see P5).
- For DCC usually this will be green (function 3/Aux 1) or purple (function 4 or Aux 2). If you connect it to white or yellow, bear in mind these are usually both set to operate with function Zero (0) and are directional, so you may need to re-map or change the CVs that control them.



*Flickerfree installed in a brake van & coach*

## **(2) Making the wheels pick up power the easy way - and with the lowest possible friction!**

The best place to start is with the installation of the pickups. First disassemble the item into which you will install your Flickerfree<sup>2</sup> and remove a wheel-set. look closely at how it is made. What we want to have is one wheel “live” to the axle, and the other insulated from the axle. These pickup instructions apply equally to DCC digital and AC or DC analog layouts.

- If the wheel-set is live to one axle, you will see that one wheel is directly attached to the axle, while the other has a fine plastic bush which electrically isolates it from the axle. Many European and most Hornby Coach wheels are like this and they will be very easy for you to add pickups to.
- If both wheels are insulated, then you will see a fine plastic bush at the hub of each wheel. Most Brake vans and most Bachmann coach wheels are like this and you will have to make one wheel “Live” to install lighting. (don't worry - it's very easy to do)

### **(2a) Add pickups to already live wheel sets**

- Remove the insulated wheel from the axle .
- Slip a pickup spring onto the axle with the plain end pointing towards the “live” wheel and the tag end towards the centre of the axle.
- Replace the wheel and make sure that the back to back distance is properly set. For 16.5/00-HO gauge this is 14.5mm (Use a gauge if possible). These should be obtainable from any stockist of DCCconcepts flickerfree products. (Please check at your dealers first - If not we can supply you direct.)
- Replace the wheel-set into the underframes or bogie. If it's a 4 wheel brake van, then one wheel set should be live to each rail. If it's a bogie vehicle, make both wheel sets in each bogie are live to the same side, and when you reinstall the bogies make one bogie live to each rail.
- Drill a small (1mm?) hole on the centre-line of the coach as close as you can get to the bogie pivot.
- Solder a fine wire to the “tag” of both springs (trim if you like) . Feed the wire up through the hole and into the vehicle.
- Once both ends of the vehicle are done, we are ready to install Flickerfree<sup>2</sup> and light it up (see next page)

### **(2b) Making a wheel set live & add pickups**

You will need some silver conductive paint. This is available from DCCconcepts... However, please check first with the dealer you purchased your Flickerfree<sup>2</sup> from - He just may have it in stock and is likely to be closer to you than we are!

- With a fine scraper or wet and dry sandpaper, gently clean one end of the axle and do the same to the back of the wheel close to the insulating bush (especially if they are blackened)
- Shake the silver conductive paint well and decant a brush-load only onto a saucer. Allow to evaporate a little, then as it starts to thicken, take it onto the tip of the brush and paint it onto the hub of the wheel, covering the whole of the plastic insulating bush, and ensuring it meets the wheel and axle right round for a couple of MM each side.
- Let it dry very thoroughly then remove the wheel which does NOT have silver paint at the hub.
- Add the pickup spring with the tag end towards the wheel with the silver conductive paint on it.. Replace the wheel.
- Check back-to-back of the wheels - ensure they're correct.
- Follow the rest of the wiring instructions from the “adding pickups to already live wheels” box to the left!

### (3) Planning the installation for best visual effect, assembling, testing and installing :

Well - that was easy wasn't it - believe it or not you've done what is thought of by most to be the hard part so it's all fun from here on! Now you're ready to do the overall installation, stop, relax & examine the coach and its interior for a while.... Its time to PLAN! The interior of your stock will be in full view once illuminated, so a little work now will make an average coach something very special!

- Consider either painting the inside of the roof white or adding tin-foil shiny side out to give better light diffusion and reflection.
- Is the interior painted - if not, check what colours things should be and get out the paints - it makes a big difference!
- How about some passengers - they really stand out well with interior lighting and will make your coaches something special!
- Plan where to run the wires... if you use fine wire then it can often be placed under the seating unit totally out of sight.
- Plan where to put the Flickerfree<sup>2</sup> - there is almost always a place totally out of sight available. If not, paint it a dark colour or to match the upholstery and it will blend in - hidden in full view so to speak!

