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OPERATING AND MAINTENANCE MANUAL
for
TRANSMITTER RT-3R
and
POWER SUPPLY RT-3PS

COPY 81 OF 305.

ORIGINAL CL BY 235979
☐ DECL ☒ REVW ON 16/06/2010
EXT BYND 6 YRS BY SAME
REASON 3 d (3)

DOC 1 REV DATE 16 JUN 1980 BY 064540
ORIG COMP 056 OPI 56 TYPE 30
ORIG CLASS M PAGES 33 REV CLASS C
JUST 22 NEXT REV 2010 AUTH: HR 10-2

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Declassified in Part - Sanitized Copy Approved for Release 2012/05/29 : CIA-RDP78-03642A000300010001-6

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PART I

TRANSMITTER TR-3R

LIST OF ILLUSTRATIONS

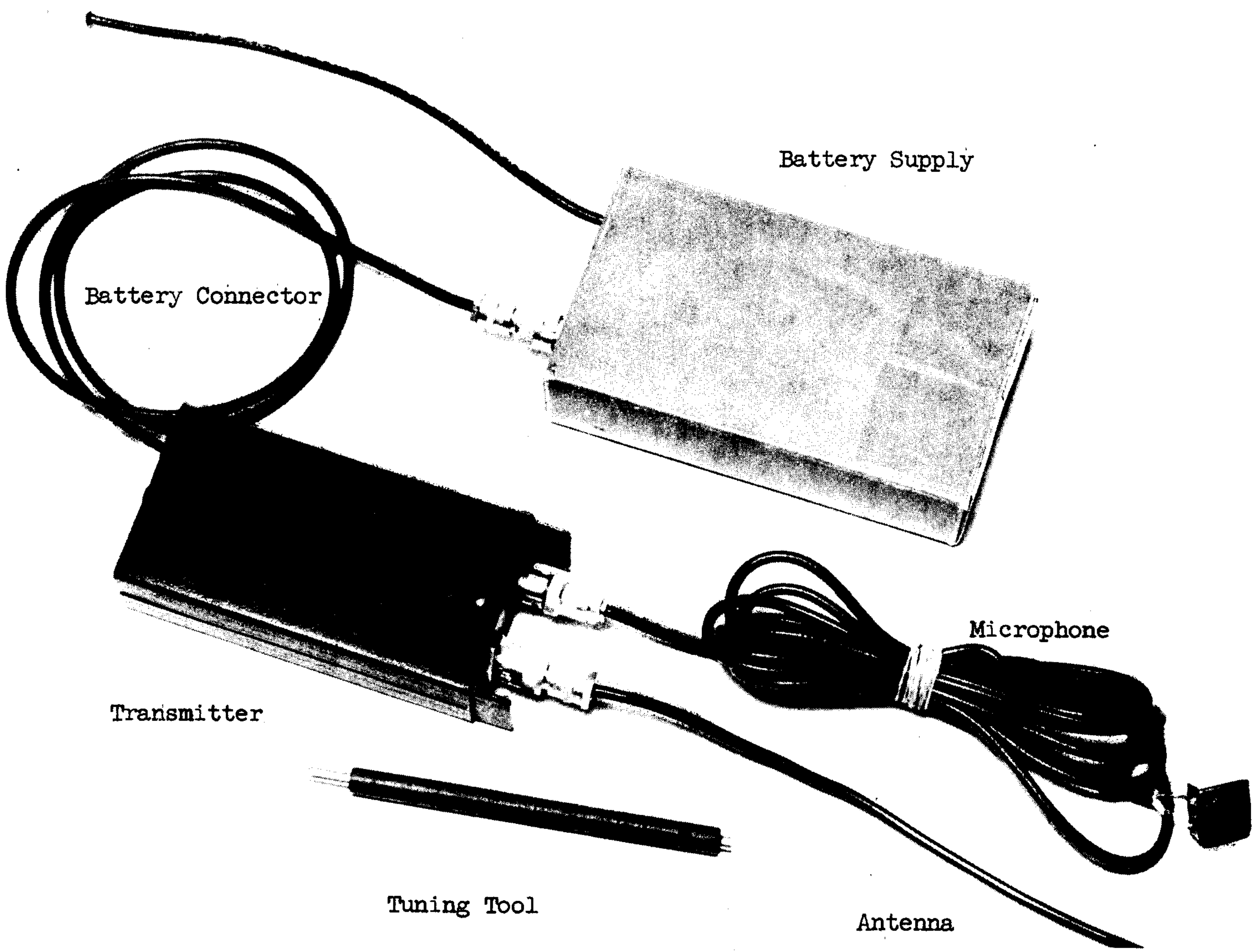


Figure I-1 TRANSMITTER RT-3R

PART I

1. INTRODUCTION

1.1 SCOPE

Part I of this instruction manual contains information for the operation and maintenance of the transmitter, Model RT-3R. The equipment is shown in Figure I-1.

1.2 GENERAL DESCRIPTION

The transmitter RT-3R is an FM transmitter, [redacted] 25X1
25X1
It is an improved version of the RT-3. Transistors and 25X1
subminiature components have been used to minimize size and reduce power consumption. The unit may be battery-operated, or may operate on either 110 vac or 220 vac when used with a power supply, as outlined in Part II of this manual.

1.3 GENERAL SPECIFICATIONS

Operating Frequencies	- 55 mc to 63 mc 64 mc to 72 mc 73 mc to 81 mc
Type Modulation	- Frequency Modulation
Deviation Sensitivity	- Adjustable (minimum setting of control produces between 1 kc/100 μv to 3 kc/100 μv. Maximum setting of control produces 15 kc/100 μv to 20 kc/100 μv. (5 kc/100 μv and 10 kc/100 μv points are clearly indicated by green and red marks respectively.)
Audio Frequency	- ±1 db between 500 cps and 5 kc, not more than 3 db down from 1 kc at 200 cps and 10 kc.
Hum and Noise	- .5 kc maximum
Microphone	- [redacted] MC-30 microphone supplied 25X1
R. F. Power Output	- 7 mw or greater
D C Power Input	- Approximately 65 mw maximum
Voltage	- 6.5 ±.5
Current	- 10 ma or less
Output Impedance	- Approximately 50 ohms

Antenna	- Quarter wave whip antenna supplied
Dimensions	- Approximately 3 13/16" x 1 3/4" x 3/4"
Weight	- Approximately 6 oz.
Finish	- Black wrinkle

1.4 EQUIPMENT LIST

a. Transmitter

1.) Microphone

2.) Antenna

3.) Tuning Tool

4.) Power Cord Extension

5.) Three (3) Antenna Connectors

6.) Three (3) Microphone Connectors

b. AC Power Supply

c. Battery Pack

2. CIRCUIT DESCRIPTION

2.1 GENERAL

The complete transmitter circuit is shown in Figure I-2. The circuit consists of a frequency modulated oscillator, Q3; an r.f. amplifier, Q4; and a two-stage audio amplifier, Q1 and Q2.

Modulation is accomplished by varying the reactance of the diode modulator CR1. The operating frequency is determined by the Oscillator Tuning Adjustment, incorporated in T1. Modulation sensitivity is controlled by the setting of potentiometer, R5.

