

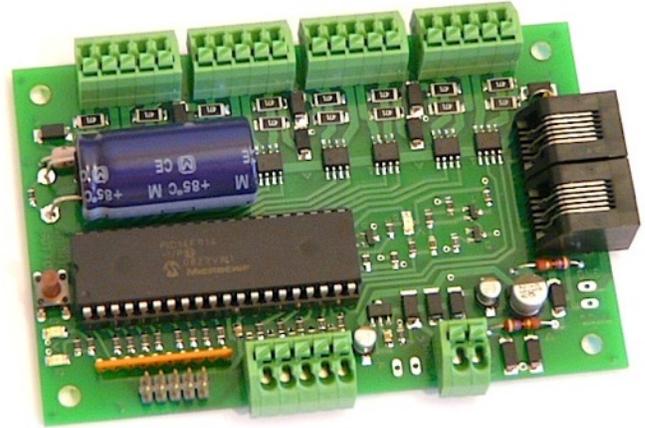


TEAM DIGITAL

Improving the world of DCC

SMD84 Switch Machine Driver with Serial Bus

- > DCC compatible accessory decoder
- > Drives 8 solenoid and/or stall type machines
- > 8 configurable routes
- > 13 Individually configurable inputs
- > “Smart” Programming
- > DCC gateway to serial bus
- > LocoNet® compatible serial bus



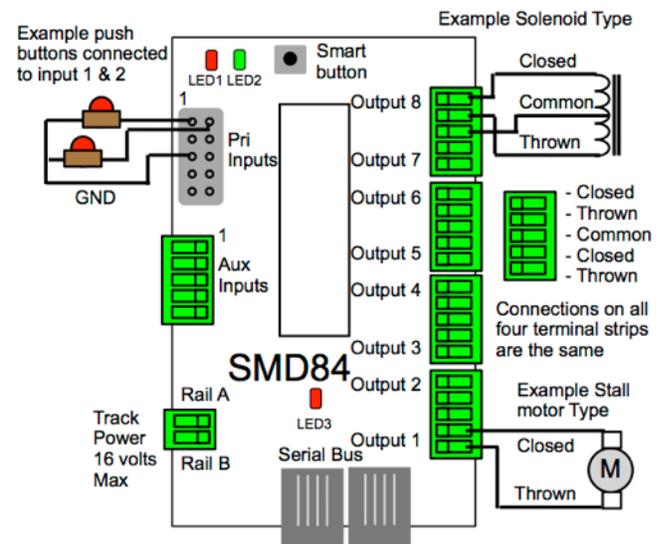
Description

The SMD84 is a DCC compatible accessory decoder. It can control up to 8 solenoid switch machines and/or low current stall type switch machines. The inputs can be used for push buttons to control switches (turnouts). It has route capability for multiple turnout control.

The SMD84 can be used as a stand-a-lone controller or communicate with other devices that have a compatible serial bus.

Using the serial bus, one SMD84 could control another. Push buttons connected to the inputs of one SMD84 can control switch machines connected to another SMD84. A route defined in SMD84 could include switch machines controlled by another SMD84. The serial bus can help in reducing and simplify the wiring.

The SMD84 works out of the box with no programming. If you need to change addresses its as easy as issuing turnout commands. If custom operation is required, CVs can be programmed by the DCC system.



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1 Operation

The SMD84 is capable of driving eight solenoid (twin coil) and/or low current stall motor type switch machines. For solenoid type it contains a 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. 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. Since more than one switch may be requested to change state at the same time, as in a route, the requests are held or 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 SMD84 supports routes. A route allows for the control of multiple switches (turnouts) with just one switch command. Each route is made up of eight cells (switch addresses) and one top level address (or route execution switch address). Each top address is completely independent of a output address. Complex routes with more than eight addresses can be created by assigning the same address to more than one top level address. Routes are executed by issuing a switch command.

Since the SMD84 is an accessory decoder, it can be controlled via DCC commands. It can also be controlled via the serial bus (LocoNet compatible). For non-Digitrax systems a DCC gateway feature allows DCC switch commands to be passed directly to the serial bus. This allows DCC switch commands to control devices connected to this serial bus.

1.1 LED Indicators

LED 1 flashes indicates “Smart” programming. LED 2 flash indicates accepted program value or a valid received address. LED 3 slow flash indicates heartbeat and fast flash indicates serial bus short.

2 Getting Started

The SMD84 comes from the factory ready to use. It is programmed to drive solenoid switch machines (three wire). An example of a three wire (twin coil) type switch machine is an Atlas Snap Switch™ or a Peco. The eight outputs are programmed with addresses one to eight respectively. Connect the outputs of the SMD84 to the solenoid switch machines and RAIL A and RAIL B terminals to the track power as shown in the diagram on the front page. You are now ready to control your switches from the throttle.

You can control the outputs from fascia buttons by connecting them to the primary and aux inputs. The eight primary inputs, when grounded, will toggle the eight outputs respectively. The five aux inputs, when grounded, will throw the first five outputs respectively.

