SR-160/500
5200 KHz IF ALIGNMENT

I. BACKGROUND:

The SR-160 and SR-500 are tri-band single conversion transceivers. The receiver portion of both rigs are identical. The receiver I.F. center frequency is 5201.650 KHz. The 3db points are 5200.500 and 5202.800 KHz. In the early 60's when this equipment was designed precision signal generators and frequency counters were not a luxury most hams could afford. Tech-writers wrote alignment procedures using what was commonly available. Things like built in xtal calibrators and separate receivers. The ultimate way to tune the I.F. is with a sweep generator with internal markers and a spectrum analyzer. But then even today not too many hams have that equipment.

Although I do have analyzers and sweepers I wanted to come up with a process that did not require a $5k to $10k investment. I also wanted equipment that would be the foundation for an effective HF repair bench.

The minimum basic equipment:

- Oscilloscope (100 MHz)
- RF-IF Signal generator (capable of 200 KHz to 50 MHz)
- Frequency counter (at least to 50 MHz)
- Audio power meter/variable load (2mw to 20watt/ 0.6 ohm to 32K ohms)
- RF power meter/load, scalable 0-50 watt, 0-250 watt, 0-500 watt and 0-1000 watt.
- Audio oscillator 600 ohm output 0 to 100 KHz.
- General purpose analog VOM (Simpson 360)
- General purpose digital VOM

In this I.F. alignment process we will need four of these.

- Signal generator (I use the URM-25D).
- Frequency counter (I use the HP 5300A/5302A vintage 70's)
- Audio power meter (I use the General Radio 1840A don't skimp here you will need to measure accurately to 1/2 of a db at 0 to 2 watt range.)
- Oscilloscope.

II. THE SETUP:

- With the case removed set the radio on its side, left side down.
- Remove V17 and V1.
- Connect the audio power meter to the front panel PHONES jack J1. Set the range to 2 watts full-scale
- Turn the mic gain and carrier to minimum
- Set the RF and AF gain to max.
- Connect the counter to test point B (At C49 coming from the cathode of V8A)
- Connect the power supply and turn to the REC ONLY position.
- Allow a 20 minute warm up.

You should see 5200.000 KHz (ok 5.200000 MHz) on the counter if not adjust C48 for a perfect reading. **This is key,** observe the counter for a few minutes until you are confident the oscillator is stable. Disconnect the counter and connect it to the signal generator. If you have a state of the art signal generator with a digital readout with 7 significant digits you can set the counter aside.

- Move the probe from the counter to the scope. You should have 3vpp.

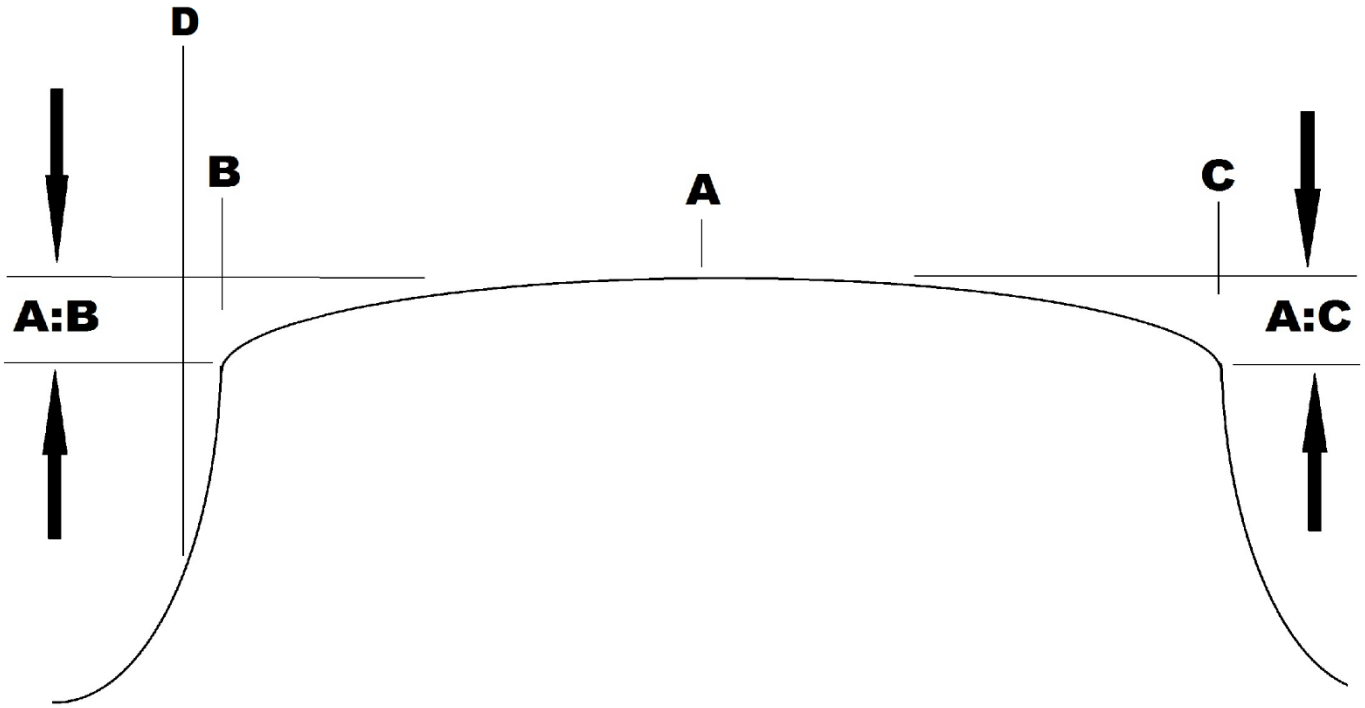
You will need between 50 and 100uv injection in the next steps. Most economical counters will not count a signal that low. I use a tee connector on the signal generator. One side of the tee goes directly to the counter. The other side of the tee connects to a 40db pad and the scope probe connects to the pad.