2.2 DETAILED DESCRIPTION

a. R.F. Section

Oscillator Circuit

Q3 is the oscillator transistor, connected in the common base configuration. The oscillator output tuned circuit consists essentially of the primary of T-1 and C13. C14 (a negative temperature coefficient capacitor) compensates for changes in frequency due to temperature. Modulation is accomplished by the diode CR1 which acts as a variable capacity with changing bias. C10 is an r.f. voltage dropping capacitor, selected for proper modulation sensitivity and linearity. R14, R15, and R16 provide temperature stable operating bias for the oscillator. C9 and C11 are r.f. bypass capacitors. Feedback, required to maintain oscillation, is provided by C12. RFC1 is an r.f. choke. R13 is an isolating resistor, used to prevent Q2 from shorting out the r.f. at CR1. R17 and R18 are DC bias resistors for CR1. C16 is an audio coupling capacitor.

R.F. Amplifier Circuit

Q4 is the r.f. amplifier transistor, connected in the common emitter configuration. The oscillator output is coupled to the r.f. amplifier input through T1. Tuning is accomplished by adjusting the tuned circuit of T2. The frequency amplified is primarily determined by the value of T2 and the resonating capacitor, C8. C7 is an r.f. bypass capacitor.

R12 is a current limiting resistor for the r.f. amplifier stage. J2 is the antenna connector.

b. Audio Section

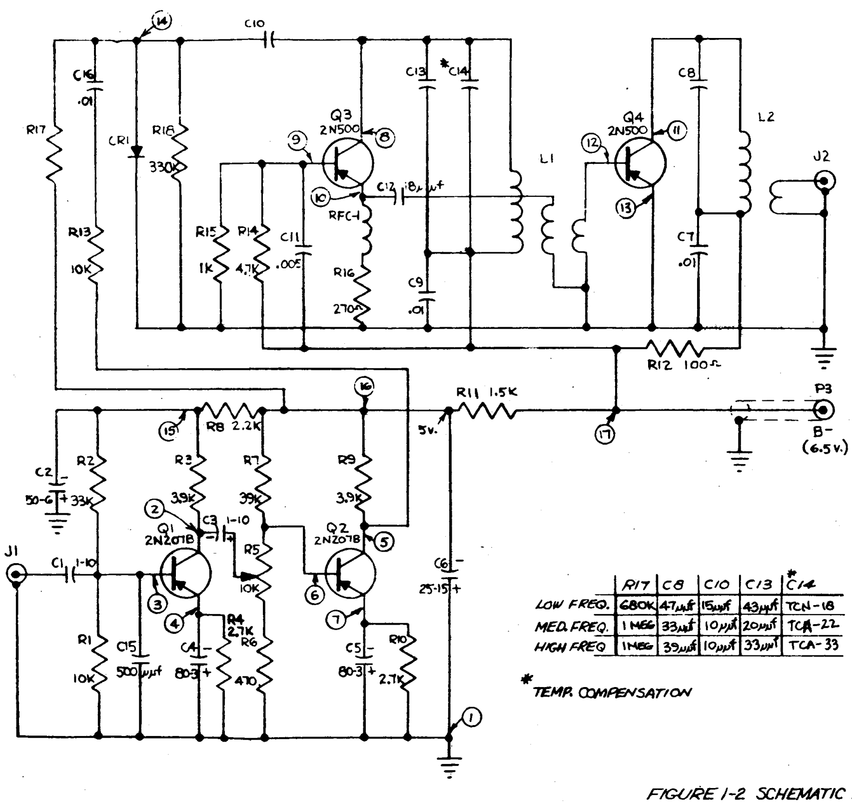
Audio Amplifier Circuit

Q1 is the first audio amplifier transistor, connected in the common emitter configuration. J1 is the microphone input jack. The microphone output is coupled to the base of Q1 by C1. C2 performs two functions: (1) decoupling capacitor, (2) ripple filter. R1 and R2 form a voltage divider to provide base bias for Q1. The combination of R1, R2, and R4 provides temperature stable dc bias for Q1. R3 is the collector load resistor. C15 is an r.f. bypass capacitor. C4 is an audio bypass capacitor. R8 is a decoupling resistor. C3 is a coupling capacitor between Q1 and Q2.

Q2 is the second audio amplifier transistor, connected in the common emitter configuration. The combination of R5, R6, R7, and R10 provides temperature stable dc bias for Q2. Modulation sensitivity is adjusted by means of potentiometer R5. C5 is an audio bypass capacitor. R9 is the collector load resistor. C6 performs two functions, (1) decoupling capacitor, and (2) ripple filter. R11 is a decoupling resistor. P3 is the power input jack.

c. <u>Battery Supply</u>

The battery supply consists of five (5) "Mallory" RM-12R cells connected in series and assembled in a cardboard case.



	R17	C8	C10	C13	C14*
LOW FREQ.	680K	47μμf	15μμf	43μμf	TCN-18
MED. FREQ.	1 MEG	33μμf	10μμf	20μμf	TCA-22
HIGH FREQ	1 MEG	39μμf	10μμf	33μμf	TCA-33

*TEMP. COMPENSATION

FIGURE 1-2 SCHEMATIC DIAGRAM
TRANSMITTER RT-3R

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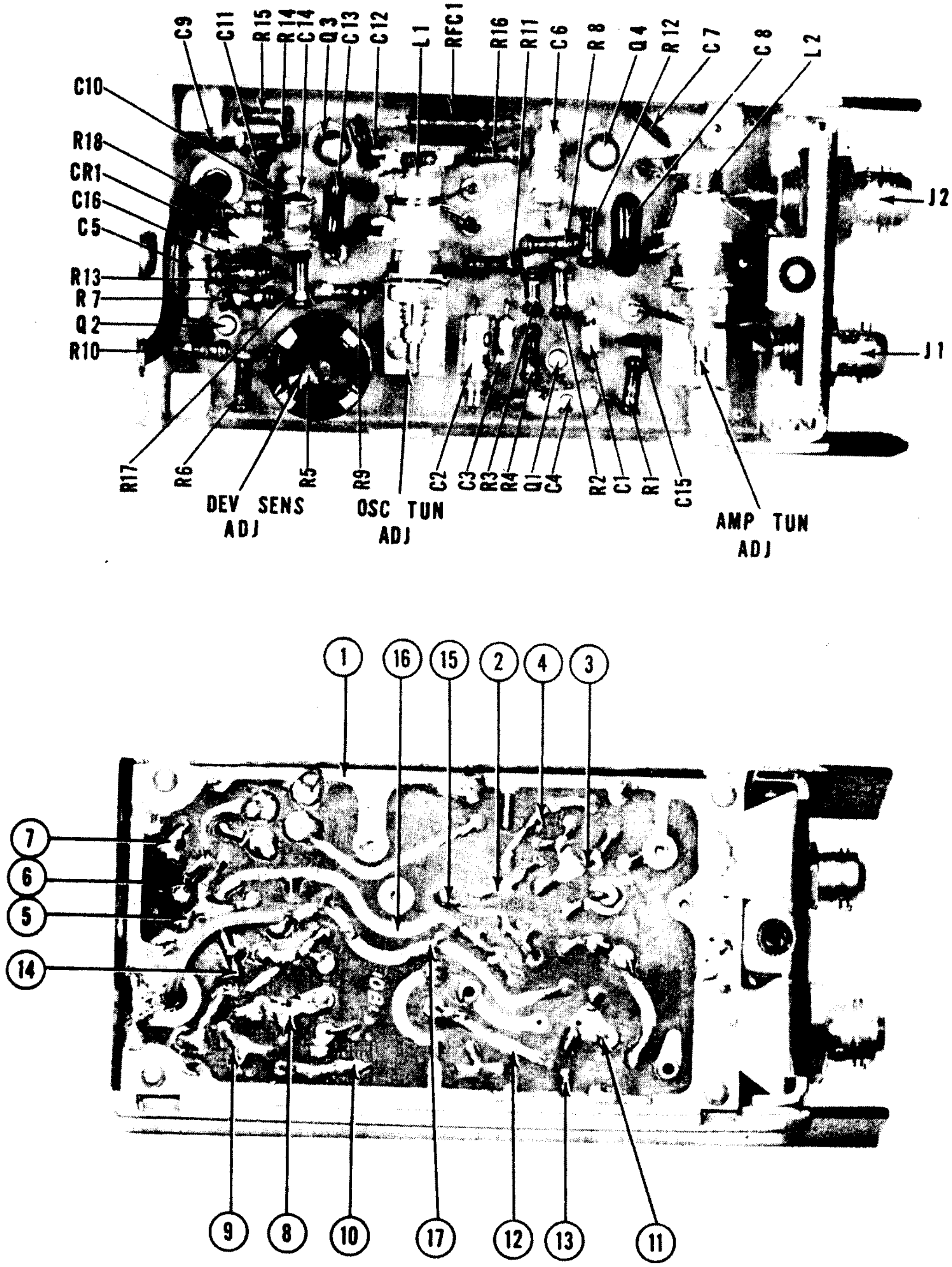