If you want to change the type of switch machine an output drives or some of the output addresses go on to “Smart” Programming section. If you want to customize the SMD84 go on to the Configuration Variables section.

Before doing any programming, it is strongly recommended that you verify basic operation.

2.1 Control via LocoNet - Digitrax Users

The SMD84 comes from the factory ready to use by control from DCC commands when it is connected to track power. To control the SMD84 via LocoNet, it must be enabled. LocoNet can be enabled using section 3, “Smart” programming Part 3 or the programming track. If the programming track is used, connect the SMD84 track power terminals to the programming track and program CV29 with a value of 48. The SMD84 can now be controlled via LocoNet. The SMD84 should be power from the track bus for proper CDU operation.

3 “Smart” Programming

“Smart” programming is a term used to describe an easy way to program Configuration Variables (CVs). A controller (any device used for switch/accessory control) is used to issue switch (turnout) or accessory commands.

“Smart” programming only works when the SMD84 is connected to track power.

There are three parts to “Smart” programming. You can:

1. change all **output** addresses to 8 sequential numbers, either for solenoid operation or low current stall motor control.
2. change each **output** address to a non sequential numbers, either for solenoid operation or low current stall motor control.
3. set the SMD84 configuration and status report options and change the primary **input** addresses to 8 sequential numbers.

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

To program in “Smart” mode, connect the SMD84 power terminals to track power. The serial bus (LocoNet in Digitrax systems) should NOT be connected to the SMD84 during “Smart” programming.

To start turn on track power. Wait 6 or 7 seconds.

You can start from any part. Also at any time you can exit “Smart” mode by pressing the button for approximately one second until LED1 stops flashing.

Part 1: To change addresses and mode, press the “Smart” program button and hold it down for approximately one second until LED1 (red) starts to flash. Then release it. The SMD84 is now ready to have the output addresses changed. You can set eight sequential addresses in one step. Issue either a close or throw command for solenoid type or stall type. Note that output configuration is not the same as SMD84 configuration.

Smart Programming Part 1 - Change addresses and output configuration (sequential addresses)					
<i>Part 1: To start - Press the “Smart” button until LED1 starts to flash</i>					
LED1 #Flashes	Description	t	c	Example	
1	Select beginning address for 8 sequential addresses	stall motor	solenoid	9	c
<i>The SMD84 will now restart and be ready to operate</i>					

For example, to set addresses 9-16 and use solenoid machines, select switch address 9 and issue a c (close) command

Part 2: To change individual output addresses and output configurations (solenoid type or stall type) press the “Smart” program button and hold it down. After about a second LED1 (red) starts to flash. Continue to hold it down until LED2 (green) turns on. Then release it. LED1 will be flashing and LED2 will be on. The SMD84 is now ready to be programmed.

Smart Programming Part 2 - Change addresses (non-sequential addresses)					
<i>Part 2: To start here - Press the “Smart” button until LED2 lights</i>					
LED1 #Flashes	Description	t	c		
1	Output 1 address	stall motor	solenoid		
2	Output 2 address	stall motor	solenoid		
3	Output 3 address	stall motor	solenoid		
4	Output 4 address	stall motor	solenoid		
5	Output 5 address	stall motor	solenoid		
6	Output 6 address	stall motor	solenoid		
7	Output 7 address	stall motor	solenoid		
8	Output 8 address	stall motor	solenoid		
<i>After the last step the SMD84 will restart and be ready to operate</i>					

As you progress through the “Smart” programming steps, the red LED flashes the number of times indicating which step in the section is ready to be programmed. The green LED will flash briefly when programmed.

Part 3: To change the SMD84 Decoder Configuration and/or the Status Report options and/or input addresses press the “Smart” program button and hold it down. After about a second LED1 (red) starts to flash. Continue to hold it down until LED2 (green) turns on and then off. Then release it. The SMD84 is now ready to have the options changed. LED1 (red) will be flashing. The CV value is the switch address you select. For example, to enable the serial bus and disable DCC control for a Digitrax system select a switch address of 48 and issue a throw command. Once the switch command has been issued, LED1 will be flashing twice with a pause and then repeats indicating that the Status Report options are ready to be programmed.

Smart Programming Part 3 - Change Configuration and Status Report					
<i>Part 3: To start here - Press the “Smart” button until LED2 lights and hold until it turns off</i>					
LED1 #Flashes	Description	t	c	Example	
1	Value of CV29 - Decoder configuration	set	clear	48	t
2	Value of CV 28 - Status report (useful only with serial bus)	set	clear	48	c
3	Beginning address for 8 sequential primary input addresses	sensor type	switch type	9	c
<i>After the last step the SMD84 will restart and be ready to operate</i>					

Example: for Digitrax systems, select switch address 48 and issue a t (throw) command. 48 is 16 (enable serial bus) plus 32 (disable DCC control).

