SR-150 RECEIVER REFINEMENT

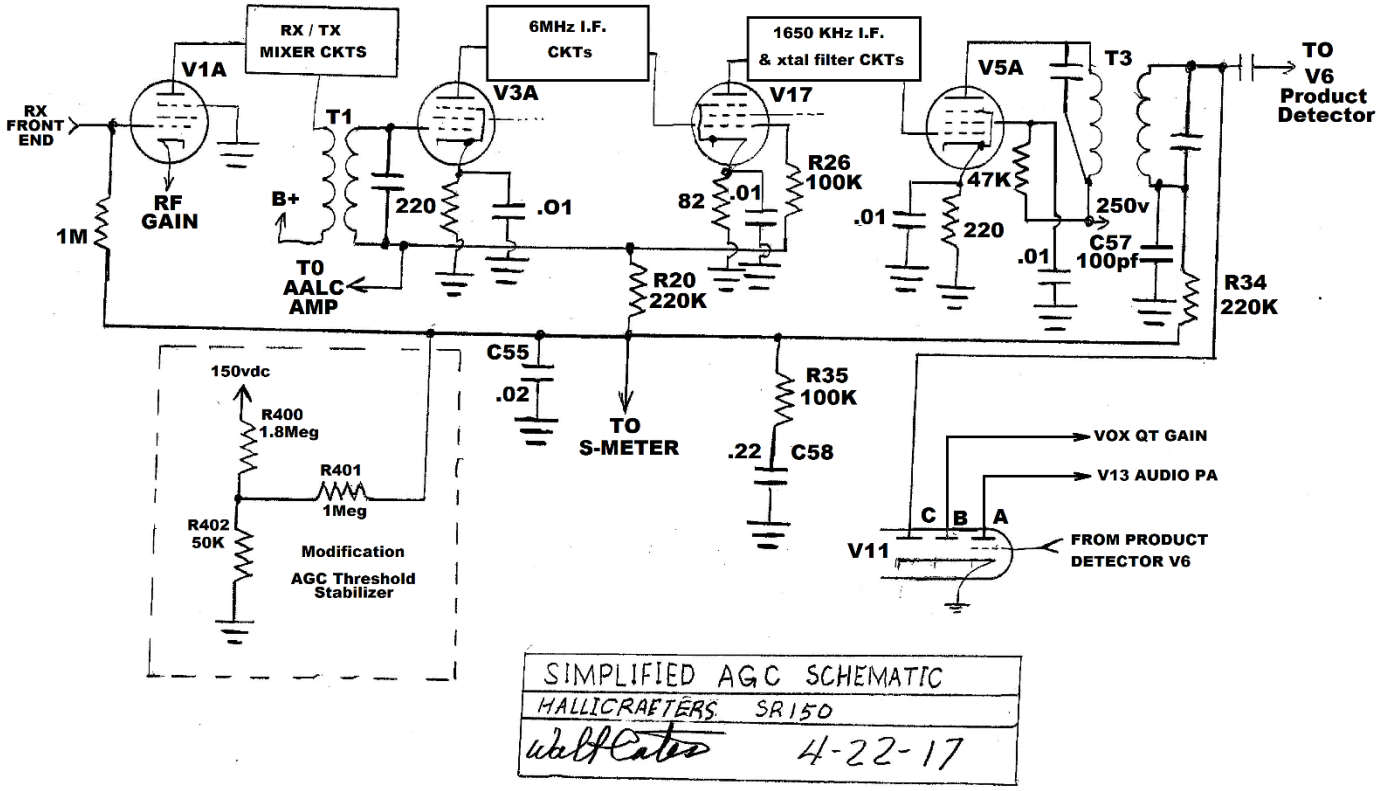
As stated in PERFORMANCE SPECIFICATION #093-801691 for the SR-150 the receiver should meet the following specifications:
Sensitivity – 1 microvolt for a 20DB signal-to-noise ratio.
Audio output -- >5 microvolt in, 2 watts, min.
Overall gain – 1 microvolt in for ½ watt output, min.
AGC figure of merit – Increasing the signal at the antenna terminal from 5 microvolts by 50db to 1580 microvolts (more precisely 1581.13883uv) will produce no more than 10 db of change in the audio output.

Roughly speaking 2 out of 3 receivers will meet these specifications with no problem. In fact for years I have replaced the 1 microvolt with 0.5 microvolt as a bench standard. I consider a unit that meets the specifications at 1 microvolt or more to be substandard.

So, what can you do if in spite of your best effort of optimizing and super tweeking it just will not meet spec? There are two key tests you can perform at this point.

TEST 1:
RF GAIN control test. The RF GAIN control wiper does not reach actual top and bottom of the pot as it ages. A simple test can be performed to prove or eliminate this as a problem. Rotate the RF GAIN control fully clockwise. With a 1 microvolt signal at the antenna terminal tune up the receiver. Locate the junction of R3 (180 ohm) and R6 (180K) in the cathode ckt of V1. Monitor the audio output and ground the junction of R3 and R6. If the audio output increases 1db or more you have a problem with the control. It needs to be repaired or replaced. For in-depth information on this problem see section 3-8 of the SR-150 SUPPLEMENTAL TECHNICAL INFORMATION. This fault will also effect the AGC FIGURE OF MERIT spec.

Before jumping into the second test let's review the basic operation of the AGC ckts. Section C of V11 is the AGC detector. It rectifies the 1650KHz IF signal and feeds a negative voltage proportional to the signal level back through the secondary of T3. This controls the gain of V1A, V3A and V17. C55, C58, C57, R34 and R 35 filters the negative voltage and sets the attack and decay of the AGC action. This is your basic AGC design approach. Problem is, it is too basic. Major shortfall is there is no adjustment for threshold. The threshold of the AGC action is determined by the idle current of the grids of V1, V3 and V17 and the GM of V11. Over time components age and drift. I have observed, over many years of testing the SR-150, that if the no-signal in voltage at the junction of R20 and R35 is between -0.1 and +0.4vdc you will achieve best receiver performance. My bench test goal is +0.3vdc. Threshold negative voltages of -0.2 or more will produce substandard performance.



TEST 2:

AGC THRESHOLD test. The AGC buss is a very high impedance line. Practically all DC meters will load the ckt. However you can measure the voltage with a scope in the DC MODE without loading the ckt. Set the RF GAIN to max. Connect the antenna to chassis gnd. Set the scope at 0.5v per centimeter, DC mode. Connect the 10x probe to the junction of R20 and R35. If the voltage is not between -0.1v and +0.4v then you have three options.

OPTION 1: Get at least a half dozen each of V1, V3, V17, and V11. While monitoring the AGC threshold voltage swap the tubes until you get a combination that delivers the proper voltage level and still meets the gain spec. Put on your patient demeanor for this one.

OPTION 2: Accurately measure the grid and cathode resistors of V1, V3 and V17 and R20 and R34 and replace as needed.

OPTION 3: Clamp the AGC line with a high impedance voltage divider. As noted in the attached simplified schematic a positive voltage is delivered to the AGC buss via a high Z source. The slight positive voltage on the AGC buss sets the gain of V1, V3 and V17 to max. Since the voltage is developed via a high z divider it is easily over driven by the rectifier action of V11. The linearity and figure of merit of the AGC are not adversely affected. You can control the threshold. Replace R402 with a 20k pot and a 30k resistor to gnd. In this way you can adjust the threshold AGC voltage for optimal operation.