Progress – LEDs - Signals – CAN Bus control – End Aug23 Update

I get to WB when I can, which for the time being means ‘not often’. I’ve demonstrated a set of controller and input/output expansion electronics (see video on TME Facebook Group Page if you’ve not already).

Since then, spending on signals has been put on ‘HOLD!’. Apparently.

What follows here is an account of my spending of my time and my money since.

A while ago I brought a prototype LED disc to WB, powered by battery. Several members saw it and offered their opinion. Views varied but on balance, this first design was ‘not bright enough’, and some thought ‘not large enough’ – the size being important as some of us have difficulty reading the colour of tiny point-sources from any distance.

I have since spent many hours comparing data sheets for numerous LEDs available from reputable industrial distributors including Farnell, RS, Mouser, Digikey, Anglia etc. One problem is that, in general, LEDs likely to be bright enough are not easily human-solderable, but … The best compromise between cost and performance I have come up with is to use multi-coloured devices aimed at the ‘mood lighting’ market, from reputable manufacturers including Cree and Osram. If any of you have time and can find something better from any reputable source then please feel free, and let me know.

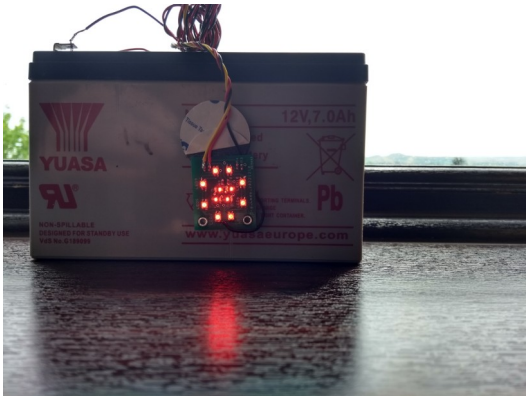

Figure 1: 'Not Bright Enough' disc!

Data on devices I propose - Cree LED devices here, Osram LED devices here.

Below, 3D CAD interpretation of a new LED signal board. It measures 2 inches square, and will be about 6 to 12 times the power of the first prototype (can’t be more precise as we’re not exactly comparing like with like). Note the foil etch pattern, hardly any of the copper foil is removed (and copper is on both sides). This is to aid spreading heat across the board. High brightness LEDs rely upon PCB copper to conduct heat away. Printed circuit board people talk of “one ounce” copper, (most PCBs use 1oz copper) this is an ancient hangover meaning the foil thickness is that of one ounce per square foot sheet (about 0.1mm I think). These boards are on order from China, I’ve specified “two ounce” copper for better thermal performance (at modest extra expense, naturally).

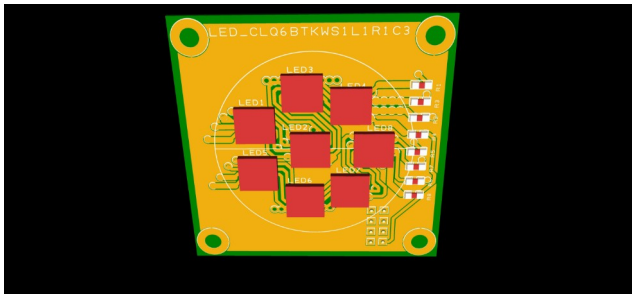

Figure 2: Bryter Layter ?

Whatever combination of whichever LEDs we end up with, care needs to be taken in driving them. Different colours work at different voltages, but it is current, not voltage, we need to regulate for reliable and consistent results.

We settled upon power distribution at nominal 50V DC (or AC?), a voltage that we must assume will vary widely as distant point motors and whatever kick in. An electronic LED driver was sought to provide constant light output over a wide supply voltage range. The AL8863 integrated circuit from Diodes Inc seems a perfect fit - see data here, we can expect signals of this design to work well at any supply voltage from about 12 to 60 volts. A board has been designed including four of these with a microcontroller, eeprom memory and CAN bus interface. At least two sets will be built to demonstrate railway signals connected and operational using a 4-wire CAN bus interface. This board provides greater functionality than required for simple signals, allowing for colour trimming etc.

West Buckland Site Wiring Options

We could wire up the whole site in the style of a town GPO telephone network of the 1950s. Wires from each and every thing going back to the 'exchange', thinner bundles of wires becoming fatter bundles closer to home, each wire entering the exchange. This would be a huge pain at huge expense.

A 'CAN Bus' has been designed into the system, a 'Controller Area Network'. This is a two-wire communication channel capable of conveying information between potentially any system component connected to the two-wire CAN bus. Two other wires are required taking power around the system. Potentially every item of signalling equipment could connect to the same four-wire cable threaded around the site. There is a cash price of the simplicity offered, CAN bus nodes need a line driver interface chip (about £6) talking to a controller (about £10, but some items will already have this), well worth spending for the relatively few, distant items.

Closer to the signal box it makes more sense using the 1950s GPO model where a number of short cables to the crossing should be quite manageable.

However we choose to mix it, both systems have been designed for, we can mix and match in any way we see fit.

Any comments, suggestions or questions ?