

McIntosh MC30

Someone told me back in 1973 that McIntosh made the best audio equipment. That idea can, and has been debated by lots of audiophiles. Let's just agree that they make very good equipment. It is also very expensive.

I was still in high school that year, and there was no possibility of me ever owning any of this expensive gear. Over the years though, I did manage to acquire some of it. I've owned quite a few vintage pieces and some of the newly manufactured stuff as well.



A few years ago, I heard that the factory was offering guided tours. I was lucky enough to get on the schedule for one of those tours, and it was well worth the long drive.

One of the other things I did in high school was attend a vocational technical school which was to prepare me to be an electronics technician. It was a two year program, and I learned a lot about electronics.

I never went on to become a technician, but the background was there for me when I needed it.

Twenty five years later, and I figured it was time to put my training to good use.

By that time, I had been through several McIntosh tube amplifiers. MC75, MC275, MC40 and of course the MC30. Somehow, I decided that I liked the sound of the MC30 more than all the others.

The MC30 was introduced in 1954. It was actually older than me. At the time it sold for \$153. It is a monophonic amplifier. In order to get stereo reproduction two of them are required.

I loved the sound I was getting from them, but one of them stopped working. I tested the tubes, and they were fine. I looked inside and couldn't see a problem. My next thought started me on a quest. I would rebuild this amp from the ground up.

The following is a blog post I made back in 2014 which documents my rebuild. I present it here (since the blog is long gone).

McIntosh MC30 Rebuild and Restoration

I will be documenting the rebuild and complete restoration of a McIntosh MC30 mono amplifier.

Saturday, January 25, 2014 Getting started.

I am now beginning work on my fourth McIntosh MC30 rebuild. This time I thought it would be fun to document the work as I go along.

For those unfamiliar with the MC30: It is a monophonic high-fidelity amplifier for a home sound system. Stereo was not an option when this amp was designed, however it was very high-end at the time (1954) and cost around \$150 (about \$1700) in today's money.

For more information on the MC30 and the McIntosh Sound Laboratory please check out the [very nice site by Roger Russell](#).

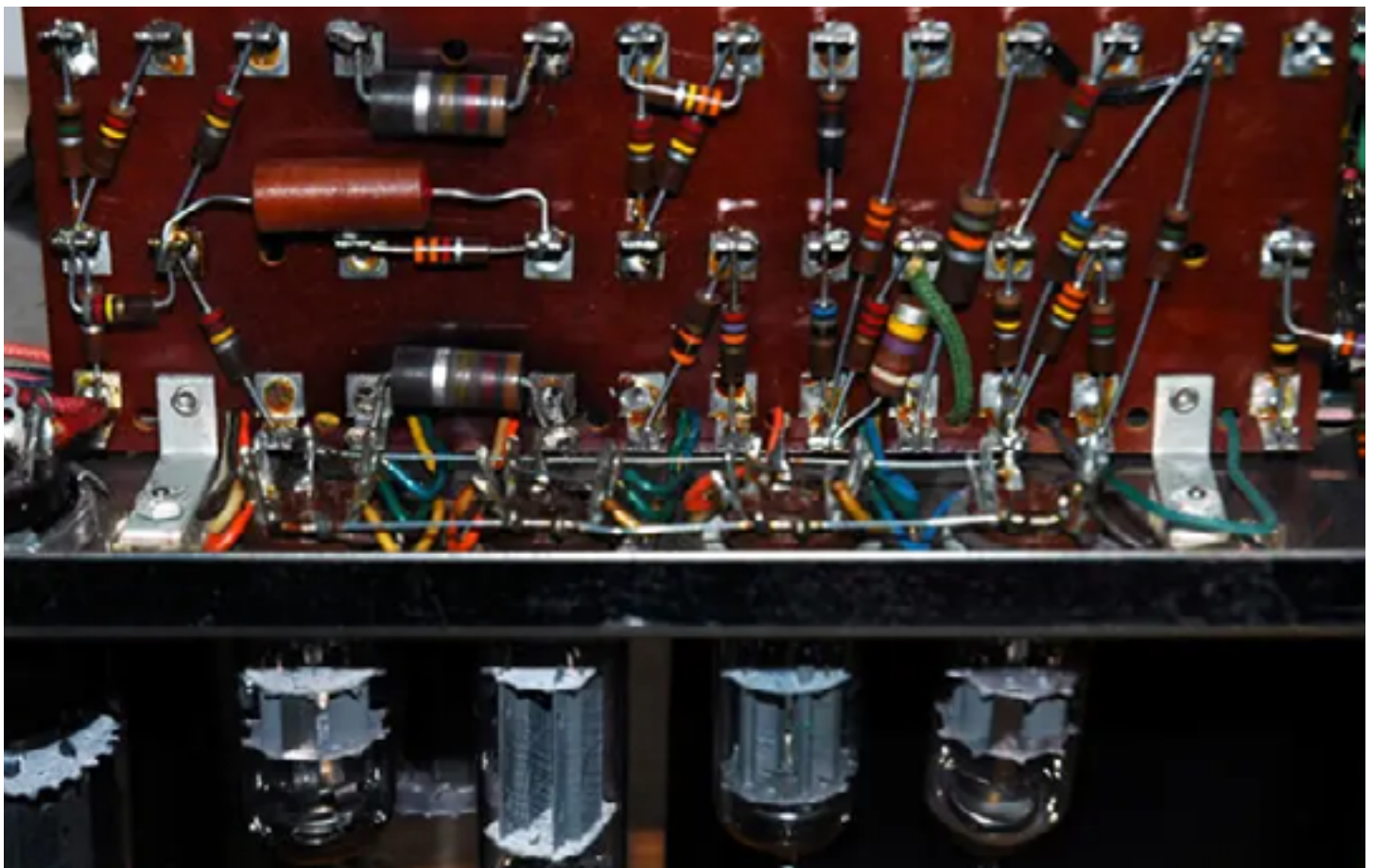
This is the first MC30 amp I rebuilt, chassis is original, re-plated with new chrome sans lettering:



Here are an example of what most MC30's look like today after 60 plus years of use:



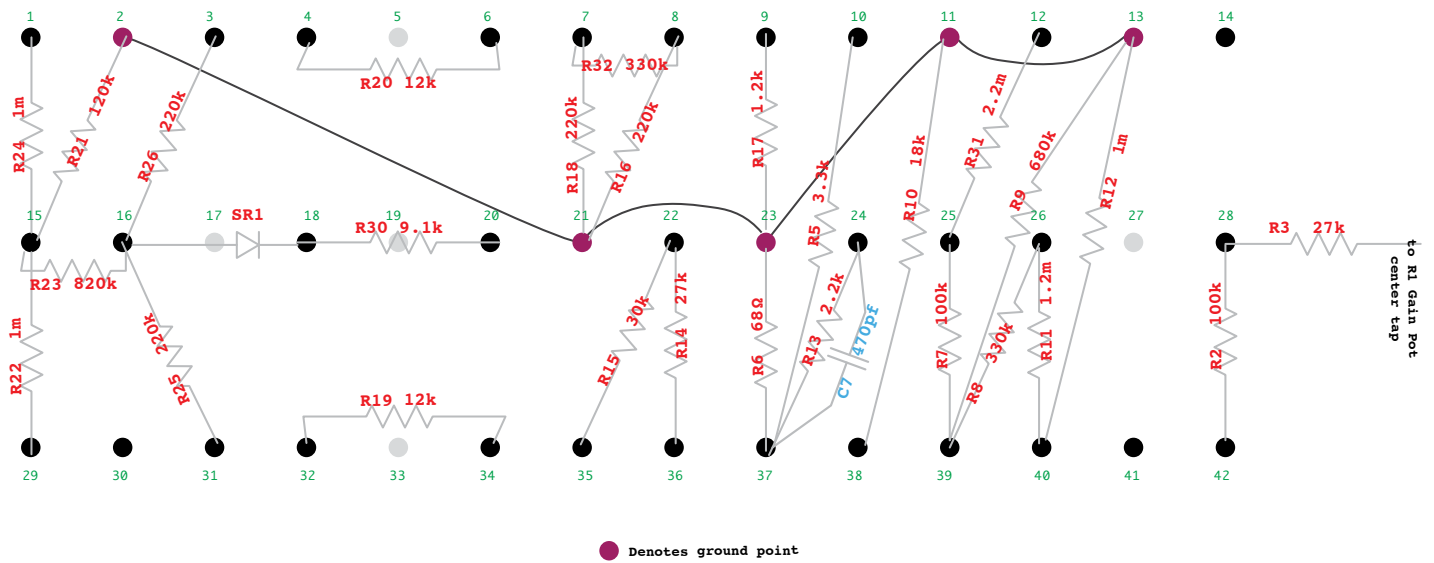
The resistor side of the parts board showing original carbon composition type resistors, a selenium rectifier and some tubes:



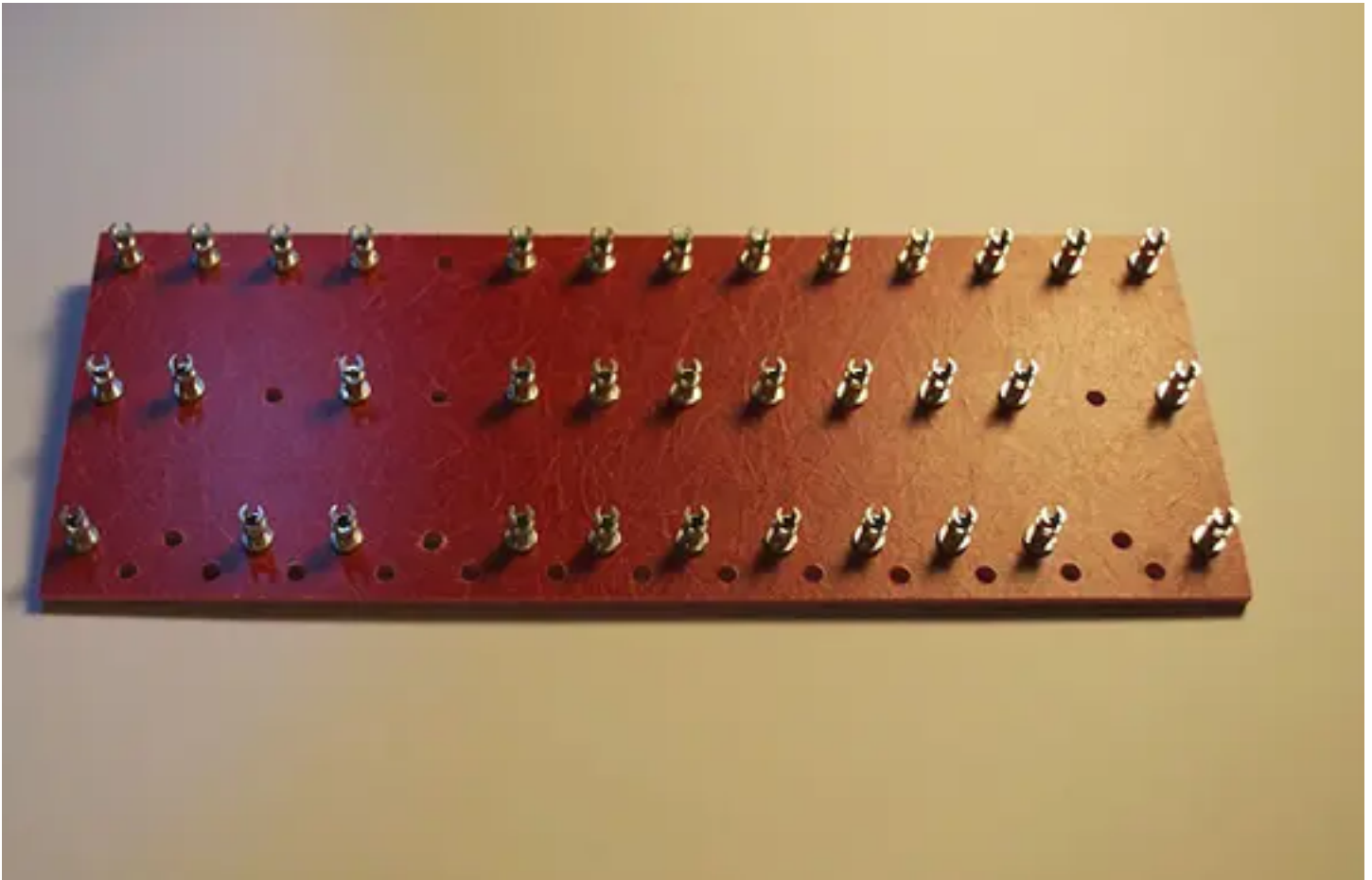
Anyhow, my goal in rebuilding is not just to get the old amp in working order again. I am building from scratch a brand new MC30 using all new parts except the transformers. The McIntosh transformers are next to impossible to recreate. They contained some patented cores as well as a special method of winding called "unity coupled" See Roger Russell's page for more on that.

So let's get started. Look at the last photo above. It is the resistor side of the parts board.

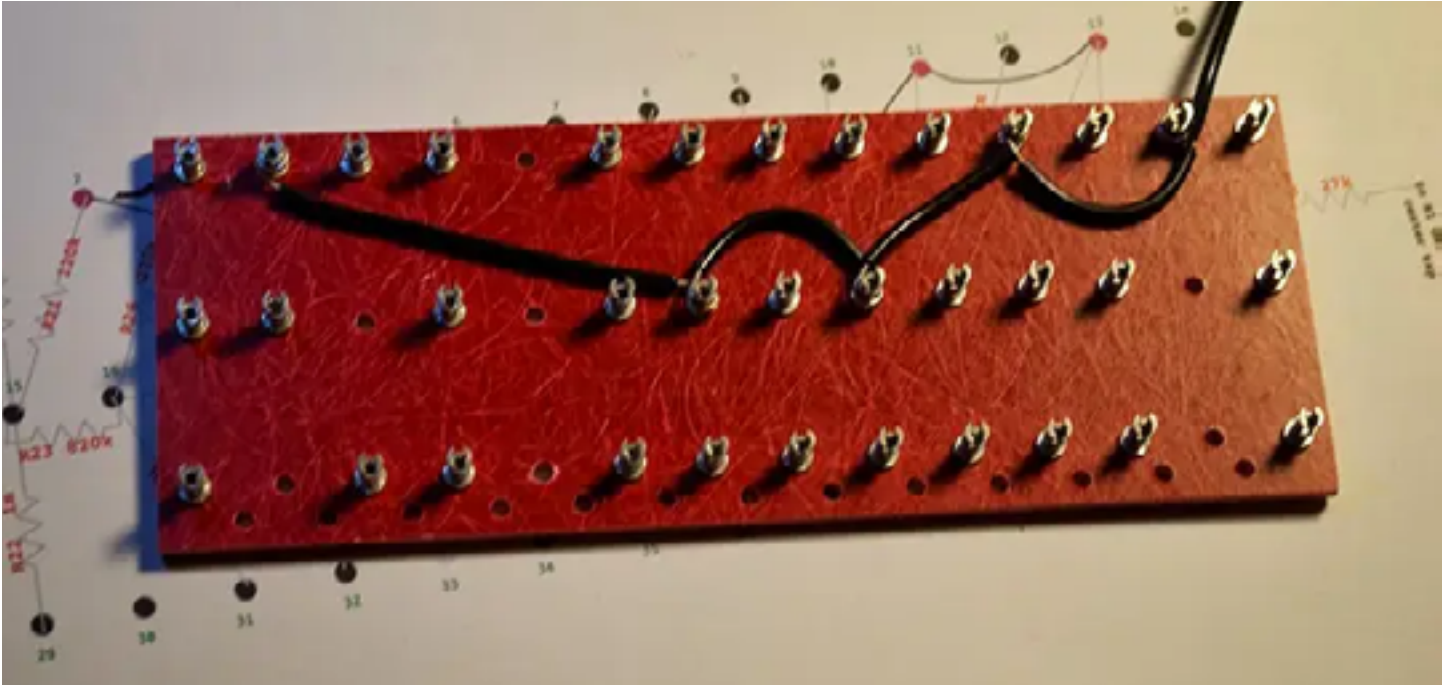
Today, I begin with a plan. Here's the diagram I created to help me locate and place resistors and jumper wires:



For the parts, a brand new custom made board:



Following the plan, I began with wiring together all of the turrets on the board that will be “ground”:



I will be using all solid core wire, 600v rated, mostly 20 AWG and some 18 AWG:



Resistors are added, and wrapped tightly to the turret before solder:

Ready for solder:



I'll do that soon.

And finally for today, a couple shots of my work bench:



Next will be the other side of the board. Capacitors!

Sunday, January 26, 2014 For the Techies...

I will be using the second generation of the MC30 for the complete restoration and rebuild. This is the circuit labeled "Serial #15329 and Over". I don't pretend to be an expert in McIntosh history. See Roger Russell's page for that. From my experience, I have seen three separate and distinct circuit designs that have subtle, and slight variations. The outward appearance also varies with each version. For example:

The early version has an old style terminal strip for the output to speakers. Looks like this:



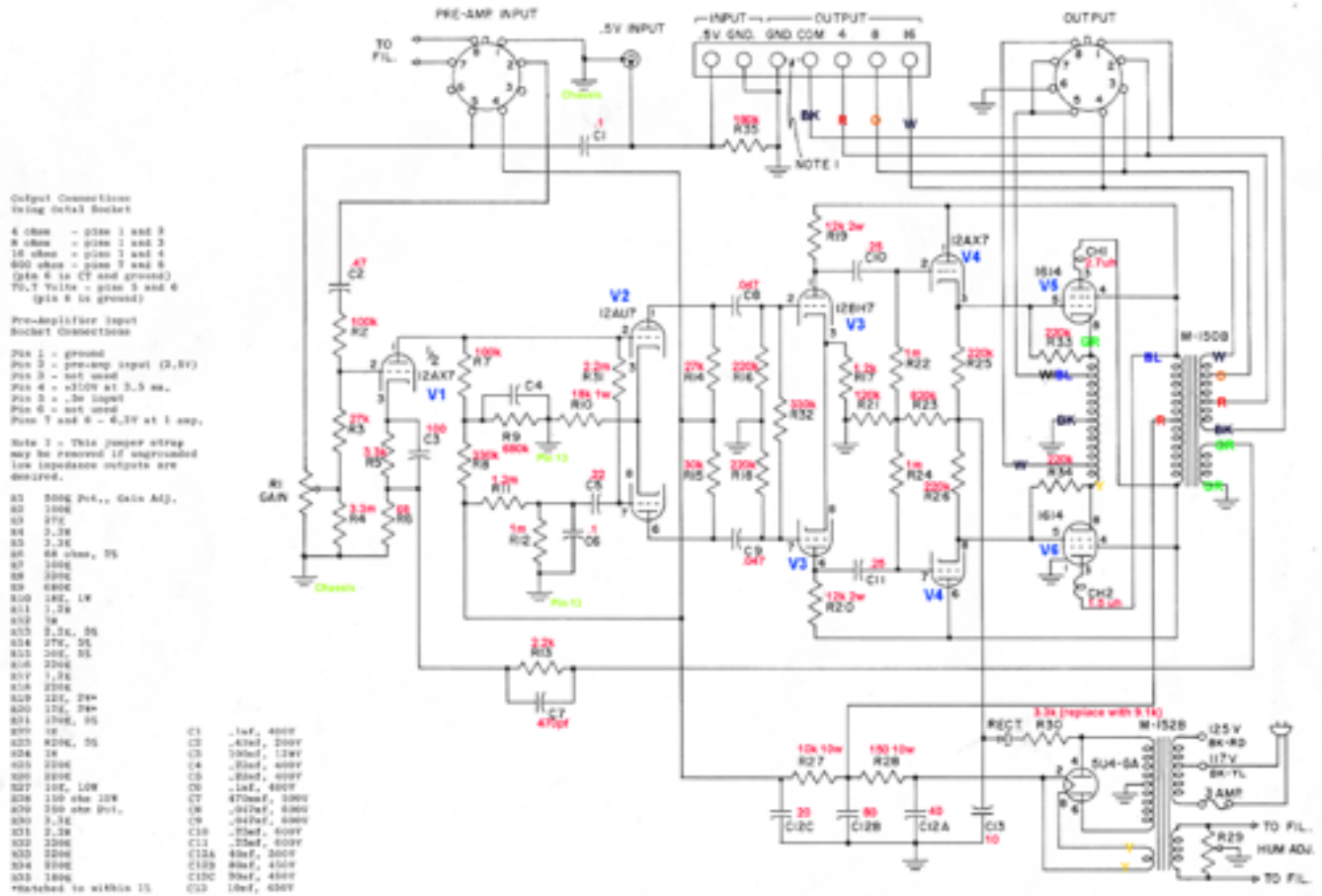
The second generation has a barrier strip:



The last version was introduced around 1960. It has the same barrier strip, as well as an AC outlet on the side next to the fuse holder. This version was also made into a kit version which McIntosh called the "Mackit 30" No photo for that one (sorry).

