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Arlo Power Distribution Board Kit Rev B (#28996)

The Arlo Power Distribution Board makes it easy to connect a plethora of add-ons to your robotic system. It may be adapted for many applications, though it's specifically designed for the Arlo Robotic System. (www.parallax.com/arlo).

This product comes as an un-assembled kit. It requires some basic soldering and minor mechanical aptitude to build. This document contains an assembly tutorial for both the mechanical as well as the soldering portions of the process – it's a great electronic assembly project for beginners as well as those who have prior experience.

Features

- Provides a convenient method of power distribution throughout the Arlo Robot system
- Eliminates a rats nest of power distribution wiring and connectors, making for a very clean and reliable installation
- Multiple fuse-protected outputs support a variety of accessories
- Connects directly to main 12V battery power supply
- High DC amperage switches

Key Specifications

- Power input: 12 VDC
- Single/dual battery supply connections
- Dimensions: 5.9 x 3.6 x 1.25 in (15 x 9.15 x 3.18 cm)

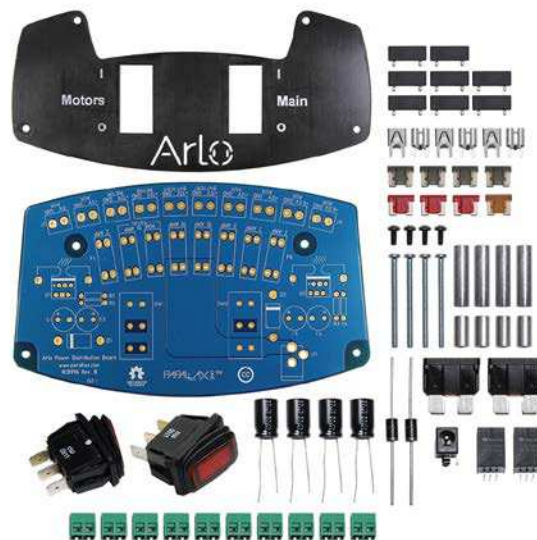
Application Ideas

- Provides multiple voltage outputs and built-in fused circuitry for your robotic system.
- Mobile robotic teaching platform power supply with redundantly fused outputs.

Assembly Process

If you're relatively new to electronic assembly techniques or have never soldered components to a Printed Circuit Board (PCB) before, we encourage you to take it slow and follow these instructions.

Along the way, we'll show you some tips and tricks that make it not only easy and enjoyable, but will also result in a well-made Robot Power System.



Additional Items Required

- Safety Glasses (this is most important!)
- Soldering iron and solder (Parallax # 700-10011 or equiv.)
- Masking tape
- Small needle-nose pliers
- Small diagonal cutters

Step 1: Check the Package Contents

Check your package contents against the Bill of Materials below. If any parts are missing, contact Tech Support via phone or email (see top of page). The Designator column in the table matches the labels on the Printed Circuit Board for correct component placement.

