TEAM DIGITAL
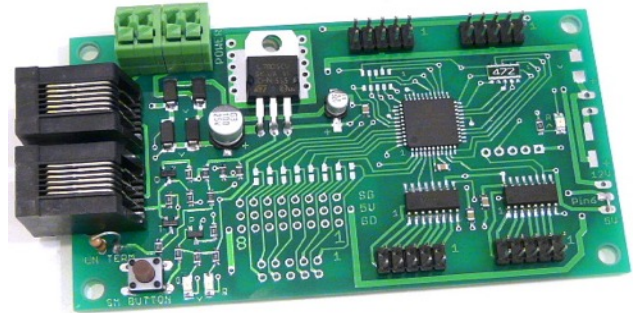
SIC24e
Signal & Indicator Controller
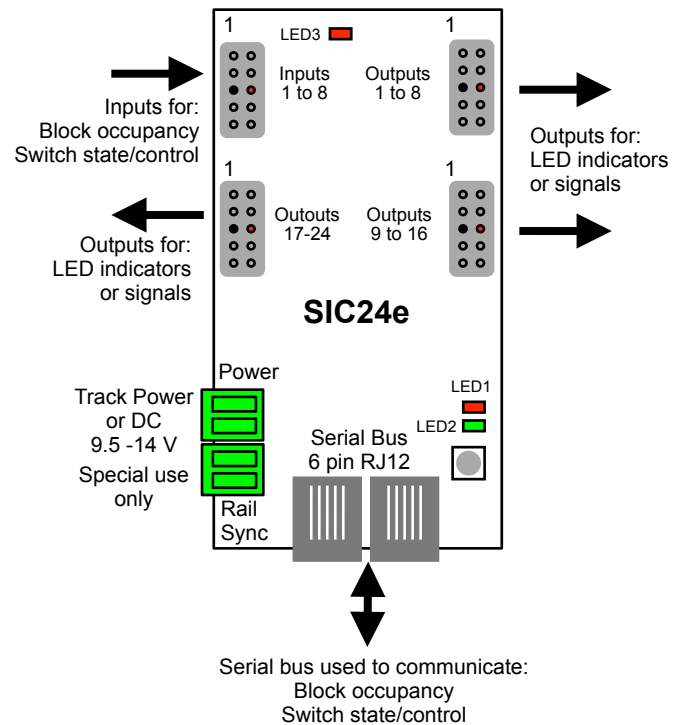
> Control signals on the layout
> Control indicators on the facia
> Control CTC panel indicators
> Control crossing gates
> Flash LEDs
> Eight inputs for sensors
> 24 outputs to drive LEDs
> Drive Tortoise™ machines
> Customizable logic
> "Smart" Programming
> DCC gateway to serial bus
> LocoNet® compatible
> Computer not required

Description

The SIC24e (Signal and Indicator Controller) is uniquely suited to control various types of signals and indicators on a layout or a CTC panel. It can be used as a signal controller, to indicate block occupancy and turnout position, and as a grade crossing gate controller with flashing signals. It can be used as a general input/output device for use with PC software like JMRI.

The internal logic can be setup for several different signal schemes using "Smart" programming with just a few steps. The logic can also be custom programmed used standard Configuration Variables (CVs).

Inputs for:
Block occupancy
Switch state/control

LED3
Inputs 1 to 8
Outputs 1 to 8

Outouts 17-24
Outputs 9 to 16

Outputs for:
LED indicators or signals

Outputs for:
LED indicators or signals

SIC24e

Power
Track Power or DC
9.5 -14 V
Special use only
Rail Sync

Serial Bus 6 pin RJ12

LED1
LED2

Serial bus used to communicate:
Block occupancy
Switch state/control

1 Operation

The SIC24e has internal signal logic that takes track block occupancy and switch state information to determine how the signals should operate. This information is managed in the form unique block/sensor and switch messages. It uses these same type messages to communicate between multiple SIC24es which can work together to form a larger signal system. Since all communication is done over a serial bus, the number of wires to implement a signal system is greatly reduced.

The block diagram on the front page shows the general layout of the various input, output and power connectors. The serial bus is based on Digitrax's LocoNet® and some features are unique to a Digitrax system. However, a Digitrax DCC system is not required for operation or programming. The SIC24e is compatible with LocoNet® block detectors such as the Team Digital BlocD8 or detectors connected to its inputs such as the Team Digital DBD22.

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

You can start using the SIC24e without doing any programming. The SIC24e comes from the factory programmed to implement up to a four block Automatic Block Signaling (ABS) system (Figure 2). If you want to use the SIC24e for some other signal or indicator arrangement, go to section 3 "Smart Programming" to see if there is a setup that meets your requirements. If there is not a setup that does exactly what you want, go on to section 4 Operation and section 5 Configuration Variables to learn how the SIC24e works and program your custom implementation.

To start using the SIC24e for an ABS system, you will need to connect block sensors to the inputs and LEDs to the outputs. Connect up to four block sensors to the first four inputs. Connect as many signal LEDs to the outputs as needed for the number of blocks you will be using. Starting with output number 1. Each LED requires a resistor as shown in the diagram on the front page. The relationship between the signal LED and the SIC24e output number is shown in figure 2. The color LED location used in the signals in figure 2 is shown in figure 1. See section 6 Connections for hooking up power and the relationship between input and output number and the SIC24e pin number.

In this Setup the output of the block detector connected to a SIC24e input must go low indicating the block is occupied. If you are using Team Digital's DBD22 for block detectors, see its manual for connecting to the SIC24e.
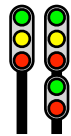
Figure 1

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 SIC24e power terminals to track power. Connection to the serial bus (LocoNet® in Digitrax system) is not used. Turn on power. If you are not familiar with controlling turnouts, you will need to check your DCC systems manual.

Before using "Smart" Programming" look through this section and determine which Setup you want to use. In addition this requires determining the base address, various other addresses, number of blocks, use of inputs and how LEDs are connected to the outputs (common anode or cathode).

The outputs of the SIC24e are numbered 1 to 24. See section 6 Connections for the relationship between the connector, the connector pin number, and the output number. The base address is the address assigned to output 1. The rest of the addresses sequentially follow the output numbers. See the diagram on the front page for connector location.

To program in "Smart" mode, connect the SIC24e power terminals to track power. Connection to the serial bus (LocoNet® in Digitrax system) is not used. Turn on power.

Press the "Smart" program button and hold it down for approximately one second until LED1 (typically red) starts to flash. Then release it. The

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

SIC24e is now ready for the Setup steps. Using the throttle select the switch or accessory number which is the base address. Depending on the setup you have selected issue the switch command by selecting either the 't' (throw) or 'c' (close) option.. LED2 (typically green) will flash briefly.
LED1 now flashes twice with a pause and then repeats indicating step 2.