Decoder Configuration (Section 4.4)	Value	Select
No options	0	
Option 1 - enable memory	1	
Option 2 - enable fixed output state at power on	2	
Option 3 - enable ops mode programming	4	
Option 4 - enable DCC to serial bus gateway	8	
Option 5 - enable serial bus communication	16	
Option 6 - disable control from DCC	32	
Configuration values total		

Example: clear (zero) the status report CV. When a c (close) command is issued, the switch address is unimportant.

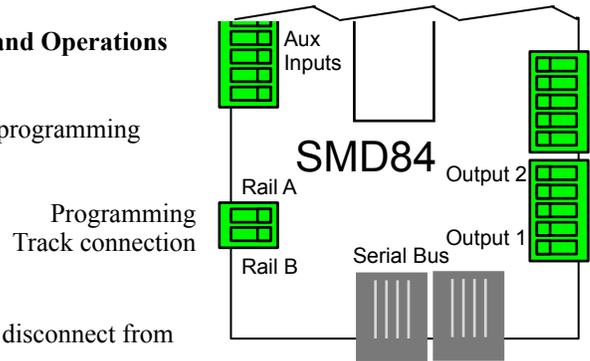
Status Report (Section 4.5)	Value	Select
No options	0	
Option 1 - Send input state at power on enabled	1	
Option 2 - Send output state at power on enabled	2	
Option 3 - Interrogate input state enabled	4	
Option 4 - Interrogate output state enabled	8	
Status Report values total		

State Report Options 1- 4 are only useful if the serial bus is enabled.

4 Configuration Variables (CVs)

The SMD84 supports **Paged Mode Programming in Service Mode and Operations (Ops) Mode** programming.

To program in paged mode, connect the Track Power terminals to the programming track. See the diagram. 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 SMD84 does not have built in feedback like a mobile decoder. Therefore, some systems may show a “no decoder on track” error or “can not read CV”. However it still is programmed. To enter normal operation, disconnect from the program track and connect as defined in section 5.



To program in ops mode (On the Main Programming) connect the power terminals to track power. Hold down the Smart button just before power is turned on. When the green LED turns on release the button then wait until the red LED turns off. The SMD84 is now in ops mode until power is turned off. The default ops address is one (1). **This is a loco address, so be careful when using this feature.** The SMD84 can be programmed so it is always in ops mode by setting option 3 in CV29. **When using ops mode to change CV values, the SMD84 does not recognize some new values until power is turned off and then back on.** Programming CV7 with a value of 1 will restart the SMD84 so power need not be cycled when programming in ops mode. This is the same as turning power off and then back on. Read/write CVs can be done via the serial bus if enabled. For programming with DecoderPro and other programming tips see Team Digital’s web site.

4.01 Reset the SMD84 to factory defaults

To “reset” the SMD84 to factory defaults, turn power on and wait until LED 1 turns off. Then press the “Smart” button and continue to hold the button down (at least 16 seconds) until both LED 1 & 2 are alternately flashing. Alternately, programming CV7 with 170 will “reset” all CV’s to the factory default value. In page mode this may not work with some systems as they do not keep power applied to the programming track long enough for all the CVs to be programmed.

4.1 Output Address

CV1, CV14-27 - These CVs determine the address of the outputs. Each output address is constructed of two CVs, an address and an address adder. See section 7 for CV numbers. 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 Address Adder table shows the CV value to use for the adder. For easier programming see “Smart” Programming.

Address, a value from 0 to 255, Address adder, a value from 0 to 7

Note: Some systems refer to CV1 as AD, AD2 or short address. CVs, an address and an address adder, that makes up the address.

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

Examples for output 1						
Required address		34	220	266	524	898
Address CV1 value		34	220	10	12	130
Address Adder CV9 value		0	0	1	2	3

4.2 Output Configuration

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

These CVs determine the output type.

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

Set the CV value to one ("1") for stall motor (continually on) type operation.

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 independent control of both close and throw sides of an output.

4.3 Power On Output State

CV33 - Power on state for outputs 1 to 4, a value from 1 to 170

CV34 - Power on state for outputs 5 to 8, a value from 1 to 170

These CVs determine the state of each output at power on. Decoder 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 SMD84 automatically programs them.

If neither throw or closed is selected the output does nothing. If both are selected this feature will not work correctly.

Outputs 1 to 4	Value	Select
Output 1 throw	1	1
Output 1 close	2	
Output 2 throw	4	4
Output 2 close	8	
Output 3 throw	16	
Output 3 close	32	32
Output 4 throw	64	64
Output 4 close	128	
Program this value into CV33		101

Outputs 5 to 8	Value	Select
Output 5 throw	1	
Output 5 close	2	2
Output 6 throw	4	
Output 6 close	8	8
Output 7 throw	16	16
Output 7 close	32	
Output 8 throw	64	64
Output 8 close	128	
Program this value into CV34		90

4.4 Decoder Configuration

CV29 - This CV determines the configuration which consists of several options.