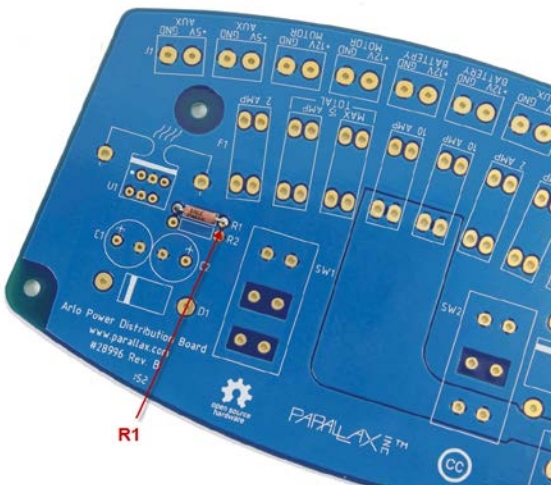
Bill of Materials – Arlo Power Distribution Board (#28996 Rev B)			
Qty	Designator	Designator - Description	Part #
1	28996 Rev B	Arlo Power Distribution Board PCB (unpopulated)	300-28996
2	SW1, SW2	Rocker Switch, SPST 25 A, 14V	400-00102
6	TR1-TR6	.250" Terminal Receptacle	400-00103
10	J1-J10	2 Position Screw Terminal	452-00012
8	FH1-FH8	Holder, Mini Fuse	452-00064
1	R1	5.3k Resistor	150-01045
2	R2, R4	1k Resistor	150-01020
1	R3	7.15k Resistor	150-01050
4	F1, F6, F7, F8	2 amp Mini LP Blade Fuse	452-00065
1	F2	5 amp Mini LP Blade Fuse	452-00083
3	F3, F4, F5	10 amp Mini LP Blade Fuse	452-00081
1	J11	2.1mm ID,5.5mm OD Jack*	452-00097
4	C1-C4	Capacitor, 470 uF 25V	200-01048
2	D1, D2	Diode, rectifier, 3 "A 50 V axial	501-00010
2	U1, U2	Voltage Regulator, MPM-80 DC/DC Converter	601-00528
4	Screw	#4-40 x 1/4" panhead, black	710-00100
4	Standoff	4-40 x 1" female / female, round, aluminum	700-00060
4	Screw	#4-40 x 1.5" panhead, zinc	710-00008
4	Spacer	#4-40 x 1/2" round, aluminum	713-00007
1	Plate	Arlo Switch Plate, Delrin	721-00020
2	Heat Sink	TO-220 Vertical Heatsink	700-00097

* Note: Units produced prior to May 2016 used a 2.5 mm inner diameter jack (Digi-Key PJ-202B), for use with the original Arlo Battery Charger – 2.5 mm (#700-00240). Units produced after May 2016 use the 2.1 mm inner diameter jack, for use with the Arlo Battery Charger – 2.1 mm (#700-00245).

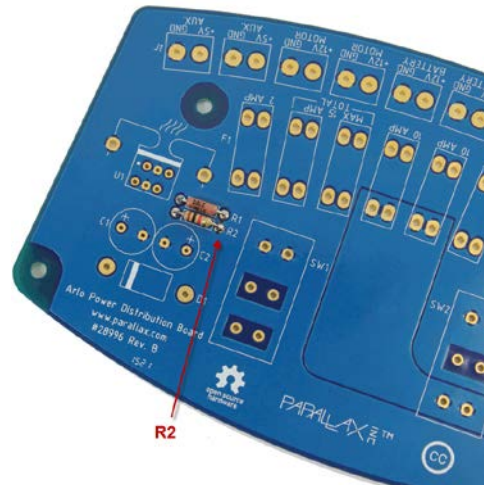
Step 2: Install the Low-Profile Components

We will begin assembly by installing the lowest profile components first: R1 has a value of 5.3k. These resistors are non-polarized, which means that you can insert them in either direction on the board and they'll work fine. Just be sure you put the correct values into the proper sets of holes. (You can double check the values of the resistors by using an ohmmeter.)

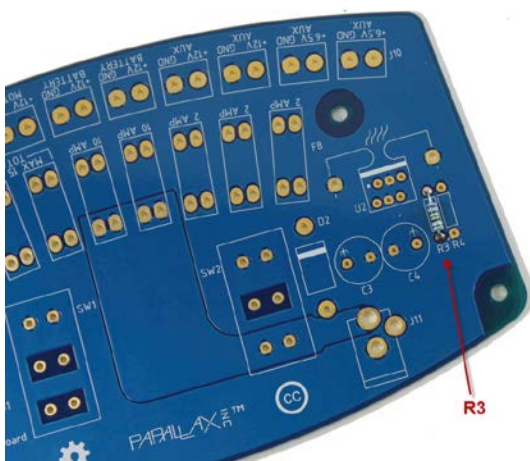
Also, after you've inserted each of the resistors, bend their leads slightly. This will help keep them tight to the PCB as you solder them into their respective locations.



