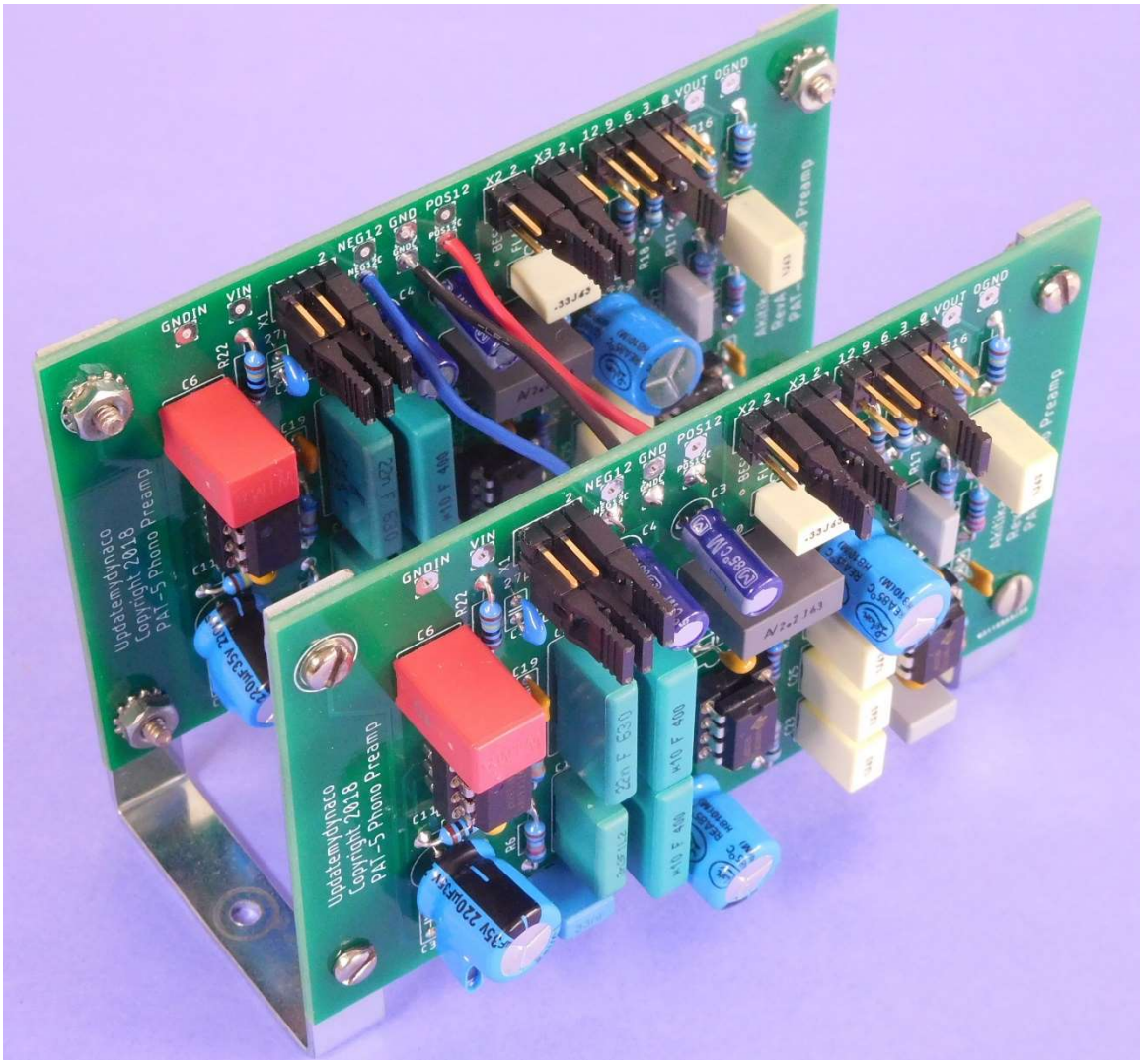
PAT-5 PREAMP
UPGRADED PHONO STAGE



INSTALLATION MANUAL

Revision 2p02 September 16, 2018

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Section 1: About This Manual

This manual gives the information you need to replace and upgrade the phono preamp boards (PC-33) of a Dynaco PAT-5 preamp, either the original or the BI-FET version. When you install this kit, you'll get better sound as you:

- Build onto a circuit board with a ground plane and decoupling capacitors, assuring greater stability and more rejection of high frequency interference,
- Replace noisy 10% carbon composition resistors with quiet 1% metal film resistors,
- Replace 40+ year old electrolytic capacitors with new film capacitors
- Reduce distortion and noise by using metal film resistors, better opamps, and more linear capacitors.
- Gain switchable high-pass filters to remove rumble, warp, and arm resonance effects that steal power and make your woofers flap.
- Get switchable gain, to maximize SNR and keep your volume control in the sweet spot.
- Get the best possible sound with selectable cartridge loading.
- Get one of the quietest preamps out there, since this design uses the same "electronic cooling" we use in the PR-101's PHONOZ preamp.
- Get incredibly accurate equalization, giving you exactly the sound the recording artists had in mind.

Who Should Attempt these Projects?

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, and
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 and Supplies You'll Need

You'll need the following tools:

1. flat blade screwdrivers for #4 and #6 screws, #2 Philips head screwdriver
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. de-soldering tools (see Appendix 1)
6. Magnifying glass, if you're over 42!
7. A multi-meter for measuring Ohms and DC volts is a *really good idea*. With it, you can double-check your reading of the color code, making sure you get the right resistors in the right location.

Recommended Solder

The kit must be assembled with 60/40 Rosin Core solder. The recommended diameter is 0.032 inches.

Project Overview

Broadly, the project consists of the following steps:

1. Building the new circuit boards.
2. Unplugging the PAT-5 and removing the cover.
3. Upgrade the power supply if currently Rev D or earlier. There is a $1.99 kit we offer, PAT5EUP, that you must apply to the Rev D or earlier power supply to allow it to deliver the extra current needed by the phono stage.
4. Installing the newly built circuit boards.
5. Re-attaching the wires to the circuit boards.
6. Reassembling the PAT-5.

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 equipment.
- Large capacitors hold lots of energy for a long time. Before you put your hands into the equipment:
    - Pull the AC plug!
    - Wait 1 full minute for the capacitors to discharge!
- Remove jewelry and rings 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 New Preamp PCBs

Overview

The listed procedure will be repeated for both left and right channel PC boards. In general, you will:

- Install the indicated component from the component (silk-screen) side.
- Solder the component on the solder side of the PCB.
- Make a check-mark the left or the right channel board as you complete the step.

You may find it convenient to install all resistors of one value first, as they will usually (but not always) be found taped together.

You'll begin with the components that sit closest to the board, and eventually move to the taller components. Begin with the resistors.

Use a Soup Bowl

Empty the contents of ***just one*** of the Channel parts envelopes into a broad, flat soup bowl. It will make it easier to find the parts. This makes building the PC boards more pleasant. It also minimizes the chance of losing a part on the floor.

