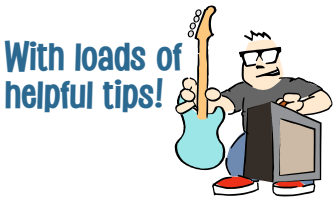
’66 BRIT-74X 18W
COMBO AMP KIT
ORIGINAL BRITISH CIRCUIT

ASSEMBLY INSTRUCTIONS



StewMac® ICON KITS

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’66 BRIT-74X 18W

COMBO AMP KIT ORIGINAL BRITISH CIRCUIT

Iconic British tone is now in your hands

Be excited!

Your new StewMac ’66 Brit-74X will be a blast to play through and even more fun to build.

Born in London, this little blues blaster earns its living every night, gigging in clubs across the USA.

This amp is an ICON

Launched in 1966, this amp quickly became a low-wattage holy grail. This is a stripped down blues machine: two channels, one tone knob, no master volume. Buckle up and go where this gritty beast takes you!

It comes with a footswitch to kick in the onboard tremolo.

Get the plexi tone without blowing the roof off the joint!

StewMac® ICON KITS

StewMac ICON KITS bring classics that are no longer made, or are simply unaffordable, within reach. And the best part is you get to build them with your own hands.

We give painstaking attention to parts selection, authentic materials, and instantly recognizable details—everything that makes the originals so sought after.

Build it with StewMac

These immersive instructions walk you through every step of creating your ’66 Brit-74X. And you’ll learn a lot, gaining a deep knowledge of your amp’s inner workings.

Follow our steps closely for safety, too: we’ve carefully laid out a path that even newcomers can follow in handling electrical components.

Building an amp can seem daunting, but nobody makes it easier than StewMac. Watch for helpful tips along the way, too—we’re here to help!

Let's get building!

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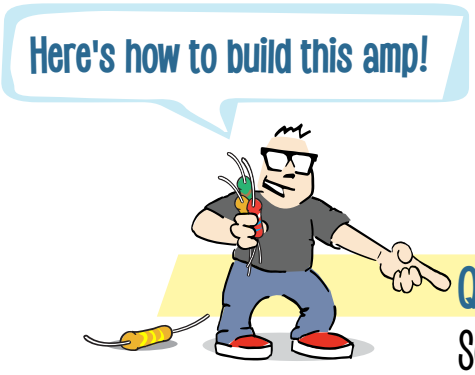
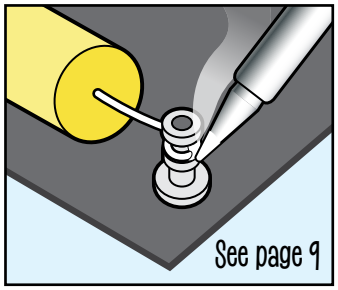


Quick look:

Sort your components by type, using the **parts list**.

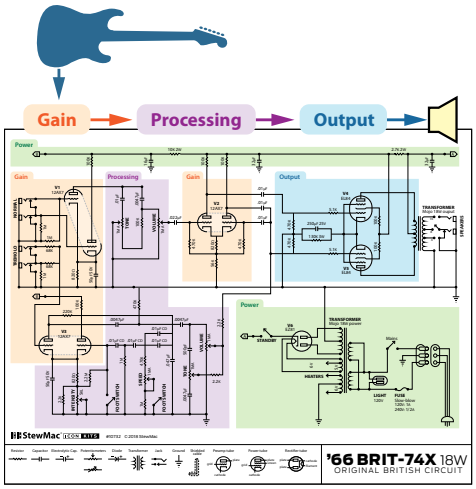
Get the **cabinet** ready, starting at **Step 1** on page 8.

You'll prep the metal **chassis** and the **eyelet board** too.



Wiring goes like this:

1. First, you'll **wrap** the leads, connecting them without solder.
2. Then **double-check** all the connections. Don't rush!
3. When everything checks out, it's time to **solder**. The numbered steps tell you when.



Learn more:
You don't need to read the **schematic**, but it's fun!
See how your guitar's signal gets processed into sound on **page 40**.

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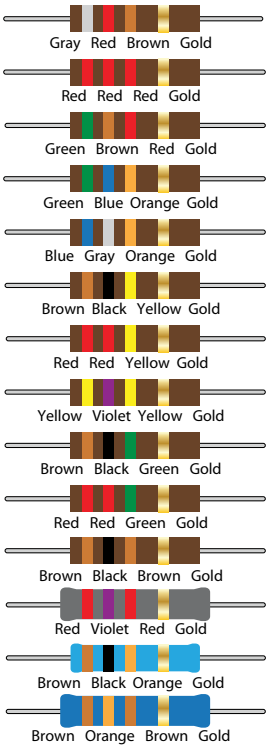
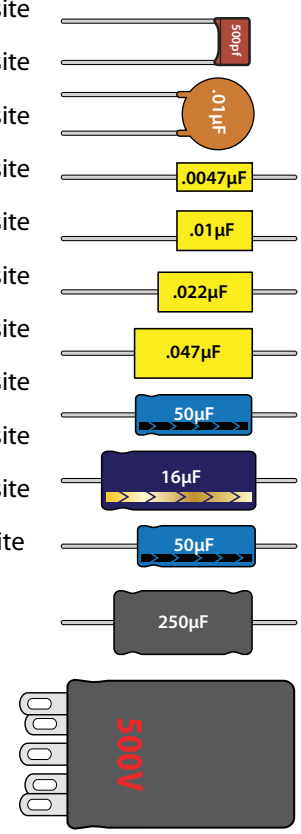
Parts list

Resistors



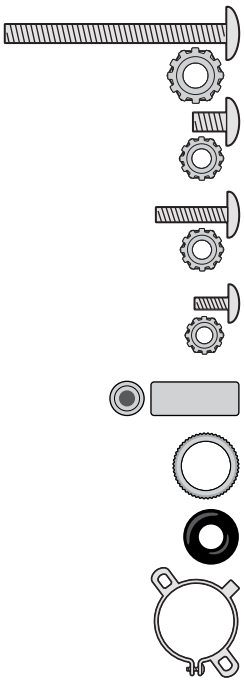
- ☐ (3) 820Ω .5W carbon composite
- ☐ (3) 2.2K .5W carbon composite
- ☐ (2) 5.1K .5W carbon composite
- ☐ (1) 56K .5W carbon composite
- ☐ (2) 68K .5W carbon composite
- ☐ (5) 100K .5W carbon composite
- ☐ (1) 220K .5W carbon composite
- ☐ (6) 470K .5W carbon composite
- ☐ (5) 1M .5W carbon composite
- ☐ (1) 2.2M .5W carbon composite
- ☐ (2) 100Ω 1W carbon composite
- ☐ (2) 2.7K 2W metal oxide
- ☐ (2) 10K 2W metal oxide
- ☐ (1) 130Ω 3W ceramic

Capacitors

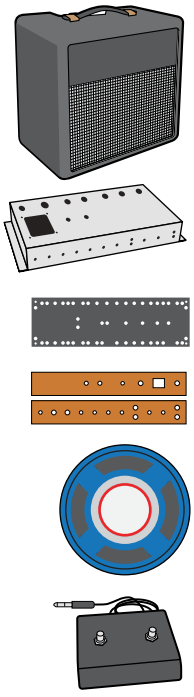


- ☐ (1) 500pF 500V silver mica
- ☐ (4) .01µF 500V ceramic disk
- ☐ (4) .0047µF 630V Mojo Dijon
- ☐ (4) .01µF 630V Mojo Dijon
- ☐ (1) .022µF 630V Mojo Dijon
- ☐ (1) .047µF 630V Mojo Dijon
- ☐ (1) 50µF 50V aluminum electrolytic
- ☐ (1) 16µF 475V aluminum electrolytic
- ☐ (1) 50µF 50V Sprague Atom
- ☐ (1) 250µF 25V bipolar electrolytic
- ☐ (1) 32µF+32µF 500V filter

Hardware



- ☐ (4) 10-32 machine screw, 1-1/2"
- ☐ (4) 10-32 locknut
- ☐ (2) 8-32 machine screw, 1/4"
- ☐ (6) 8-32 locknut
- ☐ (2) 6-32 machine screw, 1/2"
- ☐ (2) 6-32 locknut
- ☐ (20) 4-40 machine screw, 1/4"
- ☐ (12) 4-40 locknut
- ☐ (4) 4-40 threaded standoff, 1/2"
- ☐ (2) Switch mounting nut
- ☐ (2) Rubber grommet
- ☐ (1) Filter cap mounting clamp



- ☐ (1) Cabinet
- ☐ (1) Chassis
- ☐ (1) Turret board
- ☐ (1) Faceplate/backplate set
- ☐ (1) 12" speaker
- ☐ (1) Footswitch

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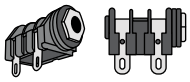
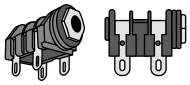
Parts list

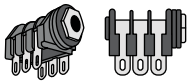
Tubes, lamps, fuses, and sockets



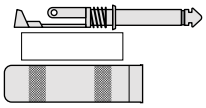
☐ (1) Two-lug jack



☐ (5) Four-lug jack

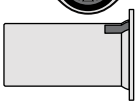


☐ (1) Six-lug jack

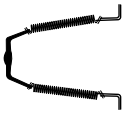


☐ (1) Speaker plug (with shield and cover)

☐ (6) 9-pin tube socket



☐ (3) Shield for 9-pin tube socket

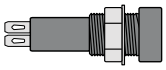


☐ (3) Tube retainer

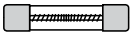
☐ (3) 12AX7 preamp tube (also called ECC83S)

☐ (2) EL84 power tube

☐ (1) 6CA4 rectifier tube (also called EZ81)



☐ (1) Fuse socket

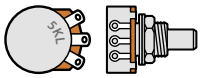


☐ (1) Fuse (5x20mm, 1 amp, slow blow)

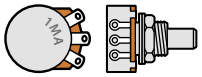
☐ (1) Indicator light

☐ (1) Power inlet

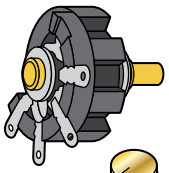
Terminals, knobs, and cords



☐ (1) 5K control pot (L–linear taper)

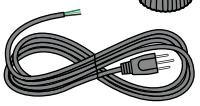


☐ (5) 1M control pot (A–audio taper)

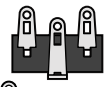


☐ (1) Selector switch

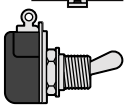
☐ (7) Knob



☐ (1) Power cord

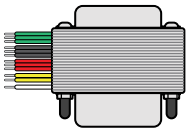


☐ (2) Three-lug terminal strip

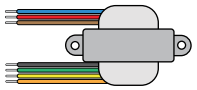


☐ (2) Two-lug switch

Transformers

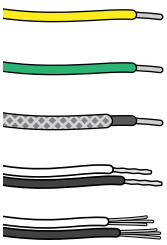


☐ (1) Power transformer



☐ (1) Output transformer

Wire



☐ (1) Yellow push-back wire

☐ (1) Green push-back wire

☐ (1) Shielded wire

☐ (1) Heater wires (pre-tinned)

☐ (1) Speaker wires (multi-strand)

Vintage-style **push-back wire** lets you push the fabric insulation back instead of cutting it away. **BUT:** Trimming the insulation still works better.

Heat-shrink tubing

☐ (8) 1/8" diameter

☐ (2) 1/16" diameter

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Tools and supplies

Required

Phillips screwdrivers, #1 and #2
Item #3000 Guitar Tech Screwdriver Set

Needle nose pliers
Item #1610 Long Nose Pliers

Wire cutter
Item #1607 Wire Cutter

Wire stripper
Item #1606 Wire Stripper

Soldering iron (preferably 40W)
Item #0501 Solomon SL-30 Soldering Station

Solder (at least one Pocket-Pak)
Item #0505 Kester Pocket-Pak Solder

Solder sucker
Item #0503 Solomon Solder Sucker

Drill with a 5/32" bit
For mounting turret board and filter cap

Ruler
Item #4905 StewMac Shop Rule

Digital multimeter
Item #3618 Fieldpiece Pocket Multimeter

Snuffer stick (bleed resistor)
Item #1552 Snuffer Stick

Pencil

Wooden chopsticks

Glue
Wood glue, white glue, or contact cement for gluing a paper label inside the cabinet

Butane lighter or matches
For heating heat-shrink tubing

Helpful

Round nose bending pliers
Item #1609 Round Nose Bending Pliers

Solder wick
Item #0504 Solder Wick, 5-foot roll

Soldering aids
Item #0521 StewMac Soldering Aids

Soldering stand
Item #0506 Solomon Soldering Stand

Solder Monster, or helping hand tool
Item #0531 StewMac Solder Monster

Chassis stand
Item #10750 Chassis Stand

Printed circuit board vise

Scratch awl or center punch
Item #3000 Guitar Tech Screwdriver Set

Tray for loose parts

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Amp voltages are seriously dangerous!

High voltage, even when unplugged

When you turn on an amp, the capacitors are designed to take on a charge and hold it. That stored voltage is enough to injure you seriously, or even kill you.

These components aren't a threat until the first time you plug the amp in. The stored electricity can be safely discharged to ground with a snuffer stick. See how to use it below.

Once your amp has been turned on, don't touch the wiring with your bare hands—even after turning it off. If you need to press on a contact, use a chopstick or Sharpie marker, which are both non-conductive. Don't use a pencil, because graphite is conductive.

It's important that you understand the dangers so you're working safely. Here's how to do it right.

Wear rubber-soled shoes

Rubber soles increase the insulation between yourself and the ground.

Take off your ring

A metal ring on your finger can bridge a hot connection to ground.

Professionals who work on amps take these safety habits very seriously

Wear safety glasses

Rosin-core solder sometimes bubbles up, and it can spew molten specks into the air. You don't want molten solder in your eyes.

It's better not to work alone

Electrical shocks can incapacitate you, and having someone available to call 911 can be a lifesaver.

Take breaks and stop when you're tired

Fatigue leads to mistakes, and no one can afford mistakes when working with electricity.

Stay suspicious

Whether it's the first time you've been inside a live amplifier or the 100th time, don't become complacent. If you discharge the caps and walk away for a few minutes, check again for residual voltage when you return. Capacitors can self-charge through a phenomenon known as dielectric memory.

Check before powering on

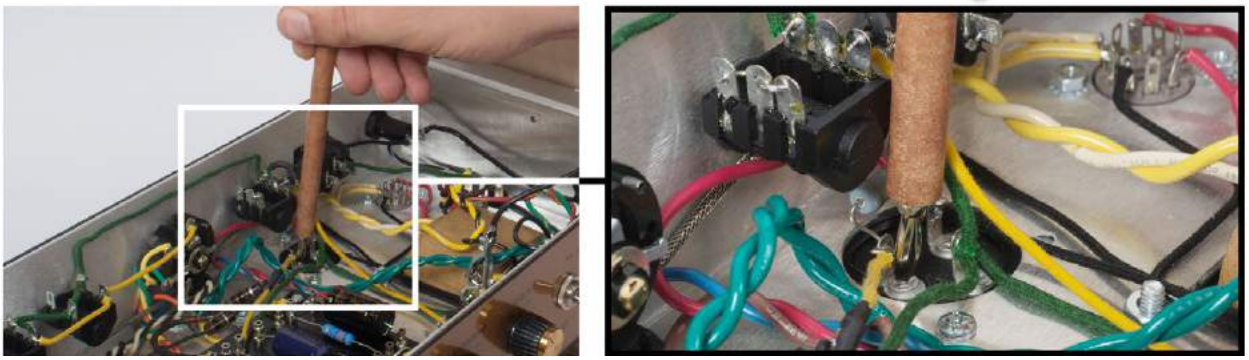
It's easy to forget that you a left a stray tool or wire in the chassis. It's also easy to forget to re-attach the speaker wire, and that can fry an output transformer in seconds. Constant vigilance is your friend when working on amps.

Always unplug it

Unplug the amp whenever you don't specifically need it plugged in. Some points are always hot when the amp's plugged in, even if the power switch is off. These points include the lugs on the fuse socket, power switch, and standby switch.

How to use a snuffer stick

To discharge a capacitor, clip the snuffer stick lead to ground—preferably a mounting bolt on the power transformer. Hold the tip of the stick to the cap's positive lead and use your multimeter to watch the voltage drain to less than 18V.



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How to read resistor values

A resistor's value—the amount of resistance it creates—is rated in ohms (Ω). Larger ohm values mean more resistance. For example, a 100Ω resistor creates ten times as much resistance as a 10Ω resistor.

The resistors used in amplifiers are too small to have value numbers printed on them. Instead, a system of colored bands tells their values. The key to reading these bands is provided below. However, an easier way to decode these bands is to download one of the many smartphone apps for this purpose.

One band will be the nearest to an end of the resistor. That band tells the first value. Combine it with the value of band 2 to get a two-digit number (68 in our example below). Multiply that number by band 3 (68 x 1,000 = 68,000). Thousands are represented by the letter K, so this resistor is 68K (kilo-ohms, or KΩ).

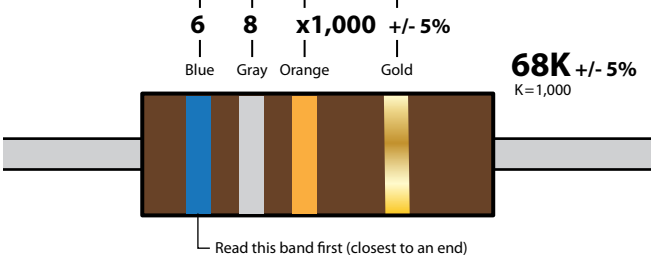
If there is a fourth band, it will be either silver or gold. This indicates the tolerance allowed during manufacturing. The resistors used in this kit have a +/- 5% tolerance, represented by a gold band 4.

A magnifying glass helps a lot. The bands on a 470Ω resistor are yellow/violet/brown, and the bands on a 47K resistor are yellow/violet/orange. They're easily confused!

Can't read the colors?

You can always use a multimeter to test a resistor's value. Set your meter to ohms and connect the test leads on each side of the resistor.

	Band 1 1st Digit	Band 2 2nd Digit	Band 3 Multiplier	Band 4 Tolerance
BLACK	0	0	1	None +/- 20%
BROWN	1	1	10	
RED	2	2	100	
ORANGE	3	3	1,000	
YELLOW	4	4	10,000	
GREEN	5	5	100,000	
BLUE	6	6	1,000,000	
VIOLET	7	7		
GRAY	8	8	0.01	+/- 10% SILVER
WHITE	9	9	0.1	+/- 5% GOLD



Capacitor values

Capacitor values are typically printed on the component. The key values with caps are their capacitance and voltage.

Think of a capacitor as a container that can hold electricity. Capacitance, measured in farads, refers to how much electricity this container can hold—its capacity. One farad (1F) would be much too large for use in an amplifier. Caps for amps are rated in millionths of a farad, called microfarads (µF), or trillionths of a farad: picofarads (pF). The voltage spec for a cap refers to how much DC voltage it can handle at any given time.

