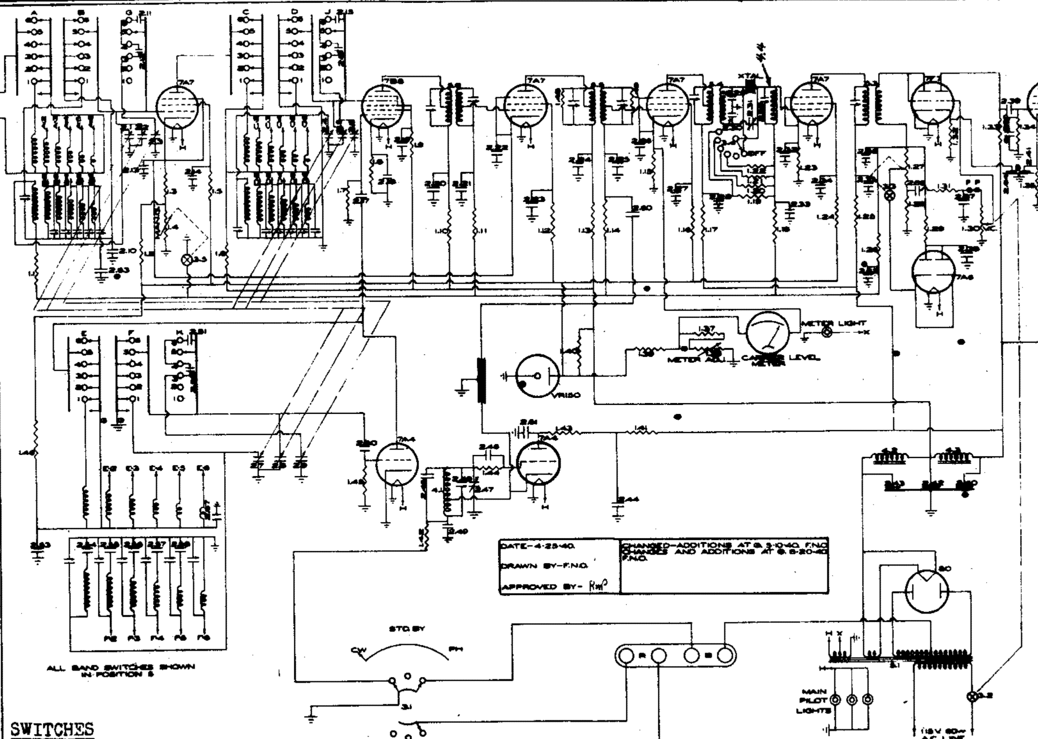


RADIO MFG. ENGINEERS, INC.

MODEL
RME-99

I.F.
PEAK
465
KC

SWITCHES

3.1 Stand-by Switch (3 position, 2 circuit).
3.2 Line Switch on Audio Gain Control (1 position, 1 circuit).
3.3 Noise Limiter on Limiter Control (1 position, 1 circuit).
3.4 Crystal Switch (5 position, 1 circuit).
3.5 AVC Switch on Manual Gain Control (1 position, 1 circuit).

RADIO MFG. ENGINEERS, Inc.
111 Harrison Street PEORIA, ILL., U. S. A.

