Some speculations on the HRO

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When I dive into some old piece of gear I understand just how an archaeologist must feel when he discovers some ancient Egyptian tomb. The deeper I get the more unanswered questions there are. These are my own speculations based on reading manuals, articles and getting my hands dirty with rebuilds. If anybody can substantiate them or show that I am wrong then please let me know .

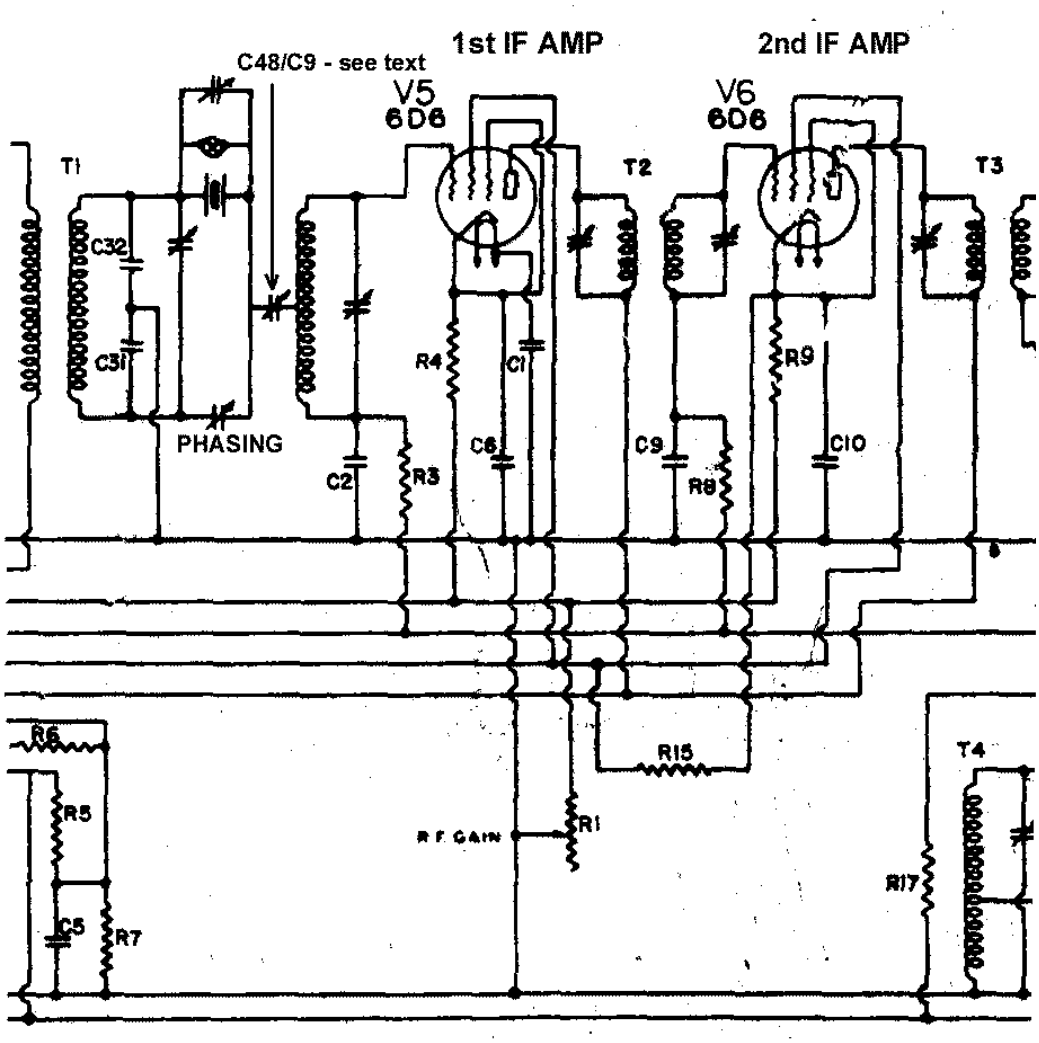
1. Tracking

Speculation: The HRO was originally designed as an amateur HF receiver only.

