

EASY Kits

Amp and Guitar BASIC info Read this first! Read the entire kit over before starting any work of any kind. ALL TORRES EZ KITS

Kits are intended as do-it-yourself hobby-type projects. It is not usually cost-effective to purchase kits and take them to a tech for installation, unless you are outside the continental United States

Note: If your kit is not an EZ kit or costs more than \$69.00 please call and get the full version of this **amp basics** flyer.

A few basics to start with. I have to assume you can get the amp out of the cabinet. You always work looking at the amp from the back. You always orient pots with the tabs pointing up, you are looking at them from the bottom.

The amp stores dangerous amounts of electricity in its filter capacitors. This is **not discharged** when you unplug (of course you always work on the amp **UNPLUGGED! Never plugged in!!**) Don't ignore this warning at risk to your own life.

You **MUST** discharge the filter caps by shorting the stored current to ground. The safer and recommended method is to connect a 10k 2 watt resistor to a pair of insulated alligator clips. Tape it all up so there is no exposed metal except the ends of the clips. Attach one clip to the + (plus) side of each filter capacitor (under the amp on Fenders, in a long metal can) and touch the other **insulated** alligator clip to ground on the amp chassis. Be sure you aren't touching the metal of the alligator clips **or the amp chassis**. This will discharge slower, safer and with less fireworks.

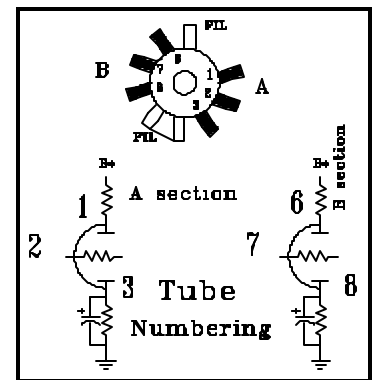
Warnings and disclaimer

Tube Amplifiers, all components and related products are electrical products with extremely high voltages that if mishandled or if used carelessly or for improper purposes, can cause life hazards and serious personal injuries. Such equipment is dangerous even when turned off or unplugged. Please read the following.

1. Please observe and have all members of your family and other users observe all precautions recommended by the manufacturer.
2. Do not allow young people to work on this equipment without being supervised by a responsible and knowledgeable adult.
3. Do not take apart equipment, kits or components without specific instructions recommending such modification and without complying with every element of such instructions.
4. Please be advised that this book, kit or article does not, nor is it intended to, list the precautions necessary to prevent personal injury, death, damages to the amplifier or other components, other property damage, malfunctions or electronic damage. By buying this book, kit or article you agree that the author of the book, kit or article shall have no responsibility for safety precautions for your tube amplifier or related components or equipment, nor shall the author have any liability whatever for any injury, death, damage to the amplifier or the components, such other property damage, malfunctions or any economic damage.
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Kits are packed by hand individually. Parts may be substituted in some cases. Replacement parts will be of the same or better specifications. Review your kit in full before doing any work to be sure you have all the parts needed for your particular kit. Some kits include extra parts.

The easy discharge method, for the **highly experienced persons only**, is to touch an INSULATED screwdriver blade to each tab of the on-off or standby switch. Move the screwdriver down until it makes contact with the amp chassis. It will discharge, sometimes with a ZAP and pop. It can be frightening but it is better than getting this current through you.

Some people feel that shorting the cap out shortens it life. That may be so. This is only a quick method to use for safety rather than killing yourself.

CIRCUIT MOD KITS (Not EZ kits)

Almost all of the work you will do will be on the preamp stages of the amplifier. Fender, Traynor and Marshall use 12AX7-7025-ECC83 and 12AT7 -ECC81 preamp tubes.

Each tube is divided into two circuits (they are "dual triodes.")

the "A section" is made up of pins 1,(output) 2,(input) & 3 (cathode.) The "B section" is pins 6, (output), 7 (input), & 8 (cathode.) See the drawing. They are referred to as: V1A and V1B. The tubes are numbered starting on the RIGHT (looking from the back) as V1 through V whatever.

