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TECHNICAL MANUAL

for

LINEAR POWER AMPLIFIER

MODEL PAL-350 C



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THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y. **DO NOT DESTROY** OTTAWA, ONTARIO

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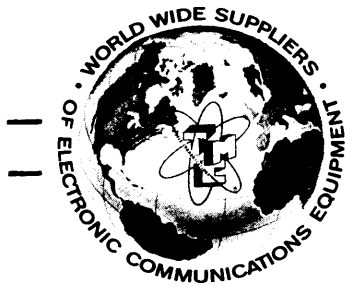
THE TECHNICAL MATERIEL CORPORATION
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THE TECHNICAL MATERIEL CORPORATION

C O M M U N I C A T I O N S E N G I N E E R S

700 FENIMORE ROAD

MAMARONECK, N. Y.

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3. That the equipment has not been altered in any way either as to design or use whether by replacement parts not supplied or approved by TMC, or otherwise.
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2. Serial Number of Equipment.
3. TMC Part Number.
4. Nature of defect or cause of failure.
5. The contract or purchase order under which equipment was delivered.

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1. Quantity Required.
2. TMC Part Number.
3. Equipment in which used by TMC or Military Model Number.
4. Brief Description of the Item.
5. The *Crystal Frequency* if the order includes crystals.

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THE TECHNICAL MATERIEL CORPORATION
Engineering Services Department
700 Fenimore Road
Mamaroneck, New York

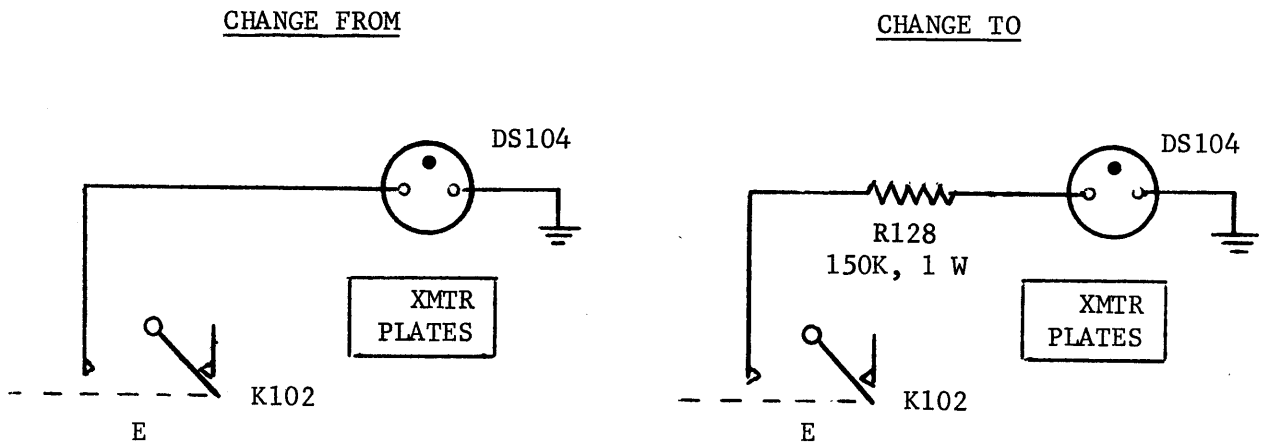


INSTRUCTION BOOK CHANGE NOTICE

Date May 1, 1967

Manual affected: Linear Power Amplifier, PAL-350 C IN 10016B

a. Figure 7-2, Schematic Diagram, PSP-350C, Page 7-2.



b. Change SYMBOLS chart to indicate last symbol used: R128.

c. Add to PARTS LIST, PSP-350C:

| | | |
|------|---|------------|
| R128 | RESISTOR, FIXED, COMPOSITION: 150,000 ohms, $\pm 5\%$; 1 watt. | RC32GF154J |
|------|---|------------|

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THE TECHNICAL MATERIEL CORP., 700 Fenimore Road, Mamaroneck, New York

Attn.: Director of Eng. Services.

CHANGE NO. 2



INSTRUCTION BOOK CHANGE NOTICE

Date May 22, 1967

Manual affected: Linear Power Amplifier, Model PAL-350C IN - 10016 B

In the LIST OF ILLUSTRATIONS, page -ii-, make the following corrections in the page column.

Change page number from 7-1 to 7-2/7-3

Change page number from 7-2 to 7-4/7-5

In SECTION - 7 SCHEMATIC DIAGRAMS

section, make the following corrections to the schematic diagram page number.

Change Figure 7-2 page number from 7-2 to 7-4/7-5

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TABLE OF CONTENTS

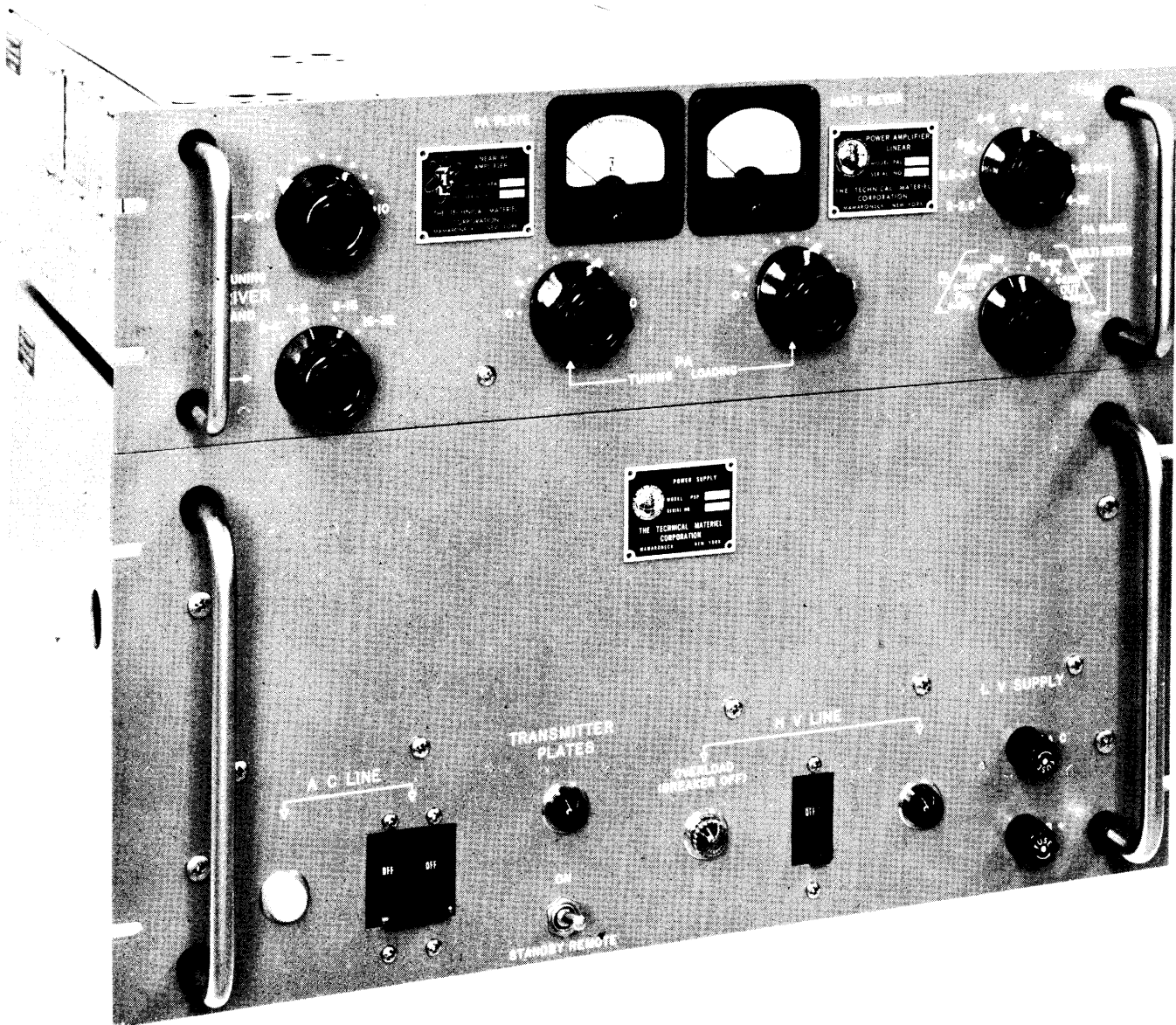
| <u>Paragraph</u> | | <u>Page</u> |
|--|--|-------------|
| <u>SECTION 1 - GENERAL INFORMATION</u> | | |
| 1-1 | Functional Description | 1-1 |
| 1-2 | Physical Description | 1-1 |
| 1-3 | Technical Specifications | 1-1 |
| <u>SECTION 2 - INSTALLATION</u> | | |
| 2-1 | General | 2-1 |
| 2-2 | Mechanical Installation | 2-1 |
| 2-3 | Electrical Installation | 2-1 |
| <u>SECTION 3 - OPERATOR'S SECTION</u> | | |
| 3-1 | Controls and Indicators | 3-1 |
| 3-2 | Operating Procedures | 3-4 |
| <u>SECTION 4 - PRINCIPLES OF OPERATION</u> | | |
| 4-1 | Introduction | 4-1 |
| 4-2 | Linear Power Amplifier, Circuit Analyses | 4-1 |
| 4-3 | Power Supply, Circuit Analysis | 4-3 |
| <u>SECTION 5 - MAINTENANCE</u> | | |
| 5-1 | Preventive Maintenance | 5-1 |
| 5-2 | Troubleshooting | 5-1 |
| 5-3 | Alignment | 5-3 |
| 5-4 | Repair and Replacement | 5-6 |
| <u>SECTION 6 - PARTS LIST</u> | | |
| 6-1 | Introduction | 6-1 |
| <u>SECTION 7 - SCHEMATIC DIAGRAMS</u> | | |

LIST OF ILLUSTRATIONS

| <u>Figure</u> | | <u>Page</u> |
|--|--|-------------|
| <u>SECTION 1 - GENERAL INFORMATION</u> | | |
| 1-1 | Linear Power Amplifier, Model PAL-350C | 1-0 |
| 1-2 | Functional Block Diagrams, PAL | 1-3 |
| <u>SECTION 2 - INSTALLATION</u> | | |
| 2-1 | Rear Panel Connections and Adjustments | 2-2 |
| <u>SECTION 3 - OPERATOR'S SECTION</u> | | |
| 3-1 | Front Panel Controls and Indicators, RFA and PSP | 3-3 |
| <u>SECTION 4 - PRINCIPLES OF OPERATION</u> | | |
| 4-1 | Simplified Block Diagram | 4-4 |
| <u>SECTION 7 - SCHEMATIC DIAGRAMS</u> | | |
| 7-1 | Linear RF Amplifier, RFE-1C | 7-1 |
| 7-2 | Power Supply Assembly, PSP-350C | 7-2 |

LIST OF TABLES

| <u>Table</u> | | <u>Page</u> |
|---------------------------------------|---|-------------|
| <u>SECTION 3 - OPERATOR'S SECTION</u> | | |
| 3-1 | Controls and Indicators | 3-1 |
| 3-2 | Driver Tuning Control Positions | 3-4 |
| 3-3 | Single Tone Input Readings | 3-5 |
| 3-4 | Two Tone Input Readings | 3-6 |
| <u>SECTION 5 - MAINTENANCE</u> | | |
| 5-1 | DC Voltages | 5-3 |



10016B-1

Figure 1-1. Linear Power Amplifier, Model PAL-350C

SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION.

Linear Power Amplifier, Model PAL-350C (figure 1-1), consisting of a Linear Power Amplifier, Model RFA-1C, and a Power Supply, Model PSP-350C, is a general purpose amplifier that provides 350 watts PEP output from a 100 milliwatt drive over the 2- to 32-mc (MHz) frequency range. The PAL operates in conjunction with other units and thus completes a transmitting system that is capable of producing single, double or independent sideband signals with any degree of carrier insertion. Figure 1-2 illustrates the relationship of the PAL in a transmitting system. A pair of 4CX350A beam power amplifier tubes in parallel, with a pi network, provide unbalanced output of from 25 to 144 ohms (VSWR 2:1).

Full interlock, overload and fuse protection are provided. An automatic load and drive control (ALDC) system limits distortion and protects the linear amplifier during high peaks of excitation.

1-2. PHYSICAL DESCRIPTION.

