Adding a Panadapter for a Drake Radio

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For most of use that like our older gear, we are stuck with no bells and whistles for the radios we have. Last year I took time off servicing radios and now of course it is full retirement for me, so I have time to relax and enjoy my favorite Drake TR-4CW/rit, which has the best recovered audio compared to my newer modern rigs! **Figure 1** while I was looking for information on what was manufactured back in early days with a panadapter; I found a chart showing how Heathkit provided

RECEIVER IF CHART IV

MAKE	MODEL	IF	MAKE CONNECTION TO	COUPLING CAPACITOR C 17
HEATH	MR-1	3000 KC	Pin 6 of 6EA8 (mixer)	7.5 μμf
	GC-1A	455 KC	Collector of X2 (mixer)	12 μμf
	GR-91	455 KC	Pin 5 of V1 (12BE6)	12 μμf
	HR-10	1681 KC	Pin 6 of V2A (6EA8)	12 μμf
	HR-20	3000 KC	Pin 6 of V2A (6EA8)	7.5 μμf
	RX-1	1681 KC	Pin 5 of 6CS6 (1st mixer)	12 μμf
	SB-100	3395 KC	Pin 6 of V12A (2nd mixer)	7.5 μμf
	SB-300	3395 KC	Pin 5 of V3 (6AU6)	7.5 μμf
HALLICRAFTERS	SX-101A	1650 KC	Pin 5 of V2 (6BY6)	12 μμf
	SX-117	1650 KC	Pin 5 of 2nd mixer (6BE6)	12 μμf
	SX-100	1650 KC	Pin 5 of V2 (6AU6)	12 μμf
COLLINS	75S1, 75S2	455 KC	Pin 6 of V3A (6U8A)	12 μμf
	75S3	455 KC	Pin 6 of V4A	12 μμf
	75A Series	455 KC	Pin 9 of V5 (6BA7)	12 μμf
NATIONAL	NC-60	455 KC		12 μμf
HAMMERLUND	HQ-110	3035 KC	Pin 5 of V2	7.5 μμf
	HQ-180	3035 KC	Pin 5 of V2 (6BE6)	7.5 μμf
RME	6900	2195 KC	Pin 6 of V2 (6U8)	7.5 μμf
DRAKE	2A, 2B	445 KC	Pin 5 of V3 (6BE6)	12 μμf

the correct pin-out of many early receivers to pull off a signal from the first mixer stage, before all the high selectivity circuits. The Heathkit scopes would use a 50 & 455 kHz "Intermediate Frequency" I.F. frequency input with ease, but trying to use higher frequencies, they all needed tuned circuits for the correct I.F. frequency to provide good amplification with a sensitivity of 50 UV at the scope input. They also were limited in display band width to about 100 kHz wide for most.

I decided to put the TR-4CW on the bench to see if I could get a signal from the first mixer V-3 (6EA8) to drive the test spectrum analyzer on the service bench and yes there was a signal, but it was down in the noise. I was disappointed and what could I do about this. I've used the Heathkit HO-13 & SB-620 panadapters for many years and they work great, but of course they did have limits as to the I.F. frequencies, many needed to be amplified with tuned circuits (Heathkit did provide when new) for each I.F. frequency. All I needed was to amplify the 9 MHz I.F. and be able to drive the scope better. The answer came when the new spring 2020 DX Engineering catalog that was delivered in the mail right after I did the first test with the TR-4CW. **Figure 2&3** while thumbing through the

