LocoMotive DCC with App - Assembly Instructions for PCB with on board LMD18200t IC

To download the FREE Arduino code, refer to my Instructable at :
www.instructables.com/id/Bluetooth-DCC-Command-Station/

To obtain the 'LocoMotive Cab' App go to Play Store :
https://play.google.com/store/apps/details?id=appinventor.ai_bill_falkland.LocoMotive_Cab

To obtain the full App at £5.99 'LocoMotive DCC' with loco address 1-127
go to Play Store : https://play.google.com/store/apps/details?
id=appinventor.ai_bill_falkland.LocoMotive_DCC

To obtain the full App at £8.49 'LocoMotive DCC 2' with 4 digit loco address
go to Play Store : https://play.google.com/store/apps/details?
id=appinventor.ai_bill_falkland.LocoMotive_DCC_2

Compatible with my Points / turnout / accessory design as in Instructable:
www.instructables.com/id/Arduino-Pointsturnoutaccessory-Control-V2/

The schematic and PCB layout diagrams are included in the included images below, also a view of the finished assembly.
Project enclosure I used, available from RS-Components '2000 ABS Enclosure, IP54, 150 x 80 x 50mm' for £5;65 uk.rs-online.com/web/p/general-purpose-enclosures/0502657/

Other components required (all available on ebay):
1 off Arduino Pro Mini Atmega328P 5V/16M
1 off LMD18200T H-bridge IC
1 off HC-06 Bluetooth module
1 off 0.1 ohm 2W Metal Film Resistor (11.5 mm x 4.5 mm)
8 off Capacitor 0.1uf
1 off 10kΩ Resistor
1 off 470 ohm (in place of 10k next to 0.1 ohm resistor)
1 off 4.7kΩ Resistor 1 off 2.7kΩ Resistor   2 off 180 Ω Resistor
1 off Capacitor 10uf 25v;
1 off Capacitor 220uf 16v;
1 off Capacitor 470uf 35v
2 off 2 Way Screw PCB Terminal Block 5.0mm
1 L7805 CV Positive Voltage Regulator IC
1 off 4 pin Female Header Edge Pins Strip 0.1" 2.54mm
2 off 12 pin Female Header Edge Pins Strip 0.1" 2.54mm
1 off Zener Diode 4.7V 0.5 watt. or 3.6v. 0.5 watt
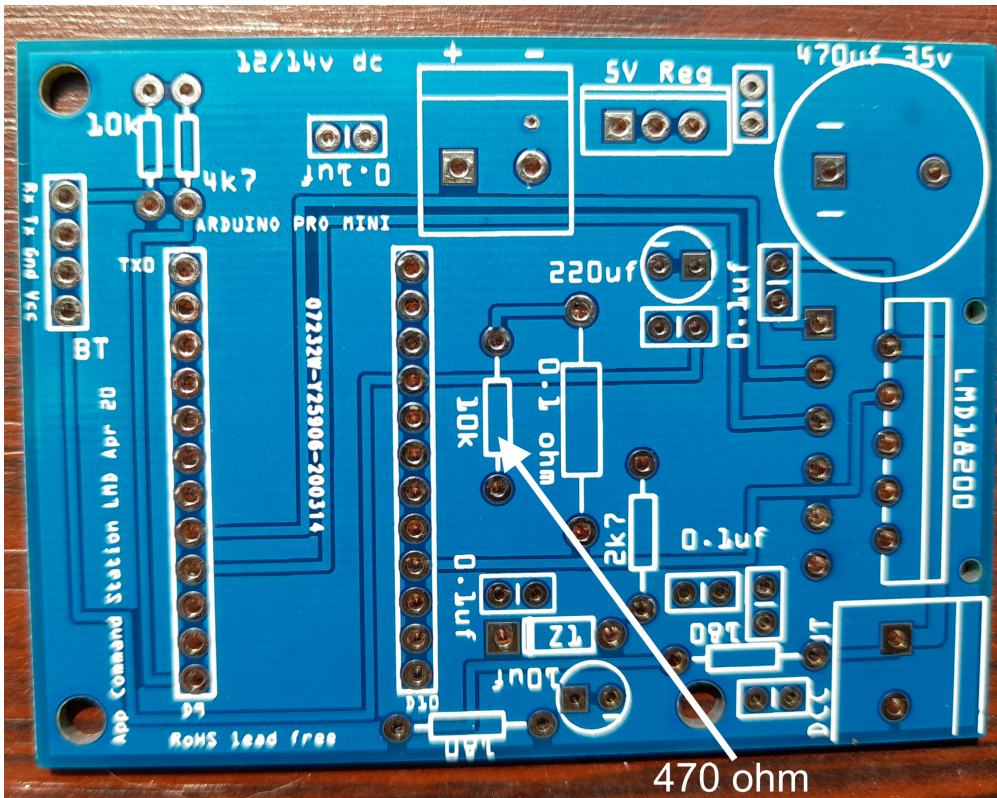1 off Aluminium Heat Sink for TO220 (designed for L298N)
Power `supply:
Do NOT use a DC train controller as these do not provide a true DC voltage.
Power supply For OO/HO layouts :
15V 2 Amp version with a 2.1 x 5.5 mm plug, search for eBay item # 401871382681

