

SECTION VI SUPPLEMENTARY DATA

1. TRANSMITTER PERFORMANCE.

a. **CARRIER FREQUENCY RANGE.**—Four crystal-controlled frequencies are provided. The three plane-to-ground channels may be set up to operate anywhere in the 140- to 144-mc band. The fourth or plane-to-plane channel is 140.580 mc.

b. **CARRIER POWER.**—Five to ten watts for any three frequency assignments in a band 1-mc wide. If three assignments are at the high end of the 140- to 144-mc band, the power output at 140.580 mc will be one watt or more.

c. **FREQUENCY STABILITY.**—Carrier frequency is maintained to within +0.012 per cent and -0.017 per cent between ambient temperatures of -31 degrees Fahrenheit (-35 degrees centigrade) and +140 degrees Fahrenheit (+60 degrees centigrade) by Western Electric 703A Crystal Units.

d. **CRYSTAL FREQUENCY RANGE.**—5.83 to 6.0 mc.

e. **MODULATION SYSTEM.**—High level amplitude modulation.

f. **MODULATION CAPABILITY.**—100 per cent.

g. **AUDIO FIDELITY.**—Less than 2 db variation from the 1000-cycle level through the range of 400 to 3000 cycles.

h. **AUDIO DISTORTION (1000 CYCLES).**—Less than 15 per cent distortion at 95 per cent modulation.

i. **AUDIO SENSITIVITY.**—Audio input level of 0.006 watt sufficient for complete modulation. (DC provided for carbon microphone).

j. **AUDIO INPUT IMPEDANCE.**—100 ohms.

k. **CARRIER NOISE LEVEL (UNWEIGHTED).**—55 db below signal for complete modulation.

2. RECEIVER PERFORMANCE.

a. **TYPE OF RECEIVER.**—Crystal-controlled superheterodyne receiver. The frequency stability is the same as for the transmitter.

b. **FREQUENCY RANGE.**—140- to 144-mc.

c. **INPUT IMPEDANCE.**—Matches 50- to 70-ohm concentric transmission line.

d. **R-F INPUT.**—Two complete r-f channels are provided. The plane-to-plane channel operates on a fixed crystal-controlled frequency. The three plane-to-ground channels operate on any one of three crystal-controlled frequencies selected by remote electrical control.

e. **INTERMEDIATE FREQUENCY.**—10 mc.

f. **BANDWIDTH.**—80 kc at -6 db. 300 kc at -60 db.

g. **AUDIO OUTPUT.**—Two channels each supplying 300 milliwatts to 500-ohm resistive load.

h. **SENSITIVITY.**—Plane-to-Plane Channel: 10 microvolts for 50 milliwatts. Plane-to-Ground Channels: 10 microvolts for 50 milliwatts at each frequency if the three frequencies are within a 1-mc band.

i. **SIGNAL-TO-NOISE RATIO.**—Plane-to-Plane Channel: 10 db at 10 microvolts (30 per cent modulation). Plane-to-Ground Channels: 10 db at 10 microvolts (30 per cent modulation).

j. **AUTOMATIC VOLUME CONTROL.**—Within 6 db from 10 to 100,000 microvolts input.

k. **IMAGE AND UNDESIRED RESPONSES.**—Attenuation -50 db.

l. **FIDELITY.**—Within 6 db from 250 to 2500 cycles.

m. **DISTORTION.**—Less than 15 per cent at 1000 cycles for 30 per cent modulated signals up to 1 volt.

n. **RECEIVER CRYSTAL FREQUENCY RANGE.**—8.125 to 8.375 mc.

3. RECEIVER MODIFICATIONS MADE DURING MANUFACTURE.

During manufacture of the 233A Airborne Radio Equipment, some modifications were made, which resulted in differences in various lots of equipments. A listing of these modifications follows:

a. SERIAL NUMBERS 101 TO 400.

The following changes were made during manufacture of equipments in this lot:

Heater by-pass C33R removed from V5R.

Coupling capacitor C76R removed from between L10.1R and L10.2R.

C108R in FL4R changed from 25 mmf to 50 mmf.

C28R changed from 50 mmf to 25 mmf.

