# COASTAL HARBOR RADIO
# TRANSMITTERS
# AERONAUTICAL COMMUNICATIONS EQUIPMENT MODEL 446-21
# MAINTENANCE

CONTENTS PAGE



## 1. GENERAL

### (A) Scope

1.01 This section describes maintenance tests, alignment procedure, and trouble location methods for the Aeronautical Communications Equipment, Inc., Model 446-21 Radio Transmitter.

### (B) General Safety Practices

**1.02 The sarety precautions prescribed in Section 010-110-001 should be observed at all times when adjusting or servicing this transmitter.**

1.03 The high-voltage relay (K11) remains under control of the remote operating point regardless of the position of the REMOTE-LOCAL switch.

Caution: Never attempt to make internal adjustments and do not touch the external antenna connections without first verifying that the transmitter MAIN SWITCH is open.

## 2. TESTS AND ADJUSTMENTS

### (A) Over-all Performance Test

2.01 The purpose of this test is to determine whether the transmitter is in normal operating condition.

2.02 Apparatus:

None

2.03 Procedure:

(1) With the unmodulated transmitter delivering full power, read all panel meters.

Requirement: The readings shall be approximately the same as those obtained in Paragraph 2.09, Step 28, of this section.

### (B) Adjustment of R21, R23, and R24

2.04 Three adjustable resistors, R21, R23, and R24, are provided to permit adjustment of the current through the windings of relays K1 and K12. These adjustable resistors are located on the underside of the chassis of the radio frequency unit.

2.05 Apparatus:

Volt-Ohm-Milliammeter, KS-14510 or Simpson Model 260, or equivalent.

2.06 Procedure:

Caution: MAIN SWITCH S12 should be opened before changing the tap setting on any of these adjustable resistors.

(1) Measure the dc voltage between pin 8 of relay K1 and chassis.

Requirement: Reading should be 1.4 to 1.8 volts. If this requirement is not met, adjust the tap setting on resistor R21 to obtain a reading of 1.6 volts.

Note The adjustment of resistor R21 affects the operation of keying relay K1 under either local or remote control.

(2) Disconnect the remote keying lead from the KEY terminal on terminal strip TB-14. Connect a dc milliammeter in series with the remote keying lead and the KEY terminal.

(3) Have the remote position operate keying relay K1. Read the indication on the dc milliammeter.

Requirement: The milliammeter should read 18 to 22 ma. If this requirement is not met, adjust resistor R23 to obtain a reading of 20 ma.

Note: If the keying lead is grounded at the transmitter location, either through the contacts of a separate relay or through a strap at terminal strip TB-14, the tap on resistor R23 should be adjusted to place maximum series resistance in the keying lead, and the current measurement described in Steps (2) and (3), above, need not be made. The adjustment of resistor R23 does not affect the operation of keying relay K1 when REMOTE-LOCAL switch S4 is in the LOCAL position.

(4) Disconnect the remote start lead from the START terminal on terminal strip TB-14. Connect a dc milliammeter in series with the remote start lead and the START terminal.

(5) Have the remote position operate start relay K12. Read the indication on the dc milliammeter.

Requirement: The milliammeter should read 65 to 75 ma. If this requirement is not met, adjust resistor R24 to obtain a reading of 70 ma.

Note: If the start lead is grounded at the transmitter location, either through the contacts of a separate relay or through a strap at terminal strip TB-14, the tap on resistor R24 should be adjusted to place maximum series resistance in the start lead, and the current measurement described in Steps (4) and (5) above, need not be made. The adjustment of resistor R24 does not affect the operation of start relay K12 when REMOTE-LOCAL switch S4 is in the LOCAL position.

(C) Transmitter Alignment

2.07 When the transmitter is initially adjusted, the meter readings, dial settings, and operating frequency should be recorded. This record should be kept near the transmitter for future reference.

2.08 Apparatus:

Dummy rf load of proper impedance and power rating

2.09 Procedure:

(1) Open transmitter MAIN SWITCH.

(2) Open the door at the rear of the transmitter cabinet. Remove the perforated shield from the rear of the radio frequency unit.