PCB :

470 ohm

Assembly notes:

The zener diode black bar is to the left

The negative (indicated by arrows along the side) on 220 uf capacitor is to the left

The negative on 10 uf capacitor is to the right

The voltage regulator metal backing faces outwards

10 k resistor has brown, black orange stripes

4k7 resistor has yellow, violet, red stripes

Use 2 x 12 way sockets to mount the Arduino Pro Mini

The Arduino pin Tx0 is close to the 4 way BT socket and the pin D9 is on the bottom left

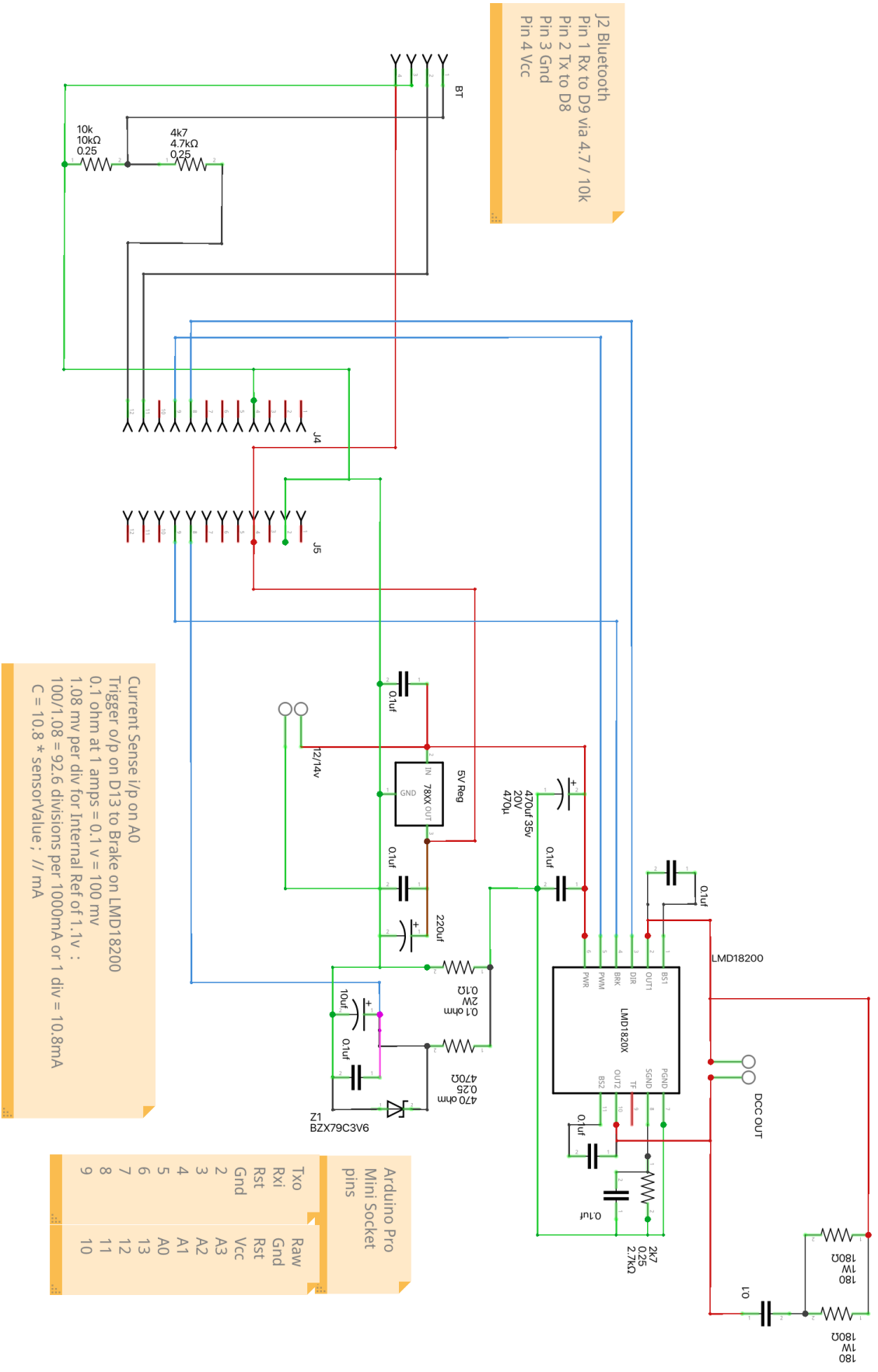When connecting the BT module Rx on PCB goes to Rx on the module and Tx to Tx .

