

NAVSHIPS 92600B

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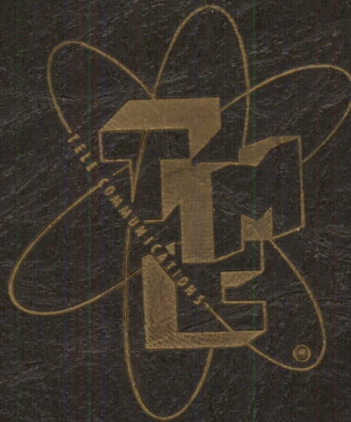
INSTRUCTION BOOK

for

REMOTE CONTROL
RECEIVER SYSTEM
MODEL RCR

AN/FRA-501

RECEIVER CONTROL GROUP



THE TECHNICAL MATERIEL CORP.
MAMARONECK, N. Y. OTTAWA, CANADA

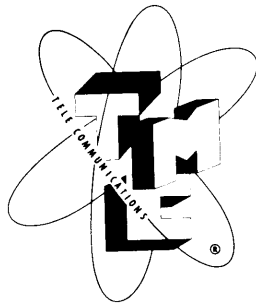
BUREAU OF SHIPS DEPARTMENT OF THE NAVY

INSTRUCTION BOOK

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RECEIVER SYSTEM
MODEL RCR

R-114



THE TECHNICAL MATERIEL CORPORATION

Mamaroneck, New York Ottawa, Ontario

**TEMPORARY CORRECTION T-1 TO INSTRUCTION BOOK
FOR RECEIVER CONTROL GROUP, AN/FRA-501**

This correction is required to reflect the addition of TUNERS, RF, TN-274, 275, 276, 277/FRR-502 and to describe the remote control of a diversity receiver set-up.

This correction applies to those units now in the field and being manufactured.

Enclosed for insertion into your copy of NAVSHIPS 92600A is the following item:

- a. Revised Instruction Book for AN/FRR-49(V), AN/FRR-502.

Make the following minor pen-and-ink changes and replace the corresponding pages currently contained in the book as indicated as follows:

PAGE NO.	CHANGE IN EFFECT	PARAGRAPH	ACTION
1-3	Orig.	1.3.6	Change lines 2 and 3 to read, "50-400 Kcs; not less than ± 3 Kcs., 500 Kcs.; ± 1.5 Kcs. per Mc., 8-16 Mcs. not less than ± 16 Kcs., 16-32 Mcs."
		1.3.7	Change line 1 to read, "Will vary receiver BFO not less than ± 2.5 Kcs."
1-9, 2-1		2.1.1	Delete lines 16 through 18 inclusive and add "See correction T-1." These lines now read as follows: "receiver not less than ± 2 Kc from 50-400 Kc; not less than ± 3 Kc at 500 Kc; ± 2 Kc per Mc from 2-8 Mc; ± 1.5 Kc per Mc from 8-16 Mc; not less than ± 16 Kc from 16-32 Mc, and to adjust the RF Gain from complete silence."
		2.1.1	Change line 21 to read, "-trolled not less than ± 2.5 Kcs. The BFO may"
2-6	Orig.	2.2.E.8	Change line 3 to read, "0 to 9.5 volts for the RF Gain channel."
3-1	Orig.		"Change the Audio Return Lines on the System Cabling Diagram, Figure 3-1, originating at E101 on the FFR from terminals 1 and 2 to terminals 2 and 3"
5-37	Orig.		"Delete the Standard Navy Stock Number N17-L003911-0150 for Symbols 1, 2, 3 and add Federal Stock Number G6240-523-9075"
5-43	Orig.		"Delete the Standard Navy Stock Number N17-L003911-0150 for Symbols 1, 2, 3", is (replaced by Federal Stock Number G6240-523-9075).

Enclosure (a) replaces the entire sections of the book covering the AN/FRR-49(V), AN/FRR-502.

CHART OF NOMENCLATURE VS COMMERCIAL DESCRIPTION

NOMENCLATURE	NOUN	T.M.C. MODEL NUMBER
AN/FRA-501	Equipment, Receiver Control Group Consisting of: (Major units)	RCR-5
C-5027/FRA-501	Control, Remote	RSC-2(A)
C-5028/FRA-501	Control, Remote	RSC-2(B)
C-5029/FRA-501	Control, Remote	RSC-2(C)
C-5030/FRA-501	Control, Remote	RSC-2(D)
C-5031/FRA-501	Control, Remote	RSC-2(E)
F-5006/FRA-501	Filter, Assembly	RSF-2(A)
F-5007/FRA-501	Filter, Assembly	RSF-2(B)
F-5008/FRA-501	Filter, Assembly	RSF-2(C)
F-5009/FRA-501	Filter, Assembly	RSF-2(D)
F-5010/FRA-501	Filter, Assembly	RSF-2(E)
AM-5027/FRA-501	Amplifier, A.F. (Mixer)	RSM-2
AM-5028/FRA-501	Amplifier, A.F. (Ampfr)	RSA-2
CV-5013/FRA-501	Detector, A.F. (Discrim)	RSD-2(A)
CV-5014/FRA-501	Detector, A.F. (Discrim)	RSD-2(B)
CV-5015/FRA-501	Detector, A.F. (Discrim)	RSD-2(C)
CV-5016/FRA-501	Detector, A.F. (Discrim)	RSD-2(D)
CV-5017/FRA-501	Detector, A.F. (Discrim)	RSD-2(E)
PP-5030/FR()	Power Supply	RSP-2

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Figure 1-1. Front View, Control Terminal, Model RCR-5.



Figure 1-2. Rear View, Control Terminal, Model RCR-5.

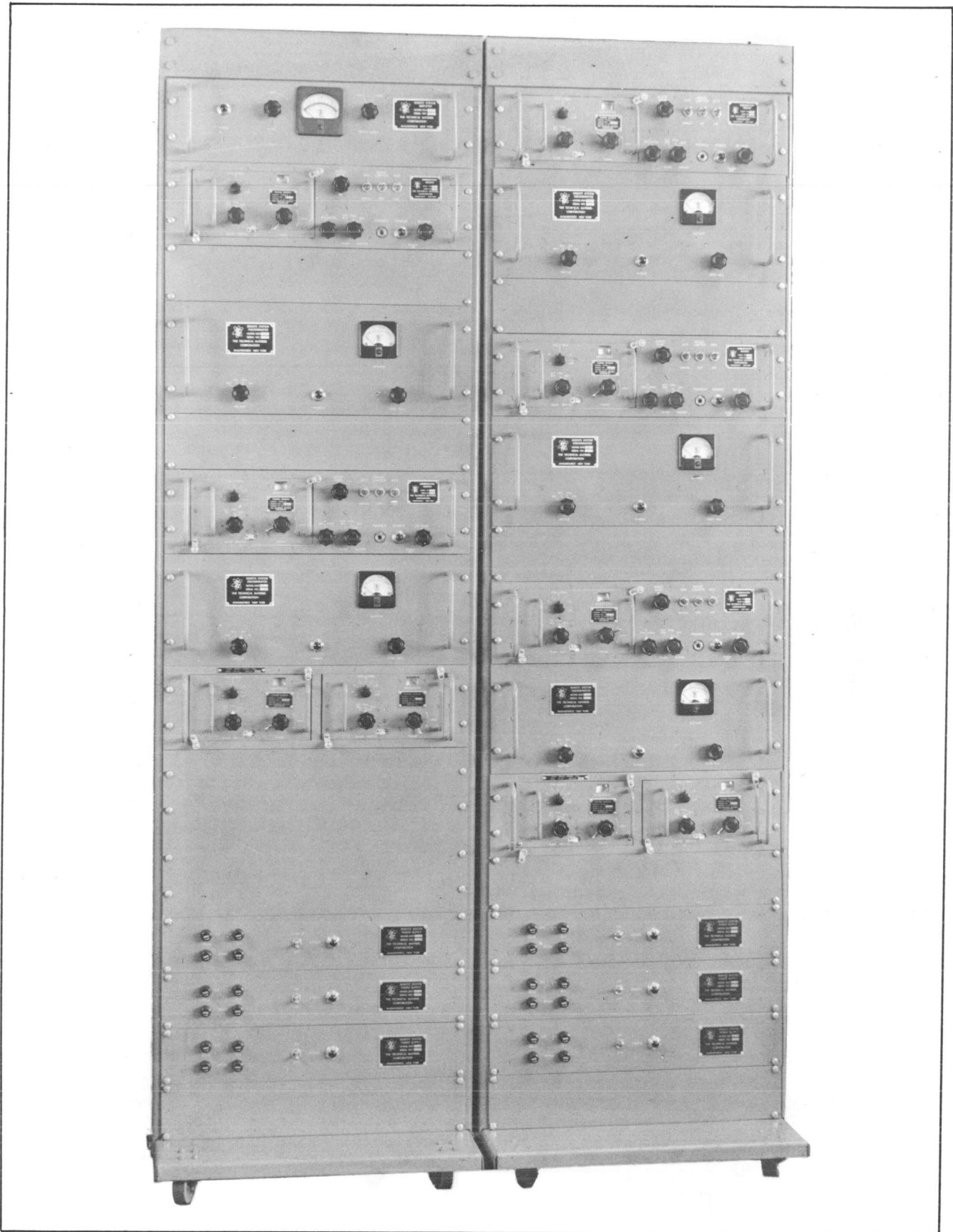


Figure 1-3. Front View Remote Terminal, Model RCR-5, with Model FFR Receivers.

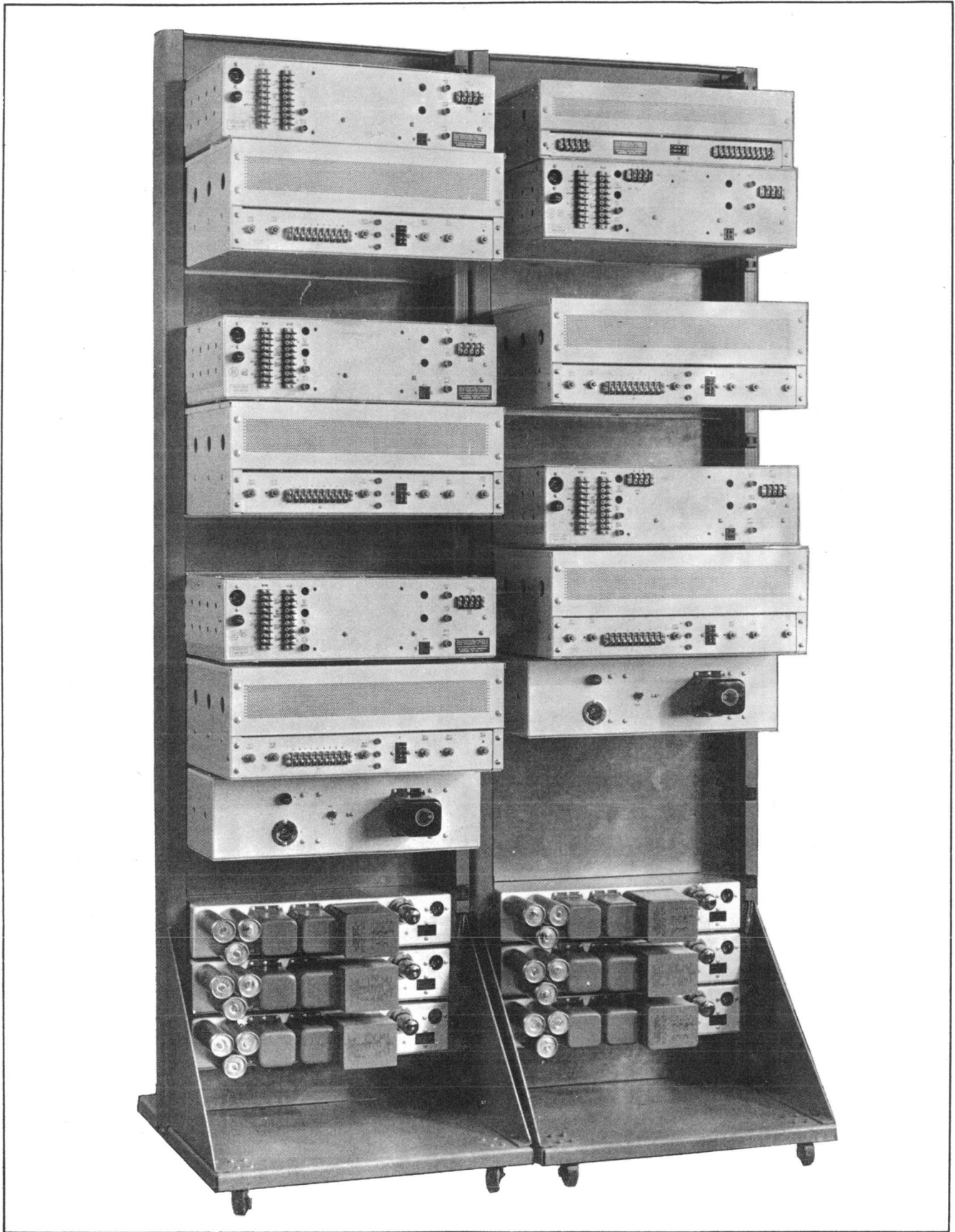


Figure 1-4. Rear View, Remote Terminal, Model RCR-5, with Model FFR Receiver.

SECTION I

GENERAL DESCRIPTION

I. PURPOSE AND BASIC PRINCIPLES

The TMC Remote Control System, Model RCR, was designed to provide a much needed facility where conditions dictate the placement of a communications receiver or other device at a remote location to be controlled from a central point.

The Model RCR provides up to 15 vernier and 10 on/off control functions within the standard voice frequency band of 400 to 3,000 cps. The vernier control is accomplished by means of audio tone carriers generated at the control site and adjusted ± 42.5 cps around an assigned center frequency. These carriers are standard 170 cycle tone frequencies (425, 595, 765, etc.). The on/off control functions are accomplished by simply turning "on" or "off" the respective tones. The variation of each tone around its assigned center frequency produces a proportionate DC potential at the remote site which is used for control of the remote equipments. It will be noted that use of this frequency-dependent principle causes the system to be virtually unaffected by transmission line fluctuations and noise interference.

Each individual control equipment (Model RSC) generates three control tones and includes the on/off provisions as well as the monitoring facilities for the audio return. As a consequence, the system can be built up in sets of three channels as required, and the individual control units may be located at separate stations if operation dictates.

For the purposes of general discussion, the TMC Communication Receiver, Model FFR is used as the controlled device, but the reader will realize that any DC sensitive equipment may be

used where the impressed voltages are sufficient to so control it. The system provides the necessary functions for remotely controlling the High Frequency Oscillator (HFO), Beat Frequency Oscillator (BFO), and Radio Frequency Gain (RFG), switching the BFO on/off, and switching the AVC on/off.

The Model RCR is separated into two groups, (a) the equipment Required at the control site, and (b) the equipment required at the remote site. The inter-connection between sites may be accomplished either by telephone, or radio (micro-wave) link using standard equipment in operation today, both commercial and military. The nominal characteristics of the interconnecting link should be 600 ohms, and be essentially flat within ± 3 db over the frequency range of 375 to 2900 cps. The attenuation should not exceed 20 dbm although the system has an excellent Automatic Volume Control (AVC) type of amplifier at the remote site input which will correct for losses in excess of that figure. A single pair of lines are required to pass the composite tones to the remote site, and five individual pairs are required to return the audio intelligence to the control operator's site for monitoring purposes.

2. DESCRIPTION OF THE SYSTEM

The TMC Remote Control System, Model RCR consists of seven basic component equipments separated by location as indicated in Figure 1-5.

From the figure below it will readily be seen how systems of less than five controls can be assembled, and this feature was considered in the design of the equipment. All equipments are designed for standard 19" rack or cabinet mount-

CONTROL SITE	REMOTE SITE
5 ea Model RSC (one per control) Remote System Control	5 ea Model RSD (one per control) Remote System Discriminator
5 ea Model RSF (one per control) Remote System Filter	1 ea Model RSA (one per system) Remote System Amplifier
5 ea Model RSP (one per RSC) Remote System Power Supply	6 ea Model RSP (one per RSD, RSA) Remote System Power Supply
1 ea Model RSM (one per system) Remote System Mixer	

Figure 1-5. Equipment Required, Complete RCR-5 (15) Channels

TABLE 1-1

Channel Frequencies, Model RCR.

FUNCTION	FREQUENCY	RSC NETWORK PART NOS.	RSF FILTER PART NOS.	RSD FILTER - DISCR. PART NOS.
HFO	425 CPS	NF-104 - 425	FX-140 - 425	FX-139 - 425 FX-140 - 425 FD-116 - 425
	595 CPS	NF-104 - 595	FX-140 - 595	FX-139 - 595 FX-140 - 595 FD-116 - 595
	765 CPS	NF-104 - 765	FX-140 - 765	FX-139 - 765 FX-140 - 765 FD-116 - 765
	935 CPS	NF-104 - 935	FX-139 - 935	FX-139 - 935 FX-140 - 935 FD-116 - 935
	1105 CPS	NF-104 - 1105	FX-139 - 1105	FX-139 - 1105 FX-140 - 1105 FD-116 - 1105
BFO	1275 CPS	NF-104 - 1275	FX-139 - 1275	FX-139 - 1275 FX-140 - 1275 FD-116 - 1275
	1445 CPS	NF-104 - 1445	FX-139 - 1445	FX-139 - 1445 FX-140 - 1445 FD-116 - 1445
	1615 CPS	NF-104 - 1615	FX-139 - 1615	FX-139 - 1615 FX-140 - 1615 FD-116 - 1615
	1785 CPS	NF-104 - 1785	FX-139 - 1785	FX-139 - 1785 FX-140 - 1785 FD-116 - 1785
	1955 CPS	NF-104 - 1955	FX-139 - 1955	FX-139 - 1955 FX-140 - 1955 FD-116 - 1955
RFG	2125 CPS	NF-104 - 2125	FX-139 - 2125	FX-139 - 2125 FX-140 - 2125 FD-117 - 2125
	2295 CPS	NF-104 - 2295	FX-139 - 2295	FX-139 - 2295 FX-140 - 2295 FD-117 - 2295
	2465 CPS	NF-104 - 2465	FX-139 - 2465	FX-139 - 2465 FX-140 - 2465 FD-117 - 2465
	2635 CPS	NF-104 - 2635	FX-139 - 2635	FX-139 - 2635 FX-140 - 2635 FD-117 - 2635
	2805 CPS	NF-104 - 2805	FX-139 - 2805	FX-139 - 2805 FX-140 - 2805 FD-117 - 2805

ings and Figures 1-1 & 1-2 indicate a system layout using open frame relay racks permitting rapid easy service, and yet providing efficient use of space. The control equipment, it will be noted is ideally suited for console layout, the maximum depth of the equipment located at the control site being only 14½ inches. A complete control, i.e., one RSC, one RSF, and one RSP may be assembled within a cabinet 14 inches high x 8½ inches deep. All equipment is ruggedly manufactured and finished in light gray enamel with functions deeply engraved in 3/16" thick aluminum panels for attractiveness and long wear.

The selection of parts and materials in the Model RCR System has been made in accordance with standard JAN/MIL specifications with parts peculiar kept at the very minimum. It will be noted that where JAN/MIL specification parts are used, the applicable part numbers have been incorporated in the TMC parts system, permitting service use of standard replacement parts from their own stocks. Where parts peculiar are necessary only sound highest quality engineering standards are used in their selection. Many of the parts used in the RCR System are interchangeable with parts in other TMC equipments, and use the same part numbers, making logistic support of the equipment less complex for those activities familiar with our other equipments.

Interconnection of all of the equipments of the RCR System is made by use of Jones plugs and receptacles, and barrier type terminal boards with fanning strip terminations to the cables. Use of these methods insures rapid installation and easy service.

3. TECHNICAL SPECIFICATIONS OF THE SYSTEM

Power Requirements: (complete RCR-5 w/FFRs)
110/220 volts 50/60 cps, single phase, 1.2 Kw.

Temperature:
Indoor installation, 0- 65°C.

Humidity:
Up to 100%

Lines required between sites:
Six (6) one for control, one each for audio return.

Rack Space:
Two 72" racks per site, or equivalent

HFO Tuning:
Will vary receiver HFO not less than ±2 Kcs.

per Mc, 2 to 8 Mcs., +1.5 Kcs. per Mc, 8 to 32 Mcs.

BFO Tuning:
Will vary receiver BFO not less than ±2 Kcs. from center.

RF Gain:
Will vary RF Gain from zero to full sensitivity.

BFO:
Will switch receiver BFO on/off.

AVC:
Will switch receiver AVC on/off.

Audio Filter:
Will effectively pass 500, 750, 1,000 1250 cps notes to assist monitoring remote receiver.

Control tones:
See Table 1-1

Muting:
Rear Panel Control provides sidetone attenuation.

4. DESCRIPTION AND SPECIFICATIONS OF COMPONENT EQUIPMENTS

The TMC Remote Control System, Model RCR has been engineered and manufactured in building block fashion and in order to present to the operator a clear understanding of the individual component equipments, discussion throughout this manual shall be done in the order in which the control tones progress through the system, effect their control functions, and the intelligence is returned to the monitoring site.

A. REMOTE SYSTEM CONTROL, MODEL RSC

The Model RSC, Figure 1-6, is the equipment wherein the control tones are generated and controlled, and where the returning audio intelligence is amplified and monitored for operating purposes.

The control tones are generated within the Model RSC and center around a specific frequency. These tones are determined by highly stable frequency determining networks. Each tone is varied by a front panel control, marked for the function which it provides. Each of the three tones may be monitored for checking purposes by means of rear panel jacks. Toggle switches are provided on the front panel of this equipment to turn the BFO on/off, and the AVC



Figure 1-6. Front View, Model RSC.

on/off. In addition to the remoting features, a system of monitoring the returning audio intelligence is provided in the form of an audio gain potentiometer, and a selective filter network, the center frequency and bandwidth of which is controllable by the operator. A switch also enables the operator to cut out the loudspeaker, yet still permitting phone monitoring. A pilot lamp is provided on the front panel to insure the operator that the separate power supply (which may be separately located) is delivering power to the unit.

Rear panel adjustments permit additional output control alignment to be used in extreme cases, and the control is equipped with a locking bushing to prevent accidental tampering.

A heavy, well ventilated cover provides excellent physical shielding and adequate ventilation. The equipment may be serviced while mounted in the rack, and quick release cover fasteners are provided for complete overhaul when necessary.

SPECIFICATIONS - MODEL RSC

Output:

Three audio tones for control (See Table 1-1 for channel frequencies).

Controls:

- Front Panel
- BFO Tuning Control
- HFO Tuning Control
- RF GAIN Tuning Control
- Audio Filter network selector switch
- Audio Filter network bandwidth control
- BFO ON/OFF switch
- AVC ON/OFF switch
- Monitor Speaker ON/OFF switch
- Top Chassis
- Feed-back control, oscillators
- Rear Apron
- Tone output controls
- Muting controls

Monitor:

3" PM Speaker

Tube Complement:

- 4 each 12AU7 Amplifier
- 3 each 12AT7 Oscillator
- 1 each 12AX7 Amplifier
- 3 each OA2 Regulator
- 1 each 9-4A Filament Ballast

Power Requirements:

65 watts from RSP

Size:

19" wide x 7" high x 7" deep.

Weight:

15 pounds net
65 pounds gross, for export.

B. REMOTE SYSTEM FILTER, MODEL RSF

The Model RSF, See Figure 1-7, is the equipment which receives the output of each of the Models RSC and its functions are to filter the three control tones of harmonic content and improve the wave form. The RSF permits monitoring of the outputs of the individual filtered tones by means of a front panel jack, selection being made by use of a rotary switch also mounted on the front panel.

The filtering is accomplished by three high quality bandpass filters, followed by a resistive network which combines the three tones to present the proper match for feeding into the Remote System Mixer, Model RSM which follows and which is the output unit of the control group.

SPECIFICATIONS - MODEL RSF

Input:

Three audio tones from RSC (See Table 1-1 for channel frequencies.)

Output:

One filtered composite tone, 600 ohms impedance.

Controls:

Tone Monitor Selector switch.
Monitor jack

Power Requirements:

None

Tube Complement:

None

Size:

19" wide x 3-1/2" high x 7" deep

Weight:

8 pounds net
33 pounds gross, for export

C. REMOTE SYSTEM MIXER, MODEL RSM

The Model RSM, See Figure 1-8, is used to combine and amplify the tone frequencies which are generated in the Model RSC and filtered in the Model RSF.

The RSM provides facilities for a linear combination or a maximum of five groups of tone frequencies (the output of five RSC's) by means of a resistive network. The RSM therefore combines all 15 tones generated by the 5 RSC's and is the output unit of the control site.

The combined signals are suitably amplified with provision for the control of the gain of the composite. The output is monitored by a meter which indicates to the operator the signal level being transmitted over the transmission medium to the remote site. Freedom from the introduction of distortion by the amplifier is insured by the use of push-pull amplification in both stages.

The RSM output arrangement permits line operation of the following types: Balanced, center grounded; Balanced, center floating; Unbalanced, one side grounded, and contains its own built-in power supply.



Figure 1-7. Front View, Model RSF



Figure 1-8. Front View, Model RSM.

SPECIFICATIONS - MODEL RSM

Input:

Up to five tone groups from RSC's.

Output:

Composite 600 ohms, maximum 15 tones.

Controls:

Front Panel - Output Level
Top Chassis - Balance

Metering:

Dbm meter in output

Power Requirements:

Self contained, 110/220 Volts,
50/60 cps, 50 Watts.

Tube Complement:

1 each 12AU7 Amplifier
1 each 12AT7 Amplifier
1 each 6X4 Rectifier
2 each OB2 Regulator

Size:

19" wide x 7" high x 8-3/4" deep

Weight:

16 pounds net
66 pounds gross, for export.

D. REMOTE SYSTEM AMPLIFIER, MODEL RSA

The Model RSA, See Figure 1-9, is the initial receiving equipment at the remote site and is used to amplify the incoming composite control signal and feed it to up to five discriminator units.

The RSA provides amplifications by means of push-pull stages which permit extremely low distortion figures, at the same time, preventing creation of undesirable harmonics of the composite. The use of an AVC amplifier stage results in an output which remains relatively unchanged for very large variations in input level. This prevents changing signal levels from influencing the operation of the Model RSD.

The Model RSA has facilities for monitoring the input level of the composite signal. The input level control permits continuous adjustment of the input level, and a dual scale dbm meter gives visual indication in the ranges -30 to -7, and -20 to +3 dbm. A low pass filter in the input circuit eliminates frequencies above the operating range which may be present due to cross talk or similar disturbances in the connecting link. Output level from the RSA is adjusted at the factory by a control within the unit, and unbalance is easily corrected by use of a control also provided.



Figure 1-9. Front View, Model RSA.

As in the case of the Remote System Mixer Model RSM, the RSA operates from a line which is either Balanced, center grounded; Unbalanced, one side grounded; or Balanced center floating.

SPECIFICATIONS - MODEL RSA

Input:

Composite from RSM via link, 600 ohms.

Output:

600 ohms to RSD.

Controls:

Front Panel

Input Level Attenuator
Meter Range Switch

Top Chassis

Meter Adjust control
Amplifier Gain control
Balance control

Metering:

Dual scale, -30 to -7, -20 to +3 dbm.

Power Requirements:

50 watts from RSP

Tube Complement:

3 each 12AU7 Amplifier

1 each 12AX7 Amplifier

1 each 12AT7 Meter Ampl. and AVC Rect.

2 each 6BA6 Amplifier

1 each OB2 Regulator

Size:

19" wide x 7" high x 12-1/2" deep.

Weight:

16 pounds net

67 pounds gross, for export.

E. REMOTE SYSTEM DISCRIMINATOR, MODEL RSD

The Model RSD, See Figure 1-10, is used to provide the DC Voltages necessary to remotely control the receiver. These voltages are obtained after selection of the appropriate tones of the composite received from the RSA, and their rectified outputs are impressed upon the outputs to the receiver.

The RSD has three independent channels, the outputs to control the HFO, BFO and RF Gain of the receiver. The specific frequencies used are determined by the filters mounted within, and reference to Table 1-1 and the Electrical Parts List will show allocation according to function. Amplitude limiting is provided which prevents noise and pulse interference from upsetting the operation of the equipment.

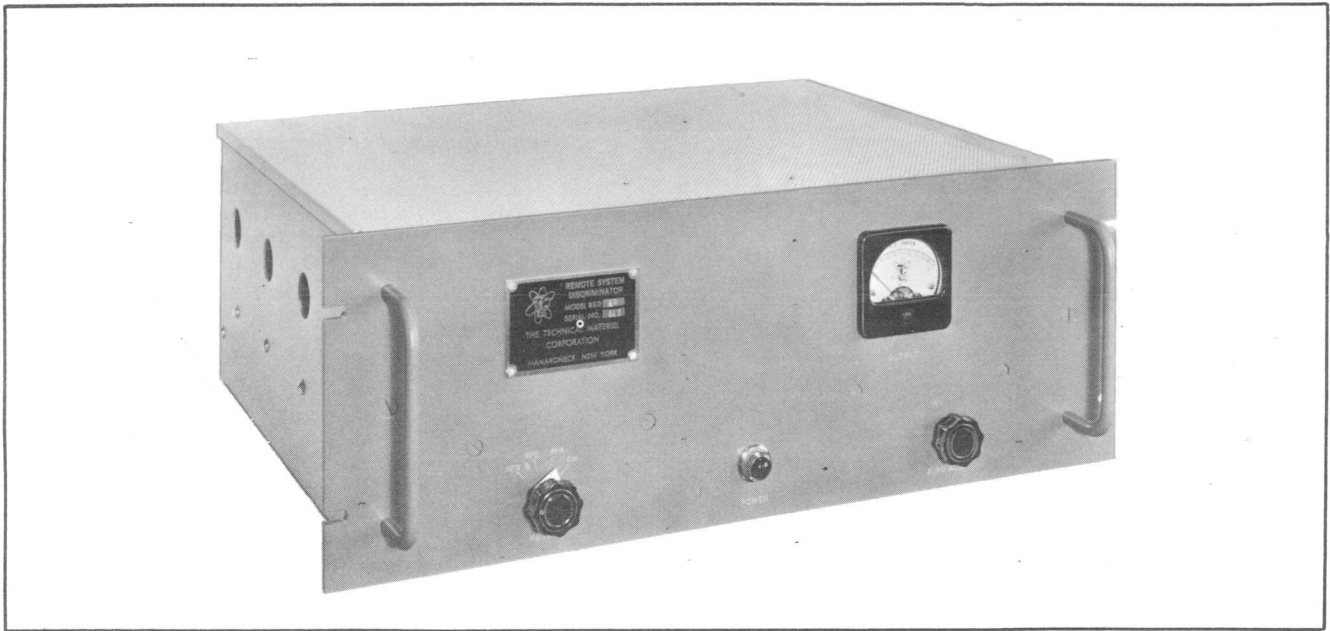


Figure 1-10. Front View, Model RSD.

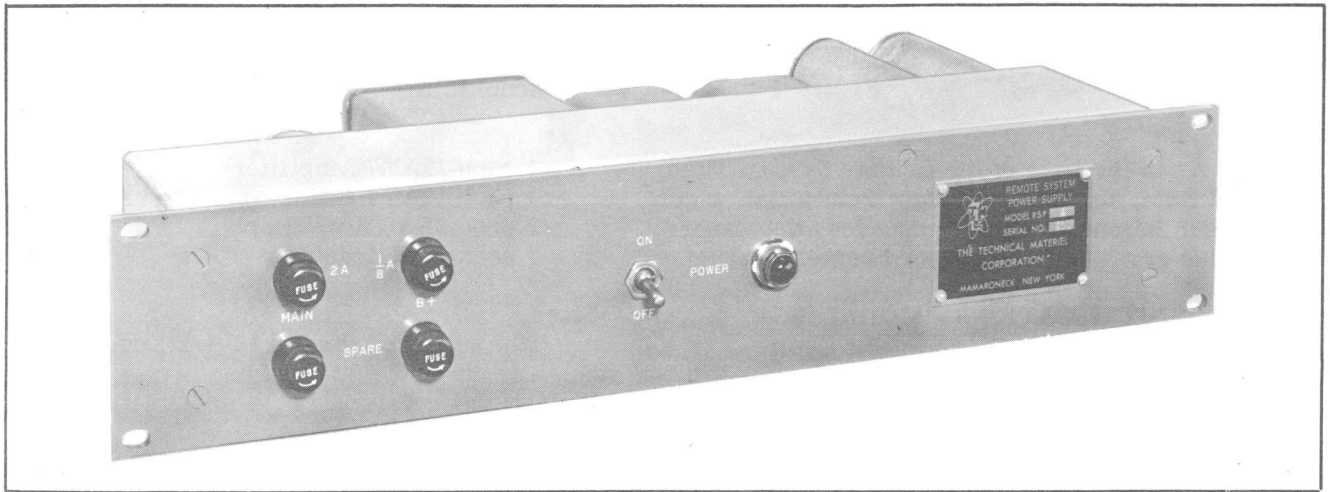


Figure 1-11. Front View, Model RSP.

The Model RSD has facilities for monitoring the DC output voltages, being equipped with a voltmeter on the front panel and rotary switch to select the appropriate channel. Test points at the amplifier input permit a rapid check of the incoming signal. Controls are available when necessary for adjustment of the discriminator on the assigned center frequency of the control signal. Separate controls are also provided to permit adjustment of the magnitude of the DC output.

SPECIFICATIONS - MODEL RSD

Input:

Composite of three tones from RSA
(See Table 1-1 for channel frequencies).

Output:

+4.5 volts for BFO
+4.5 volts for HFO
0 to -9.5 volts for RF Gain

Controls:

Front Panel
Meter Selector switch
Meter Calibrate control
Top Chassis
Meter Adjust
Rear Apron

Centering controls BFO, HFO, RFG
Output controls BFO, HFO, RFG

Metering:

Voltmeter for checking control voltages.

Tube Complement:

4 each 12AU7 Amplifier
3 each 12AT7 Amplifier
3 each 12AX7 Limiter
2 each 6C4 Driver
3 each 6AC5 Rectifier
2 each OB2 Regulator

Power Requirements:

65 Watts from RSP.

Size:

19" wide x 7" high x 14-3/4" deep.

Weight:

33 pounds net
81 pounds gross, for export.

**F. REMOTE SYSTEM POWER SUPPLY,
MODEL RSP**

The Model RSP, See Figure 1-11, provides the filament and plate voltages for the Models RSC, RSA and RSD. Each unit is identical and

can be used interchangeably. Interconnection is provided by an eight conductor cable assembly with polarized fittings. (CA-196)

SPECIFICATIONS - MODEL RSP

Input:

110/220 volts 50/60 cps 65 watts.

Output:

6.3 volts @ 3 amps, CT
6.3 volts @ 1.2 amps
300 volts @ 70 ma.

Controls:

Power on/off switch
Light Indicator
One 3 amp B+ fuse, one spare
One 1/8 amp filament fuse, one spare

Tube Complement:

One- 5Y3GT Rectifier

Size:

19" wide x 3-1/2" high x 8-1/2" deep.

Weight:

16 pounds net
43 pounds gross, for export.

SECTION II THEORY OF OPERATION

1. OVERALL SYSTEM THEORY

The TMC Remote Control System, Model RCR, as has previously been discussed, provides for remote control of a receiver or other device from a central station, using a land line or microwave link to interconnect. (Refer to Block Diagram Figure 2-1). The system uses a form of frequency shift, varying a tone $\pm 42\text{-}1/2$ cps around a center assigned frequency. Three standard tones within the band 400 to 3,000 cps are generated at the Model RSC and are calibrated depending upon the function on the front panel of that unit. The RSC also provides amplification and monitoring of the returning audio signal at the operators desk. By manipulation of the control knob it is possible to vary the HFO of the receiver a minimum ± 2 Kcs per Mc. from 2 to 8 Mcs. and ± 1.5 Kcs per Mc. from 8 to 32 Mcs. and to adjust the RF Gain from complete silence

to maximum sensitivity of the receiver. The Beat Frequency Oscillator (BFO) may be controlled a minimum of ± 2 Kcs. The BFO may also be switched on/off by means of a toggle switch on the front panel as well as the AVC switched on/off.

The Model RSC delivers the three generated tones to the Model RSF, Remote System Filter, which filters the tone to a distortionless sinusoidal voltage and a resistive network combines the tones to a single composite which is delivered to the Remote System Mixer, Model RSM which follows.

The Model RSM accepts the outputs of the five (assuming maximum use of the system) filter units and forms a single composite containing all of the tones within the 15 channel pass band for transmission over the link to the remote site.