On all kits the "final word" is the schematic. The instructions are there to help you along, but sometimes a person doesn't "click" with the instructions. If you are attempting a major modification kit (outside of my EZ kits,) you should be able to build the entire circuit from the schematics. **SOME CAUTIONS.**

As we develop kits for more and more different amplifiers, the working conditions become more varied. If your amp has a printed circuit board, not a fiberboard circuit board (like Fenders, early Ampegs, Traynors and early Marshalls) you have to observe some "printed circuit board rules." Pretty simple stuff, but really important. **Also some additional cautions for everyone.**

Remember that there is danger **under** the circuit board. If you are replacing a part, and inserting it into the same holes the old one came out of, be careful you don't go **too far**. It is very easy to go through and down to the chassis, shorting the part and the circuit to ground. This can be dangerous and damaging.

Don't overheat the circuit board. Traces are delicate things. Heat the board as little as possible. If a trace lifts or gets damaged you are going to be into major work to fix it. Be careful.

Don't flex the board. Some are real flexible. There is a strong urge to flex it up and unsolder parts from the bottom. If it breaks you are in deep s___! Just don't do it.

An old craftsman's saying applies here; "Measure twice, then measure again." Check everything, every part, the entire project at least twice. You aren't in any race here. If you put a 1k resistor in place of a 1 meg resistor you won't be able to figure out why it doesn't work.

Be sure you understand what you are doing.

Follow the instructions. Test between stages as you are supposed to. 99% of the trouble with kits is not following instructions.

Do a neat job. Trim leads to an **exact** fit. Use a little common sense and take a look at how Fender/Marshall etc. did the job way back then. Parts fit **perfectly**, and there are no messy leads, excess wire length, sloppy solder circuits, "jury rigged" parts etc. The instructions often tell you to take some parts out first. This is to **make room for the new parts**. Put them on the circuit board if at all possible.

Shielded cables have to have the internal braided shield CONNECTED TO GROUND or they aren't shielded. Connect it at one end only. It does not have to be grounded to a "star ground" or all grounded to one point. Ground the shielded cable at any convenient ground point.

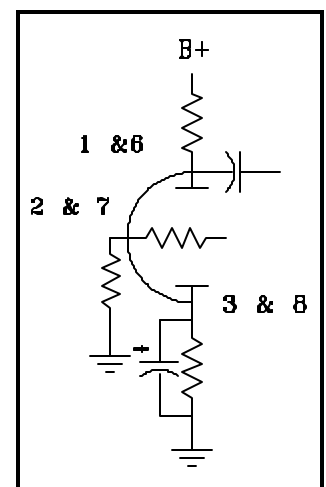
These tube circuits are all fairly similar. Look at the "Basic circuit" drawing. Just about every circuit has these common characteristics.

They have a plate load resistor at pins 1 or 6. They all have a cathode circuit, with or without a capacitor at pins 3 and 8. Input is always pins 2 or 7 and there **has to be** a resistor in front of the input circuit. They have a capacitor at the output at pins 1, or 6. Marshalls and some Fenders have the output at pins 3 or 8 on some circuits. Follow the rules and it will always come out for you first time.

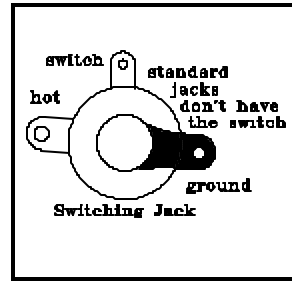
Capacitor ID Numbers Important

Capacitors have all kinds of ID codes. Not all are marked clearly with their values. Here are the code numbers to identify the Capacitors used in the kits.

Dark Green caps. All start with **2G**. The KT isn't necessary
2G102KT .001 mfd or 1000 pf



2G222KT	.0022 mfd or 2200 pf
2G472KT	.005 mfd or 5000 pf
2G103KT	.01 mfd
2G223KT	.02 mfd
2G203KT	.02 mfd also
2G303KT	.03 mfd
2G333KT	.03 mfd also
2G339KT	.039 mfd
2G503KT	.05 mfd
2G104K	.1 mfd



Disk caps. Most are in Pico Farads (PF.)