Figure 1-Use a soup bowl with the contents of 1 channel envelope to build 1 channel

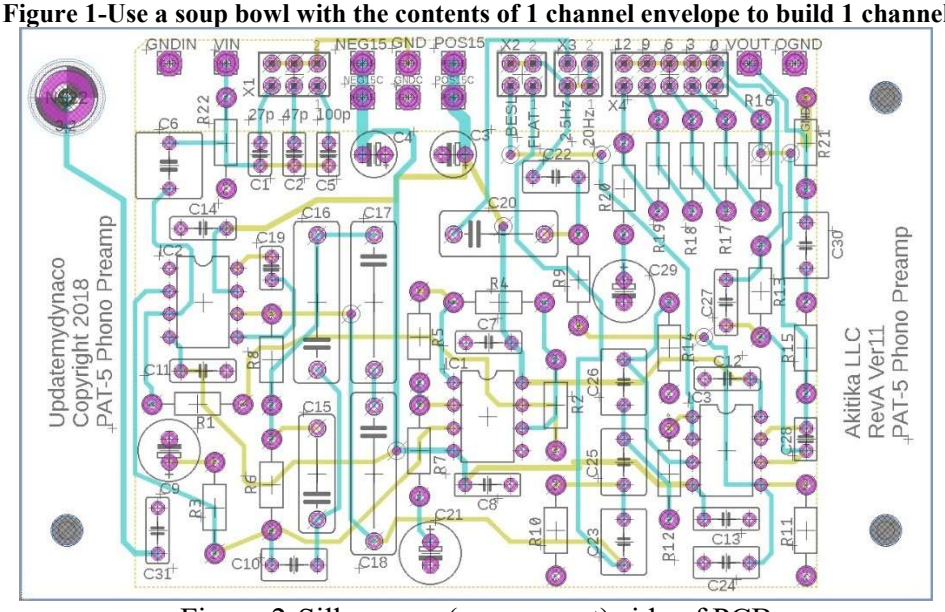

Figure 2-Silk screen (component) side of PCB

Install the resistors

If you'd like to use a lead-bender for the resistors, 0.4" works well for all the resistors. I strongly recommend using good light, magnification if necessary, and a digital ohm-meter to verify the correct resistor value before you install it.

Desig	Value	Color Code	LEFT Done ✓	RIGHT Done ✓
R20	1k	Brown, black, black, brown, brown		
R9	1K18	Brown, brown, gray, brown, brown		
R16	1k18	Brown, brown, gray, brown, brown		
R1	1Meg	Brown, black, black, yellow, brown		
R21	1Meg	Brown, black, black, yellow, brown		
R22	1Meg	Brown, black, black, yellow, brown		
R3	221	Red, red, brown, black, brown		
R7	221	Red, red, brown, black, brown		
R15	221	Red, red, brown, black, brown		
R11	23k2	Red, orange, red, red, brown		
R13	24K9	Red, yellow, white, red, brown		
R2	2K0	Red, black, black, brown, brown		
R4	2K0	Red, black, black, brown, brown		
R14	31K6	Orange, brown, blue, red, brown		
R19	412	Yellow, brown, red, black, brown		
R5	4K22	Yellow, red, red, brown, brown		
R18	590	Green, white, black, black, brown		
R6	5K23	Green, red, orange, brown, brown		
R12	5K62	Green, blue, red, brown, brown		
R8	63K4	Blue, orange, yellow, red, brown		
R17	825	Gray, red, green, black, brown		
R10	8K06	Gray, black, blue, brown, brown		

Install the small capacitors

Install these small capacitors. They are non-polar. Either orientation works fine. All the non-polar capacitors in this section have 10% or better tolerance unless otherwise indicated.

Desig	Value	Identification	LEFT Done ✓	RIGHT Done ✓
C7	0.1µF@50V	Marked 104, radial leads, ceramic		
C8	0.1µF@50V	Marked 104, radial leads, ceramic		
C11	0.1µF@50V	Marked 104, radial leads, ceramic		
C12	0.1µF@50V	Marked 104, radial leads, ceramic		
C13	0.1µF@50V	Marked 104, radial leads, ceramic		
C14	0.1µF@50V	Marked 104, radial leads, ceramic		
C27	0.1µF, film	Marked 100n, gray box, or µ1J100, blue box		
C17	0.1µF@1%	Marked µ10 F 400, green box		
C18	0.1µF@1%	Marked µ10 F 400, green box		
C22	0.33µ@63VFilm	Marked 33J, off-white box		
C19	10 pF	Marked 100, radial leads, 0.1" spacing		
C5	100 pF	Marked 101, radial leads, 0.1" spacing		
C28	100 pF	Marked 101, radial leads, 0.1" spacing		
C31	0.01 µF@250V	Marked 0.01 250, red box		
C23	1µ@63V_FILM	Marked 1J63, off-white box		
C25	1µ@63V_FILM	Marked 1J63, off-white box		
C26	1µ@63V_FILM	Marked 1J63, off-white box		
C30	1µ@63V_FILM	Marked 1J63, off-white box		
C20	2.2µ@63FILM	Marked 2.2J63, gray box		
C16	22nF@1%	Marked 22nF 630		
C1	27 pF	Marked 270		
C24	2n2 film	Marked 2n2, gray box		
C10	33n@100	Marked 33nF, 1% tolerance		
C15	3n3	Marked 3n3F		
C2	47 pF	Marked 470		
C6	4µ7@63	Marked 4.7µF63		

Install the Electrolytic capacitors

Electrolytic capacitor are polarized. You must observe the correct polarity. Make sure that the negative sign on the capacitor is at the ***opposite*** end from the ***positive sign*** on the silk-screen.

Desig	Value	LEFT Done ✓	RIGHT Done ✓
C9	220µF@16V		
C21	220µF@16V		
C29	220µF@16V		
C3	22µ@50V		
C4	22µ@50V		

Install the Opamps (or sockets)

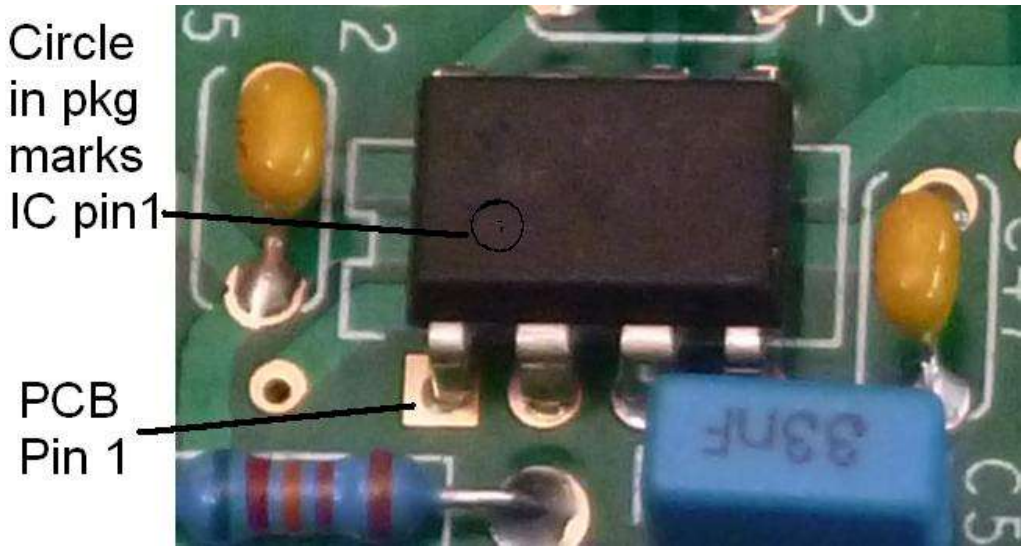

Figure 3-Locating pin 1 of the IC and pin 1 of the PCB

The installation procedure has two possible variations at this step.

