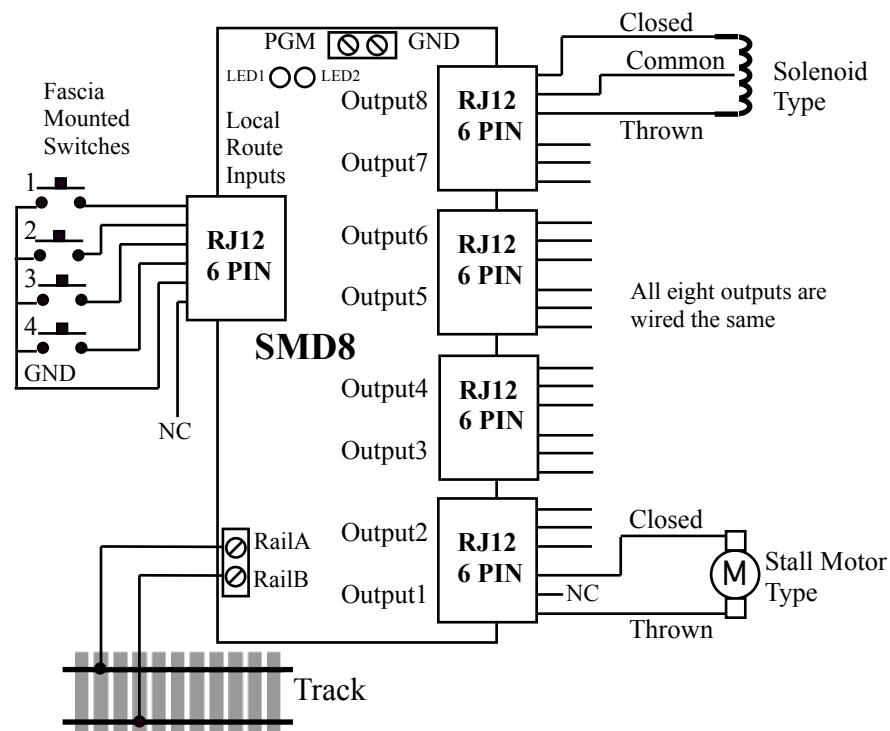


5 Summary of Configuration Variables:

CV#	Function/Default Value	CV#	Function/Default Value	
1	Low Address	01	33 Route 2 Switch State	0
2	Output On Time	31	34 Route 3 Selection	0
3	Output 1 Configuration	0	35 Route 3 Switch State	0
4	Output 2 Configuration	0	36 Route 4 Selection	0
5	Output 3 Configuration	0	37 Route 4 Switch State	0
6	Output 4 Configuration	0	38 Route 5 Selection	0
7	Manufacturer Version No.	-	39 Route 5 Switch State	0
8	Manufacturer ID	-	40 Route 6 Selection	0
9	Hi Address	0	41 Route 6 Switch State	0
10	Output 5 Configuration	0	42 Route 7 Selection	0
11	Output 6 Configuration	0	43 Route 7 Switch State	0
12	Output 7 Configuration	0	44 Route 8 Selection	0
13	Output 8 Configuration	0	45 Route 8 Switch State	0
14	Toggle Output Enable	-	46 Route 9 Selection	0
15	Local Route 1 Selection	255	47 Route 9 Switch State	0
16	Local Route 1 Switch State	0	48 Route 10 Selection	0
17	Local Route 2 Selection	255	49 Route 10 Switch State	0
18	Local Route 2 Switch State	255	50 Route 11 Selection	0
19	Local Route 3 Selection	0	51 Route 11 Switch State	0
20	Local Route 3 Switch State	0	52 Route 12 Selection	0
21	Local Route 4 Selection	0	53 Route 12 Switch State	0
22	Local Route 4 Switch State	0	54 Route 13 Selection	0
23	Reserved	-	55 Route 13 Switch State	0
24	Reserved	-	56 Route 14 Selection	0
25	Route Group 1- 8 Address	26	57 Route 14 Switch State	0
26	Route Group 9-16 Address	0	58 Route 15 Selection	0
27	Reserved	-	59 Route 15 Switch State	0
28	Reserved	-	60 Route 16 Selection	0
29	Decoder Configuration	0	61 Route 16 Switch State	0
30	Route 1 Selection	255	62 Ops Mode Address	1
31	Route 1 Switch State	0	63 Pwr On State - Outputs 1-4	0
32	Route 2 Selection	0	64 Pwr On State - Outputs 5-8	0