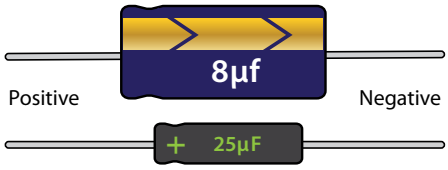
A unique property of capacitors is that they don't allow DC current to flow past them, only AC current. This is important in parts of an amplifier circuit, such as the path between a preamp stage and a power amp stage. Here, a "coupling capacitor" will block DC voltage, allowing only the AC guitar signal to pass.

Filter caps

Capacitors also filter out 60Hz hum, or "ripple," after the AC current from the wall is converted to DC. These capacitors are called filter caps, because they filter out the ripple from a power supply. The filter caps in this amp are the 8µF and 16µF electrolytic capacitors.

Electrolytic caps

Electrolytic capacitors contain electrolyte: a liquid or gel that gives them a large storage capacity. Electrolytic caps are typically polarized.



Polarized caps

Some capacitors have polarity and some don't. It's extremely important to install polarized caps correctly in a circuit. The positive lead of an electrolytic cap will be indicated by an indented ring around one edge of the capacitor. The negative lead will often be indicated by a band of arrows pointing to the negative lead.

Installing capacitors with the polarity backwards will make the circuit malfunction and quickly destroy the capacitor—even causing it to explode.

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Start by prepping the cabinet

Remove the cabinet's two back panels to prepare for installing the speaker.

☐ STEP 1

Solder the speaker plug

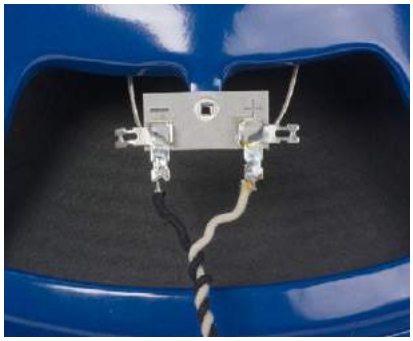
Twist your black and white speaker wires together to keep them neat.

Slide the cover of the 1/4" plug over the twisted wires, and then the plastic shielding. Strip both black and white wires back 3/8". Insert the white lead onto the short tab corresponding with the tip of the plug and solder it in place. Tin the black lead and solder it to the long lug corresponding to the shield. See "Tips for great soldering!" on the next page for an explanation of tinning.

The long lug has a two metal prongs. Crimp these together firmly around the speaker wires. This provides strain relief so that a tug on the wires doesn't pull on the solder joints.

Slide the plastic shield back over the solder joints and screw on the cover.

Use your multimeter to test for continuity between the tip and the sleeve of the 1/4" speaker plug. If you have continuity, that means that one of your leads is shorted. If that's the case, remove the cover and resolder the plug.

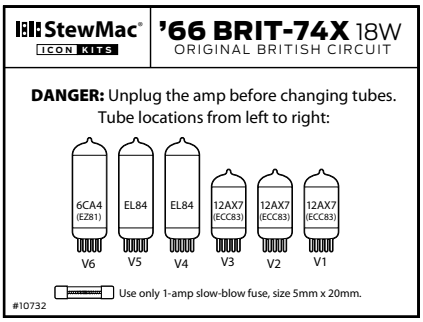


☐ STEP 2

Solder the speaker leads

Before soldering the speaker leads, place a business card or other protection under the speaker terminals to prevent solder dripping onto the speaker cone.

Strip the insulation back 3/8". Solder the white lead to the positive terminal and the black to the negative.



☐ STEP 3

Glue the tube placement chart

Cut out the chart on page 45. With a thin coat of glue or contact cement, glue it to the inside wall of the cabinet.

☐ STEP 4

Install the speaker

Remove the four speaker-mounting screws. Lay the cabinet flat on its face and lay the speaker on the back of the baffle, lining up the mounting holes in the speaker with the mounting holes in the baffle.

Install the screws so they're lightly touching the speaker frame. Don't tighten the screws in a circular pattern around the speaker, because this can warp the speaker frame.

Tighten one screw with a quarter turn so it's just snug, then do the same to the opposite side. Then snug the third screw and the fourth. Repeat this criss-cross pattern of quarter-turns until all four screws have had one full turn. This gives proper tension to compress the speaker gasket. Over-tightening can damage the speaker and cause unwanted distortion.

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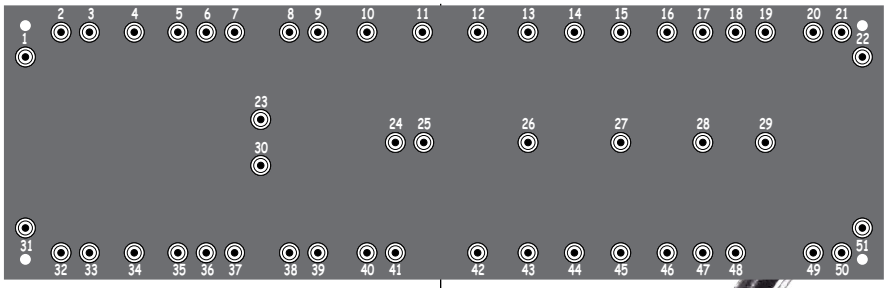
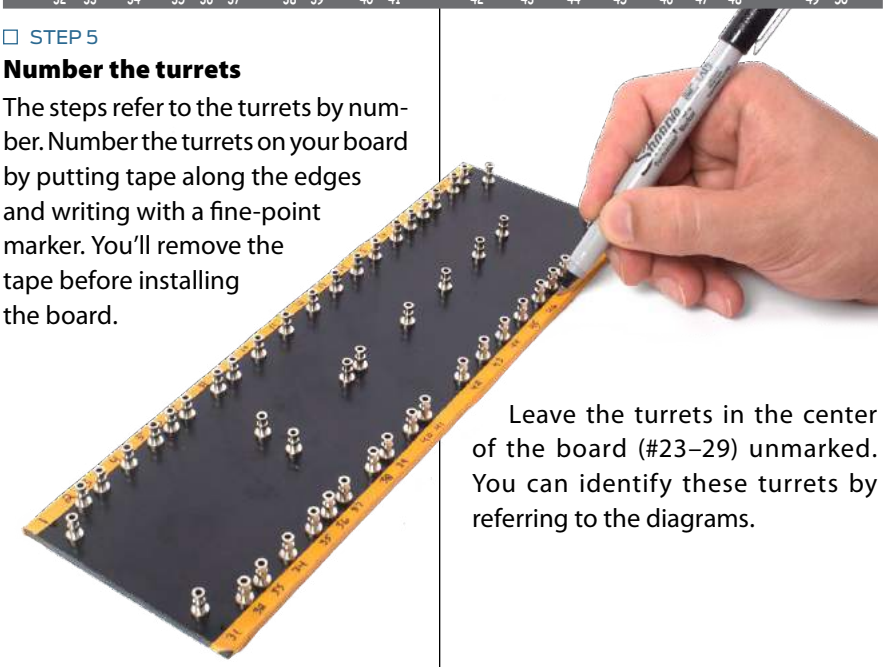
Prepping the turret board



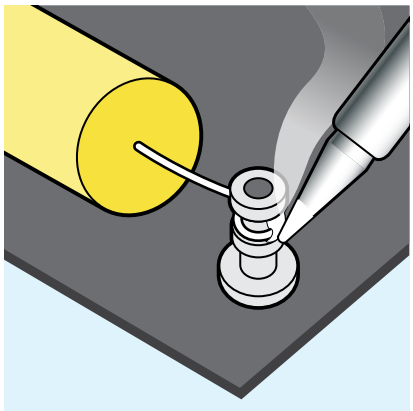
☐ STEP 5

Number the turrets

The steps refer to the turrets by number. Number the turrets on your board by putting tape along the edges and writing with a fine-point marker. You'll remove the tape before installing the board.



Leave the turrets in the center of the board (#23–29) unmarked. You can identify these turrets by referring to the diagrams.



Component leads are wrapped onto the turrets and left unsoldered while you add other parts. This way, you can check your work and make corrections without having to redo a solder joint. Ideally you solder a turret only once, which is the best way to get clean, trouble-free connections.

When it's time to solder, flow the solder all the way around the turret.

You're ready to build!

Tips for great soldering!

- Wrap the leads tightly for a good electrical contact before soldering. Don't use solder to "glue" loose joints.
- Melt a small amount of solder onto the tip of the iron ("tinning" the iron). Hold the tip against the joint for a few seconds, until the connection reaches soldering temperature.

Also tin component leads like multi-strand wires to help the solder flow.

- Keep your soldering tip clean by wiping it often on a damp sponge. Keep it tinned by occasionally melting a little solder onto it.
- Feed solder to the connection not to the iron. Keep the iron on the connection for a second longer to allow time for all of the flux to cook out of the joint.
- Don't ever blow on the hot solder or touch anything until the joint is completely cool. A good solder joint is shiny—a sign that it was left to cool undisturbed.
- Trim away the excess wires after the joint has cooled.
- Plan ahead so each joint is only soldered once. Resoldered joints are messy and more likely to fail.
- Position the parts so their specs face out so you can read them later. Many builders also align resistor bands to read in the same direction.
- How much insulation to strip? With plastic insulation, strip 3/8" from the wire ends. Push-back wire works best when you strip away about 1/4" of the cloth wrap.

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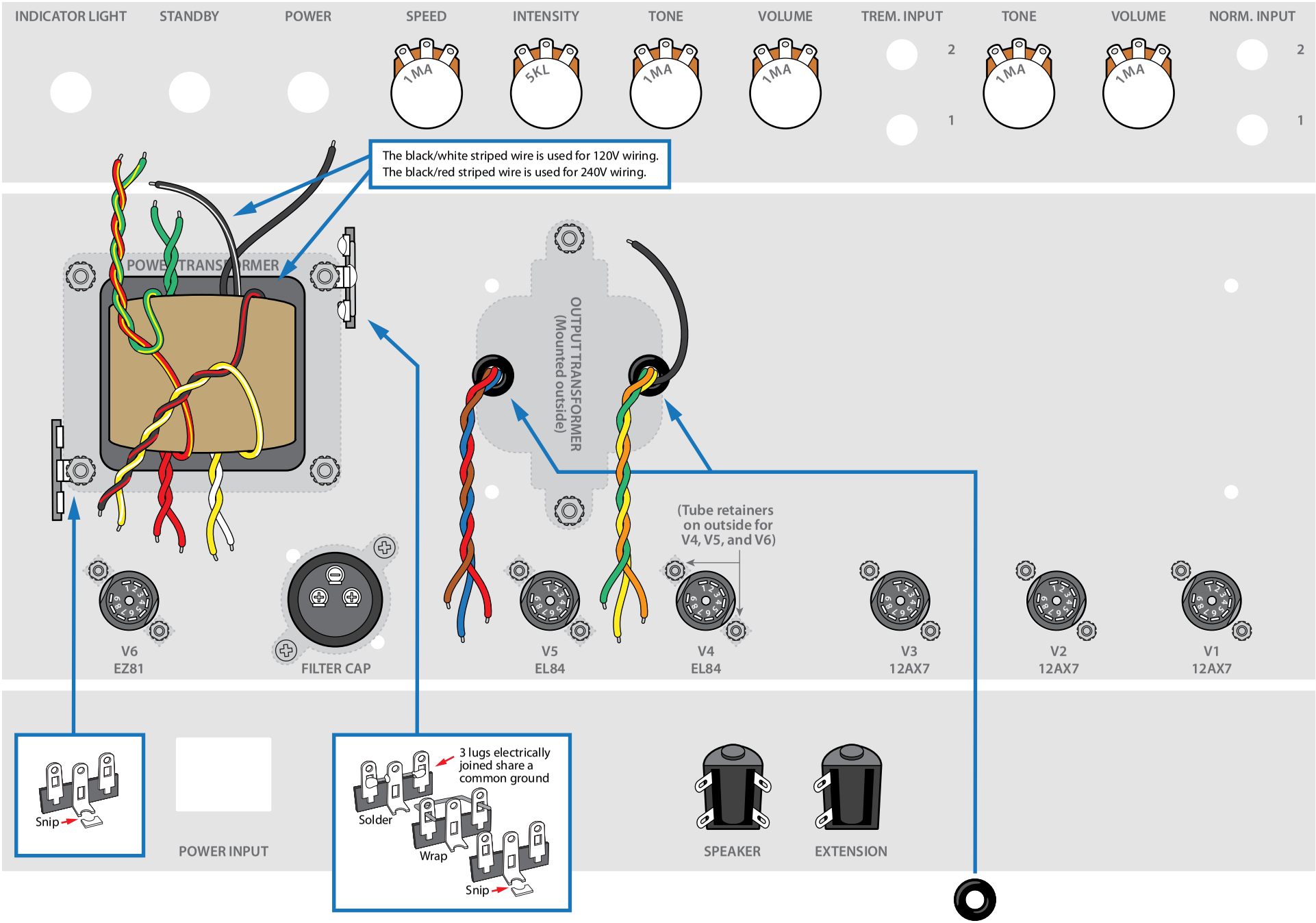

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Installing the chassis-mounted components

☐ STEP 6

Prep the two terminal strips

With a wire cutter, snip the mounting holes on the three-lug terminal strips as pictured above.

Cut a 1" piece of green wire and remove the insulation. Wrap and solder this wire across one of the strips, electrically connecting the three lugs. This will be used as a grounding strip.

Leave the three lugs of the other terminal strip unconnected.

☐ STEP 7

Install two rubber grommets

These provide strain relief for the transformer wires passing through the metal chassis. Squeeze them into their two holes as shown.

☐ STEP 8

Mount the power transformer

The power transformer has twelve leads. Separate these into color-coded pairs and twist these pairs together:

Two red leads
Two green leads
Yellow + white
Stripes: green/yellow + red/yellow

This transformer is designed for either 120V or 240V operation, depending on your country's voltage (120V is standard in the United States). The difference amounts to choosing between two wires:

- 120V uses the black/white striped wire
- 240V uses the black/red striped wire

The wire you're not going to use will be safely terminated along with the yellow/white striped wire, which is also not used in the 74X.

Twist the wire you're **not** going to use together with the yellow/white striped wire. The diagrams in this manual show 120V wiring, so the black/red striped wire is twisted with the yellow/white striped wire. Feed all the transformer leads into the chassis through the square hole.

Install the transformer on the outside of the chassis, using four 8-32 locknuts inside. Add the terminal strips at two corners as shown. The grounding strip you created goes to the front near the power switch and the other strip is at the back near the fuse socket.

☐ STEP 9

Mount the output transformer

Twist the red + blue + brown wires together. Pass these three through the grommeted hole nearest the power transformer.

Twist the orange + green + yellow wires together. Pass these through the other grommeted hole along with the black wire (four wires through this grommet).

Use two 8-32 x 1/4" machine screws with locknuts to mount the transformer on the outside of the chassis.

☐ STEP 10

Mount the filter cap

The filter capacitor is held to the chassis with its mounting clamp. This clamp attaches to the capacitor near the lugs, and is then mounted to the chassis using 6-32 x 1/2" screws and nuts. Position the clamp so that you can mount the capacitor's negative (–) lug toward the power transformer.

☐ STEP 11

Mount six tube sockets

Use 4-40 x 1/4" screws and locknuts to install the sockets. Orient each socket with pin 1 turned away from the back panel of the chassis.

Include a tube retainer on sockets V4, V5 and V6 to provide support for these three tubes when they're installed later.

☐ STEP 12

Mount the faceplate and backplate

Peel the protective film off the chassis. Secure the faceplate by placing the control pots in their holes and sliding the faceplate over them. Install washers and nuts on the pots to hold the plate in place.

Five of the six controls are 1MA pots. The intensity control is a 5KL pot. Install them with their lugs facing up for soldering, as shown in the diagram.

When the instructions refer to the left or right lug of a pot, it means left or right from the point of view of the diagram.

Attach the backplate by installing the 4-lug speaker output jack and the 2-lug extension speaker jack to hold it in place. Mount these jacks using only one of the two washers provided.

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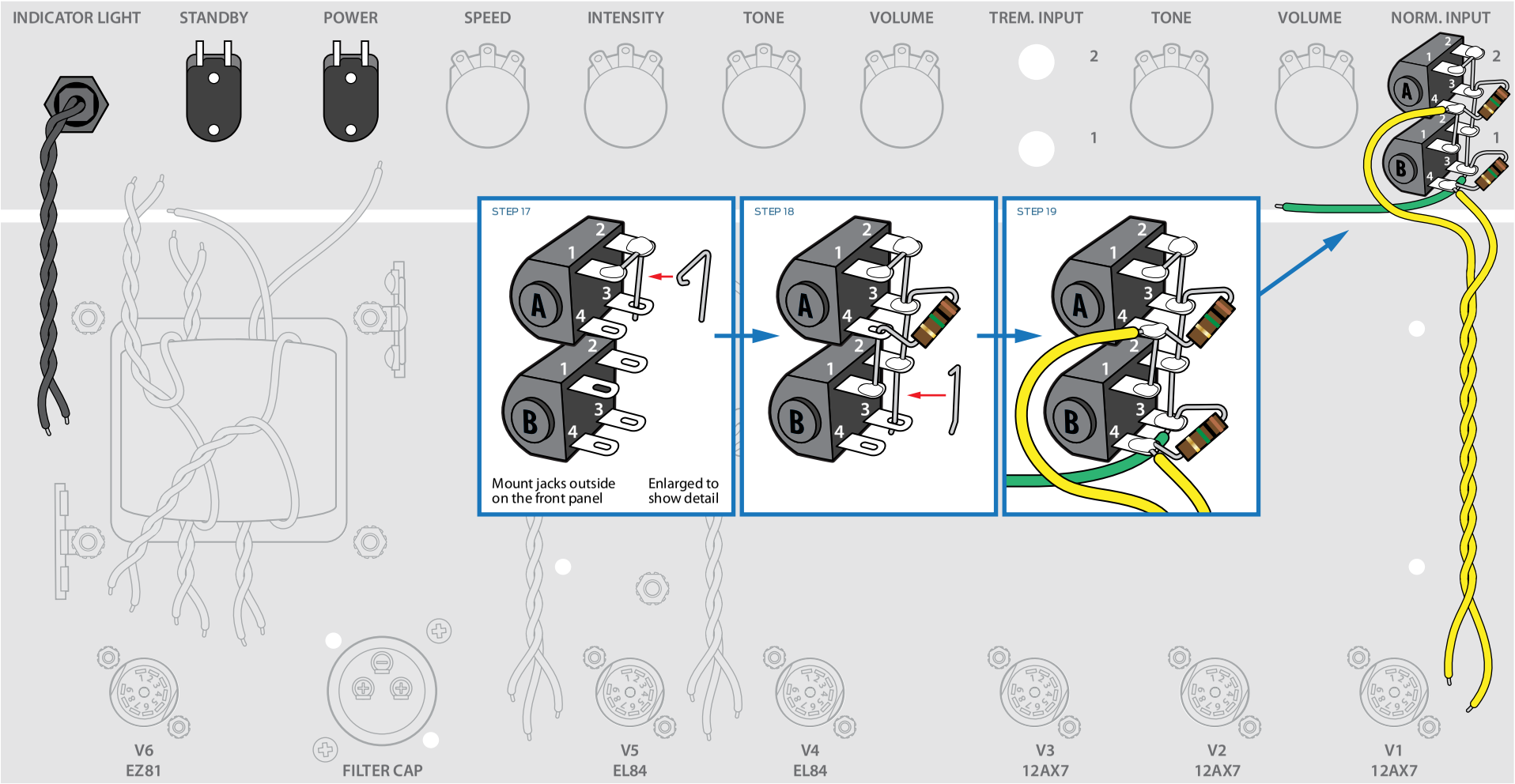

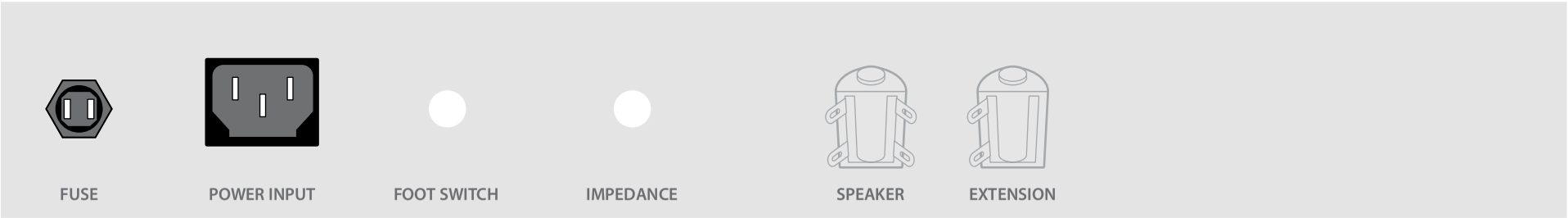

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☐ STEP 13

Install the fuse socket

Install the fuse socket in the back panel.

