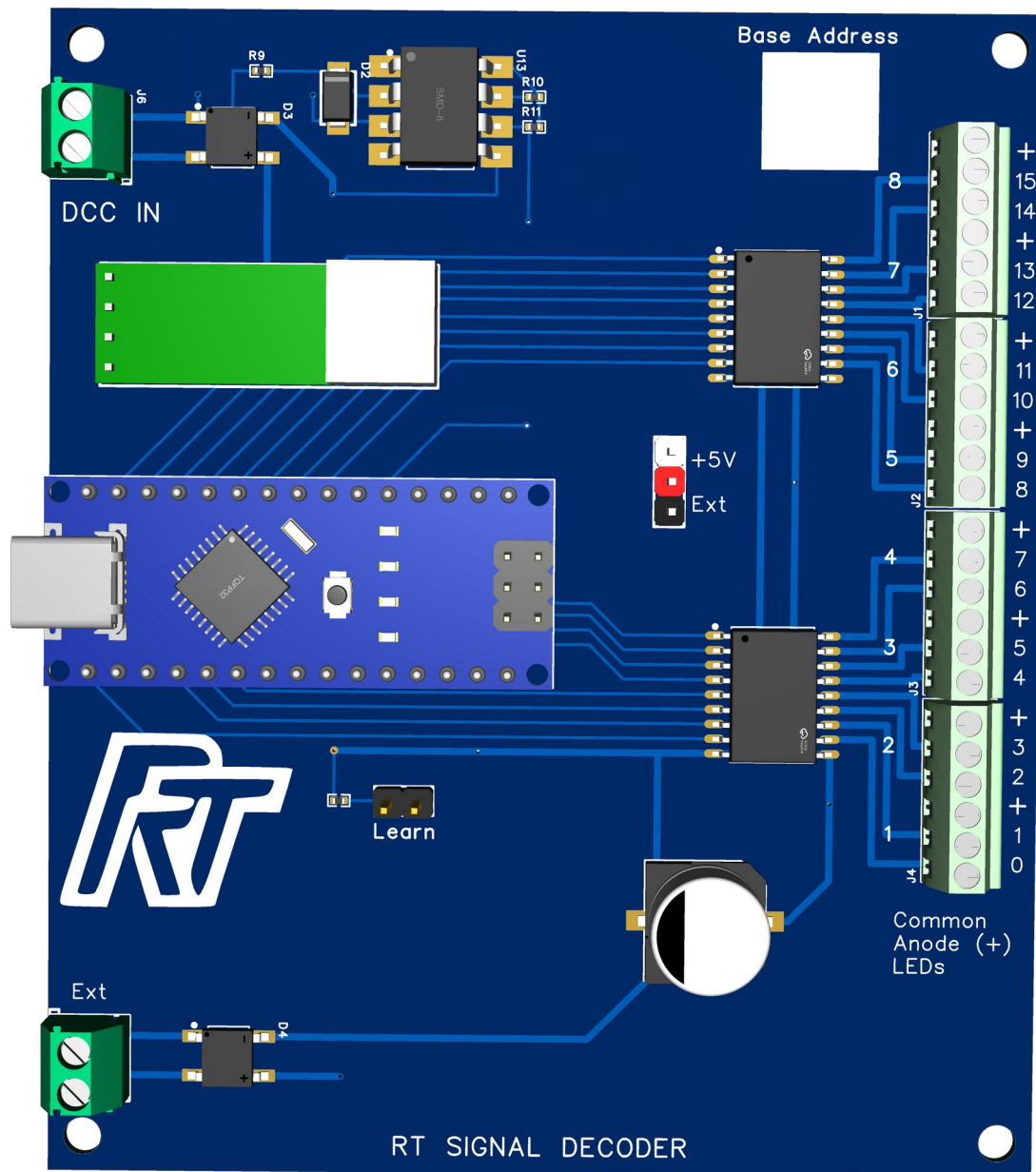


Model Railroad DCC coloured light signal decoder.



This board is a DCC accessory decoder.

This document describes the operation of this board with the RT Signal Decoder software.

There are two variants to the board one for Common Anode LED signals and one for Common Cathode LED signals. Please ensure that you purchase the board applicable to your signals or the signals applicable to the board.

Throughout this manual Common Terminal is Anode or Cathode depending on the board.

OPERATING MANUAL



In use.

The Common Terminal for both variants of the board is marked with a + sign.