SMD8 Switch Machine Driver

- > DCC compatible accessory decoder
- > Drives eight solenoid and/or stall type machines
- > Voltage step-up capacitor discharge
- > 16 programmable remote controlled routes
- > Four programmable local routes
- > Operates on low current from track power



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

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1 Operation:

The SMD8 is capable of driving eight solenoid and/or stall motor type switch machines. It contains a voltage step-up Capacitor Discharge Unit to store energy. A discharge of this energy is used to energize the solenoid to change the switch state. Using a CDU reduces the current drawn from the track to a small level sufficient to recharge the CDU. However, once the CDU has been discharged (a switch state changed) a time period is required for the CDU to recharge. This is typically about three seconds. LED 1 will be on during this time. Since more than one switch may be requested to change state at the same time, as in a local route, the requests are queued so that each switch may change state in turn. A stall motor type does not use the CDU and therefore, no recharge time is required when activated.

Caution: The CDU retains a voltage charge several minutes after power is removed.

The SMD8 is addressed in groups of eight and may be set to any of 2040 addresses by programming the low and hi address CVs. The SMD8 comes from the factory ready to use with output addresses set at 1 through 8.

Two types of route control are supported. The remote controlled routes are controlled from the command station just like a single switch is, except that multiple switches may be activated. The local routes are activated by momentarily grounding the respective input. Routes are configured by programming the respective CVs as to which outputs are selected in the route and the output state. Remote controlled routes are in two groups of eight. Each group has a group address to allow the command station to access it.

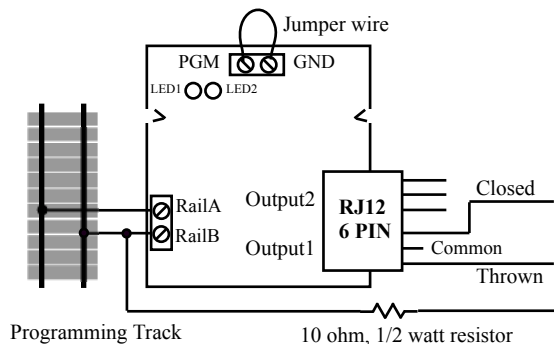
Configuration Variables (CVs):

The SMD8 supports **Paged Mode Programming in Service Mode and Ops Mode**. To program in paged mode, the program terminal (PGM) and the ground terminal (GND) must be connected together with a jumper wire. Then terminals Rail A and Rail B connected to the programming track. See diagram below. When power is applied, LED 1 will come on and LED 2 will flash when programming is successful. Some systems only apply power during actual programming, so LED1 will only be on during that time. The SMD8 does not have built in feedback like a mobile decoder. Because of this, some systems may show a "no decoder on track" error or "can not read CV". However it still is programmed. NOTE: if you want to provide external feedback so CVs can be read, add a resistor as shown in the diagram below.

To enter normal operation, disconnect from the programming track and remove the jumper from terminals (PGM) and (GND). Now connect terminals Rail A & B to the main track.

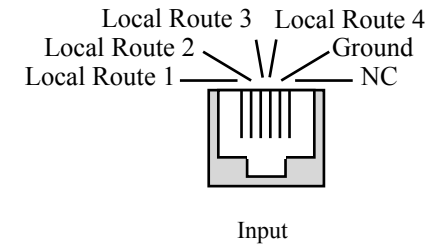
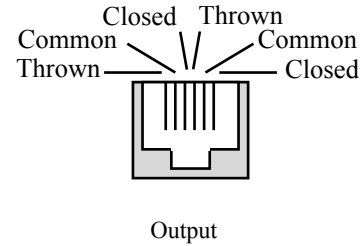
Program CV7 with 170 will "reset" all CV's from 15 and above to the default value.