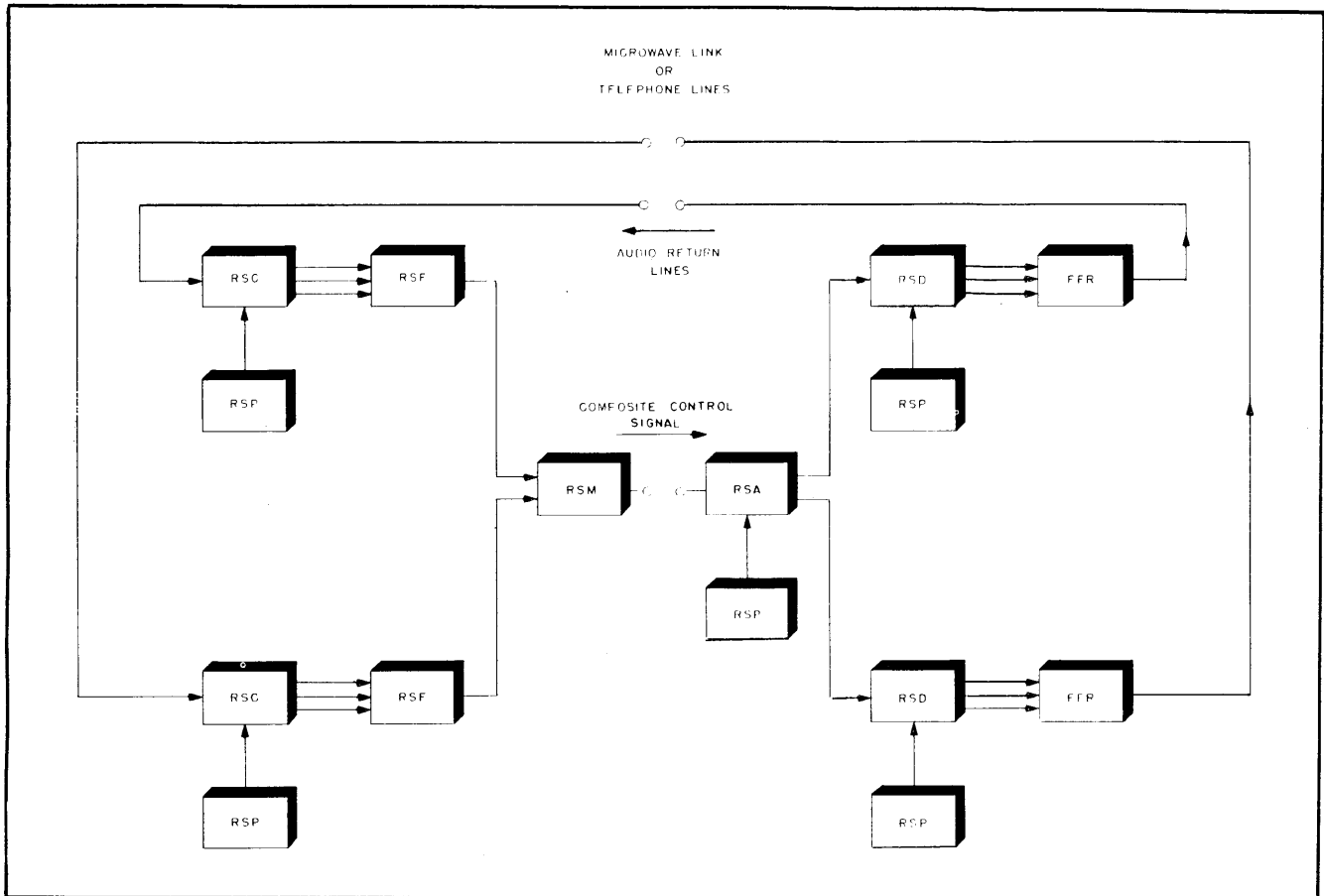


Figure 2-1. Functional Block Diagram, Model RCR.

At the remote site, the Model RSA accepts the composite output from the link and converts it into an amplitude stable signal which is virtually independent of line loss fluctuations. The composite is then broken into five properly matched pairs which serve to introduce the composite into each Model RSD.

The Model RSD selects the appropriate tone and converts its deviation from its center frequency into a proportional D.C. output. This D.C. voltage is used in turn, to control one of the receiver reactance tubes or the AVC bus.

The audio output of the receiver is then returned via an individual pair for each receiver to the control site, and is monitored by the operator at the RSC. Further details of individual theory are contained in the following portions of this section having to do with individual unit theory.

2. COMPONENT EQUIPMENT THEORY

A. THE TMC REMOTE SYSTEM CONTROL, MODEL RSC

The Model RSC provides the source of tone

frequencies used for the control of the remote receiver. Reference should be made to the Block Diagram Figure 2-2, and to the Electrical Schematic, Figure 6-2, which should be pulled out to lie flat for the purposes of discussion.

The frequency determining networks, (Z1, Z2 and Z3) bearing TMC Part Numbers NF-104-1275, NF-104-1445, etc., provide the basis for the tones. Facilities are included for adjusting the tone frequencies. Each unit is carefully checked against a calibrated counter before and after installation within the equipment. The units are sealed and once installed should require no attention.

The Oscillators (V1, V3 and V5) are controlled by the wein bridge type networks and serve as the source of audio frequency energy. Amplitude stabilization is achieved by the use of current sensitive resistor lamps, I1, 3 and 5. Since the amount of degeneration is controlled by the amplitude of the waveform, a very nearly constant output is obtained independent of frequency. Coarse frequency control is accomplished by use of an adjustable resistor mounted within the NF-104 networks. Fine frequency con-

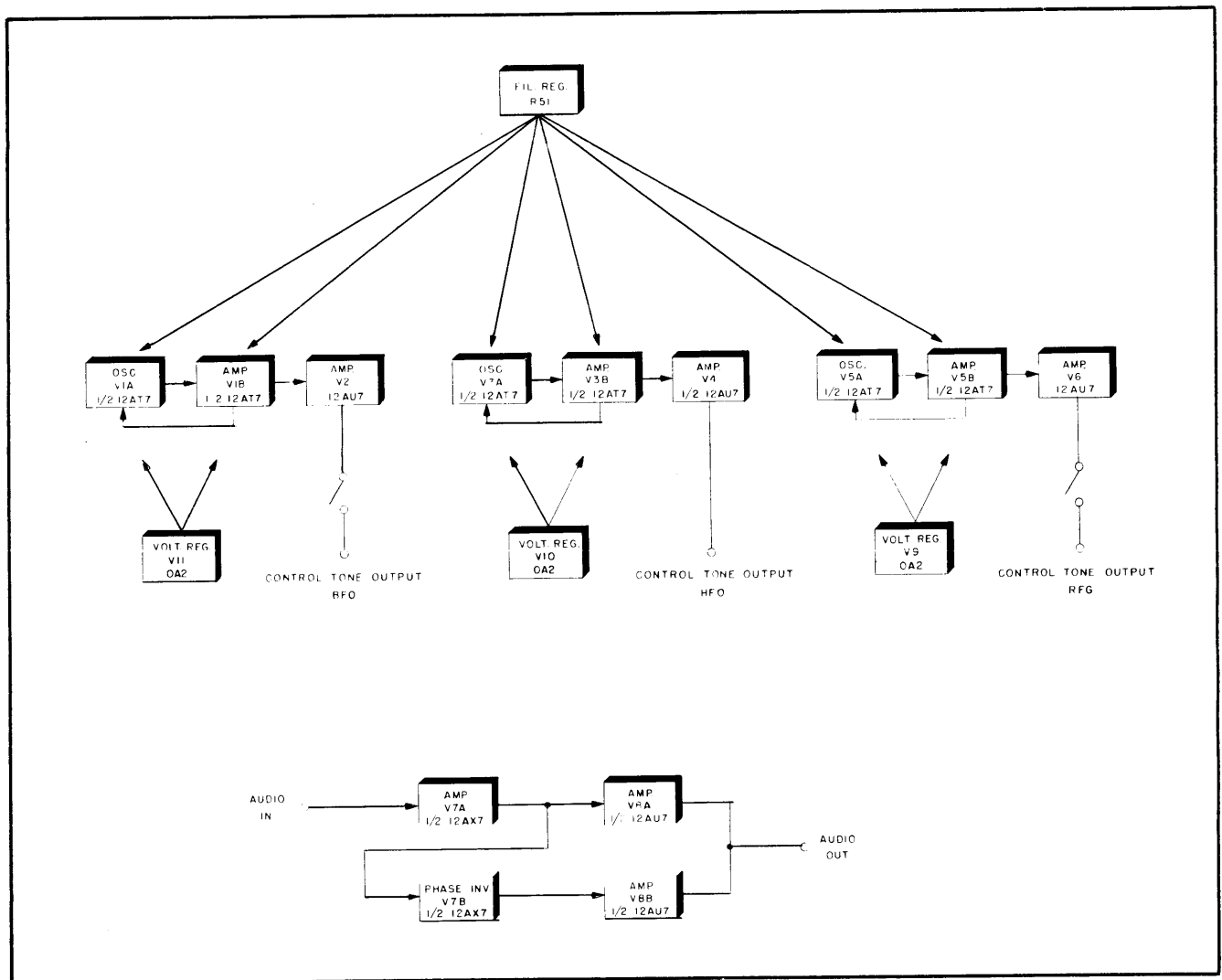


Figure 2-2. Functional Block Diagram, Model RSC.

control is provided by continuous variation of air variable capacitors C1A and C1B.

The Amplifiers (V2, V4, V6) accept the input from the oscillators through a paraphase arrangement and operate in push-pull. Amplification of the tone frequency takes place with a minimum of distortion, at the same time, isolating the oscillator-amplifier stages from each other very effectively. The adjustable pads, R11, R23 and R35 in the output circuits permits continuous variation of the output amplitude into an impedance of 600 ohms.

The returning intelligence is fed through an impedance matching transformer (T4) and then through a selective filter (Z4) and into phase inverter V7. The selective filter serves to eliminate adjacent channel interference when an operator chooses to insert it by means of a front panel switch. This switch also enables the operator to choose any one of four filter center fre-

quencies while another control permits him to vary the bandwidth of the filter.

The Output Audio Amplifier, V8 increases the output of the signal suitable for loudspeaker operation. It is possible, and frequently desirable, however, for the operator to use phone monitoring and a jack (J4) has been provided for that purpose. The toggle switch S3 silences the loudspeaker if phones are plugged in but removal of the phone plug puts the loudspeaker in operation regardless of the position of the switch. Output impedance is designed for 50 ohms.

B. THE TMC REMOTE SYSTEM FILTER, MODEL RSF

The Model RSF provides proper filtering of the three tones generated within the RSC, eliminating harmonic content and linearly combining the three tones for delivery to the Model RSM. Reference should be made to Block Diagram,

Figure 2-3 and to the Electrical Schematic Figure 6-4, which may be pulled out for purposes of discussion.

The high quality bandpass filters ZF1, ZF2 and ZF3 admit the fundamental only of the spec-

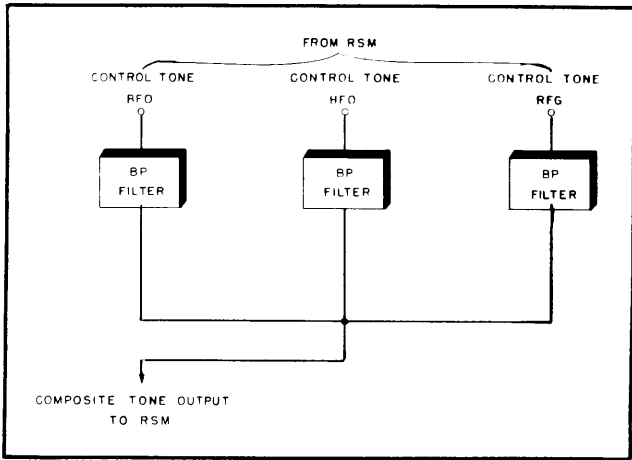


Figure 2-3. Functional Block Diagram, Model RSF.

ified frequency. See the Part Number and frequency chart on the electrical schematic Fig. 6-4 which should be pulled out to lie flat for the purposes of the discussion.

The selector switch S1 permits monitoring of the desired channel through jack J1, and both are mounted on the front panel of the equipment marked TONE MONITOR and HIGH IMPEDANCE METER respectively.

All connections of input from the RSC and output to the RSM are made via terminal board E1 mounted on the rear of the unit. Impedance of the input and output is 600 ohms.

C. THE TMC REMOTE SYSTEM MIXER, MODEL RSM

The RSM provides for combination of all of the respective outputs of the Models RSF, up to a maximum of five units (15 channels) and transmission onto the connecting link to the remote site. Reference should be made to Block Diagram Figure 2-4, and to the Electrical Schematic Fig-

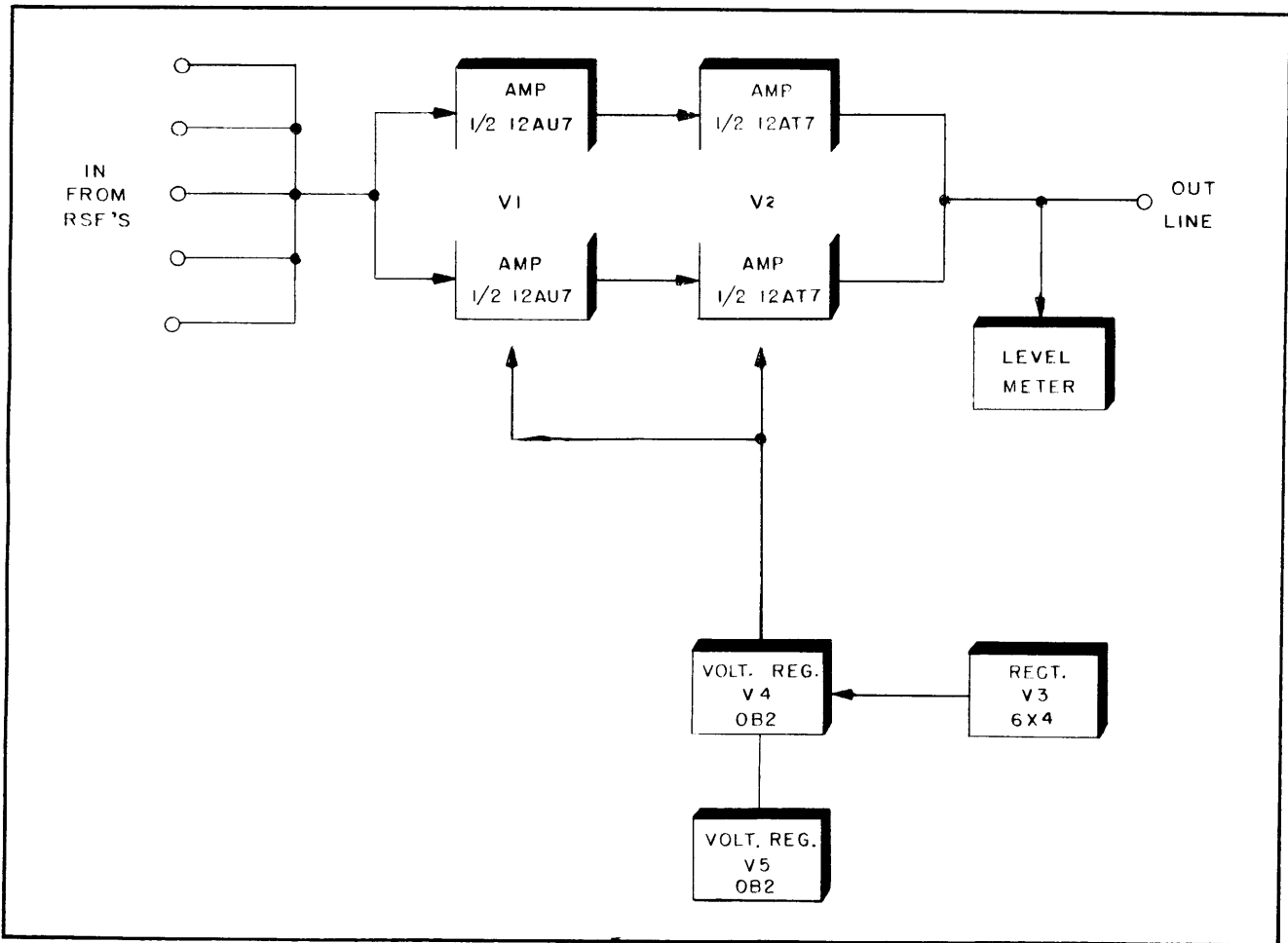


Figure 2-4. Functional Block Diagram, Model RSM.

ure 6-5, which may be pulled out to lie flat for purposes of discussion.

A ten-terminal board, E1 provides the input terminations for the composites from the RSF's and the resistive matching network R1 through R7 linearly combines them. Should less than the full five channels be used, a 680 ohm resistor should be substituted on the terminal board in place of the unused channel to simulate the normal condition.

An adjustable portion of the composite signal is then fed to the amplifier input transformer T1, and two stage amplification is provided by tubes V1 and V2. A negative feedback path for the second amplifier results in an excellent distortion figure and frequency response for the operating range. In order to bring distortion to a minimum a balance control, R13, for the second amplifier stage is incorporated, available within the unit from the top of the chassis. An output pad serves to isolate the transmission line from interaction with the secondary of T2.

Monitoring of the output of the RSM is provided by the dbm meter M1, mounted on the front panel and the output of the unit is controlled by R7, marked LEVEL on the front panel.

The Model RSM has its own built-in power supply, consisting of power transformer T3, Rectifier V3 (6X4) and its filter section. Voltage regulation is provided by use of two type OB2

tubes, V4 and V5, and the power is indicated by lamp I1, mounted on the front panel with its power switch S1.

D. THE REMOTE SYSTEM AMPLIFIER, MODEL RSA

The Model RSA, located at the remote site, is designed to accept the input from the link or telephone line, amplify it and maintain its level constant and then branch it off to the various Models RSD.

Reference should be made to the Block Diagram Figure 2-5, and to the Electrical Schematic Figure 6-1, in order to follow the discussion of stages.

A four-terminal board, E1 provides the mechanical connection from the line and feeds directly to input transformer T1 which isolates the line input from the amplifier proper. An adjustable T pad available at the front panel provides the desired signal attenuation and prevents the over-driving of the following stages. Use of the amplifier tube V6 at this point for the meter circuit prevent loading of the signal line with consequent introduction of distortion. The monitor meter M1 provides indication of line levels in two ranges, -30 to -7 and -20 to +3 dbm, selected by RANGE switch S1. A meter adjust control is also available on the top of the chassis of the unit.

A low pass filter, ZF1 is incorporated at the

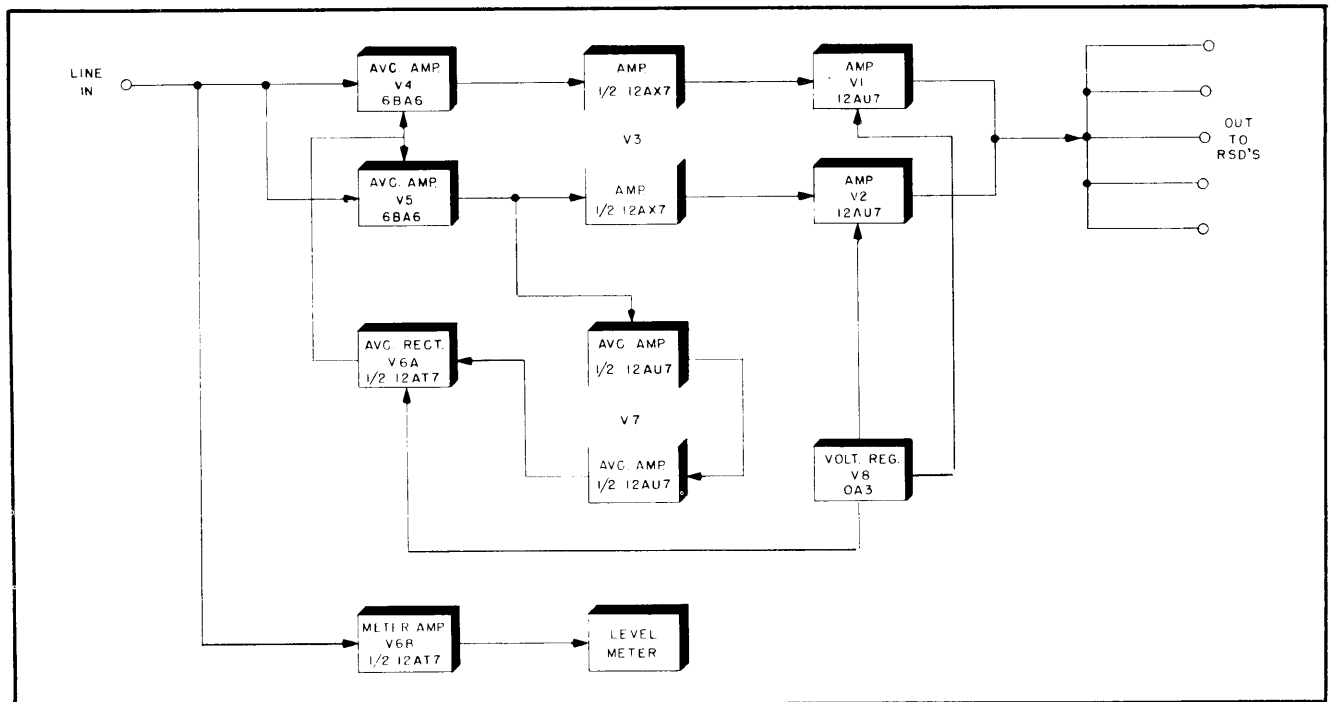


Figure 2-5. Functional Block Diagram, Model RSA.

input to interstage transformer T2, and this transformer provides a step-up ratio of approximately 2:1, isolates the input circuit from the amplifier, and permits push-pull operation of the following stages. V4 and V5 operate as push-pull AVC stages using high gain pentodes which hold the output nearly constant for large variations of input level. Elimination of 60 cycle interference is accomplished by use of trap ZF2.

The transformer T3 accepts the push pull output and feeds the two stage amplifier V3, V1-V2 with fixed interstage gain. The input level to these stages is adjusted by use of gain control R17, available within the unit on the top chassis. A balance control (R23) is similarly provided in the final stage. The function of R23 is to choose an operating point which introduces the least distortion.

Transformer T4 accepts the output of V1-V2 and feeds the amplified signal to the output pad. This pad has provisions for the maximum of five output connections and is terminated on terminal board E2. As in the case of the RSM, in the event less than five channels are used, a 680 ohm resistor should be installed on the open pair to simulate normal operation.

The RSA accepts its filament and plate voltages from a single RSP, and connection is made through J1, mounted on the rear apron of the equipment. Regulation of the high voltage takes place within the RSA (V8, OA3). An indicator lamp is mounted on the front panel to show when power is being delivered to the RSA from its RSP.

E. THE TMC REMOTE SYSTEM DISCRIMINATOR, MODEL RSD

The RSD is designed to accept one of the five outputs of the Models RSA and deliver a discriminated voltage to the receiver for control purposes. Reference should be made to the Block Diagram Figure 2-6, and to the Electrical Schematic Figure 6-3, in order to follow the discussion of the circuit.

A nine-terminal board is provided at the input to the RSD which includes a two terminal input, and the outputs of three channels to be connected to the receiver. From the input terminals 8 & 9 on E1, the composite tone is fed to the input filters ZF1, ZF2 (for BFO), ZF3, ZF4 (for HFO), and ZF5, ZF6 (for RFG), which select the appropriate frequency and after filtering, feed it to the respective amplifier stages V1, 2, 6, 7, 11, 12.

The two stage amplifiers provide a considerable amount of gain, making proper limiting action possible under a broad scope of operating conditions.

The limiters, V3, V8 and V13 serve to remove the amplitude components from the now separated signals, since only the frequency component of the signal is required for the control function. It will be noted that amplitude variations of the signal will have little effect upon the operation of the discriminator.

The driver stages V4, V9A, V14 follow the limiters and are used to power feed the discriminator-rectifier stages via interstage transformers T1, T2 and T3.

In each BFO, discriminator transformer (ZD1), two resonant circuits are used, one being above and one below the center frequency of the controlling tone. The discriminator-rectifier (V5) is so connected that opposing voltages are produced in their common load. When the tone is shifted to one side of center, one of the discriminator resonant circuits will produce more output than the other, and the resulting DC output will have a potential and sign directly proportional to the degree and direction of shift. The HFO discriminator operates in identical fashion, (V10). It is in the RG Gain that the three channels discontinue their similarity, the HFO and BFO being symmetrical discriminators, while the RF Gain requires only a voltage varying from a negative value to zero.

Further, in the case of the BFO or RFG channels, the tone is rectified at V3A or V12A and applied as a negative cut-off bias to the relay tubes, (V2B or V12B). If the tone falls below a predetermined level (as when it is shut off at the RSC) energizing current is permitted to flow in the relays and the receiver is accordingly switched to BFO OFF or to AVC LOCAL as the case may be.

The maximum DC outputs at the terminal board are ± 4.5 volts for HFO and BFO and from 0 to -9 volts for the RF Gain channel.

The Meter, M1 mounted on the front panel, enables the operator to read the DC voltages of the channel outputs, and the selection is made by operation of selector switch S1, also mounted on the front panel along with a meter adjust control.

Power is supplied to the RSD from an RSP, through connector J1 mounted on the rear of the unit. High voltage regulation is provided within the RSD by means of two tubes type OB2, V16 and V17. An indicator lamp is mounted on the front panel to show when power is being delivered to the RSD from its RSP.

Centering controls, output controls, as well as test points for checking input tones are available on the rear apron of the equipment.

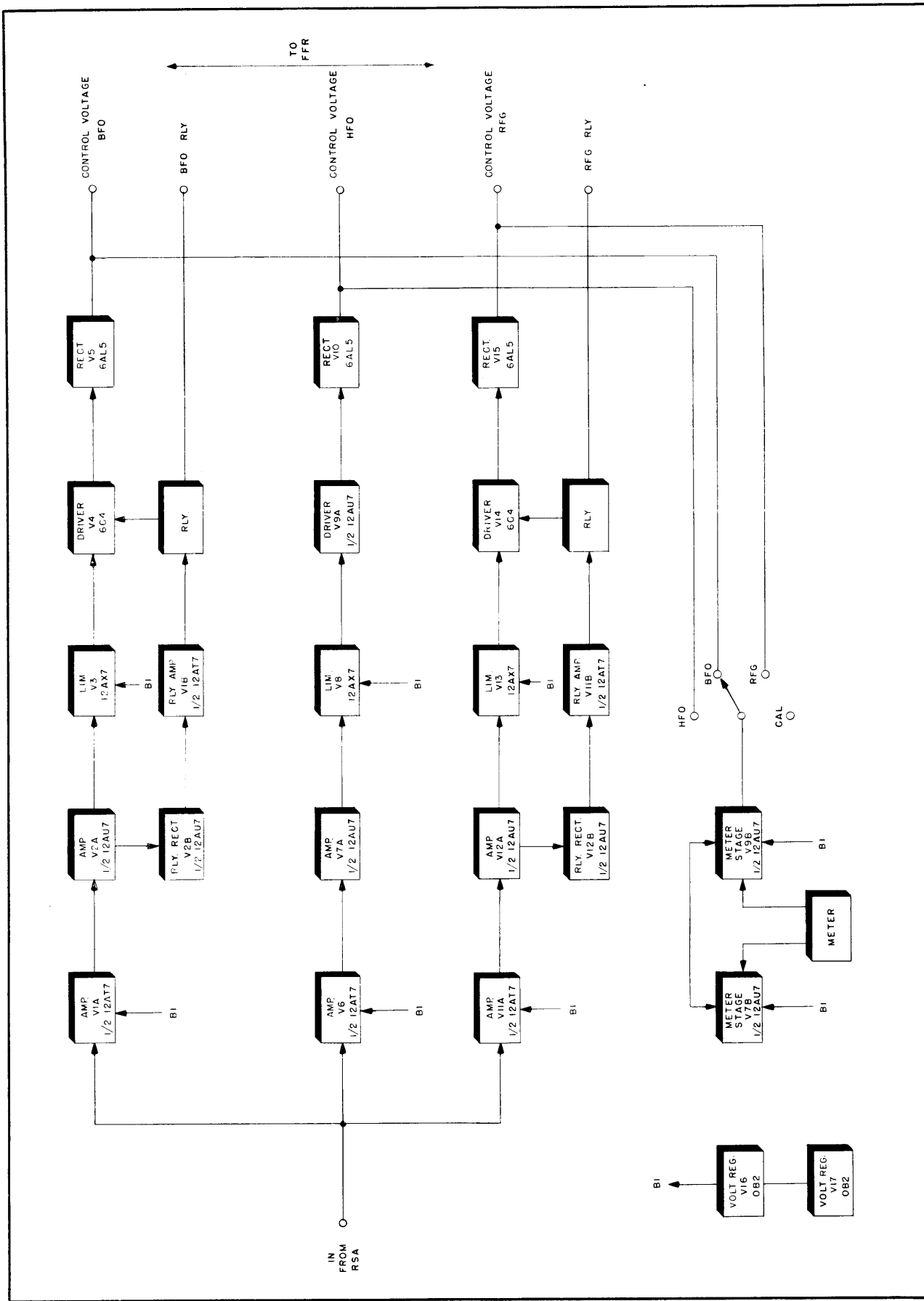


Figure 2-6. Functional Block Diagram, Model RSD

F. THE TMC REMOTE SYSTEM POWER SUPPLY, MODEL RSP

The RSP is designed to provide the filament and plate voltages to the Models RSC, RSA and RSD equipments of the System. Reference to the Schematic Diagram Figure 6-6, will indicate a 110/220 volt universal transformer having outputs to provide the necessary power to the above equipments.

The high voltage section has a double pi-section filter chain and a bleeder resistor which keeps the voltage from rising accessively in the absence of load.

All voltages are supplied to the respective equipments by means of polarized plugs, the out-

put of the RSP being a flush female receptacle, and the inputs to the equipments being flush male contact connectors.

The input power to the RSP is provided by a standard AC power cable with non-polarized male fittings one end, and female contact twist lock connector on the other, a male contact flush receptacle J2 mounted in the rear apron of the RSP.

The RSP includes two operating (3 amp, and 1/8 amp) fuses and two spares mounted in the front panel, as well as an indicator lamp for power on/off indication. The 2 watt 12 ohm resistor R1, greatly prolongs the life of the indicator lamp and prevents frequent operator maintenance.

**SECTION III
INSTALLATION AND OPERATION**

1. INSTALLATION OF THE SYSTEM

A. The TMC Remote Control System has been designed for ease of installation and operation. Each individual component equipment is packed in a separate shipping container, See Table 3-1, unless otherwise requested, and should be carefully unpacked and examined for damage in shipment. As the system has been constructed on a building block basis, the installation should normally take place by equipments and therefore most of the discussion shall be done with that in mind.

B. Once received, the equipment will generally be separated into the two sites, Control and Remote, in accordance with the listings in Figure 1-3. The power supplies should be appropriately allocated, i.e., five for each control site and six for each remote site, for a complete system, and the equipment assembled within the operating and receiving site buildings.

C. Interconnection between sites is accomplished by telephone lines or microwave link, and local conditions dictate the placement of terminations, use of amplifiers, etc. For a com-

**TABLE 3-1
PACKING WEIGHTS AND MEASURES**

UNIT	NET	GROSS	LENGTH-WIDTH-HEIGHT	CUBIC FEET
RSA	16 lbs.	67 lbs.	27 x 15 x 24	6.50
RSC	15	65	27 x 15 x 11	2.44
RSD	32	81	27 x 15 x 24	5.56
RSF	8	35	27 x 15 x 24	5.56
RSM	16	66	27 x 15 x 24	5.56
RSP	16	43	27 x 15 x 11	2.44

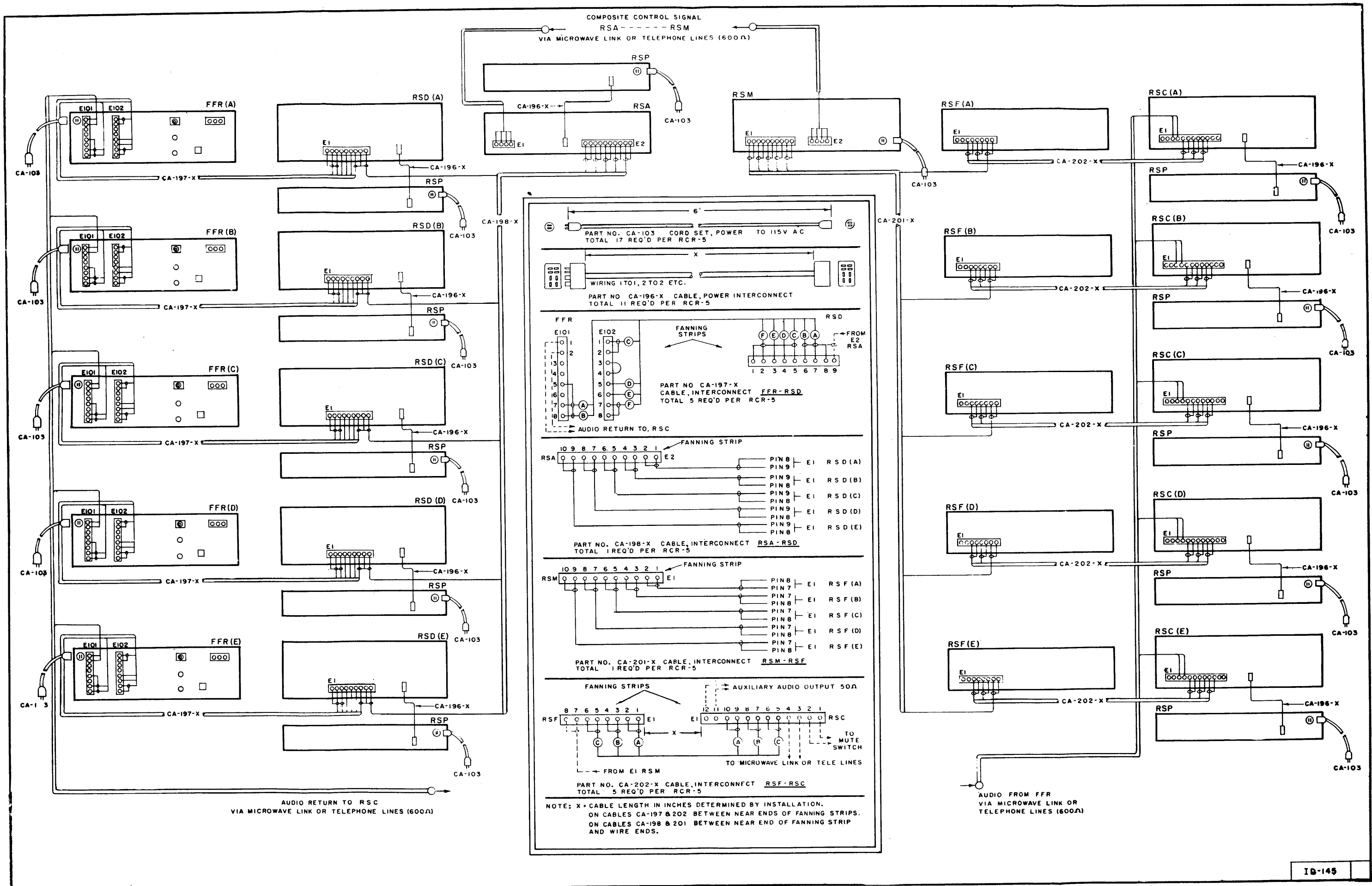


Figure 3-1. System Cabling Diagram, Model RCR-5
3-1

plete five channel (RCR-5) system, six two-wire lines are required, one for transmitting the composite control tones from the control site, and one for each receiver for the returning audio intelligence. While there is no problem involved if microwave link channels are used, it is imperative that in the case of telephone lines a thorough check be made of the frequency response of the one line for the overall composite. Since the overall composite contains frequencies ranging from about 400 cps to about 3000 cps, no attenuation in excess of ± 2 db within this band should be introduced by the telephone line. Generally a loaded type telephone line of good quality will be found to meet this requirement easily.

D. Each installation will in all probability vary from site to site, but a recommended rack layout is shown in Figures 1-1 and 1-2. It will be assumed that this installation will be used for the purposes of discussion, and variations will be worked out at each site. The equipment requires no special alignment or testing, etc., prior to rack mounting unless unpacking discloses damage. Once installed in the racks (or cabinets) as required, simple cabling and interconnection may be accomplished.

E. In many instances TMC has been supplied with installation drawings and has, therefore, provided cables with the equipment, in which event installation can be accomplished within a few hours. For those instances where this is not feasible, the equipment is supplied with fanning strips attached to each and every terminal board to enable the installation group to properly terminate the interconnecting cables. A drawing, Figure 3-1 of this manual will give installation data for the cables.

F. When equipment layout for installation is known, cable lengths can be determined and if so requested can be supplied with the equipment by TMC. Reference to Figure 3-1 will show a five channel system (15 controls) and includes cable part numbers which are completed by adding length of cable between terminations.

A standby service cable part CA-196-72 measuring 6 feet overall should be available in all installations for use in the event of a failure of an individual power supply, to permit connection of a standby equipment while corrective maintenance is being performed on the faulty unit.

G. AC line cables are standard throughout the system, TMC Part CA-103, which is used with each RSP and each RSM as well as the Model FFR receiver.

H. It is suggested that primary power be

provided to plug-in strips mounted with the rack in order that each unit requiring power will have it readily available.

2. OPERATION

A. GENERAL:

The outline below will permit operating personnel to quickly place the entire system in operation. The procedure is both simple and brief and should be followed at the time of initial installation and at regular intervals thereafter. If however, the results outlined below are not obtained at any point during set-up, reference should be made to Section IV Part 3 d.

B. CONTROL SITE:

1. Turn all Model RSP power switches to the "ON" position and do likewise on the Model RSM. Contact the remote site and request that all Models FFR (receiver) and all Model RSP power switches be turned "ON" at that point also.

Permit at least one hour to elapse for warm-up time.

2. The power indicating lamp on every piece of equipment in the system, with the exception of the Model RSF which requires no power, must be lighted.

3. The next step will be to determine if the Model RSC-A is sending out the necessary control tones and if they can be properly varied.

a. Plug a pair of high impedance head phones into the front panel jack of the Model RSF-A and rotate the TONE MONITOR switch to the BFO position.

b. On the Model RSC-A front panel turn the BFO switch to the "ON" position and rotate the BFO control from one extreme to the other. The switch must make the tone in the headphones appear in the "ON" position and disappear in the "OFF" position while rotation of the BFO control must cause the tone to vary in frequency.

c. Repeat Parts a and b (above) for the RF GAIN except that, in this case, the tone must appear when the AVC switch is thrown to "OFF".

d. Repeat Parts a and b (above) for the HFO TUNING, neglecting all references to turning the tone "ON" or "OFF".

e. Turn the SPEAKER switch to "ON". Set the AUDIO FILTER FREQUENCY to OUT. Place the AUDIO GAIN somewhere near its center of rotation.