I will be using the second generation, mostly because newly manufactured chrome chassis are available (more on that later), and also because it is the circuit that I am most familiar with.

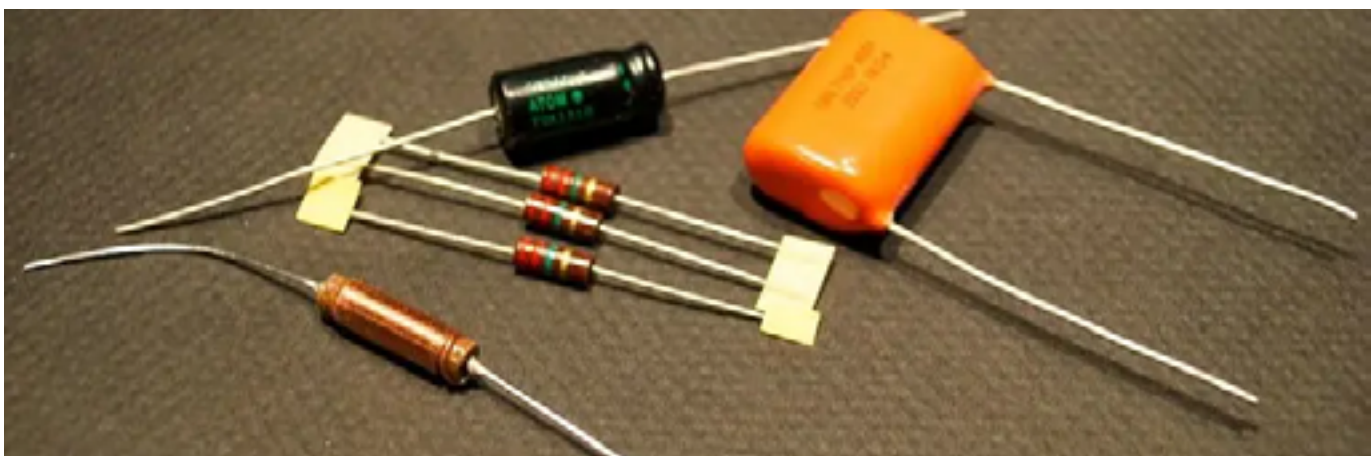
Here's the schematic:



This schematic is readily available from many places on the web. It comes from the original service manual published by McIntosh. I just added a few embellishments of my own such as labeling the component values.

As for the components; I will be using ALL new components with the exception of the transformers. Every other part will be new manufacture, or new old stock (NOS).

Here is what I'll be using:



Resistors will be carbon composition whenever possible to maintain the same early McIntosh sound. I had to use other than carbon comps in a few places, such as R19 and R20 which call for 2 watt resistors matched to within 1% of each other. Two watt carbon comps are hard to find and quite expensive, so I went with metal film resistors.

The capacitors in the original MC30 were Sprague “bumblebee”:



These Sprague caps are not manufactured anymore but are still quite popular especially with guitar amp users. They can be found on eBay and other sites for quite a bit of money.

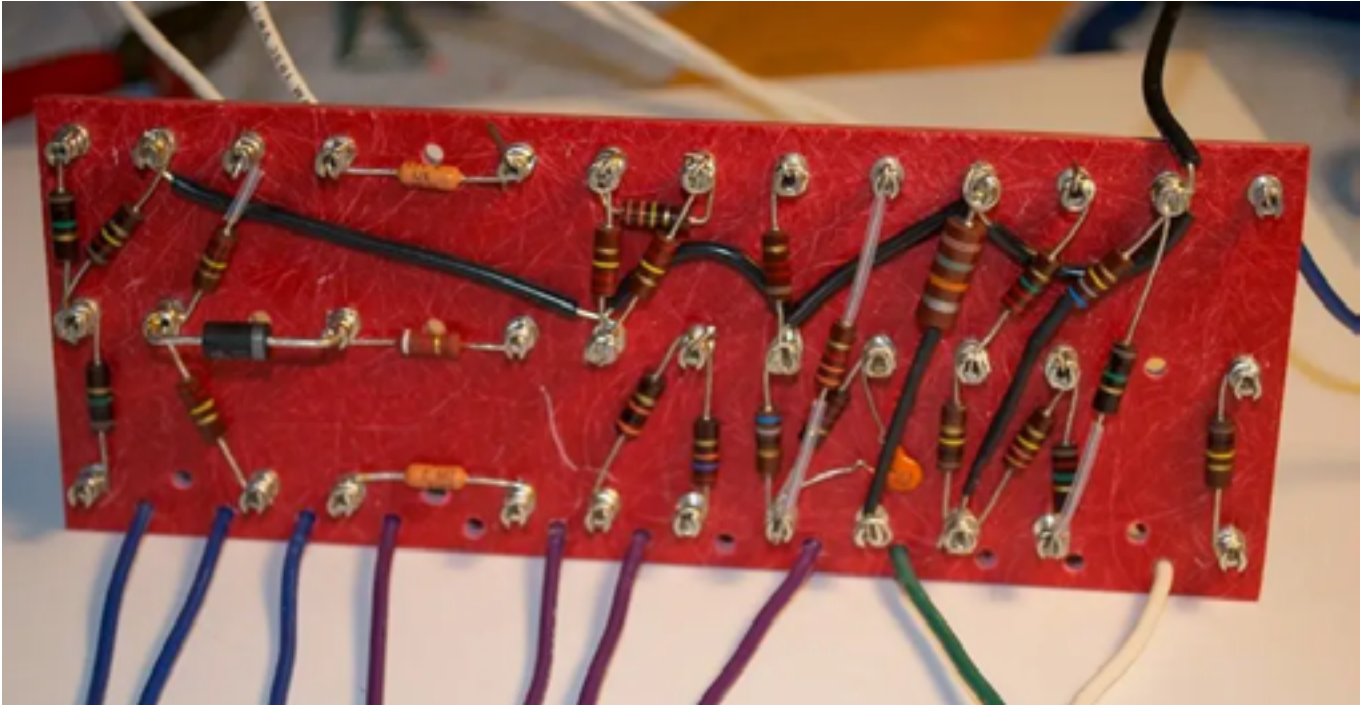
Anyhow, I will not be using bumblebees, but the modern day equivalent: “Orange Drops” by Sprague. There are lots of other capacitor brands out there. Some are very expensive “audiophile” caps, others just cheaply made for mass production.

The circuit also requires a few electrolytic capacitors. There I’ve used Sprague as well. The power supply circuit needs three large size caps, rated at high voltage. The original MC30 used a multi section can capacitor. That is an aluminum can with three or four caps built into it. I have seen a lot of restorations where the can cap was replaced internally with separate new electrolytics. This works fine, but I like the idea of using the old style cans and luckily they are still available from a company called CTech Electronics.



I use three of the four sections in this cap. The schematic calls for a 20, 40, and 80uf cap. I just snap off the connector for the unwanted 30uf. Some restorers use this section by combining with the other sections to get a higher capacitance (this also works, but again, I am trying to be as close to the original as possible). I also remove the unsightly sticker from the can. And yes, I used a paper towel as a background for that photo.

So, back to construction. Here is my progress so far. All resistors are mounted, and wiring has begun. I connect the wires to the appropriate spots on the board, than label them (so I can attach them to the tube sockets later).

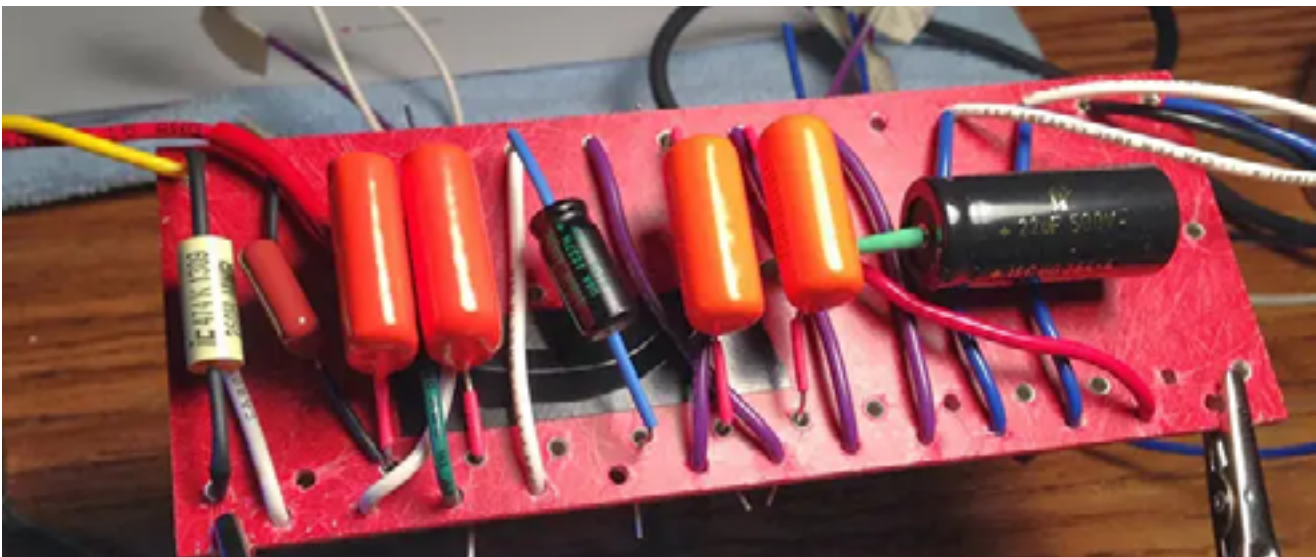


Capacitors will be mounted on the other side next!

Tuesday, January 28, 2014 Capacitors are being added.

I am slowly making progress on the reverse side of the parts board. Caps are almost complete.

This side of the board is quite colorful. Wires are color coded for each particular tube socket. Red and black are B+ voltage and ground. Just need to place two more caps and I'll be finished with the board.



Pay no attention to the small white Illinois Capacitor on the left. It is C2 on the schematic, but it's not really going to be used. It's the signal input from the "Pre-amp Input" socket. That socket was designed to be used with a McIntosh brand preamp (C4 or C8). I will be using the RCA input instead which bypasses that particular cap.

Next up will be wiring the chassis (which I don't have yet, but should very soon).