As you progress through the "Smart" programming steps, LED1 flashes the number of times indicating which step is ready to be programmed.
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.

On the seventh step, enter the number of the Setup you want the SIC24e to implement. If the Setup is implemented the logic is calculated and the SIC24e is automatically programmed. The SIC24e will then reset and the Setup is ready to use.
Note: For proper operation all the steps must be completed.

Block Signal Setup					User input	
Step	Description	t option	c option	Switch address	option
1	Base address of output cell state messages Enable output messages is required	enable output messages	disable output messages	101	t
Step 1 - 101 t is issued from the throttle. *This sets the base address to 101 with output messages enabled.*					
2	Address of first block Enable inputs Input 1 is assigned to the first block	enable inputs	disable inputs	1	t
3	Number of block - Maximum of 4 Common anode or cathode LEDs	anode	cathode	4	t
Step 3 - 4 t is issued from the throttle. *This sets the number of blocks to 4 and the outputs for common anode.*					
4	Address of west block ahead of first block	accept	don't use	4 doesn't matter	c not used
5	Address of east block following last block	accept	don't use	4 doesn't matter	c not used
6	Address of switch 1 of siding	accept	don't use	4 doesn't matter	c not used
Step 6 - 4 c is issued from the throttle. *It does not matter what the switch address is since the siding switch option is disabled.*					
7	Setup number = 1 See section 5.2 for gateway info	enable gateway	disable gateway	1	c

Below is an example showing how to implement Setup 1. Once the "Smart" button is pressed for one second, the LED flashes. To execute step 1 issue 101 (switch/accessory address) t (option) from the throttle. Once step 1 is executed, the LED flashes two times indicating ready for step 2. To execute step 2 issue 1 (switch/accessory address) t (option) from the throttle. Once step 2 is executed, the LED flashes three times indicating ready for step 3 .... and so on, until all steps are completed.

3.1 Setup 1 - Block Signal

This setup implements up to four blocks of 3 vertical aspect signals using ABS logic. The SIC24e comes pre-programmed with setup 1 implemented with a base address of 101 and four blocks numbered 1 to 4. Figure 2 shows the block arrangement and how the signal LEDs are assigned to and wired to each output. Figure 3 shows the assigned address of each output. SIC24es are designed to work together by knowing information about each other. This is done with the output address. If you are going to use more than four blocks the

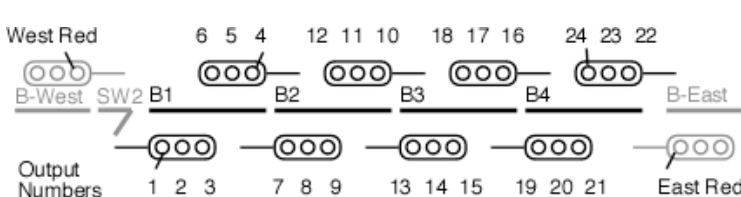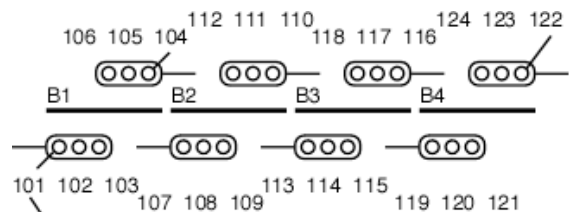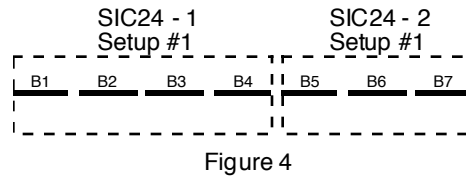| Block Signal Setup				
Step	Description	t option	c option	User input
1	Base address of output logic cell messages Enable output messages is required	enable output messages	disable output messages	
2	Address of first block Enable inputs if they are connected to block sensors Input 1 is assigned to the first block	enable inputs	disable inputs	
3	Number of blocks - Maximum of 4 Common anode or cathode LEDs	anode	cathode	
4	Address of west red signal ahead of first block	accept	don't use	
5	Address of east red signal following last block	accept	don't use	
6	Address of switch 2 of siding (see Setup 2)	accept	don't use	
7	Setup number = 1 See section 5.2 for gateway info	enable gateway	disable gateway	

Figure 2

Figure 3

address of the red LEDs for both the west and east block signals are required. These addresses are the output addresses of the other SIC24es used for those blocks.

As an example of how SIC24es are connected together using output addresses, lets look at setting up signals for seven blocks. This requires two SIC24es. Figure 4 shows how they could be assigned and the table shows how each could be programmed. Notice that SIC24 - 1 is given information about SIC24 - 2 in step 5 and SIC24 - 2 is given information about SIC24 - 1 in step 4. In this example the SIC24 inputs are enabled for block sensors.

| Example of 2 SICs "Smart" programming		
Step	SIC24 - 1	SIC24 - 2
1	101 t	125 t
2	1 t	5 t
3	4 t	3 t
4	1 c - don't use	122 t
5	125 t	1 c - don't use
6	1 c - don't use	1 c - don't use
7	1 t	1 t

Figure 4

If you are going to use this setup 1 with the siding setup 2, the switch number for switch 2 is required in step 6. The position of switch 2 determines the signals for blocks 1 and 2 as a function of the mainline or the siding. See setup 2 for more information. If an address is entered for switch 2 in step 6 then when switch 2 is thrown, block 1 east signal will be red.

3.2 Setup 2 - Block Signal With Siding

This setup implements a two block mainline with a single block siding of 3 vertical aspect signals. Figure 5 shows the block arrangement and how the signal LEDs are assigned to and wired to each output. If you are going to use more mainline blocks the address of the red LEDs for both the west and east block signals are needed. These addresses are the output addresses of the other SIC24es used for those blocks. See setup 1 to add more blocks. Switch 1 and 2 are required to have sequential numbers. When you enter the address for switch 1, say 50, then switch 2 is assigned 51. The switch position determines how the signals respond. In general if the switches are closed then block 3 occupancy determines their color. It they are thrown, then block 2 occupancy determines their color.

In Digitrax systems when a switch is thrown from the throttle, a switch type message appears on the serial bus and the SIC24e responds accordingly. In non-Digitrax systems the gateway option (section 5.2) will provide the same operation. If you want to know switch position at power on or if moved manually, you will need a micro switch attached to the switch mechanism or switch machine contacts connected to a SIC24e input. See the example a the end of this section for programming CVs.