Caution: High-voltage capacitors C71, C72, C73, and C74 should be discharged with a suitable shorting stick before any adjustments are made inside the transmitter cabinet.

(3) Determine the proper oscillator plate coil (A, B, or M) from the following table:

| Carrier Frequency (Megacycles) | Oscillator Plate Coil |
|---|---|
| 2.0 to 2.5 | M |
| 2.5 to 4.6 | A |
| 4.6 to 8.0 | B |
| 8.0 to 9.0 | A |
| 9.0 to 16.0 | B |

Using the jumper provided, connect the selected oscillator plate coil (A, B, or M) to the proper channel terminal. Channel terminals, designated by channel number, are located just below the oscillator coils.

(4) Determine the proper buffer plate coil (F, G, H, J, or N) from the following table:

| Carrier Frequency (Megacycles) | Buffer Plate Coil |
|---|---|
| 2.0 to 2.5 | N |
| 2.5 to 3.4 | F |
| 3.4 to 4.7 | F (tap) |
| 4.7 to 6.6 | G |
| 6.6 to 9.1 | G (tap) |
| 9.1 to 13.0 | H |
| 13.0 to 16.0 | J |

Using the jumper provided, connect the selected buffer plate coil (F, G, H, J, or N) to the proper channel terminal.

Note: Two terminals, C, and S, are provided for each channel. The C terminal is used to connect the buffer plate coil to the associated channel. The S terminal may be used to ground or short-circuit any other buffer plate coil which may cause interaction. The S-terminal connection is not usually required for any frequency below 13 megacycles.

(5) Determine the required number of turns for the power-amplifier plate coil from the following table:

| Carrier Frequency (Megacycles) | Turns of PA Plate Coil |
|---|---|
| 2.0 to 2.5 | 39 |
| 2.5 to 3.0 | 33 |
| 3.0 to 3.5 | 30 |
| 3.5 to 4.5 | 27 |
| 4.5 to 5.5 | 24 |
| 5.5 to 6.5 | 18 |
| 6.5 to 8.0 | 12 |
| 8.0 to 10.0 | 10 |
| 10.0 to 13.0 | 7 |
| 13.0 to 16.0 | 5 |

Count the number of turns from the bottom of the coil. Connect the inductance tap associated with the desired channel to the proper turn. The inductance taps are connected to insulators which are designated by channel numbers and which are adjacent to the power-amplifier plate coil.

Note: For frequencies in the range of 13 to 16 megacycles, use the maximum number of turns which can be tuned to the desired frequency. This permits the use of a low value of tuning capacitance.

Caution: Never use less than two full turns of the power-amplifier plate coil. Use of less than two full turns will cause excessive current in the coil.

(6) Using the jumper provided, connect the stator sections of the power amplifier plate tuning capacitor in the required single or parallel arrangement. The parallel arrangement is required for frequencies in the range of 2 to 4 megacycles, and the parallel arrangement is made by connecting the jumper between the two stator terminals. For frequencies in the range of 4 to 16 megacycles, the single arrangement is required, and the single arrangement may be made either by removing the jumper entirely or by connecting both ends of the jumper to a single stator terminal.

(7) Employing exactly the same procedure and frequency ranges given in Step (6), connect the antenna tuning capacitor in the required single or parallel arrangement.

(8) Connect the radio frequency output terminal to the proper antenna terminal or coaxial fitting. The radio frequency output terminals, designated by channel number, are mounted on the support at the rear of the antenna tuning capacitors.

(9) Replace the shield which was removed from the rear of the radio frequency unit. Close the door at the rear of the transmitter.

(10) Disconnect the coaxial transmission line or the antenna from the transmitter. Connect the dummy load to the transmitter.

Caution: While disconnected from the transmitter, the antenna or the center conductor of the coaxial transmission line should be grounded to prevent the accumulation of a static charge which might become sufficient to give a painful electric shock.

(11) Set the ANT dial at 100.

(12) Operate the REMOTE-LOCAL switch to the LOCAL position.

(13) Operate the LOCAL switch to the desired channel.

(14) Close the transmitter MAIN SWITCH.

