

Dentron Clipperton L Conversion to 6L7 Tubes and Other Modifications

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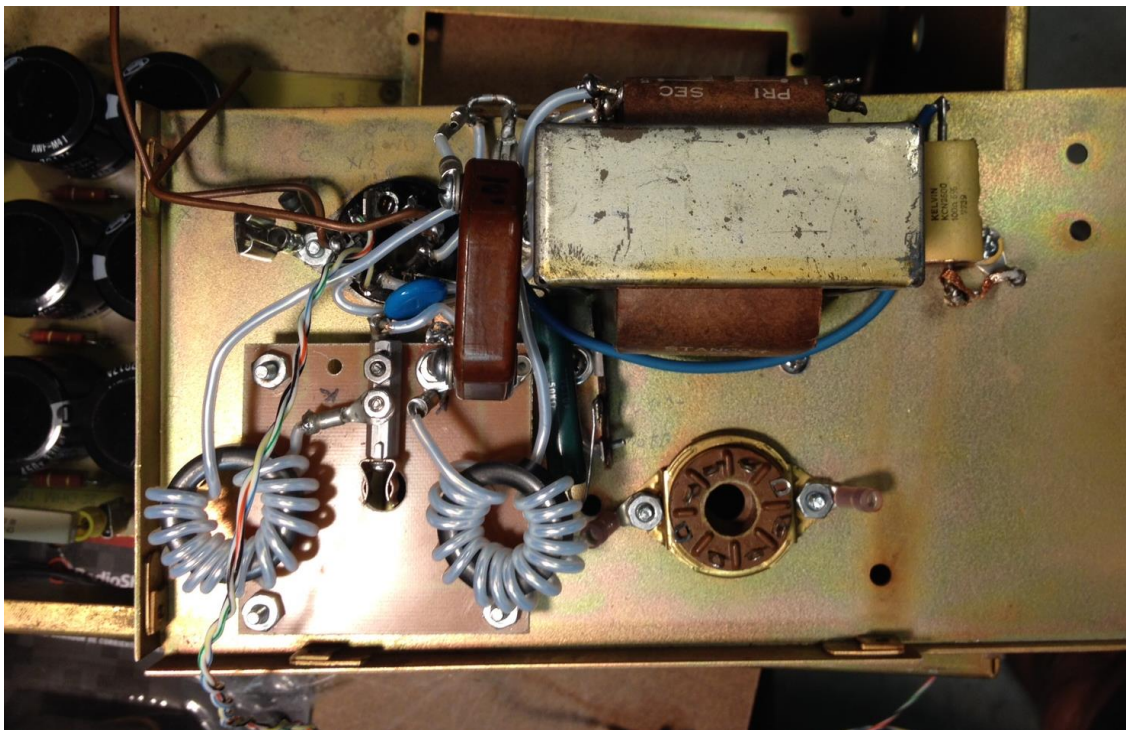
Walking out of Dayton, 2014 my eye caught a beat up Clipperton cabinet under a vendor table. Twenty bucks and it was mine. I was looking for a cabinet to house a homebrew 6L7 amp that I was moving from rack mount to table top. This old Clipperton seemed perfect and it even had the meter.

When I opened the cabinet I was pleasantly surprised. The HV transformer was gone, of course, but just about everything else was there along with a supply of dead spiders. And, with the exception of a roasted band switch, the PI-Net was largely intact. What could I do but start this Clipperton project?