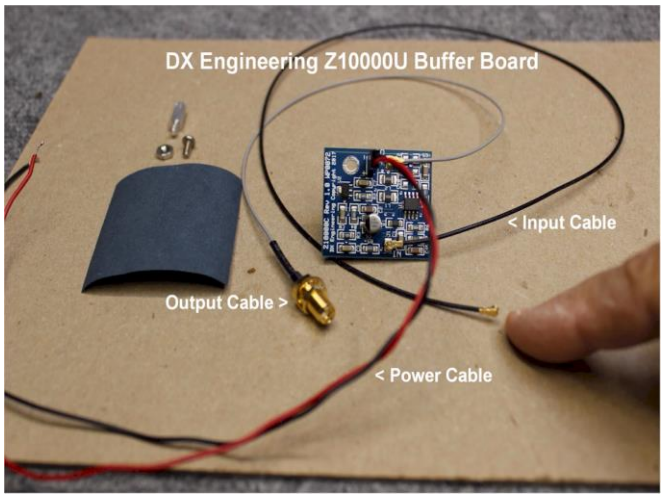

Figure 2

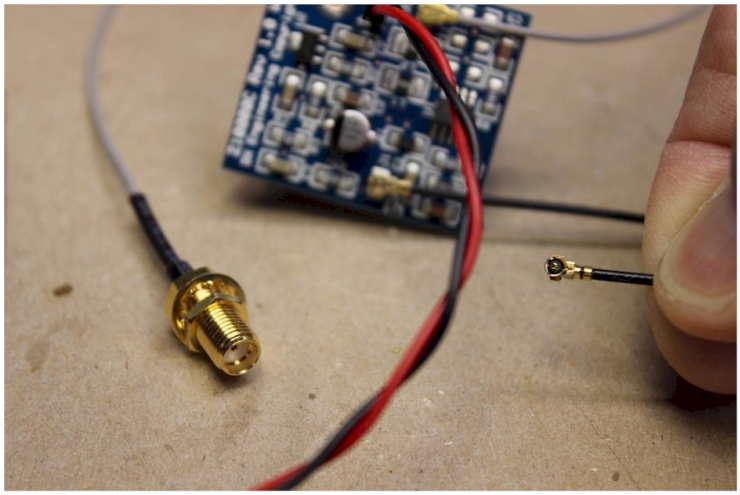

Figure 3

new catalog, I spotted a new product they just started to handle, **(DX Engineering Clifton Laboratories Z10000 Buffer Amplifiers DXE-Z10000U-KIT).** The buffer board is a nice circuit board fully assembled with wires and cables to hook up to a receiver or transceiver right after the **first** or **second** mixer stage, so it amplifies the I.F. signal about 15 to 20 dB, plus it provides high isolation (80 dB) for the radio and the panadapter. All this has to be done before the narrow selectivity of the high-Q tuned circuits, mechanical, or crystal filters, so you can look at the band properly and have plenty of band width on the display.

Figure 4 the TR-4CW/rit was fairly easy, since it did have a noise-blanker installed and that is wired right after V-3 first mixer 9 MHz T-6 I.F. coil. **Figure 5&6** the noise-blanker is plugged into a