Note: After Steps (12), (13), and (14) have been completed, the remote control point can energize the high-voltage supply of the transmitter even though the REMOTE-LOCAL switch is in the LOCAL position.

Caution: Do not touch the antenna, the antenna terminals, or the coaxial fittings without first making sure that the transmitter MAIN SWITCH is open.

(15) Adjust the line voltage to 220 volts, as read on the LINE VOLTS meter, by means of the PRIMARY VOLTAGE tap switch.

(16) Energize the high-voltage supply.

Note: The high-voltage supply is energized when high-voltage relay K11, which is located in the power unit of the transmitter, is operated. Relay K11 is normally under control of a separate relay in the applique circuit. Blocking this separate relay in the operated position will operate high-voltage relay K11.

(17) Operate the TEST KEY.

(18) Adjust the OSCILLATOR dial for maximum buffer grid current as read on meter BUFFER GRID.

(19) Adjust BUFFER dial for maximum power-amplifier grid current as read on meter PA GRID.

Requirement: Maximum power-amplifier grid current should not exceed 20 ma. If this requirement is not met, adjust BUFFER dial toward a lower setting until power-amplifier grid current is approximately 20 ma.

(20) Adjust PLATE dial for maximum power-amplifier screen-grid current as read on meter PA SCREEN.

(21) Load the power-amplifier stage by decreasing the ANT dial settings in small steps, repeating Step (20) for each setting of the ANT dial, until the proper computed value of power-amplifier plate current is obtained.

Requirement: The computed value of power-amplifier plate current shall be 240 to 265 ma. The value of power-amplifier plate current is computed from the panel meter readings as follows:

$$I_p = {}^{*}\text{PA PLATE} - \text{PA GRID} - \text{PA SCREEN}$$

* Reading on meter PA PLATE includes the power-amplifier control-grid and screen-grid currents.

Note: A reaction between the plate and grid circuits of the power-amplifier stage may be noticed under certain conditions. This is particularly true when one channel is operated at the high-frequency end of the range, and the other channels are operated at the low-frequency end of the range. This reaction may be eliminated by shifting the power-amplifier inductance taps of the low-frequency channels a few turns one way or the other.

(22) Read the nine meters on the transmitter panel and observe the position of the tuning dials. If this is an initial line-up, record the meter readings and the dial settings for future checks.

Requirement: Refer to the meter readings given in Table I for typical values.

(23) Open the transmitter MAIN SWITCH.

(24) Disconnect the dummy load. Connect the antenna or transmission line to the proper antenna terminal or coaxial fitting.

(25) Close the transmitter MAIN SWITCH.

(26) Operate the TEST KEY.

(27) Repeat Steps (20) and (21), but, instead of decreasing the ANT dial setting as directed in Step (21), make small adjustments to either side of the ANT dial setting as required, repeating Step (20) after each adjustment of the ANT dial.

(28) Read the nine meters on the transmitter panel and observe the position of the tuning dials. If this is an initial line-up, record the meter readings and the dial settings for future checks.

Requirement: Refer to the meter readings given in Table I for typical values.

(29) Lock the transmitter tuning dials in the positions established by Steps (18) to (27).

(30) Remove the block from the relay in the applique circuit.

(31) Operate the LOCAL switch to the OFF position.

(32) Operate the REMOTE-LOCAL switch to the REMOTE position in order to restore control to the remote operating point.

TABLE I

| Meter | Typical Meter Readings at Indicated Carrier Frequencies 2.5 Megacycles | 7.5 Megacycles | 12.5 Megacycles |
|---|---|---|---|
| BUFFER GRID (ma) | 0.80 | 0.80 | 0.65 |
| BUFFER PLATE (ma) | 45 | 48 | 48 |
| PA GRID (ma) | 20 | 20 | 12 |
| PA PLATE (ma) * | 355 | 355 | 310 |
| PA SCREEN (ma) ** | 60 to 100 | 60 to 100 | 25 to 45 |
| BUFFER PLATE (volts) | 700 | 700 | 700 |
| PA PLATE (volts) | 1700 | 1700 | 1700 |
| MOD SPACE (ma) | | | |
| No modulation | 50 | 50 | 50 |
| 85% modulation (1000 cps) | 220 | 220 | 220 |
| LINE VOLTS | 220 | 220 | 220 |

* Includes PA GRID and PA SCREEN currents.
** The power amplifier screen-grid current varies with different sets of power amplifier tubes.