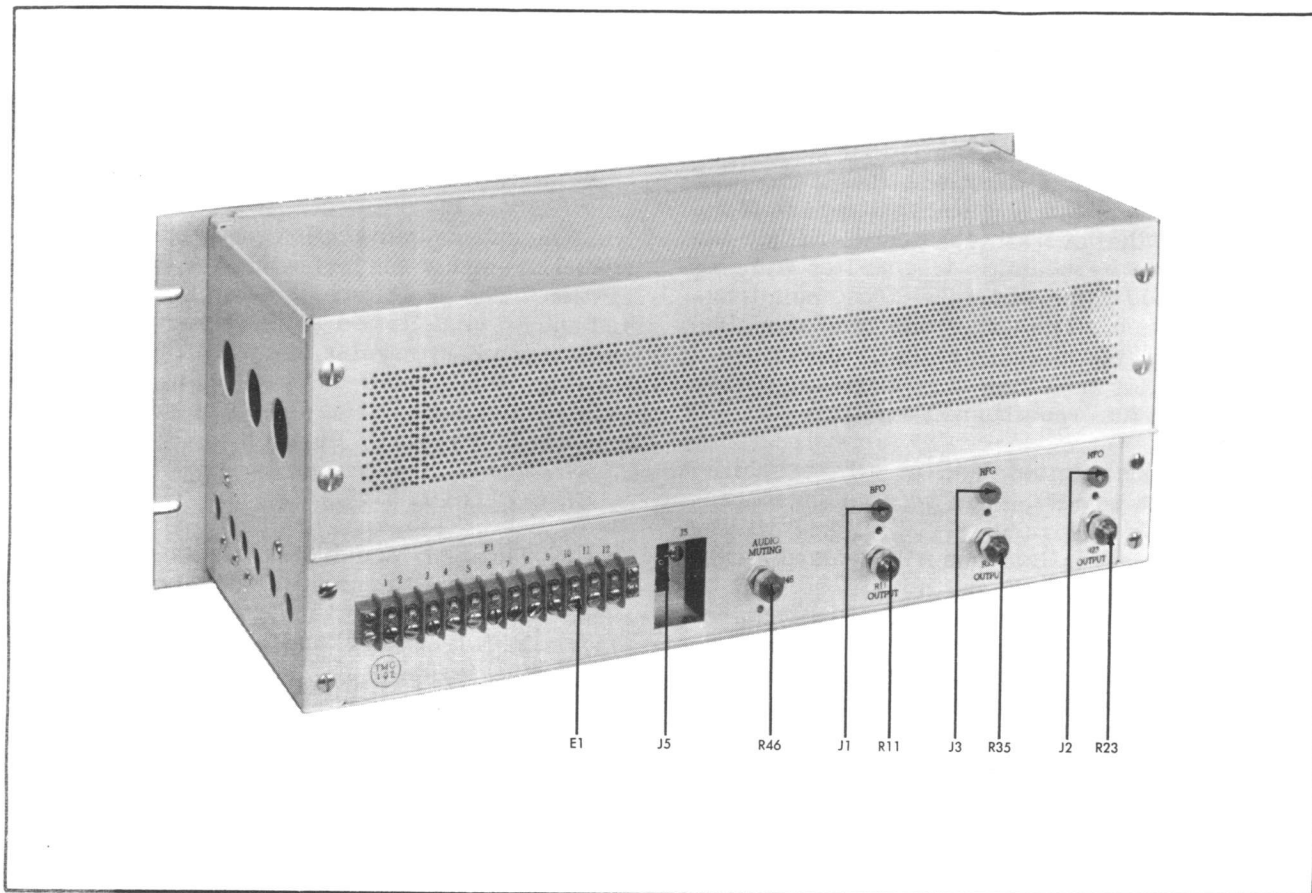


Figure 3-2. Rear View, Model RSC

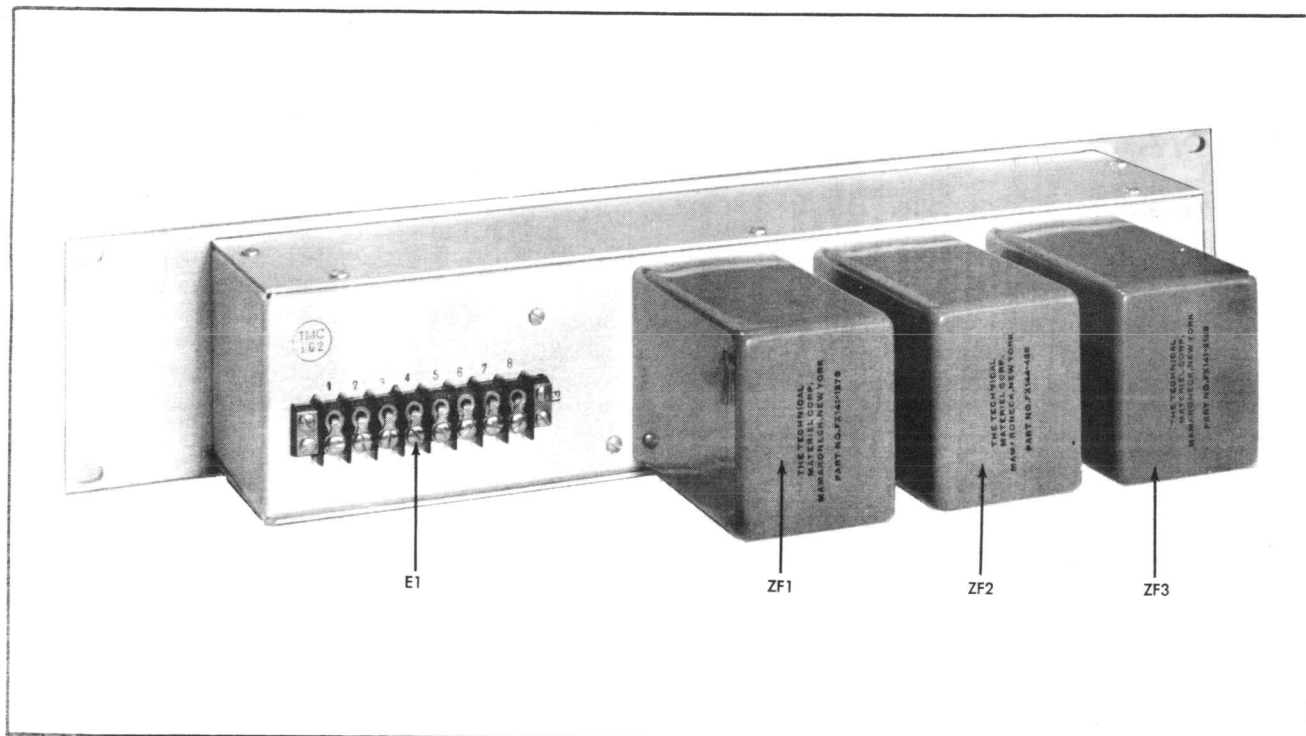


Figure 3-3. Rear View, Model RSF

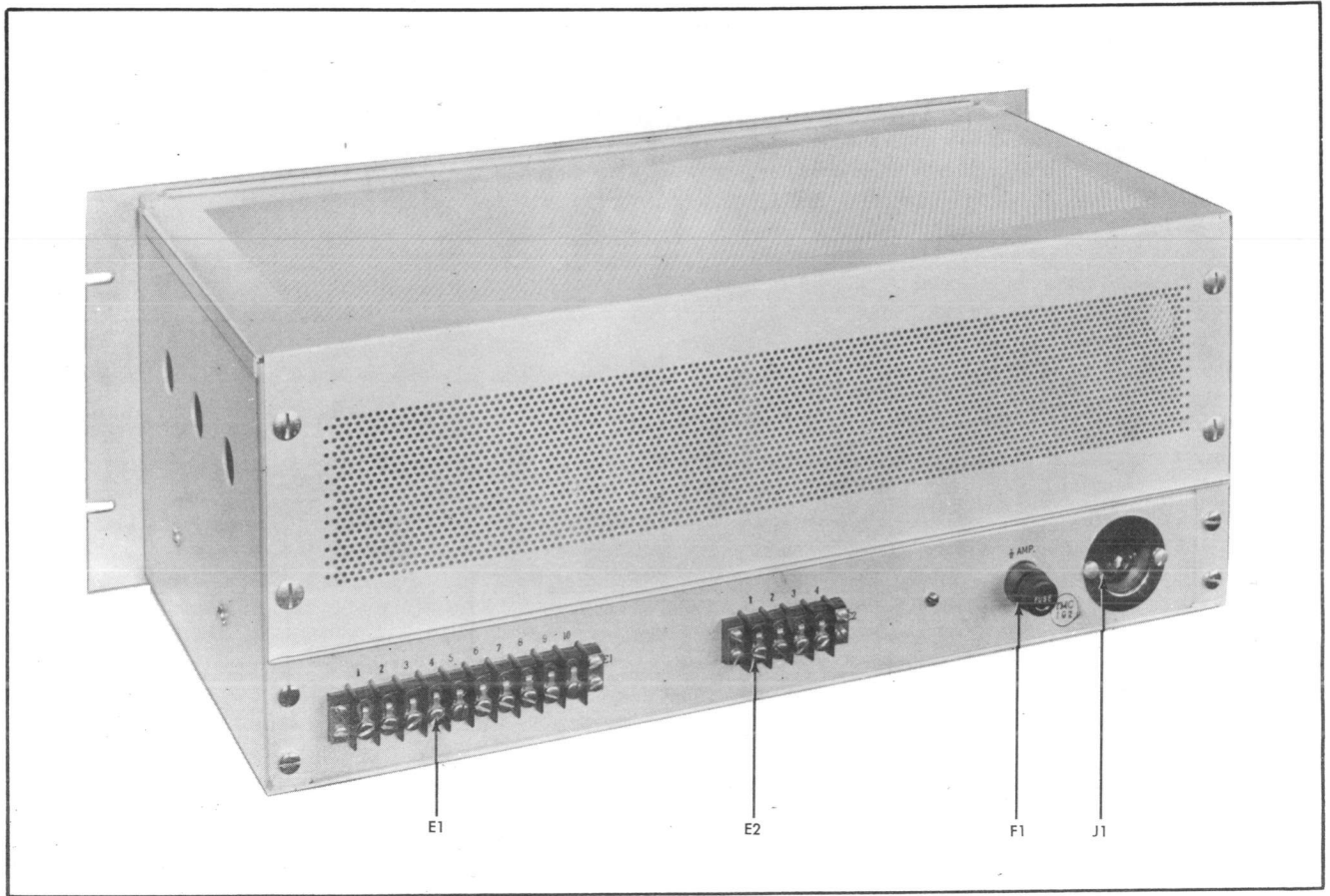


Figure 3-4. Rear View, Model RSM

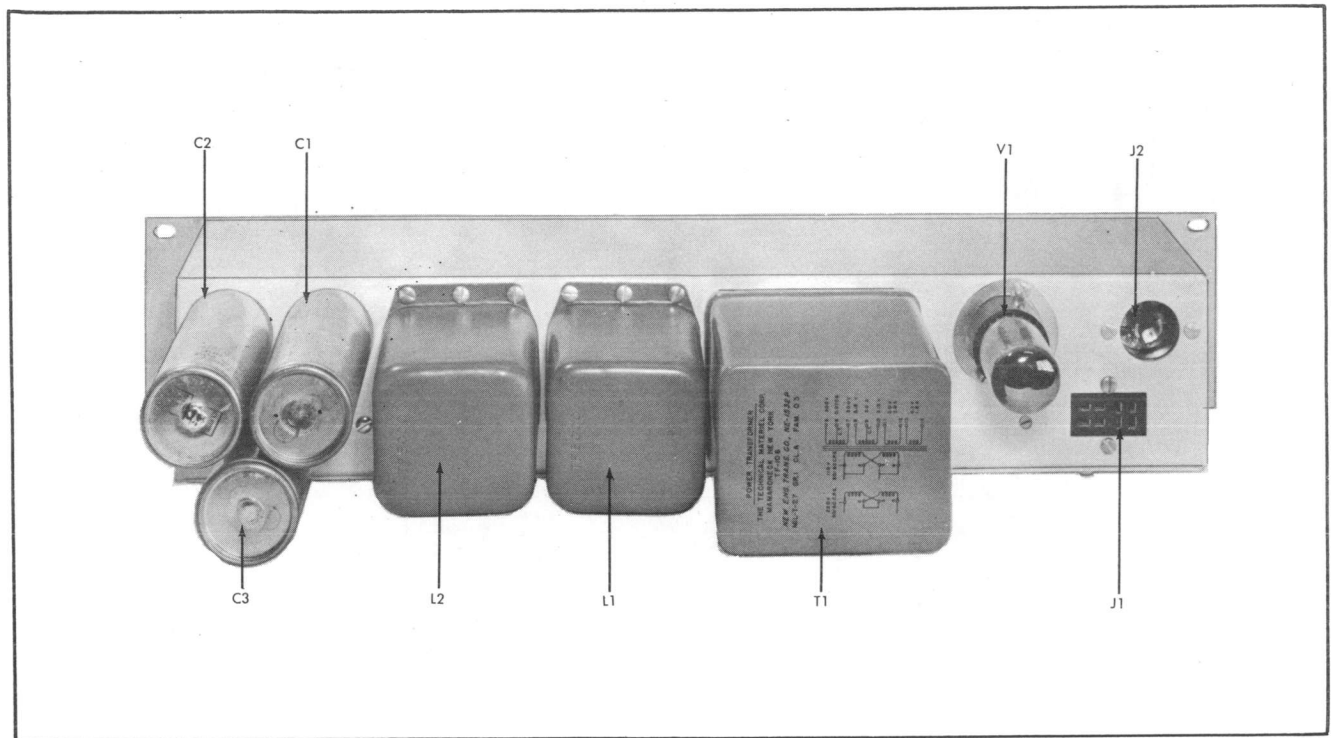


Figure 3-5. Rear View, Model RSP

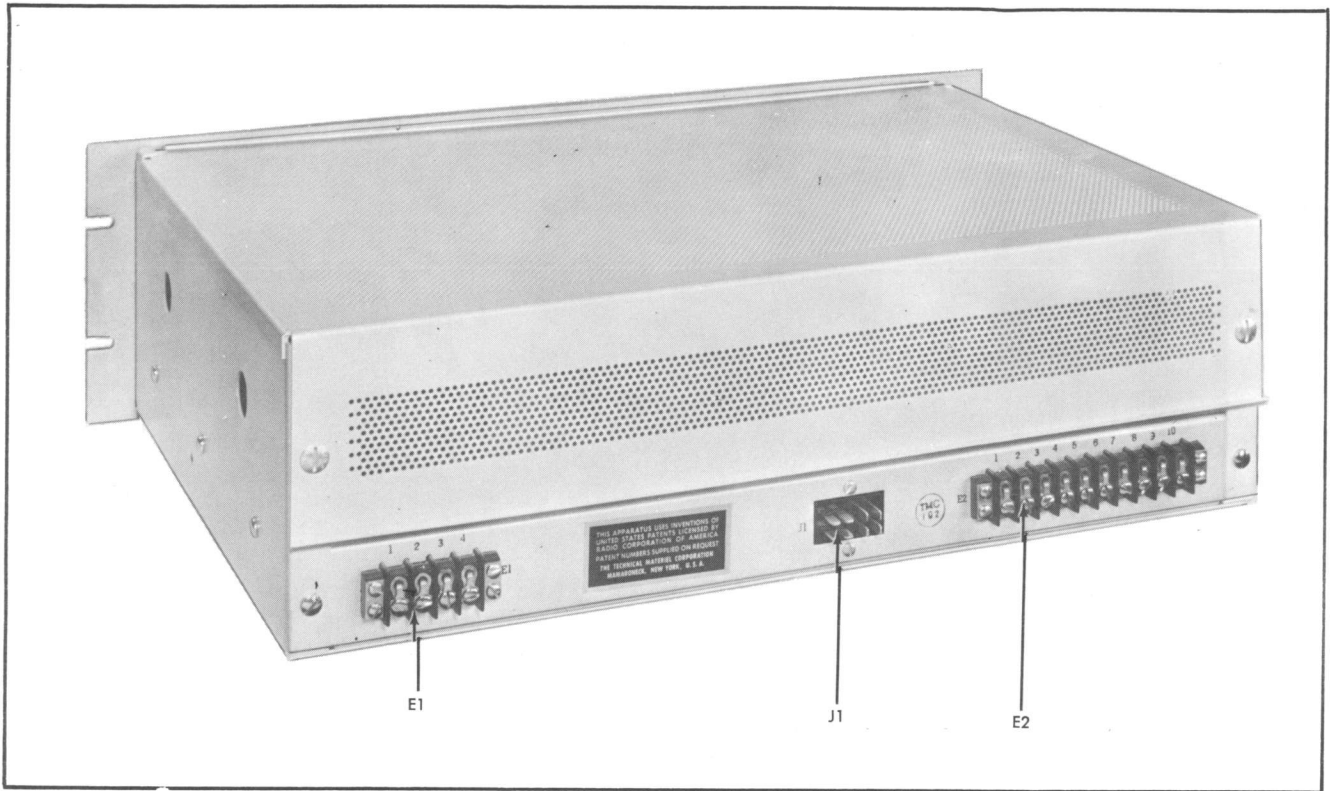


Figure 3-6. Rear View, Model RSA

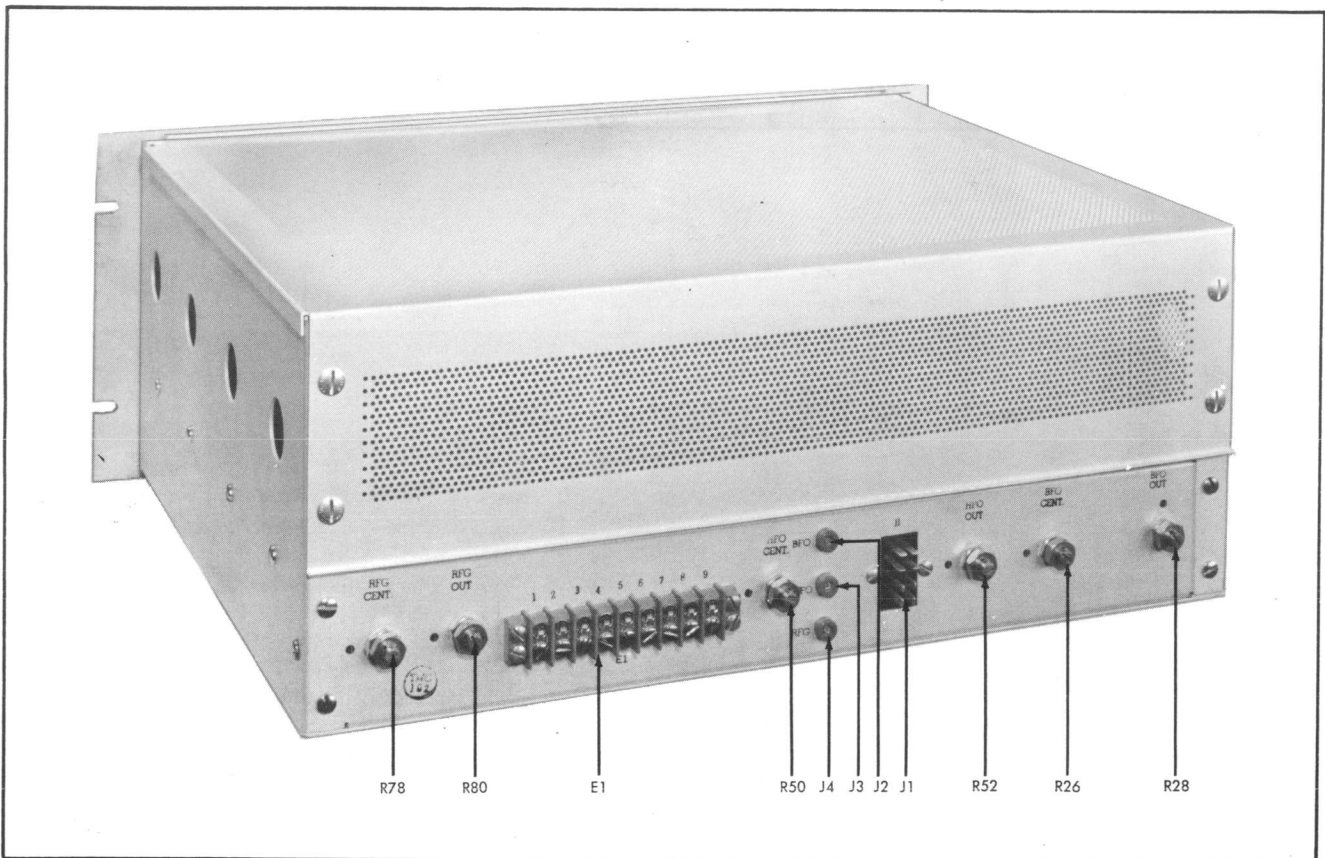


Figure 3-7. Rear View, Model RSD

4. For each Model RSC-RSF combination used (i.e., RSC-B and RSF-B, RSC-C and RSF-C, etc.) repeat Part 3 (above).

5. Set the Model RSM control marked LEVEL for a 0 dbm reading on the meter. This indicates the level of the composite tone being transmitted to the line. Adjustment of the Control Site has now been complete.

C. THE REMOTE SITE:

1. Be sure that Parts 1 and 2 (above) have been fulfilled.

2. Set the input LEVEL control on the Model RSA to maximum if the incoming composite tone is less than -5 dbm. If it is greater than that value set the LEVEL control so that the meter reads -5 dbm. The received level will, of course, be dependent upon line losses. The system should not be operated on line losses which exceed 30 db since an additional momentary drop in level will make it difficult to obtain continuous control. By the same token, in setting the maximum level to -5 dbm the operator is insuring himself against momentary upward surges which might overdrive the equipment.

3. a. On the Model RSD-A set the METER switch to CAL and rotate the ZERO ADJ knob until the meter reads zero at its center.

b. Now rotate the METER switch to BFO and, by communicating with the operator at the Control Site, request that the BFO control on the Model RSC-A be rotated through its extremes and then turned on and off. Under these conditions, the meter on the Model RSD-A must pass roughly ± 4.5 volts, through zero, and then back up to roughly -4.5 volts. The meter must read ap-

proximately zero at its center when either the BFO switch is turned to "OFF" or the BFO control is set at its center.

c. Follow a similar procedure for the HFO while keeping in mind that the HFO has no "ON" - "OFF" switch feature.

d. Follow a similar procedure for the RFG while noting that the Model RSD meter shall now swing from zero when the control on the Model RSC is set at 10 to -5 when the control is set at 0. In addition, the meter shall return to zero when the AVC switch is thrown to "ON".

4. For each Model RSC-RSD combination used repeat Part 3 (above).

5. Request that all TUNING, RF GAIN, and BFO knobs on the Model RSC's at the Control Site be returned to their center positions. Likewise, request that the AVC switches be set to "ON" and the BFO switches to "OFF". This action serves to release the receivers at the Remote Site from remote control and they then may be properly tuned in the normal manner.

6. After tuning the receivers to the desired carriers set each receiver BFO switch to "OFF" and each AVC-MANUAL switch to AVC. Set the AUDIO GAIN to the highest output which will still not overload the return link or lines. Set the RF GAIN so that when the operator at the Control Site decides to give up control of this feature and return the receiver to local AVC, the unit will not overload nor will it have too little gain to be useful.

7. At this point the Control Site is in full command of each receiver.

SECTION IV MAINTENANCE

1. GENERAL

Since the RCR System is made up of completely independent component equipments maintenance problems are greatly simplified. Any impaired operation can be rapidly traced by checking the output of each unit individually. The RCR System has been designed to provide long term, trouble free, operation under continuous duty conditions, yet it is recommended that main-

tenance to the equipment be performed by a competent maintenance technician.

2. OPERATOR'S SYSTEM MAINTENANCE

Servicing adjustments and repairs should not be attempted by unqualified persons.

Satisfactory operation depends partly upon several external mechanical conditions. In case

of trouble, examine the equipment externally before removing from the rack. For example, examine the following items to see that that apparatus is in good mechanical condition, that connections are good and made correctly, and that all plugs and sockets are clean.

- a. Interconnecting cables and lead-in or transmission lines.
- b. Grounds.
- c. Earphones or speaker including cord and plug.
- d. Power cables and plugs.
- e. Line fuses and indicators.

Any abnormal or erratic operation of the system or failure of any unit to operate should be immediately investigated and corrected. In addition, routine checks should be made at regular intervals. With the set in operation, check the indicator lamps. If they are not lighted, check the lamps and fuses. Replace burned out lamps and fuses. If the fuse continues to blow, investigate the unit for trouble. In the case of the RSP's a check of the units which they supply must also be investigated. Under no circumstances replace a fuse with one of higher rating.

Standard types of vacuum tubes are used throughout the design of the system. The location of all the tubes in the individual units are shown in this section. The tubes may be checked visually for filament operation, abnormal color or for warmth. When necessary, the tubes should be carefully removed and tested, and when replaced, care should be taken to replace tube shields.

3. PREVENTIVE SYSTEM MAINTENANCE

In order to prevent actual failure of the equipment due to corrosion, tube failures, dust or other destructive ambient conditions, it is recommended that the following preventive maintenance be performed.

a. Remove the equipment from the rack and thoroughly inspect the insides of the chassis for corrosion. Correct any defect found. A recommended cleaning agent is clean carbon tetrachloride (or equivalent) applied with a soft brush.
Recommended semi-annually.

b. Test all DC and AC Voltages as indicated on the respective tube voltage sheets and investigate any serious discrepancies.
Recommended semi-annually.

c. Test vacuum tubes regularly and replace any showing low characteristics. Loss of sensitivity, noisy operation and certain other deviations from normal performance frequently can be

traced to worn out or defective tubes. Do not undertake an alignment check without first making certain that normal performance cannot be restored with a good set of tubes.

Recommended quarterly.

d. At regular intervals a system re-examination should be performed. The alignment procedure has been carefully and rigorously attended to before shipment, however, it is possible that extremely rough handling in transit will sometimes make it necessary to slightly adjust some units.

It is strongly advised that only properly trained technical personnel make these adjustments. It is also suggested that no rear apron controls be touched unless the changes which occur exceed the limits outlined below.

THE MODEL RSC:

The Model RSC is the tone source upon which the entire system operation is dependent. Initially, the tone frequencies should be checked after the system has been installed and in constant operation for about two weeks. Monthly checks will suffice thereafter even though it may be found that the oscillators need not be retouched for much longer periods of time.

CAUTION

DO NOT ATTEMPT TO CALIBRATE THE OSCILLATORS AGAINST ANY OF THE USUAL AUDIO SIGNAL GENERATORS EMPLOYED FOR TEST BENCH PURPOSES.

It is recommended that the TMC Model PFS, Precision Frequency Standard or an equivalent frequency counter having an accuracy of at least .1% or, at worst, ± 1 count be used.

Proceed as follows:

a. Set the TUNING, RF GAIN, and BFO knobs to their center positions. Set the AVC switch to "OFF" and the BFO switch to "ON". Now all three oscillators are on.

b. Read both amplitude (by means of VTVM) and frequency (by means of Model PFS or counter) at each of the rear apron jacks marked J1, J2 and J3.

c. The center frequency must be within ± 4 cps of the listed value appearing in chart form on schematic CK-248 or Table 1-1. Where this

tolerance is not met, unlock the **FREQ ADJ** control, set the oscillator to within ± 1 cps of the listed center and then lock the control into position.

d. The amplitude must be .2 volts \pm .05 volts. Where this tolerance is not met, unlock the **OUTPUT** control, set the output as close to .2 volts as is possible, and then lock the control into position.

THE MODEL RSP:

No alignment checks necessary.

THE MODEL RSF:

No alignment checks necessary.

THE MODEL RSM:

No alignment checks necessary.

THE MODEL RSA:

The only adjustment requiring examination on this unit is the **GAIN** control (R17) which is located on the chassis deck. The output of the Model RSA should be set differently depending upon the maximum number of tones being used in the complete system;

<u>Max. no. of tones in full system</u>	<u>RSA output</u>
3	1.3 volts
6	1.9 volts
9	2.3 volts
12	2.7 volts
15	3.0 volts

The conditions which this measurement is taken are as follows:

a. Set the input to the Model RSA so that the front panel meter reads -5 dbm. This may be a composite of any number of tones derived from the line while the unit is under normal operation, or a single tone from a laboratory test generator set at approximately 1 Kcs.

b. Using a VTVM read the output voltage across any one of the five pairs on terminal board E2 (Pins 1 & 2 or 3 & 4 or 5 & 6 or 7 & 8 or 9 & 10). Be sure that all of these pairs are loaded with Model RSD inputs. IF A TWELVE TONE OR LESS SYSTEM is being used, 680 ohm composition resistors should be substituted for the missing Model RSD's.

c. If the outputs are not within \pm .3 volts of those values shown on the preceding chart, R17 should be reset and then properly locked in place.

THE MODEL RSD:

The Model RSD should be calibrated against the Model RSC only after the latter has undergone an examination and readjustment, where necessary, according to Part 1 of this discussion. The unit may also be calibrated on the test bench as described in the section on corrective maintenance, however, it is the purpose of this discussion to show how calibration may be accomplished under operating conditions. It should be kept in mind that only one Model RSC and its companion Model RSD need be checked at a time, therefore, the remaining portions of the system may be continued in uninterrupted service.

a. Request that the Model RSC be set so that the **TUNING** and **BFO** knobs are centered and the **RF GAIN** knob is at its clockwise extreme. Also, set the **AVC** switch to "OFF" and the **BFO** switch to "ON". The conditions under which all of the following tests are made are with the Model RSD outputs loaded with the Model FFR inputs or some equivalent resistances. The VTVM referred to should have an input impedance not lower than 5 megohms.

b. Connect a VTVM, in turn, to points 1 and 2 and then to points 1 and 5 of terminal board E1 at the rear of the Model RSD being inspected. To be acceptable the D.C. voltages appearing at these points must not exceed \pm .5 volts. If this condition is not met, loosen the lock on the **BFO CENT.** or **HFO CENT.**, as the case may be, and adjust for zero volts at points 1 and 2 (**BFO**) or 1 and 5 (**HFO**). Relock the control.

c. Request that the Model RSC be set so that the **TUNING** and **BFO** knobs are at their clockwise or counter-clockwise extreme. At the same points discussed above, 4.5 volts within \pm .5 volts must appear. (The polarity will be dependent upon the direction of rotation of the Model RSC controls). If this condition is not met, loosen the lock on the **BFO OUT** or **HFO OUT**, as the case may be and adjust for 4.5 volts at points 1 and 2 (**BFO**) or 1 and 5 (**HFO**). **RELOCK** the **CONTROLS**.

d. Connect the same VTVM to terminals 1 and 6 of E1. Unlock the **RF GAIN CENT** and advance its position until the VTVM just **COMMENCES TO READ** on its lowest scale. The ideal setting is the point at which output voltage barely commences to appear. Relock the control. This adjustment should be made at each inspection.

e. Request that the Model RSC be set so that the **RF GAIN** knob is rotated to its center clockwise extreme. At terminals 1 and 6 an output of -9.5 volts \pm .5 volts must appear. To readjust, un-

lock the RFG OUT and set for -9.5 volts. Relock this control.

The inspection procedure and realignment, where necessary, is now complete.

When replacing component equipments in the rack, be certain that all terminal strip screw connections at the rear of the equipment are tight.

4. CORRECTIVE SYSTEM MAINTENANCE

a. Detailed corrective maintenance procedures will be discussed in the paragraphs following. In general, troubles concerning power supply and distribution are traced with the DC voltmeter and ohmmeter, while troubles concerning signal are traced with an AC vacuum tube voltmeter, oscilloscope and sweep frequency signal generator.

b. For purpose of trouble shooting the RCR System may be divided in several ways depending upon the type of trouble encountered. The construction of the equipment on a building block basis greatly facilitates the location of the faulty units or components and makes trouble shooting a simple matter. Conveniently accessible test points and panel meters at critical locations permit operational checks without the need to "shut down" the equipment. A suggested procedure for trouble shooting follows:

WARNING

THE FOLLOWING OPERATIONS SHOULD BE PERFORMED BY DULY AUTHORIZED AND PROPERLY INSTRUCTED PERSONNEL ONLY.

c. A list of possible types of failures may serve as a guide for the method in which any of the generally occurring failures should be approached and remedied. It will be noticed that the types of failures are arranged in steps; starting with the most complex failure, of the entire system through intermediary, partial failures down to failures within individual units. For each typical failure type, a number of steps are recommended; generally it will be found that efficient service to the source of failure can be achieved by adhering closely to these steps. It is further to be understood that the maintenance technician will go through the steps recommended until he has located the defective part of the system. This part, as in the case of an individual unit, will have to be removed from the rack and serviced separately.

As an aid in trouble shooting, reference should be made to Figures 6-1 through Figures 6-6 and Tables 4-2 through 4-6 volt. chart and 4-1 trouble shooting chart. The maintenance technician is urged to use these data in the process of servicing the equipment in order to expedite the trouble shooting operation.

TABLE 4-1 TROUBLE SHOOTING CHART

PERFORM THE STEPS CHECKED TO DETERMINE CAUSE

FAILURE OF	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ENTIRE SYSTEM	x	x	x	x	x	x	x	x	x	x	x	x	x	x
SEVERAL CONTROLLED RECEIVERS	x	x	x	x	x	x	x	x	x	x	x	x	x	x
ONE CONTROLLED RECEIVER	x	x	x	x		x	x	x	x				x	x
ONE OR TWO CONTROL FUNCTIONS OF ONE OR SEVERAL CONTROLLED RECEIVERS eg. BFO, HFO or RFG				x		x	x	x	x				x	x
INDIVIDUAL COMPONENT EQUIPMENT	Once a failure has been located in an individual unit, refer to the Trouble Shooting Procedure for that Unit in the Corrective Equipment Maintenance Section, IV-5.													

Continued on following page

SYSTEM TROUBLE SHOOTING CHART

STEP

1. Check for AC power at RSP, RSM and FFR receiver. With AC power applied, the power indicator light on all units mentioned should be lighted.
2. Check for filament voltage at units which are fed by the RSP. This applies to RSC, RSA and RSD. With filament voltage present the Power indicators on all units mentioned should be lighted.
3. Check the AC and B+ fuses at the RSP, RSM and Receiver. If a fuse has blown, replace it with one of an equal rating. A blown fuse in the RSP may indicate a defect in the unit to which it supplies power. If the replaced fuse also blows, disconnect the 8 prong power cable (CA-196) and replace the fuse again. If the fuse blows remove the RSP from the rack and correct the defect. In the event the fuse does not blow, then the trouble is most likely in the unit fed by the RSP, remove that unit from the rack and correct the defect. As the RSM and FFR contain their own power supplies, a blown fuse indicates a defect within the unit. Remove the unit from the rack and correct the defect.
4. Remove the top covers from all the units in the system, with the exception of the RSF and RSP. Check the tubes visually for filament operation, abnormal color or for warmth. Carefully remove and test any defective tube and when replaced care should be taken to replace tube shields.
5. Check the transmission line between the Control and Remote Site as follows: Using a signal generator (Audio type) feed the lines, one for one, a signal of about 1000 cps, at 0 dbm, at the control site, measure directly with a VTVM (AC Type) across a 680 ohm resistor, used as the line termination at the remote site. Check for presence of hum or noise on the lines. Also check the frequency response of the lines by varying the audio generator through a range of about 400 to 3000 cps. The response of the line should be essentially flat within 2DB. For purpose of measurements, the line must be disconnected from the equipment.
6. Check the interconnect cables between the various units. Interconnect cables are used between RSC - RSF - RSM and between the RSA - RSD and Receiver. Check whether all terminal strip screw connections at the rear of the units are tight. Make resistance checks of cables and shields for shorts and open circuits. Inspect general conditions of cables and repair any found defective.
7. With power present at the RSC, check with a VTVM (AC Type) and high impedance headphones (2000 ohms or higher), for a tone present at the rear panel jacks J1, J2 and J3. The front panel switches AVC ON - OFF and BFO ON - OFF should both be in the ON position. Rotation of the Tuning, RF Gain, and BFO controls must produce variations in the tone frequency observed at the corresponding jacks. Repeat for all RSC's. If no tone is present at the jacks, the RSC effected must be removed from the rack and serviced. Refer to the Component Equipment Maintenance section for complete procedure.
8. With all RSC's operating properly with a VTVM (AC Type) and high impedance headphone (2000 ohms or greater) check for presence of a tone frequency at J1 of the RSF's. Rotation of the Tone Monitor switch of the RSF will permit a check of all tone frequencies entering the RSF from the RSC. Repeat for all RSF's. If no tone frequency is present, recheck the interconnect cable from RSC to RSF.
9. Check the operation of the bandpass filters of the RSF by connecting high impedance earphones (2000 ohms or greater) and/or an AC-VTVM to terminals 7 and 8 of E1 on the back panel of the unit. With the RF Gain and BFO of the RSC off, only the HFO tone frequency is present. Switching the BFO on must result in the presence of two frequencies. Likewise switching on the RFG must result in the presence of 3 frequencies. Repeat for all RSF's.

10. Connect a set of high impedance earphones and/or an AC-VTVM across terminals 1 and 3 on E2 of the RSM. Switch off the RSP power supply for all but one RSC and check for presence of 3 tones at the RSM; alternately switch off the BFO and RFG of the RSC and note the presence of two tones (HFO and BFO, HFO and RFG, respectively).

NOTE: The tones can easily be identified by rotating the appropriate front panel control on the RSC, the resultant change in pitch of the particular tone frequency will be clearly noticeable.

11. If it has been established that all existing tones are being properly passed through the RSF and RSM and the transmission lines are in good condition, this is an indication that the trouble exists in the units of the Remote Site, (RSA, RSD, FFR).

12. Check on the operation of the RSA by connecting high impedance headphones and/or an AC-VTVM across terminals 1 and 2 of E2. In order to verify whether all existing tones are properly being amplified, switch off the power supply for all but one unit RSC (at the control site) and check whether three tones are present; alternately switch off the BFO and the RFG of the RSC and note whether only two tones are present. Repeat this operation for all units RSC in the system.

13. Check the operation of the RSD by connecting high impedance headphones and/or an AC VTVM across the rear panel jacks marked BFO, HFO and RFG. With the BFO and RFG switches of the corresponding unit RSC at the control site in position ON, the appropriate tone frequencies must be present at these points on all RSD's of the system. Check the DC output voltage of the individual units RSD by means of the OUTPUT meter and selector switch; upon rotation of the corresponding RSC front panel control, the RSD OUTPUT meter must show an indication related to the position of this front panel control.

14. Check on the operation of the FFR receiver independently. For this purpose, remove power from the RSC which controls the receiver by switching off the respective RSP. Check whether all controls of the receiver operate satisfactorily; tune in a station, adjust the BFO, operate BFO and NOISE LIMITER switches, adjust AUDIO GAIN and RF GAIN as desired. With DC VTVM, check whether about 300 volts DC are present at terminals 5 and 6 of E102, indicating proper closure of the BFO relay of the RSD.