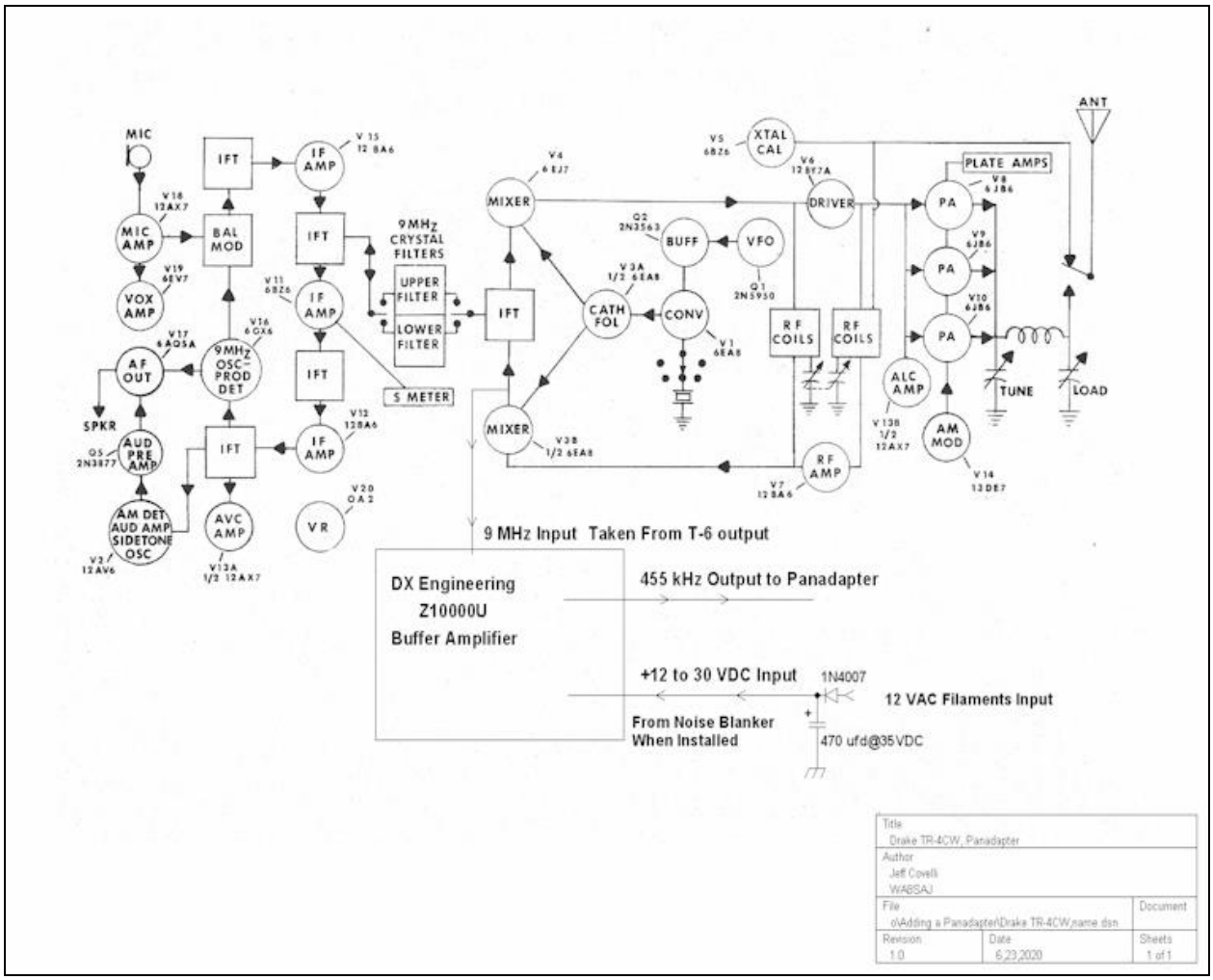

Figure 4

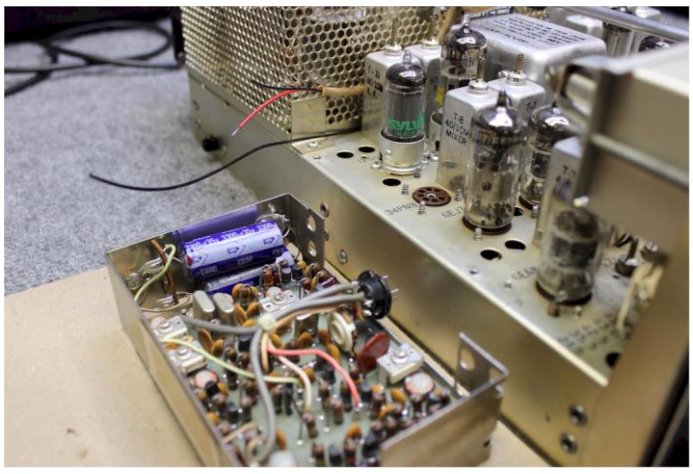

Figure 5

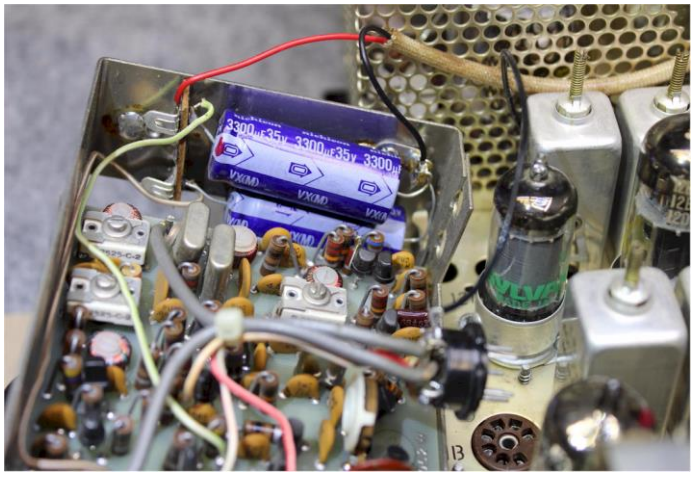

Figure 6

socket on top of the chassis and the 9 MHz input to it is on pin-2 on the noise-blanker socket. I mounted the new amplifier board in front of the final P.A. cage using the spacer stud included with the kit and tucked the wiring behind the board neatly. **Figure 7, 8 & 9** the output SMA female connector has the small coax cable wired already, so mounting to the back panel made it easy since there was a hole there for mounting. The input coax assembly is new to me, IPEX MHF1 plug with a female right angle socket. **Figure 10 & 11** the very small coax (smaller than RG-174!) cable also had