(D) Modulation Adjustment

2.10 Where a D-151165 Monitoring Panel is installed at the transmitter, the average percentage of modulation may be checked by observing the meter on the panel; quality may be judged by monitoring the circuit. During initial line-up and in locating trouble, however, a cathode-ray oscilloscope will be useful.

2.11 Apparatus:

Cathode-Ray Oscilloscope

2.12 Procedure:

(1) To obtain a sinusodial modulation pattern on the screen, connect the cathode-ray oscilloscope as follows:

(a) To one of the vertical input terminals, connect a pickup wire which is long enough to reach the top of the transmitter cabinet.

(b) Connect the other vertical input terminal to ground.

(c) Turn on the oscilloscope and apply the horizontal sweep voltage.

(d) Place the pickup near enough to the transmitter to secure a satisfactory pattern on the oscilloscope when the transmitter is energized.

Note: The amount of rf input signal that is required to produce a satisfactory pattern on the oscilloscope depends upon the amount of amplification that can be obtained through the vertical amplifier of the oscilloscope. In some cases, it may be necessary to place the pickup wire near the plate coil of the power amplifier by running the pickup wire through one of the ventilating holes near the top of the rear door of the transmitter cabinet. Do not allow the pickup wire to come into direct contact with any internal part of the transmitter.

Caution: Do not touch the pickup wire or the vertical input terminals of the oscilloscope while the transmitter is energized. Do not attempt to place the pickup wire near the plate coil without first opening the transmitter MAIN SWITCH.

(2) Set the SUPPRESSION dial at 10. This is a screwdriver adjustment which is located at the rear of the modulator chassis.

Note: With the SUPPRESSION dial set at 10, there is no suppression of the audio signal.

(3) With normal speech input being supplied to the transmitter from the control terminal, adjust the GAIN control until the indicated percentage of modulation on voice peaks is approximately 100 per cent.

Caution: The percentage of modulation must not exceed 100 per cent at any time.

(4) Adjust the SUPPRESSION control until the indicated percentage of modulation on voice peaks is reduced to about 95 per cent.

(5) Record the settings of the GAIN control and the SUPPRESSION control.

## 3. ROUTINE MAINTENANCE

### (A) Air Filter Replacement

3.01 Replace the air filter when it becomes evident that clogging impedes the free circulation of air through the transmitter cabinet.

### (B) Relay Maintenance

3.02 Apparatus:

265C Burnishing Tool

3.03 Check relays K2 and K3 for proper spring tension, ease of operation, and cleanliness of contacts. Contacts should be burnished with a 265C burnishing tool.

Caution: Do not use a file on relay contacts.

3.04 Keying relay K1 is hermetically sealed and requires no maintenance. There are two windings and each winding has approximately 160 ohms resistance. Normal operating current of winding 2-3 is 18 to 22 ma. Normal bias current through winding 1-8 is 9 to 11 ma.

3.05 High-voltage relay K11 and start relay K12 are sealed mercury relays and require no maintenance. The coil resistance of each relay is approximately 260 ohms, and each relay should operate on 60 ma or less.

3.06 Time-delay relay K13 is a sealed mercury relay and requires no maintenance. Nominal operating voltage is 110 volts at 50/60 cycles. Delay time is 25 to 45 seconds.

### (C) Connections

3.07 Check the tightness of all mechanical connections and mountings which may have been loosened by vibration. Examine the transmitter wiring carefully for fraying or chafing against metal edges. Check the electrical connections and tighten any loose connections that are found.

### (D) Vacuum Tubes

3.08 Apparatus:

Tube Tester KS-15560

3.09 Make routine inspections to determine if any tubes have become loose in their sockets. Do not remove a tube unless it is suspected of being a source of trouble. Doubtful tubes may be tested either in a tube tester or by substitution of a tube which is known to be good. Certain tubes can be tested only by substitution.

Note: When a tube is checked by substitution and the substitution does not improve the performance of the stage, return the old tube to the socket from which it was removed.