Figure I-3 COMPONENTS LAYOUT AND TEST POINTS

3. OPERATION

3.1 GENERAL

The transmitter RT-3R is designed to operate continuously and without attention. Therefore, this section will be concerned mainly with preparing the unit for use. This may best be accomplished in a laboratory, prior to final installation.

3.2 TEST EQUIPMENT

a. Required

FM Signal Generator - Boonton Radio Corp., Type 202E, or equivalent

Audio Oscillator - Hewlett Packard, Model 200AB, or equivalent

Microvolter - General Radio, Type No. 546-C, or equivalent

Oscilloscope - Dumont, Type 304-A, or equivalent

Receiver - ASR-1, or equivalent (See Section 3-4)

b. Optional

Vacuum Tube Voltmeter - Ballantine, Model 314, or equivalent.

R.F. Indicator - Special

3.3 OPERATING PROCEDURE

a. Identification of Frequency Range

Each unit is set on one of three frequency ranges. A dot of paint is placed on one end of the transmitter case in order to identify its frequency range, as follows:

Color	Frequency Range
Green	55 mc to 63 mc
Blue	64 mc to 72 mc
White	73 mc to 81 mc

b. Operation

1. Determine whether the transmitter will be battery-operated or operated from a line voltage of 110 vac or 220 vac. If the unit is to be operated from line voltage, refer to Part II of this manual, Power Supply Operation. If the unit is to be battery-operated, continue with the next step.

2. Connect the battery-pack supplied, to the transmitter, as shown in Figure I-1. If it is desired to operate the transmitter longer than the expected life of the battery pack (360 hours) without changing batteries, two or more packs may be connected in parallel, as shown below.

Figure I-4 Battery Packs Connected in Parallel

3. Attach the antenna and the microphone to the transmitter.

4. The unit should now be operating, providing the adjustments have not been changed since delivery.

c. Identification of Adjustments (Figure I-3)

Name	Function	Ref. Symbol
Deviation Sensitivity Adj.	Adjusts the deviation	R5
Oscillator Tuning Adj.	Sets the operating frequency	T1
Amplifier Tuning Adj.	Peaks the Output	T2

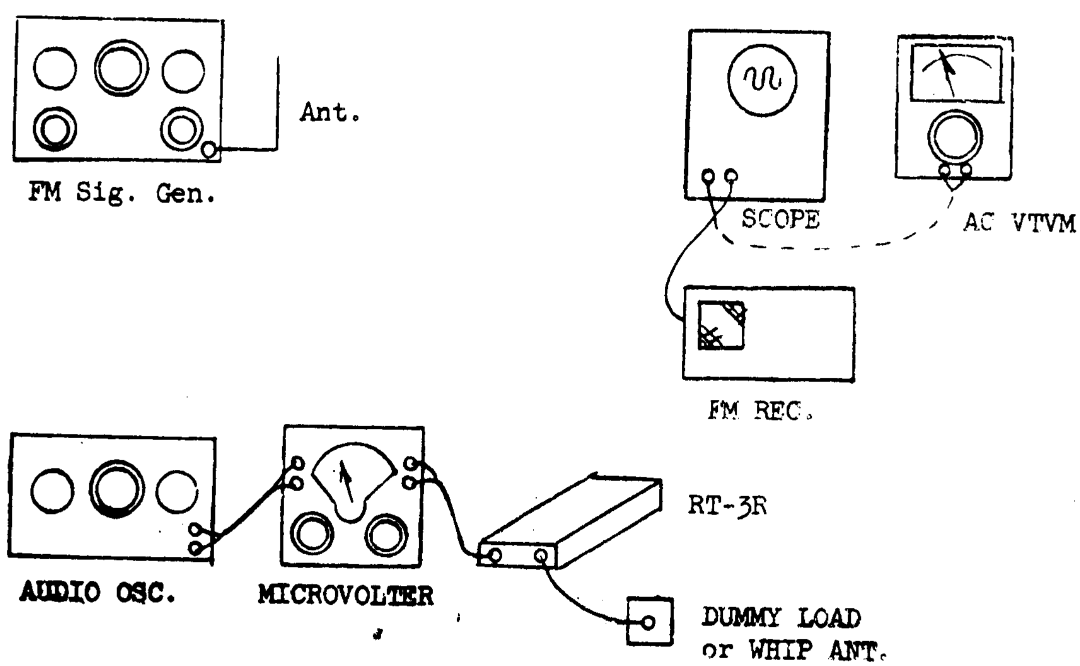

Figure I-5 Test Setup for Deviation Measurements

3.4 SETTING DEVIATION SENSITIVITY

Deviation Sensitivity can be set to any value from 2 kc/100 microvolts to 15kc/100 microvolts. The 5kc and 10kc points on the Deviation Sensitivity Adjustment are identified by a paint mark (5 kc - green, 10 kc - red).

For optimum performance, transmitter deviation should be matched with receiver bandwidth, e.g., if the PFR-5 receiver is used, transmitter deviation should be set at minimum; if the ASR-1 receiver is used, deviation should be set at 5 kc, (green mark). If a receiver is used whose deviation capabilities are unknown, the following procedure is recommended: (use the test setup shown in Figure I-5).

1. Connect an *oscilloscope directly to the output of the receiver (directly to the detector output, where possible).

2. Increase the signal generator output to maximum, set the signal generator modulating frequency to 1 kc, and adjust the deviation to 10 kc.

3. Tune the receiver to a clear-channel frequency in the vicinity of the desired operating frequency.

4. Adjust the signal generator so that it is properly tuned-in to the receiver. (This is evident by maximum limiter current and/or zero reading on the receiver discriminator meter.)