- If you purchased the basic kit, you will solder the opamps directly into the PC boards.
  - Refer to Figure 3 for the correct orientation of the opamps.
  - Make they are correctly oriented. ***Double check that you have installed 5532's where indicated, and 5534's where indicated***. They are no fun to remove if you get them wrong.
  - Solder just two diagonal corner pins first. Inspect your work to be sure that the IC sits flat on the board. Re-heat and adjust the pins if necessary.
  - Solder the remaining pins once you're sure that the IC sits flat.
- If in addition, you purchased gold plated sockets, then you will instead solder the sockets into the board, and then install the opamps into those sockets in a later step. If you're installing the sockets, refer to Figure 4.
  - Make sure the socket is correctly oriented. They are no fun to remove.
  - Solder just two diagonal corner pins first. Inspect your work to be sure that the socket sits flat on the board. Re-heat and adjust the pins if necessary.
  - Solder the remaining pins once you're sure that the socket sits flat.

Desig	Value	Marking[1]	LEFT Done ✓	RIGHT Done ✓
IC1	Dual Opamp, NE5532 (or gold-plated socket)	5532		
IC2	Single Opamp, NE5534 (or OPA1161 in an SMT to thru hole adapter, if you purchased that option)	5534		
IC3	Dual Opamp, NE5532 (or gold-plated socket)	5532		

[1] There may be more numbers and letters on the package, but the presence of these numbers is enough to correctly identify these parts.

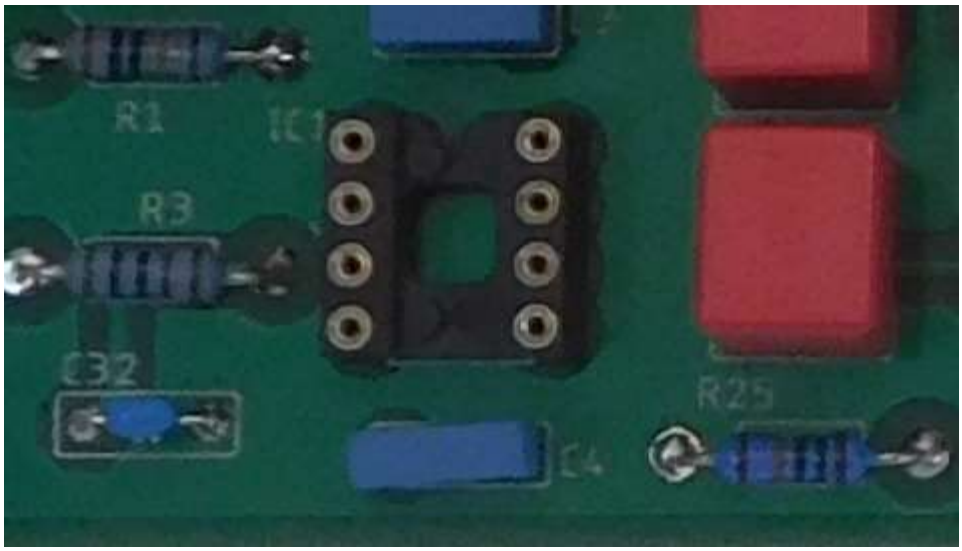

Figure 4-Socket Installation. Make sure that the socket shape matches the silk screen outline.

Install the Selector Pin Fields

Install the selector pin fields using the following check-list. Hint: Begin by soldering just one corner pin to make sure the pin-field sits straight and level. That makes it easy to re-heat and adjust the pin-fields if they're a bit crooked. Once the pin fields are straight, solder the remaining pins.

Selector Pin Fields			
Desig	Description	LEFT Done? (✓)	RIGHT Done? (✓)
X1	3x2 pin field for cartridge loading. Insert the short side into the PCB.		
X2	2x2 pin field. Insert the short side into the PCB. It selects either Bessel HP or flat Low frequency		
X3	2x2 pin field. Insert the short side into the PCB. It selects between a 2.5 Hz high pass or a 20 Hz high pass.		
X4	2x5 pin field. Insert the short side into the PCB. Gain Select.		

Install the PC boards on the brackets

Use Figure 5 to guide your installation of the PCBs, mounting brackets, and screws. We have supplied 4-40 keps nuts (nuts with built-in lock washers) to make reassembly easier.

Install power and ground wires between the boards

Cut 1.75” lengths of the following wires:

- Red 22 AWG solid
- Black 22 AWG solid
- Blue 22 AWG solid

Remove 1/4” of insulation from the ends of each wire. Use the lower terminals of each pair to connect power wiring between the two boards:

- POS15C
- GNDC
- NEG15C

Refer to Figure 5 for installation details. Solder the wires as shown, soldering the back board from the solder side, and the front board from the components side.

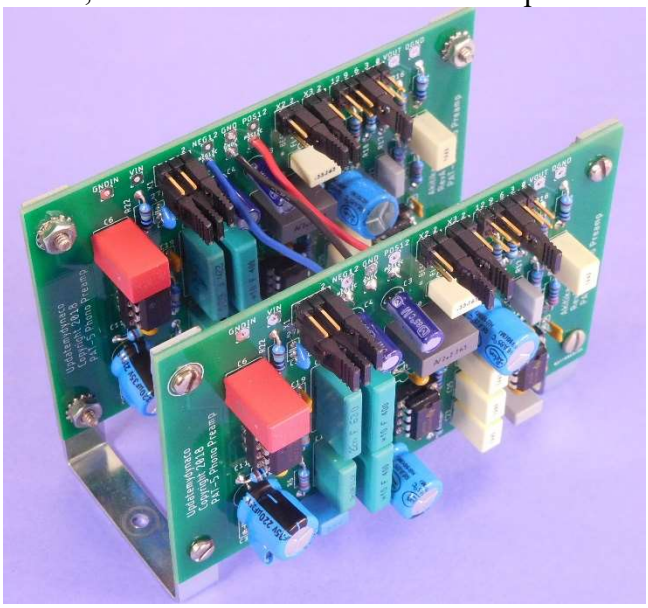

Figure 5-Installing common ground and power wires

Section 3: Modify the Power Supply (if needed)

If your PAT-5 has the original Dynaco power supply, you must change it out for the Updatemydynaco power supply, Rev E or later.

If your PAT-5 has the Updatemydynaco power supply, Rev D or earlier, then you’ll have to apply the PAT5EUP kit.

Remove the Cover

1. Disconnect the PAT-5 from your music system.
2. Unplug the power cord and allow the PAT-5 to sit for one minute before moving on.

Caution: Be sure that the power is unplugged! 120 VAC can be lethal! 240 VAC can be lethal!

3. Remove the 5 screws that hold the cover in place, 2 on the left side, 2 on the right side, and one in the center of the back cover. Do you need more screws? Here's a link: https://www.updatemydynaco.com/storeindex.html#5CS
4. Lift the cover straight up and set it aside in a safe place.

Modify the Power Supply if Rev D or earlier

If your power supply is the original Dynaco power supply, you will need to replace it. Purchase Rev E or later from the Updatemydynaco web site.

When you change the phono preamp boards, you no longer need 42 volts.

The phono preamp runs from plus/minus 15 volts, just like the line stage does. Thus, if your power supply is Rev D or below, you'll need to modify it to deliver the additional plus/minus 15 volts.

Here are the steps:

1. Download the PAT5 Power Supply Manual for the directions on how to remove the power supply and the wall.
2. Replace R3, a 4.7 Ohm resistor, with the 2.49 (Red, yellow, white, Silver, Brown) Ohm resistor supplied in the PAT5EUP kit.
3. Change U3's heat sink from the original heatsink to the taller heat-sink supplied in the PAT5EUP kit.
4. Re-install the power supply and test the plus and minus 15-volt outputs before going on.