3.10 The filament of a new mercury-vapor rectifier tube should be allowed to operate at least 20 minutes before the applications of plate voltage to the tube in order to evaporate all mercury from the filament and upper parts of the tube.

## 4. REPAIR OF CHANNEL SELECTION SWITCH S1

### (A) General

4.01 Channel selection switch S1 consists of four mechanically separate sections as follows:

Power-Amplifier Section
Oscillator-Buffer Section
Crystal-Selector Section
Channel-Selector Section

4.02 If it becomes necessary to disassemble switch S1 for repairs or other purposes, the methods described below should be employed when disassembling and realigning the switch.

### (B) Disassembly of Switch S1

4.03 Apparatus:

Wrench, Allen, size 6-32

#### Power-Amplifier Section

4.04 Procedure:

(1) Loosen the set screw on the flexible shaft coupling which is located in the top of the buffer compartment.

(2) Remove the power-amplifier section of the switch shaft through the top bearing plate.

(3) Remove the three ceramic posts which hold the top wafer to the assembly.

(4) Disconnect, at their terminals, the four wires which are connected to the wafer.

(5) Remove one of the insulating fingers which serves to hold the rotor in alignment with the stator. This will permit separation of the rotor from the stator.

(6) The top wafer may now be removed.

(7) Additional wafers may be removed by repeating Steps (3) to (6) for each wafer.

Oscillator-Buffer Section

4.05 Procedure:

Buffer Wafers

(1) Loosen the set screw on the flexible shaft coupling which is located in the top of the buffer compartment.

(2) Disconnect the Jones plug from the channel-selector assembly. The channel-selector assembly is accessible from the underside of the chassis of the radio frequency unit.

(3) Remove the four mounting screws which hold the channel-selector assembly in place.

(4) Remove the channel-selector assembly. The switch shaft which passes through the wafers of the oscillator-buffer section and the crystal-selector section is a part of the channel-selector assembly.

(5) The three buffer wafers are now accessible for repair or removal.

Oscillator Wafers

(6) Disconnect the five wires which connect the oscillator assembly to its associated circuits in the oscillator compartment.

(7) Remove the four hexagonal nuts which secure the oscillator assembly to the chassis. These nuts are accessible from the bottom of the oscillator-buffer compartment.

(8) The two oscillator wafers are now accessible for repair or removal.

Crystal-Selector Section

4.06 Procedure:

(1) Follow the procedure described in Paragraph 4.04, Steps (1) to (4) and Steps (6) and (7). The one wafer of the crystal-selector section is secured to the oscillator assembly.

Channel-Selector Section

4.07 Procedure:

(1) Follow the procedure described in Paragraph 4.05, Steps (1) to (4). The one wafer of the channel-selector section is secured to the channel-selector assembly.

(C) Alignment of Switch S1

4.08 Apparatus:

Wrench, Allen, size 6-32

4.09 Procedure:

(1) Align the notched sides of the rotor of the switch wafers in the oscillator-buffer section, the crystal-selector section, and the channel-selector section of switch S1.

(2) Pass the switch shaft of the channel-selector assembly through the switch rotors and fasten the channel-selector assembly to the chassis with the four mounting screws.

(3) Connect the Jones plug to the channel-selector assembly.

(4) Manually operate the driving member of rotary solenoid K3 to the mechanical stop which places the oscillator-buffer section of switch S1 midway between channels 1 and 1A.

Note: The channel position may be determined by noting the position of the pickup tab on one of the oscillator-buffer wafers.

(5) Manually rotate the power-amplifier section of switch S1 until it is midway between channels 1 and 1A and is centered in its ball-bearing detent.

(6) Tighten the set screw on the flexible shaft coupling which is located in the top of the buffer compartment.

## 5. TROUBLE LOCATION

5.01 Since unnecessary radiation of carrier power is likely to cause interference, a dummy rf load should be used when making tests or adjustments which require that the rf section of the transmitter be energized.

Caution: Do not touch the antenna, the antenna terminals, nor the coaxial fittings without first verifying that the transmitter MAIN SWITCH is open.

