BENCH ALIGNMENT PROCEDURE

MONITORING RECEIVER MODELS 4ER18B1,2 and 4ER19B1,2

RF ALIGNMENT

The operating frequency of the receiver can be changed by replacing the high-frequency oscillator crystal and retuning the oscillator and RF stages. The procedure for making these adjustments is given below. If the receiver needs to be completely realigned, use the procedure outlined on subsequent pages.

EQUIPMENT REQUIRED

1. A non-metallic screwdriver.
2. A vacuum tube voltmeter.
3. A crystal of the proper frequency for the high-frequency oscillator. Use the formula given below to determine the crystal frequency:

Model 4ER18B1,2	Model 4ER19B1,2
$fx=\frac{f_o-10.7\text{ mc}}{4}$ or $f_o=4f + 10.7$ mc	$f_x=f_o-10.7$ mc or $f_o=f_x + 10.7$ mc

4. A signal generator (25-50 mc or 152-174 mc range depending on set being serviced).

PROCEDURE

To change the frequency or to align the RF and Antenna stages proceed as follows:

1. Turn the receiver on and allow two or three minutes warmup.
2. Insert the new crystal in the high-frequency oscillator crystal socket XY301.
3. Connect the vacuum tube voltmeter through a 3-megohm resistor to the grid of the first oscillator (pin 2 of XV309) and ground.
4. Tune the oscillator plate tank coil (L305) for maximum oscillator grid voltage by rotating the iron core for maximum meter deflection. Note this reading and turn the iron core counterclockwise until the voltmeter reads 90% of the maximum value. This decrease in oscillator grid voltage provides optimum stability.

5. Connect the vacuum-tube voltmeter through R315 to the limiter grid and measure the negative voltage with respect to ground.

6. Apply an unmodulated signal of the correct operating frequency to the antenna post (J304). Use enough signal to obtain a reading of 2 or 3 volts on the vacuum-tube voltmeter at the limiter grid.

7. Peak the antenna transformer or trimmer T311 or T312 for ER-19-B, C301 for ER-18-B, for maximum limiter grid voltage. Reduce the input signal as the grid voltage goes to maximum so as to maintain an approximate reading of 3 volts at the limiter grid.

8. For the ER-18-B receivers only, peak the RF trimmers (C304A and C304B) for maximum limiter grid voltage. Decrease the signal so as to maintain a limiter grid voltage of 3 volts. Peak the multiplier trimmer (C334) for maximum limiter grid voltage. Decrease the signal so as to maintain a grid voltage of 3 volts.

9. Modulate the applied signal with approximately 10 kc deviation and peak the discriminator quadrature coil (L307) for a maximum audio output. Make sure that the applied signal is on the correct frequency.

10. With the receiver connected to the proper antenna, turn a signal generator to the assigned operating frequency and air couple it to the antenna. Adjust the signal generator for a weak signal and touch up the antenna input circuit of the receiver.

RECEIVER ALIGNMENT

Under normal conditions the receiver will not require a complete realignment. However, if modifications are made in the IF stages, or if unauthorized persons tamper with the tuning controls, the following procedure is recommended for realignment of the receiver.

EQUIPMENT REQUIRED

1. A non-metallic tuning tool.

2. A vacuum tube voltmeter.

3. A signal generator (output of 10.7 mc and the operating frequency), and a crystal controlled 455 kc oscillator.

PROCEDURE

1. Connect the vacuum tube voltmeter through a 220,000 ohm resistor to XV307-2. Use the 1.5 VAC scale.

2. Apply a crystal controlled 455 kc signal through a .01 ufd capacitor to XV305-1, large enough to give a reading of .5 volts on the vacuum tube voltmeter.

3. Peak T305.

4. Connect the vacuum tube voltmeter between the limiter test jack J303 and ground.

5. Apply a 455 kc signal through a .01 ufd capacitor to XV304-1. Do not apply a signal large enough to saturate the limiter.

6. Peak T304.

7. Connect a 33,000 ohm resistor between lugs 1 and 2 of T303 and peak L1 of T303. (See outline diagram for transformer lugs.)

8. Remove the resistor from lugs 1 and 2 of T303 and connect it between lugs 3 and 4 of T303. Connect a 33,000 ohm resistor between lugs 3 and 4 of T313. Peak L2 of T303.

9. Remove the resistor from lugs 3 and 4 of T303 and lugs 3 and 4 of T313. Connect them between lugs 1 and 2 of T303 and lugs 1 and 2 of T313. Peak L1 of T313.

10. Remove the resistor from between lugs 1 and 2 of T303 and lugs 1 and 2 of T313. Connect the load between lugs 3 and 4 of T313. Peak L2 of T313.

11. Connect the 10.7 mc generator to the grid (pin 1) of the high IF amplifier (XV303).

12. Peak transformer T302 for maximum limiter grid voltage.

13. Apply a 10.7 mc signal to the grid of the first mixer (XV302-1 for ER-18-B and XV309-7 for ER-19-B).

14. Peak transformer T301 for maximum limiter grid voltage. 15 microvolts at 10.7 mc should give a reading of approximately 1 volt at the limiter grid test point.

15. Remove the vacuum tube voltmeter from the limiter grid test point and connect it through a 3-megohm resistor to the grid (pin 2) of the first oscillator (XV309) and ground.

16. Tune the oscillator plate tank coil (L305) for maximum oscillator grid voltage. Note the maximum reading and turn the iron core counterclockwise until the voltmeter

reads 90% of the maximum value; this decrease will provide optimum oscillator stability. The voltage should read approximately 2 volts.

17. Apply a signal at the operating frequency to the antenna input terminal, J304.

18. Peak the antenna trimmers (T311 or T312 for the ER-19-B, C301 for the ER-18-B) for maximum limiter grid voltage. One microvolt at the operating frequency should give a reading of approximately 2 volts at the limiter grid test point.

19. To tune the gated-beam discriminator on the exact operating frequency, a special technique is used. This technique is required as there is no available (discriminator zero) measuring point.

    A. Set a reference crystal oscillator or the station transmitter on the exact operating frequency and transmit a weak signal.

    B. Connect the signal generator to the receiver antenna input terminals.

    C. Tune the signal generator until a zero beat is obtained between the signal generator and the reference oscillator or station signal. This beat will be heard on the speaker.

    D. Remove the reference oscillator or station signal.

    E. Reduce the signal from the signal generator to less than 1 microvolt and recheck the tuning of all circuits ahead of the 2nd mixer.

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COMMUNICATION PRODUCTS DEPARTMENT
GENERAL ELECTRIC COMPANY
LYNCHBURG, VIRGINIA

Printed in U.S.A.