CV#	Function/Default Value		CV#	Function/Default Value	
173	Route 3 Cell 7 Address Adder	0	215	Route 6 Cell 4 Address Adder	0
174	Route 3 Cell 8 Address	0	216	Route 6 Cell 5 Address	0
175	Route 3 Cell 8 Address Adder	0	217	Route 6 Cell 5 Address Adder	0
176	Route 4 Cell 1 Address	0	218	Route 6 Cell 6 Address	0
177	Route 4 Cell 1 Address Adder	0	219	Route 6 Cell 6 Address Adder	0
178	Route 4 Cell 2 Address	0	220	Route 6 Cell 7 Address	0
179	Route 4 Cell 2 Address Adder	0	221	Route 6 Cell 7 Address Adder	0
180	Route 4 Cell 3 Address	0	222	Route 6 Cell 8 Address	0
181	Route 4 Cell 3 Address Adder	0	223	Route 6 Cell 8 Address Adder	0
182	Route 4 Cell 4 Address	0	224	Route 7 Cell 1 Address	0
183	Route 4 Cell 4 Address Adder	0	225	Route 7 Cell 1 Address Adder	0
184	Route 4 Cell 5 Address	0	226	Route 7 Cell 2 Address	0
185	Route 4 Cell 5 Address Adder	0	227	Route 7 Cell 2 Address Adder	0
186	Route 4 Cell 6 Address	0	228	Route 7 Cell 3 Address	0
187	Route 4 Cell 6 Address Adder	0	229	Route 7 Cell 3 Address Adder	0
188	Route 4 Cell 7 Address	0	230	Route 7 Cell 4 Address	0
189	Route 4 Cell 7 Address Adder	0	231	Route 7 Cell 4 Address Adder	0
190	Route 4 Cell 8 Address	0	232	Route 7 Cell 5 Address	0
191	Route 4 Cell 8 Address Adder	0	233	Route 7 Cell 5 Address Adder	0
192	Route 5 Cell 1 Address	0	234	Route 7 Cell 6 Address	0
193	Route 5 Cell 1 Address Adder	0	235	Route 7 Cell 6 Address Adder	0
194	Route 5 Cell 2 Address	0	236	Route 7 Cell 7 Address	0
195	Route 5 Cell 2 Address Adder	0	237	Route 7 Cell 7 Address Adder	0
196	Route 5 Cell 3 Address	0	238	Route 7 Cell 8 Address	0
197	Route 5 Cell 3 Address Adder	0	239	Route 7 Cell 8 Address Adder	0
198	Route 5 Cell 4 Address	0	240	Route 8 Cell 1 Address	0
199	Route 5 Cell 4 Address Adder	0	241	Route 8 Cell 1 Address Adder	0
200	Route 5 Cell 5 Address	0	242	Route 8 Cell 2 Address	0
201	Route 5 Cell 5 Address Adder	0	243	Route 8 Cell 2 Address Adder	0
202	Route 5 Cell 6 Address	0	244	Route 8 Cell 3 Address	0
203	Route 5 Cell 6 Address Adder	0	245	Route 8 Cell 3 Address Adder	0
204	Route 5 Cell 7 Address	0	246	Route 8 Cell 4 Address	0
205	Route 5 Cell 7 Address Adder	0	247	Route 8 Cell 4 Address Adder	0
206	Route 5 Cell 8 Address	0	248	Route 8 Cell 5 Address	0
207	Route 5 Cell 8 Address Adder	0	249	Route 8 Cell 5 Address Adder	0
208	Route 6 Cell 1 Address	0	250	Route 8 Cell 6 Address	0
209	Route 6 Cell 1 Address Adder	0	251	Route 8 Cell 6 Address Adder	0
210	Route 6 Cell 2 Address	0	252	Route 8 Cell 7 Address	0
211	Route 6 Cell 2 Address Adder	0	253	Route 8 Cell 7 Address Adder	0
212	Route 6 Cell 3 Address	0	254	Route 8 Cell 8 Address	0
213	Route 6 Cell 3 Address Adder	0	255	Route 8 Cell 8 Address Adder	0
214	Route 6 Cell 4 Address	0			

