ALIGNMENT

One of the first evidences of misalignment in a receiver is low over-all gain of the receiver. In the RME-70 Receiver this is evidenced by low meter readings on signals which were formerly capable of producing higher meter readings. Due to the tremendous gain available in the audio system of the RME-70 Receiver, a misalignment due to loss of gain may not be noticed if the condition of the receiver is judged by audio output, since it may be possible to turn the volume control to the maximum output position and still obtain high values of audio output. Misalignment, however, does not effect the circuits of the audio amplifier and has solely to do with the intermediate frequency amplifier and the radio frequency amplifiers. Principal among the contributions to low gain is the part which the intermediate frequency amplifier plays in providing over-all sensitivity and selectivity of a satisfactory order.

Misalignment of the radio frequency section (principally that part of the section which is made up of the high frequency oscillator) shows up in the receiver calibration. This section also is susceptible to certain outside influences which can cause variations to such a degree that the stated calibration of the receiver is changed to other values. However, this effect is not a common effect and usually the calibration of the receiver, unless tampered with by inexperienced hands, will remain very close to its stated value indefinitely.

This loss of gain when occurring in the radio frequency section of the receiver is usually due to the fact that the oscillator has been grossly misaligned so that it is apparent in the frequency calibration of the receiver. In other words, it might well be said that a loss of sensitivity in the receiver occurring simultaneously with a wide-spread condition of off calibration night indicate the fact that the loss of gain is caused by misalignment of the radio frequency section of the receiver

On the other hand, if the gain of the receiver is low, but the calibration is correct, it might be said without hesitation that the most probable cause for the low gain is the misalignment of the intermediate frequency amplifiers relative to the trimming condensers of the intermediate frequency amplifier transformers.

It is for the purpose of realignment of these intermediate frequency transformers that the following test procedure is outlined. IMPORTANT NOTE. It is essential that the 465 KC intermediate signal which is used for realignment of the intermediate frequency amplifier is not set according to any arbitrary calibration on the test oscillator itself since it has been found that commercial test oscillators for service work vary considerably, at least to an extent which will not permit proper alignment of a communication type receiver in which is installed a quartz filter. It is therefore better if no test oscillator is had, since a broadcast station of constant signal strength will furnish adequate test signal for alignment of the intermediate frequency amplifier, using the quartz filter for establishing the proper I.F. frequency as indicated in the following procedure.

The meter on the RME-70 receiver affords an excellent method of indicating the peak alignment of each of the transformers. The location of the three intermediate frequency amplifier transformers, 5-3, 5-4, and 5-5 is given on Figure 4 of the illustrated sheet attached. The two padding condensers located in each of these transformers and accessible through apertures in the top of the shields can also be seen.

OTHER DATA IN VOLUME XI

OUTLINE OF PROCEDURE FOR CORRECT ALIGNMENT OF THE INTERMEDIATE FREQUENCY AMPLIFIER TRANSFORMER OF THE RME-70 RECEIVER.

The intermediate frequency amplifiers in the RME-70 Receiver are designed for a frequency of 465 KC. Since these receivers are always supplied with a quartz crystal filter, it is essential that the intermediate frequency amplifier transformers be accurately aligned with the crystal frequency. Crystals are supplied in frequencies slightly at variance from the above stated value of intermediate frequency by an amount not greater than one kilocycle plus or minus 465 KC. Rather therefore than align the intermediate frequency amplifier stages of the RME-70 to a set frequency of 465, it is essential that the alignment be done in conjunction with the quartz filter so that alignment of the intermediate frequency amplifier is achieved at the frequency of the filter. This is done as follows and when the process as herein outlined is followed accurately, maximum results will be obtained. The use of any other process of a general type will produce inferior results.

The first step in the alignment procedure is to tune in a broadcast station, preferrably in the low frequency portion of the broadcast band. The signal should be one of medium signal strength so that the R meter indicates a signal level of R9 or slightly less. If no station of this amplitude is available but a stronger station is available, a reduction in the efficiency of the antenna by the connection of a short wire to the antenna post may help to bring the signal strength as indicated down to R9. Usually between 550 and 800 KC in most any territory a station can be received at most any time for this test and adjustment.

