

## **The MERG DCC Accessory decoder. (Updated 31/5/02)**

Now has CV read, direct bit mode verify and optional 16F628 support.

The MERG accessory decoder, in its present version is intended for driving solenoid style point (turnout) motors. Each decoder has its own capacitor discharge unit (CDU) and will drive four pairs of coils with a high energy pulse. The MERG accessory system was intended for 'stand alone' operation rather than the more usual 'off track' operation. There were two reasons for this approach. Firstly, operation via the track generally requires a complex handset or at least relatively complicated sequences of button pressing, including remembering the number or address of each turnout. Without considerable practice and understanding of the handset, changing a turnout, while also trying to control the loco, is not easy.

The second reason for not using the track is that a short circuit on the track will disable the whole accessory system, including the ability to change the turnout that may well have caused the short in the first place. You are then completely 'stuck'.

Keeping the accessory (layout) control separate from the loco control gets round these problems and has additional advantages.

1. The DCC booster does not need the power to run the accessories.
2. The accessories (turnouts) can be operated with single on / off switches.
3. Switches can be mounted on a 'layout diagram'.
4. Action can be virtually instant, including setting many turnouts at once.
5. The locos remain under full control
6. The whole system can be used with a non-DCC layout, so greatly reducing the amount of wiring.

The MERG accessory decoders are intended for use with the MERG accessory encoders but may be operated by the signal from a DCC track. However, they do not take their power from the track and need a separate 15 to 24v AC, 50 – 60 Hz supply. (many decoders can run off a single low voltage transformer)

### **Description. (see schematic)**

The DCC signal input drives an opto isolator U1. It electrically isolates both the track and the AC power. The MERG encoder provides only 5v for the signal. R1 sets the opto current. If the decoder is run from a DCC track voltage of 12 –20v, R1 should be increased to about 1.5K. A PIC microcontroller decodes the DCC information and drives the 8 MOSFET power switches Q2 to Q9. A low power regulator U2 provides the 5v supply for the PIC. Isolated acknowledgement (ACK) is provided through U4 and the switched load R6. CVs can be programmed and read using any DCC programmer. Two updated PIC source codes are now available. Dbacc1a allows page mode or direct mode programming. The direct mode has full bit manipulation for both read and write. This speeds up CV reading greatly with programmers which use bit verify. Dccacc2.asm is functionally identical but is for the 16F628 PIC which is a cheaper replacement for the 16F84A.

The capacitor discharge circuit is the conventional rapid recharge type but with current limiting so the transformer is not excessively loaded. The same transformer can power other devices, lighting etc. without the flicker apparent with non limited CDUs. The storage capacitors C3 and C4 have a high total capacity (4400uF) and with a supply of 20vAC, will drive at least two PECO motors simultaneously. Protection diodes for the solenoid coils are included on the PCB.

## Programming

The MERG accessory decoder follows the NMRA standards and RPs for accessory decoders. Each decoder can have one accessory address in the range 0 to 510. (address 511 is defined as a broadcast address). Within that address, four pairs of outputs are defined. Each output can be individually disabled if necessary by clearing a bit in CV514. Also, the time for which an output is 'on' can also be defined. The time unit for the MERG decoder is 10 milliseconds so the on time ranges from 10 millisecs to 2.55 seconds. A value of 0 gives a constant output. The timing operates on each pair of outputs and it is not possible to set one of a pair to a different time than the other. For CDU use, 20 millisecs is a suitable value.

Note. The present design discharges a capacitor into the load so even if the CV is set to 0 (constant), the capacitor will discharge and the load current will fall with time.

### CVs used

CV513	low 6 bits of address	range 0 to 63	default 0
CV514	output activation, 1 = on, 0 = off	default is all on	11111111
CV515	on time for F1	range 0 to 255	default 2
CV516	on time for F2	range 0 to 255	default 2
CV517	on time for F3	range 0 to 255	default 2
CV518	on time for F4	range 0 to 255	default 2
CV519	version number	fixed	
CV520	manufacturer ID	fixed	13
CV521	hi 3 bits of address	range 0 to 7	default 0
CV541	configuration	fixed	10000000

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The design has been modified by others for use with lights, 'tortoise' style point motors and to run off the track power.