TECHNICAL MANUAL

FOR

RADIO TRANSMITTER

MODELS GPT-750F-2, GPT-750G-2 AND GPT-750H-2

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

THE TECHNICAL MATERIEL CORPORATION
COMMUNICATIONS ENGINEERS
700 FENIMORE ROAD MAMARONECK, N. Y.

Warranty

The Technical Materiel Corporation, hereinafter referred to as TMC, warrants the equipment (except electron tubes,* fuses, lamps, batteries and articles made of glass or other fragile or other expendable materials) purchased hereunder to be free from defect in materials and workmanship under normal use and service, when used for the purposes for which the same is designed, for a period of one year from the date of delivery F.O.B. factory. TMC further warrants that the equipment will perform in a manner equal to or better than published technical specifications as amended by any additions or corrections thereto accompanying the formal equipment offer.

TMC will replace or repair any such defective items, F.O.B. factory, which may fail within the stated warranty period, PROVIDED:

1. That any claim of defect under this warranty is made within sixty (60) days after discovery thereof and that inspection by TMC, if required, indicates the validity of such claim to TMC's satisfaction.
2. That the defect is not the result of damage incurred in shipment from or to the factory.
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.
4. That any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

Electron tubes* furnished by TMC, but manufactured by others, bear only the warranty given by such other manufacturers. Electron tube warranty claims should be made directly to the manufacturer of such tubes.

TMC's obligation under this warranty is limited to the repair or replacement of defective parts with the exceptions noted above.

At TMC's option any defective part or equipment which fails within the warranty period shall be returned to TMC's factory for inspection, properly packed with shipping charges prepaid. No parts or equipment shall be returned to TMC, unless a return authorization is issued by TMC.

No warranties, express or implied, other than those specifically set forth herein shall be applicable

and remedy. In no event does TMC assume any liability for consequential damages or
or expense directly or indirectly arising from the use of TMC Products, or any in-
m either separately or in combination with other equipment or materials or from any

Buyers sole right
for loss, damage
ability to use the
other cause.

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

Should it be necessary to return equipment or material for repair or replacement, whether within warranty or otherwise, a return authorization must be obtained from TMC prior to shipment. The request for return authorization should include the following information:

1. Model Number of Equipment.
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.

PROCEDURE FOR ORDERING REPLACEMENT PARTS

When ordering replacement parts, the following information must be included in the order as applicable:

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.

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

TMC's Warranty specifically excludes damage incurred in shipment to or from the factory. In the event equipment is received in damaged condition, the carrier should be notified immediately. Claims for such damage should be filed with the carrier involved and not with TMC.

All correspondence pertaining to Warranty Claims, return, repair, or replacement and all material or equipment returned for repair or replacement, within Warranty or otherwise, should be addressed as follows:

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

Addendum to Technical
Manual for Models GPT-750D-2
and GPT-750E-2 (IN-315)

RADIO TRANSMITTER

MODELS GPT-750 F-2, GPT-750 G-2 AND GPT-750 H-2

With the exception of the sideband exciters, Radio Transmitters GPT-750 F-2, GPT-750 G-2 and GPT-750 H-2 are similar to Radio Transmitters GPT-750 D-2 and GPT-750 E-2.

The existing technical manual (IN-315) for GPT-750 D-2 and GPT-750 E-2 will apply as written with the following exceptions:

1. GPT-750 F-2 uses Sideband Exciter SBE-8.
2. GPT-750 G-2 uses Sideband Exciter SBE-9.
3. GPT-750 H-2 uses Sideband Exciter SBE-10.

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

CHANGE NO. 1 GPT-750 D2 & GPT-750 E2

INSTRUCTION BOOK CHANGE NOTICE

Date 5/19/65

Manual affected: Technical Manual for Radio Transmitter, Model GPT-750 D2 & GPT-750 E2 IN -315

1. Change paragraph 6-3c., on pages 6-5 and 6-6, as follows:

   a. Step 1, from: "...indicator reads 2000 kc.," to "...indicator reads 1900 kc."

   b. CAUTION, step 6 from: "2000.000 kc," to: "1900.000 kc." The error is in two places; correct both.

2. Change figure 6-9, pages 6-19/6-20, as follows:

   a. Neatly cut out figure 1 (attached to this change notice) and appropriately affix it to figure 6-9 in the manual.

   b. Add the following as NOTE 5: UNLESS OTHERWISE SPECIFIED, ALL IDENTICALLY NUMBERED FRONT AND REAR TERMINALS ON SECTION A, OR SECTION B, OR SECTION C OF SWITCH S601 ARE ELECTRICALLY CONNECTED.

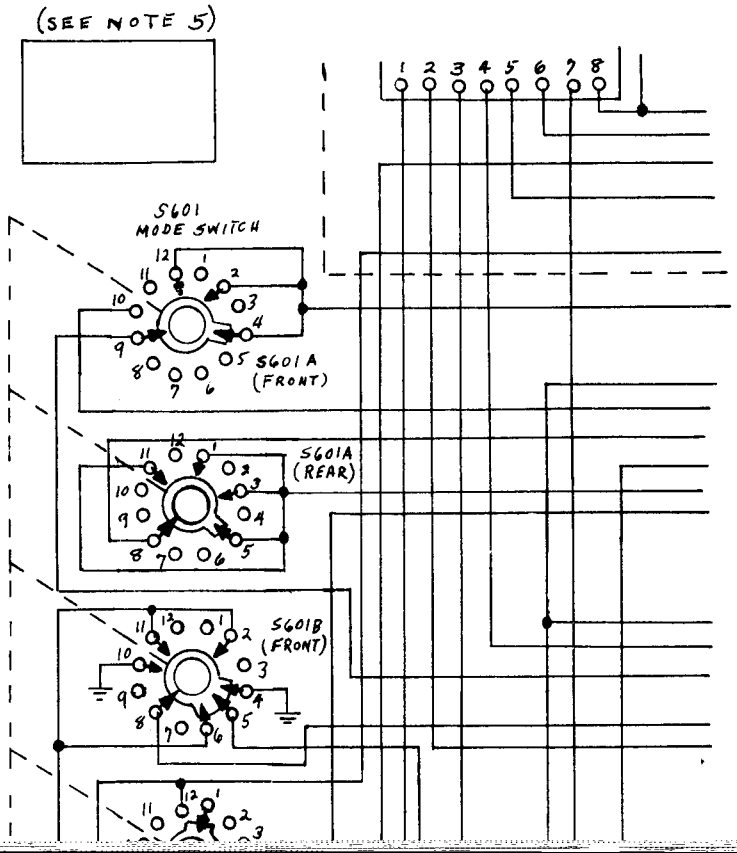
   c. Reverse diodes CR601 and CR602; they are drawn backwards.

3. Neatly cut out figure 2 (attached to this change notice) and appropriately affix it to figure 6-11 in the manual. (EMN 12880)

4. Change the parts list, page 7-19, as follows: (EMN 11585)

   a. Delete description for C608.

   b. Write the following description for C608: CAPACITOR: fixed:


(SEE NOTE 5)
S601
MODE SWITCH
S601A
(FRONT)
S601A
(REAR)
S601B
(FRONT)

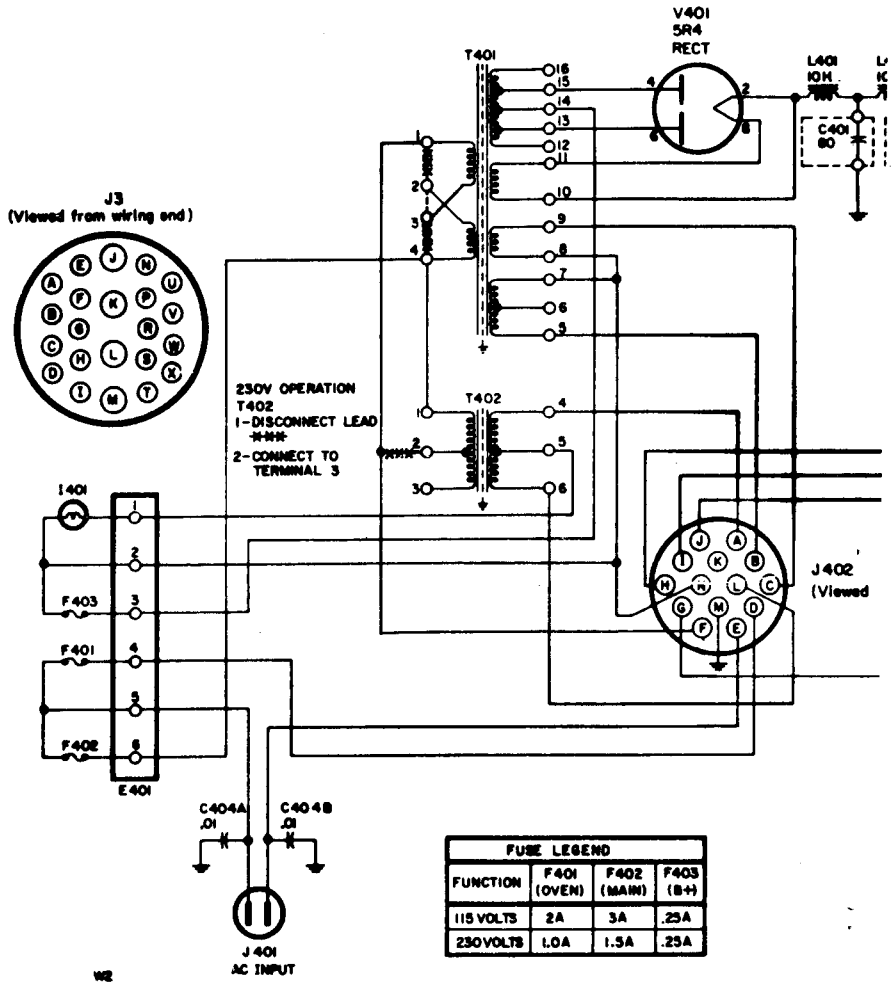

V401
5R4
RECT
T401
L401
10H
C401
60
J3
(Viewed from wiring end)
230V OPERATION
T402
1-DISCONNECT LEAD
2-CONNECT TO
TERMINAL 3
T402
I401
F403
F401
F402
E401
C404A
.01
C404B
.01
J401
AC INPUT
J402
(Viewed
FUSE LEGEND
FUNCTION
F401 (OVEN)
F402 (MAIN)
F403 (B+)
115 VOLTS
2A
3A
.25A
230 VOLTS
1.0A
1.5A
.25A

Figure 2

GPT-750D2

CHANGE NO. 2 GPT-750E2

INSTRUCTION BOOK CHANGE NOTICE

Date 3/9/66

Manual affected: Radio Transmitter, Models GPT-750D2 IN -315
and GPT-750E2 (Issue Date: 1 April 1964)

Page 6-6.

Change paragraph 6-5b to read as follows:

b. The following items should be cleaned with a soft cloth and trichloroethylene or ethylenedichloride.

CHANGE NO. 3 GPT-750 D-2
GPT-750 E-2

INSTRUCTION BOOK CHANGE NOTICE

Date 9/16/66

Manual affected: Radio Transmitter, Models IN -315
GPT-750 D-2 and GPT-750 E-2 (Issue Date: 1 April 1964)

Page 2-3. Paragraph 2-5 a.

Change the third sentence of paragraph 2-5 a. to read:

Relay TRL-3 is supplied for use with coaxial transmission lines of 50-ohm characteristic impedance; the TRL-4 is supplied for use with 70-ohm impedance coaxial transmission line.

15-16

SHOULD ADDITIONAL COPIES OF THIS CHANGE NOTICE BE REQUIRED, PLEASE CONTACT:

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

Attn: Director of Eng. Services

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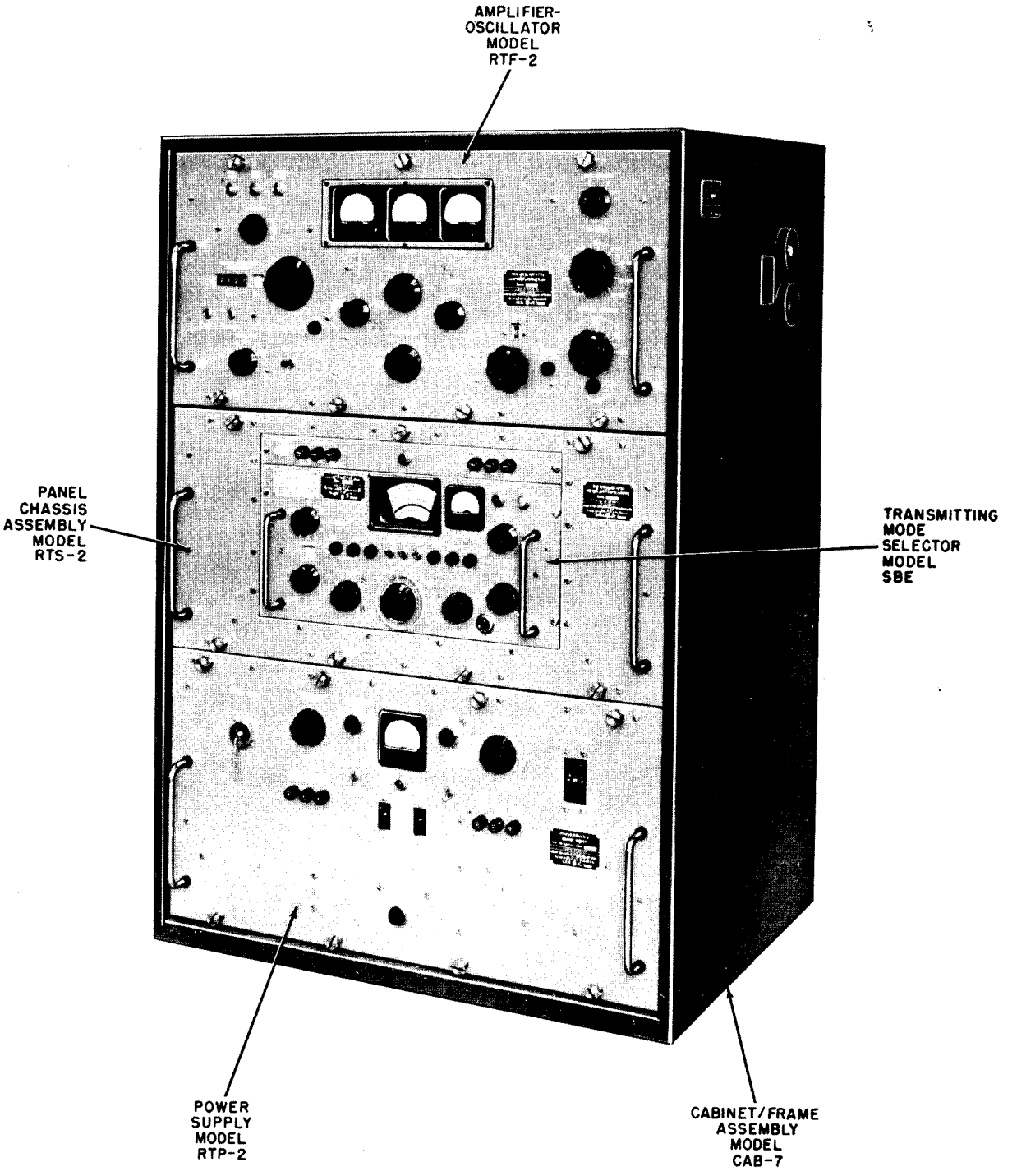


Figure 1-1. Radio Transmitters, Models GPT-750D-2 and GPT-750E-2

SECTION 1
GENERAL DESCRIPTION

1-1. SCOPE OF MANUAL.

a. This manual covers Radio Transmitter Model GPT-750D-2 and Model GPT-750E-2 (figure 1-1). The information contained in this manual is presented on a system basis and will aid operating and maintenance personnel in realizing the full performance capabilities of the equipment. An individual equipment manual covering the sideband exciter is also provided; depending on the radio transmitter model supplied. Refer to table 1-1. When detailed information regarding one of the units covered in the individual equipment manual is required, reference is made to the applicable equipment manual. Complete description, installation, system and unit trouble-shooting and maintenance instructions, and a parts list in the individual equipment manual provide all information required to order any repair part of the equipment.

b. With the exception of the exciter unit, the two models covered in this manual are identical. The difference in the models due to the exciter are explained later in this section. For the most part, the procedures and descriptions contained in this manual are applicable to both models; where there are differences, they are carefully pointed out.

TABLE 1-1. LIST OF MANUALS SUPPLIED

Technical Manual for Radio Transmitter Model GPT-750D-2, and Radio Transmitter Model GPT-750E-2.
Technical Manual for Transmitting Mode Selector Model SBE-2 (supplied with Model GPT-750D-2 only).
Technical Manual for Transmitting Mode Selector Model SBE-3 (supplied with Model GPT-750E-2 only).

1-2. DESCRIPTION.

a. The TMC Radio Transmitter Model GPT-750D-2 and Radio Transmitter Model GPT-750E-2 are designed and constructed on a modular basis. The two radio transmitters are similar; both employ the same Cabinet/Frame Assembly Model CAB-7, Amplifier-Oscillator Model RTF-2, Power Supply Model RTP-2, and Panel Chassis Assembly Model RTS-2. The difference between the two radio transmitters is in the exciters used for each; the Model GPT-750D-2 uses a Transmitting Mode Selector Model SBE-2, and the Model GPT-750E-2 uses the Model SBE-3. The audio bandpass characteristic of the exciters differs, which accounts for the differences in the two models of the radio transmitter. These differences are indicated in table 1-2, Technical Characteris_ics.

b. The two radio transmitters operate in the frequency range 2 to 32 mc, with AM, CW, SSB, or ISB emission. The power output varies, depending upon the type of emission; maximum power output is 1000 watts. Operation in the MCW mode is possible with the use of an external source of keying tone, such as the TMC Remote Control Amplifier Model RTC.

c. The radio transmitter is completely contained in a reinforced steel cabinet equipped with cross braces and track slides for support of the three drawer components. The cabinet, an integral part of the transmitter, may be supplied with a reinforced steel base or mounted on heavy duty shock mounts. The main power transformer is mounted on the bottom of the cabinet. The rear panel of the center section contains the blower, input and output connection terminals and plugs, and the terminal boards containing power supply and RF filter components. The antenna and RF monitor connections are located on the right side of the cabinet. The antenna connector is a type UG-560/U coaxial connector; the monitor connector is a UHF type.

d. The lower drawer (figure 1-1) contains the Power Supply Model RTP-2 which provides operating Power for the Amplifier-Oscillator. Eight captive screws secure the unit in the cabinet. All operating controls and indicators are mounted on the front panel; other adjustments are located in the relay deck and on the main power supply chassis. Handles on the front panel facilitate removal of the unit or opening the drawer for access to the internal adjustments.

e. The center drawer consists of the Panel Chassis Assembly Model RTS-2 which contains the exciter unit, Model SBE. Power for the exciter unit supplied from the built-in power supply of the RTS-2. Power fuses, a power indicator lamp, and an RF monitor jack are located on a panel just above the exciter unit. This panel is part of the RTS-2. There are no internal adjustments on the power supply. The exciter unit slides into the panel and chassis assembly on the RTS-2, and is secured by four captive screws. All interconnections between the exciter and the RTS-2 and the transmitter are made through connectors and terminals accessible at the rear of the unit.

f. The Transmitting Mode Selectors Models SBE are filter-type sideband exciters. Each exciter provides at least 1 watt PEP for single or independent sideband operation, or 0.5-watt average power for other modes of operation. The exciters develop single or independent sideband transmissions with any degree of carrier insertion. The exciters are completely described in individual manuals supplied for the particular model radio transmitter.

g. The Amplifier-Oscillator Model RTF-2 comprises the top drawer of the radio transmitter. This

TABLE 1-2. TECHNICAL CHARACTERISTICS

Operating Frequency Range:	2 mc to 32 mc
Power Output:	1000 watts CW 750 watts PEP, sideband
Types of Emission:	CW; AM; ISB; SSB carrier
RTF-2 Crystal Oscillator Characteristics:	
Frequency Range:	2 to 4 mc
Number of Crystals:	3, selected from front panel
Type of Crystal:	CR-18/U
Master Oscillator Characteristics:	
Frequency Range:	2 to 4 mc continuously tunable
Stability:	Better than 20 cps/mc for a 30° C change in ambient temperature.
Line Voltage Effect:	Not more than 10 cps for a ±10% line voltage variation.
Oscillator Calibration:	Direct reading in cps.
Readability:	20 cps/mc
Frequency Calibration:	Oven-controlled 100-kc oscillator provides check points every 50 kc. Oscillator may be calibrated against primary standard.
Zero Beat Indication:	50-kc check points on neon light null indicator. Aural check points available with use of headset in PHONES jack.
Average Plate Efficiency	At least 50%
Signal to Distortion Ratio:	35 db at 750 watts PEP on standard 2 tone test 40 db at 500 watts PEP on standard 2 tone test
Output Impedance:	30 to 1000 ohms at angle 0° (equivalent SWR: 1:1); 50 to 700 ohms at angle +45° (equivalent SWR: 4:1) all unbalanced to ground.
Audio input:	Two independent 600-ohm channels, balanced or unbalanced.
Audio Response per Sideband Model GPT-750D-2 using Model SBE-2 exciter:	Within ±1.5 db from 350 cps to 3300 cps.
Model GPT-750E-2 using Model SBE-3 exciter:	Within ±1.5 db from 250 cps to 7500 cps.
Overload and Bias Protection:	Automatic protection.
Cooling:	Forced filtered air from two blowers; one in cabinet, one in RTF-2 power amplifier section.
Primary Power:	115/230 volts, 50/60 cps, single phase, approximately 2600 watts at -0.87 power factor.
Overall Dimensions:	Height - 47 in. without base or shock mounts 50-3/4 in. with base 49-3/8 in. with shock mounts Width - 37-5/8 in. Depth - 28-1/2 in. Weight - 822 lbs.

TABLE 1-2. TECHNICAL CHARACTERISTICS (CONT)

Unit Dimensions:	
Amplifier-Oscillator Model RTF-2:	Height - 14 in. Width - 31-1/4 in. Depth - 25 in. Weight - 108 lbs
Panel Chassis Assembly: (Including Exciter)	Height - 14 in. Width - 31-1/4 in. Depth - 21-1/4 in. Weight - 97 lbs
Power Supply Model RTP-2:	Height - 15-3/4 in. Width - 31-1/4 in. Depth - 24-1/2 in. Weight - 171 lbs

unit consists of a master oscillator, crystal oscillator, multiplier section, power amplifier, interconnect chassis and the front panel assembly. It is secured in the cabinet by seven captive screws. Operating controls and indicators are located on the front panel and on the chassis; other maintenance and periodic adjustment controls are located on the various subchassis. A lamp installing tool is supplied with the unit and is secured in a clip on the rear of the master oscillator housing; three hex wrenches for the various size setscrews are mounted in clips on the right side of the power amplifier housing.

1-3. FUNCTIONAL SYSTEM DESCRIPTION.

a. Figure 1-2 is a simplified block diagram of the SSB radio transmitting systems. The RTF-2 is shown as consisting basically of a master oscillator, amplifiers and power amplifier; the exciter unit basically comprises dual channel audio circuits, midfrequency and high frequency circuits; the power supply contains the high voltage, midvoltage, and two low voltage supplies, one for low level plate and screen voltage, and the other for bias voltages.

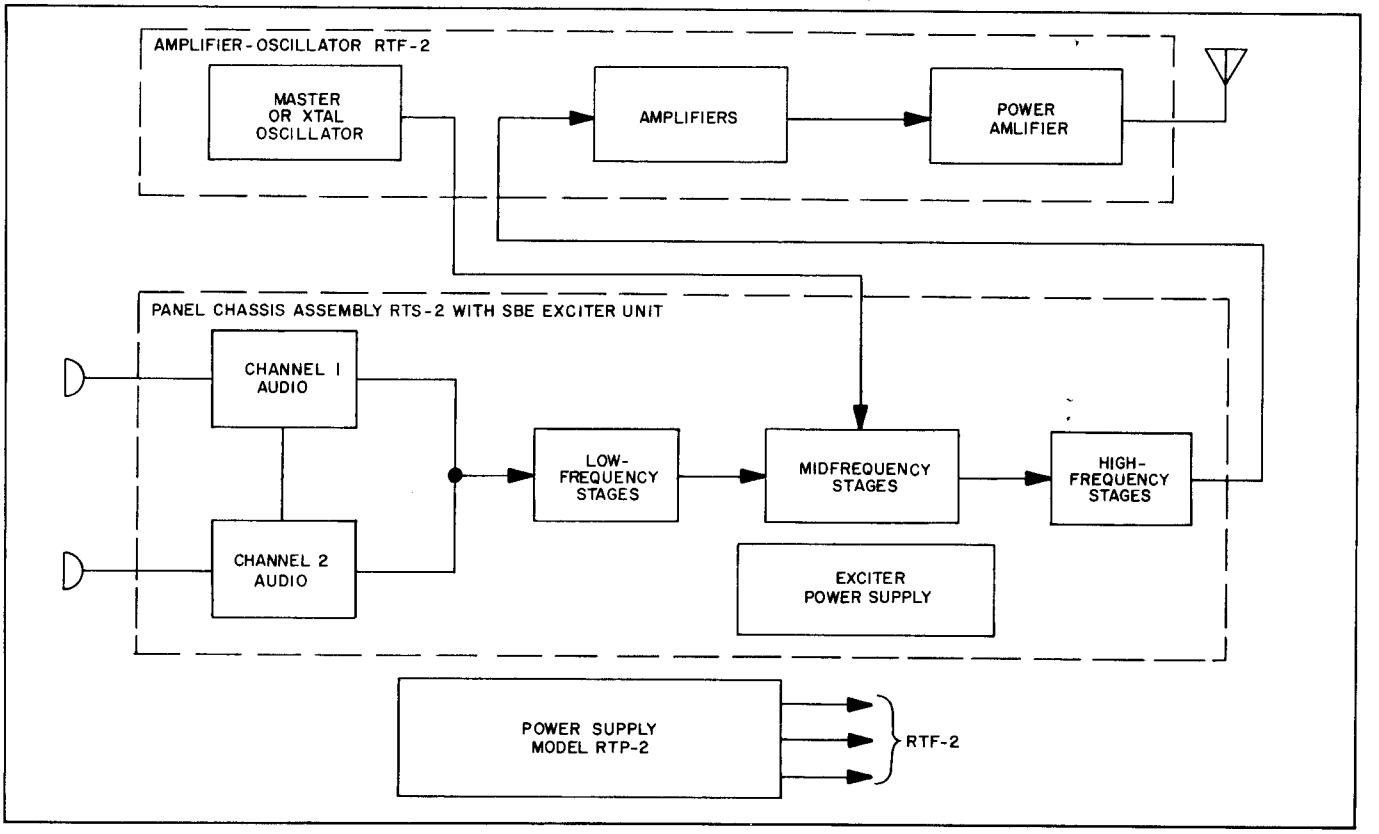


Figure 1-2. Radio Transmitters, Simplified Block Diagram

b. The master oscillator operates in the range of 2 to 4 mc. In the SSB or ISB modes, the master oscillator output is generally applied to the exciter unit as the injection frequency. The crystal-controlled oscillator also operates in the 2 to 4 mc range and may

1-5. EQUIPMENT SUPPLIED.

Table 1-3 lists the equipment supplied to make up each radio transmitter. The manufacturer's nomenclature and model number, military designation, and

TABLE 1-4. SHIPPING DATA

BOX NO.	ITEM	DIMENSIONS (in.)			WEIGHT (lbs)
		LENGTH	WIDTH	HEIGHT	
1	Cabinet/Frame Assembly Model CAB-7	38-1/2	31	56	610
2	Amplifier-Oscillator Model RTF-2	37	30-1/2	24-1/4	235
3	Panel Chassis Assembly Model RTS-2 (Including Transmitting Mode Selector SBE-2 or SBE-3)	37	30-1/2	24-1/2	222
4	Power Supply Model RTP-2	37	30-1/2	24-1/2	296
5	Assorted Items: Test Data, 1 set Technical Manuals, 2 each, TMC P/N IN-315 Tube, Electron, 2 each, Reference Symbols V606 and V607, TMC P/N 872-A (Removed from Power Supply Model RTP-2) Tube, Electron, 2 each, Reference Symbols V101 and V102, TMC P/N 4-250-A (Removed from Amplifier-Oscillator Model RTF-2) Cable, Power, 1 each, TMC P/N CA-103-72 Cover, Terminal, 1 each, TMC P/N MS-1505-C Tube, Electron, 1 each, Reference Symbol V401, TMC P/N-5R4, (Removed from Transmitting Mode Selector Model SBE-2 or SBE-3) Thumbscrew, Hexagon head, 22 each, TMC P/N SC-139 Plug, Electrical, 1 each, TMC P/N PL-134-NG Plug, Electrical, 3 each, TMC P/N PL-259-A Strip, Terminal, 2 each, F/U/W E501 and E502, located in Remote Control Amplifier Model RTC, TMC P/N TM-105-14-A1 Plug, Electrical, 1 each, TMC P/N UG-59-B/U Plug, Electrical, 3 each, TMC P/N UG-176/U Mounting Kit, Antenna Tuner to CAB-7, 1 each, consisting of: Washer, Flat, 8 each, TMC P/N FW-25-HBC Washer, Split, 4 each, TMC P/N LWS-25-MRC Nut, Wing, 4 each, TMC P/N NT110-2520BN Screw, Hexagon Head, 4 each, TMC P/N SCHH-2520-BC16 Nut, Spacer, 4 each, TMC P/N TE-2520-BC3H Washer. Fiber, 4 each, TMC P/N WA-101-6 Plug, Electrical, 1 each, TMC P/N PL-259-A Microphone, 1 each, TMC P/N MK-103 (When specified) Antenna Relay, 1 each, TMC P/N TRL04 (When specified) Plug, Electrical, 1 each, TMC P/N PL-132-3	24-1/8	13	20-7/8	65

TABLE 1-5. EQUIPMENT REQUIRED BUT NOT SUPPLIED

ITEM	CHARACTERISTICS AND USE	ITEM	CHARACTERISTICS AND USE
Power Cable	3-conductor cable for 115/230-volt ac, 3000-watt primary power input. Length as required.	Headset	For aural monitoring.
		Crystals	Type CR-18/U for RTF-2. Operating frequencies should be specified on ordering.
Coaxial cable	RG-8/U, RG-9/U, RG-11/U, or RG-12/U per station requirements. Length as required.	Antenna	50- or 70-ohm, unbalanced input

TABLE 1-6. ACCESSORIES

ITEM	USE	MANUAL
Transmit-Receive Relay Model TRL-3 (70-ohm impedance)	Antenna switching	
Transmit-Receive Relay Model TRL-4 (50-ohm impedance)	Antenna switching	
Antenna Tuning Unit Model TAC	Antenna tuning	Instruction Book for Antenna Tuning Unit Model TAC
Antenna Tuning System Model ATS-2	Antenna tuning	Technical Manual for Antenna Tuning System Model ATS-2
Remote Control Amplifier Model RTC	Tone keying for MCW operation	Technical Manual for Remote Control Amplifier Model RTC
Power Supply A-1504	12 vdc power source for remote radiophone units	

TABLE 1-7. VACUUM TUBE COMPLEMENT

REFERENCE SYMBOL	TYPE	FUNCTION
AMPLIFIER-OSCILLATOR MODEL RTF-2		
V101	4-250A	PA Final Stage
V102	4-250A	PA Final Stage
V201	6CL6	Amplifier-Doubler
V202	12AT7	Keyer-Driver
V203	OA2	Voltage Regulator
V204	6BF5	Doubler
V205	6146	Driver
V206	12AT7	Keyer Clamp
V301	6AB4	VMO
V302	12AU7	Cathode Follower
V401	OA2	Voltage Regulator
V402	6C4	Cathode Follower
V403	6AH6	Amplifier
V404	12AU7	Cathode Follower
V405	6BE6	Mixer
V406	12AU7	Amplifier

REFERENCE SYMBOL	TYPE	FUNCTION
POWER SUPPLY MODEL RTP-2		
V601	OB2	Bias Regulator
V602	OB2	Bias Regulator
V603	6X4	Low voltage rectifier
V604	5R46Y	Low voltage rectifier
V606	872A	High voltage rectifier
V607	872A	High voltage rectifier
V608	OA2	Screen grid regulator
V609	OA2	Screen grid regulator
V610	OA2	Screen grid regulator
V611	OA2	Screen grid regulator
PANEL CHASSIS ASSEMBLY MODEL RTS-2		
V401	5R4	Full-wave regtifier
V402	OA2	Voltage regulator

TABLE 1-8. FUSE COMPLEMENT

REFERENCE SYMBOL	RATING (AMPERES) 115V	RATING (AMPERES) 230V	FUNCTION
INTERCONNECT CHASSIS ON AMPLIFIER-OSCILLATOR MODEL RTF-2.			
F401	2.0	2.0	Heater
POWER SUPPLY MODEL RTP-2			
F601	3.0	1.5	Master Oscillator oven
F602	3.0	1.5	Low voltage supply
F603	3.0	1.5	Midvoltage supply
F604	0.125	0.125	Low voltage B-

REFERENCE SYMBOL	RATING (AMPERES) 115V	RATING (AMPERES) 230V	FUNCTION
POWER SUPPLY MODEL RTP-2 (CONT)			
F605	0.3	0.3	Low voltage B+
F606	0.3	0.3	Midvoltage B+
PANEL CHASSIS ASSEMBLY MODEL RTS-2			
F401	2.0	1.0	Oven fuse for exciter
F402	3.0	1.5	Main power
F403	0.25	0.25	B+

TABLE 1-9. REFERENCE SYMBOL SERIES ASSIGNMENTS

EQUIPMENT	REFERENCE SYMBOL SERIES
Amplifier-Oscillator Model RTF-2	100-499
Power Amplifier Section	100-199
Multiplier Section	200-299
Master Oscillator Section	300-399
Interconnect Chassis	400-499

EQUIPMENT	REFERENCE SYMBOL SERIES
Power Supply Model RTP-2	600-699
Cabinet/Frame Assembly Model CAB-7	500-599
Panel Chassis Assembly Model RTS-2	400-499
Transmitting Mode Selector Model SBE-2 (or SBE-3)	100-299

SECTION 2
INSTALLATION

2-1. UNPACKING AND HANDLING.

The radio transmitter is shipped in five wooden packing boxes. The contents of each box and the weights and dimensions are given in table 1-4. Each box is labeled as to its contents and also indicates the box number which contains the technical manuals with directions to open that particular box first. The boxes should be placed in the vicinity of the area selected for the installation. Each box is nailed and banded with steel strapping. Normal precautions should be used in removing the strapping and opening the boxes to avoid injury or damage to the equipment. Box number five contains the loose items including the tubes and a time delay relay and should be handled with extreme care. Inspect the contents of each box for any signs of damage that may have occurred in transit.

2-2. SITING THE EQUIPMENT.

a. The radio transmitter should be assembled at the operating position. In selecting the position for the installation, sufficient area should be allowed around the radio transmitter to permit access to the terminal board connections and plug connections at the rear of the radio transmitter and the antenna connections on the side. A minimum of 12 inches should be allowed at the rear of the transmitter. Two blowers are used for cooling, one in the main cabinet and one in the power amplifier section of the RTF-2, which both vent out the rear of the cabinet. Free flow of air must be considered when the installation is made. The top of the cabinet has holes drilled for mounting of certain accessory units. Sufficient overhead space must be allowed for the installation of these accessory units if they are to be used. Installation mounting details are shown in figure 2-1. If the radio transmitter is shipped with the two top shock mounts, usually for shipboard installations, standoffs will have to be provided by the installing activity to insure the required access at the rear of the radio transmitter.

b. Although the radio transmitter does not require a specially prepared and reinforced platform, the site should be level and be able to sustain the weight of the assembled radio transmitter. If the shock mounts are used rather than the steel base, suitable means of securing the shock mounts to the floor must be provided.

2-3. INSTALLATION PROCEDURES.

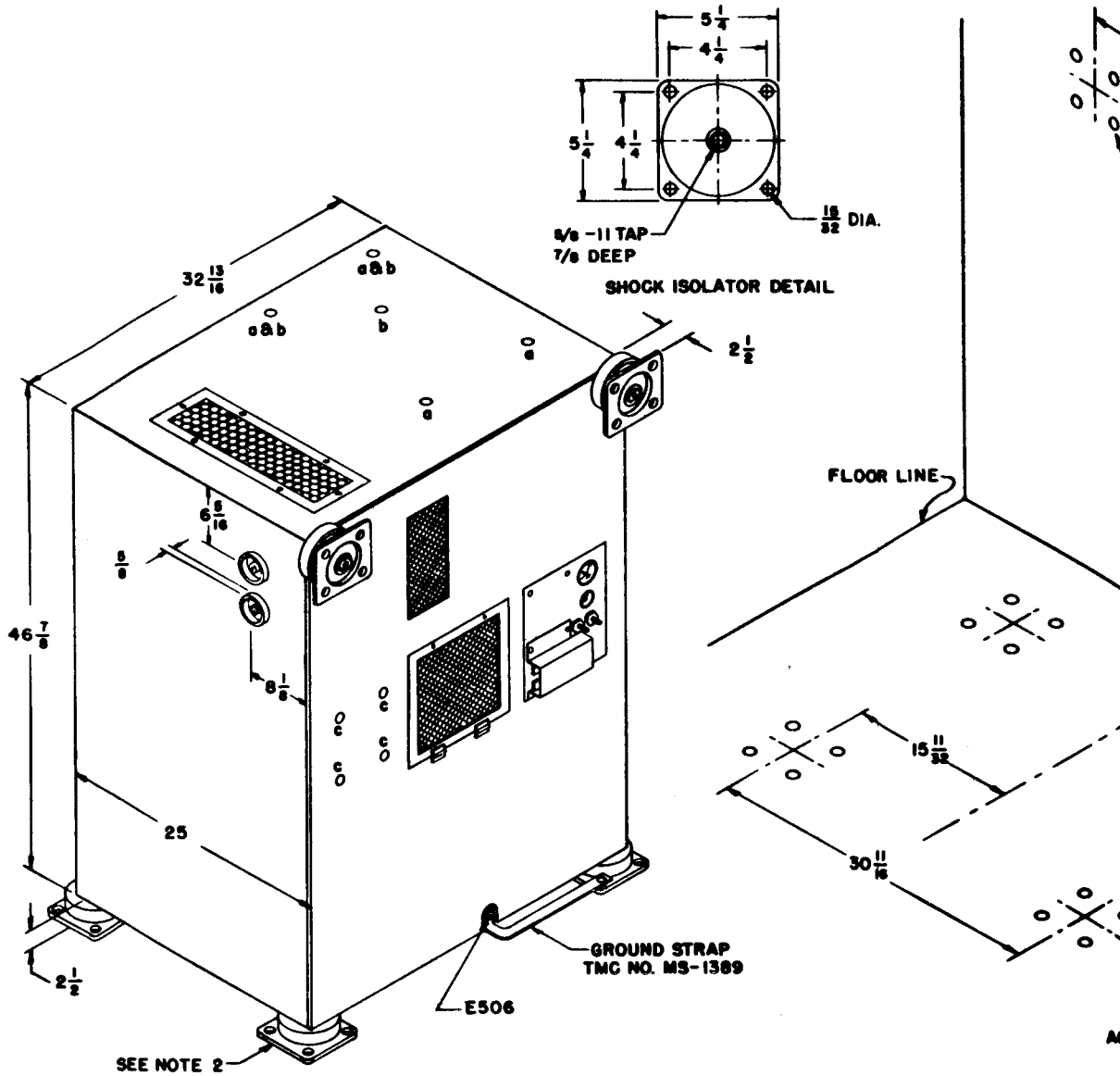
a. The primary power source must be 115/230 volts, 50/60-cps, single-phase, capable of supplying 3000 watts at a power factor of 0.87. The radio transmitter is shipped from the factory wired for 115-volt or 230-volt operation, as ordered, and the line fuses supplied with the equipment are rated accordingly. If the primary power source is changed, wiring changes must be made in all units. The necessary changes are shown on schematic diagrams of the units, figures 6-4 through 6-10, and on the schematic diagram of the exciter unit in the exciter unit manual. Table 1-8 lists each fuse and the proper value for 115-volt and 230-volt operation. Table 2-1 lists the components in each unit that require wiring changes prior to 230-volt operation. Actual installation of the radio transmitter is accomplished as follows:

Step 1. Place the empty cabinet in the location selected. If the unit is equipped with shock mounts, bolt the shock mounts to the deck or platform. Check leveling of cabinet to avoid possible difficulty when installing the drawers.

Step 2. Each cabinet compartment is equipped with drawer slides which mate with rails on the sides of each drawer component. The Power Supply Model RTP-2 should be installed in the bottom compartment first to avoid any possibility of tipping the cabinet. Pull the center section of the slide out until it locks in the extended position. Engage the rails on the side of the drawer with the extended slides and ease the drawer into the slides. Hold the lock buttons on each rail depressed until the lock button passes into the slide. The lock button will engage the slot in the slide and prevent the drawer from entering further. Once again depress the lock button and the drawer will slide completely into the cabinet.

TABLE 2-1. PRIMARY POWER WIRING CHANGES

UNIT	COMPONENT	FIGURE
Cabinet/Frame Assembly Model CAB-7	T501	6-10
Amplifier-Oscillator Model RTF-2	E301 E302	6-5
Panel Chassis Assembly Model RTS-2	T401 T402	6-11
Power Supply Model RTP-2	T601 T602 T604 CB601	6-9
Transmitting Mode Selector Model SBE-2 or SBE-3	TB101	Unit manual

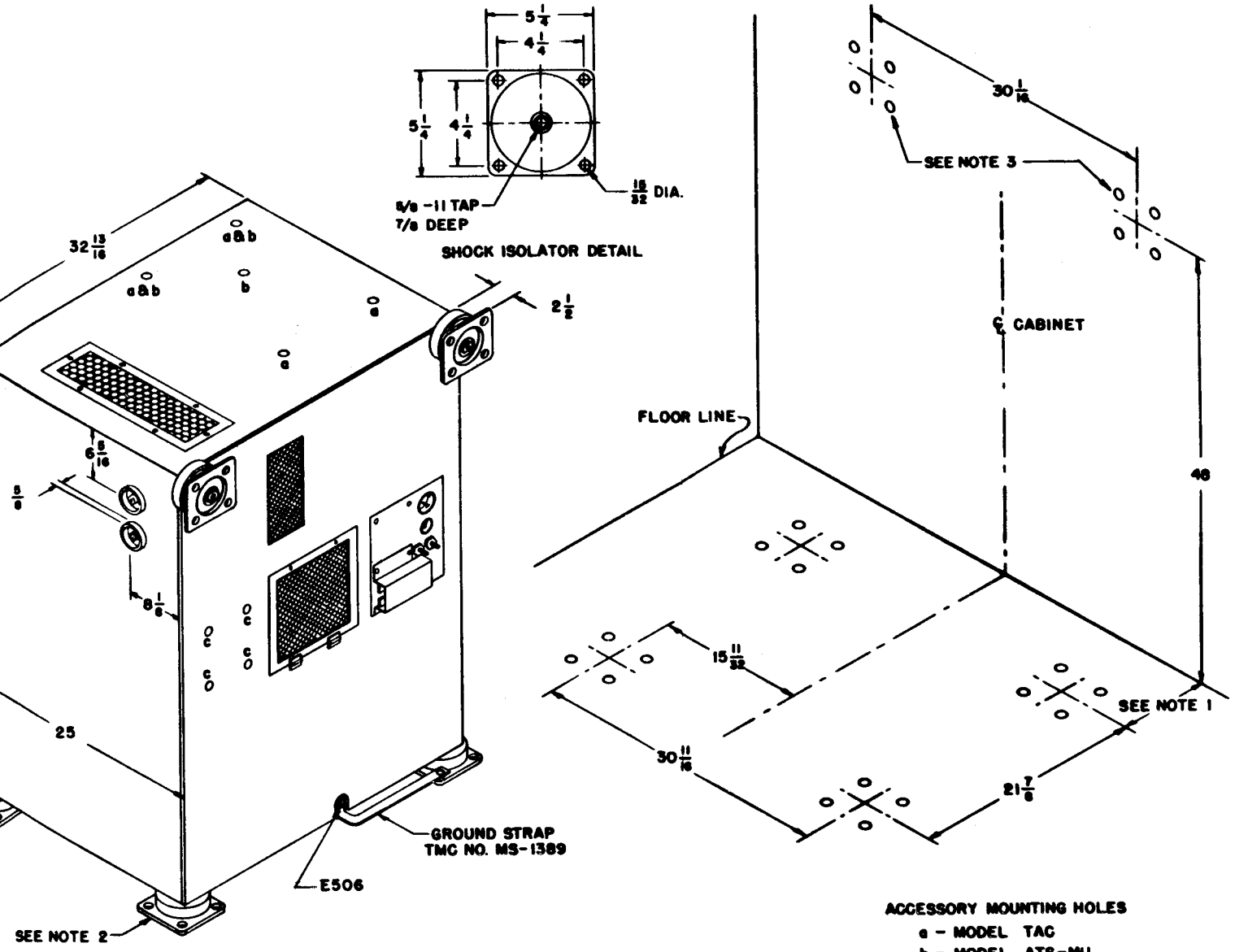


NOTE:

1. SUGGESTED DISTANCE FROM WALL FOR VENTING PURPOSES AND ACCESS TO FILTER DOOR APPROX. 12 INCHES.
2. 6 SHOCK ISOLATORS REQUIRED. TMC NO. SH-100
3. IF ONLY 4 BOTTOM SHOCK ISOLATORS ARE USED DISREGARD TOP HOLES.

IN-1088

Figure 2-1.



ACCESSORY MOUNTING HOLES

a - MODEL TAC
b - MODEL ATS-MU
c - MODEL TRL

NOTE:

1. SUGGESTED DISTANCE FROM WALL FOR VENTING PURPOSES AND ACCESS TO FILTER DOOR APPROX. 12 INCHES.
2. 6 SHOCK ISOLATORS REQUIRED. TMC NO. SH-100
3. IF ONLY 4 BOTTOM SHOCK ISOLATORS ARE USED DISREGARD TOP HOLES.

Figure 2-1. Transmitter Mounting Dimensions

Step 3. Install the RTS-2 with the Transmitting Mode Selector in the center drawer in the same manner.

Step 4. Install the RTF-2 RF deck in the top compartment of the transmitter.

Step 5. If any accessories are to be mounted on the transmitter cabinet, install them in accordance with the mounting details shown in figure 2-1 and refer to the instructions in paragraph 2-5.

Step 6. Connect the antenna, or dummy load, to J505 (HN type UG-560/U connector) on the side of the transmitter. The antenna cable must be fabricated locally. A mating plug, UG-59B/U, suitable for RG-8/U, RG-9/U, RG-11/U, or RG-12/U is supplied as a loose item.

Step 7. Connect the heavy copper ground strap between E506 at the lower rear of the cabinet and station ground.

2-4. INTERNAL CABLING CONNECTIONS.

A number of connections must be made between the three drawer units of the radio transmitter for which interconnecting cables are supplied separately or as an integral part of one of the units or cabinet. The rear panel of the cabinet should be removed to facilitate access to all the connections. Figure 2-2 illustrates the interconnections to be made and identifies the cables and connectors by reference symbol number and color code where applicable. Each cable is physically tagged with an identification label and plug and jack numbers are stamped on the various chassis. The cables should be installed or connected in the sequence shown below.

Step 1. Open the Power Supply Model RTP-2 drawer. Connect P502 of W502 to J601 on the RTP-2.

Step 2. Connect P503 of cable W501 to J602 on the RTP-2.

Step 3. Install both high-voltage rectifier tubes (V606 and V607) in their respective sockets. Be sure the tubes are firmly seated in the sockets. Connect one of the high-voltage leads from the main power transformer in the cabinet to each tube plate cap. The two leads are interchangeable and there is no danger in reversing them.

Step 4. Connect P512 of high-voltage cable W508 to J603 on the RTP-2 and P511 to J503 (part of W509) on the cabinet Connect the other end of W509, J504, to P505 on W503.

Step 5. Remove the cover from the relay deck of the RTP-2 by loosening the twist lock fasteners and insert the time delay relay K602 and its shield.

Step 6. Install the remainder of the tubes in the RTP-2. (See figure 5-4.) Replace the cover on the relay rack.

Step 7. Close the RTP-2 drawer. Open the RTF-2 drawer and be sure it locks in its extended position.

Step 8. Connect P506 of cable W503 to J303 on the RTF-2.

Step 9. Connect P504 of cable W501 to J405 on the RTF-2.

Step 10. Connect P301 on the cable from the master oscillator compartment to J402 on the RTF-2 interconnect chassis. Connect P302 from the master oscillator to J401 on the interconnect chassis. Connect P401 from the interconnect chassis to J201 on the multiplier section of the RTF-2.

Step 11. Connect P508 (red) of cable W504 to J404 (red) on the interconnect chassis of the RTF-2.

Step 12. Connect P509 (blue) of cable W505 to J403 (blue) on the RTF-2 interconnect chassis.

Step 13. Install all tubes in the RTF-2. (See figure 5-5.)

Step 14. Close the RTF-2 drawer.

Step 15. Open the RTS-2 drawer. Connect P507 (red) of cable W504 to J2 (red) on the RTS-2.

Step 16. Connect P510 (blue) of cable W505 to J1 (blue) on the RTS-2.

Step 17. Connect P501 of cable W502 from the cabinet to J3 of the RTS-2.

Step 18. Connect P101 of cable CA-346 to J402 on the RTS-2. Connect P102 on the other end of CA-346 to J109 on the SBE.

Step 19. Check all other connections: P3 to J401, P1 to J104 P2 to J103, and J102 between the RTS-2 and the exciter unit to insure that all plugs are securely twist locked into their jacks.

Step 20. Close the RTS-2 drawer.

Step 21. The installation connections to terminal boards E501 and E502 on the rear of the cabinet are shown in figure 2-3.

Step 22. Connect the utility power input cable W510 to J502 on the rear of the cabinet. The input may be any dc, 60- or 400-cps single-phase source. Whatever power is applied to J502 is connected to the UTILITY OUTLET jack J604 on the front of the RTP-2 for use as required.

