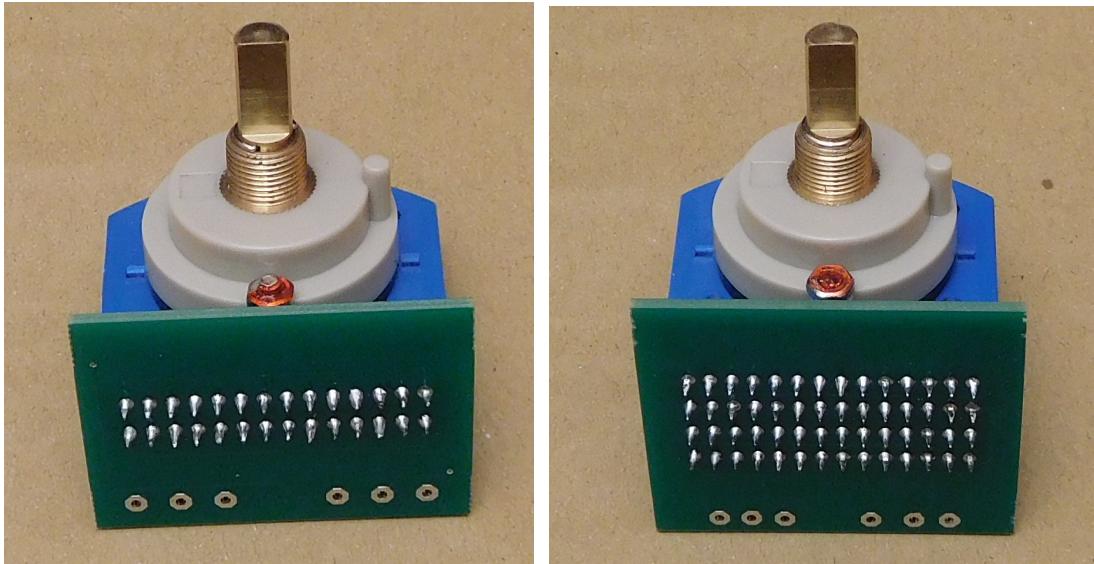


# ***STEPPED TONE CONTROLS FOR DYNACO'S PAT4 PREAMP***



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## **Section 1: About This Manual**

This manual gives the information you need to build and install stepped tone controls into Dynaco's PAT-4 Preamplifier. The old tone controls had special tapers that are now completely unavailable. These new stepped tone controls will work with either original Dynaco circuit boards or upgraded circuit boards, like Updatemydynaco's PAT4RENEW boards.

After some minor assembly, the new stepped tone controls are drop-in but also improved equivalents for the old tone controls.

The new controls combine precise 11-step rotary switches with custom designed and pre-assembled surface mount printed circuit boards. The frequency response of the controls is specified with respect to 1 kHz:

- Treble control, 11 steps of 2 dB each
  - Full counter-clockwise- 10 dB cut at 10 kHz
  - Full clockwise – 10 dB boost at 10 kHz
  - Centered position – flat.
- Bass control, 11 steps of 2 dB each:
  - Full counter-clockwise - 10 dB cut at 100 Hz
  - Full clockwise – 10 dB of boost at 100 Hz
  - Centered position – flat

If you install these stepped controls, there is no need to install a tone control bypass switch, since the center position of both controls gives perfectly flat frequency response.

Please note that there will be more shaping at frequencies higher than 10 kHz and lower than 100 Hz. The spec points given are elegant being at 10X and 1/10 of 1 kHz.

### ***Who Should Attempt this Project?***

You can build this kit if you can:

1. solder (using normal rosin core solder and a soldering iron).
2. use simple hand tools like screwdrivers, wire cutters, and pliers.
3. read and follow directions.

It helps if you:

1. know a bit about electronics, or
2. have a friend who knows a bit about electronics
3. can get to YouTube to watch a few helpful videos about the assembly process (not available as of this version of the manual)

### ***Tools You'll Need***

You'll need the following tools:

1. flat blade screwdriver for #6 screws
2. needle nose pliers (helpful, but not strictly necessary)

3. pencil type soldering iron of 25 to 50 Watts (no huge honking soldering guns or blowtorches)
4. wire cutters and strippers
5. Magnifying glass, if you're over 42!