47 or 47m	47 pf
101	100 pf
151	150 pf
251	250 pf
471	470 pf replaces 500 pf
501	500 pf
751	750 pf
502	5000 pf or .005

Bright Blue or Brown Metalized Poly caps

They have the values on them
.02, .047 etc.

Orange Drop Caps

Our custom made capacitors have "Torres" and the value right on the cap. The **418P series**.

715 Series Long numbers such as 715P47356JD3

Ok, 715P is the type. Ignore that

56JD3 is the voltage indicator, Ignore that. It leaves 473 in this case. Which is confusing industrial electronic terminology. So:

102 = .001	332 = .003	473 = .047
472 = .005 (.0047 actually)	103 = .01	104 = .1
222 = .0022 (.002 is the same)	223 or 203 = .02	

These industrial numbers are found on all the caps. Look at 2G103KT. Obviously 2G is the type, and KT is a voltage indicator. Leaving 103. 103 is .01 mfd..

Common substitutions.

- .0047 sub for .005 (.0050)
- .002 sub for .0022
- .02 substituted for .022
- .03 sub for .033
- .047 sub for .05
- 470 pf sub for 500 pf. We use the 470 pf because it has a much higher voltage rating

These don't make any difference in the circuits we are building

Resistor Codes. (At the end of this booklet)

This is the standard electronics class chart of the color codes..

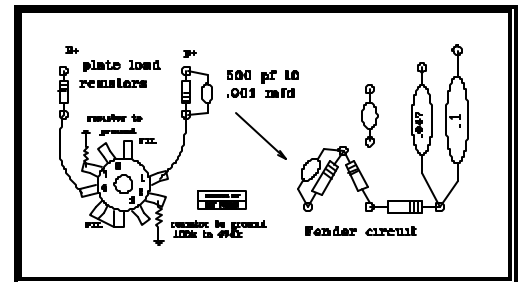
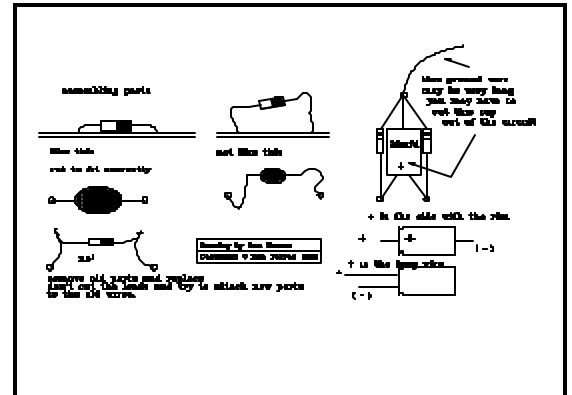
Look at the colored bands on the resistors. One side has the bands closer to the end. That's where you start.

The first two bands determine **numbers**. Lets say you find red and yellow. That's 2 and 4 - or 24.

The next band is how many zeros to add. Assume band #3 is blue. That's six zeros.

So your resistor is 24,000,000 ohms. Twenty four million ohms.

Common electronics language calls a million a "meg." So red/yellow/blue is 24 megs.



More language, 1000 is labeled "K" so 24,000 is 24k (which is red/yellow/orange.)

FINE TUNING YOUR AMPLIFIER MODIFICATION

Often amplifier modifications that work for one person real well may need some fine tuning of the gain to work for another. This is due to the basic fact that every tube amp is different from every other tube amp in existence.

Throw in the impossible to control factor of different tube manufacturers, and the obvious difference in a tube's output and microphonic qualities over its life, and you have a need for these fine tuning tricks.

TORRES high gain amplifier modifications have these circuits (as well as commercial amplifiers.)

The most common problem is too much treble. We work real hard to raise the high frequency of the amplifier to get the increased treble response needed for modern guitar technique. Sometimes it can be too much. Turning the treble control up causes the amp to squeal.

Commonly this is from microphonic preamp tubes. Tap them with a pencil (when the amp is on) and see if they ring. If they ring a lot, replace them. Tube testers won't show microphonic tubes.

If you have checked your preamp tubes and determined that they are not microphonic, or you want to stay with the tubes you already have, see the first drawing.