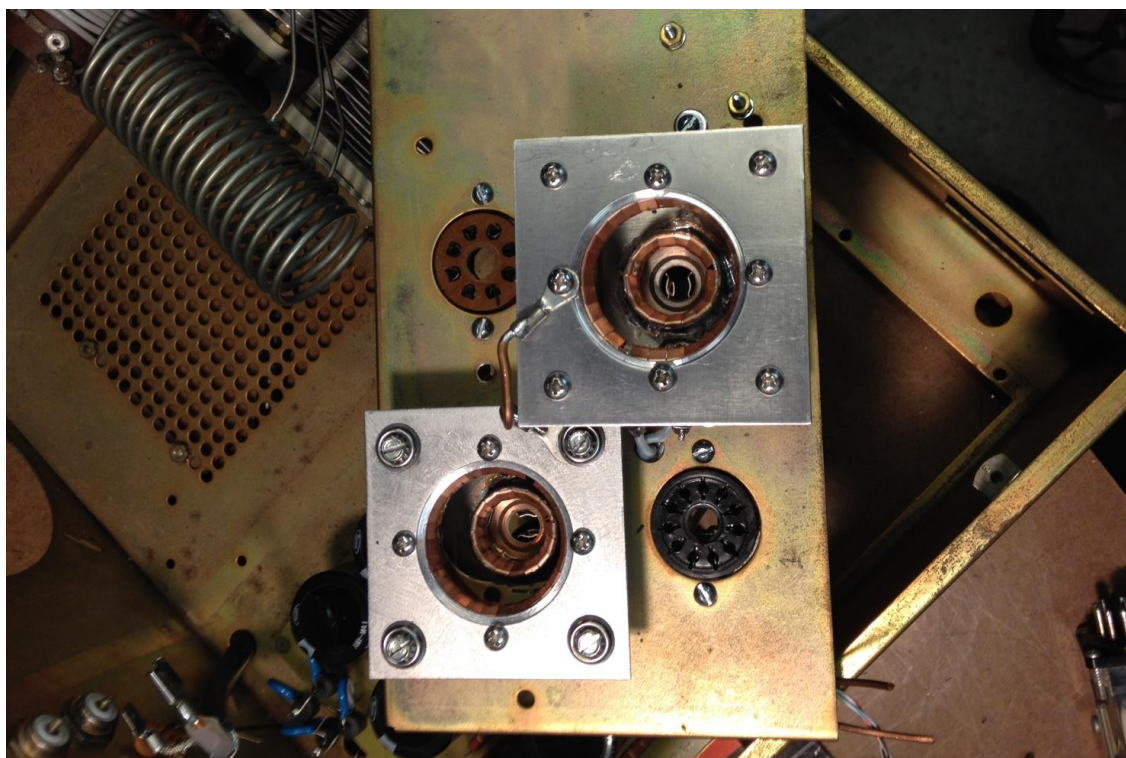
The project started as a retrofit of the Clipperton with 6L7 tubes. However, the more I worked on it the more changes I made. Here is a summary:

1. Replace 4, 6X4 tubes with 2, 6L7 tubes
2. Replace power supply diode/cap board with Far Circuits board and new, smaller caps
3. Install Heathkit SB-220 HV transformer
4. Add 12.6 vac filament transformer
5. Add toroid, filament chokes
6. Add 3PDT T/R relay
7. Add 12 VDC power supply for T/R relay
8. Add LDG Z-100 auto tuner for tuned input
9. Add 12 VDC power supply for LDG
10. Add Grid meter
11. Modify plate meter circuit and add meter shunt
12. Add LED meter lights
13. Modify Pi-Net circuit

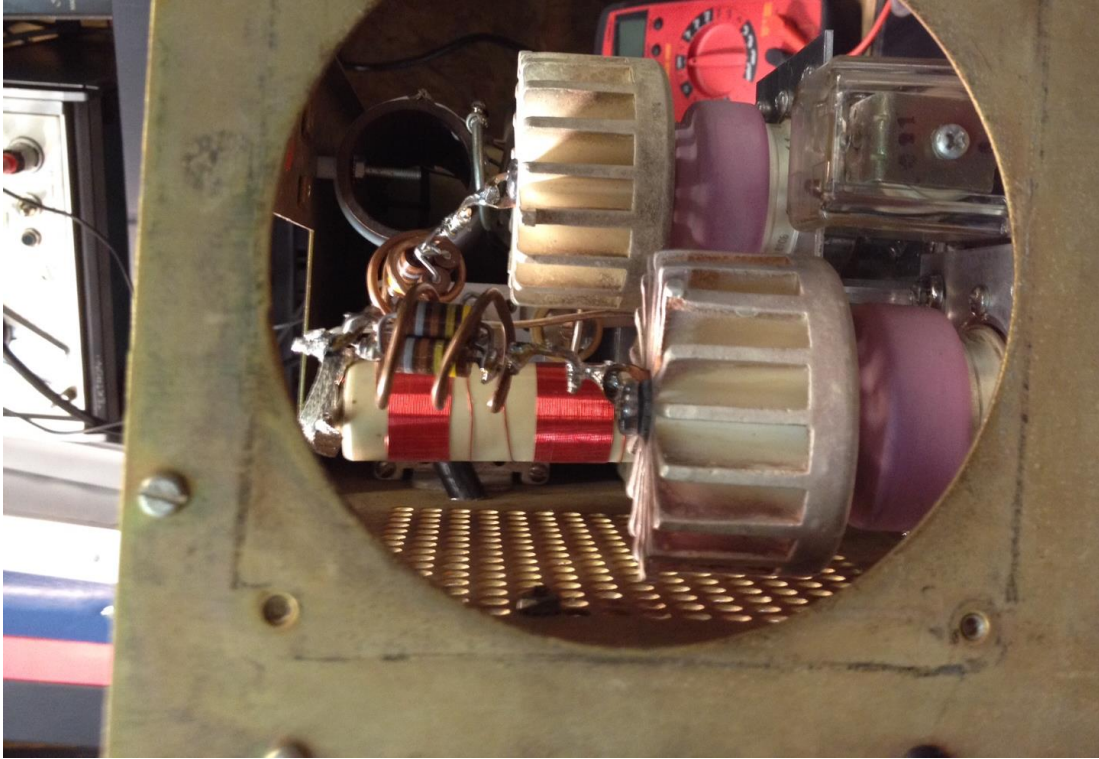
These changes will be covered in detail as this work in progress continues.