5. Set the oscilloscope for some convenient number of divisions.

6. Reduce the signal level of the signal generator until the receiver output begins to fall.

7. Retune the receiver or signal generator as described in Step 4 above, if necessary.

8. Increase the signal generator output 20 db.

9. Increase the deviation until noticeable distortion appears in the form of peak clipping. (If the receiver is properly aligned and tuned-in, both peaks will clip simultaneously; if not, clipping will occur only on one peak. Slight retuning of the receiver or signal generator will correct for misalignment.) Retune the receiver to reduce clipping and increase deviation until clipping occurs again.

THE POINT AT WHICH SYMMETRICAL CLIPPING STARTS IS THE MAXIMUM DEVIATION THE RECEIVER WILL ACCOMMODATE UNDER NORMAL OPERATING CONDITIONS. (The band width of the receiver is 2 x the maximum deviation.) (If the Boonton 202-E signal generator is used, deviation can be read directly on the deviation meter.) Set the scope to some convenient level, e.g., peak-to-peak deflection equals 10 divisions. If nearly symmetrical clipping still does not occur, the receiver is improperly aligned or in need of repair.

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*A vacuum tube voltmeter may be used in conjunction with the oscilloscope, where greater accuracy is required.

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a. Setting Transmitter Deviation With Laboratory Equipment

Using the same test setup as shown in the block diagram in Figure I-5, continue below:

1. Reduce the r.f. output of the signal generator to zero.

2. Operate the transmitter without attaching the microphone, and connect the audio oscillator and the microvolter to the transmitter input.

3. Set the audio oscillator frequency to 1 kc and the microvolter to 500 microvolts. This value (500 microvolts) will provide adequate sensitivity without overload for normal room conditions.

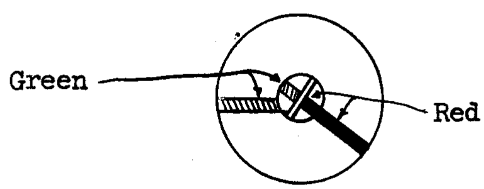
4. Tune the receiver carefully to the transmitted signal.

5. Rotate the Deviation Sensitivity Adjustment until the receiver output is equivalent (on the scope) to that obtained from the signal generator, as in Step 9 above. (To increase deviation, rotate Deviation Sensitivity Adjustment clockwise. To decrease deviation, rotate counterclockwise.)

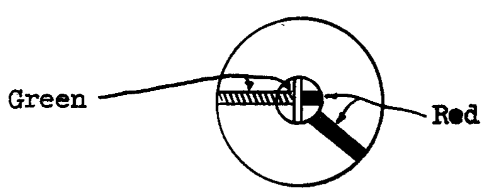
b. Setting Transmitter Deviation Without Laboratory Equipment

There is a red and a green dash painted on the Deviation Sensitivity Adjustment to indicate the setting, as follows:

For 10 kc/100 μ volts deviation, (using a Clarke or Servo receiver) rotate the adjustment until the red dash is in line, as shown below.



For 5 kc/100 μ volts deviation, (using the ASR-1 receiver) rotate the adjustment until the green dash is in line, as shown below.



For 1-3 kc/100 μ volts deviation, (using the PFR-5 receiver) rotate the adjustment fully counter-clockwise.

3.5 FREQUENCY CHECK

The oscillator frequency is the operating frequency. The following two methods may be used to determine whether the transmitter is operating at the desired frequency.

Method No. 1

The accuracy of this method depends on the accuracy of the receiver calibration.

1. Operate the unit in the vicinity of a receiver.
2. Tune the receiver to the transmitter signal. (Proper receiver tuning is indicated by maximum limiter current and/or zero reading on the receiver discriminator meter.)

Method No. 2

This method requires that a grid dip meter be used as an absorption meter. (This method should not be used where accuracy is required.)

1. Operate the transmitter. Then, remove the top cover by removing the two securing screws.
2. Place the grid dip meter coil parallel to, and as close as possible, to the oscillator coil.
3. Tune the grid dip meter until a peak is observed. The reading on the grid dip meter indicates the operating frequency.

3.6 FREQUENCY ADJUST

a. Oscillator Tuning

If it is desired to change the frequency of the transmitter, the following procedure is recommended:

1. Remove the top cover by removing the two securing screws.
2. Starting with the Oscillator Tuning Adjustment at its counter-clockwise extremity (the highest frequency is obtained with the slug in this position), rotate the slug clockwise until the desired frequency is obtained.

b. Peaking the Output

The power amplifier may be tuned, as follows:

1. Operate the unit in the vicinity of a receiver, tuned to the desired frequency.

2. Remove the top cover by removing the two securing screws.

3. The signal strength indicator on a receiver is very insensitive to changes in signal level in a high signal strength field. Therefore, it is recommended that the receiver antenna be one or two inches in length, so as to prevent saturation of the indicator. Thus, a more sensitive reading of power out may be made.

4. Rotate the Amplifier Tuning Adjustment until a maximum reading is obtained on the receiver field strength indicator.

5. Where an r. f. indicator or power meter is available, it should be used to determine the tuning which gives maximum power output.

4. MAINTENANCE

4.1 GENERAL

The transmitter RT-3R is designed to require minimum maintenance. Since transistors are soldered in place and subminiature techniques are used in the construction of the unit, little field maintenance is possible. It is recommended that with the exception of minor repairs (broken leads, loose connections, etc.) and battery replacement, all maintenance and trouble shooting be conducted in a laboratory.

4.2 ACCESSIBILITY

Both sides of the printed circuit board are easily accessible for servicing when the transmitter covers are removed. (There are two screws securing each cover to the case.) The board itself is riveted to the transmitter case for more rigid construction, and should not have to be removed.

4.3 BATTERY REPLACEMENT

The battery pack should be replaced after approximately 360 hours of transmitter operation. There is no positive method of determining the condition of the battery, i.e., to what extent it has been used or its remaining capacity; therefore, it is recommended that a record of transmitter "on" time be kept. When there is any question as to the probable condition of the battery, it should be replaced.

4.4 TEST EQUIPMENT

a. Required

Volt-ohm Meter-Simpson, Model 260, or equivalent.
Vacuum Tube Voltmeter-Ballantine, Model 314, or equivalent.
Receiver-Nems Clarke 1501, or equivalent.

b. Optional

Oscilloscope-Dumont, Type 304-A, or equivalent.
Audio Oscillator-Hewlett Packard, Model 200AB, or equivalent.
Microvolter-General Radio, Type No. 546-C, or equivalent.
Watt Meter-Jones Electronic Corp, Model MM621U, or equivalent.

4.5 GENERAL PRECAUTIONS

Whenever the unit is serviced, carefully observe the precautions listed below: (careless replacement of parts makes new faults inevitable.)

a. Remove a.c. power before servicing the foil side of the unit.

b. Before a part is unsoldered, note the position of the leads, and tag (number) each of the leads.

c. Be careful not to damage other connections by pulling or pushing the leads out of the way.

d. If soldering is performed on the unit, do not allow solder to bridge the foil at any point, it may cause a short circuit.

e. A carelessly soldered connection may create a new fault. It is important to use care in soldering; since a poorly soldered joint is one of the most difficult faults to find.

f. Use appropriate ranges on meters and test sets used for troubleshooting.

g. In replacement of the oscillator transformer, care must be exercised in the orientation of the windings.

h. In replacing transistors, use a soldering iron with a low power rating (22 1/2 watts). Excessive heat applied to a transistor lead may damage the transistor.

