Arlo Power Distribution Board Kit (#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](http://www.parallax.com/arlo)).

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

These instructions end with mounting the constructed board on the Arlo Robot Base Kit.

**Features**
- Provides a convenient method of power distribution throughout the Arlo Robot system
- Eliminates the “rat’s 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 your main 12V battery power supply.
- High DC amperage switches

**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.
- Ideal for classroom environments

**Key Specifications**
- Power input: 12 VDC
- Single or dual battery supply connections
- Dimensions (fully-assembled): 5.9 x 3.6 x 1.25 in (15 x 9.15 x 3.18 cm)

**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
- Arlo Robot Base Kit (optional, Parallax #28960)
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 slowly and follow these instructions.

Along the way, we’ll show you some tips and tricks that make it easy and enjoyable to produce a well-made Robot Power System.

Step 1 — Check the Package Contents.

Check your package contents against the Bill of Materials below. If any parts are missing, contact our Sales Team via phone or email (see first page header).

<table>
<thead>
<tr>
<th>Qty</th>
<th>Designator</th>
<th>Designator - Description</th>
<th>Part #</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>C1</td>
<td>Capacitor, 0.1 uF</td>
<td>200-01040</td>
</tr>
<tr>
<td>1</td>
<td>C5</td>
<td>Capacitor, 22 uF</td>
<td>200-01045</td>
</tr>
<tr>
<td>1</td>
<td>C3</td>
<td>Capacitor, 1000 uF</td>
<td>200-01046</td>
</tr>
<tr>
<td>1</td>
<td>C4</td>
<td>Capacitor, 10 uF</td>
<td>200-01047</td>
</tr>
<tr>
<td>2</td>
<td>C2, C6</td>
<td>Capacitor, 390 uF</td>
<td>201-01064</td>
</tr>
<tr>
<td>1</td>
<td>PCB1</td>
<td>Printed Circuit Board, Arlo Power Distribution Board</td>
<td>300-28096</td>
</tr>
<tr>
<td>2</td>
<td>SW1–SW2</td>
<td>Rocker Switch, SPST, 25 A, 14 V</td>
<td>400-0102</td>
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<tr>
<td>6</td>
<td>SW1–SW2</td>
<td>Terminal Receptacle .250 Fast PCB</td>
<td>400-0103</td>
</tr>
<tr>
<td>10</td>
<td>J1–J10</td>
<td>2-Position Screw Terminal</td>
<td>452-00012</td>
</tr>
<tr>
<td>8</td>
<td>FH1–FH8</td>
<td>Holder, Fuse Mini</td>
<td>452-00064</td>
</tr>
<tr>
<td>3</td>
<td>F6–F8</td>
<td>2 A Mini LP Blade Fuse</td>
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<tr>
<td>2</td>
<td>F4–F5</td>
<td>10 A Mini LP Blade Fuse</td>
<td>452-00081</td>
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<tr>
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<td>F1</td>
<td>1 A Mini ATO Blade Fuse</td>
<td>452-00082</td>
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<tr>
<td>2</td>
<td>F2–F3</td>
<td>5 A Mini LP Blade Fuse</td>
<td>452-00083</td>
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<tr>
<td>1</td>
<td>J11</td>
<td>2.5 mm Jack</td>
<td>452-00084</td>
</tr>
<tr>
<td>1</td>
<td>D1</td>
<td>Diode, rectifier, 3 A 50 V Axial</td>
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<tr>
<td>1</td>
<td>VR1</td>
<td>Regulator, 5.0 V LDO TO220</td>
<td>501-00506</td>
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<tr>
<td>1</td>
<td>VR2</td>
<td>DC/DC Converter, 12 V to 6.5 V</td>
<td>601-00524</td>
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<tr>
<td>1</td>
<td>-</td>
<td>Nut, #4-40, Zinc</td>
<td>700-00003</td>
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<tr>
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<td>Screw, #4-40x1/4&quot; panhead, zinc</td>
<td>700-00028</td>
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<tr>
<td>4</td>
<td>-</td>
<td>Standoff, 4-40x1&quot; female/female, round aluminum</td>
<td>700-00060</td>
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<tr>
<td>4</td>
<td>-</td>
<td>Screw, #4-40x1.5&quot; panhead, zinc</td>
<td>710-00008</td>
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<tr>
<td>4</td>
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<td>Spacer, #4x1/2&quot; round aluminum</td>
<td>713-00007</td>
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<td>-</td>
<td>Arlo Switch Plate</td>
<td>721-00020</td>
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<tr>
<td>1</td>
<td>-</td>
<td>Foam tape, double sided</td>
<td>900-00019</td>
</tr>
</tbody>
</table>

The Designator column in the table matches the labels on the printed circuit board, for correct component placement. The components are labeled with their Designator in the product photo on the next page.
Components with Designator Labels
Step 2 — Install Lowest-Profile Components First

We will begin assembly by installing the lowest profile components first: C1, C4, and C5. These capacitors are non-polarized, which means that you can insert them in either direction, and they’ll work just fine. Just make sure you put them into the correct holes.