Under-construction view of the power supply side of the partition which runs between the power supply and RF sections. The toroids are the filament chokes and the bottom octal socket is for the plate choke.



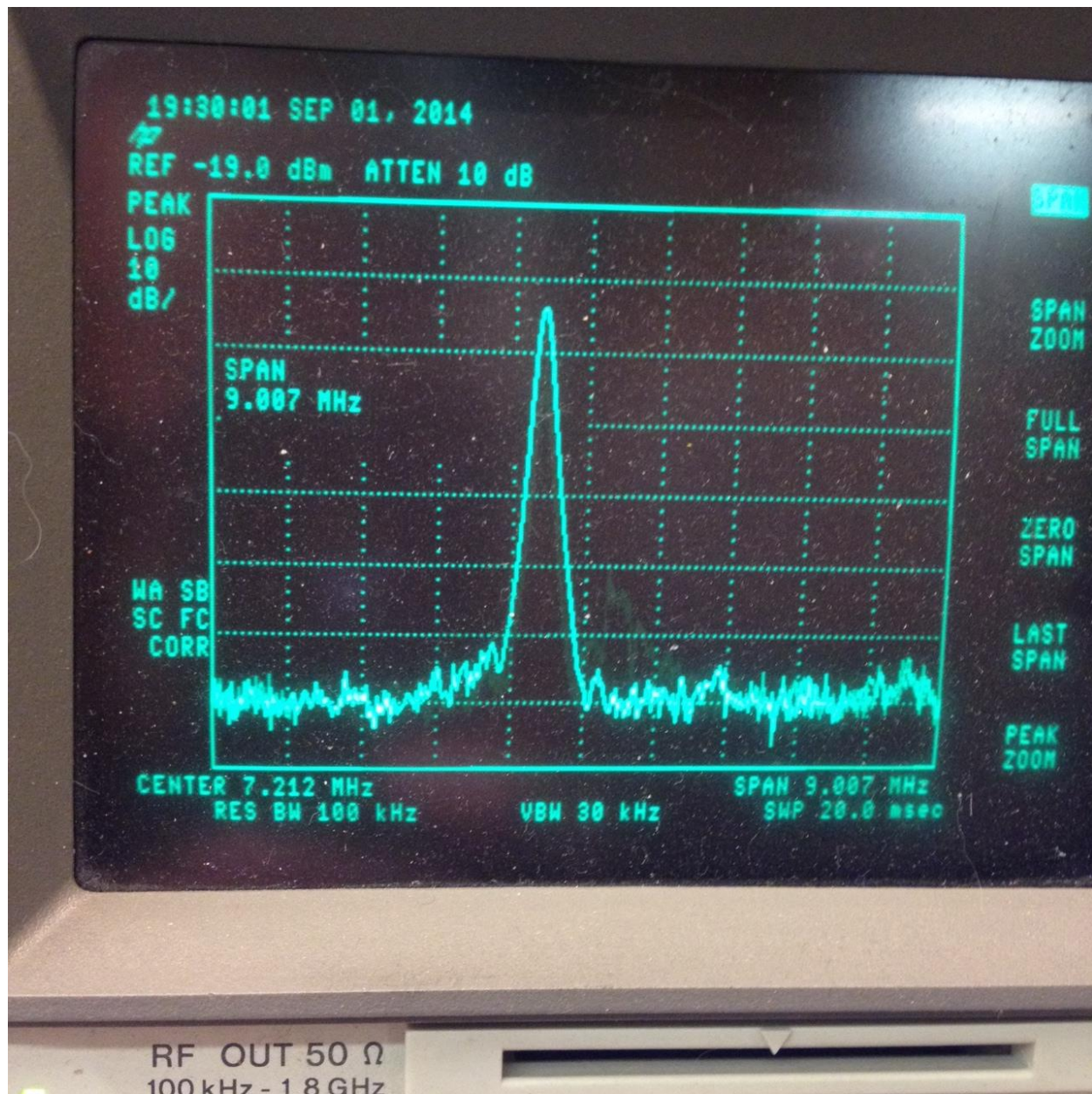
The other side of the partition showing tube sockets and octal socket for the TR relay (bottom) and for the plate choke (top).