CORRECTIVE EQUIPMENT MAINTENANCE, MODEL RSA

1. TROUBLE SHOOTING PROCEDURE

For the purpose of trouble shooting, the RSA may be broken down into four sections, each of which functions as a unit. These sections are:

- Section A - Input and signal monitor
- Section B - First amplifier (V4, V5)
- Section C - Second and third amplifier (V1, V2, V3)
- Section D - AVC amplifier (V6A, V7)

It is strongly suggested that the repair technician devote himself to one section at a time. In this manner he may more easily isolate the section at fault. A suggested procedure follows:

SECTION A

a). The signal enters the unit at E1, but no meter indication is obtained. After the usual check on tubes, voltages, components and wiring, and if the trouble still persists, trace the signal path by means of oscilloscope. If the signal is present at the plate of V6B the meter or associated circuitry must be at fault.

b). Meter shows indications but no output is obtained. Make a check of low pass filter ZF1. Verify proper operation or transformer T2 by observing the waveform at the secondary; a resistance check should be made to make certain that no shorts or open windings exist. If the sig-

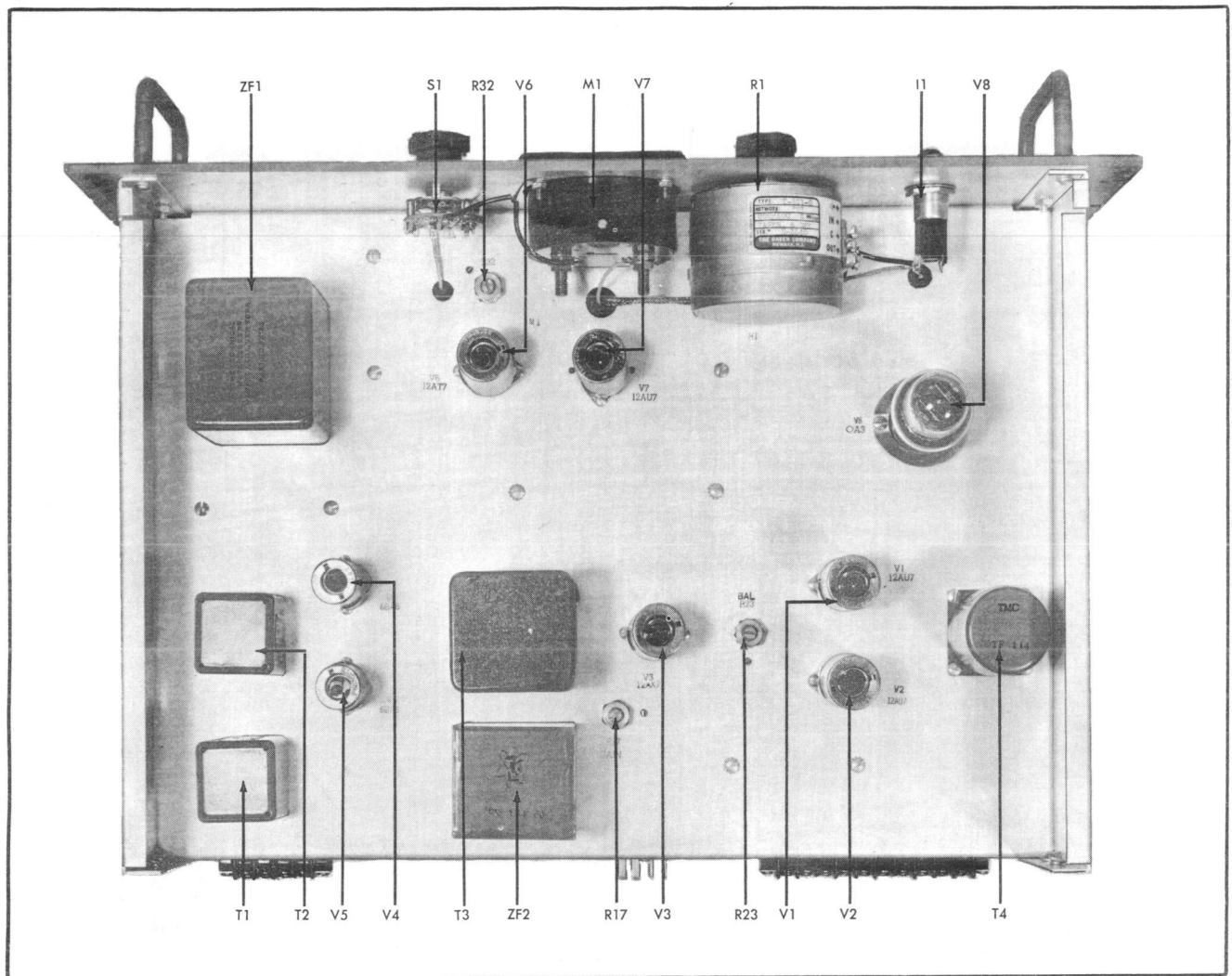


Figure 4-1. Top View, Model RSA

nal is present at the transformer secondary, the trouble must be in the following amplifier stages.

SECTION B

a). Signal is present at secondary of transformer T2, but no output is obtained across transformer T3. Make certain that tubes, voltages, and components do not show deviations. If no output is obtained even with the network ZF2 removed from the circuit, investigate whether V4 and V5 are supplied with a negative grid voltage by measuring terminals 9 and 10 of T2 with a VTVM. Increase of the signal level should produce an increase of the negative grid voltage. Failure of the negative grid voltage to be present at T2 and at the same time at pin 1 and 2 of V6A indicates a defect in the AVC amplifier or its associated circuitry.

SECTION C

a). With signal present at secondary of

transformer T3 with no output at secondary of T4. Make the usual check of tubes, voltages, components and wiring. Rotation of the gain control R17 should produce corresponding changes of the amplified signal at pins 1 and 6 of V3. If simple checks are found inadequate to rectify the failure, signal tracing may be necessary, in order to locate the trouble source. Re-adjust R17 for 3V RMS out across each load on E2 with an input of .5V (RMS) at terminals 1, 2, 3, on E1.

b). Adjustment of the balance control, R23. If it is found necessary to re-adjust the balance control as in the case of replacement of V1 and/or V2, the following procedure is recommended. Connect audio signal generator to terminals 1 and 3 of E1; set output to about 1000 cps at 1 volt (RMS). Terminate on E2 the terminals 1-2, 3-4, 5-6, 7-8 and 9-10 with 680 ohms resistors. If a distortion meter is available (such as a Barker Williamson, Model 891), connect this instrument across terminals 1-2 on E2. With the input level meter reading about 0 dbm, adjust the balance

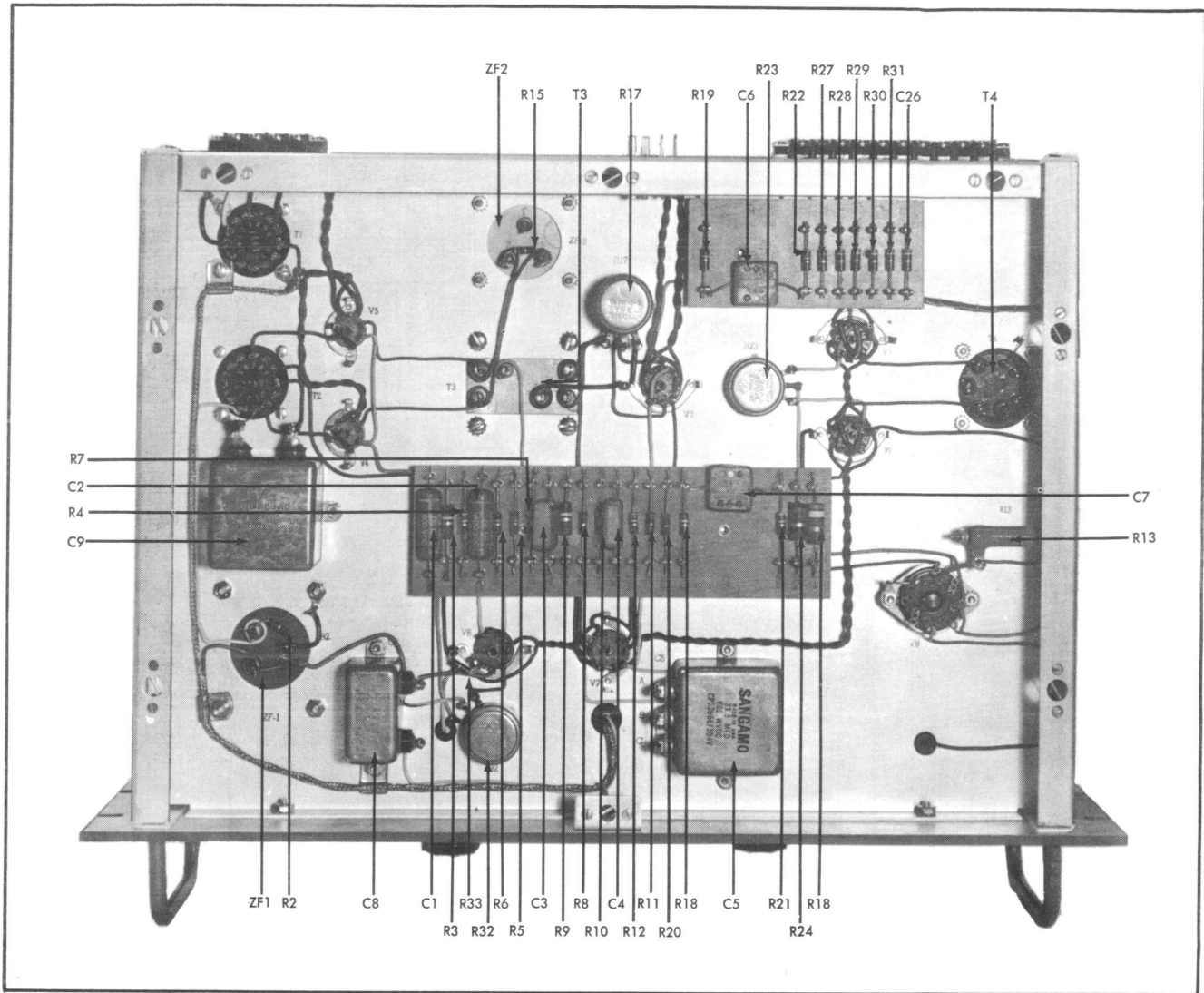


Figure 4-2. Bottom View, Model RSA

control R23 until a minimum distortion is obtained. The measured distortion must in no case exceed 1.0%. If no distortion meter is available feed audio signal into the RSA as above while monitoring the output at terminals 1-2 of E2 with an AC-VTVM and/or scope. Disconnect on terminal board capacitor C 6. Connect another mica capacitor .01 mfd from pin 2 and 7 of V2 to pin 6 of V3. This results in an in-phase signal for the push-pull amplifier stage #3. Proper balance point is reached by adjusting R23 until a minimum signal is obtained across the output. Make certain, that capacitor C6 is replaced and that R23 is firmly locked in position.

SECTION D

a). No negative grid voltage at pin 1 of V4

and V5 indicates failure of the AVC amplifier or associated circuits. Make the usual check on tubes, voltages, components and wiring. If no signal voltage is present at pin 2 of V7, check the secondary of transformer T3 for shorts or open windings. If signal is present at this point, signal tracing through V7 and V6A may be necessary to locate the trouble source.

b). If power failure occurs, check fuses of corresponding Model RSP. Failure of the voltage regulator of the RSA may be due to a defect of the resistor R13 or of V8, indicated by abnormal color or erratic operation of this tube.

(Voltage Data for the RSA on next page)

TABLE 4-2 VOLTAGE DATA, MODEL RSA

	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	290VDC	0VDC	13VDC	3.15VAC	3.15VAC	290VDC	0VDC	13VDC	3.15VAC
V2	290VDC	0VDC	13VDC	3.15VAC	3.15VAC	290VDC	0VDC	13VDC	3.15VAC
V3	155VDC	0VDC	1.3VDC	3.15VAC	3.15VAC	155VDC	0VDC	1.3 VDC	3.15VAC
V4	-10VDC*	0VDC	3.15VAC	3.15VAC	280VDC	75VDC	0VDC		
V5	-10VDC*	0VDC	3.15VAC	3.15VAC	280VDC	75VDC	0VDC		
V6	-10VDC*	-10VDC	28VDC	3.15VAC	3.15VAC	255VDC	0VDC	3.8VDC	3.15VAC
V7	62VDC	0VDC	3.2VDC	3.15VAC	3.15VAC	88VDC	0VDC	3.3VDC	3.15VAC
V8		0VDC	290VDC		75VDC		290VDC		

- Note: 1) DC measurements are at 11 megohms; AC measurements at 5 megohms.
 2) Measured values are from socket pin to common negative.
 3) Line maintained at 110V AC for voltage readings.
 4) Voltage readings are within $\pm 10\%$ from values shown.
 5) Input signal applied 1000 cps at .5 volts rms.
 6) Outputs terminated with 680 ohms.

* Typical value dependent upon input level.

CORRECTIVE EQUIPMENT MAINTENANCE, MODEL RSC

1. TROUBLE SHOOTING PROCEDURE

For the purpose of trouble shooting, the RSC is broken down into four sections which function as a unit plus the regulated plate and filament circuits. These are as follows:

Section A

BFO Oscillator and Amplifier, V1 and V2

Section B

HFO Oscillator and Amplifier, V3 and V4

Section C

RFG Oscillator and Amplifier, V5 and V6

Section D

Audio Amplifier Chain, V7 and V8

Section E

Regulated Plate and Filament Circuits

In the event of failure of sections A, B or C, the procedure for trouble shooting will be the same due to the identical electrical construction of the three oscillators (BFO, HFO and RFG). The only difference being that of the network constants.

It is recommended that the repair technician devote himself to one section at a time. In this manner he may more easily isolate the section at fault. A suggested procedure follows:

SECTIONS A, B, C

a). POWER FAILURE

If no power is present at the RSC, indicated by unlit filaments and/or "dead" voltage regulators V9, V10 and V11, check the fuses of the RSP supplying power to the unit. If a fuse has blown, replace it with one of equal rating. If replacement fuse blows, do not replace it with one of higher value, instead remove the RSC from the rack and make routine resistance checks for shorted components. If resistance checks are found to be inadequate, signal tracing may be necessary in order to locate the troublesome section.

b). OSCILLATORS IN-OPERATIVE (one or more)

CHECK AS FOLLOWS:

1. Tubes visually for lighted filaments or warmth.

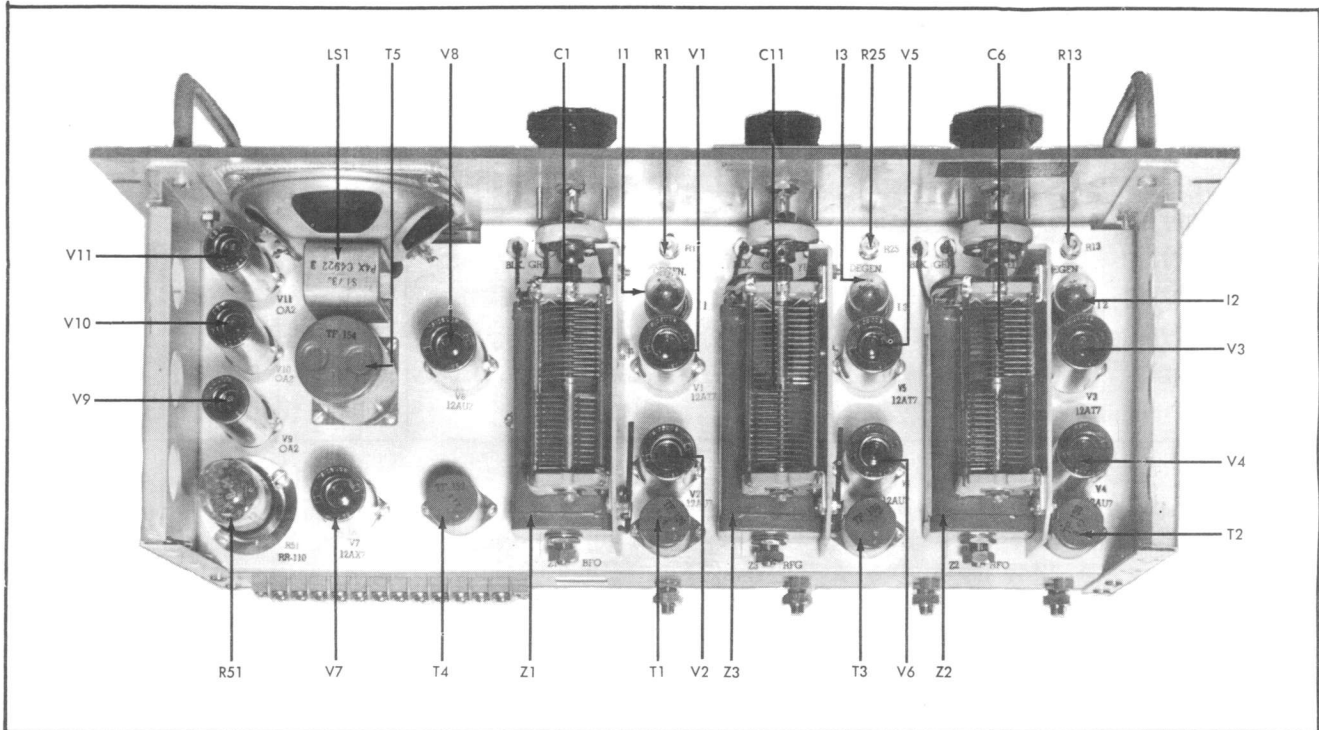


Figure 4-3. Top View, Model RSC

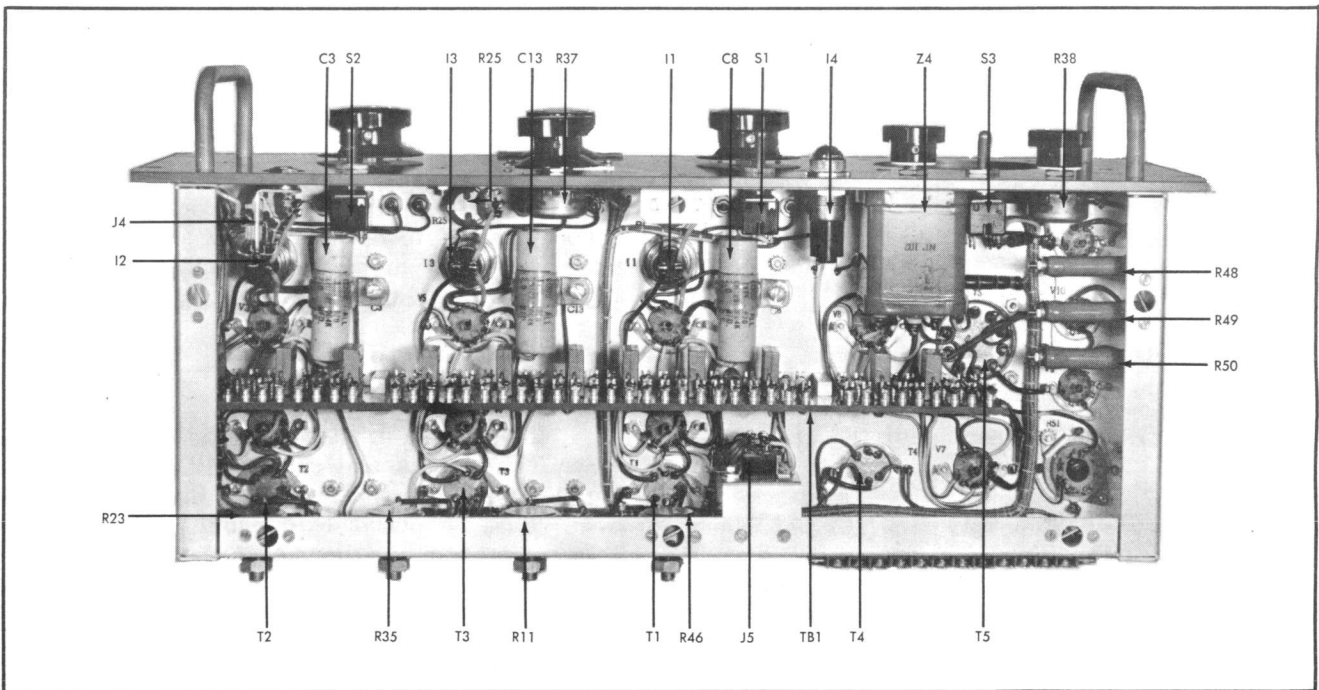


Figure 4-4. Bottom View, Model RSC

WARNING

Under no circumstances must either V1, V3 or V5 be removed from their sockets without removing Power from the set or removing R51 to protect the regulated filament supply.

2. For voltage on Pins 1 and 6 of V1, V3 and V5.
3. Remove I1, I3 and check them on a 110V line.
4. Variable capacitors for shorted plates.
5. Terminal board for components show-

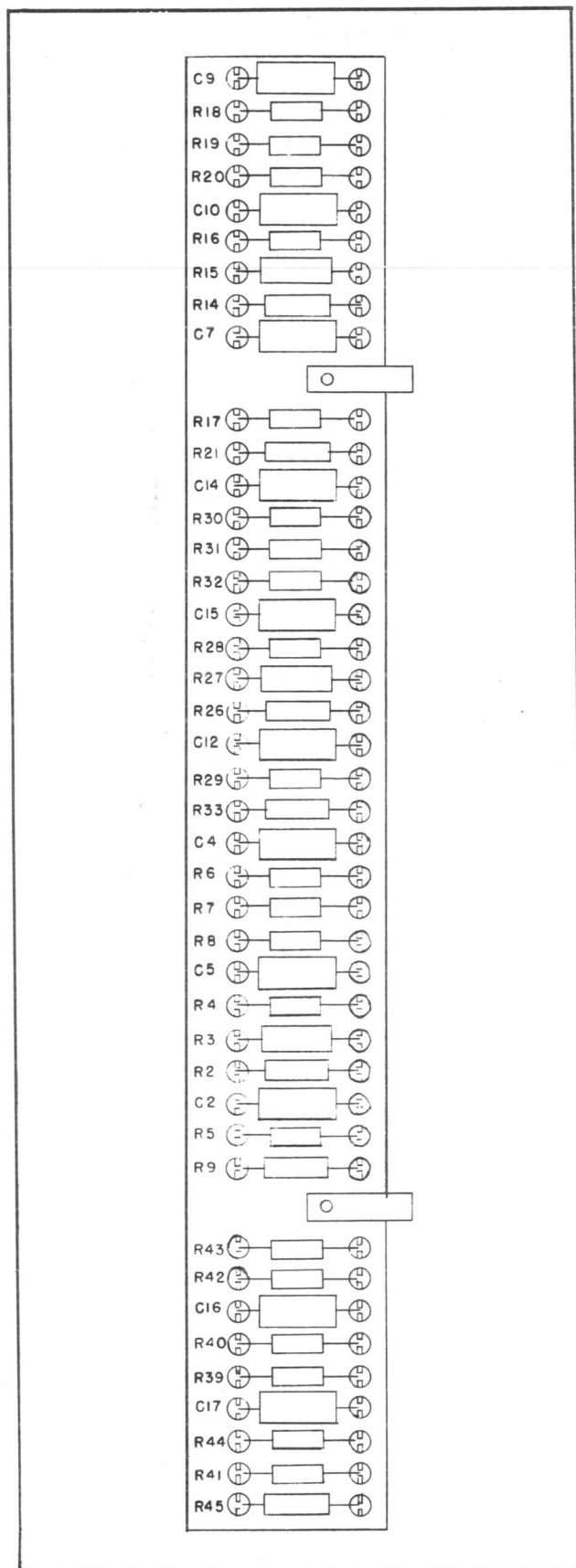


Figure 4-5. Terminal Board Layout, Model RSC

ing signs of deterioration. Replace any defective part as per parts list in rear of book.

6. If still no oscillation is obtained, unlock degeneration control R1 and rotate slowly while monitoring pin 6 of V1 with an oscilloscope. Repeat for R13, monitoring pin 6 of V3 and R25, monitoring pin 6 of V5. Should these measures fail to produce the defect (s), it is likely that the frequency determining network is defective. Replace the defective network with one of identical part number. For purposes of pin-pointing, any NF-104 available may be used. Care should be taken to connect the NF-104 to the RSC in the proper manner. Recording the color wire connected to each numbered terminal i.e., 1-Green, 2-Blue, 3-Red facilitates this operation.

c). OSCILLATOR OPERATING OUT OF FREQUENCY RANGE

1. Set the capacitors C1A & B, C6A & B and C11A & B Tuning, HFO and RF GAIN for zero setting on the front panel dial.
2. Check at pin 6 of V1 (V3 and V5 respectively) with a scope and AC VTVM that the degeneration control R1 (R13 and R25 respectively) is adjusted for maximum wave form amplitude without any visible distortion. Output voltages of from 2.0-5.0 volts (rms) are acceptable. If this range cannot be met or if instability results, the oscillator tube (V1, V3 and V5) is most likely defective. See paragraph d.
3. If nothing unusual is noticed, proceed. Connect a frequency counter of the Berkeley 5500 or 5556 type or equivalent to Pin 6 of V1 (V3 and V5 respectively) and adjust the rear apron control of the NF-104's until the frequency is brought to within +1 cps of the frequency indicated by suffix number on the NF-104 can; i.e., NF-104-495. This frequency must correspond with the assigned frequency for that channel. Reference to CK-248 will aid in clarifying this point.

d). OSCILLATOR OPERATING, WAVE FORM DISTORTED.

1. Check whether the distortion originates from the oscillator tube V1 (V3, V5) by monitoring Pin 6 of V1 (V3, V5). If output is distorted at this point, check oscillator tubes V1, V3 or V5 for defects. If a new tube is required, it is desirable to recheck the center frequency of the oscillator and degeneration adjust in-

volved. Proceed, as outlined in Paragraph "C" above, if adjustments are required.

2. If oscillator output at pin 6 of V1 (V3 and V5 respectively) is found to be undistorted, check the amplifier stage V2 (V4 and V6 respectively). Make AC and DC voltages measurements of the amplifier, transformer and output pad.

CAUTION

The Frequency Determining Network, NF-104 has been designed as a sealed unit. No adjustment other than the setting of the variable resistor should be attempted and only then by competent technicians.

SECTION D - AUDIO AMPLIFIER CHAIN

After inspection for defective components, proceed as follows:

- a. With the tone selector switch off, feed an audio signal of a 1000 cps frequency and .05 volts (rms) amplitude to terminals 3 and 4 of E1 on rear panel.
- b. Using an oscilloscope, trace the signal to pin 2 of V7.
- c. Check for signal voltage present on pin 7 of V7.
- d. Check for near equal signal amplitude at pin 2 and 7 of V8.
- e. Check output transformer primary and secondary for any defects.
- f. With the speaker switch in the OFF po-

sition, insert a dummy plug into the PHONE JACK (J4).

g. Observe the signal amplitude and purity across R47. With an input level of -20 dbm (.078 volts (rms) at terminals 3 and 4 of E1, and the gain control fully open, an undistorted output of 5.85 volts (rms) must be obtained across R47.

h. By switching the tone selector to various positions with the bandwidth control at "Min." observe across R47 a pass band of frequencies corresponding to the frequency indicated by the tone selector switch.

i. Check whether in the OFF position no more than a 3 db signal attenuation takes place in the band from 400 cps to 4000 cps.

CAUTION

The Audio Selective Network NF-102 has been designed as a sealed unit. No adjustments other than rotation of the selector switch should be attempted and only then by competent technicians.

SECTION E - FAILURE OF REGULATED PLATE AND/OR FILAMENT CIRCUITS

Failure of the regulated plate circuits can easily be traced to defects in regulator tubes, series resistors R48, 49, 50 or associated wiring. Check pin 6 of J5 for presence of high B+, indicating proper operation of Power Supply RSP. Voltage at this point should be in the range of 260V to 300 V. Regulated filament trouble is detected by abnormal or erratic operation or complete failure of the filament circuit for V1, V3 and V5. Make resistance check on R51 and check associated wiring for any defects.

TABLE 4-3 VOLTAGE DATA, MODEL RSC

	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	115VDC	0VDC	2.5VDC	6.0VAC	6.0VAC	105VDC	-1.5VDC*	1.0VDC	0VAC
V2	265VDC	0VDC	15 VDC	6.3VAC	6.3VAC	265VDC	0VDC	15VDC	0VAC
V3	115VDC	0VDC	2.5VDC	6.0VAC	6.0VAC	105VDC	-1.5VDC*	1.0VDC	0VAC
V4	265VDC	0VDC	15 VDC	6.3VAC	6.3VAC	265VDC	0VDC	15VDC	0VAC
V5	115VDC	0VDC	2.5VDC	6.0VAC	6.0VAC	105VDC	-1.5VDC*	1.0VDC	0VAC
V6	265VDC	0VDC	15VDC	6.3VAC	6.3VAC	265VDC	0VDC	15VDC	0VAC
V7	105VDC	0VDC	1.1VDC	6.3VAC	6.3VAC	105VDC	0VDC	1.1VDC	0VAC

continued on next page

	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V8	260VDC	0VDC	9.8VDC	6.3VDC	6.3VAC	260VDC	0VDC	9.8VDC	0VAC
V9	150VDC				150VDC		0VDC		
V10	150VDC				150VDC		0VDC		
V11	150VDC				150VDC		0VDC		

- Note: 1) DC measurements are at 11 megohm; AC measurements are at 5 megohms.
 2) Measured values are from socket pin to common negative.
 3) Line maintained at 110VAC for voltage readings.
 4) Voltage readings are within $\pm 10\%$ from values shown.
 5) BFO & AVC switches at ON; audio gain at MIN.
- * Dependent upon settings of degeneration control.

CORRECTIVE EQUIPMENT MAINTENANCE, MODEL RSD

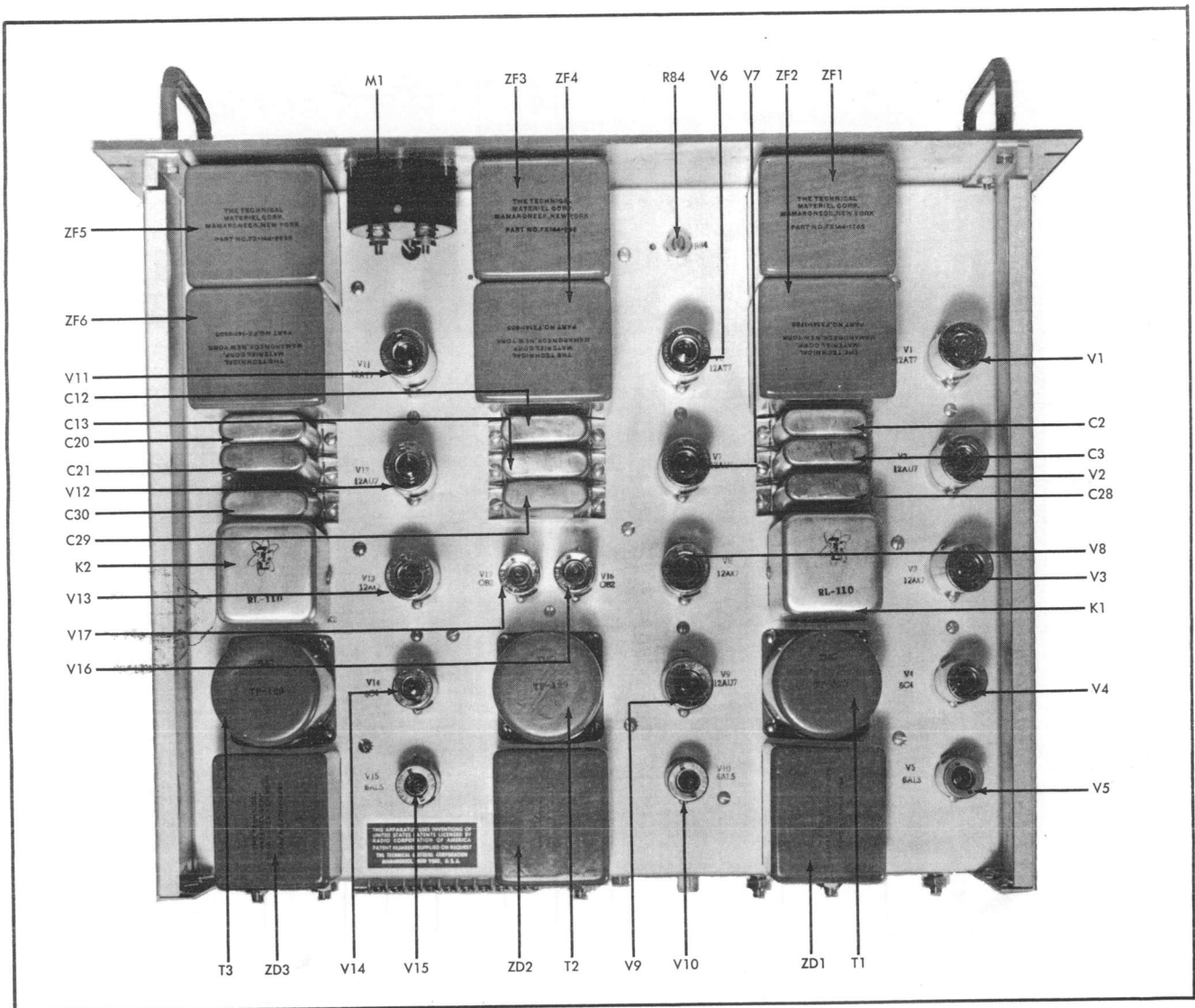


Figure 4-6. Top View, Model RSD

1. TROUBLE SHOOTING PROCEDURE

For purposes of trouble shooting, the RSD may be broken down into the three channels that deliver the DC output voltages for BFO, HFO and RF GAIN of the remotely controlled receiver. Location of the defective channel is simplified by the fact that all channels are identical except for the omission of the relay circuit in the HFO.

Each channel can further be broken down into the following sections:

Section A

The amplifiers (V1A, V2A, V6, V7A, V11A, V12A)

Section B

The limiters (V3, V8, V13)

Section C

The driver stage (V4, V9A, V14)

Section D

The discriminator and rectifier (V5, V10, V15)

Section E

The relay circuit (V1B, V2B, V11B, V12B)

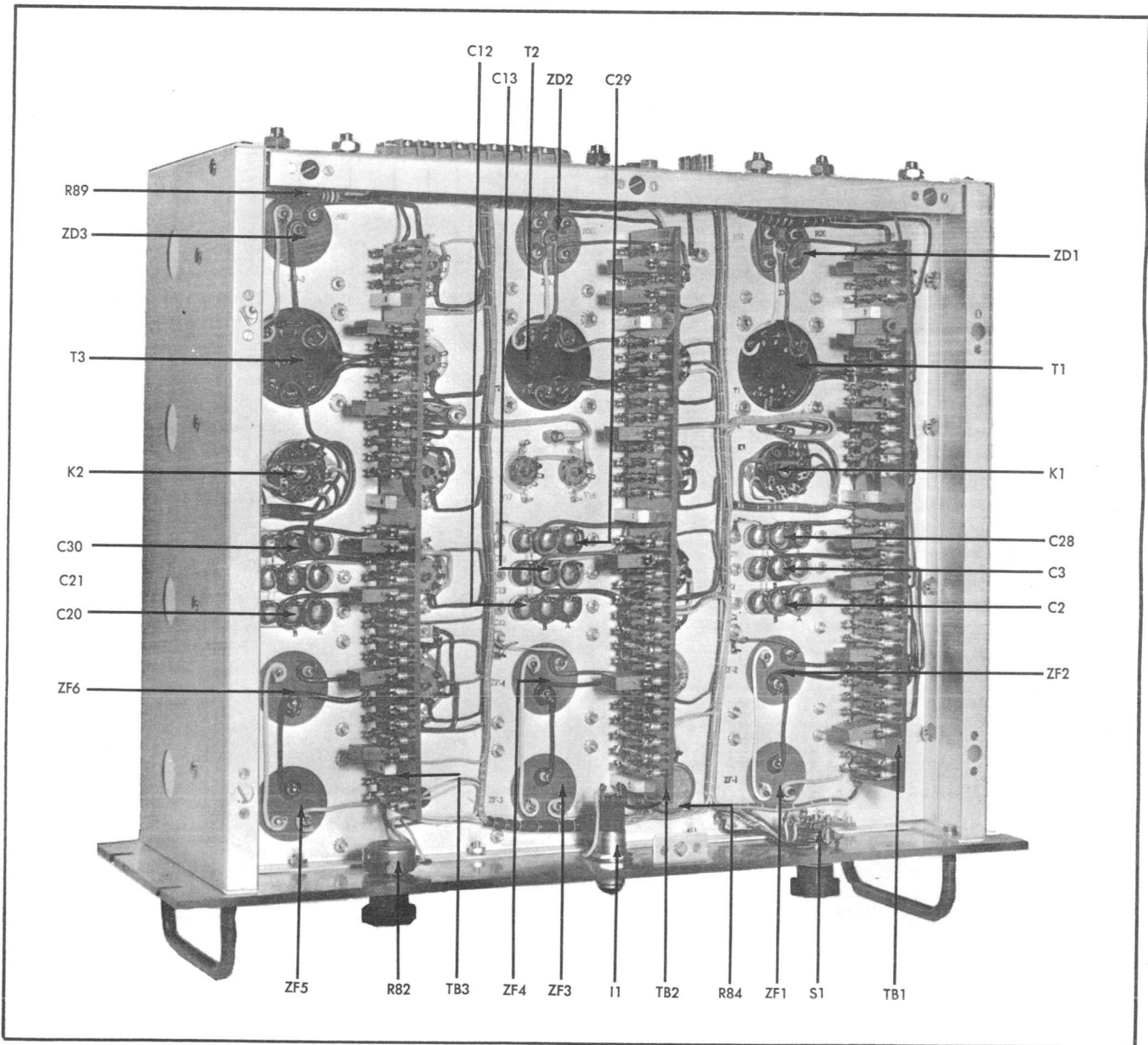


Figure 4-7. Bottom View, Model RSD

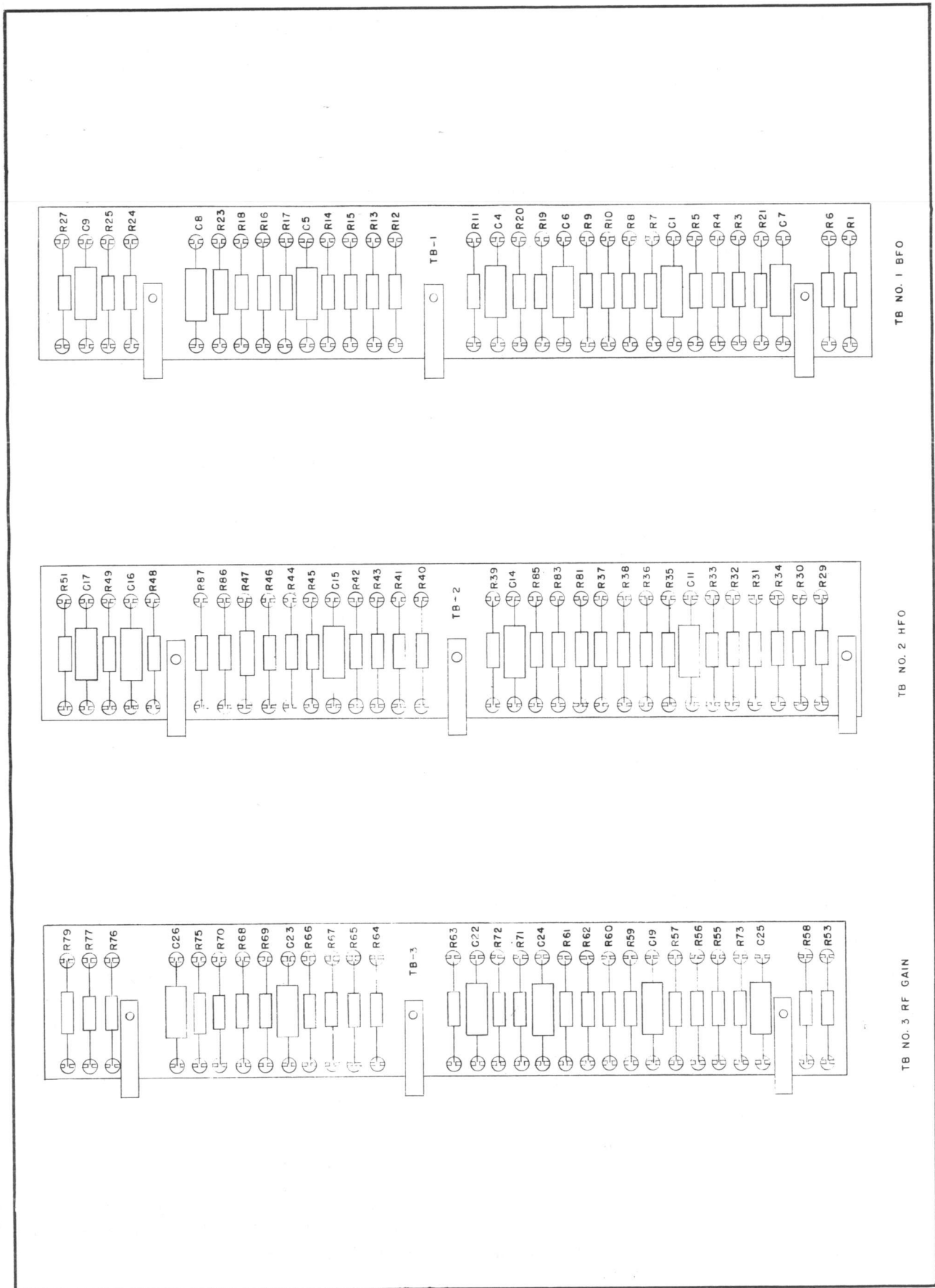


Figure 4-8. Terminal Board Layout, Model RSD

Section F

The monitor (V7B, V9B)

Section G

The voltage regulators (V16, V17)

It is strongly recommended that the repair technician devote himself to one section at a time. In this manner he may more easily isolate the section at fault. A suggested procedure follows:

a). POWER FAILURE

If no power is present at the RSD, indicated by unlit filaments and/or dead voltage regulator tubes V16 and V17, check fuses of power supply RSP for the unit. If a fuse has blown, replace it with another of equal rating. If replacement fuse blows also, never replace it with one of higher rating but remove the RSD from the rack and make routine resistance checks for shorted components and tubes. If simple voltage checks are found to be inadequate, signal tracing may be necessary in order to locate the troublesome section.

b). POWER ON, BUT ONE OR MORE CHANNELS ARE NOT OPERATING.

