

## My fix to Dr. Dallas Lankford's 2-diode SSB AGC mod

It all started when I added a product detector to my R-390A daily driver many years ago - thank you Capt. P.H. Lee. It worked great, but the AGC of my R-390A was not good for SSB, the RF gain still needed to be turned down and adjusted according to received signal strength. The main benefit to the product detector is the improved s/n on SSB signals. When I heard of Dr. D. Lankford's 2 diode mod, I tried it right away, and it worked great. Thank you Dallas! SSB is now great. But, it did remove the 'delay' in the AGC. I was not aware of it right away, but did notice some side affects:

1. Weak signals did not come in as well as before (lower s/n ratio).
2. Audio output was reduced.
3. Noise limiter did not work quite as well (a little more distortion).
4. Carrier Level meter read too low.

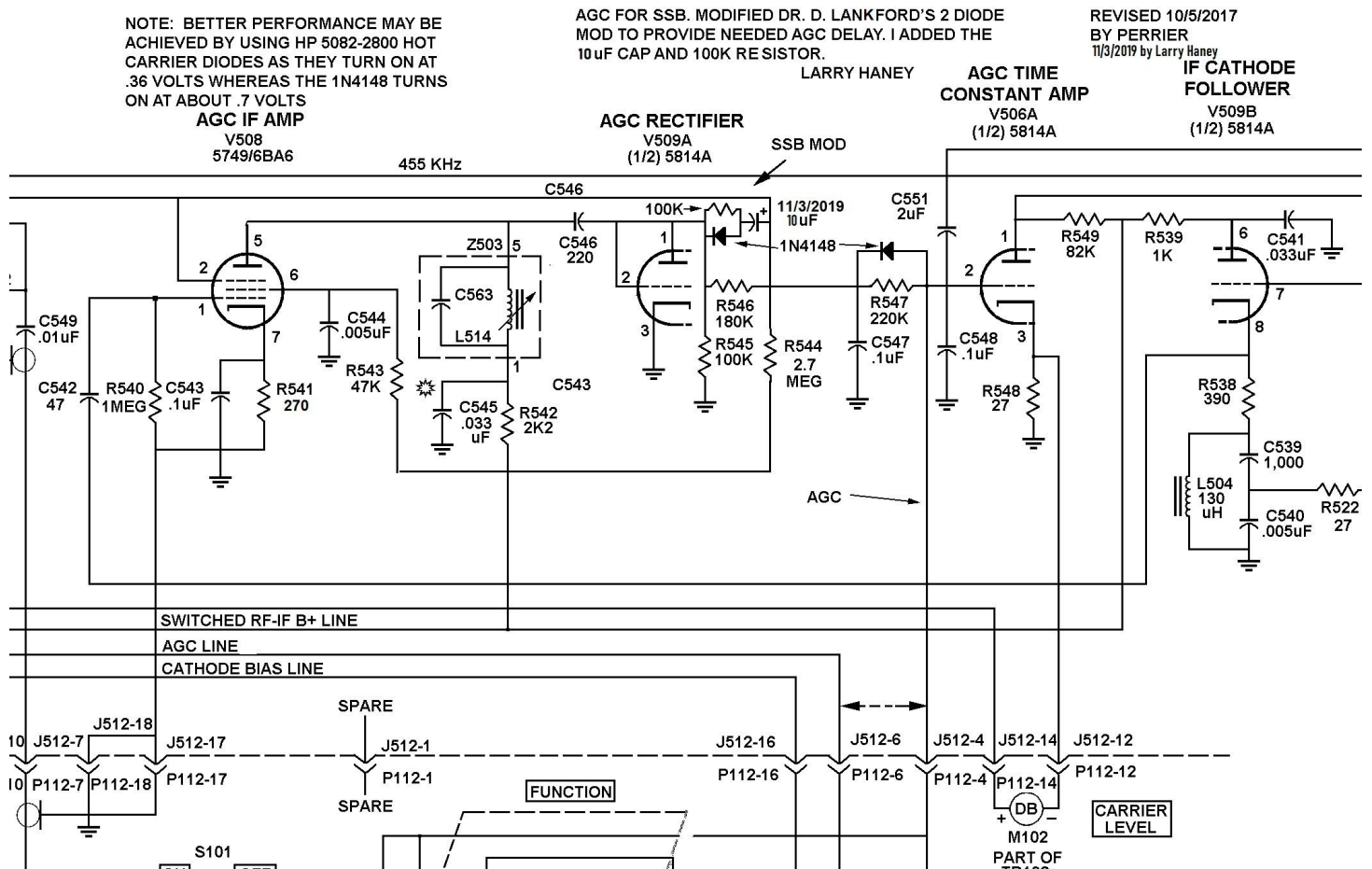
The reason that the Noise Limiter does not work as well as it was designed is that the output of the audio detector is reduced. It needs a minimum signal level coming out of the diode load so that the audio loss going through the NL is negligible compared to the input signal. With the 2 diode SSB mod installed the doide load voltage is significantly reduced all the time.

I had a good idea what the AGC was supposed to do on weak signals, but could not find any measurements anywhere, so I took a few with the AGC mods off. Now I could see clearly what it was suppose to do on weak AM signals:

| uV in balanced | AGC V det pin 1 | AGC V TB102 t3 |
|----------------|-----------------|----------------|
| 0              | -0.4            | -.15           |
| .5             | -1.7            | -.18           |
| 1              | -3.2            | -.23           |
| 2              | -4.9            | -.65           |
| 3              | -7.6            | -1.25          |
| 4              | -9.2            | -1.6           |
| 5              | -11.1           | -1.9           |
| 10             | -15.2           | -3.2           |
| 20             | -17.4           | -3.6           |

It looks like the delay is overcome at about -4.5 detector V, which is fine as the input voltage is about 2 uV (usually enough to provide a good s/n). It took me a little while to put it all together and even longer to come up with a fix. I wanted something simple and easy to remove. I finally decided on the following circuit (I added a 100k resistor and a 10 mfd cap). The value of either component is not

critical, but the cap should have very low leakage and can be an electrolytic. Thank you Perry Sandeen for making the schematic look very nice.



After reinstalling Dr. Lankford's mod and my fix, I took the following readings:

| uV in balanced | AGC V det pin 1 | AGC V TB102 t3 |
|----------------|-----------------|----------------|
| 0              | -0.4            | -.15           |
| .5             | -1.6            | -.18           |
| 1              | -3.0            | -.25           |
| 2              | -4.8            | -.7            |
| 3              | -7.4            | -1.3           |
| 4              | -9.0            | -1.7           |
| 5              | -10.8           | -2.0           |
| 10             | -15.0           | -3.3           |
| 20             | -17.0           | -3.7           |

As can be seen, the AGC voltages are very similar and it is working very well for weak and strong SSB, CW and AM signals. The AGC delay is important in obtaining the best possible s/n on weak signals. And, with the way the R-390A is designed, maintaining the correct diode load level and the correct audio and AGC level.

An important note about the Dr. D. Lankford 2-diode SSB AGC fix. He recommends also adding a 47 pf cap across the 12 PF C535 BFO injection cap to provide sufficient BFO signal to prevent audio distortion in the detector using the BFO for SSB reception. The injection voltage needs to be higher than the SSB audio coming into the detector.

Regards, Larry Haney

3-9-2019

Revisions:

1. 11-3-2019, Changed 68 mfd cap to 10 mfd. Prevents AGC and CL meter from drifting.