

Upgrading a Classic Pilot Amp

This amp construction project is vintage all the way— with old iron and coke-bottle tubes.

In the December 2005 issue of *audioXpress* (“Junk Box Tube Amp Jubilee,” p. 24), I wrote an article on constructing amps based on the Pilot 410 monoblock. As I stated in that article, this circuit lends itself to the use of many different types of tubes, output transformers, and power transformers. My friend Larry and I have built many of these types of amps, which have not only worked upon first being fired up, but have also sounded very nice and been extremely stable. I encouraged readers to dig around in their parts boxes and build one or two. Apparently, many of you did, because I have received many e-mails and notes from people who truly enjoyed the construction. I have built a number of them for some of my friends, who have enjoyed them as well.

VINTAGE COMPONENTS

Many of the ones we built used transformers from the late 50s and early 60s,

as well as some new production ones from Hammond. I decided I wanted to build a very vintage unit (Photo 1), such as was constructed in the 40s and 50s before there was readily available amateur audio equipment at a reason-

able price. I would use only octal tubes, very vintage transformers, carbon composition resistors, and period wire and chassis.

able price. I would use only octal tubes, very vintage transformers, carbon composition resistors, and period wire and chassis. I decided to use 6L6Gs for the right look (nothing like coke bottle tubes for a vintage look). Digging around, I found a very high-quality Thordarson

CHT output transformer, which was big, weighed about 8 lbs, and had both 8000 center tapped (ct) and 5000 ct primaries rated at 15W with 70mA current per plate. The connections for both primary and secondaries are on the bottom of the case, but the back featured an impedance selection with a pin plug for 2, 3, 4, 6, 8, 16, 250, and 500Ω. I was able to date it in a reproduction catalog from the late 40s. The only problem was I only had one of them and I wanted to build a stereo amplifier. I put a search online and waited.

About 1½ years later I got a hit that led me to a very similar unit. The difference was this one had the ID tag on the top of the can instead of on the front. It was also missing the bottom mount plate, but it was the same size and the rest of it appeared identical. I purchased the unit, which was identical to the first, except for the noted differences. I can only assume that they were produced in different years, but with the same model designation.



PHOTO 1: The completed amplifier.

I was able to make a suitable mount plate and now had a pair of transformers—I was on my way! I wanted to run about 295V on the plates, so I dug around and found a power transformer with 500 ct primary at 225mA, with two 6.3V 4A and 5V 3A filament windings. While I have no idea of the date of manufacture of this unit, I painted the top with wrinkle paint to match the factory finish on the outputs.

After a little more digging, I found a steel chassis from an old rack-mount telephone amplifier that used 4 and 5 pin tubes. It was very heavy steel and had 6 coupling transformers; “cat gut” wrapped wiring harness with cloth-covered wire, and some very nice oil caps under the chassis. After stripping the excess nonusable parts and sockets, I started laying out the chassis.

When you use a salvaged chassis with holes already punched and drilled in it, you must be creative. I arranged and rearranged the sockets and transformers until I covered the unwanted holes, while using the pre-punched socket holes in a pleasing arrangement. After drilling and punching the additional needed holes, I sent the chassis to the powder coat shop for a finish of gray and black antique. (This used to be called “hammered” finish, but the powder coaters refer to it as antique vein). I touched up the outputs with satin black (they were already wrinkle-finished).

I used a 5V3 coke bottle as a rectifier tube, and 6SN7 dual triodes for the pre-amp and phase inverters. I looked for a coke bottle version of the 6SN7, but the only ones I found were European versions (CV181), and the ones I have run across were generally over \$100 each. I recently found a pair of coke-bottle-shaped CV1285s, which I will substitute for the 6SN7 (for significantly less than \$100 each).

I wanted to continue my vintage theme by using as many older parts as possible, but I did use new gold-plated input jacks, newer banana output jacks, and a new volume control.

I decided to use the original oil caps in the power supply (Photo 2), as well as their original mounting hardware and spacers. I used the original cloth-covered wire salvaged from the telephone amp for all the wiring. Internally, I used all

NOS carbon composition 1 and 2W resistors for their vintage look and to stay with my theme (I know, I have scoffed at using these old beasts and ridiculed people who swear by them).