Peter Chadwick G3RZP has pointed out that the tracking could have been better. However if the receiver was only meant to be used with the bandspread coils it is probably good enough. The front-end alignment as described in the original manual is interesting to say the least, perhaps unsophisticated would be a better way of describing it.

Before describing the alignment method, it is interesting to note that the signal frequency coils only carry a trimmer, that is there is no way that their inductance can be changed. The local oscillator coil has a trimmer and some means of varying the inductance. Now it is reasonable to assume that the signal frequency coils can be made to track with each other but to expect the local oscillator to keep good track either indicates a very sophisticated design/construction process or perhaps it did not really matter.

The alignment procedure is as follows. Select a frequency (unspecified) near the HF end of the General Coverage (GC) range, 490 on the scale which reads 0-500 is suggested. Trim the oscillator onto frequency. Switch off the signal source and peak the signal frequency stages, by ear, for maximum noise. Spin the dial to the LF end and see that the noise level remains substantially the same. A further check can be made by carefully bending the local oscillator tuning capacitor plates to each side when the noise should fall. If this does not happen, alter the inductance of the local oscillator coil and re-trim the local oscillator to the chosen HF frequency and repeat. Do this until tracking is satisfactory. Hence it will be seen that tracking will progressively deteriorate as the coil is tuned LF.



An excerpt from the HRO circuit diagram

Bandspread coils (BS) are first aligned on the GS range. However on the BS range provision is made to alter the capacity swing of the tuning range for each coil. As BS is done at the HF end of the range and has more trimmers it is reasonable to assume that good tracking

can be achieved over the BS range. This is quite satisfactory if the receiver is only going to be used on the ham bands.

Later coil packs do have provision for changing the inductance of the signal frequency coils. Also the REME manual for the R106, the army designation for the HRO, addresses this point. This suggests that when the HRO was taken up by the services it was necessary to improve the GC tracking.

I have a copy of a review from The Wireless World, 18th August 1938, that only refers to the four BS/GC Coils.

2. The crystal filter and second IF amplifier

Speculation: The crystal filter was originally aligned on a test rig before being mounted in its box.

Close examination of the filter reveals four adjustments:

a) The panel mounted phasing control.

b) The panel mounted selectivity control.

c) A trimmer across the crystal which does not appear on the circuit diagram. *[It does in the circuit here—Ed]*

d) The trimmer, C9, which couples the filter bridge to the output transformer.

The first two adjustments are not relevant to my argument.

Trimmer c) can only be accessed when the filter is removed from its box. It appears to balance bridge capacities so that the balance point is near the midpoint setting of the phasing control and rejection notches can be obtained on both sides of the peak.

Trimmer C9 can, with some difficulty, be accessed from the top of the filter. The original HRO manuals identify it on both the circuit diagram and photograph, however they ignore it in the text.

REME manual dated 1945 identifies it as C48 on the circuit diagram and says "The crystal filter output coupling condenser C48 serves as a fixed IF gain control and should not be touched after it has been set by the manufacturer."

REME manual dated 1954 says "...incipient double humping. This can be cured by careful adjustment of C48 but as this affects the gain of the amplifier a compromise must be made between gain and the ideal curve shape [of the response]."

This manual is very detailed and gives coil winding data, tells you how to strip the main tuning gang, but says nothing really helpful about C48.

This leads on to the mystery of the widely differing values of the cathode bias resistor in the second IF amplifier. Again quoting from REME 1954:

" . . . the value of R9 [second IF amp cathode resistor], which can be anything from 1kÙ to 5kÙ and is chosen in manufacture to give a satisfactory overall [gain] performance."

Speculation: The filter having been set up to give the required performance the gain of the 2nd IF amplifier was then set to give some (un-specified) gain so that the overall gain of the receiver was correct.

There is also the implication that better selectivity can be achieved from the crystal filter if you are prepared to accept a greater insertion loss. This loss could be compensated for by reducing the value of R9.

At first I thought that it was set to allow for component variations. However if this was the case then I would have thought that the REME manuals would have suggested that this could be changed.

Well that's the end of my speculations. It anyone can confirm or deny them please let me know.