Figure 5
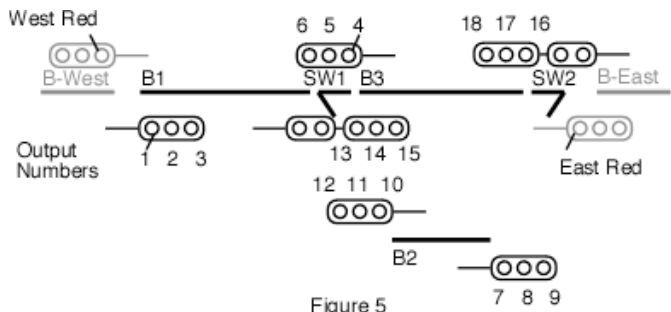
The SIC24e with Setup 2 does not control the two LEDs in the lower head. They need to be controlled from the switch machine moving the switch, a micro switch connected to the switch mechanism (could be the same mentioned above) or another SIC24e.

By using two SIC24es, you can have signals for up to six main line blocks and one siding. Implement Setup 2 in one SIC24e and Setup 1 in the other. Figure 6 shows how they work together and the table shows an example of how they could be programmed. It is important to note that a SIC24e always uses an address space of 24 regardless if all outputs are used or not.

Block Signal with Siding Setup				
Step	Description	t option	c option	User input
1	Base address of output logic cell messages. Enable output messages is required	enable output messages	disable output messages	
2	Address of first block. Enable inputs if they are connected to block sensors. Input 1 is assigned to the first block	enable inputs	disable inputs	
3	Number of block - Maximum of 3. Common anode or cathode LEDs	anode	cathode	
4	Address of west red signal ahead of first block	accept	don't use	
5	Address of east red signal following last block	accept	don't use	
6	Address of switch 1 of siding	accept	accept	
7	Setup number = 2. See section 5.2 for gateway info	enable gateway	disable gateway	

5

Example of siding "Smart" programming		
Step	SIC24 - 1	SIC24 - 2
1	101 t	125 t
2	1 t	4 t
3	3 t	2 t
4	1 c - don't use	116 t
5	125 t	1 c - don't use
6	50 t	51 t
7	2 t	1 t

SIC24 - 1
Setup #2

SIC24 - 2
Setup #1
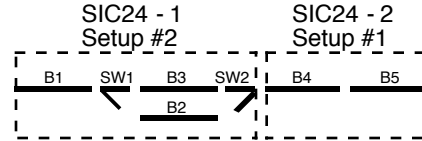
B1 SW1 B3 SW2 B4 B5
B2

Figure 6

Example of CV values if using a micro switch or switch machine contacts connected to SIC24e inputs. Use inputs 5 and 6 for switches 50 and 51 respectively. Program the CVs as follows. See section 5.4 for input control CV specifics.

For input 5   For input 6   Note: input goes hi, switch close message sent
CV 30 = 50   CV 35 = 51   input goes low, switch thrown message sent
CV 31 = 0   CV 36 = 0
CV 32 = 3   CV 37 = 3

3.3 Setup 3 - Block Occupancy Indication or General Input/Output

This setup can be used in two different ways. The first implements up to 24 blocks of occupancy indication with one LED indicator per block. An output is on if the block is occupied. Output 1 is assigned the first block address and the rest of the outputs are sequential block addresses up to the number of blocks. If the inputs are connected to block sensors, input 1 is assigned the first block address. Up to eight input can be used. Since there is no logic needed to indicate block occupancy, logic cell status output messages are not needed and can be disabled in step 1. In this case the base address can be any number.

You can also choose to have two indicator LEDs per block. Perhaps red to show occupied and green to show unoccupied. The maximum number of blocks is now 12. Odd numbered outputs will be on when the respective block is occupied otherwise even numbered outputs will be on. In this setup, outputs are set to drive common anode type LEDs, see figure 11.

Block Occupancy Indication Setup				
Step	Description	t option	c option	User input
1	Base address of output logic cell messages Disable output messages is recommended	enable output messages	disable output messages	
2	Address of first block Enable inputs if they are connected to block sensors Input 1 is assigned to the first block	enable inputs	disable inputs	
3	Number of outputs used to indicate blocks Maximum of 12 or 24 based on step 4 Common anode or cathode LEDs	anode	cathode	
4	Number of indicator LEDs per block (1 or 2)	accept	N/A	
5	Not used	skip	skip	
6	Not used	skip	skip	
7	Setup number = 3 See section 5.2 for gateway info	enable gateway	disable gateway	

The second implements a general input/output device. The only difference is how the outputs respond. Steps 2, 3 and 4 below are reworded to help select the way the outputs respond. If you are using a computer with software like JMRI then you can set the SIC24e to respond to switch command from JMRI for signal applications.

2	Start address the outputs respond to	enable inputs	disable inputs	
3	Number of outputs to use Maximum of 12 or 24 based on step 4 Common anode or cathode LEDs	anode	cathode	
4	Number of outputs per address (1 or 2) Outputs respond to sensor state or switch commands	sensor	switch	

3.4 Setup 4 - Grade Crossing

This setup implements a three block grade crossing with one or two tracks. The signal, bell and delayed gate lowering are initiated upon entering an approach. When the island is cleared the signal and bell stop and the gate is raised. The capability to activate two bell sounds is provided. Bell 1 is activated when the approach block is occupied and bell 2 takes over when the island block is occupied. See figure 7 for the approach and island arrangement.

For proper operation the approach block must be occupied as long as the train is in it or the signal flashing will not work correctly. This can be achieved if each train is not longer than the approach block or the train has enough resistive wheels sets. Also, the approach block must be occupied when the island block becomes occupied. Bell 2 operation for the island block will not work correctly if a train enters the island block and then backs up leaving the island block. Bell 2 also requires

the inputs to be used for block sensors because secondary messages are utilized. See section 5.4 to learn about input control and secondary messages.

All logic cells are used to implement the grade crossing logic. However, most of the logic cell outputs are unused except for those controlling the flashing LEDs, crossing gate motor, and bells. There are also two outputs connected to inputs as part of the logic. These inputs are in addition to the inputs used as block sensors. To change the gate lowing delay, change the value in CV 196. See section 5.6 on what values to use.