The four changes listed above have little effect on performance and they need not be made in the field.

The five modifications given below have been incorporated in the majority of equipments during manufacture. However, some sets may be in the field without these modifications, and improved performance will result if the following changes are made:

(1) Remove the RD-BL-C cable lead which connects to R35R and connect it to the adjacent terminal of R36R.

(2) Remove the shunt screen resistors R65R and R66R which are connected from screen to ground on socket VS5R and socket VS6R, respectively.

(3) Replace resistors R25R and R26R with 150,000-ohm $\pm 10\%$ 1/2-watt resistors. These resistors are associated with socket VS5R and socket VS6R.

(4) Remove resistor R79R, which is connected between the AVC terminal of the plane-to-plane unit and ground; and remove resistor R80R, which is connected between resistor R18R and a ground lug on socket VS3R.

(5) Connect a one-megohm $\pm 10\%$ 1/2-watt resistor from the screen of tube V3R to ground. Resistor R80R of step (4) can be used for this purpose, by disconnecting it at resistor R18R and connecting it to the bottom terminal of resistor R22R. Connect a one-megohm $\pm 10\%$ 1/2-watt resistor from the gain terminal of the plane-to-plane unit jack strip to ground. The resistor R79R of step (4) can be used for this.

b. SERIAL NUMBERS ABOVE 400.

In most equipments with serial numbers above 400, a potentiometer is provided for fixed gain adjustments, and further filtering has been provided in the dynamotor and the AVC circuit. Some of this lot of

equipments were not provided with this modification and should be modified in the field. See Fig. 8 and the instructions below.

(1) GAIN ADJUSTMENT POTENTIOMETER P1R.

Assemble one Allen Bradley or equivalent Type J 100,000-ohm screwdriver-adjusted locking-type linear-taper potentiometer to a bracket as shown on Fig. 8.

Mount the bracket with its feet extending toward the side of the chassis, to the two studs of the 725-C filter FL2R with two No. 6-32 x 5/16 hexagonal brass nuts. Assemble the bracket on top of the two nuts fastening the filter to the chassis, with the terminals of the potentiometer projecting toward the side of the chassis.

Remove resistor R64R (100,000 ohms) and resistor R24R (50,000 ohms).

Connect resistor R24R (50,000 ohms) between the ground terminal adjacent to terminal 8 of socket VS4R and the top terminal of potentiometer P1R. Connect a white-black "E" wire No. 20 B&S gauge (KS-8640 Wire) between terminal 6 of socket VS4R and the center terminal of P1R.

Connect resistor R64R (100,000 ohms) between terminal 7 of filter FL2R and the bottom terminal of the potentiometer P1R.

(2) PLANE-TO-PLANE AVC VOLTAGE BY-PASS.

Connect a 0.003 mf mica Cornell-Dubilier Type 1W, a Type CM30A302M or a 0.006 mf Western Electric Type 404-A paper capacitor from pin No. 2 (AVC terminal) of the plane-to-plane unit, to a grounding lug on the chassis at the point where capacitor C39R connects to ground.

(3) DYNAMOTOR NOISE REDUCTION BY-PASS.

Connect a 240-mmf capacitor between pin No. 7 of dynamotor plug and a grounding lug placed under the plug mounting screw. Similarly connect another 240-mmf capacitor between pin No. 8 of dynamotor plug and a grounding lug placed under the plug mounting screw.

(4) TUBE SHIELDS E1R AND E2R.

Tube shields have been placed on tubes V2R, V3R, V12R and V13R. When tube shields are placed on these tubes, the tube grounding clamp is removed and the flexible connection from the tube shield is fastened under the grounding stud next to the tube.