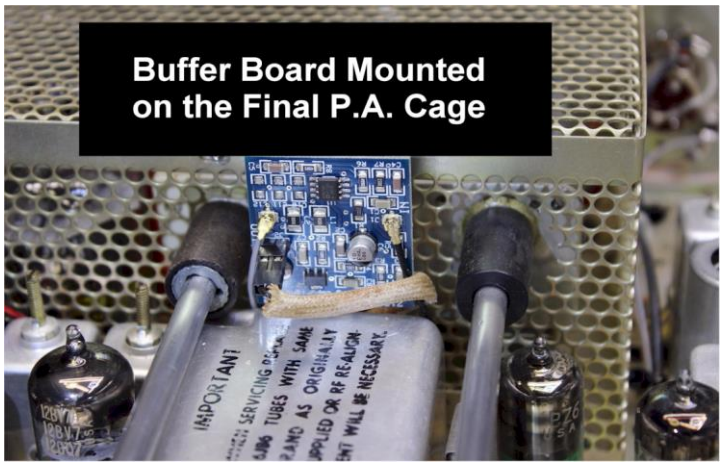

Figure 7

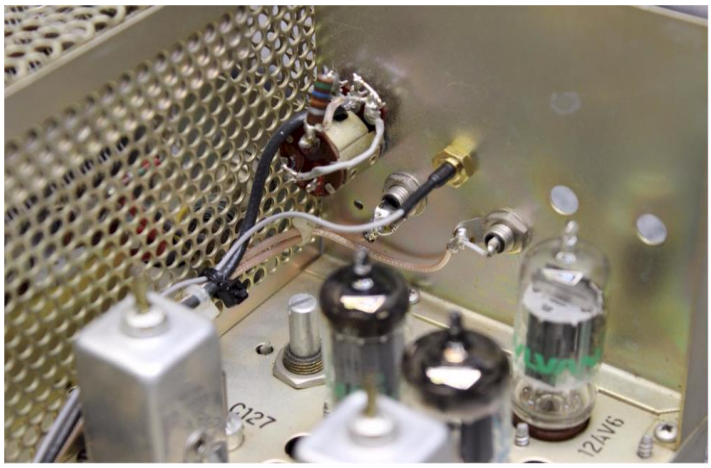

Figure 8

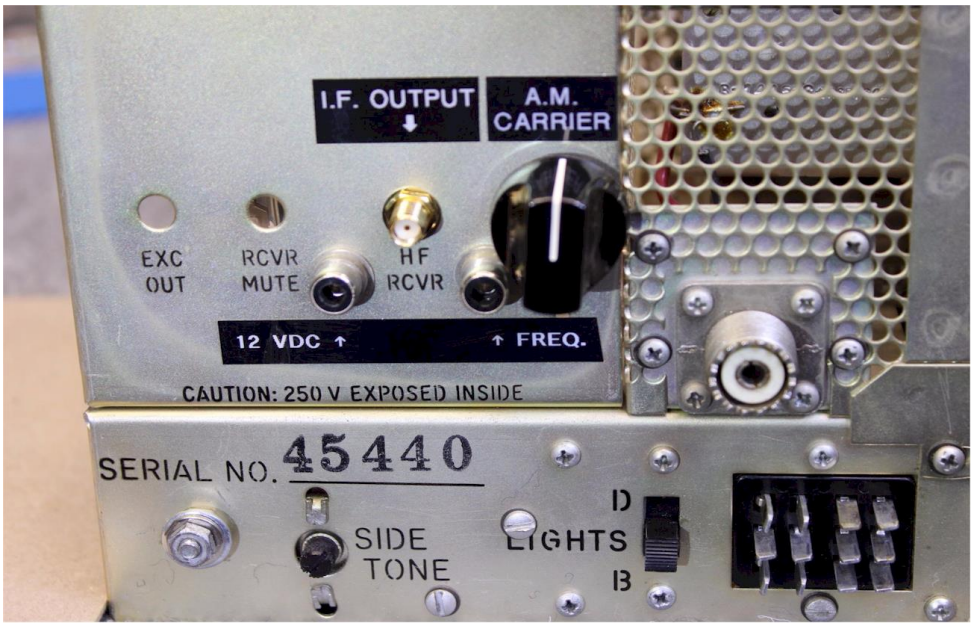

Figure 9

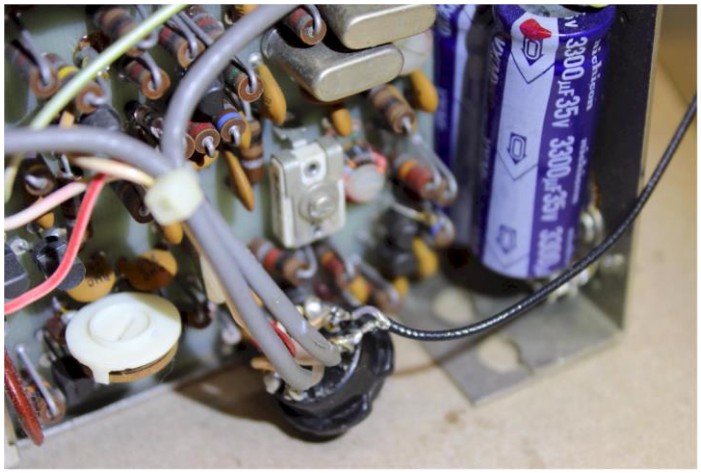

Figure 10

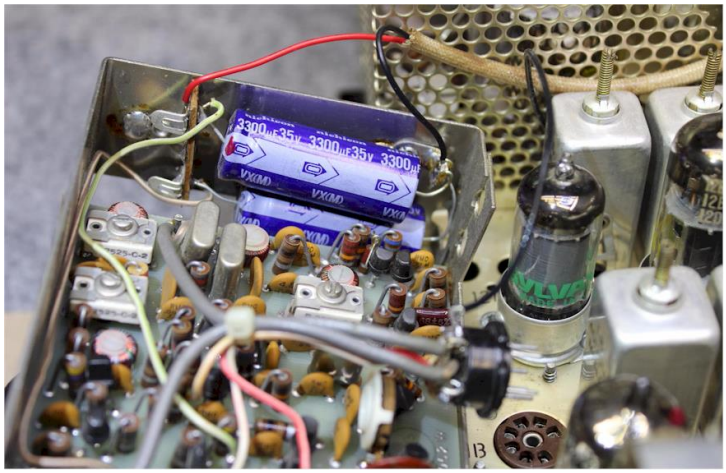

Figure 11

a female connector on the other end, which I cut and used that end for soldering to the noise-blanker socket Pin-2 on the top chassis of the TR-4CW. The +12 volts D.C. is also on the noise-blanker board on a terminal strip and is well filtered to power the new buffer amplifier board. You can provide your own +12 volts D.C. from an external supply or rectify the A.C. filament supply and filter it shown later in this article.