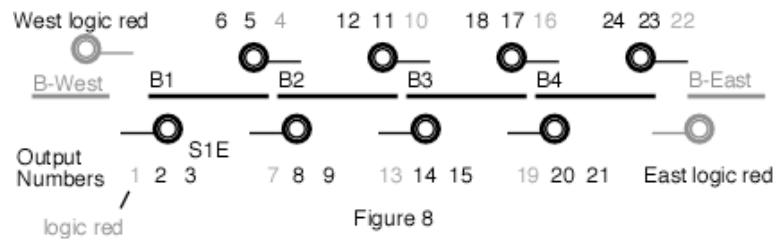|	Grade Crossing Setup			
Step	Description	t option	c option	User input
1	Base address of output logic cell messages Enable output messages is required	enable output messages	disable output messages	
2	Address of first block - Track 1 Enable inputs required and connected to block sensors for bell 2 operation Input 1 is assigned to the first block	enable inputs	disable inputs	
3	Number of blocks - Enter 3 Common anode or cathode LEDs	anode	cathode	
4	Address of first block - Track 2 Input 4 is assigned to the first block	accept	don't use	
5	Number of bell sounds (1 or 2)	accept	N/A	
6	Not used	skip	skip	
7	Setup number = 4 See section 5.2 for gateway info	enable gateway	disable gateway	

Output connections: (see section 5.6 Output Control to learn how to flash LEDs)
outputs 17 & 18 normal flash LEDs, outputs 19 &20 reciprocal flash LEDs
outputs 21 & 22, crossing gate motor - 22 is opposite polarity for motor
output 23, bell
output 24, bell 2 - island activated
output 8 to input 7, for track 1 operation of bell 2
output 16 to input 8, for track 2 operation of bell 2
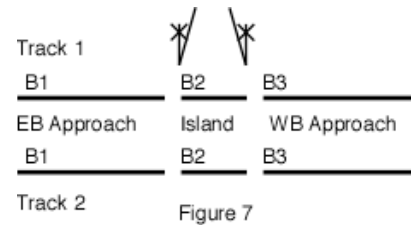
Input connections:
inputs 1 thru 3, track 1 B1 thru B3 block sensors
inputs 4 thru 6, track 2 B1 thru B3 block sensors

Figure 7

3.5 Setup 5 - Block Signal, Searchlight

This setup implements up to four blocks of searchlight signals using ABS logic. Figure 8 shows the block arrangement and how the signal LEDs are assigned to each output. Only two outputs are connected to LEDs since bicolor LEDs are used. The lower numbered output of the two is connected to the red section of the LED and the other connected to the green section. So for signal S1E, output 2 is connected to red and output 3 connected to green. Yellow is achieved when both red and green are on. However, as in setup 1, **each signal is associated with three outputs.** Even though output 1 is not connected to S1E, it is still used internally as part of the logic. This output is the 'logic red' and its address is used in connecting SIC24es together as explained in section 3.1. Each signal has a 'logic red' output which is the dimmed number shown in figure 8. To implement searchlight signals for more than four blocks see the example in section 3.1.

Figure 8

	Block Signal (Searchlight) Setup			
Step	Description	t option	c option	User input
1	Base address of output logic cell messages Disable output messages is recommended	enable output messages	disable output messages	
2	Address of first block Enable inputs if they are connected to block sensors Input 1 is assigned to the first block	enable inputs	disable inputs	
3	Number of blocks - Maximum of 4 Common anode or cathode LEDs	anode	cathode	
4	Address of west 'logic red' signal ahead of first block	accept	don't use	
5	Address of east 'logic red' signal following last block	accept	don't use	
6	Not used	skip	skip	
7	Setup number = 5 See section 5.2 for gateway info	enable gateway	disable gateway	

4 Operation

The SIC24e has 24 outputs. Each output can drive an LED and can be assigned a specific function. For signal control, a three color aspect signal will require three outputs if each aspect is to be individually controlled. Typical signal control is based on some set of rules or logic to turn each LED on. Consequently, some logic is required to turn on and off each output. In order to accomplish this, the SIC24e has a logic cell that controls each output. The logic cell determines if it's output will be on or off. When the logic cell is true the output is on. When it is false the output is off. The logic cell contains three logic elements, A, B and C. When all the logic elements are true, the logic cell is true and the output is on. Otherwise, the logic cell is false and the output is off. Each logic element can be assigned to be a block state, a switch state or a signal state. The concept of the logic cell allows the SIC24e to drive a variety of signal types. See figure 9 for a diagram of a basic logic cell.
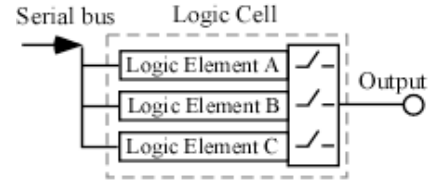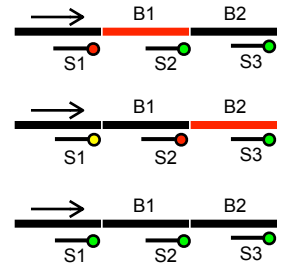

Figure 9

An illustration of Automatic Block Signaling (ABS) using a three color aspect signal can show how the logic cell works. For any given direction, when a block is occupied its signal is red and the following block signal is yellow if the following block is not occupied. If neither of the blocks is occupied, then the signal is green.

Here is a simple example of ABS block signal logic using B and S to represent block and signal respectively. B2 is the block after B1. That is, the train is traveling from B1 to B2.

S1 is red when B1 is occupied.
S1 is yellow when S2 is red and S1 is not red.
S1 is green when S1 is not yellow and not red.
S2 is red when B2 is occupied.

Six outputs of the SIC24e are assigned for the two signals. Three outputs for each signal. Each output driving an LED.
Output 1 – S1R – signal one red
Output 2 – S1Y – signal one yellow
Output 3 - S1G – signal one green
Output 4 – S2R – signal two red
Output 5 – S2Y – signal two yellow
Output 6 – S2G – signal two green
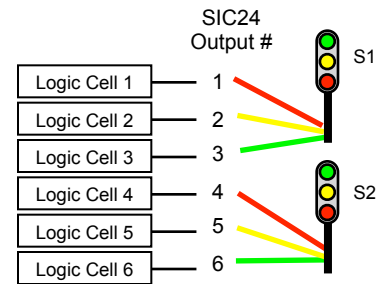
A logic cell controls each output. So each logic cell is configured to cause the output to respond to the conditions as defined above. When all logic elements that have been defined are true, the logic cell is true and the output is turned on lighting the LED. The following shows how each logic element is defined.

Logic Cell 1 (output 1, S1R)
   Logic element A – B1 occupied
   Logic element B – NU
   Logic element C – NU
Logic Cell 2 (output 2, S1Y)
   Logic element A – output 1, S1R not on
   Logic element B – output 4, S2R on
   Logic element C - NU
Logic Cell 3 (output 3, S1G)
   Logic element A – output 1, S1R not on
   Logic element B – output 2, S1Y not on
   Logic element C - NU

Logic Cell 4 (output 4, S2R)
   Logic element A – B2 occupied
   Logic element B – NU
   Logic element C - NU
Logic Cell 5 (output 5, S2Y) **
   Logic element A – NU
   Logic element B – NU
   Logic element C - NU
Logic Cell 6 (output 6, S2G)
   Logic element A – output 1, S2R not on
   Logic element B – output 2, S2Y not on
   Logic element C - NU

** this output is not used in this example

Each of the SIC24e outputs is assigned an address, so whenever an output changes state a sensor type serial bus message is sent with the address and state. So a logic cell can use the logic state of an output as part of its logic.