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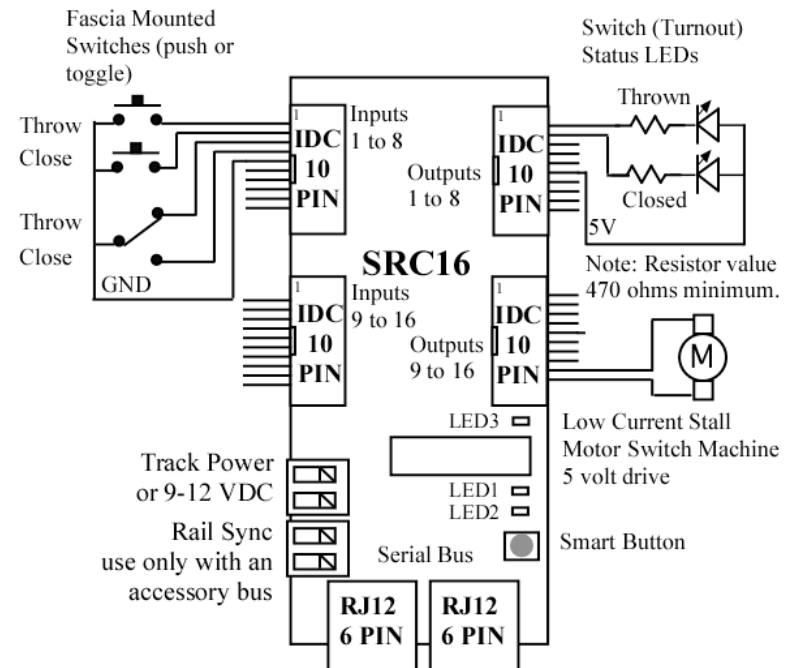
TEAM DIGITAL

Improving the world of DCC

SRC16
Switch & Route Controller

> DCC compatible accessory decoder
> Control switches (turnouts)
> Drive switch status LEDs
> Drive low current switch machines
> Eight configurable routes
> 16 Individually configurable inputs & outputs
> Featuring "Smart" Programming
> DCC gateway to serial bus
> LocoNet® compatible

03.28.11 V16
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trademark of Digitrax Inc

1 Operation

The SRC16 has 16 inputs and outputs which can each have a unique address. By assigning the same address to a pair of inputs and outputs, called a group, the SRC16 can control eight turnouts (switches) or display the state (closed or thrown) of eight turnouts. If the serial bus (LocoNet® compatible) is enabled, activating an input (close or throw) sends a turnout command (message) that correspond to it's address over the serial bus. Any device connected to the bus can receive the command. The SRC16 monitors the bus for commands from other sources. When a turnout command is received with an address that matches a group's address, that output (closed or thrown) is activated. LEDs or stall motors can be connected to the outputs. The SRC16 does not require a serial bus connection to operate. It receives it's own messages.

The SRC16 supports eight routes. Each route has eight cells. There is one top or route execution address for each route. Each top address is completely independent of an input or output address.

Any input can be used for turnout position reporting which tells the system the actual state (closed or thrown) of the turnout. Any input can be used for sensor state reporting such as track block occupancy.

Since the SRC16 is a 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.

LED 1 flashes indicates "Smart" programming steps. LED 2 flash indicates accepted program value. LED 3 slow flash indicates heartbeat (fast flash indicates serial bus short).

2 Getting Started

The SRC16 comes from the factory ready to use with inputs and outputs configured in groups of two with group addresses of 1 to 8. Once you connect LEDs and/or stall motors to the outputs and perhaps a push button or other device to the inputs, you are ready to connect to track power and use the SRC16. If you want to change some of the output or input addresses or configuration values see the "Smart" Programming section. For very custom programming see section 4, Configuration Variables for various options. If you will be using Team Digital MotoDs with the SRC16 see section 5.4.

2.1 Control via LocoNet® - Digitrax Users

The SRC16 comes from the factory ready to use by control from DCC commands when the SRC16 is connected to track power. To control the SRC16 via LocoNet®, it must be enabled. Connect the SRC16 track power terminals to the programming track and program CV9 with a value of 48. The SRC16 can now be powered from a 12 volt supply and controlled via LocoNet®.

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). **"Smart" programming only works when connected to track power.**
To program in "Smart" mode, connect the SRC16 power terminals to track power. Connection to the serial bus (LocoNet® in Digitrax system) is not used. Turn on power.