**Once the interior is all done and the installation planning is done, its time to plan the layout of the lighting.**

- If it is an open coach space you can space the lighting evenly along the PCB strip. If it's a compartment coach take care in placing the LEDs so each compartment has its own LED. If it is a longer modern coach, you can easily splice two PCB strips together - we have even spaced the very end holes to that two boards together preserve the regular 5mm gap between LED holes!

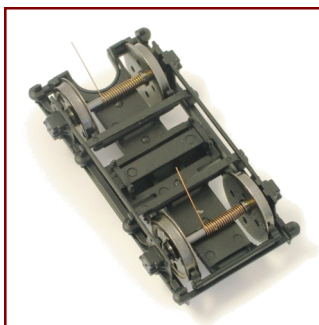
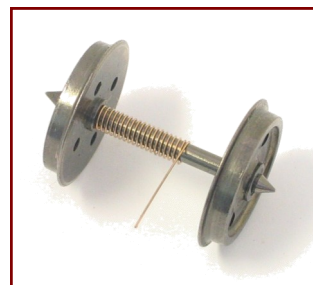
**Now at last we can get onto the final assembly and installation.**

- First, put the resistor into the place we have provided in the PCB - It is easy to see - it is a slightly longer gap at one end of the board which if you look closely, also has a gap in the copper track. This side of the PCB strip is also the positive side by the way.
- Now, place the LEDs carefully into the holes wherever you want them. In all cases, make sure the LONGER lead is on the positive (+) side... the same side as the Resistor is on. (no need to solder yet).
- TEST TIME: Solder the RED wire from the Flickerfree<sup>2</sup> to the + side of the PCB at the end, so the resistor is between the red wire and the first LED. (again - It's the side with the resistors/long LED legs). Solder the BLACK lead to the other side of the PCB.
- Even though the LEDs are not yet soldered, we have made the hole spacing very slightly wide so the through-hole plated holes will grip the leads and make contact, allowing you to test before you solder.
- Connect the two black leads of the Flickerfree<sup>2</sup> to a power supply of between 9 and 20 volts. Wait a few seconds and the LEDs should start to glow. If any do not glow, wiggle them and they'll probably come on - if not, double check that they are inserted the right way!
- Once they are all working, disconnect the power supply.
- DOUBLE CHECK the LED positions before the next step!
- Carefully ease the LEDs so they are properly seated and square on to the PCB and then solder them in place. Do NOT force them—you may damage an LED if you do. Using a no-clean flux will help (This is available from your dealer or DCCconcepts directly).
- Re-test to be sure all the solder joints are good.
- When happy, cut the LED leads as short as possible with a pair of flat backed sprue cutters or something similar.
- Give the cut ends a quick dress-up with a fine flat file to remove any sharp ends. (not always needed, but it is a nice professional touch)
- Attach several of the small double sided tape dots to each PCB and carefully press into place in the correct position in the coach roof.
- Dress and if necessary, adjust the length of the red and black wires between the Flickerfree<sup>2</sup> and PCB strip.
- Dress and adjust the length of the two black wires that are to be connected to the track pickups.

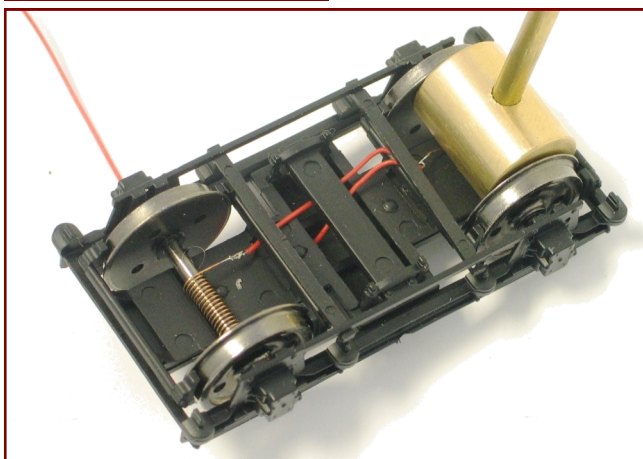
**DCC users only: (Analog DC/AC users please see page 5)**