5.02 Open the transmitter MAIN SWITCH before making internal adjustments or removing tubes.

5.03 The troubles which may occur in the Model 446-21 Radio Transmitter may be classified into the following general categories:

(A) No Power Output

(B) Low Power Output

(C) Faulty Modulation

(D) Faulty Control Circuit Operation

(A) No Power Output

5.04 Apparatus:

Tube Tester, KS-15560

Volt-Ohm-Milliammeter, KS-14510 or Simpson Model 260, or equivalent

Dummy rf load of proper impedance and power rating

5.05 Procedure:

(1) Make a visual inspection of the transmitter with all power off. Check the fuses. Examine all circuit components for evidence of overheating or damage. Look for broken wires and loose connections.

(2) Apply primary power and check to see that the tube filaments are lighted.

(3) Energize the high-voltage supply and compare the panel meter readings with those obtained in Part 2(C), above.

(4) Check the tube or tubes of the suspected stage either in a tube tester or by substitution of a tube which is known to be good.

Note: When a tube is checked by substitution, and the substitution does not correct the trouble, return the original tube to its socket.

(5) Make voltage and resistance measurements of the suspected stage or circuit. Typical tube socket voltages are given in Paragraph 5.14, and typical resistance measurements are given in Paragraph 5.15.

(B) Low Power Output

5.06 The most likely causes of low power output are the following:

(1) Low supply voltages.

(2) Faulty tubes.

(3) Misalignment.

5.07 Apparatus:

Tube Tester KS-15560

Volt-Ohm-Milliammeter, KS-14510 or Simpson Model 260, or equivalent

Dummy rf load of proper impedance and power rating

5.08 Procedure:

(1) Energize the transmitter and compare the panel meter readings with those obtained in Part 2(C), above.

(2) Check the tube or tubes of the suspected stage either in a tube tester or by substitution of a tube known to be good.

(3) Make voltage and resistance measurements of the suspected stage or circuit. Typical tube socket voltages are given in Paragraph 5.14, and typical resistance measurements are given in Paragraph 5.15.

(4) Check the alignment of the transmitter, following the procedure given in Part 2(C), above.

(C) Faulty Modulation

5.09 Apparatus:

Tube Tester KS-15560

Volt-Ohm-Milliammeter, KS-14510 or Simpson Model 260, or equivalent

Dummy rf load of proper impedance and power rating

Cathode-Ray Oscilloscope

Test Headset

5.10 Procedure:

(1) Apply primary power and check to see that the filaments of the tubes in the modulator are lighted. (Tubes having metal envelopes may be tested for warmth.)

(2) Compare the settings of the GAIN control and the SUPPRESSION control with those obtained in Part 2(D), above.

(3) Remove all power from the transmitter and bridge the test headset across the incoming line at terminals AUD A and AUD B of terminal strip TB-14. Check the incoming audio signal for relative level and quality.

(4) Test the tubes in the modulator unit.

(5) Proceed with a stage-by-stage check of voltage and resistance measurements in the modulator unit. Typical tube socket voltages are given in Paragraph 5.14, and typical resistance measurements are given in Paragraph 5.15.

5.11 After the trouble has been located and corrected, check the modulation adjustment in accordance with the procedure given in Part 2(D), above.

## (D) Faulty Control Circuit Operation

5.12 Apparatus:

Volt-Ohm-Milliammeter, KS-14510 or Simpson Model 260, or equivalent.

5.13 **Procedure:**

**(1) Check the operation of the control circuits with the description given in Section 403-242-100.**

(2) Measure the dc voltage between ground and the +LV terminal on terminal strip TB-2.

Requirement: This voltage should measure +27 to +33 volts. If this requirement is not met, check the low-voltage rectifier, CR2, and its associated circuits.

(3) Measure the dc voltage between ground and the BIAS terminal on terminal strip TB-1.

Requirement: This voltage should measure -110 to -120 volts. If this requirement is not met, check the bias rectifier tube, V18, and its associated circuits.

## (E) Voltages and Resistances

5.14 Table of Tube Socket Voltages: Unless otherwise indicated, voltages are measured between ground and the tube socket pins. Voltages measured on a particular transmitter may differ from the typical values given in the table due to resistor tolerances and variations in tubes and line voltage.