Cont. Summary of Configuration Variables

CV#	Function/Default Value		CV#	Function/Default Value	
87	Output 8 Control	0	130	Route 1 Cell 2 Address	0
88	Output 9 Address	5	131	Route 1 Cell 2 Address Adder	0
89	Output 9 Type & Address Adder	0	132	Route 1 Cell 3 Address	0
90	Output 9 Control	0	133	Route 1 Cell 3 Address Adder	0
91	Output 10 Address	5	134	Route 1 Cell 4 Address	0
92	Output 10 Type & Address Adder	64	135	Route 1 Cell 4 Address Adder	0
93	Output 10 Control	0	136	Route 1 Cell 5 Address	0
94	Output 11 Address	6	137	Route 1 Cell 5 Address Adder	0
95	Output 11 Type & Address Adder	0	138	Route 1 Cell 6 Address	0
96	Output 11 Control	0	139	Route 1 Cell 6 Address Adder	0
97	Output 12 Address	6	140	Route 1 Cell 7 Address	0
98	Output 12 Type & Address Adder	64	141	Route 1 Cell 7 Address Adder	0
99	Output 12 Control	0	142	Route 1 Cell 8 Address	0
100	Output 13 Address	7	143	Route 1 Cell 8 Address Adder	0
101	Output 13 Type & Address Adder	0	144	Route 2 Cell 1 Address	0
102	Output 13 Control	0	145	Route 2 Cell 1 Address Adder	0
103	Output 14 Address	7	146	Route 2 Cell 2 Address	0
104	Output 14 Type & Address Adder	64	147	Route 2 Cell 2 Address Adder	0
105	Output 14 Control	0	148	Route 2 Cell 3 Address	0
106	Output 15 Address	8	149	Route 2 Cell 3 Address Adder	0
107	Output 15 Type & Address Adder	0	150	Route 2 Cell 4 Address	0
108	Output 15 Control	0	151	Route 2 Cell 4 Address Adder	0
109	Output 16 Address	8	152	Route 2 Cell 5 Address	0
110	Output 16 Type & Address Adder	64	153	Route 2 Cell 5 Address Adder	0
111	Output 16 Control	0	154	Route 2 Cell 6 Address	0
112	Route 1 Top Address	0	155	Route 2 Cell 6 Address Adder	0
113	Route 1 Top Address Adder	0	156	Route 2 Cell 7 Address	0
114	Route 2 Top Address	0	157	Route 2 Cell 7 Address Adder	0
115	Route 2 Top Address Adder	0	158	Route 2 Cell 8 Address	0
116	Route 3 Top Address	0	159	Route 2 Cell 8 Address Adder	0
117	Route 3 Top Address Adder	0	160	Route 3 Cell 1 Address	0
118	Route 4 Top Address	0	161	Route 3 Cell 1 Address Adder	0
119	Route 4 Top Address Adder	0	162	Route 3 Cell 2 Address	0
120	Route 5 Top Address	0	163	Route 3 Cell 2 Address Adder	0
121	Route 5 Top Address Adder	0	164	Route 3 Cell 3 Address	0
122	Route 6 Top Address	0	165	Route 3 Cell 3 Address Adder	0
123	Route 6 Top Address Adder	0	166	Route 3 Cell 4 Address	0
124	Route 7 Top Address	0	167	Route 3 Cell 4 Address Adder	0
125	Route 7 Top Address Adder	0	168	Route 3 Cell 5 Address	0
126	Route 8 Top Address	0	169	Route 3 Cell 5 Address Adder	0
127	Route 8 Top Address Adder	0	170	Route 3 Cell 6 Address	0
128	Route 1 Cell 1 Address	0	171	Route 3 Cell 6 Address Adder	0
129	Route 1 Cell 1 Address Adder	0	172	Route 3 Cell 7 Address	0

7 Summary of Configuration Variables

CV#	Function/Default Value		CV#	Function/Default Value	
1	Ops Mode Loco Address	1	44	Input 10 Type & Address Adder	128
2	reserved	-	45	Input 10 Transition & Route	2
3	reserved	-	46	Input 11 Address	6
4	reserved	-	47	Input 11 Type & Address Adder	0
5	reserved	-	48	Input 11 Transition & Route	2
6	reserved	-	49	Input 12 Address	6
7	Manufacturer Version No.	-	50	Input 12 Type & Address Adder	128
8	Manufacturer ID	25	51	Input 12 Transition & Route	2
9	Decoder Configuration	0	52	Input 13 Address	7
10	Status Report	0	53	Input 13 Type & Address Adder	0
11	Route send delay	0	54	Input 13 Transition & Route	2
12	Pwr on state - Outputs 1 - 8	170	55	Input 14 Address	7
13	Pwr on state - Outputs 9 - 16	170	56	Input 14 Type & Address Adder	128
14	Input Lockout Address	0	57	Input 14 Transition & Route	2
15	Input Lockout Address Adder	0	58	Input 15 Address	8
16	Input 1 Address	1	59	Input 15 Type & Address Adder	0
17	Input 1 Type & Address Adder	0	60	Input 15 Transition & Route	2
18	Input 1 Transition & Route	2	61	Input 16 Address	8
19	Input 2 Address	1	62	Input 16 Type & Address Adder	128
20	Input 2 Type & Address Adder	128	63	Input 16 Transition & Route	2
21	Input 2 Transition & Route	2	64	Output 1 Address	1
22	Input 3 Address	2	65	Output 1 Type & Address Adder	0
23	Input 3 Type & Address Adder	0	66	Output 1 Control	0
24	Input 3 Transition & Route	2	67	Output 2 Address	1
25	Input 4 Address	2	68	Output 2 Type & Address Adder	64
26	Input 4 Type & Address Adder	128	69	Output 2 Control	0
27	Input 4 Transition & Route	2	70	Output 3 Address	2
28	Input 5 Address	3	71	Output 3 Type & Address Adder	0
29	Input 5 Type & Address Adder	0	72	Output 3 Control	0
30	Input 5 Transition & Route	2	73	Output 4 Address	2
31	Input 6 Address	3	74	Output 4 Type & Address Adder	64
32	Input 6 Type & Address Adder	128	75	Output 4 Control	0
33	Input 6 Transition & Route	2	76	Output 5 Address	3
34	Input 7 Address	4	77	Output 5 Type & Address Adder	0
35	Input 7 Type & Address Adder	0	78	Output 5 Control	0
36	Input 7 Transition & Route	2	79	Output 6 Address	3
37	Input 8 Address	4	80	Output 6 Type & Address Adder	64
38	Input 8 Type & Address Adder	128	81	Output 6 Control	0
39	Input 8 Transition & Route	2	82	Output 7 Address	4
40	Input 9 Address	5	83	Output 7 Type & Address Adder	0
41	Input 9 Type & Address Adder	0	84	Output 7 Control	0
42	Input 9 Transition & Route	2	85	Output 8 Address	4
43	Input 10 Address	5	86	Output 8 Type & Address Adder	64