Some of the logic cells in the above example required more than one logic element to achieve the desired response. Both the conditions for element A AND element B had to be met before the output was on. As in the case of Logic Cell 2 (output 2, S1Y) in order for it to be true (on), output 1 had to be false (NOT on) and output 4 had to be true (on). These two elements are combined by AND logic. All three logic elements can be combined with one of four different logic schemes. The four combination are A OR B OR C, (A OR B) AND C, (A AND B) OR C and A AND B AND C.

An additional feature provides for control of the output. The output can be controlled so that when the logic cell is true the output is immediately on, has a delayed turn on, is inverted or flashes. See figure 10 for a diagram of the complete logic cell with output control. It is important to note that when the logic cell tells the output to be on, that simply enables the output control to define what the output actual does. For example, it the output control is set to flash, the output will flash when the logic cell is true. The logic cell does not cycle from true to false each time the output flashes. The same holds true for a delay. The logic cell output is not delayed, only the output itself.
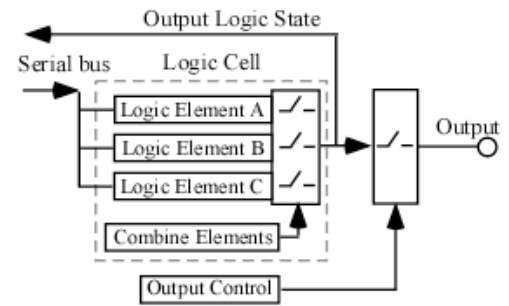

Figure 10

In some cases three logic elements in each logic cell may not be enough to implement the required logic. In these cases the logic cell of one or more unused outputs can be utilized for addition logic capability.

At power off the logic cell state is not saved nor is any block or turnout state the SIC24e has used. This means at power on the SIC24e must receive new information it needs for operation.

The SIC24e has eight inputs. Each input can be configured to send a switch command, switch position feedback or sensor/block detection serial bus message. The inputs are compatible with many stand-alone block detectors with noise filtering. Each input can be configured to send a message on a rising, a falling or a change of state signal.

Unique signal schemes can be implemented using the SIC24e by connecting outputs to inputs, particularly if an input is configured to send a message on a rising or falling state. Care must be taken to avoid endless looping of message sending.

5 Configuration Variables (CVs)

The SIC24e 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 SIC24e 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 SIC24e 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 SIC24e 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 SIC24e 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 SIC24e 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. For programming with DecoderPro and other programming tips see Team Digital's web site.

5.01 Reset the SIC24e to factory defaults

To "reset" the SIC24e 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.

5.1 Logic Cell Address

These CVs determine the output logic cell state message base address. When an output goes low or high, based on the logic cell, a sensor type bus message is sent with appropriate address and state (Figure 10). This in NOT the address the output responds to. Each of the 24 logic cells are assigned a sequential address starting with the base address. If the base address is 101, than the address of logic cell one is 101 and the address of logic cell 24 is 124. See figures 2 and 3 to see the relationship between the output number and address. The SIC24e is pre-programmed with a base address of 101.

Note: A SIC24e always uses an address space of 24 even if some outputs are not used.

CV3 - logic cell base address, a value of 0 to 255. Default is 101. CV4 - address adder.

If an address greater than 255 is needed then use the address adder. The following table shows the CV value to use for the adder.

Example: Address of 101, set CV3 = 101 & CV4 = 0

Address of 901, set CV3 = 133 & CV4 = 3

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

5.2 Configuration
CV9 - Configuration.
This CV determines the SIC24e configuration which consists of several options.

Option 1 - Ops Mode Programming. Allows Operations mode (On the Main) programming using a Loco address to be enabled all the time. See section 5.10.

Option 2 - Output message control. Disable the sending of all logic cell output state messages. In some cases like block occupancy indication these messages are not needed.

Option 3 - DCC to bus gateway. Allows DCC switch command packets to be put on the serial bus. Any device connected to the bus will have access to these DCC commands.
Note: If there are more than one SIC24e or other Gateway capable devices, only one should have the gateway enabled. In a Digitrax system **DO NOT** connect the SIC24e to the throttle LocoNet® if the gateway is enabled. This could cause an endless sending of switch commands from the track to LocoNet® and back to the track.

Option 4 - Secondary switch type throw messages are sent on the serial bus when a logic cell goes true. These messages are in addition to the normal logic cell output messages. See Section 5.7.

Option 5 -Secondary switch type close messages are sent on the serial bus when a logic cell goes false. These messages are in addition to the normal logic cell output messages. See section 5.7.

Option 7 - Input state messages are sent on the serial bus when a Digitrax interrogation command is received.

Decoder Configuration CV	Value	Select
No options	0	
Option 1 - Ops mode programming enabled	1	
Option 2 - Logic cell output messages **DISABLED**	2	
Option 3 - DCC to bus gateway enabled	4	
Option 4 - Switch throw message on logic cell true enabled	8	
Option 5 - Switch close message on logic cell false enabled	16	
Option 6 - reserved	-	
Option 7 - Input interrogation enabled	64	
Option 8 - Common cathode LEDs	128	
Program this value into the configuration CV		

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

5.3 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 SIC24e 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.

5.4 Input Control
These CVs determine how each of the inputs respond when activated. There are five CVs for each input. See section 7 for CV numbers.

The following table shows how each CV is defined and the value of each selection. Add the value of the selections together to determine the value to program the CV. In some cases only one of several selections are possible and are shown by a box as "Select one".

When an input transition occurs one or two messages can be sent. There is a primary and secondary message for each input. Two CVs for each message determine the message address and the type of message. The transition CV determines if a message will be sent and what transition will initiate the message.

When a block detector is connected to an input, a sensor type message is normally sent on both a rising and falling edge. Most block detectors compatible with the SIC24e go low when the block is occupied. The input control must be programmed to send a hi (true) sensor type message when the input is low. This means the input control must be inverted from the normal state. As an example lets determine the value of the input control CVs for block 1 using the Input Control table.

*Primary Address CV = 1
*Primary Type CV = 160 (Invert normal state = 128, sensor message = 32, 128 + 32 = 160)
*Transition CV = 3   (Send primary message on both edges = 3)

*Secondary Address CV = 0
*Secondary Type CV = 0

As another example lets say you want to close switch (turnout) number 60 when block 1 becomes occupied, but do nothing with the switch when the block becomes unoccupied. The secondary address can be used for this. The switch address is 60, the transition is set to falling edge (block becomes occupied) with state inverted (send a true when input is lo) and switch type message. The input control CV values are now the following.
*Primary Address CV = 1
*Primary Type CV = 160
*Transition CV = 11   (Send primary message on both edges = 3, Send secondary message on falling edge = 8, 3 + 8 = 11)
*Secondary Address CV = 60
*Secondary Type CV = 0

The largest number you can have for the address is 255. In some cases the address of a switch or logic cell may be greater than 255. In these cases the address adder has to be used to go beyond the 255 limit. The value of the Address adder CV can be any number from 0 to 9. Select the value based on the amount you want to add to the address from the table in section 5.1.