After I started this project my friend Jim (N8AUG) had a Drake 2-B receiver he wanted to do the same thing also, but not sure how he would monitor the output. **Figure 12 to 14** the 2-B receiver

Figure 12

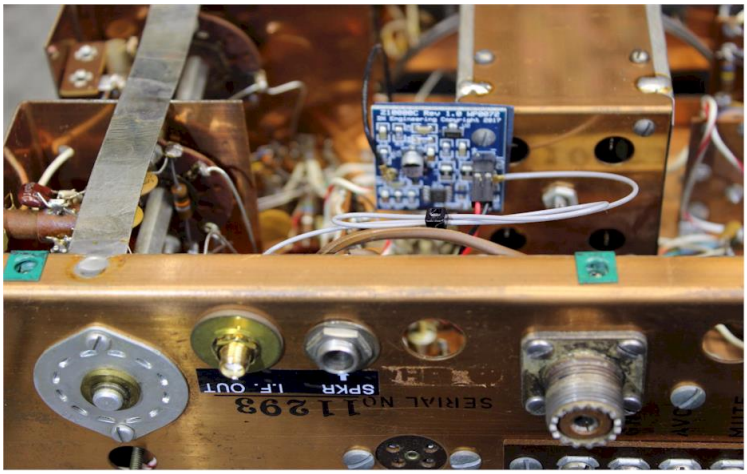

Figure 13

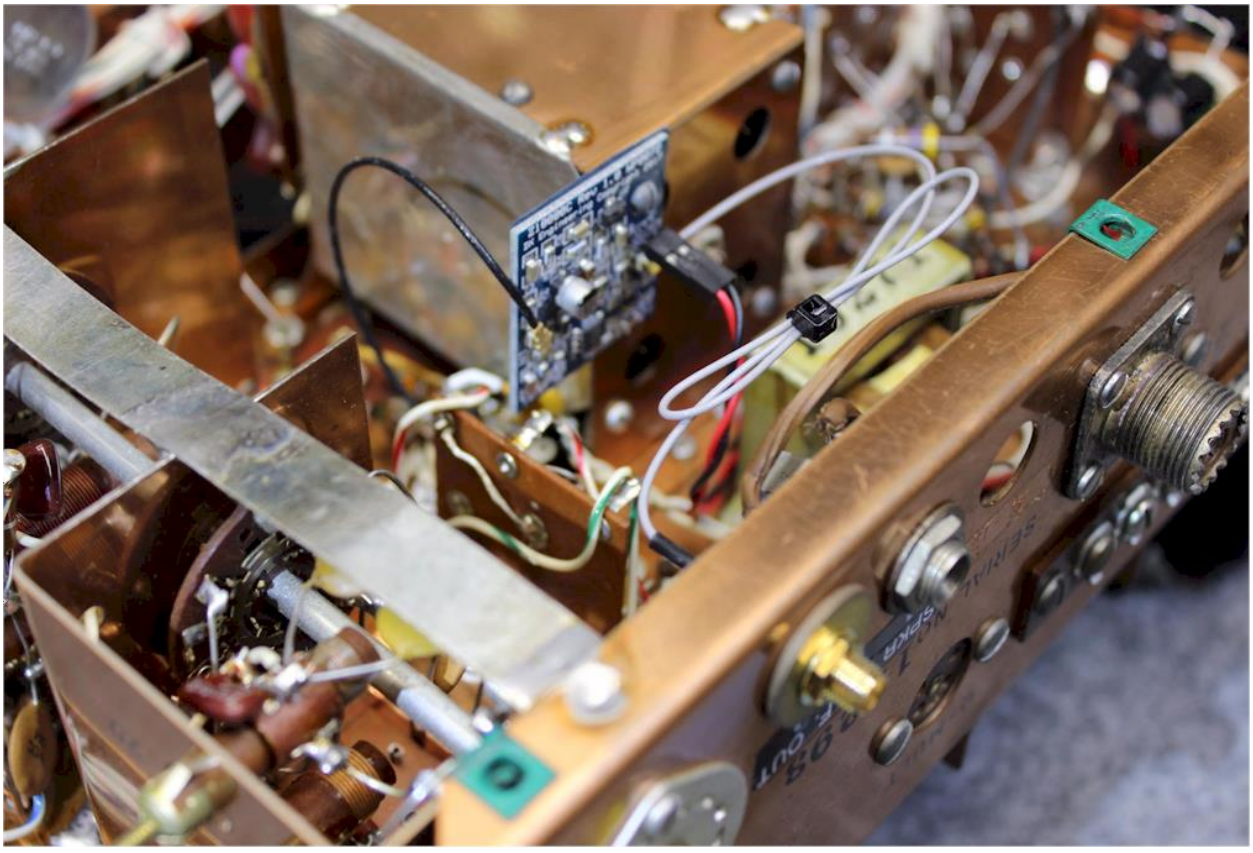

Figure 14

installation was easy with plenty of room for mounting the amplifier board using an existing sheet metal screw with two insulators on the back of the 50 kHz pass-band tuner sub-assembly, along with the thin card board included with the kit for protecting the bottom of the circuit board. **Figure 15**