The amplifier will have this circuit all the time. It is the basic B+ Plate load resistor. It is connected to pins 1 and 6 of the preamp tubes.

The trick is to add a small value capacitor (rated for 500 volts) in parallel with the plate load resistor (usually 47k to 330k - most commonly 100k and 220k.) This cap will effectively shut the squeal off. It will also roll off a bit of the highs. Once you have the squeal conquered, experiment with smaller values of capacitors until you get the happy medium. I like 750 pf for super high gain circuits, but your tone is up to you.

The squeal you get may come from too much gain also. A tube's gain can vary ON A BRAND NEW TUBE from 48 to about 62. When you multiply this by 50 with a boost stage you end up with a gain range, from the same design, of 700. That is a lot of difference to be aware of.

Looking at the same first drawing you will find resistors going to ground on pins 2 and 7. Grid load resistors. You already have some in there (in case you didn't know it.) You can cut some of the excess gain by adding additional grid load resistors. Start with 220k and go up and/or down until you get the proper gain from the stages. It shorts some of the output of the previous stage to ground before it reaches the next stage. The lower its value the more gain goes to ground.

I normally use 1 meg or 470k for the standard resistor value. Lowering it to 220k will reduce the gain of the stage, and therefore eliminate the squeal from too much gain. Its an easy change and doesn't affect much else other than gain.

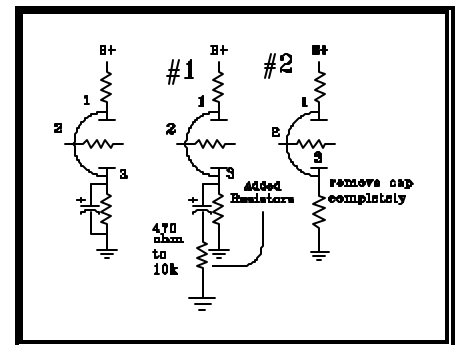
Other times the gain will be WAY, WAY too much. The amp will go into "cutoff" wherein the notes at full overdrive will seem to cutoff with no sustain. Everything will act weird at max overdrive and the amp will seem to be unusable. This is rare as the designs are tested quite a bit before being shipped out. But it can happen, especially with Marshalls and small Fenders (Princeton etc.) It is again, easy to fix.

See the drawing of several tube circuits. Note the changes in the cathode circuit. The first change is to install a resistor from 470 ohms to 10k in series with the cathode bypass capacitor.

A lot of gain comes from that capacitor, the resistor cuts it down easily. This is one of the most effective, efficient ways to fine tune an amplifier. It doesn't affect the frequency response and with different resistor values on the first two or 3 stages of the amplifier you can tune it to perfection.

Diagram #2 shows a more drastic effect. Just remove the cathode bypass capacitor entirely. Its very easy and very effective. You may just love the sound without it. (More and more modern designs are using the unbypassed cathode resistor circuit for its great "punch" and lack of raspiness.)

Using any or all of these techniques you should be able to get that amp under full control and produce just exactly the sound you want.



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related materials to anyone under any circumstance.

Kits are intended for personal hobby-style use.

This is a single user license you may install it on a single amplifier only. Multiple installations are against copyright law.

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Tube Amplifiers, all components and related products are electrical products with extremely high voltages that if mishandled or if used carelessly or for improper purposes, can cause life hazards and serious personal injuries. Such equipment is dangerous even when turned off or unplugged.

You shouldn't be working inside the amp unless you know what you are doing.

Don't work on an amp plugged in.

Always discharge the filter capacitors before starting work. If you don't know how, contact us for a reprint on how to do it ("What the Hell are filter caps?")

Be careful, but have fun.

Solder neatly, and use the smallest amount of solder you can.

resistor color codes (ohms)			
Band	1st and 2nd	multiplier	tolerance
color	band	(3rd band)	(4th band)
Black	0	1	0.01
Brown	1	10	0.02
Red	2	100	0.03
Orange	3	1000	0.04
Yellow	4	10000	
Green	5	100000	
Blue	6	1000000	
Violet	7	10000000	
Gray	8	100000000	
White	9		
Gold		0.1	0.05
Silver		0.01	0.1
No color			0.2