Meanwhile please enjoy these ads from the early fifties for the MC30:

99⁶⁰/₁₀₀% PERFECT AMPLIFICATION

The 30 watt Amplifier model MC-30

- ✓ Featuring the patented McIntosh Circuit
- ✓ Guaranteed 1/2% maximum intermodulation distortion
- ✓ Unity Coupling for performance plus
- ✓ Beautifully Styled in Black and Chrome
- ✓ Zero VU Line Level or any Tuner will drive to full output

WHY THE EXCLUSIVE PATENTED McIntosh Circuit brings you purest high-fidelity sound . . .

The McIntosh circuit is fundamentally new. It provides practically 100% modulation without any loss of the carrier component, by utilizing the primary wave together, or fully, the high efficiency of this "P" amplification can be used for the first time with high quality performance. Where other distortion causing circuitry utilizes the "P" wave in a secondary manner, each half of the plate "P" amplifier is substituted as an independent driver.

Recent 100% modulation amplifier could not actually handle 100% modulation distortion and 100% sine wave output. With the invention of the McIntosh circuit, less than 1% distortion means the performance standard which requires modulation but does not mean it exists.

The McIntosh has an inherent large advantage over conventional circuits by having the carrier wave effectively free from clip, together the impedance is 1/2 that of the conventional circuit. The coupling to the secondary is improved by a similar factor of 2 in the case of primary to secondary ratio, and has been raised to 2 in 1. The 1/2 cathode 1/2 plate factor provides a feedback factor of 1/2, which with additional loop feedback, offers the lowest distortion, most stable gain, slightest noise.

By using McIntosh's modulation circuit you obtain a maximum low dist. 1/2 of 1% harmonic distortion and less than 1/2 of 1% intermodulation distortion (modulation distortion), but only frequency or combination of frequencies, throughout the audible range, with a full power output.

from **McIntosh**
. . . the finest performance available
the MacKit 30
 A 30-Watt Unity Coupled Amplifier Kit*

*Identical to the renowned McIntosh MC-30 amplifier. Price \$100

Enjoy the wonderful experience and satisfaction of putting the finest amplifier together yourself.

A "Work of Excellence" Produced by

McIntosh
 LABORATORY, INC.
 4 Chambers St., Binghamton, N. Y.

See models at franchised McIntosh Dealers

Friday, February 28, 2014 Work will be commencing soon.

Just arrived! Brand new chrome chassis and old MC30. The chassis is beautiful. Newly manufactured, new chrome, new lettering. It's an exact copy of the original. The tube sockets and RCA input have been riveted in to match the original:



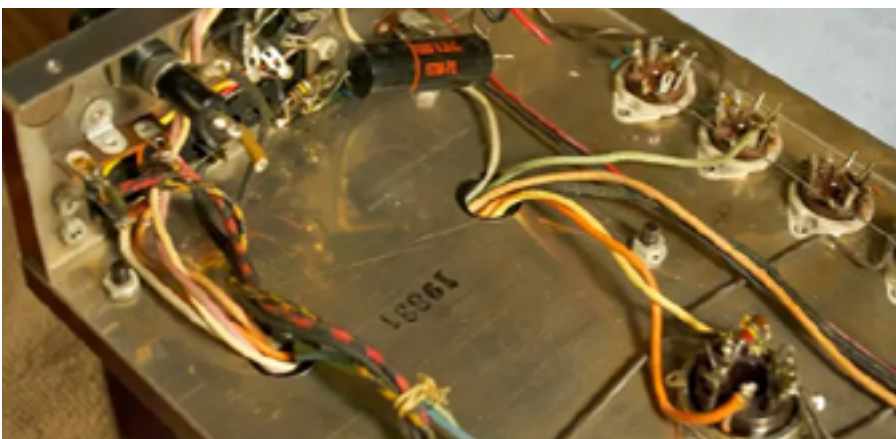
The underside of the chassis, ready for parts to be added:



And now, the only original parts to be used on the rebuild will be these transformers. I must remove them from the old chassis:



Inside of the old one. The transformer leads look nice! Should be easy to reuse:

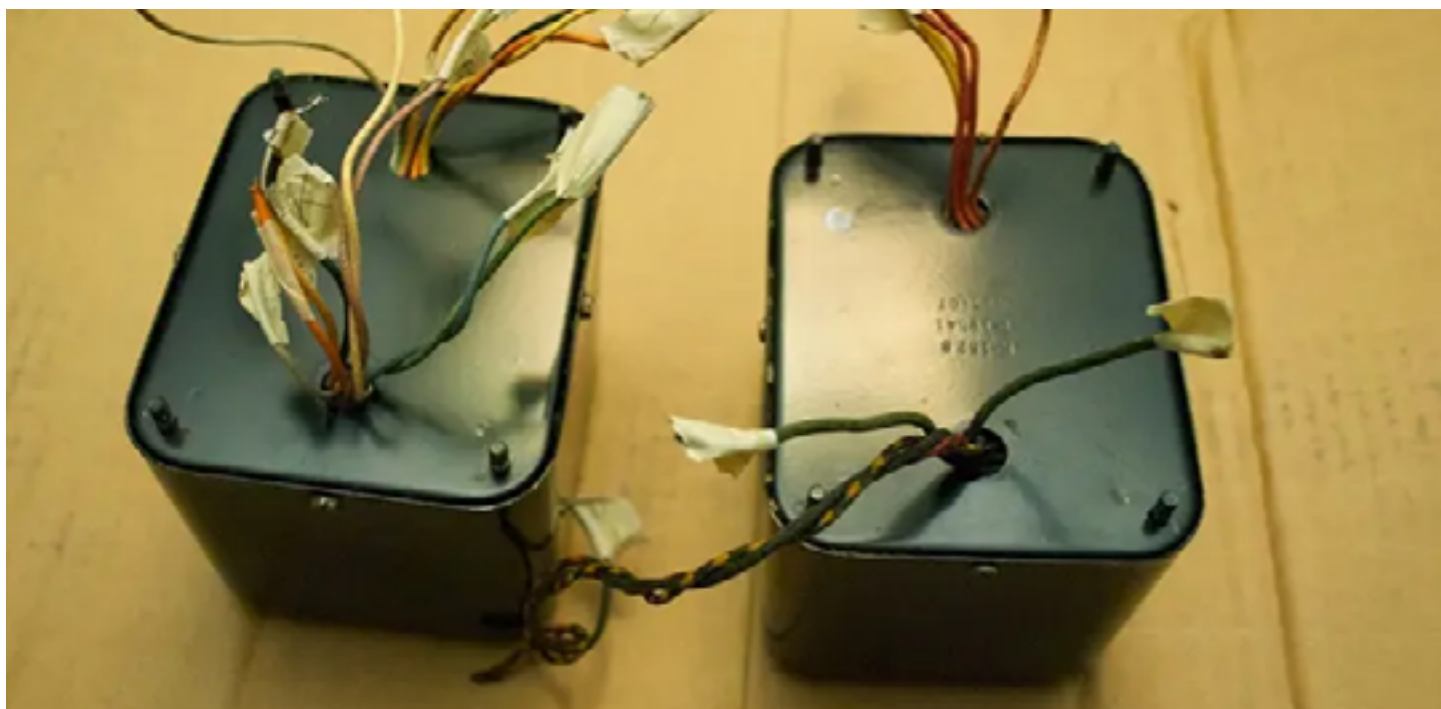


So, stay tuned here. The next few days should be full of new updates as the work progresses.

Saturday, March 1, 2014 Transformers prepared, wiring begun.

Finished separating the transformers from their original chassis. I labeled the leads for easy installation. All appear to be in good shape.

Separated transformers with leads marked with tape:

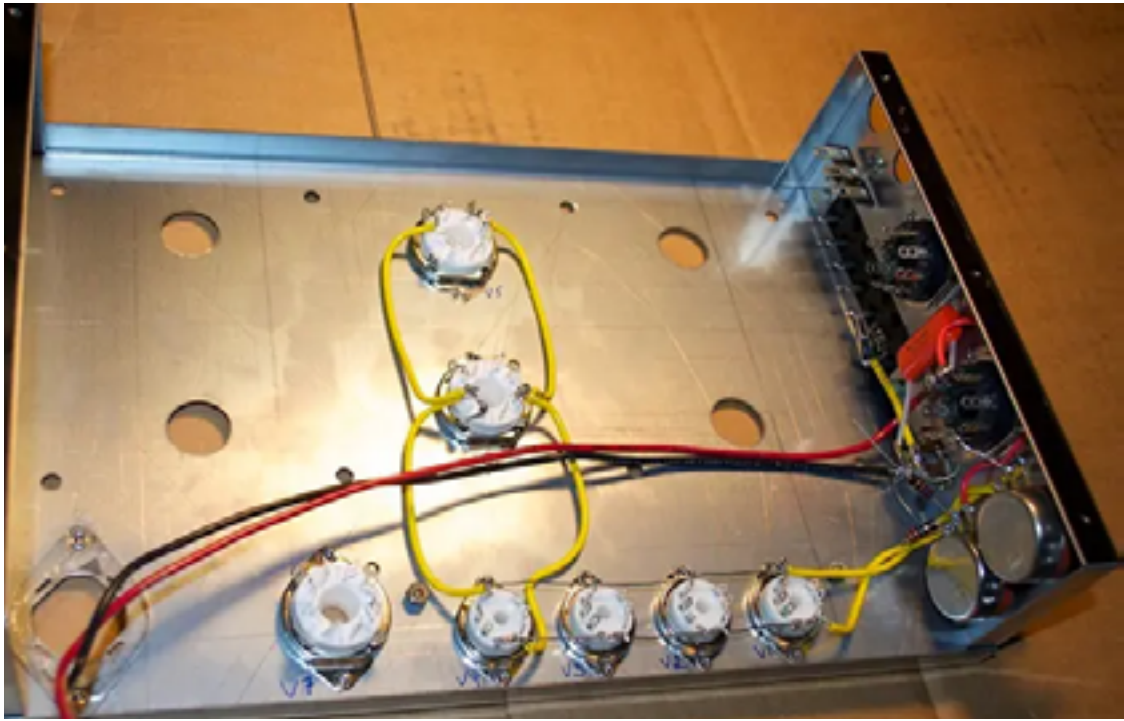


They are in pretty good shape, so I'm not going to bother repainting. I'll just do a little clean-up:

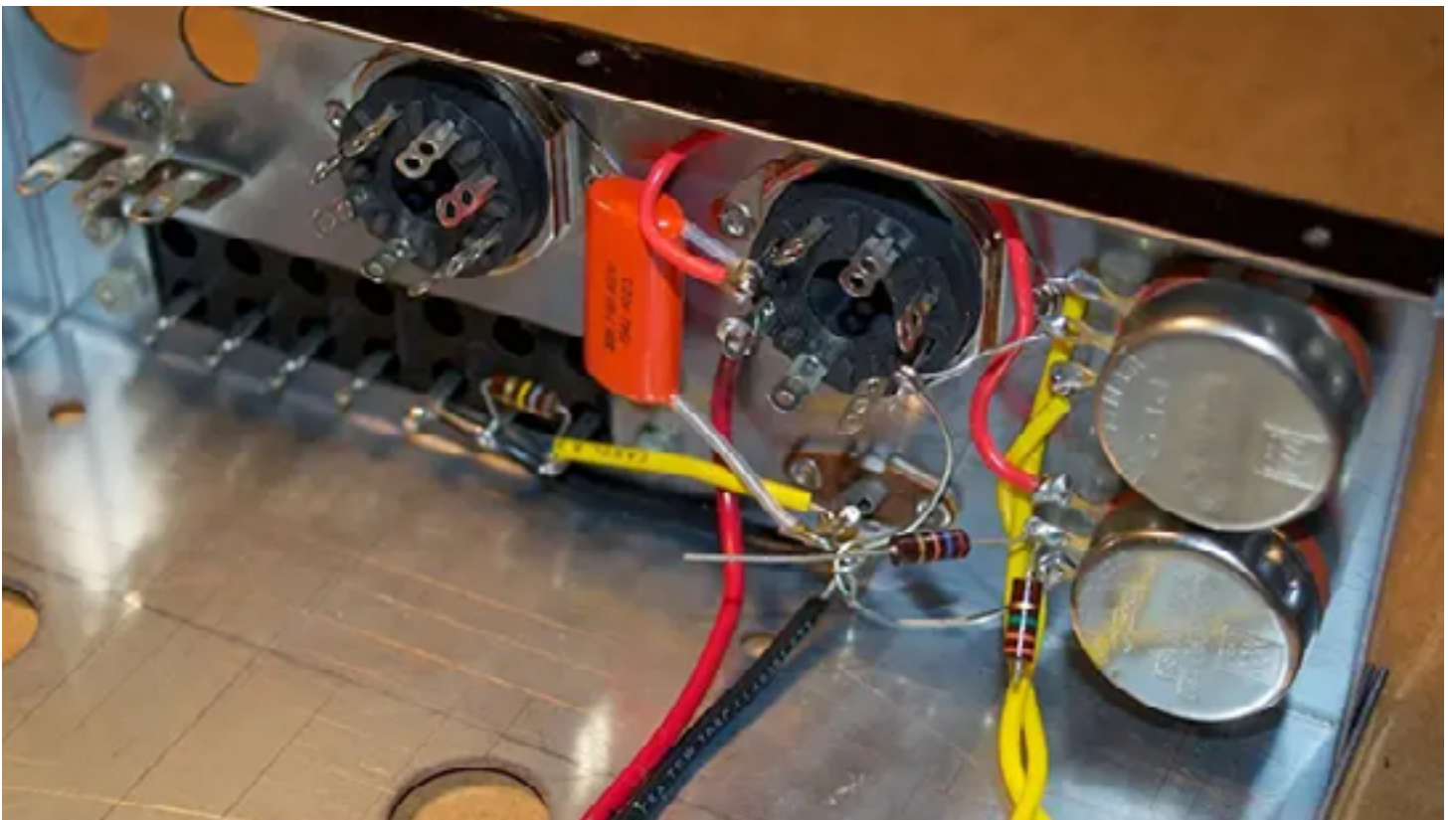


After I removed and labeled the transformers, it was time to get to work on the chassis. I started with the filament wiring. I followed the original method using bare copper (tinned) wire strung along both sides of the small tube sockets.

Before installing the heavy parts, I did as much wiring as I could on the connection side of the chassis. Gain and hum pots, input jacks (RCA and octal), and I also installed C1 (.1 uf 400V Orange Drop). I also added a red high voltage connector wire and the grounds.



Close up showing pots, barrier strip and input jacks:



Next step will be to attach the transformers, and the multi-section can capacitor.

At the end of each conducting half-cycle, the current from the tube ceases, at which instant when it was the current no longer to flow in the direction it was flowing. Then, due to the collapse of the leakage magnetic field, that current reverses. The result of that extra current flow (called "snatch distortion") is to cause a discontinuity or what should be a smooth transition of current flow from one tube to the other. This shows up as both intermodulation distortion and frequency distortion, particularly at high frequencies.

Snatch distortion is generally accepted as unavoidable, as there is no way to eliminate it in efficient amplifiers.

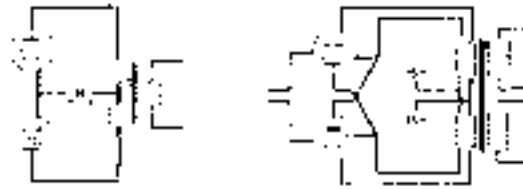


FIG. A, LEFT, CONVENTIONAL PUSH-PULL OUTPUT FIG. B, RIGHT, MCINTOSH UNITY COUPLED PUSH-PULL OUTPUT

except by employing unity coupling between the two tubes of the output transformer primary.

That is exactly what is done in the McIntosh Unity Coupled output transformer. Instead of using separate primary coil sections in the conventional manner, the primaries are bifilar windings. That is, the primaries are placed *side-by-side* by winding two wires side-by-side, as shown in Fig. B. This provides such close coupling (virtually unity coupling) that there is no leakage magnetic field to cause snatch distortion.

A further advantage is gained because the Unity Coupled leads the output tubes equally in their plate and cathode circuits, providing an additional 22 db of negative feedback. This is substantially more than is obtainable in conventional amplifiers, and contributes importantly to the performance of the MC 35.

The McIntosh Unity Coupled transformer also provides another refinement of design that shows up in the very low and very high frequencies. The core is not made up in the usual manner by stacking flat, punched laminations. Instead, it is formed by a continuous winding of grain-oriented Hypersil ribbon core, then split so that the two halves can be inserted in the transformer windings.

If flat, punched laminations were used, it would be necessary to increase the number of turns in the core to obtain the same performance at low frequencies. However, this would have an adverse effect on the high-frequency characteristics.

The use of the Hypersil ribbon core, while more expensive, extends the flat response of the Unity Coupled output transformer at both ends, without loss at one end of the frequency range in order to gain advantage at the other.

Purpose of Unity Coupling

The following explanation is provided so that you will understand exactly why this exclusive McIntosh circuit is employed, and the improvements achieved by its use.

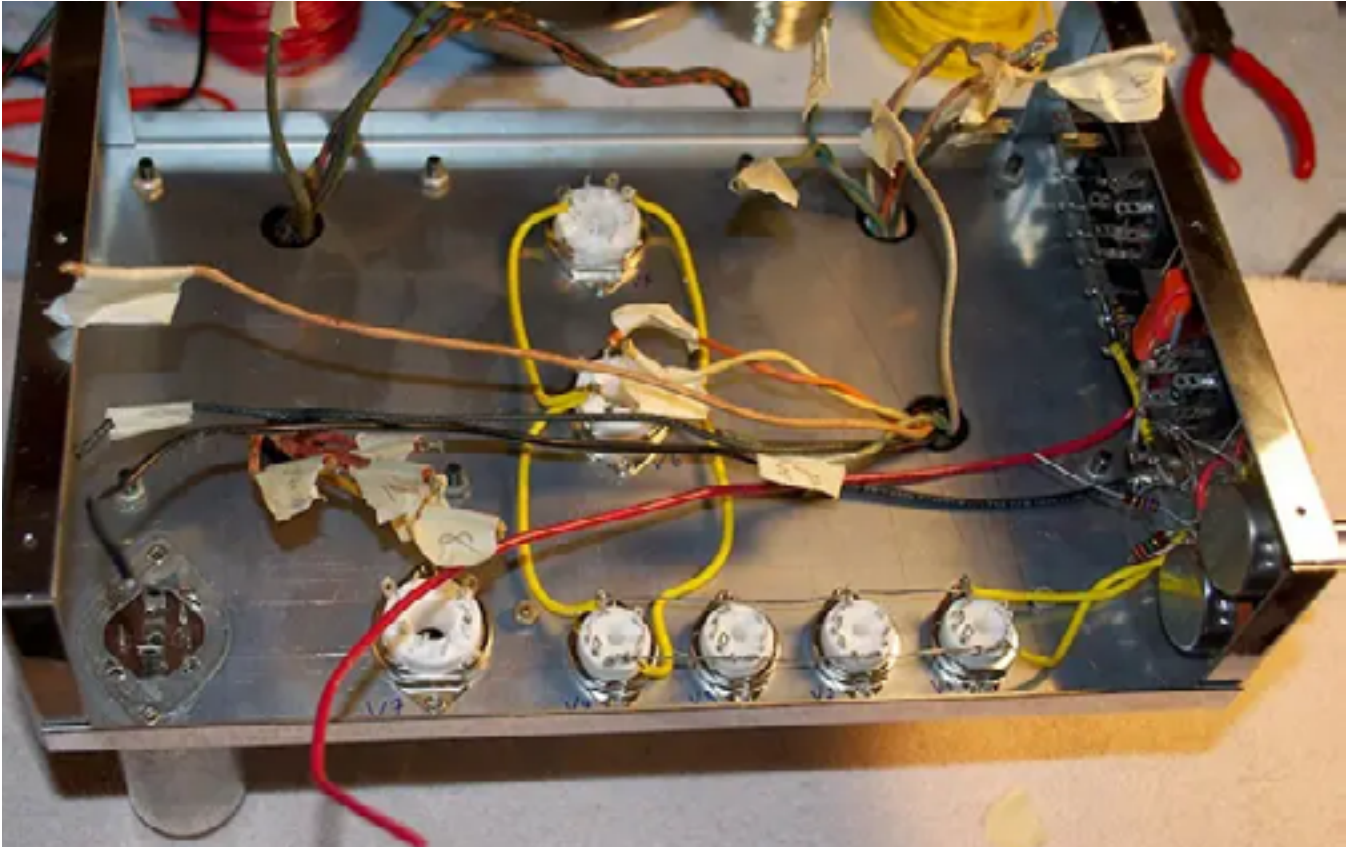
In conventional push-pull amplifiers, one half of the primary winding in the output transformer is connected across the plate and cathode of one output tube. The other half is connected across the plate and cathode of the second tube, as in Fig. A. These primary coils are wound in separate sections.

One output tube conducts current during the first half of the audio-frequency cycle, and the other conducts current during the opposite half cycle, thus inducing current in the output transformer secondary to which the loud speaker or other load is connected.