Program CV7 with 1 will restart the SMD8 so power need not be cycled when programming in ops mode. See section 2.10.



3 Connections:

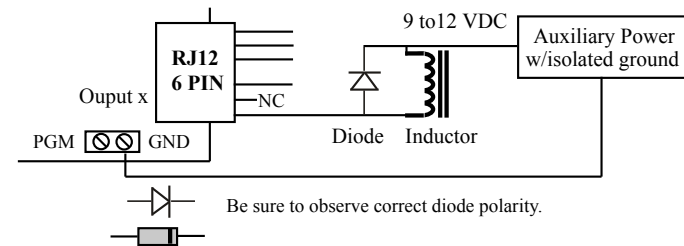
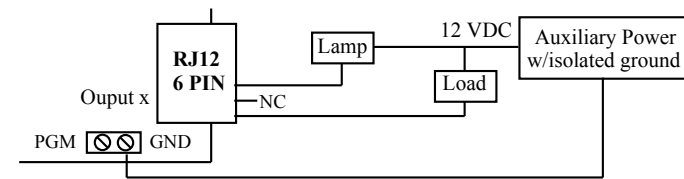
Output and local inputs are 6 pin RJ12. Below is the pin description.



4 Other Applications:

The SMD8 can be used to turn on devices other than switch machines. In these cases auxiliary power is required. If the load is an inductance, a diode is required to suppress the positive voltage transient when the load is turned off. An example of an inductance load is the Kadee electric uncoupler #307. See wiring examples below.

Note: The common connection is intended only to provide power to solenoid type switch machines. Other uses will result in improper operation.



2.8 Power On Output State

These CVs determine the state of each output at power on. Decode configuration option 1 or option 2 has to be enabled for these CVs to function. You only need to program these CVs if option 2 is enabled. If option 1 is enabled, the SMD8 automatically programs them.

CV63 - Power on state for outputs 1 to 4, a value from 1 to 170

CV64 - Power on state for outputs 5 to 8, a value from 1 to 170

Example: CV63 = 1 + 4 + 32 + 64 = 101, throw output 1, throw output 2, close output 3 and throw output 4

Example: CV63 = 2 + 8 + 16 + 64 = 90, close output 5, close output 6, throw output 7 and throw output 8

If neither throw or closed is selected the output does nothing.

Output	1		2		3		4	
State	t	c	t	c	t	c	t	c
Select State	x		x			x	x	
State Value	1	2	4	8	16	32	64	128
CV63 = 101	1		4			32	64	

t = throw
c = close
x = selected

Output	5		6		7		8	
State	t	c	t	c	t	c	t	c
Select State		x		x	x		x	
State Value	1	2	4	8	16	32	64	128
CV64 = 90		2		8	16		64	

Tip: An easy way to program CV63 and CV64.

1. Enter normal operating mode and command each of the outputs to the desired state.
2. Enter programming mode and program CV29 to 2 (enable option 2).
3. Exit programming mode.

Now each time the SMD8 is powered on, the outputs will go to the same state as set in step 1.

2.9 Output OnTime

This CV determines how long an output will stay on. In order for this CV to function the output configuration CV must be set to a value of two ("2"). See section 2.2. This CV applies to all outputs set to this configuration. The default value of this CV is 31 which give an on time of about 8 seconds.

CV2 - Output on time, a value of 1 to 127.

The time is determined by the following equation.

On time = CV2 X .256 seconds

2.10 Ops Mode Address

This CV sets the operations mode program address. Program the SMD8 just like you would a loco in ops mode. This is a loco 2 digit address and therefore must be unique among locomotive addresses. Option 3 must be enabled to use this address for programming on the main. The programming track is not required once this address and option 3 have been set.

CV62 - Ops mode address, a value of 1 to 99.

2.1 SMD8 Address

These CVs determine the address of output one. Outputs 1 to 8 are sequential addresses.