☐ STEP 14

Install the power input

Insert the power input with its central ground lug facing up toward you.

☐ STEP 15

Install the indicator light

Install the indicator light in the front panel and twist the two wires together.

Coil these wires temporarily to keep them out of your way, since they won't be connected until later.

☐ STEP 16

Add the standby + power switches

Mount the two-lug standby and power switches, using the switch mounting nuts. After inserting a switch through the hole, place its washer on the threaded shaft before adding the nut.

☐ STEP 17

Wire the normal channel input jacks

Use two 4-lug jacks for the inputs on the normal channel. For these steps, we'll refer to these input jacks as A and B.

Mount the jacks temporarily on the *outside* of the chassis, in their respective holes with their lugs pointing toward the indicator light. After inserting the jack through the hole, place a washer on the threaded shaft before adding the nut.

Mounting the jacks outside the chassis will hold them in position and give you room to do the tricky job of wiring them up. Afterward, they'll fit nicely inside the chassis as a pre-wired assembly.

In building this amp, you'll cut pieces of wire to make connections. These connecting wires are called jumpers, and you'll use a lot of them in building this amp.

Cut a 2" length of yellow wire. Remove the insulation to create a bare wire jumper.

Bend a small hook on one end and wrap it through lug 1 of jack A. Run the wire over and down through lugs 2 and 3.

Solder this jumper to lug 1 and lug 2, leaving it unsoldered at lug 3.

☐ STEP 18

Normal channel jacks, continued...

Using a 1M resistor, run one lead through lug 3 of jack A. Run this same lead straight down through lug 2 of jack B.

Run this resistor's other lead through lug 4 of jack A and down through lug 1 of jack B.

Solder the resistor lead and jumper lead to lug 3 of jack A and trim away any excess jumper (don't cut the resistor lead).

Solder the resistor lead to lug 1 of jack B and trim away any excess.

Cut a 1" piece of yellow wire and remove the insulation. Run this bare jumper through lug 2 and lug 3 of jack B. Solder this jumper with the resistor lead to lug 2.

☐ STEP 19

Normal channel jacks, continued...

With another 1M resistor, run the leads down through lug 3 and lug 4 of jack B.

Cut a 4" green jumper and solder one end to lug 3 of jack B, with the jumper from lug 2 and the resistor lead.

Cut two 7" yellow jumpers. Solder one to lug 4 of jack A along with the resistor lead.

Solder the other yellow jumper to lug 4 of jack B along with the resistor lead.

Twist these yellow jumpers together, starting about 1" from these solder joints. Leave about 2" untwisted at the other end of the jumpers.

Remove these wired-up input jacks and mount them in the same holes on the inside of the chassis. (Their lugs are now facing away from the indicator light.) Run the green jumper under jack B, which is now normal input jack 1.

Run the yellow jumpers to socket V1 but do not solder them yet.

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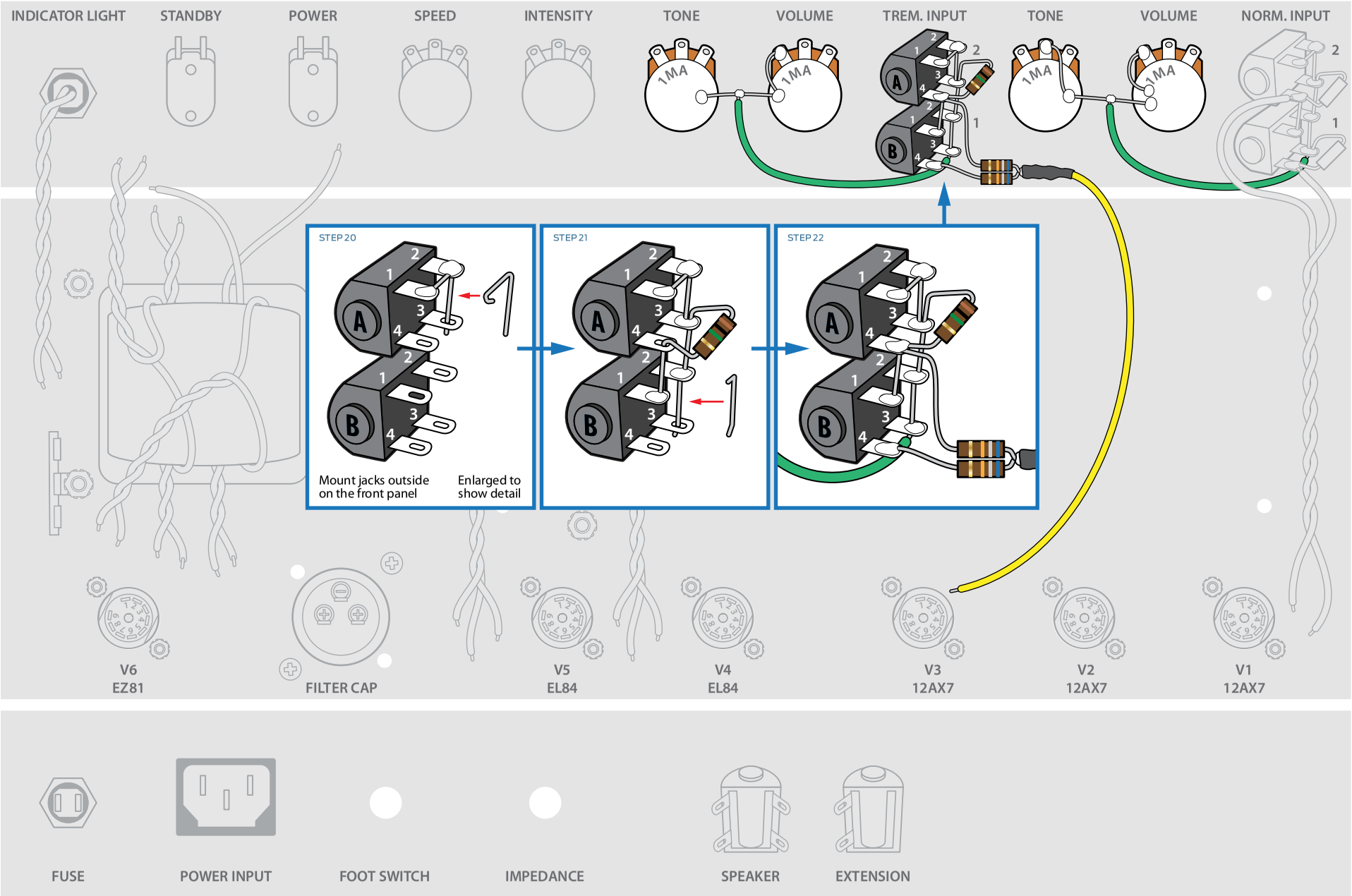

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☐ STEP 20

Wire the tremolo channel jacks

Again, use two 4-lug jacks which we'll refer to as A and B.

As you did with the normal channel jacks, assemble these on the *outside* of the chassis with their lugs pointing toward the indicator light.

Cut a 2" length of yellow wire. Remove the insulation to create a bare wire jumper.

Bend a small hook on one end and wrap it through lug 1 of jack A. Run the wire over and down through lugs 2 and 3.

Solder this jumper to lug 1 and lug 2, leaving it unsoldered at lug 3.

☐ STEP 21

Tremolo channel jacks, continued...

Using a 1M resistor, run one lead through lug 3 of jack A. Run this same lead straight down through lug 2 of jack B.

Run the other lead through lug 4 of jack A and down through lug 1 of jack B.

Solder the resistor lead and jumper lead to lug 3 of jack A and trim away any excess jumper (don't cut the resistor lead).

Solder the resistor lead to lug 1 of jack B and trim away any excess.

Cut a 1" piece of yellow wire and remove the insulation. Run this bare jumper through lug 2 and lug 3 of jack B. Solder this jumper with the resistor lead to lug 2.

☐ STEP 22

Tremolo channel jacks, continued...

Cut a 4" green jumper and solder one end to lug 3 of jack B, with the jumper from lug 2.

On each of two 68K resistors, trim one lead to 3/4" long.

Solder one of these trimmed 68K resistor leads to lug 4 of jack A, along with the resistor lead.

Solder the trimmed lead from the other 68K resistor to lug 4 of jack B.

If your wiring of these resistor leads might contact other wires or lugs, insulate the leads with heat-shrink tubing before soldering them. Slide the tubing onto the lead and shrink it to fit. See the illustration on page 17.

Cut a 5" yellow jumper and trim about 1/2" of the insulation from one end. Twist this together with the remaining 68K resistor leads and solder this connection. After soldering this joint, insulate it by sliding a piece of 1/8" heat-shrink tubing onto the wire and over the joint. Add heat to shrink the tubing.

Mount these wired-up input jacks inside of the chassis. As you do this, run the green jumper under jack B, which is now tremolo input jack 1.

Run the yellow jumper toward socket V3.

☐ STEP 23

Ground the control pots

Turn all the pots shafts counterclockwise to their zero position before starting this step. This is because you'll be applying heat to their cases, and if the heat lingers too long it could create an impression on the wiper inside. This isn't a concern if the pot is in the zero position.

Cut a 2" jumper of green wire and pull off the insulation. Solder one end to the middle lug of the normal channel tone pot. Bend this wire to contact the back of that pot and jump over to the back of the normal channel volume pot. Solder this jumper to the backs of these two pots.

Cut and strip another 2" green jumper. Solder one end to the left lug of the tremolo channel volume pot. Solder this jumper to the backs of the tremolo channel volume and tone pots to give them a shared ground. This shared ground is called a ground bus.

☐ STEP 24

Ground the input jacks

Wrap the green jumper from the normal channel input jacks onto the ground bus between the normal volume and tone pots. Solder this connection.

Wrap the green jumper from the tremolo channel input jacks onto the ground bus between the tremolo volume and tone pots. Solder this connection.

☐ STEP 25

Install a grounding jumper

Cut a 3/4" green jumper and remove the insulation. Solder one end to the left lug of the normal channel volume pot and solder the other end to the back of the same pot.

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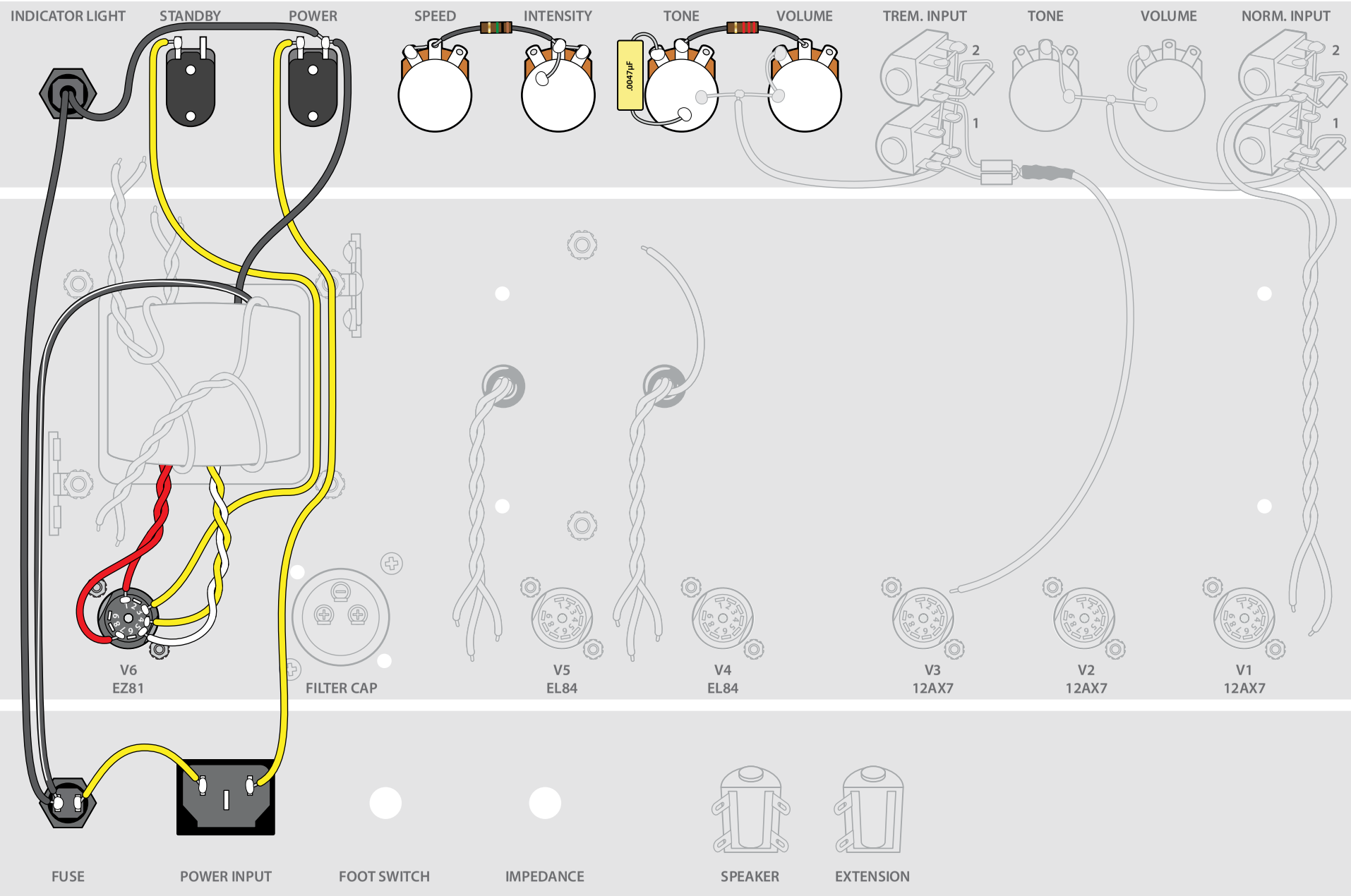

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☐ STEP 26

Add a .0047µF capacitor

Solder a .0047µF Dijon cap between the left lug of the tremolo channel tone pot and the back of the same pot. Trim away any excess lead.

☐ STEP 27

Add an insulated 2.2K resistor

Place two 3/4" lengths of 1/16" heat-shrink tubing onto the leads of the 2.2K resistor. Add heat to create electrical insulation over the bare wire of these leads.

Wrap this resistor between the middle lugs of the tremolo channel's tone and volume pots. Solder the connection to the tone pot, but don't solder to the volume pot yet.

☐ STEP 28

Add an insulated 1M resistor

Add two 3/4" lengths of 1/16" heat-shrink tubing onto the leads of a 1M resistor.

Pass one lead through the middle lug of the speed pot and solder it to the left lug of that pot. Leave the middle lug unsoldered for now.

Pass the resistor's other lead through the middle lug of the intensity pot and solder it to the right lug of that pot. The middle lug gets soldered in the next step.

☐ STEP 29

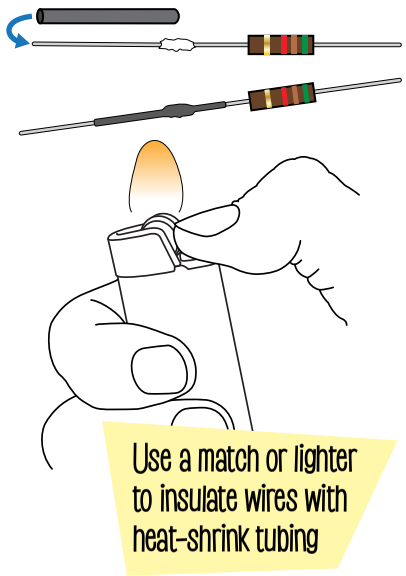
Add a short bare jumper

Cut a 1" green jumper and remove the insulation. Solder this between the middle lug of the intensity pot and the back of the same pot.

☐ STEP 30

Connect the power transformer's red leads

Run the two red wires from the power transformer to the V6 rectifier tube socket (either wire can go to either lug). Trim these wires to length and solder one to pin 7 and the other to pin 1.



☐ STEP 31

Connect the power transformer's white and yellow leads

Trim the power transformer's twisted white and yellow leads to length for connecting to socket V6. Solder the white lead to pin 5 and the yellow lead to pin 4.

☐ STEP 32

Add a yellow jumper

Cut a 10-1/2" yellow jumper. Solder one end in to the left lug of the standby switch, and the other end to pin 3 of socket V6.

☐ STEP 33

Connect the power transformer black lead

Run the black power transformer lead to the right lug of the power switch and cut it to length. Don't solder it yet.

☐ STEP 34

Connect one indicator light lead

Run either of the one of the indicator light leads to the right lug of the power switch. Cut it to length and solder it there along with the power transformer's black lead.

☐ STEP 35

Route the other indicator lead

Run the other indicator light lead to the left lug of the fuse socket and trim it to length. Don't solder it yet.

☐ STEP 36

Connect the power transformer black/white or black/red lead

For 120V use, run the black/white striped power transformer lead to the left lug of the fuse socket. Trim it to length and solder it to the left lug along with the lead from the indicator light.

If you're wiring for 240V usage, follow the above step using the black/red striped lead instead of the black/white striped lead.

☐ STEP 37

Add two yellow jumpers

Cut a 8-1/2" yellow jumper and solder one end to the right lug of the power input. Solder the other end to the left lug of the power switch.

Cut a 3-1/2" yellow jumper and solder one end to the left lug of the power input. Solder the other end to the right lug of the fuse socket.