2-5. INSTALLATION OF ACCESSORIES.

a. The cabinet CAB-7 is supplied with mounting holes for particular accessories that can be used with the radio transmitter. These accessories include the coaxial antenna switch relays, TMC Models TRL-3 or TRL-4, Antenna Tuning Unit Model TAC, and Antenna Tuning System Model ATS-2. Relay TRL-3 is supplied for use with coaxial transmission lines of 70-ohms characteristic impedance; the TRL-4 is supplied for use with 50-ohm impedance coaxial transmission line. Whichever relay is used is to be mounted on the rear

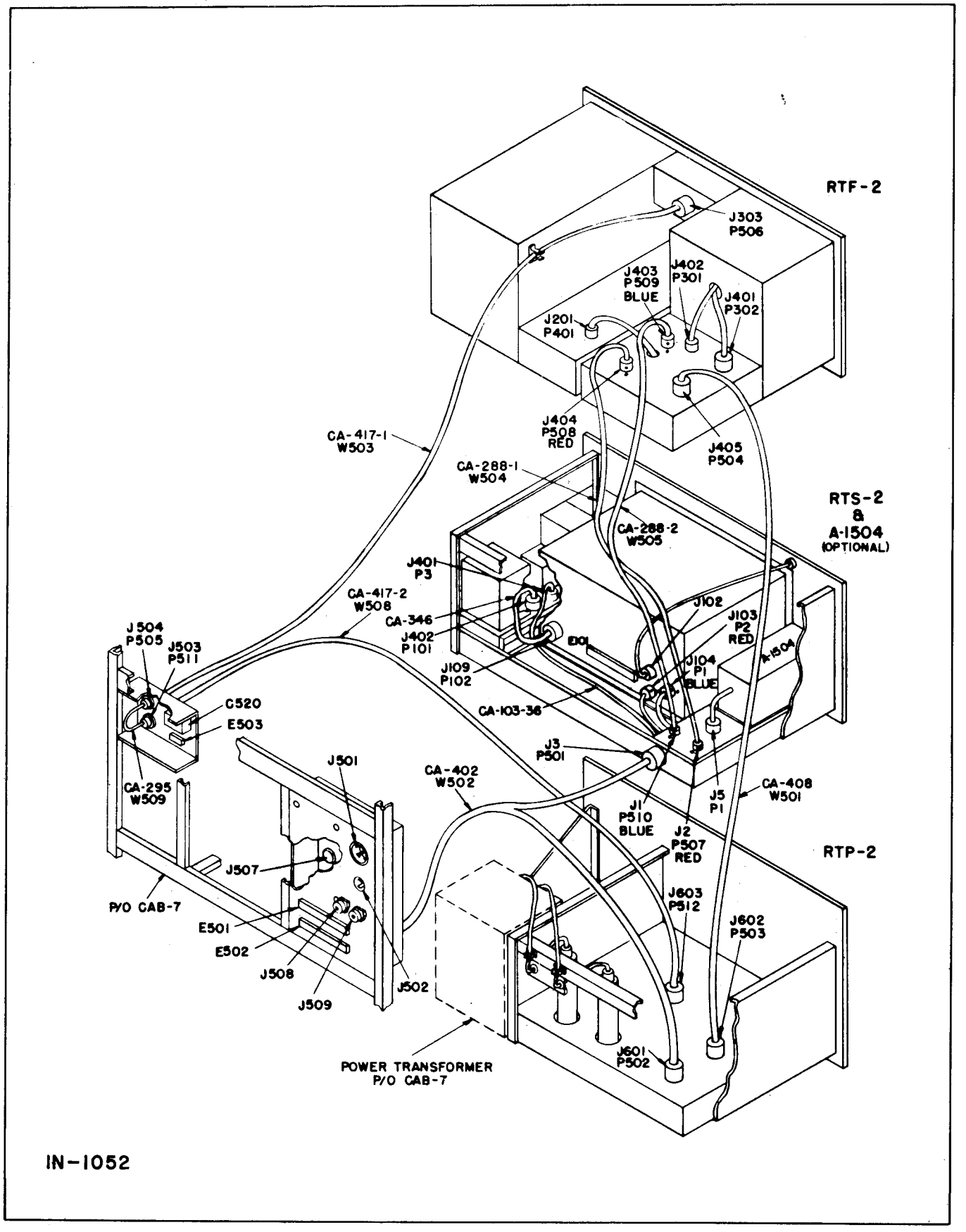


Figure 2-2. Transmitter Cabling Connections

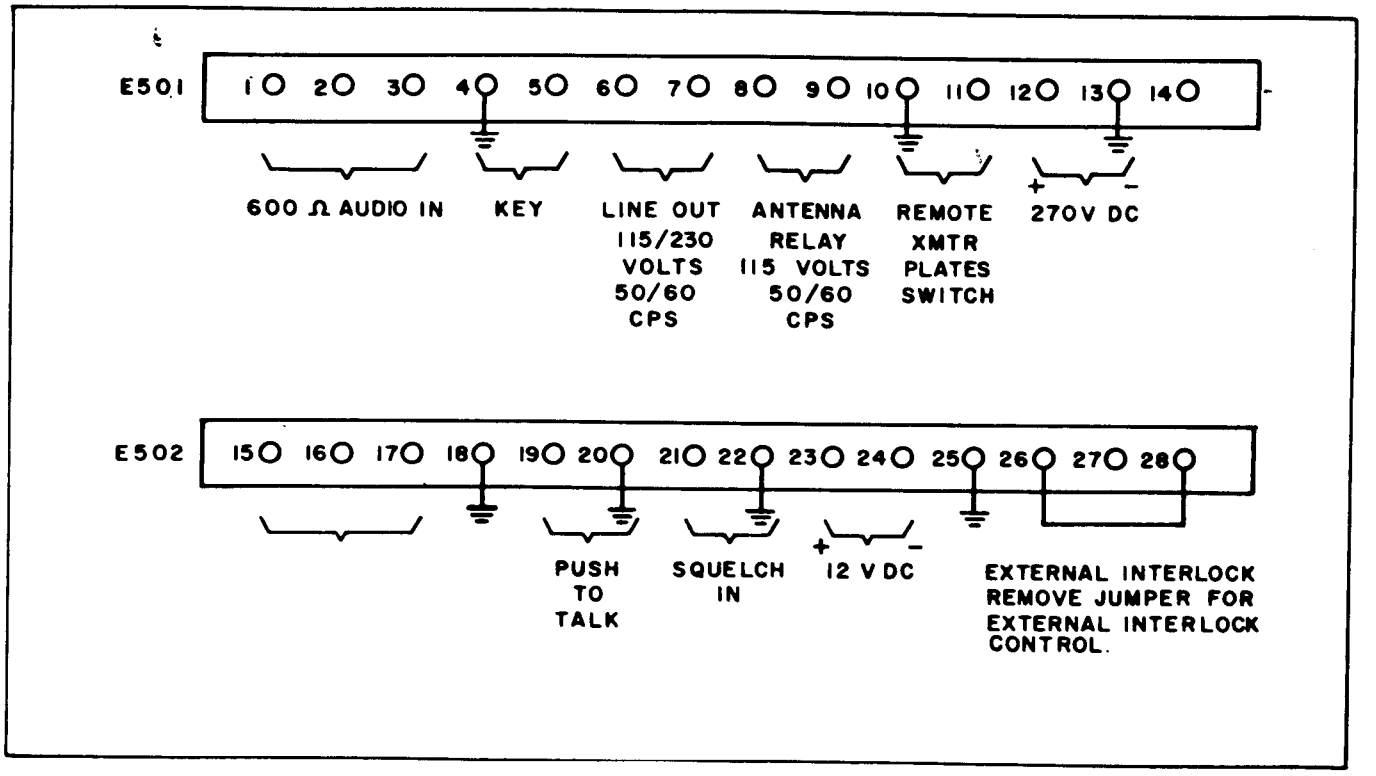


Figure 2-3. Cabinet Frame Assembly, CAB-7, Terminal Board Connections

of the cabinet by menas of the camlock fasteners in the position labeled "c" in figure 2-1. Connect the 70- or 50-ohm coaxial cable, which is supplied, between the rf output jack J505 on the side of the transmitter and the coaxial relay. The antenna connections are to be made to the coaxial relay instead of J505. Wiring connections between terminal boards E501 and E502 on the rear of the cabinet and the TRL-3 or TRL-4 are shown in figure 2-4.

b. The Antenna Tuning Unit Model TAC, if used, is to be mounted on the top of the cabinet. The mounting holes are shown in figure 2-1 and labeled "a." Mounting hardware is supplied in the assorted items box. The RTF-2 drawer may have to be removed to make this installation. Care should be taken to insure that the mounting hardware is secure within the cabinet to avoid any possibility of falling loose into the RTF-2 chassis. Refer to the applicable manual for interconnection data.

c. Antenna Tuning System Model ATS-2 can be provided for 50-ohm or 70-ohm input impedance. This system consists of three units. Refer to the applicable manual for installation instructions and interconnections.

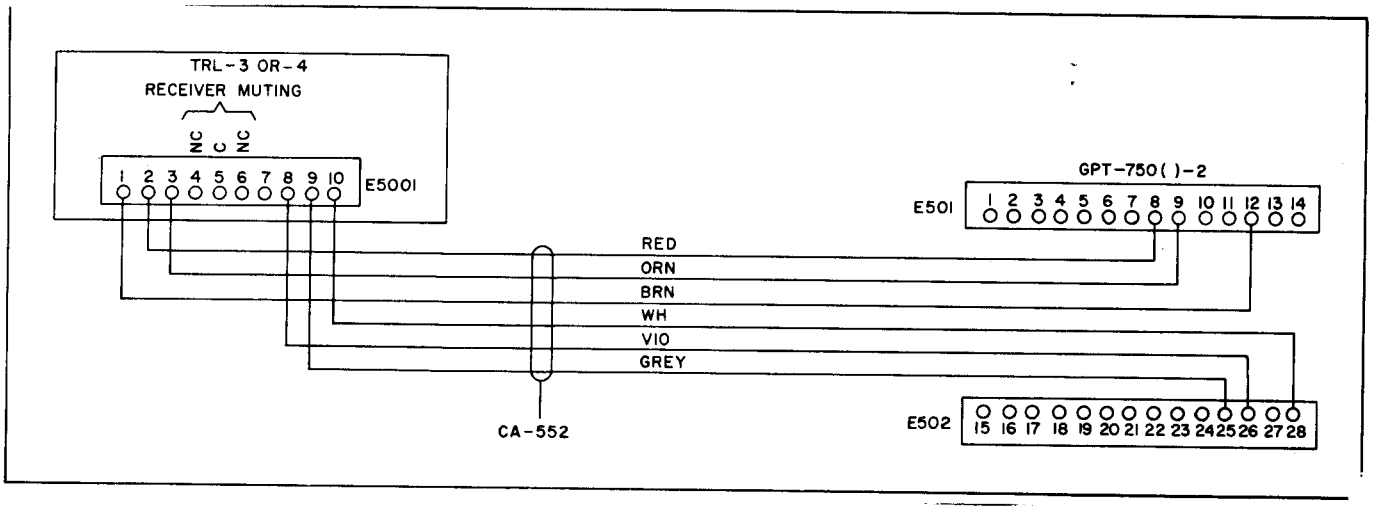


Figure 2-4. TRL-3 or TRL-4 Interconnections to Transmitter

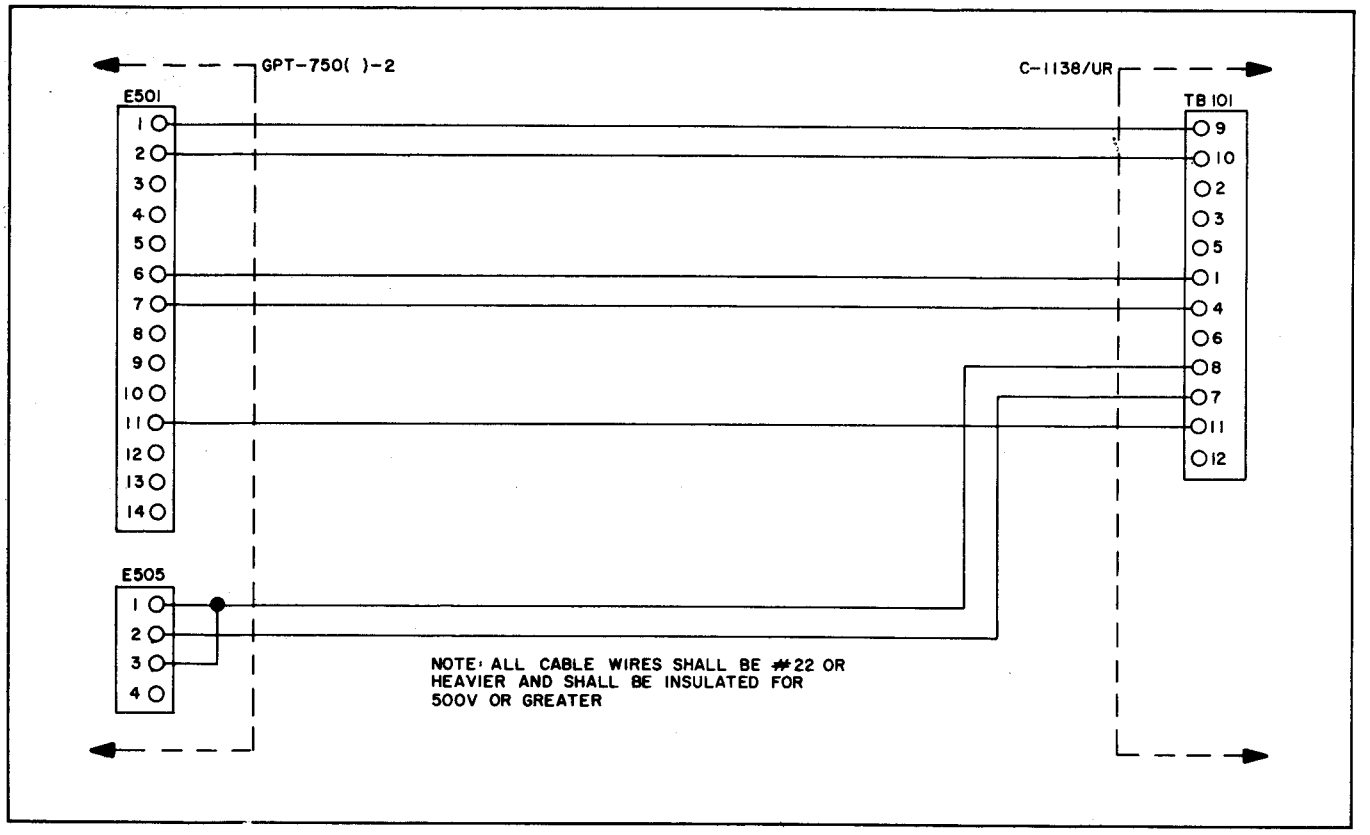


Figure 2-5. Control C-1138/UR Interconnections to Transmitter

2-6. AUXILIARY EQUIPMENT.

a. The radio transmitter is designed for use with external auxiliary equipments such as Control Unit C-1138/UR, Remote Control Amplifier Model RTC, and Radiophone Unit C-1207/UR. The wiring connections between the C-1138/UR and the radio transmitter are shown in figure 2-5; the connections between the transmitter and the RTC in figure 2-6.

b. If the remote Radiophone Unit C-1207/UR is to be used an auxiliary 12-volt power supply Model A-1504 must be mounted in the Panel Chassis Assembly Model RTS-2. The output cable of the power supply connects to J5 on the RTS-2 chassis. Wiring connections between the radio transmitter and the radiophone unit are shown in figure 2-7.

2-7. PRELIMINARY ADJUSTMENTS.

Prior to initial application of power, operate all controls to assure free movement. Check that no crystals are inserted in the position for X1 on the RTF-2 interconnect chassis or in the crystal oven. Set the controls on the various units of the radio transmitter in the positions indicated below. A complete list of the controls and their functions are given in section 3. These initial adjustments are aimed at checking static voltages to insure that all cabling is correctly installed. The adjustments should be accomplished with the radio transmitter working into a 1000-watt resistive 70-ohm or 50-ohm dummy load connected to the rf output jack J505 on the side of the cabinet.

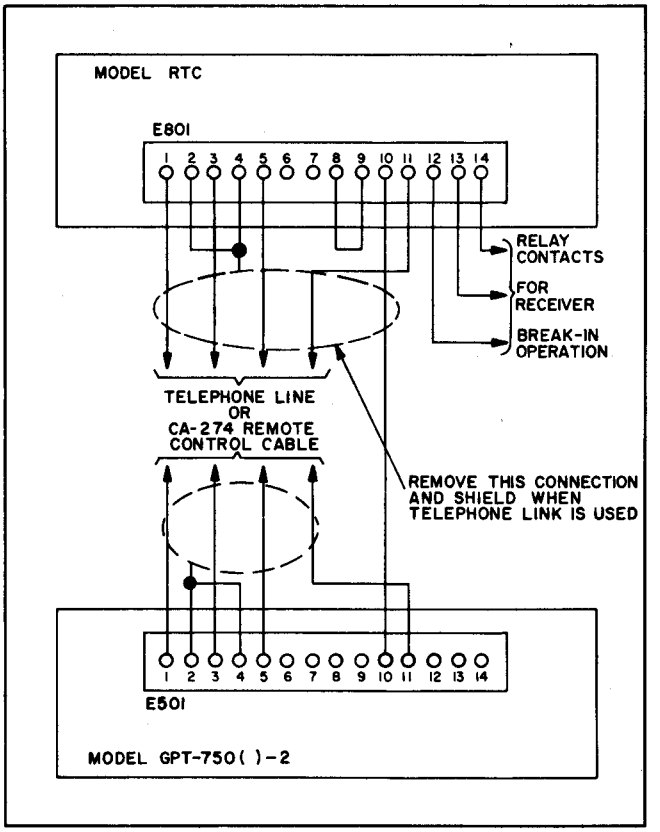
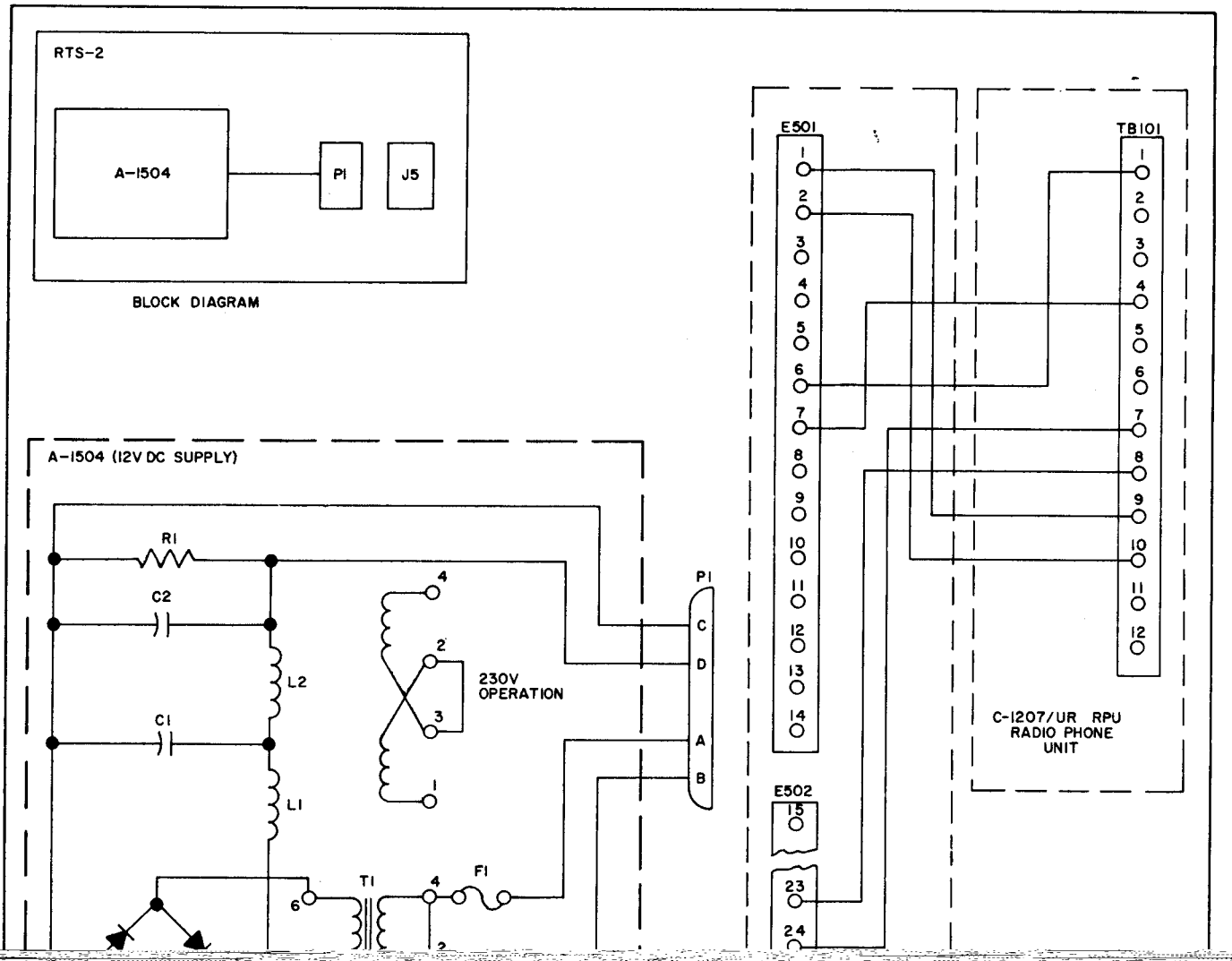


Figure 2-6. Remote Control Amplifier Model RTC, Interconnections to Transmitter


RTS-2
A-1504
P1
J5
BLOCK DIAGRAM
A-1504 (12V DC SUPPLY)
R1
C2
L2
C1
L1
T1
F1
230V OPERATION
P1
C
D
A
B
E501
E502
TB101
C-1207/UR RPU
RADIO PHONE
UNIT

WARNING

The following steps require measuring high voltages up to 1000 vdc. These voltages are dangerous. Voltages of 1000 vdc should be measured by turning power off, connecting probe to point to be measured, and turning power back on. In this way, possibilities of contact with lethal voltages is minimum.

Step 7. Check the voltage readings on terminal boards E601, E602, and E603 in the power supply. The readings should be as indicated below:

E601-1	+300 vdc
-2	-95 to -125 vdc
-5	-210 vdc
-8	+600 vdc
E602-9	+600 vdc
-10	+600 vdc
-11	0
-12	0
-17	+350 vdc
-18	+350 vdc
-19	0
-20	-105 vdc
E603-24	-105 vdc
-25	+350 vdc
-26	-105 vdc
-27	-210 vdc
-28	6 vdc

Step 8. Between terminal 31 of E603 and terminals 13, 14, 15, and 16 of E602 measure 115 vac.

Step 9. Set MODE switch on RTP-2 to SSB and FINAL PLATE switch to ON. On the RTF-2 set MULTIMETER switch to PA Ebb volts.

Step 10. On the relay deck of the RTP-2 power supply, set FINAL BIAS ADJ. control R605 unitl PA plate current reads 130-140 ma. on PA PLATE meter M302 on front panel of RTF-2. MULTIMETER M301 on the RTF-2 should read approximately 3 kv.

Step 11. Measure the voltage from terminals 6 and 7 of E601 in the RTP-2 to ground. Both readings should be +600 vdc.

Step 12. Set MODE switch S601 of the RTP-2 to CW-FS. The following voltages should be checked from the terminals indicated to ground.

E601-3	+580 vdc
-4	+1000 vdc
-6 & 7	+600 vdc
E603-29	+600 vdc
-2	-2 vdc

Step 13. The PA plate current on M302 on the RTF-2 should read between 80 and 110 ma.

Step 14. Set MODE switch on RTP-2 to TUNE. The voltage from terminals E601-6 and E601-7 to ground should be +300 vdc and the PA plate current on M302 should go to 0.

Step 15. Turn TRANSMITTER PLATES switch to STANDBY REMOTE and FINAL PLATE switch to OFF.

Step 16. Set NORMAL-SSB switch S204 of the RTF-2 to SSB, and EXCITATION SW. switch to SSB L.O. ON.

Step 17. On the RTP-2 set the MODE switch to SSB.

Step 18. On the exciter unit set the controls as follows:

POWER switch S103 to ON.

EXCITER switch S105 to OFF.

XMTR switch S104 to OFF.

USB switch S101 to CH1; and LSB switch S102 to OFF.

METER SW S109 to USB.

CARRIER INSERT control R106 fully counterclockwise.

SQUELCH GAIN control R129 fully counterclockwise.

VOX GAIN control R140 full counterclockwise.

Step 19. Connect the output of the TMC Model PTE-1, or equivalent, to terminals E501-1 and E501-3.

Step 20. Adjust USB GAIN control R129 for half-scale reading on multimeter M101 on the exciter unit. Increase the setting of the VOX GAIN control. EXCITER lamp on the front panel of the exciter will light and TRANSMITTER PLATES indicator I603 on the RTP-2 will light. The same can be accomplished by setting XMTR switch S104 and EXCITER switch S105 on the exciter unit to ON.

Step 21. Refer to Section 3, Operation, and tune the transmitter to the prescribed test frequencies using the VMO and crystal oscillator.

Note

The crystals used must be Type CR-18/U in the range 2 to 4 mc. The crystals are not supplied. Operating frequencies are determined by the using activity.

Step 22. Check the calibration of the master oscillator as indicated in Section 3.

SECTION 3
OPERATION

3-1. INTRODUCTION.

a. The radio transmitter can be operated in a variety of modes. Normally, the mode of operation, output frequency and output power are controlled by the exciter unit, SBE-2 or SBE-3. The midfrequency modulator section of the exciter is the frequency controlling stage of the transmitter. This section can be supplied with an injection frequency from the VMO of the RTF-2 or from its own crystal oscillator. Use of the internal exciter crystal oscillator insures the higher stability of crystal oscillator operation and permits selection of any one of ten preselected crystal frequencies. (Refer to appropriate exciter unit manual.) Operation with the injection frequency being supplied by the VMO of the RTF-2 has the advantage of continuous tuning over the entire output range of the transmitter with a high degree of stability.

b. A third source of injection frequency is available, the crystal oscillator of the RTF-2. Three different crystal frequencies in the range 2 to 4 mc can be available if desired. The crystal oscillator output of the RTF-2 is not normally used for this purpose but is generally used when the radio transmitter is operated without the exciter unit in certain modes of operation.

c. The master oscillator in the RTF-2 is contained in a temperature-controlled oven. Optimum stability will be realized if the oven is left on at all times if the transmitter is in regular or standby service. This can be done by setting the MO BYPASS switch S602 on the RTP-2 chassis to BYPASS. This setting permits the oven to operate although the MAIN POWER circuit breaker on the RTP-2 is OFF.

3-2. CONTROLS AND INDICATORS.

The controls and indicators for each of the components of the radio transmitter are listed in tables 3-1 through 3-4 and the front panels of each component are illustrated in figure 3-1. Certain controls of the RTF-2 are located internally on the chassis. The location of these controls is referenced to adjustment location illustrations in section 6, Maintenance and Repair.

TABLE 3-1. MODEL RTF-2, FRONT PANEL CONTROLS AND INDICATORS

CONTROL OR INDICATOR	REFERENCE SYMBOL	FUNCTION
INNER OVEN lamp	I301	Lights when inner oven is warming.
ZERO BEAT lamp	I303	When lighted indicates zero beat in calibration of master oscillator during calibration procedure.
OUTER OVEN lamp	I302	Lights when outer oven is warming.
CALIBRATE control	L301	Calibrates the master oscillator during calibration procedure.
CALIBRATE control lock		Locks setting of CALIBRATE control when turned clockwise.
MULTIMETER meter	M301	Indicates current or voltage selected by MULTIMETER switch.
MULTIMETER rotary switch	S203	Selects current or voltage indicated on MULTIMETER meter.
PA PLATE meter	M302	Indicates PA plate current.
DRIVER TUNING control	C201	Adjusts PA driver tuning capacitor.
RF OUTPUT meter	M303	Indicates RF output current.
DRIVE control	R211	Varies amount of drive to PA grids.
AUX. LOADING rotary switch	S103	Selects an additional loading capacitor for lower impedance loads.
PA BAND rotary switch	S101 S102	Sets PA tank to proper output frequency band by tapping output coil.

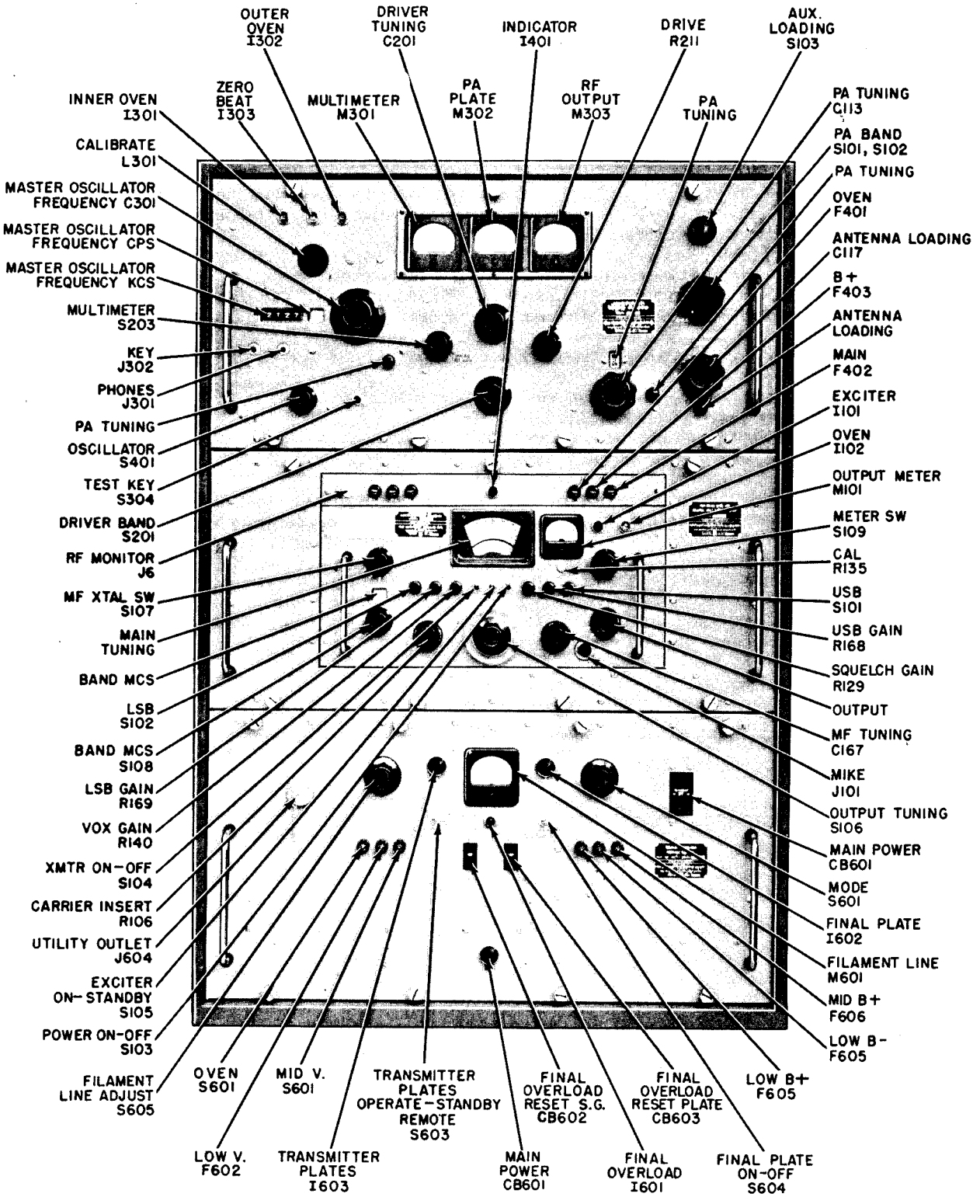


Figure 3-1. Transmitter Front Panel Controls and Indicators

TABLE 3-1. MODEL RTF-2, FRONT PANEL CONTROLS AND INDICATORS (CONT)

CONTROL OR INDICATOR	REFERENCE SYMBOL	FUNCTION
ANTENNA LOADING control	C117	Adjusts amount of coupling to load.
ANTENNA LOADING control lock		Locks setting of ANTENNA LOADING when turned clockwise.
PA TUNING dial		Indicates the setting of the PA TUNING control
PA TUNING control	C113	Adjusts main tuning vacuum capacitor, an integral part of PA pi tank.
PA TUNING control lock		Locks setting of PA TUNING control when turned clockwise.
DRIVER BAND rotary switch	S201 S202	Selects frequency range of driver and multiplier.
TEST KEY pushbutton	S304	Provides emergency and test keying.
OSCILLATOR rotary switch	S401	Selects source of frequency control for transmitter or calibration of MO.
PHONES jack	J301	Accepts earphones plug.
KEY jack	J302	Accepts key plug.
MASTER OSCILLATOR FREQUENCY control	C301 C302	Tunes master oscillator to desired frequency.
MASTER OSCILLATOR FREQUENCY control lock		Locks setting of MASTER OSCILLATOR FREQUENCY control when rotated clockwise.
MASTER OSCILLATOR FREQUENCY KCS dial		Indicates, in kilocycles, settings of MASTER OSCILLATOR FREQUENCY control.
MASTER OSCILLATOR FREQUENCY CPS dial		Indicates, in cycles, setting of MASTER OSCILLATOR FREQUENCY control.
NORMAL-SSB switch	S204	Establishes conditions for normal or SSB operation of amplifier-multiplier section. (See figure 6-2 for location.)
EXCITATION SW.	S402	Selects and routes oscillator output for SSB, FS, or CW/PHONE operation. (See figure 6-2 for location.)

TABLE 3-2. MODEL RTP-2, FRONT PANEL CONTROLS AND INDICATORS

CONTROL OR INDICATOR	REFERENCE SYMBOL	FUNCTION
UTILITY OUTLET jack	J604	Provides source of 115 vac.
FILAMENT LINE ADJUST control	S605	Selects tap on filament transformer to maintain 115 vac.
TRANSMITTER PLATES indicator light	I603	Lights when TRANSMITTER PLATES OPERATE-STANDBY/REMOTE switch is in OPERATE position.

TABLE 3-2. MODEL RTP-2, FRONT PANEL CONTROLS AND INDICATORS (CONT)

CONTROL OR INDICATOR	REFERENCE SYMBOL	FUNCTION
TRANSMITTER PLATES OPERATE-STANDBY REMOTE toggle switch	S603	Selects mode of operation for transmitter plates circuit.
FILAMENT LINE meter	M601	Indicates voltage of primary of filament transformer T603.
FINAL PLATE indicator light	I602	Lights when FINAL PLATE ON-OFF switch is in ON position.
FINAL PLATE ON-OFF toggle switch	S604	Applies high voltage to PA stage when placed in ON position.
MODE rotary switch	S601	Selects transmitter mode of operation.
MAIN POWER switch	CB601	Applies ac voltage to transmitter and provides automatic overload protection when placed in ON position.
MID B+ fuse	F606	Provides protection for mid B+ circuit.
LOW B- fuse	F604	Provides protection for low B- circuit.
Low B+ fuse	F605	Provides protection for low B+ circuit.
FINAL OVERLOAD indicator light	I601	Indicates excessive PA plate or screen grid current.
FINAL OVERLOAD RESET-S.G. switch	CB602	Resets overload relay system when tripped by excessive PA screen grid current.
FINAL OVERLOAD RESET-PLATE switch	CB603	Resets overload relay system when tripped by excessive PA plate current.
MID V. fuse	F603	Provides protection for midvoltage circuit.
LOW V. fuse	F602	Provides protection for low voltage circuit.
OVEN fuse	F601	Provides protection for oven circuit.

TABLE 3-3. MODEL RTS-2, FRONT PANEL CONTROLS AND INDICATORS

CONTROL OR INDICATOR	REFERENCE SYMBOL	FUNCTION
RF MONITOR jack	J6	Provides means of monitoring rf output.
Indicator light	I401	Lights when main power is applied.
OVEN fuse	F401	Provides protection for oven circuit.
B+ fuse	F403	Provides protection for B+ circuit.
MAIN fuse	F402	Provides protection for main power circuit.

TABLE 3-4. MODEL SBE-2 AND MODEL SBE-3, FRONT PANEL CONTROLS AND INDICATORS

CONTROL OR INDICATOR	REFERENCE SYMBOL	FUNCTION
MF XTAL SW rotary switch	S107	Selects either external VMO or proper internal crystal for medium frequency operation.
VOX GAIN control	R140	Adjusts gain of voice-operated exciter circuit
Main Tuning indicator dial		Upper sections indicates setting of OUTPUT TUNING control; lower section indicates setting of MF TUNING control.
XMTR ON-OFF	S104	In ON position applies high voltage to transmitter when TRANSMITTER PLATES OPERATE-STANDBY/REMOTE switch on RTP-2 is in STANDBY/REMOTE position; in OFF position permits operation by VOX or push-to-talk circuit when EXCITER ON-STANDBY switch is in STANDBY position.
EXCITER ON-STANDBY toggle switch	S105	In ON position activates rf stages of exciter without need for VOX or push-to-talk keying and without operating transmitter; in STANDBY permits VOX or push-to-talk to activate the rf stages of exciter and associated transmitter when XMTR ON-OFF is in OFF position.
POWER ON -OFF toggle switch	S103	Applies line voltage to SBE power supply in ON position.
SQUELCH GAIN control	R129	Adjusts gain of voice-operated exciter circuit in conjunction with VOX GAIN control.
Output meter	M101	Indicates signal levels of circuits selected by METER SW switch.
EXCITER indicator light	I101	Lights when EXCITER ON-STANDBY switch is in ON position or SBE is activated by VOX or push-to-talk operation.
OVEN indicator light	I102	Lights during operation when thermostats demand crystal-oven heating (automatic).
METER SW rotary switch	S109	Selects circuit whose signal level is to be indicated by output meter. CAL position is used to zero meter.
CAL screwdriver control	R135	Zero sets output meter when METER SW switch is in CAL position.
OUTPUT rotary switch		Adjusts SBE output level.
MIKE jack	J101	Microphone input jack (substitute for 600-ohm channel input).
USB rotary switch	S101	Selects audio input source for upper sideband channel.
USB-GAIN control	R168	Adjusts level of USB audio input.
MF TUNING control	C167	Adjusts setting of medium frequency stages as indicated in lower section of main tuning indicator dial.
OUTPUT TUNING rotary switch	S106	Selects output frequency band.
OUTPUT TUNING control	C181	Adjusts setting of output frequency as indicated in upper section of main tuning indicator dial.

TABLE 3-4. MODEL SBE-2 AND MODEL SBE-3, FRONT PANEL CONTROLS AND INDICATORS (CONT)

CONTROL OR INDICATOR	REFERENCE SYMBOL	FUNCTION
CARRIER INSERT rotary switch	R106	Selects level of carrier insertion.
BAND MCS control	S108	Adjusts injection frequency range of high-frequency modulator.
BAND MCS indicator dial		Indicates injection frequency range of high-frequency modulator in 2-mc increments.
LSB-GAIN control	R169	Adjusts level of LSB audio input.
LSB rotary switch	S102	Selects audio input source for lower sideband channel.

3-3. CALIBRATION OF VMO.

The operating procedure is based on using the VMO of the RTF-2 to supply the injection frequency for the exciter unit. Calibration of the master oscillator must be accomplished after the proper warmup using the internal 100-kc crystal oscillator of the RTF-2. Check points are available every 50 kc over the 2- to 4-mc range of the master oscillator. Calibration is accurate to 25 kc each side of check point frequency.

Step 1. On the RTF-2, set OSCILLATOR switch to CAL position.

Step 2. Select the check point frequency nearest the desired operating frequency. The check point to be used is the nearest one, regardless of whether it is higher or lower than the operating frequency.

Step 3. Insert a headset into the PHONES jack J302 on the front panel of the RTF-2.

Step 4. Unlock CALIBRATE control L301 on the RTF-2 and rotate the knob until a beat frequency of 5 cps or less is heard in the headset and observed on the ZERO BEAT indicator lamp. The lamp will flash very slowly as the zero beat is approached. Lock CALIBRATE control.

3-4. EXCITER MF TUNING.

The exciter unit used in each radio transmitter differs only in the audio bandpass. Front panel control designations on both exciters are identical and the general operation is identical. The following procedure is based on operating with the master oscillator of the RTF-2 supplying the MF injection frequency. If it is desired to use the crystal oscillator of the exciter, refer to the procedures in the exciter unit manual.

Step 1. Check that FINAL PLATE switch on the RTP-2 is OFF and exciter OUTPUT control fully counterclockwise.

Step 2. Place USB, LSB and XMTR switches to OFF.

Step 3. Turn TRANSMITTER PLATES switch on the RTP-2 to OPERATE.

Step 4. Turn exciter POWER switch to ON and allow a one-hour warmup period.

Step 5. Turn exciter METER SW to CAL position and zero the meter with CAL screwdriver adjustment R135 on the front panel of the exciter. This meter is used to make all necessary measurements within the exciter during tuning and operation.

Step 6. Turn VOX GAIN and SQUELCH GAIN controls fully counterclockwise.

Step 7. Place EXCITER switch in STANDBY position.

Step 8. Tune the master oscillator on the RTF-2 to the desired frequency. Refer to the tuning charts (figure 3-2 for the GPT-750D-2 and figure 3-3 for the GPT-750E-2) for the VMO frequency for the particular output frequency. For purposes of explanation, an output frequency of 10 mc is assumed using the GPT-750D-2. Unlock MASTER OSCILLATOR FREQUENCY control and tune to 2270 kcs on MASTER OSCILLATOR FREQUENCY dial. Carefully lock the tuning control, The output signal of the VMO is cabled to the input of the exciter at J1 through cable W505.

Step 9. Place METER SW on the exciter in MF position.

Step 10. Place MF XTAL SW in VMO position.

Step 11. Unlock MF TUNING control and tune to 2270 kc on the single scale MF DIAL.

Step 12. Turn CARRIER INSERT control fully clockwise. Adjust MF TUNING control for a peak reading on meter M101 on the exciter. Reduce the setting of CARRIER INSERT control to avoid an offscale reading. Very little movement should be required; be careful not to tune to an adjacent peak even though a higher reading may be obtained.

POWER AMPLIFIER						
			S/D RATIO DB			
A DING	PA EG-RF	PA IP	USB	LSB	CARRIER SUPPRESS	ANTENNA CURRENT
	40	240	-40	-40	-55	2.25
	45	260	-40	-40	-55	2.25
	45	270	-40	-40	-55	2.25
	45	270	-40	-40	-55	2.25
	45	275	-40	-40	-55	2.25
	40	270	-40	-40	-55	2.25
	40	265	-40	-40	-55	2.25
	45	260	-40	-40	-55	2.25
	40	270	-40	-40	-55	2.25
	45	265	-40	-40	-55	2.25
	45	260	-40	-40	-55	2.25
	45	260	-40	-40	-55	2.25
	45	265	-40	-40	-55	2.25
	45	270	-40	-40	-55	2.25
	45	270	-40	-40	-55	2.25
	45	270	-40	-40	-55	2.25
	40	265	-40	-40	-55	2.25
	40	260	-40	-40	-55	2.25
	45	270	-40	-40	-55	2.25
	45	270	-40	-40	-55	2.25
	45	265	-40	-40	-55	2.25
	40	270	-40	-40	-55	2.25
	45	270	-40	-40	-55	2.25
	45	260	-40	-40	-55	2.25
	45	275	-40	-40	-55	2.25
	45	270	-40	-40	-55	2.25
	45	290	-40	-40	-55	2.25

FREQ MC	VMO FREQ	SBE-3			DRIVER		POWER AMPLIFIER								
		MF TUNING	MOD BAND	OUTPUT BAND	BAND	TUNING	PA BAND	PA TUNING	ANTENNA LOADING	PA EG-RF	PA IP	S/D RATIO DB		CARRIER SUPPRESS	ANTENNA CURRENT
												USB	LSB		
2.0	2250	2250	0	2-4	2-4	2.0	2-2.5	61	10	30	250	40	40	55	2.25
2.5	2750	2750	0	2-4	2-4	2.5	2-2.5	118	50	30	240	41	41	55	2.25
2.5	2750	2750	0	2-4	2-4	2.5	2.5-3	67	10	33	260	41	41	55	2.25
3.0	3250	3250	0	2-4	2-4	3.0	2.5-3	111	35	35	260	41	41	55	2.25
3.0	3250	3250	0	2-4	2-4	3.0	3.0-4	67	0	35	260	41	41	55	2.25
4.0	3750	4250	0	2-4	2-4	4.0	3.0-4	131	45	36	250	40	40	55	2.25
4.0	3750	4250	0	4-8	2-4	2.0	4-6	54	80	26	250	40	40	55	2.25
6.0	2250	2250	4	4-8	4-8	3.0	4-6	143	45	38	240	41	41	55	2.25
6.0	2250	2250	4	4-8	4-8	3.0	6-8	111	25	38	240	41	41	55	2.25
8.0	2250	2250	5	4-8	4-8	4.0	6-8	152	65	36	250	41	41	55	2.25
8.0	2250	2250	5	8-16	8-16	2.0	6-8	152	60	32	230	40	40	55	2.25
8.0	2250	2250	5	8-16	8-16	2.0	8-12	134	45	35	240	40	40	55	2.25
10.0	2250	2250	6	8-16	8-16	2.5	8-12	160	65	37	230	40	40	55	2.25
12.0	2250	2250	7	8-16	8-16	3.0	8-12	174	80	36	250	40	40	55	2.25
12.0	2250	2250	7	8-16	8-16	3.0	12-16	165	55	37	250	40	40	55	2.25
14.0	2250	2250	8	8-16	8-16	3.5	12-16	178	60	32	240	40	40	55	2.25
16.0	2250	2250	9	8-16	8-16	4.0	12-16	197	75	30	220	40	40	55	2.25
16.0	2250	2250	9	16-32	16-32	2.0	16-24	160	25	37	250	40	40	55	2.25
18.0	2250	2250	10	16-32	16-32	2.25	16-24	169	40	35	240	40	40	55	2.25
20.0	2250	2250	11	16-32	16-32	2.5	16-24	177	50	35	240	40	40	55	2.25
22.0	2250	2250	12	16-32	16-32	2.75	16-24	185	60	30	240	40	40	55	2.25
24.0	2250	2250	13	16-32	16-32	3.0	16-24	199	65	30	240	40	40	55	2.25
24.0	2250	2250	13	16-32	16-32	3.0	24-32	172	50	30	240	40	40	55	2.25
26.0	2250	2250	14	16-32	16-32	3.25	24-32	177	55	30	240	40	40	55	2.25
28.0	2250	2250	15	16-32	16-32	3.5	24-32	184	60	29	250	40	40	55	2.25
30.0	2250	2250	16	16-32	16-32	3.75	24-32	190	70	29	240	40	40	55	2.25
32.0	2250	2250	17	16-32	16-32	4.0	24-32	202	80	31	260	40	40	55	2.25

Figure 3-3. Radio Transmitter Model GPT-750E-2
Typical Tuning Chart

3-5. EXCITER RF TUNING.

In tuning the rf section of the exciter, be careful not to alter the MF tuning.

Step 1. On the front panel set BAND MCS switch to the frequency range being used. The BAND MCS dial is calibrated in 2-mc increments. Set the switch so that dial reads halfway between the 6 and 8 markings, or 7 as indicated in the tuning chart.

Step 2. Set OUTPUT TUNING band switch to 8-16 position.

Step 3. Place METER SW in RF position.

Step 4. Tune OUTPUT TUNING control to read 10 mc on the multiscale output tuning dial.

Step 5. Turn EXCITER switch to ON. Advance OUTPUT control for any reading on multimeter M101.

Step 6. Slowly vary OUTPUT TUNING control for peak reading on meter. Very little movement should be necessary if the previous procedures have been carefully performed. Too much movement of the control indicates the circuits are being tuned to a harmonic, and the procedures will have to be repeated.

Step 7. Turn OUTPUT control to full counterclockwise. Place TRANSMITTER PLATES switch on the RTP-2 to STANDBY REMOTE, and EXCITER switch on the exciter unit to STANDBY. The exciter unit is fully tuned to supply the drive input to the RTF-2.

Step 5. Turn DRIVER TUNING control on the RTF-2 clockwise or counterclockwise until the PA Eg Rf reading is at a maximum.

Step 6. Return OUTPUT control on the exciter fully counterclockwise and turn XMTR switch to OFF.

3-7. RTP-2 POWER AMPLIFIER TUNING.

Note

Prior to tuning the power amplifier check that a 1000 watt, 50- or 70-ohm dummy load or an antenna is connected to the RF OUTPUT jack J505 on the side of the transmitter.

Step 1. Set PA BAND switch on the RTF-2 to the 8-12 position.

Step 2. Turn MODE switch on the RTP-2 to TUNE position and place FINAL PLATE switch ON.

Step 3. Turn ANTENNA LOADING control C117 counterclockwise. Set AUX LOADING switch S103 to +.

Step 4. Unlock PA TUNING control knob and with the control set PA TUNING to 159, the approximate setting for an output frequency of 10 mc.

Step 5. Turn XMTR switch on the exciter to ON. Turn OUTPUT control on the exciter until PA PLATE current meter M302 on the RTF-2 reads approximately 20 ma.

Step 11. The ANTENNA LOADING control should be advanced in increments, each time readjusting PA PLATE current, and decreasing the setting of OUTPUT control on the exciter. This should be continued until PA PLATE current reading is approximately 265 ma., with a minimum output from the exciter, indicated by a reading of approximately 45 on MULTIMETER in the PA Eg Rf position.

Step 12. Turn OUTPUT control and CARRIER IN-

the operator is speaking directly into the microphone or by normal push-to-talk controls.

c. OPERATION IN CW MODE.

(1) Operation of the radio transmitter in the CW mode can be accomplished through the exciter unit, or by eliminating the exciter unit and using the RTF-2 only. To operate with the exciter, refer to the exciter manual for necessary connections and switch adjust-

SECTION 4
PRINCIPLES OF OPERATION

4-1. INTRODUCTION.

a. Radio Transmitter Model GPT-750D-2 and Radio Transmitter Model GPT-750E-2 are designed to operate primarily in the SSB or ISB modes. The radio transmitter also will operate in the AM and CW modes without the use of auxiliary equipment, or in the MCW and FSK modes using auxiliary equipment.

b. The principles of operation are explained covering the basic radio transmitter operation in SSB or ISB modes. The explanation is first presented on a system function. Following the system function discussion, complete details of the operation of the Amplifier-Oscillator Model RTF-2 and Power Supply Model RTP-2 are covered. The detailed discussion of the exciter unit and exciter unit power supply is contained in the applicable exciter unit manual. The theory of operation should be thoroughly understood to aid in isolating faults to a functional unit and circuit within the functional unit.

4-2. FUNCTIONAL BLOCK DIAGRAM DESCRIPTION.

a. AMPLIFIER-OSCILLATOR, MODEL RTF-2.

(1) MASTER OSCILLATOR STAGE. - Figure 4-1 is a block diagram of the radio transmitting system. The variable master oscillator is contained in a double oven to promote stability. The stage uses a triode tube V301 in a Colpitts oscillator circuit which is tunable from 2 to 4 mc. The output of the oscillator is coupled through cathode follower V302A, and buffer V402 to amplifier V403. The cathode follower, which is also in the oven, and buffer amplifier provide two stages of isolation for the oscillator from load variations in the following stages. Tuning of the master oscillator is controlled from the front panel by the MASTER OSCILLATOR FREQUENCY control C301 and C302. The frequency to which it is tuned is indicated on the MASTER OSCILLATOR FREQUENCY KCS dial. The master oscillator is disabled when crystal operation is selected.

(2) CRYSTAL OSCILLATOR-AMPLIFIER AND CATHODE FOLLOWER. - The output of buffer amplifier V402 is applied to the input of V403 when the master oscillator is used as the basic frequency source, determined by the front panel OSCILLATOR switch S401. If the switch is in any one of the three crystal positions the master oscillator, cathode follower, and buffer amplifier are disabled by the removal of plate voltage through the switch. Tube V403 is converted into an electron-coupled Pierce oscillator with the selected crystal controlling the frequency. The frequency range of the oscillator is 2 to 4 mc and the crystals may be selected within this range. Adjustment of the crystal oscillator is accomplished by an internal adjustment. The output of V403, when used either as an amplifier or oscillator is applied through cathode follower V404 to LOCAL OSC OUTPUT jack J403, This output is used in SSB or ISB operation as the injection frequency to the MF stages of the exciter unit. Operation of the exciter unit is explained in paragraph 4-2c.

(3) GROUNDED GRID AMPLIFIER-DOUBLER. - The output signal of the exciter unit is taken from the rf amplifier stages and applied to the input of V201. This stage acts as an rf amplifier over the entire frequency range when operating in SSB mode and raises the power level of the signal. In other modes of operation, such as AM, CW, or MCW, this stage acts as an amplifier or doubler, depending upon the output frequency. The output of V201 is applied to the input of driver stage V205.

(4) DRIVER STAGE. - When operating in SSB mode, this stage operates as a driver amplifier to raise the power to sufficient level to drive the final amplifier. When operating in the other modes, the stage is an amplifier in the 2- to 16-mc range, and a doubler amplifier in the 16- to 32-mc range. The output level is controlled by a front panel control which controls the screen grid voltage level. The output of the driver is capacitor coupled to the grids of the power amplifier stage.

(5) POWER AMPLIFIER AND PI NETWORK. - The power amplifier stage employs two tubes in parallel to provide the rf output to the antenna system. When operating in SSB mode, the stage is operated as a class AB amplifier since low level modulation is used. The plate tank is tuned by PA TUNING control C113 on the front panel. Plate efficiency of the stage is at least 50% when operating in this mode. The output from the tuned plate load is applied through a pi network to the antenna system. The pi network serves as an impedance matching device between the power amplifier and the antenna circuit.

(6) CALIBRATION OSCILLATOR. - A 100-kc calibration oscillator is contained in the double oven with the master oscillator. This oscillator is crystal controlled and provides 50-kc check points for calibrating the master oscillator. The output of the oscillator is coupled to mixer stage V405; the output of the master oscillator taken from the buffer amplifier V402 is also coupled to the mixer. The two signals are heterodyned in the mixer to produce an audible beat frequency signal which is applied to two stages of audio amplification. The output of the second audio amplifier V406B is applied to the ZERO BEAT indicator on the front panel and to the PHONES jack.

(7) KEYER AND CLAMPER CIRCUITS. - When operating in the SSB mode, the keyer circuit acts as a protective stage for the RTF-2. If for any reason the low voltage supply is removed, this circuit will bias amplifier-doubler V201 and thereby protect all stages. When the stages are in use during CW or MCW operation, they key both amplifier-doubler V201 and driver V205 so as to minimize key clicks. Clamp tube V206

keeps the keying line above ground when the key is closed.

b. POWER SUPPLY MODEL RTP-2.

The RTP-2 supplies all required operating power to the RTF-2 and contains the high voltage control circuits, and mode selection circuits. Operating power is supplied from four separate supplies: a low B+, a low B- supply, a midvoltage supply, and a high voltage supply.

(1) LOW VOLTAGE SUPPLIES. - Transformer T601, rectifiers V603 and V604, and regulators V601 and V602 comprise the low B+ and B- supplies. Fuse F602 protects the primary input to transformer T601. Low B+ is provided by V604 and its LC filter network at a level of 270 vdc to the low level stages of the RTF-2. Certain stages have their screen grid voltage applied through the band switches which disable these stages by removing screen voltage when they are not in use. The regulated bias supply consisting of rectifier V603 and the RCL filter provides protective bias for the amplifier-multipliers, driver, and power amplifier in the RTF-2. Fuse F605 protects the low B+ and F604 the low B- supply. Ac voltage for the operation of the time delay relay K602 and relay K603 are provided by secondary winding 5-6-7 of T601.

(2) MIDVOLTAGE SUPPLY. - The midvoltage supply consists of transformer T602, rectifier V605, and the associated LC filter network. The primary input to T602 is fused by line fuse F603, and the output of the supply is fused by F606. The 500-vdc output of the midvoltage supply is applied to the keyer circuits in the RTF-2, and, during CW-FS or phone operation, to the PA screen grid. A reduced voltage is applied to the PA screen grid during tune operation. The output is applied to the multiplier section of the RTF-2 and to the screen of the final amplifier.

(3) HIGH VOLTAGE SUPPLY. - Primary plate power for the high voltage supply is supplied from transformer T501 located at the bottom of the cabinet. Transformer T603 provides the filament voltage. The output of +3000 vdc is applied by high voltage cable to the power amplifier section of the RTF-2. Circuit breaker CB601 protects the high voltage supply circuits.