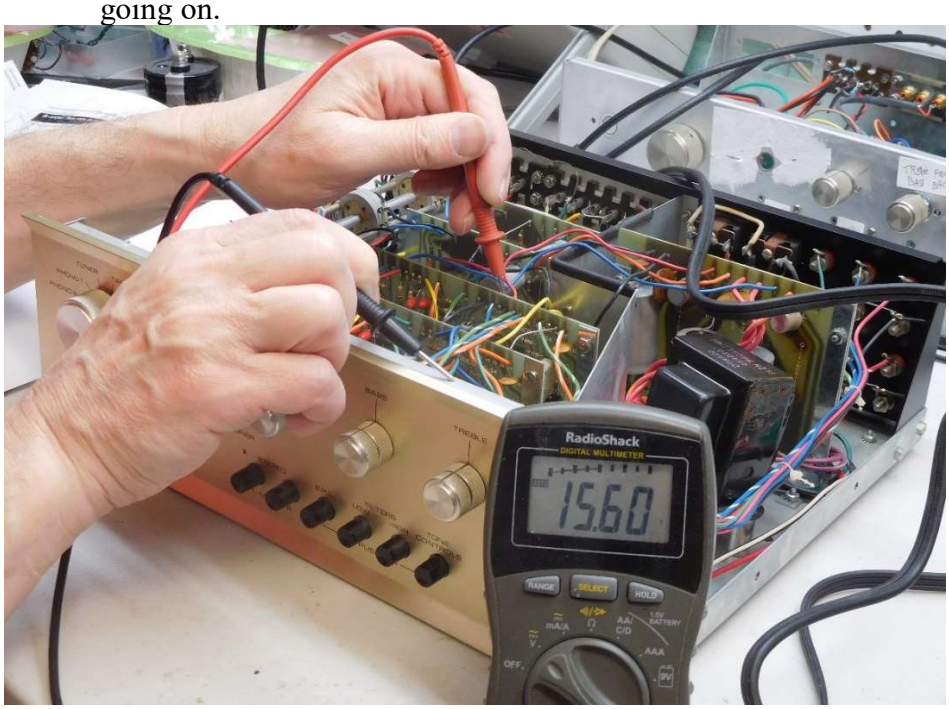

Figure 6-Measuring power supply DC Voltage. Note that black meter lead is held in contact with the chassis (ground)

With the top still off, plug in the AC mains. The PAT-5 circuits are always powered once the preamp is plugged in[2]. Set your meter to DC volts. Connect one lead of the meter to circuit common (some people would say ground). Please note that the chassis is circuit common (ground)[3].

Be careful! These steps are performed with the power connected and turned on!	Done ✓	Done ✓
The voltage on eyelets 18 and 19 of both preamp (PC-34) PCB's should measure +15+/-1.0 Volts (with respect to ground).	☐	☐
The voltage on eyelets 15 and 16 of both preamp (PC-34) PCB's should measure -15+/- 1.0 volts (with respect to ground).	☐	☐

If your voltage readings are significantly different, it could indicate either a power supply problem, or a problem with your original PCB's. There are a couple of possibilities:

1. The voltages are in tolerance. Move on to the next section.
2. The voltages are too low:
    a. The problem could be with components on the preamp circuit boards. Best thought is to continue on to the next section to install the new PC boards.
    b. You might have made an error while updating the power supply
3. The voltages are too high:
    a. You may have made an error while updating the power supply.

In either event, if the voltages are out of tolerance, troubleshoot the power supply before going on.

[2] Some early PAT-5's switched power to the preamp circuits.
[3] It has no connection to "Green Wire Ground", but that's another story.

Preparing to Remove the Circuit Boards

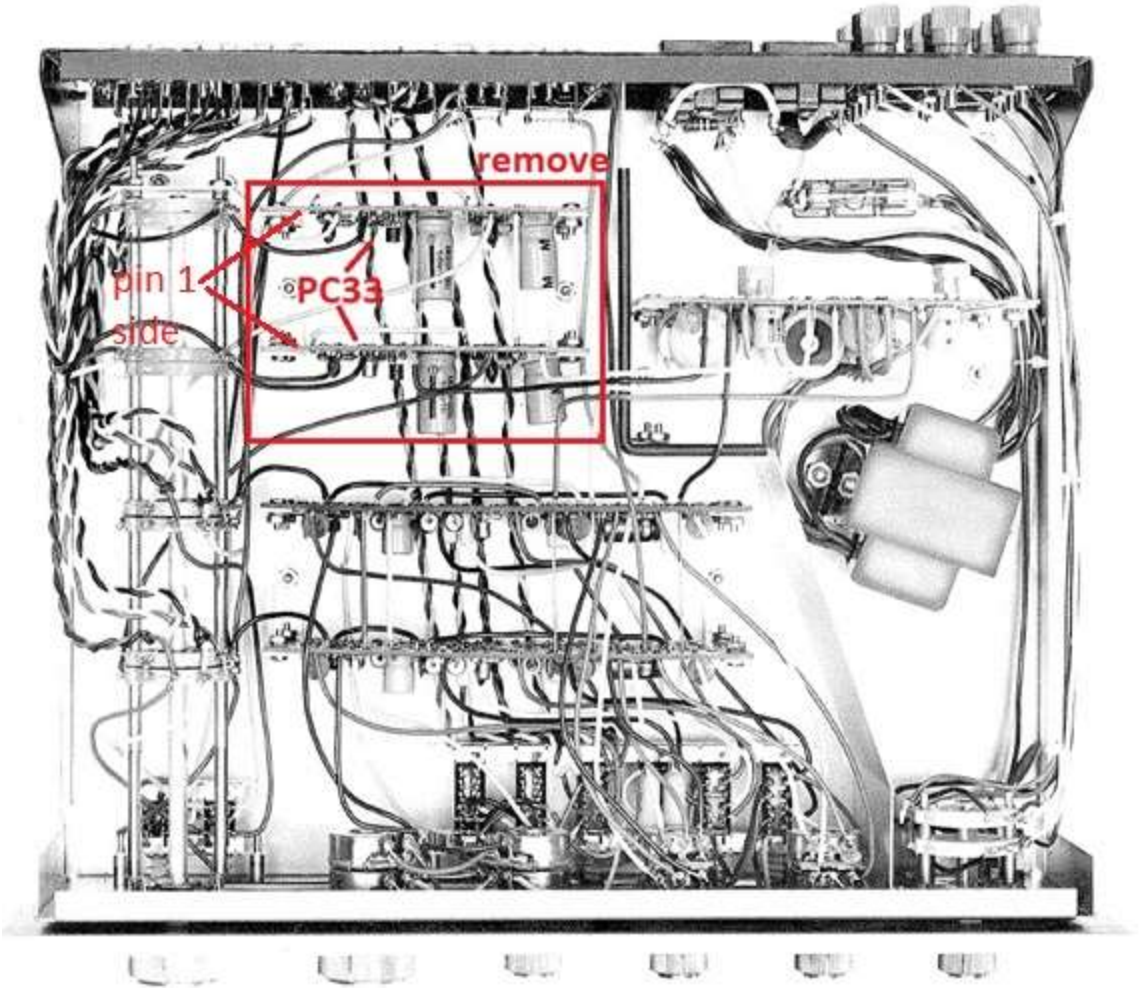

Figure 7-Locating the PC33 phono preamps

All of the following directions refer to the PC-33 circuit boards, the phono PCB's. In this section we'll remove and label most of the wires from the old PC-33 PCBs. Here we go:

1. Unplug the power cord and allow the PAT-5 to sit for one minute before moving on.

Caution: Be sure that the power is unplugged! 120 VAC can be lethal! 240 VAC can be lethal!