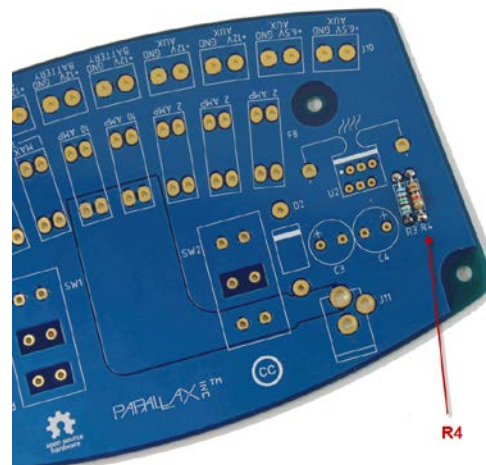
R1 is a 5.3k resistor



R2 is a 1k resistor



R3 is a 7.15k resistor

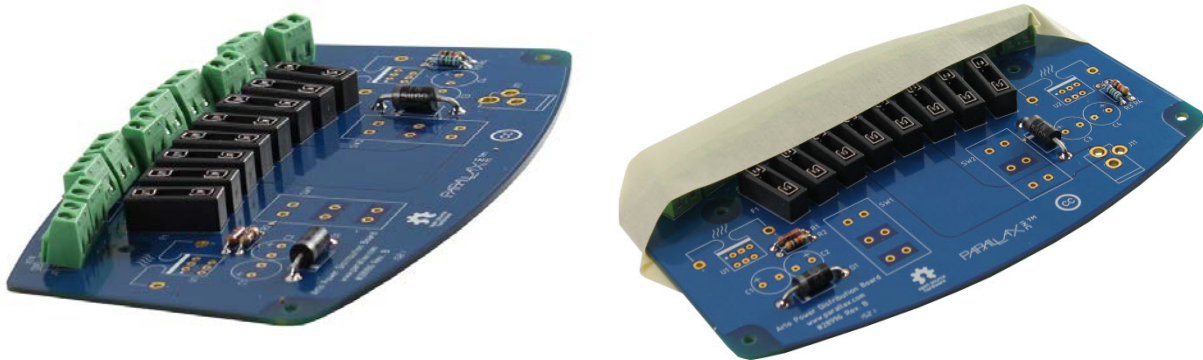


R4 is a 1k resistor

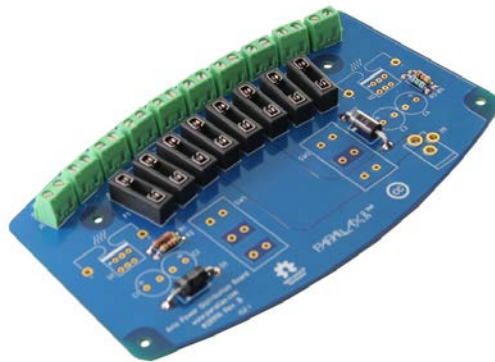
Important! Double-check that each resistor is in the correct location before continuing. Correct voltage output from the regulators is dependent on the resistor values being placed properly on the board.

Step 5: Install the Terminal Blocks

Install the green-colored screw terminal blocks (J1–J10), with the “wire input” side of the blocks facing the outer edge of the board (below, left). Use a strip of tape or cardboard to hold them in position while flipping the board over (below, right), and then solder them into place.



After soldering the terminal blocks, you should have something like this:

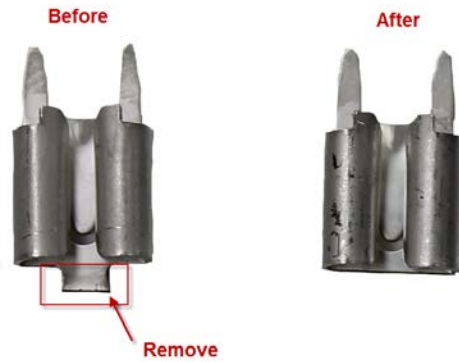


Step 6: Install the Switch Terminals

The switch terminals may come on a strip. Clip the terminals off from the carrier strip shown below.