- Mount the decoder in your chosen position.
- Connect the two power input wires to the track pickup wires.
- Connect your chosen Negative function wire to the green wire of the Flickerfree<sup>2</sup> & carefully dress unused decoder wires out of the way.
- Once happy that the wiring is tidy, Mount the Flickerfree<sup>2</sup>
- **Re-Assemble the coach and the job is done... Easy wasn't it!**

#### Add pickups easily with DCCconcepts pickup springs!



**These pictures show just how easy adding pickups is! (We have used red wire only so you could see it easily) We were able to add pickup to both axles without even drilling a hole in the coach as the wire goes directly through the bogies pivot boss. It took only minutes!**



## Adding red rear lights to the same Flickerfree<sup>2</sup> installation as interior lighting.

When you mix LED colours, you cannot simply tack a red LED onto the end of a string of White LEDs - it simply will not work, as each LED colour draws a different amount and one colour will hog all the power, leaving the other turned off and unable to light.

The answer is really easy. Just run a separate circuit back to the same red and black wires that power the PCB strip and connect it in parallel. In other words, mount your rear red light (Or DCCconcepts working lamps) to their chosen position and add a resistor of appropriate value to one leg of the LED. Now run a wire from the positive (long leg) of the LED back to the red wire of the Flickerfree, and another wire from the (-) leg of the LED to the black output wire. That's it... all done!

## Adding Flickerfree<sup>2</sup> to a guards van.

Once you have seen our accurate working 4mm scale guards van lamps you ARE going to want to add them to a brake van!

As most UK Brake vans have only two axles, good pickup is very important and even then, unless your track is always perfect you will need Flickerfree<sup>2</sup> to keep The lights burning steadily! Its also a good idea to add a bit of weight if you can. Proceed with pickup installation in just the same way as you would for a coach, except in this case, one live wheel should be to each side of the vehicle. Once the pickups are done, install the flickerfree. Add an appropriate resistor to each individual lamp and connect them all LEDs to the flickerfree in parallel.