The PAL is designed for installation in a standard 19-inch wide equipment cabinet. The RFA is 17 inches deep, 5-1/4 inches high, and weighs approximately 30 pounds; the PSP is 13 inches deep, 8-3/4 inches high, and weighs approximately 60 pounds. All operating controls and indicators are located on the front panel. Removable top and bottom protective metal covers are provided.

1-3. TECHNICAL SPECIFICATIONS.

Technical specifications for the PAL are as follows:

| | |
|------------------|---|
| FREQUENCY RANGE: | 2 to 32 MHz continuous bandswitched. |
| OUTPUT POWER: | 350 watts 2 tone PEP. 200 watts key down, CW or FSK. |

1-3. TECHNICAL SPECIFICATIONS.CON'T.

OPERATING MODES: With appropriate exciter, AM, AME, CW, MCW, SSB, ISB, FAX, FSK or pulse operation. (Special mode selection switch in the RFA provides optimum operation in the CW mode.)

TUNING: All tuning and bandswitching controls on the front panel. (No plug-in components.)

OUTPUT IMPEDANCE: Nominal 50-72 ohms with up to 2:1 VSWR.

OUTPUT CONNECTION: Type C coaxial.

INPUT IMPEDANCE: 72 ohms.

INPUT REQUIREMENTS: 100 milliwatts will produce full PEP output.

INPUT CONNECTION: Type BNC coaxial.

DISTORTION PRODUCTS: At full PEP output, 3rd order distortion products are at least 40 db below either tone of a standard two tone test.

HARMONIC SUPPRESSION: Second at least 40 db down from PEP output. Third-at least 50 db down from PEP output.

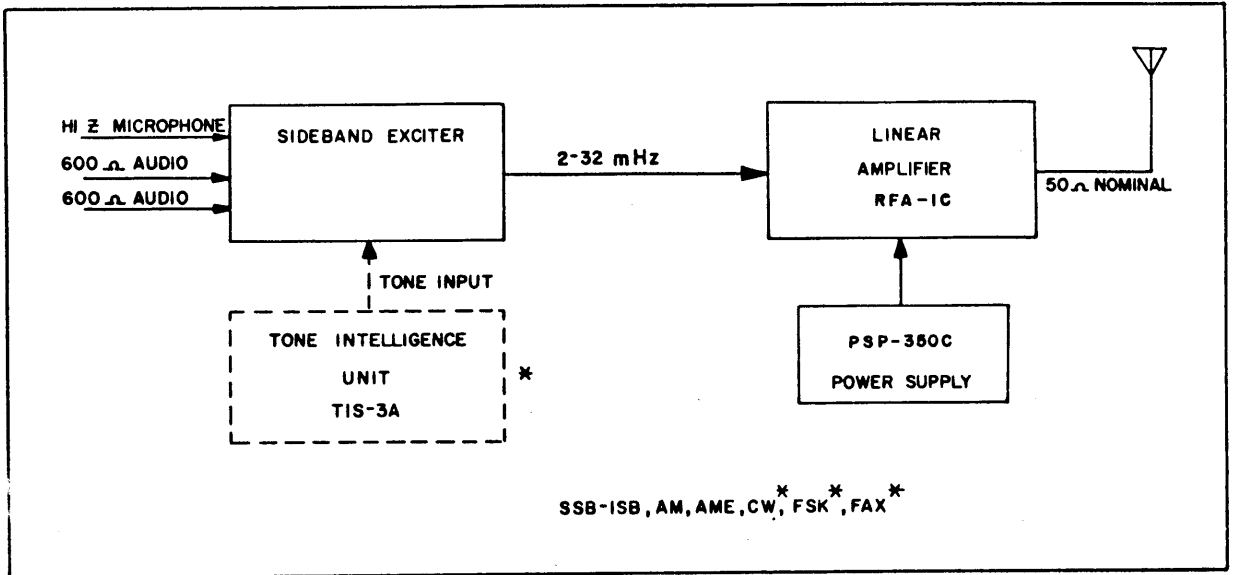
ALDC: An Automatic Load and Drive Control is provided to limit distortion during high drive peaks.

PRIMARY POWER REQUIREMENTS: 115/230 volts, $\pm 10\%$, 50/60 Hz, single phase, 550 watts under 350 watts PEP output conditions. Power supply uses solid state rectifiers throughout.

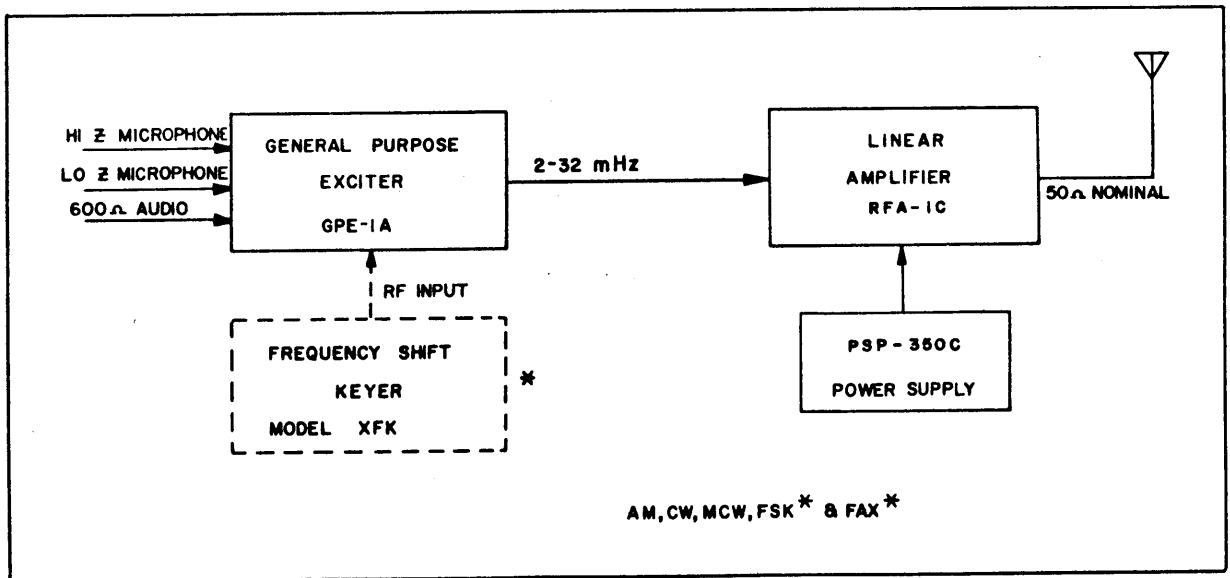
SAFETY: Full interlock protection. Full overload and fuse protection.

COOLING: Filtered, forced air blower system.

TEMPERATURE, HUMIDITY: Designed to operate in any ambient temperature between 0 and 50^o C for any value of relative humidity up to 90%.



SIDE BAND USE



GENERAL PURPOSE USE

Figure 1-2. Functional Block Diagrams, PAL

SECTION 2
INSTALLATION

2-1. GENERAL.

The RFA and the PSP that comprise the PAL are tested at the factory and are packaged carefully to prevent possible damage during shipment. When the equipment is delivered at the operating site, inspect the packing case and its content for damage that might have occurred during transit. Unpack the equipment carefully, and inspect all packing material for parts that may have been shipped as loose items. With respect to damage to the equipment for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and furnishing of replacement parts.

2-2. MECHANICAL INSTALLATION.

The units comprising the PAL are equipped with 19-inch wide front panels for mounting into any standard width equipment rack. Fasten the units to the rack with the mounting screws and washers (supplied).

NOTE

It is recommended that at least 1-3/4 inches of free space be allowed above the PSP unit.

2-3. ELECTRICAL INSTALLATION.

The PAL is wired at the factory for 115 vac, 50/60 cps, single phase operation. When 230 vac operation is required, wiring changes on T101, T102, T201, CB101, and resistor R104 must be made, as indicated in figures 7-1 and 7-2.

Figure 2-1 provides information for interconnection between RFA and PSP, and rear panel connections of both units comprising the PAL.

Regulation of the low voltage power supply is maintained by voltage regulator tubes (three in screen voltage section, one in bias section).

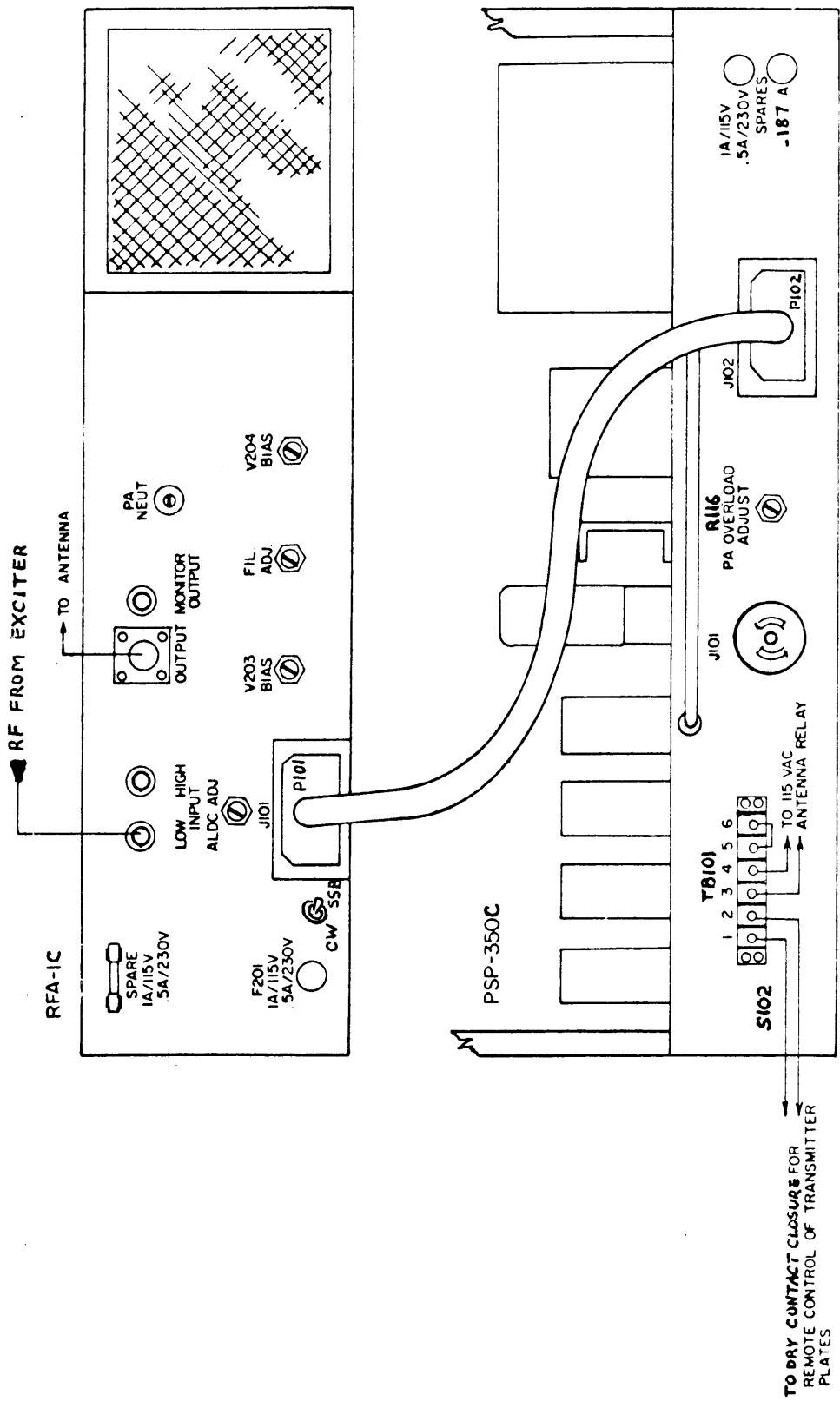


Figure 2-1. Rear Panel Connections and Adjustments

Regulation of the high voltage supply is controlled by use of a "swing" choke in the filter and by use of an appropriate bleeder load in the "CW" mode.

SECTION 3

OPERATOR'S SECTION

3-1. CONTROLS AND INDICATORS.

Before attempting to operate the equipment, the operator should familiarize himself with the controls and indicators listed in table 3-1 and illustrated in figure 3-1.