INSTRUCTIONS FOR INSTALLATION OF P1R

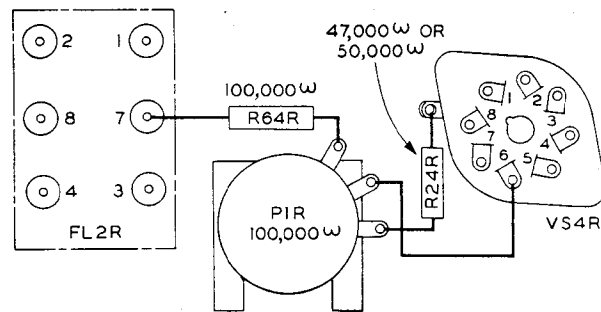
1. Remove R64R (100,000 ohms) located between terminals 3 and 6 on VS4R.
2. Remove R24R (47,000 ohms or 50,000 ohms) located between terminals 6 on VS4R and 7 on FL2R.
3. Mount the potentiometer and bracket on the studs of FL2R as shown in Fig. 8.
4. Connect R64R between the top terminal on P1R and terminal 7 on FL2R. (See the wiring diagram.)
5. Connect R24R between the bottom terminal of P1R and the ground lug on VS4R. (See the wiring diagram.)
6. Connect the black wire (in the set) between the center terminal of Potentiometer P1R and terminal 6 on VS4R. (See the wiring diagram.)
7. Loosen the locking nut of the potentiometer shaft and turn the shaft clockwise to the stop position.
8. Turn the equipment "ON" and adjust the supply voltage to 13.5 volts.
9. Place the CHANNEL SELECTION switch on Position 3, and place the P-P BOTH P-G switch on BOTH.
10. Plug the power output indicator (G.R.583A P.L.I. or equivalent set for 500 ohms) into the headset jack on the front panel. Either a vacuum tube voltmeter or an audiofrequency voltmeter can be used as a power output indicator. If such a voltmeter is used it should have a full scale range of from 10 to 15 volts and should be shunted by a resistor (at least 1/2 watt) of such a value that the parallel combination results in a terminating impedance of 500 ohms.

11. Introduce a 5-microvolt signal, modulated 30% with either 400 or 1,000 cycles per second, from a Ferris 18C Signal Generator into the ANT plug, using the receiver dummy antenna specified for the equipment.

12. Tune the signal generator for maximum audio output.

13. Using a pair of longnose pliers or a screwdriver, being careful to avoid contact with any high voltage, adjust the gain control until the audio output for 5 microvolts input is 100 milliwatts. If a voltmeter terminated to have a 500-ohm impedance is used to indicate audio output power, adjust the gain control to obtain an output reading of 7 volts (approximately 100 milliwatts).

14. Check the input required on each of the other channels to give 100 milliwatts output (7 volts across 500 ohms). The input should be less than 10 microvolts in each case.



Wiring Diagram for Installing P1R

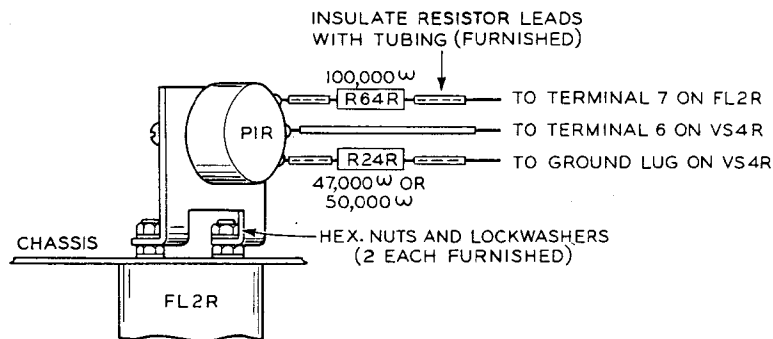
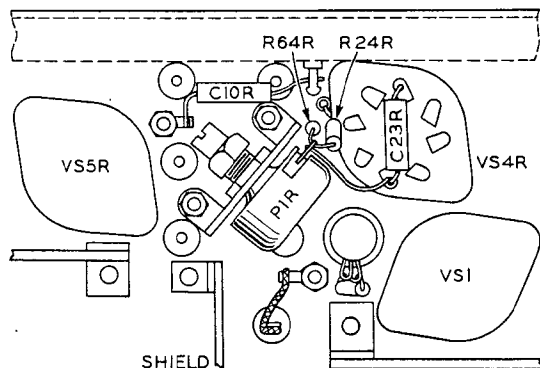


Figure 8—RT-19/ARC-4 Radio Transmitter-Receiver: Modification for Sensitivity Control

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