

# CAPI LC53A 3-Band Equalizer Kit

All Discrete • Vintage Style • 500 Series Format



## Required Tools, assembly tips and pointers:

These can be found in the VP2x Assembly Guide. All of the tips and pointers there relate to this build as well. The main difference to point out is that it's not really needed or recommended to solder from the top first. The boards go together just fine with the old method of installing the component, holding in place while flipping the board over, then slightly bending the leads outward to hold it in place. Next solder from the bottom and trim the leads. Leave the top of the PCB as is, except where noted.

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**\*\*Time to begin, I start with the Main-PCB\*\***

1. Following the BOM, fully populate the Main-PCB but **DO NOT** install J1 or the EA2503.
2. Once complete, connect to your bench PSU to confirm proper DC voltages at the opamp sockets.
3. Load a known good and working opamp into position A1. If you have not built one of my modules before and are uncertain, you can view the DOA pointers page at my website.  
The link is here: [http://capi-gear.com/catalog/DOA\\_Install.php](http://capi-gear.com/catalog/DOA_Install.php)
4. Follow the instructions in the “*VC528-ST2-CMRR-Adjustment.pdf*” to adjust the RV1 trimmer. You can connect your monitor’s probe to the negative side of C2. If you need to connect to ground (my AP doesn’t), an easy thing to do is insert a fresh DOA pin into the C socket of A2. Just be sure to make the initial connection with the power off. Also make sure your alligator clip or whatever will not pop off and short to any of the open DC connections.
5. Add the nail polish to the adjustment screw and set this PCB to the side.

**\*\*Prepare to stuff the Cut/Boost PCB\*\***

1. I recommend starting with the small sockets for the Discrete Followers and the DTO5 opamps. These can **only** have minimal solder from the **top only**. **DO NOT** solder at all from the bottom. Install a few besides the “C” holes first to get the feel for it. The “C” holes are the toughest to do since they connect to the ground plane which is on the same side we are soldering from. Each kit contains 3 extra sockets just incase some get ruined. I run my iron around 740F which works very well for these. If you have trouble, you can try to tin the top of the solder pad, let it cool, then insert the socket, heat and apply a little solder. Too much solder *inside* can be a problem though.
2. Before proceeding, it is **imperative** to point out that each and every single pin and lead at the bottom of this PCB must be trimmed as close as possible to the PCB. Big-ass blobs of solder and long leads protruding can easily short out to the steel enclosure, once fully assembled.

**\*\*Tip:** I have been using a nice pair of CHP-170 cutters I bought new from an eBay store. They are inexpensive and are the best I have used for shearing *thru* the solder joint and getting close to the PCB. Actually, if you are not careful, you can completely trim thru the solder pad itself. These neat trimmed lead joints also make for much easier cleaning of the PCB, if you do that.

3. Locate and install all resistors. The appropriate bags are clearly marked. Trim all the leads close to the PCB.
4. Locate and install all capacitors. The appropriate bags are again clearly marked. Trim all the leads close to the PCB.
5. Install the J3 and J4 headers. Trim all the pins close to the PCB. Install both gray shunts onto the headers in the HiZ position.

**\*\*Tip:** **DO NOT** install SW2 or SW3 until after installing LED1.

6. Install the pushbutton SW1. Trim all the pins close to the PCB.
7. Install the Grayhill rotary switches SW4 and SW6, (**not** SW3 at this time). Refer to the “*Grayhill stop-pins for CB-PCB.pdf*” document for proper stop-pin locations. Hold the switches tight and parallel to PCB. Trim all the pins close to the PCB.



**\*\*Tip:** I highly recommend checking the soldered Grayhill pin arrays with a lighted magnifier of some sort. It is very easy to short these pins together with excessive, sloppy soldering.

8. Install three of the 4-40 x 3/8" slotted pan head screws, from the bottom of the CB-PCB thru the three rear mounting holes securing each with an 1/8" standoff. No lock washers are used here. There is no room for them. For alignment, I center each standoff in its respective solder pad. Tighten them down as snug as you can.
9. Insert the 7-pin .1" header into the J5 position. **Do not** solder at this time.
10. Slip the Main-PCB assembly into place over the three screws and the 7-pin header. Gently hand snug the two 15/16" standoffs on the outside screws. Install a split lock washer and small pattern hex nut on the middle screw nearest to the 7-pin header.
11. Align the PCB sandwich with some sort of straight edge to make sure they are inline with each other. You can use your bench or table if it is flat and straight. Double check for 5.87" (149mm) from the front edge to the rear of the gold fingers. Once the boards are aligned, tighten the 15/16" standoffs and the small pattern nut with a 3/16" socket. I tighten these down about as tight as they will go without breaking anything.
12. Flip the assembly over (component side down) so the loose 7-pin header drops down to rest on the bottom of the Main-PCB. Solder the pins from the bottom of the CB-PCB. If you follow these steps, you will not need to trim the pins of this header at the bottom of the CB-PCB.
13. Flip the assembly over again (component side up) and solder the tops of the 7-pin header at the top of the Main-PCB. You can trim them down here if you want to but it's not totally necessary.
14. Install the red switch cap on SW1.
15. Insert the PCB assembly into the steel frame. With PCB tight to the front of the steel frame, install the two 4-40 x 1/4" Phillips round head screws into the rear of the PCB to the tapped frame.