## **Project Overview**

The project consists of the following steps:

1. Soldering the Treble PCB to the treble control.
2. Soldering the Bass PCB to the bass control.
3. Removing the original tone control pots.
4. Installing the new stepped tone controls.

## **Important Safety Notes**

By purchasing, using, or assembling this kit, you have agreed to hold AkitikA, LLC harmless for any injuries you may receive in its assembly and/or use. To prevent injuries:

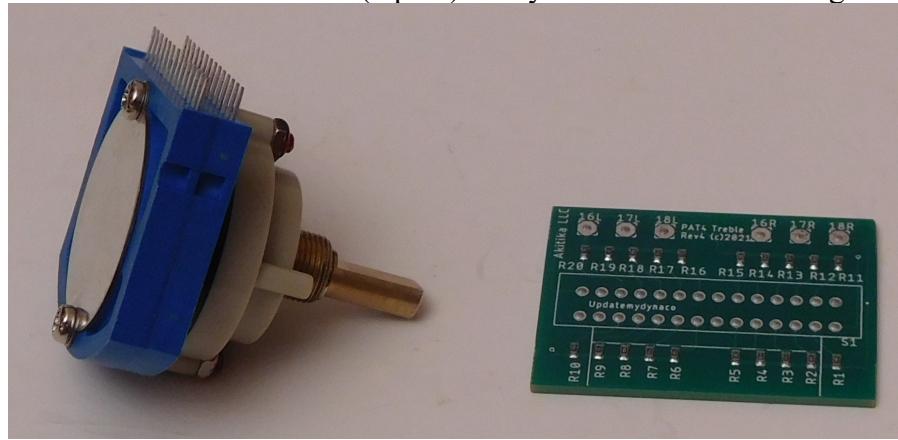
- Wear safety glasses when soldering to prevent eye injuries.
- Always unplug the power before working on the amplifier.
- Large capacitors hold lots of energy for a long time. Before you put your hands into the amplifier:
  - Pull the AC plug!
  - Wait 1 full minute for the capacitors to discharge!
- Remove jewelry, rings, and watches from your hands and wrists, or anything that might dangle into the amplifier.
- If working in the amplifier, keep one hand in your pocket, especially if you're near the power supply or power supply wires. This can prevent serious shocks.
- Build with a buddy nearby. If you've ignored all the previous advice, they can dial 911 or get you to the hospital.

## Section 2: Building the Treble and Bass Controls

This section details the process of building the treble and bass controls. It consists of soldering the pre-built surface-mount resistor boards to the 11 step switches. Warm up your soldering iron and clean the tip. The soldering your about to do will be much easier if your iron is tuned up and ready.

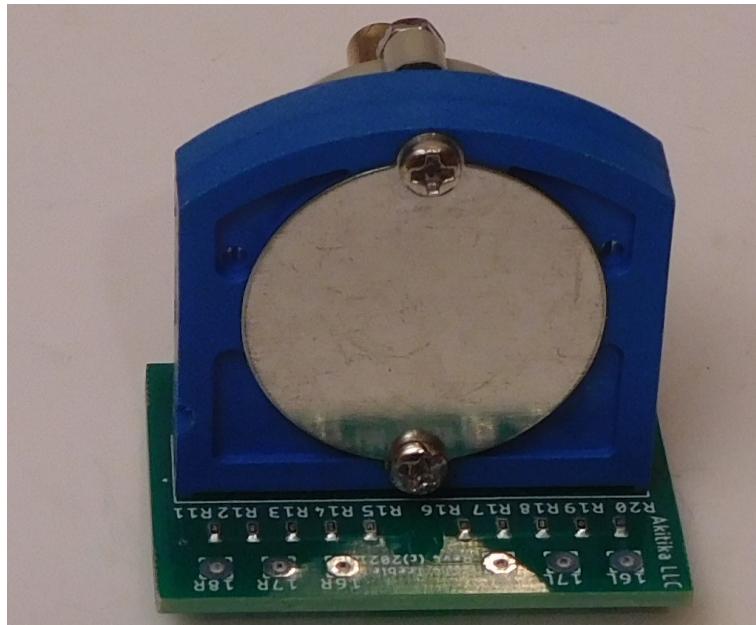
### ***Building the Treble Control***

Find the narrow PCB and the narrow (2 pole) rotary switch as shown in Figure 1.



**Figure 1-PCB and rotary switch for the treble control**

Fit the Treble PCB to the Treble Control so the result is as shown in Figure 2. The holes are snug, so we recommend keeping the plane of the board perpendicular to the body of the switch as you fit the board to the switch.



**Figure 2- PCB and rotary switch for the bass control**

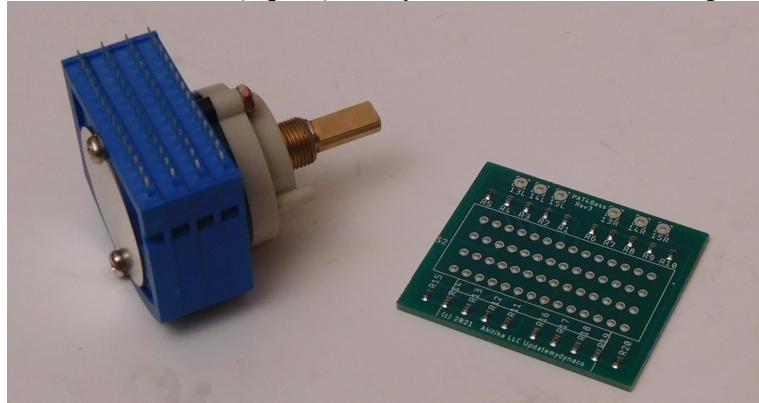
Solder two diagonal pins and double-check:

- All the switch pins project through the PCB.
- The PCB sits squarely against the body of the switch

Solder the rest of the pins. Inspect your results to assure that none of the pins have shorted to one another.

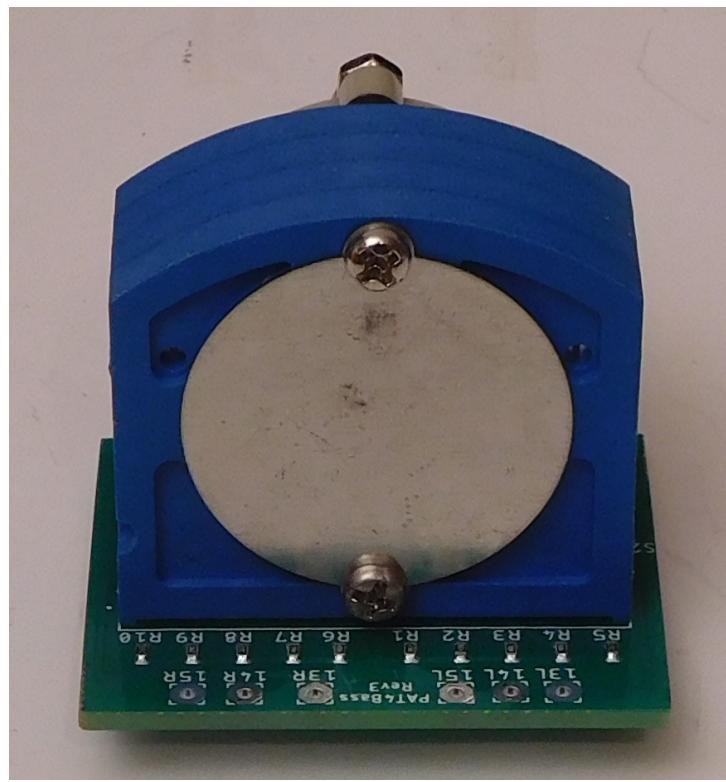
## ***Building the Bass Control***

Find the wide PCB and the wide (4 pole) rotary switch as shown in Figure 3.



**Figure 3-PCB and rotary switch for the bass control**

Fit the Bass PCB to the Bass Control so the result is as shown in Figure 4. The holes are snug, so we recommend keeping the plane of the board perpendicular to the body of the switch as you fit the board to the switch. This is especially important as there are 4 rows of contacts.



**Figure 4-Bass PCB fitted to the Bass rotary switch**

Solder two diagonal pins and double-check:

- All the switch pins project through the PCB.
- The PCB sits squarely against the body of the switch

Solder the rest of the pins. Inspect your results to assure that none of the pins have shorted to one another.

Here are pictures of the assembled treble and bass controls.

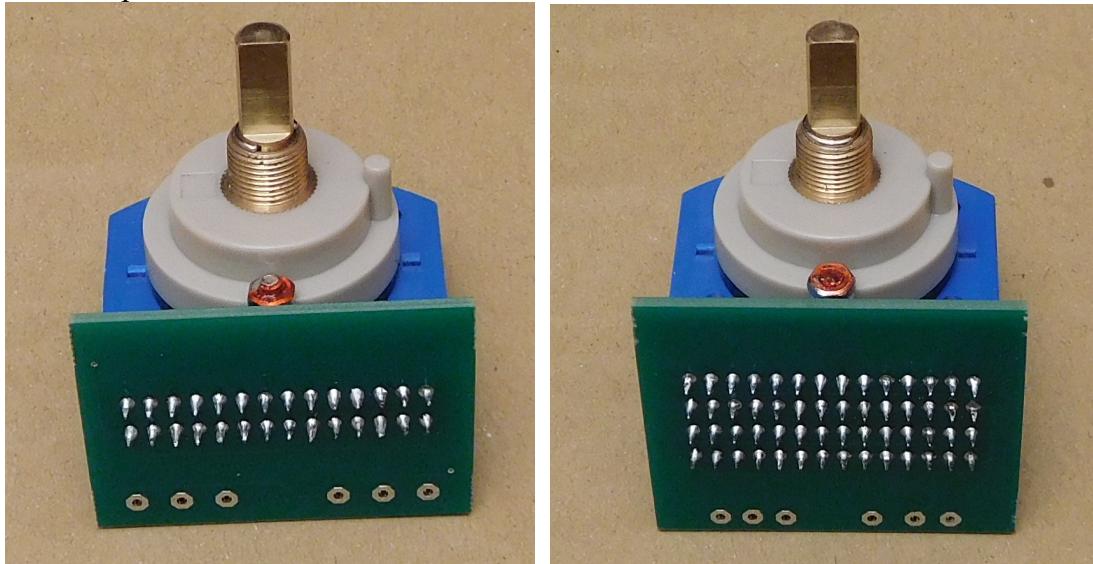


Figure 5-Assembled treble and bass controls

## Removing the old treble and bass controls

We recommend having a bowl handy for storing the parts you'll remove as you disassemble your PAT-4.

### Open the PAT-4

Disconnect the PAT-4 from your system:

- Make sure to unplug the power plug from the AC mains (wall socket). 120 volts or 240 volts of AC making a surprise appearance can be deadly.
- Disconnect all the other cables from your PAT4.
- Remove the 4 sheet metal screws that hold the cover in place. There are two screws along the bottom end of each side.
- Some PAT-4's have an additional screw that holds the top of the back panel to the cover. Remove that screw if it is present.
- Lift the cover straight up and off the PAT-4.

### Remove the Front Panel

Removing the front panel is the next step on the way to changing out the tone controls.

Here are the steps:

- Remove all the front panel knobs. Each knob is typically held in place by a small slotted set-screw. In some cases, the set screw might be a 1/16" Allen screw. Note the positions of the knobs and controls as this will help you re-install them in the correct position(s).

- Inspect the front panel and you'll see that it is held in place by nuts installed on the mounting bushings of some of the controls. Remove those nuts, make note of their position, and set them aside into your parts bowl.
- Remove the front panel and set it aside in a safe place.

### ***Removing the treble control***

Remove the nut from the bushing of the treble control that fastens it to the front panel.

Cut or de-solder the 6 wires that connect to the treble control. Make sure to cut or de-solder these wires at the tone control end. There is no need to label the wires as you can follow them back to the PCBs to observe the associated wire number. There are matching numbers on the treble PCB.

One set of 3 wires connects to the front (Right) PCB. The other set of 3 wires connects to the back (Left) PCB. It's probably helpful to keep the front set of 3 wires together, yet separated, from the back set of three wires.