Then, trim the little tab off of the terminal as shown in the image below.

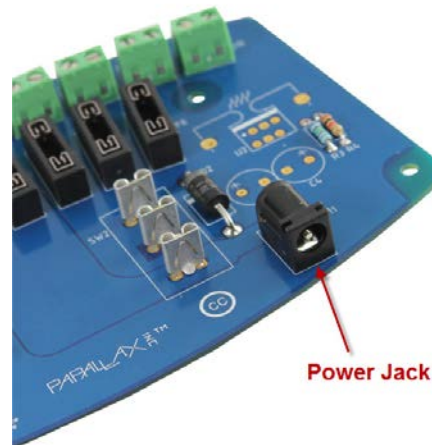


The terminals should be a tight fit, and when soldered, they should all be perpendicular to the PCB.



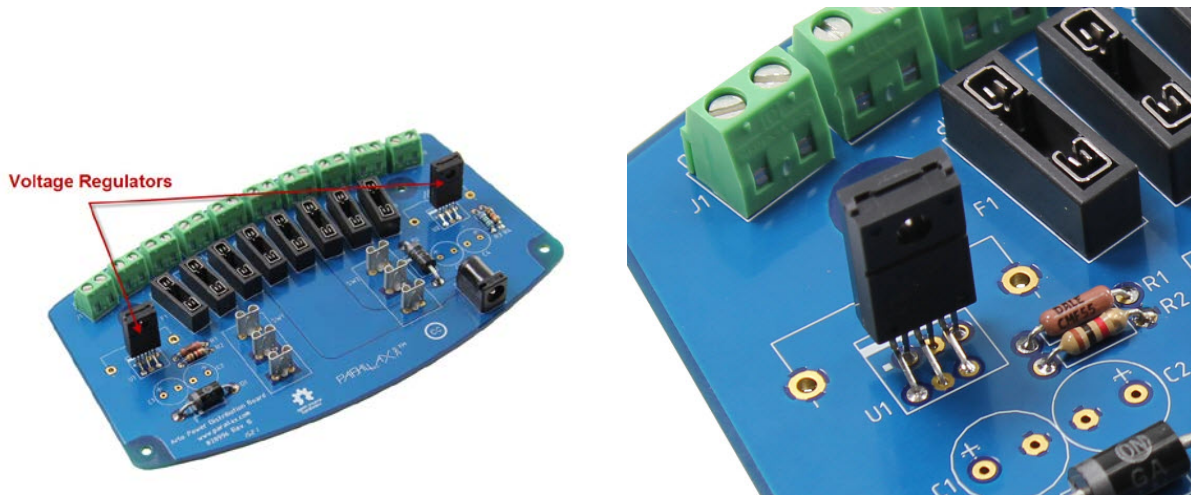
Step 7: Install the Charging Power Jack

Install the power jack. Be sure that the jack is seated tightly to the board. Due to the diameter of the holes and the flat leads that go through them, use plenty of solder so that the electrical connections are entirely filled.



Step 8: Install the Voltage Regulators

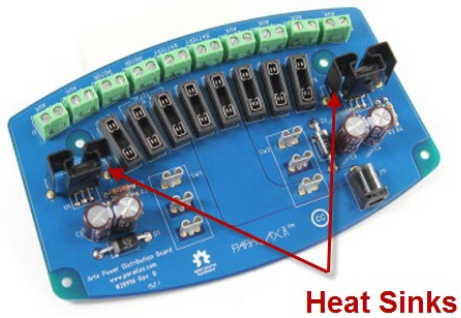
WARNING: These components **MUST** be installed in the correct orientation (see close-up below, right) - not only for proper operation, but for safety as well.



The two voltage regulators are identical, so either can be placed in their respective holes. The regulators are “programmed” to output the required voltages based on the values of each of the resistor pairs (R1, R2), and (R3-R4). For this reason, you must be certain you have installed your resistors correctly.

