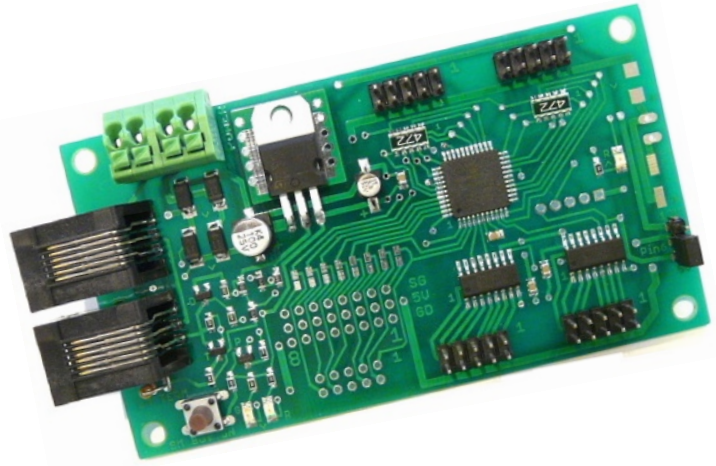# TEAM DIGITAL

Improving the world of DCC

SRC162e
Switch & Route Controller

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

Picture not exact representation of the SRC162e
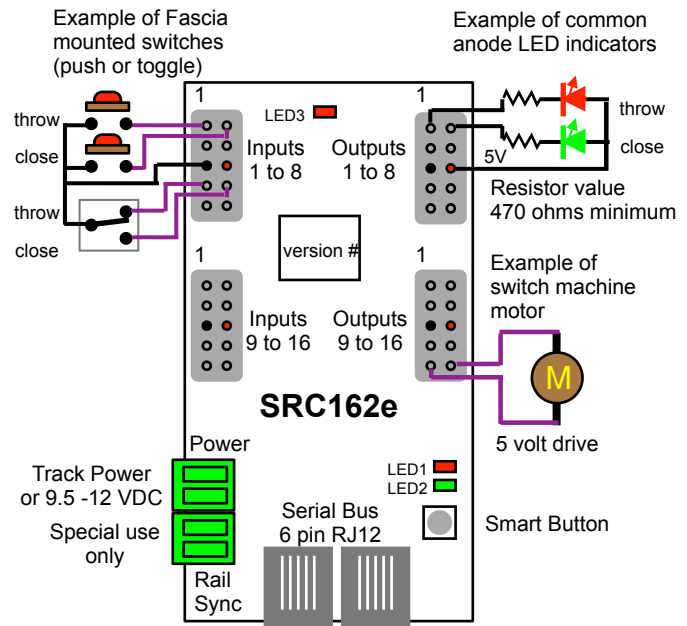
Description

The SRC162e is a DCC compatible accessory decoder. It can control up to 8 Tortoise™ switch machines directly or 16 using MotoDs. It can drive LEDs for turnout state or block state indication. It has 16 inputs for push buttons or other input devices. Also it has route capability for multiple turnout control.

The SRC162e can be used as a stand-a-lone controller or communicate with other devices that have a compatible serial bus.

As an example, using the serial bus, one SRC162e could control another. One SRC162e could be located on a panel connected to push buttons and LEDs and another SRC162e located out on the layout controlling Tortoise™ machines. Push buttons on the panel control the Tortoise™ on the layout. LEDs on the panel indicating turnout state. Using the serial bus can help in reducing and simplify the wiring.

The SRC162e works out of the box with no programming. If custom operation is required, CVs can by programming by the DCC system.

The SRC162e is essentially the same as the SRC162 except it does not have provision to adjust Tortoise™ move speed with a resistor.

06.27.16
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1 Operation

The SRC162e 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 SRC162e can control eight turnouts (switches) or display the state (closed or thrown) of eight turnouts with LEDs. 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 SRC162e 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 the Tortoise ™ switch machine can be connected to the outputs. The SRC162e does not require a serial bus connection to operate. It receives it's own messages.

The SRC162e supports 16 routes. Each route has eight cells. There is one top or route execution address for each route. Routes can be added together to creates a route with more than eight addresses by assigning the same address to more than one top address. 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 SRC162e 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 steps. LED 2 flash indicates accepted program value or a valid received address. LED 3 slow flash indicates heartbeat, slow double flash indicates compound CV programming and fast flash indicates serial bus short.