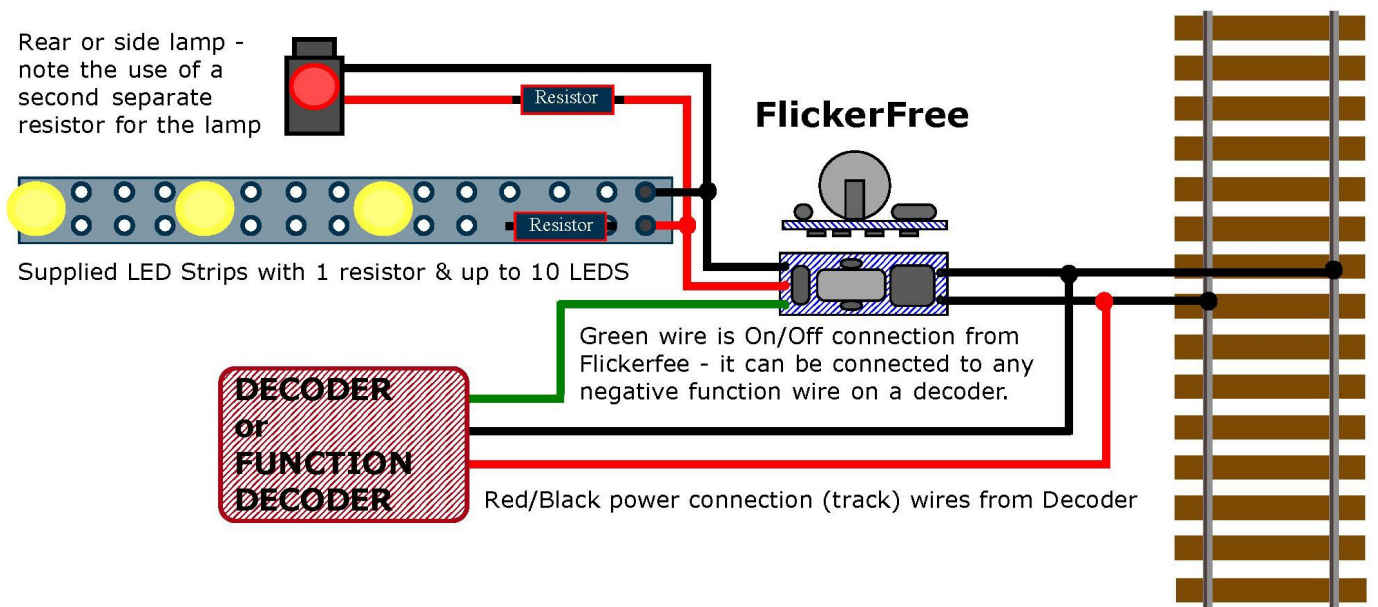


If you want to turn them on and off, connect a decoder with the red & black connected to the track pickups and the green (or any other function wire) attached to the green wire of the flickerfree. That's it... Install done, and your Guards van is now something special!

**Flickerfree in use!** The power for the hand lamp in the guards van picture above is linked to flickerfree<sup>2</sup> via our pure silver conductive paint. After it dried, we then painted over it with the guards uniform colour so it became totally invisible. It is much easier than you may think, and a real show stopper! Use your imagination... you can be VERY creative with flickerfree!

## Flickerfree<sup>2</sup> General Wiring arrangements

Rear or side lamp - note the use of a second separate resistor for the lamp



**EXPERT TIP #1:** Experiment with various resistor values for LED lighting in locos & rolling stock. We usually supply 1k resistors with flickerfree, however "Steam era" style lamps need much more resistance to give a nice low level of light and it is important too to make sure that the relative levels of red and white lamps stay in balance. Resistors are really cheap so why not buy a selection between 500 and 50,000 ohms. You will soon become an expert if you experiment.

**EXPERT TIP#2:** If you are going to do a lot of lighting or similar installations, why not treat yourself to a good quality soldering iron. Look for an iron that is light and nice to hold but of at least 25 watts. Try to find one that has a tip that is hollow and totally surrounds a ceramic element as that type of iron heats faster and holds heat better, giving you much better solder joints. Have two tips to use - a fine 1mm pointed tip for fine work, and a 2.5mm chisel tip for doing rail joints and heavier work. As a rule of thumb, budget about half the cost of a locomotive for a good quality soldering iron that will last a lifetime!

**Directional constant lighting for AC and DC users - it even stays on when the train stops!**

One of the great things about DCC has been the huge improvement to the way lighting can be done in locos and rolling stock. Flickerfree<sup>2</sup> now brings this same ability to Analog DC or AC users. As a real bonus... for conventional DC (analog) use, you can now have directionally controlled constant lighting - and even better, its very, very easy to install.

As a huge extra benefit, the huge power storage of Flickerfree<sup>2</sup> means that lights in your diesels or at the front of your steam locos - and those in your coaches and guards vans will not only remain constant and never flicker on and off... they will also stay bright and fully lit for a very long time even when you stop the train or turn the power off!

**This simple diagram tells the whole story... its dead easy and you CAN do it!**

The basic procedure is exactly the same for loco's, carriages and rolling stock - 2 black wires from one end to the rails (and it's not important which is which), red positive and black negative at the other end to LEDs via a resistor on the positive wire and if you want directional control, connect the green wire to one of the track pickups! It couldn't be easier... just 4 simple steps!

**Step One:** Install the Flickerfree<sup>2</sup> in any convenient place within the locomotive, securing it with double sided tape.

**Step Two:** Connect your LED lamps or lighting to Flickerfree<sup>2</sup>. (using the red and black wire at one end of the flickerfree. The red wire is positive. You should use an appropriate resistor - never less than 300 ohms and if you want duller "steam era" lamps, possibly as high as 30k ohms. all LEDs should always be wired in parallel. If you are lighting a long DMU or a coach then use our specially prepared PCB strips as shown at the bottom of page 1.