View showing the offset-mounted tubes, plate choke, and TR relay



Top view of the tubes and TR relay



About 700 watts at 7.2 Mhz. Looks pretty clean to me

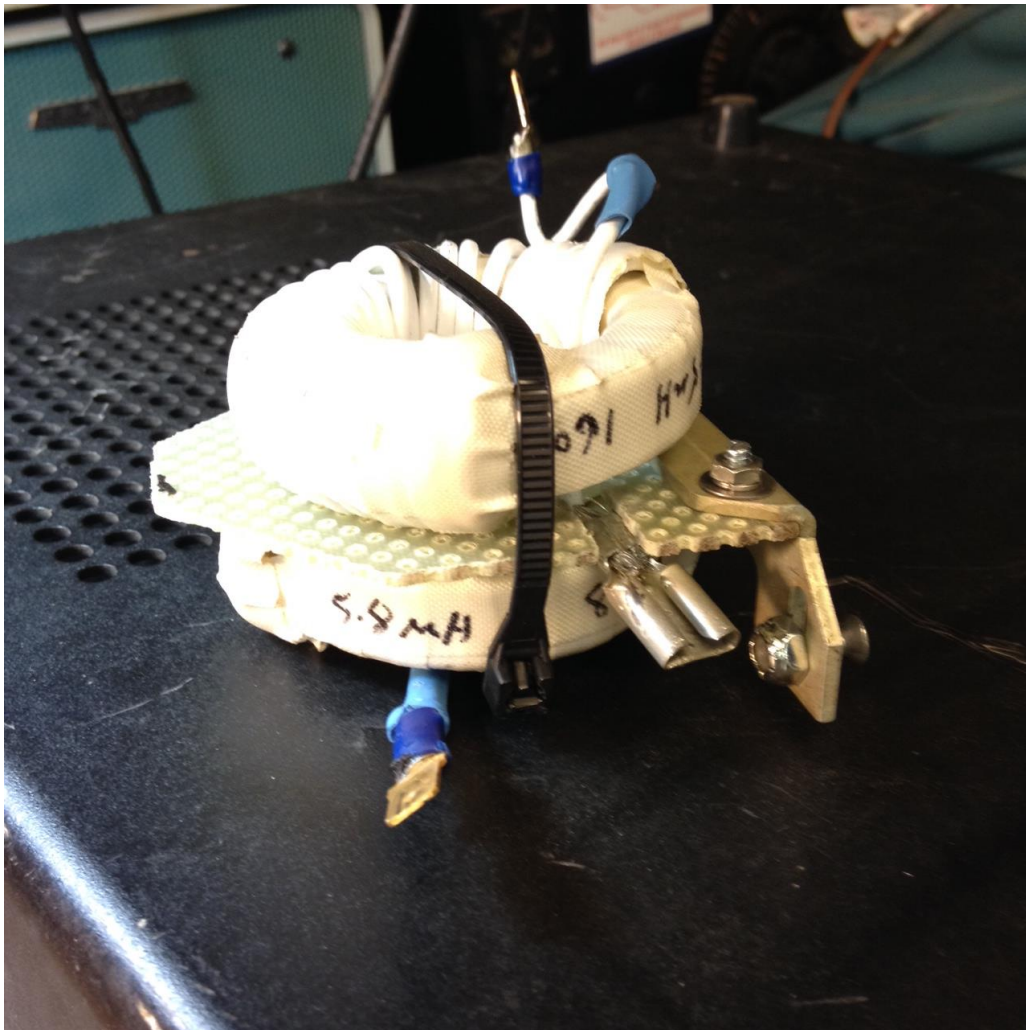
A common complaint about the L is the poor output on 160 and 80 meters. According to Tom, W8JIT, who was a consultant at Dentron, the amps were tested with the covers off. Hence, some users have opted to replace the cover or parts of it with non-metallic material. I saw one of these at a hamfest in 2014 (Shelby, NC, I think) and the owner said it made a big difference.