2 Getting Started

The SRC162e 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 a Tortoise ™ switch machine 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 SRC162e. 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 SRC162e see section 5.4. **Before doing any programming, it is strongly recommended that you verify basic operation.**

2.1 Control via LocoNet - Digitrax Users

The SRC162e comes from the factory ready to use by control from DCC commands when the SRC162e is connected to track power. To control the SRC162e via LocoNet®, it must be enabled. Connect the SRC162e track power terminals to the programming track and program CV9 with a value of 48. The SRC162e 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 SRC162e power terminals to track power. Connection to the serial bus (LocoNet® in Digitrax system) is not used. Turn on power.

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 SRC162e 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.

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

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 SRC162e for addresses from 9 to 16. Reference section 1 in the table below.

Power on the SRC162e 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.

Section 3 is a little different then the other sections because in steps 1 and 2 a CV value is programmed

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

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. There is an example of programming using section 3 on the Team Digital website.

4 Configuration Variables (CVs)

The SRC162e 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 SRC162e 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.

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 SRC162e 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 SRC162e can be programmed so it is always in ops mode by setting option 3 in CV9. **When using ops mode to change CV values, the SRC162e 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 SRC162e 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 Programming CV numbers above 256

If your DCC system can not program CV numbers greater than 256, then you will have to use compound programming for those CV numbers. To program a CV number greater than 256 first program CV7 with a value of 16. Now programming CV numbers starting at 257 will be the same as programmed CV numbers starting at 1. To determine which CV number to use for programming subtract 256. For example, to program CV number 261, subtract 256 from 261 (261-256=5). CV5 is the number to program. Compound programming can only be done in ops mode. To exit compound programming program CV247 with a value of zero or turn off power. LED 3 slow double flash indicates compound programming is enabled.

4.02 Reset the SRC162e to factory defaults

To "reset" the SRC162e 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.

Output		
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
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 the value)	0 - 9	
Program this value into the appropriate type CV		

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	Select
Normal state	0	One
Effect, flash	16	Select
Effect, delay	8	
No effect	0	One
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		

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.

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

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.

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 SRC162e automatically programs them. Note: These tables only apply if the SRC162e outputs are configured in groups. However, the power on state will also work when the SRC162e outputs are configured as single outputs for controlling MotoDs.

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 in table**)

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**

4.4 Decoder Configuration

CV9 - Configuration.
This CV determines the configuration which consists of several options.

Option 1 - Memory. The SRC162e 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.

Decoder Configuration CV	Value	Select	
No options	0		
Option 1 - Memory enabled	1		Select
Option 2 - Default output state enabled	2		One
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			

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 SRC162e to communication with devices connected to the serial bus.

Option 6 - DCC control. Allows the SRC162e 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.

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

This table will help you determine how to configure the SRC162e. If there are more than one SRC162e or other Gateway capable devices, only one should have the gateway enabled. In a Digitrax system DO NOT connect the SRC162e 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 SRC162e is controlled via the track (DCC commands). The bus is not used by the SRC162e.
Digitrax System	**Disabled**		Enabled	48	The SRC162e 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 SRC162e reports. 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.

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 on enabled	16	
Program this value into the status report CV		

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. Eight messages are sent based on output groups unless option 5 enabled. These are switch type messages. Do NOT enable option 4 at the same time.

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. Eight messages are sent based on output groups unless option 5 enabled. These are feedback type messages. Do NOT enable option 2 at the same time.

Option 5 - 16 output state messages are sent if option 2 or 4 is enabled. Use section 3 of "Smart" programming so the outputs are configured correctly for this option.

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 in any way except by a common address and type.

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 the value)	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 - 240		
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			

* Only routes 1-15

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 input groups or individual inputs in see "Smart" Programming for easier programming.

The Toggle state operation causes an input to send the opposite switch command from the previous one when the defined input transition occurs. If the previous command was a close the next one will be a throw. Since the input is not connected or linked to any output except by address and type, it does not know what state the output is in. Since other sources can change an output state, an input may have to be activated twice before the output changes. This includes power on also.

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 SRC162e, 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.

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	
Throw	0	
Execution type, sensor	32	
Execution type, switch (turnout command)	0	
Address adder (see the address adder table for the value)	0 - 9	
Program this value into the appropriate type CV		

Select one

Select one

Optionally, a route can be executed by a block sensor message. In this way several turnouts can automatically be alined when a block becomes occupied.