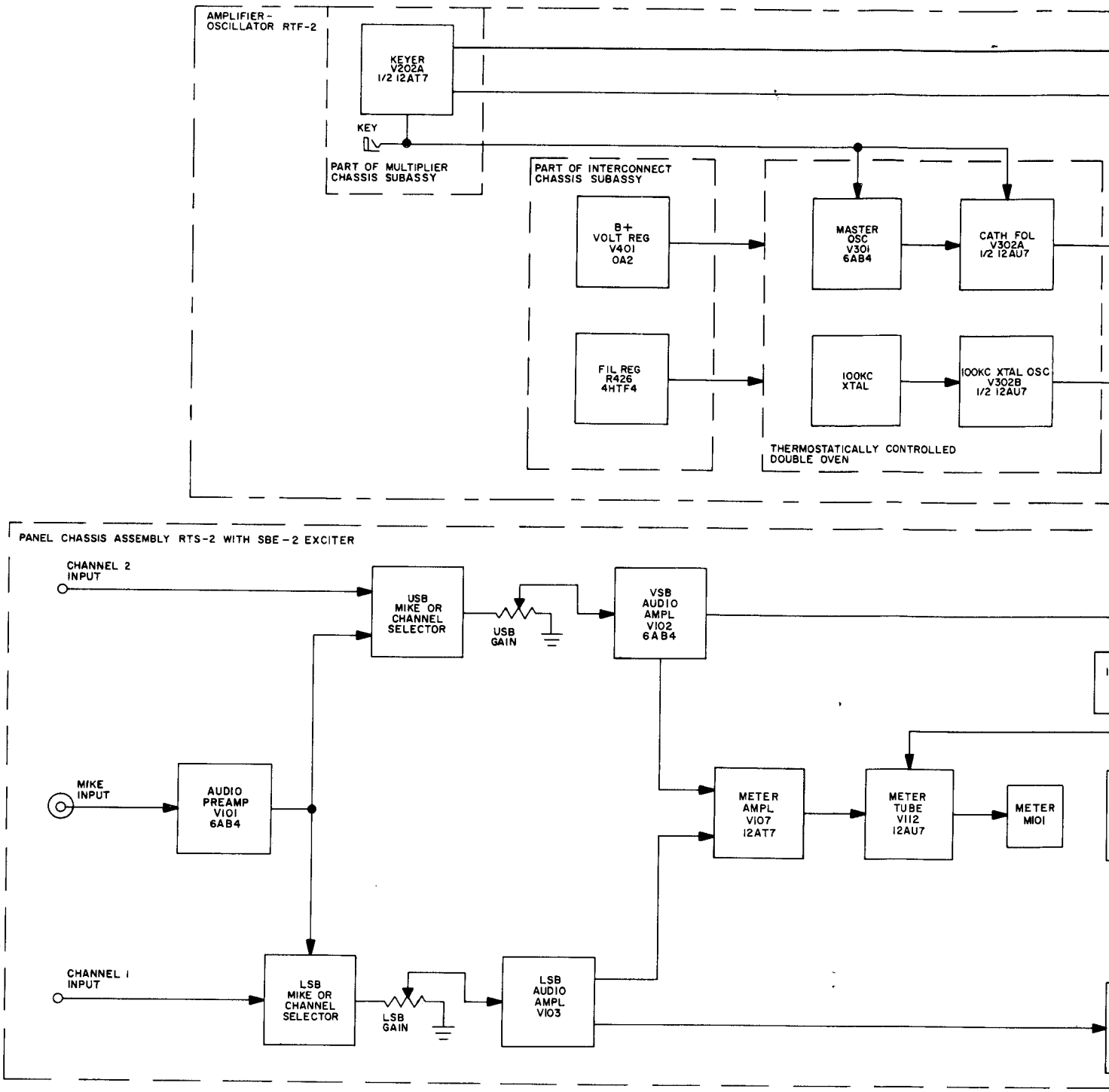
c. TRANSMITTING MODE SELECTOR MODEL SBE-2.

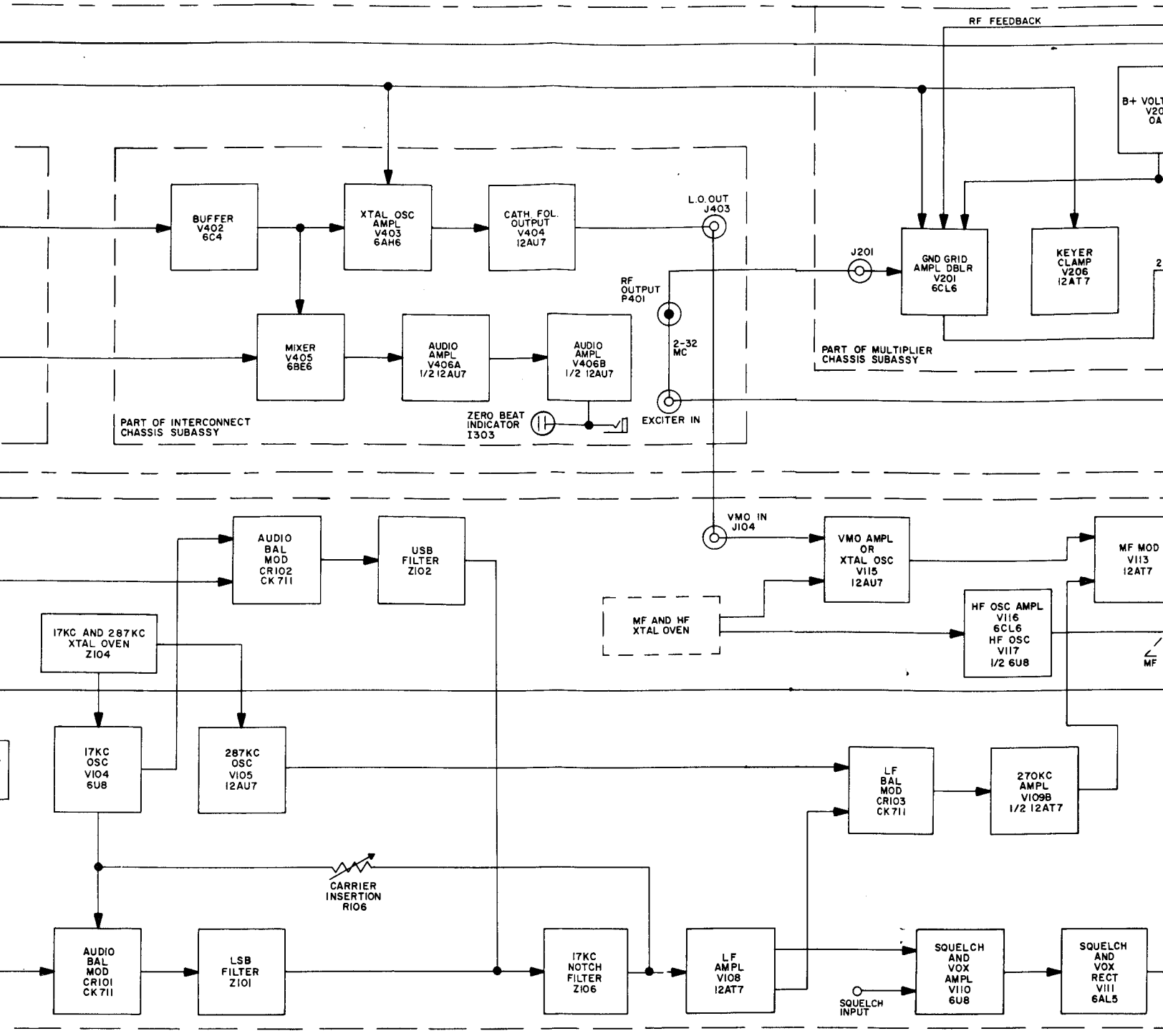
Although the two exciter units used in the two models of the transmitter perform the same function, they are not completely identical internally. Figure 4-1 presents the block diagram of the SBE-2 exciter unit used in Radio Transmitter Model GPT-750D-2. Figure 4-2 presents the block diagram of the SBE-3 exciter used in Radio Transmitter Model GPT-750E-2. The explanation in this paragraph pertains to the SBE-2; the explanation for the SBE-3 is given in paragraph 4-2d. The power supply for the exciter is contained on the RTS-2 panel assembly. Circuitwise, this power section, squelch and VOX section, and metering circuits.

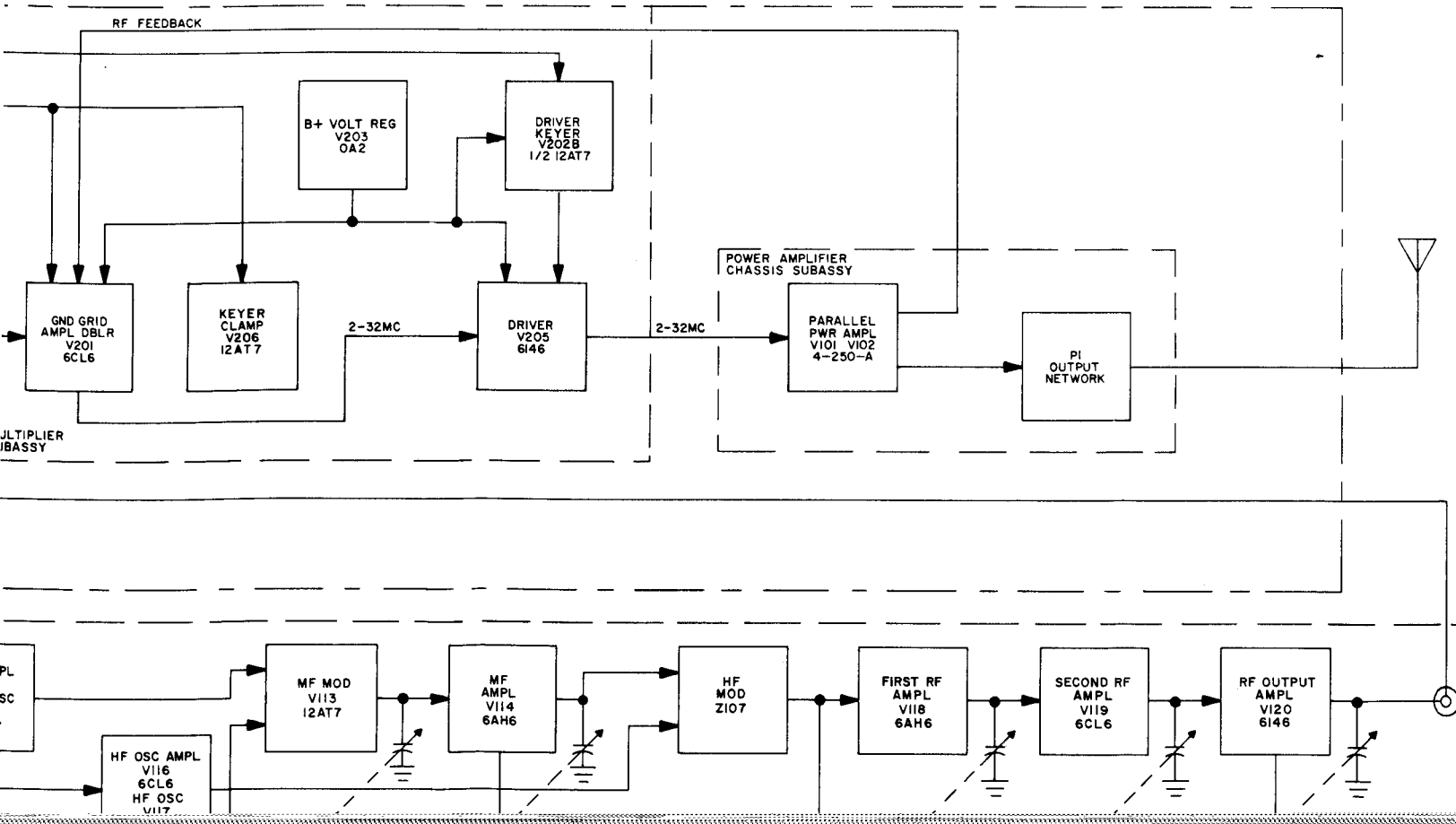
(1) AUDIO INPUT STAGES. - Individual inputs to channel 1 and 2 can be connected to the input terminals at the rear of the transmitter. When the microphone input is used, the signal is applied to an audio preamplifier. The output signals of the two channel inputs or the mike input are routed through selection switches and applied to the upper and lower side band audio amplifiers V102 and V103 respectively. The output of audio amplifier V102 is applied to balanced modulator CR102 which also receives the output of a stable 17-kc crystal oscillator. In the output of the balanced modulator, the two principle sidebands and the attenuated 17-kc carrier appear and are applied to an extremely sharp filter Z102 which passes only the upper sideband to the 17-kc notch filter. The notch filter reduces any 17-kc carrier to a negligible level. The output of V103 is applied to balanced modulator CR101 as is the output of 17-kc oscillator V104. The modulator output consisting of the principle sidebands and the 17-kc carrier is applied to filter Z101 which passes only the lower sideband and considerably reduces the 17-kc carrier. This lower sideband signal is applied to the 17-kc notch filter which further reduces the carrier signal level. The output of the notch filter consists of both the upper and lower sideband signals which are applied to the LF stages of the exciter.

(2) LF STAGES. - The low frequency stages of the exciter raise the frequency level of the sidebands by combining them with the output of stable crystal oscillator V105 which operates at 287 kc. The output of the notch filter contains only the upper and lower sideband signals and is applied to the LF amplifier V108. At this point, if desired, any degree of carrier insertion, that is the 17-kc carrier, may be reinserted by means of a front panel control. The output of the amplifier is applied to the LF balanced modulator where it is modulated with the output of the 287-kc crystal oscillator V105. The output of modulator CR103 now contains the original upper and lower sideband intelligence in the lower sideband of the 287-kc signal, that is, the intelligence is now centered around 270 kc. This signal is applied to tuned amplifier V109B; the output of the amplifier is applied to the MF stages.

(3) MF STAGES. - This section of the exciter consists of MF modulator V113 and MF amplifier V114 and operates in the 2- to 4-mc range. When the master oscillator of the RTF-2 is used to supply the injection frequency, the signal is applied to amplifier V115 and then to the input of the modulator. When the injection frequency is being supplied by the crystal oscillator within the exciter, V115 serves as the crystal oscillator. The MF modulator operates in a similar manner to LF balanced modulator. The intelligence contained in the 270-kc sidebands is modulated by the injection frequency effectively raising the frequency level to the 2- to 4-mc range. The output of the modulator is applied to the MF amplifier; when the operating frequency is in the 2- to 4-mc range, the output of the MF amplifier is applied to the input of the RF am-


AMPLIFIER-
OSCILLATOR RTF-2
KEYER
V202A
1/2 12AT7
KEY
PART OF MULTIPLIER
CHASSIS SUBASSY
PART OF INTERCONNECT
CHASSIS SUBASSY
B+
VOLT REG
V401
0A2
MASTER
OSC
V301
6AB4
CATH FOL
V302A
1/2 12AU7
FIL REG
R426
4HTF4
100KC
XTAL
100KC XTAL OSC
V302B
1/2 12AU7
THERMOSTATICALLY CONTROLLED
DOUBLE OVEN
PANEL CHASSIS ASSEMBLY RTS-2 WITH SBE-2 EXCITER
CHANNEL 2
INPUT
USB
MIKE OR
CHANNEL
SELECTOR
USB
GAIN
VSB
AUDIO
AMPL
V102
6AB4
MIKE
INPUT
AUDIO
PREAMP
V101
6AB4
METER
AMPL
V107
12AT7
METER
TUBE
V112
12AU7
METER
M101
CHANNEL 1
INPUT
LSB
MIKE OR
CHANNEL
SELECTOR
LSB
GAIN
LSB
AUDIO
AMPL
V103


RF FEEDBACK
B+ VOLT
V20
OA
BUFFER
V402
6C4
XTAL OSC
AMPL
V403
6AH6
CATH. FOL.
OUTPUT
V404
12AU7
L.O. OUT
J403
J201
GND GRID
AMPL DBLR
V201
6CL6
KEYER
CLAMP
V206
12AT7
RF
OUTPUT
P401
2-32
MC
MIXER
V405
6BE6
AUDIO
AMPL
V406A
1/2 12AU7
AUDIO
AMPL
V406B
1/2 12AU7
PART OF MULTIPLIER
CHASSIS SUBASSY
PART OF INTERCONNECT
CHASSIS SUBASSY
ZERO BEAT
INDICATOR
I303
EXCITER IN
VMO IN
J104
AUDIO
BAL
MOD
CR102
CK711
USB
FILTER
Z102
VMO AMPL
OR
XTAL OSC
V115
12AU7
MF MOD
V113
12AT7
MF AND HF
XTAL OVEN
HF OSC AMPL
V116
6CL6
HF OSC
V117
1/2 6U8
17KC AND 287KC
XTAL OVEN
Z104
17KC
OSC
V104
6U8
287KC
OSC
V105
12AU7
LF
BAL
MOD
CR103
CK711
270KC
AMPL
V109B
1/2 12AT7
CARRIER
INSERTION
R106
AUDIO
BAL
MOD
CR101
CK711
LSB
FILTER
Z101
17KC
NOTCH
FILTER
Z106
LF
AMPL
V108
12AT7
SQUELCH
INPUT
SQUELCH
AND
VOX
AMPL
V110
6U8
SQUELCH
AND
VOX
RECT
V111
6AL5


RF FEEDBACK
B+ VOLT REG
V203
0A2
DRIVER
KEYER
V202B
1/2 12AT7
POWER AMPLIFIER
CHASSIS SUBASSY
GND GRID
AMPL DBLR
V201
6CL6
KEYER
CLAMP
V206
12AT7
2-32MC
DRIVER
V205
6146
2-32MC
PARALLEL
PWR AMPL
V101 V102
4-250-A
PI
OUTPUT
NETWORK
ULTIPLIER
UBASSY

MF MOD
V113
12AT7
MF
AMPL
V114
6AH6
HF
MOD
Z107
FIRST RF
AMPL
V118
6AH6
SECOND RF
AMPL
V119
6CL6
RF OUTPUT
AMPL
V120
6146
HF OSC AMPL
V116
6CL6
HF OSC

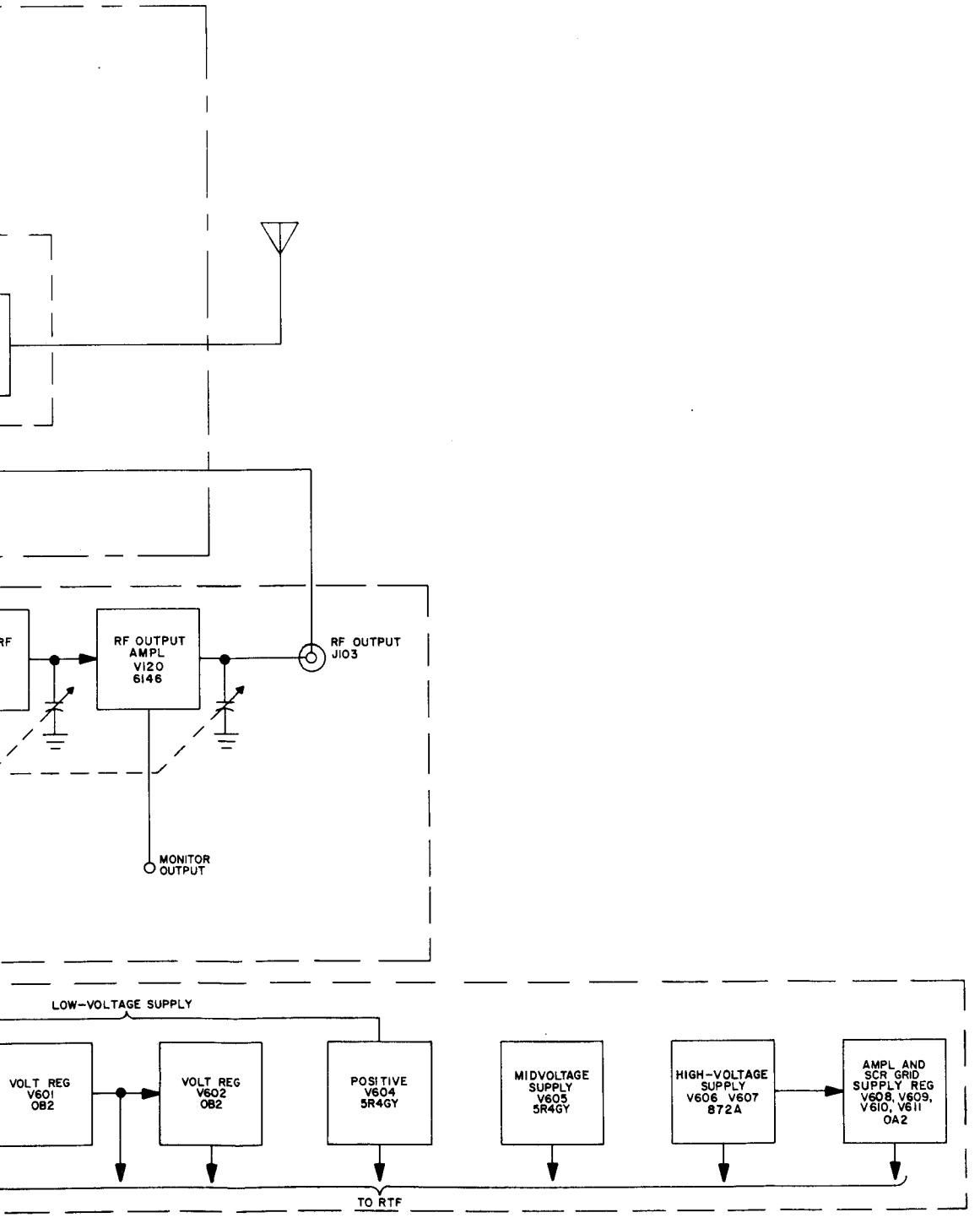
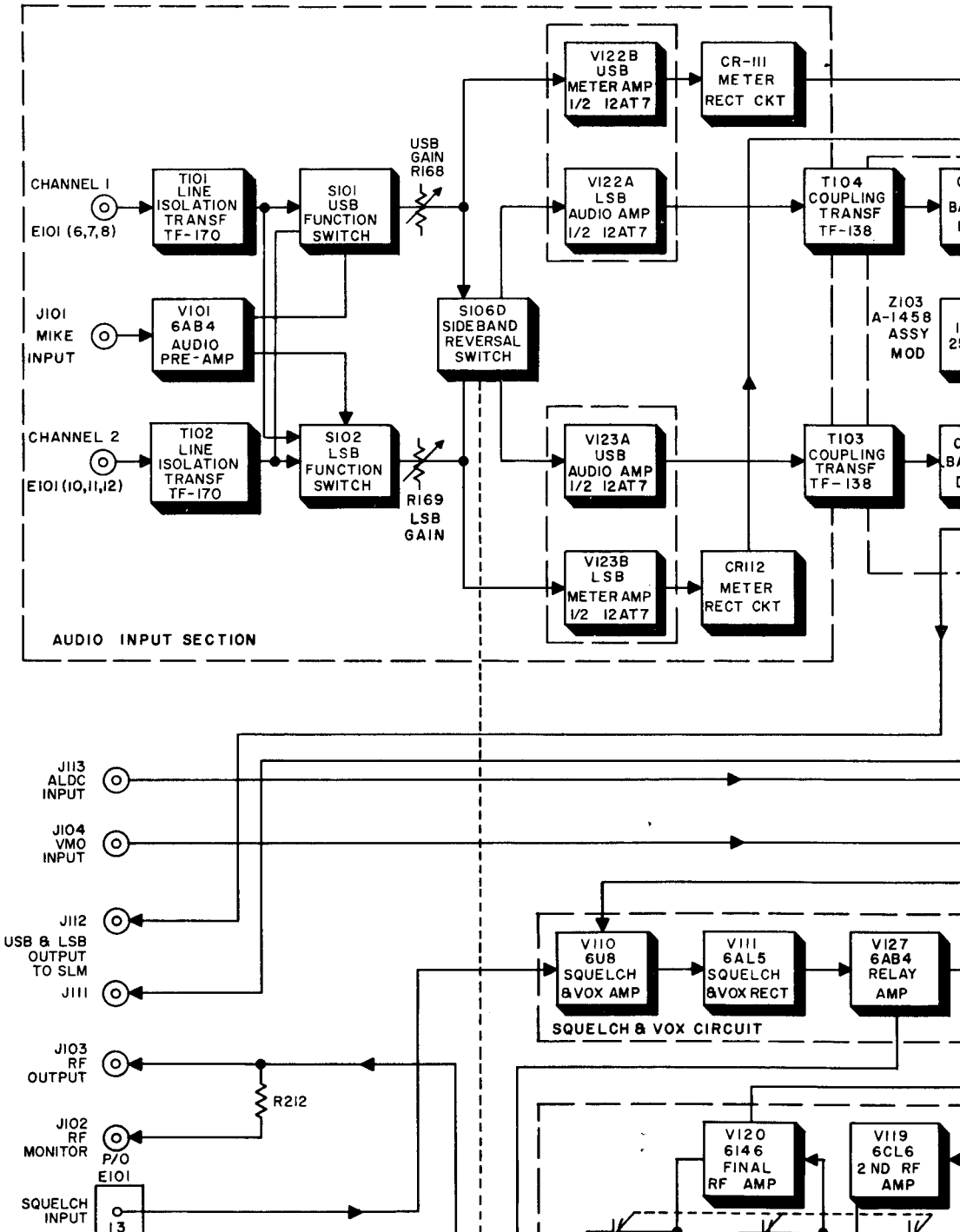


Figure 4-1. Radio Transmitter, Detailed Block Diagram


AUDIO INPUT SECTION
CHANNEL 1
E101 (6,7,8)
T101 LINE ISOLATION TRANSF TF-170
S101 USB FUNCTION SWITCH
USB GAIN R168
V122B USB METER AMP 1/2 12AT7
CR-111 METER RECT CKT
V122A LSB AUDIO AMP 1/2 12AT7
T104 COUPLING TRANSF TF-138
J101 MIKE INPUT
V101 6AB4 AUDIO PRE-AMP
S106D SIDEBAND REVERSAL SWITCH
Z103 A-1458 ASSY MOD
CHANNEL 2
E101 (10,11,12)
T102 LINE ISOLATION TRANSF TF-170
S102 LSB FUNCTION SWITCH
R169 LSB GAIN
V123A USB AUDIO AMP 1/2 12AT7
T103 COUPLING TRANSF TF-138
V123B LSB METER AMP 1/2 12AT7
CR112 METER RECT CKT
J113 ALDC INPUT
J104 VMO INPUT
J112 USB & LSB OUTPUT TO SLM
J111
V110 6U8 SQUELCH & VOX AMP
V111 6AL5 SQUELCH & VOX RECT
V127 6AB4 RELAY AMP
SQUELCH & VOX CIRCUIT
J103 RF OUTPUT
R212
J102 RF MONITOR
P/O E101
SQUELCH INPUT
13
PUSH TO TALK
1
EXTERNAL KEYING
3
V120 6146 FINAL RF AMP
V119 6CL6 2 ND RF AMP
S106A 6146 TUNED CKTS
S106B 6CL6 TUNED CKTS

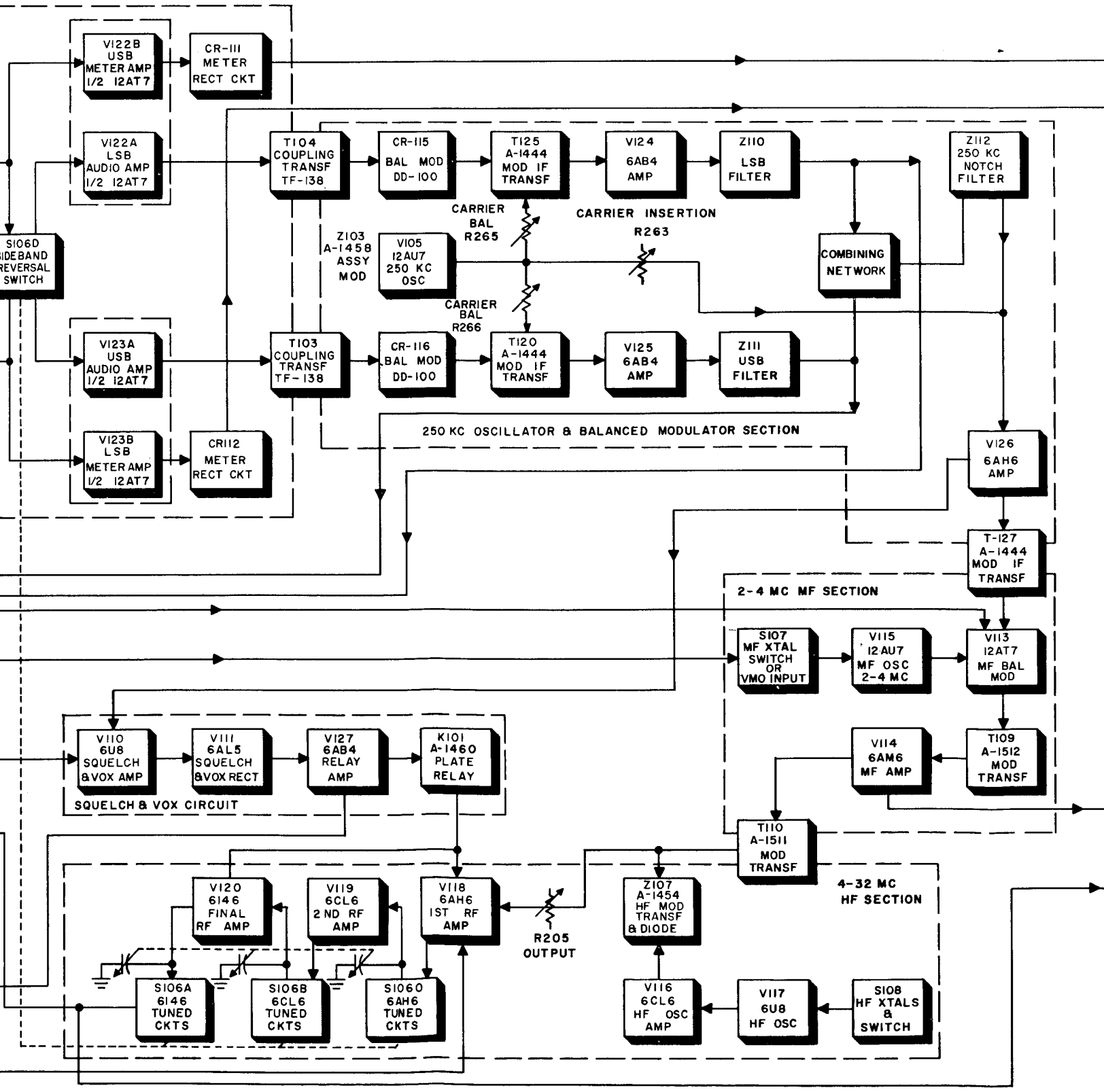

V122B USB METER AMP 1/2 12AT7
CR-111 METER RECT CKT
V122A LSB AUDIO AMP 1/2 12AT7
T104 COUPLING TRANSF TF-138
CR-115 BAL MOD DD-100
T125 A-1444 MOD IF TRANSF
V124 6AB4 AMP
Z110 LSB FILTER
Z112 250 KC NOTCH FILTER
S106D SIDEBAND REVERSAL SWITCH
Z103 A-1458 ASSY MOD
V105 12AU7 250 KC OSC
CARRIER BAL R265
CARRIER INSERTION R263
CARRIER BAL R266
COMBINING NETWORK
V123A USB AUDIO AMP 1/2 12AT7
T103 COUPLING TRANSF TF-138
CR-116 BAL MOD DD-100
T120 A-1444 MOD IF TRANSF
V125 6AB4 AMP
Z111 USB FILTER
V123B LSB METER AMP 1/2 12AT7
CR112 METER RECT CKT
250 KC OSCILLATOR & BALANCED MODULATOR SECTION
V126 6AH6 AMP
T-127 A-1444 MOD IF TRANSF
2-4 MC MF SECTION
S107 MF XTAL SWITCH OR VMO INPUT
V115 12AU7 MF OSC 2-4 MC
V113 12AT7 MF BAL MOD
V110 6U8 SQUELCH & VOX AMP
V111 6AL5 SQUELCH & VOX RECT
V127 6AB4 RELAY AMP
K101 A-1460 PLATE RELAY
SQUELCH & VOX CIRCUIT
V114 6AM6 MF AMP
T109 A-1512 MOD TRANSF
T110 A-1511 MOD TRANSF
4-32 MC HF SECTION
V120 6146 FINAL RF AMP
V119 6CL6 2 ND RF AMP
V118 6AH6 IST RF AMP
R205 OUTPUT
Z107 A-1454 HF MOD TRANSF & DIODE
S106A 6146 TUNED CKTS
S106B 6CL6 TUNED CKTS
S106C 6AH6 TUNED CKTS
V116 6CL6 HF OSC AMP
V117 6U8 HF OSC
S108 HF XTALS & SWITCH

Fig
M

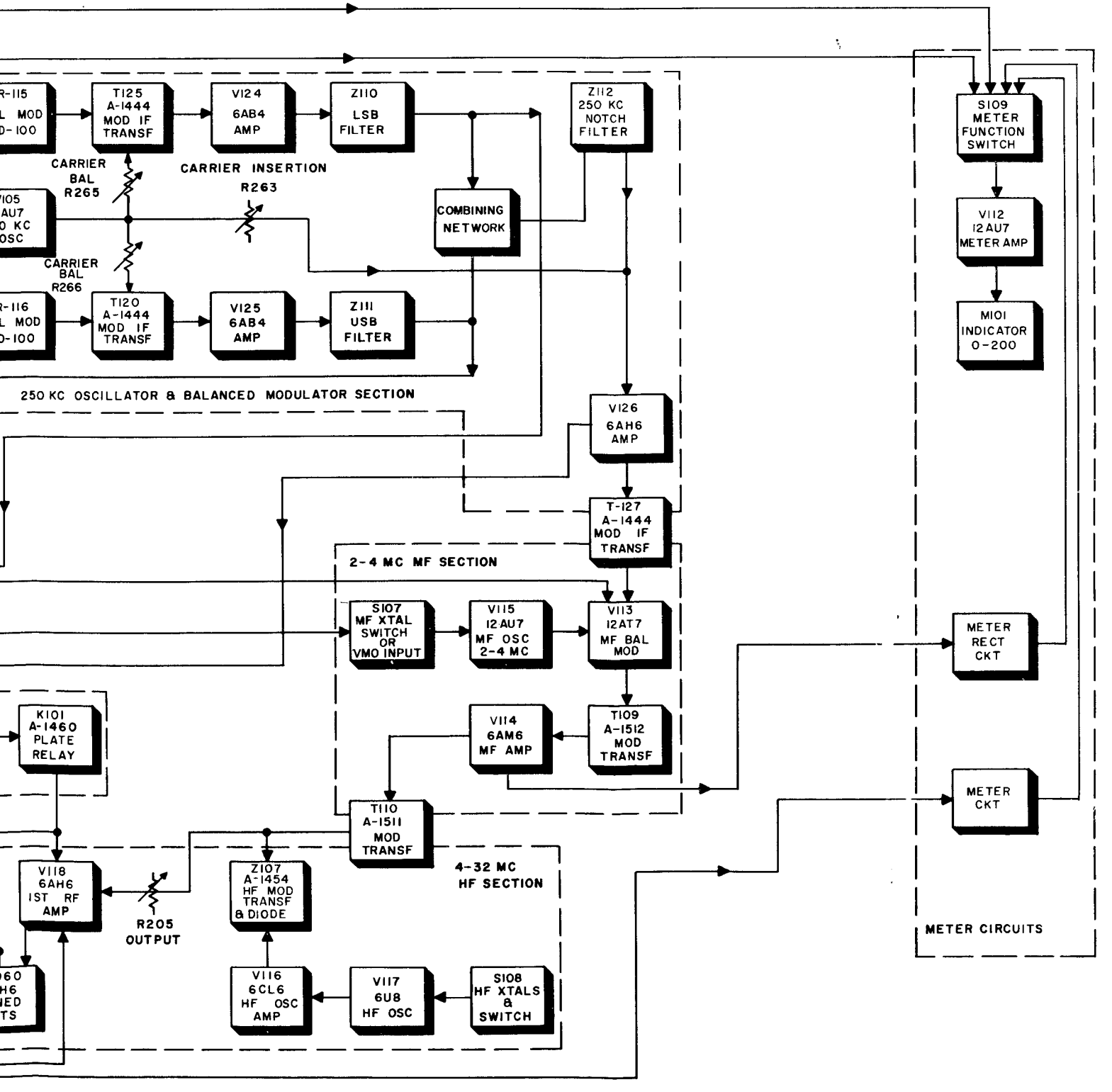


Figure 4-2. Transmitting Mode Selector Model SBE-3, Detailed Block Diagram

fier V116 and balanced modulator Z107. The oscillator may be operated at any one of the 10 preselected crystal frequencies to provide the modulating frequency for the sideband intelligence. The output of the oscillator is amplified by V116 and applied to modulator Z107 where it is combined with the output of the MF amplifier V114. The output of Z107 containing the initial sideband intelligence is applied to the input of the rf amplifier stages.

(5) RF AMPLIFIER STAGES. - Three stages of rf amplification are used to raise the power level of

4-3. DETAILED DESCRIPTION.

a. AMPLIFIER-OSCILLATOR, MODEL RTF-2.

(1) MASTER OSCILLATOR.

(a) The master oscillator stage uses triode V301 in a Colpitts oscillator circuit. (See figure 4-3.) The tuned grid circuit consists of L301, tuning capacitors C301 and C302, and padders C303, C304 and C319. The tank circuit is effectively tapped by C305 and C306

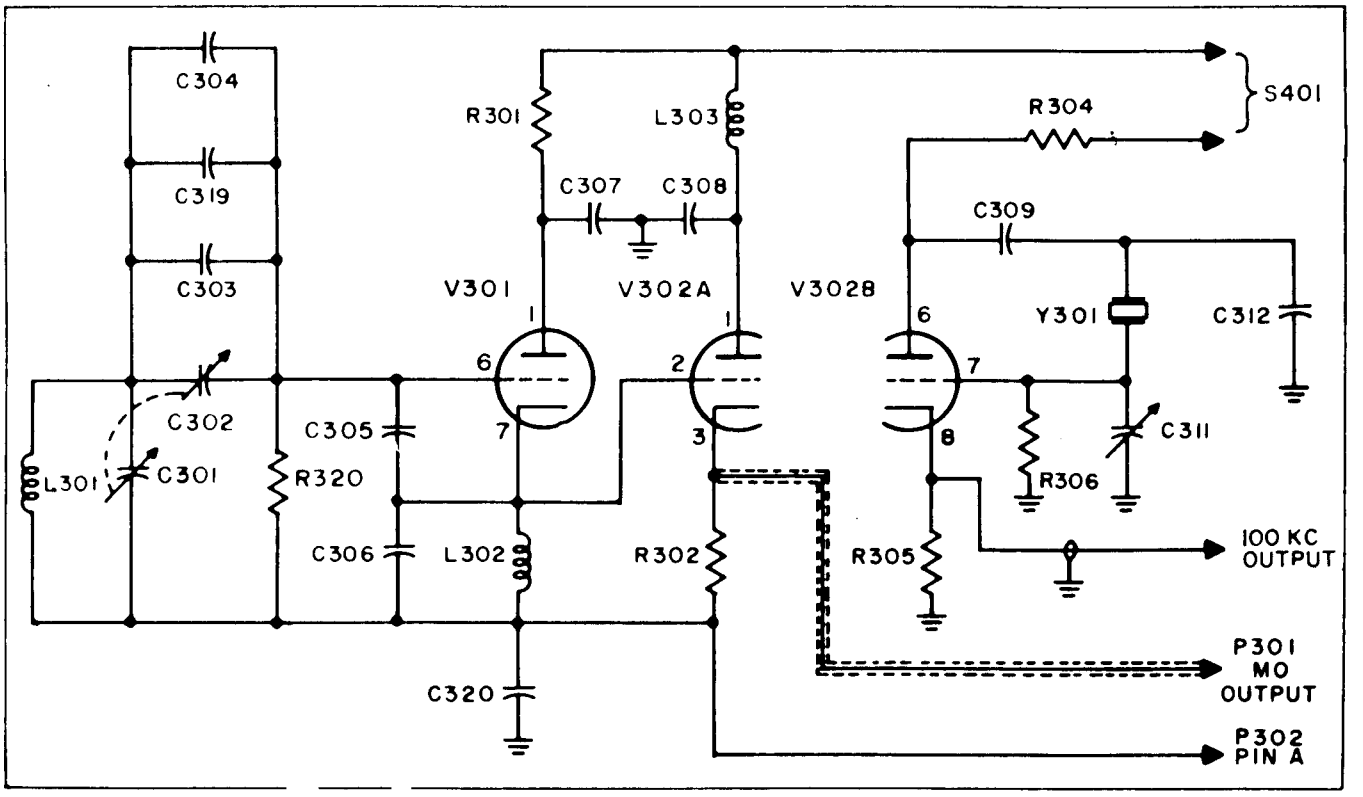


Figure 4-3. Master and Calibrator Oscillators, Simplified Schematic Diagram

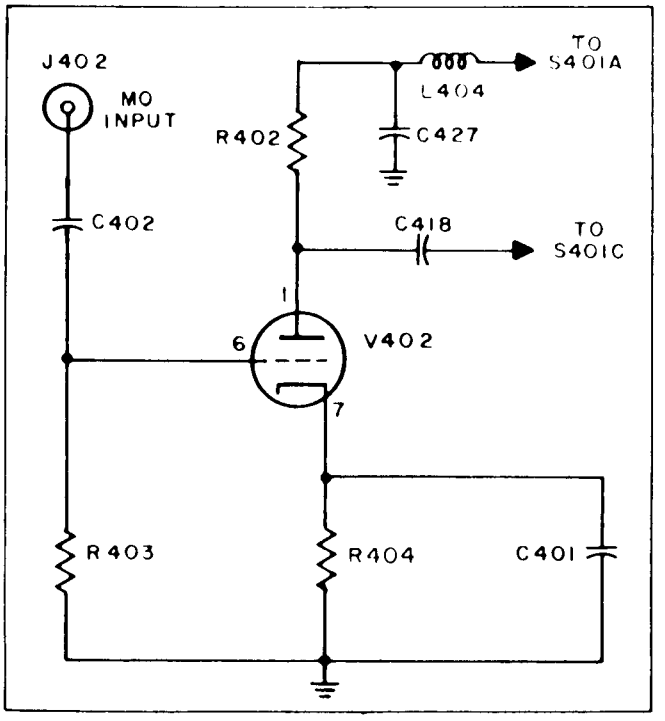


Figure 4-4. Buffer Stage, Simplified Schematic Diagram

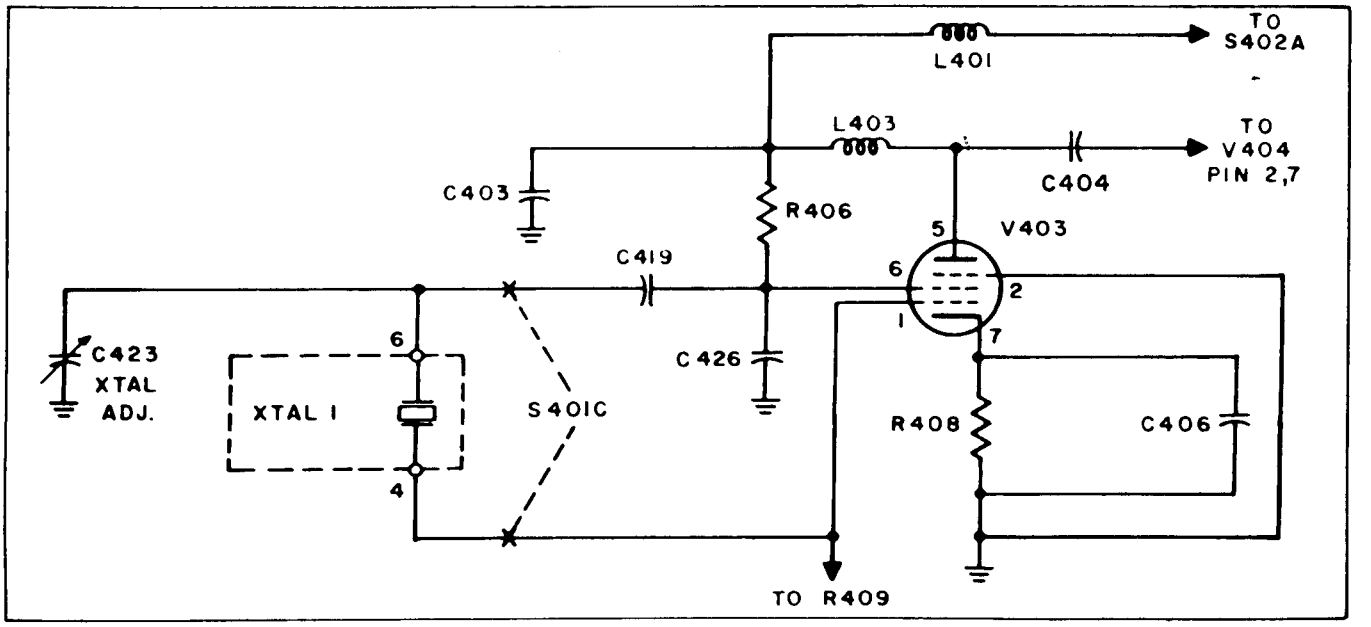


Figure 4-5. Crystal Oscillator/Amplifier, Simplified Schematic Diagram

switch S401. (See figure 4-5.) When the master oscillator is in use, and switch S401 in CAL or MO position, pentode V403 operates as a broadband rf amplifier. This amplifier stage is used to amplify the output of the buffer stage to obtain sufficient drive for the amplifier-doubler stage.

(b) When S401 is in the X1, X2, or X3 position, the master oscillator is disabled and V403 is reconnected as an electron-coupled Pierce oscillator (figure 4-5.) The screen grid is effectively the plate of the oscillator and feedback is obtained through C419. The oscillator output is electron-coupled to the plate circuit thereby isolating the oscillator from the load. The output of the stage is developed across plate load L403 and coupled through C404 to the input of V404. Grid bias is supplied from a negative supply when the stage is used as an oscillator.

(6) CATHODE FOLLOWER OUTPUT.

(a) A conventional cathode follower circuit is provided for the output of the oscillator circuits. (See figure 4-6.) The cathode follower circuit consists of dual-triode V404 connected in parallel, with T401 as the cathode load.

(b) The output of this circuit, matched to a 70-ohm line by tapping coil T401, is coupled through capacitor C408 to RF OUTPUT jack P401. The 70-ohm output impedance is provided to permit the use of longer interconnecting lines when external frequency shift or sideband exciters are driven by the transmitter oscillator.

(7) MIXER CIRCUIT.

(a) Mixer circuit V405 heterodynes the master oscillator signal and the calibration oscillator output to produce a beat note. (See figure 4-7.) A voltage output from the mixer stage is only obtained when the

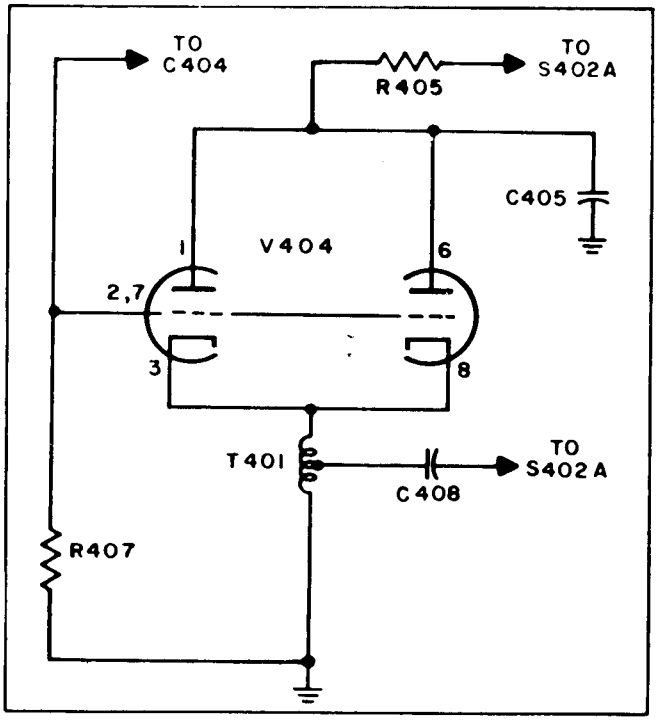


Figure 4-6. Cathode Follower, Simplified Schematic Diagram

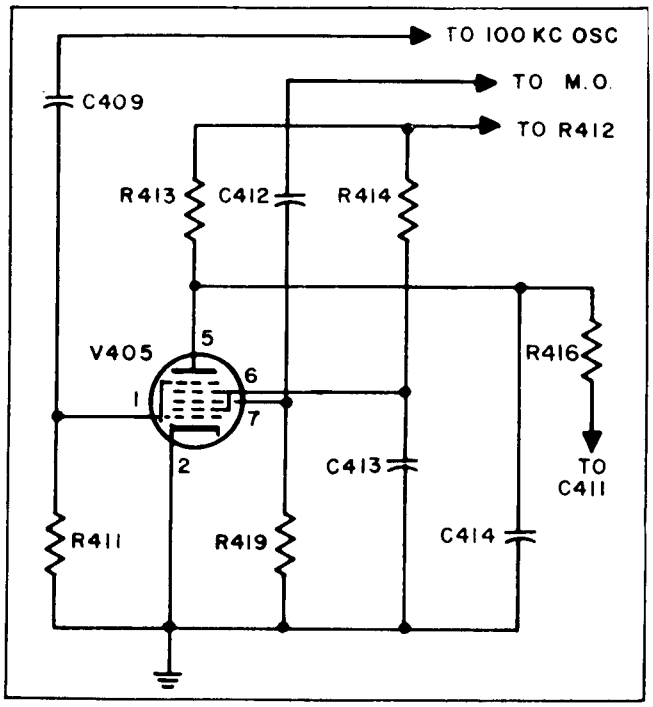


Figure 4-7. Mixer Stage, Simplified Schematic Diagram

two oscillators are within audio frequency range of each other. This is accomplished by passing the mixer output through a low pass filter consisting of C403, L401, C404, C415, and R416.

(b) Plate and screen voltage is applied to V405, a pentagrid converter, only when the OSCILLATOR switch is in the CAL position. The output of the 100-kc oscillator is coupled to the control grid through C409; and the output of the master oscillator to the injection grid through C412. Harmonics of the 100-kc oscillator are generated in the stage, one of which will beat with the master oscillator frequency to produce an audible beat note as the MO frequency is varied.

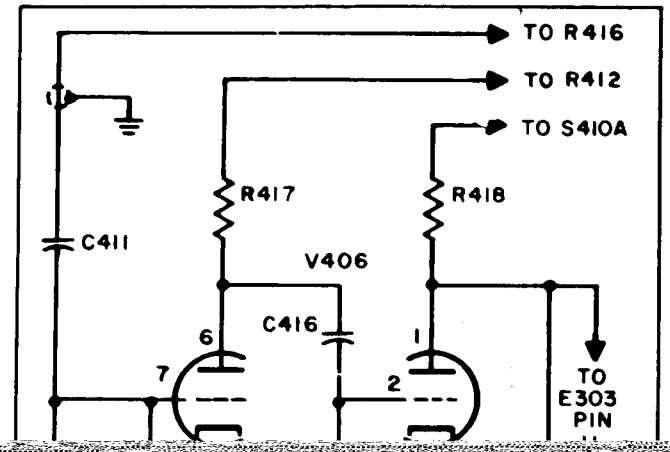
(8) AUDIO AMPLIFIER. - A two-stage audio amplifier V406 is used to amplify the audio output of the mixer stage. (See figure 4-8.) Plate voltage is applied to the amplifier only when S401 is in the CAL position. The output of V406B is applied across ZERO

(b) In SSB operation (figure 4-10), the input to the stage is applied to the cathode from the exciter at the frequency desired for transmission and containing the sideband intelligence. In this condition, the stage is operated as a straight rf amplifier to avoid distorting the intelligence. The output tank is isolated from B+ by C207. The tank circuit in the 2- to 4-mc range consists of L203 and C201A; above 4 mc, L203 is replaced by L204 through DRIVER BAND switch S201. Tuning capacitor C201A is gang tuned with C201C to insure tracking of the amplifier stages through the 2- to 32-mc operating range.

(c) In NORMAL operation, the input is taken from the output of cathode follower V404 and will be either the master oscillator signal or the crystal oscillator signal. In the 2- to 4-mc band, the stage operates as a voltage amplifier. At all frequencies above 4 mc, the stage is operated as a doubler. In the 2- to 4-mc and 4- to 8-mc settings of S201, the output of V201 is applied to the input of driver V205 through the switch. Above 8 mc, an additional doubler stage, V204, is used in the circuit. The output of V201 is then applied to the input of V204 through S201 and S204.

(10) DOUBLER.