The board will control 2, 3 or 4 aspect coloured light signals.

All instructions are to do with 2 aspect signals initially for simplicity.

3 and 4 aspect signals will be discussed later in this document.



Connection to the layout.

How you connect to your layout is really dependent on your setup.

The DCC track is connected to the DCC IN connector on the decoder.

The signals can be powered by 5VDC and do not require an external power supply. When delivered the board will be setup this way.

If your signals require a voltage other than 5VDC, for example 12VDC, connect the appropriate power supply to the Ext terminals and change the jumper from +5V to Ext.

There are several brands of LED signals that are advertised as 3V DC. These can be used with 5V DC with additional current limiting resistors in the common line.



Connecting Signals.

Either led signals or incandescent globe signals can be used. The LEDs will need limiting resistors.

Incandescent globes can be connected in either way. Although most have a common wire and two or more control wires. The common wire is always connected to +.

2 aspect coloured light signals.

These will be green/red signals.

When using LEDs the common wire is connected to the + terminal for the output address.

The red cathode/anode is connected to the lower numbered (eg 0, 2, 4, 6, 8, 10, 12, 14) terminal and the green cathode/anode is connected to the higher number (eg 1, 3, 5, 7, 9, 11, 13, 15) terminal.

The DCC addresses for these will be the base address and the next 8 addresses.

3 aspect coloured light signals.

These will be green/red/amber signals.

The connection for these is the same as 2 aspect for green and red. Amber cathode/anode is connected to the next higher number (eg 2) terminal and the common is connected to the + terminal.

So if you have 0 connected to red and 1 connected to green then amber is connected to 2. You then need to program the applicable CV for three aspect operation (see below).

The DCC addresses for these will be the base address and the next 5 addresses.

4 aspect coloured light signals.

These again will connect as for 2 aspect for green and red. Aspect 3 and aspect 4 are connected to the next two higher numbered terminals respectively.

So if 0 is connected to red and 1 connected to green then aspect 3 is connected to 2 and aspect 4 is connected to 3. You then need to program the applicable CV for four aspect operation (see below).

The DCC addresses for these will be the base address and the next 4 addresses.



CV setup

Function	Output address							
	1	2	3	4	5	6	7	8
Output Pin 1	34	44	54	64	74	84	94	104
Output Pin 2	35	45	55	65	75	85	95	105
Output Pin 3	36	46	56	66	76	86	96	106
Output Pin 4	37	47	57	67	77	87	97	107
On Time	38	48	58	68	78	88	98	108
On Time Multiplier	39	49	59	69	79	89	99	109
Off Time	40	50	60	70	80	90	100	110
Off Time Multiplier	41	51	61	71	81	91	101	111
Fade In	42	52	62	72	82	92	102	112
Fade Out	43	53	63	73	83	93	103	113

Output Pin 1 - 4: These are the output pins controlled by the DCC address. For a 2 aspect signal 1 and 2 are used. Three aspect signal 1, 2 and 3 are used. Four aspect signal 1, 2, 3 and 4 are used.

On Time/Off Time: Are the on and off times respectively for flashing aspects in milliseconds.

On Time Multiplier/Off Time Multiplier: Are multipliers for the On Time/Off Time respectively. This allows on/off times up to 650250 milliseconds (650 seconds).

Fade In/Fade Out: The time it takes for fade in/out on fading aspects in milliseconds.



OPERATING MANUAL

CV Defaults

CV	Value	CV	Value	CV	Value	CV	Value	CV	Value	CV	Value	CV	Value	CV	Value
34	0	44	2	54	4	64	6	74	8	84	10	94	12	104	14
35	1	45	3	55	5	65	7	75	9	85	11	95	13	105	15
36	0	46	0	56	0	66	0	76	0	86	0	96	0	106	0
37	0	47	0	57	0	67	0	77	0	87	0	97	0	107	0
38	10	48	10	58	10	68	10	78	10	88	10	98	10	108	10
39	100	49	100	59	100	69	100	79	100	89	100	99	100	109	100
40	10	50	10	60	10	70	10	80	10	90	10	100	10	110	10
41	100	51	100	61	100	71	100	81	100	91	100	101	100	111	100
42	10	52	10	62	10	72	10	82	10	92	10	102	10	112	10
43	10	53	10	63	10	73	10	83	10	93	10	103	10	113	10

The default settings give eight 2 aspect signals with 1000 millisecond on/off times (10 x 100), 100x multipliers and 10 millisecond fadein/fadeout.