4.6 SECTIONALIZING AND LOCALIZING A FAULT

The first step in servicing a defective unit is to sectionalize the fault; i.e., to trace the fault to the stage or circuit by appropriate voltage and/or resistance measurements as outlined in Section 4-8, Voltage-Resistance Chart. The preliminary tests listed below will aid in isolating the source of trouble.

a. Visual Inspection

The purpose of visual inspection is to locate any components which show evidence of mechanical breakdown. Through this inspection, the repairman may frequently discover the fault or determine the stage in which the fault exists. This inspection is valuable in forstalling future failure and in avoiding damage to the unit which might occur through improper servicing methods.

b. Operating and Alignment Test

It is recommended that the repairman try to operate the equipment, as directed in Section 3, to determine just what mal-function exists and to check tuning and alignment.

d. Intermittents

In all these tests, the possibilities of intermittents should not be overlooked. If present, this trouble may often be made to appear by tapping or jarring the unit. It is possible that the trouble is not in the transmitter unit itself but in the auxiliary apparatus, or connections.

4.7 TROUBLESHOOTING CHART

The following chart is supplied as an aid in locating trouble in the unit. This chart lists the symptoms which the repairman observes, and indicates how to localize trouble quickly in the various sections. Normal voltage and resistance measurements are given in the Voltage-Resistance Chart 4-8, which follows the Troubleshooting Chart.

SYMPTOM	PROBABLE CAUSE	SUGGESTION
No. R. F. Power Output	Power supply inoperative (no or low D C voltage at test point 17).	Refer to troubleshooting chart for power supply RT-3PS in Part II of this manual.
	Battery defective or weak (no or low D C voltage at test point 17).	Replace battery if voltage is less than 6 volts with a 680Ω load.
	Defective D C input cable (no voltage at test point 17).	If power supply is operating correctly, check D C input cable for continuity.
	Defective oscillator transistor.	Check D C voltages on the oscillator. If normal, replace transistor.
Low R. F. Power Output	Low D C input voltage.	Measure D C input voltage at test point 17.
	Improper tuning.	Retune the power amplifier as outlined in section 3-6b in Part I of this manual.
	Amplifier transistor defective (low total current).	Check oscillator drive by measuring total current. Normal total current is approx. 9 ma.
No Modulation	Defective audio transistor or component.	Check A C and D C voltages in audio section, and compare with voltage resistance chart, Section 4-8.
Distorted and/or Low Modulation	Improper D C operating point resulting from a resistance value change; shorted or leaky capacitor; or defective transistor.	Check A C and D C voltages in audio section, and compare with voltage resistance chart, Section 4-8.
Distorted and/or Abnormally High or Low Modulation, but Audio Functioning Properly.	Faulty diode CR-1 or improper bias on CR1.	Check voltage and resistance on CR-1 at test point 14; compare with voltage resistance chart, Section 4-8.

High Hum Level	Open ground in input cable, unshielded input connection.	Remove input cable. If hum level is reduced, check for open ground or unshielded cable.
	If power supply is used, measure A C (ripple) voltage at test points on power supply.	Open filter capacitor in power supply.
High Hum Level With Microphone Connected	Microphone near high induction field.	Disconnect microphone cable and note change in hum level; re-orientate or relocate microphone away from hum sources such as, transformers, fluorescent lights, appliances, etc.
High Noise Level With Input Circuit Disconnected	Noisy transistor Q1. Defective component R1, R2, R3, R4, C3, C4.	Rotate Deviation Sensitivity Adjustment fully counter-clockwise If noise reduces, replace Q1.
High Noise Level With Input Circuit Closed. (Generator connected or input shorted)	C1 defective.	If noise level is reduced when input circuit is opened, replace C1.
High Noise Level independent of Deviation Sensitivity Adjustment	Transistor Q2, noisy. Defective component in second audio stage R6, R9, R10, or C5.	Measure A C voltage with no signal output and compare with voltage resistance chart, Section 4-8.

4.8 VOLTAGE RESISTANCE CHART

D C voltages were measured with a Simpson, Model 260, voltohmeter. Resistances were also measured with a Simpson. A C voltages were measured with a Ballantine, Model 314, vacuum tube voltmeter.

VOLTAGE RESISTANCE CHART

Test Points	A. C. Voltage (mv) ±10% (f=1 kc)		D. C. Voltage (volts) ±10%	Resistance (Ohms) ±20%	
	No Signal In	100µv Signal In		Pos. Meter Lead to Gnd.	Neg. Meter Lead to Gnd.
Q1					
2 (coll) to *1(gnd)	<.1	2.1	-3	6.3K	1.7K
3 (base) to 1	<.1	.1	-1	2K	7.5K
4 (em) to 1	<.1	<.1	-1	3K	1.7K
Q2					
5 (coll) to 1	2	98	-3.6	5.9K	1.6K
6 (base) to 1	<.1	2.1	-1.1	2K	7.9K
7 (em) to 1	<.1	.3	-1.1	2.6K	1.6K
Q3					
8 (coll) to 1			-6	2.9K	336
9 (base) to 1			- .9	441	854
10 (em) to 1			- .8	295	266
Q4					
11 (coll) to 1			-6	2.9K	254
12 (base) to 1			0	0	0
13 (em) to 1			0	0	0
Misc.					
14 (CR1) to 1	1.6	81	- .8	24K	796
15 (junction of R3 and R8) to 1			-4.2	3.7K	2.3K
16 (junction of R9 and R11) to 1			-5	3K	1.3K
17 (B-) to 1			-7	2.9K	335

*Test Point No. 1 is ground.

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5. PARTS LIST

Ref. Symbol	Part Name, Description, Function and Location	Manufacturer's Name and Number
C1	Capacitor, Fixed, Electrolytic, Tantalum - 1µfd, 10v - Coupling capacitor between microphone and Q1	Ohmite Mfg. Co. 1T10M
C2	Capacitor, Fixed, Electrolytic, Tantalum - 50µfd, 6v - Decoupling capacitor and ripple filter	P.R. Mallory Co. TNT
C3	Capacitor, Fixed, Electrolytic, Tantalum - 1µfd, 10v - Coupling capacitor between Q1 and Q2	Ohmite Mfg. Co. 1T10M
C4	Capacitor, Fixed, Electrolytic, Tantalum - 80µfd, 3v - Emitter bypass capacitor for Q1	P.R. Mallory Co. TNT
C5	Capacitor, Fixed, Electrolytic, Tantalum - 80µfd, 3v - Emitter bypass capacitor for Q2	P.R. Mallory Co. TNT
C6	Capacitor, Fixed, Electrolytic, Tantalum - 25µfd, 15v - Decoupling capacitor	P.R. Mallory Co. TNT
C7	Capacitor, Fixed, Ceramic - .01µfd, 25v - r.f. bypass capacitor	Mucon Corp. GMV T01R
C8	Capacitor, Fixed, Silver mica - Low Frequency Unit - 43µµfd, 50v, Medium Frequency Unit - 33µµfd, 50v, High Frequency Unit - 39µµfd, 50v - Amplifier Tuned Circuit Capacitor.	Arco Electric Inc. DM-15
C9	Capacitor, Fixed, Ceramic - .01µfd, 25v - r.f. bypass capacitor	Mucon Corp. GMV T01R
C10	Capacitor, Fixed, Ceramic - High and Medium Frequency Unit - 10µµfd, 500v - Low Frequency Unit - 15µµfd, 50v, r.f. voltage divider	Mucon Corp. NPO
C11	Capacitor, Fixed, Ceramic - .005µfd, 25v - r.f. bypass capacitor	Mucon Corp. GMV T005R
C12	Capacitor, Fixed, Ceramic - 18µµfd, 500v - Oscillator feedback capacitor	Mucon Corp. NPO
C13	Capacitor, Fixed, Silver mica - selected for each unit. Oscillator Tuned Circuit Capacitor	Arco Electric Inc. DM-15
C14	Capacitor, Fixed, Ceramic - selected for each unit. Oscillator Temperature compensating capacitor	Centralab
C15	Capacitor, Fixed, Ceramic - 500µµfd, 500v - r.f. bypass capacitor in base of Q1	Mucon Corp. Hi K
C16	Capacitor, Fixed, Ceramic - .01 µf 25 volt coupling	Mucon Corp. GMV T01R

