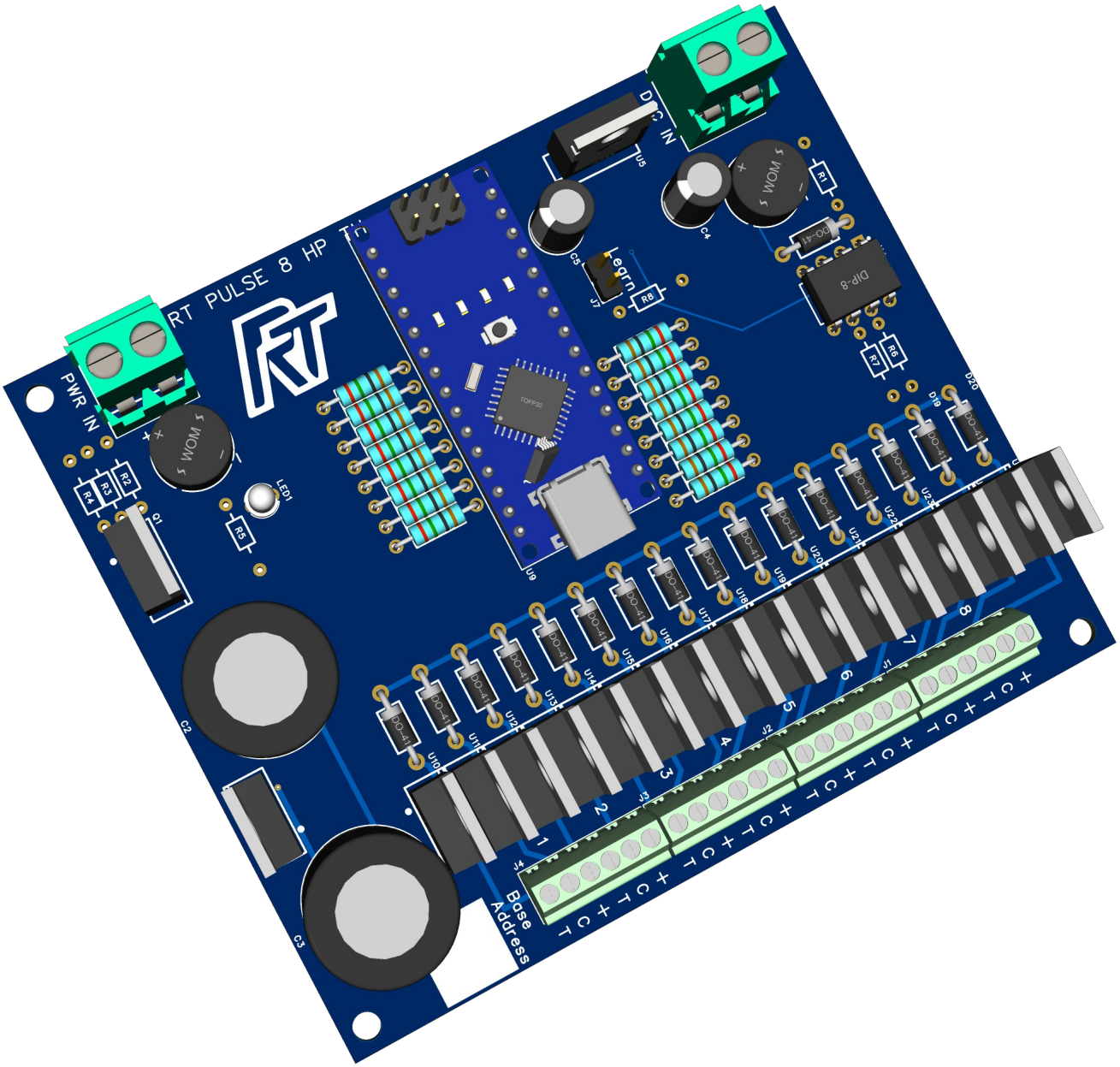
CONSTRUCTION MANUAL

Model Railroad DCC accessory decoder high power.



CONSTRUCTION MANUAL

This board is a DCC accessory decoder. What can be controlled with it is dependent on the firmware used.

This document describes the construction of the board.