The only newer-style components I used were the coupling caps and electrolytic caps. I planned on using some salvaged coupling caps, but after I sorted through about 50 I had saved, and found not one “on value” and only a few that were not leaky, I abandoned the idea. I chose to use the newer version of these parts because of the unreliability of older wax coupling caps and old electrolytics. I would have used some oil-impregnated coupling caps, but I couldn’t find any that weren’t worth a fortune to their sellers. I plan to replace the newer coupling caps with some older Sprague oil caps if I find some that are reasonably priced.

As you can see from Photo 3, there is plenty of room to work under the chassis. I used a bus wire to “float” all the grounds from the chassis, except where the input jacks are connected to chassis ground and the bus wire. This is to prevent ground loops. I was very surprised when I fired up this amp and it had a hum!

COMPLETED AMPLIFIER

Because I used the bus wire system (Photo 4), I assumed the noise problem

was something else and proceeded to swap preamp tubes, change and add filter caps, and even rerout filament wiring, all to no avail. When I asked my friend Larry (I have mentioned him before—we share a tube amp addiction) to take a look at it, he found that I had not attached the ground terminal of the volume control to the bus wire. As soon as he added it, the amp became dead quiet.

I think many of us face the same issues; we sneak in a little time to work on projects whenever we can, and sometimes just miss something. When you spend a lot of time on a project, it is almost impossible to find a simple error. It is very nice to have a friend such as Larry, who can look over your work and spot your errors quickly. Or, sometimes if you set the project aside for a while and then go back to it, you may notice your mistake.

I have not done any distortion or power measurements on this amp yet, but I was struck by how great it sounds! Larry and I both agree that it sounds the best of any of the other 12-15 of these amps we have built using the same circuit.

SOUND FACTORS

The question arises as to why it sounds so great. Is it the “old iron” outputs?

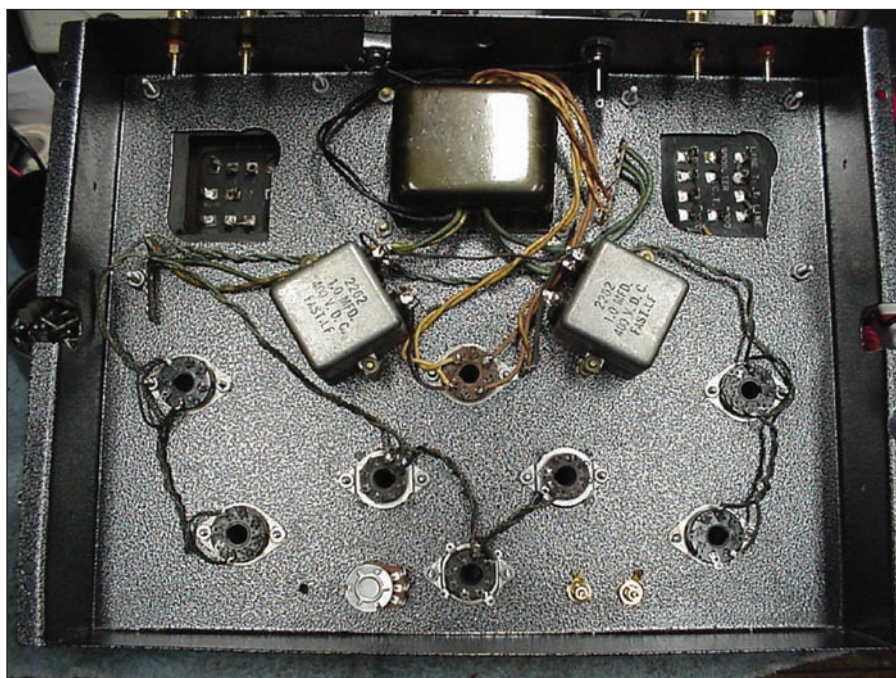


PHOTO 2: Tube wiring.

Might be, although we have used vintage iron in most of the amps we have built. We have used Sherwood, Fisher 400 and 500, Heathkit A4 and A5, and Knightkit transformers, as well as some unknowns. The Thordarson transformers are huge and heavy, especially for their 15W rating. They are every bit as heavy as Dynaco Mark III/IV outputs rated at 60W.

One of the things I think we can all

agree on is that these Thordarsons were made when quality of construction was a prime consideration in US products. Many of the others we have used were built at the same time, and we agree that they all sound different, but none sound as good as this one.