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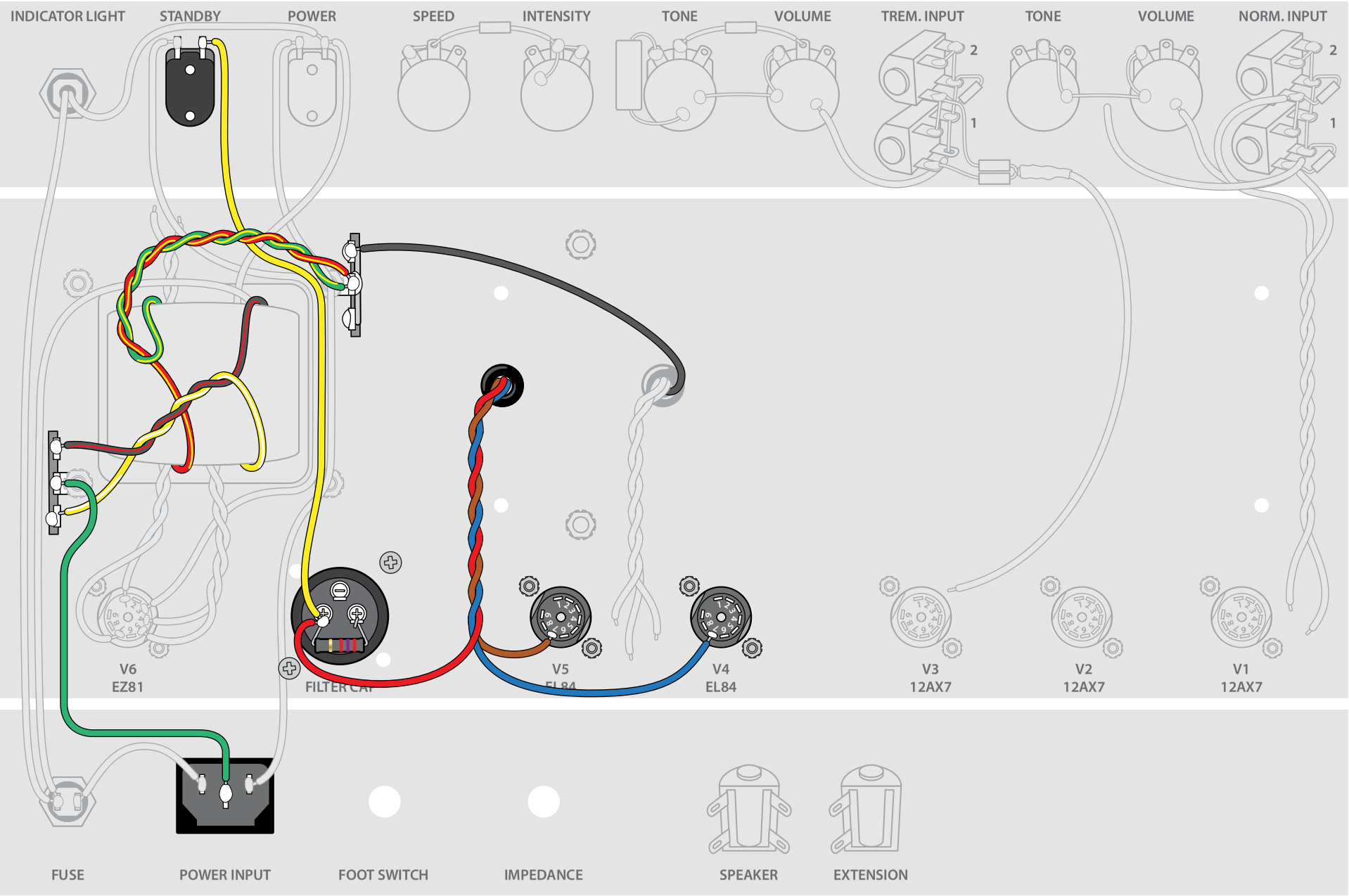

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☐ STEP 38

Connect the power transformer's green/yellow and red/yellow leads

Run the green/yellow striped and red/yellow striped twisted pair to the 3-lug grounding strip near the power switch. Trim them and solder them to the middle lug of the strip.

☐ STEP 39

Terminate the power transformer's two unused leads

Run the black/red striped and yellow/white striped twisted pair to the 3-lug strip near the fuse socket. (For 240V wiring, this will be the black/white instead of black/red wire.)

Trim the two wires to length, and solder them individually to the two outer lugs. These unused wires are now electrically isolated and soldered to separate, ungrounded lugs with no other connections. This is a safe way to terminate them so they don't interfere with other wires.

☐ STEP 40

Add a ground jumper

Cut one 4" green jumper and solder one end in to the middle lug of the power input. Solder the other end to the middle lug of the 3-lug strip near the fuse socket. Unlike the two other lugs on this strip, this middle lug is grounded through the mounting bolt to the chassis.

☐ STEP 41

Add a 2.7K resistor

Run one leg of a 2.7K resistor through each of the two positive lugs on the filter capacitor. Position the resistor so it stands up off of the lugs by at least 1/2" and wrap the leads so it stays in place. Don't solder it yet.

☐ STEP 42

Add a yellow jumper

Cut one 9-1/4" yellow jumper and solder one end to the right lug of the standby switch. Run the other end to the left positive lug of the filter capacitor.

☐ STEP 43

Connect the output transformer's red, blue, and brown leads

Untwist the red, blue, and brown wires from the output transformer just enough to connect to the filter cap and sockets V5 and V4. The twisted portion of the wires should remain long enough to reach the rear wall of the chassis.

Run the red wire to the left positive lug of the filter capacitor and solder in place with the resistor and the yellow jumper from the previous step.

Run the brown and blue wires in the opposite direction, keeping them close to the rear wall of the chassis. Trim the brown wire to length and solder it to pin 7 of socket V5.

Trim and solder the blue wire in to pin 7 of socket V4.

☐ STEP 44

Connect the output transformer's black lead

Run the black wire from the output transformer to the 3-lug grounding strip near the power switch. Trim it to length and solder it to the right lug of the strip.

Stop and inspect your work

This is a good time to step away from the project for a few minutes. Take a break before reviewing your work for errors.

When you're ready to go at it again, very carefully walk through every connection you've made so far. When everything checks out, you're ready to move on to the turret board.

Be suspicious
There's a mistake, and you're gonna find it!

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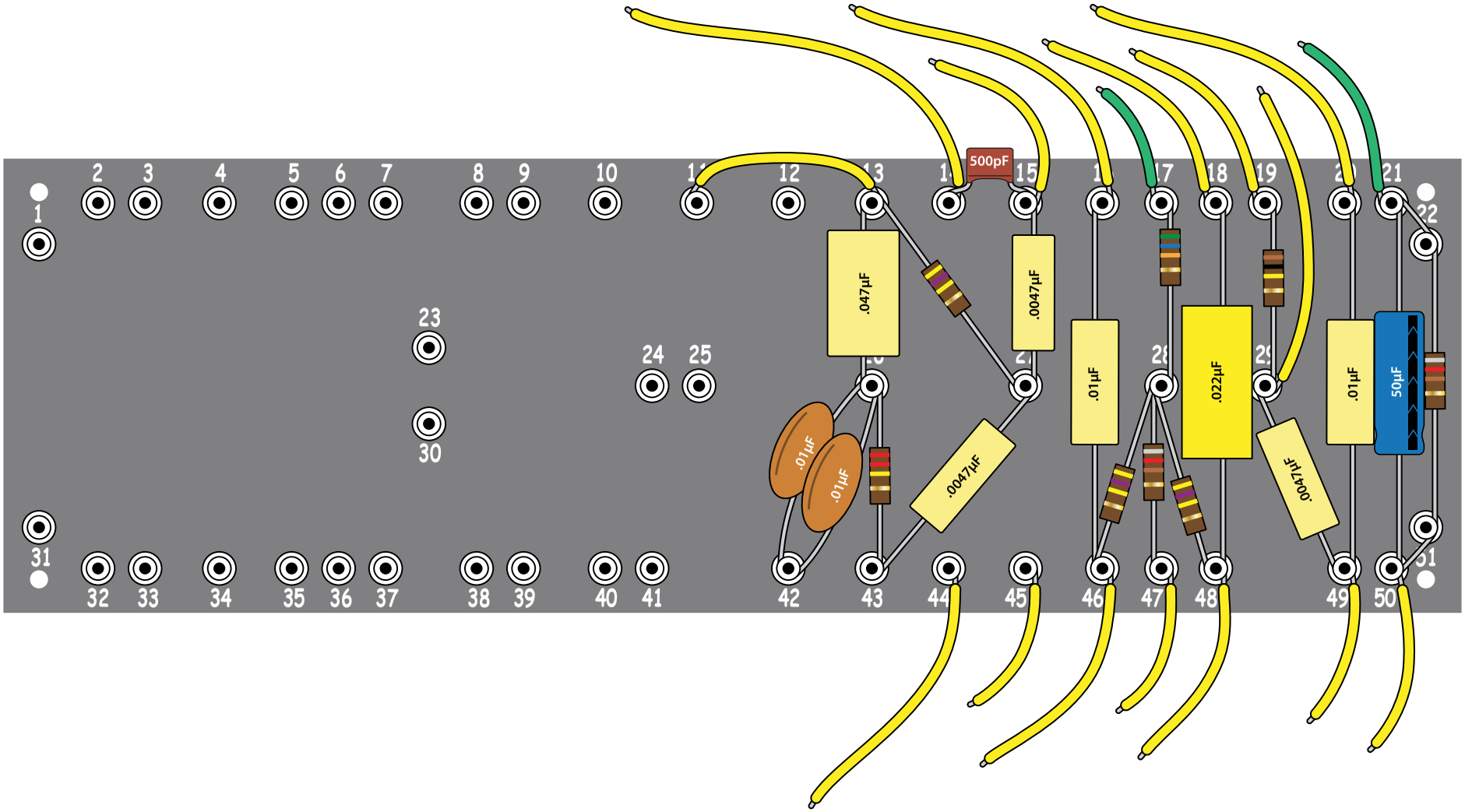

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Wrapping parts onto the turret board

You're ready to start putting parts on the turret board. In these steps, you'll wrap the leads onto the turrets without soldering, and the solder will be added later. This allows you to check your work and make corrections without having to undo solder joints. Ideally, you solder each joint only once.

☐ STEP 45

Wrap an 820Ω resistor

Wrap an 820Ω resistor between turrets 22 and 51.

☐ STEP 46

Add a 50µF cap + two jumpers

Note that this 50µF electrolytic capacitor is polarized, so it must be installed in the correct positive/negative orientation. The positive end of the cap has an indented ring, and the arrow designs point to the negative end.

Wrap the cap's positive lead around turret 50 and the negative lead around turret 21.

Cut two 1" jumpers of yellow wire and remove the insulation. Wrap one of these short bare wires between turrets 50 and 51. Wrap the other wire between turrets 21 and 22.

☐ STEP 47

Add green + yellow jumpers

Cut a 3" green jumper and wrap it onto turret 21.

Cut a 2-1/4" yellow jumper and wrap it onto turret 50.

☐ STEP 48

Add two capacitors + one resistor

Add a .01µF capacitor between turrets 20 and 49. This and the following yellow capacitors are not polarized, so you can install them in either direction. We recommend facing them all in the same direction, making their printed specs easy to read.

Add a .0047µF capacitor between turrets 29 and 49.

Add a 100K resistor between turrets 19 and 29.

☐ STEP 49

Add four jumpers

Add a 5-1/2" yellow jumper to turret 20.

Add a 5" yellow jumper to turret 29 and run it to the top of the board.

Add a 3-3/4" yellow jumper to turret 19.

Add a 2-1/4" yellow jumper to turret 49.

☐ STEP 50

Add one capacitor + one jumper

Add a .022µF capacitor between turrets 18 and 48.

Add a 4" yellow jumper to turret 18.

☐ STEP 51

Add four resistors

Add a 56K resistor between turrets 17 and 28.

Add an 820Ω resistor between turrets 28 and 47.

Add a 470K resistor between turrets 28 and 48.

Add another 470K resistor between turrets 28 and 46.

☐ STEP 52

Add one capacitor + five jumpers

Add a .01µF capacitor between turrets 16 and 46.

Add a 1-3/4" green jumper to turret 17.

Add a 5-1/4" yellow jumper to turret 16.

Add a 3" yellow jumper to turret 48.

Add a 2-1/2" yellow jumper to turret 47.

Add a 3-1/2" yellow jumper to turret 46.

☐ STEP 53

Add two capacitors + two jumpers

Add a .0047µF capacitor between turrets 15 and 27.

Add another .0047µF capacitor between turrets 27 and 43.

Add a 2-1/2" yellow jumper to turret 45.

Add a 4" yellow jumper to turret 44.

☐ STEP 54

Add one capacitor + two jumpers

Add a 500pF silver mica capacitor between turrets 14 and 15.

Add a 4-1/2" yellow jumper to turret 15.

Add a 6-1/4" yellow jumper to turret 14.

☐ STEP 55

Add a resistor + capacitor + jumper

Add a 470K resistor between turrets 13 and 27.

Add a .047µF capacitor between turrets 13 and 26.

Add a 1-3/4" yellow jumper between turrets 11 and 13.

☐ STEP 56

Add one resistor + two capacitors

Add a 220K resistor between turrets 26 and 43.

Add two .01µF ceramic disk capacitors between turrets 26 and 42.

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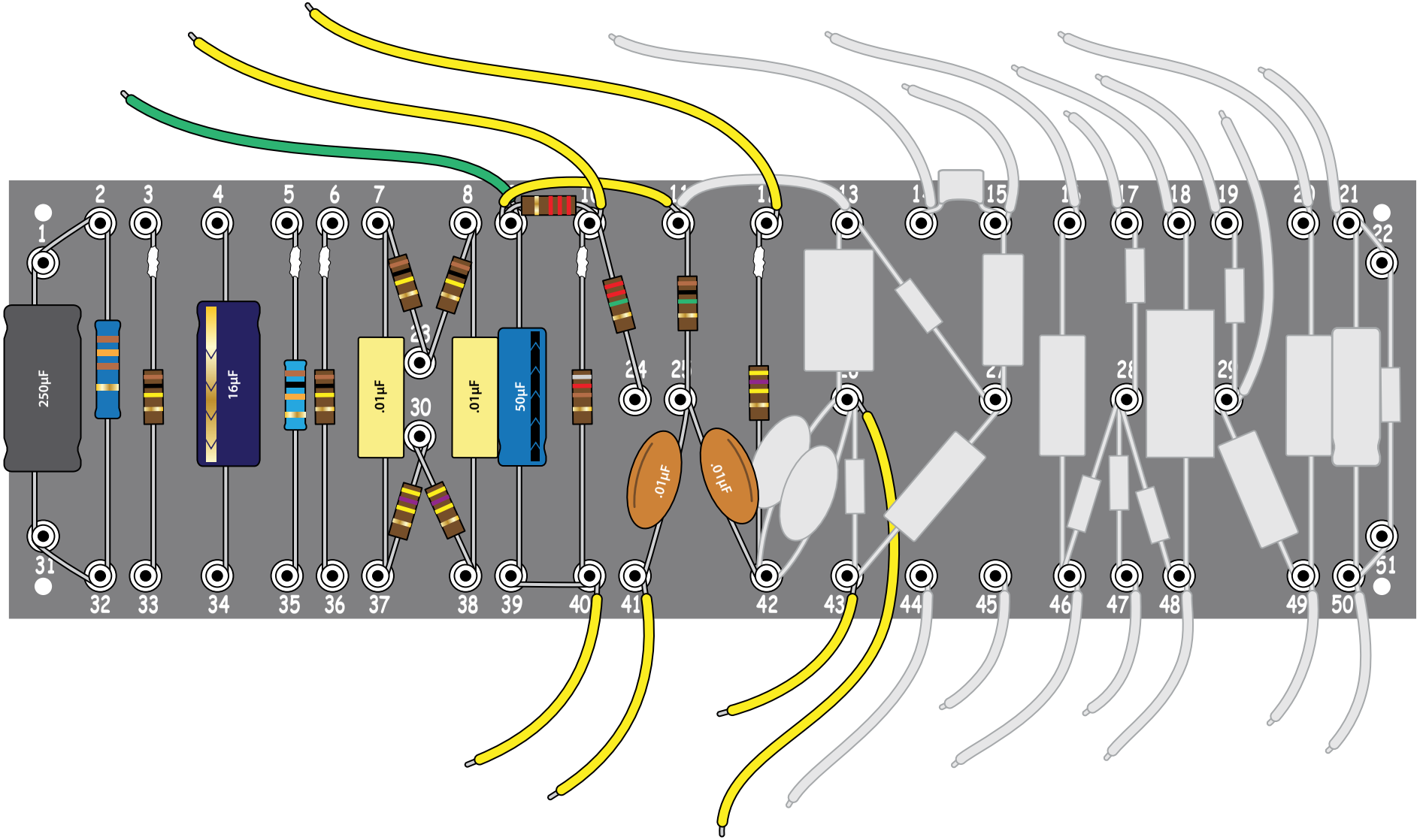

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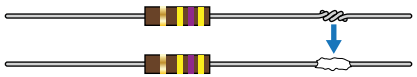
☐ STEP 57

Add one resistor + three jumpers

Cut one 1" yellow jumper and remove the insulation. Wrap and solder this jumper around one lead of a 470K resistor to extend the lead of the resistor. Doing this will allow the jumper to reach between turrets 12 and 42.



Add this 470K resistor with the extension between turrets 12 and 42.

Add a 5" yellow jumper to turret 26. Run this jumper toward the bottom of the board and under the lead of the .0047µF capacitor attached to turret 43.

Add a 2-1/4" yellow jumper to turret 43.

Add a 7-3/4" yellow jumper to turret 12.

☐ STEP 58

Add two capacitors + one resistor

Add one .01µF ceramic disk capacitor between turrets 25 and 42.

Add another .01µF ceramic disk capacitor between turrets 25 and 41.

Add a 1M resistor between turrets 11 and 25.

☐ STEP 59

Install three resistors

Add a 2.2M resistor between turrets 10 and 24.

Cut one 1" yellow jumper and remove the insulation. Wrap and solder this jumper around one lead of an 820Ω resistor to extend the lead of the resistor.

Add this 820Ω resistor with the extension between turrets 10 and 40.

Add a 2.2K resistor between turrets 9 and 10.

☐ STEP 60

Add one capacitor + one jumper

Add a 50µF electrolytic capacitor between turrets 9 and 39. This cap is polarized, so be sure the negative lead goes to turret 9 and the positive lead to turret 39.

Add a 1" yellow jumper, with the insulation removed, between turrets 39 and 40.

☐ STEP 61

Add five jumpers

Add a 3" yellow jumper to turret 41.

Add a 3-1/4" yellow jumper to turret 40.

Add a 7-1/2" yellow jumper to turret 10.

Add a 1-3/4" yellow jumper between turrets 9 and 11.

Add a 7" green jumper to turret 9.

☐ STEP 62

Add four resistors

Add a 100K resistor between turrets 8 and 23.

Add another 100K resistor between turrets 7 and 23.

Add a 470K resistor between turrets 30 and 38.

Add another 470K resistor between turrets 30 and 37.

☐ STEP 63

Add two .01µF capacitors

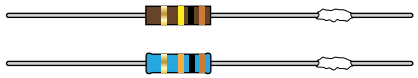
Add a .01µF capacitor between turrets 8 and 38.

Add another .01µF capacitor between turrets 7 and 37.

☐ STEP 64

Add two resistors

Cut two 1" yellow jumpers and remove the insulation. Wrap and solder one jumper around one lead of a 100K resistor to extend the lead of the resistor. Wrap and solder the other jumper around one lead of a 10K resistor to extend its lead.