The board can control dual solenoid turnouts such as the Marklin M track 5117, 5202, 5120, 5214, 5207 or 5128 with the firmware available here:

https://github.com/Rosscoetrain/DCC-Turnout-Decoder-Direct

The maximum current for any one solenoid is 4A, this is limited by the TIP120 darlington drivers.

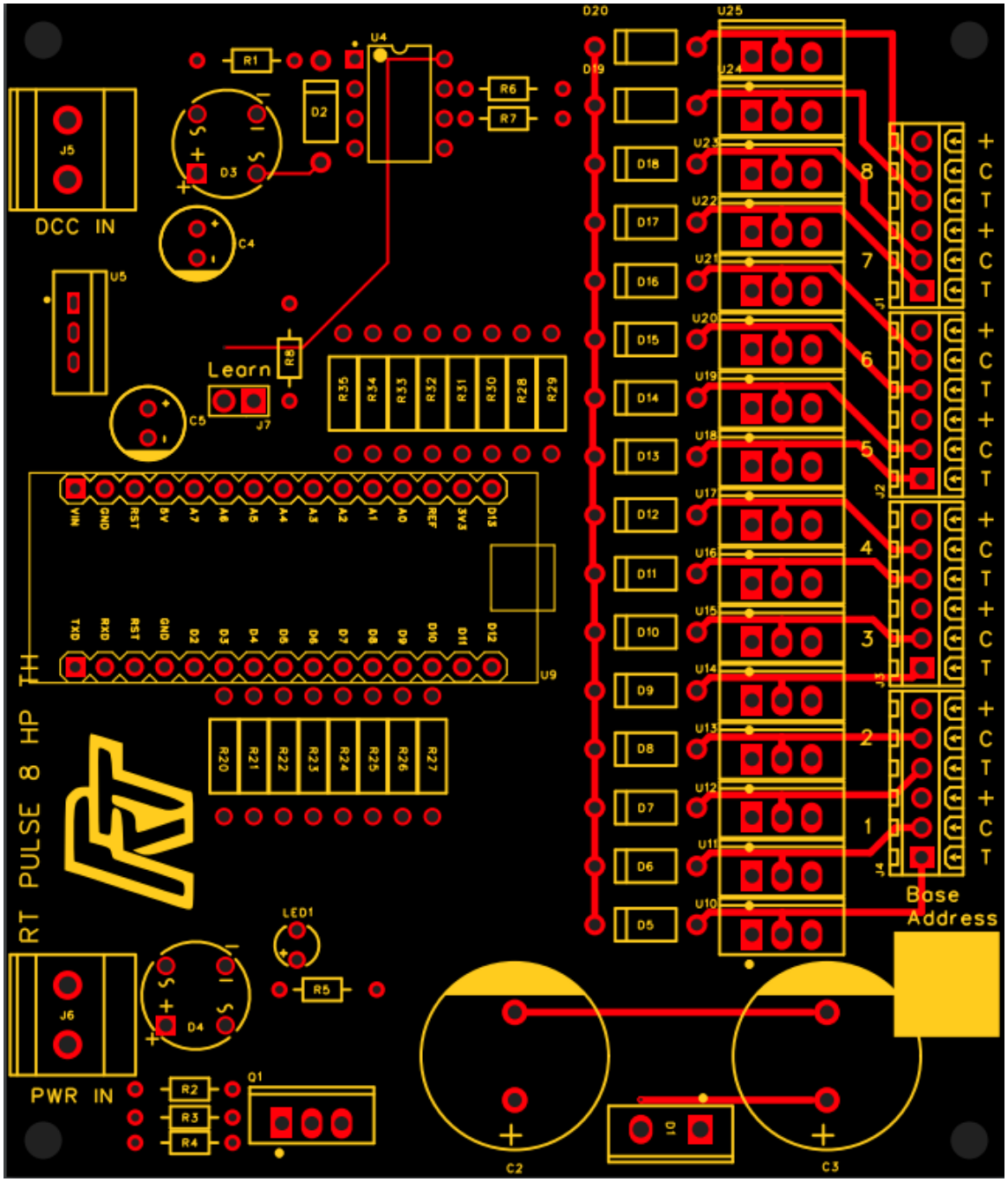
Please read all this document before construction of the PCB.