Now, eyeballing the closeness of the cabinet to the pi net would sure make you think more space would help. And, the problem I was seeing was a combination of higher plate current and lower under-load plate voltage on 160 and 80. In other words, I could get around 700 watts out on all bands but the efficiency was much less on

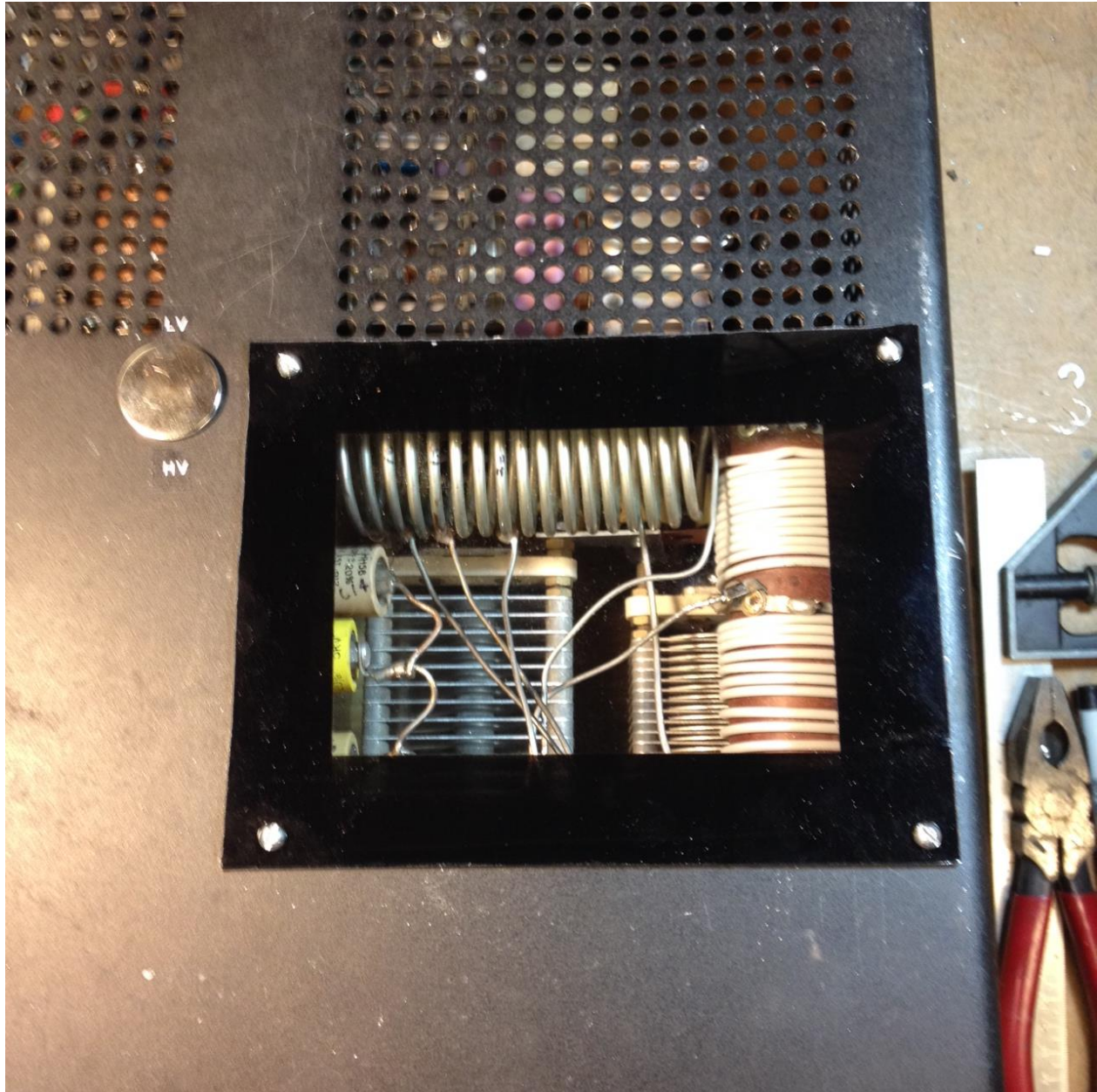
160, 80, and to some extent on 40. Both the 160 and 80 meter portions of the pi net are wound on the phenolic tube (apparently, some Ls also had 40 meters on this tube like the MLA-2500). This tube is quite close to the amp wall as well as the amp cover. Actually, I may have made it worse by remounting it a little closer to the wall to make room for the larger bandswitch.

