

AUTONOMY

(Team A)

Power Distribution System Draft Schematic

MRSD Project 1
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Carnegie Mellon University

Team Members

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Part 1

We plan on making a power distribution circuit board for our RC Car to supply power to all the components including the sensors, actuators and communication devices.

We have made a few minor changes in the conceptual design. For the relay kill switch, we came across [this breakout board](#) which comes with both the RF receiver along with the relay and output power supply for the motors. Therefore, we plan to use this external to the power supply board and have removed this.

We included an additional power input using the barrel jack connector. This can be used to power up our board directly from the AC supply using an 12V adapter.

For the voltage regulators, we are using a switching regulator for 3.3V and 5V as these are very high efficiency and meet our requirements as well. For 11.1V to 12V, we are using step-up switching regulators. Further details about these devices are mentioned in the next part. Please have a look at *Figure 1* for the updates in the PCB.

Part 2

- The [LM3671 3.3V Buck Converter Breakout - 3.3V Output 600mA Max](#) has an efficiency of 92%.
- [5V regulator 5W \(R-78E\)](#) has an efficiency of 91%.
- For 11.1V to 12V, [Pololu 12V Step-Up Voltage Regulator U3V50F12](#) has an efficiency of 80-95%.

All of these are switching regulators with very high efficiency and thus, the heat dissipation will be minimal. We will be using ambient air based convection for cooling. The LM3671 (3.3V regulator), 5V DC/DC Regulator and Pololu 11.1V to 12V DC/DC all have a thermal breakdown, reverse and overvoltage protection.

Notes

The 5V regulator we have used has the same footprint (TO-220) as the common 78XX regulators, hence we used the former in the schematic instead. The other two regulators are mounted using 2.54 mm headers on the board. Apart from SparkFun libraries, we have attached an additional library for the terminal blocks.

Bill of Materials (BOM)				
Part	Value	Device	Package	Description
3V3	YEL	LED5MM	LED5MM	3V3 Supply Port LED
5V	GRN	LED5MM	LED5MM	5V Supply Port LED
12V	GRN	LED5MM	LED5MM	12V Supply Port LED
C1	0.1uF	C-EU025-024X044	C025-024X044	CAPACITOR, European symbol
F1	10A	FUSEBLANK_5X20MM	FUSE HOLDER_5X20MM	10A Fuse
F2	5A	FUSEBLANK_5X20MM	FUSE HOLDER_5X20MM	5A Fuse
IC1	3V3REG	PINHD-1X4	1X04	LM3671 3.3V Buck Converter
IC2	5VREG	V_REG_LD1117VXX	78XXL	DC/DC Converter - 5V (R-78E)
IC3-1	12VREG	PINHD-1X4	1X04	Pololu 12V Step-Up Voltage Regulator U3V50F12
IC3-2	12VREG	PINHD-1X4	1X04	
J1	LiPo BATTERY	282836-2	CONN_282836-2	TERM BLOCK 2POS SIDE ENTRY 5MM
J2	JETSON	282836-2	CONN_282836-2	TERM BLOCK 2POS SIDE ENTRY 5MM
J3	ARDUINO	282836-2	CONN_282836-2	TERM BLOCK 2POS SIDE ENTRY 5MM
J4	RESV	282836-2	CONN_282836-2	TERM BLOCK 2POS SIDE ENTRY 5MM
J5	POWER_JACK	POWER_JACK	POWER_JACK_PTH	Power Jack Connector
J6	USB1	USB_B_PTH	USB-B-PTH	USB Type B Connector
J7	USB2	USB_B_PTH	USB-B-PTH	USB Type B Connector
JET	GRN	LED5MM	LED5MM	Jetson Fuse Indicator LED
JP1	5V PORT	PINHD-2X5	2X05	5V Supply Port
JP2	3V3 PORT	PINHD-2X5	2X05	3V3 Supply Port
FUSE	RED	LED5MM	LED5MM	Main Fuse Indicator LED
PWR	RED	LED5MM	LED5MM	Power Indicator LED
R1	10K	R-US_V234/12	V234/12	RESISTOR, American symbol
R2	10K	R-US_V234/12	V234/12	RESISTOR, American symbol
R3	10K	R-US_V234/12	V234/12	RESISTOR, American symbol
R4	10K	R-US_V234/12	V234/12	RESISTOR, American symbol
R5	10K	R-US_V234/12	V234/12	RESISTOR, American symbol
R6	10K	R-US_V234/12	V234/12	RESISTOR, American symbol
SW1	PWR	2P2T	2P2T	SLIDE SWITCH SS-22F05-G(A)4