Step 9: Install the Heat Sinks

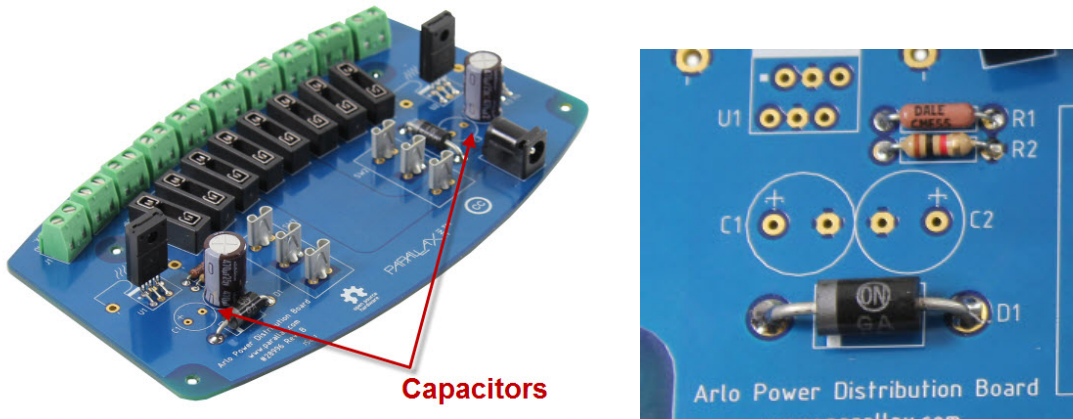
Install the heat sinks over the voltage regulators as shown, and solder them into place.



Step 10: Install the Polarized Capacitors

WARNING: These components **MUST** be installed in the correct orientation - not only for proper operation, but for safety as well.

Examine the board locations for C1, C2, C3, and C4, and note the markings indicating the correct polarity. You should see a plus-sign or a minus-sign on each of the capacitors themselves. The hole for each capacitor's positive terminal is marked with a (+) on the board (below, right).



The capacitor's negative terminal will show a (-) sign on the side of its case.

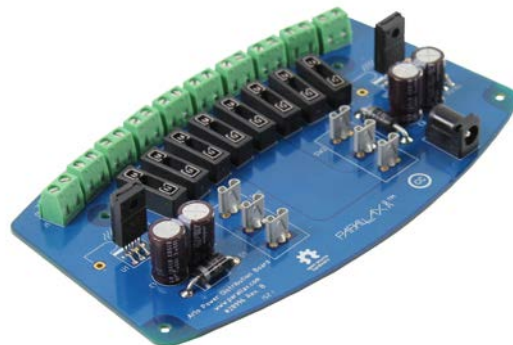
Match the polarity markings on the capacitors to the markings on the PC board. Negative on the capacitor goes to negative on the printed circuit board.

Note that when each set of capacitors (C1 & C2, and C3 & C4) is properly installed, they have their negative pins adjacent to each other.

Important! Do not install the capacitors backwards – if you do, *they may explode* when power is applied.

Insert each capacitor, double-check the polarity, flare their leads slightly to help them stay in place, and flip the circuit board over and solder into place.

Properly installed, the caps (capacitors) should look like this:



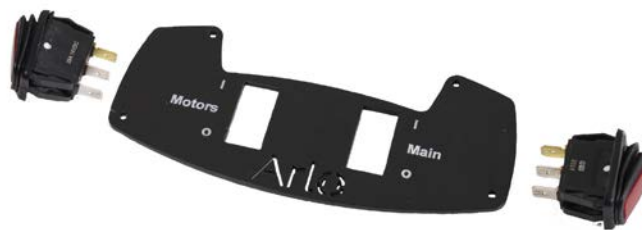
Step 11: Install the Fuses

Fuses can be installed now. Fuses have no polarity, so they can be installed into the holders in either orientation. Just be sure to insert the properly-rated values into the appropriately-labeled fuse holders. Fully seat them into the holders, as shown.