(a) This stage is used only when operating in the NORMAL position of S204. (See figure 4-9.) Above 8 mc, additional multiplication of the output of V201 is required, so at these frequencies V204 has plate and screen voltage applied and the stage operates as a doubler. The stage operates with fixed bias and self-bias



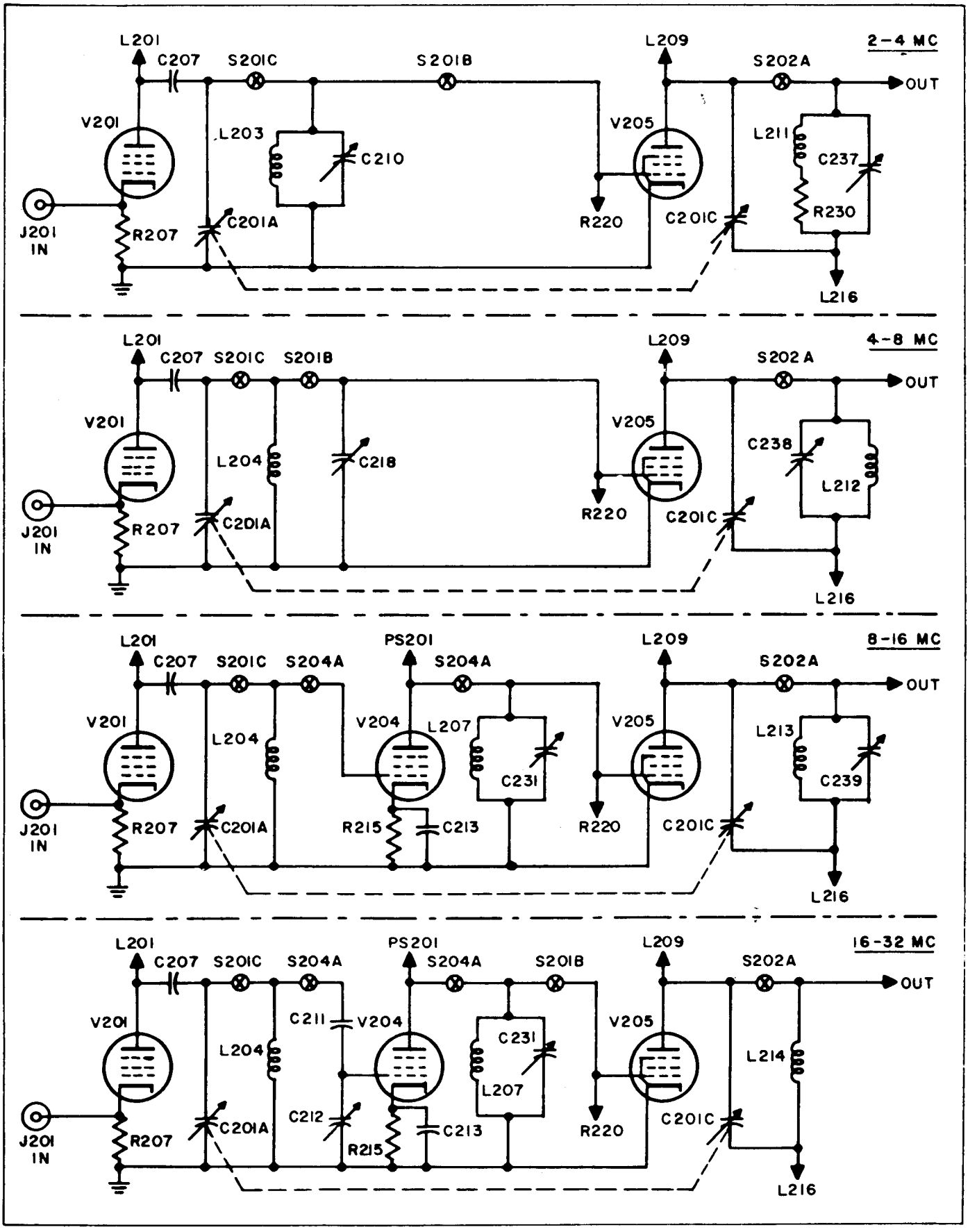


Figure 4-9. Frequency Multiplier (NORMAL Mode) Simplified Schematic Diagram

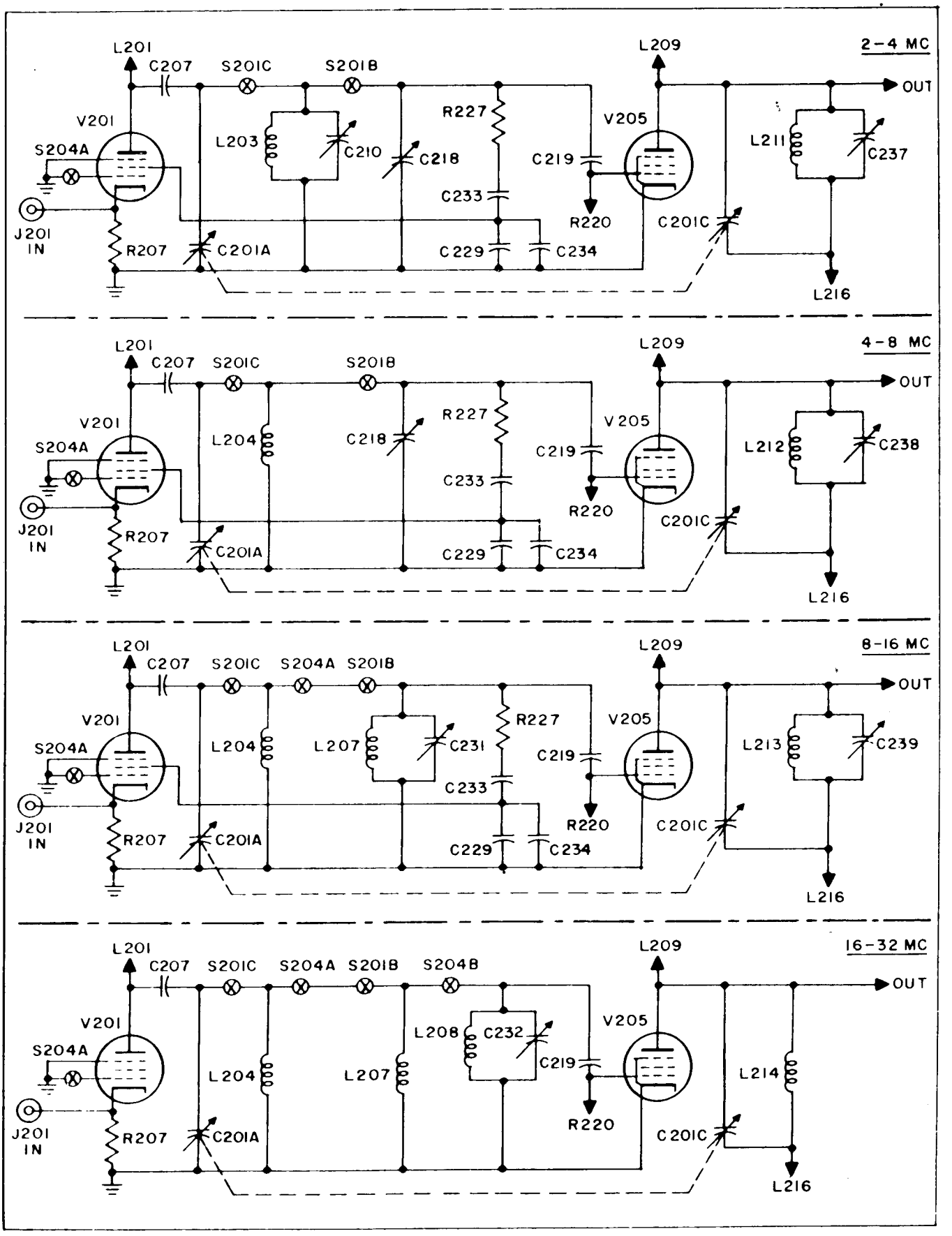


Figure 4-10. Frequency Multiplier (SSB Mode) Simplified Schematic Diagram

developed in the grid circuit. Parasitic suppressors are used in both grid and plate circuits.

(b) The tuned plate circuit consists of L207, C201B, and C231 isolated from B+ by C215. The output is gang tuned with V201 and V205 by C201B. The output, within the frequency range of 8 to 16 mc, is applied through S201 and S204 to the input of the driver.

(11) DRIVER.

voltage is supplied from transformer T101 in the power amplifier section.

(c) Band change switches S101 and S102 select the tuned tank circuit components in the output circuit. Coils L112 and L113 are tapped and various sections are switched into the circuit. PA TUNING control C113 is common to all bands. A portion of the output of the power amplifier is coupled through trimmer capacitor C104 and applied to V201. This feedback is the neutralizing signal to prevent spurious oscillations

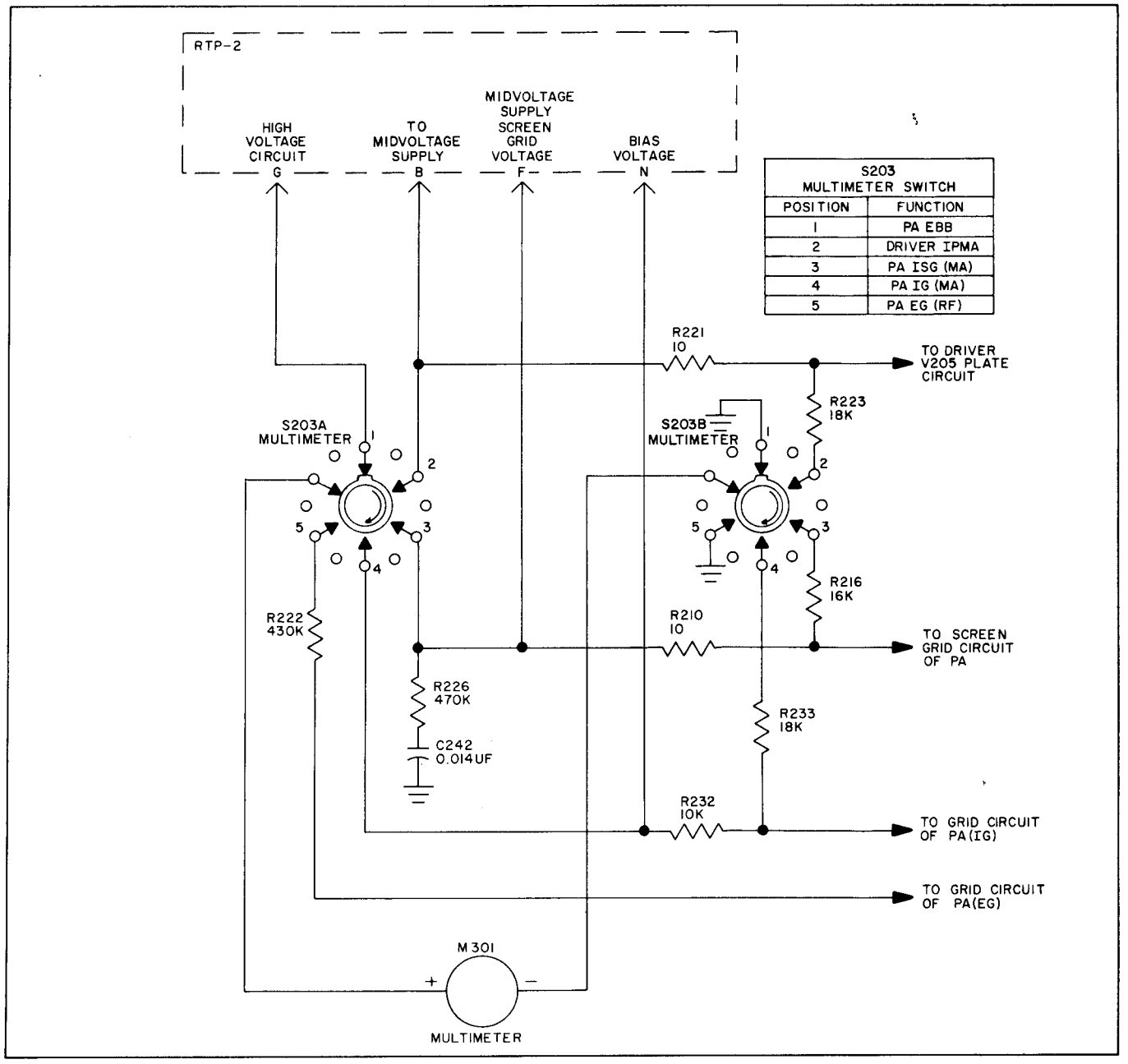


Figure 4-11. Metering Circuit, Simplified Schematic Diagram

The breaker trips automatically but must be reset manually. When MAIN POWER breaker CB601 is in the ON position, indicator I604 serves to visually indicate the presence of primary power. The BYPASS position of switch S602 permits line voltage to be applied to pins M and T of J602 even though MAIN POWER breaker CB601 is in the OFF position. Fuse F601 protects the circuit since the main power breaker is bypassed. The line voltage, after passing through CB601, is also applied as follows: through fuse F603 to the midvoltage supply, through fuse F602 to the low voltage supply; through FINAL PLATES switch S604 to normally open contacts of transmitter plates relay K601; and directly to the 115-volt tap on switch S605. With FINAL PLATE switch S604 in the ON position and transmitter plates relay K601 energized, primary power is applied to pins M and L of J601 through external circuits to FINAL PLATES lamp I602, causing I602 to light. This voltage is also applied to the high voltage input transformer of the external circuits. Adjustable filament voltage is supplied through filament line switch S605. This switch connects the line to the various taps of transformer T603. The secondary of T603 supplies filament voltage for high-voltage rectifiers V606 and V607. Meter M601 provides a means for monitoring the voltage applied to T603.

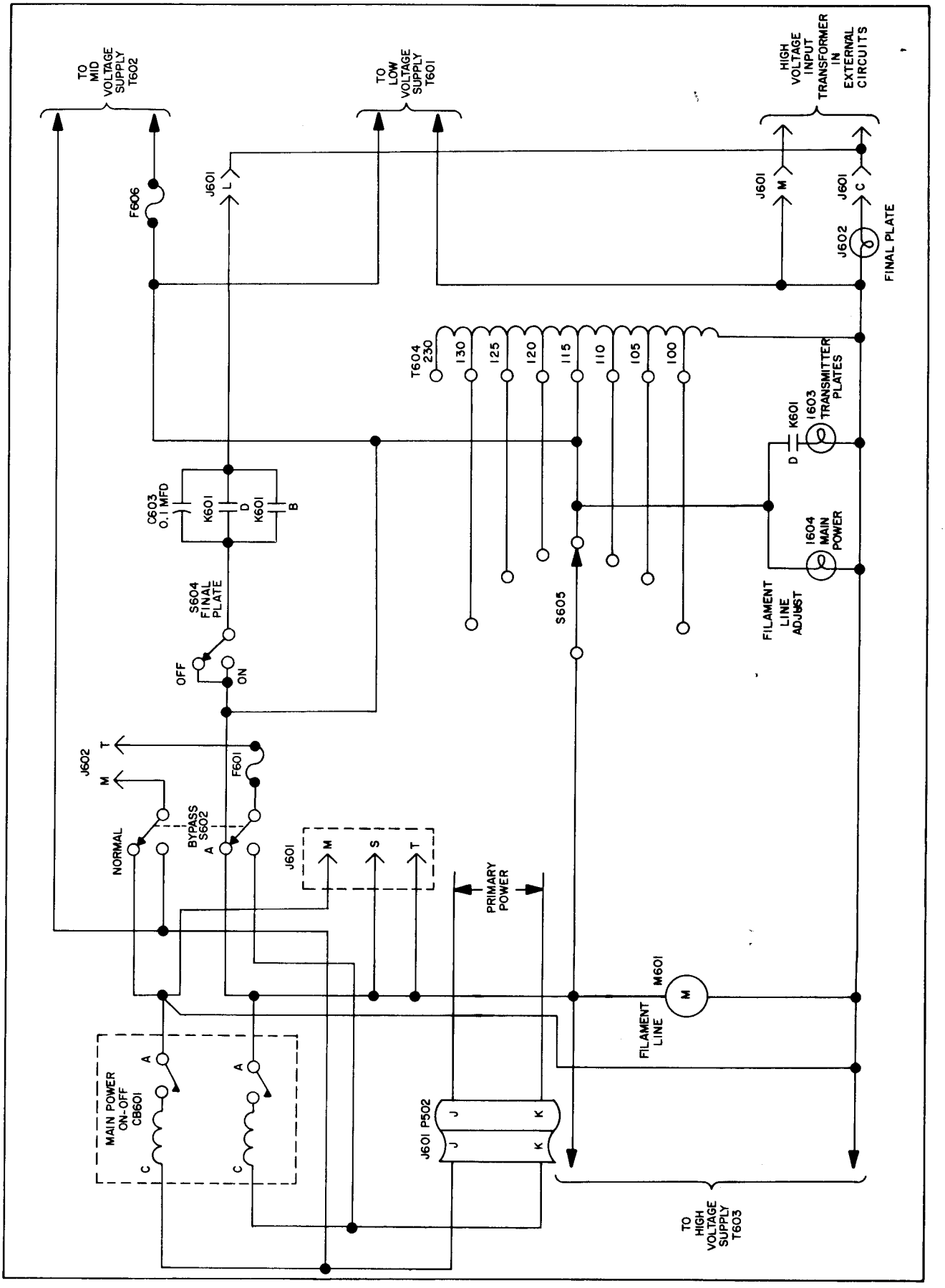


Figure 4-12. 115-Volt Line Distribution, Simplified Schematic Diagram

(2) LOW VOLTAGE SUPPLY.

(a) The low voltage power supply (figure 4-13) uses two rectification circuits, each of which produces a dc voltage of opposite polarity. The positive dc voltage is produced by a full-wave rectifier formed by dual-diode V604. Chokes L602 and L603 and capacitors C606 and C607 provide two networks of filtering while resistor R612 is used as a bleeder. Diode V603 is used as a half-wave rectifier and furnishes a negative output voltage. Filtering is provided by choke L601 and capacitors C604 and C605. Two regulated outputs are provided by use of regulators V601 and V602.

(b) The filtered output of the positive low voltage supply (figure 4-14) is applied through pin E of J602 to the grid circuit of V202 in the RTF-2 and through contacts (A) of K601 (when K601 is energized) to the plate circuits of the following tubes in the RTF-2: V201, V204, V402, V403, V404, V405, V406A, V406B, and through regulator V401 to V301 and V302. This voltage is also applied, in the RTF-2, to the cathode circuit of V202. During the first 60 seconds that primary power is applied, the low-voltage output is impressed, through normally closed contacts (B) of relay K604, across resistors R626 and R625.

(c) When primary ac power is initially applied, a secondary winding (pins 5 and 7) of transformer T601 develops 6.3 volts ac. (Refer to paragraph 4-3b(1).) This voltage is applied, through closed contacts (A) of relay K604, to the [illegible] relay K602. After

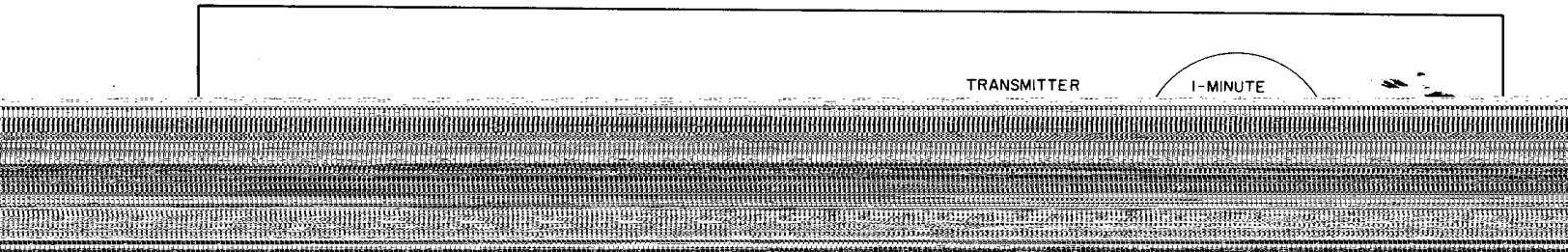
energizing, K604 is held energized by a pair of its own contacts (normally open B contacts) while an alternate pair of its contacts (A) open and deenergize time delay relay K602. Resistor R625 is no longer in the circuit due to a third pair of K604 contacts (normally closed B contacts) opening.

(d) The regulated negative voltage output of regulators V601 and V602 is applied across a series connected network comprising resistor R606 and potentiometer R605. The output of regulator V601 is also applied through pin U of J602 to the RTF-2, grid circuits of V204 and V205, and plate circuit of V206. By adjustment of R605, a negative dc voltage can be obtained within the limits of supplied voltage. This voltage is applied through pin N of J602 to the grids of V101 and V102 in the RTF-2.

(e) Transmit relay K601 is energized by the voltage at the output of regulator V601 when the following conditions exist: switch S601 is in either the PHONE, TUNE or SSB position; relay K603 is energized; circuit breakers CB602 and CB603 are in the ON (closed position); and the pin h output of J602 is provided a ground path. Under any other condition, relay K601 is deenergized. When relay K601 energizes, the following occurs:

1. Positive low voltage supply output is applied through J602A to the RTF-2. (Refer to paragraph 4-3b(2)(b).)

2. Midvoltage supply output is applied to pins J602B, J601V and made available after being divided


TRANSMITTER
1-MINUTE

3. TRANSMITTER PLATES lamp I603 and FINAL PLATE lamp I604 light. (Refer to paragraph 4-3b(1).)

4. Continuity is provided between the wiper of one section of switch S604 and primary power is applied to the high voltage supply input transformer in the external circuits. (Refer to paragraph 4-3b(1).)

(f) Circuit breakers CB603 and CB602 provide overload protection by deenergizing when excessive current flows through their windings. If either circuit breaker deenergizes, current through K601 decreases, causing relay K601 to deenergize. A visual indication of an overload is provided by FINAL OVERLOAD lamp I601. Resistor R614 is a limiting resistor; its value is high enough to maintain K601 deenergized and low enough to light lamp I601.

(3) MIDVOLTAGE SUPPLY.

(a) The midvoltage power supply (figure 4-15) uses V605 in a full-wave rectifier circuit. Chokes L604 and L605 with capacitors C608 and C609 are used as a choke input filter. Filament voltage for the rectifier is applied from secondary winding 10-11 of T602.

(b) When relay K601 is deenergized, the midvoltage supply output, through normally closed contacts of K601, is terminated across resistor R607. Capacitor C611 serves to surpress sparking. (See figure 4-16.) The energizing of K601 makes the output of the midvoltage supply available at the CW-FS and PHONE positions of S601C. This output (500vdc) also is applied through J602B to the RTF-2 and the plate circuits of V202A and V203. An external connection between pin B of J602 and pin U of J601 enables this voltage to be applied to the PHONE contact of S601. This voltage is also divided in half by resistors R601 and R602 and made available at the TUNE contact position of switch S601C. With switch S604 in the ON position, switch S601C connects either one of these three points through an overload network (circuit breaker CB602 in parallel with series connected resistor R604 and potentiometer R603) and J602F to the PA screen grids in the RTF-2. With switch S601C in the SSB position, regulated voltage from the high voltage supply is applied to the PA screen grids in the RTF-2. Circuit breaker CB602 now provides overload protection as determined by diodes CR601 and CR602. These diodes conduct to energize CB602 when the regulated voltage rises to an excessive value. When excessive current flows through CB602 its contacts open, causing relay K601 to deenergize and the output of the midvoltage supply to be terminated by resistor R607. Potentiometer R603 provides a means of adjusting the current through the winding of circuit breaker CB602, when switch S601 is in the PHONE, CW-FS or TUNE positions.

(4) HIGH VOLTAGE SUPLLY.

(a) The high voltage power supply (figure 4-17) uses two mecury vapor rectifiers, V606 and V607, for full-wave rectification. Choke L606 and capacitors C601, C602, and C610 are used as high voltage filters. Transformer T603 provides an input to the filaments of V606 and V607; transformer T501 in the cabinet provides the ac voltage to the plates of V606 and V607.

(b) The high voltage supply output is applied through jack J603 (figure 4-18) to the PA plates in the RTF-2. Resistors R618 and R619 divide a portion of

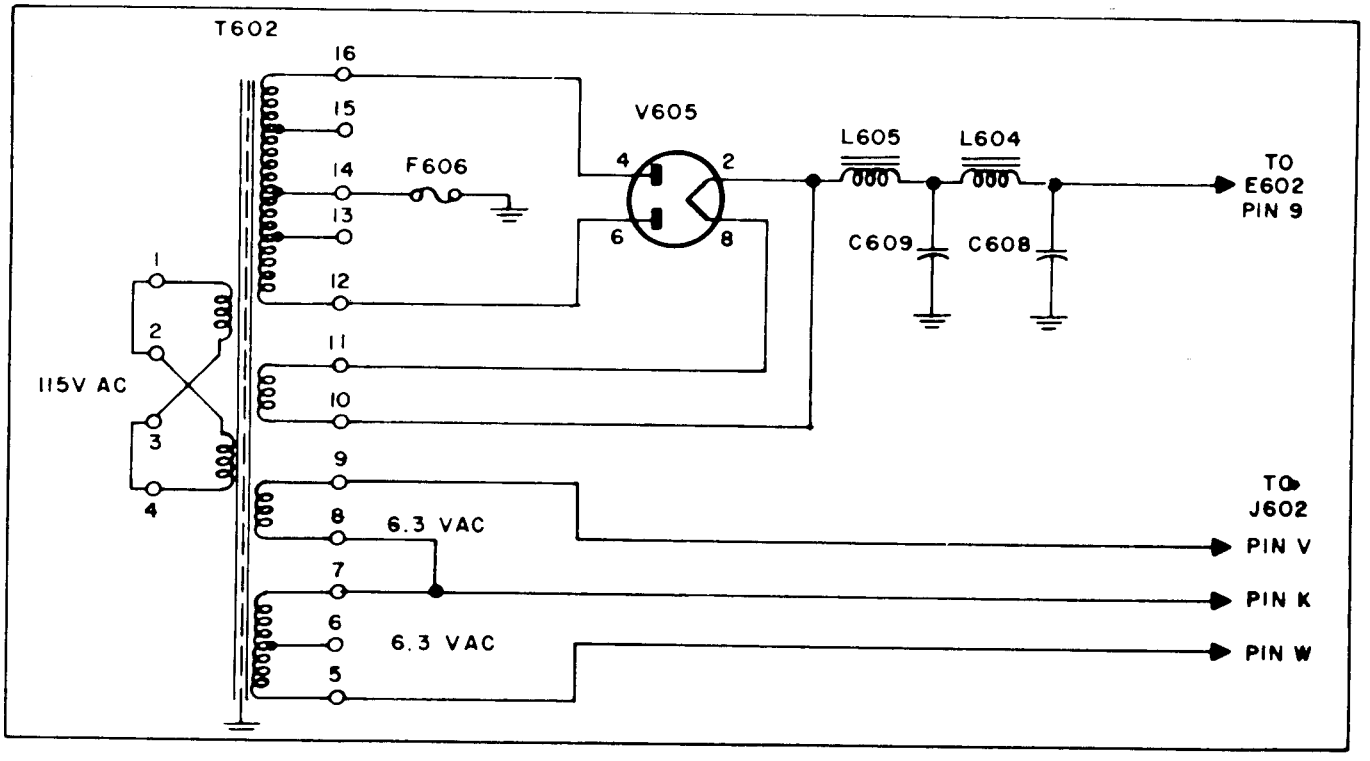


Figure 4-15. Midvoltage Supply, Simplified Schematic Diagram

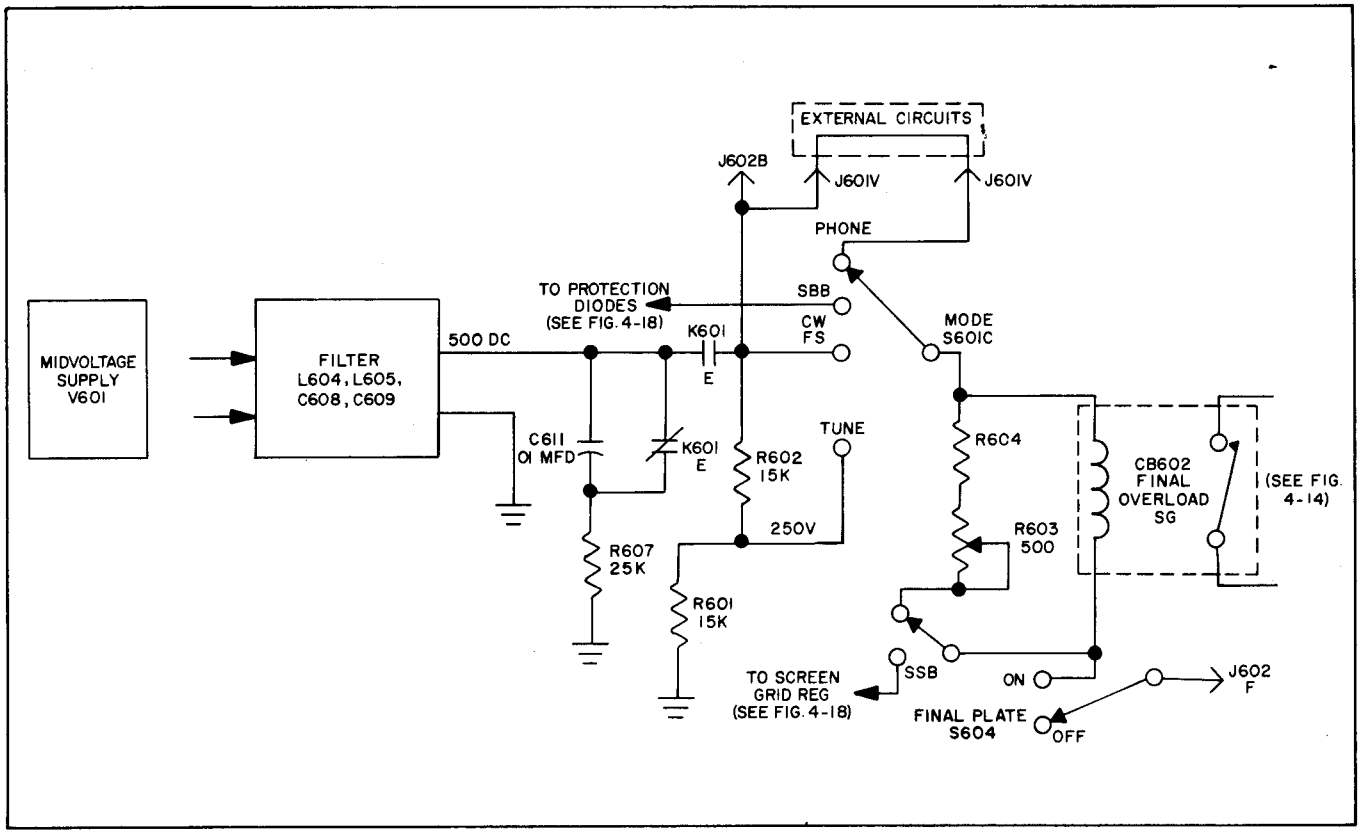
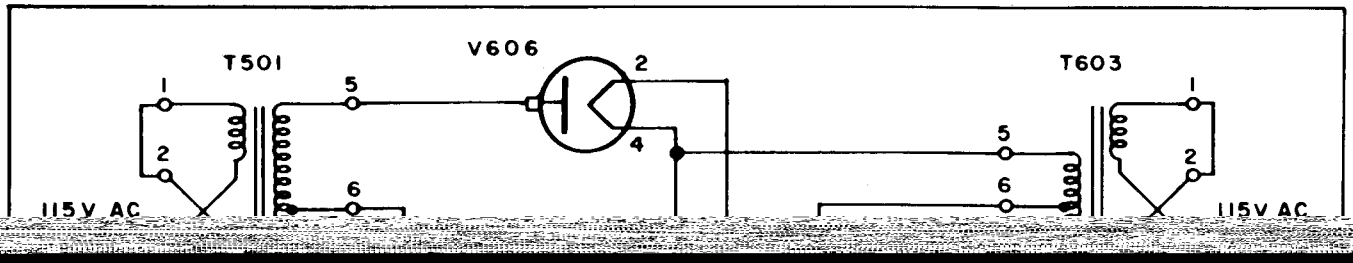


Figure 4-16. Midvoltage Supply Distribution, Simplified Schematic Diagram



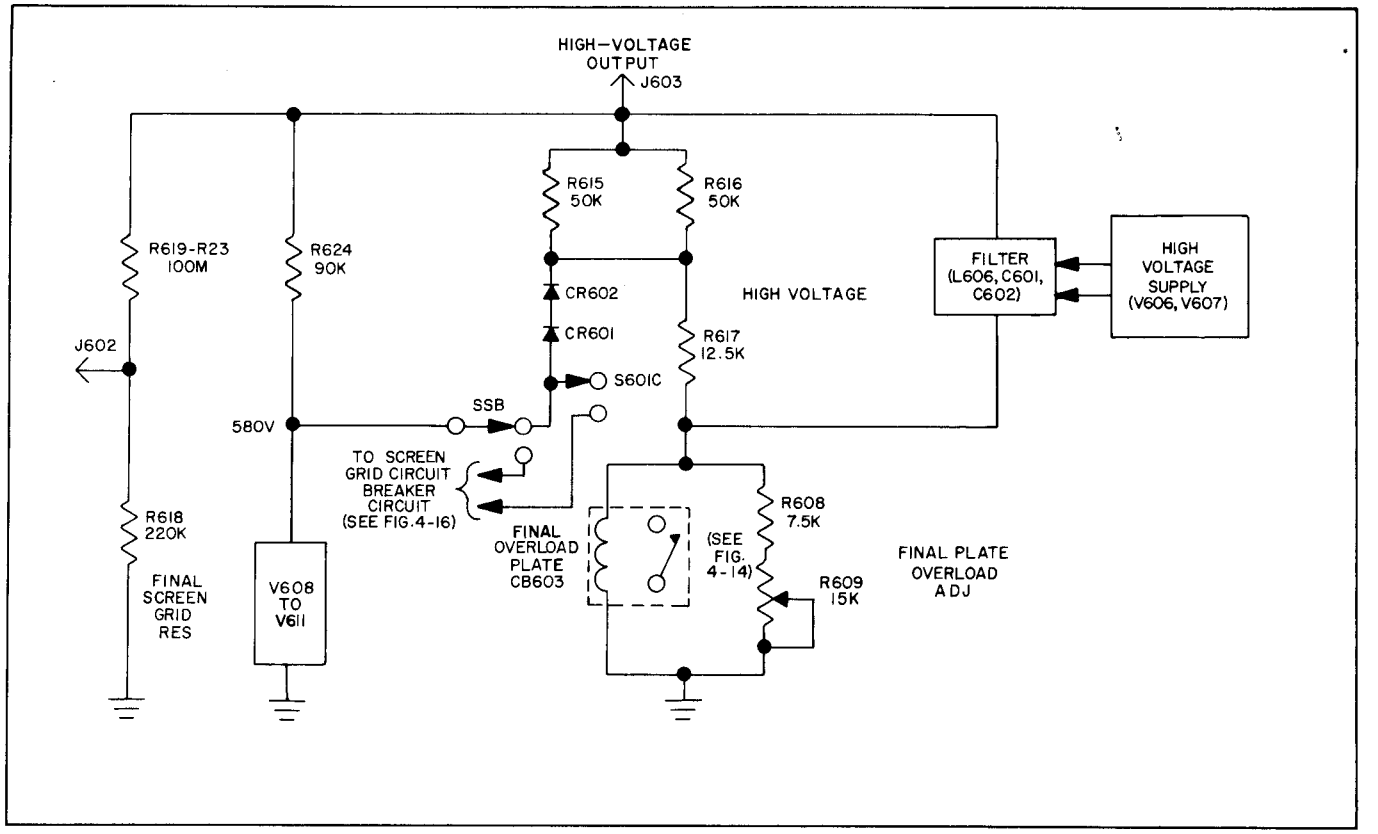


Figure 4-18. High-Voltage Supply Distribution, Simplified Schematic Diagram

this voltage for application to the metering circuit through J602G. A portion of the high voltage is also dropped across resistor R624 and regulated by screen grid regulators V608 through V611. With switch S601 in the SSB position, the regulated voltage is applied to one end of circuit breaker CB602 while diode CR601 is connected to the opposite end. Overload protection for the high output voltage is provided by FINAL PLATE OVERLOAD circuit breaker CB603. In the event of excessive current through the winding of CB603, its contacts will open and deenergize relay K601. Potentiometer R609 provides a means for adjusting the current through the winding of circuit breaker CB603.

(c) TRANSMITTING MODE SELECTOR MODELS SBE-2 AND SBE-3 AND PANEL CHASSIS ASSEMBLY RTS-2 POWER SUPPLY. - A detailed description of the SBE-2 or SBE-3 exciter unit (depending on the radio transmitter model supplied) and the exciter unit power supply is contained in the applicable exciter unit manual.

SECTION 5
TROUBLE-SHOOTING

5-1. GENERAL.

a. The trouble-shooting procedures given in this section enable isolation of a fault to a particular unit of section of a unit and then to a particular stage. The best indications of malfunction of the equipment are obtained from the readings on the front panel meters of the RTF-2, SBE-2 or SBE-3, and the RTP-2. The various circuits that are metered will provide indication of the operation of specific sections of the radio transmitter. These indicating devices and the action and affect of the front panel controls will be used to isolate the fault. Certain voltage measurements, particularly of the supply voltages, are also used as a means of isolating the fault.

b. The trouble-shooting charts presented in this section are based on the operating procedure primarily. If the fault is related to misalignment of the stages of the RTF-2, reference will be made to the alignment procedures in section 6 of this manual. Alignment of the various stages in the exciter units will be referenced to the applicable manual. Malfunctions that cannot be remedied by proper alignment or tuning will be isolated to a particular unit in a system trouble-shooting chart. Following the system trouble-shooting, individual unit trouble-shooting charts are presented. Trouble-shooting of the exciter unit is contained in the applicable exciter unit manual. Trouble-shooting procedures for the exciter unit power supply contained on the RTS-2 panel assembly are covered in detail in this manual.

5-2. TROUBLE-SHOOTING PROCEDURES.

a. SYSTEM TROUBLE-SHOOTING.

(1) Throughout the trouble-shooting procedures reference will be made to the various front panel controls and indicators. Complete listings of these controls is given in table 3-1 through 3-4. The front panels of the units of the radio transmitter are illustrated in figure 3-1. The internal adjustments of the units are described and illustrated in section 6.

(2) Table 5-1, the system trouble-shooting chart, presents the procedure in a general operating sequence with reference to the operating procedure in section 3 for the settings of the controls. The general sequence is to energize the radio transmitter, calibrate and tune the master oscillator, and tune the following: the MF and HF stages of the exciter unit, the driver section of the RTF-2, the power amplifier section, and the antenna circuit. This procedure will ascertain the operating condition of the carrier generation circuits, and of course, the power supplies. Modulating the transmitter will then verify the operation of the audio circuits of the exciter and the modulator circuits.

b. UNIT TROUBLE-SHOOTING. - Following the system trouble-shooting procedures, tables 5-2 and 5-3 present the RTP-2 and RTF-2 unit trouble-shooting procedures, respectively. These procedures enable isolation of a malfunction to a particular stage within these units. For detailed trouble-shooting procedures of the exciter unit, refer to the applicable exciter unit manual. The readings on this MULTIMETER, PA PLATE meter and RF OUTPUT meter are shown in table 5-4 for test frequencies of 2 mc, 16 mc, and 30 mc. These readings are nominal and a slight variation in readings is acceptable.

c. RTS-2 POWER SUPPLY TROUBLE-SHOOTING.

(1) Power for operation of the exciter is provided by the power supply built into the RTS-2. If, in operation, the exciter unit appears to be completely inoperative, the malfunction is most likely in the power supply. The fuses in the RTS-2 panel should be checked and replaced if necessary. The output of the supply is connected from J402 to J109 on the exciter unit by a cable. Check the cable for any defect and the connections for secure connections.

(2) Further trouble-shooting of the power supply to isolate defective circuit elements, requires the performance of voltage and resistance measurements.

5-3. VOLTAGE AND RESISTANCE DATA.

Figures 5-1, 5-2, and 5-3 contain voltage and resistance data of the RTP-2 power supply, RTF-2 amplifier-oscillator, and RTS-2 power supply, respectively. Further trouble-shooting, in addition to the procedures detailed in this manual and the applicable exciter unit manual, requires the use of voltage and resistance measurements to locate the particular circuit component that is malfunctioning. The voltage and resistance diagrams indicate the nominal value of voltage-to-ground and resistance-to-ground at the tube elements. Large deviations from the nominal values should be carefully investigated. The physical location of the tubes in the RTP-2 power supply, RTF-2 amplifier-oscillator, and RTS-2 power supply are shown in figures 5-4, 5-5, and 5-6, respectively. Table 5-4 lists the voltage readings that should be measured at various terminals of E601, E602, and E603 in the power supply RTP-2.

TABLE 5-1. SYSTEM TROUBLE-SHOOTING CHART

STEP	PRELIMINARY ACTION	NORMAL INDICATION	PROBABLE CAUSE AND REMEDY
1.	Perform preliminary procedures to energize transmitter for SSB operation.		
2.	Turn MAIN POWER switch on RTP-2 to ON.	MAIN POWER indicator lamp lights.	Power source failure. Check primary power source and input cable.
		FILAMENT LINE meter indicates 115 vac.	Set FILAMENT LINE ADJUST for proper reading.
		Blowers in cabinet and power amplifier compartment of RTF-2 operate.	Primary power circuits failure. Refer to table 5-2.
		Zero beat will be obtained at the check points with less than two turns of CALIBRATE control.	If no zero beat is obtained, master oscillator, 100-kc crystal oscillator, mixer stage, and/or audio stages inoperative. Check for defective tubes. Check interconnecting cabling from RTP-2 to RTF-2.
			If excessive roatation of CALIBRATE control is required, readjust master oscillator and calibration oscillator in accordance with procedures in section 6.
			If zero beat obtained aurally but not visually, replace ZERO BEAT indicator.
3.	Tune master oscillator to a 2.0 mc test frequency. (Refer to tuning chart, figure 3-2.)		
	On exciter unit, place MF XTAL SW in MF position. Turn CARRIER INSERT control fully clockwise. Adjust MF TUNING control for VMO frequency and maximum reading on meter.	Maximum meter reading will approach full or exceed full scale. Reduce setting of CARRIER INSERT control to prevent off-scale reading.	If VMO previously found operative, check setting of S204 on RTF-2 for SSB position and S402 for SSB L.O. ON position.
			Check cabling from VMO to exciter in operative. Refer to applicable exciter manual.
			Exciter power supply inoperative.
4.	Tune driver section of RTF-2 to MO frequency.		
	Place MULTIMETER switch to DRIVER Ip Ma position. Adjust DRIVER TUNING for dip in plate current.	MULTIMETER reads approximately 26 ma.	RF amplifier section of exciter unit inoperative. Refer to applicable exciter manual. Check cabling from exciter to RTF-2. Multiplier driver section of RTF-2 inoperative. Refer to table 5-3.

TABLE 5-1. SYSTEM TROUBLE-SHOOTING CHART (CONT)

STEP	PRELIMINARY ACTION	NORMAL INDICATION	PROBABLE CAUSE AND REMEDY
4. (CONT)			If proper indication cannot be obtained at desired frequency, check alignment of driver stages. Refer to section 6.
5.	Place MULTIMETER switch to PA Isg Ma position.	MULTIMETER reads approximately 80 ma.	Driver stage inoperative. PA stage inoperative check interconnections from driver to power amplifier.
6.	Place MULTIMETER switch to PA Eg RF Volts position. Adjust DRIVER TUNING for maximum reading on meter.	MULTIMETER reads approximately 30-40 volts.	Driver section of RTF-2 inoperative.
7.	Tune power amplifier of RTF-2 to test frequency (Refer to paragraph 3-7.)	PA PLATE meter reads approximately 250 ma.	Power amplifier section of RTF-2 inoperative. Antenna loading controls inoperative.
8.	Adjust VOX and SQUELCH controls on exciter. Set transmitter controls for VOX keying. Speak directly into microphone.	PA PLATE current meter varies with modulation. Reading should not exceed 250 ma.	VOX circuits of exciter inoperative. Audio circuits of exciter inoperative.
9.	On exciter unit, place METER SW in LSB position and then USB position. Speak directly into microphone. Adjust LSB and USB GAIN controls.	Meter readings should be in same general range as steps 3 through 7.	Tuned circuits components for a particular band in RTF-2 and exciter may be defective. If meter readings appear erratic, stages may require alignment. Refer to procedures in section 6.

TABLE 5-2. RTP-2 TROUBLE-SHOOTING CHART

STEP	POINT OF TEST	PRELIMINARY ACTION	NORMAL INDICATION	PROBABLE CAUSE AND REMEDY
1.		Set front controls as follows: MODE to TUNE; FILAMENT ADJUST to extreme counterclockwise position. FINAL OVERLOAD circuit breakers (S. G. and PLATE) to ON; FINAL PLATE to ON; TRANSMITTER PLATE to OPERATE: MAIN POWER circuit breaker to ON.	When MAIN POWER circuit breaker is set to ON position, observe that FILAMENT LINE meter indicates 85 to 115 vac and MAIN POWER lamp lights.	If both indications are abnormal check for defective CB601. If lamp lights but meter indication is abnormal, check for defective M601 or S605. If meter indication is correct and lamp does not light, replace I603.
			Observe that 60 seconds after MAIN POWER switch is set to ON, TRANSMITTER PLATES and FINAL PLATE lamps light.	If both lamps fail to light perform step 2. If measurement is normal in step 2, check for defective K601, K602, K604, R605, R606, S603, S601, CB602, CB603, or R626.

TABLE 5-2. RTP-2 TROUBLE-SHOOTING CHART (CONT)

STEP	POINT OF TEST	PRELIMINARY ACTION	NORMAL INDICATION	PROBABLE CAUSE AND REMEDY
2.	J602E		Vtvm measures +240 to +300 vdc.	Check that primary power is present at input of T601. If not present, check for defective CB601. Check low voltage power supply for defective V605, L604, C605, C608, C609, T602, or F602. Replace if defective.
3.	J602U		Vtvm measures -210 to -225 vdc.	Check that primary power is present at input to T601. If not present, check for defective CB601. Check low voltage power supply for defective V603, T601, L601, F604, V601, V602, R610, or R611. Replace if defective.
4.	J602N		Vtvm measures -95 to -125 vdc.	Check setting of R605. (See paragraph 6-2a in section 6. Same as step 2.
5.	J602F		Vtvm indicates +225 to +275 vdc with MODE switch in TUNE and +450 to +550 vdc with MODE switch in CW-FS or PHONE.	Check that primary power is present at input of T602. If not present, check step 2. Check low voltage supply for defective L604, L605, C608, C609, V605, or T602. Replace if defective. Check for defective CB602, S601, S604. Replace if defective.
6.	J602G	Set MODE switch to SSB position.	Vtvm measures +580 to +620 vdc.	Check for defective V608, V609, V610, V611, CR601, CR602, or R624. **WARNING** Dangerous high voltages exist in this area. Set the MAIN POWER breaker to OFF. Discharge high voltage capacitors C601, C602, and C610 by connecting a heavily insulated shorting lead first to ground and then to terminal of one of the above capacitors.

TABLE 5-3. RTF-2 TROUBLE-SHOOTING CHART

STEP	POINT OF TEST	PRELIMINARY ACTION	NORMAL INDICATION	PROBABLE CAUSE AND REMEDY
1.	ZERO BEAT lamp and headset	Set controls as follows: DRIVE to extreme counterclockwise position; NORMAL SSB to NORMAL; EXCITATION to CW/PHONE; OSCILLATOR to CAL; MASTER OSCILLATOR FREQUENCY to check point frequency nearest to desired operating frequency. **Note** Check points are available every 50 kc over the 2- to 4-mc range.	Unlock the CALIBRATION control and rotate the knob until a frequency of 5 cps or less is heard in the headset and is indicated by the ZERO BEAT lamp. (The lamp will flash very slowly as the zero beat is approached.)	Perform steps 2 through 5. If no trouble is encountered, check for defective V406.
2.	P301	Connect a frequency counter to point of test. Set MASTER OSCILLATOR FREQUENCY dial for 2000 kc.	Counter indicates 2000 kc.	Check for proper adjustment of C303. Check for defective V301. Replace if defective.
3.	V402-1	Remove counter and connect vtvm to point of test.	Vtvm measures 155 ±10% vdc.	Check for defective V302. Replace if defective.
4.	V405-1	Set OSCILLATOR switch to CAL position and connect counter to point of test.	Counter indicates 2000 kc.	Check for defective V302. Replace if defective.
5.	V405-7	Disconnect counter and connect with rf probe to point of test.	Vtvm measures -10 ±10% vdc.	Check for defective V402.
6.	Multimeter	Set controls as follows: OSCILLATOR to MO; MASTER OSCILLATOR FREQUENCY for 250 kc; DRIVE to extreme counterclockwise position; DRIVE BAND to desired position; MULTIMETER to PA Ig Ma; DRIVE TUNING to 2.5.	MULTIMETER can be adjusted to a peak reading by means of DRIVE TUNING control.	If indication is abnormal for all frequency bands, check for defective MULTIMETER circuit (V201, V205, V101, or V102.) If indication is abnormal at 8-16 and 16-32 bands only, check for defective V205 or V207, or C301 for proper adjustment or defect. If indication is abnormal at 2-4 mc band only, check L203, C210, L211, or C237 for proper adjustment of defect. If indication is abnormal at 4- to 8-mc band, check L204, C218, C238, or L212 for proper adjustment or defect.

TABLE 5-3. RTF-2 TROUBLE-SHOOTING CHART (CONT)

STEP	POINT OF TEST	PRELIMINARY ACTION	NORMAL INDICATION	PROBABLE CAUSE AND REMEDY
6. (CONT)				If indication is abnormal for 4- to 16-mc band, check for proper adjustment or defect of L213 or C329. If indication is abnormal at 16- to 32-mc band, check for L214 proper adjustment or defect.
7.	PA PLATE	Set controls as follows: PA BAND to correspond to desired output signal; ANTENNA LOADING fully counterclockwise; AUX. LOADING to +.	Advance DRIVE control until PA PLATE meter indicates reading in tuning chart.	Check for defective V205, V101, V102, C117A, C117B, S101, S102, S103, or M302.
8.	PA PLATE	TURN PA TUNING control for dip in PA meter.	Adjust PA TUNING control for minimum reading on PA meter.	Check for defective C113.
9.	Multimeter	Turn MULTIMETER switch to PA Isg Ma position. Adjust DRIVE control for MULTIMETER reading indicated in tuning chart. Set controls as follows: PA Isg to MA; DRIVE CONTROL for MULTIMETER reading indicated in tuning chart; ANTENNA LOADING clockwise until MULTIMETER reading drops to zero and PA PLATE meter indicates rise in current; PA TUNING for dip on PA PLATE METER.		
		Continue to advance the ANTENNA LOADING and DRIVE controls and returning the PA TUNING control for dip on PA PLATE meter until MULTIMETER and PA PLATE meter indicate PA Isg and PA Ip given in tuning chart. **CAUTION** The plate current dips must be obtained at the lowest possible PA TUNING setting to avoid doubling in the final amplifier.	PA PLATE meter indicates PA Isg given in tuning chart; MULTIMETER indicates PA Ip given in tuning chart.	Check for defective V101, V102, C117A, or C117B. See step 6.

TABLE 5-3. RTF-2 TROUBLE-SHOOTING CHART (CONT)

STEP	POINT OF TEST	PRELIMINARY ACTION	NORMAL INDICATION	PROBABLE CAUSE AND REMEDY
10.	PA PLATE and Multi-meter	Depress TEST KEY button. **CAUTION** Do not maintain TEST KEY button depressed for any long period of time.	PA PLATE meter indicates PA Ip given in tuning chart. MULTIMETER indicates PA Ig given in tuning chart. If these conditions are not obtained advance DRIVE control to increase PA Ig; advance ANTENNA LOADING CONTROL to increase PA Ip.	Check for defective V202, V203, or V206. Replace if defective.

TABLE 5-4. AMPLIFIER-OSCILLATOR RTF-2, FRONT PANEL METER READINGS

METER AND POSITION	2 MC	16 MC	30 MC
PA Ebb volts	2.9 kv	2.9 kv	2.9 kv
DRIVER Ip Ma.	26 ma.	54 ma.	72 ma.
PA Isg Ma.	90 ma.	90 ma.	90 ma.
PA Ig	10 ma.	8 ma.	10 ma.
PA Eg RF Volts	82 volts	82 volts	82 volts
PA PLATE	460 ma.	430 ma.	425 ma.
RF OUTPUT	4.3 amp	6.3 amp	4.2 amp

Note

Above readings based on transmitter being tuned for CW operation and 1000 watt output.

The readings on the MULTIMETER, PA PLATE meter and RF OUTPUT meter are shown in tables 5-4 for test frequencies of 2 mc, 16 mc, and 30 mc. These readings are nominal and a slight variation in readings is acceptable.

TABLE 5-5. TERMINAL STRIP VOLTAGES

TERMINAL	VOLTS	TERMINAL	VOLTS
E601-1	300	E602-9	620
-2	-130	-10	620
-3	600*	-11	0
-4	1000*	-12	0
-5	-210	-13	1v
-6	620	-14	1v
-7	620	-15	1v
-8	620	-16	1v

* - FINAL PLATE switch ON

TERMINAL	VOLTS	TERMINAL	VOLTS
E602-17	325	E603-25	325
-18	325	-26	-105
-19	0	-27	-210
-20	-105	-28	6.3 ac
E603-21	NC	-29	600*
-22	NC	-30	115 ac
-23	NC	-31	0
-24	-105	-32	-1.2*

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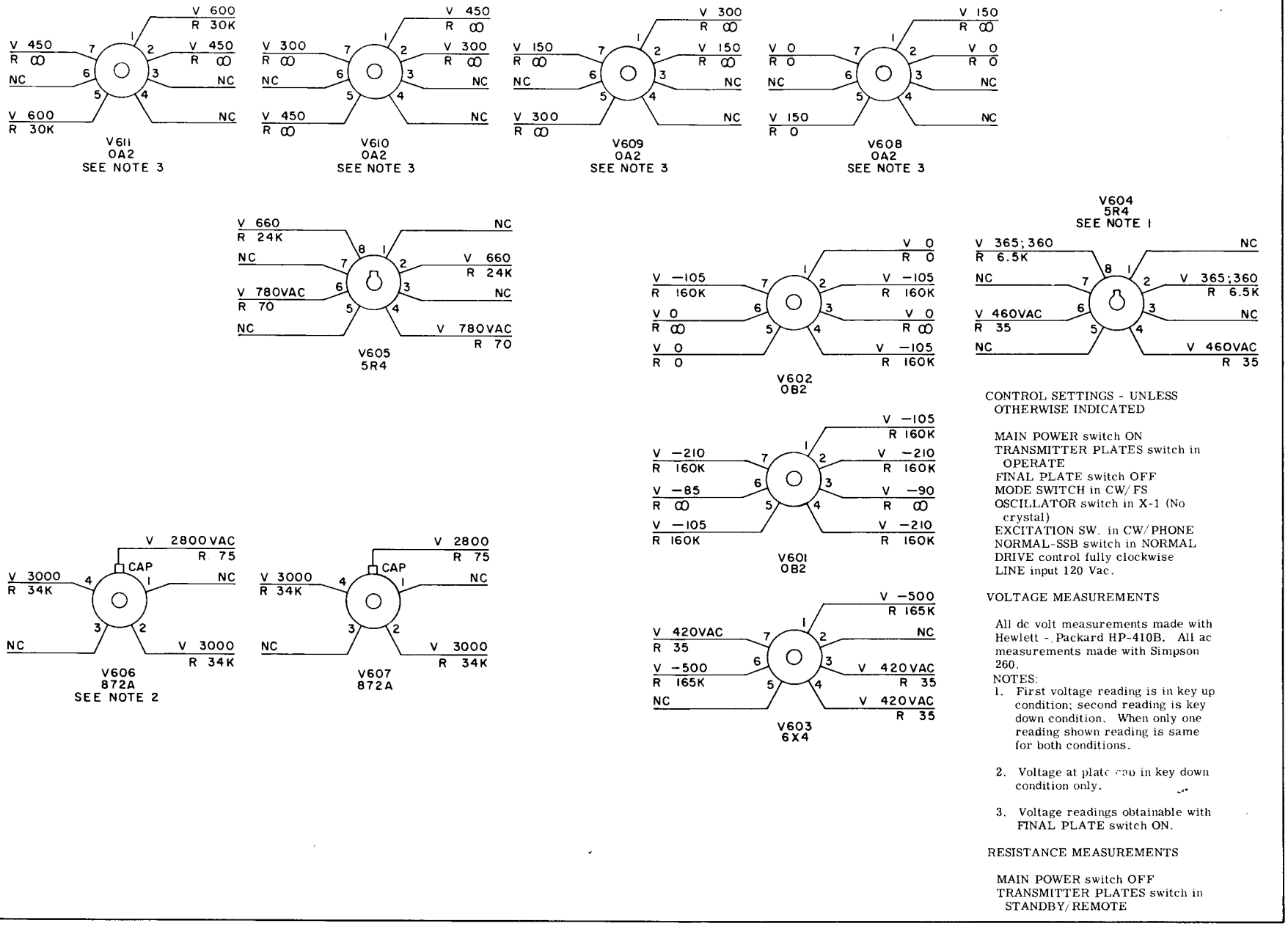


CONTROL SETTINGS - UNLESS OTHERWISE INDICATED

MAIN POWER switch ON
TRANSMITTER PLATES switch in OPERATE
FINAL PLATE switch OFF
MODE SWITCH in CW/FS
OSCILLATOR switch in X-1 (No crystal)
EXCITATION SW. in CW/PHONE
NORMAL-SSB switch in NORMAL
DRIVE control fully clockwise
LINE input 120 Vac.