* Note: Setting the SMD84 mode by programming this CV does not change any of the input or output addresses. To change these addresses use "Smart" programming. To calculate the value of CV29, add up the selected values. Example: Option 1 and option 3 - CV9 = 1 + 4 = 5

Decoder Configuration (Section 4.4)	Value	Select
No options	0	
Option 1 - enable memory	1	
Option 2 - enable fixed output state at power on	2	
Option 3 - enable ops mode programming	4	
Option 4 - enable DCC to serial bus gateway	8	
Option 5 - enable serial bus communication	16	
Option 6 - disable control from DCC	32	
Configuration values total		

Option 1 - Memory. The SMD84 will remember the output state at power off and at power on the outputs will be set to the same state.

Option 2 - Fixed output state. At power on each output will be set to the state as determined by CV33 and CV34. You must program these CVs to the desired state. See section 4.3.

Option 3 - Ops Mode Programming. Allows Operations mode (On the Main) programming using a Loco address to be enabled all the time. See section 4.10.

Typical Values for SMD84 Configuration (CV29)					
System	DCC Control Option 6	Gate-Way Option 4	Serial Bus Option 5	CV Value	Notes
All DCC Compatible Systems	Enabled			0	The SMD84 is controlled via the track (DCC commands). The bus is not used by the SMD84.
Digitrax System	Disabled		Enabled	48	The SMD84 is controlled via LocoNet.
Digitrax System	Enabled	Enabled	Enabled	24	Provides a separate LocoNet bus for LocoNet accessory devices. Allows devices to receive turnout commands from the track (DCC commands). Reduces throttle bus traffic.
NCE System and others	Enabled	Enabled	Enabled	24	Provides separate bus for bus enabled accessory devices. Allows devices to receive turnout commands from the track (DCC commands)

Option 4 - DCC to bus gateway. Allows DCC switch command packets to be put the serial bus. Any device connected to the bus will have access to these DCC commands. Requires option 5.

Option 5 - Serial Bus communication. Allows the SMD84 to communication with devices connected to the serial bus.

Option 6 - DCC control. Allows the SMD84 to receive instructions from DCC (track). **Note:** Selecting this option **DISABLES** this feature.

See the Typical Values table for help on how to configure the SMD84. If there are more than one SMD84 or other Gateway capable devices, only one should have the gateway enabled. In a Digitrax system DO NOT connect the SMD84 to the throttle LocoNet if the gateway, DCC control and serial bus are enabled. This could cause an endless sending of switch commands from the track to LocoNet and back to the track.

4.5 Status Report

CV28 - This CV determines which input and output states the SMD84 reports when used for turnout control and useful only when the serial bus is enabled. Options 1 and 3 do NOT apply to inputs that are used for switch (turnout) control. Options 2 and 4 may NOT work correctly unless Decoder Configuration (section 4.4) option 1 or 2 is enabled. These options can be enabled in part 3 of Smart Programming.

Option 1 - Input state messages are sent on the serial bus at power on. This options is typically used for inputs that are used for block detection or turnout feedback. This does NOT apply to inputs that are used for switch (turnout) control.

Option 2 - Output state messages are sent on the serial bus at power on. Unless the output states have been defined this will not work correctly. See section 4.4. These are switch type messages.

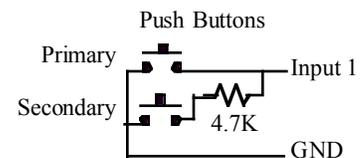
Option 3 - Input state messages are sent on the serial bus when a Digitrax interrogation command is received.

Option 4 - Output state messages are sent on the serial bus when a Digitrax interrogation command is received. These are feedback type messages.

Status Report (Section 4.5)	Value	Select
No options	0	
Option 1 - Send input state at power on enabled	1	
Option 2 - Send output state at power on enabled	2	
Option 3 - Interrogate input state enabled	4	
Option 4 - Interrogate output state enabled	8	
Status Report values total		

4.6 Input Control

CV35-97. These CVs determine what action the inputs will have when activated. There are three CVs for each input. An address, type and transition CV. Each input address is constructed of two CVs, an address and an address adder. See section 4.1. They can each be programmed to operate independently and are not linked or connected to the outputs in any way except by a common address and type.



There are 13 physical input terminals. Eight primary and five auxiliary. If you require more than 13, you can use the secondary inputs which use the same terminal as the primary inputs but require the use of a resistor as shown in the diagram. Each input can be programmed individually. In order to control an output the input must be programmed with the same address as the output with a message type of 'switch'.

In order for an input to cause an action, including executing a route, a transition must be selected. The input is normally at 5 volts. An input transition occurs when the voltage on an input goes from high to low (falling edge) or from low to high (rising edge). For example, if a push button is connected to an input and ground, when it is pressed the input is grounded. This causes a high to low transition. When the button is released this causes a low to high transition.

To set addresses for both inputs and outputs see "Smart" Programming for easier programming.