Tip: To send a message with a true (close or hi) state when the input goes false (low), use the invert normal state selection. See above example.

Note: An input transition is when the voltage on a input goes from high to low (falling edge) or from low to high (rising edge). 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.

Input Control			
Primary Address CV		Value	Select
Address		1 - 255	
Program this value into the appropriate address CV			
Primary 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
Send primary message on change transition		3	Select
Send primary message on hi to low transition		2	
Send primary message on low to hi transition		1	One
Disable primary message		0	
Send secondary message on change transition		12	Select
Send secondary message on hi to low transition		8	
Send secondary message on low to hi transition		4	One
Disable secondary message		0	
Program this value into the appropriate transition CV			
Secondary Address CV		Value	Select
Address		1 - 255	
Program this value into the appropriate address CV			
Secondary Type CV		Value	Select
Invert the normal state		128	Select
Normal state		0	one
Reserved		-	
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			

5.5 Logic Cell

These CVs determine how each of the logic cells are defined. There are six CVs for each cell. See section 7 for CV numbers. Two CVs for each logic element. See figure 10 for a diagram of the logic cell. Each logic element has an address CV and a type CV which determine the address, type and state of the message that will cause the element to be true. When the SIC24e receives a message that matches the element definition, the element is true. The element will stay true until a message matches the element definition with the opposite state. The element will then be false. All three elements do not have to be used. An element is not defined and thus not used when it's address is zero and it's logic set to OR. If only element A is used, the logic cell will be true and it's output on when element A is true.
Note: If an element's address is zero and it's logic set to AND, the element will always be false since there are no messages with an address of zero. **Avoid this condition!**

Logic elements B and C can be combined with logic element A in AND and OR logic combinations by using the logic selection in elements B and C. When the logic combination is satisfied, the logic cell is true.

Logic Combination	B Logic	C Logic
A OR B OR C	OR	OR
(A OR B) AND C	OR	AND
(A AND B) OR C	AND	OR
A AND B AND C	AND	AND

The following tables show how each of the logic elements are defined and the value of each selection. Add the value of the selections together to determine the value to program the CV. In some cases only one of several selections are possible and are shown by a box as "Select one".

Lets look at some examples to see how to use the logic cells. We want output 1 to turn on a LED when block 1 becomes occupied. When block 1 become occupied a hi (true) type sensor message is sent. When this condition happens logic cell 1 must be true in order to make output 1 turn on. So we will set logic element A to respond to this condition. From the table the CV values are as follows.

Logic element A
*Element Address CV = 1
*Element Type CV = 96 (true state = 64, sensor message = 32, 64 + 32 = 96)

Going on, lets say we also want output 1 to turn on the LED when switch (turnout) number 61 is thrown. When switch 61 is thrown a throw (false) type switch message is sent. When this condition happens logic cell 1 must be true in order to make output 1 turn on. So we will set logic element B to respond to this condition. From the table the CV values are as follows.

Logic element B
*Element Address CV = 61
*Element Type CV = 0 (OR logic = 0, false state = 0, switch message = 0, 0 + 0 + 0 = 0)

In summary, when block 1 is occupied OR switch 61 is thrown, turn on output 1.

Note: Switch commands from the throttle only appear on the serial bus in a Digitrax system.

Now lets control logic cell 2 as a result of logic cell 1 and block 2. From section 5.1 we saw that the base address of the SIC24e sets the address of the logic cells.

Logic Element A		
Element Address CV	Value	Select
Address	1 - 255	
Program this value into the appropriate address CV		

Element Type CV	Value	Select	
State, true (close or hi)	64		Select
State, false (NOT true) (throw or low)	0		one
Message type, sensor	32		Select
Message type, feedback (actual turnout position)	16		
Message type, switch/turnout (commanded position)	0		one
Address adder (see the address adder table for amount to add)	0 - 9		
Program this value into the appropriate type CV			

Logic Element B		
Element Address CV	Value	Select
Address	1 - 255	
Program this value into the appropriate address CV		

Element Type CV	Value	Select	
Logic, AND	128		Select
Logic, OR	0		one
State, true (close or hi)	64		Select
State, false (NOT true) (throw or low)	0		one
Message type, sensor	32		Select
Message type, feedback (actual turnout position)	16		
Message type, switch/turnout (commanded position)	0		one
Address adder (see the address adder table for amount to add)	0 - 9		
Program this value into the appropriate type CV			

Logic Element C		
Element Address CV	Value	Select
Address	1 - 255	
Program this value into the appropriate address CV		

Element Type CV	Value	Select	
Logic, AND	128		Select
Logic, OR	0		one
State, true (close or hi)	64		Select
State, false (NOT true) (throw or low)	0		one
Message type, sensor	32		Select
Message type, feedback (actual turnout position)	16		
Message type, switch/turnout (commanded position)	0		one
Address adder (see the address adder table for amount to add)	0 - 9		
Program this value into the appropriate type CV			

In this example the address of logic cell 1 has been set to 101. We want logic cell 2 to be true when logic cell 1 is false AND block 2 is occupied. Logic element A will be used to respond to the state of logic cell 1 and logic element B will be used to respond to the state of block 2. From the table the CV values are as follows.
Logic element A
*Element Address CV = 101
*Element Type CV = 32 (false state = 0, sensor message = 32, 0 + 32 = 32)

Logic element B
*Element Address CV = 2
*Element Type CV = 224 (AND logic = 128, true state = 64, sensor message = 32, 128 + 64 + 32 = 224)
In summary, when output 1 is off AND block 2 is occupied, turn on output 2.

Warning: When defining logic cells, be very careful not to create infinite loops (recursive). Otherwise various unexplained problems will occur. For example, if one of the elements is assigned the same address as it's output.

Now lets see how to control a low current stall type switch machine. We will give it an address of 60. Each machine requires two output logic cells with each motor terminal connected to an output. To implement a motor drive, program one of the logic cells with a address so it is true (close). Program the other logic cell with the same address so it is false (throw). Now the motor moves one way or the other depending on the state of the received message. From the table the CV values are as follows:

Logic cell 10 - Logic element A (the logic cell numbers are arbitrary)
*Element Address CV = 60
*Element Type CV = 96 (true state = 64, sensor message = 32, 64 + 32 = 96)

Logic cell 11 - Logic element A
*Element Address CV = 60
*Element Type CV = 32 (false state = 0, sensor message = 32, 0 + 32 = 32)

5.6 Output Control

This CV determines how the output will respond when the logic cell is true. There is an output control CV for each logic cell. See section 7 for CV numbers.

