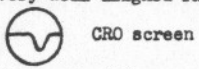
INTERMEDIATE FREQUENCY TRANSFORMER ALIGNMENT

Theory:

Method one - sweep alignment using Cathode Ray Oscilloscope to monitor IF alignment for rx's w/IF between 450-460 khz.

A signal is introduced to the frequency discriminant IF transformers (an inductance-capatance filter that will only allow one frequency range through - the less the better for selectivity). Using the RF sweep generator, the frequency "transmitted" to the rx varies from 450 to 460 khz at 60 cycles/second. Obviously, the amplification should be markedly greater at the IF of the rx if it is to be at all selective. A CRO across the AF Gain control (volume control potentiometer) will show something like the following:

if the CRO is synchronized against the 60 hz line frequency. The sharp "valley" shows the IF frequency as would be seen on a very well aligned rx. High fidelity rx look often as follows:



The actual alignment procedure is an adjustment of the capacitance or inductance (depending on actual IF can manufacture) of the primary and secondary windings.

It is essential that a non-metallic instrument is used to turn the IF can adjustment screws since the extra surface area of metal added will change the capacitance of the IF transformer and change the resonant frequency. Then all adjustment is for not.

The deeper the valley, the more sensitive the rx is on the desired frequency i.e. - the stronger the desired station is in relation to QRN and QRM that is not near the specific frequency.

The sharper the sides of the valley, the more abruptly the sideband QRM is reduced.

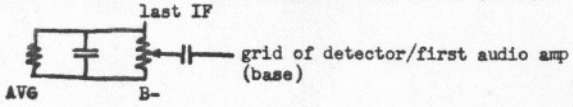
The closer the sides of the valley, the better the sensitivity of the rx. As well, the frequency response of the rx is decreased at the high end. It should be noted that table radios often have IF_2 set to a wide band pass to allow relatively high fidelity sound through. The DXer is advised to align any table rx if he plans to DX with it. The average housewife is tone deaf anyway. Add to that the fact that the audio amplifier in a table radio is pretty bad at high frequency (over 5000 hz) and you have a strong case. Who ever heard of a DXer using a high fidelity communications receiver??

Method two - When you adjust the IF can for the loudest or highest reading, you are, in effect, deepening the valley as it would appear on the CRO.

In Practice in the lab:

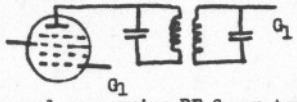
Method one - you need: RF sweep generator at 455 khz (preferably @ 60 hz with reverse blanking), jumper wire for table of transistor rx only, cathode ray oscilliscope (CRO), diddle stick (non-metalic tuning instrument). Unless adjustment of IF transformers is very stiff, a tongue depressor can be widdled to serve this purpose. The tongue depressor can be widdled to a blade like a screwdriver.

1) Warm up the rx for at least twenty minutes (not just on stand-by).
2) Connect the CRO's verticle displacement terminals across the AF Gain control. The ground terminal of the CRO should be connected to the chassis side of the volume control.



3) i) All American five tube rx and other rx without BFO and RF sections - jumper small gang of 365 pf variable capacitor from one of the two terminals on the small gang (remember, they are connected together internally) to the chassis of the capacitors. Apply the RF Sweep signal to either: I - the antenna terminal (if any) and chassis of rx
II - the large gang of the capacitor
III - pin 8 of the 12SA7 (third grid of V_1 - pentagrid converter)

ii) Complicated tube rx - remove local oscillator tube and apply RF Sweep signal to third grid of mixer tube.



or follow instructions in manual concerning RF Generator hook-up.

4) Set CRO for line sweep (60 hz sync.). If the CRO being used lacks this convenience, another possibility is to set sweep speed at 60 hz.

5) If rx has any of the following controls or switches, set as follows:
i) AVC (automatic volume control) or MVC (manual volume control) - AVC should be off or set to MVC.
ii) BFO off
iii) Q Multiplier or pre-selector off
iv) RF Gain up full
v) IF Gain up full
vi) Automatic Noise Limiter (ANL) or Blanker off
vii) Detection Mode - AM, not CW or SSB or FM
viii) Band Selector - to BCB/AM; not FM or TV

6) Set RF Generator to 455 khz sweep (no modulation) with the lowest RF output signal level possible.

7) With CRO set to be as sensitive as possible, either try and find the signal or slowly advance the RF output until a signal is seen on the CRO.

8) If the CRO has a phase control, adjust it until the "Valley" appears in the center of the screen. If the CRO doesn't have a phase control (or it is ineffective), this step is not essential; it just makes life easier.

9) Begin with the IF can closest to the antenna on the schematic. Adjust the secondary first (as with each IF can). The secondary is located on the top of the chassis of most communication rigs. On cans with both adjustment screws on the top of the can and primary and secondary screws look the same, the end result is the same, but alignment may take longer and is a little more tricky (i.e. touchy). Adjust the IF screw with non-metallic diddle stick until the deepest valley is seen on the CRO. Reduce RF Output (to prevent overloading) and adjust primary to deepest possible as well.

10) Proceed form IF_1 can closest to RF section and antenna to IF_2, always adjusting secondary first and primary second. Repeat from IF_1 through the cycle until no deeper valley can be seen.

Method two - you need: RF Generator that is variable between 440 khz and 470 khz with modulated carrier or provisions for input of a tone to be modulated, jumper wire (for table and transistor rx), diddle stick, any one of the following (in order of preference):

I wattmeter with internal load

II AC VTVM or AC Voltmeter (e.g. VOM) with 3 volt AC (or less) scale and 4-20 ohm load resistor (wattage rating should be more than maximum output of audio section of rx) plus normal loudspeaker.

III a good sensitive ear, a load resistor (4-20 ohm), a small capacitor (.05 uf or less depending on power output of rx) and loudspeker.

1) Warm up rx for at least twenty minutes (not just on standby position)
2) Connect RF Generator as in method one 3)
3) Set controls as suggested in method one 5).

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4) Apply a medium intensity modulated RF signal (400-1000 hz tone about 50-70% modulation recommended), and with AF gain (volume) at a level at which semi-locals are normally listened to, adjust RF frequency until the loudest signal is heard on rx. This should be receiver's IF frequency (likely between 450 and 460 khz). Don't put too much confidence in the RF Generator's dial frequency as being correct. This frequency found should be held.

5) Disconnect speaker (only one terminal must be disconnected, but both can be) and connect either wattmeter with internal load or load resistor to speaker terminals. This may require some delicate surgery on table rx. Just be sure you don't become known as "the Butcher" by the next person who services the rx. The speaker terminals are usually found after a small audio transformer that used to match the circuit and speaker impedance.

6) AF Gain must be full open.

7) Beginning with secondary of IF_1 (nearest to antenna and RF section on schematic), adjust the IF screw with diddle stick until AC Voltmeter shows largest reading or loudest sound is heard. Adjust primary of IF_1, then secondary of IF_2 and so on, repeating cycle a few times. RF signal intensity should be decreased as alignment continues to prevent overloading. About S-7 to S-9 is recommended. Remember that there is a difference between modulation percentage (i.e. of tone) and signal output intensity. Modulation should be maintained at 50-70%.