Make voltage and frequency measurements at J2 (J3 and J4 respectively) to determine whether the control signal arrives at the RSD amplifier input. If no signal is present, check the operation of the bandpass filters at the input. If the bandpass filters are operating properly, the fault must lie in one of the other components of that particular control channel. (For example, investigate the RSC, RSM, transmission line, RSA). If the signal arrives at the amplifier input, check tubes and components for that particular channel. Also make resistance check of components and wiring and inspect for signs of deterioration. In cases where the trouble cannot be located by these means, it may be necessary to check the various stages by signal tracing.

c). DISCRIMINATOR RE-ADJUSTMENT

NOTE: Make certain that all controls are locked after adjustments are completed. Re-adjustment of the discriminator center is accomplished in the following manner:

(1) BFO and HFO

Set the BFO and TUNING controls at the

corresponding RSC to exactly mid-scale; verify that the control signal is at the assigned center frequency (See Figure 6-3); on RSD, set monitor switch to calibrate and center the meter; switch to BFO or HFO channel to be adjusted; rotate control R26 for the BFO or R50 for the HFO until meter is centered on the dial. Rotating the RSC control for BFO or HFO will now produce a corresponding swing of the RSD monitor meter to either side of the center. The voltage values read on the monitor meter give a fair indication of the actual DC output voltages present at terminal strip E1.

(2). RF GAIN

Set the RF Gain control at the corresponding RSC to position O-MIN; verify that the control signal is 40 cps \pm 3 cps lower than the assigned center frequency (See Figure 6-3); on RSD, set monitor switch to calibrate and center the meter; switch to RF Gain channel to be adjusted; rotate control R78 through its range and locate the point where the meter just begins to move away from the center of the dial. Rotating the RSC control for RF Gain will now produce a corresponding swing of the RSD monitor meter from center to the negative side of the dial. The voltage values read on the monitor meter fairly accurately indicate one half the actual DC output voltage present at terminal strip E1.

d). OUTPUT READJUSTMENT

In order to re-adjust the discriminator DC output voltage, it is simply necessary to re-adjust the controls R28 for the BFO, R52 for the HFO and R80 for the RFG. No adjustment need to be made to the discriminator itself.

e). RELAY CIRCUIT DOES NOT FUNCTION

Make a check on tubes, components and wiring; verify whether a negative voltage is present at the grid of V1B (for the BFO) or at V11B (for the RF Gain); if the control signal for that channel is fed into the unit. If it is suspected that the relay may be at fault, replace the relay with the identical part.

f). FAILURE OF REGULATED PLATE SUPPLY

Failure in this section can easily be traced to defects in regulator tubes, series resistor R88 or associated wiring. Check pin 6 of J1 for presence of high B+, indicating proper operation of Power Supply RSP. Voltage at this point should be in the range of 260 to 300 volts.

TABLE 4-4 VOLTAGE DATA, MODEL RSD

	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	290VDC **	-23VDC ‡	0VDC	6.3VAC	6.3VAC	22VDC	0VDC	.37VDC	0VAC
V2	-23VDC ‡	-23VDC ‡	2.2VDC ‡	6.3VAC	6.3VAC	130VDC	0VDC	7.3VDC	0VAC
V3	185VDC ‡	-2.6VDC ‡	12VDC ‡	6.3VAC	6.3VAC	170VDC ‡	0VDC	12VDC ‡	0VAC
V4	245VDC **	0VDC	6.3VAC	0VAC	245VDC **	0VDC	9.0VDC **		
V5	0VDC	-75VDC # ‡	6.3VAC	0VAC	0VDC # ‡		-75VDC # ‡		
V6					6.3VAC	19VDC	0VDC	.37VDC	0VAC
V7	100VDC *	0VDC	5VDC *	6.3VAC	6.3VAC	130VDC	0VDC	7.3VDC	0VAC
V8	185VDC ‡	-5VDC ‡	12VDC ‡	6.3VAC	6.3VAC	170VDC ‡	0VDC	12VDC ‡	0VAC
V9	100VDC *	0VDC *	5VDC *	6.3VAC	6.3VAC	245VDC ‡	0VDC	9.0VDC ‡	0VAC
V10	0VDC	-34VDC # ‡	6.3VAC	0VAC	0VDC # ‡		-34VDC # ‡		
V11	290VDC **	-15VDC ‡	0VDC	6.3VAC	6.3VAC	22VDC	0VDC	.37VDC	0VAC
V12	-15VDC ‡	-15VDC ‡	1.4VDC ‡	6.3VAC	6.3VAC	130VDC	0VDC	7.3VDC	0VAC
V13	185VDC ‡	-.7VDC ‡	12VDC ‡	6.3VAC	6.3VAC	170VDC ‡	0VDC	12VDC ‡	0VAC
V14	245VDC **	0VDC	6.3VAC	0VAC	245VDC **	0VDC	9.0VDC **		
V15	100VDC #		6.3VAC	0VAC			-13VDC ‡		
V16	210VDC						105VDC		
V17	105VDC						0VDC		

- Note: 1) DC measurements are at 11 megohms; AC measurements are at 5 megohms.
 2) Measured values are from socket pin to common negative.
 3) Line maintained at 110VAC for voltage readings.
 4) Voltage readings are within $\pm 10\%$ from values shown.
 5) Signal input .5V rms at terminals 8 & 9 of E1.

- * Meter in CAL position.
 ** Relay in NO Current condition.
 # Dependent upon setting of centering control.
 ‡ Value at f_c ; dependent upon frequency of operation.

CORRECTIVE EQUIPMENT MAINTENANCE, MODEL RSF

1. TROUBLE SHOOTING PROCEDURE

Failure of one or more frequencies to appear at the RSF output.

a. Make certain that connections from RSC are properly made.

b. Check for presence of 3 frequencies at the RSF input.

c. Monitor these frequencies by inserting phones at J1 (HIGH IMPEDANCE METER) of the RSF.

d. Place selector switch, in succession, to BFO, HFO, and RFG for a check on the tone frequencies.

e. Monitor RSF output by connecting phones or scope to terminals 7 & 8 of E1.

f. Switch BFO and RFG on RSC to "OFF". HFO tone frequency must appear at the RSF output.

g. Switch BFO on RSC to "OFF", RFG to "ON"; two tone frequencies must appear at the output of the RSF.

If the above checks should show that one or more frequencies are at fault, remove the RSF from the rack and inspect wiring for defects. If no wire defects are in evidence, the filter unit at fault will have to be replaced.

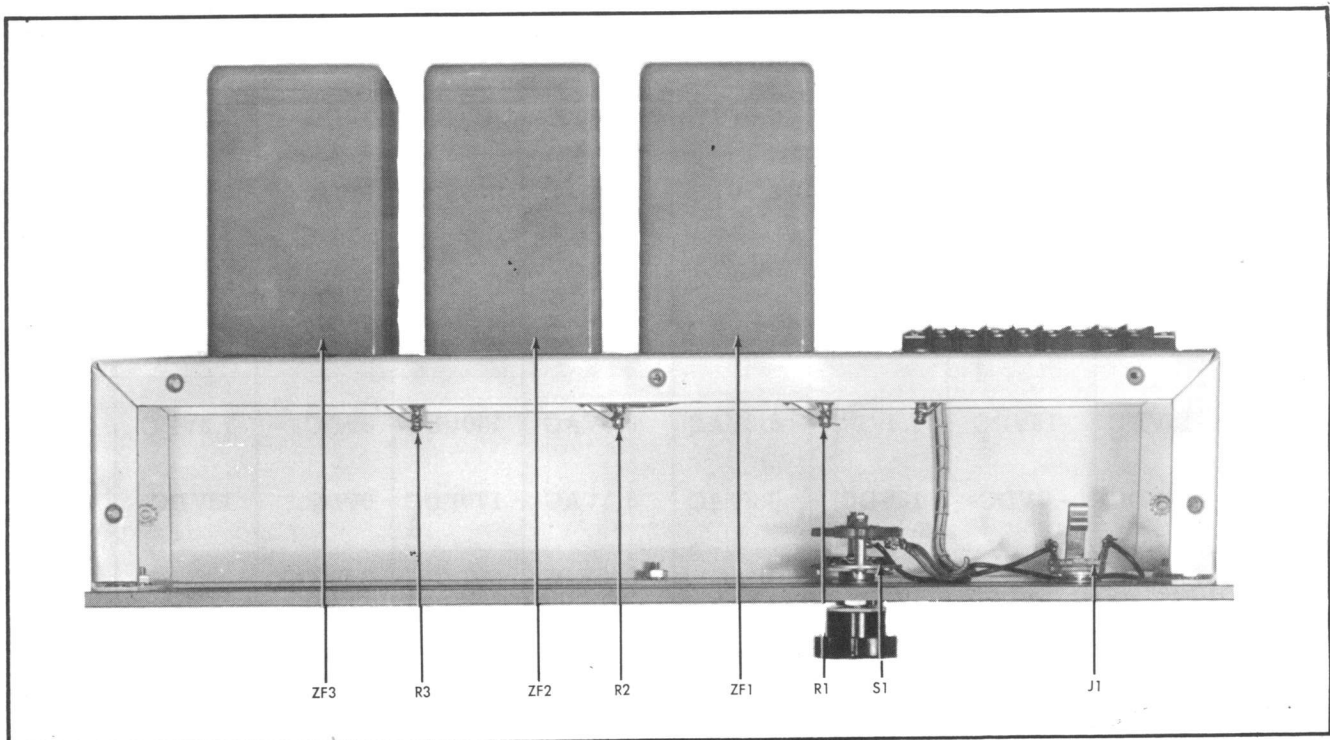


Figure 4-9. Inside View, Model RSF

CORRECTIVE EQUIPMENT MAINTENANCE, MODEL RSM

1. TROUBLE SHOOTING PROCEDURE

For the purpose of trouble shooting, the RSM may be broken down into 3 sections, each of which functions as a unit. These sections are:

Section A

The resistive combining network

Section B

The amplifier, stages #1 and #2

Section C

The power supply

It is strongly recommended that the repair

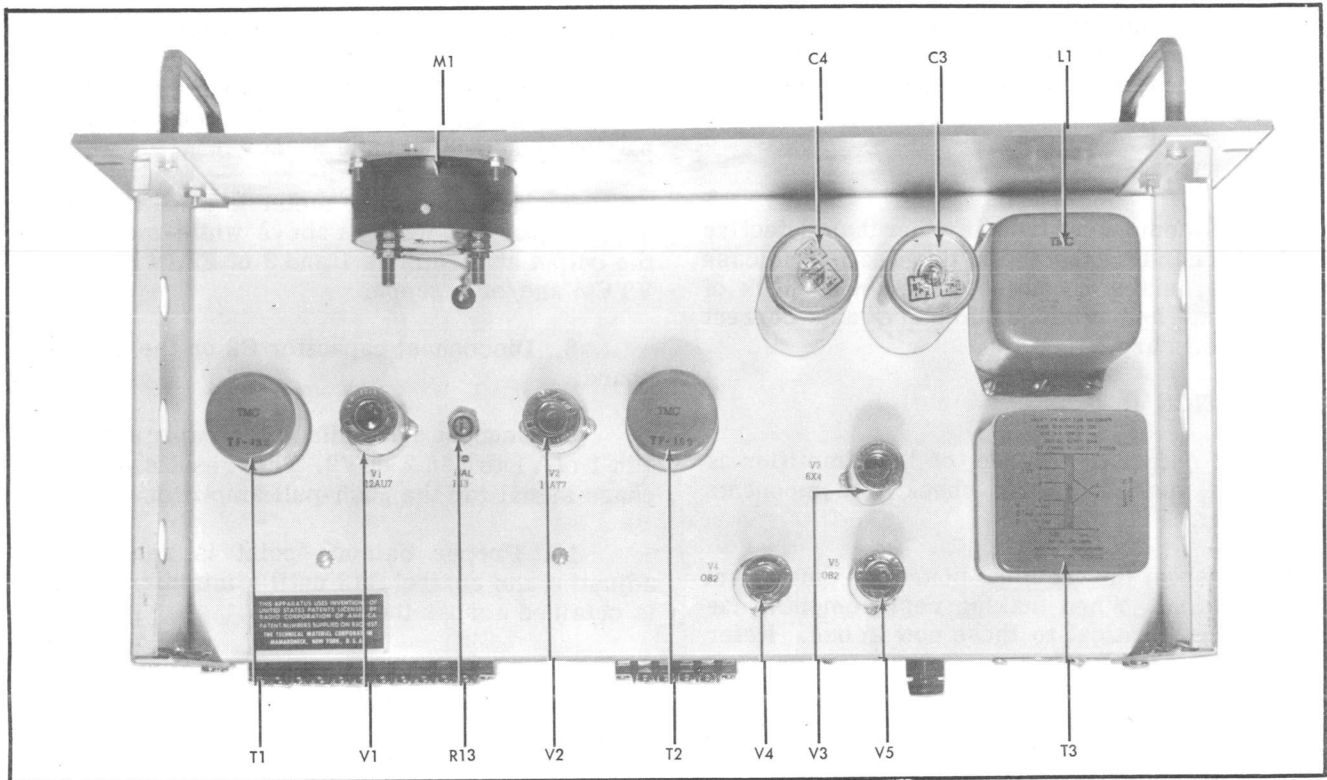


Figure 4-10. Top View, Model RSM

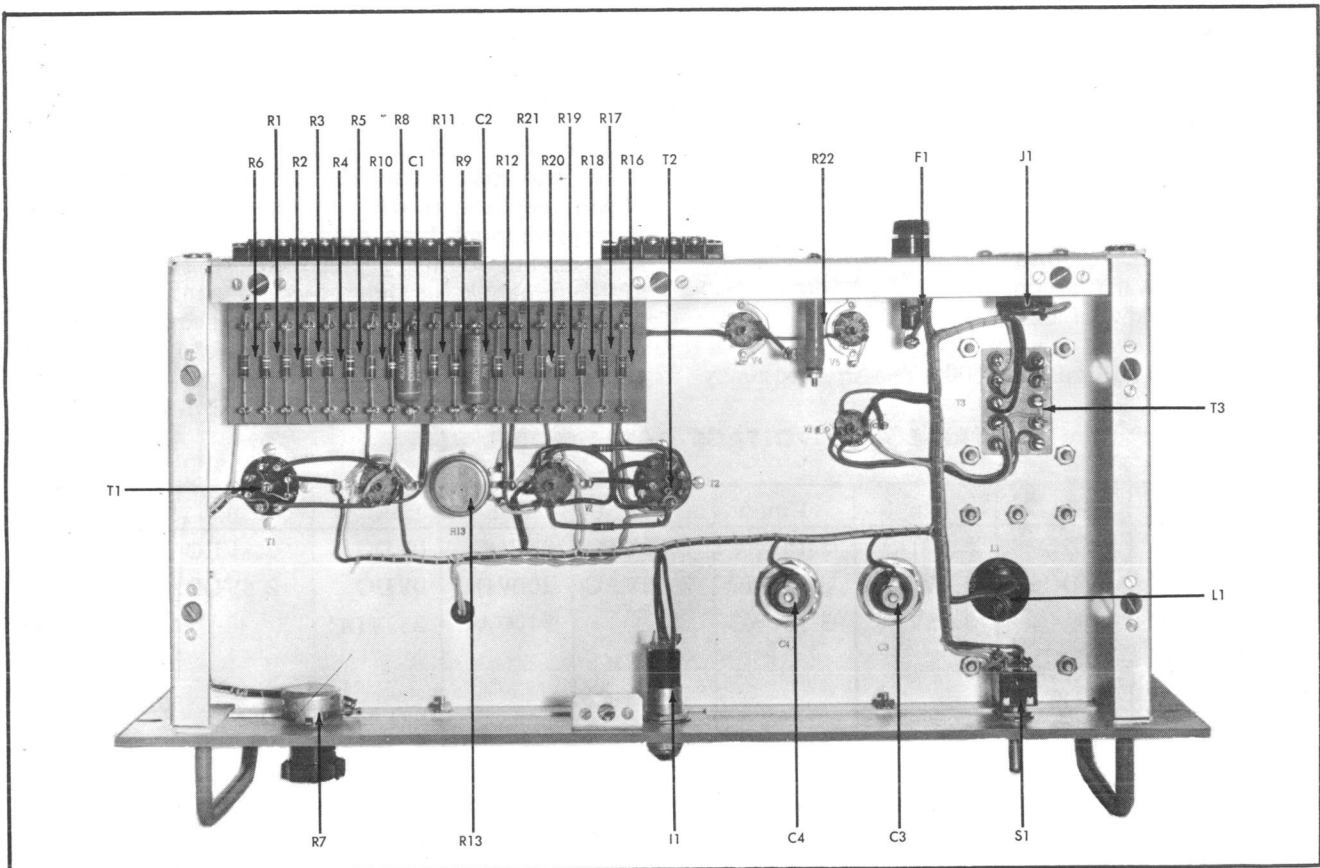


Figure 4-11. Bottom View, Model RSM

technician devote himself to one section at a time. In this manner, he may isolate the section at fault more easily. A suggested procedure follows:

SECTION A

a) No component trouble other than defective resistors can be expected in this section. In case of failure, make a routine resistance check of components and wiring. Replace and correct where necessary.

SECTION B

a) If defect or failure of the amplifier is suspected, make a routine check of components and wiring.

b) Inspect the terminal board for component deterioration. When making replacements, use components identical to those now in use. Refer to Parts List for RSM.

c) If it is found necessary to readjust the balance control, as in the case of replacing V2, the following procedure is recommended:

1. Connect audio generator to terminals 1 and 2 of E1.

2. Terminate 3-4, 5-6, 7-8 and 9-10 using 680 ohm resistors.

3. Connect a 680 ohm resistor across terminals 1 and 3 of E2.

4. If a distortion meter is available (such as a Barker-Williamson, Model 891), connect to terminals 1 and 3 of E2.

5. Feed a signal of 1000 cps in frequency

and 1 volt (rms) in amplitude into the RSM.

6. Adjust the balance control until a minimum distortion is obtained. The measured distortion should in no case exceed .8%.

7. If no distortion meter is available, feed audio signal into RSM as above while monitoring the output at terminals 1 and 3 of E2, with an AC VTVM and/or a scope.

8. Disconnect capacitor C2 on the terminal board.

9. Connect a .01 mfd mica capacitor from Pin 1 of V1 to Pin 2 of V2. This results in an in-phase signal for the push-pull amplifier stage #2.

10. Proper balance point is reached by adjusting the control R13 until a minimum signal is obtained across the output.

11. Remove the capacitor which was placed between pin 1 of V1 and Pin 2 of V2.

12. Replace capacitor C2.

13. Firmly lock R13 in position.

SECTION C

FAILURE OF THE POWER SUPPLY. If power failure occurs, indicated by unlit filaments and/or dead voltage regulator tubes V4 and V5, check the main fuse for defect. If a fuse has blown, replace it with another of equal rating. If replacement fuse blows also, never replace with one of higher rating. Make a routine resistance check for shorted components and tubes. If simple checks are found inadequate, signal tracing may be necessary to locate the trouble source.

TABLE 4-5 VOLTAGE DATA, MODEL RSM

	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	65VDC	0VDC	2.4VDC	3.15VAC	3.15VAC	65VDC	0VDC	2.4VDC	3.15VAC
V2	200VDC	0VDC	2.4VDC	3.15VAC	3.15VAC	200VDC	0VDC	2.4VDC	3.15VAC
V3	240VAC		3.15VAC	3.15VAC		240VAC	255VDC		
V4	210VDC	105VDC			210VDC				
V5		0VDC			105VDC				

- Note:
- 1) DC measurements are at 11 megohms; AC measurements at 5 megohms.
 - 2) Measured values are from socket pin to common negative.
 - 3) Line maintained at 110 VAC for voltage readings.
 - 4) Voltage readings are within $\pm 10\%$ from values shown.
 - 5) Output terminated with 680 ohms.

CORRECTIVE EQUIPMENT MAINTENANCE, MODEL RSP

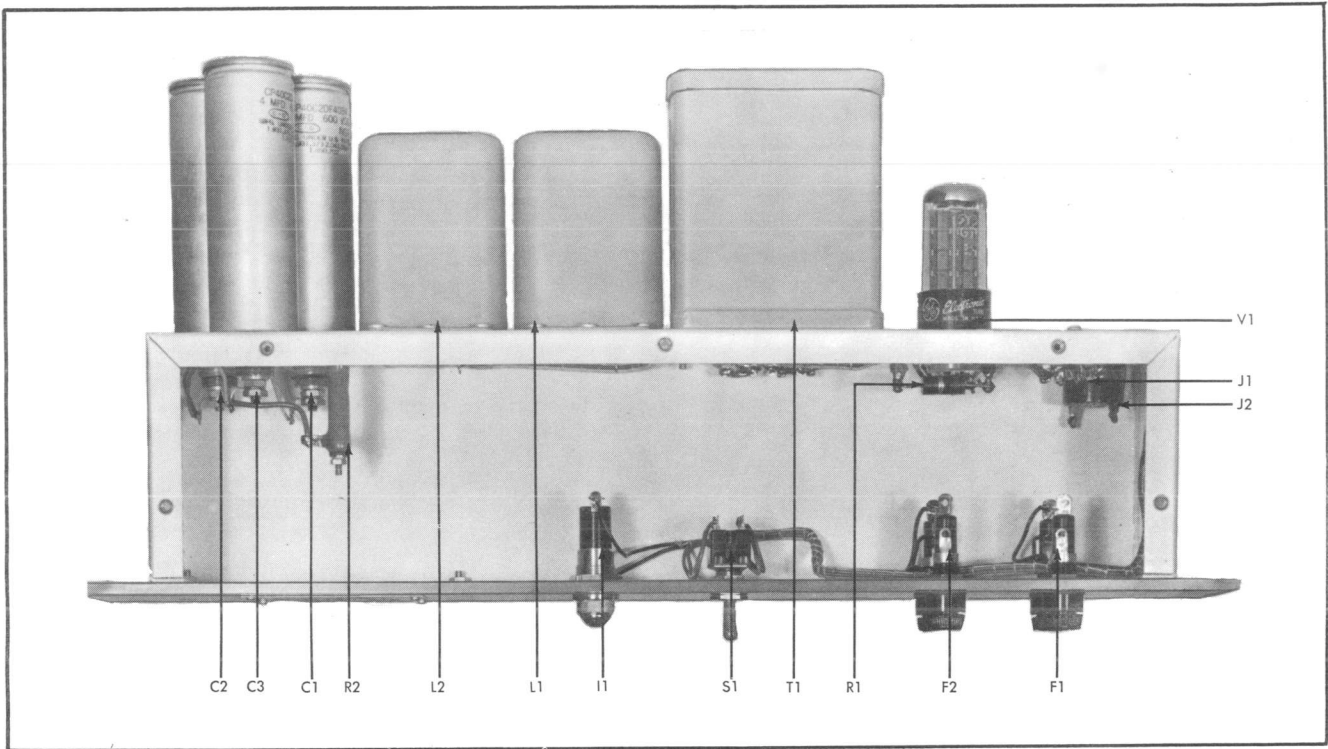


Figure 4-12. Inside View, Model RSP

TABLE 4-6 VOLTAGE DATA, MODEL RSP

	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V1		400VDC		310VAC		310VAC		400VDC

- Note:**
- 1) DC measurements are at 11 megohms; AC measurements are at 5 megohms.
 - 2) Measured Values are from Socketpin to common negative.
 - 3) Line maintained at 110VAC for voltage readings.
 - 4) Voltage readings are within $\pm 10\%$ from values shown.
 - 5) No load connected to the unit.

PARTS LIST
RECEIVER CONTROL GROUP AN/FRA-501
AM-5028/FRA-501
TMC Model RSA

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
C1	CAPACITOR, fixed: paper; .05 mfd, +40, -20%; 400 wvdc.	AVC Time Constant V6A	CN-100-3
C2	CAPACITOR, fixed: paper; .05 mfd, +40, -20%; 400 wvdc.	DC Filter V6A	CN-100-3
C3	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Blocking, V6A	CM35B103K
C4	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Blocking, V7	CM35B103K
C5A, B,C	CAPACITOR, fixed: bathtub case; 3 sections; .5 mfd ea. sect., +20, -10%; 600 wvdc.	Cathode Bypass, V7	CP53B5EF504V
C6	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V2-V3	CM35B103K
C7	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V1-V3	CM35B103K
C8	CAPACITOR, fixed: bathtub case; .5 mfd. ±10%, 600 wvdc.	Blocking, V6B	CP53B1EF504K
C9	CAPACITOR, fixed: bathtub case; 4 mfd, ±10, -10%; 100 wvdc; oil filled and impregnated.	AVC Time Constant, V6A	CP53B1EB405K
E1	BOARD, terminal: molded phenolic; 4 brass nickel plated 6-32 binding head machine screws.	Line Input Terminal	TM-100-4
E2	BOARD, terminal: molded phenolic; 10 brass nickel plated 6-32 binding head machine screws.	RSD Output Terminal	TM-100-10
E3	FANNING STRIP, phenolic: 4 spade terms for #6 MS; angle type; w/cable grips; left end feed.	Line Cable Terminal	TM-105-4AL
E4	FANNING STRIP, phenolic: 10 spade terms for #6 MS; angle type; w/cable grips; left end feed.	RSD Cable Terminal	TM-105-10AL
I1	LAMP, incandescent: 6-8 volts; .25 amps T-3-1/4 bulb; bayonet base.	Power Indicator	BI-101-44
J1	CONNECTOR, receptacle: male; 8 prong; polarized; molded bakelite; 730 v. RMS, 10 amps.	Power Receptacle	JJ-127-1

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
M1	METER, VU: twin scale, -20 to +3 and -30 to -7; 3-1/2" square case.	Line Input Level Indicator	MR-101-3
P1	CONNECTOR, plug: female; 8 contact, polarized.	Power Plug	PL-116-2
R1	RESISTOR, adjustable: step type; 600 ohms.	Input Level Control	RR-111
R2	RESISTOR, fixed: composition; 560 ohms, $\pm 10\%$; 1/2 watt.	Filter Load Resistor ZF1	RC20GF561K
R3	RESISTOR, fixed: composition; 100,000 ohms, $\pm 10\%$; 1 watt.	AVC Time Constant V6A	RC30GF104K
R4	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Diode Load	RC20GF474K
R5	RESISTOR, fixed: composition; 27,000 ohms, $\pm 10\%$; 1/2 watt.	Voltage Divider V6A	RC20GF273K
R6	RESISTOR, fixed: composition; 10,000 ohms, $\pm 10\%$; 1/2 watt.	Voltage Divider V6A	RC20GF103K
R7	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Diode Load V6A	RC20GF474K
R8	RESISTOR, fixed: composition; 1800 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias, V7B	RC20GF182K
R9	RESISTOR, fixed: composition; 100,000 ohms, $\pm 10\%$; 1 watt.	Plate Load V7B	RC30GF104K
R10	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Resistor V7B	RC20GF474K
R11	RESISTOR, fixed: composition; 6800 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias, V7A	RC20GF682K
R12	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V7A	RC20GF474K
R13	RESISTOR, fixed: wire-wound; 10,000 ohms, $\pm 10\%$; 10 watt.	Series Resistor V8	RW-109-34
R14	RESISTOR, fixed: composition; 220 ohms, $\pm 10\%$; 1/2 watt.	Cathode shunt V6B	RC20GF221K
R15	RESISTOR, fixed: composition; 4700 ohms, $\pm 10\%$; 1/2 watt.	Load Resistor, T3	RC20GF472K
R16	RESISTOR, fixed: composition; 3900 ohms, $\pm 10\%$; 2 watts.	Isolation Resistor, T3	RC42GF392K
R17	RESISTOR, variable: composition; dual unit; 50,000, ohms, $\pm 10\%$; 2 watts ea. unit, w/locking bushing.	Gain Control V3	RV104ATXA503A

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R18	RESISTOR, fixed: composition; 220,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load, V3A	RC20GF224K
R19	RESISTOR, fixed: composition; 220,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load, V3B	RC20GF224K
R20	RESISTOR, fixed: composition; 1000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias, V3	RC20GF102K
R21	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Resistor, V1	RC20GF474K
R22	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Resistor, V1	RC20GF474K
R23	RESISTOR, variable: composition; 250 ohms, $\pm 10\%$; 2 watts; w/locking bushing.	Balance Control, V1, V2	RV4ATXA251A
R24	RESISTOR, fixed: composition; 560 ohms, $\pm 10\%$; 2 watts.	Cathode Bias, V1, V2	RC42GF561K
R25	Not Used.		
R26	RESISTOR, fixed: composition; 390 ohms, $\pm 10\%$; 1/2 watt.	Output Network	RC20GF391K
R27	RESISTOR, fixed: composition; 390 ohms, $\pm 10\%$; 1/2 watt.	Output Network	RC20GF391K
R28	RESISTOR, fixed: composition; 390 ohms, $\pm 10\%$; 1/2 watt.	Output Network	RC20GF391K
R29	RESISTOR, fixed: composition; 390 ohms, $\pm 10\%$; 1/2 watt.	Output Network	RC20GF391K
R30	RESISTOR, fixed: composition; 390 ohms, $\pm 10\%$; 1/2 watt.	Output Network	RC20GF391K
R31	RESISTOR, fixed: composition; 390 ohms, $\pm 10\%$; 1/2 watt.	Output Network	RC20GF391K
R32	RESISTOR, variable: composition; 10,000 ohms, $\pm 10\%$; 2 watts; w/locking bushing.	Meter V6B Adjustment	RV4ATXA103A
R33	RESISTOR, fixed: composition; 1000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias, V6B	RC20GF102K
S1	SWITCH, rotary, one pole, two pos. single sect.	Meter-range Switch M1	SW-119
T1	TRANSFORMER, audio: pri 600 ohms, sec 600 ohms; 1-1/2 in. lg x 1-1/2 in. wd x 2 in. hg o.a. dim.	Input Transformer	TF-124

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
T2	TRANSFORMER, audio: pri 600 ohms, sec.600 ohms; 1-1/2" lg x 1-1/2" wd x 2" hg o.a. dim.	Line Coupling	TF-124
T3	TRANSFORMER, audio: pri 30,000 ohms, 8 ma DC unbalanced max. sec 80,000 ohms; 2-1/4" x 2-1/8" x 1-9/16" o.a. dim.	Line Coupling	TF-115
T4	TRANSFORMER, audio: pri 30,000 ohms, sec 50,200,500 ohms; 2-1/4" x 1-5/8" x 1-5/8" o.a. dim.	Output V1, 2 Transformer	TF-114
V1	TUBE, electron: 12AU7; min. 9 pin.	Amplifier	12AU7
V2	TUBE, electron: 12 AU7; min. 9 pin.	Amplifier	12AU7
V3	TUBE, electron: 12AX7; min. 9 pin.	Amplifier	12AX7
V4	TUBE, electron: 6BA6; min. 7 pin.	Amplifier	6BA6
V5	TUBE, electron: 6BA6, min. 7 pin.	Amplifier	6BA6
V6	TUBE, electron: 12AU7, min. 9 pin.	Rect. And Isol. Amp.	12AU7
V7	TUBE, electron: 12AU7; min. 9 pin.	Amplifier	12AU7
V8	TUBE, electron: OA3, octal.	Regulator	OA3
XV1	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V1	TS103P01
XV2	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V2	TS103P01
XV3	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V3	TS103P01
XV4	SOCKET, tube: min. 7 pin; one piece saddle mounting.	Socket for V4	TS102P01
XV5	SOCKET, tube: min. 7 pin; one piece saddle mounting.	Socket for V5	TS102P01
XV6	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V6	TS103P01
XV7	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V7	TS103P01
XV8	SOCKET, tube: octal; molded in plate.	Socket for V8	TS-121
XV9	LIGHT, indicator: red-frosted lens; min. bayonet base; T-3-1/4 bulb.	Socket for I1	TS-106-1

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
ZF1	FILTER, assembly: low pass; 0 to 3000 ohms.	Low Pass Filter	FX-133
ZF2	FILTER, assembly: band rejection.	60 Cycle Trap V4, 5	FX-134-60
HV8	HOLDER, tube.	Clamp for V8	CU-100-6
MB1	KNOB, instrument: fluted type.	Knob for R1	MP-100-4
MB2	KNOB, instrument: fluted type.	Knob for S1	MP-100-4
OV1	SHIELD, tube.	Shield for V1	TS103U02
OV2	SHIELD, tube.	Shield for V2	TS103U02
OV3	SHIELD, tube.	Shield for V3	TS103U02
OV4	SHIELD, tube.	Shield for V4	TS102U02
OV5	SHIELD, tube.	Shield for V5	TS102U02
OV6	SHIELD, tube.	Shield for V6	TS103U02
OV7	SHIELD, tube.	Shield for V7	TS103U02

PARTS LIST
C-5027 thru 5031/FRA-501
TMC Model RSC

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
C1A, B	CAPACITOR, variable: air dielectric; dual unit; 6.8 to 99 mmfd, ea. sect.	Freq. Control BFO	CB-103-3
C2	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V1	CM35B103K
C3	CAPACITOR, fixed: mylar; 2.0 mfd, 200 volts.	Feedback V1	CN108C2004K
C4	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V2	CM35B103K
C5	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V2	CM35B103K
C6A, B	CAPACITOR, variable: air dielectric; dual unit; 6.8 to 99 mmfd, ea. sect.	Freq. Control HFO	CB-103-3
C7	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V3	CM35B103K
C8	CAPACITOR, fixed: mylar; 2.0 mfd, 200 volts.	Feedback V3	CN108C2004K
C9	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V4	CM35B103K
C10	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V4	CM35B103K
C11A, B	CAPACITOR, variable: air dielectric; dual unit; 6.8 to 99 mmfd, ea. sect.	Freq. Control V5	CB-103-3
C12	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V5	CM35B103K
C13	CAPACITOR, fixed: mylar; 2.0 mfd, 200 volts.	Feedback V5	CN108C2004K
C14	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V6	CM35B103K
C15	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V6	CM35B103K
C16	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V8	CM35B103K
C17	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling V8	CM35B103K