Remove the old treble control and set it aside. It will no longer be used.

### ***Removing the bass control***

Remove the nut from the bushing of the bass control that fastens it to the front panel.

Cut or de-solder the 6 wires that connect to the bass control. Make sure to cut or de-solder these wires at the tone control end. There is no need to label the wires as you can follow them back to the PCBs to observe the associated wire number. There are matching numbers on the bass PCB.

One set of 3 wires connects to the front (Right) PCB. The other set of 3 wires connects to the back (Left) PCB. It's probably helpful to keep the front set of 3 wires together, yet separated, from the back set of three wires.

Remove the old bass control and set it aside. It will no longer be used.



Figure 6-Enlarge the locator tab holes for bass and treble controls

### **Enlarge the locator tab holes**

Just like the original controls, the new controls also have locator tabs that keep the control in place. You'll have to enlarge the existing locator tab holes in the chassis in order to fit the tabs of the new controls. Use a 3/16" drill to get close. The actual hole size you'll need is a bit closer to 7/32". But first:

- Form a catch-basin of masking tape or packing tape behind the locator hole. This should catch most of the shavings generated by drilling the hole.
- Once the hole is drilled, smush the catch basin of tape toward the front panel to help pick up the stray metal shavings.
- Remove the tape and the metal shavings.

Make a test fitting of the new controls to check the size of the hole.



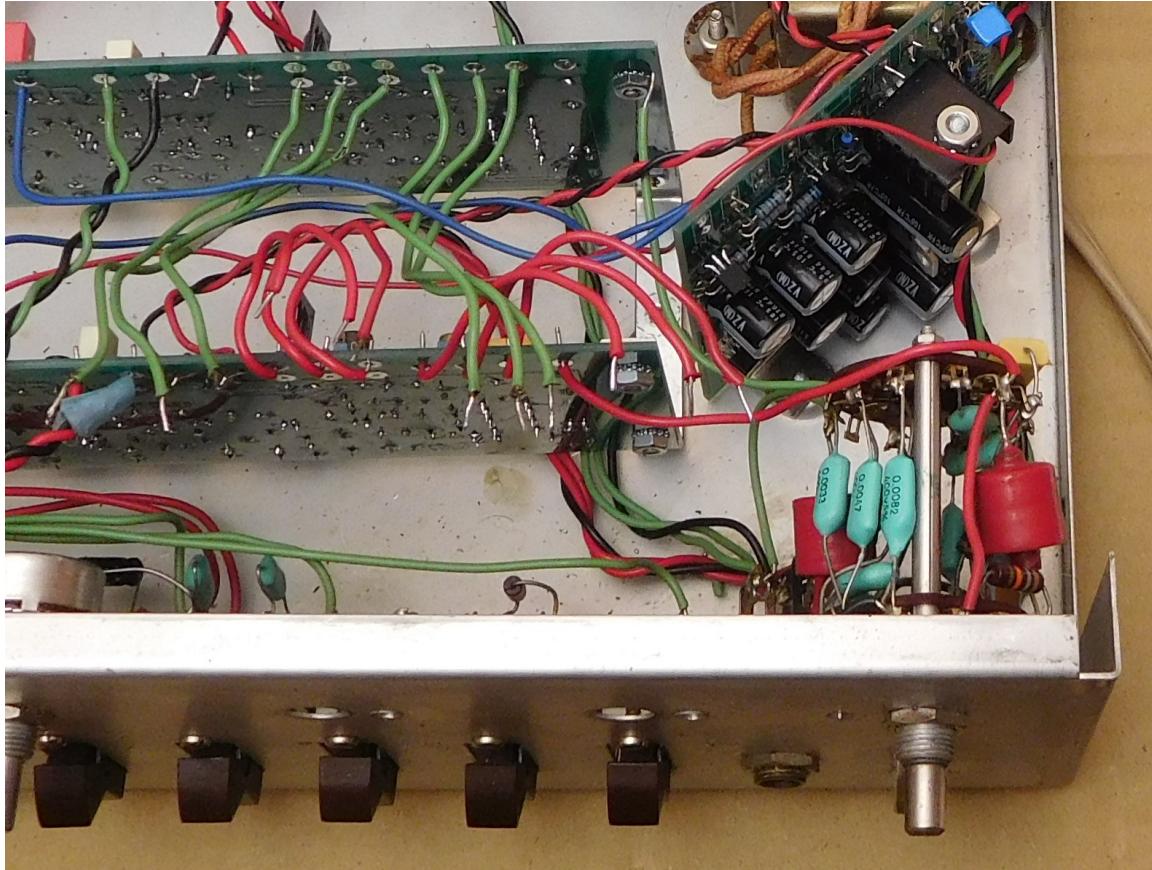
Figure 7-You may have to swing the electronics out of the way