Typical
Tube Socket Voltages

| Tube | | | Tube Pin Numbers | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Symbol | Type | Circuit | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Cap |
| V1 | 6AK5/5654 | Oscillator | | 50 | HT | HT | 200(1) | 165 | 50 | | |
| V2 | 807 | Buffer | HT | 240 | -65(2) | | HT | | | | 700 |
| V3 | 4-125A | PA | HT | 380(4) | -215(3) | 380(4) | HT | | | | 1700(5) |
| V4 | 4-125A | PA | HT | 380(4) | -215(3) | 380(4) | HT | | | | 1700(5) |
| V11 | 6SG7 | Speech Amp. | | HT | 0.25 | | | 20 | HT | 37 | |
| V12 | 6SG7 | Speech Amp. | | HT | 0.25 | | | 20 | HT | 37 | |
| V13 | 6SG7 | Speech Amp. | | HT | 4.7 | | | 115 | HT | 135 | |
| V14 | 6SG7 | Speech Amp. | | HT | 4.7 | | | 115 | HT | 135 | |
| V15 | 828 | Modulator(6) | HT | 700 | -115 | 55 | HT | | | | 1700 |
| V16 | 828 | Modulator(6) | HT | 700 | -115 | 55 | HT | | | | 1700 |

HT = Filament connection.

Note 1: Measure C5 to ground with the TEST KEY operated.

Note 2: Measure C11 to ground.

Note 3: When meter PA GRID reads 20 ma. Measure C20 or C21 to ground.

Note 4: When meter PA SCREEN reads 80 ma. Measure at SCREEN terminal on TB-2.

Note 5: Measure at terminal E1.

Note 6: Cathode voltage measured at terminal MOD K on TB-11 is 0 volts with TEST KEY depressed and 200 volts with TEST KEY released.

5.15 Table of Resistance Measurements: The typical resistance values given in the following table were measured between ground and the tube socket pins. Resistance values obtained on a particular transmitter may differ from those given in the table due to resistor tolerances. All power must be off when making resistance measurements.

Typical
Resistance Measurements

| Tube | | | Tube Pin Numbers | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Symbol | Type | Circuit | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Cap |
| V1 | 6AK5/5654 | Oscillator | 100K | 8K | 0 | 0 | 25K | 30K | 8K | | |
| V2 | 807 | Buffer | 0 | 31K | 16K | 0 | 0 | | | | 4400 |
| V3 | 4-125-A | PA | 0 | 3300 | 12K | 3300 | 0 | | | | 50K |
| V4 | 4-125-A | PA | 0 | 3300 | 12K | 3300 | 0 | | | | 50K |
| V11 | 6SG7 | Speech Amp. | 0 | 0 | 100 | 110K | 100 | 46K | 0 | 300K | |
| V12 | 6SG7 | Speech Amp. | 0 | 0 | 100 | 110K | 100 | 46K | 0 | 300K | |
| V13 | 6SG7 | Speech Amp. | 0 | 0 | 1500 | 250K | 1500 | 70K | 0 | 105K | |
| V14 | 6SG7 | Speech Amp. | 0 | 0 | 1500 | 250K | 1500 | 70K | 0 | 105K | |
| V15 | 828 | Modulator | 160K | 4300 | 300K | 510 | 160K | | | | 50K |
| V16 | 828 | Modulator | 160K | 4300 | 300K | 510 | 160K | | | | 50K |
| V17 | 6H6 | Suppressor | - | 0 | 50K | 125K | 50K | - | 0 | 125K | |
| V18 | 5U4G | Bias Rect. | - | 0 | - | 1500 | - | 1500 | - | 0 | |
| V19 | 866A | 700V Rect. | 4500 | - | - | 4500 | | | | | 20 |
| V20 | 866A | 700V Rect. | 4500 | - | - | 4500 | | | | | 20 |
| V21 | 866A | 1700V Rect. | 50K | - | - | 50K | | | | | 45 |
| V22 | 866A | 1700V Rect. | 50K | - | - | 50K | | | | | 45 |

All values are shown in ohms.

K = 1000.