Wait 6 or 7 seconds then press the "Smart" program button and hold it down for approximately one second until LED1 (red) starts to flash. Then release it. The SRC16 is now ready to have the input and output group addresses changed.

Using the throttle select the switch address or accessory number you want for group 1 and issue a throw (reverse) command. LED2 (green) will flash briefly.
LED1 now flashes twice with a pause and then repeats indicating that the group 2 address is ready to be programmed.

As you progress through the "Smart" programming steps, LED1 flashes the number of times indicating which step in the section is ready to be programmed. When either sections one or two have been completed LED2 lights indicating the start of the next section.

There are three sections to "Smart" programming. You can start from any section. At any time you can exit "Smart" mode by pressing the button for approximately one second until LED1 stops flashing.

Example to set the SRC16 for addresses from 9 to 16. See section 1 in the table below.
Power on the SRC16 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 desired address (9) for group 1 with a close or throw. LED 2 (green) will flash briefly. The LED 1 (red) now flashes a two (two quick flashes with a pause then repeat) indicating group 2 address is ready to be programmed with a 10. Continue this for the rest of the groups. When LED 2 (green) lights continually the 8 groups addresses have been programmed. Exit Smart programming by holding down the button until the red led stops flashing. The green led will also turn off.

Smart Programming Summary				
#Flashes	Description		t	c
Section 1: To start - Press the "Smart" button until LED1 starts to flash				
1	Input/Output group 1 address		accept	accept
2	Input/Output group 2 address		accept	accept
3	Input/Output group 3 address		accept	accept
4	Input/Output group 4 address		accept	accept
5	Input/Output group 5 address		accept	accept
6	Input/Output group 6 address		accept	accept
7	Input/Output group 7 address		accept	accept
8	Input/Output group 8 address		accept	accept
Section 2: To start here - Press the "Smart" button until LED2 lights - Output addresses are not changed				
1	Input group 1 address		accept	accept
2	Input group 2 address		accept	accept
3	Input group 3 address		accept	accept
4	Input group 4 address		accept	accept
5	Input group 5 address		accept	accept
6	Input group 6 address		accept	accept
7	Input group 7 address		accept	accept
8	Input group 8 address		accept	accept
Section 3: To start here - Press the "Smart" button until LED2 lights and continue until it turns off				
1	Value of CV9 - Decoder configuration		set	clear
2	Value of CV10 - Status report		set	clear
3	Beginning address of 16 sequential input/output addresses - Useful for block sensors or high density switch control with MotoDs		Sensor type	Switch type

Section 3 is a little different then the other sections because in steps 1 and 2 a CV value is programmed instead of an address. Check the appropriate section in the manual to determine the CV value and use a switch address for that value.

In step 3 of section 3 the input and corresponding output are programmed with 16 sequential addresses. Input 1 and output 1 are programmed with the issued switch address. The rest of the input/outputs are automatically programed with sequential addresses. Switch type or sensor type messages can be chosen.

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 SRC16 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 diagram on the front page. 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 SRC16 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 is section 5.

Ops mode or "programming on the main" is very convenient because you can try out the CV changes almost immediately. In order to use this type of programming the ops mode loco address must be set in CV1 (default is 1) and option 3 must be set in CV9. **This is a loco address, so be careful when using this feature**. You can immediately start programming in "Power On" ops mode without programming CV9 by holding down the Smart button just before power is turned on. When LED2 turns on release the button then wait until LED1 turns off. This temporarily sets option 3 until power is turned off. **When using ops mode to change CV values, the SRC16 does not recognize the new values of CV 1 - 13 until power is turned off and then back on.**

Programming CV7 with a value of 1 will restart the SRC16 so power need not be cycled when programming in "Power On" ops mode. This is the same as turning power off and then back on. For programming with DecoderPro and other programming tips see Team Digital's web site.

