7 Summary of Configuration Variables

CV#	Function	Default Value	User Value
1	Control Address (CV1 & CV9 default = 900)	132	
2	reserved	-	
3	Over current limit	4	
4	Time(ms) of over current (fault) before output off	25	
5	Time(x262ms) of output off after fault	8	
6	Time(x262ms) before output on after booster on	4	
7	Manufacturer Version No.	-	
8	Manufacturer ID	25	
9	Control Address Adder	3	
10	reserved	-	
11	Time(ms) on - special turn on sequence	0	
12	Time(ms) off	10	
13	Time(ms) on	10	
14	Time(ms) off	10	
15	Time(ms) on	15	
16	Time(ms) off	8	
17	Time(ms) on	20	
18	Time(ms) off	8	
19	reserved	-	
20	reserved	-	
21	reserved	-	
22	reserved	-	
23	reserved	-	
24	reserved	-	
25	reserved	-	
26	reserved	-	
27	reserved	-	
28	reserved	-	
29	Configuration	0	
30	reserved	-	
31	Ops Mode Loco Address	1	
32	reserved	-	
33	reserved	-	
34	reserved	-	

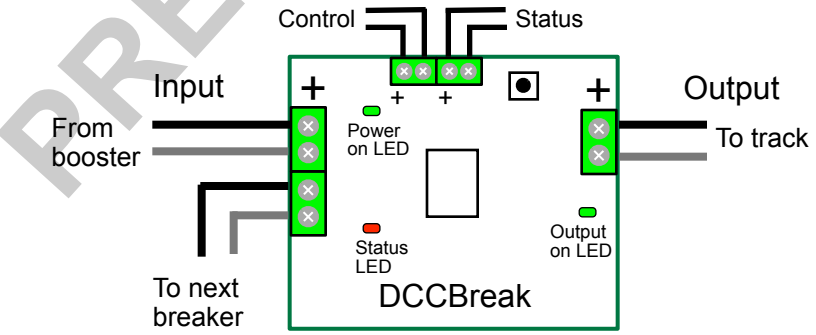
WARNING: This product contains a chemical known to the state of California to cause cancer, birth defects or other reproductive harm.

TEAM DIGITAL

Improving the world of DCC

DCCBreak
DCC Circuit Breaker

- > Short and over current protection
- > Adjustable shutdown current level
- > Very low track voltage drop
- > 4 amp continuous operation
- > Local and remote on/off control
- > Remote status
- > Provision for buzzer



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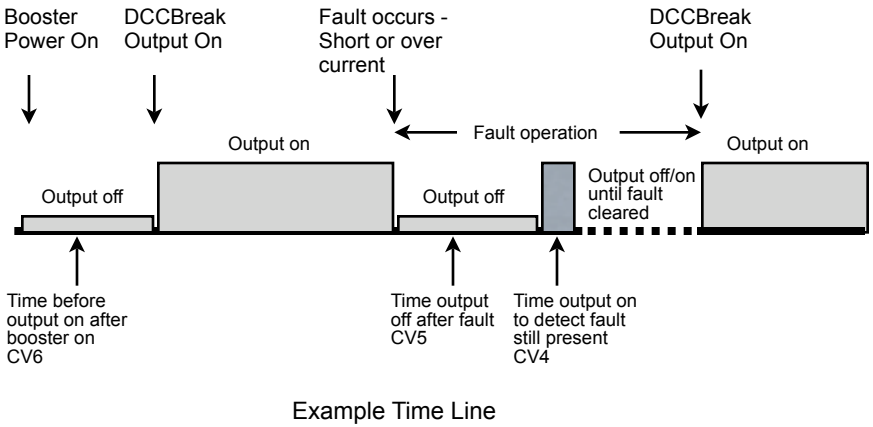
03.07.10

1 Operation

The DCCBreak is designed to protect boosters from shutting down due to short circuits or over current conditions (fault) beyond the booster's current limit. It has a special option that helps to start "difficult loads" that may otherwise cause the booster problems. One type of "difficult load" is caused by the capacitors used in some decoders, typically with sound. When power is first applied to a capacitor, it appears like a short until it is charged.

When a fault is detected the DCCBreak immediately turns off the output. It waits a time and then turns on the output and determines it the fault is still present. It continues this off/on sequence until the fault is removed.



Example Time Line

The output of the DCCBreak can be turned on and off by issuing turnout (switch) command or by the control input. This can be useful if you do not want sections of track to be powered all the time. Additional it can be programmed so that when booster power is turned on the DCCBreak does not turn on it's output until commanded. Note: If a fault is present the DCCBreak does not respond to any DCC commands.

The DCCBreak is intended to be used with 5 amp (or less) boosters. The maximum continuous operating current is 4 amps. The highest over current limit can be set to about 4.5 amps.