TABLE 3-1. FRONT PANEL CONTROLS AND INDICATORS

| ITEM NO. (Fig. 3-1) | DESIGNATION | FUNCTION |
|------------------------|-----------------------|---|
| <u>RFA</u> | | |
| 1 | DRIVER-BAND switch | Selects required coil to change the frequency (2- to 32-mc range, in 4 increments) of the driver plate tank. |
| 2 | DRIVER-TUNING control | Varies the driver tuning capacitors to resonate the circuit to the desired frequency. |
| 3 | PA BAND switch | Selects the appropriate tap on the PA tank coil. |
| 4 | PA TUNING control | Used to vary the PA tuning capacitor to resonate the circuit to the desired frequency. |
| 5 | PA LOADING control | Used to adjust the amount of coupling to the load. |
| 6 | MULTIMETER switch | Selects following: PA filament voltage, PA screen grid current, PA high voltage, RF voltage at the output of the driver, and RF voltage at the plate and output of the power amplifier. |
| 7 | MULTIMETER indicator | Indicates following: PA screen grid current, PA high voltage, PA filament voltage, RF drive to PA stage, PA RF plate voltage, and RF output voltage. |
| 8 | PA PLATE meter | Indicates PA plate current. |

TABLE 3-1. CONTROLS AND INDICATORS (CONT)

| ITEM NO. (Fig. 3-1) | DESIGNATION | FUNCTION |
|------------------------|---|---|
| <u>PSP</u> | | |
| 9 | AC LINE switch and circuit breaker | When set at ON, applies AC power to the transmitter and provides line overload protection. |
| 10 | AC LINE lamp | Lights to indicate AC power is applied. |
| 11 | H.V. LINE switch | When set at ON, applies voltage to the final plates (provided TRANSMITTER PLATES switch 14 is at ON). |
| 12 | H.V. LINE lamp | Lights to indicate voltage is applied to final plates. |
| 13 | OVERLOAD (BREAKER OFF) lamp | Lights to indicate excessive PA plate or screen grid currents. |
| 14 | TRANSMITTER PLATES ON/STANDBY-REMOTE switch | <p>When set at ON, applies plate and screen voltages to the driver tubes, ALDC, and final plates (provided H.V.LINE switch 11 is at ON).</p> <p>When H.V. LINE switch 11 is at OFF, plate and screen voltages are applied to the ALDC and driver stages only.</p> <p>When set at STANDBY-REMOTE, permits remote control of above functions.</p> |
| 15 | TRANSMITTER PLATES lamp | Indicates plate voltage is applied to the linear amplifier. |

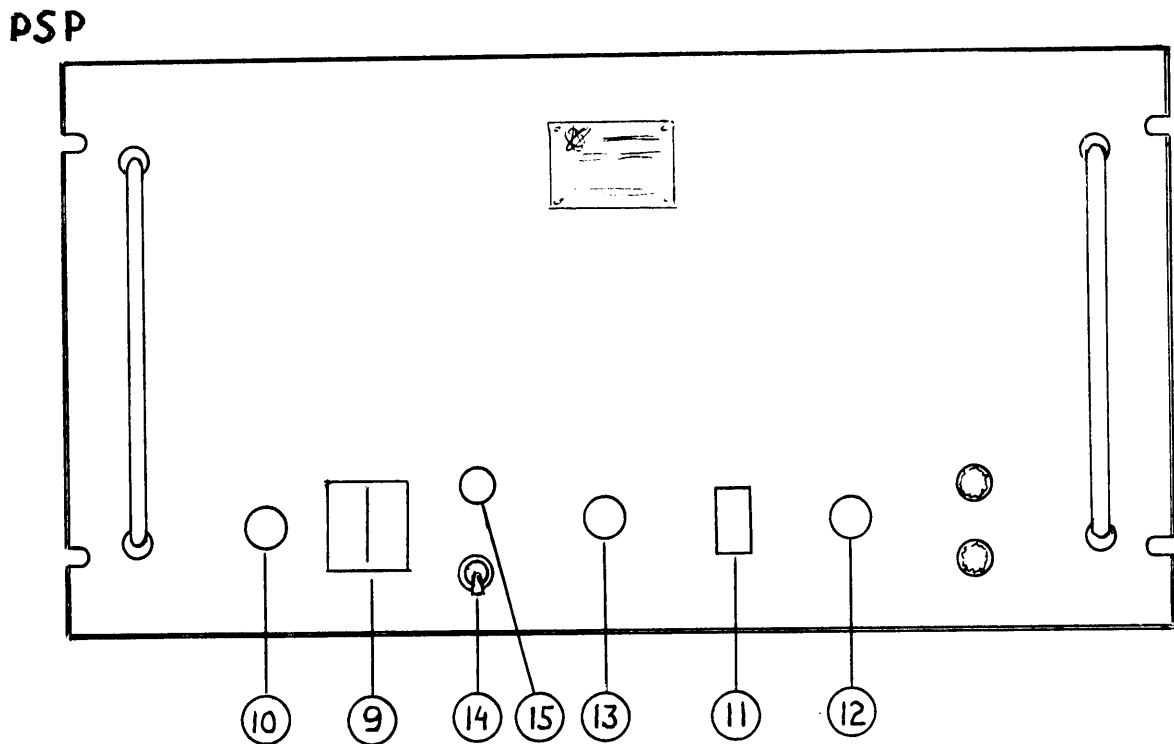
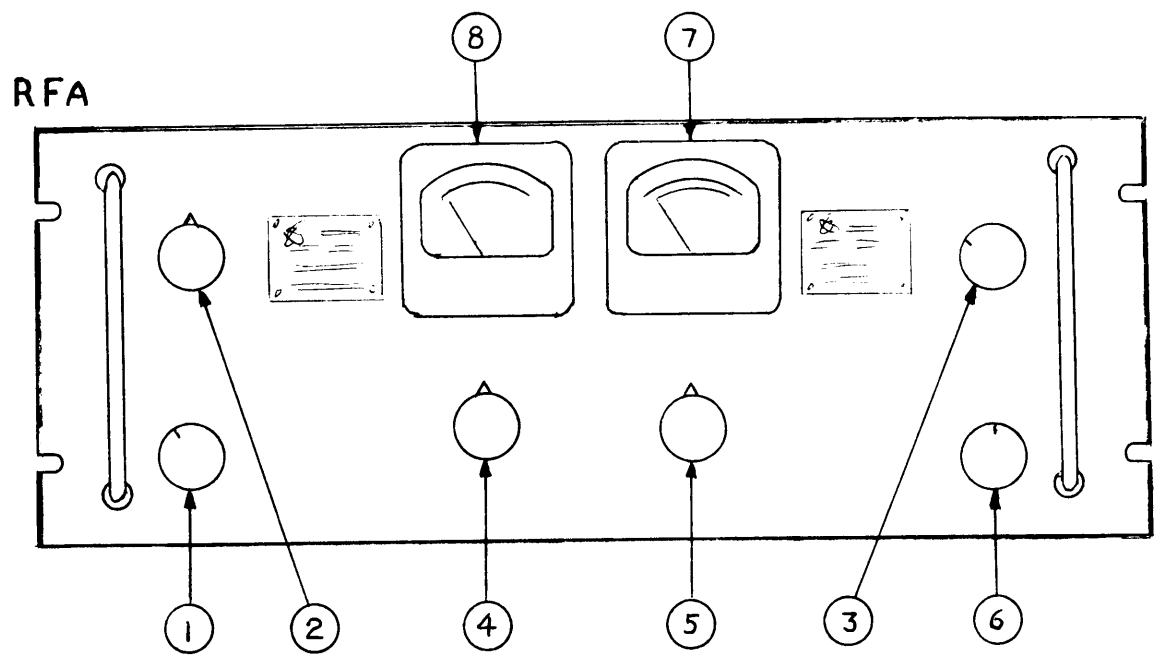


Figure 3-1. Front Panel Controls and Indicators, RFA and PSP

3-2. OPERATING PROCEDURES.

NOTE

Steps m and n apply only on initial tune-up after installation (unless bias settings need re-adjustment). For numbers in parenthesis, refer to figure 3-1.

- a. Temporarily set the following controls in the positions indicated:

| | |
|-------------------------|-------|
| H.V. LINE (9) | - OFF |
| TRANSMITTER PLATES (14) | - OFF |
| PA TUNING (4) | - 0 |
| PA LOADING (5) | - 0 |
| CW/SSB SWITCH | - SSB |

- b. Set AC LINE switch (9) at ON.

c. Set MULTIMETER switch (6) at PA FIL. MULTIMETER (7) should read at "FILADJUST" mark (equivalent to 6 volts). If it does not, FIL. ADJ. on rear of RFA chassis shown in figure 2-1 must be adjusted.

d. Set DRIVER-BAND switch (1) to the range covering the desired output frequency.

- e. Set PA BAND switch to cover the same frequency as above.

- f. Set MULTIMETER switch (6) at RF DR.

g. Turn the associated exciter on and tune to the desired output frequency and mode of operation. Adjust for very low output level. (In cases where the Model SBE is to be used, consult its accompanying instruction manual.)

- h. Approximate the DRIVER-TUNING control (2) position by use of table 3-2.

TABLE 3-2. DRIVER BAND AND TUNING CONTROL POSITIONS

| DRIVER BAND | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-------------|---|----|------|-----|------|----|------|-----|------|----|----|
| 2-4 | | 2 | 2.25 | 2.5 | 2.75 | 3 | 3.25 | 3.5 | 3.75 | 4 | |
| 4-8 | | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 | 7.5 | 8 | |
| 8-16 | | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | |
| 16-32 | | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | |

- i. Set TRANSMITTER PLATES switch (14) at ON.
- j. Adjust the DRIVER-TUNING control (2) until a peak reading is obtained on MULTIMETER (7). Peaks should be kept below a reading of 30 on the meter to assure a full range of meter movement. Use the exciter's output control to keep the meter reading within range as the peak tuning is approached.

NOTE

The DRIVER-TUNING is now completed.
It is essential that these controls are not readjusted unless another frequency is to be tuned.

- k. Reduce the exciter output to zero; check to make sure load or antenna is connected to J205.
- l. Set H.V. LINE switch (11) at ON.
- m. Set MULTIMETER switch (6) at HV; reading on MULTIMETER (7) will be 3000 volts approximately.
- n. Slowly adjust potentiometer R213 until V203 is drawing 100 ma plate current, using the PA PLATE meter (8) as the indicator. Adjust R221 until total plate current V203 and V204 is 200 ma.
- o. Apply drive slowly from the exciter while observing the PA PLATE meter (8). The drive level will be correct when the meter indicates 300 ma of PA PLATE current.

TABLE 3-3. SINGLE TONE INPUT

| SWITCH POSITION | <u>MULTIMETER:</u> | |
|---|--------------------|-------|
| | READING | VALUE |
| ISG | 15 | -5 ma |
| RF DR | 18 | 18 V |
| RF PL | 10 | 500 V |
| RF OUT* | 7 | 70 V |
| PA PLATE METER 240 ma. | | |
| * RF output measurements can indicate a wide range of voltages since the actual loading of an antenna may involve a great variety of impedances and reactances. | | |

p. Set MULTIMETER switch (6) at DR and adjust the PA TUNING control (4) until a dip is observed on MULTIMETER (7).

NOTE

This does not necessarily coincide with a dip in the PA plate current. Both readings will not dip at the same time until the final stage is properly loaded.

q. Use the PA LOADING control (5) in the following manner: Observe the RF DR on MULTIMETER (7) as the PA LOADING is increased. As the meter reading increases, readjust the PA TUNING for a dip as before. Continue this loading procedure until the values indicated in the tables 3-3 and 3-4 are observed. Refer to table 3-3 if a single tone is applied to the exciter input; table 3-4 if two tones of equal levels are applied.

r. Before actual operation of the transmitter begins, adjust the PA TUNING control (4) again for a dip on MULTIMETER (7) on the RF DR position of MULTIMETER switch (6).

s. Use the OUTPUT CONTROL of the exciter to keep the RF PL reading on MULTIMETER (7) from ever exceeding 800 volts. This must be done regardless of the various input combinations that may be applied (speech and/or tones, etc.).

t. If at any time during the tuning procedure the amplifier shows signs of instability or self oscillation, it should be neutralized as described in the maintenance section of this handbook.