Reset the SRC16 to factory defaults.
To "reset" the SRC16 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
These CVs determine the address of the outputs and how the output responds. Each output has two CVs, an address and a type which includes the address adder, that makes up the address. See section 7 for CV numbers. The type CV also contains the message type the output responds to. That is, the output will turn on when a command is received when this criteria is met. The following table shows the CV value to set the criteria. To calculate the type CV value add up the selected values.


Outputs — Pin Out / Pin Out

Serial Bus Connectors

Inputs — Pin Out / Pin Out
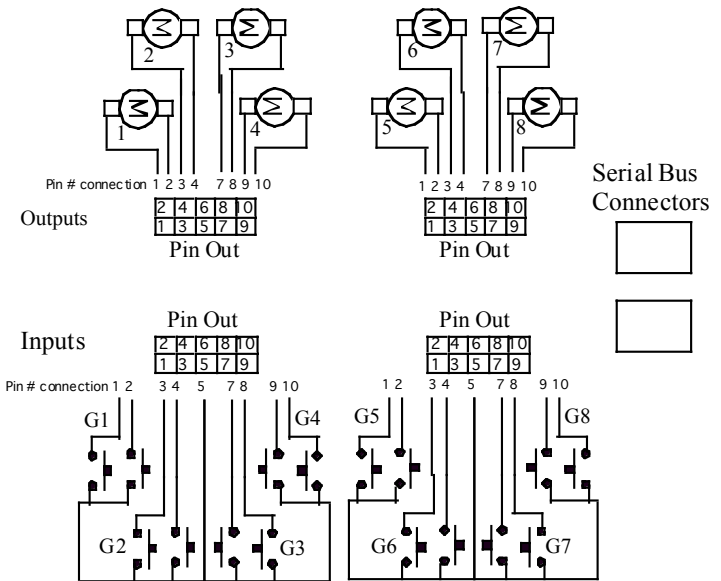
6.2 Routes
The SRC16 is well suited to handle routes in a yard. The following shows an example of five routes using four switches. The route CV values were determined using the information in sections 4.6 and 4.7. One very nice tool that makes custom programming much easier is JMRI DecoderPro.

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.


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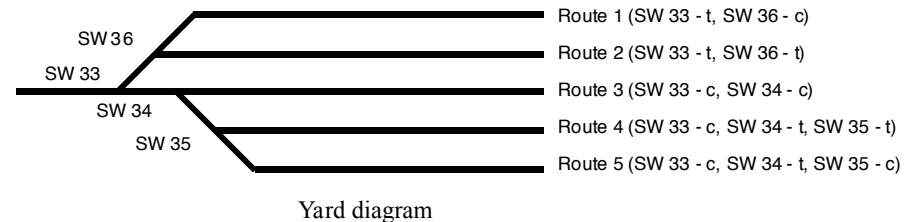
Route Example								
Route	1	2	3	4	5	6	7	**8**
Execute address	101 t	101 c	102 t	102 c	103 t			
Address 1	33 t	33 t	33 c	33 c	33 c			
Address 2	36 c	36 t	34 c	34 t	34 t			
Address 3				35 t	35 c			
Address 4								
Address 5								
Address 6								
Address 7								
Address 8								

5.5 Serial Bus

The SRC16 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 SRC16 the RS is only connected to the two terminal RS connector. In a system where the SRC16 is NOT connected to LocoNet the RS may be used to pass power from one SRC16 to another.

In a systems when more than 10 SRC16s are used the bus terminating resistor should be cut on any additional devices.

Cables are wired pin 1 to pin 1
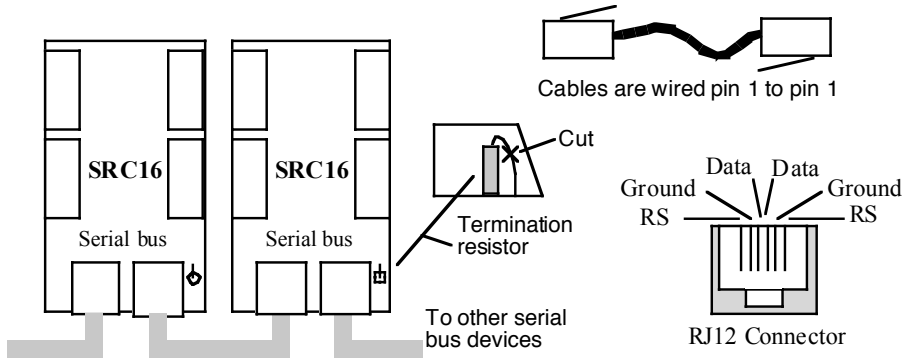
6 Applications

6.1 Switch Machine drive

The SRC16 is capable of driving low current stall type switch machines. It has been tested with the Tortoise ™ switch machine and can drive up to eight of them. Programming is the same whether using a switch machine or LEDs. A group of two outputs for throw and close needs to be used. "Smart" programming will automatically do this when addresses are assigned.