Add the 100K resistor with extension between turrets 6 and 36.

Add the 10K resistor with extension between turrets 5 and 35.

☐ STEP 65

Add one capacitor + one resistor

Add a 16µF electrolytic capacitor with the positive lead going to turret 4 and the negative lead to turret 34.

Cut one 1" yellow jumper and remove the insulation. Wrap and solder it to a 100K resistor to extend the lead. Wrap this resistor between turrets 3 and 33.

☐ STEP 66

Add one resistor + one capacitor

Add a 130Ω 3W resistor between turrets 2 and 32.

Add a 250µF bipolar capacitor between turrets 1 and 31. This cap looks like a polarized electrolytic cap but it's actually bipolar, meaning it can be installed in either direction.

☐ STEP 67

Add two jumpers

Cut two 1" yellow jumpers and remove the insulation. Wrap one around turrets 1 and 2 and wrap the other around turrets 31 and 32.

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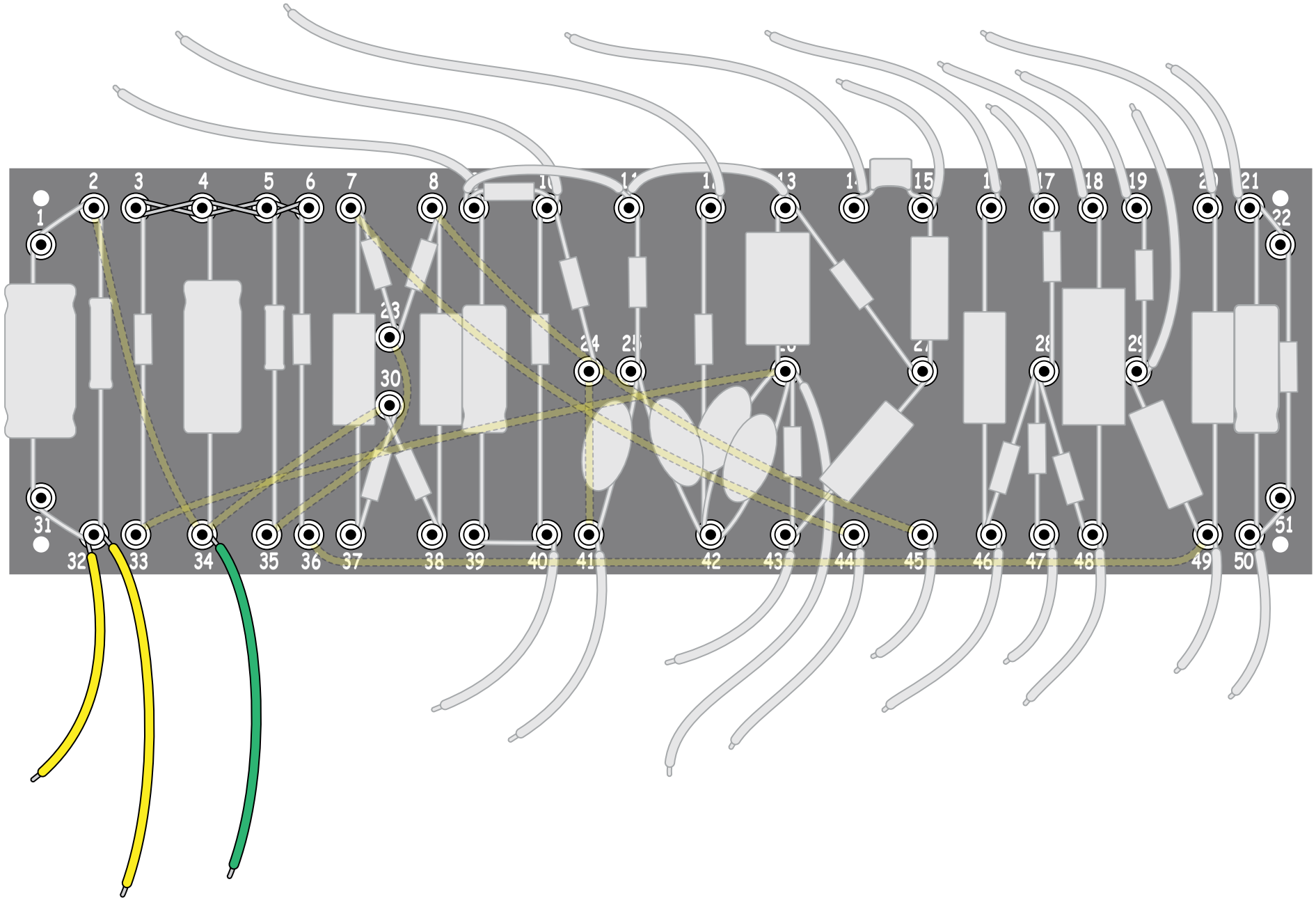

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☐ STEP 68

Add one jumper

Cut one 3" jumper and remove the insulation. Starting at turret 3, wrap in a figure 8 pattern around turrets 4 and 5, completely around turret 6, and then in an opposite figure 8 pattern around turrets 5 and 4, and back to turret 3. This creates a bus connecting turrets 3, 4, 5, and 6.

☐ STEP 69

Add three more jumpers

Add a 4-1/4" green jumper to turret 34.

Add a 3" yellow jumper to turret 32.

Add a 4-3/4" yellow jumper to turret 32.

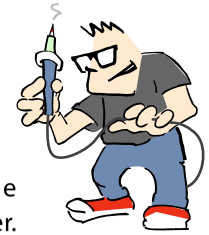
Stop and inspect your work

All the components and wires are now on the turret board. Take a break to rest your eyes before making sure you've followed each step correctly.

To find no mistakes at this stage would be surprising, and it's much less work to find them now than after soldering! As you check your work, make sure all the connections are tight.

☐ STEP 70

Solder the turret board connections



It's time to set all the connections with solder.

Review the tips for great soldering on page 9, then solder each connection on the turret board.

After all the joints are soldered clip the excess leads from the turrets. Trimming the excess leads is important to avoid a short in your circuit. Check all your solder joints to make sure they're shiny, and to see that you didn't miss one.

☐ STEP 71

Add eight back-of-board jumpers

Cut these jumpers to length and trim 3/8" of insulation off each end. Run these ends up into the bottom of the turrets and solder them in to place.

Cut a 3" yellow jumper and solder it to the back of turret 2. Place the other end into the bottom of turret 34 but don't solder it yet.

Solder a 2" yellow jumper to the bottom of turret 30. Solder the other end to turret 34, along with the other lead you just placed there.

Solder a 2-1/2" yellow jumper to the bottom of turret 35. Solder the the other end to turret 23, routing this wire around, not over, the jumper at turret 30. (It's good wiring practice to avoid locating jumpers on top of other leads and connections.)

Solder a 6" yellow jumper between the bottoms of turrets 33 and 26.

Solder a 5-1/2" yellow jumper between the bottoms of turrets 7 and 44.

Solder a 5" yellow jumper between the bottoms of turrets 8 and 45.

Solder a 7-1/4" yellow jumper between the bottoms of turrets 36 and 49.

Solder a 1-1/2" yellow jumper between the bottoms of turrets 24 and 41.

☐ STEP 72

Test the continuity of your back-of-board jumpers

Once all of these solder joints are set, flip the board back over and test for continuity on each pair of turrets connected by back-of-board runs. Use a multimeter for continuity testing, as described on page 37.

You're ready to install the turret board in the chassis.

It's time to remove your tape with the turret numbers. When the board's installed, you won't be able to get at the tape to remove it. From this point on, you can identify jumpers and turrets by referring to the diagrams.

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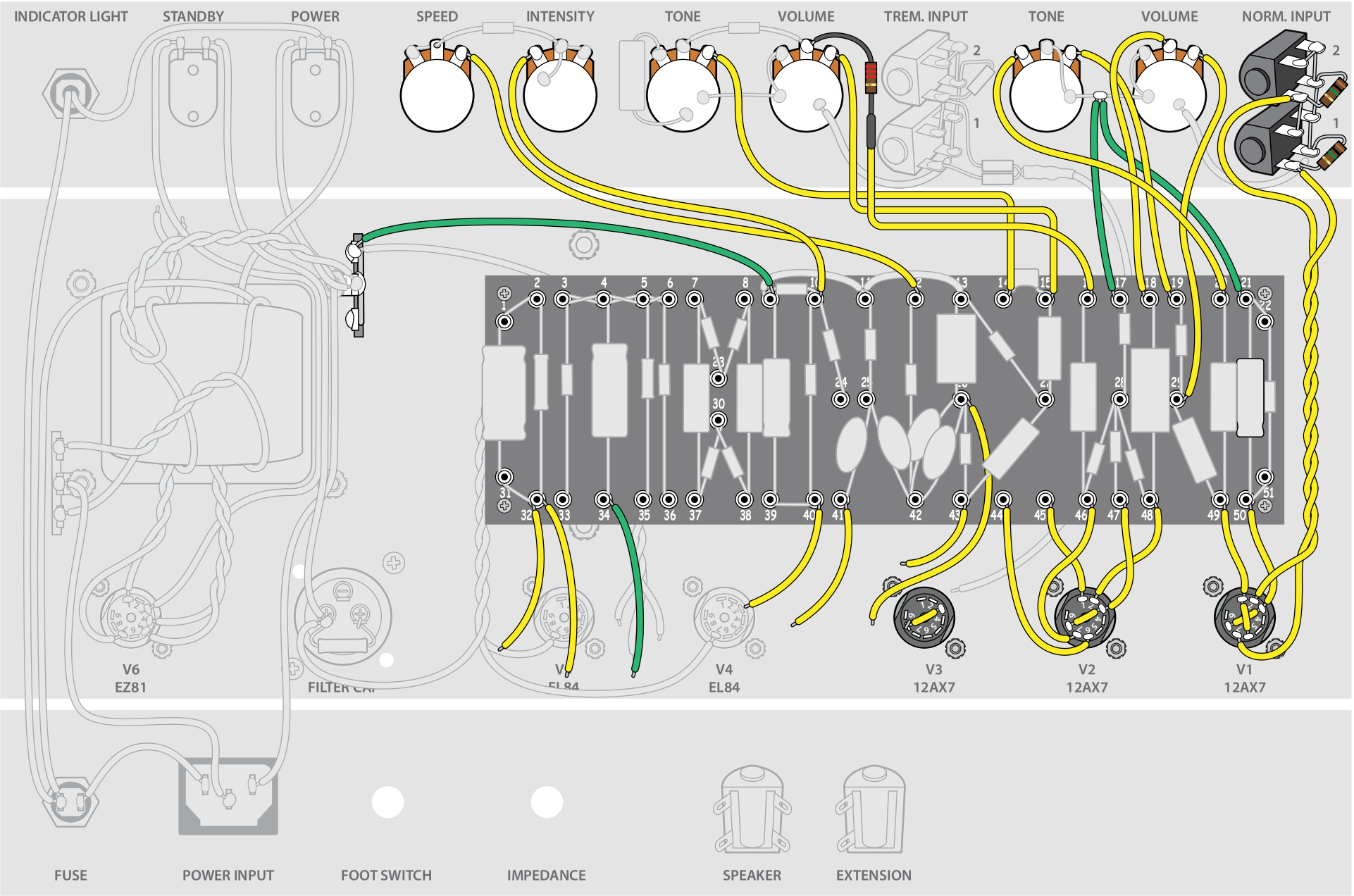

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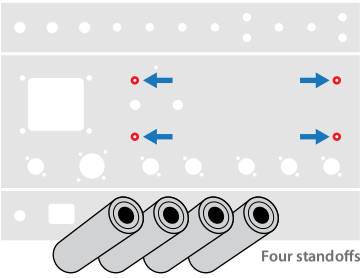
Installing the board in the chassis

☐ STEP 73

Install the turret board

To keep the turret board connections from shorting against the metal chassis, the board is mounted on four threaded standoffs that hold it away from the chassis.



Using 4-40 screws, mount these four standoffs to the chassis. Line up the turret board on these standoffs.

Route the jumpers from turrets 14, 15, and 16 so they run below the tremolo channel inputs. When two jumpers cross over each other, bend them so they cross at 90° angles, rather running side-by-side. This detail influences the amp's sound, especially on a high-gain circuit like this one.

Be sure that the flying lead from the tremolo channel input jacks does not get caught on any of the underboard leads and can still reach socket V3.

☐ STEP 74

Solder the normal channel volume + tone pots

Solder the jumper from turret 20 to the left lug of the normal channel tone pot.

Solder the jumper from turret 29 to the right lug of the normal channel volume pot.

Solder the jumper from turret 19 to the right lug of the normal tone pot.

Solder the jumper from turret 18 to the middle lug of the normal volume pot.

Solder the jumper from turret 21 and the jumper from turret 17 to the ground bus between the normal volume and tone pots.

☐ STEP 75

Add an insulated 2.2K resistor

Place a 1" piece of 1/8" heat-shrink tubing over the jumper from turret 16 and slide it all the way down to the turret. Wrap this jumper to a 2.2K resistor and solder the connection. After the solder cools, slide the heat-shrink tubing over the joint and shrink it to insulate the solder joint.

Insulate the 2.2K resistor's other lead with heat-shrink tubing and solder it to the middle lug of the tremolo volume pot along with the resistor lead that you wrapped there previously.

☐ STEP 76

Solder the tremolo channel pots

Solder the jumper from turret 15 to the right lug of the tremolo channel volume pot.

Solder the jumper from turret 14 to the right lug of the tremolo tone pot.

Solder the jumper from turret 12 to the right lug of the tremolo speed pot.

Solder the jumper from turret 10 to the left lug of the tremolo intensity pot.

☐ STEP 77

Solder the ground jumper

Solder the green jumper from turret 9 to the 3-lug grounding strip near the power switch.

☐ STEP 78

Add four tube socket jumpers

Cut four 1" yellow jumpers.

Use the first to connect pin 3 and pin 8 of socket V1. Solder it to pin 8 only.

The second connects pin 1 and pin 6 of socket V1. Solder it to pin 6 only.

The third connects pin 3 and pin 8 of socket V2. Solder it to pin 8 only.

The fourth connects pin 3 and pin 8 of socket V3. Solder it to pin 3 only.

☐ STEP 79

Solder the jumpers to V1

Plug an instrument cable into either of the normal channel input jacks, which will open the jack's built-in shorting switch. This is necessary for the following continuity tests.

Using a multimeter, identify the jumper that has continuity to the normal channel's input jack 2. Solder this jumper to pin 2 of socket V1.

Identify the jumper with continuity to the normal channel's input jack 1. Solder this jumper to V1 pin 7.

Solder the jumper from turret 50 to V1 pin 3 along with the jumper already in place.

Solder the jumper from turret 49 to V1 pin 1 along with the jumper already in place.

☐ STEP 80

Solder the jumpers to V2

Solder the lead from turret 48 to V2 pin 2.

Solder the lead from turret 47 to V2 pin 3 along with the jumper already in place.

Solder the lead from turret 46 to V2 pin 7.

Solder the lead from turret 45 to V2 pin 1.

Solder the lead from turret 44 to V2 pin 6.

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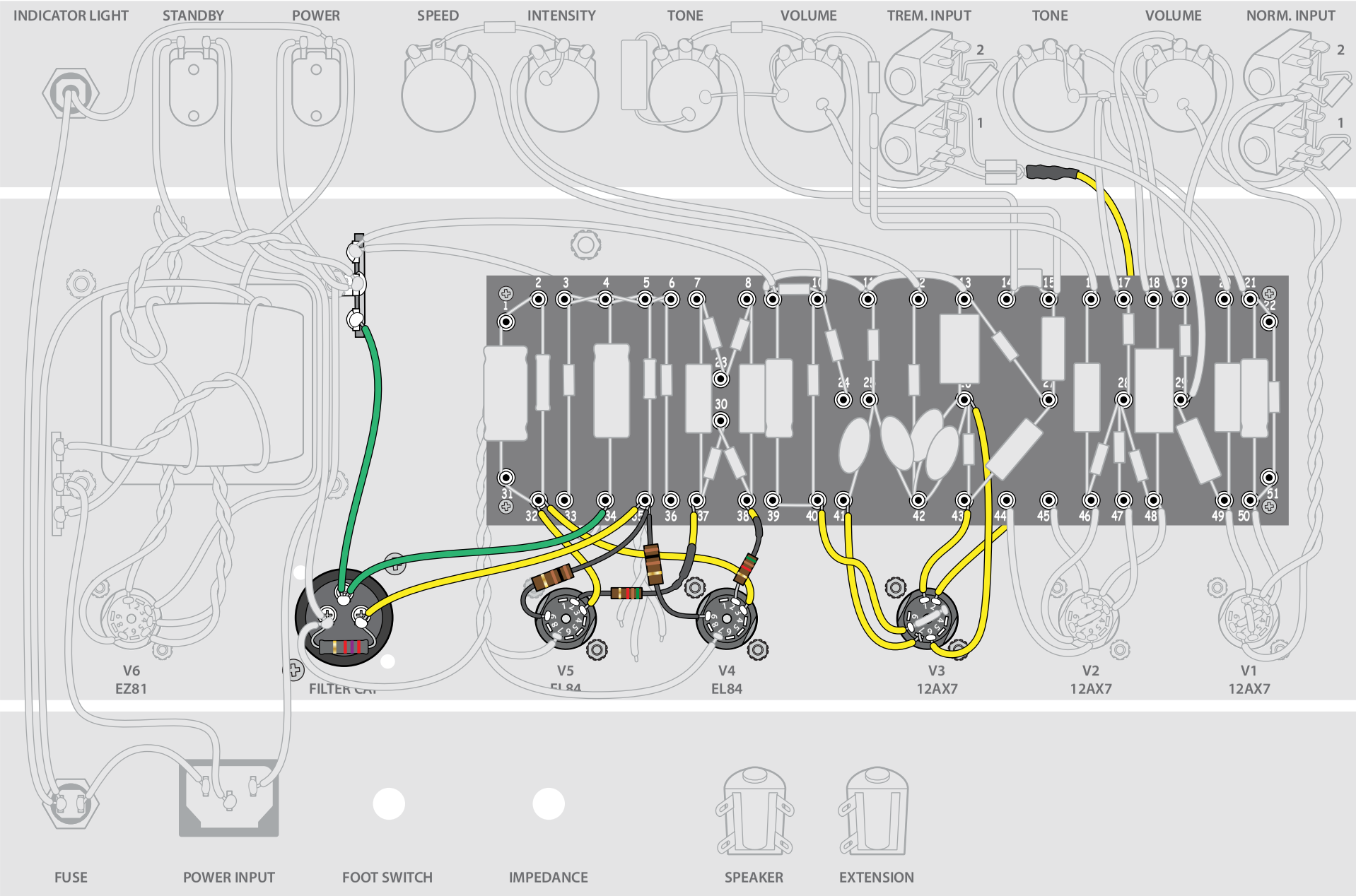

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☐ STEP 81

Solder the jumpers to socket V3

Solder the jumper coming from turret 26 to V3 pin 6.

Solder the jumper from turret 43 to V3 pin 1.

Solder the jumper that runs under the board from the tremolo channel input jacks to V3 pin 2.