Bill of Materials

PCB	RT PULSE 8 TH HP
C2,C3	3000uF electrolytic capacitor*
C4	100uF electrolytic capacitor *
C5	10uF electrolytic capacitor *
D1,D2	1N4001
D5,D6,D7,D8,D9,D10,D11,D12,D13,D14,D15,D16,D17,D18,D19,D20	1N4001
D3,D4	2W10
J1,J2,J3,J4	6 way 2.54mm screw terminal
J5,J6	2 way 5.08mm screw terminal
J7	2 way 2.54mm male header
LED1	3mm blue
R1,R2,R3,R4,R5	1kΩ
R20,R21,R22,R23,R24,R25,R26,R27,R28,R29,R30,R31,R32,R33,R34,R35	1kΩ
R6,R7,R8	10kΩ
Q1	TIP120
U10,U11,U12,U13,U14,U15,U16,U17,U18,U19,U20,U21,U22,U23,U24,U25	TIP120
U4	6N137
U5	7805 *
U9	Arduino Nano
	15 pin female headers x 2 for Arduino Nano *

* see Other Information section

Construction of the board.



As with most PCB construction start with soldering in the lowest profile items first, eg resistors, diodes, leds, etc.

I suggest marking them of the list on the next page as you go.

As with all semiconductor items they are heat sensitive.

With the TIP120 a heat sink clip (bulldog clip) on the leads is a good idea.

Recommended soldering order:

		Done
R1	1kΩ	
R2	1kΩ	
R3	1kΩ	
R4	1kΩ	
R5	1kΩ	
R6	10kΩ	
R7	10kΩ	
R8	10kΩ	
R20 - R35	1kΩ	
D1	1N4001 diode	
D2	1N4001 diode	
D5 - D20	1N4001 diode	
LED2	3 mm led	
D3	2W10 bridge rectifier NOTE orientation	
D4	2W10 bridge rectifier NOTE orientation	
J1	6 way 2.54mm screw terminal	
J2	6 way 2.54mm screw terminal	
J3	6 way 2.54mm screw terminal	
J4	6 way 2.54mm screw terminal	
J7	2 way 2.54mm male header	
U9	2 x 15 pin female headers for Arduino Nano	
PWR IN	2 way 5.08mm (0.2”) screw terminal or pluggable terminal	
DCC IN	2 way 5.08mm (0.2”) screw terminal or pluggable terminal	
Q1	TIP120. NOTE orientation.	
U10 - U25	TIP120. NOTE orientation.	
U5	7805. NOTE orientation. (see Other Information section).	
C4	100uF 35V electrolytic capacitor (see Other Information section).	
C5	10uF 25V electrolytic capacitor (see Other Information section).	
C2	3000uF 35V electrolytic capacitor (see Other Information section).	
C3	3000uF 35V electrolytic capacitor (see Other Information section).	

Other information.

The Arduino Nano should be mounted into 15 pin female headers. If your Nano does not have male headers already installed then you will need to solder them on the underside of that as well.

Optional components.

C2 and C3 can be replaced with any electrolytic capacitor that will fit. There are holes for 7.5mm pitch on the PCB. eg a 10000uF 25V electrolytic capacitor will fit the 7.5mm pitch holes. It's up to you to determine if the electrolytic capacitor will fit.

U5 the 7805 regulator can be replace with a buck converter board like this and I recommend them as there is virtually no heat generated.

They are available on ebay and aliexpress just search for:

Power Supply DC Buck Step Down Voltage Converter Regulator Mini Module 3A 5V

Note that they are the version that has the holes at the end so that they can be simply soldered in place instead of a 7805 (TO220) voltage regulator.

If you use the converter then C4 and C5 are not required.

Addendum

References.

PCB on pcbway.com:

https://www.pcbway.com/project/shareproject/RT_DCC_Pulse_8_High_Power_Turnout_Decoder_with_capacitor_discharge_unit_ae884dd9.html

5V 3A buck converter on ebay:

https://www.ebay.com.au/itm/325224780087

Dual solenoid accessory decoder firmware:

https://github.com/Rosscoetrain/DCC-Turnout-Decoder-Direct