Each switch machine is connected to one of the SRC16 group outputs. When the SRC16 receives a switch command for that group, lets say a close command, that output is grounded. The thrown output is at 5 volts, so 5 volts is applied to the motor. It then moves in the close direction. Likewise, when a throw command is received for that group, that output is grounded. The closed output is now at 5 volts, so 5 volts is applied to the motor in the opposite direction. Consequently, it moves in the throw direction.

Since the SRC16 uses 5 volts for motor drive, the switch machine moves slower than if 12 volts were applied. If a higher voltage is desired use the Team Digital MotoD. A MotoD is a satellite motor driver that is controlled by the SRC16. Up to four MotoDs can be controlled by the SRC16.

See section 5.4 for more information.

Output		
Address CV	Value	Select
Address	1 - 255	
Program this value into the appropriate address CV		
Type CV	Value	Select
Close	64	
Throw	0	
Message type, sensor	32	
Message type, feedback (actual switch position)	16	
Message type, switch (commanded switch position)	0	
Address adder (see the address adder table for amount to add)	0 - 9	
Program this value into the appropriate type CV		

Select one

Select one

If an address greater than 255 is needed then use the address adder. The address adder value represents a number that is added to the address value to give the 'actual' address. The following table shows the CV value to use for the adder. To set addresses for output groups see "Smart" Programming for easier 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

4.2 Output Control

This CV determines how the output will respond when it is turned on. The following table shows how each output control is defined. See section 7 for CV numbers.

The normal state for the outputs is to drive common anode LEDs . If you want to use a common cathode connected LED select the invert normal state. If you want to change all the outputs set Option 8 of the Decoder Configuration CV.

Output Control CV	Value	Select
Invert the normal state (for common cathode)	128	
Normal state	0	
Effect, flash	16	
Effect, delay	8	
No effect	0	
Reciprocal or alternate (use with flash effect only)	4	
Duration time, use with effect (see duration table)	0 - 3	
Program this value into the appropriate output control CV		

Select One

Select

One

The delay effect causes the output to delay turn on once it has been commanded.

Reciprocal is used only with the flash effect to cause two outputs to flash alternately. Both outputs have to be selected to flash with the same duration. One of the outputs is selected for reciprocal. This can be used for grade crossing flashers.

The duration of time works only when one of the effects is selected. It determines the flash rate and delay time. See the table to get the value for selection based on the time.

Duration Time		
Value	Flash	Delay
0	.5 sec	5 sec
1	1 sec	10 sec
2	2 sec	20 sec
3	4 sec	40 sec

4.3 Power On Output State

CV12 - Power on state for output groups 1 to 4, a value from 1 to 170
CV13 - Power on state for output groups 5 to 8, a value from 1 to 170
These CVs determine the state of each output group at power on. Decoder configuration option 1 or option 2 has to be enabled for this these CVs to function. You only need to program these CVs if option 2 is enabled. If option 1 is enabled, the SRC16 automatically programs them. These tables only apply if the SRC16 outputs are configured in groups.

Output Groups 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 CV12		101

Output Groups 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 CV13		90

Example: CV12 = 1 + 4 + 32 + 64 = 101, throw output group 1, throw output group 2, close output group 3 and throw output group 4
Example: CV13 = 2 + 8 + 16 + 64 = 90, close output group 5, close output group 6, throw output group 6 and throw output group 6   (**example shown above in table**)

4.4 Decoder Configuration

CV9 - Configuration.
This CV determines the configuration which consists of several options.
Option 1 - Memory. The SRC8 will remember the output state at power off and at power on the outputs will be set to the same state.

Option 2 - Default output state. At power on each output will be set to the state as determined by CV12 and CV13. You must program CV12 and CV13 to the desired state at power on. Option 2 disables option 1. 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.

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 SRC16 to communication with devices connected to the serial bus.

Option 6 - DCC control. Allows the SRC16 to receive instructions from DCC (track). **Note:** Selecting this option **DISABLES** this feature.

Option 7 - Output lockout. Allows an input, when grounded, to keep the respective output from changing. Intended for use when inputs and outputs are configured as groups. This is address independent.

