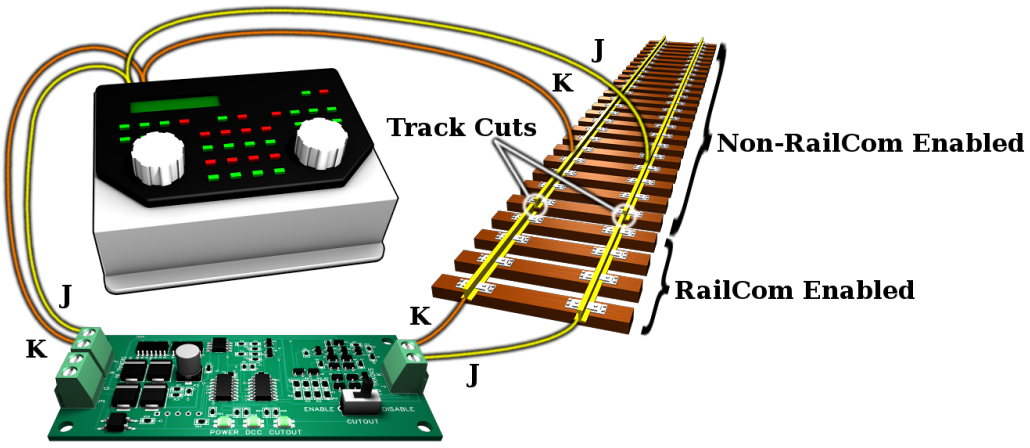
DCC_4PC Cutout Device Manual

1 Installation

This device can be used either on the output of a command station or booster, to add a cutout to an entire power district, or can be attached locally, to add or remove a cutout from a specific subset of the layout.

When a locomotive moves from a section supplied by our device to a section supplied by the same command station or booster as powers our device, there will be a brief period where the track signals are connected. Therefore it is important to ensure that the tracks are connected to the `J` and `K` terminals of the cutout device consistently with neighbouring sections. This is illustrated below:



2 Adding A Cutout

All DCC packets begin with a section called the preamble. It's a sequence of consecutive one bits which is longer than any which can possibly appear in any other part of a DCC packet, and allows DCC decoders to successfully identify DCC packets, even when mixed with packets of other protocols, such as Motorola or Selectrix.

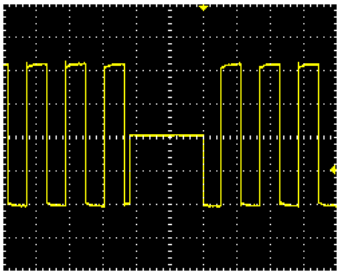
In order to create a cutout, some of these preamble bits are removed. Naturally, if enough preamble bits are removed, decoders will no longer be able to successfully interpret DCC packets. The NMRA DCC specification (S-9.2) requires that all command stations produce at least 14 preamble bits, and that decoders must be able to function with as few as 12 preamble bits, which leaves two bits which can safely be used for a cutout. This is what is commonly referred to as a short cutout.

As many command stations produce more than the required minimum number of preamble bits, a second, long cutout is defined. A long cutout can only be used with command stations which generate at least 16 preamble bits, as it replaces four of them.

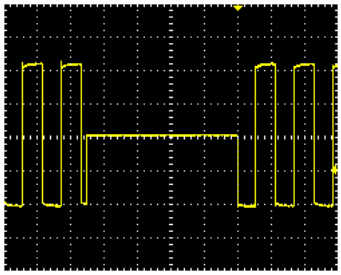
Short cutouts limit the information transmitted by a RailCom decoder. In fact, only broadcasting the decoder's address, and reading its CVs is possible. Long cutouts permit more information to be transmitted, making all of the features of RailCom available (e.g. actual speed information and reading several CVs at once). Additionally, long cutouts permit identification of multiple decoders in a single zone.