Pri, Sec & Aux Input Control		
Address CV	Value	Select
Address	1 - 255	1
Program this value into the appropriate address CV		
Type CV	Value	Select
Invert the normal state	128	
Normal state	0	0
Toggle state (only if switch type)	64	64
Message type, sensor	32	
Message type, feedback (actual switch position)	16	
Message type, switch (commanded switch position)	0	0
Address adder (see the address adder table for amount)	0 - 9	
Program this value into the appropriate type CV		
Transition CV	Value	Select
Send message on change transition	3	
Send message on hi to low transition	2	2
Send message on low to hi transition**	1	
Disable message	0	
Program this value into the appropriate transition CV		

4.7 Route Execute Address

CV112-127 - These CVs determine the top or execute address of a route. Each top address is completely independent of an input or output address. A route is executed when a turnout (switch) command from any source including those from the SMD84, throttles or computers matches the top address and switch state for that route. To increase a route to greater than than eight turnouts, give more than one top address the same address. When a route is executed, turnout commands are sent for each cell containing an address. Optionally, a route can be executed by a block sensor message. In this way several turnouts can automatically be aligned when a block becomes occupied.

Route Top (Execute) Address		
Address CV	Value	Select
Address	1 - 255	
Program this value into the appropriate address CV		
Type CV	Value	Select
Close	64	Select one
Throw	0	one
Execution type, sensor	32	Select one
Execution type, switch (turnout command)	0	one
Address adder (see the address adder table for the value)	0 - 9	
Program this value into the appropriate type CV		

4.8 Route Cell Address

CV128-255 - These CVs determine the address in a route cell. When a route is executed all cell addresses are sent one at a time. For all addresses in a route to be sent there must be no empty cells between cells with addresses.

Route Cell Address		
Address CV	Value	Select
Address	1 - 255	
Program this value into the appropriate address CV		
Type CV	Value	Select
Close	64	Select one
Throw	0	one
Address adder (see the address adder table for the value)	0 - 9	
Program this value into the appropriate type CV		

4.9 Route Address Send Delay

CV99 - Send address time delay, value 0 to 255.

This CV determines the time delay the SMD84 waits before sending the next address in a route. Some switch machine drivers require a time delay between switch activation.

Delay between sending route addresses								
CV99 Value	0	1	2	4	8	12	16	20
Delay (sec)	0.23	0.45	0.68	1	2	3	4	5

4.10 Operations Mode Loco Address

CV31 - Ops mode address, a value of 1 to 127. Default is one (1).

This CV sets the operations mode program address. This address is used ONLY for programming and has NOTHING to do with normal operation. This allows programming the SMD84 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.

TIP: If the “Smart” program button is pressed when power is turned on, option 3 (ops mode) is enabled until power is removed. Useful if you do not want to have ops mode enabled all the time.

4.11 Input Lockout Address

CV100 - Address, value 0 to 255: CV101 - Address adder, value 0 to 9

These CVs set the input lockout address. When a switch (turnout) throw command is issued that matches this address the SMD84 inputs are disabled. When a close command is issued with this address the inputs are enabled. This feature is useful for dispatcher control when the SMD84 inputs are used for local turnout control.

4.12 Output On Time

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

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 4.2. This CV applies to all outputs set to this configuration. The default value of this CV is 31 which gives an on time of about 8 seconds.

The time is determined by the following equation.

$$\text{On time} = \text{CV2} \times .256 \text{ seconds}$$

5 Connections

5.1 Power

The SMD84 is recommended for HO and N scale. It should be connected to DCC track power for control via DCC. DCC track power also allows the CDU to charge to a higher voltage to give solenoid switch machines good performance. Use the two terminal spring type connector for power. The terms RAIL A and RAIL B are used for reference. The power connections are spring type terminals.

Maximum track voltage is 16 Volts.

5.2 Input Interface

Each input has a 4.7K ‘pullup’ resistor connected to 5 volts, so the input is normally at 5 volts with respect to pin 5 (minus) when no device is connected. This is a high or true state. When the input is connected to pin 5 (minus) by a push button switch or block sensor, the input is “grounded” and the state is low or false. The secondary inputs are unique in that they share the same physical connection as the primary. They also require a resistor as shown in section 4.6.

5.3 Output Drive

The outputs can be configured to drive two types of switch machines; solenoid (twin coil) and low current stall motor (such as a Tortoise™). The common connection should ONLY be used for solenoid type.

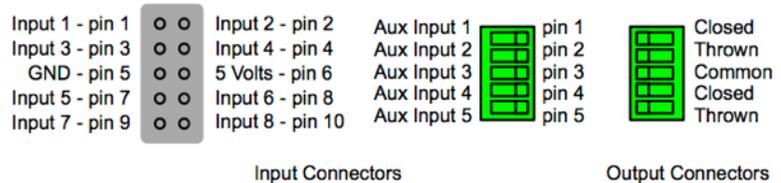
Note: The SMD84 will not drive SwitchMaster, Scale Shops, Switch Tender or Fulgurex motors.