Note: Depending on the source of supply some LMD18200 ICs may not be reliable and fail during first use. It is advisable to test first by inserting the pins into the pcb holes and checking it works before soldering.

Attach the heat sink to the LMD18200t IC before insertion in the PCB

Once, inserted and heatsink is placed in the 2 retaining holes at the edge of the PCB, the 11 pins can then be soldered.

The DCC output is from OUT 1 and OUT 2 to the rail tracks.

Circuit Diagram:

J2 Bluetooth
Pin 1 Rx to D9 via 4.7 / 10k
Pin 2 Tx to D8
Pin 3 Gnd
Pin 4 Vcc

BT

10k
10kΩ
0.25

4k7
4.7kΩ
0.25

J4

J5

0.1uf

12/14v

5V Reg
IN 78XX OUT
GND

0.1uf

220uf

470uf 35v
20v
470µ

0.1uf

0.1uf

LMD18200

LMD182OX
PWR
PWM
BRK
DIR
TF
SGND
PGND
BS1
OUT1
BS2
OUT2

10uf

0.1 ohm
2W
0.1Ω

0.1uf

470 ohm
0.25
470Ω

Z1
BZX79C3V6

0.1uf

0.1uf

2K7
0.25
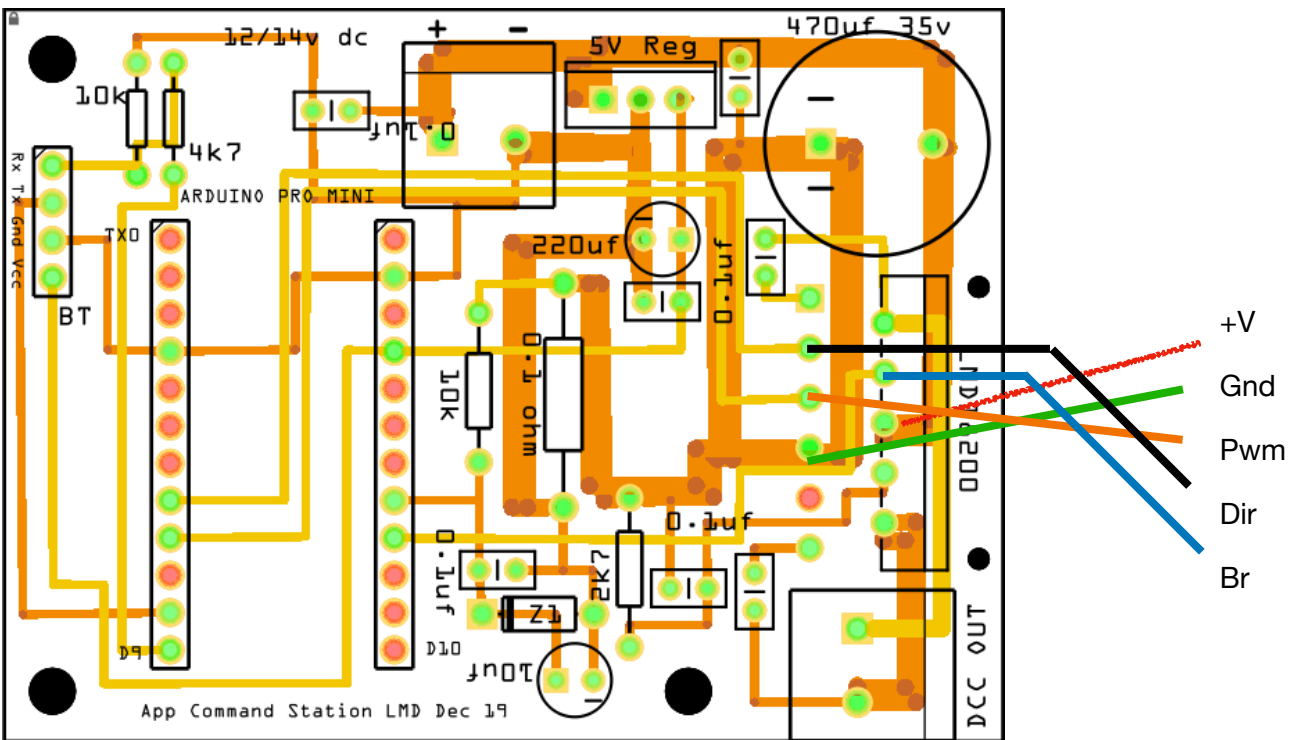2.7kΩ

DCC OUT

L0

180Ω
1W
180

180Ω
1W
180

Current Sense i/p on A0
Trigger o/p on D13 to Brake on LMD18200
0.1 ohm at 1 amps = 0.1 v = 100 mV
1.08 mv per div for Internal Ref of 1.1v :
100/1.08 = 92.6 divisions per 1000mA or 1 div = 10.8mA
C = 10.8 * sensorValue ; // mA

Arduino Pro
Mini Socket
pins

Txo   Raw
Rxi   Gnd
Rst   Rst
Gnd   Vcc
2   A3
3   A2
4   A1
5   A0
6   13
7   12
8   11
9   10
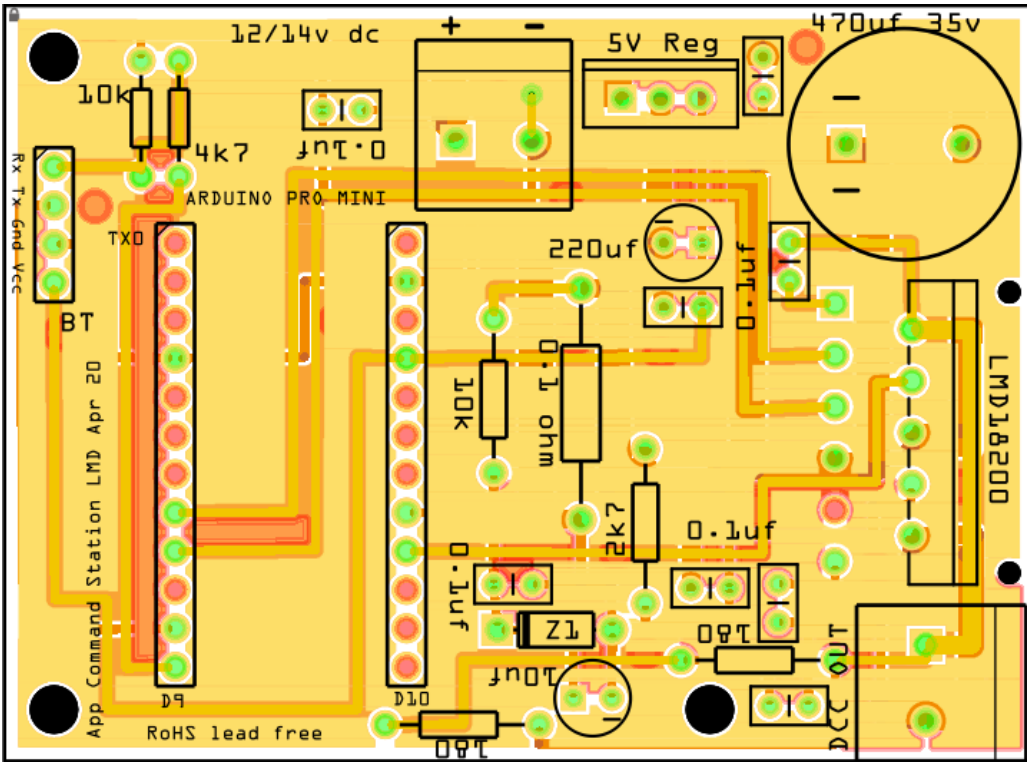
If you are using an external LMD18200 module: