

## **MERG DCC accessory encoder – adapter for computer control. (Ace\_PC1)**

The MERG accessory system uses a simple encoder for operating points. It has a switch matrix where each point can be operated using a single pole On / Off switch with up to 128 individual switches. Route setting is possible with rotary or other multi-pole switches but there is now an adapter which simulates the matrix but may be connected to a PC for a computer controlled layout or more complex and flexible route setting.

The thinking behind this adapter was to make it an add-on to the existing encoder so it is possible to use either the switch matrix or computer control. For users already with an encoder, the PC interface is an extra PCB. This has a 25 way D (male) connector which is wired pin-for-pin to the 25 way D (female) on the encoder board. The PC adapter board also has a 25 way D (female) so the original control panel (switch matrix) can still be plugged in as before, but now into the connector on the PC adapter.

The adapter (Ace\_PC1) uses a PIC microcontroller to simulate the matrix and takes commands through a standard RS232 serial input at 9600Baud. The Ace\_PC1 board takes its DC supply from the encoder where J2 pins 1 and 3 have 12v DC available. (The encoder must be Rev 2, which is the one in the MERG kits).

The command sequence is very simple. The PC sends a string (ASCII) starting with either a "S" for straight or "T" for turn followed by a number from 1 to 128 for the individual point. Number 0 or numbers greater than 128 are ignored. The decoder addressing sequence is the same as for the switch matrix. Point numbers 1 to 4 drive a decoder with address 0, points 5 to 8 - decoder address 1, points 9 to 12 - decoder address 2 etc. up to points 125 to 128 for decoder address 31.

When power is applied to the adapter, the microcontroller is reset and checks whether the contacts on J7 are shorted or not. J7 can have a jumper or an external switch and sets whether the adapter is in PC mode or control panel (CP) mode. With J7 open, it is in CP mode. The mode can be changed at any time with the adapter running so it is easy to switch between PC and CP modes during an operating session. Note, when in CP mode and a control panel is attached, the encoder will set all the points to match the physical switches on reset. In PC mode the last point settings are not remembered and must be initialised by the PC program.

It is up to the end user to provide the layout control software.

### **Circuit description.**

The design is based on a PIC 18F4220 microcontroller. This is the latest generation of PIC and contains its own clock oscillator – set at 8MHz by the program. Each of the encoder column lines feeds an input on U1. The 16 column lines use the two PIC ports A and B. When a column is logic low, the PIC places the corresponding switch data on the output port D and this is interpreted by the encoder as if it came from the physical matrix. When reset, port D is an input so the real matrix is functional. The switch matrix is routed through U3 (tri-state buffer) and this isolates it when in PC mode. Transistor Q1 acts to invert the RS232 serial data. To save cost and space, a RS232 converter IC is not used.

The schematic is APC1\_sch.pdf and the PIC code is Ace\_PC1.asm (Ace\_PC1.hex). This description is APC1\_txt.pdf and the PCB layout is APC1\_pcb.pdf.