5.4 Input and Output

The primary input connector is a 10 pin flat ribbon cable (IDC) type. Jameco #138376 will work as the mating connector. 10 ft of gray flat ribbon cable is #643794. 10 ft of multicolor flat ribbon cable is #639672. Our cable connection kit (CCK) is available with 10’ of multicolor cable and four connectors.

If you want screw terminals for the primary inputs you can use our terminal strip adapter (TSA).

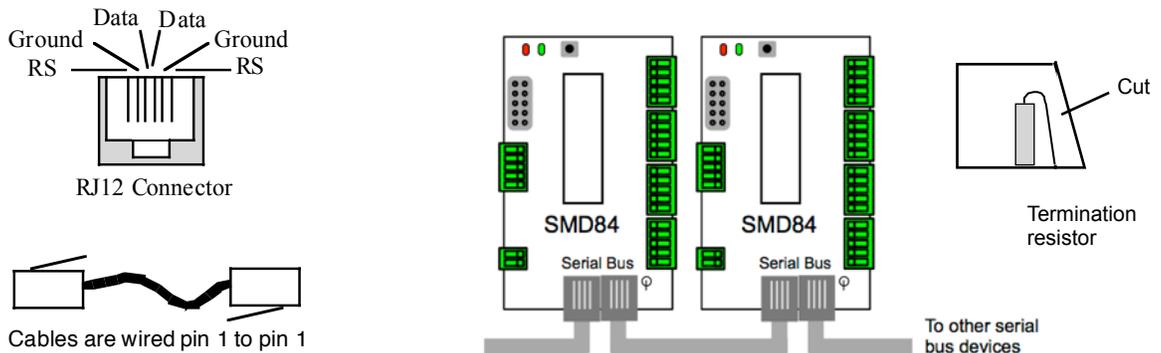
The Aux inputs and outputs are spring type terminals.



5.5 Serial Bus

The SMD84 has two RJ12 connectors for ease in making connections as shown below. In a Digitrax system the data pins are LocoNet and the RS pins are Rail Sync. In a Digitrax system Rail Sync is a replica of the track power signal but has limited power. One of its uses is to provide power to throttles connected to LocoNet. In the SMD84 the RS is not used.

In a system when more than 10 Team Digital products with a serial bus are used, the bus terminating resistor should be cut on any additional devices.



6 Applications

6.1 Examples of “Smart” programming

Example to set the SMD84 addresses from 9 to 16 for solenoid machines. See part 1 in section 3.

Power on the SMD84 with track power, after 6 or 7 seconds hold down the Smart button until LED1 (red) is flashing. Using the throttle in switch mode issue the first address (9) with a close. LED 2 (green) will flash briefly. The SMD84 will restart indicated by LED 1 (red) on solid for several seconds. Inputs are unchanged.



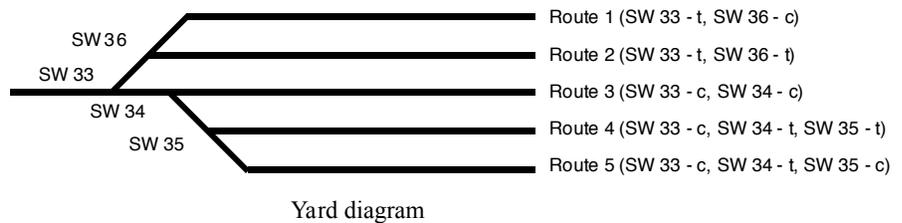
Power Connector

Example to set the SMD84 addresses from 9 to 12 for solenoid machines and addresses 31 to 34 for Tortoise® machines. See part 2 in section 3.

Power on the SMD84 with track power, after 6 or 7 seconds hold down the Smart button until LED1 (red) is flashing and LED 2 (green) is on solid. Using the throttle in switch mode issue the first address (9) with a close (solenoid). LED 2 (green) will flash briefly and LED1 (red) will now be flashing a two (step 2, two quick flashes with a pause then repeat). Using the throttle in switch mode issue the second address (10) with a close. Again LED 2 (green) will flash briefly. Continue this process for the next 2 steps until step 5 is reached. Here issue the fifth address (31) with a throw (Tortoise®). Continue until all steps are complete. At this point the SMD84 will restart indicated by LED 1 (red) on solid for several seconds.

6.2 Routes

The SMD84 is well suited to handle routes in a yard. The following shows an example of five routes using four switches. The route CV values were determined using the information in sections 4.7 and 4.8. One very nice tool that makes custom programming much easier is JMRI DecoderPro.



A route can be executed with an actual turnout (switch) address or a pseudo address of a switch (not a physical switch). Program the top address of the route with the address you want to execute the route. Inputs can be programmed to execute a route from a push button.