When the station has been chosen, let us assume that its frequency is 700 KC, the next step is to slightly detune the main tuning control so that the frequency reads approximately 715 or 720 KC. This of course will tune the station out. It does not necessarily have to be the frequency mentioned or the exact frequency of detune, but the general procedure is to tune the main tuning control slightly higher than the chosen station so that it may be brought back to resonance by decreasing the scale reading of the band spread control. This is done merely to provide vernier tuning.

With the station chosen and resonated on the band spread scale, the crystal filter is switched into the circuit by setting the phasing control pointer to vertical upright position (approximately 90° clockwise from "OFF" position). The band spread scale is then adjusted with respect to the signal so that a maximum meter reading is obtained. This procedure is one which requires patience and accuracy of adjustment since the receiver is ultra sharp with the crystal filter in and there will be one definitely sharp peak indicating crystal resonance. The receiver should be tuned to this peak and left on it during all adjustments to be made regarding the intermediate frequency amplifier.

When this peak has been tuned to and the meter is at maximum reading, a small standard intermediate frequency trimmer tool of the insulated screw-driver type should be used. Then the selectivity control, should be set so that the condenser it adjusts is set at 50% mesh. Then, without particular attention to a course of procedure in tuning, any transformer may be adjusted at any particular time, the important factor being that they all be adjusted so that the R meter is brought to and left at a maximum meter reading. Usually this adjustment will not require very much turning of the adjustment screws. A good procedure to follow is to start with the 5.5 transformer and align in sequency 5.4 and 5.3. All adjustments should be made as before mentioned so that the meter reading is maximum.
It is advisable from time to time to make sure that the signal is still adjusted to peak resonance of the crystal by slightly varying the

adjustment of the band-spread control. When this procedure has been completed as outlined and all transformers have been adjusted and left at maximum meter reading, the intermediate frequency amplifier of the receiver is in peak adjustment and the crystal aligned with it for maximum effectiveness in filter action.

PHASING CONTROL OPERATION

The phasing control of the RME-70 receiver, located on the front panel in the top right corner is indicated by the words "CRYSTAL PHASING". Directly to the left of the shaft is the word "OFF". There is a stop connected with the shaft so that when the receiver is to be used without the crystal filter, rotation of the crystal phasing control is set so that the pointer points to the "OFF" position and further counter-clockwise rotation is impossible due to the stop. This indicates that the crystal filter has been removed from the circuit and normal receiver operation is possible. This function is provided by a cam operated switch connected with the phasing control of the crystal filter. In order to put the crystal into operation it is necessary to rotate the crystal phasing control clockwise to a position where the pointer is approximately in a vertical position, similar to that normally required of the selectivity control, located just below it.

Failure of the crystal to cut out of the circuit when the crystal phasing control pointer is set to the "OFF" position is due either to the fact that the knob has slipped or the switch contacts are bad and probably need adjustment. The cam switch closes when this pointer is in the "OFF" position, shorting out the crystal unit. Failure, of course, to short out the crystal unit will make it possible for the crystal filter to be in operation at all times. Slight pressure or bending of the contacts can improve this function should it fail.

When the crystal filter is being used the phasing function is provided by the variation in capacity of a phasing condenser controlled by the crystal phasing knob. Usually this is indicated by minimum noise or background response when the receiver is tuned off of the signal and the crystal is being used. This position, as before indicated, will be approximately one which allows the pointer to be vertical. Slight variations, either clockwise or counter clockwise, from this minimum noise response position change the rejection point of the crystal and make it possible to tune the rejection characteristic of the crystal to various slightly higher and lower frequencies for rejection purposes during QRM from a heterodyne on a desired signal.

If the phasing control does not work it is indicative of the fact that probably a connection is broken or that the R.F. choke connecting the A.V.C. to the grid of the tube (indicated on the schematic drawing by R.F.C. in the crystal filter circuit) is open. The continuity check between the grid of the first I.F. amplifier tube and the junction of resistor 1.8 on the automatic volume control terminal strip should show continuity when the crystal is in the operating position.

ALIGNMENT OF RADIO FREQUENCY SECTION OF THE RME-70 RECEIVER

Alignment of the radio frequency section of the receiver will effect principally the calibration of the receiver. Within certain limits this of course will also effect the sensitivity. Small variations in frequency (up to 2%) will not materially reduce the sensitivity of the receiver although they of course will show up as variations in the calibration as indicated by the required setting of the main tuning dial indicator. Correction for any variation is calibration can be made by following the suggestions outlined.