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

Select one

4.9 Route Address Send Delay

CV11 - Send address time delay, value 0 to 255.

This CV determines the time delay the SRC162e waits before sending the next address in a route. Some switch machine drivers require a time delay between switch activation.

Delay examples are shown in the table.

Delay between sending route addresses								
CV11 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

CV1 - Ops mode address, a value of 1 to 127. Default is one (1). (If using Loconet and JMRI higher values are allowed.) 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 SRC162e 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 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 SRC162e 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 SRC162e inputs are used for local turnout control.

5 Connections

5.1 Power

The SRC162e is powered by using the two terminal connector labeled Power. See diagram on front page. Power can be from the track (accessory decoder operation) or a filtered DC voltage (9.5 to 12 VDC) power supply. For a DC supply do not use old analog 'Power Packs'. The SRC162e 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 SRC162es are used they can be all connected to one power supply. The plus and minus of the power supply must be connected to the same power input terminal on each SRC162e.

Power supply current requirements: 20mA for just a SRC162e, 20mA for each Tortoise™ using a MotoD. Good practice - select a supply with at least 10% more current capability than required.
See section 5.3 for output drive considerations.

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.

5.3 Output Drive

The output supplies about 5 volts to drive LEDs and the Tortoise™ switch machine. If LEDs are used current limiting resistors are required and should not be 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.
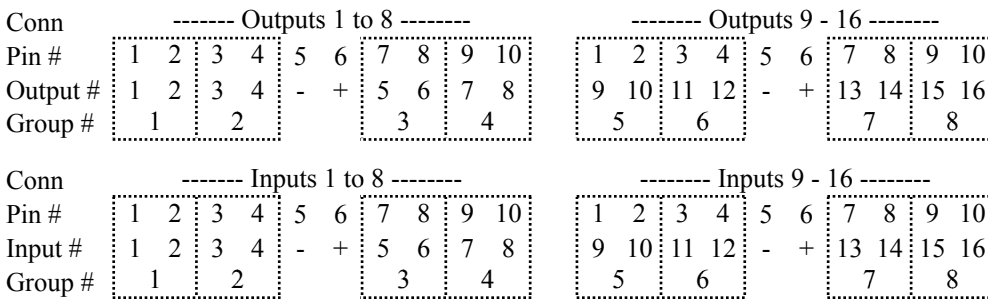
Warning: The output driver is rated for a maximum of 5 volts. Do not change the position of the shorting bar from the factory setting unless MotoDs are being used. See section 5.4.

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 using flat ribbon cable Insulation Displacement (IDC) and connectors from Jameco. The mating connector is #138376. 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 5 of the 10 pin IDC connector. Do not connect any outputs together or to other SRC162e outputs.

All 10 pin connectors have the same pin numbers. Viewed from the top of the SRC162e with serial bus RJ12 connectors at the right. See front page.

Conn	------- Outputs 1 to 8 --------									-------- Outputs 9 - 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
Group #	1		2				3		4		5		6				7		8	

Conn	------- Inputs 1 to 8 --------									-------- Inputs 9 - 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
Group #	1		2				3		4		5		6				7		8	

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 SRC162e is driving LEDs or other low current 5 volt devices. See section 5.3.

The other position provides 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 SRC162e. Up to four MotoDs can be controlled be the SRC162e.

Caution: Do NOT move the shorting bar from the factory position unless MotoDs are being used or the SRC162e may be damaged!
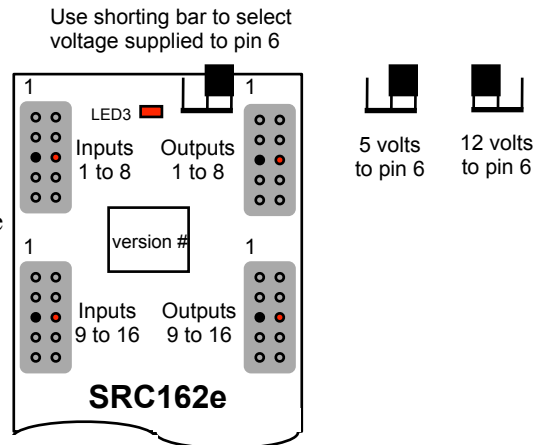
5.5 Serial Bus

The SRC162e 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 SRC162e the RS is only connected to the two terminal Special use connector.