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
E1	TERMINAL STRIP, 12 contacts.	Cable Terminal	TM-100-12
E2	FANNING STRIP, 12 terminals, left end feed.	Cable Connector	TM-105-12SL
I1	LAMP, incandescent: 115-125 volts; 3 watts; double contact bayonet base.	Amplitude Control BFO	BI-102-3
I2	LAMP, incandescent: 115-125 volts; 3 watts; double contact bayonet base.	Amplitude Control HFO	BI-102-3
I3	LAMP, incandescent: 115-125 volts; 3 watts; double contact bayonet base.	Amplitude Control RFG	BI-102-3
I4	LAMP, incandescent: 6-8 volts, .250 amp. T-3-1/4 clear bulb.	Power Indicator	BI-101-44
J1	JACK, receptacle: red body; phosphour bronze contact; for .081" dia pin; 7/8" lg x 3/8" dia o.a. dim.	Test Jack BFO	JJ-114-2
J2	JACK, receptacle: red body; phosphour bronze contact; for .081" dia pin; 7/8" lg x 3/8" dia o.a. dim.	Test Jack HFO	JJ-114-2
J3	JACK, receptacle: red body; phosphour bronze contact; for .081" dia pin; 7/8" lg x 3/8" dia o.a. dim.	Test Jack RFG	JJ-114-2
J4	JACK, telephone, switching.	Phone Output	JJ-128
LS-1	LOUDSPEAKER, permanent magnet: 4-1/2" rd.; 2 watt.	Monitor	LS-102
J5	RECEPTACLE, male: 8 prong; polarized, molded bakelite; 730 v. RMS, 10 amps.	Power Connector	JJ-127-1
R1	RESISTOR, adjustable: wirewound, 1.5 watts; 2000 ohms, $\pm 10\%$.	Degeneration Control BFO	RA103AQXM202A
R2	RESISTOR, fixed: composition; 68,000 ohms, $\pm 5\%$; 1 watt.	Plate Load V1	RC30GF683J
R3	RESISTOR, fixed: composition; 10,000 ohms, $\pm 5\%$; 2 watts.	Plate Load V1	RC42GF103J
R4	RESISTOR, fixed: composition; 270,000 ohms, $\pm 5\%$; 1/2 watt.	Voltage Divider V2	RC20GF274J
R5	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Resistor V1	RC20GF474K
R6	RESISTOR, fixed: composition; 470 ohms, $\pm 5\%$; 1/2 watt.	Cathode Resistor V1	RC20GF471J

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R7	RESISTOR, fixed: composition; 100,000 ohms, $\pm 5\%$; 1/2 watt.	Grid Resistor V2	RC20GF104J
R8	RESISTOR, fixed: composition; 100,000 ohms, $\pm 5\%$; 1/2 watt.	Grid Resistor V2	RC20GF104J
R9	RESISTOR, fixed: composition; 3,900 ohms, $\pm 10\%$; 1 watt.	Cathode Resistor V2	RC30GF392K
R10	RESISTOR, fixed: composition; 470 ohms, $\pm 10\%$; 1/2 watt.	Output Pad BFO	RC20GF471K
R11	RESISTOR, variable: composition; 500 ohms, $\pm 10\%$; 2 watts.	Output Pad BFO	RV4ATXA501A
R12	RESISTOR, fixed: composition; 150 ohms, $\pm 10\%$; 1/2 watt.	Output Pad BFO	RC20GF151K
R13	RESISTOR, adjustable: wirewound, 1.5 watts; 2000 ohms, $\pm 10\%$.	Degeneration Control HFO	RA103AQXM202A
R14	RESISTOR, fixed: composition; 68,000 ohms, $\pm 5\%$; 1 watt.	Plate Load V3	RC30GF683J
R15	RESISTOR, fixed: composition; 10,000 ohms, $\pm 5\%$; 2 watts.	Plate Load V3	RC42GF103J
R16	RESISTOR, fixed: composition; 270,000 ohms, $\pm 5\%$; 1/2 watt.	Voltage Divider V4	RC20GF274J
R17	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Resistor, V3	RC20GF474K
R18	RESISTOR, fixed: composition; 470 ohms, $\pm 5\%$; 1/2 watt.	Cathode Resistor V3	RC20GF471J
R19	RESISTOR, fixed: composition; 100,000 ohms, $\pm 5\%$; 1/2 watt.	Grid Resistor V4	RC20GF104J
R20	RESISTOR, fixed: composition; 100,000 ohms, $\pm 5\%$; 1/2 watt.	Grid Resistor V4	RC20GF104J
R21	RESISTOR, fixed: composition; 3,900 ohms, $\pm 10\%$; 1 watt.	Cathode Resistor V4	RC30GF392K
R22	RESISTOR, fixed: composition; 470 ohms, $\pm 10\%$; 1/2 watt.	Output Pad HFO	RC20GF471K
R23	RESISTOR, variable: composition; 500 ohms, $\pm 10\%$; 2 watts.	Output Pad HFO	RV4ATXA501A
R24	RESISTOR, fixed: composition; 150 ohms, $\pm 10\%$; 1/2 watt.	Output Pad HFO	RC20GF151K
R25	RESISTOR, adjustable: wirewound, 1.5 watts, 2000 ohms, $\pm 10\%$.	Degeneration Control RFG	RA103AQXM202A

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R26	RESISTOR, fixed: composition; 68,000 ohms, $\pm 5\%$; 1 watt.	Plate Load V5	RC30GF683J
R27	RESISTOR, fixed: composition; 10,000 ohms, $\pm 5\%$; 2 watts.	Plate Load V5	RC42GF103J
R28	RESISTOR, fixed: composition; 270,000 ohms, $\pm 5\%$; 1/2 watt.	Voltage Divider V6	RC20GF274J
R29	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Resistor V5	RC20GF474K
R30	RESISTOR, fixed: composition; 470 ohms, $\pm 5\%$; 1/2 watt.	Cathode Resistor Resistor V5	RC20GF471J
R31	RESISTOR, fixed: composition; 100,000 ohms, $\pm 5\%$; 1/2 watt.	Grid Resistor V6	RC20GF104J
R32	RESISTOR, fixed: composition; 100,000 ohms, $\pm 5\%$; 1/2 watt.	Grid Resistor V6	RC20GF104J
R33	RESISTOR, fixed: composition; 3,900 ohms, $\pm 10\%$; 1 watt.	Cathode Resistor V6	RC30GF392K
R34	RESISTOR, fixed: composition; 470 ohms, $\pm 10\%$; 1/2 watt.	Output Pad RFG	RC20GF471K
R35	RESISTOR, variable: composition; 500 ohms, $\pm 10\%$; 2 watts.	Output Pad RFG	RV4ATXA501A
R36	RESISTOR, fixed: composition; 150 ohms, $\pm 10\%$; 1/2 watt.	Output Pad RFG	RC20GF151K
R37	RESISTOR, variable: composition; 100 K ohms, $\pm 20\%$; 2 watts.	Audio Gain	RV4ATRD104B
R38	RESISTOR, variable: composition; 3500 ohms, $\pm 20\%$; 2 watts.	Band width Control	RV4ATRD352B
R39	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V7	RC20GF474K
R40	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V7	RC20GF474K
R41	RESISTOR, fixed: composition; 1500 ohms, $\pm 10\%$; 1/2 watt.	Cathode Resistor V7	RC20GF152K
R42	RESISTOR, fixed: composition; 1 megohm, $\pm 10\%$; 1/2 watt.	Grid Resistor V8	RC20GF105K
R43	RESISTOR, fixed: composition; 12,000 ohms, $\pm 5\%$; 1/2 watt.	Voltage Divider V8	RC20GF123J
R44	RESISTOR, fixed: composition; 1 meg, $\pm 10\%$; 1/2 watt.	Grid Resistor V8	RC20GF105K

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R45	RESISTOR, fixed: composition; 680 ohms, ±10%; 1 watt.	Cathode Resistor V8	RC30GF681K
R46	RESISTOR, variable: composition; 250 ohms, ±20%; 2 watts.	Muting Control	RV4ATXA251B
R47	RESISTOR, fixed: composition; 68 ohms, ±10%; 1 watt.	Output Load V8	RC30GF680K
R48	RESISTOR, fixed: wire wound; 10,000 ohms, ±10%; 10 watts.	Series Resistor V9	RW-109-34
R49	RESISTOR, fixed: wire wound; 10,000 ohms, ±10%; 10 watts.	Series Resistor V10	RW-109-34
R50	RESISTOR, fixed: wire wound; 10,000 ohms, ±10%; 10 watts.	Series Resistor V11	RW-109-34
R51	Not Used.		
R52	RESISTOR, fixed: composition; 1500 ohms, ±10%; 1/2 watt.	Degen. Limiter V1 V1	RC20GF152K
R53	RESISTOR, fixed: composition; 47,000 ohms, ±10%, 1 watt.	Feedback Res. V1	RC30GF473K
R54	RESISTOR, fixed: composition; 1500 ohms, ±10%, 1/2 watt.	Degen. Limiter V3	RC20GF152K
R55	RESISTOR, fixed: composition; 47,000 ohms, ±10%, 1 watt.	Feedback Res. V3	RC30GF473K
R56	RESISTOR, fixed: composition; 1500 ohms, ±10%, 1/2 watt.	Degen. Limiter V5	RC20GF152K
R57	RESISTOR, fixed: composition; 47,000 ohms, ±10%, 1 watt.	Feedback Res. V5	RC30GF473K
S1	SWITCH, toggle: SPST; 3 amp, 250 volts, phenolic body.	BFO ON/OFF	ST12A
S2	SWITCH, toggle: SPST; 3 amp, 250 volts, phenolic body.	RFG ON/OFF	ST12A
S3	SWITCH, toggle: DPDT; 3 amp, 250 volts, phenolic body.	LS ON/OFF	ST22N
T1	TRANSFORMER, audio: pri 20,000 ohms CT; secdy 150, 600 ohms, 4 ma DC in pri; ±2db, 200 to 10,000 Cps.	BFO Output	TF-138
T2	TRANSFORMER, audio: pri 20,000 ohms CT; secdy 150, 600 ohms; 4 ma DC in pri; ±2db, 200 to 10,000 Cps.	HFO Output	TF-138

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
T3	TRANSFORMER, audio: pri 20,000 ohms CT; secdy 150, 600 ohms; 4 ma DC in pri; +2db, 200 to 10,000 Cps.	RFG Output	TF-138
T4	TRANSFORMER, audio: pri 150, 600 ohms, secdy 1 megohm; 0 DC in pri; +2db, 200 to 3,000 Cps.	Audio Input	TF-152
T5	TRANSFORMER, audio: pri 30,000 ohms split; secdy 50/200 ohms, 125/500 ohms; 8 ma DC in pri; +2db, 30 to 20,000 Cps.	Audio Output	TF-154
V1	TUBE, electron: 12AT7; miniature 9 pin.	Oscillator	12AT7
V2	TUBE, electron: 12AU7; miniature 9 pin.	Amplifier	12AU7
V3	TUBE, electron: 12AT7; miniature 9 pin.	Oscillator	12AT7
V4	TUBE, electron: 12AU7; miniature 9 pin.	Amplifier	12AU7
V5	TUBE, electron: 12AT7; miniature 9 pin.	Oscillator	12AT7
V6	TUBE, electron: 12AU7; miniature 9 pin.	Amplifier	12AU7
V7	TUBE, electron: 12AX7; dual triode; miniature 9 pin.	Amplifier	12AX7
V8	TUBE, electron: 12AU7; miniature 9 pin.	Output Amplifier	12AU7
V9	TUBE, electron: OA2; miniature 7 pin.	Voltage Regulator	OA2
V10	TUBE, electron: OA2; miniature 7 pin.	Voltage Regulator	OA2
V11	TUBE, electron: OA2; miniature 7 pin.	Voltage Regulator	OA2
V12	TUBE, ballast: current regulating; .88 to .92 amps; 10.7 to 14.5 volts; octal base.	Current Reg. V1, 3, 5	RR-110
XV1	SOCKET, tube: 7 pin miniature.	Socket for V1	TS102P01
XV2	SOCKET, tube: 9 pin noval.	Socket for V2	TS103P01
XV3	SOCKET, tube: 7 pin miniature.	Socket for V3	TS102P01
XV4	SOCKET, tube: 9 pin noval.	Socket for V4	TS103P01
XV5	SOCKET, tube: 7 pin miniature.	Socket for V5	TS102P01
XV6	SOCKET, tube: 9 pin noval.	Socket for V6	TS103P01
XV7	SOCKET, tube: 9 pin noval.	Socket for V7	TS103P01

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
XV8	SOCKET, tube: 9 pin noval.	Socket for V8	TS103P01
XV9	SOCKET, tube: 9 pin noval.	Socket for V9	TS103P01
XV10	SOCKET, tube: 9 pin noval.	Socket for V10	TS103P01
XV11	SOCKET, tube: 9 pin noval.	Socket for V11	TS103P01
XV12	SOCKET, tube: octal.	Socket for V12	TS101P01
Z1A	NETWORK, frequency determining: BFO; 1275 cycles.	BFO Control Source Chan. A	NF-104-1275
Z2A	NETWORK, frequency determining: HFO; 425 cycles.	HFO Control Source Chan. A	NF-104-425
Z3A	NETWORK, frequency determining: RF Gain; 2125 cycles.	RF Gain Control Source Chan. A	NF-104-2125
Z1B	NETWORK, frequency determining: BFO; 1445 cycles.	BFO Control Source Chan. B	NF-104-1445
Z2B	NETWORK, frequency determining: HFO; 595 cycles.	HFO Control Source Chan. B	NF-104-595
Z3B	NETWORK, frequency determining: RF Gain; 2295 cycles.	RF Gain Control Source Chan. B.	NF-104-2295
Z1C	NETWORK, frequency determining: BFO; 1615 cycles.	BFO Control Source Chan. C	NF-104-1615
Z2C	NETWORK, frequency determining: HFO; 765 cycles.	HFO Control Source Chan. C	NF-104-765
Z3C	NETWORK, frequency determining: RF Gain; 2465 cycles.	RF Gain Control Source Chan. C	NF-104-2465
Z1D	NETWORK, frequency determining: BFO; 1785 cycles.	BFO Control Source Chan. D	NF-104-1785
Z2D	NETWORK, frequency determining: HFO; 935 cycles.	HFO Control Source Chan. D	NF-104-935
Z3D	NETWORK, frequency determining: BF Gain; 2635 cycles.	RF Gain Control Source Chan. D	NF-104-2635
Z1E	NETWORK, frequency determining: BFO; 1955 cycles.	BFO Control Source Chan. E	NF-104-1955
Z2E	NETWORK, frequency determining: HFO; 1105 cycles.	HFO Control Source Chan. E	NF-104-1105
Z3E	NETWORK, frequency determining: RF Gain; 2805 cycles.	RF Gain Control Source Chan. E	NF-104-2805
Z4	NETWORK, audio selective: 500, 750, 1000, 1250 cycles.	Audio Tone Selector	NF-102

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
HV12	HOLDER, tube.	Clamp for V12	CU-100-3
MB1	KNOB, instrument: skirt type.	Knob for C6	MP-106-2
MB2	KNOB, instrument: skirt type.	Knob for C1	MP-108-2
MB3	KNOB, instrument: skirt type.	Knob for C11	MP-106-2
MB4	KNOB, instrument: skirt type.	Knob for R37	MP-108-2
MB5	KNOB, instrument: fluted type.	Knob for Z4	MP-100-4
MB6	KNOB, instrument: fluted type.	Knob for R38	MP-100-4
OV1	SHIELD, tube.	Shield for V1	TS103U02
OV2	SHIELD, tube.	Shield for V2	TS103U02
OV3	SHIELD, tube.	Shield for V3	TS103U02
OV4	SHIELD, tube.	Shield for V4	TS103U02
OV5	SHIELD, tube.	Shield for V5	TS103U02
OV6	SHIELD, tube.	Shield for V6	TS103U02
OV7	SHIELD, tube.	Shield for V7	TS103U02
OV8	SHIELD, tube.	Shield for V8	TS103U02
OV9	SHIELD, tube.	Shield for V9	TS102U03
OV10	SHIELD, tube.	Shield for V10	TS102U03
OV11	SHIELD, tube.	Shield for V11	TS102U03

PARTS LIST
CV-5013 thru 5017/FRA-501
TMC Model RSD

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
C1	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling Capacitor V2A	CM35B103K
C2, A,B	CAPACITOR, fixed: paper; dual section; .5 mfd, ±15%; ea. sect.; 600 wvdc.	Plate Decoupling V1,2	CP69B4EF504L
C3 A,B	CAPACITOR, fixed: paper; dual section; .5 mfd, ±15%; ea. sect.; 600 wvdc.	Bypass Capacitor V2,3	CP69B4EF504L
C4	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling Capacitor V3	CM35B103K
C5	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling Capacitor V4	CM35B103K
C6	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling Capacitor V2B	CM35B103K
C7	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Bypass Capacitor V1B	CM35B103K
C8	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Bypass Capacitor V5	CM35B103K
C9	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Bypass Capacitor V5	CM35B103K
C10	Not Used		
C11	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling Capacitor V7A	CM35B103K
C12 A,B	CAPACITOR, fixed: paper; dual section; .5 mfd, ±15% ea. sect.; 600 wvdc.	Plate Decoupling	CP69B4EF504L
C13 A,B	CAPACITOR, fixed: paper; dual section; .5 mfd, ±15%; ea. sect.; 600 wvdc.	Bypass Capacitor V7,8	CP69B4EF504L
C14	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling Capacitor V8	CM35B103K
C15	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling Capacitor V9	CM35B103K

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
C16	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Bypass Capacitor V10	CM35B103K
C17	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Bypass Capacitor V10	CM35B103K
C18	Not Used.		
C19	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling Capacitor V12A	CM35B103K
C20 A,B	CAPACITOR, fixed: paper; dual section; .5 mfd, ±15%; ea. sect; 600 wvdc.	Plate Decoupling V11, 12	CP69B4EF504L
C21 A,B	CAPACITOR, fixed: paper; dual section; .5 mfd, ±15%; ea. sect; 600 wvdc.	Bypass Capacitor V12, 13	CP69B4EF504L
C22	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling Capacitor V13	CM35B103K
C23	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling Capacitor V14	CM35B103K
C24	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Coupling Capacitor V12B	CM35B103K
C25	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Bypass Capacitor V11B	CM35B103K
C26	CAPACITOR, fixed: mica; .01 mfd, ±10%; 300 wvdc.	Bypass Capacitor V15	CM35B103K
C27	Not Used		
C28 A,B	CAPACITOR, fixed: paper; dual section; .5 mfd, ±15%; ea. sect.; 600 wvdc.	Plate Decoupling V4, 5	CP69B4EF504L
C29 A,B	CAPACITOR, fixed: paper; .5 mfd, ±15% ea. sect.; 600 wvdc.	Plate De-coupling V9,10	CP69B4EF504L
C30 A,B	CAPACITOR, fixed: paper; .5 mfd, ±15% ea. sect.; 600 wvdc.	Plate De-coupling V14,15	CP69B4EF504L
E1	BOARD, terminal: general purpose barrier type; 9 brass nickel plated 6-32 binding head machine screws; molded phenolic.	Input and Output Terminals	TM-100-9
E2	FANNING STRIP, phenolic: nine spade terms for #6, MS.	Cable Terminal	TM-105-9AL
I1	LAMP, incandescent: 6-8 volts; 250 ma; T-3-1/4 bulb; bayonet base.	Power Indicator	BI-101-44

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
J1	CONNECTOR, receptacle: male; 8 prong; polarized; molded bakelite; 730 v. RMS, 10 amps.	Power Plug	JJ-127-1
J2	JACK, receptacle: red body; phosphor bronze contacts; for .081" dia pins.	BFO Test Jack	JJ-114-2
J3	JACK, receptacle: red body; phosphor bronze contacts; for .081" dia pins.	HFO Test Jack	JJ-114-2
J4	JACK, receptacle: red body; phosphor bronze contacts; for .081" dia pins.	RFG Test Jack	JJ-114-2
K1	RELAY, plug-in; DPDT; octal; 20,000 ohms; .07 watts, 55 v. DC.	BFO Relay	RL-110
K2	RELAY, plug-in; DPDT; octal; 20,000 ohms, .07 watts, 55 v. DC.	RF Gain Relay	RL-110
M1	METER, panel: 2-1/2" square; -5 to +5 volts.	Output Meter	MR-102
P1	CONNECTOR, plug: female, 8 contact, polarized.	Power Plug	PL-116-2
R1	RESISTOR, fixed: composition; 330 ohms, $\pm 10\%$; 1/2 watt.	PAD Resistor	RC20GF331K
R2	Not Used		
R3	RESISTOR, fixed: composition; 680 ohms, $\pm 10\%$; 1/2 watt.	Grid Resistor V1A	RC20GF681K
R4	RESISTOR, fixed: composition; 1000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V1A	RC20GF102K
R5	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V1A	RC20GF474K
R6	RESISTOR, fixed: composition; 22,000 ohms, $\pm 10\%$; 1/2 watt.	Plate De-coupling V1A	RC20GF223K
R7	RESISTOR, fixed: composition; 1 megohm, $\pm 10\%$; 1/2 watt.	Grid Resistor V2A	RC20GF105K
R8	RESISTOR, fixed: composition; 10,000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V2A	RC20GF103K
R9	RESISTOR, fixed: composition; 220,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V2A	RC20GF224K
R10	RESISTOR, fixed: composition; 22,000 ohms, $\pm 10\%$; 1/2 watt.	Plate De-coupling V2A	RC20GF223K

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R11	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Resistor V3	RC20GF474K
R12	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Isolation Resistor V3	RC20GF474K
R13	RESISTOR, fixed: composition; 10,000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V3	RC20GF103K
R14	RESISTOR, fixed: composition; 150,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V3	RC20GF154K
R15	RESISTOR, fixed: composition; 22,000 ohms, $\pm 10\%$; 1/2 watt.	Plate De-coupling V3	RC20GF223K
R16	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Resistor V4	RC20GF474K
R17	RESISTOR, fixed: composition; 100,000 ohms, $\pm 10\%$; 1/2 watt.	Isolation Resistor V4	RC20GF104K
R18	RESISTOR, fixed: composition; 1000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V4	RC20GF102K
R19	RESISTOR, fixed: composition; 1 megohm, $\pm 10\%$; 1/2 watt.	Diode Load V2B	RC20GF105K
R20	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Isolation Resistor V2B	RC20GF474K
R21	RESISTOR, fixed: composition; 10 megohms, $\pm 10\%$; 1/2 watt.	Diode Load V2B	RC20GF106K
R22	Not Used		
R23	RESISTOR, fixed: composition; 3900 ohms, $\pm 10\%$; 1 watt.	Plate De-coupling V4	RC30GF392K
R24	RESISTOR, fixed: composition; 2.2 megohms, $\pm 10\%$; 1/2 watt.	Diode Load V5	RC20GF225K
R25	RESISTOR, fixed: composition; 2.2 megohms, $\pm 10\%$; 1/2 watt.	Diode Load V5	RC20GF225K
R26	RESISTOR, variable: composition; 50,000 ohms, $\pm 10\%$; 2 watts, w/locking bushing.	BFO Centering Control	RV4ATXA503A
R27	RESISTOR, fixed: composition; 1 megohm, $\pm 10\%$; 1/2 watt.	Isolation Resistor BFO	RC20GF105K
R28	RESISTOR, variable: composition 500,000 ohms, $\pm 20\%$; 2 watts, w/locking bushing.	BFO Output Control	RV4ATXA504B
R29	RESISTOR, fixed: composition; 330 ohms, $\pm 10\%$; 1/2 watt.	PAD Resistor	RC20GF331K

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R30	RESISTOR, fixed: composition; 330 ohms, $\pm 10\%$; 1/2 watt.	PAD Resistor	RC20GF331K
R31	RESISTOR, fixed: composition; 680 ohms, $\pm 10\%$; 1/2 watt.	Grid Leak V6	RC20GF681K
R32	RESISTOR, fixed: composition; 1000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V6	RC20GF102K
R33	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V6	RC20GF474K
R34	RESISTOR, fixed: composition; 22,000 ohms, $\pm 10\%$; 1/2 watt.	Plate De-coupling V6	RC20GF223K
R35	RESISTOR, fixed: composition; 1 megohm, $\pm 10\%$; 1/2 watt.	Grid Leak V7A	RC20GF105K
R36	RESISTOR, fixed: composition; 10,000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V7A	RC20GF103K
R37	RESISTOR, fixed: composition; 220,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V7A	RC20GF224K
R38	RESISTOR, fixed: composition; 22,000 ohms, $\pm 10\%$; 1/2 watt.	Plate De-coupling V7A	RC20GF223K
R39	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Leak V8	RC20GF474K
R40	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Isolation Resistor V8	RC20GF474K
R41	RESISTOR, fixed: composition; 10,000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V8	RC20GF103K
R42	RESISTOR, fixed: composition; 150,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V8	RC20GF154K
R43	RESISTOR, fixed: composition; 22,000 ohms, $\pm 10\%$; 1/2 watt.	Plate De-coupling V8	RC20GF223K
R44	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Leak V9A	RC20GF474K
R45	RESISTOR, fixed: composition; 100,000 ohms, $\pm 10\%$; 1/2 watt.	Isolation Resistor V9A	RC20GF104K
R46	RESISTOR, fixed: composition; 1000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V9A	RC20GF102K
R47	RESISTOR, fixed: composition; 3900 ohms, $\pm 10\%$; 1/2 watt.	Plate De-coupling V9A	RC30GF392K
R48	RESISTOR, fixed: composition; 2.2 megohms, $\pm 10\%$; 1/2 watt.	Diode Load V10	RC20GF225K

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R49	RESISTOR, fixed: composition; 2.2 megohms, $\pm 10\%$; 1/2 watt.	Diode Load V 10	RC20GF225K
R50	RESISTOR, variable: composition; 50,000 ohms, $\pm 10\%$; 2 watts, w/locking bushing.	HFO Centering Control	RV4ATXA503A
R51	RESISTOR, fixed: composition; 1 megohm, $\pm 10\%$; 1/2 watt.	Isolation Resistor HFO	RC20GF105K
R52	RESISTOR, variable: composition; 1 megohm, $\pm 20\%$; 2 watts, w/locking bushing.	HFO Output Control	RV4ATXA105B
R53	RESISTOR, fixed: composition; 330 ohms, $\pm 10\%$; 1/2 watt.	PAD Resistor	RC20GF331K
R54	Not Used.		
R55	RESISTOR, fixed: composition; 680 ohms, $\pm 10\%$; 1/2 watt.	Grid Leak V 11A	RC20GF681K
R56	RESISTOR, fixed: composition; 1000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V 11A	RC20GF102K
R57	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V 11A	RC20GF474K
R58	RESISTOR, fixed: composition; 22,000 ohms, $\pm 10\%$; 1/2 watt.	Plate De- coupling V 11A	RC20GF223K
R59	RESISTOR, fixed: composition; 1 megohm, $\pm 10\%$; 1/2 watt.	Grid Leak V 12A	RC20GF105K
R60	RESISTOR, fixed: composition; 10,000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V 12A	RC20GF103K
R61	RESISTOR, fixed: composition; 220,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V 12A	RC20GF224K
R62	RESISTOR, fixed: composition; 22,000 ohms, $\pm 10\%$; 1/2 watt.	Plate De- coupling V 12A	RC20GF223K
R63	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Leak V 13	RC20GF474K
R64	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Isolation Resistor V 13	RC20GF474K
R65	RESISTOR, fixed: composition; 10,000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V 13	RC20GF103K
R66	RESISTOR, fixed: composition; 150,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V 13	RC20GF154K
R67	RESISTOR, fixed: composition; 22,000 ohms, $\pm 10\%$; 1/2 watt.	Plate De- coupling V 13	RC20GF223K

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R68	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Leak V14	RC20GF474K
R69	RESISTOR, fixed: composition; 100,000 ohms, $\pm 10\%$; 1/2 watt.	Isolation Resistor V14	RC20GF104K
R70	RESISTOR, fixed: composition; 1000 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V14	RC20GF102K
R71	RESISTOR, fixed: composition; 1 megohm, $\pm 10\%$; 1/2 watt.	Diode Load V12B	RC20GF105K
R72	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Isolation Resistor V12B	RC20GF474K
R73	RESISTOR, fixed: composition; 10 megohms, $\pm 10\%$; 1/2 watt.	Diode Load V12B	RC20GF106K
R74	Not Used.		
R75	RESISTOR, fixed: composition; 3900 ohms, $\pm 10\%$; 1 watt.	Plate De- coupling V14	RC30GF392K
R76	RESISTOR, fixed: composition; 2.2 megohms, $\pm 10\%$; 1/2 watt.	Diode Load V15	RC20GF225K
R77	RESISTOR, fixed: composition; 1 megohm, $\pm 10\%$; 1/2 watt.	Isolation Resistor RFG	RC20GF105K
R78	RESISTOR, variable: composition; 50,000 ohms, $\pm 10\%$; 2 watts, w/locking bushing.	RF Gain Cen- tering Control	RV4ATXA503A
R79	RESISTOR, fixed: composition; 15,000 ohms, $\pm 10\%$; 1/2 watt.	Volt Divider V15	RC20GF153K
R80	RESISTOR, variable: composition; 500,000 ohms, $\pm 20\%$; 2 watts, w/locking bushing.	RF Gain Output	RV4ATXA504B
R81	RESISTOR, fixed: composition; 4700 ohms, $\pm 10\%$; 1/2 watt.	Cathode Load V7B	RC20GF472K
R82	RESISTOR, variable: composition; 250 ohms, $\pm 20\%$; 2 watts, w/locking bushing.	Meter Calibrate M1	RV4ATRD251B
R83	RESISTOR, fixed: composition; 4700 ohms, $\pm 10\%$; 1/2 watt.	Cathode Load V9B	RC20GF472K
R84	RESISTOR, variable: composition; 1000 ohms, $\pm 20\%$; 2 watts, w/locking bushing.	Meter Series M1	RV4ATXA102B
R85	RESISTOR, fixed: composition; 47,000 ohms, $\pm 10\%$; 1/2 watt.	Plate V7B Decoupling V9B	RC20GF473K

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R86	RESISTOR, fixed: composition; 1 megohm, $\pm 10\%$; 1/2 watt.	Grid Leak V9B	RC20GF105K
R87	RESISTOR, fixed: composition; 1 megohm, $\pm 10\%$; 1/2 watt.	Isolation Resistor V9B	RC20GF105K
R88	RESISTOR, fixed: wire-wound; 4000 ohms, $\pm 5\%$; 10 watts.	Voltage V16 Dropping V17	RW-109-31
R89	RESISTOR, fixed: composition; 39,000 ohms, $\pm 10\%$; 1 watt.	Voltage Divider V15	RC30GF393K
S1	SWITCH, rotary: 4 pos. 2 poles, 1 sect; non-shorting contacts; mycalex insulation.	Meter Switch M1	SW-120
T1	TRANSFORMER, audio: pri. imp. 30,000 ohms, sec. imp. 80,000 ohms; 2-3/16" lg x 2-3/16" wd x 2-7/8" hg.	Audio V4 Transformer	TF-129
T2	TRANSFORMER, audio: pri. imp. 30,000 ohms, sec. imp. 80,000 ohms; 2-3/16" lg x 2-3/16" wd x 2-7/8" hg.	Audio V9A Transformer	TF-129
T3	TRANSFORMER, audio: pri. imp. 30,000 ohms, sec. imp. 80,000 ohms, 2-3/16" lg x 2-3/16" wd x 2-7/8" hg.	Audio V14 Transformer	TF-129
V1	TUBE, electron: 12AT7; min. 9 pin.	Amplifier	12AT7
V2	TUBE, electron: 12AU7; min. 9 pin.	Amplifier	12AU7
V3	TUBE, electron: 12AX7; min. 9 pin.	Limiter	12AX7
V4	TUBE, electron: 6C4; min. 7 pin.	Amplifier	6C4
V5	TUBE, electron: 6AL5; min. 7 pin.	Rectifier	6AL5
V6	TUBE, electron: 12AT7; min. 9 pin.	Amplifier	12AT7
V7	TUBE, electron: 12AU7; min. 9 pin.	Amplifier	12AU7
V8	TUBE, electron: 12AX7; min. 9 pin.	Limiter	12AX7
V9	TUBE, electron: 12AU7; min. 9 pin.	Amplifier	12AU7
V10	TUBE, electron: 6AL5; min. 7 pin.	Rectifier	6AL5
V11	TUBE, electron: 12AT7; min. 9 pin.	Amplifier	12AT7
V12	TUBE, electron: 12AU7; min. 9 pin.	Amplifier	12AU7
V13	TUBE, electron: 12AX7; min. 9 pin.	Limiter	12AX7
V14	TUBE, electron: 6C4; min. 7 pin.	Amplifier	6C4
V15	TUBE, electron: 6AL5; min. 7 pin.	Rectifier	6AL5

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
V16	TUBE, electron: OB2; min. 7 pin.	Voltage Regulator	OB2
V17	TUBE, electron: OB2; min. 7 pin.	Voltage Regulator	OB2
XI1	LIGHT, indicator: red-frosted lens; min. bayonet base; T-3-1/4 bulb.	Socket for I1	TS-106-1
XV1	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V1	TS103P01
XV2	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V2	TS103P01
XV3	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V3	TS103P01
XV4	SOCKET, tube: min. 7 pin; one piece saddle mounting.	Socket for V4	TS102P01
XV5	SOCKET, tube: min. 7 pin; one piece saddle mounting.	Socket for V5	TS102P01
XV6	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V6	TS103P01
XV7	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V7	TS103P01
XV8	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V8	TS103P01
XV9	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V9	TS103P01
XV10	SOCKET, tube: min. 7 pin; one piece saddle mounting.	Socket for V10	TS102P01
XV11	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V11	TS103P01
XV12	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V12	TS103P01
XV13	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V13	TS103P01
XV14	SOCKET, tube: min. 7 pin; one piece saddle mounting.	Socket for V14	TS102P01
XV15	SOCKET, tube: min. 7 pin; one piece saddle mounting.	Socket for V15	TS102P01
XV16	SOCKET, tube: min. 7 pin; one piece saddle mounting.	Socket for V16	TS102P01

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
XV17	SOCKET, tube: min. 7 pin; one piece saddle mounting.	Socket for V17	TS102P01
XV18	SOCKET, octal: molded in-plate.	Socket for K1	TS-121
XV19	SOCKET, octal: molded in-plate.	Socket for K2	TS-121
ZD1A	FILTER, discriminator: BFO; 1275 cycles.	BFO Discr. Filter Chan. A	FD-116-1275
ZD2A	FILTER, discriminator: HFO; 425 cycles.	HFO Discr. Filter Chan. A	FD-116-425
ZD3A	FILTER, discriminator: RF Gain; 2125 cycles.	RF Gain Discr. Filter Chan. A	FD-117-2125
ZF1A	FILTER, bandpass: BFO; 1275 cycles.	BFO Filter Chan. A	FX-139-1275
ZF2A	FILTER, bandpass: BFO; 1275 cycles.	BFO Filter Chan. A	FX-140-1275
ZF3A	FILTER, bandpass: HFO; 425 cycles.	HFO Filter Chan. A	FX-139-425
ZF4A	FILTER, bandpass: HFO; 425 cycles.	HFO Filter Chan. A	FX-140-425
ZF5A	FILTER, bandpass: RF Gain, 2125 cycles.	RF Gain Filter Chan. A	FX-139-2125
ZF6A	FILTER, bandpass: RF Gain; 2125 cycles.	RF Gain Filter Chan. A	FX-140-2125
ZD1B	FILTER, discriminator: BFO; 1445 cycles.	BFO Discr. Filter Chan. B	FD-116-1445
ZD2B	FILTER, discriminator: HFO; 595 cycles.	HFO Discr. Filter Chan. B	FD-116-595
ZD3B	FILTER, discriminator: RF Gain; 2295 cycles.	RF Gain Discr. Filter Chan. B	FD-117-2295
ZF1B	FILTER, bandpass: BFO; 1445 cycles.	BFO Filter Chan. B	FX-139-1445
ZF2B	FILTER, bandpass: BFO; 1445 cycles.	BFO Filter Chan. B	FX-140-1445
ZF3B	FILTER, bandpass: HFO; 595 cycles.	HFO Filter Chan. B	FX-139-595
ZF4B	FILTER, bandpass: HFO; 595 cycles.	HFO Filter Chan. B	FX-140-595

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
ZF5B	FILTER, bandpass: RF Gain; 2295 cycles.	RF Gain Filter Chan. B	FX-139-2295
ZF6B	FILTER, bandpass: RF Gain; 2295 cycles.	RF Gain Filter Chan. B	FX-140-2295
ZD1C	FILTER, discriminator: BFO; 1615 cycles.	BFO Discr. Filter Chan. C	FD-116-1615
ZD2C	FILTER, discriminator: HFO; 765 cycles.	HFO Discr. Filter Chan. C	FD-116-765
ZD3C	FILTER, discriminator: RF Gain; 2465 cycles.	RF Gain Discr. Filter Chan. C	FD-117-2465
ZF1C	FILTER, bandpass: BFO; 1615 cycles.	BFO Filter Chan. C	FX-139-1615
ZF2C	FILTER, bandpass: BFO; 1615 cycles.	BFO Filter Chan. C	FX-140-1615
ZF3C	FILTER, bandpass: HFO; 765 cycles.	HFO Filter Chan. C	FX-139-765
ZF4C	FILTER, bandpass: HFO; 765 cycles.	HFO Filter Chan. C	FX-140-765
ZF5C	FILTER, bandpass: RF Gain; 2465 cycles.	RF Gain Filter Chan. C	FX-139-2465
ZF6C	FILTER, bandpass: RF Gain; 2465 cycles.	RF Gain Filter Chan. C	FX-140-2465
ZD1D	FILTER, discriminator: BFO; 1785 cycles.	BFO Discr. Filter Chan. D	FD-116-1785
ZD2D	FILTER, discriminator: HFO; 935 cycles.	HFO Discr. Filter Chan. D	FD-116-935
ZD3D	FILTER, discriminator: RF Gain; 2635 cycles.	RF Gain Discr. Filter Chan. D	FD-117-2635
ZF1D	FILTER, bandpass: BFO; 1785 cycles.	BFO Filter Chan. D	FX-139-1785
ZF2D	FILTER, bandpass: BFO; 1785 cycles.	BFO Filter Chan. D	FX-140-1785
ZF3D	FILTER, bandpass: HFO; 935 cycles.	HFO Filter Chan. D	FX-139-935
ZF4D	FILTER, bandpass: HFO; 935 cycles.	HFO Filter Chan. D	FX-140-935
ZF5D	FILTER, bandpass: RF Gain; 2635 cycles.	RF Gain Filter Chan. D	FX-139-2635