Band 1 includes the frequencies between 550 and 1500 KC. For band 1 there are two frequency adjustments for adjusting the indicator to proper calibration. The adjustments (condensers 2.51 and 2.50) are adjusted as indicated on Figure 4 through the top of the shield can just in the rear of the main tuning condenser assembly. 2.51 adjusts the band 1 oscillator calibration in the low frequency portion of the range and condenser 2.50 is the adjustment for the high frequency end of band 1. The procedure is this; Put the main tuning indicator to a position so that the main tuning condensers are fully meshed. The pointer of the main tuning control should then be set at maximum left end of scale so that the pointer falls just below the line above the numbers indicating the various channels. In this respect it will partially cover the top half of the numerals indicating the different tuning bands on this scale. In other words, the line which borders the semi-circular scale at the extreme counter-clockwise position should rest on the top edge of the pointer as it is turned to maximum counter-clockwise rotation and the condenser plates are at full mesh.

The next step is to choose a station or a signal of accurately known frequency, around 700 KC, and set the main indicator to the frequency of the signal which is going to be used for the test. For example: There is a station available with fairly good signal strength or a test oscillator is available which can ACCURATELY be set at 700 KC. If the receiver indicator on the main tuning dial is set at 700, and the receiver is considerably out of calibration of course the signal will not be received. However, leave the indicator at the correct frequency of the signal being used for the test and set the band-spread control to a reading of 180 on the dial at which position it has no material effect on the tuning circuits of the receiver and permits the calibration of the main tuning dial to indicate accurately the frequency of setting.

Then by means of condenser (2.51) (Figure 4) accessible through the trimming hole in the oscillator shield can for Band 1, adjust until the signal is brought in with the pointer set at the proper frequency. Then choose a signal at about 1200 or 1300 kilocycles, and set the main tuning dial indicator to the correct frequency for that signal and bring the signal in on that setting with trimmer 2.50. It will then be necessary to return to the former frequency setting of 700 KC to make sure that the variation of 2.50 has not made some slight change in the setting for the lower frequency calibration point and it may be necessary to readjust condenser 2.50 slightly again. Then in order to make certain of the accuracy of both settings return to the frequency chosen between 1200 and 1300 KC and if necessary, slightly readjust condenser 2.51 again. After several checks on each frequency it will be found that the calibration can be made satisfactorily.

Calibrations on the higher frequency bands are controlled for Bands 2,3,4,5, and 6 by the trimmers 2.49, 2.48, 2.47, 2.46, 2.45, (Figure 3) respectively. High side beat is used on all frequencies on the RME-70 Receiver which means that all of the condensers 2.49, 2.48, 2.47, 2.46, 2.45, must be set to the lowest capacity setting which will provide a beat and the proper calibration for the frequencies in the respective bands. Calibration frequencies used are as follows:

Band 2:	2 megacycles and 3 megacycles.
Band 3:	4 megacycles, 5 megacycles, 6 megacycles.
Band 4:	7 megacycles, 9 megacycles, 11 megacycles, 13 megacycles.
Band 5:	14 megacycles, 15 megacycles, 17 megacycles.
Band 6:	30 megacycles.

After the calibration has been made accurately on all of the frequencies, or if the receiver has been found to be accurately set insofar as its calibration is concerned on all frequencies, the trimmers 2.2

and 2.1 have a distinct effect upon the RF grid circuits for bands 5 and 6 respectively. They are adjusted as follows: With a steady incoming signal on between 14 and 15 megacycles and the most effective setting of the resonator control for signal in that region, and with the antenna connected, the condenser 2.2 is adjusted for maximum meter reading. With these same conditions existing on 30 megacycles, with the band switch set on band 6 and the antenna connected, 2.1 is adjusted for maximum response on a given steady signal. All other trimming and adjusting is done manually by means of the resonator control, a variable RF amplifier and detector grid padder, which can be critically adjusted for peak resonance at any frequency it is desired to tune to.