TABLE 3-4. TWO TONE INPUT

| SWITCH POSITION | <u>MULTIMETER:</u> | |
|---|--------------------|--------------|
| | READING | VALUE |
| ISG | 12 to 10 | -8 to -10 ma |
| RF DR | 25 to 30 | 25 to 30 V |
| RF PL | 18 | 800 V |
| RF OUT* | 14 | 140 V |
| PA PLATE METER 300 ma | | |
| * RF output measurements can indicate a wide range of voltages since the actual loading of an antenna may involve a great variety of impedances and reactances. | | |

u. If it is desired to operate in the CW mode only, greater efficiency can be obtained by setting the CW/SSB switch, on the rear apron of the RFA, to the CW position. The 4CX350 tubes will now be biased to cut-off. At the same time, an additional bleeder load (R124,R125,R126 and R127) is added to the high voltage supply by relay K104. The CW/SSB switch also changes the scale reading of the multimeter to prevent the needle from pinning in the RF drive position because of the greater drive required to produce full rated output.

SECTION 4
PRINCIPLES OF OPERATION

4-1. INTRODUCTION

In the SSB mode, the RFA operates as a class AB1 linear amplifier, using a pair of a pair of 4CX350A beam power amplifiers in parallel to a pi network to provide an unbalanced output of 50 or 70 ohms (refer to figure 4-1). The final amplifiers are driven by a pentode driver stage which employs R.F. feedback to improve the linearity. The driver stage is preceded by an automatic load and drive control (ALDC) stage to limit the distortion produced when high peaks or load changes occur.

The RFA requires a maximum of 100 milliwatts excitation to produce full output. A choice of BNC input connectors is provided to accommodate input between 100 milliwatts and 1 watt. The output connections on the RFA consist of a type C coaxial connector, which provides full R.F. output and a BNC connector which provides 1/300th of the R.F. output for monitoring purposes. The monitoring output may be terminated in any resistive load of 50 ohms or higher.

The unit covers a frequency range of 2 to 32 megacycles, and is band-switched. All tuning and operating adjustments are accomplished from the front of the unit. Complete metering facilities are provided by a MULTIMETER and a PA PLATE meter.

4-2. LINEAR POWER AMPLIFIER, CIRCUIT ANALYSES.

a. CONTROLLED AMPLIFIER. - The drive can be applied to either J202 or J203, depending upon the level of excitation available (refer to RFA schematic CK10514). The signal is coupled via C212 to the grid of this amplifier V201, 6CL6. The screen grid of this amplifier is directly grounded. However, since the cathode is -150 volts, with respect to the chassis, and the plate 150 volts positive, the screen grid is 150 volts positive with respect to the

cathode and the plate is 300 volts positive with respect to the cathode. The plate circuit has a parasitic suppressor PS201, the signal being coupled via C282 to the appropriate tuned circuit selected by S201 A and B for the frequency of operation. Plate voltage for V201 is applied via network L201, L202 and feed-through decoupling capacitor C279. ALDC is applied to this first stage in the form of bias derived from the ALDC rectifier CR202.

b. DRIVER. - Coupling of the driver stage V202 is via C221 to grid of V202. A grid stopper resistor in this grid helps to stabilize the stage. The driver stage plate circuitry is almost identical to the previous stage with the signal being coupled to the final amplifier tubes V203 and V204 grids via C240 and C243. Neutralization of the driver stage is achieved by feeding back a small amount of signal voltage from the plate of the driver tube V202 via driver neutralizing capacitor C223 to the grid circuit.

c. POWER AMPLIFIER. - The final amplifier consists of a pair of parallel connected 4CX350A beam tetrodes V203 and V204. The screen grids are operated at a potential of regulated 360 volts positive, while the plates have 2000 volts positive applied. Bias for each of the two tubes is adjustable by means of R213, R221 (at the rear of the unit), the grid leads having parasitic suppressors PS203, PS204 directly at the grid pin of each tube. The plate is tuned by a "PI" network tank circuit. The output of the unit is brought out through J205. A small portion of the output (1/300th) appears at the monitor output jack J204. This is derived from the capacitive divider C274 and C275. Another capacitive divider across the output comprising C277 and C278 is used for the RF output metering circuit. Other metering of this stage includes metering of RF drive voltage, RF plate voltage, B+ and filament voltages, screen and plate current metering.

The final tubes are forced air cooled by blower B201, through the air system sockets of V203, V204. It is essential to have the R/F section bottom cover in place at all times while the unit is operating.

Neutralization of the final amplifier stage is effected by C2-4 (adjustable from rear of unit).

4-3. POWER SUPPLY, CIRCUIT ANALYSIS

a. HIGH VOLTAGE (Refer to figure 7-2). - This supply is of a conservative design containing solid state rectifiers. Rectification is full wave and is followed by a choke input filter network. A plate voltage of 2000 volts is provided to the final RF stage. Voltage regulation of the HV supply is maintained by the use of a swinging choke in the filter supply. The screen voltage for the final RF stage is dropped from the 2000 volt supply and regulated by three gas-filled regulator tubes.

b. LOW VOLTAGE. - The lower voltage power supply contains a solid state full wave rectifier. This supply provides a voltage of 300 (-150V and +150V) volts to the plates of the first amplifier and driver stages, and a voltage of -150 (regulated) bias for the final amplifier.

c. CONTROL OVERLOAD CIRCUIT. - The time delay relay prevents the application of high voltage until the 4CX350A filaments have been allowed to warm up sufficiently for operation.

The plate overload breaker removes both plate and screen voltages from the final RF stage when the current drawn from the high voltage supply becomes excessive, thus protecting the final amplifier tubes.

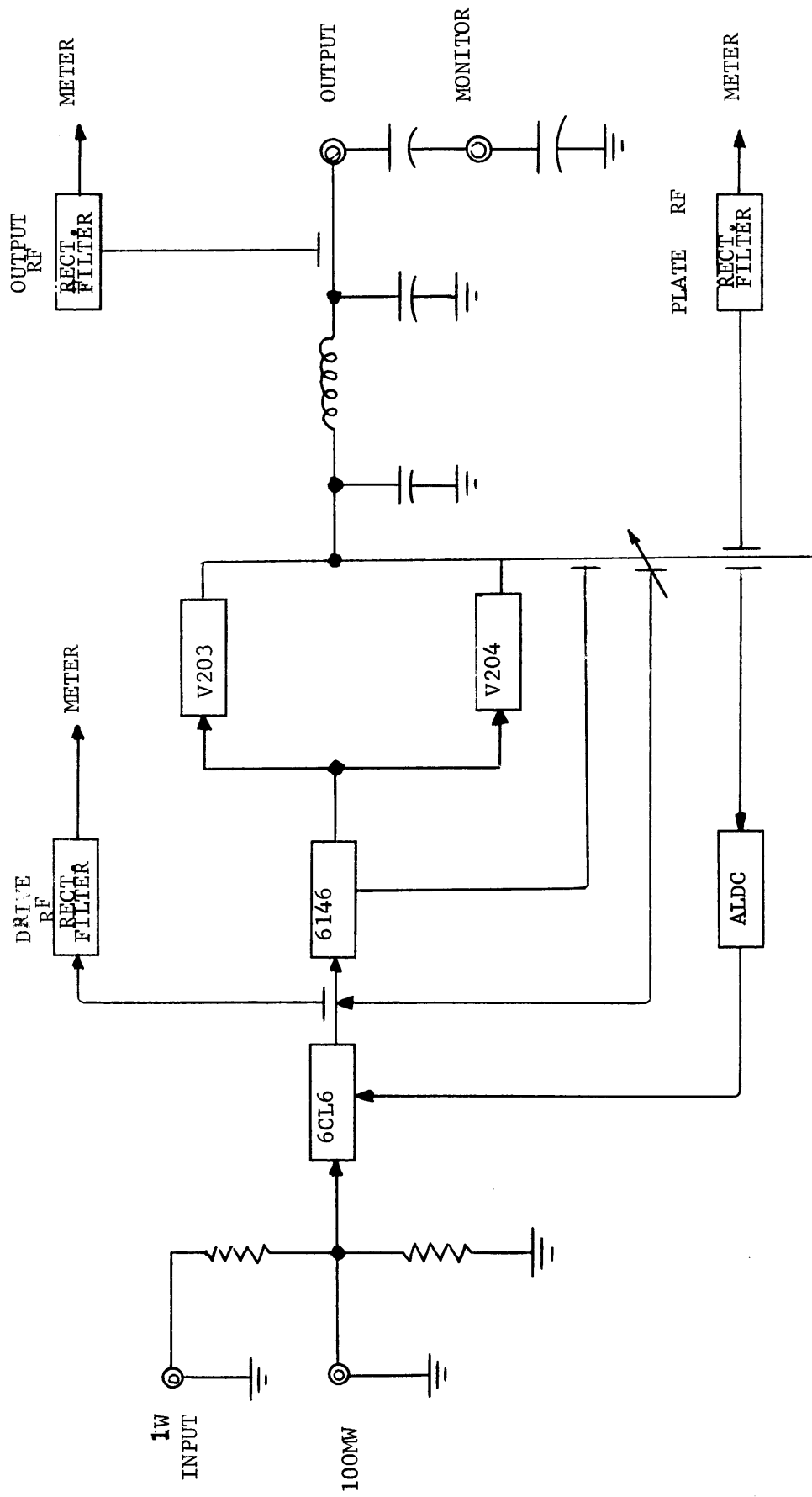


Figure 4-1. Simplified Block Diagram

SECTION 5
MAINTENANCE

5-1. PREVENTIVE MAINTENANCE.

In order to prevent equipment failure due to dust, dirt or other destructive elements, it is suggested that a schedule of preventive maintenance be set up and adhered to.

At periodic intervals, the equipment should be removed from its mounting for cleaning and inspection. The wiring and all components should be inspected for dirt, dust, corrosion, grease or other harmful conditions. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease with any suitable cleaning solvent. Use of carbon tetrachloride should be avoided due to its highly toxic effects. Trichlorethylene or methyl chloroform may be used, providing the necessary precautions are observed.

WARNING

When using toxic solvents, make certain that adequate ventilation exists. Avoid prolonged or repeated breathing of the vapor. Avoid prolonged or repeated contact with skin. Flammable solvents shall not be used on energized equipment or near any equipment from which a spark may be received. Smoking, "hot work", etc. is prohibited in the immediate area.

CAUTION

When using trichlorethylene, avoid contact with painted surfaces, due to its paint removing effects.

5-2. TROUBLESHOOTING.

When a piece of equipment has been operating satisfactorily and suddenly fails, the cause of failure may be due to circumstances occurring at the time of failure, or to conditions similar to those that have occurred in the past. Therefore, the first check is to ascertain that proper equipment voltages are present and that all

interconnecting wires are secure.

If these checks fail to locate the fault, the unit should be removed from the rack and visually checked for corrosion, dirt, or other harmful conditions.

When troubleshooting, refer to the schematic diagrams contained in Section 7.

WARNING

The voltages used in this equipment are sufficiently high to endanger life. All personnel are advised to be thoroughly familiar with these units before troubleshooting them in a POWER-ON condition. Always use caution.

The RFA contains three protective devices, as follows:

- Top cover interlock (S204), indicator DS102
- Bottom Cover interlock (205), indicator DS102
- Filament fuse (F201), for all heaters.

The PSP contains seven protective devices, as follows (the action of one or several will disable all or part of the PAL):

- L.V. MAIN fuse (F101), indicator DS101
- L.V. SUPPLY fuse (F102), indicator DS104
- AC LINE circuit breaker (CB101), indicator DS101
- H.V. LINE circuit breaker (CB102), indicator DS102, DS103
- Top cover interlock (S101), indicator DS102
- Bottom cover interlock (S102), indicator DS102

In the event that an indicator lamp fails to light, check the related protective device; if this check fails to uncover the source of indicator failure, check the lamp itself.

NOTE

Never replace a fuse with one of a higher rating unless brief continued operation is more important than probable damage to the equipment. If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been located and corrected.

In the event that a tube is suspected, the substitution method will prove the quickest. When substituting tubes during the check, do not leave the replacement tubes in the equipment unless the original tubes are proven defective.

5-3. ALIGNMENT.

Before any alignment or internal adjustment of the equipment is attempted, it should be established that all tubes and fuses are in working order.

a. INITIAL POWER CHECKS.