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
ZF6D	FILTER, bandpass: RF Gain; 2635 cycles.	RF Gain Filter Chan. D	FX-140-2635
ZD1E	FILTER, discriminator: BFO; 1955 cycles.	BFO Filter Chan. E	FD-116-1955
ZD2E	FILTER, discriminator: HFO; 1105 cycles.	HFO Filter Chan. E	FD-116-1105
ZD3E	FILTER, discriminator: RF Gain; 2805 cycles.	RF Gain Discr. Filter Chan. E	FD-117-2805
ZF1E	FILTER, bandpass: BFO; 1955 cycles.	BFO Filter Chan. E	FX-139-1955
ZF2E	FILTER, bandpass: BFO; 1955 cycles.	BFO Filter Chan. E	FX-140-1955
ZF3E	FILTER, bandpass: HFO; 1105 cycles.	HFO Filter Chan. E	FX-139-1105
ZF4E	FILTER, bandpass: HFO; 1105 cycles.	HFO Filter Chan. E	FX-140-1105
ZF5E	FILTER, bandpass: RF Gain; 2805 cycles.	RF Gain Filter Chan. E	FX-139-2805
ZF6E	FILTER, bandpass: RF Gain; 2805 cycles.	RF Gain Filter Chan. E	FX-140-2805
MB1	KNOB, instrument.	Knob for S1	MP-100-4
MB2	KNOB, instrument.	Knob for R82	MP-100-1
OV1	SHIELD, tube.	Shield for V1	TS103U02
OV2	SHIELD, tube.	Shield for V2	TS103U02
OV3	SHIELD, tube.	Shield for V3	TS103U02
OV4	SHIELD, tube.	Shield for V4	TS102U02
OV5	SHIELD, tube.	Shield for V5	TS102U01
OV6	SHIELD, tube.	Shield for V6	TS103U02
OV7	SHIELD, tube.	Shield for V7	TS103U02
OV8	SHIELD, tube.	Shield for V8	TS103U02
OV9	SHIELD, tube.	Shield for V9	TS103U02
OV10	SHIELD, tube.	Shield for V10	TS102U01
OV11	SHIELD, tube.	Shield for V11	TS103U02
OV12	SHIELD, tube.	Shield for V12	TS103U02

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
OV 13	SHIELD, tube.	Shield for V 13	TS103U02
OV 14	SHIELD, tube.	Shield for V 14	TS102U02
OV 15	SHIELD, tube.	Shield for V 15	TS102U01
OV 16	SHIELD, tube.	Shield for V 16	TS102U03
OV 17	SHIELD, tube.	Shield for V 17	TS102U03

PARTS LIST

F-5006 thru 5010/FRA-501

TMC Model RSF

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
E1	BOARD, terminal: general purpose barrier type; eight 6-32 binding head screws.	Terminal Connections	TM-100-8
E3	FANNING STRIP, phenolic: eight spade terms for #6 MS.	Cable Terminal	TM-105-8AL
J1	JACK, telephone: open circuit.	Phone Jack	JJ-034
R1	RESISTOR, fixed: composition; 270 ohms, $\pm 10\%$; 1/2 watt.	Pad Resistor	RC20GF271K
R2	RESISTOR, fixed: composition; 270 ohms, $\pm 10\%$; 1/2 watt.	Pad Resistor	RC20GF271K
R3	RESISTOR, fixed: composition; 270 ohms, $\pm 10\%$; 1/2 watt.	Pad Resistor	RC20GF271K
R4	RESISTOR, fixed: composition; 270 ohms, $\pm 10\%$; 1/2 watt.	Pad Resistor	RC20GF271K
S1	SWITCH, rotary: 4 pos, 1 sect; non-shortening contacts; mycalex insulation.	Tone Monitor Switch	SW-105
ZF1A	FILTER, bandpass: BFO; 1275 cycles.	BFO Filter Chan. A	FX-139-1275
ZF2A	FILTER, bandpass: HFO; 425 cycles.	HFO Filter Chan. A	FX-140-425
ZF3A	FILTER, bandpass: RF Gain; 2125 cycles.	RF Gain Filter Chan. A	FX-139-2125
ZF1B	FILTER, bandpass: BFO; 1445 cycles.	BFO Filter Chan. B	FX-139-1445
ZF2B	FILTER, bandpass: HFO; 595 cycles.	HFO Filter Chan. B	FX-140-595
ZF3B	FILTER, bandpass: RF Gain; 2295 cycles.	RF Gain Filter Chan. B	FX-139-2295
ZF1C	FILTER, bandpass: BFO; 1615 cycles.	BFO Filter Chan. C	FX-139-1615

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
ZF2C	FILTER, bandpass: HFO; 765 cycles.	HFO Filter Chan. C	FX-140-765
ZF3C	FILTER, bandpass: RF Gain; 2465 cycles.	RF Gain Filter Chan. C	FX-139-2465
ZF1D	FILTER, bandpass: BFO; 1785 cycles.	BFO Filter Chan. D	FX-139-1785
ZF2D	FILTER, bandpass: HFO; 935 cycles.	HFO Filter Chan. D	FX-139-935
ZF3D	FILTER, bandpass: RF Gain; 2635 cycles.	RF Gain Filter Chan. D	FX-139-2635
ZF1E	FILTER, bandpass: BFO; 1955 cycles.	BFO Filter Chan. E	FX-139-1955
ZF2E	FILTER, bandpass: HFO; 1105 cycles.	HFO Filter Chan. E	FX-139-1105
ZF3E	FILTER, bandpass: RF Gain; 2805 cycles.	RF Gain Filter Chan. E	FX-139-2805
MB1	KNOB, instrument.	Knob for S1	MP-100-4

PARTS LIST
AM-5027/FRA-501
TMC Model RSM

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
C1	CAPACITOR, fixed: paper; .05 mfd, +40, -20%, 400 wvdc.	Blocking Capacitor V2	CN-100-3
C2	CAPACITOR, fixed: paper; .05 mfd, +40, -20%; 400 wvdc.	Blocking Capacitor V2	CN-100-3
C3	CAPACITOR, fixed: paper; 4 mfd, +20, -10%; 600 wvdc.	Power Supply Filter	CP40C2DF405V
C4	CAPACITOR, fixed: paper; 4 mfd, +20, -10%; 600 wvdc.	Power Supply Filter	CP40C2DF405V
E1	BOARD, terminal: molded phenolic; 10 brass nickel plated 6-32 binding head machine screws.	Input Terminals From RSF's	TM-100-10
E2	BOARD, terminal: molded phenolic; 4 brass nickel plated 6-32 binding head machine screws.	Output Terminals To Line	TM-100-4
E3	FANNING STRIP, phenolic: ten spade terms for #6 MS.	Cable Terminals	TM-105-10AL
E4	FANNING STRIP, phenolic: four spade terms for #6 MS.	Cable Terminals	TM-105-4AL
F1	FUSE, cartridge: 1/2 amp; operate in one hour at 135% load and in 25 seconds at 200% load.	Line Fuse	FU-100-.500
I1	LAMP, incandescent: 6-8 volts; 0.25 amp; T-3-1/4 bulb; bayonet base.	Power Indicator	BI-101-44
J1	RECEPTACLE, male: twist lock; 10 amps, 250 volts; 15 amps, 125 volts; 1.62" o.d. x .937" hg o.a. dim.	Power Line Plug	JJ-100
L1	REACTOR, filter: one section; 15 henries; 85 ma DC, 270 ohms DC res., 2500 volts RMS test; 2 solder lug terminals.	Filter Choke	TF-5000
M1	METER, VU: -20 to +3 db; 3-1/2" sq. panel.	Output Level Indicator	MR-101-2
R1	RESISTOR, fixed: composition; 390 ohms, ±10%; 1/2 watt.	Input Impedance Network	RC20GF391K

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R2	RESISTOR, fixed: composition; 390 ohms, $\pm 10\%$; 1/2 watt.	Input Impedance Network	RC20GF391K
R3	RESISTOR, fixed: composition; 390 ohms, $\pm 10\%$; 1/2 watt.	Input Impedance Network	RC20GF391K
R4	RESISTOR, fixed: composition; 390 ohms, $\pm 10\%$; 1/2 watt.	Input Impedance Network	RC20GF391K
R5	RESISTOR, fixed: composition; 390 ohms, $\pm 10\%$; 1/2 watt.	Input Impedance Network	RC20GF391K
R6	RESISTOR, fixed: composition; 560 ohms, $\pm 10\%$; 1/2 watt.	Input Impedance Network	RC20GF561K
R7	RESISTOR, variable: composition; 500 ohms, $\pm 20\%$; 2 watts.	Output Level Control	RV4ATRD501D
R8	RESISTOR, fixed: composition; 100,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V1	RC20GF104K
R9	RESISTOR, fixed: composition; 100,000 ohms, $\pm 10\%$; 1/2 watt.	Plate Load V1	RC20GF104K
R10	RESISTOR, fixed: composition; 820 ohms, $\pm 10\%$; 1/2 watt.	Cathode Bias V1	RC20GF821K
R11	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Resistor V2	RC20GF474K
R12	RESISTOR, fixed: composition; 470,000 ohms, $\pm 10\%$; 1/2 watt.	Grid Resistor V2	RC20GF474K
R13	RESISTOR, variable: composition; 1000 ohms, $\pm 10\%$; 2 watts; w/locking bushing.	Balance Control V2	RV4ATXA102A
R14	RESISTOR, fixed: composition; 56,000 ohms, $\pm 10\%$; 1/2 watt.	Feedback Resistor V2	RC20GF563K
R15	RESISTOR, fixed: composition; 56,000 ohms, $\pm 10\%$; 1/2 watt.	Feedback Resistor V2	RC20GF563K
R16	RESISTOR, fixed: composition; 11,000 ohms, $\pm 5\%$; 1/2 watt.	Meter Series Resistor M1	RC20GF113J
R17	RESISTOR, fixed: composition; 160 ohms, $\pm 5\%$; 1/2 watt.	Output Impedance Network	RC20GF161J
R18	RESISTOR, fixed: composition; 160 ohms, $\pm 5\%$; 1/2 watt.	Output Impedance Network	RC20GF161J

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
R19	RESISTOR, fixed: composition; 430 ohms, $\pm 5\%$; 1/2 watt.	Output Impedance Network	RC20GF431J
R20	RESISTOR, fixed: composition; 160 ohms, $\pm 5\%$; 1/2 watt.	Output Impedance Network	RC20GF161J
R21	RESISTOR, fixed: composition; 160 ohms, $\pm 5\%$; 1/2 watt.	Output Impedance Network	RC20GF161J
R22	RESISTOR, fixed: wire-wound; 1500 ohms, $\pm 10\%$; 10 watts.	Series Resistor V4,5	RW-109-26
R23	Not Used.		
S1	SWITCH, toggle: DPST; 3 amp; 250 volts; phenolic body.	Power ON/OFF Switch	ST22K
T1	TRANSFORMER, audio: hum bucking coil and core; pri 600 ohms; sec 60,000 ohms CT; 1-9/16" dia x 2" hg. o.a. dim.	Audio Input	TF-132
T2	TRANSFORMER, audio: pri 60,000 ohms CT; sec 600 ohms; 1-9/16" dia x 2" hg. o.a. dim.	Audio Output	TF-133
T3	TRANSFORMER, power: pri 110/220 v. 50/60 cps, single phase; sec #1: 250-0-250 v. RMS, 35 ma DC; sec #2: 6.3 v, CT, 3a; hermetically sealed metal case.	Power Transformer	TF-126
V1	TUBE, electron: 12AU7; min. 9 pin.	Amplifier	12AU7
V2	TUBE, electron: 12AT7; min. 9 pin.	Amplifier	12AT7
V3	TUBE, electron: 6X4; min. 7 pin.	Rectifier	6X4
V4	TUBE, electron: OB2; min. 7 pin.	Regulator	OB2
V5	TUBE, electron: OB2; min. 7 pin.	Regulator	OB2
W1	CORDSET, power: consists of molded non-polarized male plug, and six feet 18/2 SJ rubber covered cord, phenolic twist lock female connector w/ cord grips.	Line Cord	CA-103
XF1	HOLDER, fuse: for extractor post type, for single AGC fuse.	Socket for F1	FH 100-2
XV1	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V1	TS103P01

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
XV2	SOCKET, tube: min. 9 pin; one piece saddle mounting.	Socket for V2	TS103P01
XV3	SOCKET, tube: min. 7 pin; one piece saddle mounting.	Socket for V3	TS102P01
XV4	SOCKET, tube: min. 7 pin; one piece saddle mounting.	Socket for V4	TS102P01
XV5	SOCKET, tube: min. 7 pin; one piece saddle mounting.	Socket for V5	TS102P01
XV6	LIGHT INDICATOR: red frosted lens; min. bayonet base; T-3-1/4 bulb.	Socket for I1	TS-106-1
MB1	KNOB, instrument.	Knob for R7	MP-100-1
OV1	SHIELD, tube.	Shield for V1	TS103U02
OV2	SHIELD, tube.	Shield for V2	TS103U02
OV3	SHIELD, tube.	Shield for V3	TS102U03
OV4	SHIELD, tube.	Shield for V4	TS102U03
OV5	SHIELD, tube.	Shield for V5	TS102U03

PARTS LIST
PP-5030/FRA ()
TMC Model RSP

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
C1	CAPACITOR, fixed: 4 mfd, +20, -10%; 600 wvdc.	AC Filter	CP41B1FF405V
C2	CAPACITOR, fixed: 4 mfd, +20, -10%; 600 wvdc.	AC Filter	CP40C2DF405V
C3	CAPACITOR, fixed: 4 mfd, +20, -10%; 600 wvdc.	AC Filter	CP40C2DF405V
F1	FUSE, cartridge type: 2 amp; operate in one hour at 135% load and in 25 seconds at 200% load; rated continuous at 110% load; one time.	Line Fuse	FU-100-2
F2	FUSE, cartridge type: 125 ma; operate in one hour at 135% load and in 25 seconds at 200% load; rated con- tinuous at 110% load; one time.	B Plus Fuse	FU-100-.125
I1	LAMP, incandescent: 6-8 volts; 250 ma; bulb T-3-1/4; bayonet base.	Power Indicator	BI-101-44
J1	RECEPTACLE, male: twist lock; 10 amps, 250 volts; 15 amps, 125 volts, 1.62" o.d. x .937" hg o.a. dim.	Input Line Plug	JJ-100
J2	RECEPTACLE, female: 8 prong; polarized; molded bakelite; 730 volts RMS, 10 amps.	Output Connector	JJ-127-2
L1	REACTOR, filter choke: one section; 15 henries; 85 ma DC, 270 ohms DC res.; 2500 volts RMS test; 2 solder lug terminals.	Filter Choke	TF-5000
L2	REACTOR, filter choke: one section; 15 henries; 85 ma DC, 270 ohms DC res.; 2500 volts RMS test; 2 solder lug terminals.	Filter Choke	TF-5000
P1	CONNECTOR, male contact; eight polarized straight contacts.	Output Plug to Cordset	PL-116-1
R1	RESISTOR, fixed: composition; 12 ohms, +10%; 1/2 watt.	Current Limiter, I1	RC42GF120K
R2	RESISTOR, fixed: wire-wound; 50,000 ohms, +10%; 10 watts.	Bleeder Resistor	RW-109-43

SYM.	DESCRIPTION	FUNCTION	TMC PART NO.
S1	SWITCH, toggle: DPDT; 3 amp, 250 volts; phenolic body.	Power ON/OFF Switch	ST22N
T1	TRANSFORMER, power: pri 110/220 volts; 50/60 cycles, single phase; sec. #1:300-0-300 volts, .070 amp; sec. #2: 3.15-0-3.15 volts, 3 amps; sec. #3: 5 volts, 2 amps; sec. #4: 6.3 volts, 1.2 amps; all windings insulated 1000 volts; hermetically sealed, metal rectangular case.	Power Transformer	TF-106
V1	TUBE, electron: 5Y3; octal.	Rectifier	5Y3
W1	CORDSET, power:	Line Cord	CA-103
XII1	LIGHT, indicator: w/red lens, for miniature bayonet base T-3-1/4 bulb.	I1 Socket	TS-106-1
XV1	SOCKET, tube: octal; one piece saddle mounting w/4 tinned ground lugs.	Socket for V1	TS101P01
XF1	HOLDER, fuse: extractor post type for single AGC type fuse.	F1 Holder	FH-100-2
XF2	HOLDER, fuse: extractor post type for single AGC type fuse.	F2 Holder	FH-100-2
HV1	HOLDER, tube.	Clamp for V1	CU-100-3

STOCK NUMBER IDENTIFICATION

AMPLIFIER, A.F. (AMPFR) AM-5028/FRA-501

REF. DESIG.	STOCK NUMBERS			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	USAF
C1,2		*N16-C055872-1577		3330-052-251-095
C3, 4, 6, 7		*N16-C033617-4751		
C5		N16-C054613-5958		
C8		N16-C047297-3175		3330-319-001-095
C9		N16-C049948-9347		
E1		N17-B077636-3899		
E2		*N17-B077936-5240		
E3		#		
E4		#		
I1		*G17-L006305-0000		
J1		N17-C073542-5310		
M1		N17-M022897-2904		
P1		N17-C071255-2387		
R1		*N16-R098521-4846		
R2		*N16-R049805-0818		
R3, 9		N16-R050634-0234		
R4, 7, 10, 12, 21, 22		N16-R050822-0761		3350-103-000-716
R5		N16-R050399-0813		
R6		N16-R050282-0725		
R8		N16-R049985-0813		
R11		N16-R050201-0818		
R13		N16-R066401-3726		3350-516-000-8378
R14		N16-R049661-0818		3350-103-000-1921
R15		N16-R050129-0815		3350-103-000-3981
R16		N16-R050094-0496		
R17		N16-R088968-1850		
R18, 19		N16-R050714-0818		3300-381-171-514
R20, 33		N16-R049922-0730		
R23		N16-R087089-4300		
R24		N16-R049806-0493		
R26, 27, 28 29, 30, 31		N16-R049733-0750		
R32		N16-R087679-4540		
S1		N17-S059672-9950		
T1, 2		N17-T062611-2388		
T3		N17-T062125-1958		
T4		N17-T066095-4866		
V1, 2, 3 6, 7		N16-T058241-0000		
V3		N16-T058241-0060		
V4, 5		*N16-T075749-0000		3370-286-000-6295
V8		N16-T053030-0000		3330-243-005-6000
XV1, 2, 3, 6, 7		N16-S064063-6713		8850-896-590
XV4, 5		N16-S062603-6702		8850-882-880
XV8		N16-S063516-6475		
XV9		*N16-L076854-4141		
ZF1		N16-F044311-8131		
ZF2		N16-F034004-4501		
HV8		N17-C814143-0551		
MB1, 2		N16-K700314-0658		3320-392-241-030
OV1, 2, 3, 6, 7		N16-S034576-6514		3370-274-000-2185
OV4, 5		N16-S034557-8351		3370-274-000-1955

#Indicates: Low failure item - if required requisition from ESO referencing NAVSHIPS 900,180A.

*Indicates: "For replacement use SNSN-"

CONTROL, REMOTE C-5027 THRU 5031/FRA-501

REF. DESIG.	STOCK NUMBERS			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	USAF
C1, 6, 11		N16-C062631-1986		3300-058-100-150
C2, 4, 5, 7,		*N16-C033617-4751		
9, 10, 12, 14,				
15, 16, 17				
C3, 8, 13		N16-C055983-5910		
E1		*N17-B077987-4710		
E2		#		
I1, 2, 3		N17-L003911-0150		
I4		*N17-L006305-0000		
J1, 2, 3		N17-C073108-4416		
J4		N17-J039237-1665		
J5		N17-C073542-5310		
LS1		N17-L091269-9671		
R1, 13, 25		N16-R091911-4142		3300-381-320-620
R2, 14, 26		N16-R050551-0758		
R3, 15, 27		N16-R050282-0131		
R4, 16, 28		N16-R050740-0380		
R5, 17, 29,		N16-R050822-0761		3350-103-000-7416
39, 40				
R6, 18, 30		N16-R049768-0438		
R7, 8, 19,		N16-R050632-0416		3300-381-166-200
20, 31, 32				
R9, 21, 33		N16-R050092-0717		
R10, 22, 34		N16-R049769-0799		
R11, 23, 35		N16-R087189-4475		
R12, 24, 36		N16-R049625-0818		
R37		*N16-R088009-4296		
R38		N16-R097459-4610		
R41		N16-R049967-0760		
R42, 44		N16-R050975-0725		
R43		N16-R050308-0438		
R45		N16-R049842-0238		
R46		*N16-R087089-4300		
R47		N16-R049500-0238		
R48, 49, 50		N16-R066401-3726		
R52, 54, 56		N16-R049922-0730		
R53, 55, 57		N16-R050481-0233		3350-133-000-4256
S1, 2		N17-S070777-8626		3360-395-852-800
S3		N17-S074139-4844		3360-395-739-045
T1, 2, 3		N17-T065926-1597		
T4		N17-T061610-1859		
T5		N17-T065556-2079		
V1, 3, 5		N16-T058240-0010		3370-316-000-1365
V2, 4, 6, 8		N16-T058241-0000		
V7		N16-T058241-0060		
V9, 10, 11		*N16-T052001-0003		3370-331-000-1615
XV1, 3, 5		N16-S062603-6702		8850-882-880
XV2, 4, 6, 7,		N16-S064063-6713		8850-896-590
8, 9, 10, 11				
XV12		N16-S063515-4151		8850-889-946
Z1A		N16-N054926-1211		
Z2A		N16-N054926-1219		
Z3A		N16-N054926-1208		
Z		N16-N054926-1209		

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*Indicates: "For replacement use SNSN-"

REF. DESIG.	STOCK NUMBERS			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	USAF
Z2B		N16-N054926-1215		
Z3B		N16-N054926-1207		
Z1C		N16-N054926-1218		
Z2C		N16-N054926-1214		
Z3C		N16-N054926-1206		
Z1D		N16-N054926-1212		
Z2D		N16-N054926-1216		
Z3D		N16-N054926-1220		
Z1E		N16-N054926-1213		
Z2E		N16-N054926-1210		
Z3E		N16-N054926-1217		
Z4		N16-N054926-1221		
HR51		N17-C812003-0471		
MB1, 3		*N16-K700406-0421		
MB2, 4		*N16-K700350-0216		
MB5, 6		N16-K700314-0658		3320-392-241-030
OV1, 2, 3, 4, 5, 6, 7, 8		N16-S034576-6514		3320-224-000-2185
OV9, 10, 11		N16-S034607-6039		3320-774-000-1975

DETECTOR, A.F. (DISCRIM) CV-5013 THRU 5017/FRA-501

C1, 4, 5, 6, 7, 8, 9, 11, 14, 15, 16, 17, 19, 22, 23, 24, 25, 26		*N16-C033617-4751		
C2, 3, 12, 13, 20, 21, 28, 29, 30		N16-C053683-4665		3330-319-001-101
E1		N17-B077891-1123		
E2		#		
I1		G17-L006305-0000		
J1		N17-C073542-5310		
J2, 3, 4		N17-C073108-4416		
K1, 2		N17-R064906-9603		
M1		N17-M035134-9761		
P1		N17-C071255-2387		
R1, 29, 30, 53		N16-R049706-0761		
R3, 31, 55		N16-R049841-0818		
R4, 18, 32, 46, 56, 70		N16-R049922-0730		
R5, 11, 12, 16, 20, 33, 39, 40, 44, 57, 63, 64, 68, 72		N16-R050822-0761		3350-103-000-7416
R6, 10, 15, 34, 38, 43, 58, 62, 67		N16-R050372-0833		3350-103-000-4941
R7, 19, 27, 35, 51, 59, 71, 77, 86, 87		N16-R050975-0725		
R8, 13, 36, 41, 60, 65		N16-R050282-0725		

#Indicates: Low failure item - if required requisition from ESO referencing NAVSHIPS 900,180A.

*Indicates: "For replacement use SNSN-"

REF. DESIG.	STOCK NUMBERS			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	USAF
R9, 37, 61		N16-N050714-0818		3300-381-171-514
R14, 42, 66		N16-R050678-0818		
R17, 45, 69		N16-R050633-0785		
R21, 73		N16-R051326-0818		
R23, 47, 75		*N16-R050092-0717		
R24, 25, 48, 49, 76		N16-R051065-0818		3300-381-168-220
R26, 50, 78		N16-R087849-4590		
R28, 80		N16-R088182-5495		
R52		N16-R088342-5555		
R79		N16-R050336-0815		
R81, 83		N16-R050129-0815		3350-103-000-3981
R82		*N16-R087089-3001		
R84		N16-R087352-5380		
R85		N16-R050479-0440		3350-103-000-5461
R88		*N16-R070680-3306		
R89		N16-R050445-0233		
S1		N17-S059332-5903		
T1, 2, 3		N17-T066106-3365		
V1, 6, 11		N16-T058240-0010		3370-316-000-1365
V2, 7, 9, 12		N16-T058241-0000		
V3, 8, 13		N16-T058241-0060		
V4, 14		N16-T056214-0000		
V5, 10, 15		*N16-T075726-0000		3370-259-000-6125
V16, 17		N16-T052001-0005		
XI1		*N16-L076854-4141		
XV1, 2, 3, 6, 7, 8, 9, 11, 12, 13		N16-S064063-6713		
XV4, 5, 10, 14, 14, 15, 16, 17		N16-S062603-6702		8850-882-880
XV18, 19		N16-S063516-6475		
ZD1A		N16-N060961-1084		
ZD2A		N16-N060961-1082		
ZD3A		N17-T067101-3203		
ZD1B		N16-N060961-1083		
ZD2B		N17-T067101-2002		
ZD3B		N17-T067101-3198		
ZD1C		N17-T067101-2498		
ZD2C		N17-T067101-1767		
ZD3C		N17-T067101-3454		
ZD1D		N17-T067251-6152		
ZD2D		N17-T067101-1927		
ZD3D		N17-T067101-3525		
ZD1E		N17-T067251-6151		
ZD2E		N17-T067101-2124		
ZD3E		N17-T067101-3748		
ZF1A		N16-F032113-4349		
ZF2A		N16-F032113-4392		
ZF3A		N16-F032037-8298		
ZF4A		N16-F032037-8249		
ZF5A		N16-F032188-5363		
ZF6A		N16-F032188-3347		
ZF1B		N16-F032128-4874		
ZF2B		N16-F032128-4583		

#Indicates: Low failure item - if required requisition from ESO referencing NAVSHIPS 900,180A.

*Indicates: "For replacement use SNSN-"

REF. DESIG.	STOCK NUMBERS			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	USAF
ZF3B		N16-F032052-9338		
ZF4B		N16-F032052-9308		
ZF5B		N16-F032204-1454		
ZF6B		N16-F032204-1477		
ZF1C		N16-F032143-6476		
ZF2C		N16-F032142-4902		
ZF3C		N16-F032068-1359		
ZF4C		N16-F032068-1378		
ZF5C		N16-F032217-7936		
ZF6C		N16-F032216-3472		
ZF1D		N16-F032158-7319		
ZF2D		N16-F073158-7893		
ZF3D		N16-F032082-2907		
ZF4D		N16-F032083-4856		
ZF5D		N16-F032238-2578		
ZF6D		N16-F032240-7016		
ZF1E		N16-F032173-6666		
ZF2E		N16-F032173-4888		
ZF3E		N16-F032098-3294		
ZF4E		N16-F032098-3213		
ZF5E		N16-F032254-1062		
ZF6E		N16-F032252-2805		
MB1		N16-K700314-0658		3320-392-241-030
MB2		N16-K700314-0524		3320-088-335-3181
OV1, 2, 3, 6, 7, 8, 9, 11, 12, 13		N16-S034576-6514		3320-224-000-2185
OV4, 14		N16-S034557-8351		3320-224-000-1955
OV5, 10, 15		N16-S034520-3862		3320-224-000-1925
OV16, 17		N16-S034607-6039		

FILTER, ASSEMBLY F-5006 THRU 5010/FRA-501

E1		*N17-B077840-1659		8880-600-808-3755
E3		#		
J1		N17-J039248-4418		8850-249-430
R1, 2, 3, 4		N16-R049688-0746		
S1		N17-S063948-5930		
ZF1A		N16-F032113-4349		
ZF2A		N16-F032037-8249		
ZF3A		N16-F032188-5363		
ZF1B		N16-F032128-4874		
ZF2B		N16-F032052-9308		
ZF3B		N16-F032204-1454		
ZF1C		N16-F032143-6476		
ZF2C		N16-F032068-1378		
ZF3C		N16-F032217-7936		
ZF1D		N16-F032158-7319		
ZF2D		N16-F032082-2907		
ZF3D		N16-F032238-2578		
ZF1E		N16-F032173-6666		
ZF2E		N16-F032098-3294		
ZF3E		N16-F032254-1062		
MB1		N16-K700314-0658		3320-392-241-030

#Indicates: Low failure item - if required requisition from ESO referencing NAVSHIPS 900,180A.

*Indicates: "For replacement use SNSN-"

AMPLIFIER, A.F. (MIXER) AM-5027/FRA-501

REF. DESIG.	STOCK NUMBERS			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	USAF
C1,2		*N16-C055872-1577		3330-052-251-095
C3,4		N16-C049981-9983		
E1		*N17-B077936-5240		
E2		N17-B077636-3899		
E3		#		
E4		#		
F1		N17-F016302-0060		
I1		*N17-L006305-0000		
J1		N17-C073428-3259		8850-491-260
L1		N16-R029318-5633		3340-062-454-170
M1		N17-M022897-2884		
R1,2,3,4,5		N16-R049733-0750		
R6		N16-R049805-0818		
R7		N16-R087192-5560		
R8,9		N16-R050633-0785		
R10		N16-R049877-0818		3350-103-000-2646
R11,12		N16-R050822-0761		3350-103-000-7416
R13		N16-R087349-4560		
R14,15		N16-R050516-0818		3350-103-000-5616
R16		N16-R050299-0438		
R17,18,20,21		N16-R049633-0438		
R19		N16-R049750-0438		
R22		N16-R066080-2796		3350-516-000-5961
S1		N17-S073082-9028		3360-395-853-000
T1		N17-T061606-2701		
T2		N17-T065936-6722		
T3		N17-T073895-2591		
V1		N16-T058241-0000		
V2		N16-T058240-0010		
V3		N16-T056840-0000		
V4,5		N16-T052001-0005		
W1		N17-C048215-1505		
ZF1		N17-F074266-9392		8820-112-000-229
XV1,2		N16-S064063-6713		8850-896-590
XV3,4,5		N16-S062603-6702		8850-882-880
XV6		*N17-L076854-4141		
MB1		N16-K700314-0524		3320-088-335-3180
OV1,2		N16-S034576-6514		3320-224-000-2185
OV3,4,5		N16-S034607-6039		3320-774-000-1975

POWER SUPPLY PP-5030/FR()

C1		*N16-C049958-5179		3330-317-643-027
C2,3		N16-C049981-9983		
F1		G17-F016302-0100		
F2		N17-F016302-0030		
I1		*G17-L006305-0000		
J1		N17-C073428-3259		8850-491-260
J2		N17-C073255-1511		
L1,2		N16-R029310-5633		3340-062-454-170
P1		N17-C071542-6128		
		N16-R049257-0486		

#Indicates: Low failure item - if required requisition from ESO referencing NAVSHIPS 900,180A.
 *Indicates: "For replacement use SNSN-"

REF. DESIG.	STOCK NUMBERS			
	FEDERAL	STANDARD NAVY	SIGNAL CORPS	USAF
R2		*N16-R070808-1436		
S1		N17-S074139-4844		3360-395-749-045
T1		N17-T073895-2592		5950-003-2749
V1		*N16-T055735-0000		3320-304-000-5265
W1		N17-C048215-1505		2200-082-196-52
XI1		*N17-L076854-4141		
XF1		N17-F074266-9392		8820-112-000-229
XV1		N16-S063515-4151		8850-889-946
HV1		N17-C812003-0471		

#Indicates: Low failure item - if required requisition from ESO referencing NAVSHIPS 900,180A.
*Indicates: "For replacement use SNSN-"

STOCK NUMBER CROSS REFERENCE

AM-5028/FRA-501 RSA-2

STANDARD NAVY	REF. DESIG.	STANDARD NAVY	REF. DESIG.	STANDARD NAVY	REF. DESIG.
*G17-L006305-0000	I1	*N17-L076854-4141	XV9	N16-R050282-0131	R3,15,27
*N16-C033617-4751	C3,4,6,7	N17-M022897-2904	M1	N16-R050308-0438	R43
N16-C047297-3175	C8	N17-S059672-9950	S1	N16-R050481-0233	R53,55,57
N16-C049948-9347	C9	N17-T062125-1958	T3	N16-R050551-0758	R2,14,26
N16-C054613-5958	C5	N17-T062611-2388	T1,2	N16-R050632-0416	R7,8,19,20,31,32
*N16-C055872-1577	C1,2	N17-T066095-4866	T4	N16-R050740-0380	R4,16,28
N16-F034004-4501	ZF2	#	E3	N16-R050822-0761	R5,17,29,39,40
N16-F044311-8131	ZF1	#	E4	N16-R050975-0725	R42,44
N16-K700314-0658	MB1,2	C-5027 thru 31/FRA-501 RSC-2 A,B,C,D,E		N16-R066401-3726	R48,49,50
N16-R049661-0818	R14	*G17-L006305-0000	I4	N16-R085001-4033	V12
N16-R049733-0750	R26,27,28,29,30,31	N16-C033617-4751	C2,4,5,7,9,10,12,14,15,16,17	*N16-R087089-4300	R46
*N16-R049805-0818	R2	N16-C055983-5910	C3,8,13	N16-R087189-4475	R11,23,35
N16-R049806-0493	R24	N16-C062631-1986	C1,6,11	N16-R087459-4610	R38
N16-R049922-0730	R20,33	N16-K700314-0658	MB5,6	*N16-R088009-4296	R37
N16-R049985-0813	R8	*N16-K700350-0216	MB2,4	N16-R091911-4142	R1,13,25
N16-R050094-0496	R16	*N16-K700406-0421	MB1,3	N16-S034576-6514	OV1,2,3,4,5,6,7,8
N16-R050129-0815	R15	N16-N054926-1206	Z3C	N16-S034607-6039	OV9,10,11
N16-R050201-0818	R11	N16-N054926-1207	Z3B	N16-S062603-6702	XV1,3,5
N16-R050282-0725	R6	N16-N054926-1208	Z3A	N16-S063515-4151	XV12
N16-R050399-0813	R5	N16-N054926-1209	Z1B	N16-S064063-6713	XV2,4,6,7,8,9,10,11
N16-R050634-0234	R3,9	N16-N054926-1210	Z2E	*N16-T052001-0003	V9,10,11
N16-R050714-0818	R18,19	N16-N054926-1211	Z1A	N16-T058240-0010	V1,3,5
N16-R050822-0761	R4,7,10,12,21,22	N16-N054926-1212	Z1D	N16-T058241-0000	V2,4,6,8
N16-R066401-3726	R13	N16-N054926-1213	Z1E	N16-T058241-0060	V7
N16-R087089-4300	R23	N16-N054926-1214	Z2C	*N17-B077987-4710	E1
N16-R087679-4540	R32	N16-N054926-1215	Z2B	N17-C073108-4416	J1,2,3
N16-R088968-1850	R17	N16-N054926-1216	Z2D	N17-C073542-5310	J5
*N16-R098521-4846	R1	N16-N054926-1217	Z3E	N17-C812003-0471	HR51
N16-S034557-8351	OV4,5	N16-N054926-1218	Z1C	N17-J039237-1665	J4
N16-S034576-6514	OV1,2,3,6,7	N16-N054926-1219	Z2A	N17-L003911-0150	I1,2,3
N16-S062603-6702	XV4,5	N16-N054926-1220	Z3D	N17-L091269-9671	LS1
N16-S063516-6475	XV8	N16-N054926-1221	Z4	N17-S070777-8626	S1,2
N16-S064063-6713	XV1,2,3,6,7	N16-R049500-0238	R47	N17-S074139-4844	S3
N16-T053030-0000	V8	N16-R049625-0818	R12,24,36	N17-T061610-1859	T4
N16-T058241-0000	V1,2,6,7	N16-R049768-0438	R6,18,30		
N16-T058241-0060	V3	N16-R049769-0799	R10,22,34		
*N16-T075749-0000	V4,5	N16-R049842-0238	R45		
N17-B077636-3899	E1	N16-R049922-0730	R52,54,56		
*N17-B077936-5240	E2	N16-R049967-0760	R41		
N17-C071255-2387	P1	*N16-R050092-0717	R9,21,33		
N17-C073542-5310	J1				
N17-C814143-0551	HV8				

#Indicates: Low Failure item - if required requisition from ESO referencing NAVSHIPS 900,180A.