**\*\*Tip:** Some gentle tweaking of the steel frame may be required. The steel is semi soft and flexible. It may have been slightly distorted as it has been shipped from the steel plant to the plating plant, back to the steel plant, then to me and now to you! So, some small adjustments are to be expected.

16. Gently and temporarily install the faceplate over the two Grayhill switch shafts. Hand snug the nuts on these Grayhills. Align the faceplate so it is parallel with the steel frame. The margin or distance past the steel frame should be equal on both sides. Adjust the PCB assembly so that the red switch cap is centered in its hole. The nuts need only be tight enough to hold things together. They do not need to be cranked down tight at this time. Remember, console tape on the socket's edge.
17. Install the LED into the hole in the faceplate. The leads of the LED should be facing downward at an approximate 45° angle, sloping towards the center of the PCB. This must be done or SW1 on the LC-EP-PCB will crush into the LED. I recommend fitting one of the loose Grayhills into the lowest frame position to verify that your LED placement is safe. The lower part of the LED's leads must be perpendicular to the PCB and not encroach into the space of the SW1 pushbutton. Make sure that the shortest lead goes to the hole that the arrow points to. Before soldering, install the two supplied 1/2" long pieces of heat shrink tubing over the lower parts of the LED's leads. Once soldered, Trim the leads close to the PCB.

**\*\*Tip:** If your LED doesn't illuminate when the button is engaged, you have it in backwards.



18. Remove the PCB assembly. Install the last Grayhill which is SW3. Trim all the pins close to the PCB.
19. Install the 3M .1" receptacles into the J1 and J2 positions, making sure they are flat and perpendicular to the PCB. Trim all the pins close to the PCB.

**\*\*Warning:** The receptacles **must** go on the CB-PCB and the long headers on the LC-EP-PCB. These cannot be flipped around or you will physically not be able to get the CB/Main-PCB assembly into the steel frame.

20. Take a cutoff lead from one of the larger capacitors, and use pliers to insert this lead into each of the twenty two DF and DTO5 sockets, to prep them for the pins. A similar concept to that of prepping the sockets for the 2520 style DOA's.

### **\*\*Final Items on the CB/Main PCB Assembly\*\***

1. Install the EA2503. The hardware for the transformer is packed separately in a small bag. The method is the same as described in the VP2x Guide. The extra flat washers go between the PCB and the transformer. Trim the leads as required. Try to be neat and keep the leads out of A2's space.
2. Install SW2 and SW5 on the CB-PCB, which are the mini C&K toggles. **Only** solder the rear center pin of each switch at this time.
3. Install the PCB assembly in the steel frame again and secure the two rear mounting screws. This time use a split lock washer on each screw as this *should* be the last time for this. Temporarily install the faceplate as described before. After aligning the faceplate, snug the nuts on the three Grayhill switches.
4. Solder the remaining pins on SW2 and SW5. Trim all the pins close to the PCB.
5. Remove the faceplate.

### **\*\*Build the Discrete Followers & DTO5 Opamps Following Their Build Instructions\*\***

#### **\*\*A Quick Test Before Continuing\*\***

1. Install all of the DF.2 and DTO5 assemblies in their respective positions. Gently push evenly and straight down, much like a 2520 style opamp. Since the pins for these devices are smaller in diameter, more care should be taken as they bend easier.
2. Install a known good working opamp into the A2 position of the Main-PCB.
3. Flip both Filter Switches down so they are in the off position.
4. Connect the module to a proper DC power source. I use a jig to keep the module flat on my bench but I see no reason why you can install in a 500 series rack if you support the front or leave the faceplate on temporarily. The module should now pass signal at unity gain. The position of the Grayhill switches does not matter as their wipers are not connected to anything yet. The On/Off pushbutton will only activate the LED at this time and not effect the audio signal. Assuming all is good, it's time to move on!

#### **\*\*Prepare to stuff the LC-EP PCB\*\***

1. Before proceeding, it is **imperative** to point out that each and every single pin and lead at the bottom of this PCB must be trimmed as close as possible to the PCB, same as done with the CB-PCB.