III. T3, T4 and T7 alignment.

- Set the signal generator to exactly 5201.650 KHz (or 5.201650 MHz if you prefer)
- Using a scope probe connect the output of the signal generator (via attenuator pad if necessary) to V2 pin 7. (V2 is the receiver mixer. With V17 removed there is no VFO signal injection so V2 will simply act as an amplifier. This is done to maintain proper loading on the input of T1. V1 is pulled to eliminate noise from the front end.)
- Increase the output of the signal generator until you get 1 watt on the wattmeter.
- Reduce the AF gain until the audio power is 1/2 watt. Unless otherwise noted, from this point on adjust the signal generator output to maintain 1/2 watt.
- Insure that the signal generator is on freq then adjust T3 and T4 for a peak audio output.
- Increase the signal generator output until you get 1 watt output. Adjust T7 for a peak S-meter reading. **NOTE** As T7 peaks the S-reading the audio output will drop slightly this is normal. As you adjust T7 either side of its peak audio output will rise.

IV. T1 and T2 alignment.

- Set AF Gain to Max
- Adjust the signal generator for 5201.650 KHz
- Adjust the signal generator output level for 1/2 watt audio output. This will be db reference level.
- Adjust the signal generator for 5200.500 KHz and record the difference in audio output in db.
- Adjust the signal generator for 5202.800 KHz and record the difference in audio output in db.



A = center freq = 5201.650 KHz.
B = low end freq = 5200.500 KHz adjusted by **T1**.
C = high end freq = 5202.800 KHz adjusted by **T2**.
A:B = difference from **A** to **B** measured in db, **B** should be -1.5 to 3db.
A:C = difference from **A** to **C** measured in db, **C** should be -1.5 to 3db.
Normally T2 will have greater effect.
D = Carrier freq 5200.00 KHz, should be -6 to -9db below **A** (see next section **V**).

V. FL1 and the CW-TUNE function.

In the balanced modulator a negative voltage is applied to the diodes CR2 and CR3 via the CARRIER BAL pot. When the operation switch is placed in the CW-TUNE position a ground is applied to the diodes through the front panel CARRIER control and R46. This cuts off CR2 and turns on CR3 to unbalance the circuit and allow the 5200 KHz signal from the carrier oscillator to be fed directly to the FL1 network. It is then amplified by V3 and passed to the xmtr mixer V13. This signal is outside the passband of FL1. However as long as it falls between -6 and -9 db down from the center frequency the signal level is sufficient, after amplification by V3 to drive V13. We can test this in the receive mode.

- Set up equipment as in the first three steps in **III** above.
- 1 watt of audio output is your reference level.
- Readjust the signal generator to 5200.00 KHz, record the drop in audio in db. Between 6 and 9db is the goal.

These tests and results are all predicated on the assumption that all circuits are working to original specifications. Failure to perform at any step of the procedure in an indication of a fault in the circuit. Search the www for the document ***SR160 & SR500 supplemental tech info*** for a guide to fault analysis and repair.