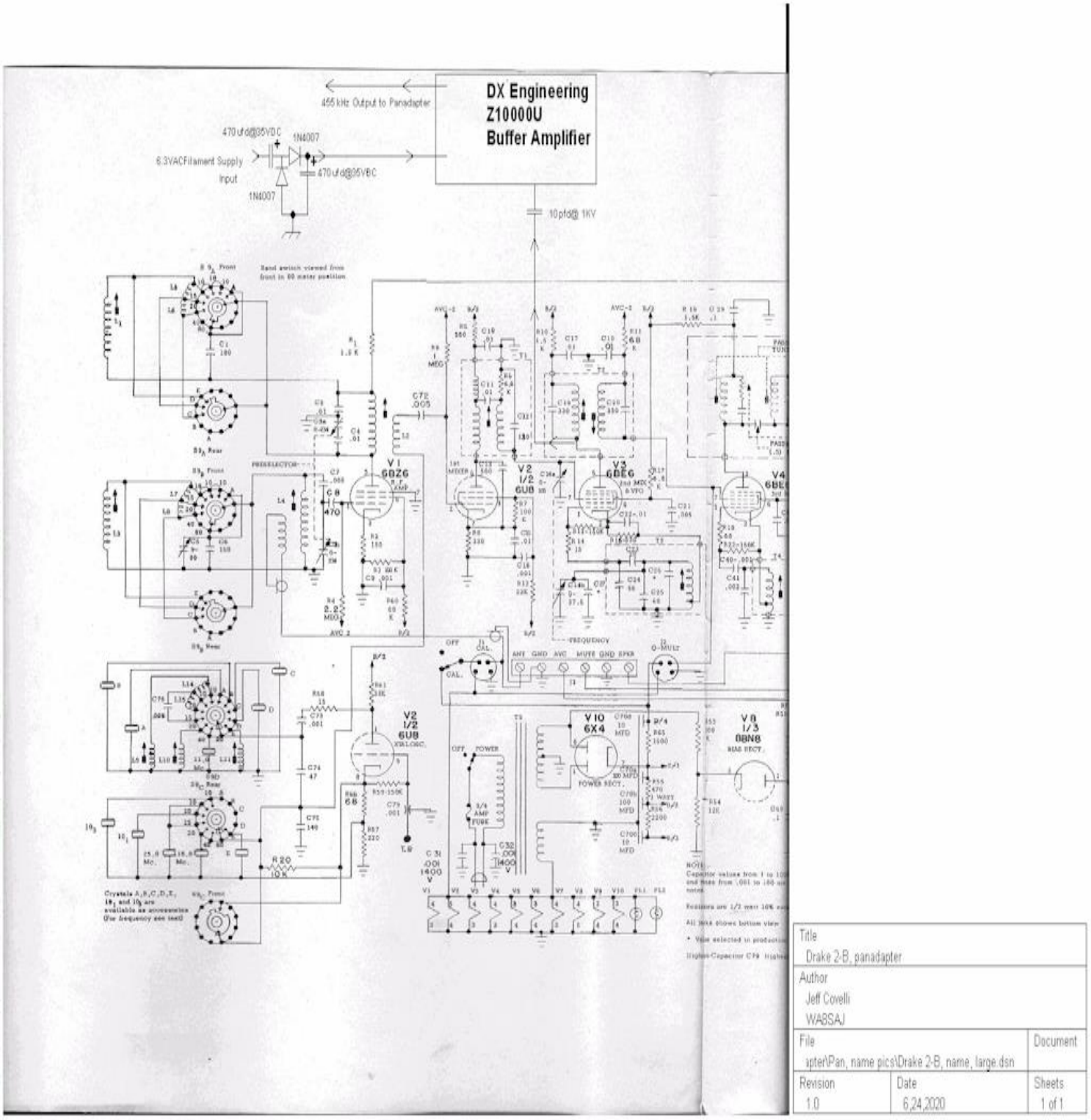

Figure 15

This 455 kHz I.F. is actually the 2nd I.F. just before the 50 kHz high-Q pass-band filter. **Figure 16** the female output SMA connector was mounted with some large flat washers through an existing hole on the back of the 2-B next to the speaker jack. **Figure 17** the D.C. power came from a voltage-doubler circuit I made up using the existing 6.3 VAC filament supply, putting out +13 volts D.C. with plenty of filtering for the amplifier board.