I tested the notion about the cover by replacing it with cardboard. Sure enough, the efficiency went from around 48% to 58% on 160 with similar results on the other bands. However, I didn't want to butcher the cabinet. So, I tried replacing the 160 and 80 meter coils with a couple of toroids (see below) wound such that the inductance was close to the original coils, viz., 10.5 μH for 160 and 5.0 μH for 80. The results with this gizmo were not very encouraging. The output on 160 was worse and the output on 80 was about the same.

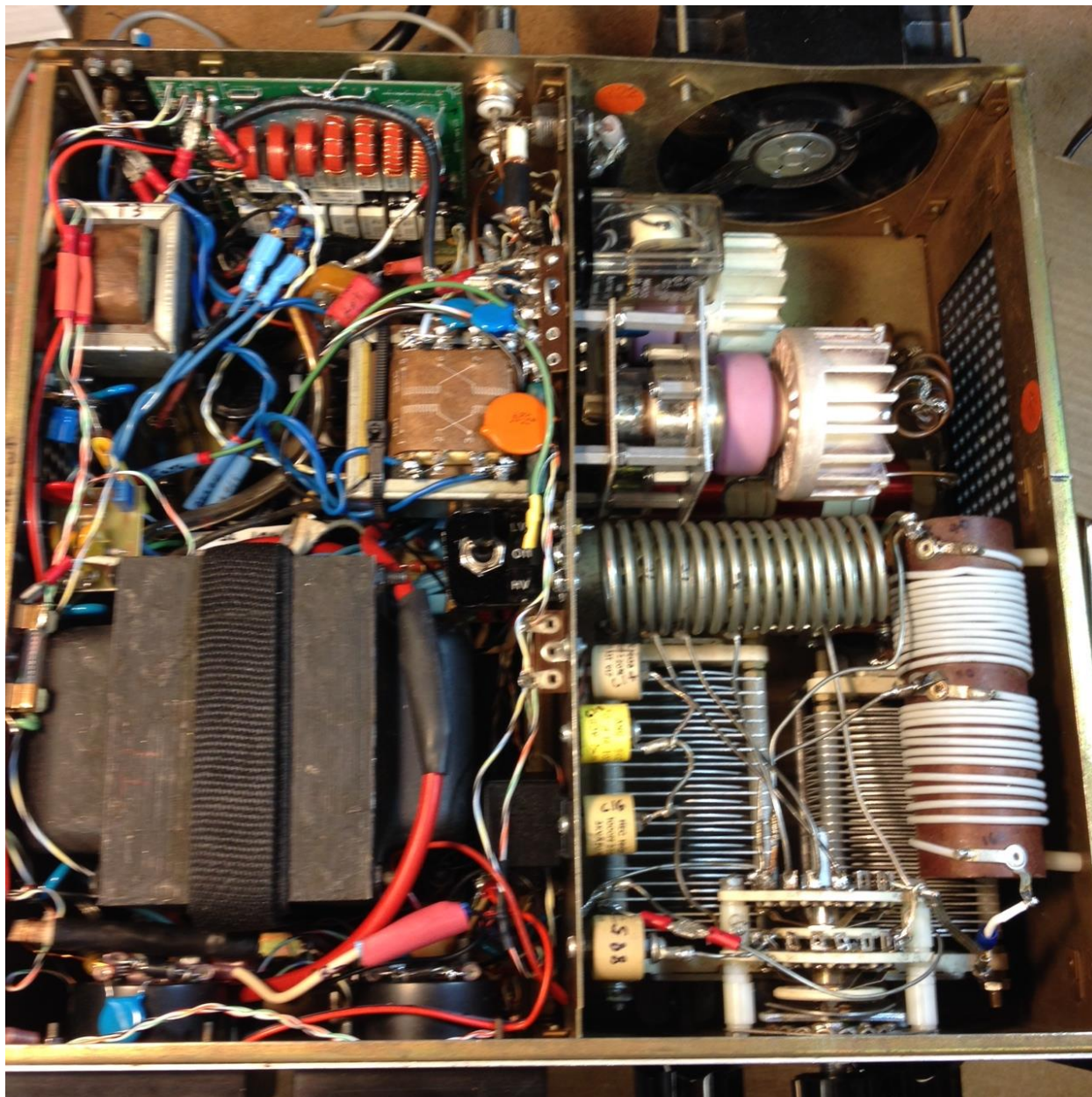
Next, I replaced the original 160 and 80 meter coil. However, I moved it away from the side wall to about its original position. Then, instead of cutting a hole in the cover, I drilled a matrix of about a billion holes in the cover over the RF section. The results were not encouraging. Finally, like other folks, I cut a big hole in the cover (see below). With this arrangement, the efficiency is around 58% on 160-40 and better on the other bands.