In a system where the SRC162e is NOT connected to LocoNet the RS may be used to pass power from one SRC162e to another. Do NOT use the rail sync terminals in a standard Digitrax system if the SRC162es are connected to the main LocoNet bus. See Team Digital website for more information on using an accessory bus with RS.

In a systems when more than 10 SRC162es are used the bus terminating resistor should be cut on any additional devices.

Ground — Data — Data — Ground
RS — RS

RJ12 Connector

Cables are wired pin 1 to pin 1
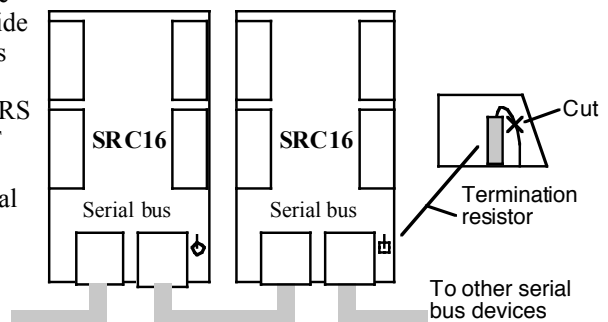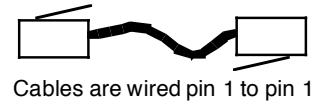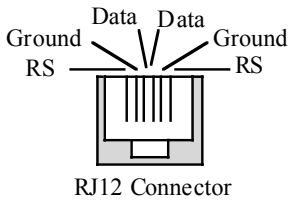
6 Applications

6.1 Switch Machine drive

The SRC162e is capable of driving the Tortoise ™ switch machine and can direct drive up to eight of them. If more than one SRC162e is used "Smart" programming can be used to assign group addresses. Programming is the same whether using a switch machine or LEDs. Groups are required to direct drive Tortoise ™.

Each switch machine is connected to one of the SRC162e group outputs. When the SRC162e 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 SRC162e 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 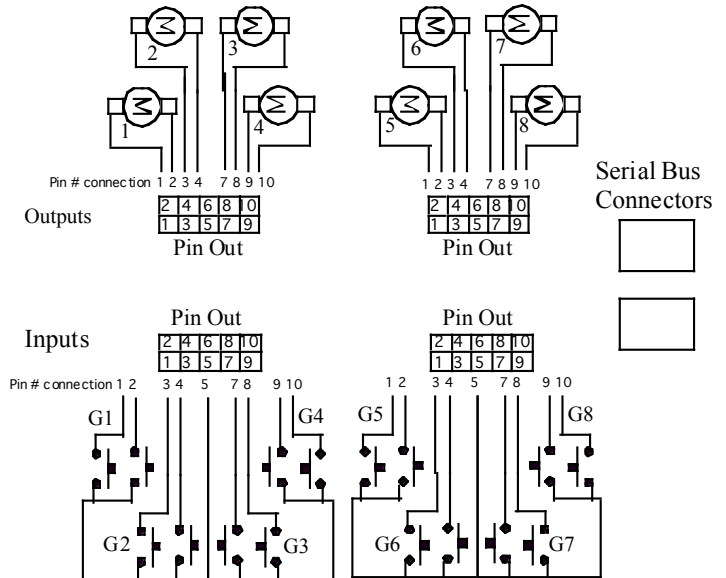Team Digital MotoD. A MotoD is a satellite motor driver that is controlled by the SRC162e. Up to four MotoDs can be controlled by the SRC162e. See section 5.4 for more information.

6.2 Routes

The SRC162e 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.
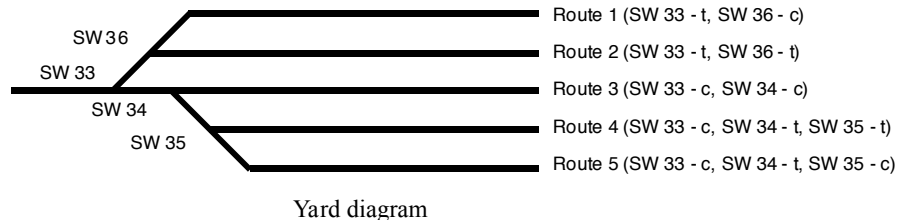
A route can be executed with an actual turnout (switch) address or a pseudo address of a switch (not a physical switch). Program the top address of the route with the address you want to execute the route. Inputs can be programmed to execute a route from a push button.