RME-99 SCHEMATIC	C-183

CONDENSERS

2.1	Main Tuning Condenser, Large RF section
2.2	Main Tuning Condenser, Small RF section
2.3	Band Spread Condenser, RF section
2.4	Main Tuning Condenser, Large Det. section
2.5	Main Tuning Condenser, Small Det. section
2.6	Band Spread Condenser, Detector section
2.7	Main Tuning Condenser, Large Osc. section
2.8	Main Tuning Condenser, Small Osc. section
2.9	Band Spread Condenser, Oscillator section
2.10	.01 µfd. 400 volt paper
2.11	50 µµfd. 1% Silver Mica
2.12	50 µµfd. 1% Silver Mica
2.13	.01 µfd. 400 volt paper
2.14	.01 µfd. 400 volt paper
2.15	50 µµfd. 1% Silver Mica
2.16	50 µµfd. 1% Silver Mica
2.17	50 µµfd. 5% Mica
2.18	.01 µfd. 400 volt paper
2.19	.01 µfd. 400 volt paper
2.20	.01 µfd. 400 volt paper
2.21	.01 µfd. 400 volt paper
2.22	.01 µfd. 400 volt paper
2.23	.01 µfd. 400 volt paper
2.24	.01 µfd. 400 volt paper
2.25	.01 µfd. 400 volt paper
2.26	.01 µfd. 400 volt paper
2.27	.01 µfd. 400 volt paper
2.28	.01 µfd. 400 volt paper
2.29	50 µµfd. 5% Mica
2.30	50 µµfd. 5% Mica
2.31	30 µµfd. Variable
2.32	.01 µfd. 400 volt paper
2.33	.01 µfd. 400 volt paper
2.34	.01 µfd. 400 volt paper
2.35	.01 µfd. 400 volt paper
2.36	100 µµfd. Mica
2.37	250 µµfd. Mica
2.38	.1 µfd. 400 volt paper
2.39	.1 µfd. 400 volt paper
2.40	15 µfd. 450 v. electrolytic
2.41	20 µfd. 25 v. electrolytic
2.42	15 µfd. 450 v. electrolytic
2.43	10 µfd. 450 v. electrolytic
2.44	.01 µfd. 400 volt paper
2.45	100 µµfd. Mica
2.46	250 µµfd. Mica
2.47	50 µµfd. Variable
2.48	70 µµfd. Mica Padder
2.49	.01 µfd. 400 volt paper
2.50	100 µµfd. Ceramic
2.51	50 µµfd. Silver Mica
2.52	50 µµfd. Silver Mica
2.53	.1 µfd. 400 volt paper
2.54	550 µµfd. Mica
2.55	600 µµfd. Mica
2.56	1300 µµfd. Mica
2.57	1700 µµfd. Mica
2.58	3900 µµfd. Mica
2.59	100 µµfd. Mica Padder
2.60	100 µµfd. Mica
2.61	.01 µfd. 400 volt paper
2.62	.01 µfd. 400 volt paper
2.63	.1 µfd. 400 volt paper
2.64	20 µfd. 25 v. electrolytic
2.65	250 µµfd. Mica
2.66	.1 µfd. 400 volt paper
2.67	.01 µfd. 400 volt paper

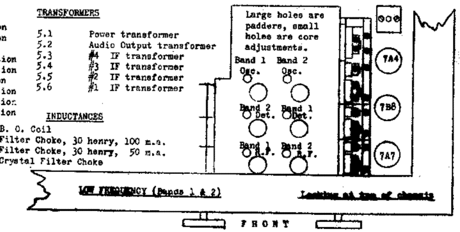
All osc. and detector parallel padders 10 µµfd.
All RF Parallel padders 30 µµfd.
All IF Trimmers 100 µµfd.

TRANSFORMERS

5.1	Power transformer
5.2	Audio Output transformer
5.3	#4 IF transformer
5.4	#3 IF transformer
5.5	#2 IF transformer
5.6	#1 IF transformer

INDUCTANCES

4.1	B. O. Coil
4.2	Filter Choke, 30 henry, 100 m.a.
4.3	Filter Choke, 30 henry, 50 m.a.
4.4	Crystal Filter Choke



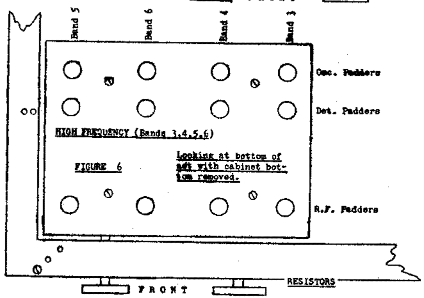


FIGURE 6

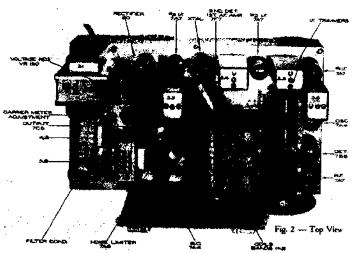


Fig. 2 — Top View

TEST VOLTAGES OBTAINED AT VARIOUS POINTS IN RECEIVER CIRCUIT

Measurements made with voltmeter having internal resistance of 1000 ohms per volt. Instruments with other internal resistances give entirely different readings. **NOTE: Line voltage should be 115 volts, Stand-by Switch on.**