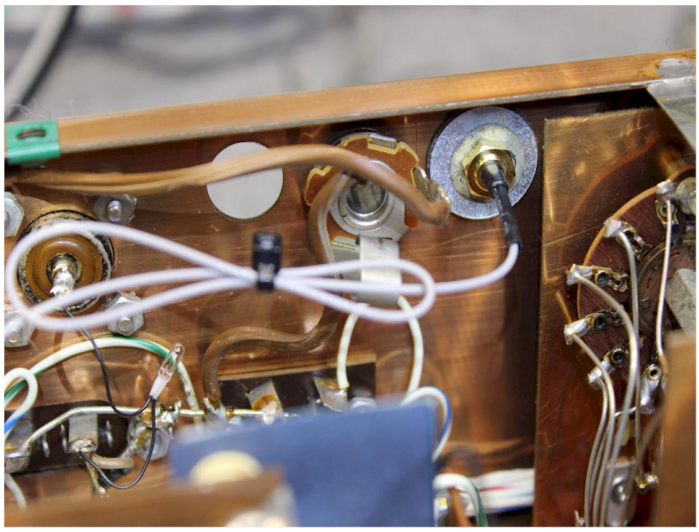

Figure 16

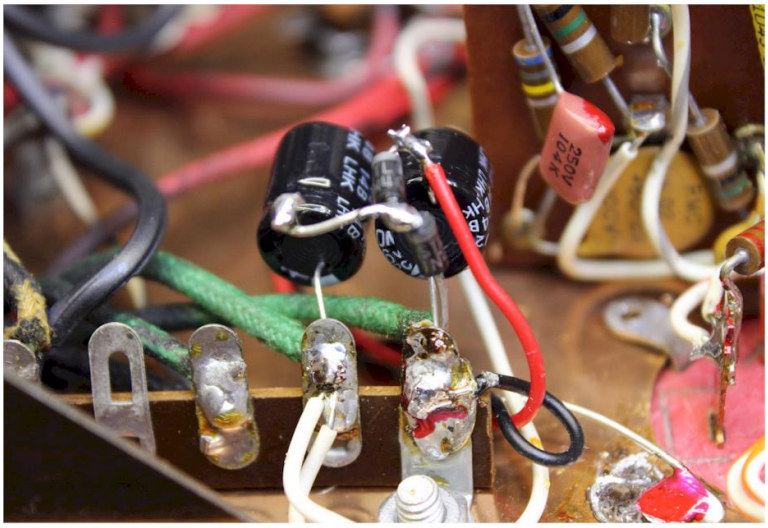

Figure 17

Doing the first test on the service bench worked very well, but I was not going to use my test Siglent spectrum analyzer for looking at the band in the ham shack. **Figure 18 & 19** I did have plenty of options in the ham shack and one being the Elecraft P-3 panadapter that is used along with the K-3 transceiver normally, but it also has a built in feature that includes many of the I.F. frequencies needed to display across the band. One frequency is 9 MHz for the TR-4CW and 455 kHz for the 2-B, wow this is great and an extra input BNC connector on the back of the P-3 scope to

Figure 18

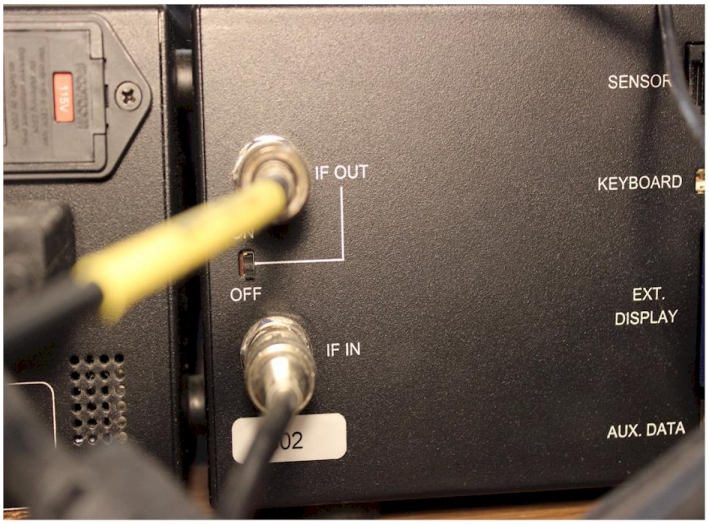

Figure 19

use for a monitoring only. **Figure 20 & 21** I also have the Icom 7300 transceiver which I installed an (INRAD RX7300 Receive Only Input Modification Kit) also sold by DX Engineering. This lets you add another receiver or you can back feed a signal into the 7300 receiver with a "Y" cable and use it as a panadapter at whatever frequency you want, since the radio covers 30 kHz to 70 MHz with all

Figure 20

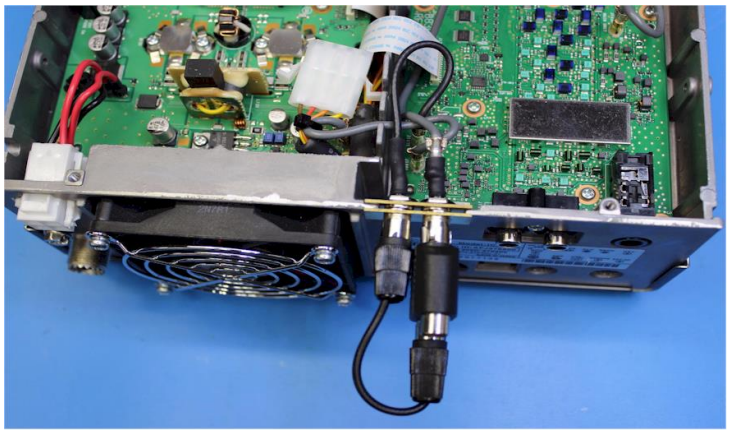

Figure 21

the many features of the 7300 including variable bandwidth, noise blanking, noise reduction, notch filters etc! Now we are talking about having the fun of a great old receiver and watching the band with existing gear. **Figure 22, 23 &24** I also have a SDR-Play receiver that is tied to the same two other radios and now I can see even more with a 24 to 50 inch screen and the band is plenty BIG for these tired old eyes to look at.