Notice routes 4 and 5 both control turnouts 33 and 34 the same. If there are more than 8 turnouts required in a route that route can "call" another route. For example, both routes 4 and 5 could "call" route 6 by including 103 c. Therefore turnouts 33 and 34 would not be included in routes 4 and 5.

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	103 c		
Address 1	33 t	33 t	33 c	33 c	33 c	33 c		
Address 2	36 c	36 t	34 c	34 t	34 t	34 t		
Address 3				35 t	35 c			
Address 4								
Address 5								
Address 6								
Address 7								
Address 8								

6.3 Wiring Examples

This diagram shows wiring for a number of devices that can be used with the SRC162e.

Input#   Product Pin#

1 — 1
2 — 2
3 — 3
4 — 4
5 - GND
6 - 5 Volts
5 — 7
6 — 8
7 — 9
8 — 10

Ribbon cable with connector

9 — 1
10 — 2
11 — 3
12 — 4
5 - GND
6 - 5 Volts
13 — 7
14 — 8
15 — 9
16 — 10

Team Digital SRC162e

Input

Output

Pin 1, Input 9   Input 10, Pin 2
Pin 3, Input 11   Input 12, Pin 4
Pin5, Ground   5 Volts, Pin 6
Pin 7, Input 13   Input 14, Pin 8
Pin 9, Input 15   Input 16, Pin 10

Input 9 - 16 Connector

SRC16 Output#	TSA Pin# Group#	
1	1t	1
2	1c	2
3	2t	3
4	2c	4
	GND - 5	
	5 volts - 6	
5	3t	7
6	3c	8
7	4t	9
8	4c	10