PLACE TEST PRODS BETWEEN	CORRECT VOLTAGE
Radio frequency amplifier plate and ground	210 volts
Radio frequency amplifier screen and ground	130 volts
Radio frequency amplifier cathode and ground	4 volts
First detector plate and ground	250 volts
First detector cathode and ground	3.2 volts
First I.F. amplifier plate and ground	240 volts
First I.F. amplifier screen and ground	130 volts
First I.F. amplifier cathode and ground	4 volts
(The same voltages apply to the 2nd and 3rd I.F. Amplifier stages)	
First detector screen and ground	43 volts
First audio amplifier plate and ground	105 volts
First audio amplifier cathode and ground	1.5 volts
7C5 plate and ground	220 volts
7C5 screen and ground	230 volts
7C5 cathode and ground	12 volts
80 rectifier filament and ground	320 volts
Oscillator plate and ground	120 volts
Voltage regulator plate and ground (With stand-by switch on CW)	150 volts
B. O. plate and ground	11 volts

These voltages are subject to a fluctuation of plus or minus 15% without indication of material difficulties.

CONTINUITY CHECKS

(Receiver turned off. No jumper between A-2 and ground on antenna terminal strip.)

PLACE TEST PRODS BETWEEN		RESISTANCE VALUE
A-1 and ground		Infinite
A-2 and ground		Infinite
RF amplifier grid to ground		1.1 Megohm
First detector grid to ground	Band 1	3.5 Ohms
	Band 2	1.5 Ohms
	Band 3	.3 Ohm
	Band 4	.2 Ohm
	Band 5	.1 Ohm
	Band 6	.1 Ohm
First I.F. grid to ground		1.5 Ohms ±20%
Second I.F. grid to ground		1.5 Ohms ±20%
Third I.F. grid to ground		1.5 Ohms ±20%
Oscillator grid to ground		50,000 ohms ±20%
Beat Oscillator grid to ground		100 Megohms ±20%
First Audio grid and ground		250 Megohms to 0 ohm. (As audio gain control is rotated.)
7C5 grid and ground		250 Megohms ±20%
Oscillator section of main tuning condenser and ground		Bands 1,2,3,4, and 5 Infinite Band 6 .1 ohm

RESISTORS

1.1	100,000 ohms, 1/3 watt
1.2	50,000 ohms, 1 watt
1.3	150 ohms, 1/3 watt
1.4	30,000 ohms, Pot. w/switch
1.5	5,000 ohms, 1/3 watt
1.6	2,000 ohms, 1/3 watt
1.7	50,000 ohms, 1/3 watt
1.8	1,000 ohms, 1/3 watt
1.9	70,000 ohms, 1/3 watt
1.10	2,000 ohms, 1/3 watt
1.11	100,000 ohms, 1/3 watt
1.12	5,000 ohms, 1/3 watt
1.13	2,000 ohms, 1/3 watt
1.14	100,000 ohms, 1/3 watt
1.15	300 ohms, 1/3 watt
1.16	5,000 ohms, 1/3 watt
1.17	2,000 ohms, 1/3 watt
1.18	100,000 ohms, 1/3 watt
1.19	250,000 ohms, 1/3 watt
1.20	100,000 ohms, 1/3 watt
1.21	50,000 ohms, 1/3 watt
1.22	5,000 ohms, 1/3 watt
1.23	300 ohms, 1/3 watt
1.24	5,000 ohms, 1/3 watt
1.25	2,000 ohms, 1/3 watt
1.26	1 Megohm, 1/3 watt
1.27	50,000 ohms, Pot. w/switch
1.28	50,000 ohms, 1/3 watt
1.29	1 Megohm, 1/3 watt
1.30	250,000 ohms, Pot. w/switch
1.31	1 Megohm, 1/3 watt
1.32	1,000 ohms, 1/3 watt
1.33	50,000 ohms, 1/3 watt
1.34	250,000 ohms, 1/3 watt
1.35	240 ohms, 1 watt
1.36	5,000 ohms, 1/3 watt
1.37	150 ohms, 1/3 watt
1.38	200 ohms, Potentiometer
1.39	10,000 ohms, 5 watt
1.40	2,000 ohms, 10 watt
1.41	2,000 ohms, 1/3 watt
1.42	5,000 ohms, 1/3 watt
1.43	1 Megohm, 1/3 watt
1.44	100,000 ohms, 1/3 watt
1.45	50,000 ohms, 1/3 watt
1.46	2,000 ohms, 1/3 watt
1.48	100,000 ohms, 1/3 watt
1.49	100,000 ohms, 1/3 watt

RADIO MFG. ENGINEERS, INC.