Route Example								
Route	1	2	3	4	5	6	7	8
Execute address	101 t	101 c	102 t	102 c	103 t			
Address 1	33 t	33 t	33 c	33 c	33 c			
Address 2	36 c	36 t	34 c	34 t	34 t			
Address 3				35 t	35 c			
Address 4								
Address 5								
Address 6								
Address 7								
Address 8								

6.3 Other Input Devices

Typically you may connect push buttons to the SMD84 inputs as shown. The primary input connector provides a 5 volt source, so DBD22s (block detectors) can be powered and when connected to an input a route or turnout can be controlled.

6.4 Driving Other Devices

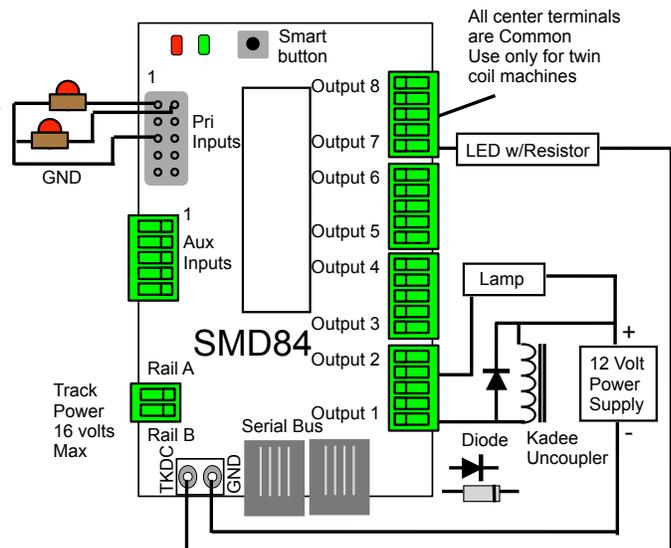
The SMD84 can be used to turn on devices other than switch machines. In some cases external auxiliary power is required. If the load is an inductance, a diode is required to suppress the positive voltage transient when the load is turned off. The diagram shows a LED, a lamp and an inductive load. Connect the minus or ground of the isolated external supply to GND.

An example of an inductance load is the Kadee electric uncoupler #307. This particular device can not have power applied to it very long or it may be damaged. To handle this set the SMD84 output configuration CV of the output connected to the uncoupler to a value of two (2). The default ‘on time’ is about eight seconds which is enough time to uncouple a car.

The connection TKDC provides DC from the track voltage and can be used for small current loads like LEDs.

Maximum current is 500ma. When connecting to TKDC or GND use a small iron (20W-40W) for soldering to the board.