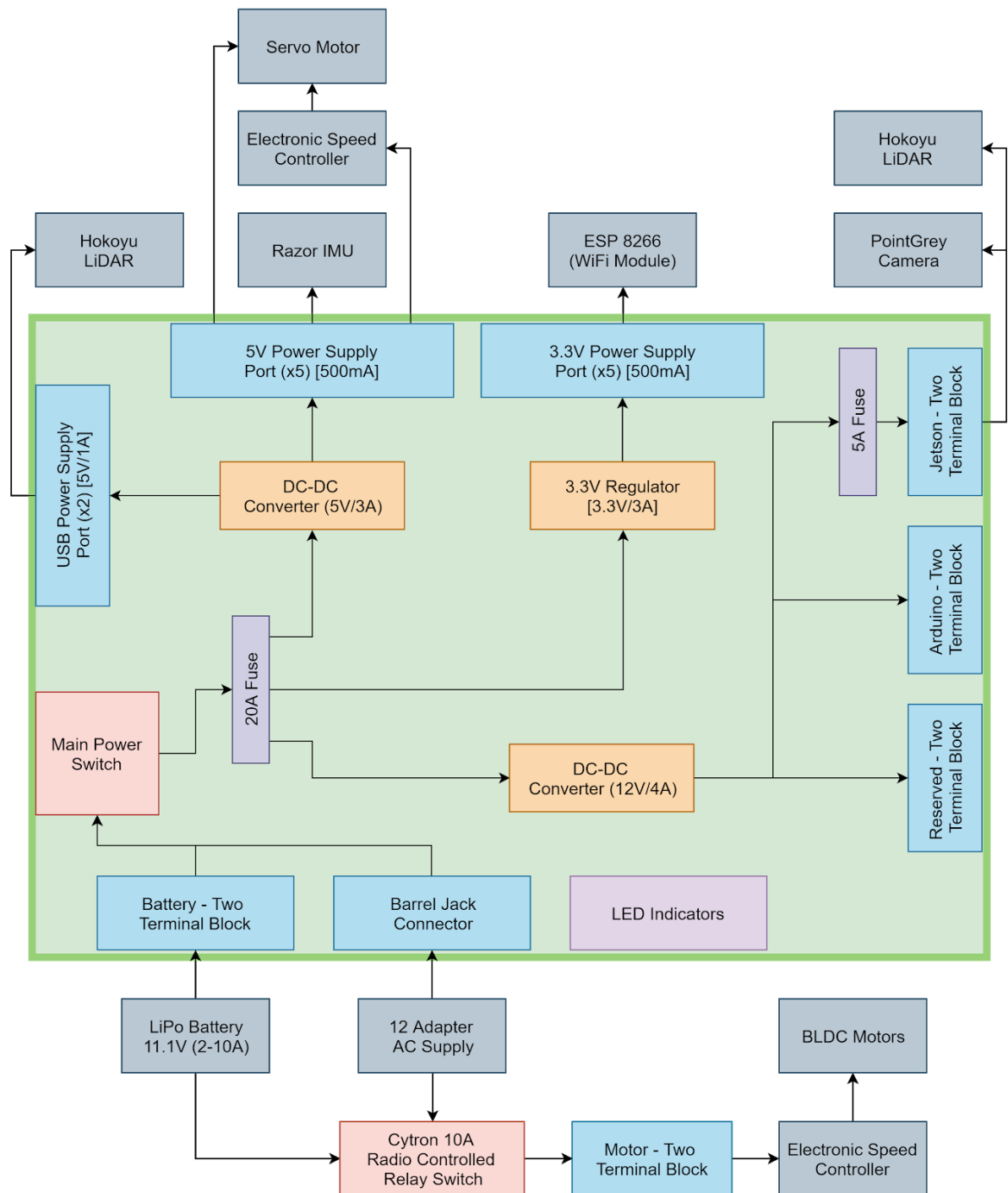
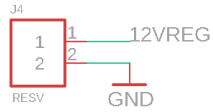
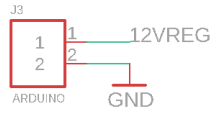
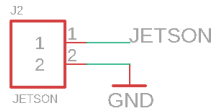
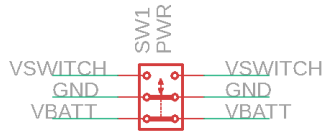


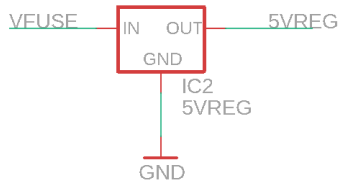
Figure 1: Updated PCB draft layout showing the connections between the components



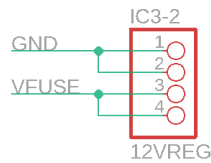
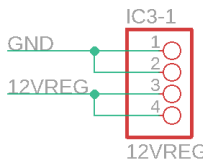
12V Terminal Blocks



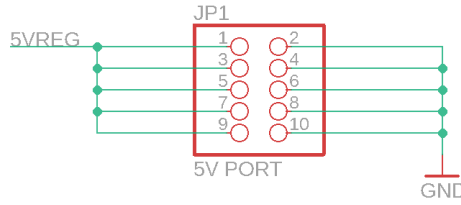
Power Switch



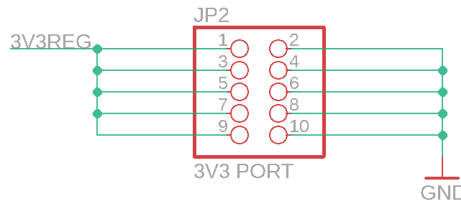
5V Regulator



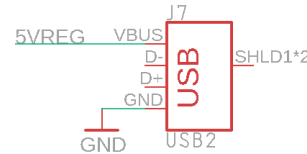
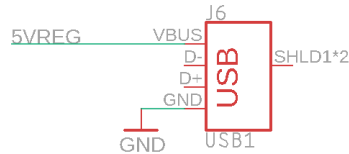
12V Regulator



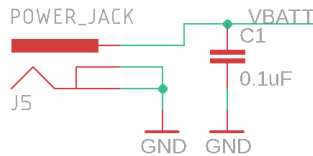
5V Supply Port



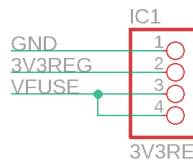
3V3 Supply Port



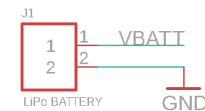
USB Power Supply Port



Barrel Jack Connector



3V3 Regulator



Battery Terminal Block



LED Indicators



Fuses

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TITLE: PCB_RC_01

Design by:
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