VOLTAGE MEASUREMENTS

All dc volt measurements made with Hewlett - Packard HP-410B. All ac measurements made with Simpson 260.

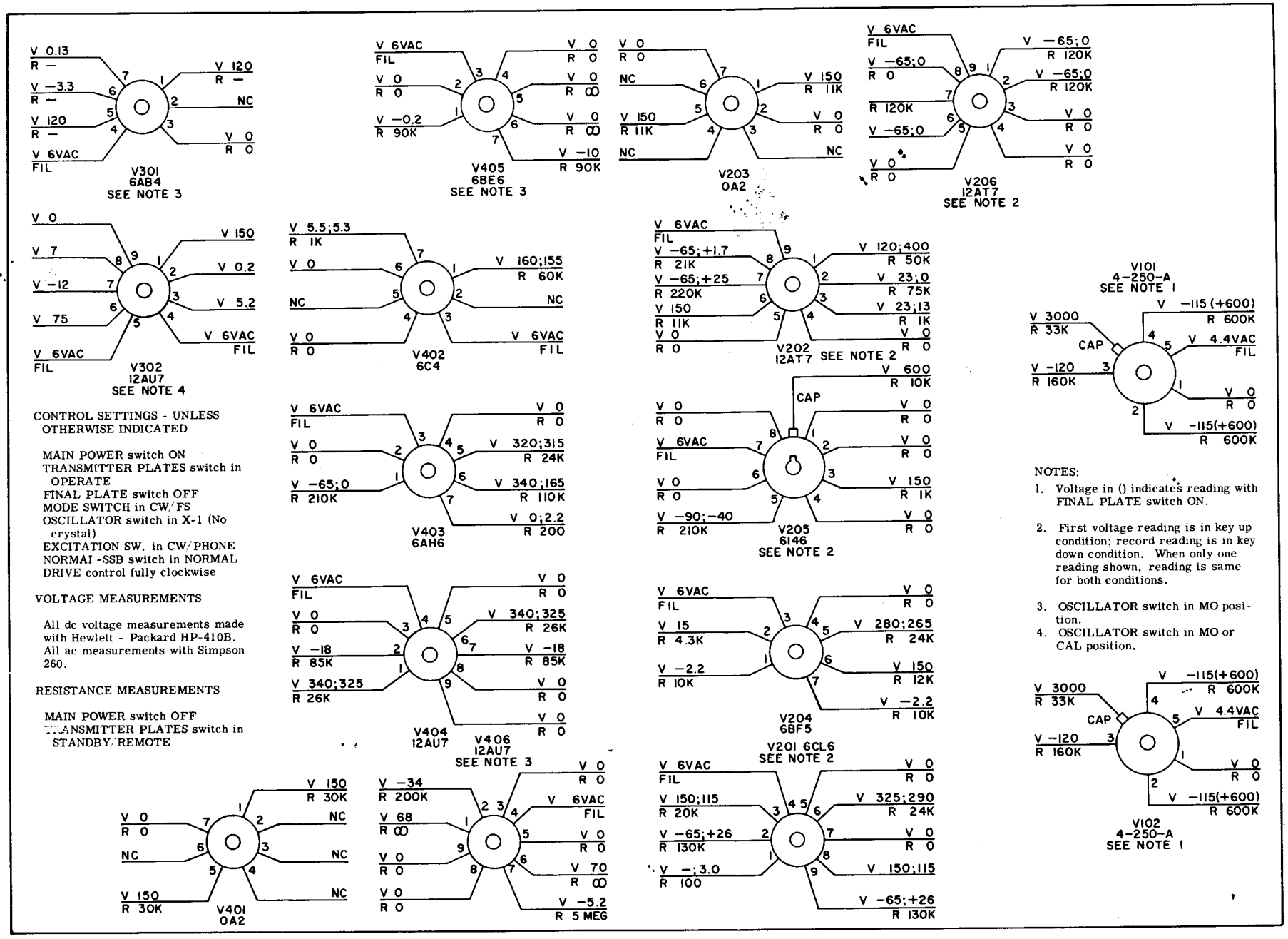
NOTES:

1. First voltage reading is in key up condition; second reading is key down condition. When only one reading shown reading is same for both conditions.
2. Voltage at plate cap in key down condition only.
3. Voltage readings obtainable with FINAL PLATE switch ON.

RESISTANCE MEASUREMENTS

MAIN POWER switch OFF
TRANSMITTER PLATES switch in STANDBY/REMOTE

Figure 5-1. Voltage and Resistance Diagram, Model RTP-2



CONTROL SETTINGS - UNLESS OTHERWISE INDICATED

MAIN POWER switch ON
TRANSMITTER PLATES switch in OPERATE
FINAL PLATE switch OFF
MODE SWITCH in CW/FS
OSCILLATOR switch in X-1 (No crystal)
EXCITATION SW. in CW/PHONE
NORMAL-SSB switch in NORMAL
DRIVE control fully clockwise

VOLTAGE MEASUREMENTS

All dc voltage measurements made with Hewlett - Packard HP-410B. All ac measurements with Simpson 260.

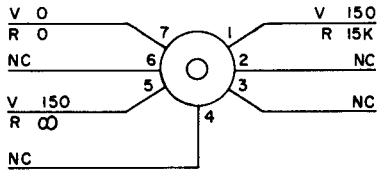
RESISTANCE MEASUREMENTS

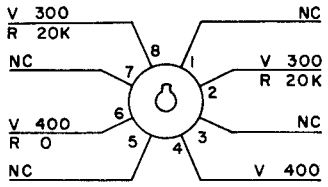
MAIN POWER switch OFF
TRANSMITTER PLATES switch in STANDBY/REMOTE

NOTES:

1. Voltage in () indicates reading with FINAL PLATE switch ON.
2. First voltage reading is in key up condition; record reading is in key down condition. When only one reading shown, reading is same for both conditions.
3. OSCILLATOR switch in MO position.
4. OSCILLATOR switch in MO or CAL position.

Figure 5-2. Voltage and Resistance Diagram, Model RTF-2





VOLTAGE MEASUREMENTS CONTROL SETTINGS UNLESS OTHERWISE NOTED

MAIN POWER switch ON
TRANSMITTER PLATES switch in OPERATE
FINAL PLATE switch OFF
MODE switch in SSB
OSCILLATOR switch in X-1 (No crystal)
EXCITATION SW. in SSB L.O. ON
NORMAL-SSB switch in SSB
DRIVE control fully clockwise
LINE input 120 Vac

All dc voltage measurements made with Hewlett - Packard HP-410B. All ac measurements made with Simpson 260.

RESISTANCE MEASUREMENTS

MAIN POWER switch OFF
TRANSMITTER PLATES switch in STANDBY/REMOTE

Figure 5-3. Voltage and Resistance Diagram, Model RTS-2

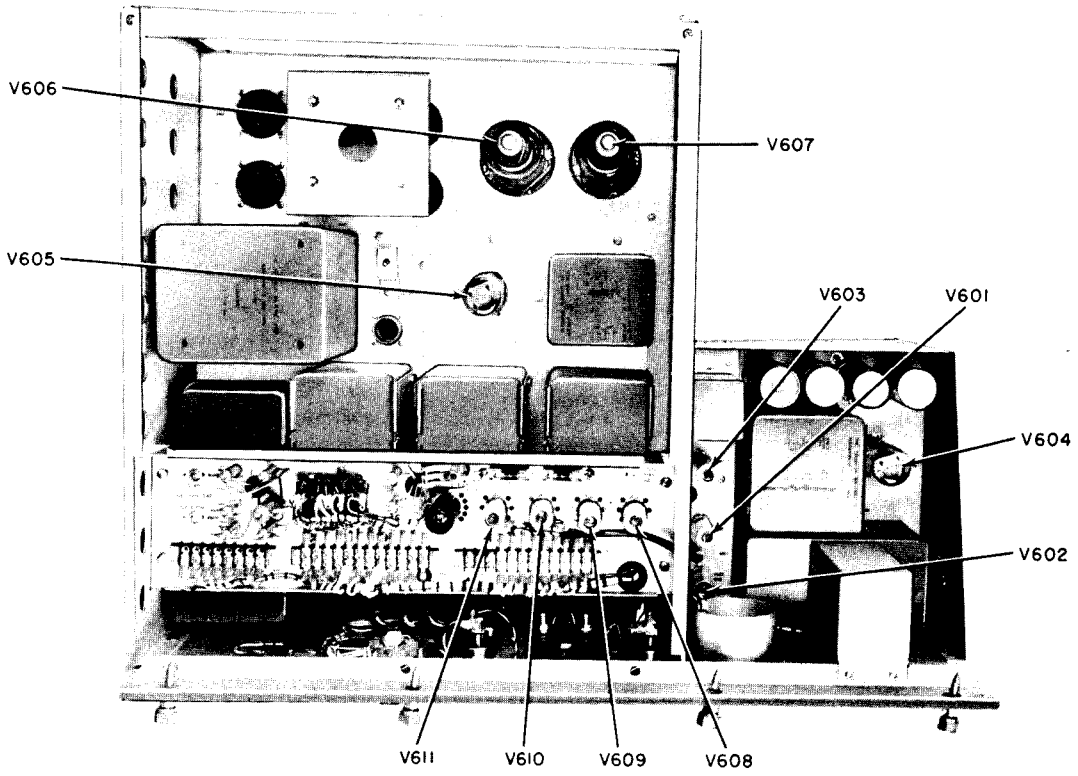
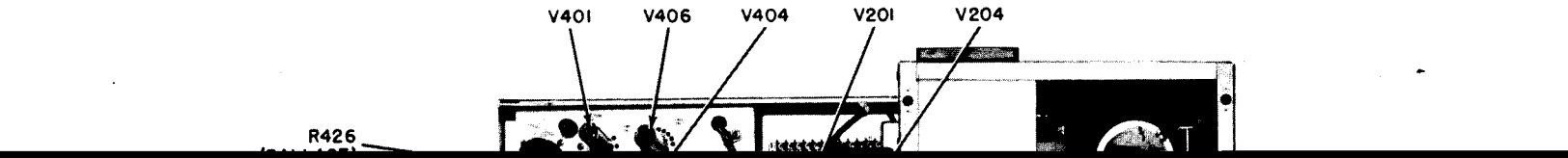


Figure 5-4. Tube Locations, Model RTP-2


V401
V406
V404
V201
V204
R426

SECTION 6
MAINTENANCE AND REPAIR

6-1. GENERAL.

This section contains information required to maintain and repair the radio transmitter. Strict adherance to the procedures detailed in this section will enable the realization of peak equipment performance, minimum repair, and longer life. The procedures contained in this section, in addition to the procedures detailed in the applicable exciter unit manual cover every aspect of maintenance and repair of the radio transmitter.

6-2. TUNING ADJUSTMENT.

(See figures 6-1 and 6-2.)

a. BIAS ADJUSTMENT. - To adjust the bias output voltage of the RTP-2 power supply, proceed as follows:

Step 1. Connect a vtvm between J602N and ground.

Step 2. Place MODE switch in SSB, TUNE, or PHONE position.

Step 3. Adjust R605 for a vtvm indication of -110 volts.

Step 4. Tune radio transmitter for SSB operation at a test frequency.

Step 5. Set DRIVE control on exciter fully counterclockwise.

Step 6. With no excitation supplied to RTF-2, adjust FINAL BIAS ADJ. R605 until PA PLATE meter reads approximately 130 ma.

b. CALIBRATION OF 100-KC AND MASTER OSCILLATORS. - Relatively little rotation of the CALIBRATE control should be required to calibrate the mas-

Note

Do not use receiver bfo.

Step 3. Disconnect transmitting antenna and connect a 50- or 70-ohm, 1000-watt resistive dummy load to RF OUTPUT jack. Attach a short length of wire to transmitter RF MONITOR jack to provide local radiation for purposes of calibration.

Step 4. Consider a WWV frequency of 2.5 mc. Zero beat the master socillator at nearest check point which, in this example, is 2.5 mc. Approach the zero beat from the high-frequency end toward the low-frequency end.

Step 5. Tune transmitter, at a low level, to the WWV frequency being monitored.

Note

Exercise care and precision when setting MASTER OSCILLATOR FREQUENCY dial to proper setting. Actual frequency indication at any dial setting may not be exact, but correction of frequency-to-dial setting relationship is object of this procedure. Approach final frequency setting of dial from same direction of rotation as check point.

CAUTION

Do not attempt to correct any master oscillator frequency-to-dial deviation by mechanical means such as slipping control shaft couplings, etc.

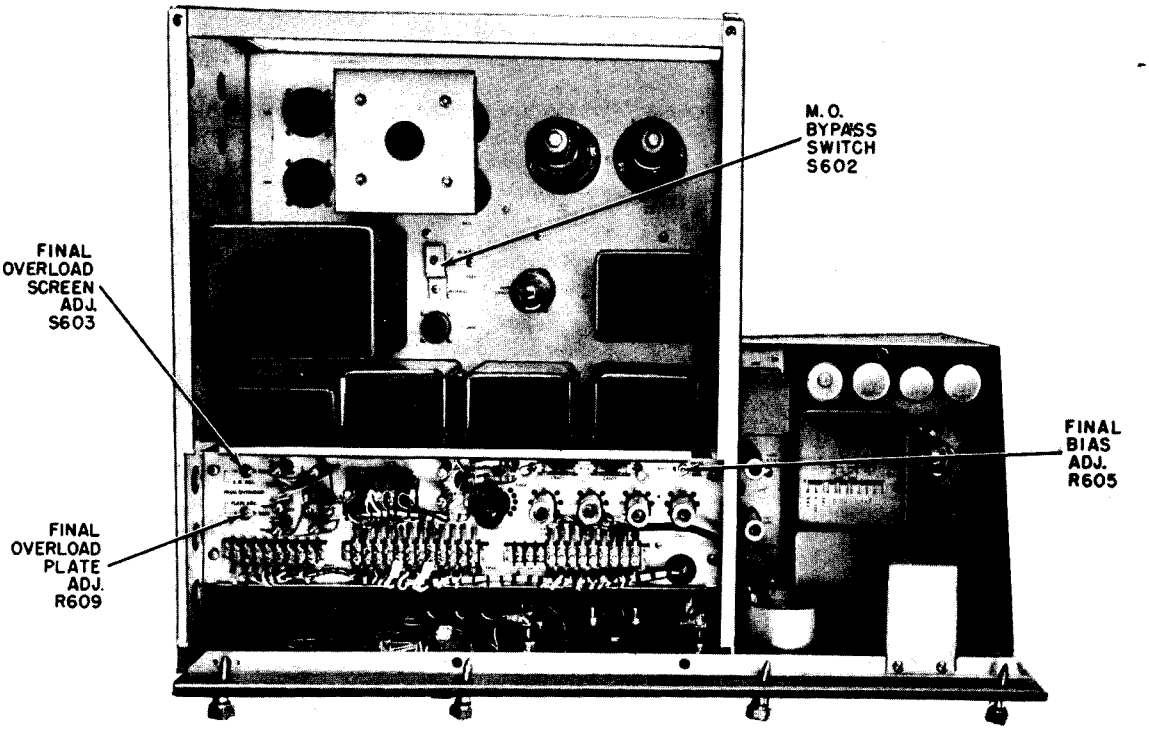


Figure 6-1. Internal Adjusting Controls, Model RTP-2

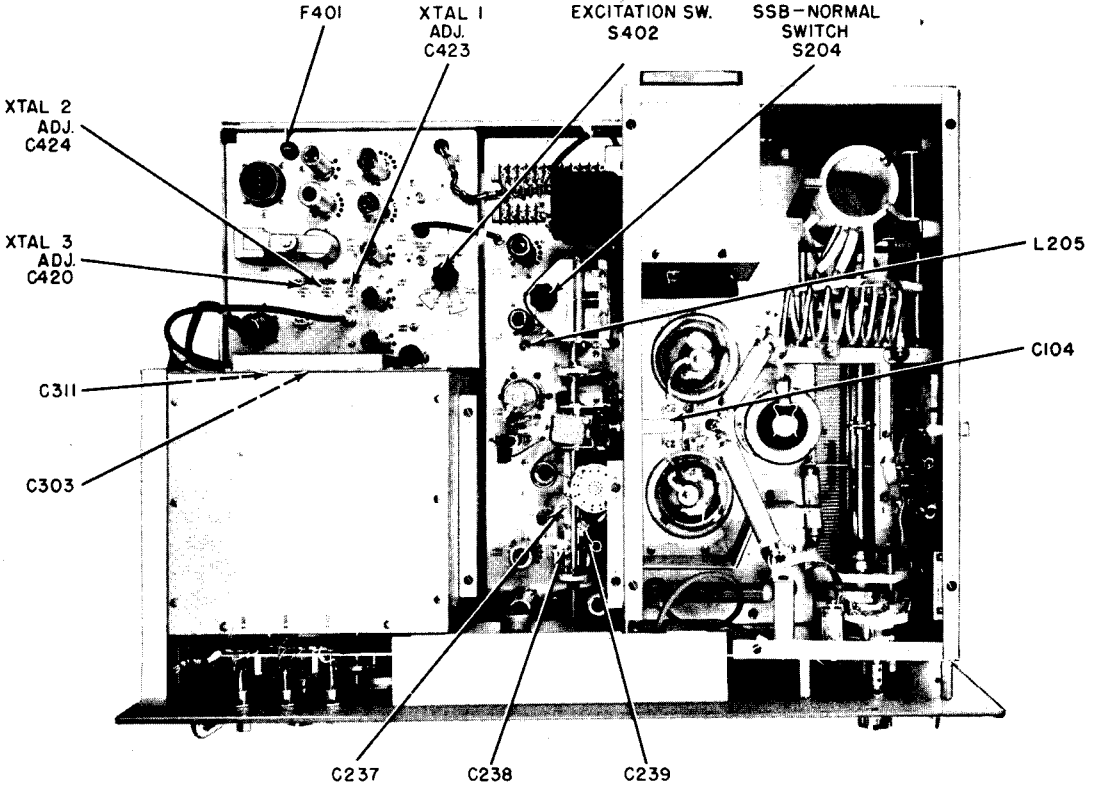


Figure 6-2. Internal Adjusting Controls, Model RTF-2 (Sheet 1 of 2)

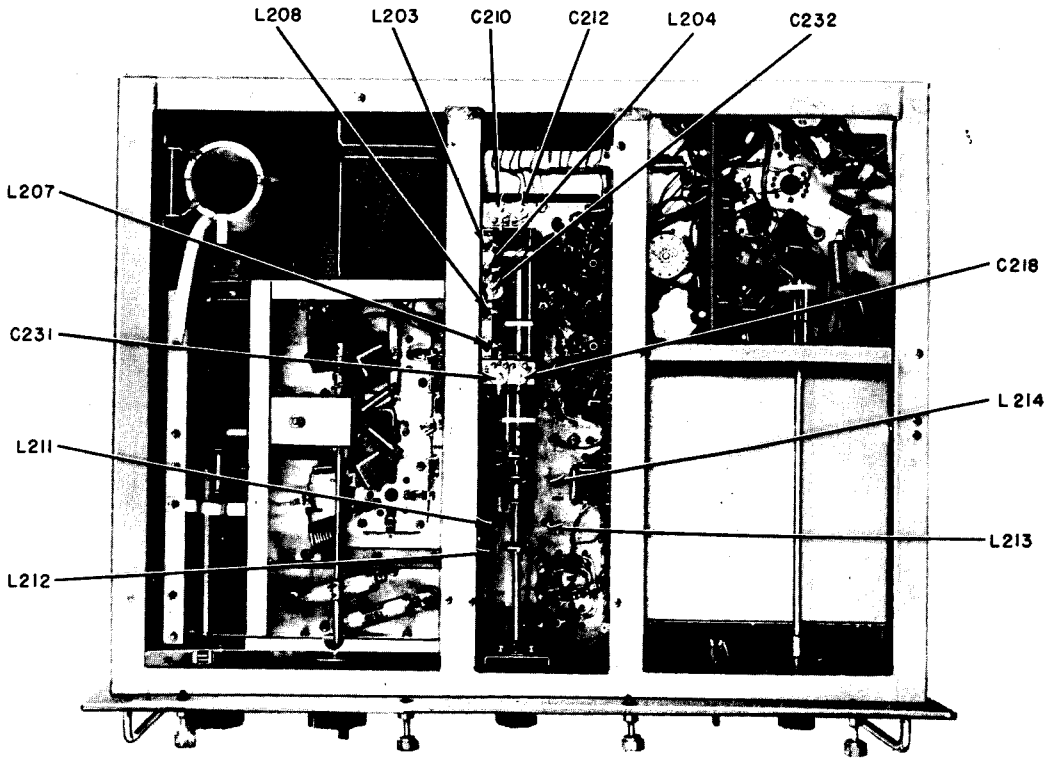


Figure 6-2. Internal Adjusting Controls, Model RTF-2 (Sheet 2 of 2)

Step 11. Adjust capacitor C311 until ZERO BEAT flashes at a minimum rate.

Step 12. Using MASTER OSCILLATOR FREQUENCY and CALIBRATE controls, tune transmitter to 2-mc keeping DRIVE control set at a minimum. Lock CALIBRATE control.

Step 13. Tune receiver to 4 mc.

Step 14. Tune transmitter to 4 mc. Remove cover from C303 access hole and use C303 in place of CALIBRATE control. Use receiver to ensure that C303 is being adjusted to 4 mc instead of some nearby check point.

Step 15. Repeat steps 12, 13, and 14 several times until master oscillator zero beats at 2- and 4-mc ends without necessity of adjusting CALIBRATE control or C303.

Step 16. Replace cover over C303 access hole.

c. ALIGNMENT OF MULTIPLIER AND DRIVER. Alignment of multiplier and driver requires the use of a signal generator having a frequency range of 2 to 32 mc. (The exciter unit may be used in place of a signal generator.) To align the multiplier and driver, proceed as follows:

WARNING

The FINAL PLATE switch must be in the OFF position throughout this procedure. However, dangerously high voltages of 600 vdc exist in other areas where adjustments must be performed.

Step 1. Connect a signal generator output to J201 on RTF-2. (If exciter is used in place of signal generator, connect in same manner as usually used for transmitting.)

Step 2. Place NORMAL-SSB switch in SSB position, MODE switch in TUNE position, EXCITATION SW. switch in SSB L. O. OFF position, DRIVER BAND switch in 4-8 position, MULTIMETER switch in DRIVER Ip Ma position, MAIN POWER switch in ON position, and TRANSMITTER PLATES switch in OPERATE position.

Step 3. Tune signal generator to 4 mc at a low output level. (If exciter is used, tune to 4 mc and adjust OUTPUT control for a low output level.)

Step 4. Place DRIVER TUNING control in 2.0 position.

Step 5. Increase signal generator output level until MULTIMETER indicates a current increase.

Step 6. Adjust L204 for maximum MULTIMETER deflection. If MULTIMETER reading goes off scale, decrease signal generator output level and retune L204 for maximum.

Step 7. Place MULTIMETER switch in PA Eg RF volts position.

Step 8. Adjust L212 for maximum MULTIMETER deflection while adjusting signal generator output level to maintain a reading of approximately 50 volts.

Step 9. Tune signal generator to 8 mc.

Step 10. Place DRIVER TUNING control in 4.0 position.

Step 11. Adjust C218 and C238 for maximum MULTIMETER deflection.

Step 12. Repeat steps 3 through 11 until adjustments are at optimum setting.

Step 13. Place DRIVER BAND switch in 8-16 position.

Step 14. Place DRIVER TUNING control in 2.0 position.

Step 15. Place MULTIMETER switch in DRIVER Ip Ma position.

Step 16. Increase signal generator output level until MULTIMETER indicates a current increase.

Step 17. Adjust L207 for maximum MULTIMETER deflection. If MULTIMETER reading goes off scale, decrease signal generator output level and retune L207 for maximum.

Step 18. Place MULTIMETER switch in PA Eg Rf volts position.

Step 19. Adjust L213 for maximum MULTIMETER deflection while adjusting signal generator output level to maintain a reading of approximately 50 volts.

Step 20. Place DRIVER TUNING control in 4.0 position.

Step 21. Tune signal generator to 16 mc.

Step 22. Adjust C231 and C239 for maximum MULTIMETER deflection.

Step 23. Repeat steps 13 through 22 until adjustments are at optimum setting.

Step 24. Place DRIVER BAND switch in 16-32 position.

Step 25. Place DRIVER TUNING control in 2.0 position.

Step 26. Adjust L208 and L214 for maximum MULTIMETER deflection.

Step 27. Tune signal generator to 32 mc.

Step 28. Place DRIVER TUNING control in 4.0 position.

Step 29. Adjust C232 for maximum MULTIMETER deflection.

Step 30. Repeat steps 24 through 29 until adjustments are at optimum setting.

Step 31. Lock all coil tuning slugs.

Step 32. Place DRIVER TUNING control in 2.0 position.

Step 33. Place NORMAL-SSB switch in NORMAL position.

Step 34. Place MULTIMETER switch in PA Ig Ma position, EXCITATION SW. switch in CW-FS position, and OSCILLATOR switch in MO position.

Step 35. Set MASTER OSCILLATOR FREQUENCY control for 2 mc.

Step 36. Place EXCITATION SW. switch in CW-PHONE position and rotate DRIVE control to extreme clockwise position.

Step 37. Adjust L205 for maximum MULTIMETER deflection.

Step 38. Place EXCITATION SW. switch in SSB L.O. OFF position and NORMAL-SSB switch in SSB position.

Step 39. Tune signal generator to 32 mc.

Step 40. Place DRIVER BAND switch in 16-32 position and adjust DRIVER TUNING control for maximum MULTIMETER deflection

Step 41. Place EXCITATION SW, switch in CW-PHONE position and NORMAL-SSB switch in NORMAL position.

Step 42. Deenergize signal generator.

Step 43. Place OSCILLATOR switch in MO position.

Step 44. Set MASTER OSCILLATOR FREQUENCY control for 4 mc.

Step 45. Adjust C212 for maximum MULTIMETER deflection.

Step 46. If maximum MULTIMETER deflection is less than 30 ma., adjust L205 for a MULTIMETER indication of 30 ma. If maximum MULTIMETER deflec-

tion is greater than 30 ma., do not disturb setting of L205.

Step 47. Set MASTER OSCILLATOR FREQUENCY control for 2 mc.

Step 48. Adjust DRIVER TUNING control for max-

WARNING

The FINAL PLATE switch must be in the OFF position throughout this procedure.

e. ADJUSTMENT OF FINAL PLATES OVERLOAD RESET CB603. - To adjust final plates overload reset CB603, proceed as follows:

CAUTION

Do not operate the transmitter in the condition outlined below for prolonged periods because of the excessive plate dissipation.

Step 1. Tune and load transmitter for cw operation.

Step 2. Adjust ANTENNA LOADING control so that DRIVE control can be used to adjust PA plate current to 600 ma.

Step 3. Unlock and adjust R609 to th point where a slight rise in PA plate current beyond 600 ma. causes CB603 and K601 to open.

Step 4. Repeat steps 1, 2, and 3, if necessary. Lock R609.

f. ADJUSTMENT OF FINAL SCREEN OVERLOAD RESET CB602. - To adjust final screen overload reset CB602, proceed as follows:

Step 1. Tune and load radio transmitter for cw operation.

Step 2. Place MULTIMETER switch in PA Isg Ma position.

Step 3. Adjust DRIVE control for a MULTIMETER indication of 100 ma.

Step 4. Unlock and adjust R603 to the point where a slight rise in current causes CB602 and K601 to open.

6-3. REPLACEMENT OF COMPONENTS.

WARNING

Dangerously high voltages exist in the equipment. Place MAIN POWER breaker in OFF position and discharge high voltage capacitors to prevent accidents which can result in loss of life.

a. Except for the replacement of the master oscillator assembly and vacuum tube capacitor C113, there are no special replacement procedures.

CAUTION

Maintenance personnel should not attempt, under any circumstances, to replace any component on the master oscillator assembly with the exception of V301 and V302. Never remove V301 or V302 without first removing ballast R426, or setting the MAIN POWER breaker to OFF position.

b. REPLACEMENT OF VACUUM CAPACITOR C113. - To replace C113, proceed as follows:

Step 1. Turn the PA TUNING control fully clockwise until it stops (PA TUNING indicator reads 000).

Step 2. Remove the top connector from C113 and loosen the clamp at the base of the glass envelope.

Step 3. Carefully lift the old capacitor from its position. The PA TUNING indicator reading will change as the capacitor is withdrawn.

Step 4. Turn the control shaft and nylon gear (figure 6-3) on the new capacitor until the collar does not turn freely. Add one more quarter turn.

Step 5. Slowly lower the new capacitor into position. The nylon drive gear will engage the PA TUNING indicator stop limit mechanism and turn the indicator back to 000.

c. REPLACEMENT OF OSCILLATOR ASSEMBLY. - To replace the master oscillator assembly, refer to figure 6-2 and proceed as follows:

Step 1. Turn MASTER OSCILLATOR FREQUENCY dial until MASTER OSCILLATOR FREQUENCY indicator reads 2000 kc.

Step 2. Disconnect and tag all wires connected between the oscillator assembly and the two terminal boards located on the left side when viewing unit from front.

Step 3. Disengage oscillator assembly shaft from MASTER FREQUENCY OSCILLATOR control shaft by loosening two setscrews from shaft coupling.

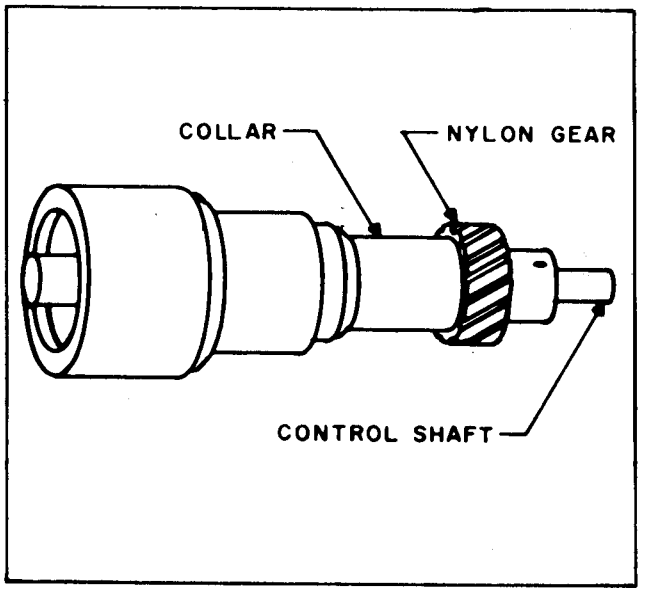


Figure 6-3. Vacuum Tube Capacitor C113, Replacement

Step 4. Remove screws securing the interconnect chassis.

Step 5. Remove eight front panel screws securing oscillator assembly. Withdraw the oscillator assembly from unit while insuring that it has a clear path.

Step 6. Set the new oscillator assembly into its position in the RTF-2, and perform assembly in reverse of disassembly.

CAUTION

Before engaging shaft coupling, insure that MASTER OSCILLATOR FREQUENCY indicator reads 2000.000 kc. All oscillator assemblies are factory set for 2000.000 kc.

d. EXCITER POWER SUPPLY. - Three circuits of the exciter power supply are fused; oven heaters, power supply primary, and high voltage. Because a partial short across the B+ line may not blow the line fuse, the separate high voltage fuse has been incorporated. If meter readings cannot be obtained or the EXCITER lamp fails to light when the POWER switch is in the ON position, check the B+ fuse. If dial lights and tube filaments fail to light when POWER switch is in the ON position, check the MAIN fuse. If, after a 1-hour warmup, the OVEN lamp fails to cycle every 4 to 5 minutes, check the OVEN fuse.

CAUTION

Never replace a fuse with one of higher rating unless continued operation is more important than probable damage to the equipment. If a fuse burns out immediately after replacement, has been located and corrected.

6-4. INSPECTION.

a. Operating or maintenance personnel should adhere to a daily inspection procedure, to insure optimum performance of the transmitter. These inspections should include:

(1) Checking meters during operation for proper current and voltage readings.
(2) Checking meters for zero adjustment.
(3) Checking controls and control locks for proper operation.
(4) Checking cables for secure connections.

b. At periodic intervals (at least every six months), remove the equipment from the cabinet for cleaning and inspection. Inspect wiring, and components for dirt, corrosion, charring, discoloring, or grease. Carefully inspect the tube sockets for deterioration. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease from electrical parts with trichloroethylene or ethylenedichloride. Remove dirt or grease from other parts with any good dry cleaning fluid.

WARNING

When using trichloroethylene or ethylenedichloride make sure that adequate ventilation exists.

c. While the unit is out of the cabinet, it is advisable to check the tubes, all of which are accessable from the top of the chassis. Carefully inspect for loose solder connections or screws, especially those on solder lugs. Recommended time interval is every 6 to 12 months, depending on the amount of vibration encountered in service.

6-5. CLEANING.

a. The following items should be cleaned with a soft brush and/or vacuum cleaner at intervals determined by general area conditions.

(1) Chassis surfaces.
(2) Tubes and sockets.
(3) Cables
(4) Terminal and barrier strips and insulators.
(5) Switches.
(6) Insulators.

b. The following items should be cleaned with crocus cloth and trichloroethylene or ethylenedichloride.

WARNING

When using trichloroethylene or ethylenedichloride make sure that adequate ventilation exists.

(1) Meter glasses.
(2) Front panels.
(3) Blower blades.
(4) Motor housings.

c. Clean dirty filters by immersing in a pan of solvent, such as gasoline, benzine, kerosene, methyl alcohol, and similar materials. Move the filter through the solvent to create an agitated current through the filter passages. After cleaning, allow filter to dry. When filter is dry, dip the filter in a pan of oil and allow it to drain, face downward, until dripping ceases. The oil used for this process should be one that will not run at the highest, nor solidify at the lowest, temperatures of the incoming air.

6-6. LUBRICATION.

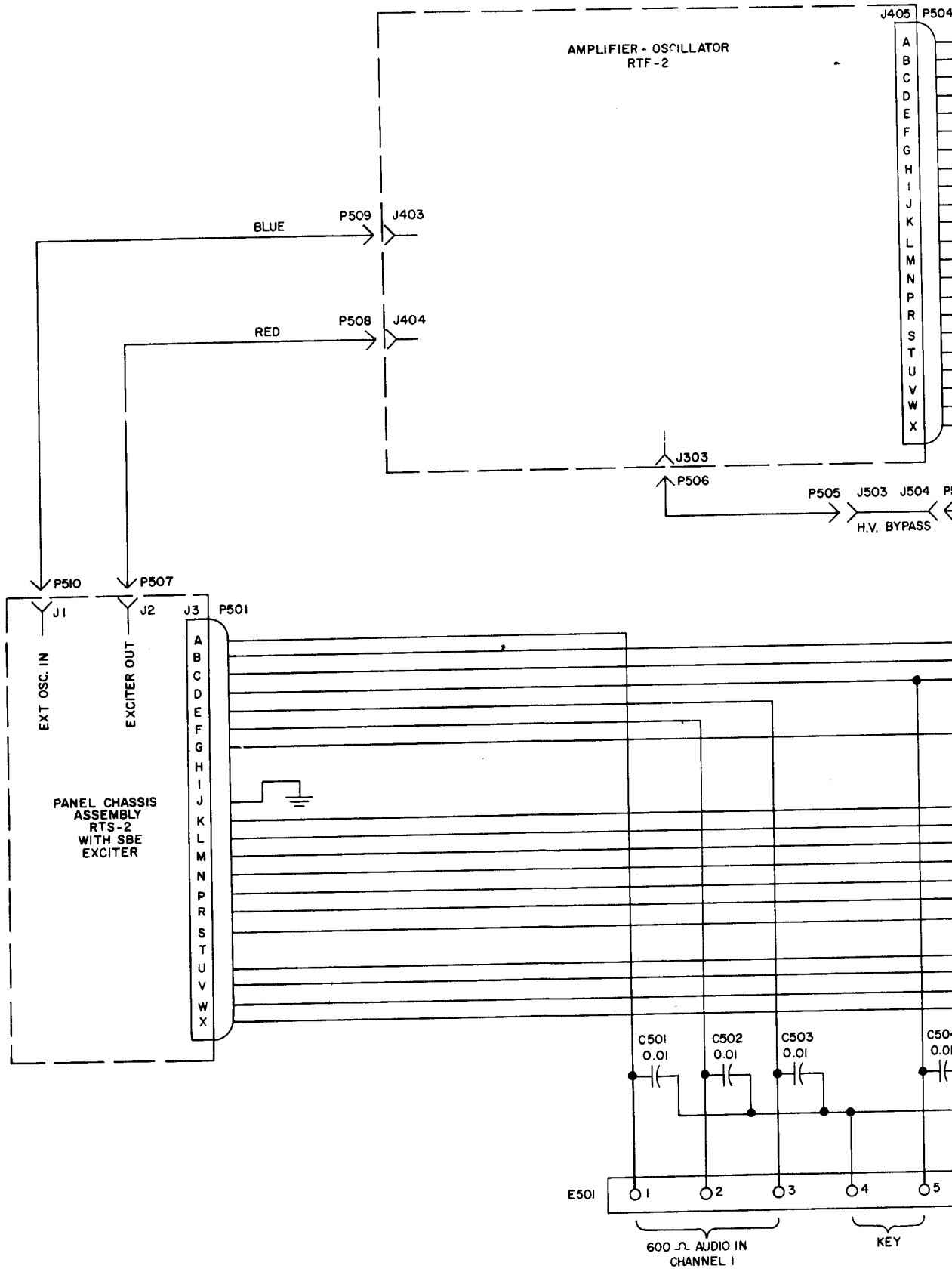
Lubricate all gears and drawer slides with light oil.

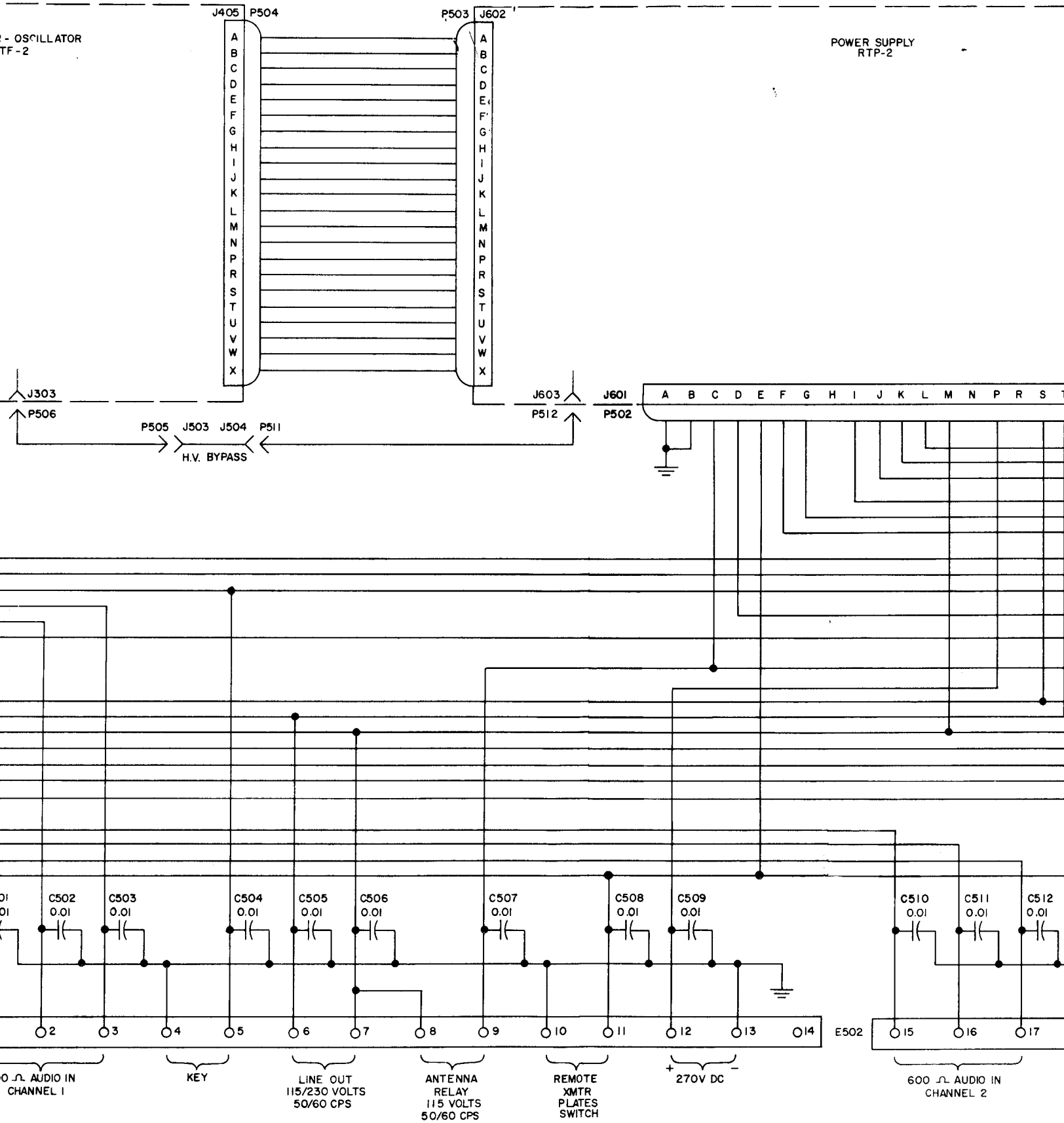
CAUTION

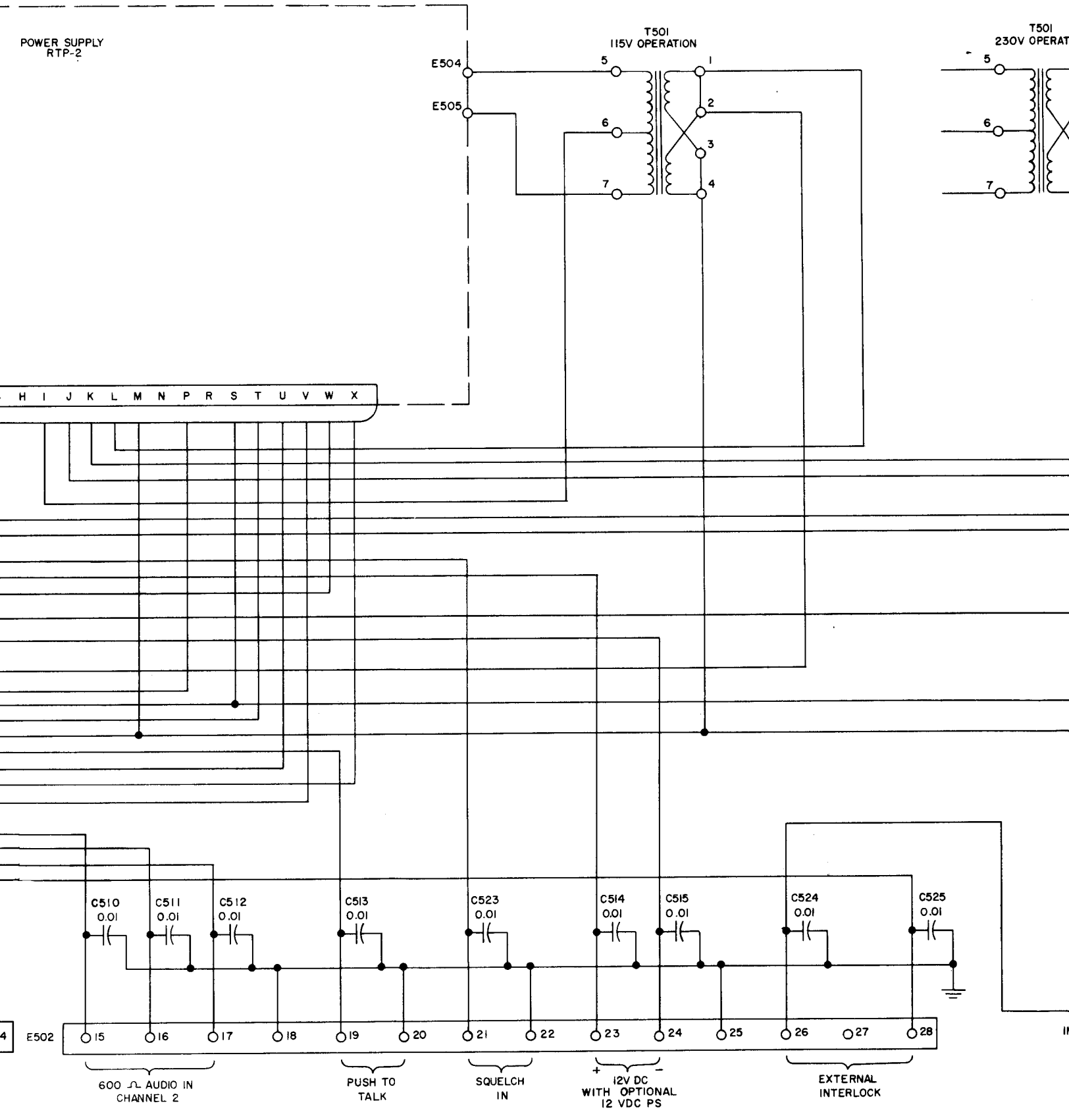
Do not lubricate friction drive mechanism.

6-7. SCHEMATIC DIAGRAMS.

The schematic diagram of the radio transmitter is shown in figure 6-4. The schematic diagrams for each assembly of the RTF-2 unit are shown in figures 6-5 through 6-8. The schematic diagram for the RTP-2 unit is shown in figure 6-9, the cabinet in figure 6-10, and the RTS-2 in figure 6-11.