It is of importance to note the setting of the condenser 2.4 (Figure 4). This is the antenna coupling condenser used when the receiver is set to Band 1. It should be set to practically its minimum capacity in order to provide constant alignment and proper coupling to the antenna when using Band 1. Excessive capacity in the condenser 2.4 will cause misalignment of the RF amplifier and hence promiscuous beating of harmonically related broadcast frequencies to the effect that a number of whistling tones will be received on the high frequency end of the broadcast band. When the receiver leaves the factory it is set at a very small capacity and should not be set at any other capacity or material reduction in the efficiency of operation will be produced.

The padders 2.2 and 2.1 materially contribute to the image signal rejection on the bands 5 and 6. Special care should therefore be taken in the adjustment of these condensers when the receiver is aligned.

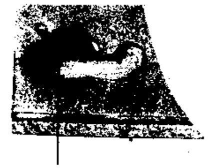

FIG. 7

MODEL
69 (late)

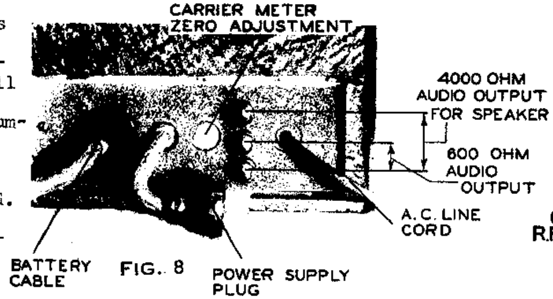

FIG. 8

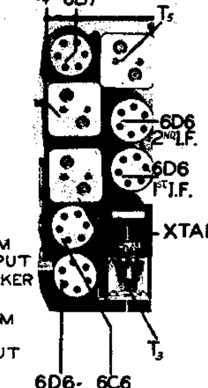

Fig. 4B

ADJUSTMENT OF THE BEAT OSCILLATOR

The beat oscillator has its frequency adjustable on the panel by means of the C.W.Tone control. This control is normally set for zero beat with the condenser 2.59 (C.W.Tone control) set at 50% mesh. If it is found that zero beat does not occur or that the beat oscillator is not beating with the intermediate frequency to produce an audible solid beat, it is probably due to the fact that the beat oscillator is tuning to a frequency other than the intermediate frequency of the receiver. This can be remedied by the following procedure:

Set the Band Switch to position Number 1, and tune in a broadcast station so that it reads maximum on the R meter. With this condition existing, snap on the C.W.Tone Control. Then by making certain that the condenser 2.59 is set to 50% mesh, the condenser 2.60 (Figure 4) located in the beat oscillator compartment just below 2.59 (Figure 4) near the top plate of the chassis in front of the beat oscillator tube should be adjusted by means of a screw-driver so that zero beat is achieved with the signal tuned in as before mentioned. When this is achieved, variation of the beat oscillator from minimum to maximum mesh will give a total beat frequency variation of eight kilocycles (plus or minus 4 kilocycles from zero beat).

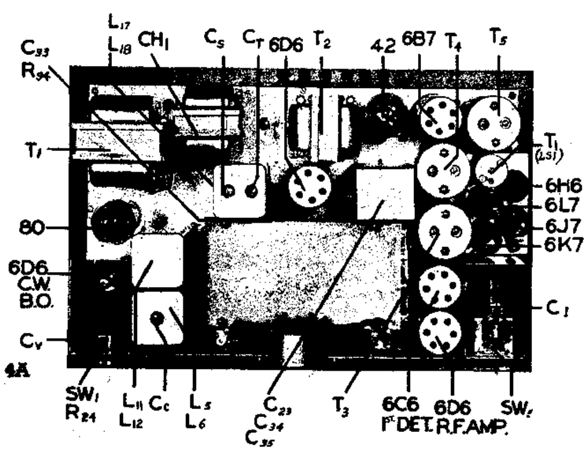

Fig. 4A

Figure 4A shows the component layout for 69 receiver with LS-1 noise silencer. Figure 4B shows the layout of the section which was changed to accommodate the silencer and therefore is standard form of chassis layout. If the receiver is connected for use, the line drawing in connection with the photograph in Figure 4A or 4B will indicate the socket locations of the respective tubes.

FOR ALIGNMENT AND FIGS. 3,6,11A, and 11B
SEE RME 69 VOLUME X Pages 3 through 6.