160 and 80 meter toroid



Cabinet top with hole over the RF section. The hole is covered with a sheet of Lexan. The hole was cut using the "drill a bunch of holes and cut between them" method. Hence, a black border was painted on the underside to hide that work.



Clipperton L almost finished

Above is a shot of the L in its current, almost finished state. To the back is the LDG tuned input. To the left is the transformer and power supply for the TR relay. Just to the front of the transformer is the K4POZ bias board and the cathode fuse.

Across from the bias board is the GI-7B filament transformer. Between the power transformer and the filament transformer is a high-voltage/low-voltage switch which switches the power transformer primary. The high-voltage position yields about 3KV no load and the low-voltage position yields about 2.5KV no load. Except for an occasional test, I have always run it under low voltage. The high-voltage setting produces an additional 100-150 watts out; however, I'm OK without this additional output to give the HV transformer a break.

The power supply for the LDG board is wedged to the right of the HV transformer. The black cube also to the right of the transformer is an automotive relay for the fan high/low speed circuit. Finally, the new grid meter is to the left of the original plate current/voltage meter. The shunts for both the grid and plate meters are wound on wooden dowels. The grid meter shunt is visible behind the meter.

The two 6L7s are mounted horizontally near the back of the RF section. The tubes are mounted using the K4POZ sockets and are offset horizontally and vertically so, in theory, one does not block ventilation for the other. To achieve the horizontal offset, one of the sockets was disassembled and mounted such that the cathode and heater connections are on the left side of the RF section partition. One of the original tube-socket holes can be enlarged a bit so this can be done without too much metal work.

The plate choke is an Ameritron 160-10 choke and is barely visible beneath the tubes. An 8-pin octal plug was secured to the bottom of the choke and it is mounted in an octal tube socket. The parasitic suppressors are three, 220 ohm 5 watt carbon resistors in parallel shunted by three turns of No 12 copper wire.

The pi net coils are original. The bandswitch is a heavy-duty, 12 position Centralab. It has a total of four sections so one is unused. The additional loading capacitors are on the partition to the left. The additional tuning capacitors are not visible and are under the point where the 160 and 80 meter coils join the 40-meter coil.



Almost finished on the outside

Above is the Clipperton buttoned up. On the top next to the pi-net cutout is an access hole for the HV/LV switch. The added grid-current meter is on the left and the original plate current/voltage meter has been moved to the right. Under it is the current/voltage switch and the LDG input-tuning button. The new band switch has a larger rotation arc than the original; hence, the white band tabs next to the switch.



Above is the completed amp. Notice the pot without a knob between the meters. This control is for adjusting the bias. I noticed that sometimes the bias would get as high as 150 ma after extended operating. Hence, the control was moved to the front panel for more convenient adjustment. Also, there was an intermittent problem with the on-off switch. So both it and the stby-opt switch were replaced with Marquardt 1830.3112-02 switches. These switches fit the cutouts exactly and are available from various distributors. I got mine from Newark, part number 27T3086.

I sold this amp and posted a YouTube video illustrating the tune-up procedure for the buyer. This video can be viewed at <http://www.youtube.com/embed/a58nU2Nq4yI>

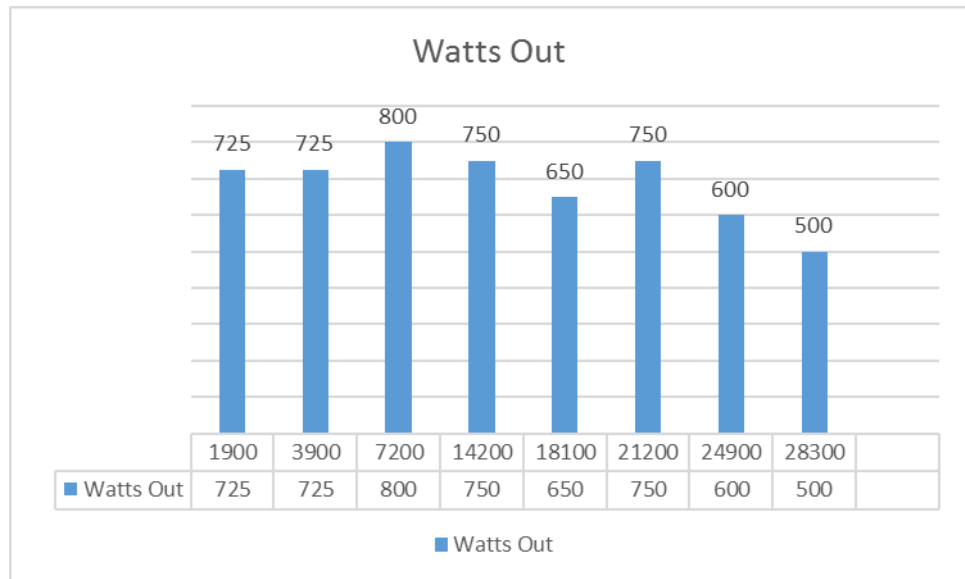
Unfortunately, FedEx almost destroyed the amp even though they packed and double boxed it. I got the amp back and was able to repair it. I think I will keep it.