To use the cutout device to introduce a cutout to an existing signal, set the `CUTOUT` switch to the `ENABLE` position. As the cutout device can't add extra preamble bits to the signal generated by the command station, there is no guarantee that it will always be able to generate a long cutout. Therefore the `CUTOUT` LED is used to indicate the type of cutout which is being added to the signal:

Preamble Bits	Cutout	LED
≤ 13	None	Off
$14 \ldots 15$	Short	Red
≥ 16	Long	Green



A Short Cutout (Red LED)

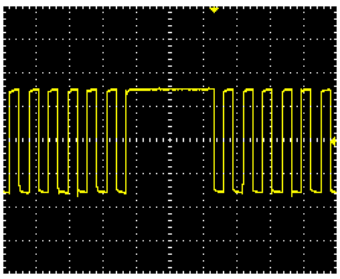


A Long Cutout (Green LED)

Some command stations permit you to set the number of preamble bits, so, even if you see a red LED, you may be able to get full RailCom support. For example, the Uhlenbrock Intellibox allows you to set the number of preamble bits using Sonderoption 904 (the value should be twice the number of preamble bits you want, so a minimum of 32 for full RailCom).

3 Removing A Cutout

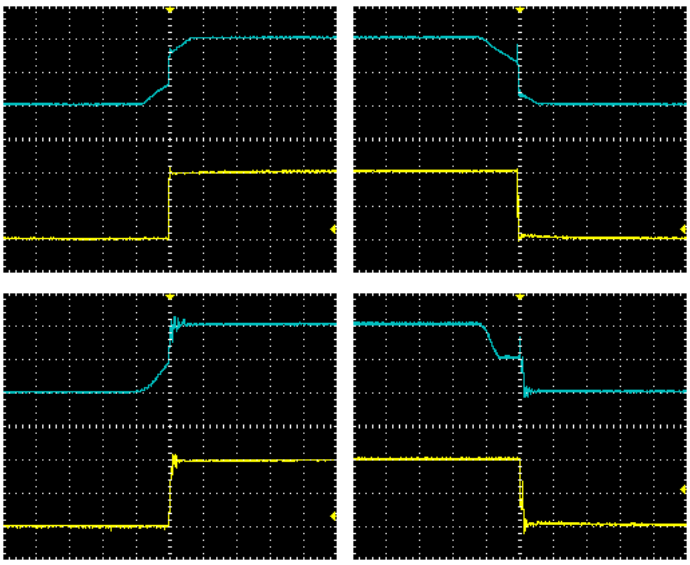
If the `CUTOUT` switch is set to `DISABLE`, then the output of the cutout device will have no cutout, even if the original signal had one. In this position the `CUTOUT` LED will always be off. The original DCC signal won't be restored, but the cutout device will ensure that there is power applied to the tracks even during the command station's cutout.



The result of removing an existing cutout using the cutout device set to `DISABLE`.

4 DCC Repair and Verification

The cutout device internally adjusts its incoming signal, so as to bring the signal closer to a perfect square wave. Whilst the NMRA DCC specification requires that decoders be quite tolerant of imperfect square waves, not all decoders perform as well as they should. As can be seen in the oscilloscope traces below, the cutout device significantly improves the shape of the DCC signal from two widely used command stations.



The blue traces show the signals produced by the command stations, while the yellow traces show the signals produced by the cutout device, and sent to the tracks.

The one aspect of the DCC signal which the cutout device can't change is the timing of the transitions. Therefore the `DCC` LED is used to indicate whether the DCC signal from the command station has timings which are within the NMRA DCC specification (S-9.1). If the timings are valid, the LED will be green, otherwise it will be red. If the `DCC` LED is green, then the output of the cutout device should be compatible with any NMRA-compliant DCC decoder.

5 Short-Circuit Detection

The cutout device provides short-circuit protection, with a current limit fixed at 5 amps. If a current greater than this limit is detected, the cutout device will remove power from the tracks. The cutout device will periodically check whether the short-circuit condition is still present, and when the short is removed, will automatically restore power.

If desired, the command station can be alerted when the cutout device has detected a short circuit, and the two terminals `D` and `E` are provided for this purpose. The command station's booster output will generally have three terminals, usually labelled `C`, `D` and `E`. If the `D` and `E` terminals of the cutout device are connected to the `D` and `E` terminals of the command station, then when the cutout device detects a short-circuit, the command station will be automatically informed.

Note: As most command stations will cut power when a booster detects a short circuit, the cutout device will lose power, causing all three LEDs to turn off, and preventing the cutout device from detecting when the short circuit has been removed.