Option 8 - Common cathode LEDs. Allows common cathode connection of LEDs to the outputs.

using flat ribbon cable Insulation Displacement (IDC) and connectors from Jameco. The mating connector is #138377. 10 ft of gray flat ribbon cable is #643794. 10 ft of multicolor flat ribbon cable is #639672. See the diagram on the front page for connector location.

Warning: Do not connect the power supply ground (minus) to the ground (minus) pin of the 10 pin IDC connector. Do not connect any outputs together or to other SRC16 outputs.

Conn	--------- Outputs 1 to 8 ------------	--------- Outputs 9 to 16 -----------
Pin #	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10
Output#	1 2 3 4 - + 5 6 7 8	9 10 11 12 - + 13 14 15 16

Conn	--------- Inputs 1 to 8 --------------	---------- Inputs 9 to 16 -----------
Pin #	1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10
Input#	1 2 3 4 - + 5 6 7 8	9 10 11 12 - + 13 14 15 16
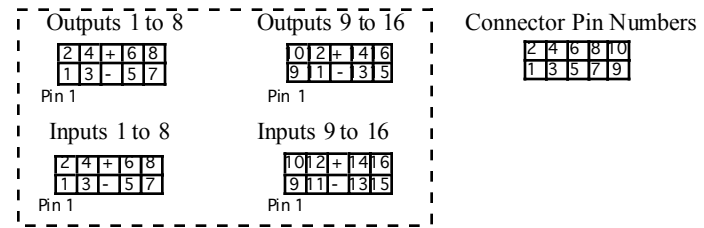
Voltage applied to pin 6 of the two output connectors can be changed by the position of the shorting bar. The standard position provides 5 volts when the SRC16 is driving LEDs or other low current 5 volt devices. See section 5.3.

The other positions provide a higher voltage for use when Team Digital MotoDs are connected to the outputs. A MotoD is a satellite motor driver that is controlled by the SRC16. Up to four MotoDs can be controlled be the SRC16.

Caution: Do NOT move the shorting bar from the factory position unless MotoDs are being used or the SRC16 may be damaged!
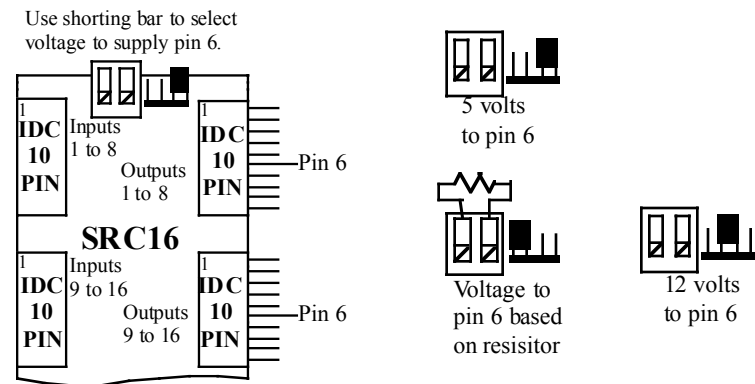
The programming track is not required once this address and option 3 have been set.
TIP: If the "Smart" program button is pressed when power is turned on, option 3 is enable until power is removed. Useful if you do not want to have ops mode enabled all the time.

4.11 Input Lockout Address
CV14 - Address, value 0 to 255: CV15 - 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 SRC16 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 SRC16 inputs are used for local turnout control.

5 Connections

5.1 Power
The SRC16 is powered by using the two terminal connector labeled "Track Power or 9-12 VDC". See diagram on front page. Power can be from the track (accessory decoder operation) or a filtered DC voltage (9 to 12 VDC) power supply. Most analog 'Power Packs' will not work because they do not provide smooth (filtered) DC power. The SRC16 power connector is non polarized and either terminal can be connected to plus or minus of the DC power supply. The power supply should be isolated from the system ground. That is, not connected to ground (booster ground, house wiring ground, etc). When multiple SRC16s are used they can be all connected to one power supply. The power supply must be able to supply the current for all the SRC16s. The plus and minus of the power supply must be connected to the same power input terminal on each SRC16. The rail sync terminals can be used to connect power to other SRC16s when using an accessory bus. See section 5.5. Do NOT use the rail sync terminals in a standard Digitrax system if the SRC16s are connected to the main LocoNet bus. See Team Digital website for more information on using an accessory bus.

5.2 Input Interface
Each input is at 5 volts when no device is connect. This is a hi or true state. When the input is connected to ground by a push button switch or block sensor the state is low or false.

5.3 Output Drive
The output supplies about 5 volts to drive LEDs and other low current devices such as low current stall type switch machines. The SRC16 has been tested with a Tortoise™ switch machine which can be used for a switch machine drive.

If LEDs are used current limiting resistors are required and should not less the 470 ohms. This is a general guide line for a typical LED. The current limit for any single output is 20 mA and the total of any connector group of eight outputs is 50 mA.