1 2 3 4 5 6 7 8 9 10
TSA   Pin#

Example of common anode LED indicators TSA has built-in resistors for LEDs

Product Pin#

1
2
3
4

8

M

1

7
6
5
4
3
2

Example of Tortoise™ connections

8

M

1

7
6
5
4
3
2

11

7 Summary of Configuration Variables

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

CV#	Function/Default Value		CV#	Function/Default Value		CV#	Function/Default Value	
178	Route 4 Cell 2 Address	0	238	Route 7 Cell 8 Address	0	299	Route 10 Cell 6 Address	0
179	Route 4 Cell 2 Address Adder	0	239	Route 7 Cell 8 Address Adder	0	300	Route 10 Cell 6 Address Adder	0
180	Route 4 Cell 3 Address	0	240	Route 8 Cell 1 Address	0	301	Route 10 Cell 7 Address	0
181	Route 4 Cell 3 Address Adder	0	241	Route 8 Cell 1 Address Adder	0	302	Route 10 Cell 7 Address Adder	0
182	Route 4 Cell 4 Address	0	242	Route 8 Cell 2 Address	0	303	Route 10 Cell 8 Address	0
183	Route 4 Cell 4 Address Adder	0	243	Route 8 Cell 2 Address Adder	0	304	Route 10 Cell 8 Address Adder	0
184	Route 4 Cell 5 Address	0	244	Route 8 Cell 3 Address	0	305	Route 11 Cell 1 Address	0
185	Route 4 Cell 5 Address Adder	0	245	Route 8 Cell 3 Address Adder	0	306	Route 11 Cell 1 Address Adder	0
186	Route 4 Cell 6 Address	0	246	Route 8 Cell 4 Address	0	307	Route 11 Cell 2 Address	0
187	Route 4 Cell 6 Address Adder	0	247	Route 8 Cell 4 Address Adder	0	308	Route 11 Cell 2 Address Adder	0
188	Route 4 Cell 7 Address	0	248	Route 8 Cell 5 Address	0	309	Route 11 Cell 3 Address	0
189	Route 4 Cell 7 Address Adder	0	249	Route 8 Cell 5 Address Adder	0	310	Route 11 Cell 3 Address Adder	0
190	Route 4 Cell 8 Address	0	250	Route 8 Cell 6 Address	0	311	Route 11 Cell 4 Address	0
191	Route 4 Cell 8 Address Adder	0	251	Route 8 Cell 6 Address Adder	0	312	Route 11 Cell 4 Address Adder	0
192	Route 5 Cell 1 Address	0	252	Route 8 Cell 7 Address	0	313	Route 11 Cell 5 Address	0
193	Route 5 Cell 1 Address Adder	0	253	Route 8 Cell 7 Address Adder	0	314	Route 11 Cell 5 Address Adder	0
194	Route 5 Cell 2 Address	0	254	Route 8 Cell 8 Address	0	315	Route 11 Cell 6 Address	0
195	Route 5 Cell 2 Address Adder	0	255	Route 8 Cell 8 Address Adder	0	316	Route 11 Cell 6 Address Adder	0
196	Route 5 Cell 3 Address	0	256	reserved	-	317	Route 11 Cell 7 Address	0
197	Route 5 Cell 3 Address Adder	0	257	Route 9 Top Address	0	318	Route 11 Cell 7 Address Adder	0
198	Route 5 Cell 4 Address	0	258	Route 9 Top Address Adder	0	319	Route 11 Cell 8 Address	0
199	Route 5 Cell 4 Address Adder	0	259	Route 10 Top Address	0	320	Route 11 Cell 8 Address Adder	0
200	Route 5 Cell 5 Address	0	260	Route 10 Top Address Adder	0	321	Route 12 Cell 1 Address	0
201	Route 5 Cell 5 Address Adder	0	261	Route 11 Top Address	0	322	Route 12 Cell 1 Address Adder	0
202	Route 5 Cell 6 Address	0	262	Route 11 Top Address Adder	0	323	Route 12 Cell 2 Address	0
203	Route 5 Cell 6 Address Adder	0	263	Route 12 Top Address	0	324	Route 12 Cell 2 Address Adder	0
204	Route 5 Cell 7 Address	0	264	Route 12 Top Address Adder	0	325	Route 12 Cell 3 Address	0
205	Route 5 Cell 7 Address Adder	0	265	Route 13 Top Address	0	326	Route 12 Cell 3 Address Adder	0
206	Route 5 Cell 8 Address	0	266	Route 13 Top Address Adder	0	327	Route 12 Cell 4 Address	0
207	Route 5 Cell 8 Address Adder	0	267	Route 14 Top Address	0	328	Route 12 Cell 4 Address Adder	0
208	Route 6 Cell 1 Address	0	268	Route 14 Top Address Adder	0	329	Route 12 Cell 5 Address	0
209	Route 6 Cell 1 Address Adder	0	269	Route 15 Top Address	0	330	Route 12 Cell 5 Address Adder	0
210	Route 6 Cell 2 Address	0	270	Route 15 Top Address Adder	0	331	Route 12 Cell 6 Address	0
211	Route 6 Cell 2 Address Adder	0	271	Route 16 Top Address	0	332	Route 12 Cell 6 Address Adder	0
212	Route 6 Cell 3 Address	0	272	Route 16 Top Address Adder	0	333	Route 12 Cell 7 Address	0
213	Route 6 Cell 3 Address Adder	0	273	Route 9 Cell 1 Address	0	334	Route 12 Cell 7 Address Adder	0
214	Route 6 Cell 4 Address	0	274	Route 9 Cell 1 Address Adder	0	335	Route 12 Cell 8 Address	0
215	Route 6 Cell 4 Address Adder	0	275	Route 9 Cell 2 Address	0	336	Route 12 Cell 8 Address Adder	0
216	Route 6 Cell 5 Address	0	276	Route 9 Cell 2 Address Adder	0	337	Route 13 Cell 1 Address	0
217	Route 6 Cell 5 Address Adder	0	277	Route 9 Cell 3 Address	0	338	Route 13 Cell 1 Address Adder	0
218	Route 6 Cell 6 Address	0	278	Route 9 Cell 3 Address Adder	0	339	Route 13 Cell 2 Address	0
219	Route 6 Cell 6 Address Adder	0	279	Route 9 Cell 4 Address	0	340	Route 13 Cell 2 Address Adder	0
220	Route 6 Cell 7 Address	0	280	Route 9 Cell 4 Address Adder	0	341	Route 13 Cell 3 Address	0
221	Route 6 Cell 7 Address Adder	0	281	Route 9 Cell 5 Address	0	342	Route 13 Cell 3 Address Adder	0
222	Route 6 Cell 8 Address	0	282	Route 9 Cell 5 Address Adder	0	343	Route 13 Cell 4 Address	0
223	Route 6 Cell 8 Address Adder	0	283	Route 9 Cell 6 Address	0	344	Route 13 Cell 4 Address Adder	0
224	Route 7 Cell 1 Address	0	284	Route 9 Cell 6 Address Adder	0	345	Route 13 Cell 5 Address	0
225	Route 7 Cell 1 Address Adder	0	285	Route 9 Cell 7 Address	0	346	Route 13 Cell 5 Address Adder	0
226	Route 7 Cell 2 Address	0	286	Route 9 Cell 7 Address Adder	0	347	Route 13 Cell 6 Address	0
227	Route 7 Cell 2 Address Adder	0	287	Route 9 Cell 8 Address	0	348	Route 13 Cell 6 Address Adder	0
228	Route 7 Cell 3 Address	0	288	Route 9 Cell 8 Address Adder	0	349	Route 13 Cell 7 Address	0
229	Route 7 Cell 3 Address Adder	0	289	Route 10 Cell 1 Address	0	350	Route 13 Cell 7 Address Adder	0
230	Route 7 Cell 4 Address	0	290	Route 10 Cell 1 Address Adder	0	351	Route 13 Cell 8 Address	0
231	Route 7 Cell 4 Address Adder	0	291	Route 10 Cell 2 Address	0	352	Route 13 Cell 8 Address Adder	0
232	Route 7 Cell 5 Address	0	292	Route 10 Cell 2 Address Adder	0	353	Route 14 Cell 1 Address	0
233	Route 7 Cell 5 Address Adder	0	293	Route 10 Cell 3 Address	0	354	Route 14 Cell 1 Address Adder	0
234	Route 7 Cell 6 Address	0	294	Route 10 Cell 3 Address Adder	0	355	Route 14 Cell 2 Address	0
235	Route 7 Cell 6 Address Adder	0	295	Route 10 Cell 4 Address	0	356	Route 14 Cell 2 Address Adder	0
236	Route 7 Cell 7 Address	0	296	Route 10 Cell 4 Address Adder	0	357	Route 14 Cell 3 Address	0
237	Route 7 Cell 7 Address Adder	0	297	Route 10 Cell 5 Address	0	358	Route 14 Cell 3 Address Adder	0
238	Route 7 Cell 8 Address	0	298	Route 10 Cell 5 Address Adder	0	359	Route 14 Cell 4 Address	0