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Ref. Symbol	Part Name, Description, Function and Location	Manufacturer's Name and Number
CR1	Semiconductor device, diode - diode modulator	Pacific Semi-conductor V-47
J1	Connector receptacle, electrical - microphone input	Cannon Elec. Co. D1C 2902
J2	Connector receptacle, electrical - antenna receptacle	Dage Elec. Co. 1-311-1
P1	Connector, plug, electrical - microphone plug	Cannon Elec. Co. D1C 2928
P2	Connector, plug, electrical - antenna plug	Dage Elec. Co. 1-934-1
P3	Connector, plug, electrical - power supply plug (or cable)	Dage Elec. Co. 5143-1
Q1	Transistor, 1st audio amplifier	Lansdale Tube Co. Philco 2N207B
Q2	Transistor, 2nd audio amplifier	Lansdale Tube Co. Philco 2N207B
Q3	Transistor, Oscillator	Lansdale Tube Co. Philco 2N500
Q4	Transistor, r.f. amplifier	Lansdale Tube Co. Philco 2N500
R1	Resistor, Fixed Film - 10k, 1/20W, 5% - Base bias resistor for Q1	Arnhold Ceramics Stemag Type R
R2	Resistor, Fixed Film - 33k, 1/20W, 5% - Base bias resistor for Q1	Arnhold Ceramics Stemag Type R
R3	Resistor, Fixed Film - 3.9k, 1/20W, 5% - Collector load for Q1	Arnhold Ceramics Stemag Type R
R4	Resistor, Fixed Film - 2.7k, 1/20W, 5% - Emitter bias resistor for Q1	Arnhold Ceramics Stemag Type R
R5	Resistor, Variable - 10k - Deviation Sensitivity Adjustment	Allen-Bradley Type F
R6	Resistor, Fixed Film - 470 ohms, 1/20W, 5% - Base bias resistor for Q2	Arnhold Ceramics Stemag Type R
R7	Resistor, Fixed Film - 39k, 1/20W, 5% - Base bias resistor for Q2	Arnhold Ceramics Stemag Type R

Ref. Symbol	Part Name, Description, Function and Location	Manufacturer's Name and Number
R8	Resistor, Fixed Film - 2.2k, 1/20W, 5% - Decoupling resistor with C2	Arnhold Ceramics Stemag Type R
R9	Resistor, Fixed Film - 3.9k, 1/20W, 5% - Collector load for Q2	Arnhold Ceramics Stemag Type R
R10	Resistor, Fixed Film - 2.7k, 1/20W, 5% - Emitter bias resistor for Q2	Arnhold Ceramics Stemag Type R
R11	Resistor, Fixed Film - 1.5k, 1/20W, 5% - Decoupling resistor with C6	Arnhold Ceramics Stemag Type R
R12	Resistor, Fixed Film - 100 ohms, 1/20W, 5% - Current limiting resistor for Q4	Arnhold Ceramics Stemag Type R
R13	Resistor, Fixed Film - 10k, 1/20W, 5% - r.f. isolating resistor	Arnhold Ceramics Stemag Type R
R14	Resistor, Fixed Film - 4.7k, 1/20W, 5% - Base bias resistor for Q3	Arnhold Ceramics Stemag Type R
R15	Resistor, Fixed Film - 1k, 1/20W, 5% - Base bias resistor for Q3	Arnhold Ceramics Stemag Type R
R16	Resistor, Fixed Film - 270 ohms, 1/20W, 5% - Emitter bias resistor for Q3	Arnhold Ceramics Stemag Type R
R17	Resistor, Fixed Film - 1/20W, 5% - Selected d.c. bias resistor for CR1.	Arnhold Ceramics Stemag Type R
R18	Resistor, Fixed Film - 330k ohms d.c. bias resistor for CR1.	Arnhold Ceramics Stemag Type R
RFC1	Choke, r.f. - 1.8 μh	Wilco Corp. 208-11
T1	Transformer, r.f. - Oscillator Transformer	Special
T2	Transformer, r.f. - Output Transformer	Special

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PART II

OPERATING AND MAINTENANCE MANUAL

FOR

POWER SUPPLY RT-3PS

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PART II

POWER SUPPLY RT-3PS

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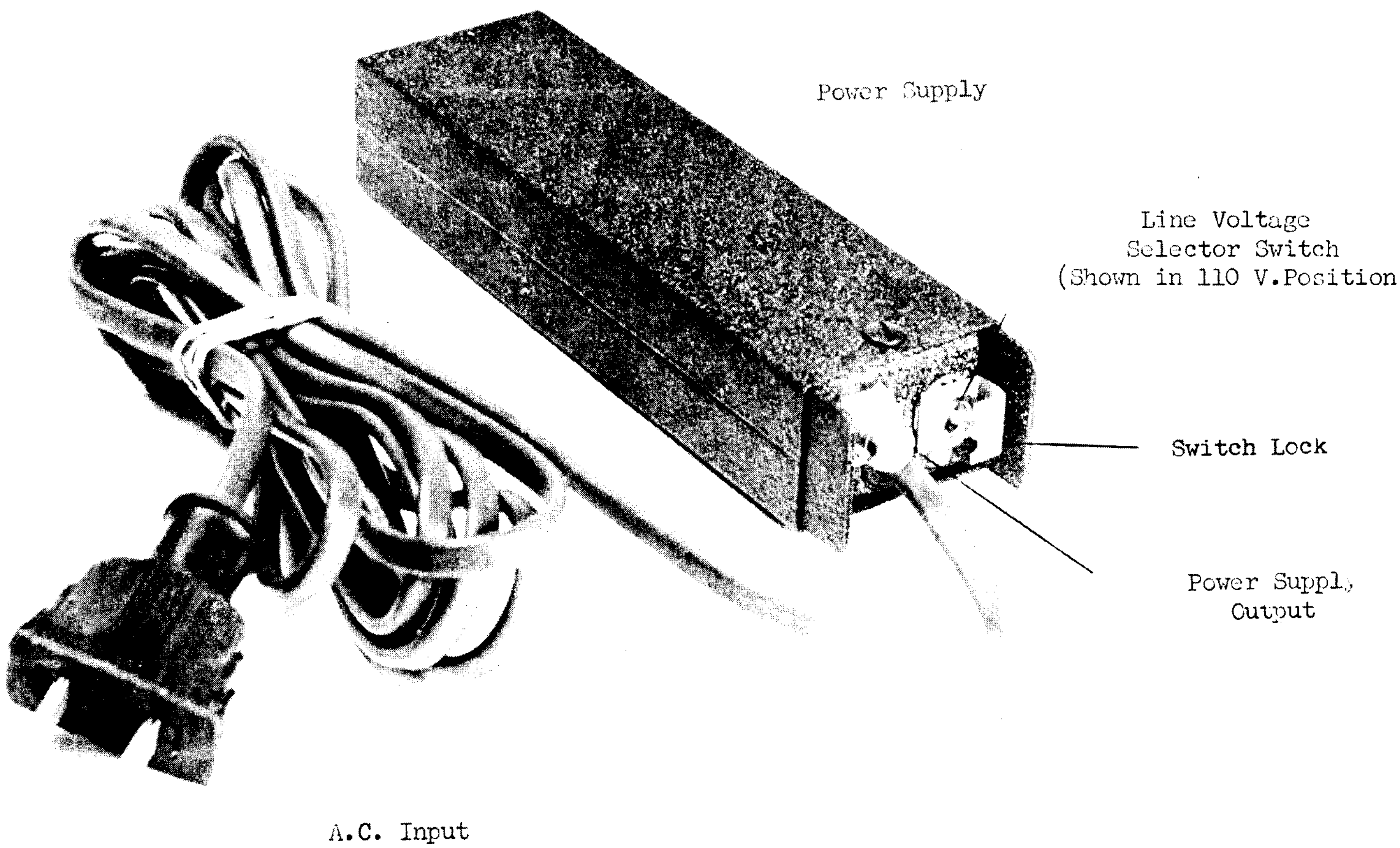

