R-390A AGC Troubleshooting, Part 2

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I especially like Charles Steinmetz's R-390A AGC Troubleshooting procedure from 2/17/20 to start with because it's clear, easy to follow and you don't need to remove any modules to make significant progress in isolating the problem. I believe that it will identify a high percentage of the problems with the AGC (it has for me). I call it Part 1. If you get to the end of his procedure and do not have an indication of where the problem lies, the following is some additional diagnosing you can do.

I've only had to use the following additional diagnosis (I call part 2) a few times, but it is worth it and yielded results every time. With the power on and while tuned to a strong station, if the voltage on V509A (the AGC rectifier), pins 1 or 2 is -10 VDC or higher, then capacitors C541, C542, C543, C544, C545, V509A and Z503 are probably OK (this is assuming that the AGC line voltage (TB102-3) is over loaded by leakage and is less than -4 or -5 VDC). You can measure the AGC rectifier output by using a tube socket test extender. When the whole AGC circuit is working OK, this voltage (on pin 1) should be about -15 VDC or higher (on a strong station), so that the resultant AGC line voltage (TB102-3) is about -11 VDC. If there is no leakage holding down the AGC line voltage (TB102-3), and this measurement is below -11 VDC, then the AGC amp circuit (V508) is suspect. This is indicated by a voltage drop of less than 3 or 4 volts across R546 and R547 (normal light load on the AGC line). The above voltage measurements need to be made with a VTVM that has a 1 megohm decoupling resistor in the probe (most do). If the AGC amp circuit (V508) is OK, then next I'd try replacing all the tubes that are controlled by AGC in the RF deck and IF deck (V201 - V204 and V501 - V503), one at a time. Two other tubes that can also affect the AGC are V506A and V509B. All these can cause a problem and this would be an easy fix before pulling out one of the decks.

If it's not a tube, start by removing the IF deck, as it is easier to remove than the RF deck. The following assumes you do not have one of the fixes for the 'moment of silence' or other AGC mods installed. If you do, adjust your testing to accommodate the schematic changes. If you recall in Charles' procedure, resistors to ground from TB102-3 (the AGC line) prevent the resistance reading from going above 500K ohms. The 3 resistors (R545, R546 and R547) that cause this, can mask detecting the possible leakage of capacitors C546, C547, C548, C551, or wiring or a mechanical filter. Remember, all capacitors on the AGC line must have no measurable leakage. I'd start by measuring C551. Because of the way C551 is made, you will need to measure across both of it's terminals and from each one to ground. Only one terminal should have resistance to ground (caused by the 3 resistors). That terminal will require further testing, later. If 2 of the 3 readings are OK, I'd continue by disconnecting one end of R545 (100K ohms) and remeasuring the AGC line (pin 2 on V506A) resistance to ground. If your reading does NOT go up to 3M ohms, a leaking capacitor or other issue is holding it down – find the culprit. If it does, then disconnect one end of R544 (2.7M ohms) and remeasure pin 2 on V506A (the AGC line) to ground. If your measurement does NOT go up to at least 30M ohms, one or more of the 4 capacitors above are probably leaking or it's a wiring fault – find the culprit. And don't forget that with P112 disconnected, the main part of the AGC line in the IF deck still needs to be tested (J512-6 or the junction of resistors R501, R507 and R516). This section of the AGC line has the connection to the mechanical filters. You are looking for at least 30M ohms here, also.

So, with one end of both resistors still disconnected, if the resistance measurement goes up to 30M ohms in both legs of the AGC in the IF deck, all the AGC capacitors and the filters are probably OK, and the problem may be in the RF deck. As Charles states in his procedure, this measurement is dependent on using a good meter suitable for it, a VTVM and some VOMs for resistance (those

capable of 40M ohms or more). If you find a bad capacitor, replace it and remeasure. Keep at it until the measurement goes up to 30M ohms or higher. And, don't forget that the problem can be leakage in the wiring, connectors or any of the mechanical filters. But, if you corrected a problem and the leakage measurement is now good on both AGC legs, reconnect the 2 resistors ends and put it all back together. Then power it on, and tune in a strong station and check the AGC voltage as in Charles' procedure. If you get good AGC voltage and action, you're done. If not, go to the RF deck.

The RF deck has a similar situation with 2 resistors (R201 and R234) on the AGC line to ground, their total resistance is 1.77M ohms. In order to give the AGC line there a clean bill of health, 1 end of R234 must be disconnected. If the resistance from the AGC line (J208-E or the junction of resistors R206 and R217) to ground is not 30M ohms or more, you know what to do. If it does go up to 30M ohms or higher, then the capacitors on the AGC line and the fiber bushing on the antenna trimmer shaft in the RF deck are probably OK. When you put it back together and if you find that you still have the problem, look closely at the wiring and the connectors.

But, keep in mind that some tricky capacitors don’t show much leakage until the voltage across them is 15 to 30 VDC. Of course, the proper way to measure capacitor leakage is using a voltage at the capacitors working voltage and measure the current flow. Some types of capacitors normally have some leakage (like electrolytics), but no capacitors on the AGC line should have more than 1 uA of leakage at it’s working voltage. The reason I mention this is if you get to the end of the diagnosis and have not found the problem, then you might try applying 30 volts to the AGC line and measuring the leakage. Watch the polarity and use a buffering resistor of around .5 megohms. This test can only be done with the resistors disconnected in the IF and RF decks as described above. And, you should also remove all the tubes connected to the AGC line. I only had to do this once, so it’s very unlikely that you will need to do it.

Here’s some more info on meters. When a meter is used to check for capacitor leakage using the resistance scale, a meter that uses a voltage source of more than 1.5 or 3 VDC is very beneficial. So, this is why I mentioned earlier that some VOMs are good for capacitor leakage testing. Since capacitors can have more leakage at higher voltages, using a meter that uses a voltage source of more than 3 or 4 VDC is much better. I like using my Triplett 625-NA VOM because it uses a 15 VDC battery on the 40 Megohm scale, whereas my Senior VoltOhmyst VTVM only uses a 1.5 VDC battery on all the resistance scales. The use of a 1.5 VDC battery is very common in VTVMs. The good thing about using most VTVMs is that the highest resistance scale is usually around 1,000 megohms, plenty high enough to find a leaky capacitor, unless it’s one of those tricky ones.