# SR-400 AGC DISCUSSIONS

*QUESTION*. --->

***Thanks again Walt.***
***This radio is getting to be very nice thanks to you.***
***A small problem still exists... the S meter is very generous; most strong signals are full scale and weaker ones are S7 to S9. This is after a one hour warm up with the meter zero and AGC set per the manual.***
***Could you point me in the right direction?***

*REPLY*.

The agc circuit is a closed loop circuit and fault isolation can be a challenge.

The S-Meter is true only when the receiver RF GAIN control is at max. So, let us start there. With power on and no signal input (terminate the antenna in 50 ohms, dummy load works fine). Ground the tie-point of R2 and C12 (grid of V1 this blocks the AGC action). Measure the voltage at the junction of R3, 4A, R5 and R7 (cathode of V1). It should be between +0.1 and -0.1 volts dc. If it is not then R4A is probably at fault or there is a wiring error. That point needs to be as close to ground as possible with the pot at max gain.

The S-meter linearity depends on the receiver train gain, proper alignment and the linearity of V8A & B. Use the fault isolation chart below to determine if the receiver train gain is good. In all the steps in the chart the tie-point of R2 and C12 is grounded disabling the AGC.

***2-4. RECEIVER FAULT ISOLATION CHART***

| | Injection point | Frequency | Signal injection level | Audio output | If good go to next step. If not check suggestions below. |
|---|---|---|---|---|---|
| 1 | V15 pin 7 | 1000 Hz | 14 vpp 1:1 probe | ½ wt. | Problem most likely V15 or associated circuitry. See section 4-2 for details. |
| 2 | V9B pin 2 | 1000 Hz | 0.6 vpp 1:1 probe | ½ wt. | Problem is most likely V9B or associated circuitry. See section 4-3 for details. |
| 3 | V9A Pin 7 | 1650 KHz | 5000 uv | ½ wt. | Problem is most likely V9A or associated circuitry. See section 4-4 for details. |
| 4 * | V7A Pin 2 | 1650 KHz | 425 uv | ½ wt. | Problem is most likely V7A or associated circuitry. See section 4-5 for details. |
| 5 | Tie point C54/C59 | 1650 KHz | 5000 uv 1:1 probe | ½ wt. | Problem is most likely xtal filter or notch filter. See section 4-6 for details. |
| 6 | V6 pin 1 | 1650 KHz | 35 uv | ½ wt. | Problem is most likely V6 or associated circuitry. See section 4-7 for details. |
| 7 | V4A Pin 2 | 6.250 MHz | 100 uv | ½ wt. | Problem is most likely V4A or associated circuitry. See section 4-8 for details. |
| 8 @ | V3A Pin 2 | 6.250 MHz | 15 uv | ½ wt. | Problem is most likely V3 A or B or associated circuitry. See section 4-9 for details. |
| 9 # | V2A Pin 9 | 7.250 MHz | 8 uv | ½ wt. | Problem is most likely V2A or associated circuitry. See section 4-10 for details. |
| 10 ~ | Junction C15&C20 | 7.250 MHz | 6 uv | ½ wt. | Problem is most likely 6.5 MHz traps, S1F, V18 grid or associated circuitry. |
| 11 | V1 pin 1 | 7.250 MHz | 0.5 uv | ½ wt. | Problem is most likely V1 or associated circuitry. See section 4-11 for details. |
| 12 $ | Tie point S1D wiper and 6.25 trap | 7.250 MHz | 0.5 uv | ½ wt. | Problem is most likely S1D, S1C, or associated circuitry. |
| 13 ** | J1 direct from sig. generator | 7.250 MHz | 0.5 uv | ½ wt. | Problem is most likely K1, 6.25 MHz trap, L17 or associated circuitry. **Upon successful completion to this point leave all equipment set as they are for AGC test in next section.** |

* May require peaking of T3
\# may require peaking of T1
$ May require peaking of L3 and PRESELECTOR
** If the RX is working at this point perform the 6meg trap alignment. See section 8-12.
@ May require peaking of T2
~ May require peaking of L10 and PRESELECTOR

Next is V8 the AGC/S-meter amp. This tube needs to be hand selected for the best balance of agc and s-meter operation. This is a tedious process every time you swap out V8 you must reset the agc threshold and the meter zero.

Finally, the S-meter was never intended to be precision instrumentation. This is testified to by the considerable wide spec. "25uv to 100uv at the antenna shall produce a reading of S-9". I can usually get most radios very close to actual scale. Some not so close. However all radios will meet the 25-100uv spec with time and diligence. The actual scale is as follows:
0.8uv = S-3
3.2uv = S-5
50uv = S-9

**TESTING:**

**AGC TEST**
The following agc test results are dependent upon overall gain and sensitivity of the receiver. This assumes a fully functional receiver and proper alignment. If you are in the process of restoring to operation you may not get the agc figure of merit in spec. When you have removed all the receiver and transmitter faults and have done a complete alignment you will re-run these two tests for compliance to spec.

**AGC FIGURE OF MERIT**
With a ground jumper connected to the agc line ( Junction of R2 and C12), tune the receiver to 7.250 MHz. Set the input at the antenna jack to 5.0 uv. Adjust the AF gain control for 1-watt audio output.

Test 1: Remove the clip lead from the agc line. The audio output should drop about 1 db. You are now through with the clip lead.

Test 2: Re-adjust the AF gain for 1-watt audio output with 5 uv RF input. Increase the signal from 5 uv to 5000 uv. There should be a change of less than 10 db in the audio output.

If either of these tests fails you have a problem in the agc circuit or the AGC threshold is improperly adjusted.

**S-METER ZERO**
True meter zeroing can occur only when all faults have been removed and the system is in perfect alignment. Turn the RF GAIN and the AF GAIN controls fully counter-clockwise. Set the meter switch to RFO S. Locate CR17. Place a clip lead from ground to the anode of CR17. Power up and warm up at least 15 minutes. Adjust METER ZERO (R120) for a meter reading of exactly zero. If it will not zero you have a fault in the meter circuit V8B. Remove the clip lead, if the meter moves off of zero you most likely have an agc fault in V8A, or associated circuitry.

**AGC THRESHOLD ADJUSTMENT**
The S-meter must be properly zeroed and the receiver fully and properly aligned before this operation can be done correctly. Tune up the receiver to 7.250 MHz with a 3.2uv signal in. Turn the AGC threshold pot fully clockwise. Slowly turn the AGC THRESHOLD pot counter-clockwise until the S-meter reads S-5. Now increase the output from the signal generator to 50uv; The S-meter should read between S-7 and S-9, with S-9 being the perfect result. The meter zero and threshold adjustments do interact. You may have to repeat each adjustment several times. If the adjustment is successful re-run the AGC FIGURE OF MERIT test. If it fails either test there is a fault in the agc amp. **NOTE:** The procedure in the factory manual, section 8-4-D should not be used. The manual procedure sets the AGC threshold at the level of ambient noise which is always changing.