IRREGULAR FEATURE

Lighting the way

The theory

Many model locomotives have head and taillights fitted by the manufacturer and under the right conditions they look quite realistic but that's the rub, they must have the right conditions, they are not always directional and if you run the locomotive too fast they look like a searchlight, or too slow and they appear more like a candle! This is because the 12-16 volt globes are wired in parallel with the motor (Diagram 1) and as the voltage supply to the motor varies so too does that to the globes. Some manufacturers have addressed this problem and their newer models are fitted with constant and directional lighting and now do a much better job. So the question is, how is it done and can it be applied to the older models? The answer is diodes and yes it can be done to any model including those without lights fitted by the manufacturer but of course those without working lights will require a little extra work i.e. drilling some holes for the lights.

Diagram 1

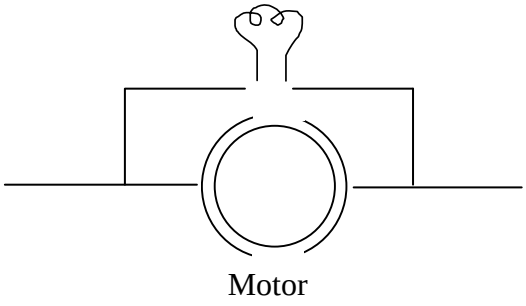
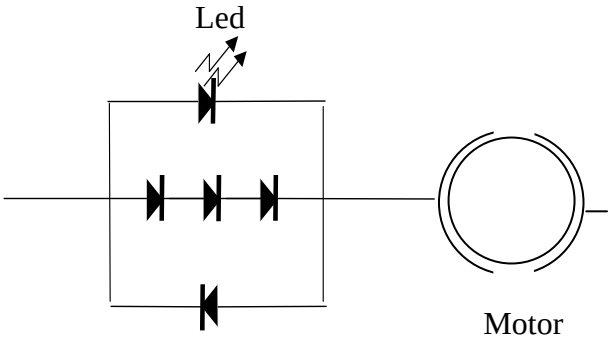
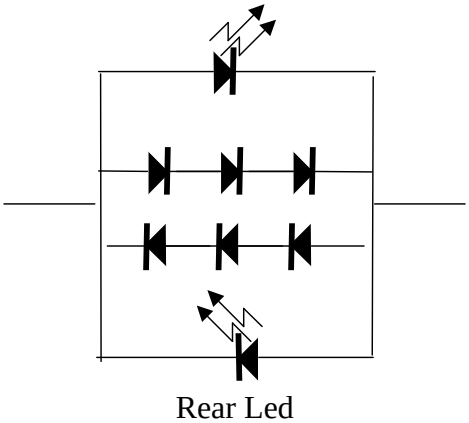


Diagram 2 Single directional led



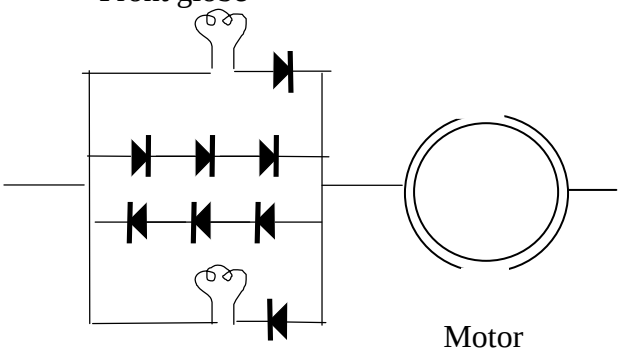
1.8 volts are dropped across the 3 diodes when forward biased. The single diode at the bottom is for reverse voltage protection

Diagram 3 Dual directional Leds



This modification is very simple, cheap and effective, just right for both the beginner and expert looking for a quick upgrade. The circuitry required for this modification can be easily adjusted to suit the users requirements for constantly on, or directional lighting also for globes or light emitting diodes (leds) it uses the forward voltage drop across a silicon diode which remains constant at ·6 volts. A diode is a small electronic device that is basically a one-way valve for electricity. Current flows when a positive supply is connected to the anode (the back of the arrow) but is blocked when the power supply is reversed. By wiring several diodes in series the total voltage dropped across them rises in ·6 volt increments, with the right number of diodes a level that is just right for a led or a 1·5-volt globe can be achieved, the addition of one extra diode in parallel but reverse biased (Diagram 2) will provide reverse polarity protection when using a led and allow the locomotive to reverse. If two such circuits are wired back to back with the globes / leds in opposite ends of the locomotive then full directional lighting can be achieved. In this case each bank of diodes will provide reverse polarity protection for the led in the other. (Diagram 3) To use the circuit for globes only a small variation is required, which is to

Diagram 4 Dual directional globes



add the extra diode in series with each globe to provide for directional lighting. (Diagram 4)
A circuit board is not required as the diodes are quite small and can be wrapped in tape once wired to prevent any shorts to the rest of the locomotive. As the diodes are so small the whole lot can be easily hidden inside any locomotive bodywork. Because both the diodes and leds / globes are wired in series with the motor the voltage drop will also slow the top speed of the locomotive a little, a definite advantage with a lot of the older models which can tend to be a bit like racehorses.

Putting it together

Different makers have their own methods of securing the globes into the bodywork but most are similar either a small blob of glue or the globe may just be wedged into place. Start by removing the body shell from the locomotive to gain access to the motor and lighting wires. Carefully disconnect the lighting wires from those for the motor and then remove the globes from the body. Place the body and lights to one side for the moment. The next step is to insert the diodes and lighting wires into one of the motor supply wires, anywhere in either wire that is out of the way and wont short out against anything is fine. Fit the new globes or leds to their respective positions then refit the body and test. If the lighting works the wrong way round simply swap the position of the globes or leds.

The globes that were removed can be put to use on the layout as house or street lighting using a suitable power supply, usually around 9 or 10 volts this gives a nice slightly yellowish glow, the globes don't get as hot and they last a lot longer.

If you would like to 'see before you try' then ask David to demonstrate his V-Line G class loco, I have done this modification to it and this loco will stand still on the track with the lights (globes) at full brightness. Although I wouldn't recommend this practice be done for too long at a time as the power is also flowing through the motor, but it does look good.

Parts required

1N4001 diodes…number required depends on which version of the circuit is chosen
1.5-volt grain of wheat globes or light emitting diodes, check the voltage rating if using leds, as different colours and high efficiency leds require different voltages.

All these parts are available from any of the electronics stores; ring around for prices as they do vary between the stores.

Catch you down the track...Tony Mikolaj.