4.8 Operations Mode Loco Address

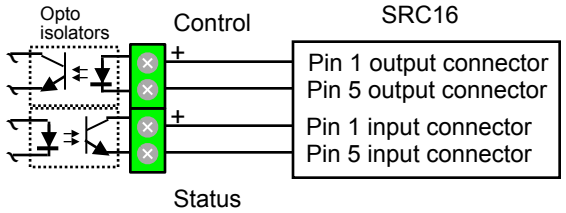
This CV sets the operations mode program address. Program the DCCBreak just like you would a loco in ops mode. This is a loco 2 digit address and therefore must be unique among locomotive addresses. If the "Smart" program button is pressed when power is turned on, ops mode is enable until power is removed.
CV31 - Ops mode address, a value of 1 to 127. Default is one (1).

5 Specifications

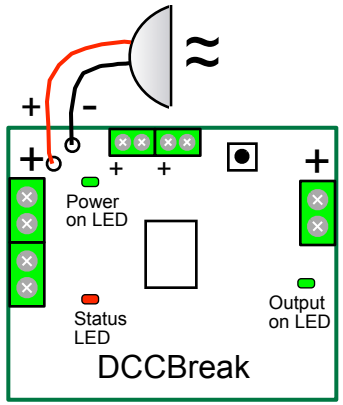
Operating voltage: 9 to 20 volts DCC
Maximum continuous current: 4 amps
Control input voltage: 5 - 15 volts
Status output maximum current: 6 milliamps
(100 milliamps = 0.1 amps)

6 Applications

By connecting a DCCBreack(s) to a Team Digital SRC16, status and control could be handled in one or more remote locations via the serial bus. A typical connection is shown.



If an audible alert is desired a buzzer can be connected to the DCCbreaker with a couple of wires as shown. Be sure and observe the polarity of the connection. Mallory buzzer MSR320R will work (Digikey 458 -1087).



4.3 Current limit

This CV determines the current at which the DCCBreak considers to be a fault. Note -The CV value is not the same as the actual current limit.
CV3 - Current limit number, value of 1 to 7.

Current Limit Table			
CV Value	**Current Limit**	**CV Value**	**Current Limit**
1	~ 1.6 Amps	5	~ 3.8 Amps
2	~ 2.1 Amps	6	~ 4.3 Amps
3	~ 2.7 Amps	7	~ 4.8 Amps
4	~ 3.4 Amps (default)	-	

4.4 Time of over current

This CV determines the time the DCCBreak allows an over current (fault) condition before it turns off the output. The over current limit is defined by CV3.
Over current time is somewhat of a compromise. If there is a short on the track it is desirable to turn off power immediately to avoid the booster shutting down or damage to a locomotive. On the other hand, if there are several sound locomotives on the track, they present what looks like a short (high current spike) when power is first turned on.
CV4 - Time in milliseconds (0.1 seconds) of over current, value of 1 to 255. Values greater than 100 ms are not recommended because of booster shut down times.

4.5 Time off after fault

This CV determines the time the DCCBreak keeps the output off after a fault before it turns the output back on. Once it turns on, it will turn back off if the fault is still present.
CV5 - Number times .256 seconds, value of 1 to 255.
Example: 8 x .256 ~ 2 seconds

4.6 Time before output on

This CV determines the time the DCCBreak waits to turn the output on after it is powered on (after the booster turns on).
CV6 - Number times .256 seconds, value of 1 to 255.
Example: 4 x .256 ~ 1 seconds

4.7 Special turn on sequence

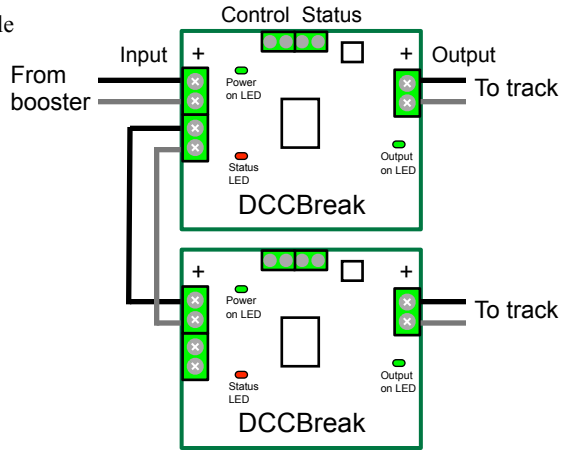
These CVs determine a sequence of on/off times the DCCBreak inserts, every so often, in place of the over current time (CV4). This sequence tends to average high current spikes caused by loads like sound locomotives as mentioned in section 4.4. For example, if the DCCBreak in on for 10 ms and off for 10 ms the average current is about 50%. By rapidly turning the output on and off the current inrush to a sound locomotive can be reduced. This sequence can be enabled be setting CV11 to a value greater than zero (recommend 10). Total on time greater than 100 ms is not recommended because of booster shut down times.

CV11 to CV18 - Time in milliseconds (0.1 seconds), value of 1 to 255.