2. As you de-solder each wire, label it, and let it remain near the place from where it was removed. This will make it easier to re-attach it to the new PCB.
3. The kit is supplied with wire number labels. We recommend that you de-solder and label these wires in the following order:

For the Back PCB-33:

Figure 7 identifies the front and back PCB-33's and shows you the location of eyelet 1. That is the eyelet you will de-solder and label first.

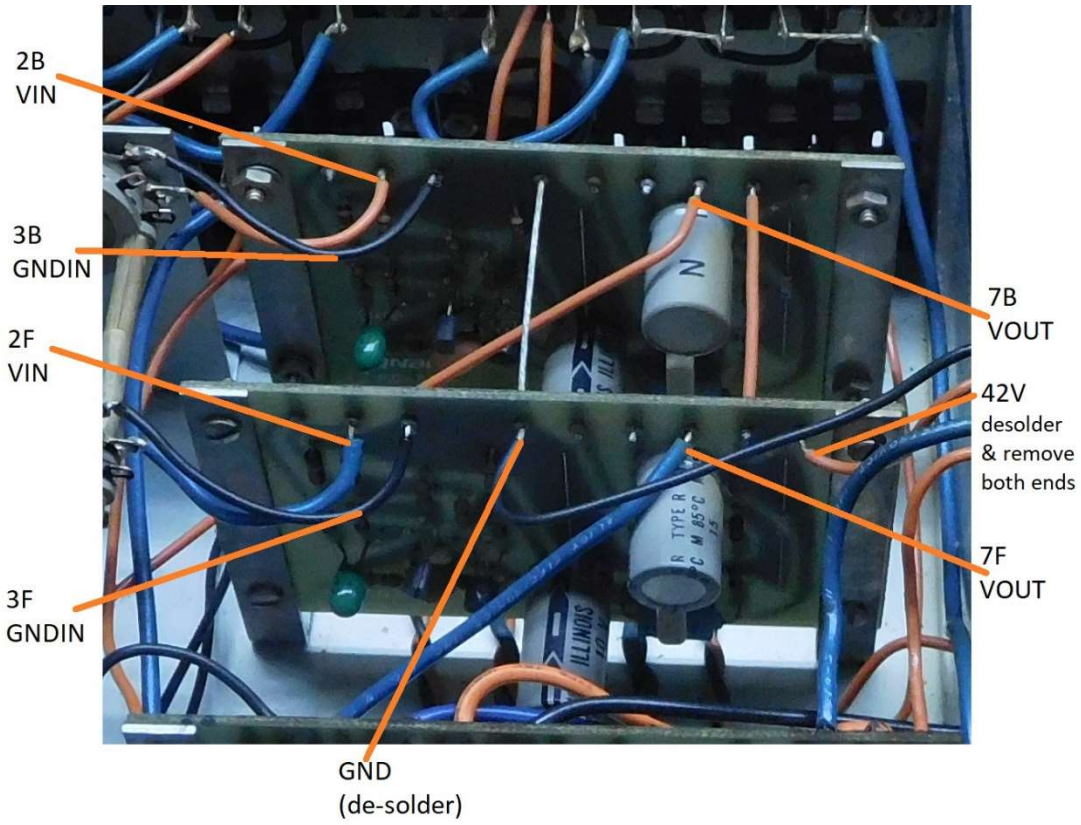

Figure 8-Removing wires from original PCB's

PCB and Eyelet	Label	Function
Back 1	It your PAT5 has the gain toggle switch on the back panel, clip this wire at the gain toggle switch. If your PAT5 doesn't have the gain toggle switch, nothing needs to be done.	PCB EQ jumper (and gain switch in BIFET units).
Back 2	Desolder at the PC-33 end and apply the 2B label.	Phono input
Back 3	Desolder at the PC-33 end and apply the 3B label. Typically a black wire.	Phono Ground
Back 4	Desolder at the PC-33 end and apply the 4B label.	Phono power Ground
Back 5	No label needed, no action needed	Not used
Back 6	No Label needed, no action needed	PCB EQ jumper
Back 7	Desolder at the PC-33 end and apply the 7B label.	Phono preamp output
Back 8[4]	Disconnect wire from this end and from the power supply (pin 4 on the power supply)	Old phono +42V strap
Back 9	Disconnect wire from this end.	Old phono +42V strap

[4] The 42 volt wiring may differ between units. In any event, you'll remove all connections to the 42 volt power supply output.

For the Front PCB-33:

Now it's time to perform a similar operation for the Front PCB-33.

PCB and Eyelet	Label	Function
Front 1	It your PAT5 has the gain toggle switch on the back panel, clip this wire at the gain toggle switch. If your PAT5 doesn't have the gain toggle switch, nothing needs to be done.	PCB EQ jumper
Front 2	Desolder at the PC-33 end and apply the 2F label.	Phono input
Front 3	Desolder at the PC-33 end and apply the 3F label. Typically a black wire	Phono Ground
Front 4	Desolder at the PC-33 end and apply the 4F label.	Phono power Ground
Front 5	No label needed, no action needed	Not used
Front 6	No Label needed, no action needed	PCB EQ jumper
Front 7	Desolder at the PC-33 end and apply the 7F label.	Phono preamp output
Front 8	Disconnect wire from this end and from the power supply (pin 4 on the power supply)	Old phono +42V strap
Front 9	Disconnect wire from this end.	Old phono +42V strap

Remove the PCB's and the U-brackets

1. Prepare to remove the two PCB's and the brackets that hold them in place by carefully dressing the wires out of the way.
2. Remove the two 4-40 nuts, lock washers, and screws that hold the U-shaped brackets that retain the circuit boards to the bottom of the chassis.
3. Remove the assembly of the brackets and the two PCB's from the chassis.
4. Remove the 4-40 hardware that holds the PCB's to the U-shaped bracket. Keep track of the lock washers, and remove them so they don't float around inside the preamp or on the PC board. The kit has keps nuts, which include captive lock-washers. You'll use these keps nuts when you reassemble the PCB's and U-brackets in a later section of the manual.
5. Once both boards are removed, set them aside. They will not be used any further.

Inspection and Preliminary Reassembly

Inspect the new PCB's you built for good solder joints and freedom from solder bridges. Touch up any questionable connections now. It will be painful to have to disassemble things to repair something later.

Reinstall the U-bracketed boards

Screw the assembly of PC-boards and U-shaped bracket back into the PAT-5 chassis. Use the original 4-40 screws and the supplied 4-40 keps nuts. Make sure that the component side of both PCBs is closest to the front panel.

Hint about re-installing the u-bracket fasteners

Fold over a small piece of masking tape on the plain (not-lock-washered) side of the keps nut. Push the nut and tape into a ¼" nut-driver. That will tend to keep the nut from falling out. Further, use gravity to your advantage by turning the PAT-5 up on one side. Between the tape on the nut, and turning the PAT-5 on its side, you'll get it all back together without increasing your contributions to the "swear jar".

Re-attach the signal and ground wires

In this section, you'll connect the signal and ground wires. Power wiring is covered in the next section. Reconnect the wires to the back PCB as indicated in the following table. Install from the component side and solder on the solder side.