Note: The pair of “Max 15 Amp Total” fuse holders should have a 10 amp and a 5 amp fuse in each. It does not matter which of the two fuses goes into which of the two holders.

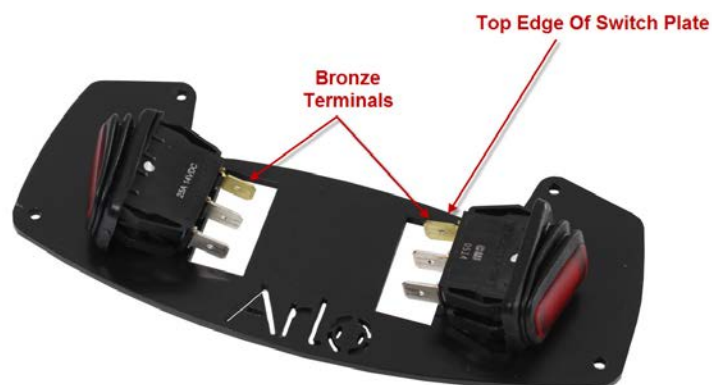
Step 12: Switch Plate Assembly

The plate is cut from .093 thick Delrin, and the text is etched into the surface.



If you would like to enhance its readability, you can flood or fill the text with correction fluid (“white-out” or white paint) and then simply wipe off the excess. The fluid remains in the recessed etched lettering.

Both switches are exactly the same; therefore each can be put into either mounting hole. However, notice that each switch has a bronze colored terminal (shown below) at one end (the other two terminals are silver). Orient the switches such that their bronze terminals are closest to the “top edge” of the plate that has the “I” (on indicator). The orientation of the switch in the mounting hole is very important; double-check your installation. Do not install these switches in reverse.

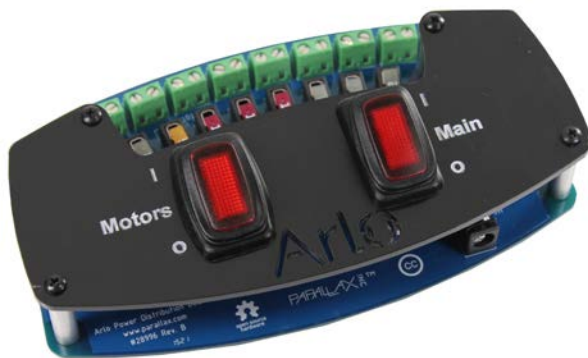


Step 13: Mount Switch Plate Assembly to the Power Distribution Board

Next, attach each of the four 1" long standoffs through each of the four holes in the plate using (4) #4-40 x 1/4" long black pan-head screws.



Now, being gentle yet firm, carefully line up the switch connections with the terminals on the PCB and gently "wiggle" the assemblies together such that the standoffs are flat to the PCB.