- Insert the capacitors into their designated holes on the board. As you install these capacitors, spread the leads slightly (see image, right). This prevents them from falling out of the board when you flip it over to apply the solder.

- Check that each capacitor is in the correct location.

- Solder the capacitors in place.

- Next, install the fuse holders FH1–FH8. Begin by placing each one in their respective holes (below, left). The fuse holders - like the capacitors you just installed - are non-polarized, which means that they may be installed in either direction.

Since they don’t have long enough leads to be bent over for retention, simply place a piece of cardboard or anti-static foam on the top of the holders and then flip the whole assembly over such that the fuse holders are prevented from falling out (below, right).

This allows the whole row of fuse holders to be soldered down tight to the PCB (below).
Step 3— Install the Trickier Components

Next, you will be installing the taller components as shown on the Parts Placement Diagram. **WARNING: These parts MUST be installed in the right direction for safety and functionality.**

- Examine the board markings C2, C3, and C6, and the large capacitor markings carefully to observe the correct polarity. The hole for each capacitor’s positive terminal is marked with a (+) on the board (below, left). The capacitor’s negative terminal will show a (−) sign on the side of its case (below, right). Match positive terminal with positive marking on the board, and negative with negative. **Do not insert the capacitors backward, or they may explode when power is applied.**

![Capacitor and Markings](image)

- Position each capacitor, double-check the polarity, and solder into place. You can use the “bend leads” method of retention while you’re soldering.

- Check the markings on the diode D1. Match the striped end of the diode case with the striped end of the D1 rectangle on the board, and solder into place.

- Use the double-stick tape to hold the DC/DC Converter VR2 down tight to the PCB, and then solder it to the board.

- Install the voltage regulator VR1. Bend the voltage regulator leads such that they allow the device to lay flat against the board. Use the #4-40 bolt and nut to secure it to the board, and then solder its three pins.

- Install the screw terminals J1–J10, with the wire receptacles facing the outer edge of the board.

Step 4 — Install the Switch Connectors

Now it is time install the switch connectors SW1–SW2 onto the PCB.

**IMPORTANT:**

1. You MUST match the curved shape each connector with the curved marking on the PCB silkscreen (right).
2. The connectors MUST be soldered perfectly vertical to the PCB itself.

Since the connectors are a loose fit in their mounting holes, use this simple trick to make both rows of the (3) connectors sit in perfect vertical alignment while you solder.

- Insert a row of (3) of the connectors into their respective holes.

- Now, holding the board perfectly level (making sure that the connectors are perpendicular to the board) place a piece of tape directly across the tops of each row of connectors as shown below. Solder in place.
• Do the same for the second row (of three) connectors (below, left). Solder in place. When you are done, your board should look like the one below, right.

• Now you can install the fuses. Be sure to that you insert the proper values into their respective holders.

Step 5 — Switch Plate Assembly

Now let’s assemble the Switch Plate Assembly. The plate itself is covered in protective paper. It’s much easier to remove the paper at this stage than after the assembly has been put together. However, be careful not to scratch, chip, or burn the plate while you’re assembling it.

• Look closely at the switches. Each has a bronze terminal (shown below) at one end of the switch. Orient the bronze terminals so that they are closest to the edge of the plate that has the ArloBot logo (the logo will be on the reverse side from the switch terminals). This is very important; double-check your installation! Do not install these switches backward.

• Snap each switch securely into the panel from the top side of the plate.
• 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 panhead screws.

• Be gentle, yet firm, with this step. Carefully line up the switch connections with the terminals on the PCB and slightly wiggle the connectors together so that the standoffs are flat to the PCB.

• Now secure the Arlo Power Distribution Board to the Arlo Robot Base using (4) #4-40 x 1.5” long machine screws.

You now have a complete power distribution system that is well suited for easy expandability.
As shown above, the Arlo Power Distribution Board’s charging jack is a convenient way to charge the Arlo Robot’s 12 Sealed Lead Acid Batteries without having to disconnect any wiring in your circuits. You can use Parallax #700-00240, 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 2.5 mm in diameter.

The schematic of the board is shown below:

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 12 VDC Sealed Lead Acid batteries. You don’t need to connect two batteries to your system – but these terminals give you the ability to do so easily. If you do 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 the ability to charge the robot’s power source while the entire system is shutdown.

If you turn just 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”,

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you have the ability to allow your most of your robot system to be powered “ON”, except for your main drive motors; this can be very handy during code development.

As shown in the schematic, all outputs are fuse-protected. It’s always best-practice to shut off all power to the output terminals when you’re connecting or re-connecting wires to the Power Distribution Board.

This completes the assembly of your Arlo Power Distribution Board. With all of this power, you can easily add a myriad of devices to customize your robot. 😊