Wrap the lead from turret 41 through V3 pin 7 but do not solder it yet.

Solder the lead from turret 40 to V3 pin 8 along with the jumper already in place.

☐ STEP 82

Solder two jumpers from turret 32

Solder the short jumper from turret 32 to V5 pin 3 and solder the longer jumper from turret 32 to V4 pin 3.

☐ STEP 83

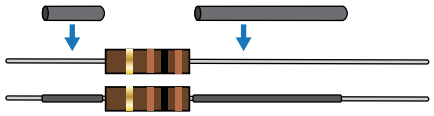
Wrap the jumper from turret 34

Wrap the jumper from turret 34 through the ground lug (-) of the filter capacitor but do not solder it yet.

☐ STEP 84

Add one jumper + two resistors

Add 1/16" heat-shrink tubing to a 100Ω resistor to insulate the leads. Wrap this resistor between turret 35 and V4 pin 9.



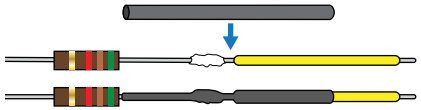
Insulate another 100Ω resistor with heat-shrink tubing and wrap it between turret 35 and V5 pin 9.

Add a 5" yellow jumper between turret 35 and the right filter cap lug.

☐ STEP 85

Add two jumpers + two resistors

Cut a 2-1/2" yellow jumper. Twist one end of this jumper onto a 5.1K resistor and solder together. Use 1/8" heat-shrink tubing to insulate this solder joint and the bare lead.



Solder the free end of the yellow jumper to turret 38 and solder the free lead from the 5.1K resistor in to V4 pin 2.

Cut a 3" yellow jumper. Twist one end of this jumper around the lead of a 5.1K resistor and solder together. Install 1/8" heat-shrink tubing around the jumper and solder joint.

Solder the free end of the yellow jumper to turret 37 and solder the free lead from the 5.1K resistor in to V5 pin 2.

☐ STEP 86

Add a ground jumper

Cut a 4" green jumper. Solder one end in to the ground lug (-) of the filter cap along with the jumper from turret 34. Solder the other end of this ground jumper to the nearest lug of the 3-lug grounding strip by the power switch.

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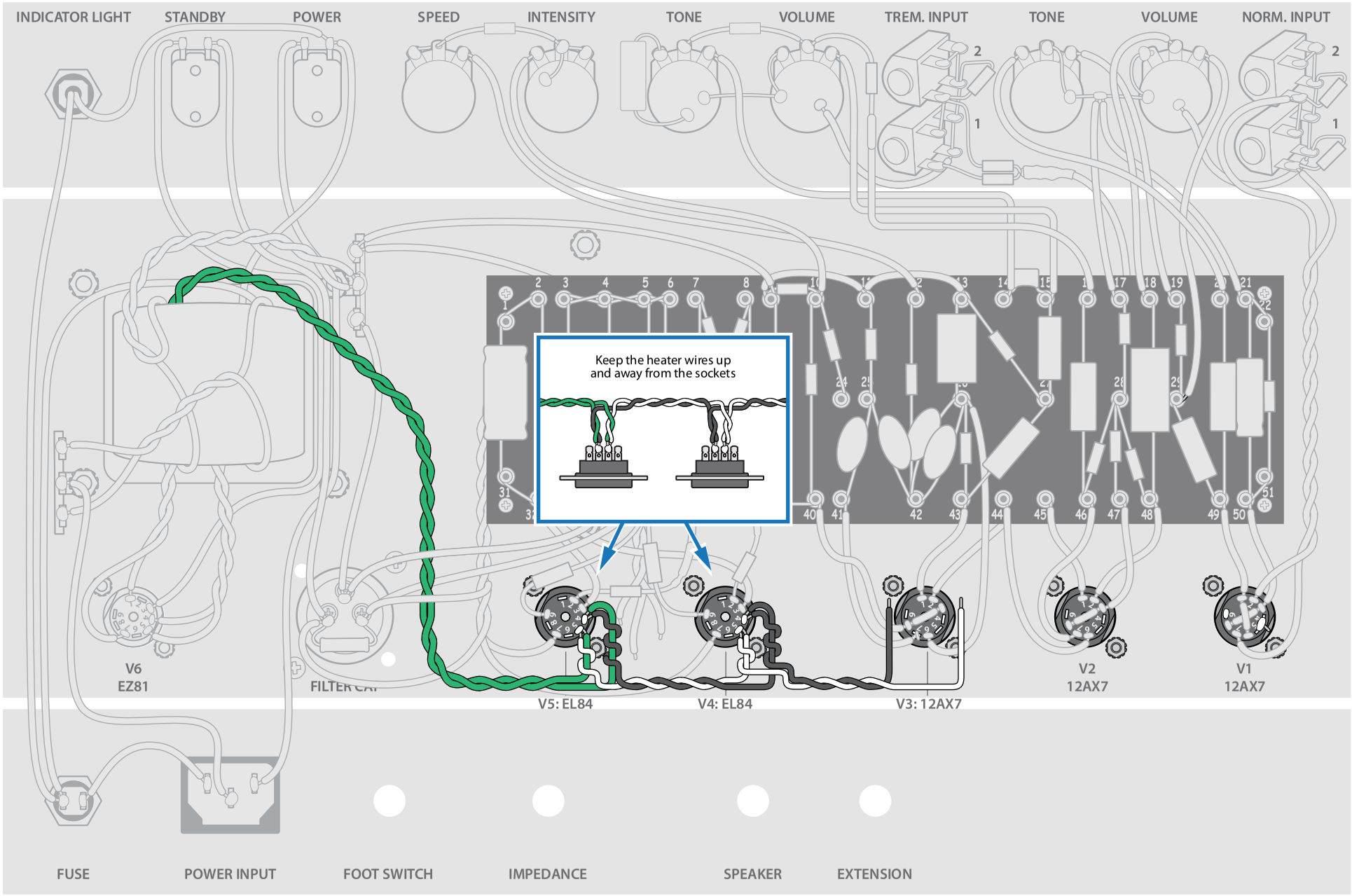

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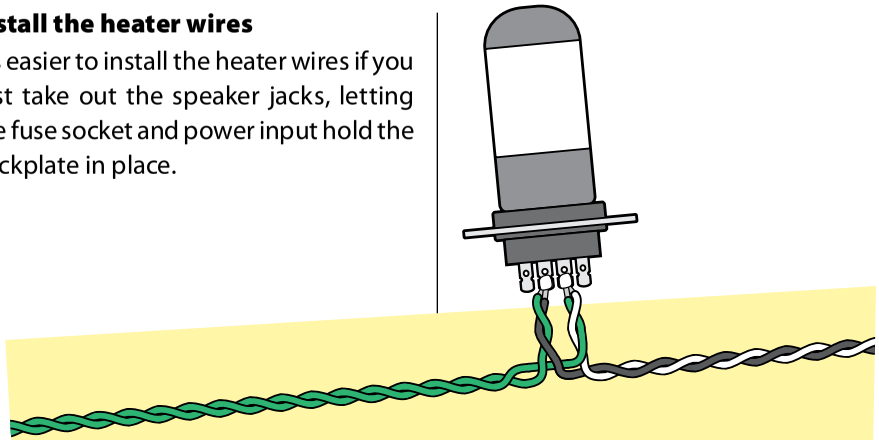
Install the heater wires

It's easier to install the heater wires if you first take out the speaker jacks, letting the fuse socket and power input hold the backplate in place.



Use this heater-wire technique to minimize the hum caused by AC voltage

The twisted green wires from the power transformer carry AC voltage to the heating filaments in the tubes. This voltage will cause your amp to hum if these wires are allowed to run too close to signal-carrying wires.

Twist the wires tightly together

This twist isn't for looks; it's an important hum-cancelling technique to reduce noise in your amp. It works in a way similar to the opposite-wound coils in a humbucking pickup.

Route them up and away

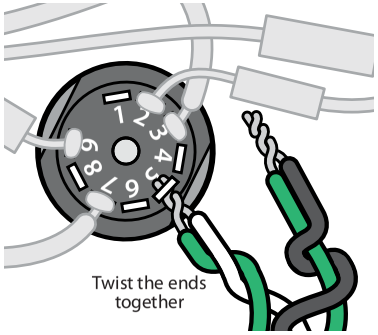
To keep twisted heater wires away from signal-carrying wires, bend them so they're up at least 1" from the tube sockets. Give them a sharp right angle bend toward the next socket, and another sharp bend back down to that socket. This keeps them at a useful distance.

☐ STEP 87

Connect to socket V5

Run the green power transformer wires to socket V5, keeping them down as close to the chassis as possible. The preferred path is to go under the jumpers from the filter cap to the turret board and then take a 90° angle up and over the blue, red, and brown wires from the output transformer.

Cut two 4-1/2" heater wires, one white and one black. Twist them together very tightly, leaving about 1" of the ends untwisted. Join the white jumper to either of the green power supply leads by twisting the ends together. Join the black jumper to the other green lead.



Solder the pair with the white wire to pin 4 of socket V5. Solder the pair with the black wire to pin 5 of socket V5. Bend these wires up and away from the socket. At 1" above the socket, bend the black-and-white pair at a 90° angle toward socket V4.

☐ STEP 88

Connect to socket V4

Cut two 5" heater wires, one white and one black. Twist them tightly together.

Twist the end of the white wire to the white jumper coming from V5. Twist the black wire with the black jumper coming from V5.

Solder the white pair onto pin 4 of V4. Solder the black pair onto pin 5. Bend the wires up away from the socket, and on toward socket V3.

Make sure that the like-colored jumper wires are going to the same-numbered pins, or you will have a phase issue from the pulsing voltage. For example, if the white wire is soldered to V5 pin 4 and the black wire is soldered in to V5 pin 5, make sure you connect the white wire to V4 pin 4 and the black wire to V4 pin 5.

Solder these jumpers to V4 pin 4 and V4 pin 5. Run the black-and-white twisted pair up 1" from the tube socket, directly over to V3, and back down V3, but do not solder it in place yet.

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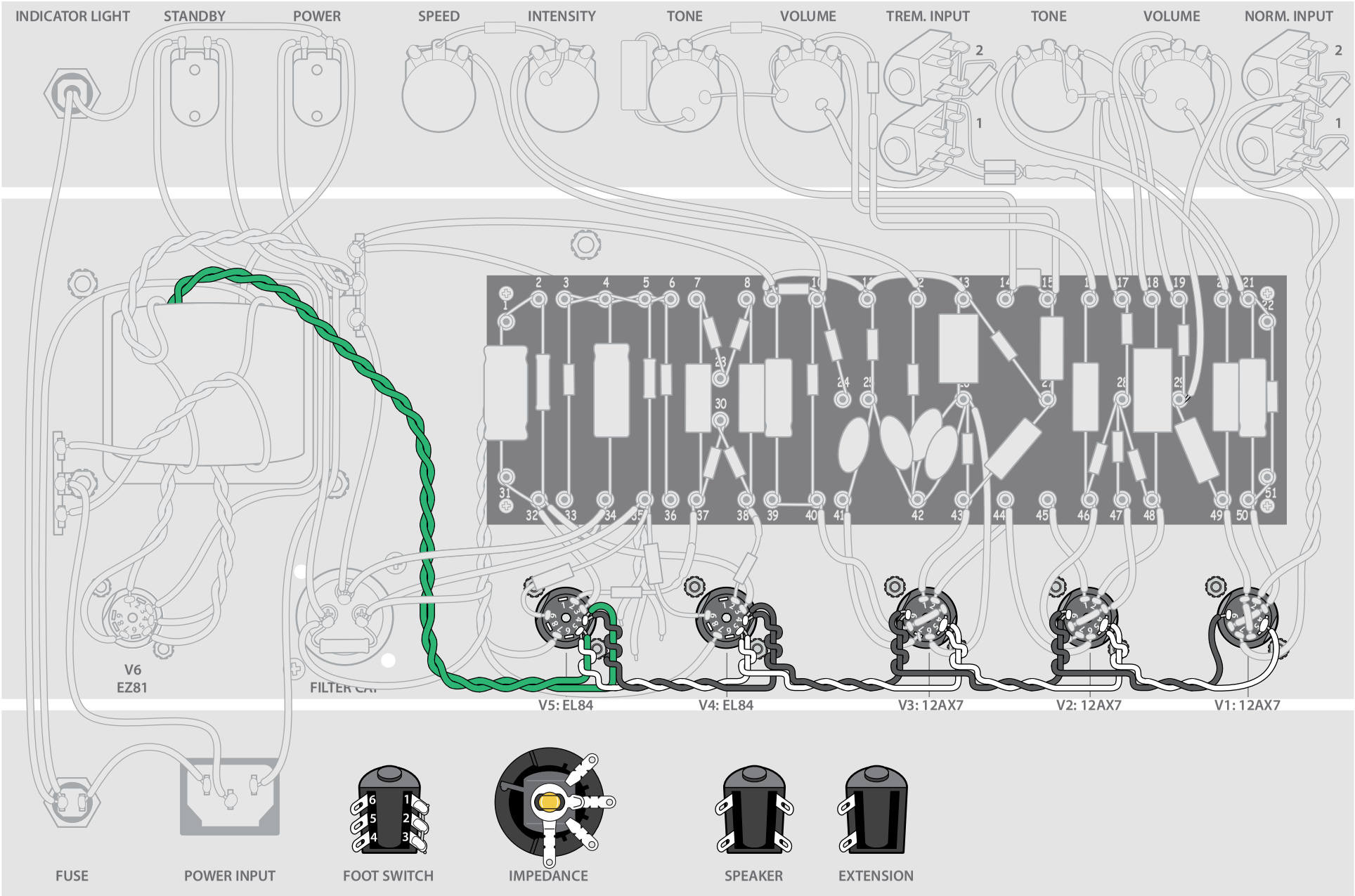

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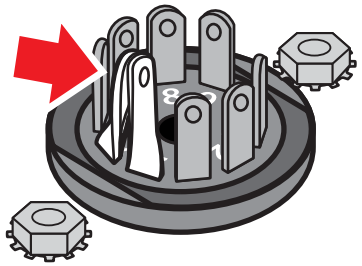
☐ STEP 89

Connect to socket V3

On sockets V3, V2, and V1 you will need to join pins 4 and 5 together. On these three sockets, gently twist pins 4 and pin 5 toward each other so their eyelets line up. Be very careful while doing this as these pins are delicate.



Cut two 5" heater wires, one white and one black. Twist them tightly together.

Twist the end of the white wire together with the white jumper coming from V4. Twist the black wire with the black jumper coming from V4.

Solder the white pair to V3 pin 9 and solder the black pair to combined pins 4+5 on V3. Bend the wires up away from the socket, and on toward socket V2.

☐ STEP 90

Connect to socket V2

Cut two 5" heater wires, one white and one black. Twist them tightly together, leaving about 1" untwisted at both ends.

Twist the like-colored wires of this new pair in with the like-colored wires of the twisted pair coming from V3.

Solder the pair of twisted white wires to V2 pin 9 and solder the twisted black wires to V2 pin 4+5.

☐ STEP 91

Connect to socket V1

Run the black-and-white twisted pair up 1" from the tube socket, directly over to V1, and back down V1. Solder the white wire to V1 pin 9 and solder the black wire to V1 pin 4+5.

Carefully inspect each solder joint from this heater wire installation and once the solder joints have cooled push your heater wires away from the tube sockets as far as you can.

☐ STEP 92

Reinstall the speaker jacks

If you removed the jacks from the back wall of the chassis, reinstall them now with their lugs facing up.

☐ STEP 93

Install the impedance switch

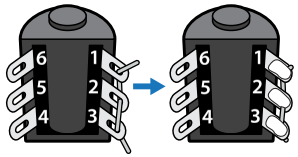
Mount the impedance selector as shown in the diagram, with the right lug up and other lugs facing the speaker jacks.

☐ STEP 94

Install the foot switch jack

Mount the 6-lug foot switch jack in its hole to the right of the power inlet. Use one washer under the mounting nut. Discard the second fiber washer.

Cut a 1" green jumper and remove the insulation. Thread this wire through the lugs 1, 2, and 3 on the right side of the jack, uniting them in a common ground.



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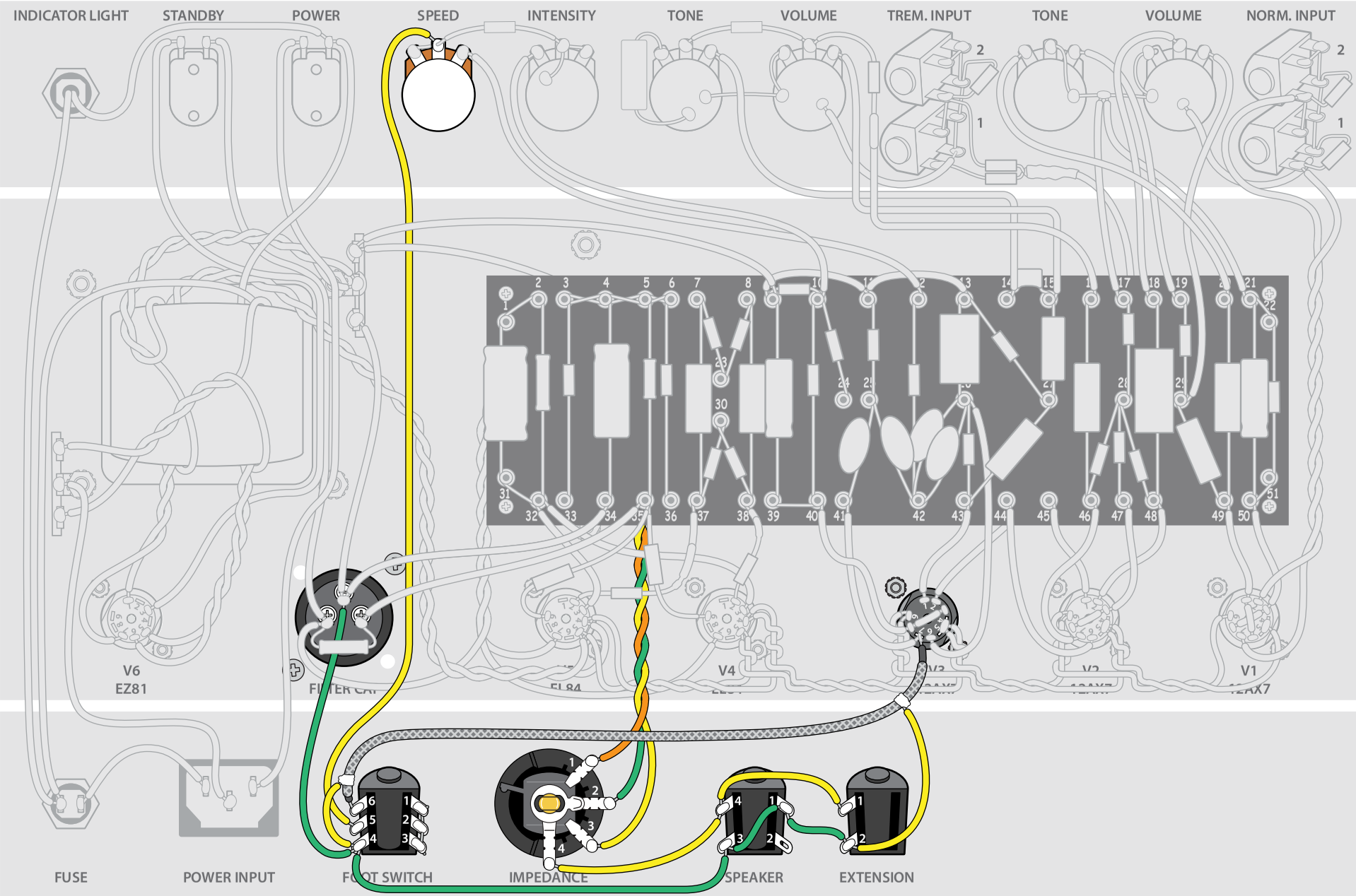

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☐ STEP 95

Connect the impedance switch

Cut the output transformer's twisted orange, green, and yellow wires to length for connecting to the impedance selector switch.