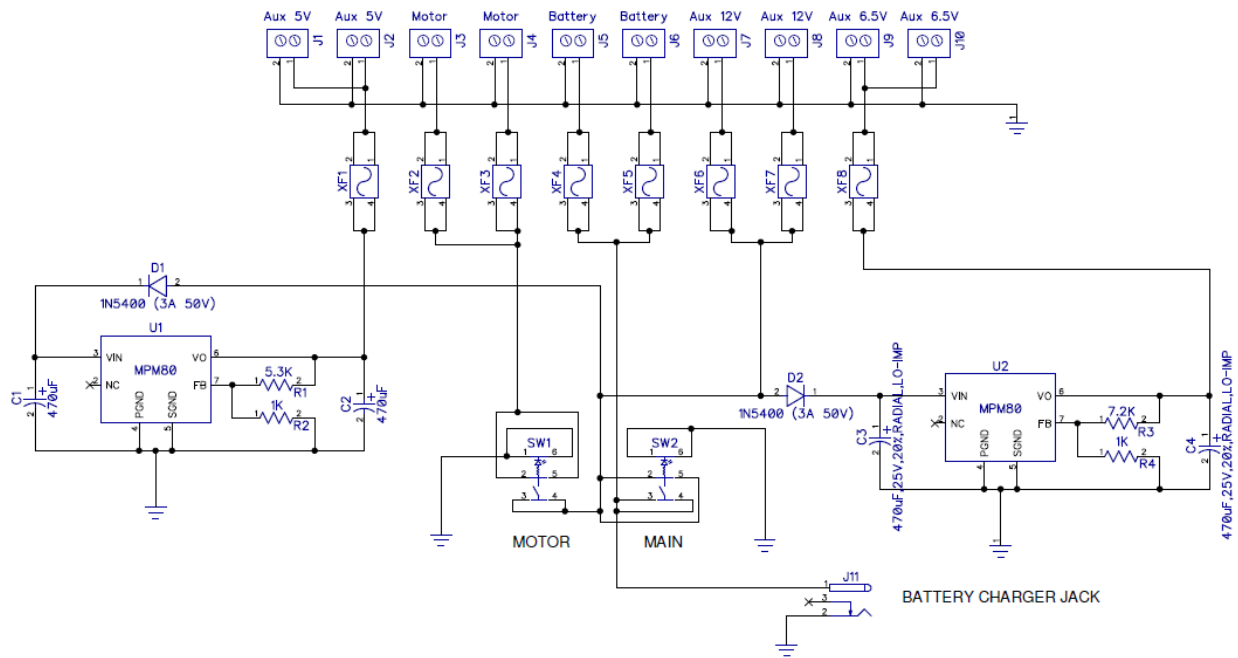


Step 14: Mount the Switch Plate to the Arlo Robot Base

If you are mounting the Arlo Power Distribution Board to the Arlo Robot Base, use the (4) #4-40 x 1.5" long machine screws and the (4) 1/2" long x 1/4" diameter aluminum spacers (under the PCB), and screw them through the spacers (which lift the PCB 1/2" up off the Arlo deck), into the 1.5" long standoffs.

You now have a complete power distribution system that is well-suited for your mobile robot that can provide for easy expandability.

An illustration from the schematic of the board is shown below; the complete schematic is available for download from the 28996 product page at www.parallax.com.



The Arlo Power Distribution Board's charging jack is a convenient way to charge your robot's 12V sealed lead acid batteries without having to disconnect any wiring in your circuits. You can use Parallax's Arlo Smart charger (# 700-00245), or another of your own choosing. The charger must be designed for charging Sealed Lead Acid batteries. The input power jack's pin is "center-positive", and is 2.1mm in diameter.

Notice that J5 and J6 are the Power Input terminals. These are where you would typically connect the robot's power source which is typically 12VDC Sealed Lead Acid batteries. You don't need to connect two batteries to your system for operation – but these terminals give you the ability to do so easily if desired. If you do choose to use two batteries, they should be identically-rated.

The battery power input supply goes directly to the MAIN switch. If this switch is "OFF", then there is NO power applied to the board (except at the input fuse terminals and at the charger jack – which allows charging of the robot's power source while the entire rest of its system is shutdown).

If you turn the MAIN switch "ON", then power will be available at all terminals except for J3 and J4, which are designed for connecting to your MOTOR drive power circuitry.

With the MOTOR switch "OFF", it gives you the ability to have your entire robot system to be ON except for your main drive motors. This can come in handy during code development or troubleshooting.

As shown in the schematic, all outputs are fuse-protected.

This concludes the assembly of the Arlo Power Distribution Board. It's now ready to be installed on an Arlo Robot Base system, or in any other custom application you may have.

Revision History

Version 1.1: Power jack (J11) changed from 2.5 mm (Digi-Key PJ-202B) to 2.1 mm. for units produced beginning May 2016. Correspondingly, the Arlo Battery Charger – 2.5 mm Plug (# 700-00240) is being replaced by the Arlo Battery Charger – 2.1 mm Plug (# 700-00245). Updated schematic. Added parts picture to first page.