By default an outputs goes low (ground) when the logic cell is true. This will drive common anode LEDs. For common cathode LEDs set Option 8 CV9 (Decoder Configuration).

The following table shows how each output control is defined and the value of each selection. Add the value of the selections together to determine the value to program the CV. In some cases only one of several selections are possible and are shown by a box as "Select one".

Output Control			
Output Control CV	Value	Select	
Invert the state as defined in Option 8 CV9	128		Select
Normal state	0		One
Bi-color phase 2	96		Select
Bi-color phase 1	32		
Bi-color not used	0		One
Effect, dynamic flash	24		Select
Effect, flash	16		
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			

To change all outputs to drive common cathode LEDs set Option 8 CV9 (Decoder Configuration). To change a single output select the invert state. Do not use the invert state with two lead bicolor LEDs.

Bi-color LEDs with two leads require two outputs as shown in figure 11. Set one of the output control CVs to phase 1 and the other to phase 2. This gives the SIC24e the ability to display three colors.

There are two types of flash effects. Flash causes the output to flash whenever the logic cell is true. Dynamic flash works only with logic element C. If the logic cell is true due to either logic element A or B the output will be on. If logic element C becomes true then the output will flash. This can be used to implement a flashing yellow aspect signal.

The delay effect causes the output to delay turn on once the logic cell is true. This can be used to delay the grade crossing gate lowering from the time the flashers start.

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.

Figure 11

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

5.7 Secondary Output Address

CV5 - base address, a value of 0 to 255. Default is 1. CV6 - address adder.
These CVs determine the secondary output address. The address is constructed as defined in section 5.1. When an output changes status a sensor type message is sent over the serial bus. These messages are typically used by the internal logic. If more sophisticated logic is required a secondary switch type message can be sent when an output changes state. See section 4 & 5.2 for more details.
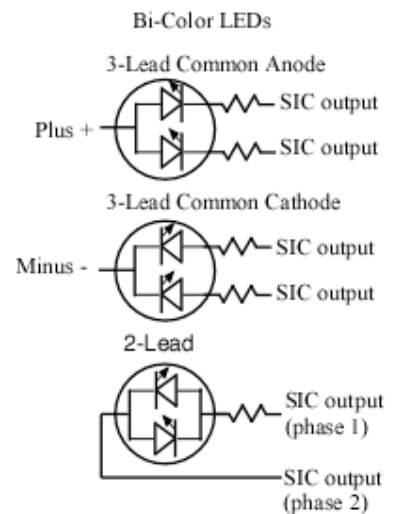
13

6 Connections

6.1 Power

The SIC24e 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 14 VDC) power supply. For a DC supply do not use old analog 'Power Packs'. The SIC24e 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 SIC24es 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 SIC24e.

Power supply current requirements: 20mA for just a SIC24e, 20mA for each Tortoise™ using a MotoD. Good practice - select a supply with at least 10% more current capability than required.

See section 6.3 for output drive considerations.

6.2 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.

6.3 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.

6.4 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 SIC24e outputs.

All 10 pin connectors have the same pin numbers. Viewed from the top of the SIC24e with serial bus RJ12 connectors at the bottom.
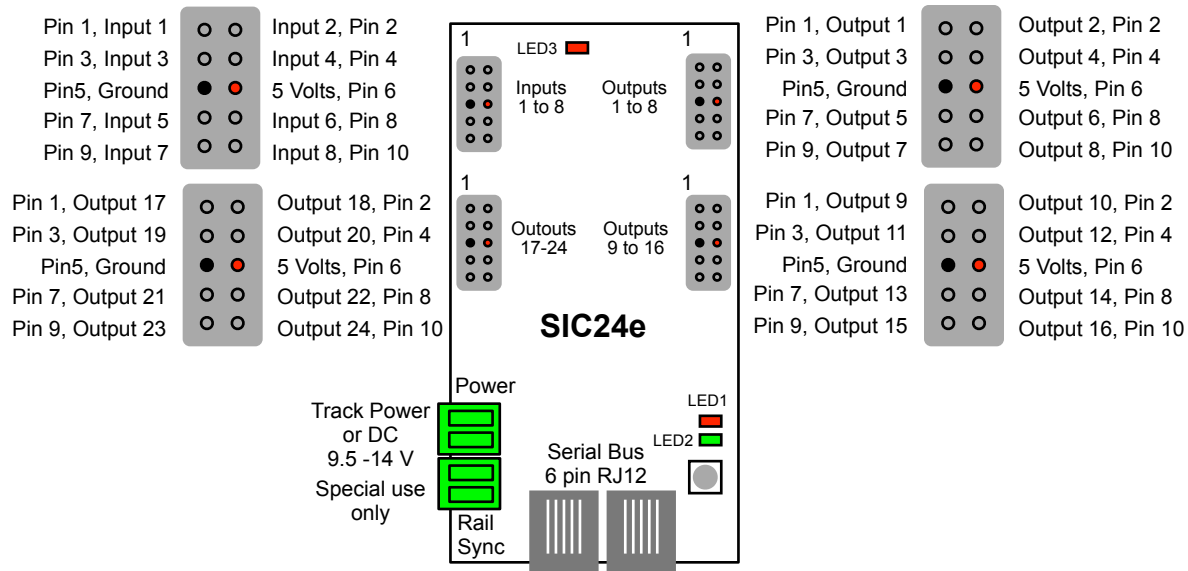
6.5 Serial Bus

The SIC24e 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 SIC24e the RS is only connected to the two terminal Special use connector.

