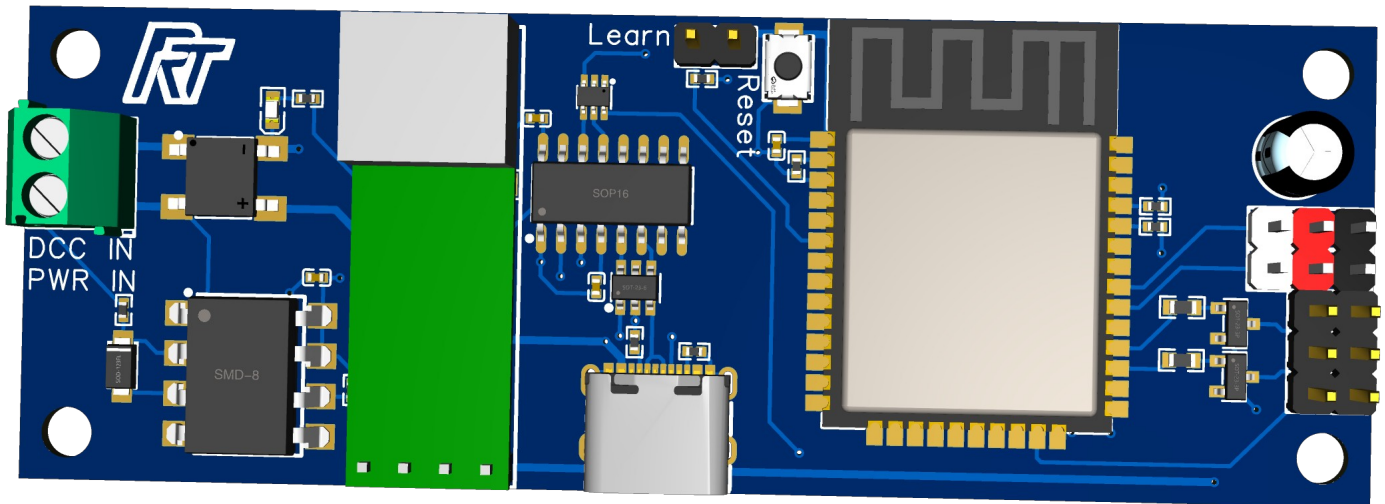


Model Railroad servo and led DCC accessory decoder.

This board is a DCC accessory decoder for servos and leds.

This document describes the operation of the board.

Please read through all of this document before use.



In use.

The board will control 2servos, 2 leds and an auxillary output.



Connection to the layout.

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

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

If your command station has the capability it is recommended to use a second track output for the accessory decoders. This way if a short occurs on the main track output then the accessory decoders will continue to function.



Connecting Servos

The servos are connected as below.

The wiring to the PCB is connected thus:

S = Servo control (white on decoder) yellow or white on servo

+ = Servo +V (red on decoder) red on servo

G = Servo Ground (black on decoder) black or brown on servo

The connectors are pin headers and designed to be used with servos directly or via servo extension cables. The servo connectors are colour coded to the servo cables.

Connecting Leds



The diagram above is one way to wire up the leds for connection to the RT_Pulse_Xing_32 decoder.

The 1kΩ resistor allows a reasonable brightness of the leds. If you need brighter then reduce the value of this. There is a limitation of how much current can be provide on each output (15mA) and in total 50mA.

With a 1kΩ the current is 3mA per output. With a 680Ω resistor the current is 4.5mA per output.

The connections are:

+5V - +5V supply from the decoder. (red)

GND - Switched ground connection to the decoder. (black)

If you need more than one led connected to a pin then use the diagram above for each led.



Auxiliary Output

The auxiliary output is a logic level output.

It is an active low output and intended to control a sound module or something similar.

The controlled item needs to have its Gnd connected to the RT_Pulse_Xing_32 on the same connector as the output signal.

Maximum sink current is 10mA.

It is also beneficial that the power supply for any external module is from the +5V supply from the RT_Pulse_Xing_32. This could be from one of the led connectors or one of the servo connectors.



Power Supply

The decoder is powered by DCC track power as the supply input provided the track voltage is greater than 9V.

Note that if your track shuts down due to short or power off command then the decoder stops functioning.

It is recommended that if your command station can use a second track output for the accessory decoders.



Web Interface

The decoder can be configured via a web interface.

This is the simplest way to configure the decoder.

When first powered the decoder has the following WIFI AP (access point) settings.

ssid **RT_ESP32_Xing**
password **rt-esp32**

The decoder can be reset to this access point at any time.

To access the decoder. Connect your WIFI enabled device to the network ssid above. The device could be PC, Laptop, Mobile Phone or Tablet.

When connected open a browser and enter 192.168.4.1 into the address bar.

The decoder configuration page will then open.

Wifi Configuration

The ssid and password can be changed to your local network.

The hostname can be changed so that it's easier for you to locate the decoder on your network.