### **Solder in the new (stepped) treble and bass controls**

Here are some general instructions for installing the new treble and bass controls:

1. Make sure that the wires will be long enough to allow the controls to be installed.
2. Wire the controls before you install them into the front panel.
3. Double check the wire numbers at both ends before soldering them in place.
  - a. L or LEFT wires go to the rear preamp channel PCB.
  - b. R or RIGHT wires go to the front preamp channel PCB.
4. There are 6 wires for the bass control. There are 6 wires for the treble control.
5. The twelve wires should have clean and straight ends that will allow them to pass into the holes on the PCBs.

6. Insert the wires into the silk screen side of the PCBs. Solder the wires on the solder side of the PCBs.



**Figure 8-wires ordered for easy installation**

Inspect the twelve wires that connect the treble and bass controls to the channel circuit boards. Make sure that the PCB numbers on the channel circuits match those on the treble and bass PCBs.

- 6 wires for the treble control.
- 6 wires for the bass control.

### **Installing the Tone controls**

At this point, the 12 tone control wires should be connected. To install the tone controls into the front panel:

1. Orient the controls to point in the same direction they will face after installation.  
At this point, they will probably be above the circuit boards.
2. You will probably find that you must move the channel PCBs a bit to install the bass control. I have found that removing one of the U-bracket mounting screws lets me swing the board set out of the way, allowing me to install the bass control into the front panel.
3. Place a washer over the bushing of the treble control.
4. Place a washer over the bushing of the bass control.
5. Be careful not to let these washers drop off the controls.

Depending on how your PAT-4 was wired, you may have to temporarily disconnect a wire (or wires) to allow the board to swing back. Label each disconnected wire as soon as you disconnect it so you can get it back in the right place! In Figure 7 you'll notice that I had to temporarily disconnect the rear PCB wire that connected to pin 19.

1. Insert the bass control into its front panel opening.
2. Insert the treble control into its front panel opening.
3. Make sure that the locator tab fits into the newly enlarged locator holes.
4. Add a nut to the bass control bushing to fasten the bass control to the front panel.
5. Add a nut to the treble control bushing to fasten it to the front panel.

## Reassembling your PAT-4

Re-install the front panel on the chassis. Hold it in place using whatever control nuts were previously used. You may want to also use nuts on the new bass and treble control. This part of the re-installation may take a bit of judgement as the mechanicals vary a bit from box to box.

If you removed one of the u-bracket mounting screws to swing the boards out of the way, move the boards and brackets back to their normal place and reinstall the mounting screws.

Install the new bass and treble knobs. Your note that the two sets of split knobs have been replaced by two single knobs that adjust both channels in tandem. To get the new treble and bass knobs in the right position:

- Set the shaft with the flat side parallel to the ground.
- Install the knob with the set screw facing down.

This will put the control in the center position that gives flat frequency response. From there, there will be 5 positions to the clockwise stop, and 5 positions to the counter clockwise stop.

Re-install the rest of the knobs. The new knobs are slightly different than the old knobs. You may find you like the look of different knobs for bass and treble. You may also find that you prefer to make all the knobs look the same. Similar new style knobs will shortly be available on the web-site.

Fit the cover onto the chassis. Note that the cover is not symmetric. Only one orientation will cause the mounting holes in the cover and the chassis to line up.

Re-install the 4 (or perhaps 5 screws) that hold the cover in place.

Your PAT-4 is ready to be re-installed into your sound system.