Note: Some systems refer to CV1 as AD, AD2 or short address.

CV1 - Low address, a value from 0 to 63

CV9 - High address, a value from 0 to 7

The address is determined from the CV values by the following equation.

Address = ((CV9 x 64) + CV1 - 1) x 4 + 1

Example: For CV1 = 1 and CV9 = 0 then Address = ((0 x 64) + 1 - 1) x 4 + 1 = 1

Output	1	2	3	4	5	6	7	8	
CV1 = 1	1	2	3	4	5	6	7	8	CV9 = 0
CV1 = 2	5	6	7	8	9	10	11	12	CV9 = 0
CV1 = 0	253	254	255	256	257	258	259	260	CV9 = 1
CV1 = 1	257	258	259	260	261	262	263	264	CV9 = 1

2.2 Output Configuration

These CVs determine the output type.

CV3, 4, 5, 6, 10, 11, 12, 13- Output configuration

Set the CV value to zero ("0") for solenoid type operation (queued).

Set the CV value to one ("1") for stall motor (continually on) type operation (not queued).

Set the CV value to two ("2") for 8 second motor on type operation (not queued). If the motor doesn't have to be continually powered, use this type to reduce track current draw.

The length can be adjusted by changing the value of CV2.

Set the CV value to four ("4") for on/off manual motor control type operation. This type doesn't response if included in a route.

2.3 Decoder Configuration

This CV determines the decoder configuration options.

CV29 - Configuration, a value from 0 to 2

Option 1, CV29 = 1 The SMD8 will remember each outputs state at power off. Then at power on, after about five seconds, each output will be set to the same state. The output state is automatically stored in CV63 and CV64.

Option 2, CV29 = 2 At power on, after about five seconds, each output will be set to the state as determined by CV63 and CV64. You must program CV63 and CV64 to the desired state at power on. Option 2 disables option 1. See section 2.8.

Option 3, CV29 = 4 Enables ops mode programming. This allows the address in CV62 to be used as if it is a "loco" address and can be programming on the main. See section 2.10.

To combine options add their value together.

Example: Enable options 2 and 3, CV29 = 2 + 4 = 6

2.4 Toggle Output State

This CV enables an input (local route), when grounded, to toggle (change to the opposite state) one or more of the outputs. At least one output has to be selected. See section 2.6. Switch state CVs are not used (section 2.7). Consider using option 1 or 2 of CV29 so that, after power on, the first time the toggle is activated a known output state will occur.

Also, if the toggle is re-activated before an output has timed out a random state may occur.

CV14 - Toggle Output State, a value from 0 to 15

Example: CV14 = 3, enable inputs 1 and 2 for toggle output function.

Example Toggle Output	Value	Select
No toggle enabled	0	
Input 1 Toggled enabled	1	1
Input 2 Toggled enabled	2	2
Input 3 Toggled enabled	4	
Input 4 Toggled enabled	8	
CV value		3

2.5 Remote Control Route Address

These CVs determines the address of the route group and are independent of the SMD8 address.

CV25 - Route Group 1-8 Address, a value from 1 to 63

CV26 - Route Group 9-16 Address, a value from 1 to 63

The address is determined from the CV values by the following equation.

Address = (CV25 – 1) x 4 + 1 and (CV26 – 1) x 4 + 1

Example: CV25 = 26, throw switch 101 to activate route 1, close switch 101 for route 2

Route Group Address Assignment Examples									
Route	1	2	3	4	5	6	7	8	
CV25 = 1	1t	1c	2t	2c	3t	3c	4t	4c	t = throw c = close
CV25 = 2	5t	5c	6t	6c	7t	7c	8t	8c	
CV25 = 26	101t	101c	102t	102c	103t	103c	104t	104c	
Route	9	10	11	12	13	14	15	16	
CV26 = 5	17t	17c	18t	18c	19t	19c	20t	20c	

2.6 Route Output Selection

These CVs determine which output is included in the route. Each of the eight outputs has its own value. To calculate the CV value, add up all the individual values of the outputs to be included (selected). An excluded output has a value of zero.