The default hostname is http://RT-NODE.local

The hostname is only applicable if connecting the decoder to your local WIFI network.

DCC accessory decoder base address

Accessory address

Accessory base address

Set address

Set the base accessory decoder address here.

The decoder occupies this address and the next 7 consecutive addresses.

So 1-8, 5-12, etc.

Note that the base address will be automatically adjusted to a multiple of 4 + 1. ie 1,5,9,13,...

Servo Settings

Servo settings

Servo 1	Servo 2
Closed position (degrees)	Closed position (degrees)
0	0
Open position (degrees)	Open position (degrees)
90	90
Travel time (milliseconds)	Travel time (milliseconds)
1000	1000
Servo delay (milliseconds)	Open hold (milliseconds)
2000	2000
Save servo settings	

Each servo can have it's Closed and Thrown positions set. The value is in degrees. These are between 0 and 180. They become active for the decoder when "Save servo settings" button is clicked.



The travel time in milliseconds is the time for servo to move from closed to thrown or thrown to closed.
1000ms = 1second.

Servo Delay is the time in milliseconds before the servos start to move after the leds start to flash when used as a level crossing decoder.

Open Hold is the time the leds will continue to flash after the servos have stopped moving when used as a level crossing decoder.

Once you have set the positions for the servo click "Save servo settings" button to permanently store the values.

Controls

Controls

Crossing	Activate	Deactivate
Servo1	Close	Open
Servo2	Close	Open
Led 1 on/off	On	Off
Leds 2 on/off	On	Off
Leds on/off	On	Off
Leds flashing	On	Off
Aux	On	Off

Here you can test the servos, leds and auxillary output directly from the web interface.

Obviously it's just a matter of clicking on the relevant button to confirm that your servos are working and positioning is correct.

The leds can be turned on/off individually, together or to alternate flash. Likewise the auxiliary output.



Decoder



Clicking on "Reset factory defaults" returns the decoder to the factory defaults. This puts all CVs to their default values (Closed 0, Thrown 90) and clears the WIFI ssid, password and hostname to "RT-NODE".

The decoder when restarted will return to WIFI AP mode.

"Restart" resets the decoder. You will have to reload the web interface after this.



Serial Commands

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

<?>	Show available commands
<>	Show current Control Variables
<A address>	Change decoder base linear address
<C address>	Close a turnout at address
<T address>	Throw a turnout at address
<SC servo angle>	Set servo closed position angle 0 - 180 deg
<SO servo angle>	Set servo open position angle 0 - 180 deg
<ST servo time>	Set servo transit time (milliseconds) maximum 2550ms
<SH time>	Set servo delay time (milliseconds) maximum 2550ms
<SR time>	Set open hold time (milliseconds) maximum 2550ms
<WS ssid>	Set the decoder WIFI ssid for connection to a local network
<WP password>	Set the WIFI password for the local network
<WH hostname>	Set the hostname for the decoder on the local network
<WA>	Return the decoder to AP (access point) mode
<W>	Show current wifi settings
<D>	Reset to factory defaults CV, ssid, password and hostname
<Z>	Soft Reset

Where output is 0 - 1 for the servo

The M and N position commands are in degrees

The <A 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 a base address of 1 and the outputs 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 15 addresses you use to control your turnouts. Eg, 1-16, 5-20 ...

Some examples using the serial monitor are:

<C 1>	Close output at address 1
<T 2>	Throw output at address 2

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 base address can be between 1 and 2024

In all cases the output will be addressed from the base address for the next 8 addresses 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.



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 servos connected at this point.

Put a jumper on the Learn header next to the ESP32.

Turn power on to the track.

Send a throw or close 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 2032.

Once the address is learnt, power off the track and remove the jumper from the Learn header. Your decoder will now respond at the new addresses.



Programming Track Setup and programming on main.

The CV's can be set with the decoder connected to a programming track or use programming on main (POM).

Connect the decoder DCC IN to the programming track of your command station.

How you send a write command to the decoder CV will depend on your command station.

Eg Using a DCC-EX command station connected to a serial monitor send the following command to change the address:

<W 1 value> - programming track

<wa address 1 value> - POM where address is the current base address

The following CV's hold the information for the decoder.

CV	Description	Range	Default
33	Servo 1 closed position	0 - 180 degrees	0
34	Servo 1 open position	0 - 180 degrees	90
35	Servo 1 transit time * 10	0 - 255 ms	100
36	Servo 2 closed position	0 - 180 degrees	0
37	Servo 2 open position	0 - 180 degrees	90
38	Servo 2 transit time * 10	0 - 255 ms	100
39	Servo start delay * 10	0 - 255 ms	200
40	Servo hold delay * 10	0 - 255 ms	200

CV35, CV38, CV39 and CV40 are multiplied by 10 to give the time in milliseconds, eg. 100 x 10 = 1000milliseconds = 1 second.



Addendum



References.