Output Pins

The output pin numbers for the CVs are those printed on the decoder board near the screw terminals.

They are:

PCB Connection															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Output Pin number															



Adding a signal

To add a signal it only needs to program the Output pin CVs.

This assumes that the base address is 1 and you are using DCC-EX with EX-Rail. Other DCC command stations will have similar commands.

3 aspect signal

With the following connections.

Red - 0
 Green - 1
 Amber - 2

Program the CVs as below.

CV 34 = 0
 CV 35 = 1
 CV 36 = 2

This signal is then controlled by GREEN(1), RED(1) or AMBER(1).

The next signal will have address 2 and could be 2, 3 or 4 aspect.

4 aspect signal

With the following connections.

Red - 0
 Green - 1
 Amber - 2
 White - 3

Program the CVs as below.

CV 34 = 0
 CV 35 = 1
 CV 36 = 2
 CV 37 = 3

This signal is then controlled by GREEN(1), RED(1), AMBER(1) or ASPECT(id, 4).

The next signal will have address 2 and could be 2, 3 or 4 aspect.



CV Setup for Different Signals

In all cases the Output Pins can be defined for each address and do not have to follow the below tables. These are example settings only.

Output 0 on the pcb can only be used for Output Pin 1 or Output Pin 2.

These are for signals that use aspects 0-3.

2 aspect signals

Address	CV = Output Pin 1	CV = Output Pin 2	Output Pin 3	Output Pin 4
1	CV34 = 0	CV35 = 1	CV36 = 0	CV37 = 0
2	CV44 = 2	CV45 = 3	CV46 = 0	CV47 = 0
3	CV54 = 4	CV55 = 5	CV56 = 0	CV57 = 0
4	CV64 = 6	CV65 = 7	CV66 = 0	CV67 = 0
5	CV74 = 8	CV75 = 9	CV76 = 0	CV77 = 0
6	CV84 = 10	CV85 = 11	CV86 = 0	CV87 = 0
7	CV94 = 12	CV95 = 13	CV96 = 0	CV97 = 0
8	CV104 = 14	CV105 = 15	CV106 = 0	CV107 = 0

3 aspect signals

Address	CV = Output Pin 1	CV = Output Pin 2	Output Pin 3	Output Pin 4
1	CV34 = 0	CV35 = 1	CV36 = 2	CV37 = 0
2	CV44 = 3	CV45 = 4	CV46 = 5	CV47 = 0
3	CV54 = 6	CV55 = 7	CV56 = 8	CV57 = 0
4	CV64 = 9	CV65 = 10	CV66 = 11	CV67 = 0
5	CV74 = 12	CV75 = 13	CV76 = 14	CV77 = 0

Output pin 15 could be used for other addresses by programming the appropriate CV.



4 aspect signals

Address	CV = Output Pin 1	CV = Output Pin 2	Output Pin 3	Output Pin 4
1	CV34 = 0	CV35 = 1	CV36 = 2	CV37 = 3
2	CV44 = 4	CV45 = 5	CV46 = 6	CV47 = 7
3	CV54 = 8	CV55 = 9	CV56 = 10	CV57 = 11
4	CV64 = 12	CV65 = 13	CV66 = 14	CV67 = 5

Aspects 4 - 6

Wiring and CV programming is the same as the 2 or 3 aspect signals and will flash the applicable LED/globe.

Aspect 7 (alternate flash) and 8 (alternate flash fade)

Wire the two LEDs/globes as common to + and other wire to the output pin you wish to use.

Use CV Output Pin 1 and CV Output Pin 2 for the applicable address with the pin that the two LEDs/globes are connected to.

These aspects are similar but 8 will fade the globes on/off to give a more realistic effect.

Aspect 9 (double strobe) and 10 (single strobe)

Wire one LED/globe to the + and the other to the output pin you wish to use.

Use CV Output 1 for the applicable address with the pin the LED/globe is connected to.

These work best with high brightness white LEDs with limiting resistors that give the maximum current for the LED.



Serial Commands

Several commands are available via the Arduino serial monitor for configuring or displaying information on the decoder.

<?>	Show available commands
<>	Show current Control Variables
<A address>	Change decoder base linear address
<W CV value>	Write a value to the CV
<Z>	Soft Reset

The address is the decoder linear address to use within the DCC command station. When you set an address it will display the correct base address to use for the decoder at the serial monitor. Eg will give a base address of 1 and the signals will be assigned addresses 1 – 8.