Is it the coke bottle outputs? This is pretty easy to check, and I have tried various 6L6 tubes in the amp. Honestly, I haven't been able to detect a difference

with the 6L6s. Larry disagrees with me on this; he says they sound different, but not enough to account for the kind of difference we hear in this amp. To be fair, I have found some significant difference in the sound of NOS output tubes versus Chinese and Russian imports, but I think the reliability of the NOS is better than anything made today.

Is it the 6SN7 input and phase inverter tubes? Over the years, quite a number of very well-known and intelligent audio people have stated that octal preamp tubes are better sounding than 7- or 9-pin tubes. I am not sure about this one either. The other amps we have built used a variety of input and phase inverter tubes including 6C4s, 12AU7s, as well as 6SN7s. I suppose I could build some socket adapters and try 7- and 9-pin tubes, but that would require much more effort than I am willing to expend. I do believe that you can hear a huge difference in preamp tubes!

If you want to experiment with this, try a half-dozen various 12AX7s (or whatever common ones you use) in your favorite preamp. After a pretty short exposure to various tubes, you can detect some differences. Noise levels and microphonics are the easiest to hear, but the treble smoothness is also generally apparent after some critical listening. I have found that some of the newer production tubes are every bit as good as NOS ones, so I would not spend a bunch of money on smooth plate Telefunks. (I couldn't hear the difference in these and other NOS quality tubes.)

What about the tube rectifier and oil caps in the power supply? This is the first of my amps that used a coke bottle rectifier tube and oil caps. The stereo version in the original article used silicon diode voltage doublers and it sounds very good, not much different from this one, but maybe not quite as smooth. We have used a variety of tube and diode rectifiers in the 410 clones, and even though they all sound a little different, I am not sure why.

Many people believe the oil caps are superior to electrolytic caps in power supplies, and I think it may make a difference in single-ended amps, but I am not sure that this is true here. I do have

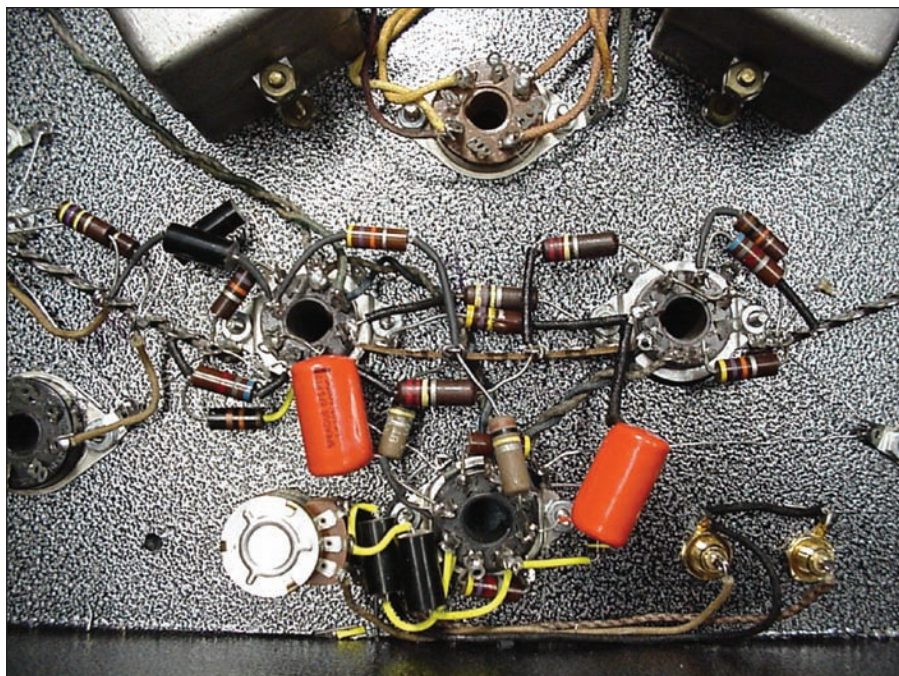


PHOTO 3: Grounding the amp.