Figure II-1 POWER Supply RT-3PS

PART II

1. INTRODUCTION

1.1 SCOPE

Part II of this instruction manual contains information for the operation and maintenance of the Power Supply, Model RT-3PS. The equipment is shown in Figure II-1.

1.2 GENERAL DESCRIPTION

The power supply RT-3PS was designed primarily for use with the transmitters, Model RT-3R and RT-3T, when a 110/220, 50-60 cps line voltage is availabe. This unit may be used, however, with any low-powered device, requiring -6.5 v d.c. at 15 ma, or less. The equipment is shown in Figure II-1.

1.3 GENERAL SPECIFICATIONS

Input	- 105/210 volts ±20%
Input Frequency	- 50 - 60 cps
Output Voltage	- 6.5 ±.5 volts
Output Current	- 0 -15 ma
Ripple and Noise Output	- .5% or less
Dimensions (Approximately)	- L = 5 3/16, W= 1 3/8, H = 15/16
Weight	- 10 oz.
Finish	- Black wrinkle

2. CIRCUIT DESCRIPTION

2.1 GENERAL

The power supply circuit diagram is shown in Figure II-3. This power supply is a full wave rectifier, consisting of a power transformer; (T1) a center-tap rectifier, using two silicon diodes (CR1, CR2); an r.f. filter network, comprised of two r.f. chokes (RFC1, RFC2) and two capacitors (C1-C2). C3, R1 and C4, R2 are the filters for the rectified output. The zener diode (CR3) maintains the output of the power supply constant with variations in line voltage. A Switch (S1) in the primary of the power transformer connects the two halves of the primary, either in series or parallel for operation on 220v and 110v, respectively.

3. OPERATION

3.1 PRIMARY VOLTAGE SELECTION

1. Before applying any line voltage to the power supply, determine

the value of line voltage to be used (220 or 110 vac).

2. Locate the Line Voltage Selector Switch (S-1) at the end of the unit, Figure II-1; and set it to the desired position.

NOTE

There is a spring clip attached to the switch to hold it in position and prevent accidental changeover. To change the switch position, push the spring clip aside with the thumb and throw the switch.

3.2 TRANSMITTER CONNECTION

1. Insert the plug, P3, on the end of the transmitter power supply cable, into the jack, J3, on the end of the power supply. Connect the input leads of the power supply to the desired a.c. line voltage.

2. Continue with transmitter operating instructions according to section 3.3b, Step 3, Part I of this manual.

4. MAINTENANCE

4.1 GENERAL

The Power Supply RT-3PS is designed to require minimum maintenance. Since components are soldered in place and subminiature techniques are used in construction of the unit, little field maintenance is possible. It is recommended that with the exception of minor repairs (broken leads, loose connections, etc.), all maintenance and troubleshooting be conducted in a laboratory.

4.2 ACCESIBILITY

Both sides of the printed circuit board are easily accessible for servicing when the power supply covers are removed. (There are two screws securing each cover to the case). The board itself is riveted to the power supply case for more rigid construction, and should not have to be removed.

4.3 TEST EQUIPMENT REQUIRED

Volt-ohm-Meter - Simpson, Model 260, or equivalent.
*Vacuum Tube Voltmeter - Ballantine, Model 314, or equivalent
Oscilloscope - Dumont, Type 304-A, or equivalent

4.4 GENERAL PRECAUTIONS

Whenever the unit is serviced, carefully observe the precautions listed below: (Careless replacement of parts makes new faults inevitable.)

*Optional

a. Remove a c power before servicing the foil side of the unit.

b. Be careful not to damage other connections by pulling or pushing the leads out of the way.

c. If any soldering is done, do not allow solder to bridge the foil foil at any point, it may cause a short circuit.

d. Use care in soldering, since a poorly soldered connection is one of the most difficult faults to find.

e. Use appropriate ranges on meters and test sets used for troubleshooting.

f. Observe polarity when replacing electrolytic capacitors.

g. If the power transformer is removed, note the position of the leads and tag (number) each lead.

4.5 TROUBLESHOOTING CHART

The following chart is supplied as an aid in locating trouble in the unit. This chart lists the symptoms which the repairman observes, and indicates how to localize trouble quickly in the various sections. Normal voltage and resistance measurements are given in the Voltage-Resistance Chart 4-6, which follows the Troubleshooting Chart.

SYMPTOM	PROBABLE CAUSE	SUGGESTION
No Output (Switch in 110 or 220 v position)	Defective input wiring. Defective selector switch. Shorted zener diode CR3. Open resistor R1 or R2.	Check input voltage (110 or 220v). Measure voltages and resistances, and compare with Voltage-Resistance Chart, Section 4.6.
Low Output, Increased Ripple	Defective diode CR1 or CR2. Open choke L1 or L2. Shorted capacitor C1 or C2.	
Low Output, Ripple Normal or Less Than Normal.	Increased value of resistor R1 or R2.	
High Ripple In Output.	Open or Defective C3 or C4.	
No Output With Switch in 220 v Position, But NormalIn 110 v Position.	Open primary in T1. Defective selector switch.	Check power transformer T1, and replace if necessary. Replace switch S1.
High Output Voltage, Increased Ripple.	Zener diode CR3 open.	Replace CR3 if output voltage is greater than 7 volts.

4.6 VOLTAGE-RESISTANCE CHART

The following voltages and resistances were made with a Simpson, Model 260, Voltohmmeter. Voltages were measured with 110 vac applied.