AMPLIFIER - OSCILLATOR
RTF-2
J405
P504
A B C D E F G H I J K L M N P R S T U V W X
BLUE
P509
J403
RED
P508
J404
J303
P506
P505
J503
J504
H.V. BYPASS
P510
P507
J1
J2
J3
P501
EXT OSC. IN
EXCITER OUT
PANEL CHASSIS
ASSEMBLY
RTS-2
WITH SBE
EXCITER
C501
0.01
C502
0.01
C503
0.01
E501
1
2
3
4
5
600 Ω AUDIO IN
CHANNEL 1
KEY


- OSCILLATOR
TF-2
J405 P504
P503 J602
A B C D E F G H I J K L M N P R S T U V W X
POWER SUPPLY
RTP-2
J303
P506
J603
P512
J601
P502
A B C D E F G H I J K L M N P R S T
P505 J503 J504 P511
H.V. BYPASS
C502 0.01
C503 0.01
C504 0.01
C505 0.01
C506 0.01
C507 0.01
C508 0.01
C509 0.01
C510 0.01
C511 0.01
C512 0.01
2 3 4 5 6 7 8 9 10 11 12 13 14
E502
15 16 17
600 Ω AUDIO IN CHANNEL 1
KEY
LINE OUT 115/230 VOLTS 50/60 CPS
ANTENNA RELAY 115 VOLTS 50/60 CPS
REMOTE XMTR PLATES SWITCH
+ 270V DC −
600 Ω AUDIO IN CHANNEL 2


POWER SUPPLY
RTP-2
T501
115V OPERATION
T501
230V OPERAT
E504
E505
5
6
7
1
2
3
4
H I J K L M N P R S T U V W X
C510
0.01
C511
0.01
C512
0.01
C513
0.01
C523
0.01
C514
0.01
C515
0.01
C524
0.01
C525
0.01
E502
15 16 17 18 19 20 21 22 23 24 25 26 27 28
600 Ω AUDIO IN
CHANNEL 2
PUSH TO
TALK
SQUELCH
IN
+ 12V DC
WITH OPTIONAL
12 VDC PS −
EXTERNAL
INTERLOCK

004640315

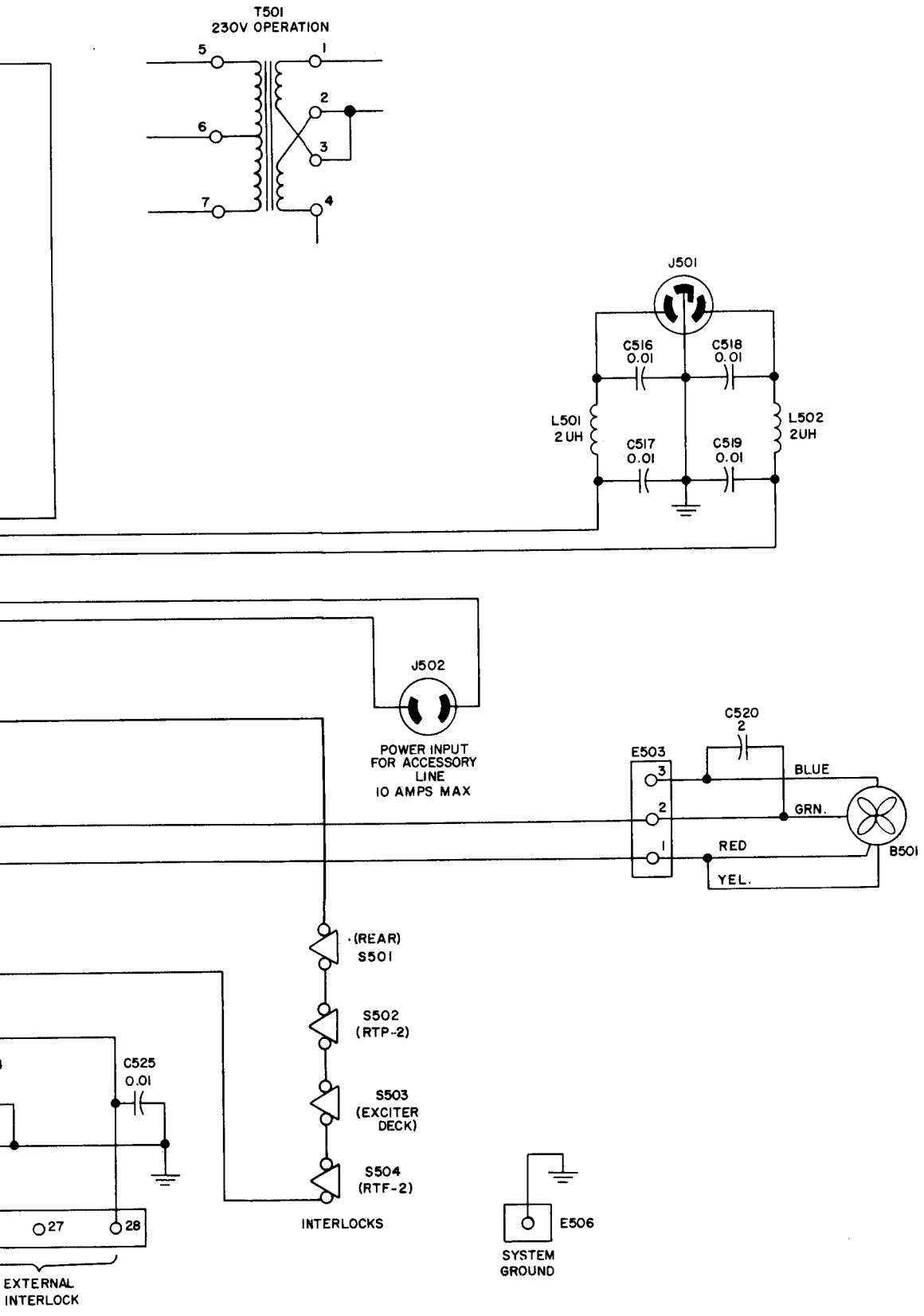
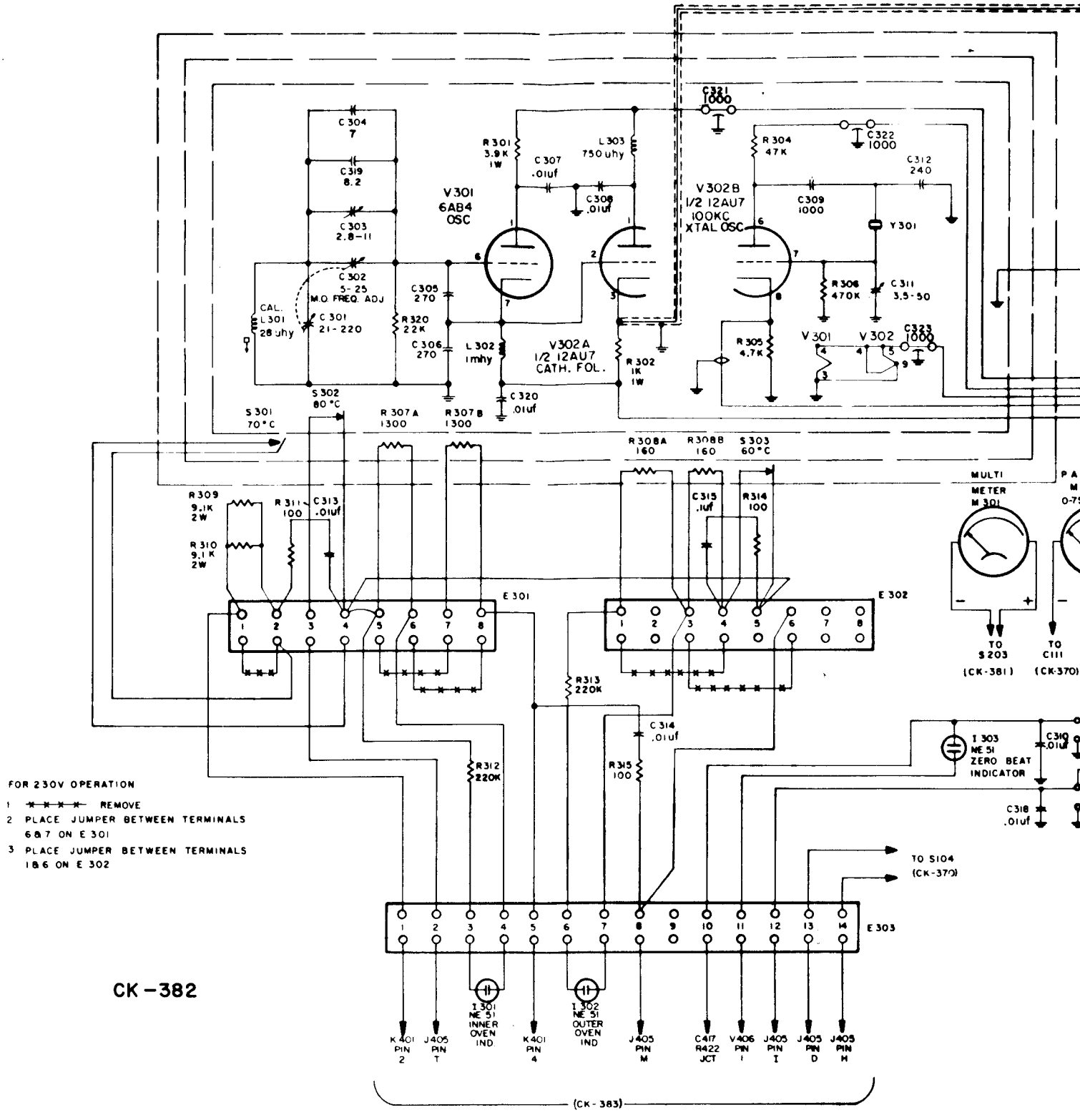


Figure 6-4. Radio Transmitters Models GPT-750D-2 and GPT-750E-2, Schematic Diagram



FOR 230V OPERATION

1 ✕✕✕✕ REMOVE
2 PLACE JUMPER BETWEEN TERMINALS 6&7 ON E 301
3 PLACE JUMPER BETWEEN TERMINALS 1&6 ON E 302

CK-382

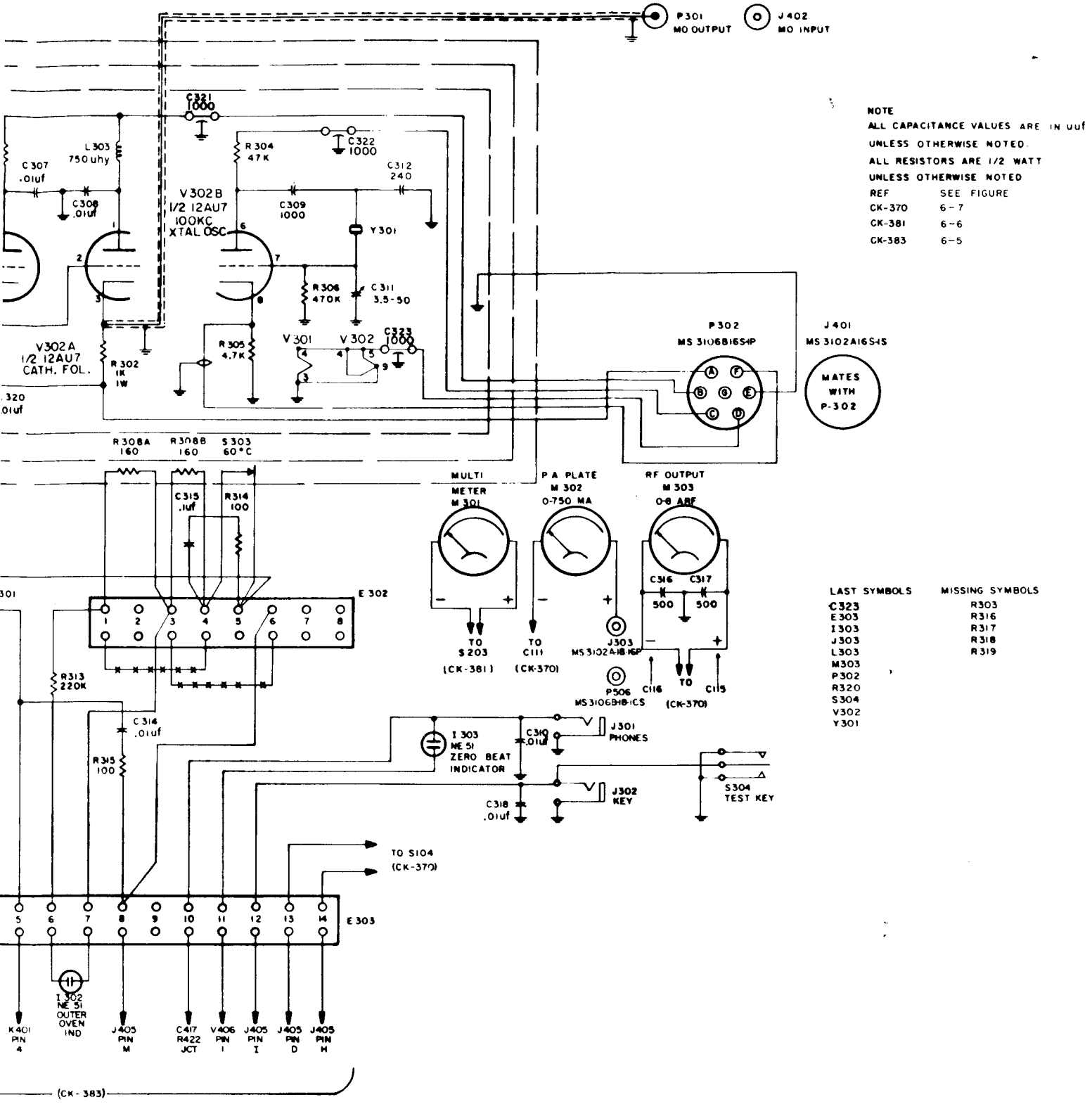
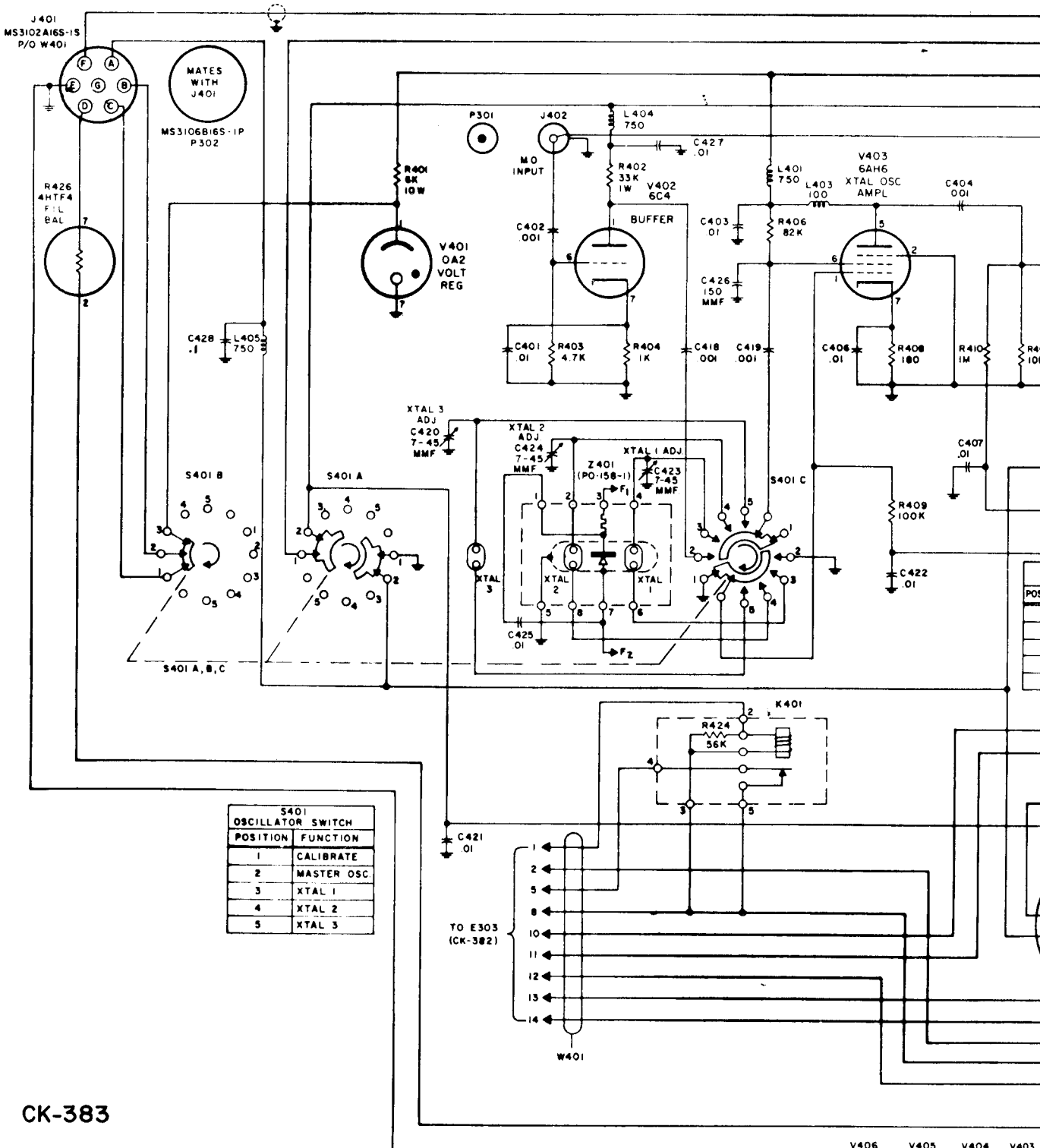
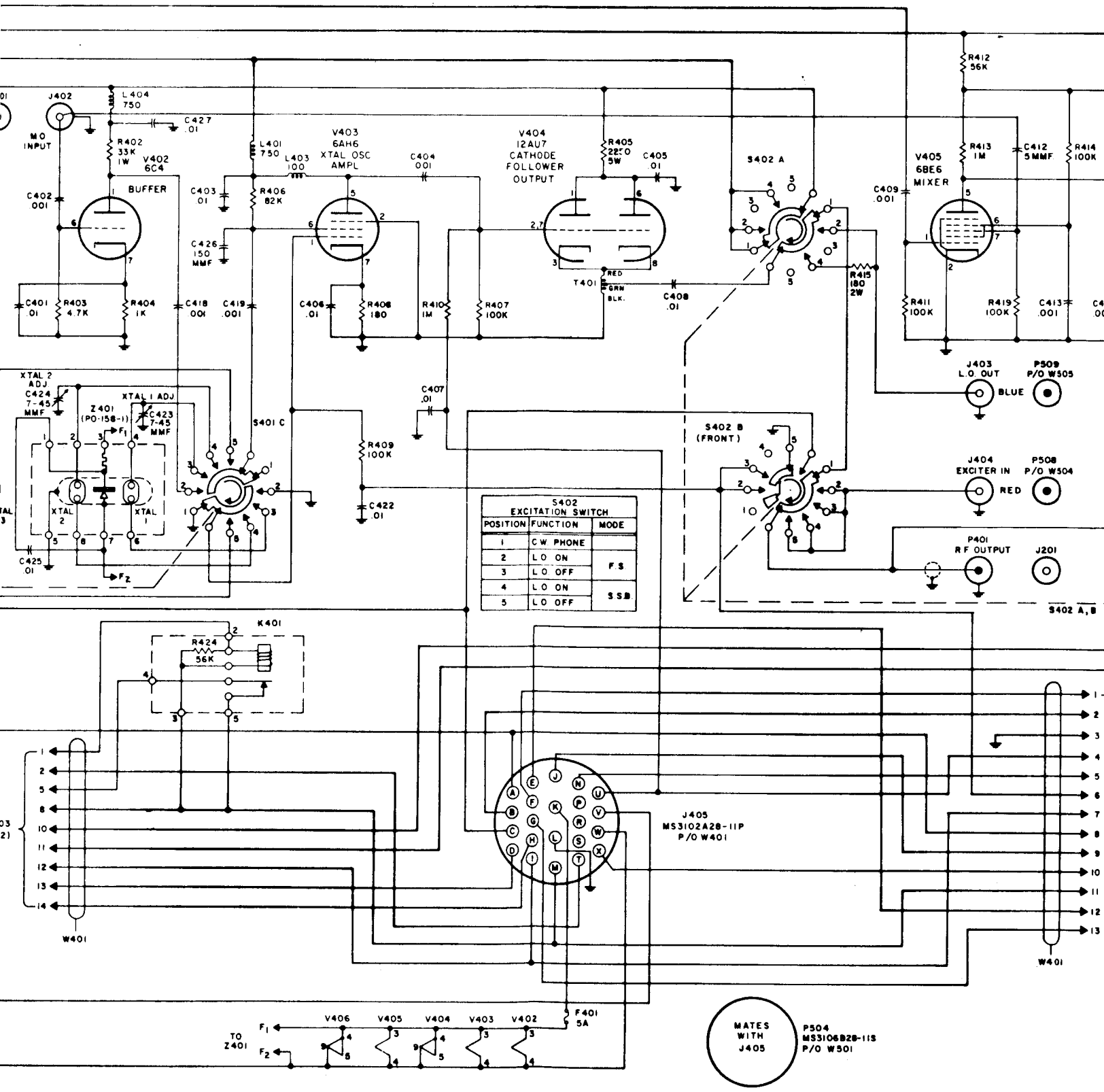


Figure 6-5. Master Oscillator, Model RTF-2, Schematic Diagram

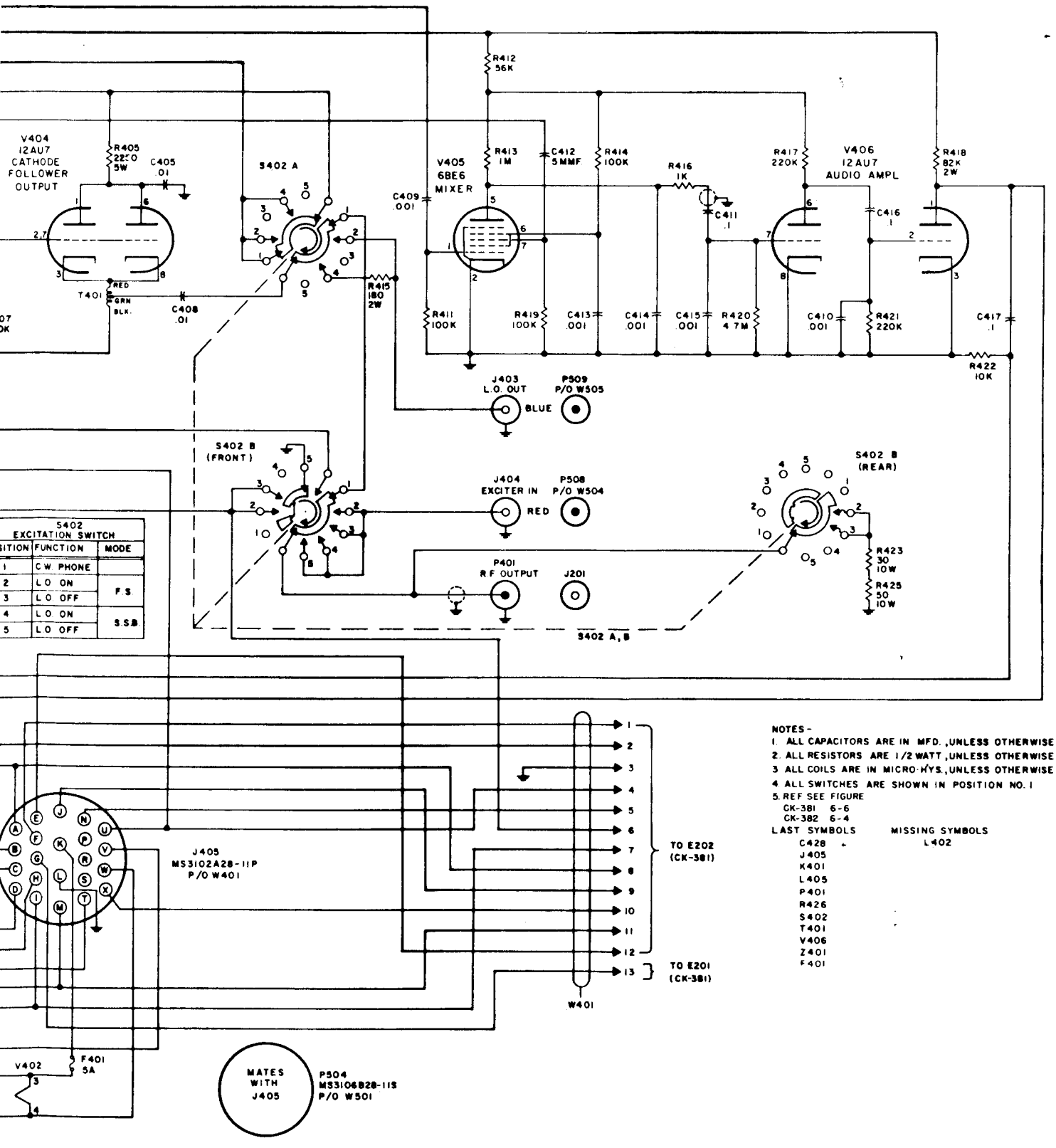


S401 OSCILLATOR SWITCH	
POSITION	FUNCTION
1	CALIBRATE
2	MASTER OSC
3	XTAL 1
4	XTAL 2
5	XTAL 3

CK-383



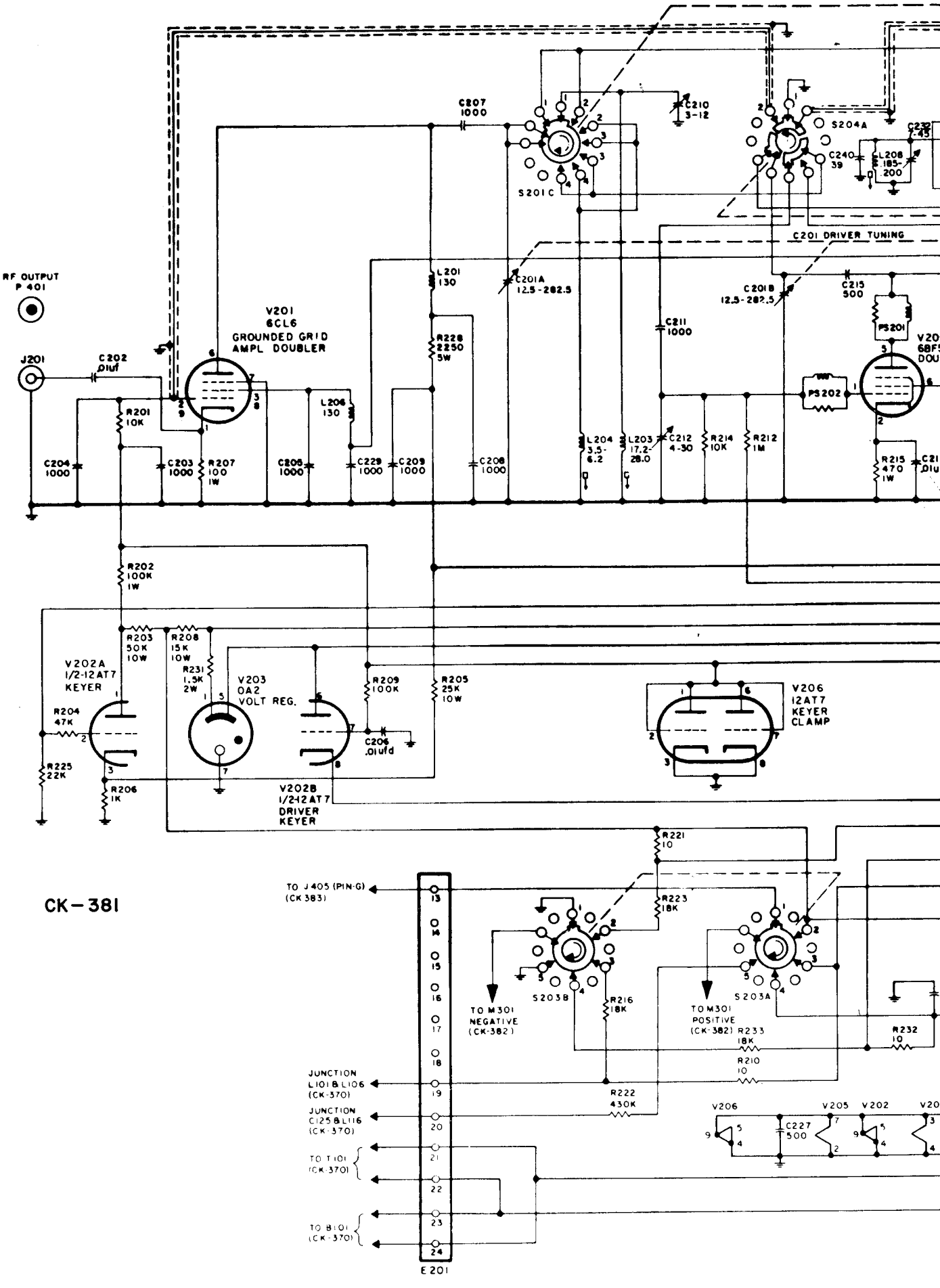
004640312/3/4/5



NOTES -
1. ALL CAPACITORS ARE IN MFD., UNLESS OTHERWISE SPECIFIED.
2. ALL RESISTORS ARE 1/2 WATT, UNLESS OTHERWISE SPECIFIED.
3. ALL COILS ARE IN MICRO-HYS., UNLESS OTHERWISE SPECIFIED
4. ALL SWITCHES ARE SHOWN IN POSITION NO. 1
5. REF SEE FIGURE
   CK-381 6-6
   CK-382 6-4

LAST SYMBOLS	MISSING SYMBOLS
C428	L402
J405	
K401	
L405	
P401	
R426	
S402	
T401	
V406	
Z401	
F401	

Figure 6-6. Interconnect Chassis, Model RTF-2, Schematic Diagram


RF OUTPUT P 401
J201
C202 .01uf
V201 6CL6 GROUNDED GRID AMPL DOUBLER
R201 10K
C204 1000
C203 1000
R207 100 1W
C806 1000
C229 1000
C209 1000
C208 1000
L206 130
L201 130
R228 2250 5W
C807 1000
C201A 12.5-282.5
C210 3-12
S201C
S204A
C240 39
L208 8.185-200
C201 DRIVER TUNING
C201B 12.5-282.5
C215 500
C211 1000
PS201
PS202
L204 3.5-6.2
L203 17.2-28.0
C212 4-30
R214 10K
R212 1M
R215 470 1W
R202 100K 1W
R203 50K 10W
R208 15K 10W
R231 1.5K 2W
V202A 1/2-12AT7 KEYER
R204 47K
R225 22K
R206 1K
V203 0A2 VOLT REG.
R209 100K
R205 25K 10W
C206 .01ufd
V202B 1/2 12AT7 DRIVER KEYER
V206 12AT7 KEYER CLAMP
CK-381
TO J405 (PIN-G) (CK 383)
R221 10
R223 18K
S203B
R216 18K
TO M301 NEGATIVE (CK-382)
S203A
TO M301 POSITIVE (CK-382)
R233 18K
R232 10
R210 10
R222 430K
JUNCTION L101 & L106 (CK-370)
JUNCTION C125 & L116 (CK-370)
TO T101 (CK-370)
TO B101 (CK-370)
E201
V206
V205
V202
C227 500

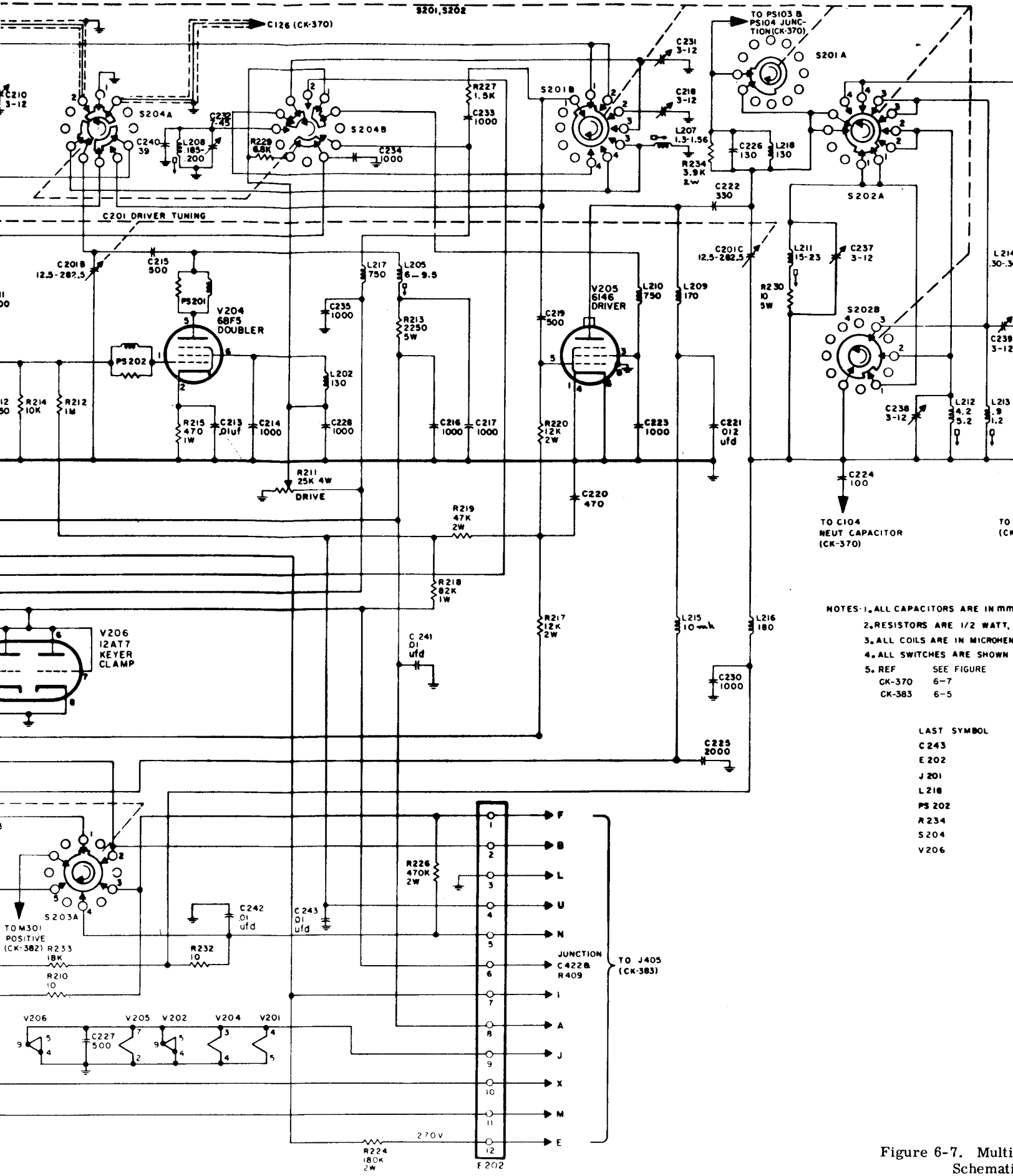
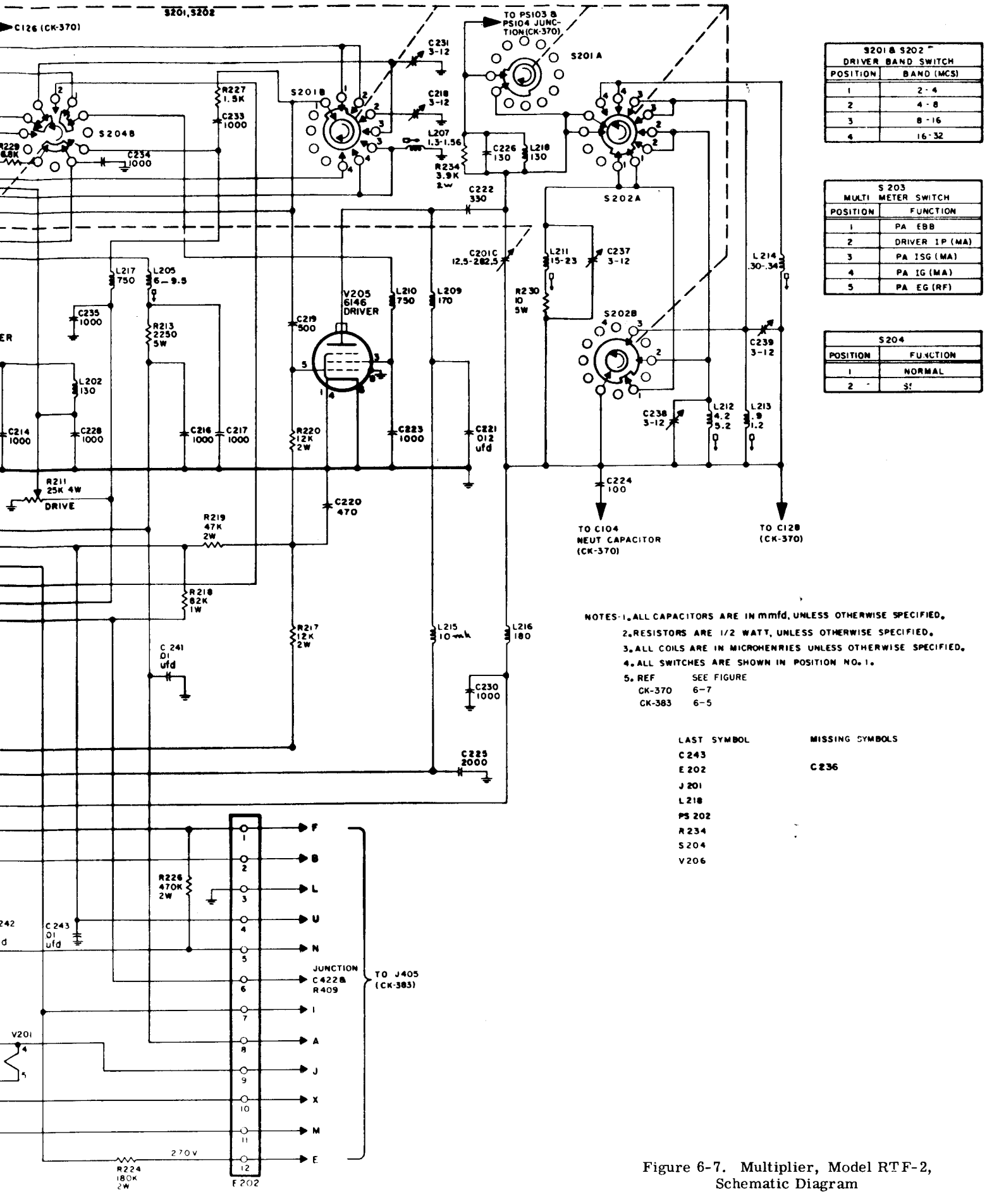


Figure 6-7. Multi
Schemati



S201B S202 DRIVER BAND SWITCH	
POSITION	BAND (MCS)
1	2 - 4
2	4 - 8
3	8 - 16
4	16 - 32

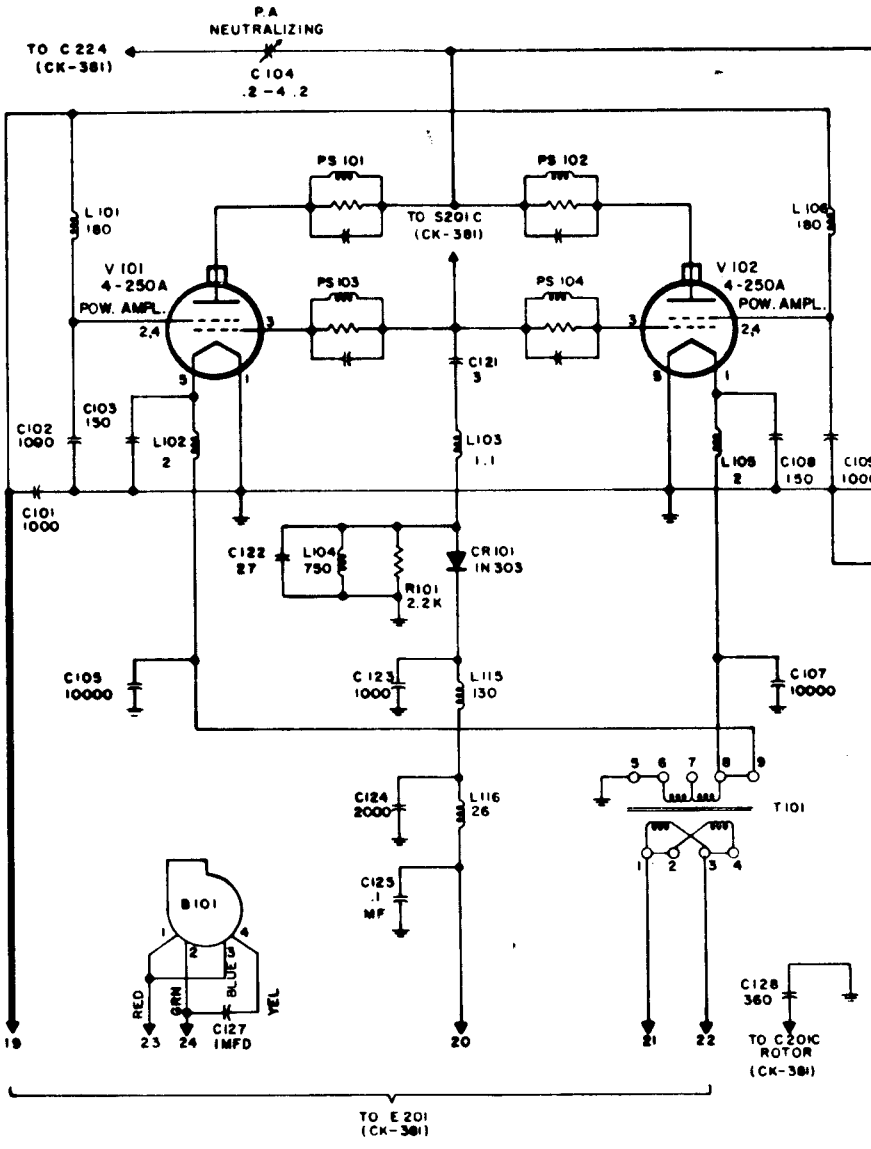
S 203 MULTI METER SWITCH	
POSITION	FUNCTION
1	PA EBB
2	DRIVER IP (MA)
3	PA ISG (MA)
4	PA IG (MA)
5	PA EG (RF)

S204	
POSITION	FUNCTION
1	NORMAL
2	ST

NOTES-1. ALL CAPACITORS ARE IN mmfd. UNLESS OTHERWISE SPECIFIED.
2. RESISTORS ARE 1/2 WATT, UNLESS OTHERWISE SPECIFIED.
3. ALL COILS ARE IN MICROHENRIES UNLESS OTHERWISE SPECIFIED.
4. ALL SWITCHES ARE SHOWN IN POSITION NO. 1.
5. REF SEE FIGURE
CK-370 6-7
CK-383 6-5

LAST SYMBOL	MISSING SYMBOLS
C 243	
E 202	C 236
J 201	
L 218	
PS 202	
R 234	
S 204	
V 206	

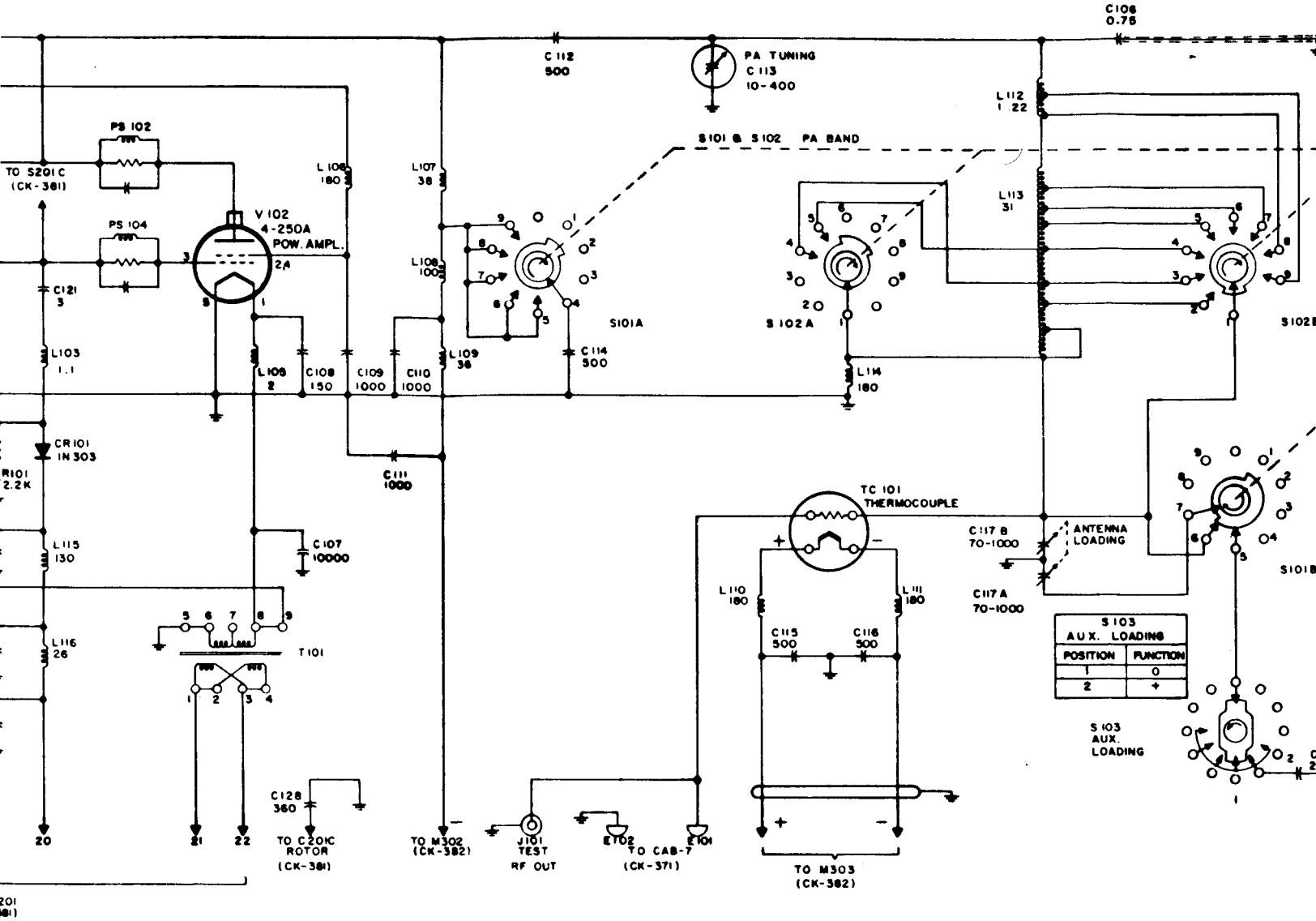
Figure 6-7. Multiplier, Model RTF-2, Schematic Diagram



NOTES:

1. ALL CAPACI
2. ALL RESISTO
3. ALL COILS A
4. ALL SWITCHE
5. REF S
CK-371 6
CK-381 6
CK-382 6

CK-370

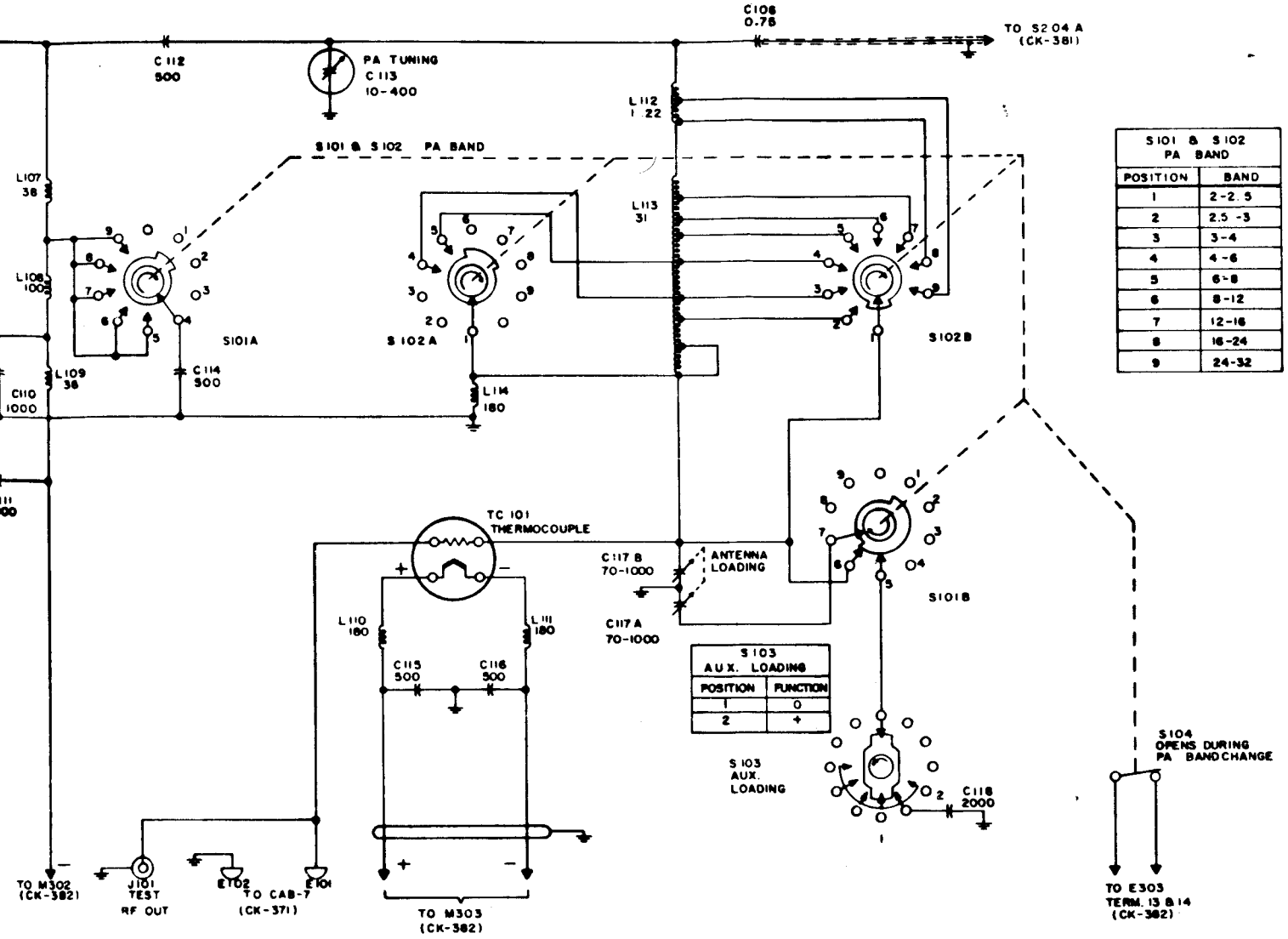


NOTES:

1. ALL CAPACITORS ARE IN MMFD UNLESS OTHERWISE SPECIFIED.
2. ALL RESISTORS ARE 1/2 WATT.
3. ALL COILS ARE IN MICROHENRIES
4. ALL SWITCHES SHOWN IN POSITION NO. 1
5. REF SEE FIGURE
   CK-371 6-9
   CK-381 6-6
   CK-382 6-4

LAST SYMBOLS	MISSING SYMBOLS
B 101	C119,120,126
C 128	
CR 101	
E 102	
J 101	
L 116	
PS 104	
R 101	
S 104	
T 101	
TC101	
V 102	

Figure 6-8. I
S



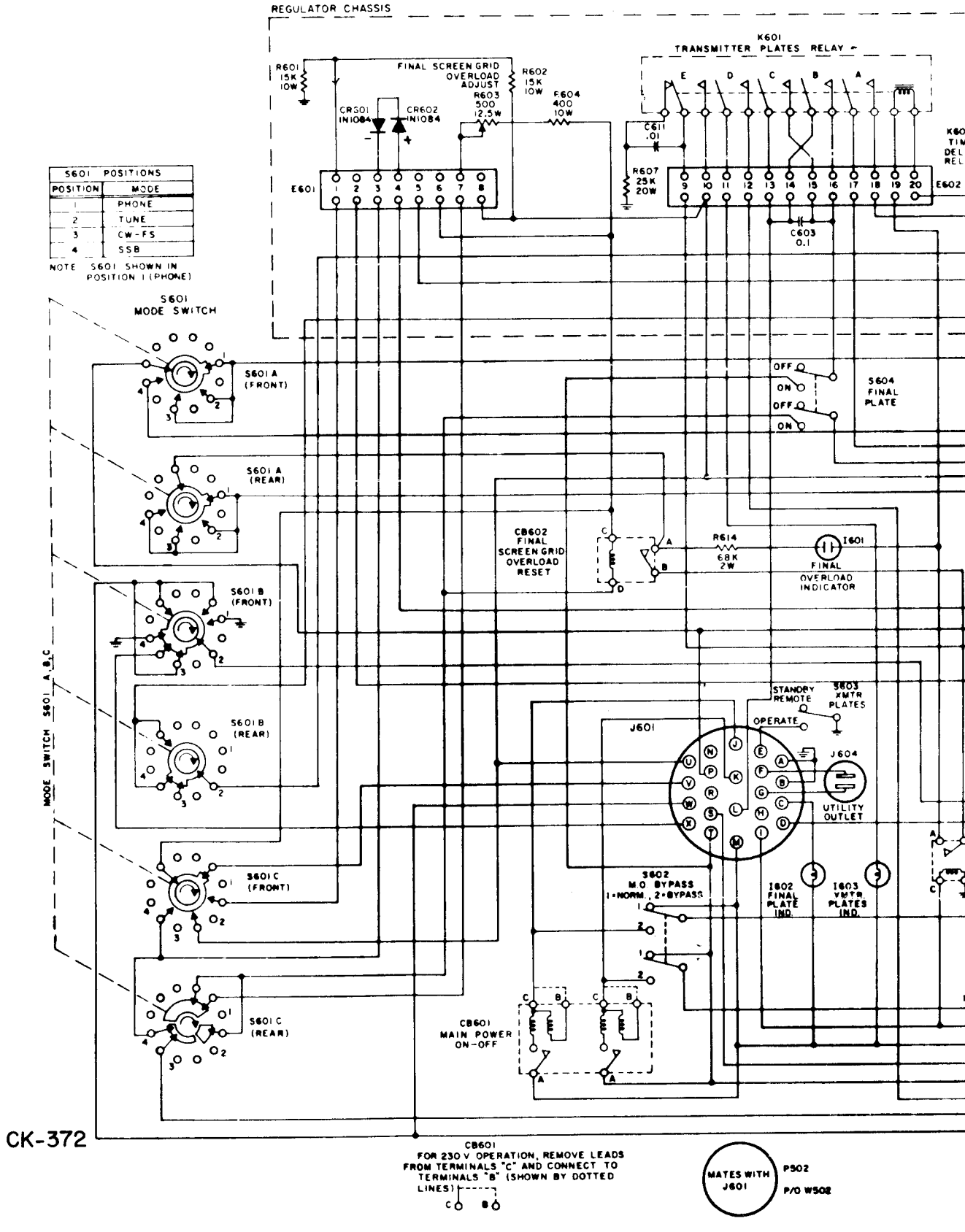
S101 & S102 PA BAND	
POSITION	BAND
1	2-2.5
2	2.5-3
3	3-4
4	4-6
5	6-8
6	8-12
7	12-16
8	16-24
9	24-32

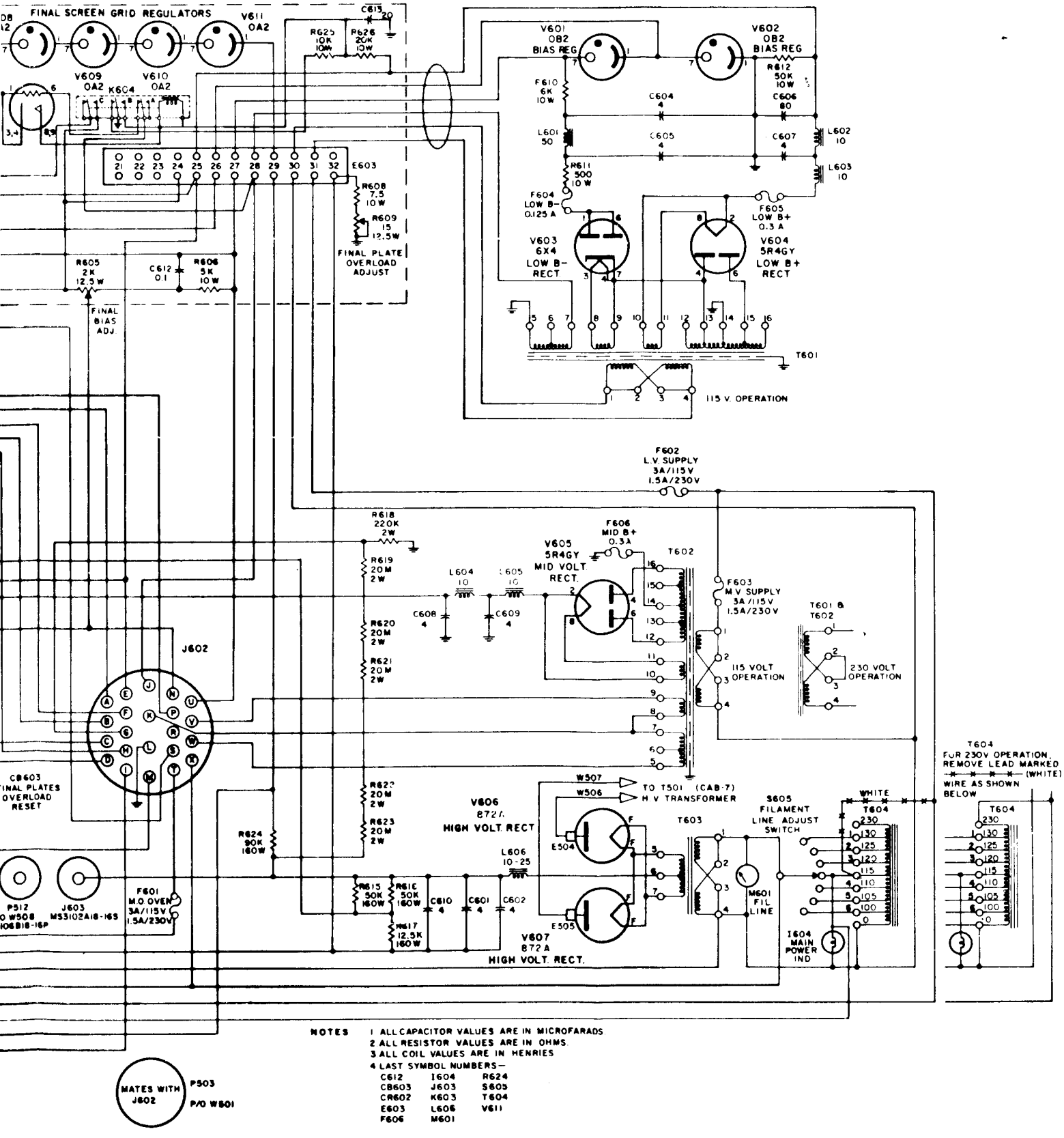
S103 AUX. LOADING	
POSITION	FUNCTION
1	0
2	+

RS ARE IN MMFD UNLESS OTHERWISE SPECIFIED.
ARE 1/2 WATT.
IN MICROHENRIES
SHOWN IN POSITION NO. 1
FIGURE
9
6
4

LAST SYMBOLS	MISSING SYMBOLS
B 101	C119,120,126
C 128	
CR 101	
E 102	
J 101	
L 116	
PS 104	
R 101	
S 104	
T 101	
TC101	
V 102	