McIntosh Model MC 35, 243 Tube, 225 Watt, 2500000 Ohm, 4000000

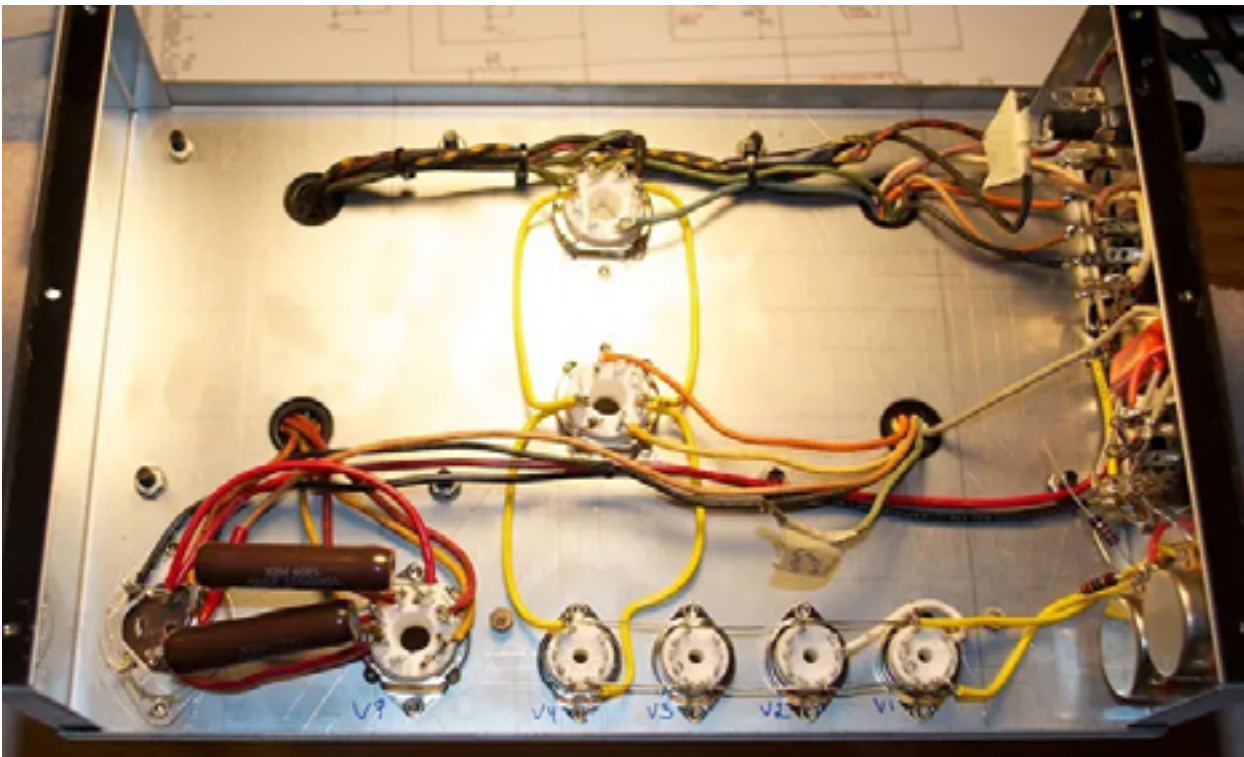
Sunday, March 2, 2014 Heavy parts attached; time to start connecting things.

I attached the transformers and the multi-section cap.

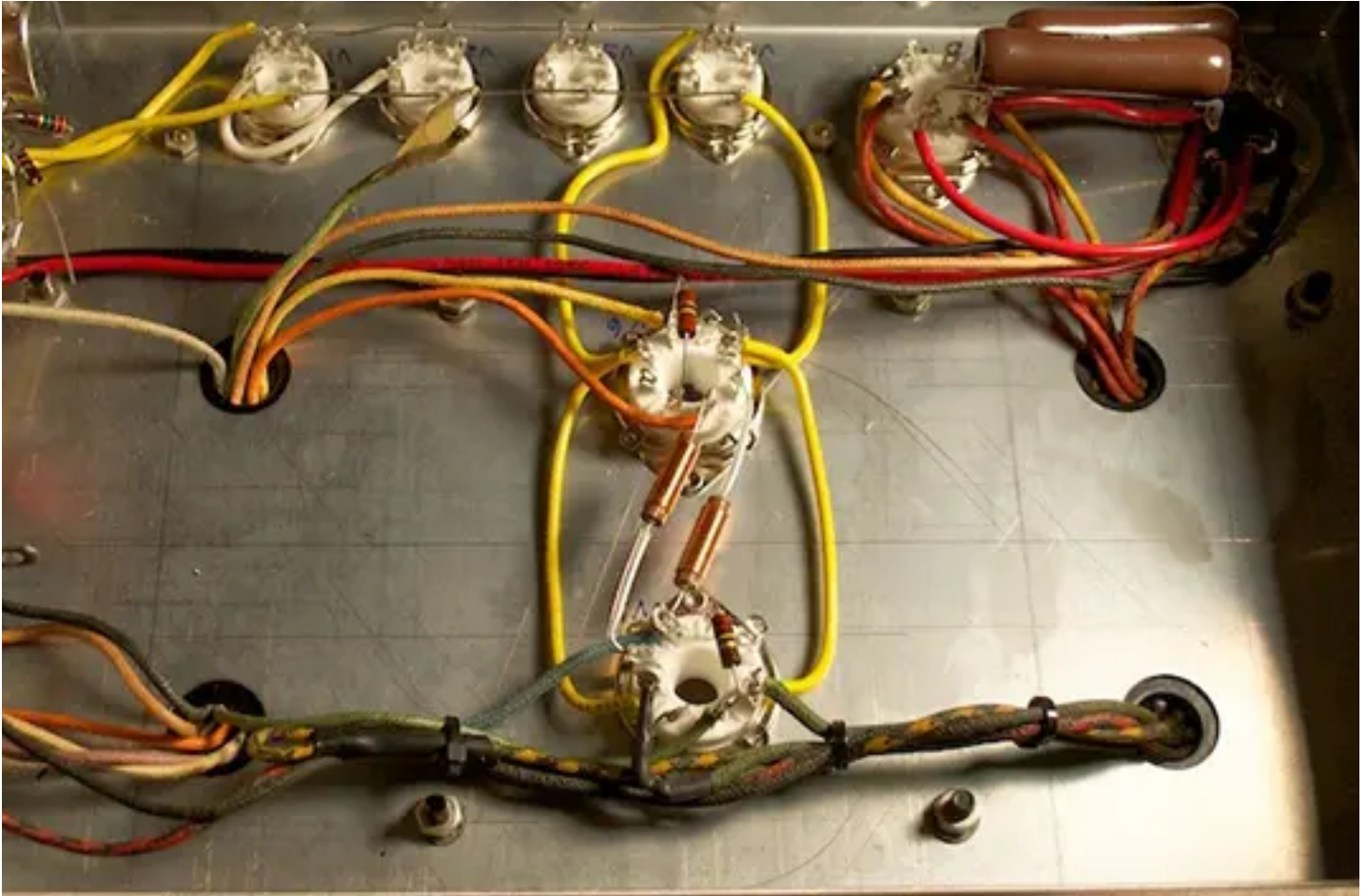


Wiring of the output transformer is completed first, then I took on the power transformer. All transformer leads are attached where they need to be with the exception of one that needs to attach to the parts board.

Transformers, power supply wiring complete:

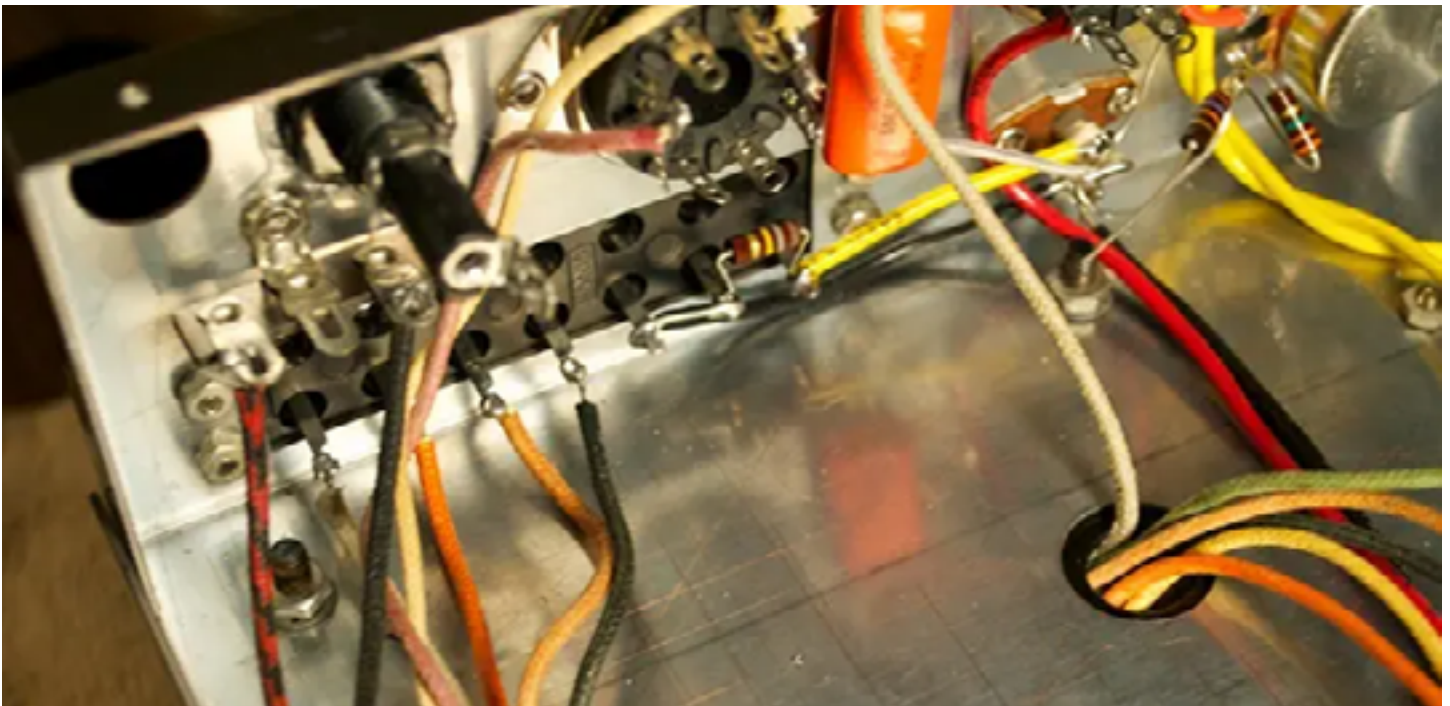


Next up, are two resistors attached to the output tube sockets, and the two coils as well:



Finally, a couple close-ups of my work. You'll notice that I did not bother to connect the speaker connections to the output octal. Since this amp is for personal use, and I will never use that output socket, I decided to reduce the clutter of excess wiring and not connect.