One of the first evidences of misalignment in a receiver is low over-all gain of the receiver. In the RME-99 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-99 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.

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 rec. In other words, it might well be said that a loss of sensitivity in the rec. occurring simultaneously with a wide-spread condition of 'off calibration' might indicate the fact that the loss of gain is caused by misalignment

I.F. AMPLIFIER ADJUSTMENT

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. 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 a quartz crystal is installed. It is therefore better if no test oscillator is used, 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-99 receiver affords an excellent method of indicating the peak alignment of each of the transformers. The location of the 4 intermediate frequency amplifier transformers, 5.3, 5.4, 5.5 and 5.6 is given on Figure 2 of the illustrated sheet attached. The padding condensers located in each of these transformers, and accessible through apertures in the top of the shields, can also be seen.

The intermediate frequency amplifiers in the RME-99 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 ±1 KC. Rather, therefore, than align the I.F. amplifier stages of the RME-99 to a set frequency of 465 KC, 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, preferably 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, a reduction in the efficiency of the antenna by the connections 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 kilocycles, 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 on. The crystal selectivity switch should be tuned to position 3 or 4. The band spread scale is then adjusted with respect to the signal so that the 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 — 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 on the intermediate frequency amplifier.

When the above adjustments have been made the intermediate frequency transformers may be peaked up. For this purpose a standard small trimmer tool of the insulated screw driver type is used. The four transformers to be adjusted may be located on Figure 2. They are marked 5.3, 5.4, 5.5 and 5.6. It will be noticed that the #1 and #2 transformers (5.5 and 5.6) have 2 trimmers; the #3 and #4 transformers (5.3 and 5.4) each have 1 trimmer. The order in which the transformers are adjusted is immaterial. However, each trimmer should be carefully adjusted to give the maximum reading on the meter.

It is advisable during the above procedure to check the tuning from time to time to see that the receiver is adjusted accurately on the crystal.

If the above procedure is followed carefully the intermediate frequency amplifier circuits will be adjusted to peak performance.

CRYSTAL FILTER CIRCUIT ADJUSTMENT

In order that the full capabilities of the wide band crystal operation on points 1 and 2 of the selectivity switch may be realized the tuned circuit in the filter circuit must be accurately adjusted. The trimmer for this circuit will be found on the rear apron (See Figure 3). The easiest way to adjust this trimmer is to tune in a station on the broadcast band, that is broadcasting music, preferably an orchestra. The crystal selectivity switch is turned to Position 1. The pointer on the phasing control should be set approximately vertical. When this is done it will be noticed that the higher frequencies of modulation and the background noise will be cut out. The trimmer should now be carefully adjusted. As the trimmer is turned it will be found that the character of the music changes. The trimmer should be set to the point that sounds the most natural. If this adjustment is made carefully there will be a regular sharpening of the receiver as the selectivity switch is turned from "off" to Position 5.

ALIGNMENT OF THE RADIO FREQUENCY SECTION

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 will, of course, show up as variations in the calibration as indicated by the setting of the main tuning dial. Correction of any variation of calibration can be made by following the suggestions outlined in the following paragraphs:

Band 1 includes frequencies between 550 and 1600 KC. For Band 1 there are two frequency adjustments for adjusting the main dial to the proper calibration. The adjustments are made on the top of the chassis through the dust cover over the Band 1 and 2 coils. The proper holes for making the adjustments are indicated on the top sketch on Figure 6. There are 6 sets of a large and a small hole each. The two sets toward the rear of the chassis are the oscillator adjustments. The set toward the front are the RF stage adjustments; and the center set are for the detector. Under the large hole is a padder for adjusting the high frequency end of the scale. Under the small hole is a screw which moves the core in the coil and adjusts the low frequency end. In aligning an RME-99 an output meter or such device is unnecessary since the carrier meter is available at all times to indicate resonance.

