

NRD-525 AGC Mod:  
Remove R104 And Jump Pins 3&4 And Jump Pins 8&9 Of IC7

Dallas Lankford, 19IV92

As is well-known, an unmodified NRD-525 suffers from several serious AGC problems in AM mode, namely muffled (distorted) audio due to audio on the AGC line, hanging of the AGC due to noise spikes and other strong signals of brief duration, and inappropriate release times which cause poor audio quality for strongly fading SW signals and MW graveyarders.

A number of mods for the NRD-525 AM mode AGC problems have been suggested in the past. But none of the previous AGC mods have been arrived at from an understanding of the NRD-525 circuitry, and none of the previous modifiers reported measurements of the modified AGC attack and release times. Apparently those previous mods were arrived at by tinkering with component values, and the effectiveness of those previous mods was determined by subjective evaluation rather than measurements of attack and release times using lab equipment. By contrast the AM mode AGC mod I will present in this note was arrived at by a mathematical analysis of the NRD-525 AGC circuitry, followed by a computer simulation using circuit analysis software, and the attack and release times were measured using a lab grade signal generator and a lab grade scope. The end result is the best AM mode AGC mod available at this time for the NRD-525. My mod is also much simpler than previous mods, and requires only the removal of one surface mount resistor and the addition of two jumper wires to the pins of an integrated circuit.

About 9 months ago I suggest an NRD-525 AM mode AGC mod in my article "NRD-525 AGC Mod, Preliminary Version 2, August 16, 1991." The basic idea was to disable the AM branch of the AGC circuit and to use the SSB/CW AGC circuit in all modes. The mod was untested because I had no NRD-525. Recently Russell Scotka sent me his NRD-525 to try out my ideas.

In the previous note I suggested removing R104, jumping pins 3 and 4 of IC7, and removing C78 and C79. This is what I tried first. But bad low frequency audio distortion in the FAST AGC setting was observed. The release times were measured and found to be about 25 mS for FAST and 500 mS for SLOW, much faster than my mathematical analysis and software simulation had suggested. Apparently there is a discharge path internal to IC9A equivalent to a 500K ohm resistor. In any case, this demonstrates the importance of measuring the results of any modification.

When C78 and C79 were restored and pins 8 and 9 of IC7 were jumped, the measured release times increased to 100 mS for FAST and 2 seconds for SLOW, which is about optimal. And no low frequency audio distortion was heard on received signals in either FAST or SLOW.

Consequently, the good news is that reception quality using the NRD-525 AM mode can be made much better (and much better than ECSS) by removing one surface mount resistor (R104) and adding two jumpers to pins of IC7 (pins 3&4 and pins 8&9). With these changes, AM FAST AGC is now excellent for fast bandscanning and for DXing steady or moderately fading signals, and AM SLOW AGC is now excellent for strongly fading SW signals and for nighttime MW graveyarders provided not much thunderstorm static is present. Of course, any AGC with a 2 second release will hang briefly on strong noise spikes, and this SLOW AGC is no exception.

The bad news is that the SSB/CW AGC (which is now also the AM AGC) has rather bad overshoot. This is not a problem for AM signals. And, curiously, there is no audible pop or click on initial SSB transmissions as is often the case with overshoot. The NRD-525 also has undershoot on FAST release in SSB/CW mode. No audible evidence of the FAST release undershoot was observed on AM or SSB/CW signals. Because there was no audible evidence of the overshoot or undershoot in any mode, I did not try further modification to eliminate them. Perhaps the overshoot could be reduced or eliminated by replacing R103 with a higher value resistor. But tinkering with different values for R103 is not a good idea because a PC board trace goes underneath R103.

Russell Scotka has told me that he is very pleased with the improved AM performance of his "new" NRD-525. Before I modified the AM mode AGC of his NRD-525 he used ECSS for AM reception because of the original AM mode AGC problems and related poor AM mode audio quality of received signals. Now that the AM mode AGC problems have been eliminated with my mod, Russell has found that the AM mode provides much better audio quality than the tinny sounding ECSS he used previously. Curiously, Russell said that his NRD-525 passband tuning now works much better in AM mode than before. I have no explanation for why my AM mode AGC mod should improve the performance of NRD-525 passband tuning in AM mode, but apparently it does.

revised 2VI92