

## Building an Apple-1 Triad based Power Supply:

### Parts List

Triad F40-X Transformer  
Triad F31-X Transformer  
Power Entry Module with resistor or 2 wire electrical cable with plug (see notes #1)  
#18 Gauge wire (see notes #4)  
Panel Mounted fuse holder (Radio Shack is fine)  
3amp Slow blow fuse  
Panel Mounted Power Toggle Switch SPST (Metal Radio Shack ones are fine)  
Wire Nuts  
Heat Shrink Tubing (see notes #4)  
Wood for base/side (see notes #5)  
Molex connector pins and 6 pin holder

### Notes:

1. The decision, are you going to have a two-wire plug or a three-wire power entry module with bleeder resistor?
  - a. Three wire with 1 MegaOhm  $\frac{1}{2}$  watt resistor will protect the board from static electricity and slowly drain the large blue caps when the board is turned off or the fuse blows to prevent accidental damage.
  - b. Two wire is more typical of what was used in 1976, but three wire was available and some people did hook their Apple-1 up this way.
2. If you are using a two wire solution, note the "hot" side wire (you will need to use a continuity checker). This is the side with the smaller "spade".
3. If you are using a three wire solution, the hot side is the right side of the power entry module back (as seen from inside the power supply, not from the side where the plug enters).
4. You will need 6 wires measured to the length needed for your case. 18 Gauge stranded wire will be slightly flexible and allow for movement. You will also need a few pieces of miscellaneous wire and some electrical nuts the kind used for electrical wiring in the house (this will allow you to setup your supply and move it to a case later). I also recommend getting either 2 sets of 3 colors each or 6 different colored wire. You should also get some heat shrink tubing and a hair dryer or heat gun. For ease of working, you will want have 2 lengths of  $\frac{1}{2}$  inch heat shrink tubing and 1 length of  $\frac{3}{4}$  inch heat shrink tubing optionally to group the two bundles together. You may also want to have some  $\frac{1}{4}$  heat shrink tubing to cover the smaller solder joints that you will be performing.
5. If you are not installing the supply into a case at this point, you will want a small board of wood to hold the transformers. You may optionally want to tack a smaller board to the side and drill out holes for the switch and panel mounted fuse holder.

## Building the supply...

Step 1: Build the base and mount the two transformers. I typically will put the Triad logo to the back to make the wiring neater.

Step 2: Solder a small length of wire to the hot side of the Power Entry Module or to the 2 prong cord so that you have a clean 18 gauge area to use the wire nut on. The length of this wire should allow you to mount the entry module and reach the wires from the transformers. If you are using the 2 prong cord, then push the cord through a hole in your mounting setup (i.e. case or wood panel) and tie a knot in the cord so that it does not pull out.

Step 3: Repeat for the neutral side of the Power Entry Module or 2 prong cord step 2: You may wish to use a different color wire.

Step 4: Solder a small length of wire to each tab on the power switch. These lengths of wire should be long enough to allow you to connect to the power entry module's (or 2 prong cord) wire you soldered in Step 2.

Step 5: On the fuse holder, carefully solder two small length of wires long enough to connect to the power switch wire to the fuse holder, one to each tab on the fuse holder. Note, do not use a lot of solder and make sure your connection is flat if you fuse holder has a tab that can get in the way of the "mounting nut" on the fuse holder.

Step 6: You may mount the fuse holder, Power Entry module and switch if you have not done so already.

Step 7: Assembly of the high voltage side...

- a. On the transformers, from the side that has 2 wires coming out. Take one wire from the right of each transformer and twist them together. Then using a wire nut connect them to one wire (doesn't matter which one) that you soldered onto the fuse holder.
- b. Using a wire nut, connect the other wire from the fuse holder to one of the wires you soldered to the power switch.
- c. Using a wire nut, connect the remaining wire from switch to the hot side wire of the Power Entry module or 2 prong cord.
- d. Take the left side wires from each transformers 2 wire side and twist them together then using a wire nut connect to the neutral wire side of the Power Entry module or 2 prong cord.

Step 8: Prepare the board supply wires and assemble low voltage side

- a. As mentioned in note#1, measure 6 lengths of wire from the power supply module to the Apple-1 board leaving enough space for your mounting in a case. Use different colored wire or 2 sets of 3 colors. My recommendation is 6 different colors (you only need 5 wires if you are using a two prong cord).
- b. For 5 wires, Strip about  $\frac{1}{4}$  from each wire on one side and solder mox pins on. If you have a proper mox crimper you do not need to solder, if you don't have a crimper, use pliers to bend the back tabs to hold the wire in place and then putting solder already on your iron, simply touch the mox connector where the wire is. It should "suck" enough solder to make the connection strong.

- c. On the one remaining wire (if you are using a Power Entry Module) you will need to cut it a little shorter and solder a 1 MegaOhm resistor. Then you will solder the Molex connector to the resistor.
- d. Bundle the wires together and insert them into the molex holder. They will snap in. Note: The wire with the soldered resistor needs to go to pin #6. If you are using different colors then any location will do for now. If you are using 2 sets of color follow the pattern below. Take note of the connector and how it fits in the board so you can see which pin is #6 and which is #1

Example with 2 color set...

Pin 1: Color #1

Pin 2: Color #2

Pin 3: Color #1

Pin 4: Color #2

Pin 5: Color #3

Pin 6: Color #3 (note: has resistor and is only for Power Entry Module)

- e. Using the ½ inch heat shrink tubing bundle pins 1, 2 and 6 together, then pins 3,4,5 together. Note: leave some uncovered length at the far end so that it can be connected to the wires on the power supply. It's easier not to shrink the tubing yet.
- f. If you have chosen to bundle the wire bundles into 1 using ¾ heat shrink tubing, mark each bundle on the end with tape so that you know which one is which. You will need to shrink the ½ inch tubing first.
- g. Follow the following diagram to solder the wires to the transformer cables. Note: You may wish to use ¼ heat shrink tubing (pre-cut and fitted till after you solder on the transformer side wires, you will move them into place and shrink with a hair dryer or heat gun after soldering). If you don't use heat shrink tubing you can optionally use electrical tape to insulate your solder joints.

Molex Pin	Transformer Wire
Pin #1	F31X - Left
Pin #2	F31X - Right
Pin #3	F40X - Left
Pin #4	F40X - Right
Pin #5	F40X - Center

Note: you may cap with a small wire nut or with a small piece of heat shrink tubing, the center wire on F31X.

- h. If you are using a power entry module solder a small wire to the Power Entry Module's ground wire, then using a wire nut, connect the wire from pin #6 to the ground wire.
- i. You may now heat shrink any tubing you have not shrunk already.
- j. To test the supply, insert the fuse in the holder then turn on and using an A/C multimeter check the power in pins 1,2 and pins 3,4.

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