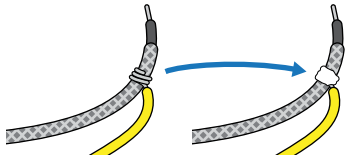
Solder the orange wire to the bottom lug (lug 1 in the diagram). Solder the green wire to lug 2, and the yellow wire to lug 3. The top lug (4) is empty at this point.

The impedance selector switch allows you to set the amplifier's output to match the extension speakers you might choose to add. Set this switch to 8Ω when using the internal speaker by itself.

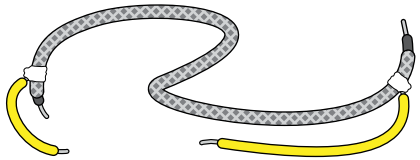
☐ STEP 96

Connect the foot switch jack

Cut a 10-1/2" length of braided, shielded wire. Pull the ends of the braid back to reveal the inner wire, and strip the ends for soldering.



Cut a 2" yellow jumper. Wrap one end tightly around the shielded wire, joining the two wires so the yellow insulation is snugged up to the braid. Solder this connection.



Solder a 1" yellow jumper to the other end of the shielded wire.

Solder center lead of the shielded wire —the end with the short jumper—to lug 6 of the foot switch jack. Wrap the short jumper onto lug 4, but don't solder it.

Run the shielded wire along the bottom corner of the chassis and solder the end to pin 7 of socket V3.

Wrap the other yellow jumper to lug 2 of the 2-lug extension speaker jack, but don't solder it yet.

☐ STEP 97

Connect the speaker jacks

Cut a 2" yellow jumper and solder it to lug 1 of the 2-lug extension speaker jack along with the jumper from the shielded cable.

Wrap the other end of this jumper to lug 4 of the 4-lug speaker jack. Don't solder this connection yet.

Cut a 2-1/2" yellow jumper and solder it to lug 4 of the 4-lug speaker jack along with the jumper from the extension jack.

Solder the other end of this jumper to the top lug of the impedance selector switch.

Wrap a 1" green jumper between lug 2 of the extension jack and lug 1 of the speaker jack. Don't solder it yet.

Wrap another 1" green jumper diagonally between lugs 1 and 3 on the speaker jack. Don't solder it yet.

Cut a 5-1/4" green jumper and solder one end in to lug 3 of the speaker jack along with the short jumper just placed there. Solder the two short jumpers at lug 1 of the speaker jack, and solder the other end of the short jumper to lug 2 of the extension speaker jack.

Run the 5-1/4" jumper from the speaker jack along the chassis wall, over the impedance switch, and wrap it to lug 4 of the 6-pin foot switch jack. Don't solder this joint yet.

☐ STEP 98

Finish wiring the foot switch jack

Cut a 2-1/2" green jumper and solder one end to lug 4 of the foot switch jack along with the green jumper from the previous step and the yellow jumper from the shielded wire.

Solder the other end of this to the grounding lug (–) of the filter capacitor.

Cut a 10" yellow jumper and solder one end in to lug 5 of the foot switch jack. Run this jumper along the floor of the chassis and solder it to the middle lug of the speed pot.

Take a break and review your work

Now you've soldered the components and wires, and it's time to take a break. Rest your eyes and review your work later, carefully searching out any errors before you move on.

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Installing the fuse and knobs

☐ STEP 99

Install the fuse

Insert the 1-amp fuse into the fuse socket from the back of the chassis. Make sure the socket cap is secure. Never use a fuse rated above 1 amp in this amplifier.

☐ STEP 100

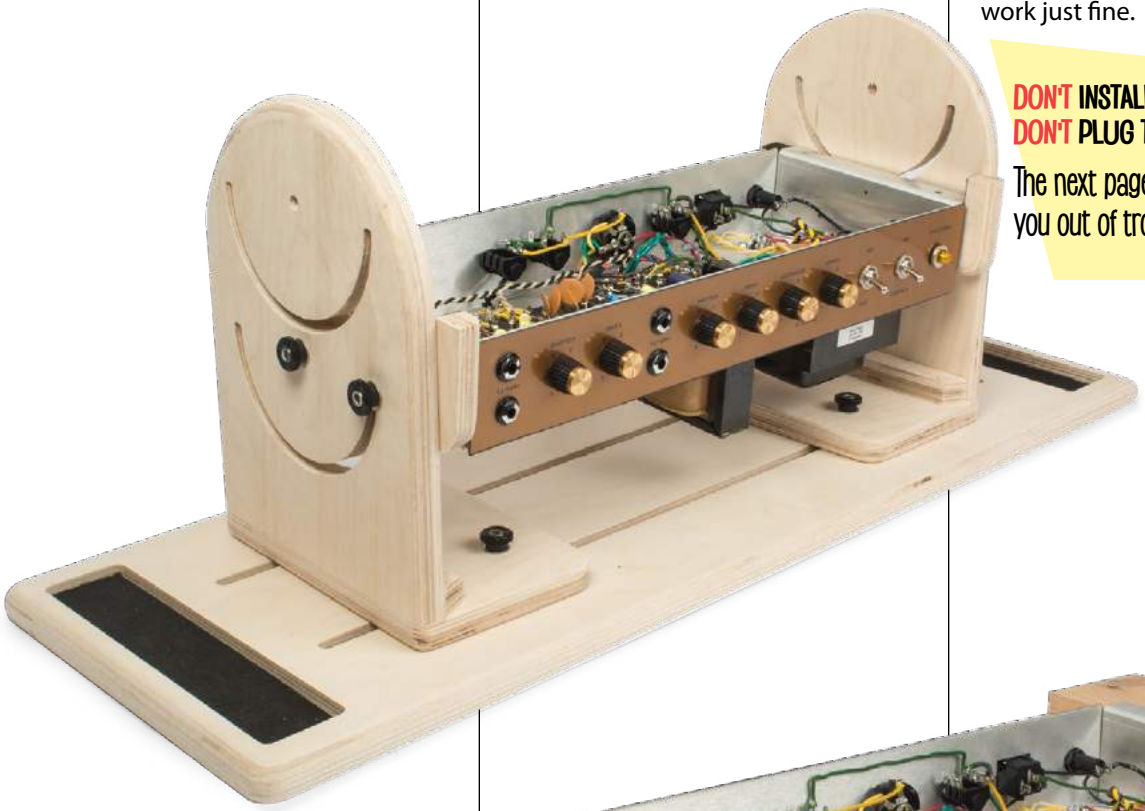
Install the six control knobs

Turn the shaft of each pot all the way counterclockwise to the "off" point and install the knob so the indicator line points to zero.

☐ STEP 101

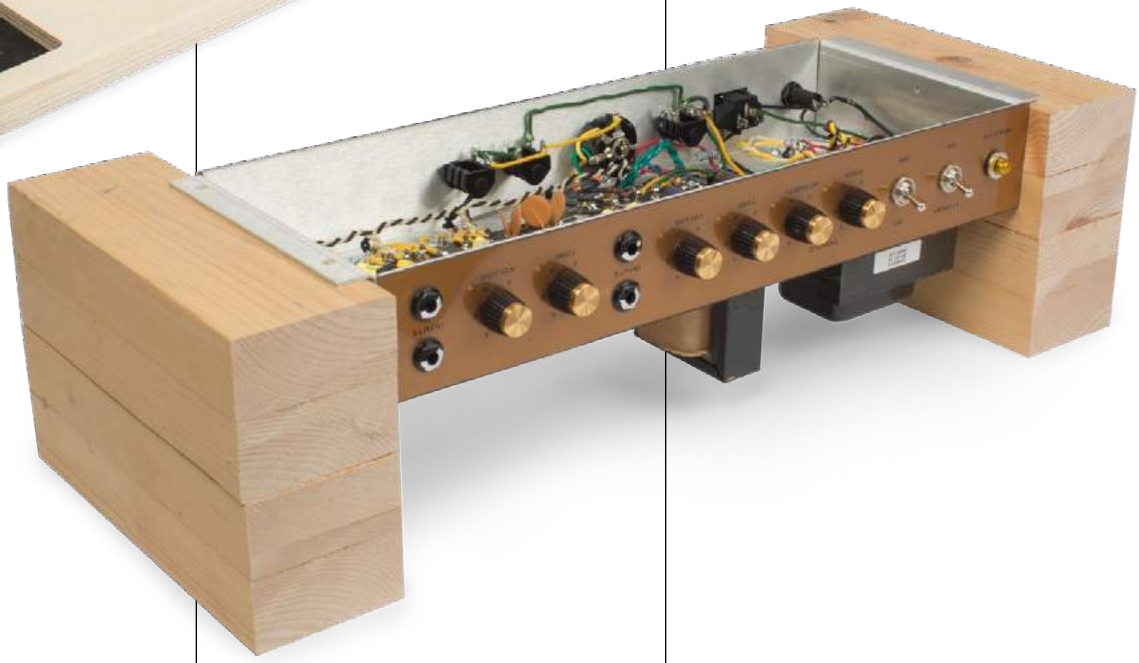
Set the chassis on chassis stand or on blocks for testing

Set your chassis up for final testing. Chassis stands are extremely useful for this. If you do not have a chassis stand a couple of blocks of wood can work just fine.



DON'T INSTALL THE TUBES YET!
DON'T PLUG THE AMP IN YET!

The next page is going to keep you out of trouble!



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Any **multimeter** will work fine for the two types of tests we're about to do: checking **continuity** and reading **voltages**. The instructions that came with your meter will be helpful.

Continuity testing is simply making sure current flows between two points successfully. Touch the meter's red lead to one end of the section being tested, and the black lead to the other end. If the continuity is good, your meter will beep or register this on the display.

Voltage testing is where you need to be careful. Some steps require the amp to be plugged in and turned on. This becomes dangerous if you're not cautious. Respect the voltages and follow the directions, and these tests are safe and easy.

☐ STEP 102

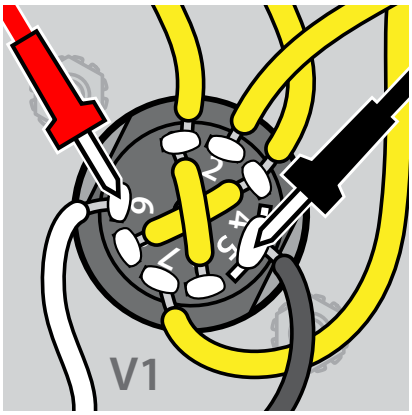
Perform a safe power-up

At this point, there should be no tubes installed, and the speaker should be disconnected.

Before plugging the amp in, turn the power switch to ON. Switching the amp on before the first power-up protects you from shock if a mistake in your wiring has created a short to the chassis. If this short exists, an indication would be that the pilot light will not turn on, since the AC current is going directly to ground.

Plug the power cord in. The pilot lamp should light.

For a few minutes, watch for smoke or unusual smells. If anything seems unusual, disconnect the power immediately and carefully review all your connections.



☐ STEP 103

Test the standard AC voltage

Set your multimeter to 20V AC. Check the heater voltage across pin 9 and pins 4+5 on the V1/12AX7 socket. This should read between 5-7V AC. If this reading is drastically different, unplug the amp and check your connections. If the amp seems normal, unplug the power cord while still leaving the power switch ON.

ALWAYS discharge the filter cap before working on the circuit. See how to use a snuffer stick on page 6.

And seriously, keep one hand behind your back!

☐ STEP 104

Test the dangerous DC voltage

The dangerously high DC voltage that passes through the rectifier tube and the filter caps is referred to as "B+". The next step is to test this B+ voltage.

With the amp still unplugged, install the 6CA4 rectifier tube in socket V6 and flip the standby switch on.

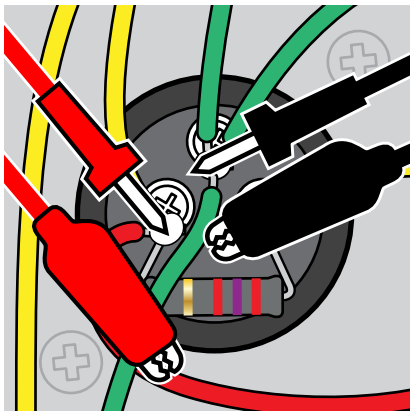
Plug the power cord back in. The pilot lamp should light, along with the filament inside the 6CA4 tube.

Again, spend a few minutes watching for smoke or smells.

At this point, dangerous voltage is forming in the filter caps. Always discharge them before working on the circuit, even if the amp is unplugged. See how to use a snuffer stick on page 6.

For safety, use only one hand to probe the amp during DC tests.

Keep your other hand behind your back when you need to probe a component. This way, you can't be a path between B+ voltage and ground—a mistake that would send a dangerous charge through your heart.



Set your multimeter to 500V DC and connect the black (negative) probe to ground. Once that probe is secured to ground, measure the DC voltage at the right lug of the filter cap (lug closest to power input). This B+ voltage should be roughly 440V DC.

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☐ STEP 105

Test the preamp tubes

Unplug the amp. Use the snuffer stick (see page 6) to discharge the capacitors before working on the circuit. Even after discharging the caps, the best habit is to use a wooden chopstick instead of your fingers when you need to nudge a component.

With the amp unplugged, install the 12AX7 preamp tubes in sockets V1, V2 and V3. After they're installed, plug the amp back in. The pilot lamp should light up. Let the amp warm up for a few minutes. Again, if you get smoke or smells, unplug immediately.

Connect your multimeter's negative lead to ground.

Set the multimeter to 5V DC and check turret 50, which should read around 1.5V.

Set the multimeter to 200V DC and check turret 43, which should read around 110V.

Set the multimeter to 200V DC and check turret 26, which should read around 175V.

Set the multimeter to 200V DC and check turret 49, which should read around 150V.

Set the multimeter to 500V DC and check turrets 44 and 45, both of which should read around 230V.

If the readings at turrets 44 or 45 show no voltage or low voltage, follow this test: unplug the amp, drain the filter caps with the snuffer stick, set your meter to read continuity, and make sure you have properly installed the back-of-board jumpers from turret 7 to turret 44 and turret 8 to turret 45.

If all of these voltages come within approximately 10% of their expected values, unplug the amp.

☐ STEP 106

Test the EL84 power tubes

With the amp unplugged, install the EL84 power tubes in sockets V4 and V5.

Plug the speaker into the left speaker jack. The other jack is for an extension cabinet; if you plug the internal speaker into it, you'll get no sound.

Plug the foot pedal in as well.

Perform these next tests with the speaker turned away from you. If the amp starts to oscillate and squeal, this will help protect your ears.

Plug the amp in. After a few moments you should hear a low hum. If the hum becomes very loud, unplug it immediately and review your connections.

After the amp's warmed up for a few minutes attach your multimeter's negative lead to ground.

Set your multimeter to read 500V DC, and test for voltage at the left lug of the filter cap (the lug nearest to the impedance selector switch). This voltage should read around 315V.

Set your multimeter to 20V DC and check the voltage at turret 32. This should be around 10V.

Set the normal channel tone knob to 10. Begin to turn the normal channel volume knob and listen for a slight hiss. As you increase the volume past here the hiss should become much more noticeable. Any sound beyond this hiss and a slight hum is a sign of poor wiring.

Turn the volume knob back to zero and repeat this process with the tremolo channel.

If your voltage readings are correct, plug a guitar in and begin playing at low volume. If the amp is behaving as it should, keep increasing the volume. It should start to break up nicely as you increase the volume. Test the tremolo effect and the foot switch functions at this time as well. The left button on the footswitch will be the "on/off" switch and the right switch will be a "high/low" switch.

If there are any strange oscillations, squeals, or the amp seems at all unstable, use a wooden chopstick to begin probing for loose connections:

- from the input jacks to the turret board
- from the tube sockets to the turret board
- from the tube sockets to the front panel controls.

It usually takes just a minor wiring adjustment like resoldering a loose joint to correct this sort of distortion.

After testing all inputs, if everything seems to be operating normally, turn the amp off. You're ready to assemble it and play it!

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Final assembly

☐ STEP 107

Install the chassis

Secure the chassis to the back panel of the cabinet with the four 10-32 mounting screws and nuts.

Lay the cabinet face down. With the chassis attached, secure the back panel to the cabinet. Also attach the lower back panel.

Tips for using the 74X

You might notice this amp is quite a bit "dirtier" than other amps of the 60's era. One factor contributing to that is the gain stages are all biased extremely hot, with 820Ω resistors. This small value for the bias resistor (cathode resistor) both reduces headroom and increases preamp distortion.

You should find that the normal channel has a bit more gain and bass to it than the tremolo channel. You'll be amazed at how many colors live in this very simple amp. The clean tones won't be mistaken for Fender or Vox amps, but they still have a certain "airy shimmer" that gives them life. Still, this amp was made for cranking the volume, and that's where it shines.

One of my favorite ways to play the 74X is through the normal channel with the volume and tone both set to 8. This puts the amp right on the edge of saturation, and you can push it over that edge by really digging in on your guitar.

If you play with pedals, the tremolo channel will most likely be your favorite. The tremolo channel is coupled with smaller caps, which makes the bass less overwhelming than the normal channel. With less bass coming from the amp, your boost pedals are free to drive the signal without swamping out.

Both channels of this amp have their own low-loss master tone control. One advantage of this master tone control over a treble-mid-bass setup is that the signal is less processed, which leads to more gain. And this amp is all about gain.

With the tone knob at 5, treble and bass will both be at maximum. As you turn the tone knob down, you start to bleed treble from the tone. With the tone knob at 1 you'll have nothing but bass. In the range from 5 to 11, the tone knob is removing bass from the mix. With the tone at 11 you'll have nothing but treble.

The channels of this amp are out of phase with each other when you jumper them together by placing a cable between the inputs. You might like to jumper the channels together, but I think it makes the sound thin and brittle.

Matt Clouston, StewMac

Tube life

The life span of the power tubes is affected by how hard you drive the amp. If you are overdriving the amp for hours every day, expect the power tubes to have a shorter life span.

We encourage you to experiment with different tube brands and find the brand that is most favorable to your ears and your wallet.

MAKE IT
MOD IT
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For questions and support, StewMac is here to help!

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Email: service@stewmac.com

Thanks for choosing this StewMac kit, and welcome to the world of amp building!