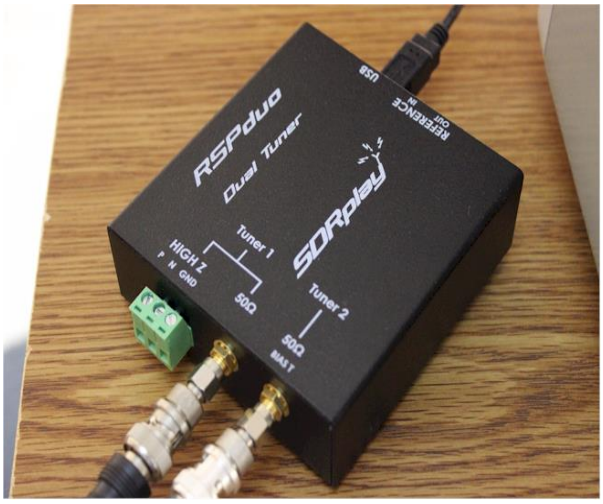

Figure 22

Figure 23

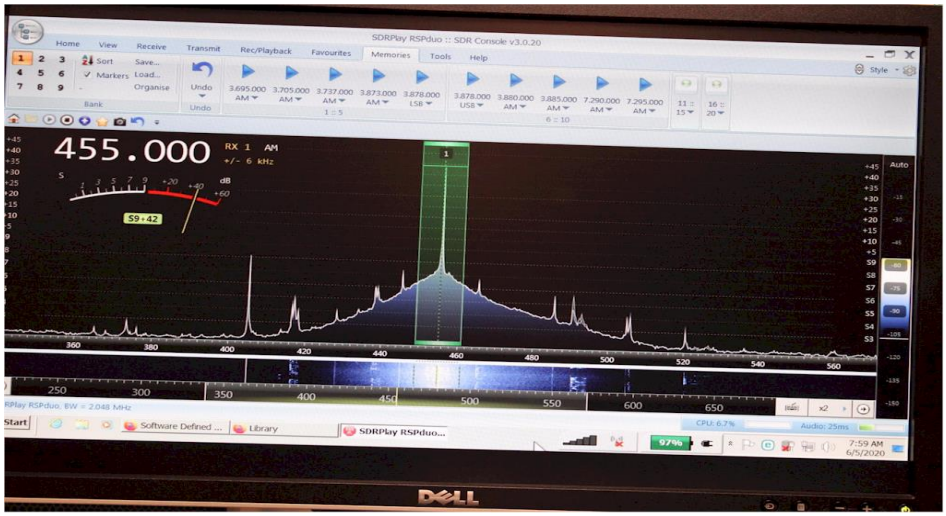

Figure 24

Figure 25 Jim chose to use his IC-7300 for now and later maybe an SDR receiver for his tired old eyes. I made an easy hookup for his radio with the INRAD RX7300 mod kit and short coax cable added for the Drake 2-B and he was all set. I on the other hand have been using the IC-7300 and

Figure 25

SDR-Play receiver for digging out those weak **A.M.** signals. The SDR-Play also has **sync-detection** and if you have never used this function you are in for a surprise, it brings out those very weak signals out of the noise very nicely. Only one problem with the sync function, if someone has a "wobbly" VFO, then it can be a problem trying to sync up. It will sit there and hunt forever and seldom can lock up.

Figure 26 when I started, the thought was to just "T" off the panadapter units, but this brought down the signal about 6 dB, so I then used a bridge arrangement with a pre-amp to compensate for all the losses. Having done this, I said, I can only look at one radio at a time, so I made up a switch box and it certainly is best as now all signals are cleanly displayed with no losses as with the "T" off idea.

Figure 26

The Clifton Labs buffer/amplifier has been great and it can be added to most any receiver including modern ones. I did not have a R-4B or R-4C at the time of writing, but certainly this would be a great addition, plus if using an actual SDR type receiver along with the older analog receiver the features of bandwidth, auto notch, noise-blanking, noise reduction can all help. **Figure 27** as you can see the TR-4CW/rit looks great on the SDR-Play receiver listening to A.M. with whatever I select on the screen for selectivity and in this case USB mode to get rid of the QRM on LSB below. So you might want to think about what can be done for your older receiver or transceiver as I did and make it a little more enjoyable as you tune that analog dial, wow what fun!

Figure 27