Tuneup Procedure

1. Turn on power to the amp but leave the STBY/OPR switch in the STBY position. Let the amp warm up for at least 2 minutes. This warm up is important to ensure the directly-heated cathodes of the tubes are fully functional.
2. With the amp still in the STBY position, adjust the output of the exciter in CW mode to about half of the required driving power for the particular band shown in the table below, e.g., if tuning up on 40 meters, adjust the exciter to about 20-25 watts.
3. Set the load control to minimum, full counter clockwise and the tune control to the setting shown in the table.
4. Set the STBY/OPR switch to OPR, switch the amp to transmit (short RCA jack on back to ground), and key the exciter. QUICKLY adjust the tune control for maximum output as shown on a watt meter, output meter, monitor scope, etc. Never hold key down for more than a few seconds. Be sure the Grid meter reads below 250 ma. The Grid meter reads high so 250 ma is really about 200 ma. NEVER let the grid current exceed 300 ma as shown on the meter.
5. At this point we need to make sure the input is matched to the exciter. If you have previously used the frequency, or close to it, key the exciter and press the LDG button on the front of the amp momentarily (about .5 sec). The LDG with search memory and adjust the input. If you have not used the frequency before or want to do a full tuning cycle, key the exciter and press the button for about 2 secs. and release it and unkey the exciter. When you release the button, the red led between the meters should come on. Without pressing the button, key the exciter in a key-down/key-up sequence repeatedly until the light goes off. At this point the tuning cycle is complete. During the tuning cycle you should hear the LDG relays chattering. The LDG using latching relays to save its progress; hence, this key-down/key-up procedure works well and doesn't stress the amp.
6. Finally, the amp should be adjusted for maximum output. Increase the load control and adjust the tune control until the load control is near the setting in the table. If the Grid is less than 250-300 ma, increase the drive from the exciter. Alternate these adjustments until the output in the table is achieved. But, remember, key down for only a few seconds, e.g., 2 secs.
7. Once you have found maximum output, advance the load control just a bit more until the output falls just a bit. The increase in loading will help linearity and can be shown on a monitor scope capable of a trapezoid pattern.
8. A word about dipping the plate current: In all cases, the maximum output will be close to the dip in plate current (resonance) even though the dip on 160 is very shallow. Pay little attention to this. Tune using the Grid meter and an output meter.
9. This tuning procedure may seem involved. However, after you do it a few times it will be second nature.

Below are the results of tests into a B&W wattmeter/dummy load. The results with this particular wattmeter are very close if not identical to a Bird.

Frequency khz	Bandswitch	Watts In	Grid ma	Plate ma	Plate V	Load	Tune	Watts out	Eff
1900	1.8	55	250	1000	1700	6	2	725	0.42647
3900	3.5	30	250	900	1700	6.5	3.5	725	0.47385
7200	7	45	250	700	1800	9	7	800	0.63492
14200	14	55	250	700	1800	4	14	750	0.59523
18100	21	70	250	600	1900	3.9	14	650	0.57017
21200	21	65	250	700	1800	6.8	21	750	0.59523
24900	28	80	250	600	1900	5	14	600	0.52631
28300	28	55	150	600	1900	7	21	500	0.43859



Conditioning 6I-7B Tubes

If you need to replace a tube it must be conditioned before first use. The following procedure has always worked for me. To be safe, do not connect anything to the RF in connector

1. 4 hours filament voltage only. To be safe, you can put the HV/LV switch on the top of the amp in the Off position.
2. 2 hours filament + 2500 VDC no plate current
3. 30 mins filament + 2500 VDC + 50 ma plate current. Place the amp in transmit mode and adjust the resting bias to 50 ma with bias pot.