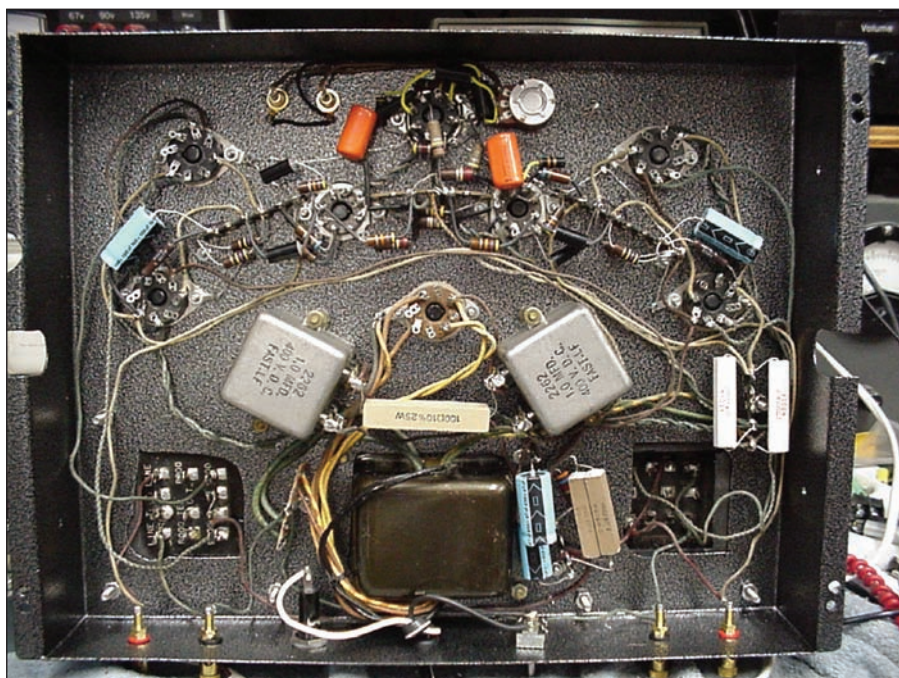


PHOTO 4: All hooked up.

the oil caps bypassed with a 100mF Sprague electrolytic because of the hum issue I mentioned. After Larry found my wiring error, I neglected to remove the electrolytic cap. It might just be the oil caps. The only way this is going to be solved is to take them out of the circuit. Not really sure I want to do that.

Could it be the carbon composition resistors? I am sure that I will hear a lot on this one! I have criticized carbon comp resistors for their troublesome noise characteristics. I have tried to avoid them in preamp circuits, and have used them only in restoration work, where the appearance of the components is as important to collectors as the function of the unit. Noise from them is an issue, but in the case of this amp there is no noise, even with tapping on the various resistors (a technique used in troubleshooting noise).

In this amp I used a variety of NOS and used carbon comp resistors, but discarded any used ones that were off value more than 5%. This question must remain unanswered, because I have no intention of substituting all the resistors in this amp to find out.

Last but not least, is it the old cloth-covered wire from the 40s? I think this one is very easy. I have never been able to hear a difference in the "sound" of wire. I have tried silver wire, Teflon coated wire, and heavy wire. All with the same results—no difference in sound. I generally use quality—but sometimes salvaged—wire and prefer to use solid wire over stranded, but have yet to be convinced that there is a difference in sound.

The same goes for speaker wire. I use Monster™ wire or heavy zip cord (for short runs with small speakers) and haven't seen the need for spending extraordinary amounts of money for speaker wire.

Many years ago Frank Van Alstine challenged high-end cable manufacturers to send him their cables for a scientific evaluation. Only one manufacturer responded. After measuring them, he said they were nice, satisfactory, but not superior. Frank believes that if the amplifier is designed correctly there should be no difference in sound. I tend to agree with him. He thinks that the capacitance of some cables could unbal-

ance the output circuits in solid-state amplifiers, especially poorly designed ones. I think this is one of those personal choices.

At any rate, I don't think the hook-up wire makes the difference. Now, if someone wants to send me some \$1000/ft cables to evaluate, I would be happy to try them. But don't send \$10K cables, because I can't afford the insurance rate increase.

So, after considering all these factors, I conclude that it might be the combination of all these things acting

together. I think the combination of extremely good iron, vintage good tubes, overall high-quality NOS USA components, and, of course, good construction techniques have resulted in a very superior amplifier. The bass is solid without boominess, the midrange is liquid, and the treble is extremely smooth.

This amplifier has become my "reference" unit in my shop, and I find myself listening to it frequently, rather than working on a project.

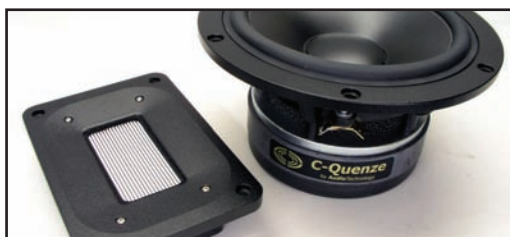
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