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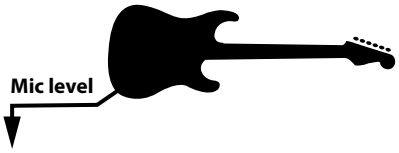
Learning more: secrets revealed in the schematic

You don't need to read a schematic to build this kit. But it's fun to see how the circuit works, and to see the different subcircuits that interact to shape your sound.

Working with the tiny signal from the guitar, the amp creates the power needed to drive the speaker. The signal is affected by the **gain**, **processing**, **output** and **power** stages as it passes through the circuit.

We've color-coded these stages on our schematic, to show how the parts work together. Symbols for components are in the key at the bottom of the frame.

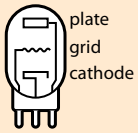
On the **wiring diagram** we build step-by-step in these pages, the parts are easier to recognize. But studying these color-coded stages will help you understand where each component fits into the creation of your sound.



Gain

Line level

The gain circuit increases the signal to **line level** (about 1 volt), by passing it through a 12AX7 preamp tube where electrons flow from a heated **cathode** to be received by the anode **plate**. The **grid** between these receives the tiny voltage from the guitar, whose varying musical signal controls the flow of electrons to the plate.



This amp's dirt comes from gain stages that are biased extremely hot: the small-value 820Ω resistors reduce headroom and increase distortion.

The tremolo inputs' 68K resistors create less gain and bass than the normal channel, making the tremolo channel a good platform for pedals.

Processing

Line level

The processing stage shapes the **tone**. Each channel on this amp has its own low-loss master tone control. One advantage of this master tone control over a treble/mid/bass setup is that the signal is less processed, which leads to more gain—and this amp is all about gain.

With the tone set to 5 both treble and bass will be at maximum. As you turn the tone down, it begins to bleed treble from the tone. Turning the tone knob all the way down gives you nothing but bass. As you turn the tone knob up past midway towards full, you start to cut bass out of the mix. With the tone knob all the way up, you'll have nothing but treble.

Output

Speaker level

The output stage increases the line level signal to **speaker level**, which is typically 8 volts or greater.

In this amp the signal is split, and half of it is inverted through the second half of the 12AX7 tube.

The split signal is then passed to the pair of EL84 tubes for final amplification and then sent to the output transformer to step down the voltage and step up the current.

The output transformer adjusts the impedance to 4, 8, or 16 ohms to drive the amp's **8Ω** speaker.

Negative feedback

A negative feedback loop is a stage that flattens and extends the amp's frequency response to reduce the distortion generated in the output stage. This makes an amp's sound cleaner and more hi-fi.

The 74X, however, has no negative feedback loop. This results in early breakup and plenty of grit.

Power

The power supply stage provides power to the other circuit stages, as well as the tube heaters and pilot light.

This circuit receives the **AC power** from your wall and passes it through the power transformer to create higher voltage. The electricity then goes to the rectifier, which converts it to a pulsing **DC current**.

This then passes through a series of three large electrolytic capacitors which filter out the pulsing to create a smooth current. As each cap smoothes a bit more, the current is also passing through resistors that lower the voltage.

As the signal from the guitar becomes more amplified, the ripple of DC current becomes less evident and the fully filtered current is sent to the most sensitive part of the amplifier, the first pre-amp tube in the gain stage.

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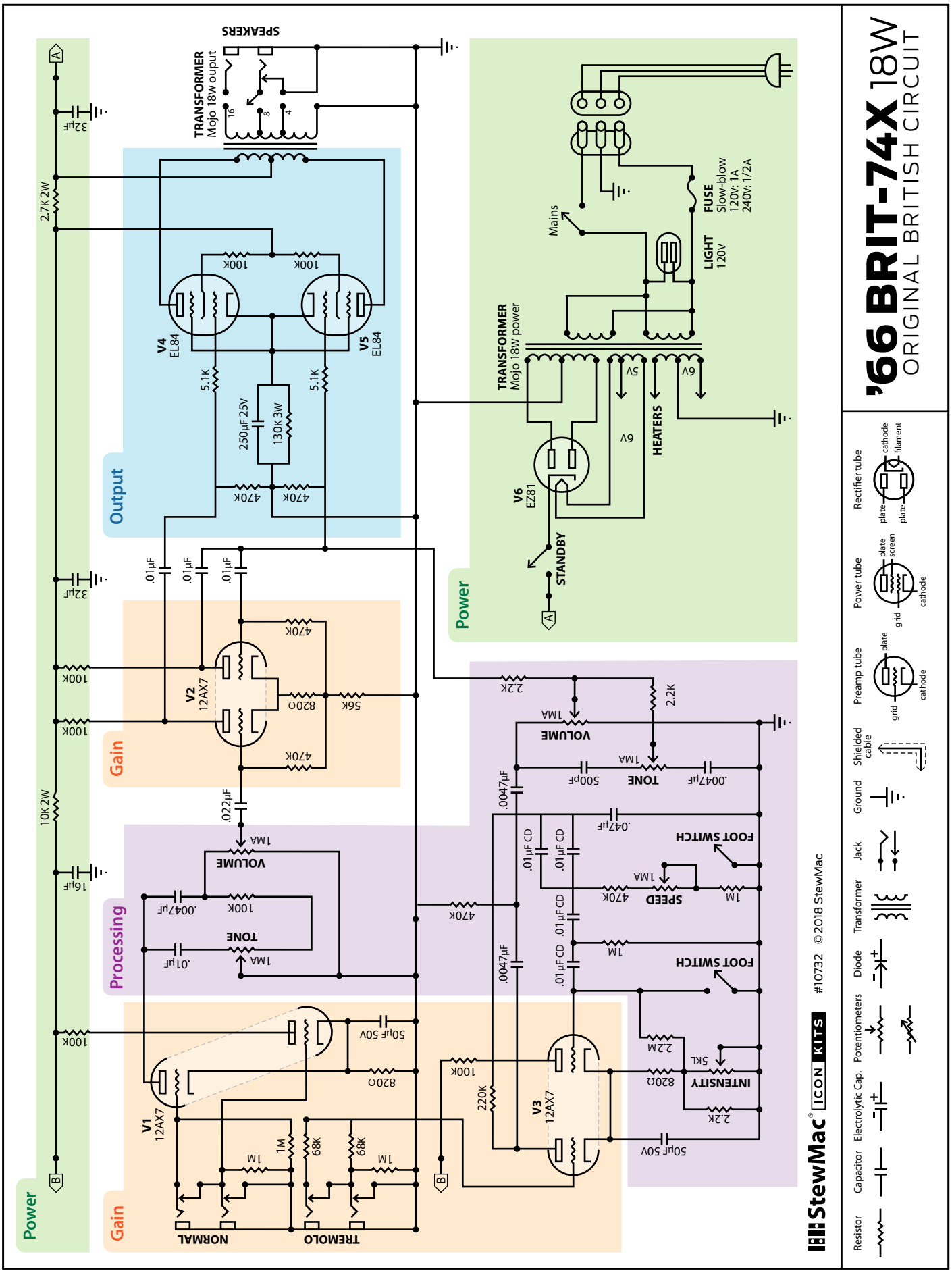

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It's your amp. Your tone. You built it!

StewMac **ICON KITS** teach you the world of amp building, then turn you loose with amazing hand-built tone machines!

'57 MINI TWEED 5W AMP KIT

One-knob titan of tone.

A timeless studio darling whose tiny size hides tremendous punch and versatility.

The 5F1 circuit was meant to be a student amp but wasn't kid stuff for long; rock's finest guitarists hijacked it for some of the greatest songs ever recorded. Listen to Eric Clapton ("Layla") or Joe Walsh ("Rocky Mountain Way") while you build this amp!

Our simplest kit; the quickest way to get into amp building.

#10730 5 WATTS / 8" SPEAKER / ORIGINAL 5F1 CIRCUIT

DIFFICULTY
HOURS: **6**

'59 TWEED 15W AMP KIT

Dirty little devil that shaped guitar history.

With mysteriously fat saturated tone, this little monster makes it easy to achieve seismic distortion.

This amp's 5E3 circuit is an enigma: Why do the controls on the channel you're NOT using make your tone so great? The answer: Who cares? This is one of the greatest tone monsters ever created! Listen to Neil Young's *Rust Never Sleeps* while building this kit.

Our most popular amp kit and a great learning experience.

#10731 15 WATTS / 12" SPEAKER / ORIGINAL 5E3 CIRCUIT

DIFFICULTY
HOURS: **8**

'65 P-REVERB 15W AMP KIT

Sparkling bright, perfect for the surf.

Plug your single-coils straight in for that signature clean American tone, or go surfing with onboard effects.

The smallest member of the black-panel family to offer reverb and tremolo, this amp made its name as a jangly pop dream machine. Aficionados treasure its early low-end breakup powered by a pair of 6V6 tubes.

Listen to "Surfin' USA" and the great sounds of Ryan Adams.

#10734 15 WATTS / 10" SPEAKER / ORIGINAL AA1164 CIRCUIT

DIFFICULTY
HOURS: **12**

'66 D-REVERB 22W AMP KIT

Famously clean, with enough guts to gig.

Perfect for recording as well as performing, the D-Reverb produces stinging clarity that absolutely refuses to get lost in the mix.

One of the most popular designs ever, this amp lives in the happy middle between bright clarity and rich distortion. It excels in the studio and on the stage. While capable of crystal clear tones at good volume, you can push this one into beautifully saturated, play-sensitive distortion.

It's all here: clarity, distortion, and rectifier tube sag.

#10737 22 WATTS / 12" SPEAKER / ORIGINAL AB763 CIRCUIT

DIFFICULTY
HOURS: **16**

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StewMac **ICON KITS** are fun to build, with friendly instructions to guide you and loads of info to add to your knowledge.

’62 BRIT-PLEX 45W AMP KIT

The original British showstopper.

This amp started a revolution. It’s been rocking the world for over 50 years, and we still can’t get enough.

Favored by blues and rock players for exceptional sustain and rich creamy tone, the ’62 Brit-Plex is chock-full of harmonic gain, yet it still stays articulate and even a little crispy. Put this head on a classic 4x12 cab and watch out!

While building, listen to Gary Moore’s “Still Got The Blues."

#10736 45 WATTS / ORIGINAL BRITISH CIRCUIT

DIFFICULTY
HOURS: **12**

’81 BRIT-800 50W AMP KIT

This hairy monster lives to shred.

The defining British circuit that dominated the ’80s.

This 50W giant created your favorite heavy rock and metal albums. Used by Slayer and Pixies, and recorded on early Metallica albums, this circuit produces that screaming guitar tone that your mother despises. With solid-state rectification there’s no sag, and the distortion created by this circuit is way more about treble than mids or bass.

Listen while building: Smashing Pumpkins’ *Siamese Dream*.

#10735 50 WATTS / ORIGINAL BRITISH CIRCUIT

DIFFICULTY
HOURS: **16**

’66 BRIT-74X 18W AMP KIT

Leave your half-stack at home.

Born in London, this little blues blaster earns its living every night, gigging in clubs across the USA.

Launched in 1966, this amp quickly became a low-wattage holy grail. This is a stripped-down blues machine: two channels, one tone knob, no master volume. Buckle up and go where this gritty beast takes you! It comes with a footswitch to kick in the onboard tremolo.

Get the plexi tone without blowing the roof off the joint!

#10732 18 WATTS / 12" SPEAKER / ORIGINAL BRITISH CIRCUIT

DIFFICULTY
HOURS: **12**

’64 REVERB UNIT KIT

Reverb you can’t get from a pedal.

This is the unit that put the waves in surf music! Looks like an amp, sounds like a beach party.

This tube-driven reverb tank relies on good ol’ physics for a perfect effect. Your guitar signal travels along two large suspended springs to produce the reverb that launched the iconic surf sound. This isn't a pocket-sized digital simulation; this is the real deal!

Listen to Dick Dale’s “Misirlou" while doing this easy build.

#10733 ORIGINAL 6G15 CIRCUIT

DIFFICULTY
HOURS: **8**

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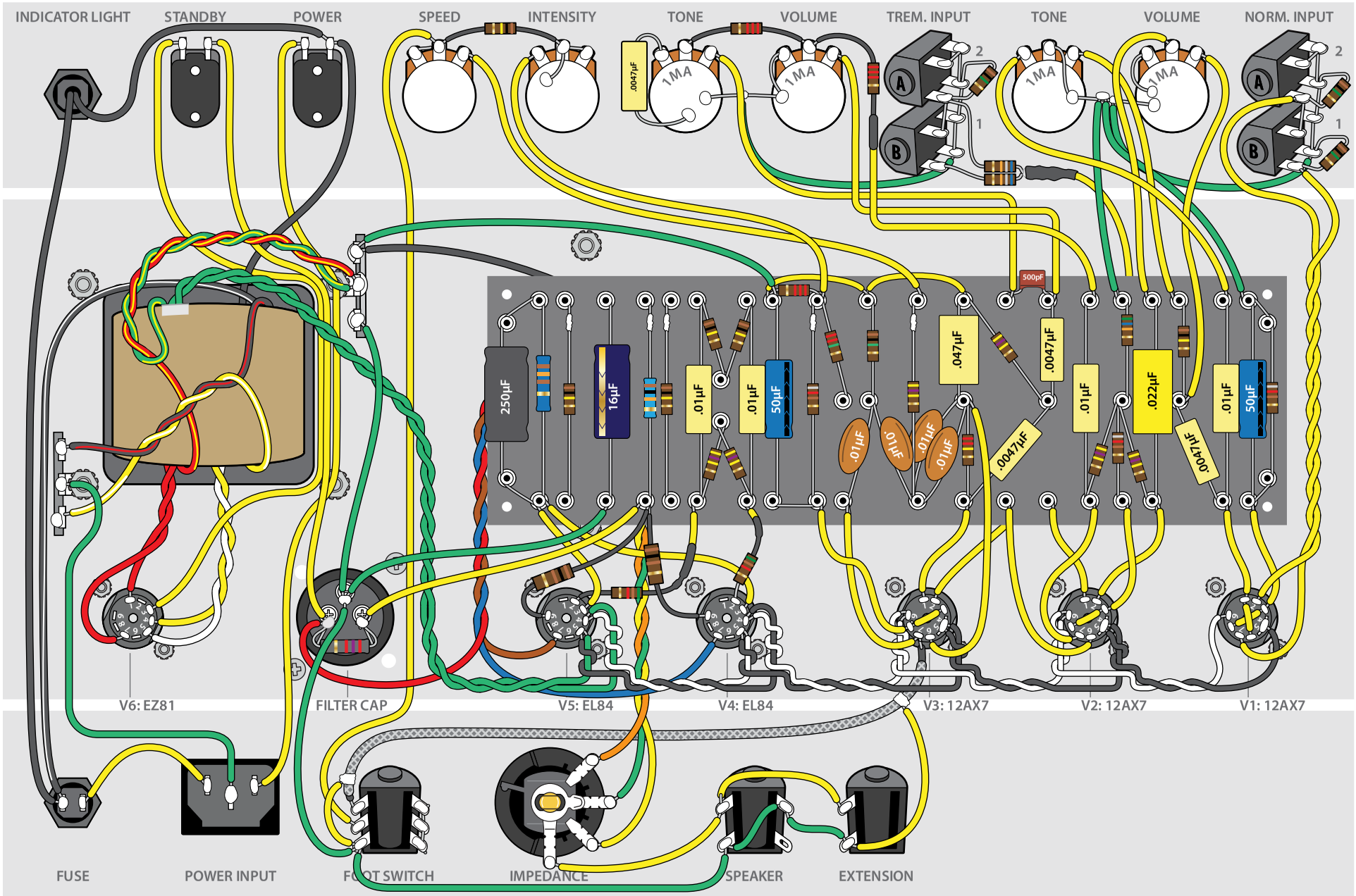

’66 BRIT-74X 18W

ORIGINAL BRITISH CIRCUIT

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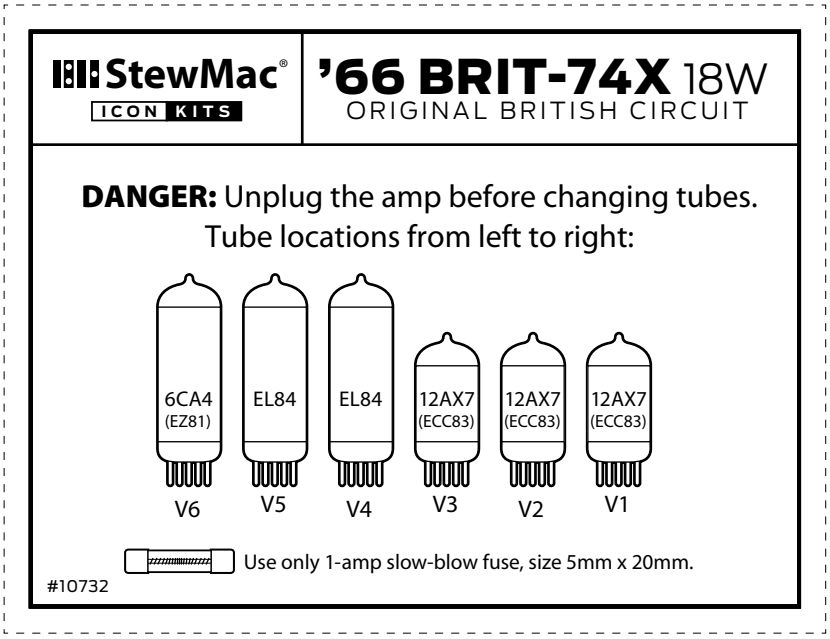
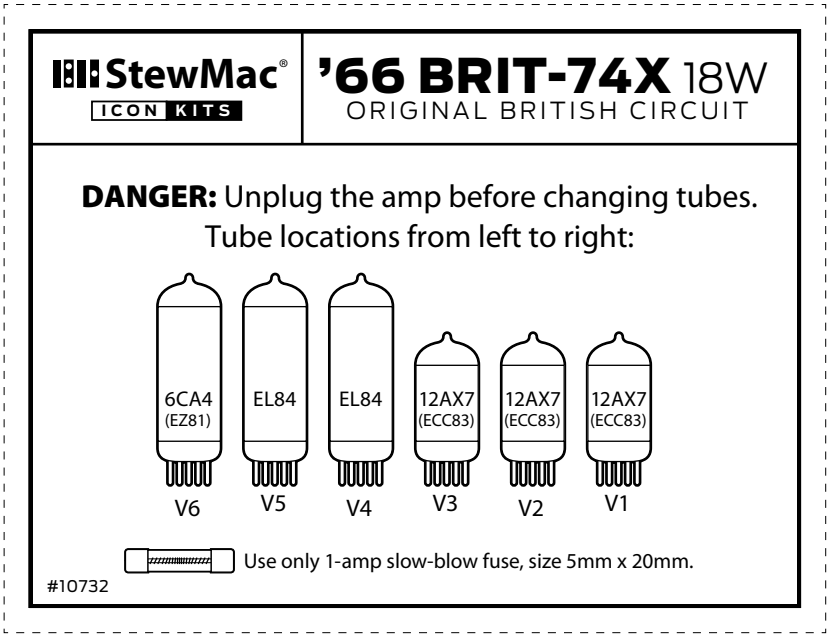


Cut this label on the dotted line with a razor knife and metal straightedge.
Fasten it inside the cabinet using thinned wood glue or contact cement.
The duplicate copy below is included as a backup.



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