*Indicates: "For replacement use SNSN-"

STANDARD NAVY	REF. DESIG.	STANDARD NAVY	REF. DESIG.	STANDARD NAVY	REF. DESIG.
N17-T065556-2079 N17-T065926-1597 #	T5 T1,2,3 E2	*N16-L076854-4141 N16-N060961-1082 N16-N060961-1083 N16-N060961-1084 N16-R049706-0761	XI1 ZD2A ZD1B ZD1A R1,2,9, 30,53 R3,31, 55 R4,18, 32,46, 56,70 R23, 47,75 R81,83 R8,13, 36,41, 60,65 R79 R6,10, 15,34, 38,43, 58,62, 67 R89 R85 R17, 45,69 R14, 42,66 R9,37, 61 R5,11, 12,16, 20,33, 39,40, 44,57, 63,64, 68,72 R7,19, 27,35, 51,59, 71,77, 86,87 R24,25, 48,49, 76 R21,73 R88 R82 R84 R26, 50,78 R28,80	N16-R088342-5555 N16-S034520-3862 N16,S034557-8351 N16-S034576-6514 N16-S034607-6039 N16-S062603-6702 N16-S063516-6475 N16-S064063-6713 N16-T052001-0005 N16-T056214-0000 N16-T058240-0010 N16-T058241-0000 N16-T058241-0060 *N16-T075726-0000 N17-B077891-1123 N17-C071255-2387 N17-C073108-4416 N17-C073542-5310 N17-M035134-9761 N17-R064906-9603 N17-S059332-5903 N17-T066106-3365 N17-T067101-1767 N17-T067101-1927 N17-T067101-2002 N17-T067101-2124 N17-T067101-2498 N17-T067101-3198 N17-T067101-3203 N17-T067101-3454 N17-T067101-3525 N17-T067101-3748 N17-T067251-6151 N17-T067251-6152 #	R52 OV5, 10,15 OV4,14 OV1,2,3, 6,7,8, 9,11, 12,13 OV16,17 XV4,5, 10,14, 15,16, 17 XV18,19 XV1,2,3, 6,7,8, 9,11, 12,13 V16,17 V4,14 V1,6,11 V2,7, 9,12 V3,8,13, V5,10, 15 E1 P1 J2,3,4 J1 M1 K1,2 S1 T1,2,3 ZD2C ZD2D ZD2B ZD2E ZD1C ZD3B ZD3A ZD3C ZD3D ZD3E ZD1E ZD1D E2
CV-5013 thru 17/FRA-501 RSD-2 A,B,C,D,E					
*G17-L006305-0000 *N16-C033617-4751 N16-C053683-4665 N16-F032037-8249 N16-F032037-8298 N16-F032052-9308 N16-F032052-9338 N16-F032068-1359 N16-F032068-1378 N16-F032082-2907 N16-F032083-4856 N16-F032098-3213 N16-F032098-3294 N16-F032113-4349 N16-F032113-4392 N16-F032128-4583 N16-F032128-4874 N16-F032142-4902 N16-F032143-6476 N16-F032158-7319 N16-F032158-7893 N16-F032173-6666 N16-F032173-4888 N16-F032188-3347 N16-F032188-5363 N16-F032204-1454 N16-F032204-1477 N16-F032216-3472 N16-F032217-7936 N16-F032238-2578 N16-F032240-7016 N16-F032252-5684 N16-F032254-1062 N16-K700314-0524 N16-K700314-0658	II C1,4,5, 6,7,8, 9,11, 14,15, 16,17, 19,22, 23,24, 25,26 C2,3,12, 13,20, 21,28, 29,30 ZF4A ZF3A ZF4B ZF3B ZF3C ZF4C ZF3D ZF4D ZF4E ZF3E ZF1A ZF2A ZF2B ZF1B ZF2C ZF1C ZF1D ZF2D ZF1E ZF2E ZF6A ZF5A ZF5B ZF6B ZF6C ZF5C ZF5D ZF6D ZF6E ZF5E MB2 MB1	N16-R049841-0818 N16-R049922-0730 *N16-R050092-0717 N16-R050129-0815 N16-R050282-0725 N16-R050336-0815 N16-R050372-0833 N16-R050445-0233 N16-R050479-0440 N16-R050633-0785 N16-R050678-0818 N16-R050714-0818 N16-R050822-0761 N16-R050975-0725 N16-R051065-0818 N16-R051326-0818 *N16-R070680-3306 *N16-R087089-3001 N16-R087352-5380 N16-R087849-4590 N16-R088182-5495		F-5006 thru 10/FRA-501 RSF-2 A,B,C,D,E N16-F032037-8249 N16-F032052-9308	ZF2A ZF2B

#Indicates: Low failure item - if required requisition from ESO referencing NAVSHIPS 900,180

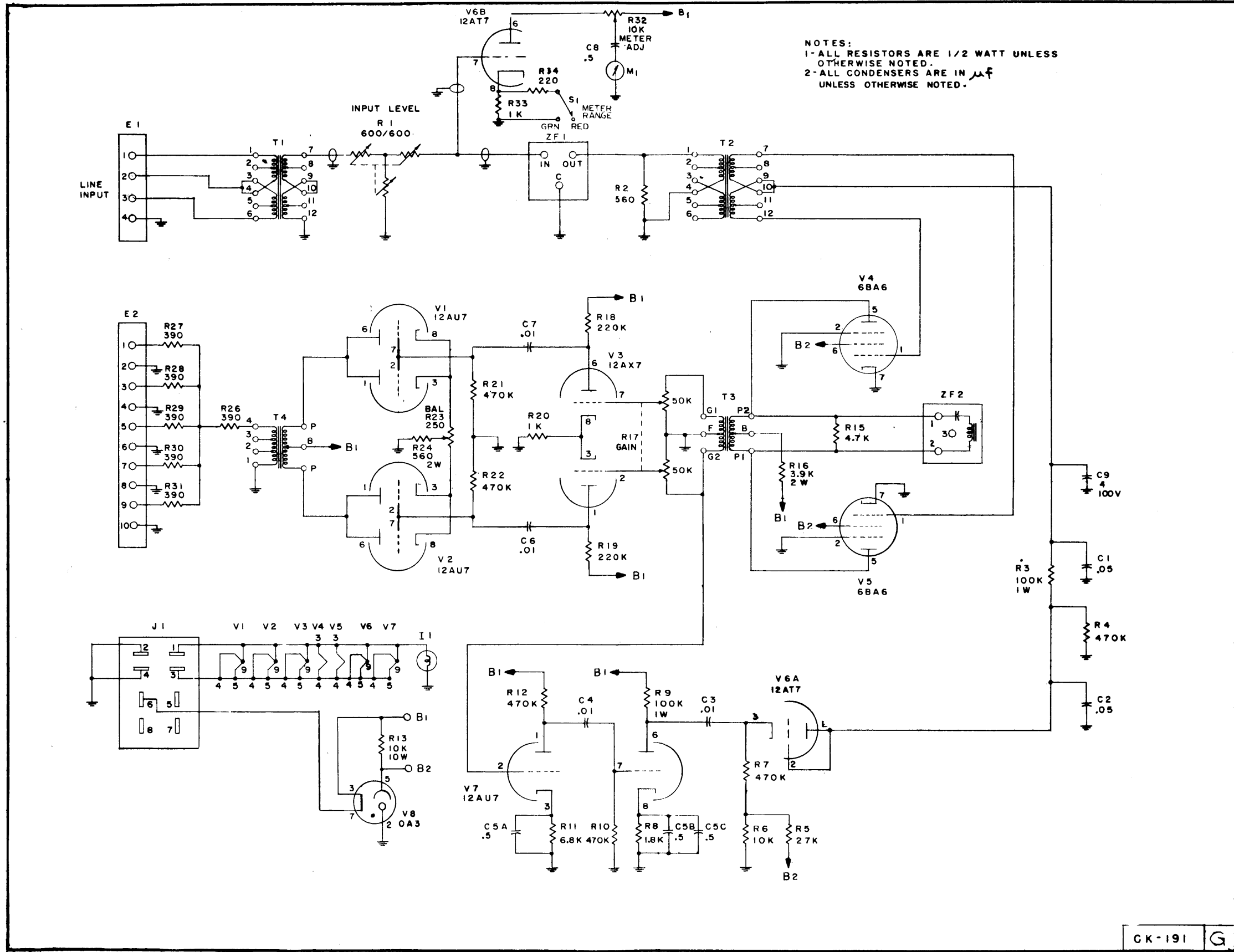
*Indicates: "For replacement use SNSN-"

STANDARD NAVY	REF. DESIG.	STANDARD NAVY	REF. DESIG.	STANDARD NAVY	REF. DESIG.
N16-F032068-1378	ZF2C	N17-F074266-9392	XF1		
N16-F032082-2907	ZF2D	*N17-L076854-4141	XV6		
N16-F032098-3294	ZF2E	N17-M022897-2884	M1		
N16-F032113-4349	ZF1A	N17-S073082-9028	S1		
N16-F032128-4874	ZF1B	N17-T061606-2701	T1		
N16-F032143-6476	ZF1C	N17-T065936-6722	T2		
N16-F032158-7319	ZF1D	N17-T073895-2591	T3		
N16-F032173-6666	ZF1E	#	E3		
N16-F032188-5363	ZF3A	#	E4		
N16-F032204-1454	ZF3B				
N16-F032217-7936	ZF3C	PP-5030/FR ()	RSP-2		
N16-F032238-2578	ZF3D				
N16-F032254-1062	ZF3E	G17-F016302-0100	F1		
N16-K700314-0658	MB1	*G17-L006305-0000	I1		
N16-R049688-0746	R1,2, 3,4	*N16-C049958-5179	C1		
*N17-B077840-1659	E1	N16-C049981-9983	C2,3		
N17-J039248-4418	J1	N16-R029318-5633	L1,2		
N17-S063948-5930	S1	N16-R049257-0486	R1		
#	E3	*N16-R070808-1436	R2		
		N16-S063515-4151	XV1		
		*N16-T055735-0000	V1		
		N17-C048215-1505	W1		
		N17-C071542-6128	P1		
		N17-C073255-1511	J2		
		N17-C073428-3259	J1		
		N17-C812003-0471	HV1		
		N17-F016302-0030	F2		
		N17-F074266-9392	XF1		
		*N17-L076854-4141	XI1		
		N17-S074139-4844	S1		
		N17-T073895-2592	T1		
AM-5027 (MIXER)	RSM				
*G17-L006305-0000	I1				
N16-C049981-9983	C3,4				
*N16-C055872-1577	C1,2				
N16-K700314-0524	MB1				
N16-R029318-5633	L1				
N16-R049633-0438	R17,18, 20,21				
N16-R049733-0750	R1,2,3, 4,5				
N16-R049750-0438	R19				
N16-R049805-0818	R6				
N16-R049877-0818	R10				
N16-R050299-0438	R16				
N16-R050516-0818	R14,15				
N16-R050633-0785	R8,9				
N16-R050822-0761	R11,12				
N16-R066080-2796	R22				
N16-R087192-5560	R7				
N16-R087349-4560	R13				
N16-S034576-6514	OV1,2				
N16-S034607-6039	OV3,4,5				
N16-S062603-6702	XV3,4,5				
N16-S064063-6713	XV1,2				
N16-T052001-0005	V4,5				
N16-T056840-0000	V3				
N16-T058240-0010	V2				
N16-T058241-0000	V1				
N17-B077636-3899	E2				
*N17-B077936-5240	E1				
N17-C048215-1505	W1				
C073428-3259	J1				
F016302-0060	F1				

#Indicates: Low failure item - if required requisition from ESO referencing NAVSHIPS 900,180A.

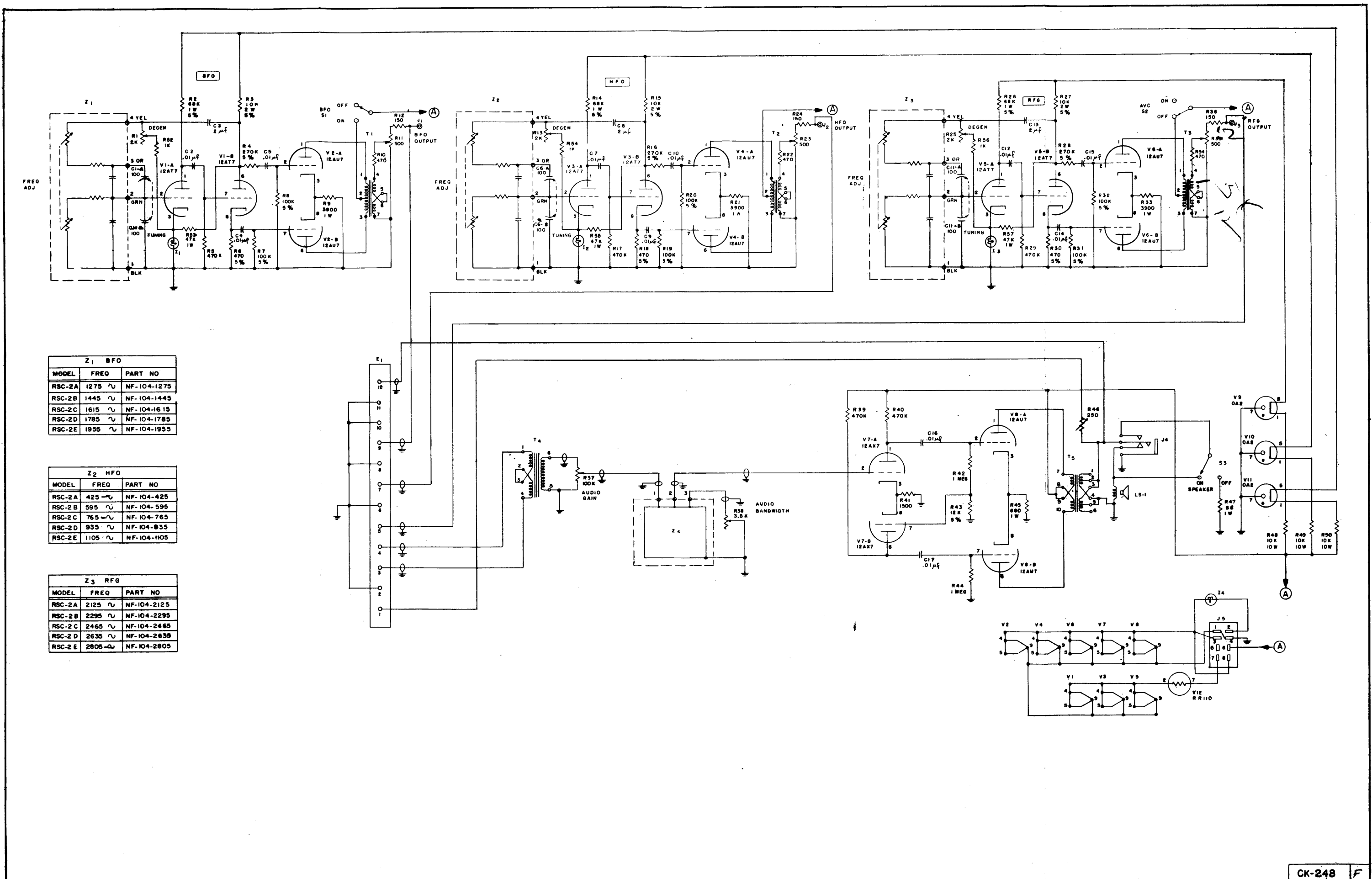
*Indicates: "For replacement use SNSN-"





NOTES:
 1- ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE NOTED.
 2- ALL CONDENSERS ARE IN μf UNLESS OTHERWISE NOTED.

FIGURE 6-1. SCHEMATIC DIAGRAM, MODEL RSA-2

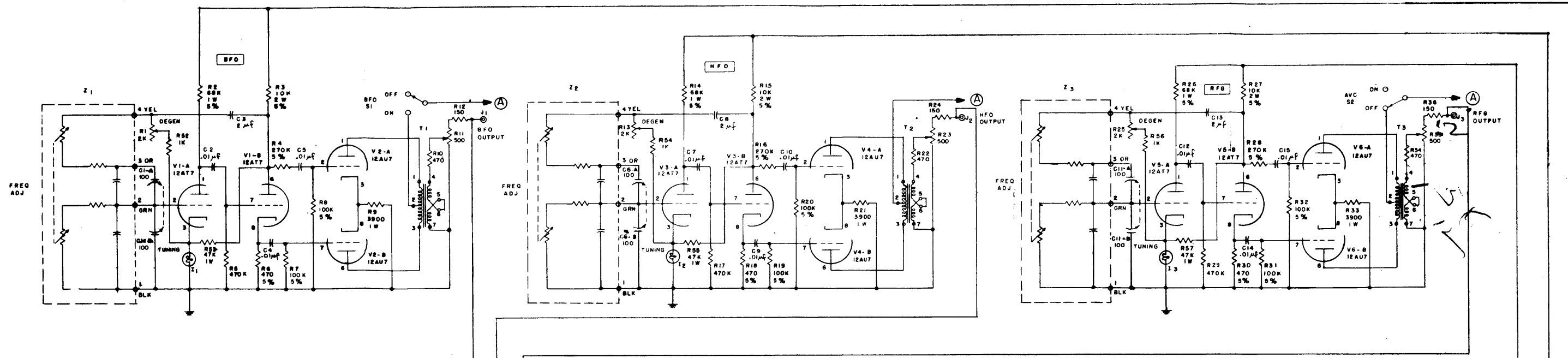


Z1 BFO		
MODEL	FREQ	PART NO
RSC-2A	1275 ~	NF-104-1275
RSC-2B	1445 ~	NF-104-1445
RSC-2C	1615 ~	NF-104-1615
RSC-2D	1785 ~	NF-104-1785
RSC-2E	1955 ~	NF-104-1955

Z2 HFO		
MODEL	FREQ	PART NO
RSC-2A	425 ~	NF-104-425
RSC-2B	595 ~	NF-104-595
RSC-2C	765 ~	NF-104-765
RSC-2D	935 ~	NF-104-935
RSC-2E	1105 ~	NF-104-1105

Z3 RFG		
MODEL	FREQ	PART NO
RSC-2A	2125 ~	NF-104-2125
RSC-2B	2295 ~	NF-104-2295
RSC-2C	2465 ~	NF-104-2465
RSC-2D	2635 ~	NF-104-2635
RSC-2E	2805 ~	NF-104-2805

FIGURE 6-2. SCHEMATIC DIAGRAM, MODEL RSC-2



Z1 BFO		
MODEL	FREQ	PART NO
RSC-2A	1275	NF-104-1275
RSC-2B	1445	NF-104-1445
RSC-2C	1615	NF-104-1615
RSC-2D	1785	NF-104-1785
RSC-2E	1955	NF-104-1955

Z2 HFO		
MODEL	FREQ	PART NO
RSC-2A	425	NF-104-425
RSC-2B	595	NF-104-595
RSC-2C	765	NF-104-765
RSC-2D	935	NF-104-935
RSC-2E	1105	NF-104-1105

Z3 RFG		
MODEL	FREQ	PART NO
RSC-2A	2125	NF-104-2125
RSC-2B	2295	NF-104-2295
RSC-2C	2465	NF-104-2465
RSC-2D	2635	NF-104-2635
RSC-2E	2805	NF-104-2805

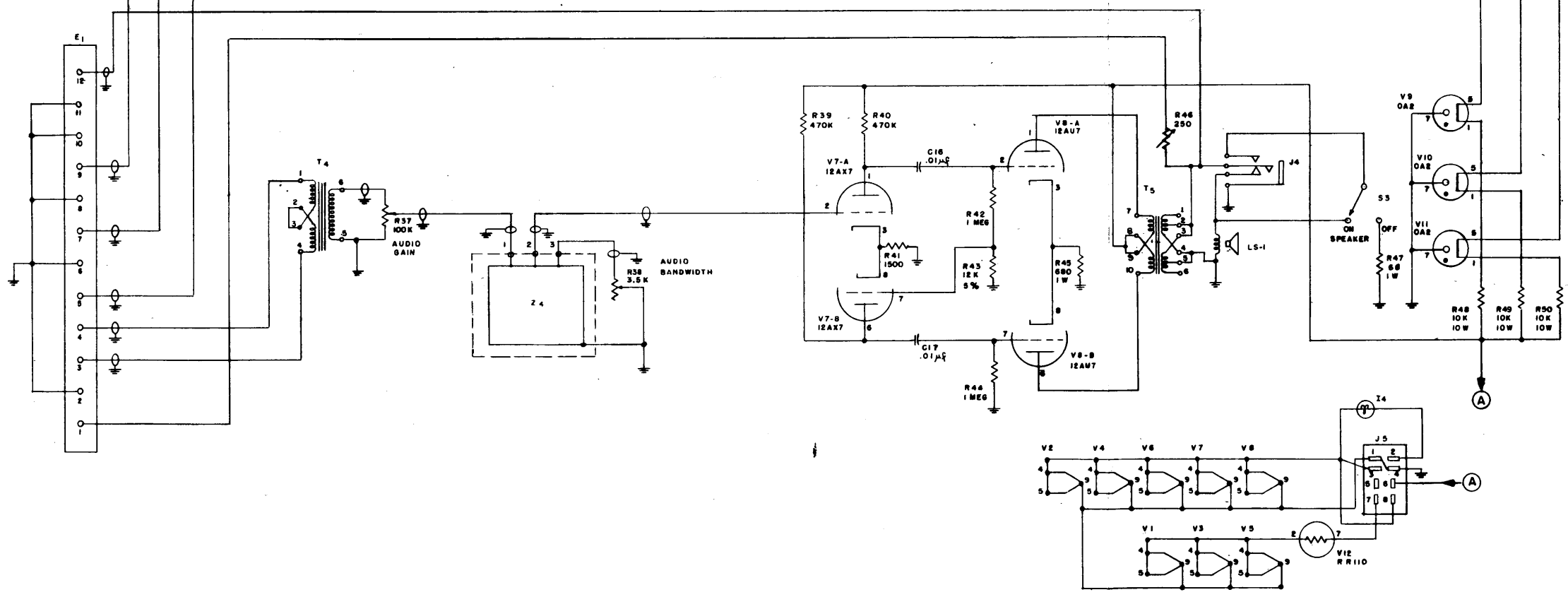
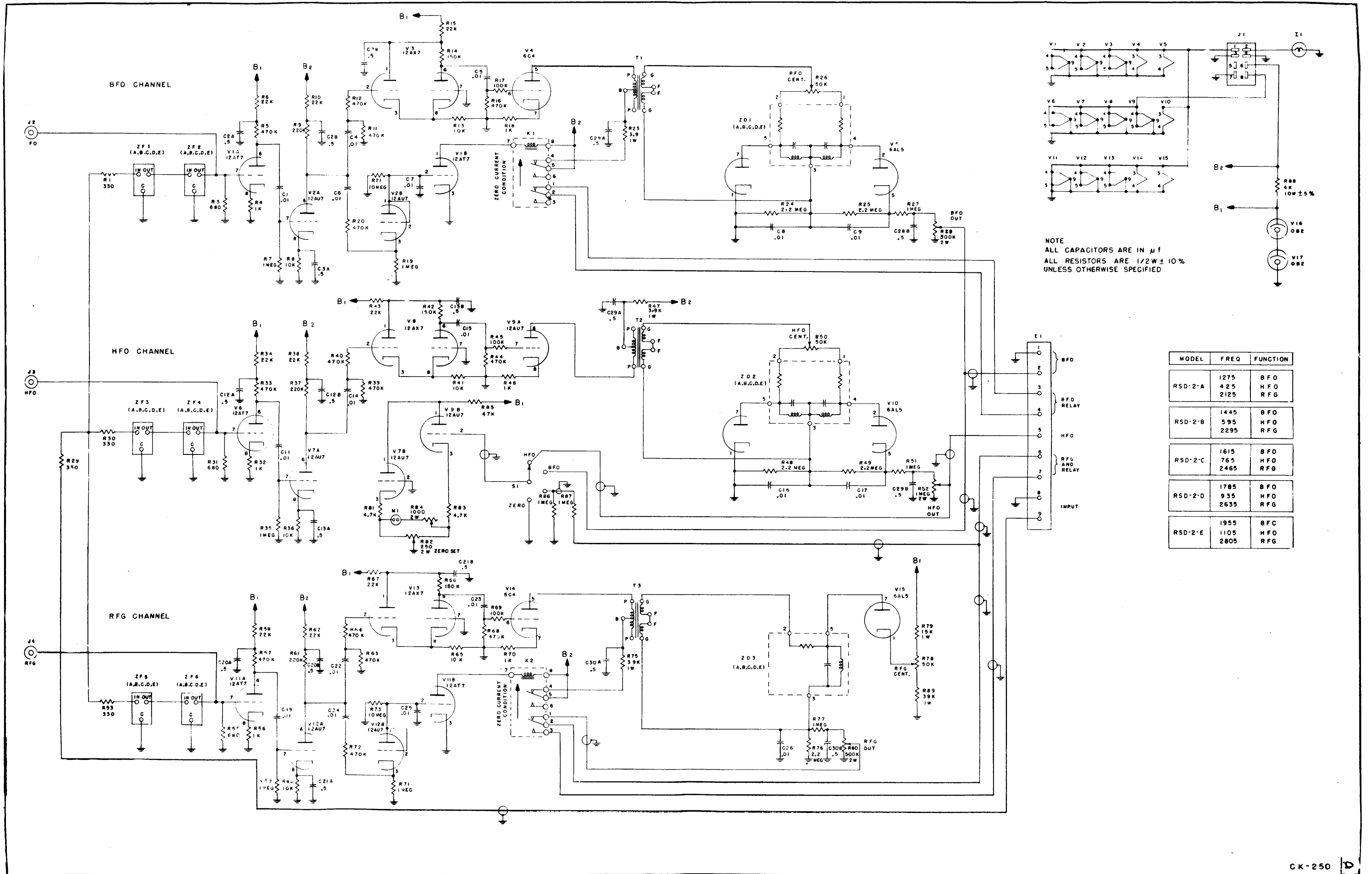


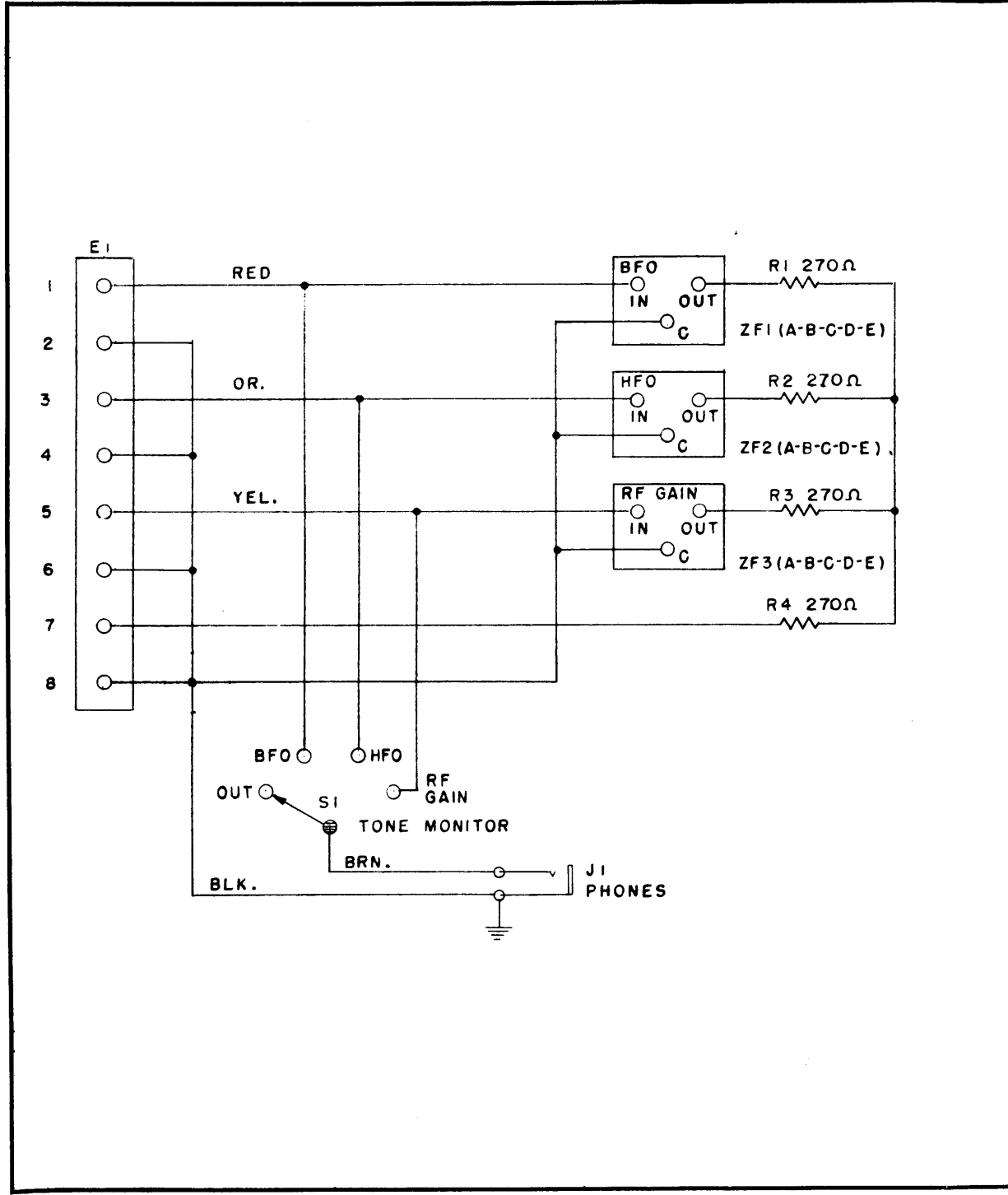
FIGURE 6-2. SCHEMATIC DIAGRAM, MODEL RSC-2



NOTE
ALL CAPACITORS ARE IN μf
ALL RESISTORS ARE $1/2W \pm 10\%$
UNLESS OTHERWISE SPECIFIED

MODEL	FREQ	FUNCTION
RSD-2-A	1275	BFO
	425	HFO
	2125	RFG
RSD-2-B	1445	BFO
	595	HFO
	2295	RFG
RSD-2-C	1615	BFO
	765	HFO
	2465	RFG
RSD-2-D	1785	BFO
	935	HFO
	2635	RFG
RSD-2-E	1955	BFO
	1105	HFO
	2805	RFG

FIGURE 6-3. SCHEMATIC DIAGRAM, MODEL RSD-2



MODEL	FREQ	FUNCTION	FILTER NETWORK	TMC NO.
RSF-2A	1275	BFO	ZF1A	FX-139-1275
	425 ✓	HFO	ZF2A	FX-140-425
	2125	RF G	ZF3A	FX-139-2125
RSF-2B	1445 ✓	BFO	ZF1B	FX-139-1445
	595	HFO	ZF2B	FX-140-595
	2295	RF G	ZF3B	FX-139-2295
RSF-2C	1615	BFO	ZF1C	FX-139-1615
	765	HFO	ZF2C	FX-140-765
	2465	RF G	ZF3C	FX-139-2465
RSF-2D	1785	BFO	ZF1D	FX-139-1785
	935	HFO	ZF2D	FX-139-935
	2635	RF G	ZF3D	FX-139-2635
RSF-2E	1955	BFO	ZF1E	FX-139-1955
	1105	HFO	ZF2E	FX-139-1105
	2805	RF G	ZF3E	FX-139-2805

FX-139 IS INTERCHANGEABLE WITH FX-141
 FX-140 IS INTERCHANGEABLE WITH FX-144

FIGURE 6-4. SCHEMATIC DIAGRAM, MODEL RSF-2

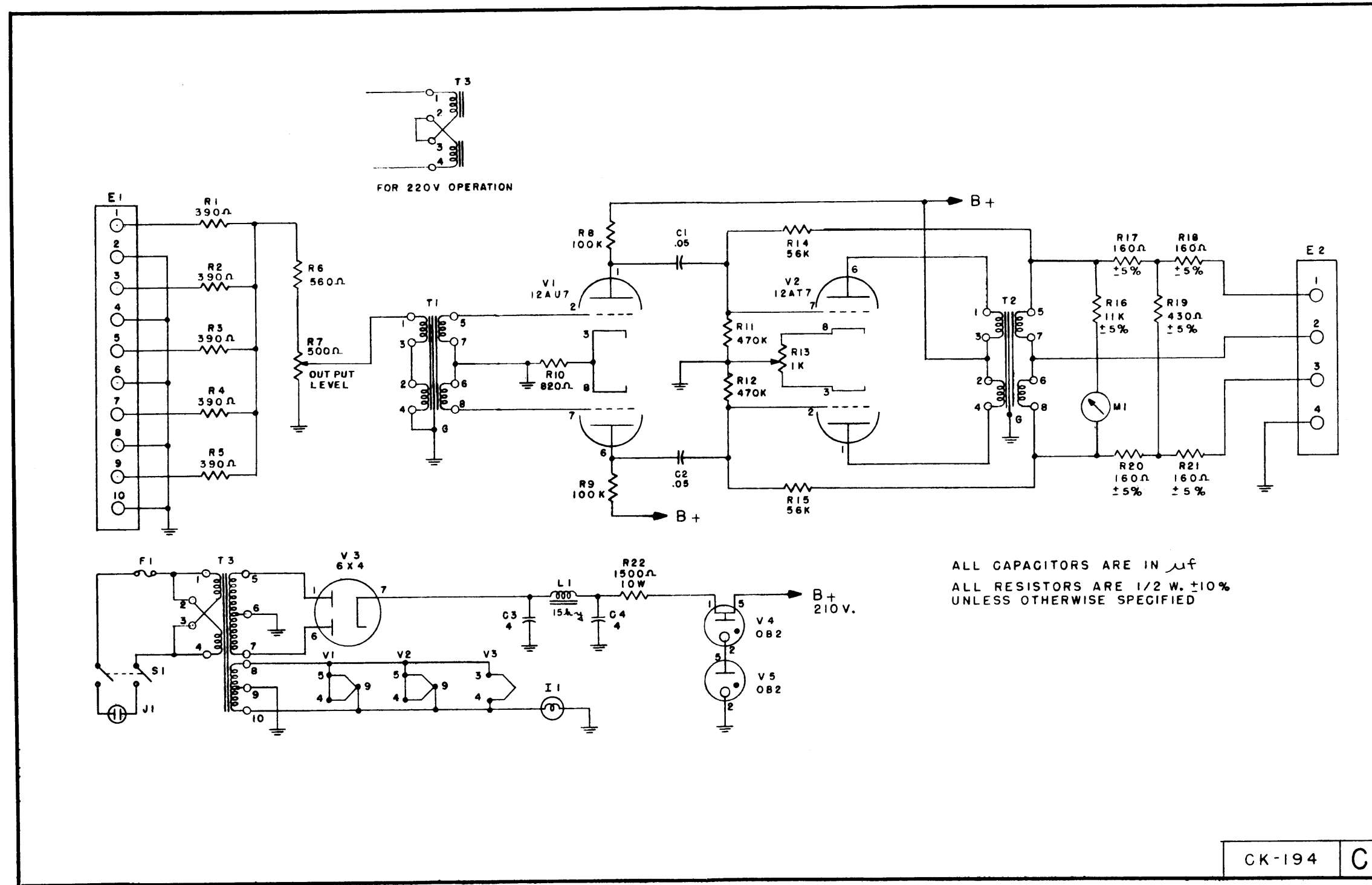


FIGURE 6-5. SCHEMATIC DIAGRAM, MODEL RSM-2

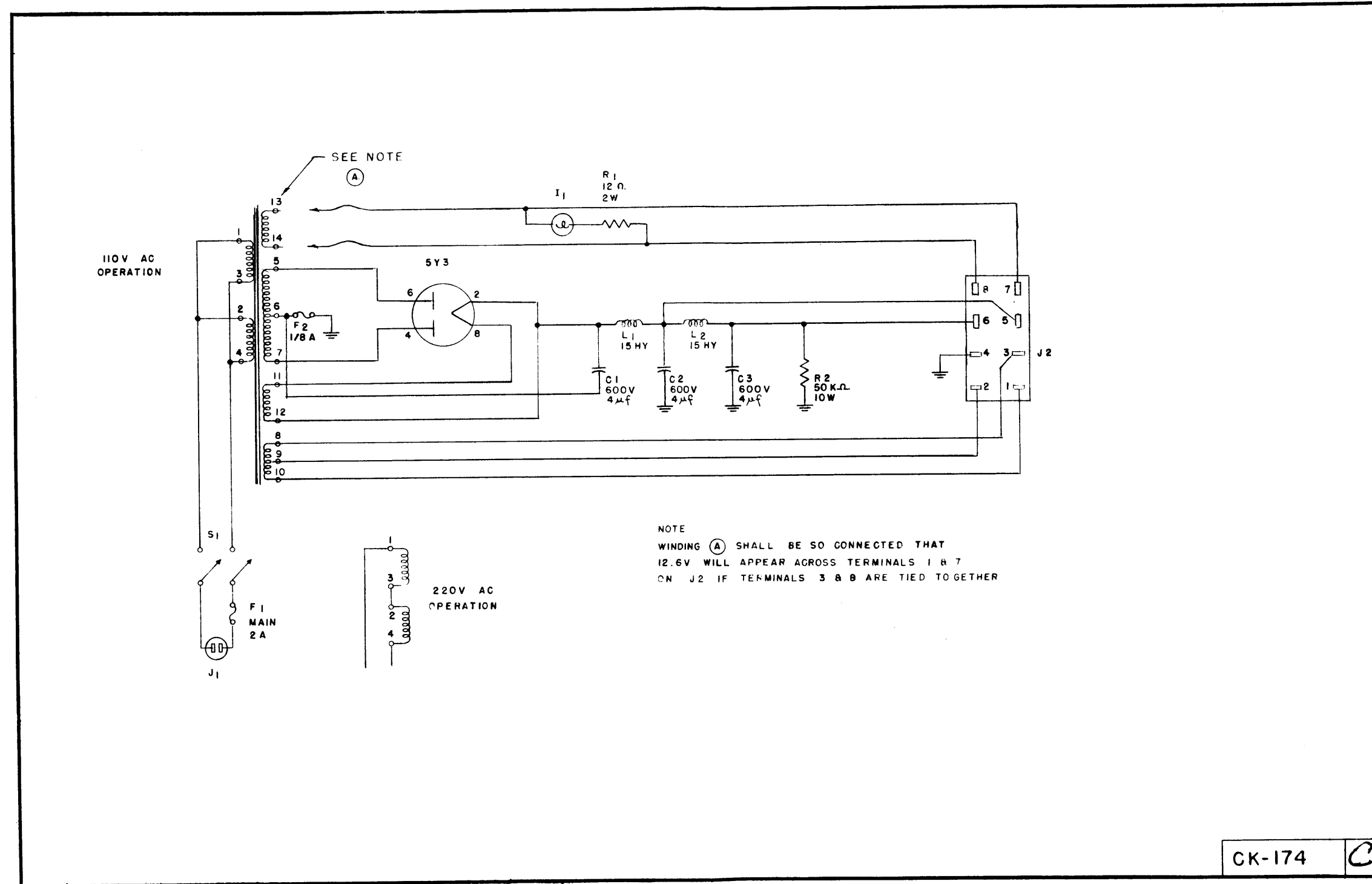


FIGURE 6-6. SCHEMATIC DIAGRAM, MODEL RSP-2