Wire Labeled	Connect to terminal of new PCB labeled	Function
2B	VIN	Phono input
3B	GNDIN	Phono Ground
7B	VOUT	Phono preamp output

Re-solder each numbered wire to its proper eyelet and PCB. Here are some hints that may help keep you out of trouble:

1. Remove just one wire label at a time, then re-connect that wire to its proper place.
2. The new PCB pads have holes sized at 1 mm, or 0.0394". These are sized to properly accommodate the old wires, whose diameters were measured at 26 mils (22 AWG) and 33 mils (20 AWG), but there isn't a lot of slop. This was done to assure the best possible solder connections. However, the old wires will have to be fairly clean to fit in the holes. If they have too much solder you can either:
    a. Clean the tip of your iron, and remove the extra solder with the clean tip, or
    b. If the nose of the wire will poke into the hole, but won't go through, then you can heat the wire as you poke it into the hole, and it will usually continue to insert.
    c. If needed, cut back the existing, exposed part of the wire, and strip back a fresh ¼" of wire.
    d. There was some variation in the wire supplied to PAT-5's thru the years. I may not have seen the worst of it. If yours has some really fat wire, you may have to replace a wire or two with a thinner gauge. In this case, please send me data so only the required holes might be adjusted on future production.
3. Be gentle…don't yank on the wires, but rather form them carefully.

Reconnect the wires to the front PCB as indicated in the following table. Install from the component side and solder on the solder side.

Wire Labeled	Connect to terminal of new PCB labeled	Function
2F	VIN	Phono input
3F	GNDIN	Phono Ground
7F	VOUT	Phono preamp output

Power Wiring

With this revision, everything in your PAT5 is powered by plus and minus 15 volts. The three power supply output wires, +15V, GND, and -15V are routed as follows:

1. From the power supply to the Back PHONO PCB
2. From the Back PHONO PCB to the front PHONO PCB by way of the already installed wires between the POS15C, GNDC, and NEG15C terminals.
3. From the Front PHONO PCB to the Back line stage PCB
4. From the Back line stage PCB to the Front line stage PCB by way of already installed wires.

Connect the Power Supply to the Rear PCB

To minimize interference between the power wires and the jumpers, install all these power wires in from the solder side of the board, and solder them on the component side of the board.

Cut an 8” length of Blue 22 AWG solid wire. Remove ¼” of insulation from both ends. Insert one end into the solder side of the rear PHONO PCB’s NEG15 terminal. Solder it on the component side. Connect the other end of the wire to the power supply -15V terminal, labeled H7, inserting it on the solder side and soldering it on the component side.

Cut a 6” length of Red 22 AWG solid wire. Remove ¼” of insulation from both ends. Insert one end into the solder side of the rear PHONO PCB’s POS15 terminal. Solder it on the component side. Connect the other end of the wire to the power supply +15V terminal, labeled H3, inserting it on the solder side and soldering it on the component side.

Cut a 7” length of Black 22 AWG solid wire. Remove ¼” of insulation from both ends. Insert one end into the solder side of the rear PHONO PCB’s GND terminal. Solder it on the component side. Connect the other end of the wire to the power supply Ground terminal, labeled H1, inserting it on the solder side and soldering it on the component side.

Connect the Power Supply from the front Phono PCB to the Rear Line Stage PCB

Connect the ground wire of Rear Line Stage PCB to the power supply ground H2.

Connect a wire from the Rear Line Stage PCB +15V to the Front Phono PCB upper POS15 eyelet.

Connect a wire from the Rear Line Stage PCB -15V to the Front Phono PCB upper NEG15 eyelet.

Final Sanity Checks

Here are a few last tests *before* you reconnect your PAT-5 to your music system. With the top still off, plug in the AC mains. Turn on the power switch. Set your meter to DC volts. Connect one lead of the meter to ground.

Be careful! These steps are performed with the power connected and turned on!	Done ✓	Done ✓
The voltage on POS15 eyelets of both phono PCB's should measure +15 +/-1 Volts (with respect to ground).	☐	☐
The voltage on NEG15 eyelets of both phono PCB's should measure -15 +/- volts (with respect to ground).	☐	☐

If your voltage readings are significantly different, it could indicate either a power supply problem, or a problem with your re-assembled PCB's. Re-inspect your work, looking for disconnected or swapped wires.

Section 5: Configure the Options

Cartridge Loading

Capacitive loading of the cartridge changes its frequency response. Typical RCA phono cables have a capacitance of about 17 pF/foot. You can add to this capacitance by selecting jumpers on P2 and P3.

As an example, the Shure M97E is said to have improved sound with 200 pF of loading. Given 3-foot cables, there would be 51 pF of loading from the cables. You'd then add another 147 pF, for a total of 198 pF to optimize its loading.

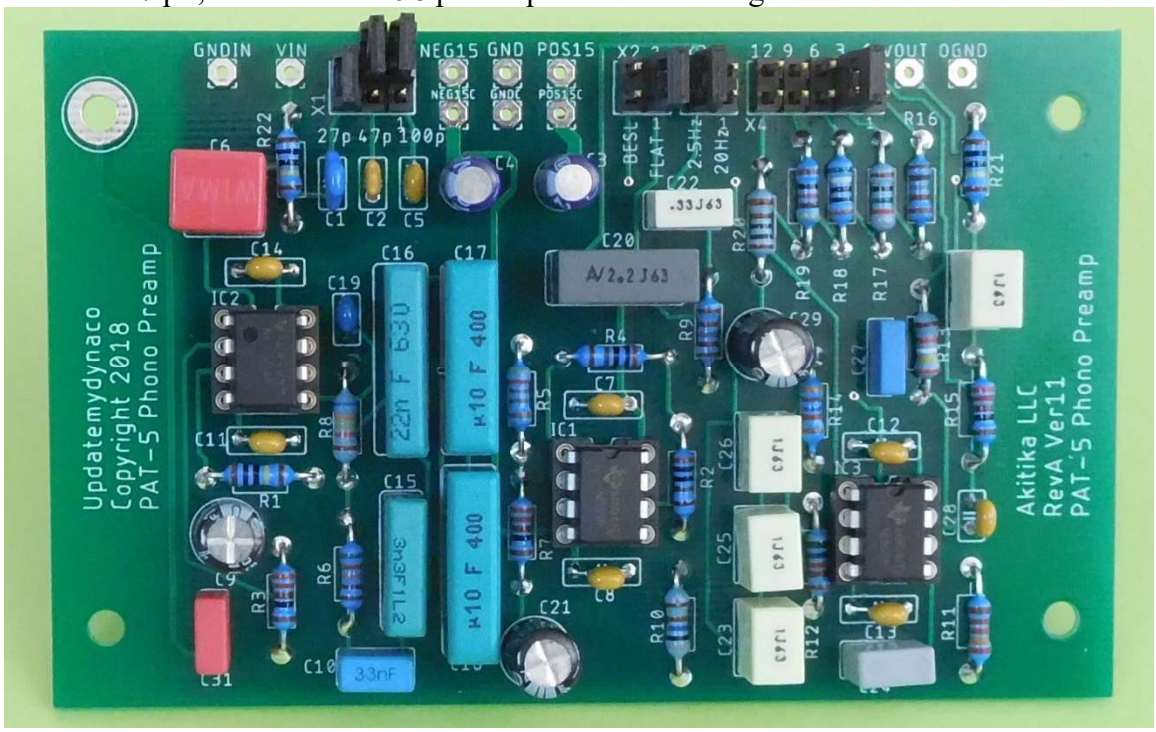

Figure 9-27 pF of additional capacitive loading is selected with the jumper plugs as shown here

The additional capacitive loading is the sum of the selected values:

100 pF	47 pF	27 pF	Total Additional Loading (pF)
Not selected	Not selected	Not selected	0
Not selected	Not selected	selected	27
Not selected	selected	Not selected	47
Not selected	selected	selected	74
selected	Not selected	Not selected	100
selected	Not selected	selected	127
selected	selected	Not selected	147
selected	selected	selected	174

Notes:

1. To select a capacitor, install the shorting plug to bridge both terminals on a line with the capacitance designation.
2. Recommended default: 100 pF
3. To *not* select a capacitor, install the shorting plug to only contact one terminal on a line with the capacitance designation, that terminal being the one farthest from the capacitance designation. See Figure 9.

