

1. Tools. (a) You'll need a heavy set of "dykes" (wire cutting pliers) to cut individual blade connectors off the reel. Mouser ships them all connected together and wound into a reel, it's your job to cut them off one by one. Don't even try to use your electronics-grade, precision wire cutters that are meant to nip off excess length from quarter-watt resistors, you'll dull those in 15 seconds. Get the tool you'd use to cut a wire coat-hanger in half. (b) I am glad I spent \$15 to purchase a set of metric Nut Drivers from Amazon. These are screwdrivers but instead of a blade at the end, they have a hex socket. They make quick work of tightening up the large number of hex nuts connecting the Amp Main Board to the heatsink. More importantly, they are sure and precise when tightening up the nuts that connect the IPS Daughter Board to the Amp Main Board. (c) Look into your heart and decide whether you want to spend \$2 for a "Bourns H-90" screwdriver from Mouser. It's 99% plastic except for the tip, so it won't create an electrical short circuit if you accidentally drop it into the guts of a live, powered-up Class A amplifier, while you're performing output offset adjustment on the trimmer potentiometers. Remove the pocket clip!

2. Jumpers. When you look at the amplifier main board, you'll see four white U-shaped markings inside the rectangle where the input stage module is bolted. Look for the text "I/O 1" , "I/O 2" , "I/O 3" , "I/O 4". The U-shaped markings are less than 1cm from those pieces of text. Just bend some scrap AWG22 wire into a U shape (resistor cut-off leads are perfectly fine too), stuff into the component side, add a piece of masking tape to hold it in place while soldering, and solder both ends on the back. Trim flush, remove tape, done. The purpose of these jumpers is to provide a safety backup, and a backup-to-the-backup, guaranteeing that the bolts are electrically connected to both sides of the amplifier main board. Even if the plated-through-holes somehow become no\_longer\_plated on this board. Yes we are preparing for a very unlikely tornado-during-earthquake event. But the cost of preparation is zero, so: why not?

3. WARNING: BLASPHEMOUS HERESY! DO NOT READ THIS! Some DIY builders of the M2 amplifier, using the very fine “Tea-Bag” circuit board, have reported a problem to the diyAudio forums. Their M2 amplifier’s output offset voltage is negative, and no setting of trimmer resistor RV1 removes this negative offset. I would like to gently mention a possible fix: leave R7=47K, but change R6 to 37K and change RV1 to 20K. Now (R6+RV1) can vary from 37K to 57K, in other words, from (10K less than R7) to (10K more than R7). This lets you null out *either polarity* of offset voltage. However, to faithfully reproduce Nelson Pass’s original M2 design, the M2X schematic and PCB silkscreen do not include this modification. M2X has R6=47K and RV1=5K. If you decide to make this R6,RV1 modification *on your M2X*, don’t tell anyone. And don’t quote me.

4. The silkscreen text on the M2X amplifier board, and the text on the M2X schematic diagram, calls out three different grounds.

**GND.I** is the input ground, the second wire in the two wire pair which connects the input jack to the amplifier PCB.

**GND.P** is the power ground. There are two twisted pairs of wires which connect the amplifier board to the PSU board. One twisted pair is (**VPOS** and **GND.P**), the other twisted pair is (**VNEG** and **GND.P**). The connectors for **VPOS** and **GND.P** are placed close together for easy wiring. Similarly the connectors for **VNEG** and **GND.P** are placed close together for easy wiring.

**GND.O** is the (optional) output ground. If desired, you can connect a twisted pair of wires between the amplifier board and the loudspeaker output jacks: (**OUTPUT** and **GND.O**). However many builders find that hum and noise is reduced if the speaker ground is connected on the PSU circuit board rather than on the amplifier circuit board. Try them both and see which you prefer.

5. Capacitor “C0” is not present in the original M2 amplifier by Nelson Pass. The M2 owner’s manual explains that this makes it easier for tube preamps to drive an M2. However C0 does perform a useful function: together with input resistor R1, it filters (removes) unwanted radio frequency interference. The transformer’s HF rolloff helps too. I suggest that if you’re absolutely certain you’ll never drive M2X with a tube preamp, never ever ever, consider soldering C0 into the amplifier board. C0 is a NP0/C0G ceramic capacitor, 50 volts, 220 pF. Of course you can cut it out later if you change your mind.

6. Assembly Sequencing. Here is my suggested order in which to stuff and solder the components on the amplifier main board.

i. Diodes D1-3

ii. All resistors Rnn except 3W parts R13 and R14. If you use a resistor lead forming tool (like the Sparkfun TOL-13114), you will quickly discover that the small resistors need their leads bent to 0.50 inch pitch (12.5 mm).

iii. C1 and (if you so choose!) C0.

iv. Q5, Q6, Q7

v. 3W resistors R13 and R14

vi. The Edcor transformer. Gently try both orientations, use the one that fits very easily. Tape down with a lot of masking tape before soldering.

vii. C2, RV1, C3, and CB3

viii. The six 1/4 inch blade connectors (VPOS, VNEG, OUTPUT, 3xGND)

7. Cleaning the PCB. Soldering leaves behind a sticky brown residue of flux which looks ugly and which can also degrade circuit performance. I like to clean my PCBs using a toothbrush and some 99% alcohol, either 99% Isopropyl or 99% Ethyl

(Ethyl alcohol is sold in the USA as “Denatured” – with trace amounts of poison added to discourage people from drinking it). If your grocery store and your pharmacy don’t carry it (look in the First Aid section), try the paint department of a big-box home improvement store like Lowes or Home Depot. It’s used to thin shellac and other varnishes.

Flood the board with 99% alcohol, give it a good scrub with the toothbrush, rinse with alcohol. Do this at least 3 times – solder flux leaves a hazy film even at very low concentrations. Then I flood one more time and scrub with a big wad of clean toilet paper. Somehow the wiping plus absorption of the TP gives superior results. A last flood of alcohol to rinse off the TP fluff, and then dry with a pistol shaped hair blow-dryer on low heat setting. Your PCB is now clean and beautiful and ready for glamor photos.