Warning: The output driver is rated for a maximum of 5 volts. Do not change the position of the shoring bar from the factory setting unless MotoDs are being used. See section 5.4.

5.4 10 PIN Input and Output
Input and output connectors have the same pin definitions. Connections can be made using our terminal strip adapter (TSA) or our Connector Cable Kit. You can build your own by

To calculate the value of CV9, add up the selected values. Example: Option 1 and option 3 - CV9 = 1 + 4 = 5

Decoder Configuration CV	Value	Select
No options	0	
Option 1 - Memory enabled	1	
Option 2 - Default output state enabled	2	
Option 3 - Ops mode programming enabled	4	
Option 4 - DCC to bus gateway enabled	8	
Option 5 - Serial Bus communication enabled	16	
Option 6 - Control from DCC **DISABLED**	32	
Option 7 - Output lockout enabled	64	
Option 8 - Common cathode LEDs	128	
Program this value into the configuration CV		

Select One

The following table will help you determine how to configuring the SRC16. If there are more than one SRC16 or other Gateway capable devices, only one should have the gateway enabled. In a Digitrax system DO NOT connect the SRC16 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.

System	DCC Control Option 6	Gate-Way* Option 4	Serial Bus Option 5	CV Value	Notes
All DCC Compatible Systems	Enabled			0	The SRC16 is controlled via the track (DCC commands). The bus is not used by the SRC16.
Digitrax System	**Disabled**		Enabled	48	The SRC16 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. Easier trouble shooting.
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)

4.5 Status Report
CV10 - Status report.
This CV determines which input and output states the SRC16 provides. This is typically used when the serial bus is enabled. Options 3 and 4 will not work correctly if the outputs are not configured as responding to switch commands and in groups of close/throw.

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. 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. Eight messages are sent based on output groups unless option 5 enabled. 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.

Option 5 - 16 output state messages sent if option 2 is enabled. Use section 3 of "Smart" programming so the outputs are configured correctly for this option. Requires version 15.

Status Report CV	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	
Option 5 - Send 16 output state messages at power enabled	16	
Program this value into the status report CV		

4.6 Input Control
These CVs determine what action the inputs will have when activated. There are three CVs for each input. An address, type and transition CV. See section 7 for CV numbers. If an address greater than 255 is needed then use the address adder. The address adder value represents a number that is added to the address value to give the 'actual' address.

There are 16 physical input terminals. They can each be programmed to operate independently or to operate as a pair in a group (default). They are not linked or connected to the outputs an any way except by a common address and type.

In order for an input to cause an action, a transition must be selected. Each input has a 'pull-up' resistor connected to 5 volts, so the input is normally at 5 volts. An input transition is 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 input groups see "Smart" Programming for easier programming.
Route execution feature requires version 16.

Input Control		
Address CV	Value	Select
Address	1 - 255	
Program this value into the appropriate address CV		
Type CV	Value	Select
Invert the normal state	128		Select
Normal state	0		one
Toggle state (only if switch type)	64		
Message type, sensor	32		Select
Message type, feedback (actual switch position)	16		
Message type, switch (commanded switch position)	0		one
Address adder (see the address adder table for amount to add)	0 - 9	
Program this value into the appropriate type CV		
Transition CV	Value	Select
Execute route number x 16 (example to execute route 2, 2 x 16 = 32)	0 - 128	
Send message on change transition	3		Select
Send message on hi to low transition	2		
Send message on low to hi transition	1		One
Disable message	0	
Program this value into the appropriate transition CV		

4.7 Route Execute Address
These CVs determine the top or execute address of a route. See section 7 for CV numbers. 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 SRC16, throttles or computers matches the top address and switch state for that route. 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 alined went 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
Throw	0		one
Execution type, sensor	32		Select
Execution type, switch (turnout command)	0		one
Address adder (see the address adder table for amount to add)	0 - 9	
Program this value into the appropriate type CV		

4.8 Route Cell Address
These CVs determine the address in a route cell. See section 7 for CV numbers. 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 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
Throw	0		one
Address adder (see the address adder table for amount to add)	0 - 9	
Program this value into the appropriate type CV		

4.9 Send Address Delay
CV11 - Send address time delay, value 0 to 255.
This CV determines the time delay the SRC16 waits before sending the next address in a route. Some switch machine drivers require a time delay between switch activation. The delay is the CV11 value x 0.25 seconds.

Delay between sending route addresses								
CV11 Value	0	1	2	4	8	12	16	**20**
Delay (sec)	0	0.25	0.5	1	2	3	4	5

4.10 Operations Mode Loco Address
CV1 - Ops mode address, a value of 1 to 127. Default is one (1).
This CV sets the operations mode program address. Program the SRC16 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.