The default address is 1, you need to change this if using more than one stationary decoder on your layout. Once the address is set, this address and the next 8 are the addresses you use to control your signals. Eg, 1-8, 5-12.

How you add them to your DCC Command Station will depend on the command station.

Base addresses are multiples of 4 + 1 eg, 1, 5, 9, 13, 17, ...

The address can be between 1 and 2037

In all cases the 8 signals will be addressed from the base address for the next 8 address eg, base address 1, addresses are 1, 2, 3, 4, 5, 6, 7, 8. base address 5 addresses are 5, 6, 7, 8, 9, 10, 11, 12.

RosscoeTrain Firmware Update Configure program

There is a program for Linux and Windows users to make setting up the decoder easier.

It's available here:

https://rosscoe.com/shop/index.php?main_page=page&id=4



Learning Mode.

To set the address on the decoder in learning mode.

Connect the decoder to your DCC track via the DCC input connector. It's best not to have any signals connected at this point.

With the power off.

Put a jumper on the Learn header next to the Arduino nano.

Turn on the power to the Arduino nano.

The LED on the nano will flash to show it is in learning mode.

Send a RED or GREEN command to the base address you want for the decoder.

Base addresses are multiples of 4 + 1. eg, 1, 5, 9, 13, 17, ...

The address can be between 1 and 2037.

Once the address is learnt remove the jumper from the Learn header and power off/on the decoder.



Aspects available

The decoder will respond to the following aspects sent from the command station as Extended Accessory Packets.

Aspect	Details
0	Red - if using DCC-EX ExRail then RED(address)
1	Green - if using DCC-EX ExRail then GREEN(address)
2	Amber - if using DCC-EX ExRail then AMBER(address)
3	Amber Amber - if using DCC-EX ExRail then ASPECT(address, 3)
4	Flashing Red - if using DCC-EX ExRail then ASPECT(address, 4)
5	Flashing Green - if using DCC-EX ExRail then ASPECT(address, 5)
6	Flashing Amber - if using DCC-EX ExRail then ASPECT(address, 6)
7	Alternate Flash - if using DCC-EX ExRail then ASPECT(address, 7)
8	Alternate Flash Fade - if using DCC-EX ExRail then ASPECT(address, 8)
9	Double Strobe - if using DCC-EX ExRail then ASPECT(address, 9)
10	Single Strobe - if using DCC-EX ExRail then ASPECT(address, 10)
18	Dark - if using DCC-EX ExRail then ASPECT(address, 18)

See also the DCC-EX command <A address aspect> here:

<https://dcc-ex.com/reference/software/command-summary-consolidated.html#a-address-aspect-command-for-dcc-extended-accessories>

Aspects 0-2 are the normal 2/3 aspect signals.

Aspect 3 is the 4th aspect on a 4 aspect signal called Amber Amber but could be whatever is on the signal

Aspect 4, 5 and 6 flash the red, green and amber connections as in aspects 0, 1 and 2 respectively.

Aspect 7 and 8 are for connection of level crossing signals or similar (see next page for connection).

Aspect 9 and 10 are for strobe type signals (see next page for connection).

Aspect 18 is for turning of the signal all together.



Level Crossing Signal connection.

Aspect 7 and 8 can be used to control a level crossing signal connected as follows.

Using address 1 on the board as an example.

Connect the common wire for the two LEDs to the + terminal.

Connect the other wire for one LED to 0 terminal and the other wire for one LED to 1 terminal.

To activate the crossing signal send the command <A 1 7> or <A 1 8> from the DCC-EX command station.

Aspect 7 gives a sharp on/off signal where as Aspect 8 gives a more realistic fading on/off signal.

Strobe Signal connection.

Aspect 9 and 10 output a strobe type signal best used with a high brightness white LED.

Using address 1 on the board as an example.

Connect the anode if it's the common anode board or cathode if common cathode board to the + terminal.

Connect the other lead from the LED to the 0 terminal.

Aspect 9 is a double flash strobe and Aspect 10 is a single flash strobe.



Addendum



References.

Coloured light signal decoder firmware:

<https://github.com/Rosscoetrain/RT-Signal-Decoder-Direct>

Firmware updater and Configure program

https://rosscoe.com/shop/index.php?main_page=page&id=4