Figure 6-8. Power Amplifier, Model RTF-2, Schematic Diagram

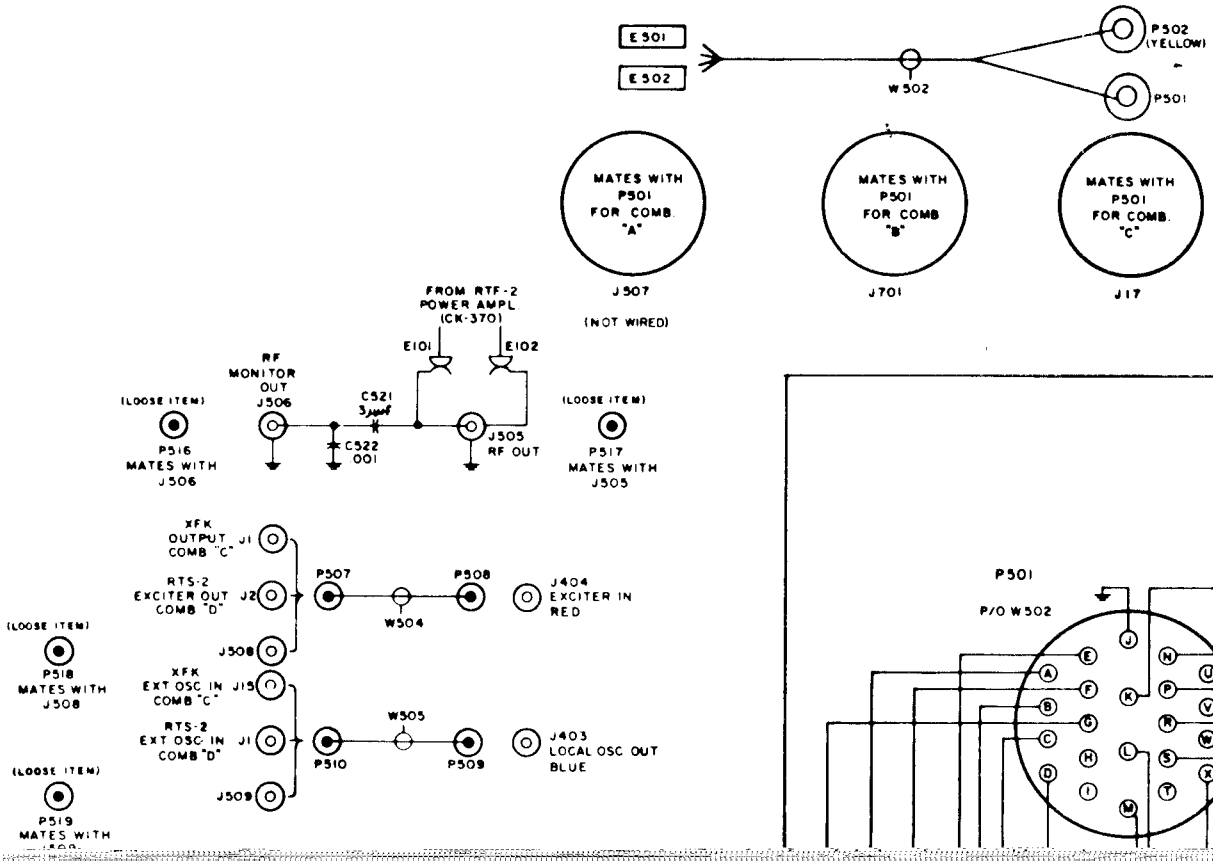

REGULATOR CHASSIS
K601
TRANSMITTER PLATES RELAY
R601 15K 10W
FINAL SCREEN GRID OVERLOAD ADJUST R603 500 12.5W
R602 15K 10W
R604 400 10W
CR601 IN1084
CR602 IN1084
C611 .01
R607 25K 20W
E601
E602
C603 0.1
S601 POSITIONS
POSITION | MODE
1 PHONE
2 TUNE
3 CW-FS
4 SSB
NOTE S601 SHOWN IN POSITION 1 (PHONE)
S601 MODE SWITCH
S601A (FRONT)
S601A (REAR)
S601B (FRONT)
S601B (REAR)
S601C (FRONT)
S601C (REAR)
MODE SWITCH S601 A,B,C
S604 FINAL PLATE
OFF
ON
CB602 FINAL SCREEN GRID OVERLOAD RESET
R614 6.8K 2W
I601 FINAL OVERLOAD INDICATOR
STANDBY REMOTE
S603 XMTR PLATES
OPERATE
J601
J604 UTILITY OUTLET
S602 M.O BYPASS 1=NORM., 2=BYPASS
I602 FINAL PLATE IND.
I603 XMTR PLATES IND.
CB601 MAIN POWER ON-OFF
CB601 FOR 230 V OPERATION, REMOVE LEADS FROM TERMINALS "C" AND CONNECT TO TERMINALS "B" (SHOWN BY DOTTED LINES)
MATES WITH J601
P502
P/O W502
CK-372

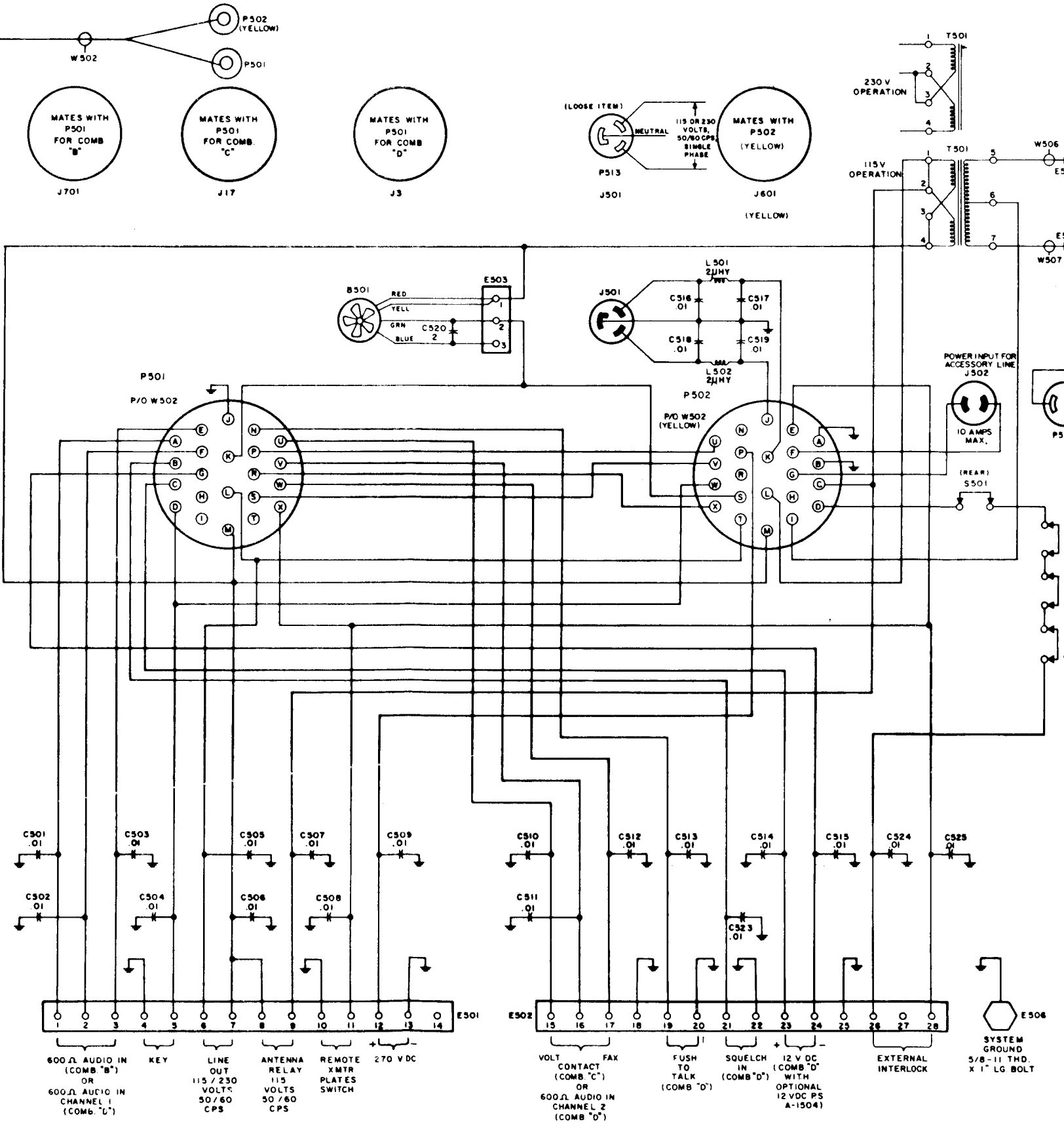


NOTES
1. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. ALL RESISTOR VALUES ARE IN OHMS.
3. ALL COIL VALUES ARE IN HENRIES.
4. LAST SYMBOL NUMBERS—

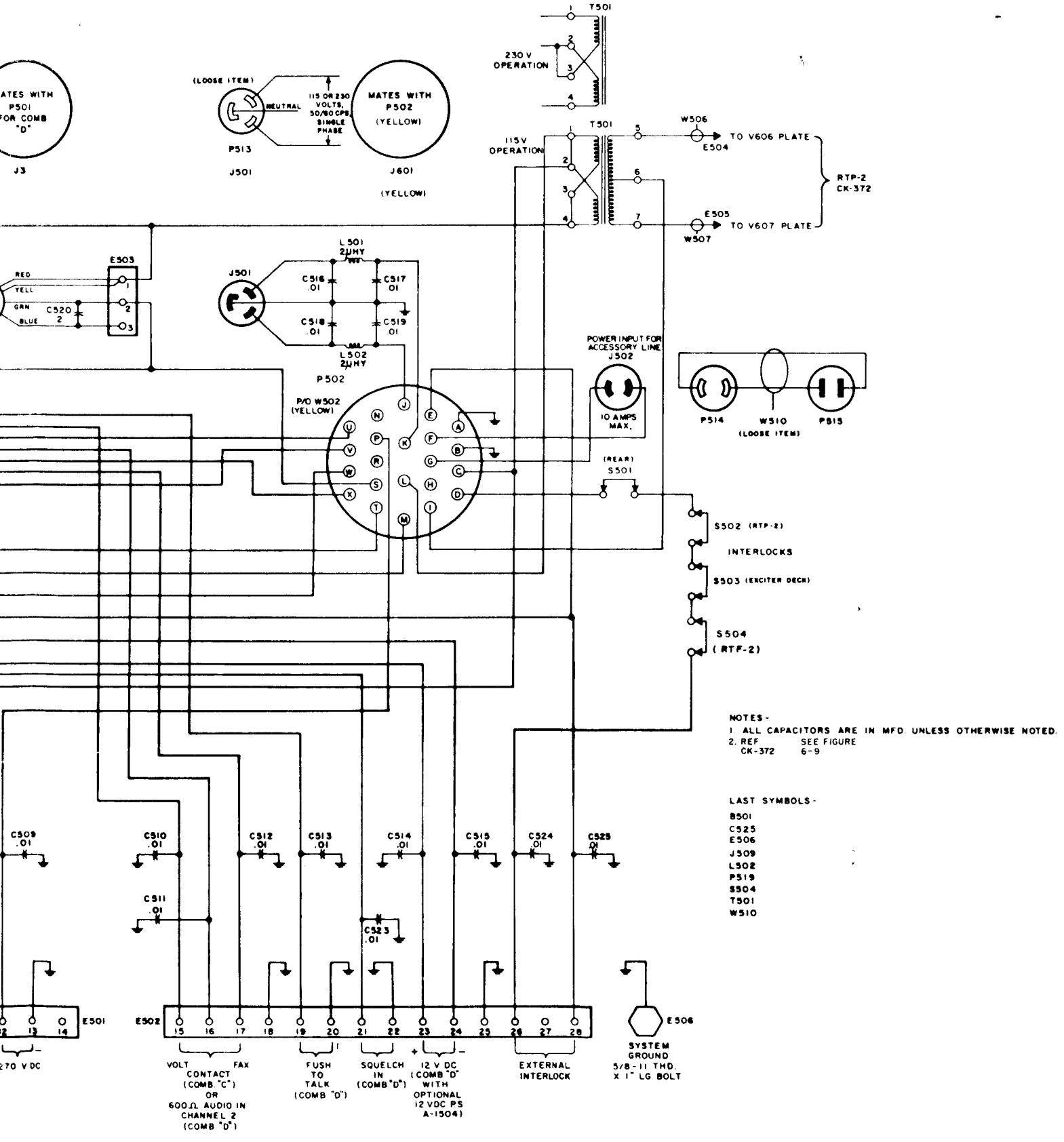
C612	I604	R624
CB603	J603	S605
CR602	K603	T604
E603	L606	V611
F606	M601	

Figure 6-9. Power Supply, Model RTP-2, Schematic Diagram


E501
E502
W502
P502 (YELLOW)
P501
MATES WITH P501 FOR COMB. "A"
MATES WITH P501 FOR COMB "B"
MATES WITH P501 FOR COMB. "C"
J507
J701
J17
(NOT WIRED)
FROM RTF-2 POWER AMPL (CK-370)
E101
E102
RF MONITOR OUT J506
C521
C522 .001
J505 RF OUT
(LOOSE ITEM)
P516 MATES WITH J506
(LOOSE ITEM)
P517 MATES WITH J505
XFK OUTPUT J1 COMB "C"
RTS-2 EXCITER OUT J2 COMB "D"
J508
P507
P508
W504
J404 EXCITER IN RED
(LOOSE ITEM)
P518 MATES WITH J508
XFK EXT OSC IN J15 COMB "C"
RTS-2 EXT OSC IN J1 COMB "D"
J509
W505
P510
P509
J403 LOCAL OSC OUT BLUE
(LOOSE ITEM)
P519 MATES WITH
P501
P/O W502
A
B
C
D
E
F
G
H
I
J
K
L
M
N
P
R
S
T
U
V
W
X


W502
P502 (YELLOW)
P501
MATES WITH P501 FOR COMB "B"
J701
MATES WITH P501 FOR COMB. "C"
J17
MATES WITH P501 FOR COMB "D"
J3
(LOOSE ITEM)
NEUTRAL
115 OR 230 VOLTS, 50/60 CPS, SINGLE PHASE
P513
J501
MATES WITH P502 (YELLOW)
J601
(YELLOW)
T501
230 V OPERATION
115 V OPERATION
W506
W507
B501
RED
YELL
GRN
BLUE
C520 2
E503
L501 2μHY
L502 2μHY
C516 .01
C517 .01
C518 .01
C519 .01
POWER INPUT FOR ACCESSORY LINE J502
10 AMPS MAX.
(REAR)
S501
P501
P/O W502
P502
P/O W502 (YELLOW)
C501 .01
C502 .01
C503 .01
C504 .01
C505 .01
C506 .01
C507 .01
C508 .01
C509 .01
C510 .01
C511 .01
C512 .01
C513 .01
C514 .01
C515 .01
C523 .01
C524 .01
C525 .01
E501
E502
E506
600Ω AUDIO IN (COMB "B") OR 600Ω AUDIO IN CHANNEL 1 (COMB. "L")
KEY
LINE OUT 115/230 VOLTS 50/60 CPS
ANTENNA RELAY 115 VOLTS 50/60 CPS
REMOTE XMTR PLATES SWITCH
27.0 V DC
VOLT CONTACT FAX (COMB "C") OR 600Ω AUDIO IN CHANNEL 2 (COMB "D")
PUSH TO TALK (COMB "D")
SQUELCH IN (COMB "D")
12 V DC (COMB "D" WITH OPTIONAL 12 VDC PS A-1504)
EXTERNAL INTERLOCK
SYSTEM GROUND 5/8-11 THD. X 1" LG. BOLT

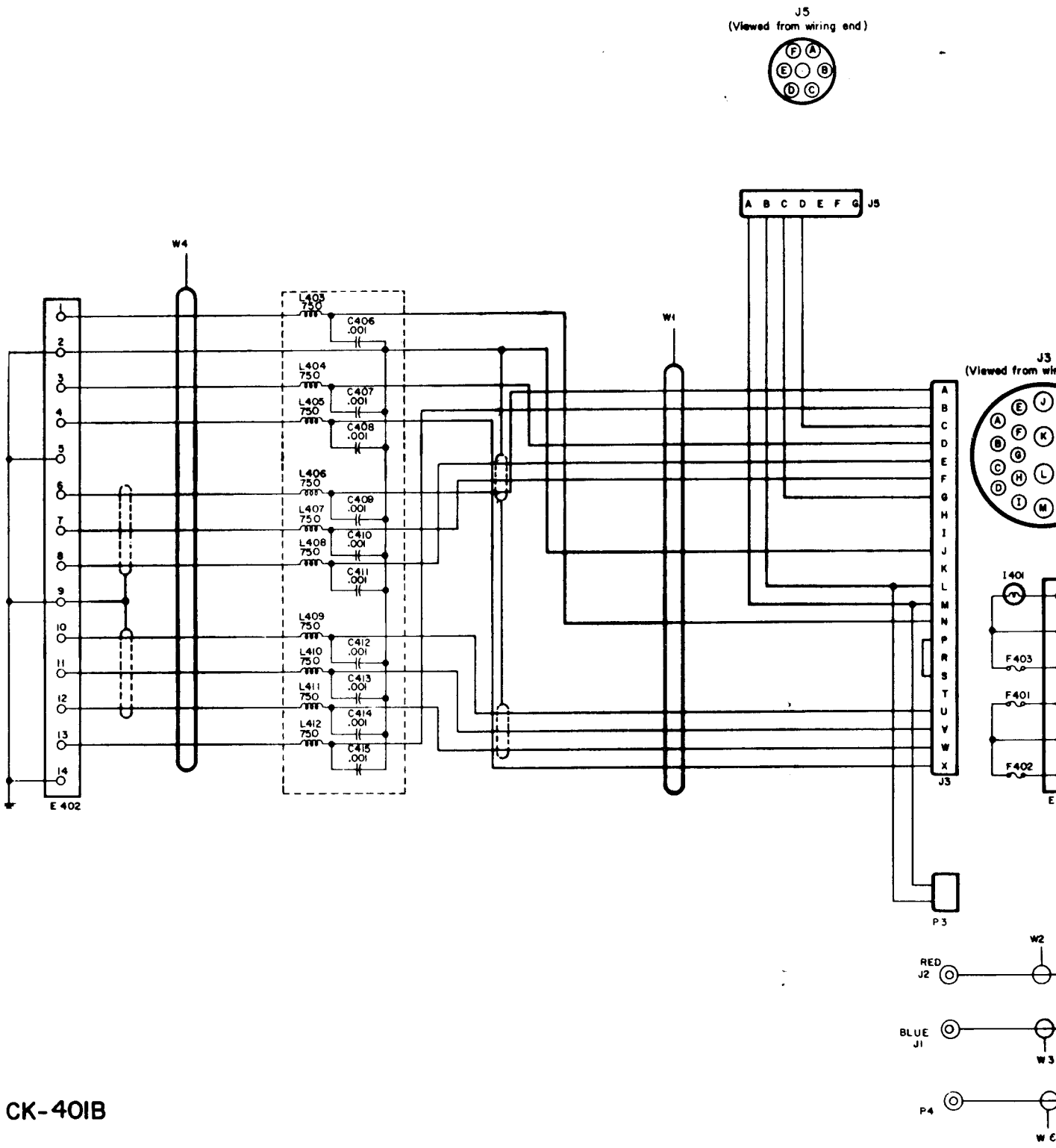
Figure



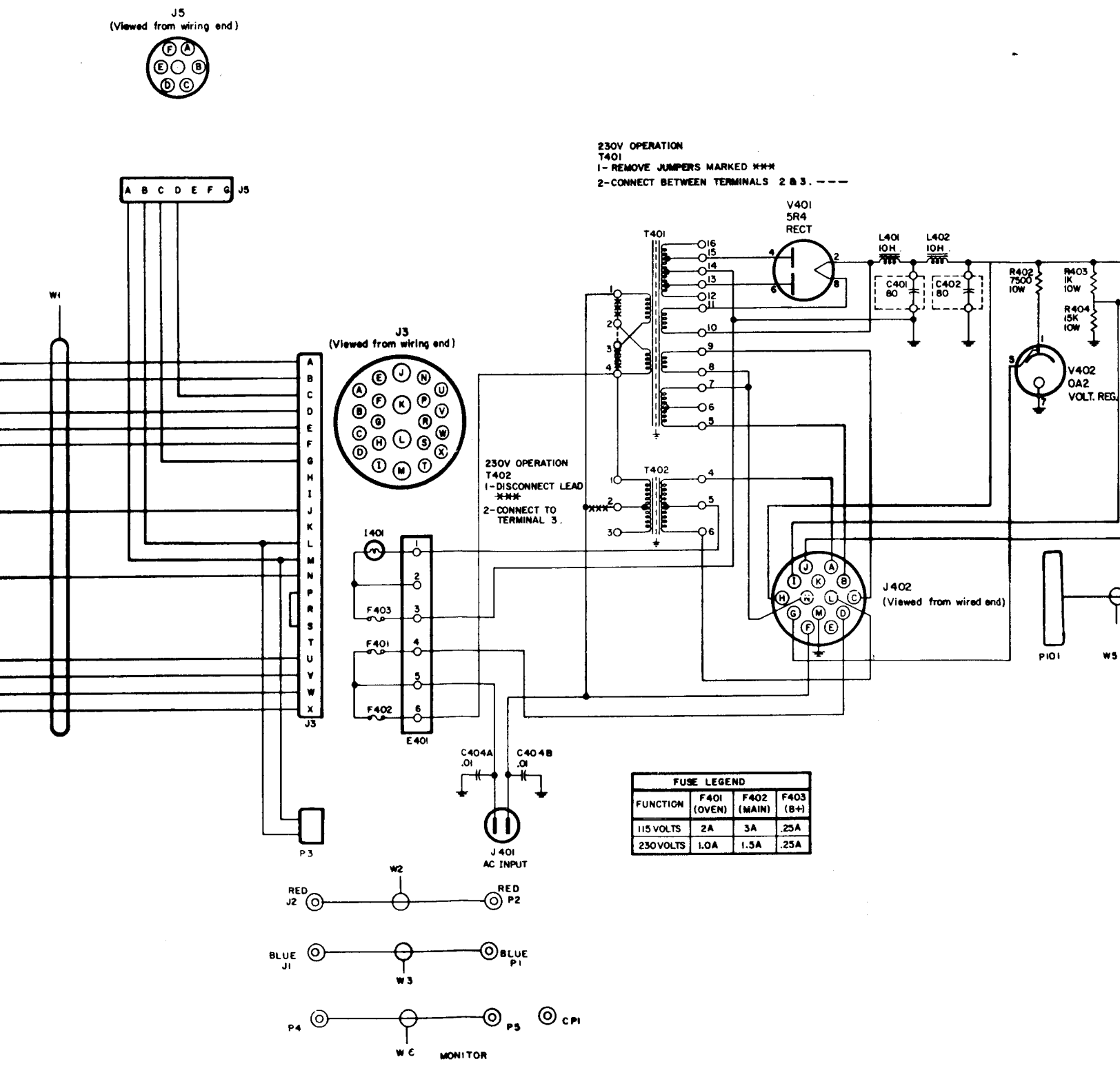
NOTES -
1. ALL CAPACITORS ARE IN MFD. UNLESS OTHERWISE NOTED.
2. REF. CK-372 SEE FIGURE 6-9

LAST SYMBOLS -
B501
C525
E506
J509
L502
P519
S504
T501
W510

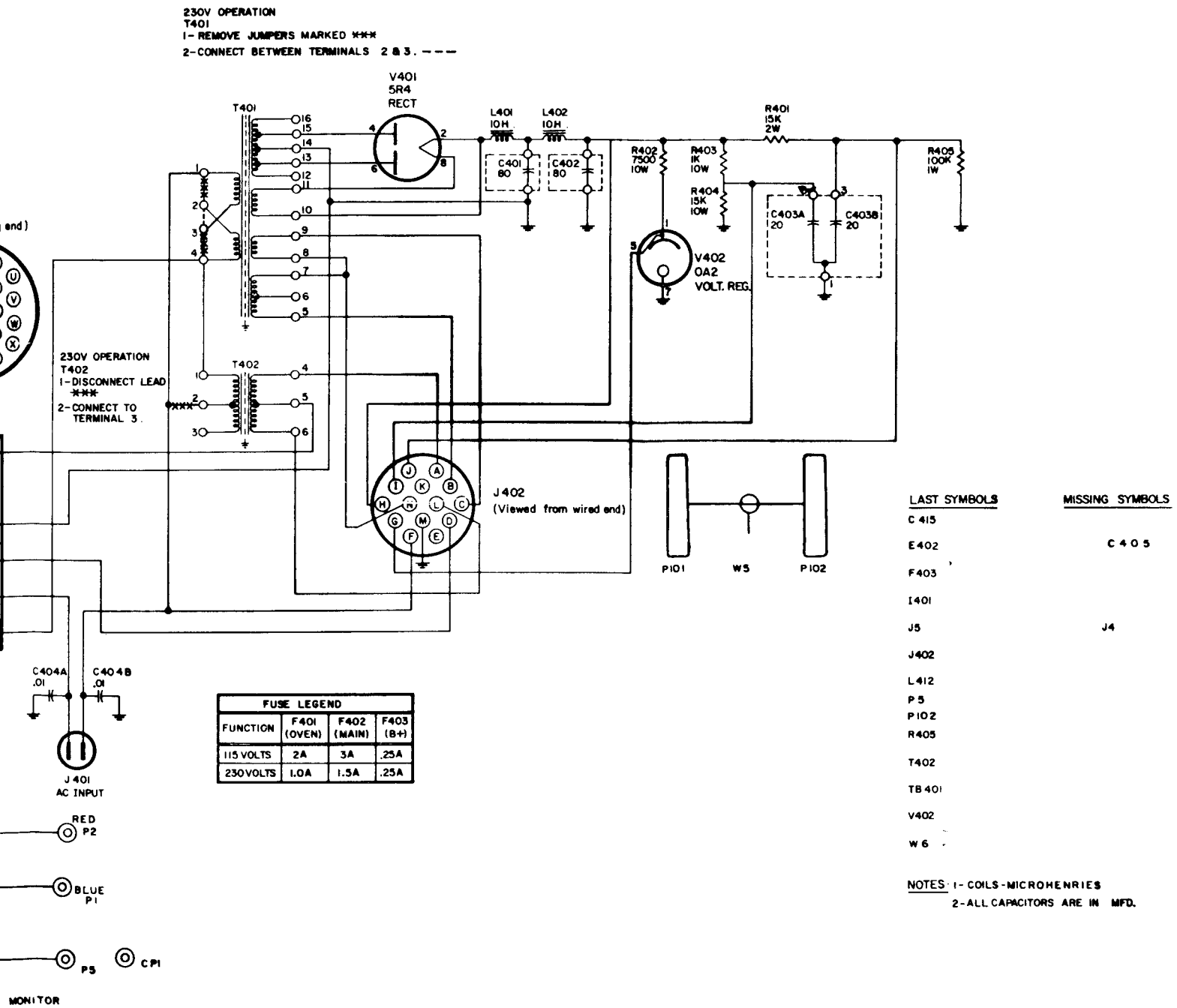
Figure 6-10. Cabinet Frame Assembly CAB-7, Schematic Diagram


J5
(Viewed from wiring end)
A B C D E F G J5
W4
W1
L403 750
C406 .001
L404 750
C407 .001
L405 750
C408 .001
L406 750
C409 .001
L407 750
C410 .001
L408 750
C411 .001
L409 750
C412 .001
L410 750
C413 .001
L411 750
C414 .001
L412 750
C415 .001
E 402
J3
(Viewed from wi
I401
F403
F401
F402
P3
W2
RED J2
BLUE J1
W3
P4

CK-401B


J5
(Viewed from wiring end)
230V OPERATION
T401
1- REMOVE JUMPERS MARKED ***
2-CONNECT BETWEEN TERMINALS 2 & 3. - - -
V401
5R4
RECT
T401
L401
10H
L402
10H
C401
80
C402
80
R402
7500
10W
R403
1K
10W
R404
15K
10W
V402
0A2
VOLT. REG.
W1
J3
(Viewed from wiring end)
230V OPERATION
T402
1-DISCONNECT LEAD
***
2-CONNECT TO
TERMINAL 3.
T402
J402
(Viewed from wired end)
P101
W5
I401
F403
F401
F402
E401
J3
P3
C404A
.01
C404B
.01
J401
AC INPUT
W2
RED
J2
RED
P2
BLUE
J1
BLUE
P1
W3
P4
P5
CP1
W6
MONITOR
FUSE LEGEND
FUNCTION
F401 (OVEN)
F402 (MAIN)
F403 (B+)
115 VOLTS
2A
3A
.25A
230 VOLTS
1.0A
1.5A
.25A

Figur



FUSE LEGEND			
FUNCTION	F401 (OVEN)	F402 (MAIN)	F403 (B+)
115 VOLTS	2A	3A	.25A
230 VOLTS	1.0A	1.5A	.25A

LAST SYMBOLS	MISSING SYMBOLS
C 415	
E402	C 4 0 5
F403	
I401	
J5	J4
J402	
L412	
P5	
P102	
R405	
T402	
TB 401	
V402	
W 6	

NOTES: 1- COILS - MICROHENRIES
2- ALL CAPACITORS ARE IN MFD.

Figure 6-11. Panel Chassis Assembly, Model RTS-2, Schematic Diagram

SECTION 7
SPARE PARTS

AMPLIFIER-OSCILLATOR MODEL RTF-2
FRONT PANEL (SYMBOL SERIES 300)

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
C310	CAPACITOR, fixed: mica; .01 mfd., ±10%, char. B; 300 wvdc	Bypass	CM35B103X
C318	Same as C310.	Bypass	
I301	LAMP, neon: miniature; 110 volts, 1/25 watt; T-3-1/4 clear bulb; bayonet base.	Inner Oven Indicator	BI-100-51

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
A301	OSCILLATOR ASSEMBLY, variable: consists of: C301, 302, 303, 304, 305, 306, 307, 308, 309, 311, 312, 319, 320, 321, 322, 323, L301, 302, 303, P301, 302, R301, 302, 304, 305, 306, 320, V301, 302, W301, 302, XV301, 302, XY301, Y301.	VMO Oscillator	AO-100
C301	CAPACITOR ASSEMBLY: variable: air dielectric; 21.0 to 220 mmfd. Not a replaceable item, see A301.	VMO Tuning V301	p/o AO-100
C302	CAPACITOR, variable: air dielectric; one section, 7 plates; 5 to 25 mmfd, ±5 mmfd. Not a replaceable item, see A301.	VMO Correction	p/o AO-100
C303	CAPACITOR, variable: air dielectric; one section, 3 plates; 2, 8-11 mmfd; 1-17/32 in. lg. x 1-3/8 in. high o/a. Not a replaceable item, see A301.	VMO Trimmer Cap. V301	p/o AO-100
C304	CAPACITOR, fixed: ceramic; 10 mmfd, ±.25 mmfd, 500 wvdc. Not a replaceable item, see A301.	VMO Padder Cap. V301	p/o AO-100
C305	CAPACITOR, fixed: ceramic; 270 mmfd, ±5%, 500 wvdc. Not a replaceable item, see A301.	VMO Grid Coupling Cap. V301	p/o AO-100
C306	Same as C305. Not a replaceable item, see A301.	VMO Cathode Coupling Cap. V301	
C307	CAPACITOR, fixed: mica; .01 mfd, ±10%; char. B; 300 wvdc. Not a replaceable item, see A301.	MO Plate Bypass V301	p/o AO-100
C308	Same as C307	Cath. Fol. Plate Bypass Cap. V302A	
C309	CAPACITOR, fixed: mica; 1000 mmfd, ±5%; 500 wvdc, char. B. Not a replaceable item, see A301.	Plate Coup. Cap. 100 Kc Osc. V302B	p/o AO-100
C310	Same as C307.		
C311	CAPACITOR, fixed: mica; 240 mmfd, ±5%; char. C, 500 wvdc. Not a replaceable item, see A301.	100 Kc Adjust V302B	p/o AO-100
C312	CAPACITOR, fixed: mica; 240 mmfd; ±5%; char. C, 500 wvdc. Not a replaceable item, see A301.	Plate Coup. Cap. 100 Kc, V302B	p/o AO-100
C313	Same as C307	Inner Oven Ther. Arc Supp. E301	
C314	Same as C307	Relay Arc Supp. E301	
C315	CAPACITOR, fixed: paper; .1 mfd, +40-10%; 400 wvdc; plastic tubular case.	Outer Oven Ther. Arc. Supp. E302	CN-100-4
C316	CAPACITOR, fixed: mica; 500 mmfd, ±5%; 500 wvdc, char. B.	RF Meter Decoup. Cap. M303	CM20B501J
C317	Same as C316.	RF Meter Decoup. Cap. M303	

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
C318	Same as C307.	Bypass Cap. V302A	
C319	CAPACITOR, fixed: ceramic; 8.2 mmfd., ±5%, 500 wvdc. Not a replaceable item, see A301.	VMO Temperature Compensation	p/o AO-100
C320	Same as C307. Not a replaceable item, see A301.	RF Bypass Cap. V301	
C321	CAPACITOR, feed thru type: 1000 uuf. ±2%, 500 wvdc. char A. Not a replaceable item, see A301.	Bypass	p/o AO-100
C322	Same as C321. Not a replaceable item, see A301.	Bypass	
C323	Same as C321. Not a replaceable Item, see A301.	Bypass	
L301	COIL ASSEMBLY, R. F.:	VMO Tank Coil V301	p/o AO-100
L302	CHOKE, R. F.:	VMO Cathode Choke, V301	p/o AO-100
L303	CHOKE, R. F.:	Plate Decoup. Choke, V302A	p/o AO-100
R301	RESISTOR, fixed: composition; 3900 ohms, ±10%; 1/2 watt. Not a replaceable item, see A301.	Plate Decoup. Res. V301	p/o AO-100
R302	RESISTOR, fixed: composition; 1000 ohms, ±10%; 1 watt. Not a replaceable item, see A301.	Cathode Output Res., V302A	p/o AO-100
R303	NOT USED.		
R304	RESISTOR, fixed: composition; 47,000 ohms, ±10%; 1/2 watt. Not a replaceable item, see A301.	Plate Load Res., V302B	p/o AO-100
R305	RESISTOR, fixed: composition; 4700 ohms, ±10%; 1/2 watt. Not a replaceable item, see A301.	Cathode Output Res., V302B	p/o AO-100
R306	RESISTOR, fixed: Composition; 470,000 ohms, ±10% 1/2 watt. Not a replaceable item, see A301.	Grid Leak Res., V302B	p/o AO-100
R307 A & B	RESISTOR, fixed: wire wound; heater element, two sections, 1300 ohms each section, insulated.	Inner Oven Heaters	RR-106
R308 A & B	RESISTOR, fixed: wire wound; heater element, two sections, 160 ohms each section, insulated.	Outer Oven Heaters	RR-105
R309	RESISTOR, fixed: composition; 9100 ohms, ±5%; 2 watts.	Relay Drop Res., 220 V oper. E301	RC42GF912J
R310	Same as R309.	Relay Drop Res., 220 V. oper. E301	
R311	RESISTOR, fixed: composition; 100 ohms, ±10%; 1/2 watt.	Inner Thermo. Arc Suppressor	RC20GF101K
R312	RESISTOR, fixed; composition; 220,000 ohms, ±10%; 1/2 watt.	Inner Oven Ind. Protector E301	RC20GF224K

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
R313	Same as R312.	Outer Oven Ind. Protector E302	
R314	Same as R311.	Outer Oven Therm Arc Supp. E302	
R315	Same as R311.	Relay Arc Supp. E303	
R316	NOT USED.		
R317	NOT USED.		
R318	NOT USED.		
R319	NOT USED.		
R320	RESISTOR, fixed: composition; 22,000 ohms, ±10%; 1/2 watt. Not a replaceable item, see A301	VMO Grid Leak	RC20GF223K p/o AO-100
S301	SWITCH ASSEMBLY, thermostatic: bimetallic; operate at 70° C, ±0.5° C.	Inner Oven Thermostat	A-1236
S302	SWITCH, thermostatic: bimetallic; operate at 80° C, ±2° C.	Inner Oven Safety Thermostat	SS-100-3
S303	SWITCH, thermostatic: bimetallic; operate at 60° C, ±2° C.	Outer Oven Thermostat	SS-100-1
V301	TUBE, electron: HF power triode; 7 pin miniature	VMO	6AB4 p/o AO-100
V302	TUBE, electron: medium-mu duo-tride; 9 pin miniature.	Cathode Follower 100 Kc Osc.	12AU7 p/o AO-100
XV301	SOCKET, electron tube: 7 pin miniature. Not a replaceable item, see A301.	Socket for V301	p/o AO-100
XV302	SOCKET, electron tube: 9 pin miniature. Not a replaceable item, see A301.	Socket for V302	p/o AO-100
XY301	SOCKET, crystal: .487 in. spacing for .095 in. pins. Not replaceable item, see A301.	Socket for Y301	p/o AO-100
Y301	CRYSTAL UNIT, quartz; 100 Kcs. Not a replaceable item, see A301.	100 Kc Crystal	p/o AO-100

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
A101	ASSEMBLY, switch-coils, consists of S102, L112, L113; 7-1/2 in. lg. x 6 in. wide x 5-1/2 in. high o/a.	Band Switching	AX-141
A102	COUPLER ASSEMBLY, indicator: consists of C115, C116, L110, L111, and TC101, terminal board and two leads w/solder lug terminals. Terminal board has four 6-32 threaded inserts on 1-3/4 x 5-3/8 in. mounting centers.	Low Pass Filter	AX-143
B101	BLOWER ASSEMBLY: 115 v, 50/60 cps, .34 watts, single phase; 3400 rpm, counterclockwise rotation. Consists of motor, blades and mounting plate.	Ventilation	AX-146
C101	CAPACITOR, fixed: mica; 1000 uufd, ±10%, 2500 wvdc, char. B.	Screen Decoupling V101	CM45B102K
C102	Same as C101.	Screen Decoupling V101	
C103	CAPACITOR, fixed: mica; 150 uufd, ±10%, 2500 wvdc, char. B.	Cathode Bypass V101	CM45B151K
C104	CAPACITOR, variable: teflon dielectric: 2-4.2 mmfd, consisting of: Aluminum Mounting Plate, neutralizer: aluminum Rotor Disc, neutralizer: teflon Plate, dielectric: teflon.	Neutralizing Cap. V101-V102	AM-107, MS-780 A-1338, PX-324 PX-325
C105	CAPACITOR, fixed: mica; 10,000 uufd, ±5%, 300 wvdc, char. C.	p/o LP Filter , V101	CM35C103J
C106	CAPACITOR, fixed: ceramic; 0.75 uufd, 10 kvdc, NPO temperature coef.; complete with brackets.	RF Feedback	AM-105
C107	Same as C105.	p/o LP Filter V102	
C108	Same as C103.	Cathode Bypass V102	
C109	Same as C101.	Screen Bypass V102	
C110	CAPACITOR, fixed: "trylar"; 1000 uufd, ±10%, 8000 wvdc.	RF Bypass, S101	CX-102K-102P
C111	Same as C110.	RF Decoupling S101	
C112	CAPACITOR, fixed: "trylar"; 500 uufd, ±10%, 8000 wvdc.	PL Plate Decoup. S101	CX-102K-501P
C113	CAPACITOR ASSEMBLY, variable: vacuum; 10-400 uufd, 7.5 kv; 42 amp; CW rotation decr. capacitance. Complete w/gear.	PA Tuning S101	AM-108
C114	Same as C112.	RF Bypass S101	

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
C115	CAPACITOR, fixed: mica; 500 uufd, ±5%, 500 wvdc, char. B. Suggested replacement assembly - A102.	p/o LP Filter M303	CM20B501J
C116	Same as C115. Suggested replacement assembly - A102.	p/o LP Filter M303	
C117	CAPACITOR, variable: air; 2 sections, 70-1000 mmfd ea.	Antenna Loading S103	CB-140
C118	CAPACITOR, fixed: "trylar"; 2000 uufd, ±5%, 4000 wvdc.	Antenna Loading S103	CX-102J-202M
C119	NOT USED.		
C120	NOT USED.		
C121	CAPACITOR, fixed: ceramic; 3 uufd, ±.25 uufd, 500 wvdc, char. SL.	p/o Divider Network	CC21SL030C
C122	CAPACITOR, fixed: mica; 27 uufd, ±10%, 500 wvdc, char. B.	p/o Divider Network	CM20B270K
C123	CAPACITOR, fixed: mica; .001 ufd, ±10%, 500 wvdc, char. B.	RF Filter	CM20B102K
C124	CAPACITOR, fixed: mica; 2000 uufd, ±10%, 500 wvdc, char. B.	RF Filter	CM30B202K
C125	CAPACITOR, fixed: "mylar"; .1 ufd, ±5%, 200 wvdc, char. B.	RF Filter	CN108B1Ø03K
C126	NOT USED.		
C127	CAPACITOR, fixed: paper; bathtub case; 1 ufd, ±10% 600 wvdc, char. F.	Phase Shift B101	CP53B1FF105K
C128	CAPACITOR, fixed: button type; 360 uufd, ±2%, 300 wvdc, char. D.	p/o PA Neutralization	CB21PD361G
CR101	DIODE, silicon.	Half Wave Rectifier	IN-303
J101	CONNECTOR, receptacle: female; BNC type.	RF Out, Test	UG-560/U
L101	COIL, R.F.:	Screen Decoupling Coil	CL-178
L102	COIL, R.F.:	p/o LP Filter V101	CL-120-2
L103	COIL, R.F.:	Filter	CL-139

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
L107	COIL, R. F.:	Plateload, Choke HF Band	A-1163
L108	CHOKE, R. F.:	Plate Load, Choke, LF Band	A-1529
L109	Same as L107.	RF Decoupling S101	
L110	Same as L101. Suggested replacement assembly - A102.	p/o LP Filter M303	
L111	Same as L101. Suggested replacement assembly - A102.	p/o LP Filter M303	
L112	COIL, R. F.: p/o A101, not a replaceable item.		A-1208
L113	COIL, R. F.: p/o A101, not a replaceable item.		A-1209
L114	Same as L101.	Safety Choke S102A	
L115	COIL, R. F.:	Filter	A-1045
L116	COIL, R. F.:	Filter	A-1076
PS101	SUPPRESSOR, parasitic; 124 Mc, ±3 Mc.	To Plate V101	AX-144
PS102	Same as PS101.	To Plate V102	
PS103	SUPPRESSOR, parasitic: 105 Mc, ±3 Mc.	To Control Grid V101	AX-155
PS104	Same as PS103.	To Control Grid V102	
R101	RESISTOR, fixed: composition; 2200 ohms, ±5%, 1/2 watt.	p/o Divider Network	RC20GF222K
S101 A & B	SWITCH, rotary: 9 position; single section, 36 deg. detent; ceramic wafer and insulation; silver plated contacts and wiper.	p/o PA Band-switch	SW-165
S102	SWITCH, rotary: 9 position; single section; ceramic wafer and insulation; silver plated contacts and wiper; 30 amps max. current: p/o A101, not a replaceable item.		SW-166
S103	SWITCH, rotary: 2 position; single section; 60 deg. detent, non-shorting.	Aux. Loading	SW-234
S104	SWITCH, push-button: momentary contact; normally closed; SPST, 15 a. at 125, 250 or 460 VAC; 1/2 a. at 125 VDC; 1/4 a. at 250 VDC.	p/o PA Band-switch	SW-169
T101	TRANSFORMER, power: filament; pri.-115/230 VAC, 50/60 cps, single phase; insulation 1500 V peak; hermetically sealed metal case.	PA Filament	TF-155

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
TC101	THERMOCOUPLE, meter: external; range 0-8. Suggested replacement assembly - A102.	Sensing Device M303	TH-100-8
V101	TUBE, electron: radial beam power pentode; 5 pin metal shell base and plate cap.	p/o PA Final Stage	4-250A
V102	Same as V101.	p/o PA Final Stage	
XV101	SOCKET, tube: giant 5 pin base.	Socket for V101	TS-125-2
XV102	Same as XV101.	Socket for V102	

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
C201 A & B	CAPACITOR, variable: air dielectric; two sections 12.5-282.5 uufd ea. section; ceramic insulation.	Driver Tuning	CB-127
C201C	CAPACITOR, variable: air dielectric; 12.5-282.5 ufd; ceramic insulation.	Driver Tuning	CB-128
C202	CAPACITOR, fixed: mica; .01 ufd, ±5%, char. C, 300 wvdc.	Input Coupling	CM35C103J
C203	CAPACITOR, fixed: terminal type; 1000 uufd, ±10%, char. W; terminal type Q.	RF Bypass	CB21QW102K
C204	Same as C203.	RF Bypass	
C205	Same as C203.	Screen Bypass	
C206	Same as C202.	p/o Key Click Filter	
C207	CAPACITOR, fixed: mica; 1000 uufd, ±5%, char. B. 500 wvdc.	RF Coupling, V201	CM20B102J
C208	Same as C203.	RF Bypass V201	
C209	Same as C207.	Plate Decoupling V201	
C210	CAPACITOR, variable: ceramic; 3-12 uufd, 500 wvdc, char. A.	Tank Trimmer V201	CV11A120
C211	Same as C207	RF Coupling V204	
C212	CAPACITOR, variable: ceramic; 4-30 uufd, 500 wvdc, char. C.	p/o V201 Tank Capacity	CV11C300
C213	Same as C202.	Cathode Bypass V204	
C214	Same as C203.	Screen Bypass V204	
C215	CAPACITOR, fixed: mica; 500 uufd, ±5%, 500 wvdc, Char. B.	RF Coupling V204	CM20B501J
C216	Same as C207.	Plate Decoupling V204	
C217	Same as C207	Plate Decoupling V204	
C218	Same as C210.	Trimmer Band 2	
C219	Same as C215.	RF Coupling V205	
C220	Capacitor, fixed: terminal type; 470 uufd, ±10%, char. W; terminal type Q.	p/o LP Filter V202B	CB21QW471K

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
C221	CAPACITOR, fixed: mica; 12000 uufd, ±5%, 600 wvdc, char. B.	Plate Decoupling	CM50B123J
C222	CAPACITOR, fixed: mica; 330 uufd, ±10%, 2500 wvdc, char. B.	RF Coupling V205	CM45B331K
C223	Same as C203	Screen Bypass V205	
C224	CAPACITOR, fixed: mica; 100 uufd, ±5%, 500 wvdc, char. D.	DC Blocking to C104	CM20D101J
C225	CAPACITOR, fixed: mica; 2200 uufd, ±10%, 1200 wvdc, char. B.	p/o LP Filter V205	CM45B222K
C226	CAPACITOR, fixed: mica; 130 uufd, ±10%, 500 wvdc, char. D.	RF Coupling	CM20D131G

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
J201	CONNECTOR, coaxial: female; BNC type, single hole mtg.	RF Input V201	UG-625/U
L201	CHOKE, R. F.:	Plate Load Choke, V201	A-1045
L202	Same as L201.	Screen Decoupling V204	
L203	COIL ASSEMBLY,	Trimmer Band 1 V201	A-1103
L204	COIL ASSEMBLY,	Trimmer Band 2 V201	A-1104
L205	COIL ASSEMBLY,	Equalizer V209	A-1626
L206	Same as L201.	Screen Decoupling V201	
L207	COIL ASSEMBLY, 8-16 Mc;	Trimmer Band 3	A-1105
L208	COIL ASSEMBLY, 16-32 Mc;	Trimmer Band 4	A-1601
L209	CHOKE, plate:	Plate Load Choke V205	A-1096
L210	CHOKE, R. F.:	p/o LP Filter V205	CL-100-5
L211	SWITCH COIL ASSEMBLY: 2-4 Mc;	Trimmer Band 1	A-1108
L212	SWITCH COIL ASSEMBLY:	Output Tuning, V205	A-1628
L213	SWITCH COIL ASSEMBLY:	Output Tuning, V205	A-1627
L214	SWITCH COIL ASSEMBLY: 16-32 Mc;	Trimmer Band 4	A-1192
L215	COIL, R. F.:	p/o LP Filter V205	CL-101-4
L216	INDUCTOR, choke:	p/o LP Filter M301 CKT	A-1126
L217	Same as L210.	RF Choke	
L218	Same as L201.	RF Choke	
PS201	SUPPRESSOR, parasitic: 6 close wound turns #30 DSC wire on a 100 ohm ±10%, 1/2 watt resistor.	PS, Plate Ckt. V204	A-1119
PS202	Same as PS201.	PS, Control Grid V204	A-1119
R201	RESISTOR, fixed: composition; 10, 000 ohms, ±10%, 1/2 watt.	Grid Leak V201	RC20GF103K

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
R202	RESISTOR, fixed: composition; 100,000 ohms, ±10%, 1 watt.	p/o Keyer Load V202A	RC32GF104K
R203	RESISTOR, fixed: wire wound; 50,000 ohms, ±5%, 10 watts.	Keyer Plate Load V202A	RW-109-43
R204	RESISTOR, fixed: composition; 47,000 ohms, ±10%, 1/2 watt.	Grid Current Limiting	RC20GF473K
R205	RESISTOR, fixed: wire wound; 25,000 ohms, ±5%, 10 watts.	p/o Cathode Bias V202A	RW-109-38
R206	RESISTOR, fixed: composition; 1000 ohms, ±10%, 1/2 watt.	p/o Cathode Bias V202A	RC20GF102K
R207	RESISTOR, fixed: composition; 100 ohms, ±10%, 1 watt.	Cathode Bias V201	RC32GF101K
R208	RESISTOR, fixed: wire wound; 15,000 ohms, ±5%, 10 watts.	Volt. Dropping V203	RW-109-36
R209	RESISTOR, fixed: composition; 100,000 ohms, ±10%, 1/2 watt.	p/o keyer Click Filter, V202B	RC20GF104K
R210	RESISTOR, fixed: composition; 10 ohms, ±5%, 1/2 watt.	Meter Shunt M301	RC20GF100J
R211	RESISTOR, adjustable: wire wound; 25,000 ohms linear, ±10%; 4 watts.	Driver Control V205	RA-109-TRD-253A
R212	RESISTOR, fixed: composition; 1 megohm, ±10%, 1/2 watt.	p/o Voltage Divider	RC20GF105K
R213	RESISTOR, fixed: wire wound; 2250 ohms, 47 ma; 5 watts.	DC Dropping V204	RW-107-41
R214	Same as R201.	Grid Leak Bias V204	
R215	RESISTOR, fixed: composition; 470 ohms, ±10%, 1 watt.	Cathode Bias V204	RC30GF471K
R216	RESISTOR, fixed: composition; 18,000 ohms, ±5%, 1/2 watt.	Meter Multiplier M301	RC20GF183J
R217	RESISTOR, fixed: composition; 12,000 ohms, ±10%, 2 watts.	p/o Voltage Divider V205	RC42GF123K
R218	RESISTOR, fixed: composition; 82,000 ohms, ±10%, 1 watt.	p/o Keyer Load V202B	RC30GF823K
R219	RESISTOR, fixed: composition; 47,000 ohms, ±10%, 2 watts.	p/o Voltage Divider V202B	RC42GF473K
R220	Same as R217.	Grid Leak Bias V205	
R221	Same as R210	Meter Shunt M301	

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
R222	RESISTOR, fixed: composition; 430,000 ohms, ±5%, 1/2 watt.	Meter Multiplier M301	RC20GF434J
R223	Same as R216.	Meter Multiplier M301	
R224	RESISTOR, fixed: composition; 180,000 ohms, ±10%, 2 watts.	p/o Voltage Divider V202A	RC42GF184K
R225	RESISTOR, fixed: composition; 22,000 ohms, ±10%, 1/2 watt.	p/o Voltage Divider V202A	RC20GF223K
R226	RESISTOR, fixed: composition; 470,000 ohms, ±10%, 2 watts.	PA Screen Protective	RC42GF474K
R227	RESISTOR, fixed: composition; 1500 ohms, ±10%, 1/2 watt.	SSB Input S204B	RC20GF152K
R228	Same as R213.	Plate Load, V201	
R229	RESISTOR, fixed: composition 6800 ohms, ±10%, 1/2 watt.	Voltage Dropping	RC20GF682K
R230	RESISTOR, fixed: wire wound; 10 ohms, ±5%, 5 watts.	Driver Load Band 1	RR-114-10-W
R231	Same as R227.	Voltage Dropping	
R232	Same as R210.	Meter Shunt M301	
R233	Same as R216.	Multiplier M301	
R234	RESISTOR, fixed: composition; 3,900 ohms, ±10%, 2 watts.	RF Filter	RC42GF392K
S201	BANDSWITCH, multiplier, rotary: 3 sections; no detent, non-shorting, ceramic wafers; silver plated; brass contacts.	p/o Driver Band Switch	SW-247
S202	SWITCH ASSY., rotary: 2 sections, 4 positions, ceramic, silver plated contacts and wipers.	p/o Driver Band Switch	AS-105
S203	SWITCH ASSY., rotary: 2 sections, 5 positions, 60 deg. angle of throw; non-shorting type; ceramic wafer and insulation, silver plated contacts and wipers.	Multi-Meter Switch	AS-107
S204	SWITCH ASSY., 2 sections, 2 positions, 30 deg. angle of throw; non-shorting type; ceramic wafer and insulation, silver plated contacts and wipers.	SSB Normal Switch	AS-103
V201	TUBE, electron: power pentode, 9 pin miniature.	Grounded Grid Amp. Doubler	6CL6
V202	TUBE, electron: duo diode, 9 pin miniature.	Keyer/Driver Keyer	12AT7
V203	TUBE, electron: voltage regulator; 7 pin miniature.	Voltage Reg.	OA2

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
V204	TUBE, electron: beam power amplifier; 7 pin miniature.	Doubler	6BF5
V205	TUBE, electron: beam power; large wafer octal base with sleeve.	Driver	6146
V206	Same as V202.	Keyer Clamp	
XV201	SOCKET, electron tube: miniature 9 pin.		TS103P01
XV202	Same as XV201.		
XV203	SOCKET, electron tube: miniature 7 pin.		TS102P01
XV204	Same as XV203.		
XV205	SOCKET, electron tube: octal base.		TS101P01
XV206	Same as SV201.		