2. Locate and install all resistors. Trim all the leads close to the PCB. For the vertical resistors, I bend the lead at the top of the resistor around my smallest jewelers screwdriver. That way it doesn't get bent at the body and the lead has a nice round shape to it with no kinks. The circles in the silk designate where the R's body should go. I have seen guys not do this and it looks sloppy if not done right. No one wants that!
3. Install the five FET's. I alternate FET's when soldering so I don't over heat them. Trim all the leads close to the PCB.
4. Locate and install all capacitors. Make sure that the larger Nichicon film caps are tight to the PCB. If they are not flat and tight to the board, they could interfere with components on the CB-PCB when things are fully assembled. Trim all the leads close to the PCB.
5. Install all four inductors. Pay special attention to the angled notch that indicates the #1 pin for each part. Align it to match the angle in the silk. Some adjustment or straightening of the pins may be required. Pay special attention to keep the inductors flat and tight to the PCB. Trim all the pins close to the PCB.
6. Install the Grayhill switches in the following order. SW3, SW1 and then SW4. It is easiest to view that they are flat and parallel to the PCB when done in this order. Refer to the "*Grayhill stop-pins for LC-EP PCB.pdf*" document for proper stop-pin locations. Trim all the pins close to the PCB.
7. Install SW2 and SW5, which are the mini C&K toggles. **Only** solder the rear center pin of each switch at this time.
8. Install the two 3M 3-pin long gold headers in positions J1 and J2. Make very sure they are flat, tight and perpendicular to the PCB in both directions. Pre-assembly of the PCB sandwich before soldering these is not really necessary if the headers and the sockets have been installed carefully. Trim all the pins close to the PCB.

### **\*\*Final Assembly\*\***

1. If the Main/CB-PCB assembly is not installed in the steel frame you should do so now. Use the two 4-40 x 1/4" Phillips screws with split lock washers at the rear of the Main-PCB.
2. Insert the LC-EP-PCB into position by sliding it straight down making sure the long gold header pins all mate properly to their receptacles. You can verify this by looking thru the strategically placed vent holes in the steel frame. Tricky ☺
3. Tightly secure the LC-EP-PCB to the main assembly with the two remaining 4-40 x 3/8" slotted pan head screws.
4. Switch all four of the mini C&K toggles in the same direction. The faceplate will slide on easier if the switches are all pointing the same way.
5. Install the faceplate. **DO NOT** use the lock washers for the Grayhill switches. Just throw them out or save for another project. Finger-snug the nuts on the Grayhills. Check for proper alignment of the faceplate. The margin from the steel bracket to the edge of the faceplate should be parallel and equal on both sides. Once aligned, you can tighten the nuts. Remember the console tape tip on the end of the socket. The faceplates are anodized but can still be scratched if you use gorilla type force here so be careful. If the tape leaves marks or you have smudges to clean, just use a Q-tip or cloth and water. **DO NOT** use alcohol or any other chemical without testing on the back of the faceplate first. Some chemicals can damage the anodized finish.
6. Finish soldering all of the remaining pins on the two mini C&K toggles. Trim all the pins close to the PCB.



7. Before installing the steel cover, use a straight edge of some sort to make sure that none of the solder joints protrude above the edges of the steel frame. The heads of the slotted screws should be the tallest thing on the bottom of both of the PCB's in question. A piece or two of padded, double faced tape can be used in the middle of these PCB's to ensure there is no shorting to the steel cover. I have built a number of these now and never had a shorting problem though so this should not be necessary if you were careful during the build process.
8. Install the steel cover by slipping it over the frame assembly. Use the two 4-40 x 1/8" Phillips round head screws to secure the rear of the cover to the steel frame. Use the four 2-56 x 3/16" slotted pan head screws near the front of the enclosure. On some occasions, the four metal tabs on the steel frame will need to be tweaked a little so that everything lines up. Adjust as needed.
9. Use a pliers to turn each of the six Grayhill knob shafts so they are in the 3:00 position. This will make the knob install easier due to the set screw locations.
10. Install the colored inserts into the knobs. The blue is for frequency select and the gray will be for the cut/boost switches.
11. I install all three knobs on the frequency select switches first making sure they point to the 3:00 position. Rotate the switches to make sure the knobs are aligned properly.
12. Lastly, install all three of the cut/boost knobs making sure they all point to the 3:00 position. Rotate the switches to make sure the knobs are aligned properly.

**That's it!! Apply power and test this baby out!!**

### **\*\*The HiZ / LoZ jumpers on the CB-PCB\*\***

The typical and recommended start up position for these will be HiZ. If the EQ's are installed in a vintage API console with 600Ω faders, the jumpers can be set to the LoZ position. This basically increases the gain by around 1.5dB for a more unity gain device. From my research, there is no perfect world way to do this that does not mess a little with the cut/boost values of the respective filter. The swinging inputs topology is a little tricky this way and cannot be adjusted by just changing only one resistor. At least two need to be changed simultaneously, hence the two shunt jumpers.