Output connections to barrier strip:



The choke coils are not original. They look a little different than the original McIntosh coils which were encased and look a little like resistors. These replacements are as close as I could get. The schematic calls for 1.5 and 2.7 mh, I am using a 1.5 and a 2.4 (should still work fine).

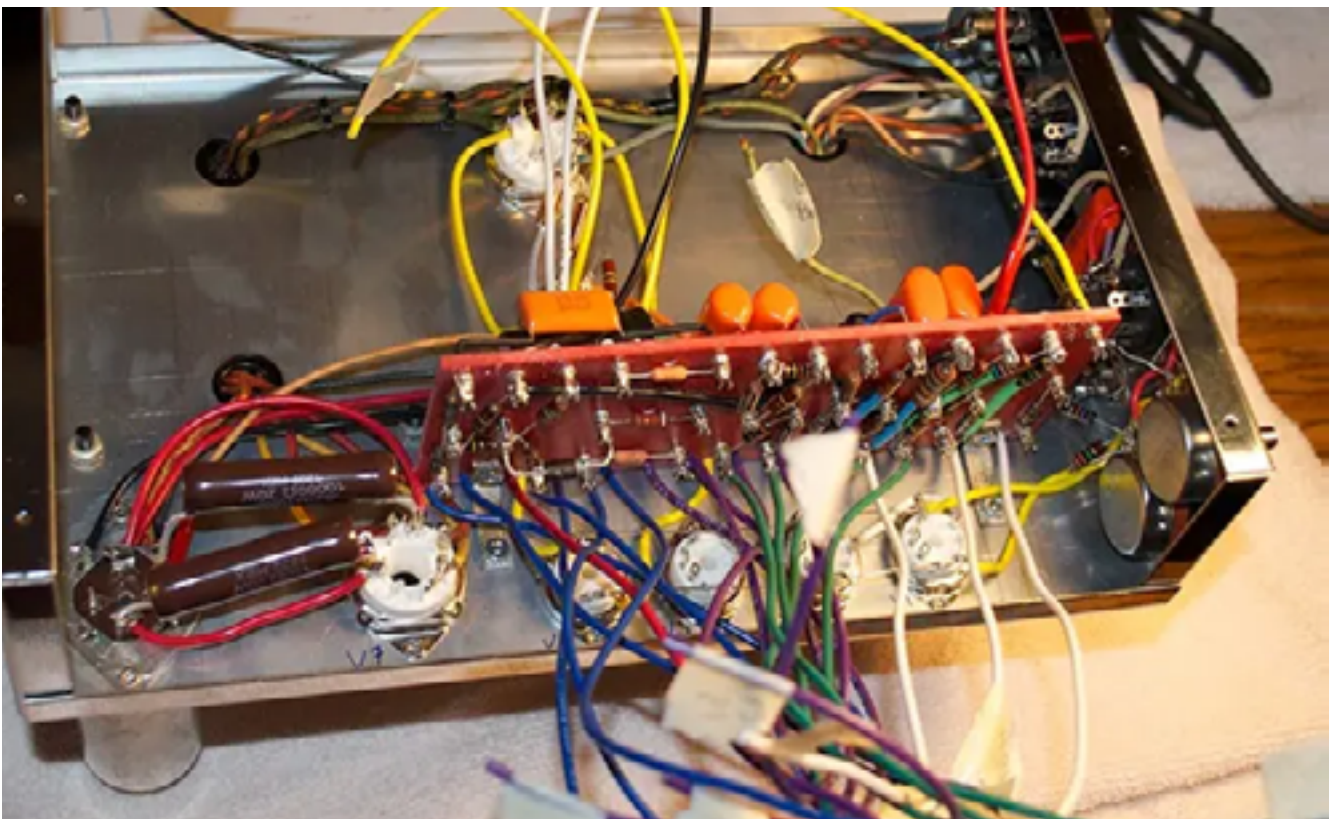


I'm getting close. Next step will be to bolt the parts board on and start attaching wires to the tube sockets.

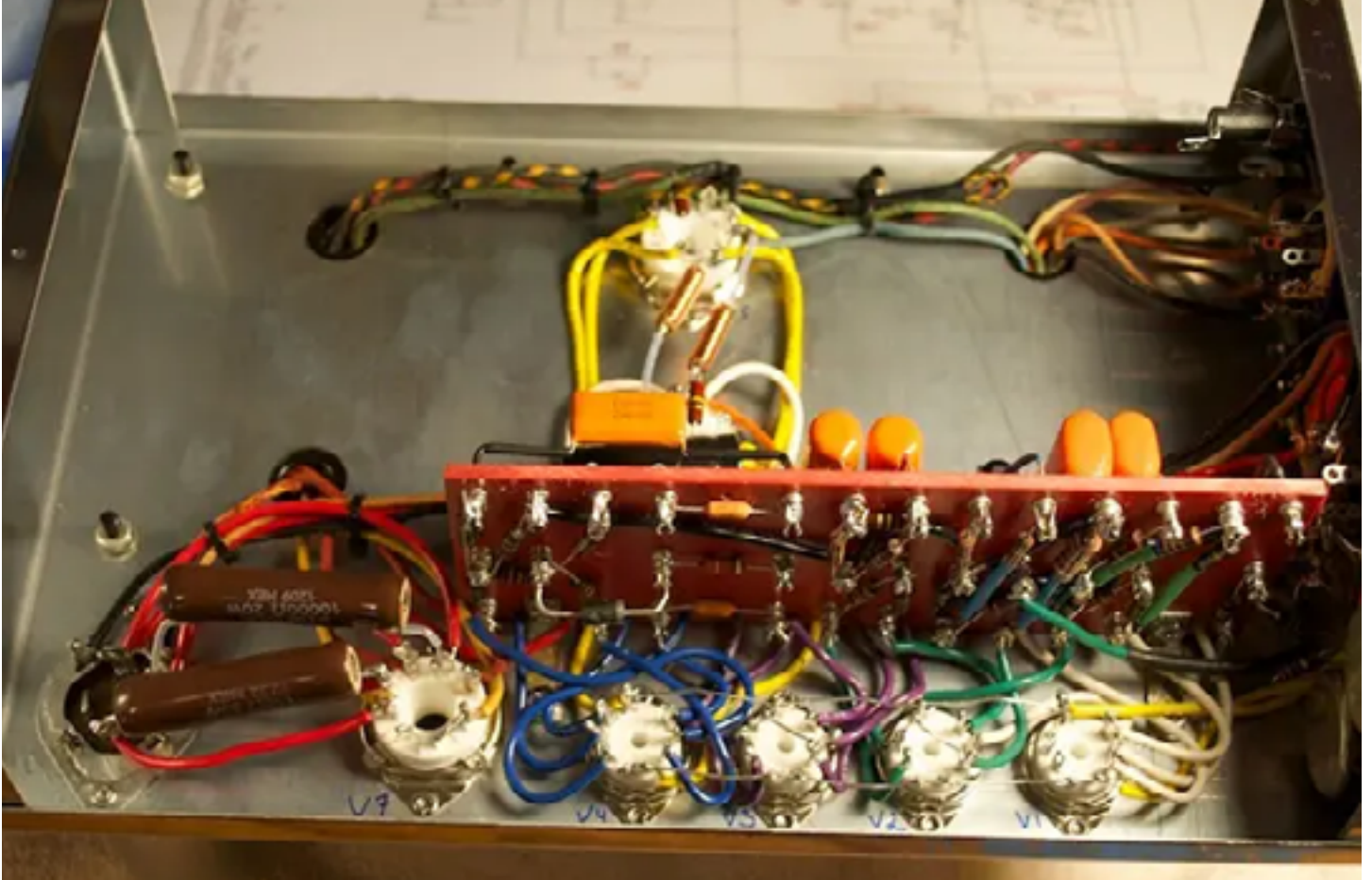
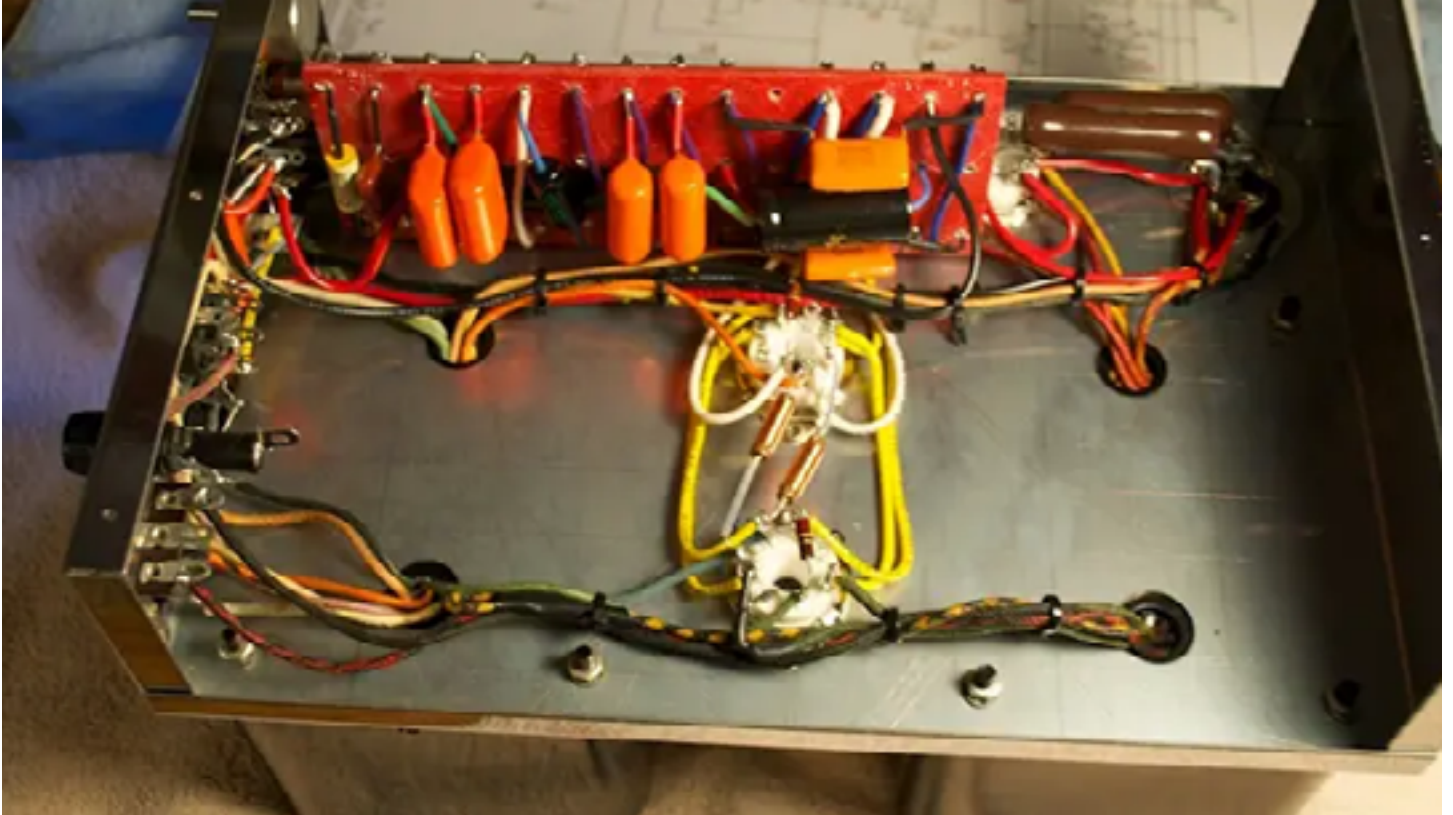
Monday, March 3, 2014 All those tubes and wires...