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



7 Summary of Configuration Variables

CV#	Function/Default Value		CV#	Function/Default Value		CV#	Function/Default Value	
1	Output 1 Address	1	60	Sec Input 1 Type & Address Adder	0	119	Route 4 Top Address Adder	0
2	Output On Time	31	61	Sec Input 1 Transition	0	120	Route 5 Top Address	0
3	Output 1 Configuration	0	62	Sec Input 2 Address	0	121	Route 5 Top Address Adder	0
4	Output 2 Configuration	0	63	Sec Input 2 Type & Address Adder	0	122	Route 6 Top Address	0
5	Output 3 Configuration	0	64	Sec Input 2 Transition	0	123	Route 6 Top Address Adder	0
6	Output 4 Configuration	0	65	Sec Input 3 Address	0	124	Route 7 Top Address	0
7	Manufacturer Version No.	-	66	Sec Input 3 Type & Address Adder	0	125	Route 7 Top Address Adder	0
8	Manufacturer ID	25	67	Sec Input 3 Transition	0	126	Route 8 Top Address	0
9	Output 1 Address Adder	0	68	Sec Input 4 Address	0	127	Route 8 Top Address Adder	0
10	Output 5 Configuration	0	69	Sec Input 4 Type & Address Adder	0	128	Route 1 Cell 1 Address	0
11	Output 6 Configuration	0	70	Sec Input 4 Transition	0	129	Route 1 Cell 1 Address Adder	0
12	Output 7 Configuration	0	71	Sec Input 5 Address	0	130	Route 1 Cell 2 Address	0
13	Output 8 Configuration	0	72	Sec Input 5 Type & Address Adder	0	131	Route 1 Cell 2 Address Adder	0
14	Output 2 Address	2	73	Sec Input 5 Transition	0	132	Route 1 Cell 3 Address	0
15	Output 2 Address Adder	0	74	Sec Input 6 Address	0	133	Route 1 Cell 3 Address Adder	0
16	Output 3 Address	3	75	Sec Input 6 Type & Address Adder	0	134	Route 1 Cell 4 Address	0
17	Output 3 Address Adder	0	76	Sec Input 6 Transition	0	135	Route 1 Cell 4 Address Adder	0
18	Output 4 Address	4	77	Sec Input 7 Address	0	136	Route 1 Cell 5 Address	0
19	Output 4 Address Adder	0	78	Sec Input 7 Type & Address Adder	0	137	Route 1 Cell 5 Address Adder	0
20	Output 5 Address	5	79	Sec Input 7 Transition	0	138	Route 1 Cell 6 Address	0
21	Output 5 Address Adder	0	80	Sec Input 8 Address	0	139	Route 1 Cell 6 Address Adder	0
22	Output 6 Address	6	81	Sec Input 8 Type & Address Adder	0	140	Route 1 Cell 7 Address	0
23	Output 6 Address Adder	0	82	Sec Input 8 Transition	0	141	Route 1 Cell 7 Address Adder	0
24	Output 7 Address	7	83	Aux Input 1 Address	1	142	Route 1 Cell 8 Address	0
25	Output 7 Address Adder	0	84	Aux Input 1 Type & Address Adder	0	143	Route 1 Cell 8 Address Adder	0
26	Output 8 Address	8	85	Aux Input 1 Transition	2	144	Route 2 Cell 1 Address	0
27	Output 8 Address Adder	0	86	Aux Input 2 Address	2	145	Route 2 Cell 1 Address Adder	0
28	Status Report	0	87	Aux Input 2 Type & Address Adder	0	146	Route 2 Cell 2 Address	0
29	Decoder Configuration	0	88	Aux Input 2 Transition	2	147	Route 2 Cell 2 Address Adder	0
30	reserved	0	89	Aux Input 3 Address	3	148	Route 2 Cell 3 Address	0
31	Ops Mode Address	0	90	Aux Input 3 Type & Address Adder	0	149	Route 2 Cell 3 Address Adder	0
32	reserved	0	91	Aux Input 3 Transition	2	150	Route 2 Cell 4 Address	0
33	Pwr On State - Outputs 1-4	0	92	Aux Input 4 Address	4	151	Route 2 Cell 4 Address Adder	0
34	Pwr On State - Outputs 5-8	0	93	Aux Input 4 Type & Address Adder	0	152	Route 2 Cell 5 Address	0
35	Pri Input 1 Address	1	94	Aux Input 4 Transition	2	153	Route 2 Cell 5 Address Adder	0
36	Pri Input 1 Type & Address Adder	64	95	Aux Input 5 Address	5	154	Route 2 Cell 6 Address	0
37	Pri Input 1 Transition	2	96	Aux Input 5 Type & Address Adder	0	155	Route 2 Cell 6 Address Adder	0
38	Pri Input 2 Address	2	97	Aux Input 5 Transition	2	156	Route 2 Cell 7 Address	0
39	Pri Input 2 Type & Address Adder	64	98	Output Busy Timer	19	157	Route 2 Cell 7 Address Adder	0
40	Pri Input 2 Transition	2	99	Route SendDelay	0	158	Route 2 Cell 8 Address	0
41	Pri Input 3 Address	1	100	Input Lockout Address	7	159	Route 2 Cell 8 Address Adder	0
42	Pri Input 3 Type & Address Adder	64	101	Input Lockout Address Adder	0	160	Route 3 Cell 1 Address	0
43	Pri Input 3 Transition	2	102	reserved	-	161	Route 3 Cell 1 Address Adder	0
44	Pri Input 4 Address	4	103	reserved	-	162	Route 3 Cell 2 Address	0
45	Pri Input 4 Type & Address Adder	64	104	reserved	-	163	Route 3 Cell 2 Address Adder	0
46	Pri Input 4 Transition	2	105	reserved	-	164	Route 3 Cell 3 Address	0
47	Pri Input 5 Address	5	106	reserved	-	165	Route 3 Cell 3 Address Adder	0
48	Pri Input 5 Type & Address Adder	64	107	reserved	-	166	Route 3 Cell 4 Address	0
49	Pri Input 5 Transition	2	108	reserved	-	167	Route 3 Cell 4 Address Adder	0
50	Pri Input 6 Address	6	109	reserved	-	168	Route 3 Cell 5 Address	0
51	Pri Input 6 Type & Address Adder	64	110	reserved	-	169	Route 3 Cell 5 Address Adder	0
52	Pri Input 6 Transition	2	111	reserved	-	170	Route 3 Cell 6 Address	0
53	Pri Input 7 Address	7	112	Route 1 Top Address	0	171	Route 3 Cell 6 Address Adder	0
54	Pri Input 7 Type & Address Adder	64	113	Route 1 Top Address Adder	0	172	Route 3 Cell 7 Address	0
55	Pri Input 7 Transition	2	114	Route 2 Top Address	0	173	Route 3 Cell 7 Address Adder	0
56	Pri Input 8 Address	8	115	Route 2 Top Address Adder	0	174	Route 3 Cell 8 Address	0
57	Pri Input 8 Type & Address Adder	64	116	Route 3 Top Address	0	175	Route 3 Cell 8 Address Adder	0
58	Pri Input 8 Transition	2	117	Route 3 Top Address Adder	0	176	Route 4 Cell 1 Address	0
59	Sec Input 1 Address	0	118	Route 4 Top Address	0	177	Route 4 Cell 1 Address Adder	0