- (1) Replace covers on the PSP power supply.
- (2) Reconnect cable from PSP to RFA.
- (3) Close the interlocks, S204 and S205, of the RFA by pulling their shafts outward.
- (4) Be sure that HV LINE and TRANSMITTER PLATES switches are off (11 and 14, figure 3-1).
- (5) Set AC LINE circuit breaker (9) at ON. See that tube filaments light.
- (6) Rotate the MULTIMETER switch (6) through all its positions. The pointer should deflect only when switch is in the FIL position.
- (7) Adjust R216, FIL ADJ. potentiometer on the rear of the RFA chassis, if necessary, so that MULTIMETER (7) reading is at the "FIL ADJUST" mark. (Equivalent of 6 volts).
- (8) Bias controls R213 and R221 must be turned fully counter-clockwise.
- (9) Measure the voltage from pin C of V203 to ground. 90 to 115 vdc should be indicated.
- (10) Voltage measured from pin 2 of V201 to ground must be 147 to 163 vdc.
- (11) Use a reliable VTVM to see that voltages listed in table 5-1 are present.
- (12) Turn power off and replace cover on the RFA RF deck.

TABLE 5-1. DC VOLTAGES

| FROM | TO | DC VOLTAGE |
|-----------------|--------|--------------|
| Plate Cap. V202 | Ground | 90 to 150 |
| Pin 6 of V201 | Ground | 90 to 150 |
| Pin 3 of V202 | Ground | 40 to 70 |
| Pin 4 of V202 | Ground | -120 to -130 |
| Pin 5 of V202 | Ground | -140 to -150 |
| Pin 2 of V201 | Ground | -145 to -155 |
| Pin 1 of V201 | Ground | -140 to -150 |

b. DRIVER SECTION ALIGNMENT.

- (1) Any of the following capacitors which have been replaced or accidentally misadjusted should be set to their center values (approximate): C201, C202, C203, C204, C207, C208, C210, C211 or C223.
- (2) See that TRANSMITTER PLATES (14) and HV LINE (11) switches are OFF. Set AC LINE switch (9) at ON.

- (3) After a 60 second delay, set TRANSMITTER PLATES switch (14) at ON.
- (4) Set MULTIMETER switch (6) at FIL; if MULTIMETER (7) is not on the METER (7), "FIL ADJUST" mark
- (5) Set MULTIMETER switch (6) at RF DR.
- (6) Set DRIVER BAND switch (1) at the 2-4 mc range.
- (7) Set the DRIVER TUNING control (2) to position 1.
- (8) Adjust associated exciter to apply low level drive at 2 mc.
- (9) Tune T201 and T204 of the RFA for a peak reading on MULTIMETER (7) while adjusting the drive to keep meter readings below 30 volts.
- (10) Set the DRIVER TUNING control (2) to position 9.
- (11) Tune trimmers C201 and C207 for peak indication on MULTIMETER (7); again maintain a meter reading of less than 30 volts by use of the exciter output drive control.
- (12) Remove drive. If MULTIMETER (7) continues to read, readjust C223 and repeat the last steps beginning with step 7 until there is no sustained reading when drive is removed. This must be repeated until the desired results are achieved.
- (13) Reduce the exciter output level temporarily to minimum.
- (14) Set DRIVER BAND switch (1) at the 4-8 mc range.
- (15) Set the DRIVER TUNING control (2) to position 1.
- (16) Adjust the exciter to apply low level drive at 4.0. mc.
- (17) Tune T202 and T205 for peak indication on MULTIMETER (7) while controlling the exciter output to keep meter readings below 30 volts, as before.
- (18) Set DRIVER TUNING control (2) to position 9.
- (19) Tune trimmers C202 and C208 for peak indication on MULTIMETER (7); maintain less than 30 volts on the meter by use of the exciter output drive control.
- (20) Remove drive. If MULTIMETER (7) continues to read, readjust C223 as before and repeat procedure starting with step 7.
- (21) Repeat steps 15 through 19 until no further adjustments are necessary.
- (22) Set DRIVER BAND switch (1) at the 8-16 mc range.
- (23) Set the DRIVER TUNING control (2) to position 1.
- (24) Adjust associated exciter to apply low level drive at 8 mc.

- (25) Tune T203 and T206 of the RFA for a peak reading on MULTIMETER (7) while adjusting the drive to keep meter readings below 30 volts.
- (26) Set the DRIVER TUNING control (2) to position 9.
- (27) Tune trimmers C204 and C211 for peak indication on the MULTIMETER (7); maintain a meter reading of less than 30 volts by use of the exciter output drive control.
- (28) Remove drive. If MULTIMETER (7) continues to read, readjust C223 and repeat procedure beginning with step 7 until there is no sustained reading when drive is removed.
- (29) Repeat steps 22 through 28 several times until no further adjustment is necessary.
- (30) Set the DRIVER BAND switch (1) at the 16 to 32 mc position.
- (31) Set the DRIVER TUNING control (2) to position 1.
- (32) Adjust the associated exciter to apply low level drive at 16 mc.
- (33) Tune L208 and T207 for peak indication on MULTIMETER (7) while controlling the exciter output drive to keep the meter readings below 30 volts.
- (34) Set the DRIVER TUNING control (2) to position 9.
- (35) Tune trimmers C203 and C210 for a peak indication on MULTIMETER (7) while again keeping the reading below 30 volts by use of the exciter output drive control.
- (36) Remove drive. If MULTIMETER (7) continues to read, readjust C223 and repeat procedure beginning with step 7 until there is no sustained reading when drive is removed.
- (37) Repeat steps 30 through 36 several times until no further adjustments are necessary.

c. NEUTRALIZATION OF P.A.

WARNING

Be certain that the high voltage overload breaker stays in OFF position throughout the neutralization process.

The neutralization procedures for this transmitter are carried out before shipping, and it should not normally be necessary to readjust in the field. Should it be found necessary, for example, in the event of a tube change, then the following procedure should be adopted.

It should be noted at this point that there are two stages in the PAL which require neutralizing; the driver stage V202, and the final stage V203 and V204. The driver

stage neutralizing is described fully in the section on driver section alignment (5-3, b).

- (1) Turn ALDC ADJ to extreme counter-clockwise position (refer to figure 2-1).
- (2) Connect VTVM to the plates of power amplifiers.
- (3) Set P.A. loading at point No. 0.
- (4) Disconnect lead from C215. (Feed back loop.)
- (5) Set TRANSMITTER PLATES switch (14) at ON.
- (6) Apply drive at 32 mc. (Single tone.) Tuning the driver stages to the peak meter indication in RF DR position, adjust the drive control to 18 volts on multimeter.
- (7) Set PA BAND switch (3) at 24-32 mc range.
- (8) Tune PA TUNING control (4) to peak indication on RF VTVM.
- (9) Adjust P.A. neutralizing capacitor C214 each time retuning PA TUNING control (4) to the peak until the reading on VTVM is approximately 0.9 volts rms.
- (10) Apply drive at 16 mc and tune the drive stages to the peak indication in RF DR position. Adjust the drive control till 18 volts on MULTI-METER (7) is obtained.
- (11) Set the PA BAND switch (3) at 16-24 mc range.
- (12) Tune PA TUNING control (4) to the peak indication on RF VTVM; the reading must not exceed 1 volt rms.
- (13) Set up the unit at 2 mc. The reading on VTVM must not exceed 1 volt rms. If more than 1 volt rms, readjust the neutralizing capacitor C214 and recheck at 32 mc.
- (14) Disconnect VTVM and remove drive.
- (15) Set the TRANSMITTER PLATES switch (14) at OFF.
- (16) Connect the feedback cable to C215.

5-4. REPAIR AND REPLACEMENT.

Maintenance of the PAL will consist mainly of component replacement. It should be noted that when replacing components having many wire connections, such as switches, relays, etc., the wires should be tagged and marked for accurate identification. Use of the schematic diagrams in section 7 is advisable when replacing or disconnecting components; also refer to figures 5-1 through 5-5.

SECTION 6

PARTS LIST

6-1. INTRODUCTION

The parts list presented in this section is a cross-reference list of parts identified by a reference designation and TMC part number. In most cases, parts appearing on schematic diagrams are assigned reference designations in accordance with MIL-STD-16. Wherever practicable, the reference designation is marked on the equipment, close to the part it identifies. In most cases, mechanical and electro-mechanical parts have TMC part numbers stamped on them.

To expedite delivery when ordering any part, specify the following:

- a. Reference symbol.
- b. Description as indicated in parts list.
- c. TMC part number.
- d. Model and serial numbers of the equipment containing the part being replaced; this can be obtained from the equipment nameplate.

For replacement parts not covered by warranty (refer to warranty sheet in front of manual), address all purchase orders to:

The Technical Materiel Corporation
Attention: Sales Department
700 Fenimore Road
Mamaroneck, New York

PARTS LIST
for
LINEAR POWER AMPLIFIER, MODEL RFA-1C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|----------------------|--|--------------------|
| A201 | COIL AND SWITCH ASSEMBLY: consists of one capacitor, symbol no. C273; one switch, symbol no. S202; one transformer, symbol no. T209. | A10298 |
| B201 | FAN, CENTRIFICAL: 0.2 hp; 115 VAC, 50/60 cps, single phase; 3,400 RPM; 53 CFM. | BL100 |
| C201 | CAPACITOR, VARIABLE, CERAMIC DIELECTRIC: 4.0 to 30.0 uuf; 500 WVDC. | CV11C300 |
| C202 thru C204 | Same as C201. | |
| C205A | CAPACITOR, VARIABLE, AIR DIELECTRIC: 12 to 270 uuf; 700 VAC peak; 3/8" shaft length, both sides. | CB139-1 |
| C205B | CAPACITOR, VARIABLE, AIR DIELECTRIC: 12.5 to 270 uuf; 700 VAC peak; 3/8" shaft length, one side. | CB139-2 |
| C206 | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2,000 uuf, $\pm 20\%$; 500 WVDC. | CK70AW202M |
| C207 | Same as C201. | |
| C208 | Same as C201. | |
| C209 | CAPACITOR, FIXED, MICA DIELECTRIC: 1,000 uuf, $\pm 10\%$; 300 WVDC; button type. | CB21QW102K |
| C210 | Same as C201. | |
| C211 | Same as C201. | |
| C212 | CAPACITOR, FIXED, MICA DIELECTRIC: 1,600 uuf, $\pm 2\%$; 500 WVDC. | CM100-11 |
| C213 | CAPACITOR, VARIABLE, AIR DIELECTRIC: 20 to 500 uuf; 2,000 VAC peak. | CB138-3AN |
| C214 | CAPACITOR, VARIABLE, AIR DIELECTRIC: 0.4 to 4.2 uuf. | AC172 |
| C215 | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10 uuf, $\pm 10\%$; 5,000 WVDC. | CC109-6 |
| C216 | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 3 uuf, $\pm 10\%$; 5,000 WVDC. | CC109-2 |

PARTS LIST (CONT)

LINEAR POWER AMPLIFIER, MODEL RFA-1C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|------------|---|-----------------|
| C217 | CAPACITOR, FIXED, PLASTIC DIELECTRIC: 2,000 uuf, $\pm 5\%$; 4,000 WVDC. | CX102J202M |
| C218 | Same as C209. | |
| C219 | CAPACITOR, FIXED, MICA DIELECTRIC: 150 uuf, $\pm 10\%$; 300 WVDC; button type. | CB21QW151K |
| C220 | CAPACITOR, FIXED, MICA DIELECTRIC: 1,000 uuf, $\pm 2\%$; 500 WVDC. | CM20F102G03 |
| C221 | Same as C220. | |
| C222 | CAPACITOR, FIXED, MICA DIELECTRIC: 470 uuf, $\pm 10\%$; 300 WVDC; button type. | CB21QW471K |
| C223 | CAPACITOR, VARIABLE, CERAMIC DIELECTRIC: 1.5 to 7.0 uuf; 500 WVDC. | CV11A070 |
| C224 | Same as C209. | |
| C225 | Same as C206. | |
| C226 | Same as C206. | |
| C227 | CAPACITOR, FIXED, PLASTIC DIELECTRIC: 0.1 uuf, $\pm 5\%$; 200 WVDC. | CN108C1003J |
| C228 | CAPACITOR, FIXED, MICA DIELECTRIC: 10,000 uuf, $\pm 1\%$; 300 WVDC. | CM35F103F03 |
| C229 | Same as C206. | |
| C230 | Same as C209. | |
| C231 | CAPACITOR, FIXED, ELECTROLYTIC: 50 uf; 50 WVDC; polarized. | CE63C500G |
| C232 | Same as C220. | |
| C233 | Same as C209. | |
| C234 | Same as C228. | |
| C235 | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 3 uuf, ± 0.25 uuf; 500 WVDC. | CC21SL030C |
| C236 | Same as C219. | |