The parts board fit nicely onto the reproduction chassis. As you can see, I used a little more wire than necessary (better safe than sorry...). I'll trim them as I attach each to the tube sockets.

Parts board is bolted on. A few loose wires remain:

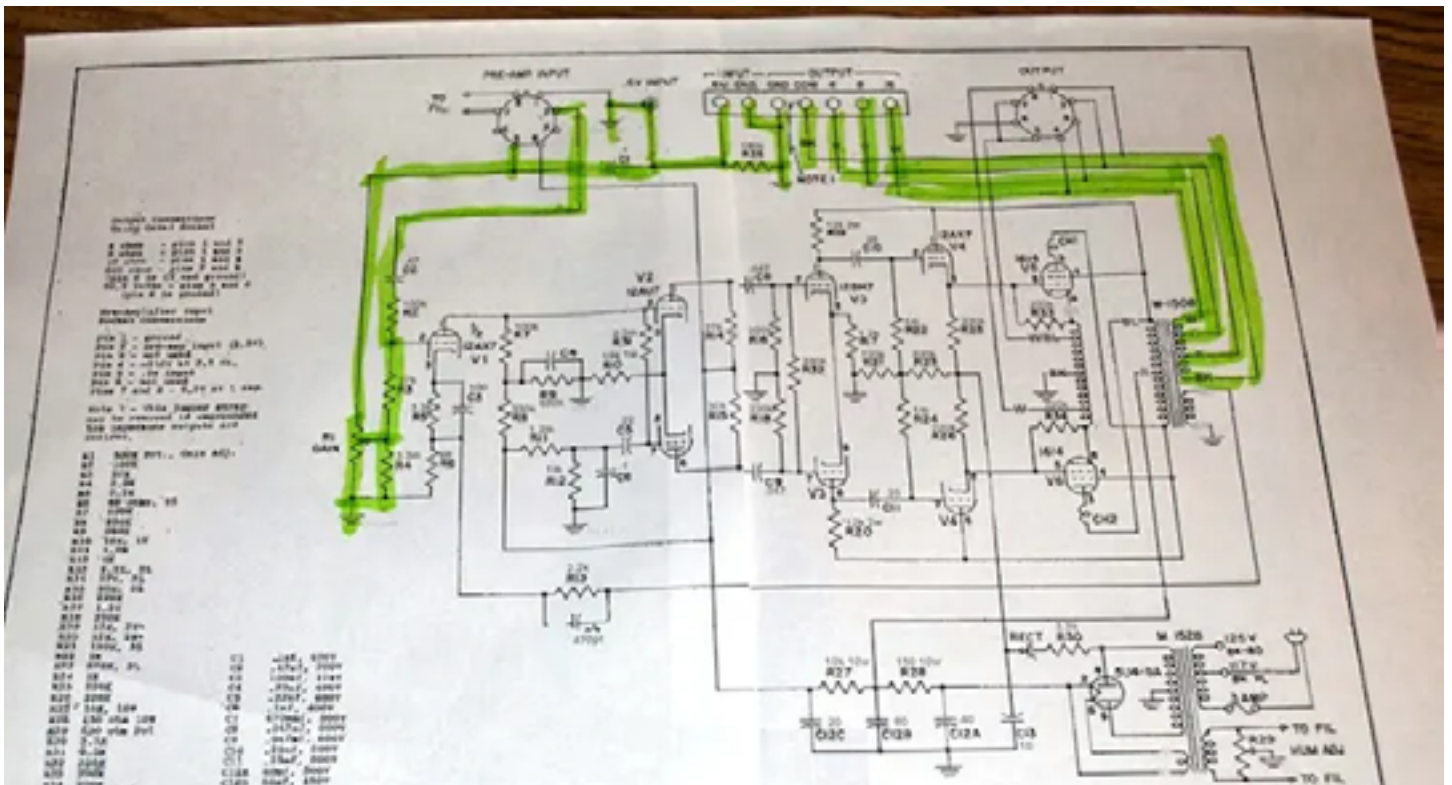


After a couple of hours the new amp looks like this. It's a bit more colorful than the original, and my wires are much fatter (600v insulation is kind of thick). Anyhow, I neatened up the wires a little, and then realize that I am awfully close to being finished.



I must resist the urge to plug it in right away. I will methodically trace every bit of the circuit making sure everything is connected properly and that everything is in place. This takes about a hour, but it will be worth it when I'm all finished. I just highlight the circuit once I've checked it. As you can see, I have quite a bit more to do.

My schematic showing highlighted (checked) areas:



I'll be working on this late into the evening, so my next post should wrap things up.

Tuesday, March 4, 2014 Success!

After quite a few hours of work, the newly manufactured (with two old parts) McIntosh MC30 is complete. I traced the entire circuit and matched it with the schematic, then before adding power, I used the service manual to verify resistances at each tube pin.

Once convinced I had done everything right I hooked up a speaker and a cd player for a source and slowly brought the AC up with my variac. At about 80 volts, I noticed the filaments lighting. I waited there for a minute or two, and then slowly went all the way to 120 VAC. Within a few seconds I heard music, and [this video](#) captures that moment.



A little more testing was necessary. I checked all of the voltages.

MC30 Service Manual pages 4 and 5, showing resistances and voltages:

GUARANTEE

We guarantee the performance of this equipment and the mechanical and electrical workmanship to be free of serious defects for a period of 90 days. This guarantee does not extend to components damaged by improper use nor does it extend to transportation to and from the factory.

SERVICE INFORMATION

All McIntosh equipment is designed for long trouble free operation. All components are of highest quality and are conservatively operated. If trouble develops the amplifier may be serviced by your franchised dealer, a competent serviceman, or returned to the factory. Equipment will not be accepted at the factory unless factory return authorization is first received. The following chart of operating voltages and resistances is offered as a guide for servicing the unit. All voltages and resistances are measured to chassis except those with asterik (*). These are measured to chassis with pin #2 of either 5U4GA grounded. Voltages are measured with high impedance VTVM. **NOTE—UNIT MUST BE TURNED OFF WHEN MEASURING RESISTENCES.**

VOLTAGE AND RESISTANCE CHART

Tube	Pin No.	DC Volts No Signal	DC Volts 30W out	AC Volts 30W out	Resistance Unit Off
12AX7 (input)	1	120	102	1.5	380K*
	2	0	0	.42	27K (gain C.C.W.)
	3	1.1	1	.4	3.3K
	4 & 5	Filament	(6.3V AC to pin 9)	—	0 (hum C.C.W.)
	6, 7 & 8 9	— Filament	— —	— —	— 0
12AU7	1	240	210	10	40K*
	2	120	102	1.5	380K*
	3 & 8	129	108	.5	18K
	4 & 5	Filament	(6.3V AC to pin 9)	—	—
	6	240	210	10	40K*
	7	96	86	0	2.5K*
	9	Filament	—	—	—
12BH7	1	352	295	132	12.2K*
	2	0	0	10	220K
	3 & 8	18	15.5	.4	1.2K
	4 & 5	Filament	(6.3V AC to pin 9)	—	—
	6	352	295	132	12.2K*
	7	0	0	10	220K
	9	Filament	—	—	—

Tube	Pin No.	DC Volts No Signal	DC Volts 30W out	AC Volts 30W out	Resistance Unit Off
12AX7	1	440	375	98	205*
	2	-42	-41	132	1.1M
	3	-42	-42	132	150K
	4 & 5	Filament	(6.3V AC to pin 9)	—	—
	6	440	375	98	205*
	7	-42	-41	132	1.1M
	8	-42	-42	132	150K
	9	Filament	—	—	—
	1614	1	0	0	0
2		Filament	(6.3V AC to pin 7)	—	—
3		440	375	98	205*
4		440	375	98	205*
5		-42	-42	132	150K
6		—	—	—	—
7		Filament	—	—	—
8		.8	5.5	98	19
5U4	1	—	—	—	—
	2	Filament 460	410	8.8 (ripple)	0*
	3	—	—	—	—
	4	—	—	370	44
	5	—	—	—	—
	6	—	—	370	44
	7	—	—	—	—
	8	Filament	(5.0V AC to pin 2)	—	0*

U. S. Patents No. 2,477,074; 2,545,788; 2,646,467; 2,654,058 others pending

McINTOSH LABORATORY, INC.

2 Chambers Street

Binghamton, N. Y., U.S.A.

Finally finished, the “new” MC30 finds itself in it’s proper place. It’s three other siblings are happy too. Yes, I now have four beautiful MC30’s and I am bi-amping for the first time... (more on that later).

The MC30 in place, just above the C22 preamp:



Close up of MC30 number four:



Sunday, March 23, 2014 Burn in period complete.

This is just a quick update to let you know that after a few weeks of intense testing I am quite satisfied with the newly rebuilt amp.

I'm successfully bi-amping (passive mode right now). My next goal will be to complete restoration of two more MC30's and then build an active three-way crossover based on the Linkwitz-Riley circuit. Once complete, I will dismantle my three-way speakers and then tri-amp them using a total of six MC30's.

That will be essentially 90 watts per channel of wonderful tube amplification. (42 vacuum tubes, or 49 if you count my C22 preamp).

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