All the shorting plugs will be used, even if some of the shorting plugs for capacitor loading are in the storage position (described in 3 above) rather that the active position.

High-Pass Filter Setting

A turntable can generate extreme low frequency signals that really aren't part of the music. Depending on your turntable, amp, and speakers, it may be beneficial to reduce some of this extreme low frequency information.

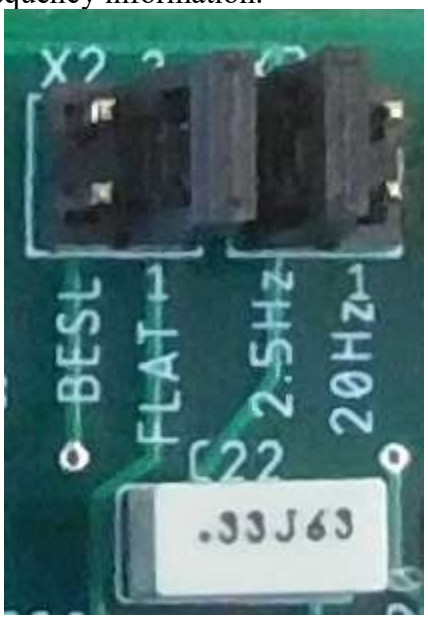

Figure 10-High pass jumpers shown here select flat response with a 2.5 Hz High pass

The right-side jumpers, 2.5 Hz and 20 Hz give a high pass response that is:

- -3 dB at 20 Hz when the 20 Hz pins are connected by a shorting plug.
- -3 dB at 2.5 Hz when the 2.5 Hz pins are connected by a shorting plug.

There must be a jumper on either the 2.5 Hz or the 20 HZ position.
Recommended default: Jumper on the 2.5 Hz position.

The left side jumpers modify the high pass response:

- Not at all, e.g. this filter is flat, when the flat pins are connected by a shorting plug.
- By adding a 3rd order Bessel Filter that is -3 dB at 20 Hz (and quite a bit farther down at the critical warp region below 10 Hz) when the BESL pins are selected.

There must be a jumper on either the BESL or FLAT position.
Recommended default: jumper on the BESL position.

Gain Setting

This phono preamp was made to use with moving magnet cartridges. Moving magnet cartridges provide around 5 mV at 5 cm/sec at 1 kHz, and are meant to be loaded by 47 K Ohms.

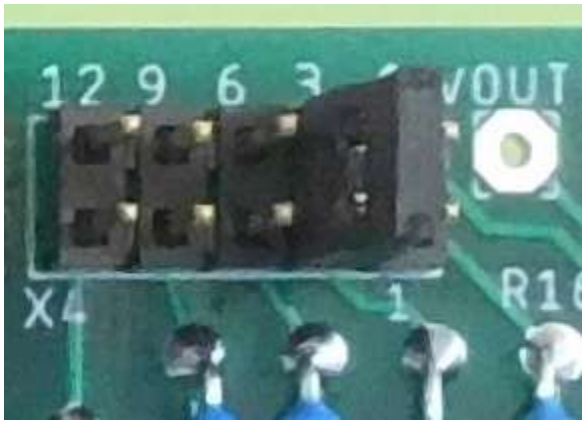

Figure 11-Jumper as shown adds 3 dB to the 1 kHz gain, making for a total of 33 dB at 1 kHz

It's hard to say what gain setting will be best for your system in advance. In general, it's best to use the lowest gain setting that provides adequate volume for your equipment and listening situation.

You must install one shorting plug in the gain setting position. Recommended default is the 3 dB position.

We recommend using the 3 dB setting as a starting point. If, with this setting, you find that the volume control is cramped toward the low-end, you can change to the 0 dB setting. If the volume control is too far toward the high end, you can change to gain settings of 6, 9, or 12 dB.

It is possible to access and change all of the options after the phono preamp has been installed without removing the phono preamp. However, we recommend that you power down the preamp before re-configuring the jumpers.

Prepare to Reconnect your PAT-5 to your Music System

- Turn off the power.
- Remove the AC plug from the wall socket.
- Replace the cover. Before you test your work, it's important to replace the cover. Without the cover in place, there will likely be a lot of hum. With the cover in place, the PAT-5 quiets down very nicely (unless of course you have power supply problems).
- Reinstall the five screws that hold the cover in place.
- Reinstall the PAT-5 to your music system.

A Note About Hum

To keep overall hum low, it's very important that the cover be in place with at least one screw tightened down. Assuming that your power supply capacitors are good, the hum will be very low in the upgraded preamp so long as the cover is screwed in place.

The upgraded PAT-5 phono preamp is very quiet. Any hum generated will originate on the RCA cords and from the phono cartridge external to the PAT-5. If you'd like more ways to get the best possible hum performance, please visit this link for more information.

http://theobjectiveturntable.com/HumStrategies.html

Section 7: Hooking Up a Turntable

Connect Left channel from the turntable to the left channel input using high quality RCA jacks. Connect right channel from the turntable to the right channel input using high quality RCA jacks. Make sure that the ground crowns fit snugly to get lowest hum and noise.

Grounding notes

If your turntable has a separate ground wire (most do, but there are some notable exceptions…the Orbit basic turntable and the Acoustic Research XA turntable don't have separate ground wires) make sure to tighten it down under the ground screw.

The ground screw or knurled nut on the PAT-5 back panel, the chassis ground, is connected to the circuit ground.