CV#	Function/Default Value							
360	Route 14 Cell 4 Address Adder	0						
361	Route 14 Cell 5 Address	0						
362	Route 14 Cell 5 Address Adder	0						
363	Route 14 Cell 6 Address	0						
364	Route 14 Cell 6 Address Adder	0						
365	Route 14 Cell 7 Address	0						
366	Route 14 Cell 7 Address Adder	0						
367	Route 14 Cell 8 Address	0						
368	Route 14 Cell 8 Address Adder	0						
369	Route 15 Cell 1 Address	0						
370	Route 15 Cell 1 Address Adder	0						
371	Route 15 Cell 2 Address	0						
372	Route 15 Cell 2 Address Adder	0						
373	Route 15 Cell 3 Address	0						
374	Route 15 Cell 3 Address Adder	0						
375	Route 15 Cell 4 Address	0						
376	Route 15 Cell 4 Address Adder	0						
377	Route 15 Cell 5 Address	0						
378	Route 15 Cell 5 Address Adder	0						
379	Route 15 Cell 6 Address	0						
380	Route 15 Cell 6 Address Adder	0						
381	Route 15 Cell 7 Address	0						
382	Route 15 Cell 7 Address Adder	0						
383	Route 15 Cell 8 Address	0						
384	Route 15 Cell 8 Address Adder	0						
385	Route 16 Cell 1 Address	0						
386	Route 16 Cell 1 Address Adder	0						
387	Route 16 Cell 2 Address	0						
388	Route 16 Cell 2 Address Adder	0						
389	Route 16 Cell 3 Address	0						
390	Route 16 Cell 3 Address Adder	0						
391	Route 16 Cell 4 Address	0						
392	Route 16 Cell 4 Address Adder	0						
393	Route 16 Cell 5 Address	0						
394	Route 16 Cell 5 Address Adder	0						
395	Route 16 Cell 6 Address	0						
396	Route 16 Cell 6 Address Adder	0						
397	Route 16 Cell 7 Address	0						
398	Route 16 Cell 7 Address Adder	0						
399	Route 16 Cell 8 Address	0						
400	Route 16 Cell 8 Address Adder	0						