In a system where the SIC24e is NOT connected to LocoNet the RS may be used to pass power from one SIC24e to another. Do NOT use the rail sync terminals in a standard Digitrax system if the SIC24es are connected to the main LocoNet bus. See Team Digital website for more information on using an accessory bus with RS.
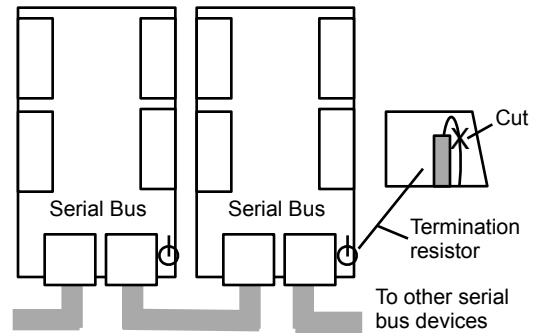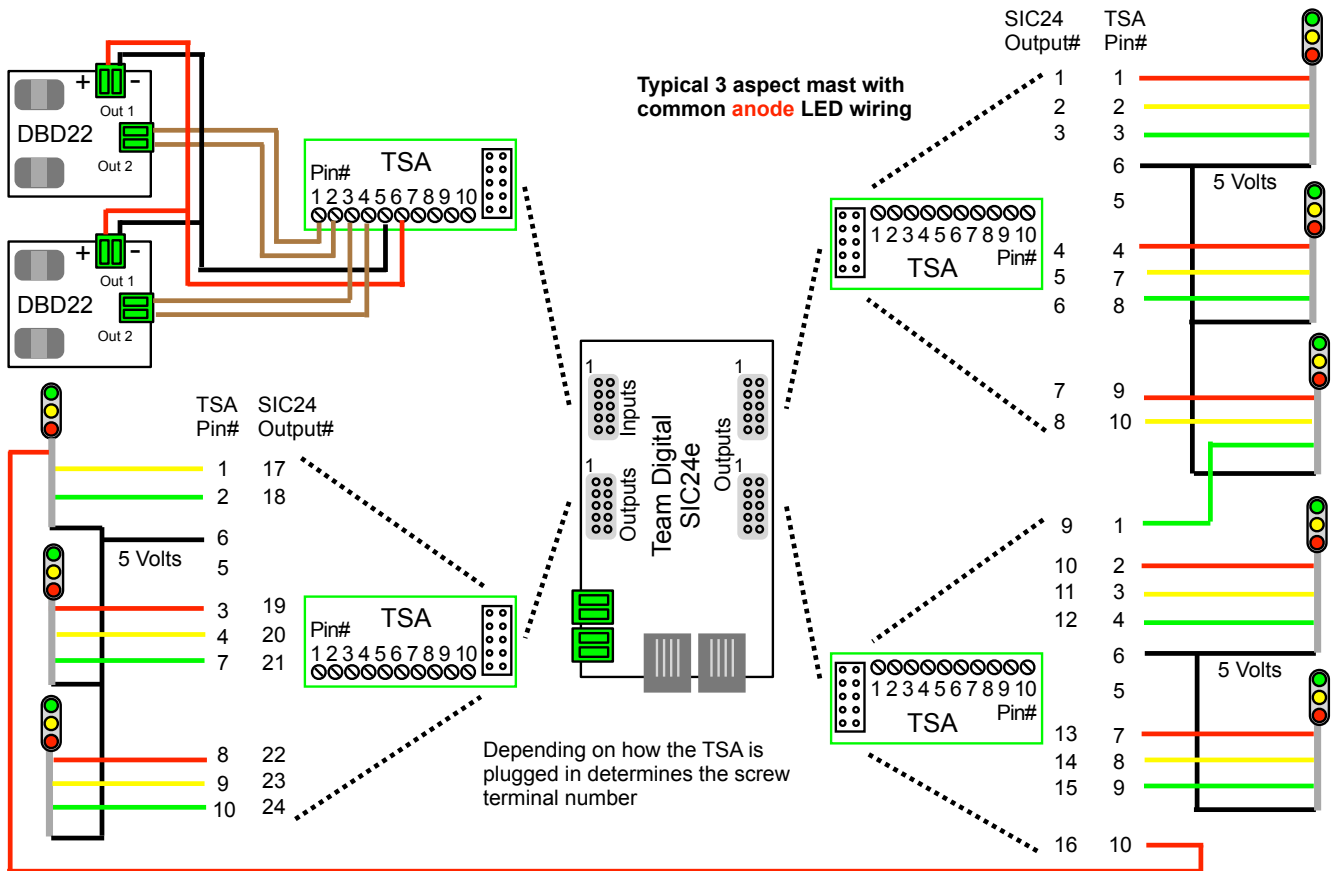
In a systems when more than 10 SIC24es are used the bus terminating resistor should be cut on any additional devices.

RJ12 Connector

Cables are wired pin 1 to pin 1
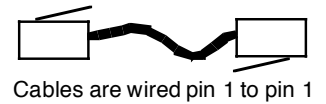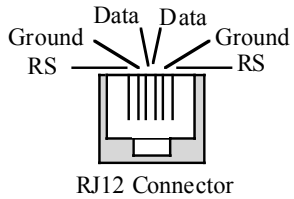
6.6 Wiring Examples

This diagram shows wiring for a SIC24e driving eight signal masts. Two DBD22s provide occupancy detection for the four blocks. This wiring could be used to implement Setup1 (default setting), section 3.1.

Typical 3 aspect mast with common anode LED wiring

Depending on how the TSA is plugged in determines the screw terminal number

7 Summary of Configuration Variables

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

CV#	Function/Default Value		CV#	Function/Default Value		CV#	Function/Default Value	
178	Logic Cell 19 - Element B Address	0						
179	Logic Cell 19 - Element B Type	0						
180	Logic Cell 19 - Element C Address	0						
181	Logic Cell 19 - Element C Type	0						
182	Logic Cell 19 - Output Control	0						
183	Logic Cell 20 - Element A Address	0						
184	Logic Cell 20 - Element A Type	96						
185	Logic Cell 20 - Element B Address	119						
186	Logic Cell 20 - Element B Type	160						
187	Logic Cell 20 - Element C Address	0						
188	Logic Cell 20 - Element C Type	0						
189	Logic Cell 20 - Output Control	0						
190	Logic Cell 21 - Element A Address	119						
191	Logic Cell 21 - Element A Type	32						
192	Logic Cell 21 - Element B Address	120						
193	Logic Cell 21 - Element B Type	160						
194	Logic Cell 21 - Element C Address	0						
195	Logic Cell 21 - Element C Type	0						
196	Logic Cell 21 - Output Control	0						
197	Logic Cell 22 - Element A Address	4						
198	Logic Cell 22 - Element A Type	96						
199	Logic Cell 22 - Element B Address	0						
200	Logic Cell 22 - Element B Type	0						
201	Logic Cell 22 - Element C Address	0						
202	Logic Cell 22 - Element C Type	0						
203	Logic Cell 22 - Output Control	0						
204	Logic Cell 23 - Element A Address	116						
205	Logic Cell 23 - Element A Type	96						
206	Logic Cell 23 - Element B Address	122						
207	Logic Cell 23 - Element B Type	160						
208	Logic Cell 23 - Element C Address	0						
209	Logic Cell 23 - Element C Type	0						
210	Logic Cell 23 - Output Control	0						
211	Logic Cell 24 - Element A Address	122						
212	Logic Cell 24 - Element A Type	32						
213	Logic Cell 24 - Element B Address	123						
—	reserved	-						
—	reserved	-						
—	reserved	-						
—	reserved	-						
255	Start up delay x .256 seconds	8						