‘Arc’ A combined DCC auto-reverse and cutout module.

Experience has shown that using a completely separate auto-reverse booster for sections requiring auto-reverse such as ‘reverse loops’ is very wasteful and may lead to the ‘double voltage’ scenario. Also, having a single powerful booster with sections each with their own overload protection is not only economical on boosters but allows one section to short without shutting down the whole layout.

The Arc design combines both functions on a single PCB.

Principle.

The module is fed with the booster output and connects between the booster and the track section. The rectified DCC signal provides power for the module. Track current is sensed with a low value resistors in series with the track feed. For effective auto reversing the module must sense a short circuit in either feed and be able to isolate both feeds. The voltage developed across the sense resistors during a short is sufficient to turn on the transistors Q3 and / or Q4. Although DCC is alternating, the circuit will switch on the positive half cycle relative to the sense line.

All the necessary timing is provided by a cheap 8 pin PIC (12C509A). This obviated the need for a considerable amount of conventional logic and monostables. The PIC continually scans for an overload condition. When this is sensed the DCC output is switched off. Each ‘switch’ is two series MOSFETs which carry current in both directions and have virtually instant action. The PIC then reverses the relay, waits 25 milliseconds for the relay to change , then reconnects the track. Disconnecting the track while the relay changes is essential to prevent the main booster from tripping. If the short persists, the PIC disconnects the track again and retries at 0.5 second intervals – without again reversing the relay.

If the short has cleared for about one second, the sequence is reset and the next short will again reverse the relay first. This prevents the relay changing on every retry. As the ‘switch’ is purely electronic, it is much faster than any booster and the retry periods are also very short. So short that decoder-fitted locos on other sections are totally unaffected even though, during the retries the main booster is also effectively shorted.

A LED on the board indicates a short condition and there is a connector for an optional AWD.

The current needed to trip is set by the value of R7 and R8. The transistors turn on with a voltage of about 0.7v so with 0.22 ohms the current is 3.2 amps and with 0.33 ohms is 2.2 amps peak.

The MOSFET switching transistors are not critical and there are many alternatives. They must be able to carry at least 5 amps and should have a Vds of 50v or more to be on the safe side. The lower the Rds (on) the better but 0.15 ohms or less is adequate.

Mike Bolton. 23/01/02