CV15, 17, 19, 21 - Local route (input) selection

CV30, 32, 34, 36, 38, 40, 42, 44 - Remote control route group 1-8 selection

CV46, 48, 50, 52, 54, 56, 58, 60 - Remote control route group 9-16 selection

Example: For remote route 1, select outputs 1, 2, and 6. CV30 = 1+2+32 = 35.

Route Selection Example									
Output	1	2	3	4	5	6	7	8	
Output Value	1	2	4	8	16	32	64	128	
Select Output	x	x				x			x = selected
CV30 = 35	1	2	0	0	0	32	0	0	

2.7 Route Switch State

These CVs determine the state, closed or thrown, of the switch. Each of the eight outputs has a close and throw value. A close always has a zero ("0") value. A throw has a value greater than zero. To calculate the CV value, add up all the close and throw values. Even if an output is not selected, a close or throw value must be given.

CV16, 18, 20, 22 - Local route switch state

CV31, 33, 35, 37, 39, 41, 43, 45 - Remote control route group 1-8 switch state

CV47, 49, 51, 53, 55, 57, 59, 61 - Remote control route group 9-16 switch state

Example: For remote route 1, close outputs 2, 4, 7 and 8, and throw outputs 1, 3, 5 and 6.

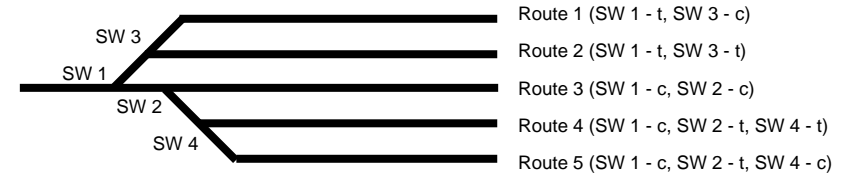
CV31 = 1+4+16+32 = 53.

Switch State Example								
Output	1	2	3	4	5	6	7	8
Throw Value	1	2	4	8	16	32	64	128
Select State	t	c	t	c	t	t	c	c
CV31 = 53	1	0	4	0	16	32	0	0

t = throw
c = close

Note: Switch or turnout position can be referred to by throw (t) or Reverse (R) and close (c) or Normal (N). Throw and close are used in this document.

Example of using SMD8 Routes



Route Group 1 - 8 address CV 25 = 26

SW 1 to 4 connected to SMD8 outputs 1 to 4 respectively

Route 1 CV 30 = 5, CV 31 = 1 execute with 101t

Route 2 CV 32 = 5, CV 33 = 5 execute with 101c

Route 3 CV 34 = 5, CV 35 = 0 execute with 102t

Route 4 CV 36 = 11, CV 37 = 10 execute with 102c

Route 5 CV 38 = 11, CV 39 = 2 execute with 103t

One SMD8 can handle routes with up to eight switches. However, it may necessary to have routes with more than eight switches and consequently more than one SMD8. Multiple SMD8 can be programmed to operate together to execute a route with one command. Lets say you have a route with 16 switches. This would require two SMD8s.

The first SMD8 controls switches 1 to 8 and the second SMD8 controls switches 9 to 16.

The CV 1 & 9 values should be different for each SMD8 giving them their own address because you still may want to control each switch individually. The SMD8 address is independent of the route address.

The CV 25 value should be the same for both SMD8s because when you execute the route with one switch command both SMD8s will respond.

CV 30 & 31 of the first SMD8 will determine how switches 1 to 8 operate in route 1.

CV 30 & 31 of the second SMD8 will determine how switches 9 to 16 operate in route 1.

CV 32 & 33 of the first SMD8 will determine how switches 1 to 8 operate in route 2.

CV 32 & 33 of the second SMD8 will determine how switches 9 to 16 operate in route 2.

.....etc

This applies for routes 1 to 8 because the CV 25 values are the same for both SMD8s.

If you want routes 9 to 16 in both SMD8s to function together then the CV 26 value must be the same for both SMD8s.