PARTS LIST (CONT)

LINEAR POWER AMPLIFIER, MODEL RFA-1C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|----------------------|---|-----------------|
| C237 thru C239 | Same as C209. | |
| C240 | Same as C220. | |
| C241 | Non-replaceable item. Part of XV203. | |
| C242 | Non-replaceable item. Part of XV204. | |
| C243 | Same as C220. | |
| C244 thru C246 | Same as C209. | |
| C247 | Same as C217. | |
| C248 | Same as C209. | |
| C249 | Same as C217. | |
| C250 | Same as C209. | |
| C251 | Same as C228. | |
| C252 thru C264 | Same as C206. | |
| C265 thru C267 | Same as C228. | |
| C268 | CAPACITOR, FIXED, PAPER DIELECTRIC: 1 uf, $\pm 10\%$; 600 WVDC. | CP69B1EF105K |
| C269 | Same as C227. | |
| C270 | Same as C227. | |
| C271 | Same as C228. | |
| C272 | Same as C227. | |
| C273 | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 100 uuf, $\pm 10\%$; 5,000 WVDC. Part of A201. | CC109-28 |

PARTS LIST (CONT)
 LINEAR POWER AMPLIFIER, MODEL RFA-1C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|------------|---|-----------------|
| C274 | Same as C209. | |
| C275 | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 3 uuf, $\pm 10\%$; 5,000 WVDC. | CC109-1 |
| C276A,B | CAPACITOR, VARIABLE, AIR DIELECTRIC: 30 to 950 uuf, no peak voltage rating; .125" shaft length. | CB125A950X |
| C277 | CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10 uuf, $\pm 10\%$; 5,000 WVDC. | CC109-5 |
| C278 | Same as C219. | |
| C279 | Same as C206. | |
| C280 | Same as C206. | |
| C281 | CAPACITOR, FIXED, MICA DIELECTRIC: 100 uuf, $\pm 2\%$; 500 WVDC. | CM15F101G03 |
| C282 | Same as C220. | |
| C283 | Same as C209. | |
| C284 | NOT USED | |
| C285 | Same as C206. | |
| CR201 | SEMICONDUCTOR DEVICE, DIODE: Silicon | 1N303 |
| CR202 | Same as CR201. | |
| CR203 | Same as CR201. | |
| CR204 | SEMICONDUCTOR DEVICE, DIODE: Germanium | 1N67 |
| CR205 | SEMICONDUCTOR DEVICE, DIODE: Silicon | 1N645A |
| EV201 | SHIELD, ELECTRON TUBE: heat dissipating; 2-1/2" high x 1" dia. | TS128-6 |
| F201 | FUSE, CARTRIDGE: 1 amp; time lag; 1-1/4" long x 1/4" dia.; slo-blo. (FOR 115 V OPERATION) | FU102-1 |
| F201 | FUSE, CARTRIDGE: 1/2 amp; time lag; 1-1/4" long x 1/4" dia.; slo-blo. (FOR 230 V OPERATION) | FU102-.5 |
| J201 | CONNECTOR, RECEPTACLE, ELECTRICAL: 12 male 5 amp contacts, 1 female HV, 5 amp contact. | JJ158P |

PARTS LIST (CONT)

LINEAR POWER AMPLIFIER, MODEL RFA-1C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|----------------------|--|-----------------|
| J202 | CONNECTOR, RECEPTACLE, ELECTRICAL: RF; 1 round female contact, straight type; series BNC to BNC. | UG625*/U |
| J203 | Same as J202. | |
| J204 | Same as J202. | |
| J205 | CONNECTOR, RECEPTACLE, ELECTRICAL: RF; 1 round female contact, straight type; series UHF. | S0239A |
| L201 | COIL, RADIO FREQUENCY: fixed; 120 uh, 4.65 ohms DC resistance; 250 ma current rating. | CL10006-6 |
| L202 thru L205 | Same as L201. | |
| L206 | COIL, RADIO FREQUENCY: fixed; 680 uh, 13 ohms DC resistance; 155 ma current rating. | CL10006-7 |
| L207 | COIL, RADIO FREQUENCY: fixed; 50 uh; resistance not rated, current not rated. | CL10013 |
| L208 | COIL, RADIO FREQUENCY: tuned; 16-32 Mc; nominal inductance .36 to .48 uh. | CL10029-1 |
| L209 | Same as L201. | |
| L210 | COIL, RADIO FREQUENCY: fixed; 27 uh, 2.8 ohms DC resistance; 300 ma current rating. | CL10006-2 |
| L211 | Same as L206. | |
| L212 | COIL, RADIO FREQUENCY: fixed; 50 uh; resistance not rated, current not rated. | CL10012 |
| L213 | Same as L206. | |
| L214 | Same as L210. | |
| L215 thru L217 | Same as L201. | |
| L218 | Same as L210. | |
| L219 | COIL, RADIO FREQUENCY: fixed; 8.5 uh, $\pm 10\%$; 1,000 ma current rating | CL10023-2 |

PARTS LIST (CONT)

LINEAR POWER AMPLIFIER, MODEL RFA-1C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|----------------------|--|-----------------|
| L220 | Same as L219. | |
| L221 | Same as L210. | |
| L222 | Same as L206. | |
| L223 | Same as L219. | |
| L224 | Same as L219. | |
| L225 | Same as L210. | |
| L226 | COIL, RADIO FREQUENCY: fixed; 1 uh, 0.3 ohms DC resistance; 1.050 ma current rating. | CL10006-3 |
| L227 | Same as L206. | |
| L228 thru L231 | Same as L201. | |
| L232 | COIL, RADIO FREQUENCY: fixed; 4.5 uh, $\pm 10\%$; 3,000 ma current rating. | CL10023-1 |
| L233 | Same as L232. | |
| L234 | Same as L201. | |
| L235 | Same as L201. | |
| L236 | COIL, RADIO FREQUENCY: fixed; 185 uh; operating frequency 790 Kc. | CL178 |
| L237 | Same as L201. | |
| L238 | NOT USED | |
| L239 thru L241 | Same as L210. | |
| M201 | AMMETER: 0-500 ma; linear scale, black scale, white background; RF type. | MR10003 |
| M202 | MULTIMETER: 0-2.5 amps; 0-5 volts; -20 to +30 V scale; 0-50 ua. | MR10002 |

PARTS LIST (CONT)
 LINEAR POWER AMPLIFIER, MODEL RFA-1C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|------------|--|-----------------|
| PS201 | SUPPRESSOR, PARASITIC: consists of one 1/2 watt, 39 ohm resistor; 4 turns of #22 wire. | AX161 |
| PS202 | SUPPRESSOR, PARASITIC: consists of one 2 watt, 12 ohm resistor; 2 turns of #18 wire. | AX164 |
| PS203 | SUPPRESSOR, PARASITIC: consists of one 1 watt, 47 ohm resistor; 2 turns of #22 wire. | AX162 |
| PS204 | Same as PS203. | |
| R201 | RESISTOR, FIXED, COMPOSITION: 5,600 ohms, $\pm 5\%$; 1/2 watt. | RC20GF562J |
| R202 | RESISTOR, FIXED, COMPOSITION: 2,200 ohms, $\pm 5\%$; 1/2 watt. | RC20GF222J |
| R203 | RESISTOR, FIXED, COMPOSITION: 8,200 ohms, $\pm 5\%$; 1/2 watt. | RC20GF822J |
| R204 | RESISTOR, FIXED, COMPOSITION: 2,700 ohms, $\pm 5\%$; 1/2 watt. | RC20GF272J |
| R205 | Same as R202. | |
| R206 | RESISTOR, FIXED, COMPOSITION: 180 ohms, $\pm 5\%$; 2 watts. | RC42GF181J |
| R207 | RESISTOR, FIXED, COMPOSITION: 47 ohms, $\pm 5\%$; 1/2 watt. | RC20GF470J |
| R208 | Same as R207. | |
| R209 | RESISTOR, FIXED, COMPOSITION: 33,000 ohms, $\pm 5\%$; 1/2 watt. | RC20GF333J |
| R210 | RESISTOR, FIXED, COMPOSITION: 220,000 ohms, $\pm 5\%$; 1/2 watt. | RC20GF224J |
| R211 | RESISTOR, FIXED, COMPOSITION: 12 ohms, $\pm 5\%$; 1/2 watt. | RC20GF120J |
| R212 | RESISTOR, FIXED, COMPOSITION: 560 ohms, $\pm 5\%$; 2 watts. | RC42GF561J |
| R213 | RESISTOR, VARIABLE, COMPOSITION: 50,000 ohms, $\pm 10\%$; 2 watts. | RV4LAYS A503A |
| R214 | RESISTOR, FIXED, COMPOSITION: 22,000 ohms, $\pm 5\%$; 1 watt. | RC32GF223J |
| R215 | Same as R214. | |

PARTS LIST (CONT)

LINEAR POWER AMPLIFIER, MODEL RFA-1C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|------------|---|-----------------|
| R216 | RESISTOR, VARIABLE, WIREWOUND: 0.5 ohms, $\pm 10\%$; 25 watts. | RA75AXAOR5AK-25 |
| R217 | RESISTOR, FIXED, COMPOSITION: 82,000 ohms, $\pm 5\%$; 1 watt. | RC32GF823J |
| R218 | RESISTOR, FIXED, COMPOSITION: 220 ohms, $\pm 5\%$; 2 watts. | RC42GF221J |
| R219 | RESISTOR, FIXED, COMPOSITION: 100 ohms, $\pm 5\%$; 2 watts. | RC42GF101J |
| R220 | RESISTOR, FIXED, COMPOSITION: 100,000 ohms, $\pm 5\%$; 1/2 watt. | RC20GF104J |
| R221 | Same as R213. | |
| R222 | RESISTOR, FIXED, COMPOSITION: 15 megohms, $\pm 5\%$; 1/2 watt. | RC20GF156J |
| R223 | RESISTOR, FIXED, COMPOSITION: 13,000 ohms, $\pm 5\%$; 1/2 watt. | RC20GF133J |
| R224 | Same as R203. | |
| R225 | RESISTOR, FIXED, COMPOSITION: 1.2 megohms, $\pm 5\%$; 1/2 watt. | RC20GF125J |
| R226 | RESISTOR, FIXED, COMPOSITION: 10 ohms, $\pm 5\%$; 1/2 watt. | RC20GF100J |
| R227 | Same as R202. | |
| R228 | Same as R213. | |
| R229 | RESISTOR, FIXED, COMPOSITION: 47,000 ohms, $\pm 5\%$; 1/2 watt. | RC20GF473J |
| R230 | RESISTOR, FIXED, COMPOSITION: 750,000 ohms, $\pm 5\%$; 1/2 watt. | RC20GF754J |
| R231 | Same as R202. | |
| R232 | RESISTOR, FIXED, COMPOSITION: 3,300 ohms, $\pm 5\%$; 1/2 watt. | RC20GF332J |
| R233 | RESISTOR, FIXED, COMPOSITION: 15,000 ohms, $\pm 5\%$; 1 watt. | RC32GF153J |
| R234 | Same as R203. | |