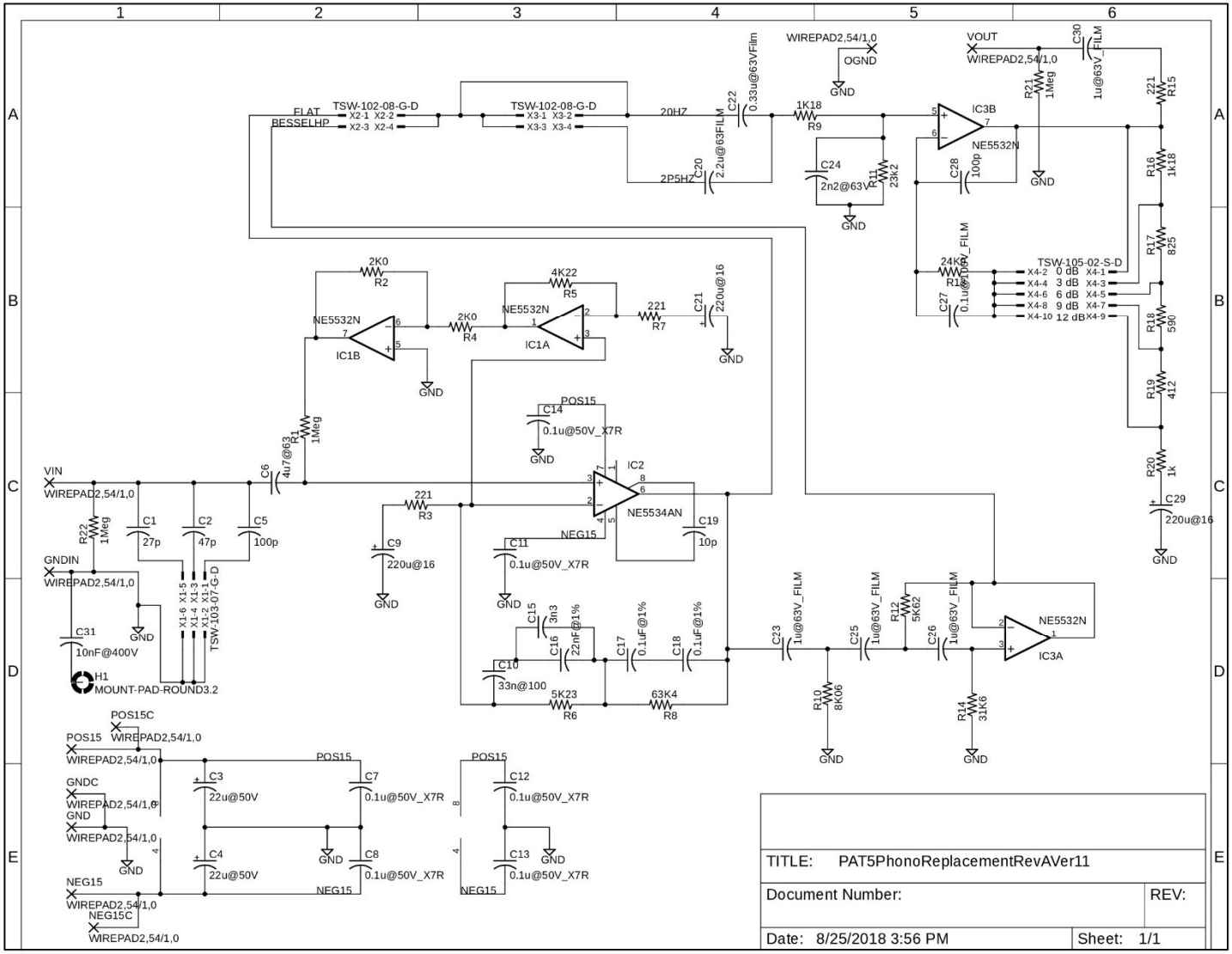

Figure 12-Schematic of PAT-5 new phono PCB's

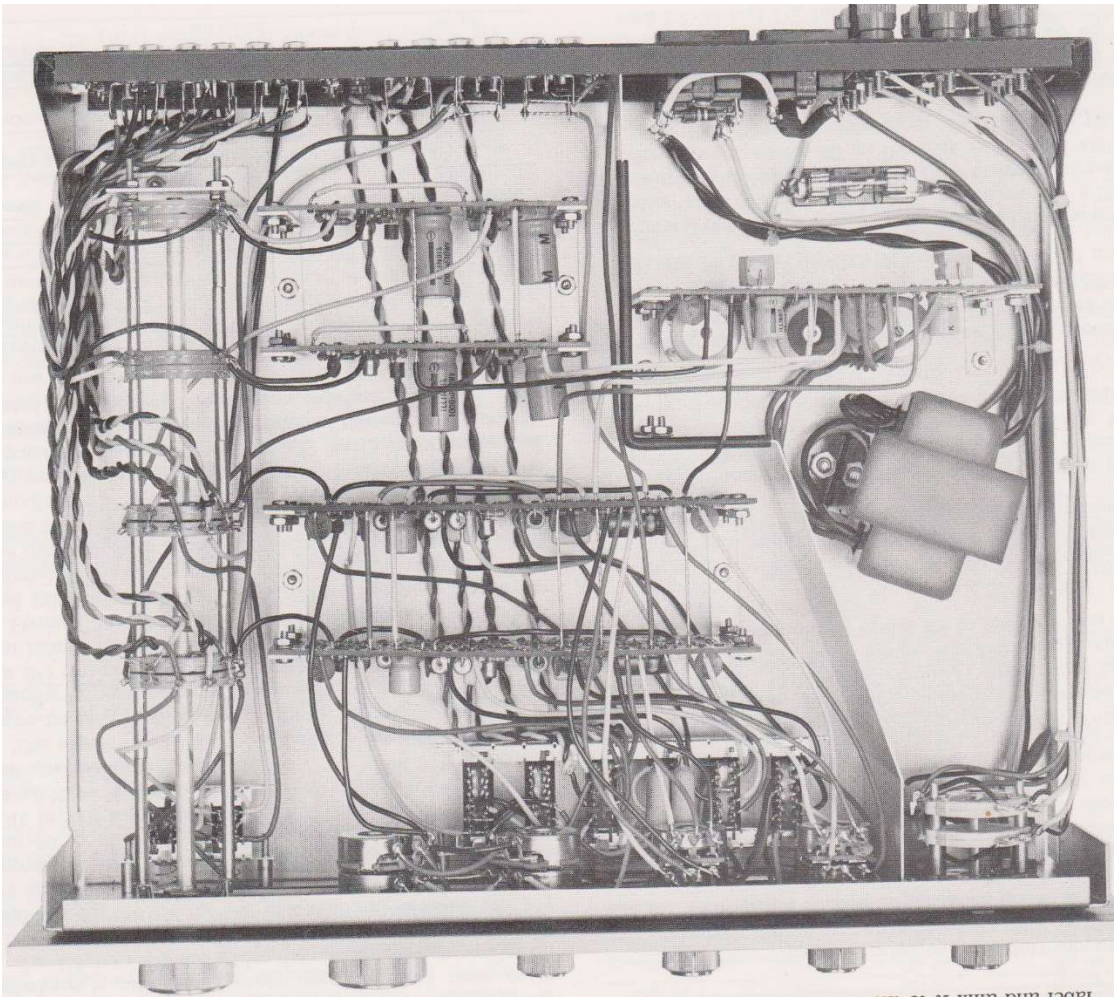

Figure 13-PAT-5 Original Wiring

Specifications

Specifications listed here are based on IC2 as a NE5534, and IC1 and IC3 areNE5532 opamps.

Current Drain:

- +15 Volts, per board – 22.5 mA
- -15 Volts, per board – 22.5 mA

Compatibility:

- Replacement for original PAT-5 Phono stage PC-33 Circuit boards
- Requires the use of the Updatemydynaco power supply to have enough +/-15 Volt power to both the phono and line stages.

Distortion:

- Harmonics of 1 kHz into 100 K-Ohms nearly 120 dB below 1 Volt output level

Gain:

- 30, 33, 36, 39, or 42 dB at 1 kHz

System Level Power Drain Comments:

The combination of the PAT5 enhanced line stage and the PAT5 upgraded phono preamps takes a total of 16+22.5=38.5 mA per channel. To give ourselves some margin, we're looking at 50 mA per channel, times 2 channels, for a total of 100 mA. You must use the Updatemydynaco PAT5 Power supply, Rev E or later, to deliver this amount of current.

Appendix 1: The Toothpick Trick

This appendix describes an easy way to clear the solder from a hole in the PCB. It can also be used to clear the solder from terminals on pots or jacks. Doing so makes it easier to install a new component, or reinstall wires that were temporarily removed to allow access to some other component.

All you'll need is a soldering iron and some toothpicks with sharp points. The diameter of the pointed part of the toothpick must be smaller than the diameter of the hole that you're trying to clear.

Heat the solder land on the component side of the board until the solder flows. Insert the toothpick from the component side of the board while pushing and twisting the toothpick. If the solder has melted, the toothpick should push through the board, displacing the solder. Remove the soldering iron, but let the toothpick remain in the hole until the solder has solidified. Now remove the toothpick. There should be a hole through the solder sufficiently large to allow you to insert the component lead or wire.

Sometimes, a bit of the toothpick will break off in the hole. If this happens, use a stiff piece of wire to push the toothpick fragment out of the hole.