Test Points	A C Voltage ±10% (Volts)	D C Voltage ±10% (Volts)	Resistance (Ohms) ±20% Pos. Meter Lead to Ground	Neg. Meter Lead to Ground
2 to 1 (gnd)	24		49	49
3 to 1	24		44.7	44.7
4 to 1		-21.7	269	269
5 to 1		-13.5	269	948
6 to 1		- 6.5	269	786
7 to 8			620	* 2.6 K

*Measured with switch in 220 volt position.

5. PARTS LIST

Ref. Symbol	Part Name, Description and Function	Manufacturer's Name and Number
C1, C2	Capacitor, Fixed, Ceramic-800µµfd, 1000v, r.f. Filter capacitor	Centralab DD801
C3	Capacitor, Fixed, Electrolytic, Tantalum-100µfd, 30v, Filter capacitor	Fansteel Met. Co. PP100B30A2
C4	Capacitor, Fixed, Electrolytic, Tantalum-250µfd, 10v, Filter Capacitor	Fansteel Met. Co. PP250B10A2
CR1, CR2	Semiconductor Device-silicon diode rectifier	Transitron LN484
CR3	Semiconductor device-zener diode voltage regulator	Transitron SV-7
J3	Connector, Jack-d c output	Dage Elec. Co. 1-875-1
L1, L2	Choke, r.f.-38µh, r.f. Filter Choke	Wilco Corp. 3038-15
P1	Connector, Plug, Electrical-a c input	Eagle Elec. Mfg. Co
R1	Resistor, Fixed, Wire Wound-330 ohms, 3W, 5% Filter resistor	Sprague Prod. Co. Type 151E
R2	Resistor, Fixed, Wire Wound, 270 ohms, 3W, 5% Filter resistor	Sprague Prod. Co. Type 151E
S1	Switch, Toggle-DPDT, Line Voltage Selector Switch	Torsion Balance Co. DP-1
T1	Transformer, Power-110/220v, 50/60 cps.	Special

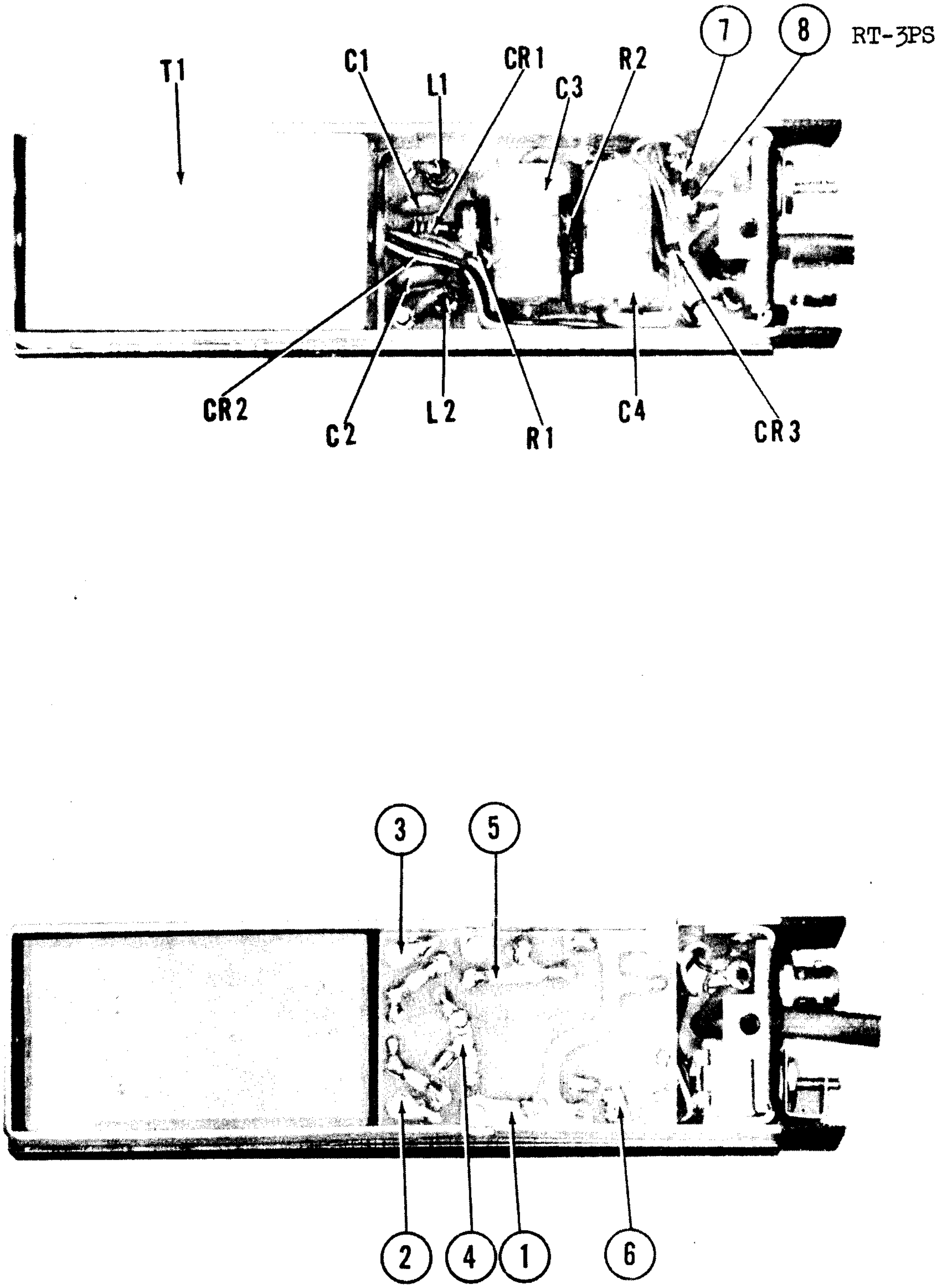

Figure II-2 COMPONENT LAYOUT AND TEST POINTS

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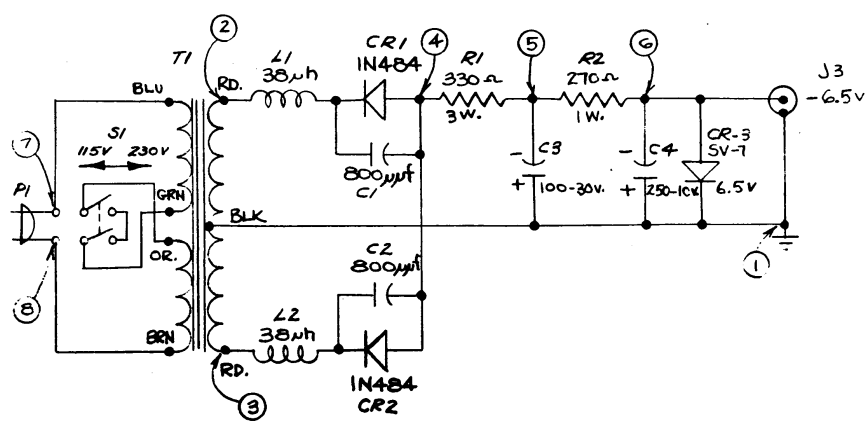

FIGURE II-3 SCHEMATIC DIAGRAM
POWER SUPPLY RT-3PS