PARTS LIST (CONT)
 LINEAR POWER AMPLIFIER, MODEL RFA-1C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|----------------------|---|--------------------|
| R235 | RESISTOR, FIXED, COMPOSITION: 8,200 ohms, $\pm 5\%$; 1 watt. | RC32GF822J |
| R236 thru R336 | NOT USED | |
| R337 | RESISTOR, FIXED, COMPOSITION: 13,000 ohms, $\pm 5\%$; 1 watt. | RC32GF133J |
| R338 | Same as R203. | |
| S201A,B | WAFER, ROTARY SWITCH: 2 sections, 4 positions; contacts rated for 1 amp at 28 VDC or 5 amps at 110 VAC. | WS101 |
| S202 | SWITCH, ROTARY: 1 section, 2 pole, 4 positions; contacts rated for 0.5 amps at 115 VAC or 1 amp at 28VDC. Part of A201. | SW218 |
| S203A,B | SWITCH, ROTARY: 2 sections, 6 positions; contacts rated for 0.5 amps at 115 VAC or 1 amp at 28 VDC. | SW217 |
| S204 | SWITCH, PUSH/PULL: SPDT; current rating 5 amps at 250 VAC. | SW219 |
| S205 | Same as S204. | |
| T201 | TRANSFORMER, RADIO FREQUENCY: tuned; 2-4 Mc; 26-34 uh inductance. | CL10020 |
| T202 | TRANSFORMER, RADIO FREQUENCY: tuned; 4-8 Mc; 5.4-8.2 uh inductance. | CL10021 |
| T203 | TRANSFORMER, RADIO FREQUENCY: tuned; 8-16 Mc; 1.4-1.8 uh inductance. | CL10022 |
| T204 | Same as T201. | |
| T205 | Same as T202. | |
| T206 | Same as T203. | |
| T207 | TRANSFORMER, RADIO FREQUENCY: tuned; 16-32 Mc; 36-48 uh inductance, tapped. | CL10029-2 |
| T208 | TRANSFORMER, RADIO FREQUENCY: tuned; 16-32 Mc; tapped. | TF10020 |
| T209 | TRANSFORMER, RADIO FREQUENCY: w/silver solder 1/4" straps. Part of A201. | TF10019 |

PARTS LIST (CONT)

LINEAR POWER AMPLIFIER, MODEL RFA-1C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|------------|---|-----------------|
| T210 | TRANSFORMER, POWER, STEP-DOWN: primary 115 VAC, 50/60 cps (Hz), single phase; secondary 6.3 V at 2 amps and 6.9 V at 6 amps, center tap; insulated for 1,500 V. | TF180 |
| TB201 | TERMINAL BOARD, BARRIER: three 6-32 thd. x 1/4" long binding head machine screws. | TM102-3 |
| V201 | TUBE, ELECTRON: power pentode, 9 pin miniature. | 6CL6 |
| V202 | TUBE, ELECTRON: beam power, octal | 6146 |
| V203 | TUBE, ELECTRON | 4CX350A |
| V204 | Same as V203. | |
| W101 | FOR REFERENCE SEE PSP-350C PARTS LIST. | |
| XF201 | FUSEHOLDER: extractor post type; accommodates cartridge 1-1/4" long x 1/4" dia.; bushing mounted. | FH103 |
| XV201 | SOCKET, ELECTRON TUBE: 9 pin miniature. | TS103P01 |
| XV202 | SOCKET, ELECTRON TUBE: octal | TS101P01 |
| XV203 | SOCKET, ELECTRON TUBE: air system; grounded cathode; 9 pin contact; consists of one, 1,100 uuf silver mica capacitor, C241. | TS132 |
| XV204 | Same as XV203. Consists of capacitor, C242. | |

PARTS LIST
for
POWER SUPPLY, MODEL PSP-350C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|------------------------|--|--------------------|
| C101 | CAPACITOR, FIXED, PAPER DIELECTRIC: 4 uf, $\pm 10\%$; 600 WVDC. | CP41B1FF405K |
| C102 | Same as C101. | |
| C103 | CAPACITOR, FIXED, ELECTROLYTIC: 50 uf; 50 WVDC; polarized. | CE63C500G |
| C104 | CAPACITOR, FIXED, PAPER DIELECTRIC: 4 uf, $\pm 10\%$; 3,000 WVDC. | CP70E1FL405K |
| C105 | Same as C104. | |
| C106 | Same as C104. | |
| C107 | CAPACITOR, FIXED, MYLAR DIELECTRIC: 0.1 uf, $\pm 10\%$; 600 WVDC. | CN100-22 |
| C108 | CAPACITOR, FIXED, PAPER DIELECTRIC: 2 uf, $\pm 10\%$; 100 WVDC. | CP531EF205K |
| C109 | Same as C108. | |
| C110 | CAPACITOR, FIXED, ELECTROLYTIC: 20 uf, 250 WVDC; polarized. | CE116-4VN |
| CB101 | CIRCUIT BREAKER: dual; DPST; contacts rated for 7.5 amps at 230 VAC, 15 amps at 115 VAC; 60 cps; toggle lever type; manual reset. | SW298 |
| CB102 | CIRCUIT BREAKER: SPST; contacts rated for 15 amps at 250 VAC, 50/60 cps; coil rated at 0.1 amps DC; insulated for 1,500 V; shunt trip release; instantaneous toggle lever type; overload protection; manual reset. | SW215 |
| CR101 | SEMICONDUCTOR DEVICE, DIODE: Zener | 1N3006RB |
| CR102 thru CR104 | NOT USED | |
| CR105 | SEMICONDUCTOR DEVICE, DIODE: Silicon; PIV 3,600 volts; average forward current 250 ma at 25°C; operating temperature range -65°C to +150°C; high voltage rectifier type. | DD112-1 |
| CR106 | Same as CR105. | |

PARTS LIST (CONT)
POWER SUPPLY, MODEL PSP-350C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|------------------------|--|--------------------|
| CR107 | SEMICONDUCTOR DEVICE, DIODE: halfwave rectifier; PRV 5,000 volts; average forward current 625 ma at 60°C; 3,500 WVRMS. | DD133-5000-625 |
| CR108 | Same as CR107. | |
| DS101 | LAMP, NEON: 105/125 V, 1/2 watt; miniature bayonet base, T-3-1/4 bulb. | BI100-51H |
| DS102 thru DS104 | Same as DS101. | |
| EK101 | SHIELD, ELECTRON TUBE: 9 pin miniature; 2-3/8" high x 1.065" base dia. | TS103-U03 |
| EV101 | NOT USED | |
| EV102 | SHIELD, ELECTRON TUBE: 2-1/2" high x 0.875" base dia. | TS128-3 |
| EV103 thru EV105 | Same as EV102. | |
| F101 | FUSE, CARTRIDGE: 1 amp; 1-1/4" long x 1/4" dia.; slo-blo. (FOR 115 VOLT OPERATION) | FU102-1 |
| F101 | FUSE, CARTRIDGE: 1/2 amp; 1-1/4" long x 1/4" dia.; slo-blo. (FOR 230 VOLT OPERATION) | FU102-.5 |
| F102 | FUSE, CARTRIDGE: 3/16 amp; 1-1/4" long x 1/4" dia.; slo-blo. (FOR DC OPERATION) | FU102-.187 |
| J101 | CONNECTOR, RECEPTACLE, ELECTRICAL: 2 half round male contacts, straight type; twist lock. | JJ175 |
| J102 | CONNECTOR, RECEPTACLE, ELECTRICAL: twelve 5 amp contacts; 1 HV 5 amp male contact. | JJ158S |
| K101 | RELAY, THERMAL: SPST; delay type; 60 sec., <u>+12</u> sec.; heater voltage 6.3 VAC; contact rating 2 amps at 115 volts or 1 amp at 220 volts; non-inductive; 1,000 V contact to contact breakdown; temperature range -55°C to +70°C; glass case, 9 pin miniature base. | RL111-6N060T |
| K102 | RELAY, PLATE: 5PST; 500 ohms, 115 VDC; contact rating 25 amps. | RL114 |

PARTS LIST (CONT)

POWER SUPPLY, MODEL PSP-350C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|------------|---|-----------------|
| K103 | RELAY, ARMATURE: 10,000 ohms coil resistance; contacts rated for 5 amps at 150 V; 120 volts DC; non-inductive. | RL116DC3C120 |
| K104 | RELAY, ARMATURE: SPST; 4,000 ohms, $\pm 10\%$; 48 VDC; DC coil power 500 mw nominal, 2 watts for continuous duty. | RL176-1 |
| L101 | REACTOR: 15 h; 285 ohms DC resistance; 85 ma DC; insulated for 2,500 V RMS; hermetically sealed case. | TF5000 |
| L102 | Same as L101. | |
| L103 | REACTOR: inductance range 7 to 25 Hys; DC current rating 80 to 300 ma; test voltage 6,000 V RMS; hermetically sealed case. | TF5031 |
| L104 | REACTOR: 7 Hy; DC current rating 300 ma; DC resistance 50 ohms; hermetically sealed case. | TF190 |
| P101 | CONNECTOR, PLUG, ELECTRICAL: twelve male contacts, rated for 5 amps, one HV 5 amp female contact. Part of W101. | PL160S |
| P102 | CONNECTOR, PLUG ELECTRICAL: twelve male contacts, rated for 5 amps, one HV 5 amp female contact; Part of W101. | PL160P |
| P103 | CONNECTOR, PLUG, ELECTRICAL: two female contacts, rated for 10 amps at 250 volts; polarized; twist lock type. Part of W102. | PL176 |
| P104 | CONNECTOR, PLUG, ELECTRICAL: AC power; 3 prong male contacts, with removeable ground connection; polarized; Part of W102. | PL218 |
| R101 | RESISTOR, FIXED, COMPOSITION: 2,200 ohms, $\pm 5\%$; 2 watts. | RC42GF222J |
| R102 | RESISTOR, FIXED, WIREWOUND: 10,000 ohms, $\pm 5\%$; 10 watts. | RW109-34 |
| R103 | RESISTOR, FIXED, COMPOSITION: 100,000 ohms, $\pm 5\%$; 2 watts. | RC42GF104J |
| R104 | RESISTOR, FIXED, WIREWOUND: 45,000 ohms, $\pm 5\%$; 10 watts. | RW109-42 |

PARTS LIST (CONT)
POWER SUPPLY, MODEL PSP-350C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|----------------------|---|--------------------|
| R105 | RESISTOR, FIXED, WIREWOUND: 40,000 ohms, $\pm 5\%$; 50 watts. | RW105-37 |
| R106 | RESISTOR, FIXED, COMPOSITION: 56 ohms, $\pm 5\%$; 2 watts. | RC42GF560J |
| R107 | RESISTOR, FIXED, WIREWOUND: 100,000 ohms, $\pm 5\%$; 20 watts. | RW110-43 |
| R108 | RESISTOR, FIXED, COMPOSITION: 470,000 ohms, $\pm 5\%$; 2 watts. | RC42GF474J |
| R109 | RESISTOR, FIXED, COMPOSITION: 20 megohms, $\pm 5\%$; 2 watts. | RC42GF206J |
| R110 thru R113 | Same as R109. | |
| R114 | RESISTOR, FIXED, COMPOSITION: 220,000 ohms, $\pm 5\%$; 2 watts. | RC42GF224J |
| R115 | RESISTOR, FIXED, WIREWOUND: 20 ohms, $\pm 5\%$; 5 watts. | RW107-11 |
| R116 | RESISTOR, VARIABLE, COMPOSITION: 100 ohms, $\pm 10\%$; 25 watts. | RA75AXA101AK-25 |
| R117 | RESISTOR, FIXED, COMPOSITION: 43 ohms, $\pm 5\%$; 2 watts. | RC42GF430J |
| R118 | RESISTOR, FIXED, WIREWOUND: 7,500 ohms, $\pm 5\%$; 20 watts. | RW110-32 |
| R119 | NOT USED | |
| R120 | Same as R105. | |
| R121 thru R123 | NOT USED | |
| R124 | RESISTOR, FIXED, WIREWOUND: 12,500 ohms, 50 watts. | RW105-31 |
| R125 thru R127 | Same as R124. | |
| S101 | SWITCH, INTERLOCK: SPDT; 250 VAC, 5 amps. | SW219 |
| S102 | Same as S101. | |