2 Getting Started

The DCCBreak comes from the factory ready to use. The default current limit setting is 3 amps. If you are using a NCE PowerCAP reduce the current limit to 2.3 amps. Connect the DCCBreak input to a booster and the output to the track section to be protected. Be sure and maintain the correct polarity when connecting the DCC wiring. Since the DCCBreak is powered from the track, it draws current. Any block detectors should be installed on the output side of the DCCBreak.

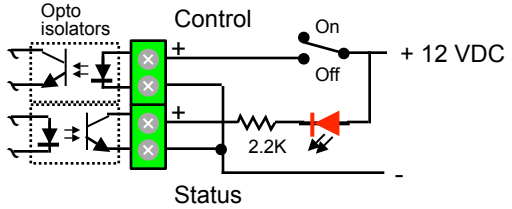
The DCCBreak has a second input connector so that multiple DCCBreaks can be daisy chained together.



Note: It is normal for the Power On LED to flicker during a fault condition. However, if the Power ON LED goes out during a fault, that means the booster shutdown instead of the DCCBreak. In this case you will need to decrease the current limit and perhaps the over current time. Also during a fault condition the Smart button can be pressed to turn off the output (DCC).

The status output is used to indicate when a fault is present. It can be used to drive an external LED or interface to a device like Team Digital's SRC16. See the applications section for more details.

The control input is used to turn on and off the output. If the output is off due to the control input than the output can not be turned on by a turnout command via DCC. The control input over rides control via DCC. It will also turn off the output during a fault condition.



3 “Smart” Programming

“Smart” programming is a term used to describe an easy way to program Configuration Variables (CVs). The throttle is used to issue switch or accessory commands just like controlling switches (turnouts).

To program in “Smart” mode, connect the DCCBreak power terminals to track power. Turn on power and wait for the output to turn on. Press the “Smart” program button and hold it down for approximately one second until the status LED starts to flash. Then release it. The DCCBreak is now ready to be programmed via turnout commands.

Using the throttle select the switch address or accessory number you want for the over current limit.

Current Limit Table			
Number	**Current Limit**	**Number**	**Current Limit**
1	~ 1.6 Amps	5	~ 3.8 Amps
2	~ 2.1 Amps	6	~ 4.3 Amps
3	~ 2.7 Amps	7	~ 4.8 Amps
4	~ 3.4 Amps (default)	-	

The status LED now flashes twice with a pause and then repeats indicating that the time of over current is ready to be programmed. Note: If you are just changing the limit current then press and hold the “Smart” button until the status LED stops flashing.

As you progress through the “Smart” programming steps, the status LED flashes the number of times indicating which step is ready to be programmed.

At any time you can exit “Smart” mode by pressing the button for approximately one second until the status LED stops flashing. The output will then be turned on.

Smart Programming Summary			
#Flashes	**Description**	Default	t or c
To start - Press the “Smart” button until the Status LED starts to flash			
1	Over current limit (see current limit table)	4	accept
2	Time(ms) of over current (fault) before output off	25	accept
3	Time(x262ms) of output off after fault	8	accept
4	Time(x262ms) before output on after booster on	4	accept
5	On/Off Control address	900	accept

Switch (Turnout) Terminology		
This manual	throw or t	close or c
Digitrax	throw or t	close or c
NCE	reverse or OFF or 2	normal or ON or 1
Lenz	-	+
MRC	OFF	ON

4 Configuration Variables (CVs)

The DCCBreak supports **Operations (Ops) Mode** programming. To program in Ops mode or “programming on the main” holding down the Smart button just before power is turned on. When the Status LED begins to flash rapidly release the button. This temporarily sets the DCCBreak in ops mode until power is turned off. **When using ops mode to change CV values, the DCCBreak does not recognize the new values of CVs until power is turned off and then back on.** The default address is 1 and can be changed if desire (CV31). **This is a loco address, so be careful when using this feature**.

To reset all the CVs to the factory values hold down the Smart button until the status LED flashes rapidly (at least 10 seconds). At first the LED will flash at a slower rate and then flash rapidly.

4.1 On/Off Control Address

These CVs determine the address that allows the DCCbreak to be turned off and on by a turnout (switch) command via DCC. By issuing a turnout throw command with this address the output of the DCCbreak is turned off. To turn it on issue a close command. Note: This does not function during a fault condition.

The address is constructed with two CVs, an address and an address adder. If an address greater than 255 is needed then the address adder value will be greater than zero. Otherwise the address is set by the address value only.

The address adder value represents a number that is added to the address value to give the required address. The following table shows the CV value to use for the adder. For easier programming see “Smart” Programming.

Address Adder										
CV Value	0	1	2	3	4	5	6	7	8	9
ADD	0	256	512	768	1024	1280	1536	1792	2048	2304

The default turnout address is 900 (CV1 = 132, CV9 = 3).
CV1 - Control address, value 0 to 255
CV9 - Control address adder, 0 to 9

4.2 Decoder Configuration

This CV determines the configuration.
CV29 - Configuration.
Option 1 - Off at power on. The DCCBreak output will be off at power on until commanded to be on. It can be turned on by issuing a close turnout command with the control address or by the control input. This option disables CV6.