The next step is to choose a station or a signal of accurately known frequency on the low frequency end of the range (for example 600 KC) and set the main tuning scale to read this frequency.

IMPORTANT: DURING ALL CALIBRATING AND ALIGNMENT PROCEDURE THE BAND SPREAD POINTER MUST BE AT THE EXTREME RIGHT, OR 180° END OF THE SCALE.

If the station is not tuned in which the scale indicates its frequency it may be brought in by adjusting the oscillator coil core. This may be done with a small screw driver through the small hole marked "BAND 1 OSC" on Figure 6. Another station or signal is now selected near the high frequency end of the range (for example 1400 KC). If this signal is not heard when the dial is accurately set to its frequency it may be brought in by adjusting the padder under the large hole marked "BAND 1 OSC" by means of an insulated trimmer tool. When this signal is accurately brought in as indicated by a maximum reading on the carrier meter one should go back to the low frequency test point and readjust it if it has changed. It may be necessary to go back and forth several times until both frequencies are accurately calibrated.

When the calibration is accurate the alignment of the RF and detector circuits may be checked. This is done at the two points used in calibrating. With the low frequency test signal tuned in, the Band 1 RF and detector coil cores are adjusted until a maximum meter reading is obtained. Then the high frequency signal is tuned in and the padders are adjusted as was done in calibrating.

Note on Figure 6 that the oscillator and RF adjustments are on the left hand side, but the detector adjustments are on the right hand side. Band 2 oscillator and RF adjustments are on the right side while the Band2 detector adjustments are on the left side.

The accuracy of most service signal generators is not very great, especially on the higher frequencies. The owner of an RME-99 should hesitate in using one to calibrate his receiver unless he is sure that it is accurately calibrated.

The procedure in calibrating and aligning Band 2 is the same for Band 1. On this band two frequencies, such as 1800 and 2800 KC, may be used.

The four high frequency bands are calibrated and aligned by removing the bottom plate from the receiver. The screws holding the four rubber feet and the four small screws between them are removed. This allows the bottom plate to be removed. It will be found that an aluminum plate covers the coils. This plate has holes over the 12 padders and all adjustments should be made with this plate in position.

Since the inductance of the coils are accurately adjusted and set at the factory it is necessary only to calibrate one frequency on each band. The same applies to the alignment of the RF and detector padders. This calibration and alignment should preferably be made somewhere near the upper 3/4 of each range. Suggested calibration points for each band are as follows:

Band 3	5 MC.
Band 4	9 MC.
Band 5	17 MC.
Band 6	30 MC.

From the bottom sketch on Figure 6 the location of each of the 3 padders for each band may be readily located. Note in particular the location of Band 5 and 6 padders. Adjustments should be made with <u>insulated</u> screw driver type of trimmer tool.

High frequency beat is used on all bands. That is to say, that the oscillator is 465 KC higher in frequency than the signal received.

If sufficient input is used each signal can be received at two points, differing by 930 KC. The other signal is the image or "low beat" signal. The higher frequency signal received, according to the receiver dial, is the proper one and the circuits should be aligned to it.

When using a signal generator or test oscillator to align the set a resistor of about 150 or 200 ohms should be inserted between the signal generator and the antenna connection. This will prevent misaligning of the RF stage caused by the connection of the low impedance of the signal generators output circuit across the receiver input.

ADJUSTMENT OF THE BEAT OSCILLATOR

The beat oscillator has its frequency adjustable from the front panel. If it is found that zero beat does not occur with the pointer vertical, it may be adjusted as follows:

The cabinet bottom is removed and a signal should be tuned in, exactly on resonance as indicated by a maximum meter reading. The BO tone control ("F" Figure 1) pointer should be set vertical. The beat frequency is then adjusted by means of the padder that can be seen through the hole in the side of the beat oscillator shield can. When the padder is adjusted properly zero beat will be obtained when the control "F" is vertical and the beat frequency will rise when the control is turned either to the right or left.