PARTS LIST (CONT)
POWER SUPPLY, MODEL PSP-350C

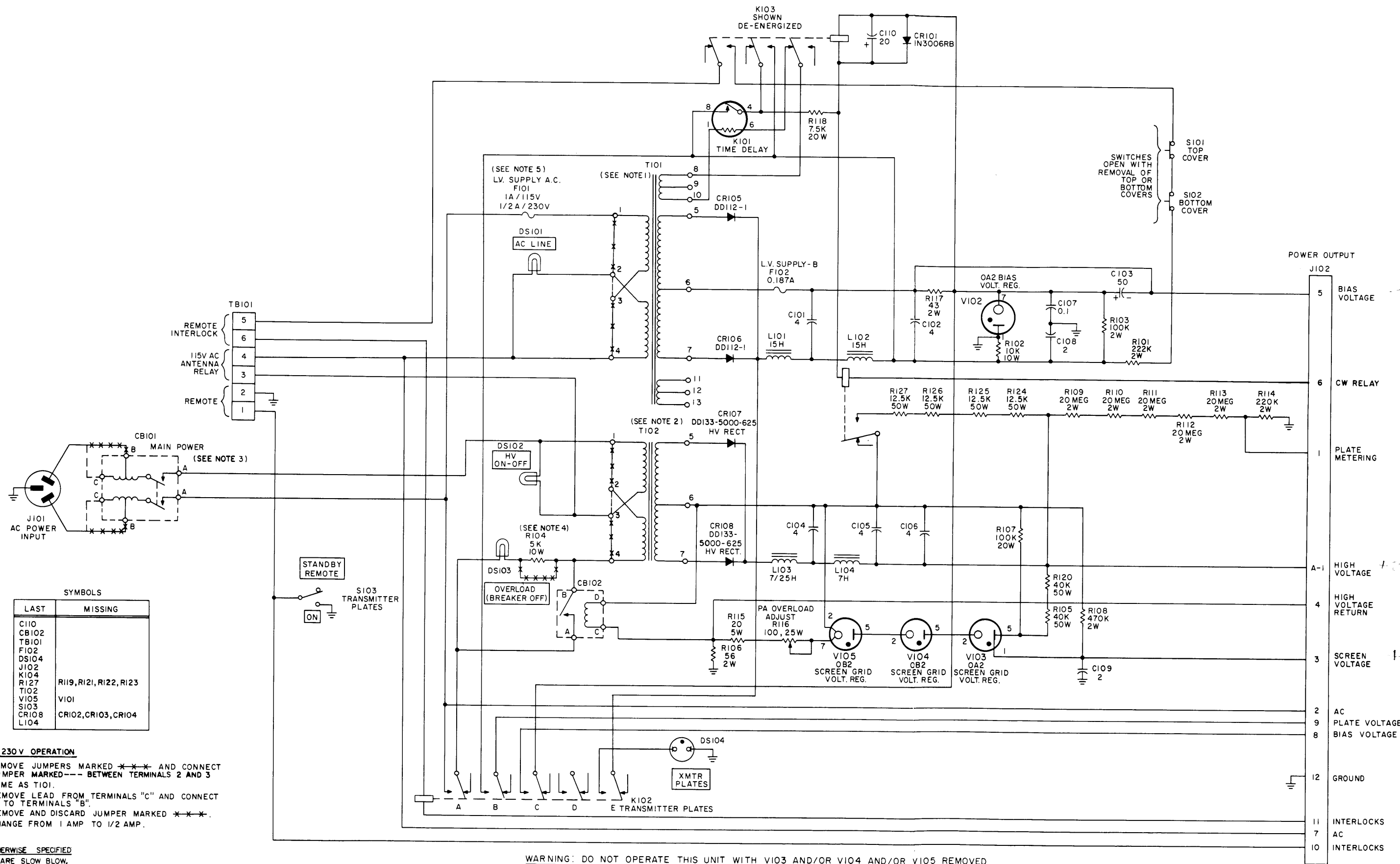
| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|---------------|--|--------------------|
| S103 | SWITCH, TOGGLE: SPST; 28° angle of throw; bat type handle. | ST12A |
| T101 | TRANSFORMER, POWER, STEP-UP/STEP-DOWN: primary 115/230 VAC, 50/60 cps, single phase; secondary #1, terminals (5,6,7,) 811 V at 100 ma; #2 terminals (8, 9) 5V at 2 amps; terminals (11,12,13,) 2.5 V at 10 amps, CT; terminals (8,10) 6.3 V at 2 amps; hermetically sealed case. | TF181 |
| T102 | TRANSFORMER, POWER, STEP-UP: primary 115/230 VAC; 50/60 cps, single phase; secondary 4,800 V, CT/300 MADC; hermetically sealed steel case. | TF189 |
| TB101 | TERMINAL BOARD, BARRIER: six 6-32 thd x 1/4" long binding head machine screws; black phenolic body. | TM100-6 |
| V101 | NOT USED | |
| V102 | TUBE, ELECTRON | OA2 |
| V103 | Same as V102. | |
| V104 | TUBE, ELECTRON | OB2 |
| V105 | Same as V104. | |
| W101 | CABLE ASSEMBLY, ELECTRICAL: Power; consists of two connectors, P101,P102. (SUPPLIED AS A LOOSE ITEM) | CA10136-110 |
| W102 | CABLE ASSEMBLY, ELECTRICAL: Power; consists of 7" length of 2 conductor rubber covered wire; two connectors, P103, P104. (SUPPLIED AS A LOOSE ITEM) | CA555-3 |
| XDS101 | LIGHT, INDICATOR: w/white translucent lens. | TS185-3 |
| XDS102 | LIGHT, INDICATOR: w/red lens. | TS185-1 |
| XDS103 | LIGHT, INDICATOR: w/yellow lens. | TS185-2 |
| XDS104 | Same as XDS102. | |
| XF101 | FUSEHOLDER: extractor post type; accommodates cartridge fuse 1-1/4" long x 1/4" dia. | FH103 |
| XF102 | Same as XF101. | |
| XV101 | NOT USED | |

PARTS LIST (CONT)
POWER SUPPLY, MODEL PSP-350C

| REF SYMBOL | DESCRIPTION | TMC PART NUMBER |
|------------------------|---|--------------------|
| XV102 | SOCKET, ELECTRON TUBE: 7 pin miniature. | TS102P01 |
| XV103 thru XV105 | Same as XV102. | |

SECTION 7

SCHEMATIC DIAGRAMS



SYMBOLS

| LAST | MISSING |
|-------|------------------------|
| C110 | |
| CB102 | |
| TB101 | |
| F102 | |
| DS104 | |
| J102 | |
| K104 | |
| R127 | R119, R121, R122, R123 |
| T102 | |
| V105 | V101 |
| S103 | |
| CR108 | CR102, CR103, CR104 |
| L104 | |

- NOTE: FOR 230V OPERATION**
- 1- T101 REMOVE JUMPERS MARKED * * * * AND CONNECT JUMPER MARKED --- BETWEEN TERMINALS 2 AND 3
 - 2- T102 SAME AS T101.
 - 3- CB101 REMOVE LEAD FROM TERMINALS "C" AND CONNECT IT TO TERMINALS "B".
 - 4- R104 REMOVE AND DISCARD JUMPER MARKED * * * *.
 - 5- F101 CHANGE FROM 1 AMP TO 1/2 AMP.

UNLESS OTHERWISE SPECIFIED
 ALL FUSES ARE SLOW BLOW.
 TB101 NO.5 AND 6 NORMALLY JUMPED UNLESS REMOTE INTERLOCKING IS REQUIRED.
 ALL RESISTORS ARE IN OHMS 1/2 WATT.
 ALL CAPACITORS ARE IN MICROFARADS.

WARNING: DO NOT OPERATE THIS UNIT WITH V103 AND/OR V104 AND/OR V105 REMOVED

Figure 7-2. Power Supply Assembly, PSP-350C

S201-A, B DRIVER BAND SWITCH

| POS | BAND (Mcs) |
|-----|------------|
| 1 | 2-4 |
| 2 | 4-8 |
| 3 | 8-16 |
| 4 | 16-32 |

S202 BANDSWITCH

| POS | BAND (Mcs) |
|-----|------------|
| 1 | 2-2.5 |
| 2 | 2.5-3 |
| 3 | 3-4 |
| 4 | 4-6 |
| 5 | 6-8 |
| 6 | 8-12 |
| 7 | 12-16 |
| 8 | 16-24 |
| 9 | 24-32 |

UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE IN OHMS, 1/2 W ALL CAPACITORS ARE IN μ F ALL COILS & TRANSFORMERS ARE IN μ H

CHANGES NECESSARY TO CONVERT TO 250V OPERATION.
 - F201 CHANGED FROM 1AMP TO 1/2 AMP
 - T201 REMOVE JUMPERS MARKED *** & CONNECT A JUMPER BETWEEN TERMINALS 2 & 3

* C241 & C242 ARE INTEGRAL PARTS OF V203 & V204 SOCKETS.

S203 A, B MULTI-METER SWITCH

| POS | METER READING | SECTION |
|-----|------------------|---------|
| 1 | (FIL) 0-10V | PA |
| 2 | (HV) 0-5KV | PA |
| 3 | (Isg) -30 + 30MA | PA |
| 4 | (DR) 0 - 50V | RF |
| 5 | (FL) 0-25KV | RF |
| 6 | (OUT) 0-500V | RF |

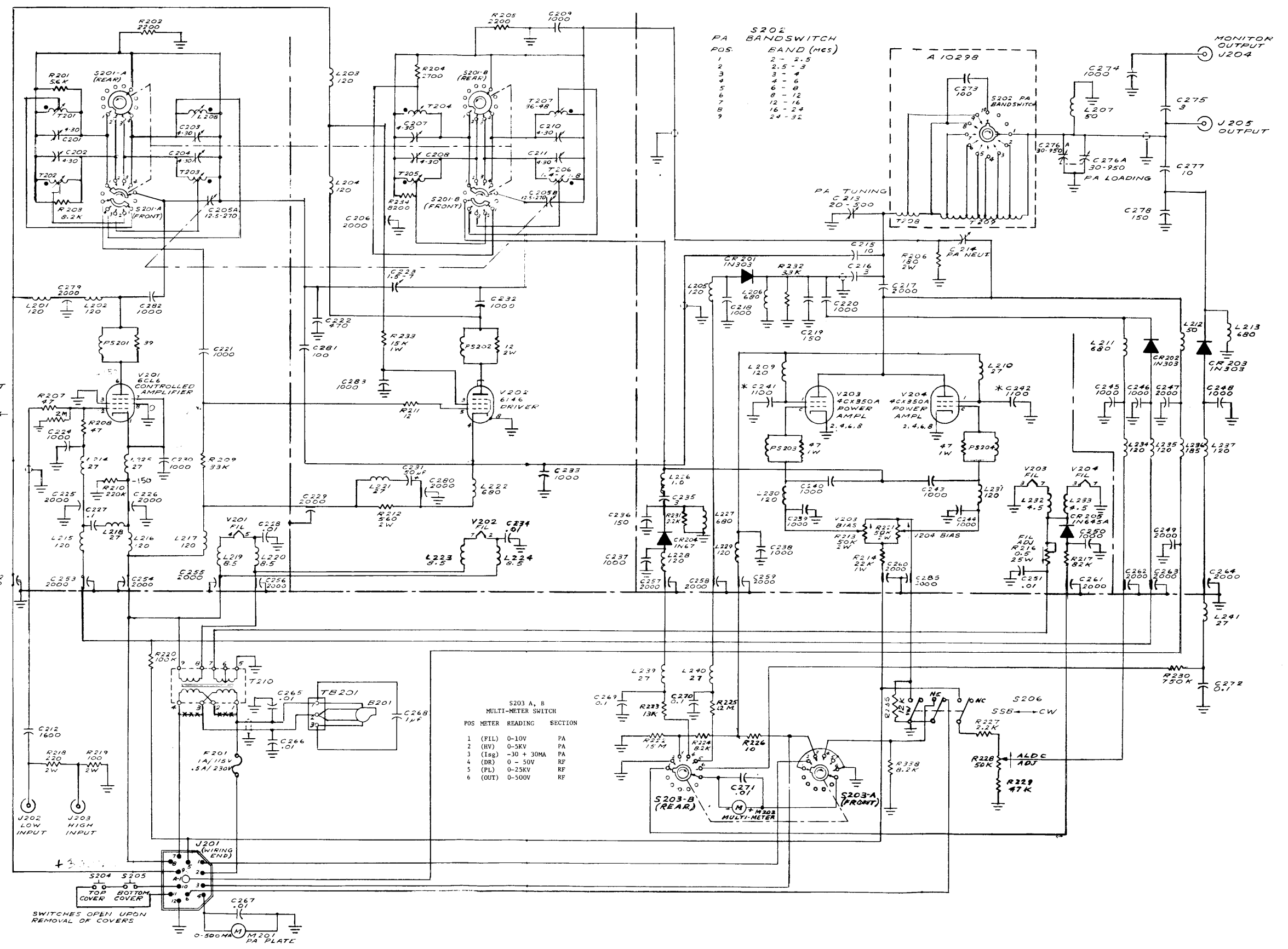


Figure 7-1. Linear RF Amplifier, RFA-1C