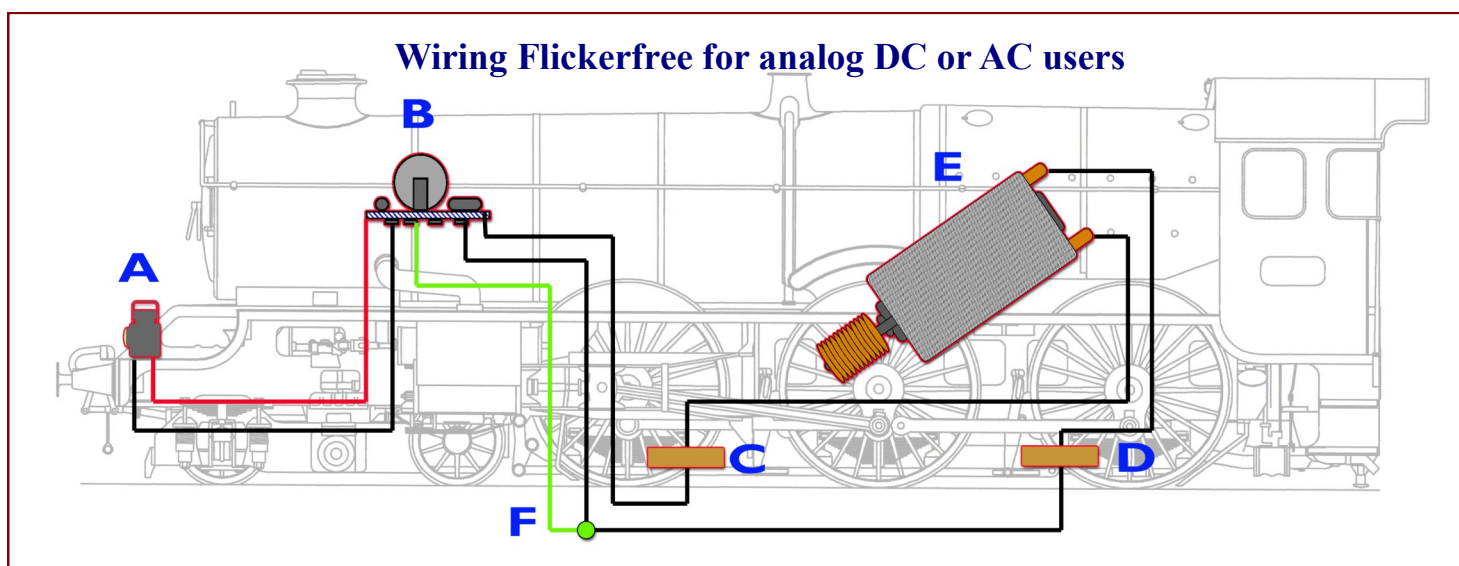
**Step Three:** Connect the Flickerfree<sup>2</sup> to the same two track pickup wires that go to the motor (In parallel with the motor)

**Step Four** If you want directional lighting, then connect also connect one pickup wire to the Green wire that is attached to flickerfree. When this wire receives a negative voltage, it will turn Flickerfree<sup>2</sup> OFF. Because train manufacturers don't standardise which wire is which, we can't tell you which pickup wire it should be... however don't worry about it... just connect it and if it turns off when you want it on, then just reconnect it to the other pickup!

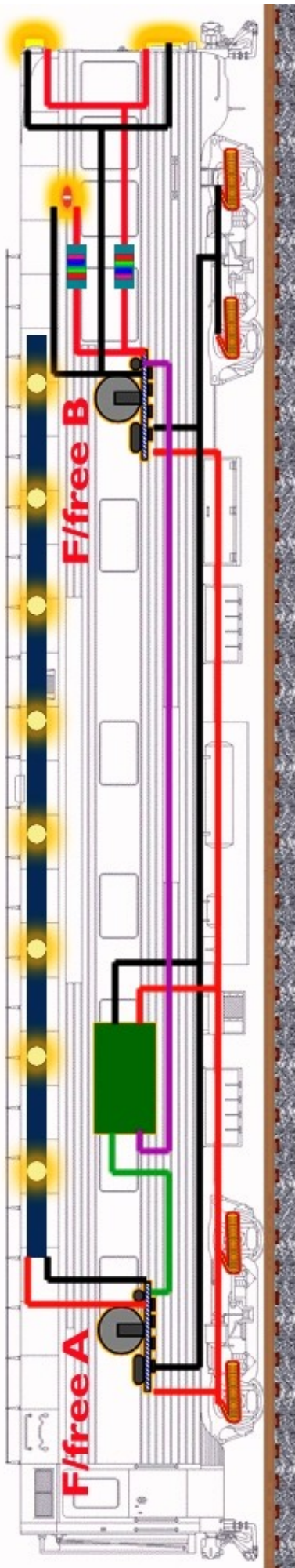
**Note:** If you want directional lamps each end of a railcar or diesel, then use two Flickerfree<sup>2</sup>, connecting the green wire from Flickerfree<sup>2</sup> # one to one rail, the green from Flickerfree<sup>2</sup> # two to the other rail. Easy isn't it!

That's all there is to it... A few simple connections and your locomotives and rolling stock will take on a whole new look that was previously impossible without going to DCC - and you will really amaze everyone when your lights stay on, even if you take the loco or coach off the track or disconnect the controller!

**Have a go! We want you to try without risk so the Flickerfree<sup>2</sup> unit itself is covered by a 1 year "goof proof" warranty, so if you make a mistake and let the smoke out, we'll replace it for you free of charge.**



A=Lamp, B=Flickerfree unit, C/D=track power pickups, E=Motor, F= on/off wire for DCC/direction control for DC



For DCC, you can easily have control of multiple Flickerfree<sup>2</sup> by connecting them to any decoder function.

DC users can now have some lights directional and others which remain on in both directions by just connecting ONE wire!

We have used the example here of a rear end observation coach - however exactly the same wiring applies to any multiple installation of Flickerfree<sup>2</sup> - in diesels, sleeping cars or anything else... on any prototype in any scale,

DCC users can in fact have as many switchable Flickerfree<sup>2</sup> as they like, as all it needs is ONE wire from each decoder function!

DC users can also have as many Flickerfree<sup>2</sup> as they like, for example in a DMU, one at each end wired directionally, one or two for coach lighting!

There may seem to be a lot of wires here, but it is simple to do.

- (1) DCCconcepts pickup springs are used. Each bogie has two springs, one on each axle. On each bogie, the “live” wheels are on one side only, and the two bogies are live to opposite sides of the track, so give 2 axles picking up power from each side for good reliable performance.
- (2) The two Flickerfree<sup>2</sup> units and the decoder all share the pickups - just wire them in parallel. Note that we showed a red and black wire here for clarity, but Flickerfree<sup>2</sup> is not polarity sensitive for its power supply so on the real thing, both wires are black!
- (3) We didn't show it but there is of course a resistor on the PCB strip with the coach lighting (there's a place for it on the circuit board)
- (4) Because we assumed that the end of the coach had two different colours for rear lights, we gave each colour its own resistor as differently colour LEDs have different levels of current draw so cannot share the same resistor (if you try it, there will not be any damage but only one colour will light)
- (5) The GREEN wire on Flickerfree<sup>2</sup> connects to any function wire on a decoder. Do not forget that white and yellow are directional, so may need to be remapped if you want lights on in both directions. If you do not feel too confident in re-mapping of functions or your decoder will not allow it, don't worry... just connect BOTH white and yellow to the same Flickerfree<sup>2</sup> Green wire - then the lights will stay on in either direction.
- (6) We think that the rest is pretty self explanatory, but please do not hesitate to email us at [questions@dccconcepts.com](mailto:questions@dccconcepts.com) if you need more information.

**A special note for DC modellers: Wire it the same as this example except for the following minor changes.**

- (1) You do not need a decoder at all, so ignore that part of the diagram.
- (2) For the main lights, you do not need to connect the green on/off control wire of the Flickerfree<sup>2</sup> at all.
- (3) For the rear lights, you should connect the green wire to one side of the power pickup. That will let lights turn on in one direction, and not in the other. Do it and test—if the direction is wrong, just swap the green wire to the other side of the pickups, and it will work correctly!