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
C401	CAPACITOR, fixed: mica; .01 mfd., ±5%; 300 wvdc; char. C.	Plate Bypass V402	CM20B102J
C402	CAPACITOR, fixed: mica; 1000 mmfd, ±5%; 500 wvdc, char. B.	RF Input V402	CM20B102J
C403	Same as C401.	p/o LP Filter V403	
C404	Same as C402.	RF Coupling V404	
C405	Same as C401.	Plate Bypass V404	
C406	Same as C401	Cathode Bypass V403	
C407	Same as C401.	RF Bypass V404	
C408	Same as C401.	Output V404	
C409	Same as C402.	Input Coupling V405	
C410	Same as C402.	LP Filter V406	
C411	CAPACITOR, fixed: paper; .1 mfd,, +40 -10%; 400 wvdc; plastic tubular case.	Input Coupling V406	CN-100-4
C412	CAPACITOR, fixed: mica; 5 mmfd, ±20%; char. B, 500 wvdc.	DC Blocking V405	CM20B050M
C413	Same as C402.	Screen Bypass V405	
C414	Same as C402.	p/o LP Filter V405	
C415	Same as C402.	p/o LP Filter V405	
C416	Same as C411.	Audio Coupling V406	
C417	Same as C411.	Audio Coupling V406	
C418	Same as C402.	RF Coupling V402	
C419	Same as C402.	Screen Bypass V403	
C420	CAPACITOR, variable: air dielectric; one section, nineteen plates; 3.2 to 50 mmfd, 500 wvdc.	Xtal 3 Trimmer	CT-104-3
C421	Same as C401.	RF Bypass	
C422	Same as C401.	RF Bypass V403	
C423	Same as C420.	Xtal 1 Trimmer	

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
C424	Same as C420.	Xtal 2 Trimmer	
C425	Same as C401.	Arc Suppress Z401	
C426	CAPACITOR, fixed: mica; 150 mmfd; ±2%; char. D., 500 wvdc.	Screen Bypass V403	CM20D151G
C427	Same as C401.	B+ Bypass	
C428	Same as C411.	B+ Bypass	
F401	FUSE, cartridge: 2 amps.		FU-102-2
F402	FUSE, cartridge: 3 amps.		FU-102-3
F403	FUSE, cartridge: .250 amps.		FU-102-.250
J401	CONNECTOR, receptacle: 7 contacts rated at 20 amps, 200 VDC, 150 VAC (RMS); mtg. dim. 1-1/32 in. mtg. centers.	Interconnect MO Power	MS3102A-16S-1S
J402	CONNECTOR, receptacle: electrical; 1 female contact; 52 ohms; BNC type.	MO Input	UG-625/U
J403	Same as J402.	LO Out	
J404	Same as J402.	Exciter In	
J405	CONNECTOR, receptacle; pin type; 4 contacts rated at 35 amps, 18 contacts rated at 20 amps; 200 VDC, 150 VDC (RMS): mtg. dim. 1.782 in. dia. cutout w/four 9/64 in. dia. holes on 1-9/16 in. mtg. centers	Interconnect RTF	MS3102A-28-11P
K401	RELAY ASSEMBLY, 4500 ohms DC; hermetically sealed.	Inner Oven Control Relay	A-123
L401	COIL, radio frequency:	p/o LP Filter V403	CL-100-5
L403	COIL, radio frequency:	Parasitic Choke V403	CL-172
L404	Same as L401.	B+ Filter	
L405	Same as L401.	B+ Filter	
R401	RESISTOR, fixed: wire wound; 6000 ohms, ±5%, 10 watts.	Voltage Dropping V401	RW-109-45
R402	RESISTOR, fixed: composition; 33,000 ohms, ±10%; 1 watt.	Plate Load, V402	RC32GF33K
R403	RESISTOR, fixed: composition; 4700 ohms, ±10%; 1/2 watt.	Grid Leak, V402	RC20GF472K
R404	RESISTOR, fixed: composition; 1000 ohms, ±10%; 1/2 watt.	Cathode Load, V402	RC20GF102K

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
R405	NOT USED.		
R406	RESISTOR, fixed: composition; 82,000 ohms, ±10%; 1/2 watt.	Screen Dropping, V403	RC20GF823K
R407	RESISTOR, fixed: composition; 100,000 ohms, ±10%; 1/2 watt.	Grid Leak, V404	RC20GF104K
R408	RESISTOR, fixed: composition; 160 ohms, ±5%; 1/2 watt.	Cathode Bias V403	RC20GF181K
R409	Same as R407.	Grid Leak, V403	
R410	RESISTOR, fixed: composition; 1 megohm, ±10%; 1/2 watt.	Cathode Bias V404	RC20GF105K
R411	Same as R407.	Grid Leak, V405	
R412	RESISTOR, fixed: composition; 56,000 ohms, ±10%; 1/2 watt.	Voltage Dropping	RC20GF563K
R413	Same as R410.	Plate Load, V405	
R414	Same as R407.	Screen Dropping V405	
R415	NOT USED.		
R416	Same as R404.	p/o LP Filter V405	
R417	RESISTOR, fixed; composition; 220,000 ohms, ±10%; 1/2 watt.	Plate Load, V406	RC20GF224K
R418	RESISTOR, fixed: composition; 82,000 ohms, ±10%; 2 watts.	Plate Load, V406	RC42GF823K
R419	Same as R407.	Grid Leak Bias, V405	
R420	RESISTOR, fixed: composition; 4.7 megohms; ±10%; 1/2 watt.	Grid Leak Bias, V406	RC20GF475K
R421	Same as R417.	Grid Leak Bias, V406	
R422	RESISTOR, fixed: composition; 10,000 ohms, ±10%; 1/2 watt.	Output Load V406	RC20GF103K
R423	RESISTOR, fixed: wire wound; 30 ohms, ±5%; 10 watts.	p/o RF Output Attenuator	RR-116-30-W
R425	RESISTOR, fixed: wire wound; 50 ohms, ±5%; 10 watts.	p/o RF Output Attenuator	RR-116-50-W
R426	RESISTOR, current regulating: ballast vacuum tube type.	Ballast	RR-109

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
S401	SWITCH ASSY., rotary : 3 section; 5 position; wafer "A & B" bakelite, wafer "C" ceramic; contacts and wipers silver plated, 1/4 in. dia. drive shaft 10-1/2 in. lg.	Oscillator Switch	AS-106
S402	SWITCH ASSY., CW-FS: 2 section; 5 position; 30 deg. angle of throw; non-shorting; ceramic wafers; silver plated brass contacts; 1/4 in. shaft.	Excitation Switch	AS-108
T401	TRANSFORMER, H. F.: VMO output.	CF Load	TR-166
V401	TUBE, electron regulator; 7 pin miniature, operating at 150 VDC; 5 amps min.; 30 amps max. current.	Voltage Regulator	OA2
V402	TUBE, electron: HF power triode; 7 pin miniature.	Cathode Follower	6C4
V403	TUBE, electron: sharp cutoff R. F. pentode; 7 pin miniature.	Xtal Osc. Amp.	6AH6
V404	TUBE, electron: medium-mu duo-triode; 9 pin miniature.	Cathode Follower Osc. Output	12AU7
V405	TUBE, electron: heptode converter; 7 pin miniature.	Mixer	6BE6
V406	Same as V404.	Audio Amplifier	
XF401	FUSE, extractor post type; 250 v, 15 amp.	Holder for F401	FH-100-2
XK401	SOCKET, electron tube: octal.	Socket for K401	TS101P01
XR426	SOCKET, electron tube: 9 pin miniature.	Socket for R426	TS103P01
XV401	SOCKET, electron tube: 7 pin miniature.	Socket for V401	TS102P01
XV402	Same as XV401.	Socket for V402	
XV403	Same as XV401.	Socket for V403	
XV404	Same as XR426.	Socket for V404	
XV405	Same as XV401	Socket for V405	
XV406	Same as XR426.	Socket for V406	
XY401	SOCKET, crystal: .486 in. spacing for .050 in. pin dia.	Socket for Y401	TS-104-1
XZ401	Same as XK401.	Socket for Z401	
Z401.	OVEN, crystal: 6.3 v, 7.5 watt heater; 75° C ±2° C; 1-1/4 in. dia. x 2-5/32 lg; octal base.	Crystal Holder	PO-158-1

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
C601	CAPACITOR, fixed: paper dielectric; 4 ufd, ±10%, 4000 wvdc; furnished with mounting clamps.	H.V. B+ Filter Cap. T603	CN-109
C602	Same as C601.	H.V. B+ Filter Cap., T603	
C603	CAPACITOR, fixed: 0.10 ufd, +40 -10%, 600 wvdc.	Arc Suppressor Cap., E602	CN-100-22
C604	CAPACITOR, fixed: paper dielectric; 4 ufd, ±10%, 600 wvdc.	B- Filter Cap., V601	CP40C2FF405K
C605	Same as C604.	B- Filter Cap., V602	
C606	CAPACITOR, fixed: dry electrolytic; polarized, 80 ufd, 450 wvdc.	B+ Filter Cap., V604	CE51C800R
C607	Same as C604.	B+ Filter Cap., V604	
C608	Same as C604.	B+ Filter Cap., V605	
C609	Same as C604.	B+ Filter Cap., V605	
C610	Same as C601.	H.V. B+ Filter Cap., T603	
C611	CAPACITOR, fixed: paper dielectric; 10,000 uufd, +30 -10%, 1000 wvdc.	Spark Suppressor Cap., K601	CN-110-103-G
C612	Same as C603.	Pulse Forming Cap., K602	
C613	CAPACITOR, fixed: dry electrolytic; polarized, 20 mfd, 250 wvdc.		CE-103-5
CB601	CIRCUIT BREAKER, main power; toggle lever type; DPST; connection A to B 250 VAC, 16A; A to C 250 VAC, 32A; manual reset, armature trip release.	Line Voltage Breaker	SW-164
CB602	CIRCUIT BREAKER, final S.G. overload reset; toggle lever type; 250 VAC, 15A; 1% ripple; .01 ADC, manual reset, armature trip release.	Final Screen Grid Overload Reset	SW-229
CB603	CIRCUIT BREAKER, final plate overload reset; toggle lever type; 250 VAC, 15A; 1% ripple; .01 ADC, manual reset, armature trip release.	Final Plate Overload Reset	SW-215
CR601	DIODE, silicon:	S.G. Protect	1N1084A
CR602	Same as CR601.	S.G. Protect	
F601	FUSE, time lag: cartridge type; 3 amps, 115 V.	M.O. Oven Fuse	FU-102-3
F602	Same as F601.	Low Voltage	

POWER SUPPLY MODEL RTP-2
(SYMBOL SERIES 600)

REF SYMBOL	DESCRIPTION	FUNCTION	†MC PART NO.
F602	Same as F601.	Low Voltage Supply Fuse	
F603	Same as F601.	Mid Voltage Supply Fuse	
F604	FUSE, time lag: cartridge type; .125 amp, 115 V.	Low B- Fuse	FU-102-.125
F605	FUSE, time lag: cartridge type; 0.3 amp; 115 V.	Low B+ Fuse	FU-102-.300
F606	Same as F605.	Mid B+ Fuse	
I601	LAMP, neon: miniature bayonet base; 110/125 V, type T-3-1/4.	Final Overload Indicator	BI-100-51H
I602	LAMP, incandescent: double contact bayonet base; 120 V, 3 watts, type 5-6.	Final Plate Indicator	BI-102-3

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
L605	Same as L602.	Filter Choke V605	
L606	REACTOR, filter:	High Voltage	TF-5012
M601	METER, A.C. volt: 0 to 150 range.	Filament Line	MR-108-150
R601	RESISTOR, fixed: wire wound; 15,000 ohms, 10 watts, 25.5 ma.	p/o PA SG Divider	RW-109-36
R602	Same as R601.	p/o PA SG Divider	
R603	RESISTOR, variable: wire wound; 500 ohms, ±10%, 12.5 watts; linear taper.	PA SG Overload Adjust.	RP-100-X-H-501K
R604	RESISTOR, fixed: wire wound; 400 ohms, 10 watts, 158 ma.	p/o PA SG Overload Circuit	RW-109-17
R605	RESISTOR, variable: wire wound; 2000 ohms, ±10%, 12.5 watts; linear taper.	Final Bias Adj.	RP-100-X-H-202K
R606	RESISTOR, fixed: wire wound; 5,000 ohms, 10 watts, 45 ma.	Bias Divider	RW-109-32
R607	RESISTOR, fixed: wire wound; 25,000 ohms, 20 watts, 16 ma.	Bleeder Res., K602	RW-110-36
R608	RESISTOR, fixed: wire wound; 7.5 ohms, 10 watts, 1.15 ma.	p/o PA Overload Circuit	RW-109-48
R609	RESISTOR, variable: wire wound; 15 ohms, ±10%, 12.5 watts. linear taper.	Final Plate Overload Adjust	RP-100-X-H-150K
R610	RESISTOR, fixed: wire wound; 6,000 ohms, 10 watts, 41 ma.	Bleeder V601	RW-109-45
R611	RESISTOR, fixed: wire wound; 500 ohms 10 watts, 142 ma.	Peak Current Limiter	RW-109-19
R612	RESISTOR, fixed: wire wound; 50,000 ohms, 10 watts, 14 ma.	Bleeder V602	RW-109-43
R613	DELETED.		
R614	RESISTOR, fixed: composition; 68,000 ohms, ±10%, 2 watts.	p/o PA Plates Overload Divider	RC42GF683K
R615	RESISTOR, fixed: wire wound; 50,000 ohms, ±5%, 160 watts, 57 ma.	Bleeder HV	RW-117-35
R616	Same as R615.	Bleeder HV	
R617	RESISTOR, fixed: wire wound; 12,500 ohms, ±5%, 160 watts, 113 ma.	Bleeder HV	RW-117-28
R618	RESISTOR, fixed: composition; 220,000 ohms, ±10%, 2 watts.	p/o HV Divider	RC42GF224K

POWER SUPPLY MODEL RTP-2
(SYMBOL SERIES 600)

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
V603	TUBE, electron: full wave rectifier; 7 pin miniature.	LV Rect.	6X4
V604	TUBE, electron: full wave rectifier; octal base.	LV Rect.	5R4GY
V605	Same as V604.	MV Rect.	
V606	TUBE, electron: mercury vapor half wave rectifier; A4-29 base.	HV Rect.	872A
V607	Same as V606.	HV Rect.	
V608	TUBE, electron: Voltage Regulator, 7 pin miniature.	SG Reg.	OA2
V609	Same as V608.	SG Reg.	
V610	TUBE, electron: Voltage Regulator, 7 pin miniature.	SG Reg.	OA2
V611	Same as V608.	SG Reg.	
XC606	SOCKET, octal.	Cap. Socket for C606	TS101P01
XCR601	BLOCK, mounting: polarized; albaloy plated bronze clips.	Socket for CR601	CU-128
XCR602	Same as XCR601.	Socket for CR602.	
XF601	HOLDER, fuse: solder lug terminals, phenolic body and cap.	Socket for F601	FH-103
XF602	Same as XF601.	Socket for F602	
XF603	Same as XF601.	Socket for F603	
XF604	Same as XF601.	Socket for F604	
XF605	Same as XF601.	Socket for F605	
XF606	Same as XF601.	Socket for F606	
XI601	SOCKET, miniature: bayonet base; w/red lens.	Socket for I601	TS-106-1
XI602	SOCKET, lamp: bayonet base; w/red lens.	Socket for I602	TS-124-1
XI603	Same as XI602.	Socket for I603.	
XI604	SOCKET, lamp: bayonet base; w/green lens.	Socket for I604.	TS-124-2
XK602	SOCKET, 9 pin miniature.	Socket for K602	TS-103-P01
XV601	SOCKET, 7 pin miniature.	Socket for V601	TS-102-P01
XV602	Same as XV601.	Socket for V602	
XV603	Same as XV601.	Socket for V603	
XV604	XC606 Same as	Socket for V604.	

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
XV605	Same as XC606.	Socket for V605	
XV606	SOCKET, tube: bayonet base; jumbo twist lock, 4 pin base.	Socket for V606	TS-123-211-1
XV607	Same as XV606.	Socket for V607	
XV608	Same as XV601.	Socket for V608	
XV609	Same as XV601.	Socket for V609	
XV610	Same as XV601.	Socket for V610	
XV611	Same as XV601.	Socket for V611	

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
B501	FAN, intake: includes motor, blade, frame, and mounting plate; 115 v, 50/60 cps, single phase; 2 ufd running capacitor, 1650 rpm, 38 watts full load.	Air Intake	AX-142
C501	CAPACITOR, fixed: mica; .01 ufd, ±20%, char. B, 300 wvdc.	RF Filter	CM35B103M
C502	Same as C501.	RF Filter	
C503	Same as C501.	RF Filter	
C504	Same as C501.	RF Filter	
C505	Same as C501.	RF Filter	
C506	Same as C501.	RF Filter	
C507	Same as C501.	RF Filter	
C508	Same as C501.	RF Filter	
C509	Same as C501.	RF Filter	
C510	Same as C501.	RF Filter	
C511	Same as C501.	RF Filter	
C512	Same as C501.	RF Filter	
C513	Same as C501.	RF Filter	
C514	Same as C501.	RF Filter	
C515	Same as C501.	RF Filter	
C516	Same as C501.	RF Filter	
C517	Same as C501.	RF Filter	
C518	Same as C501.	RF Filter	
C519	Same as C501.	RF Filter	
C520	CAPACITOR, fixed: paper dielectric; 2 ufd, ±10%, 600 wvdc, oil filled and impregnated; hermetically sealed bathtub case.	Phase Shift	CP53B1FF205K
C521	CAPACITOR, fixed: ceramic; high voltage; 3 uufd, ±10%, 5000 wvdc.	Voltage Divider	CC-109-1
C522	CAPACITOR, fixed: mica; button type; 1000 uufd, ±5%, char. D, 300 wvdc.	Voltage Divider	CB21PD102J
C523	Same as C501.	RF Filter	
C524	Same as C501.	RF Filter	
C525	Same as C501.	RF Filter	

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
J501	CONNECTOR, receptacle: male; recessed, locking type; 3 contacts, 20 amps.	Power Input	PL-133-NG
J502	CONNECTOR, receptacle: male; recessed, locking type; 2 contacts, 10 amps at 250 v, 15 amps at 125 v.	Power Input for Accessory Line	JJ-100
J503	Used on W509.		
J504	Used on W509.		
J505	CONNECTOR, receptacle: R. F. female.	RF Out	UG-560/U
J506	CONNECTOR, receptacle: R. F. female.	RF Monitor	SO-239
J507	CONNECTOR, receptacle: male, 22 contacts.	Interconnect	MS3102A28-11P
J508	ADAPTER, bulkhead: UHF type; one female contact on each end.	Interconnect	PL-274
J509	Same as J508.	Interconnect	
L501	INDUCTOR, choke:	Line Filter	CL-120-1
L502	Same as L501.	Line Filter	
MP502	FILTER, air: 10-1/8 x 11-3/8 x 1/2 in. o/a.	Air Filter	AD 103-2
MP503	FILTER, air: 7-5/8 x 16-7/8 x 1/2 inch o/a.	Air Filter	AD 103-5
P501	Used on W502.		
P502	Used on W502.		
P503	Used on W501.		
P504	Used on W501.		
P505	Used on W503.		
P506	Used on W503.		
P507	Used on W504.		
P508	Used on W504.		
P509	Used on W505.		
P510	Used on W505.		
P511	Used on W508.		
P512	Used on W508.		
P513	CONNECTOR, plug: female; locking type; polarized; 3 contacts, 20 amps (loose item, for J501.)	J501 Mating	PL-134NG
P514	Used on W510.		

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
P515	Used on W510.		
P516	CONNECTOR, plug: coaxial; UHF type; one contact, 500 vdc peak, mica insulation (loose item, for J506.)	J506 Mating	PL-259A
P517	CONNECTOR, plug: coaxial; HN type; 50 ohms, 5000 volts peak (loose item, for J505.)	J505 Mating	UG-59B/U
P518	Same as P516.	J508 Mating	
P519	Same as P516.	J509 Mating	
S501	SWITCH, interlock: push pull; SPDT, normally open, 15 amps; at 120/250 VAC; .2 amps (resistive) at 250 VDC.	Safety Switch	SW-230
S502	Same as S501.	Safety Switch	
S503	Same as S501.	Safety Switch	
S504	Same as S501.	Safety Switch	
T501	TRANSFORMER, power: step up; primary - 115/230 vac, 50/60 cps, single phase: secondary - to deliver 2800 v at 680 ma into load of 4120 ohms. Hermetically sealed rectangular steel case. Four 1/4-20 thd. mtg. inserts on 6 inch x 6 inch mtg. centers.	Power	Tf-193
W501	CABLE ASSEMBLY, power: 98 inch long o/a. Consists of 22 conductors, insulated sleeving;	Power Supply to RTF	CA-408

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
W508	CABLE ASSEMBLY, high voltage; 4 ft. 6 in. long o/a. Consists of single conductor, P511 (MS3108B -18-16S) on one end, P512 (MS3106B-18-16P) on other end. 2 each MS-3057-10 cable clamp.	High Voltage Cable	CA-417-2
W509	CABLE ASSEMBLY, high voltage; 7 inches long o/a. Consists of single conductor, J503 (MS3102A -18-16P) on one end, J504 (MS3102A-18-16S) on other end.	High Voltage Bypass Cable	CA-295
W510	CABLE ASSEMBLY, power: 6 ft. long o/a. Consists of double conductor, P514 female plug on one end, P515 two prong male plug on other end.	Power Cable	CA-103-72

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
C401	CAPACITOR, fixed: dry electrolytic; polarized, 80 mf. 450 wvdc.	Filter Cap., V401	CE51F800R
C402	Same as C401.	Filter Cap., V401	
C403 A & B	CAPACITOR, fixed: dry electrolytic; polarized, 20 mf, 450 wvdc.	Filter Cap., V401	CE52E200R
C404 A & B	CAPACITOR, fixed: ceramic; disc type; two section; .01 mf, 500 wvdc each section.	Line Bypass Cap.	CC-100-23
F401	FUSE, cartridge: 2 amps.	Oven Fuse; 115 V operation	FU-102-2
F401	FUSE, cartridge: 1 amp.	Oven Fuse; 230 V operation	FU-102-1
F403	FUSE, cartridge: 1/4 amp.	B+ Fuse	FU-102-.250
F402	FUSE, cartridge: 3 amps.	Main Pwr. Fuse; 115 V operation	FU-102-3
F402	FUSE, cartridge: 1.5 amps.	Main Pwr. Fuse; 230 V operation	FU-102-1.5
I401	LAMP, incandescent: 6-8v; 150 ma; T-3-1/4 clear bulb; bayonet base.	Main Pwr. Ind.	BI-101-47
J1	CONNECTOR, jack series UHF, mica dielectric. Part of W403 and W404.	RF Input	SO-239A
J2	Same as J1.	RF Output	
J3	CONNECTOR, receptacle: AN pin type: 4 contacts rated at 35 amps, 18 contacts rated at 20 amps, 200 VDC, 150 VAC (RMS); mtg. dim. 1.782" dia. cutout with four 9/64" dia. holes on 1-9/16" mtg. centers.	Power Input	MS3102A-28-11P (p/o CA455)
J5	CONNECTOR, receptacle: AN socket type; 7 contacts rated at 20 amps, 200 VDC, 150 VAC (rms); mtg. dim. 1-1/32" mtg. centers.	For 12 volt Power Supply if used.	MS3102A-16S-1S
J401	CONNECTOR, receptacle: male; two contacts; 10 amps at 250 v., 15 amps at 125 v., twist lock type.	AC Input	JJ-100
J402	CONNECTOR, receptacle: female; AN pin type.	Power Interconnect	MS3102A-20-27S (P/O CA344)
L401	REACTOR filter: 10 henries; DC resistance approx. 85 ohms, 200 ma DC, insulated for 1500 v., in a/w MIL-T-27 GR., 1 CL A. FAM. 04.	Filter Choke V401	TF-144
L402	Same as L401.	Filter Choke V401	

PANEL CHASSIS ASSEMBLY MODEL RTS-2
(SYMBOL SERIES 400)

REF SYMBOL	DESCRIPTION	FUNCTION	TMC PART NO.
R401	RESISTOR, fixed: composition; 15,000 ohms, ±10%; 2 watts.	Voltage Dropping V402	RC42GF153K
R402	RESISTOR, fixed: wire wound; 7500 ohms, ±5%; 10 watts.	Voltage Dropping V402	RC32GF33K
R403	RESISTOR, fixed: wire wound; 1,000 ohms, ±5%; 10 watts.	Voltage Dropping	RW-109-24
R404	RESISTOR, fixed: wire wound; 15,000 ohms, ±5%; 10 watts.	Bleeder Res.	RW-109-36
R405	RESISTOR, fixed: composition; 100,000 ohms, ±10%; 1 watt.	Bleeder Res.	RC32GF104K
T401	TRANSFORMER, power; 115/230 VAC, 50/60 cycles; term 12 & 16 500 VDC, 13 & 15 270 VDC term 14 CT; at 200 ma; term. 10 & 11 5.0 VAC at 2 amps; 8 & 9 6.3 VAC at 1.2 amps; 5 & 7 6.3 VAC at 3 amps; CT insulated for 3000 volts in accordance with MIL-T-27 GR. 1 CL. A FAM. 03.	Power Xfmr.	TF-161
T402	TRANSFORMER, power: step-down primary 110 or 220 v, 50 to 60 cps; secondary 6.3 v at 4.125 A center tapped.	Fil. Xfmr.	TF-104
V401	TUBE, electron: duo diode; rectifier.	Rectifier	5R4
V402	TUBE, electron, voltage regulator, 7 pin miniature; operating at 150 VDC.	Voltage Regulator	OA2
XF401	FUSEHOLDER: extractor post type; 250 V, 15 amp.	Fuse Holder F401	FH-100-1
XF402	Same as XF401.	Fuse Holder F402	
XF403	Same as XF401.	Fuse Holder F403	
XC401	SOCKET, electron tube: octal.	Socket, C401	TS-101-P01
XC402	Same as XC401.	Socket, C402	
XC403	Same as XC401.	Socket, C403	
XI401	SOCKET, lens, miniature bayonet, red indicator lens.	Socket, I401	TS-106-1
XV401	Same as XC401.	Socket, V401	
	CABLE ASSY: power; consists of 13 conductors MS3106B-20-27P on one end MS3108B-20-27S on other end; 3 feet long cable clamp to cable clamp	Power Cable	CA-47113 W401

UNCLASSIFIED

TECHNICAL MANUAL

for

TRANSMITTING MODE SELECTOR, SBE-8,-9,-10

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

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Issue Date: 31 August 1966

THE TECHNICAL MATERIEL CORPORATION
COMMUNICATIONS ENGINEERS
700 FENIMORE ROAD MAMARONECK, N. Y.

Warranty

The Technical Materiel Corporation, hereinafter referred to as TMC, warrants the equipment (except electron tubes,* fuses, lamps, batteries and articles made of glass or other fragile or other expendable materials) purchased hereunder to be free from defect in materials and workmanship under normal use and service, when used for the purposes for which the same is designed, for a period of one year from the date of delivery F.O.B. factory. TMC further warrants that the equipment will perform in a manner equal to or better than published technical specifications as amended by any additions or corrections thereto accompanying the formal equipment offer.

TMC will replace or repair any such defective items, F.O.B. factory, which may fail within the stated warranty period, PROVIDED:

1. That any claim of defect under this warranty is made within sixty (60) days after discovery thereof and that inspection by TMC, if required, indicates the validity of such claim to TMC's satisfaction.
2. That the defect is not the result of damage incurred in shipment from or to the factory.
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.
4. That any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

Electron tubes*furnished by TMC, but manufactured by others, bear only the warranty given by such other manufacturers. Electron tube warranty claims should be made directly to the manufacturer of such tubes.

TMC's obligation under this warranty is limited to the repair or replacement of defective parts with the exceptions noted above.

At TMC's option any defective part or equipment which fails within the warranty period shall be returned to TMC's factory for inspection, properly packed with shipping charges prepaid. No parts or equipment shall be returned to TMC, unless a return authorization is issued by TMC.

No warranties, express or implied, other than those specifically set forth herein shall be applicable to any equipment manufactured or furnished by TMC and the foregoing warranty shall constitute the Buyers sole right and remedy. In no event does TMC assume any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of TMC Products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

Should it be necessary to return equipment or material for repair or replacement, whether within warranty or otherwise, a return authorization must be obtained from TMC prior to shipment. The request for return authorization should include the following information:

1. Model Number of Equipment.
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.

PROCEDURE FOR ORDERING REPLACEMENT PARTS

When ordering replacement parts, the following information must be included in the order as applicable:

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.

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

TMC's Warranty specifically excludes damage incurred in shipment to or from the factory. In the event equipment is received in damaged condition, the carrier should be notified immediately. Claims for such damage should be filed with the carrier involved and not with TMC.

All correspondence pertaining to Warranty Claims, return, repair, or replacement and all material or equipment returned for repair or replacement, within Warranty or otherwise, should be addressed as follows:

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

134-146

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

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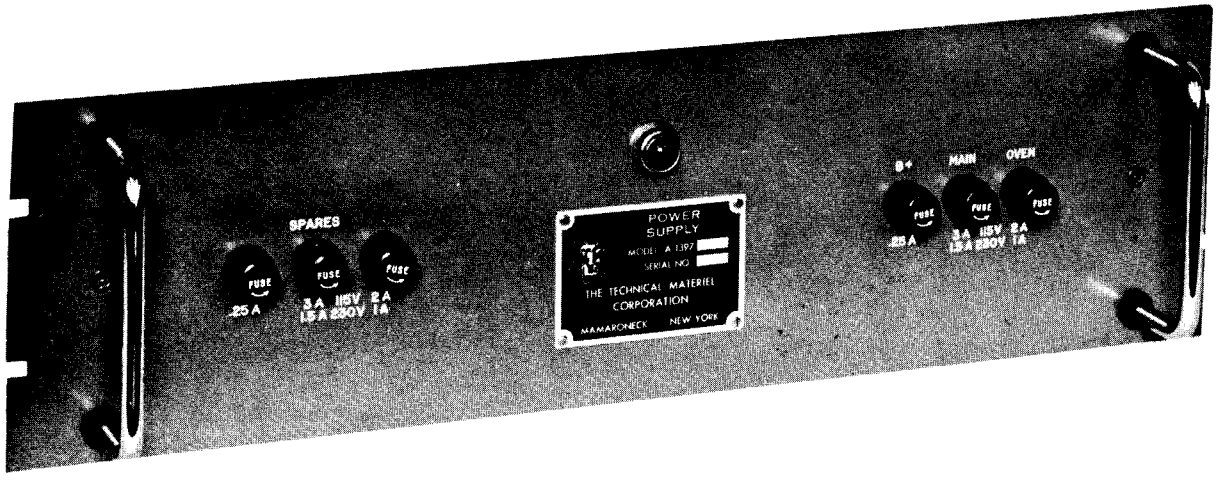
A. Exciter



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B. Power Supply

Figure 1-1. Transmitting Mode Selectors, Models SBE-8, SBE-9, SBE-10

SECTION 1
GENERAL INFORMATION

1-1. PURPOSE AND DESCRIPTION.

Transmitting Mode Selectors, Models SBE-8, SBE-9, SBE-10 and Power Supply (figures 1-1 and 1-2), are filter-type sideband exciters that can be used with any linear amplifier that accepts up to 250 milliwatts PEP of drive to provide ISB, SSB, AM, AME, and CW modes of operation. The SBE models are identical except for the bandwidth of the audio bandpass filters.

The SBE develops single, double, or independent sideband transmissions with various degrees of carrier insertion with up to 250 milliwatts (PEP) at 72-ohm input impedance.

A voice-operated (VOX) control circuit and an associated squelch circuit allows for proper VOX operation under varying ambient noise conditions. Both circuits are front-panel controlled and may be easily adjusted for best performance over a wide range of operating conditions. Manual push-to-talk control may be used instead of VOX, if desired. The SBE accepts ALDC voltages from associated linear power amplifiers to minimize distortion and limit drive during high modulation peaks or load changes.

1-2. TECHNICAL SPECIFICATIONS.

The SBE technical specifications are listed below.

Frequency range	1.75 to 32 mcs (mHz) continuous, bandswitched.
Modes of operation	The following modes of operation may be selected and used with continuously adjustable amounts of carrier insertions. 1. AM with full carrier (same intelligence on both sidebands) (A3). 2. AM Equivalent. 3. Single Sideband (SSB) with any degree of carrier suppression from -55db to 0db. (A3A, A3J, A7A). *4. MCW (Telegraphy) (A2). (With appropriate tone keyer.) 5. Independent Sideband (ISB, separate intelligence on each sideband with any degree of carrier suppression from -55db to 0db). (A3B, A9B). **6. Frequency-Shift Keying (FSK) (F1). **7. CW Telegraphy (A1). **8. Facsimile (FAX) (F4).
Power output	0 to 250 mw PEP, continuously adjustable.
Output impedance	72 ohms unbalanced, nominal.
Frequency stability	1. Crystal controlled, at least 1 part in 10^6 per day for 15°C change in temperature with the range of 0 to 50°C. 2. VFO controlled by external input. Stability that of external VFO.
Frequency control	10 crystals, front panel selected, plus external VMO input. All crystals contained in temperature controlled oven.

*With appropriate tone generator, such as TMC Model RCR, TMC Model TIS.
**With appropriate keyer, such as TMC Model XFK or TMC Model TIS.

1-2. TECHNICAL SPECIFICATIONS (CONT).

Tuning system	All front panel tuning controls directly calibrated in frequency.
Signal/Distortion ratio	Distortion products are at least 45 db below either tone of a standard two-tone test at 250 mw PEP output.
Unwanted sideband rejection	A signal of 500 cps (Hz) in the desired sideband is at least 60 db down from full PEP in the other sideband.
Spurious emission	All spurious outputs, as a result of internal mixing, are at least 60 db below full PEP output.
Carrier insertion	-55 db to full PEP output.
Harmonic suppression	Second harmonics are at least 40 db below full PEP output. All other harmonics are at least 50 db below full PEP output.
Audio response	SBE-8 ±1.5db from 250 to 3040 cps (Hz) SBE-9 ±1.5db from 250 to 7500 cps (Hz) SBE-10 ±1.5db from 250 to 6080 cps (Hz) (Other audio bandpass filters are available on special order.)
Audio inputs	1. 500,000 ohms for high impedance crystal or dynamic mike. -50 dbm input will provide full RF output. 2. Two independent 600 ohm channels, balanced or unbalanced, -20 dbm to +10 dbm. -20 dbm input will provide full RF output.
ALDC	SBE Models will accept 0 to approximately -11 volts d-c from ALDC circuit of an associated linear amplifier to improve linearity, limit distortion and deliver a relatively constant output level during high modulation peaks or load changes. It is recommended that the ALDC input voltage have an attack time of approximately 2 ms and a decay time of approximately 100 ms in order to give faithful reproduction on voice circuits and multichannel tone telegraph signal operation.
Voice operated relay	Voice operated relay, which includes anti-trip feature, adjustable gain and squelch, is provided.
Metering	Front panel meter with a five position switch provides metering of the following: 1. Calibration. 2. Lower sideband audio level. 3. Upper sideband audio level. 4. Carrier insertion level. 5. RF output level.
Environmental conditions	Designed to operate in any ambient temperature between 0° and 50°C, and any value of humidity up to 90%.
Storage conditions	Equipment will not be materially affected under storage of -20° to +65°C and humidity of 0 to 95%.
Keying information	For CW keying, connections are provided on rear terminal strip that opens the cathode circuit of the first r-f amplifier.

1-2. TECHNICAL SPECIFICATIONS (CONT).

Installation data	Exciter:	Weight: Approximately 38 lbs. Size: 19" w x 8-3/4" h x 15" d.
	Power Supply:	Weight: Approximately 35 lbs. Size: 19" w x 5-1/4" h x 8-5/8" d.
Primary power		115/230v, 50/60 cycles (Hz) single phase, 120 watts average. 140 watts with oven on.
Shipping data		130 lbs, domestic pack, 6 cu. ft. 140 lbs, level "A" pack, 9 cu. ft.
Components and construction		All equipment manufactured in accordance with JAN/MIL specifications wherever practicable.

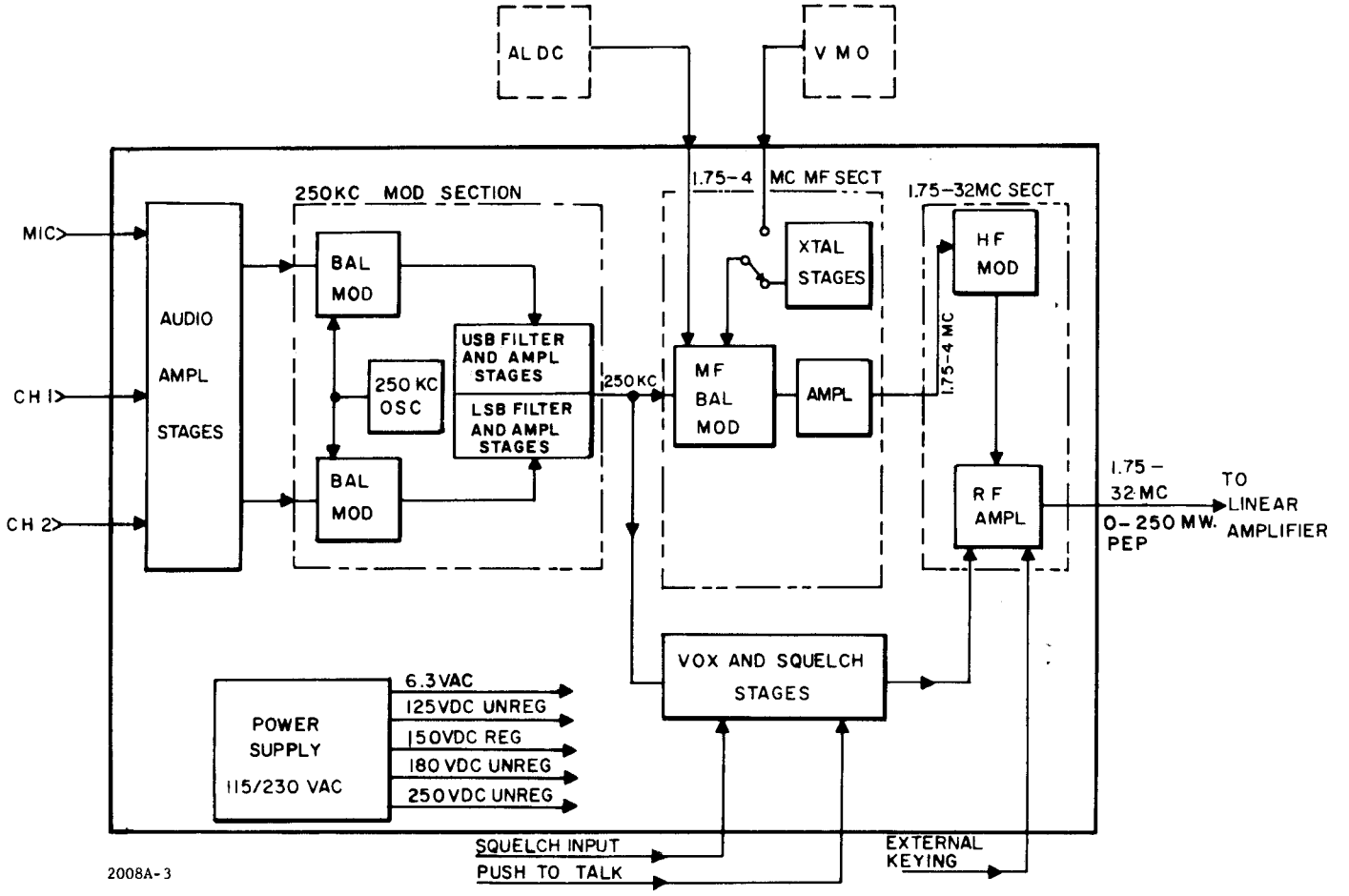


Figure 1-2. Simplified Block Diagram, Model SBE

SECTION 2
INSTALLATION

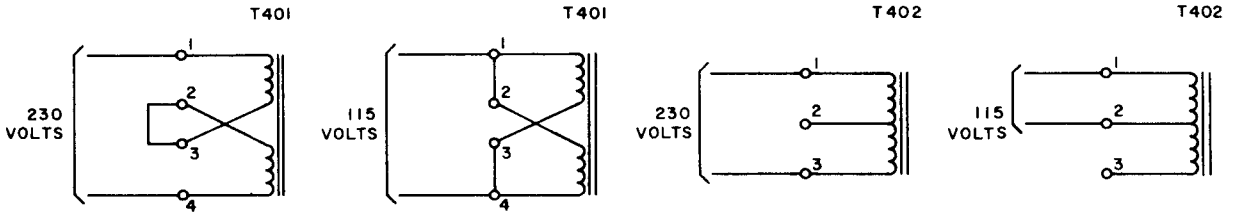
2-1. INITIAL INSPECTION.

The SBE is calibrated and tested at the factory prior to shipment. When it arrives at the operating site, inspect the packing case and contents for possible damage. 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 the furnishing of parts.

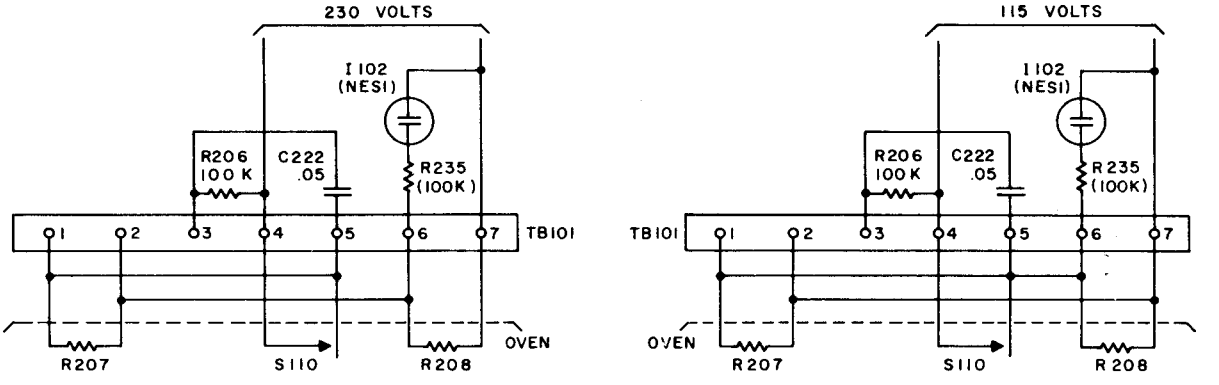
The equipment is shipped with all modules and other components installed. Check that all such components are properly positioned.

2-2. POWER REQUIREMENTS.

Refer to figure 2-1. The SBE is designed for 115/230 volt, 50 to 60 cycles (Hz), single phase power. Unless specifically ordered otherwise, the unit is shipped wired for 115 volt operation. Where 230 volt operation is required, wiring changes must be made to the SBE power supply and to the crystal oven; the power supply fuses (MAIN-3 ampere, and OVEN-2 ampere) must be changed to 1.5 and 1 ampere, respectively.



SKETCH A- POWER SUPPLY



SKETCH B- OVEN

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Figure 2-1. Installation Diagram Showing 115-vs 230-Volt Power Supply Connections

2-3. INSTALLATION PROCEDURE.

To install the SBE, proceed as follows:

a. Mount the SBE and its power supply in a standard 19-inch relay rack or other housing desired. Figure 2-2 is an outline dimensional drawing of the SBE and its power supply.

b. Connect cable CA346-3-0 (supplied) from J402 (item 1, figure 2-3) power supply to J109 (item 2, figure 2-3) of the SBE.

c. Set three toggle switches in center of front panel at following positions: XMTR at OFF, EXCITER at STANDBY, POWER at OFF.

d. Connect cable CA-103-72 (supplied) from J401 (item 3) of power supply to a-c source.

e. Connect RF OUT connector J103 (item 4) to associated transmitter. Use one of two connectors (UG-260/U, or RF-59/U) supplied.

f. If an external VMO is to be used, connect it to VMO IN connector J104 (item 5) on rear of SBE and use the MF XTAL SW in the VMO position. Use one of two connectors (UG-260/U, or RF-59/U) supplied.

g. For local voice operation, connect high impedance (1/2-megohm) crystal or dynamic microphone to MIKE jack on front panel of SBE. Use microphone connector (PL132-3) supplied.

h. ALDC INPUT connector J113 (item 6), connected on rear apron of chassis, is furnished for connection of an ALDC (Automatic Load and Drive Control) signal. This ALDC signal may be obtained from any TMC linear amplifier.

i. An r-f monitor connector, RF MON J102 (item 7) is provided on rear apron of chassis. This connector is provided for sampling the r-f output signal with any suitable r-f monitoring device, such as the TMC Model PTE-3.

j. At terminal board E101, proceed as follows:

(2) Connect audio channel 2 to terminals 10, 11, and 12. Terminal 11 may be grounded for systems balanced to ground. Terminal 12 may be grounded for systems unbalanced to ground.

(3) Other inputs on terminal board E101 include the following:

(a) Terminal 1 and ground are intended for push-to-talk keying line when VOX and SQUELCH circuits are not in use.

(b) Terminal 2 (ground) and terminal 3 (key) are CW keying terminals and are normally connected by a jumper when CW is not being used.

(c) Terminal 4 is grounded by K101 (SBE control relay) and can be used to energize an associated r-f amplifier or transmitter.

(d) Terminal 13 is in the SQUELCH input which is normally obtained from the 600-ohm output of a receiver at the operating position.

(e) Terminals 5, 9, and 14 grounded.

2-4. INITIAL ADJUSTMENTS AND INSTALLATION OF MF CRYSTALS.

Proceed as follows:

a. Set POWER switch at ON. Allow 1-hour warm-up period to allow crystal ovens to reach operating temperatures ensuring frequency stability.

b. After 1-hour warm-up period, turn METER SW to CAL and zero meter M101 (if necessary) by screwdriver adjustment through the front panel opening located directly beneath the meter.

c. The equipment is now ready to be tuned. (Refer to Section 3.)

Refer to paragraph 4-4 for proper crystal selection for desired output frequency. To insert crystals, open oven top by turning snap screws half-turn counterclockwise. Remove cover and celotex insulation and install crystals. Sockets 1, 2, 3, etc., correspond to positions of front panel switch MF XTAL SW. [illegible]

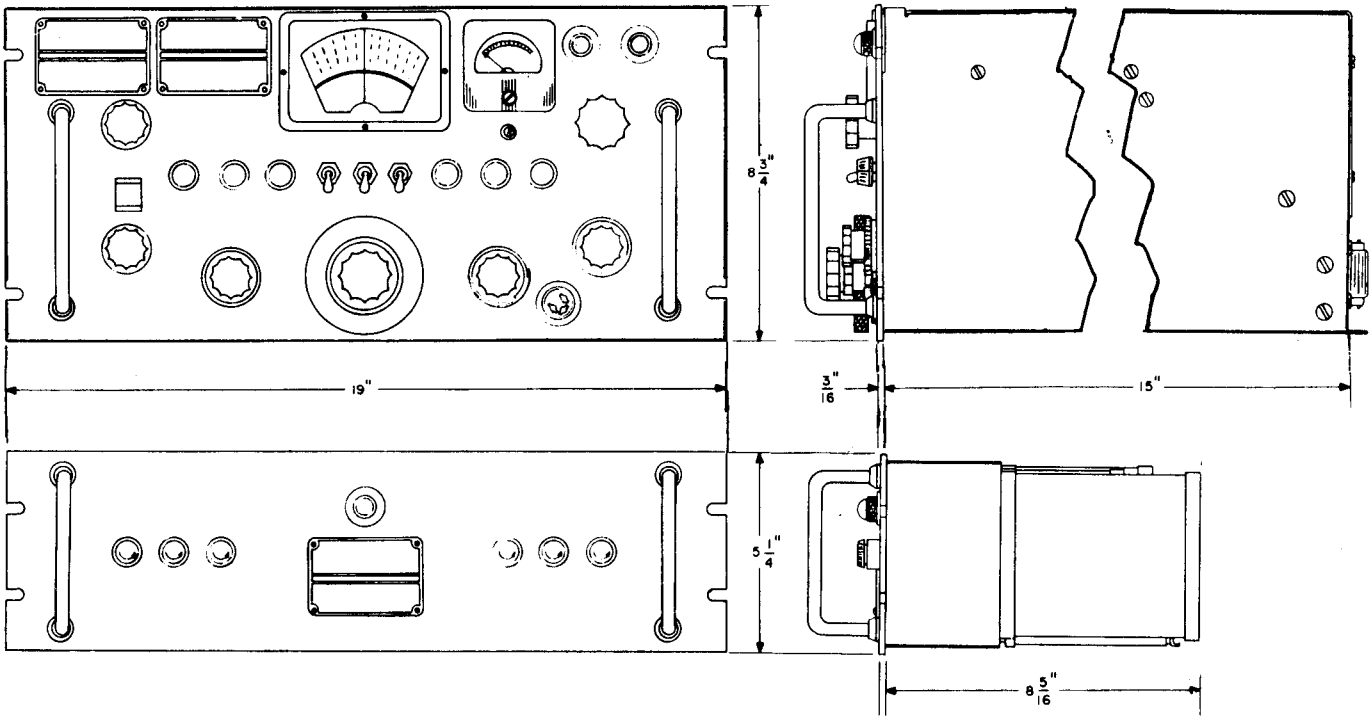

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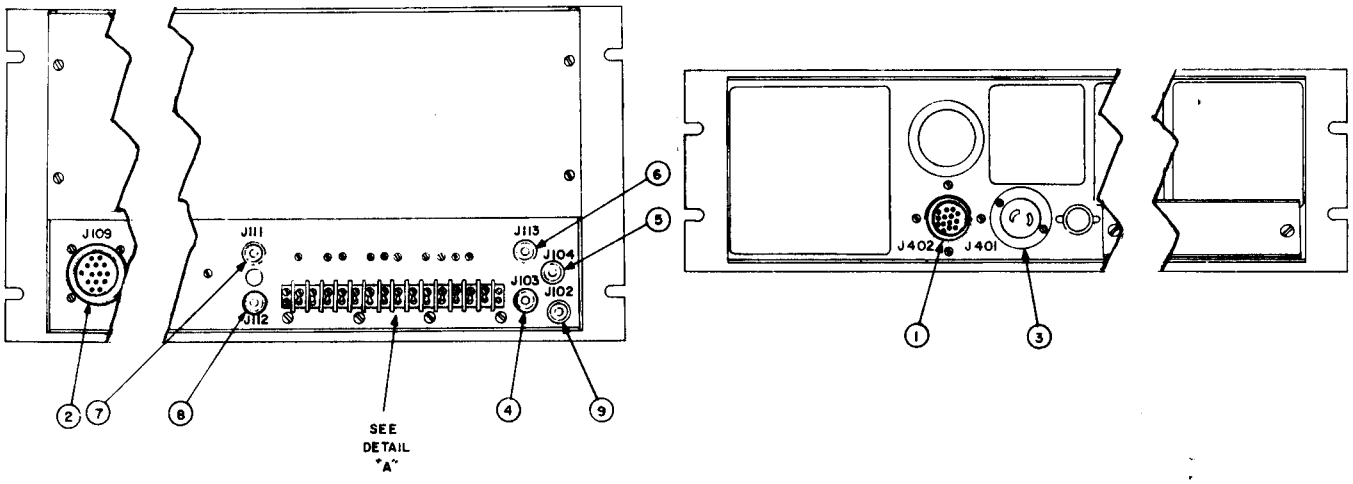
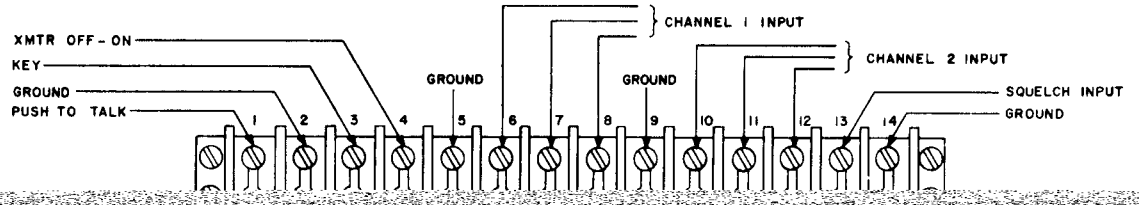
Figure 2-2. Dimensional Outline Diagram, SBE





SECTION 3
OPERATOR'S SECTION

3-1. OPERATING CONTROLS.

The operating controls for the SBE are located on the front panel of the exciter unit (see figure 3-1); the protective fuses are located on the front panel of the power supply (see figure 3-2). The operating controls are listed in table 3-1; the protective fuses are listed in table 3-2.

TABLE 3-1. OPERATING CONTROLS

ITEM NUMBER (Figure 3-1)	PANEL DESIGNATION	FUNCTION
1	MF XTAL SW, S107	11-position selector switch. Selects either external VMO (variable master oscillator) or proper internal crystal for medium frequency oscillator.
2	Two Section Dial	Upper dial coordinates with OUTPUT TUNING (disc, vernier) and lower dial with MF TUNING (knob).
3	XMTR switch, S104	ON-activates associated transmitter. Eliminates need for VOX or push-to-talk, through EXCITER (below) by completing the ground circuit of the XMTR final plates relay. OFF-associated transmitter operated by VOX or push-to-talk circuit when EXCITER switch is in STAND-BY position.
4	EXCITER switch, S105	ON-activates SBE without need for VOX or push-to-talk input and without associated operating transmitter. STANDBY-allows VOX or push-to-talk operation to activate the SBE and its associated transmitter.
5	POWER switch, S103	ON-applies line voltage to SBE power supply. OFF-turns off entire SBE.
6	Meter, M101	Indicates signal levels in circuits selected by METER SW, S109.
7	EXCITER lamp, I101	Glows durung operation when EXCITER switch is in ON-position or SBE is activated by VOX or push-to-talk.
8	OVEN lamp, I102	Glows during operation when thermostats demand crystal-oven heating (automatic).
9	METER SW, S109	Selects point in system to be measured by built-in VTVM circuit. CAL position is used to zero meter.
10	USB switch, S101	Selects audio input source for upper sideband channel.
11	USB GAIN control, R168	Adjusts level of USB audio input.

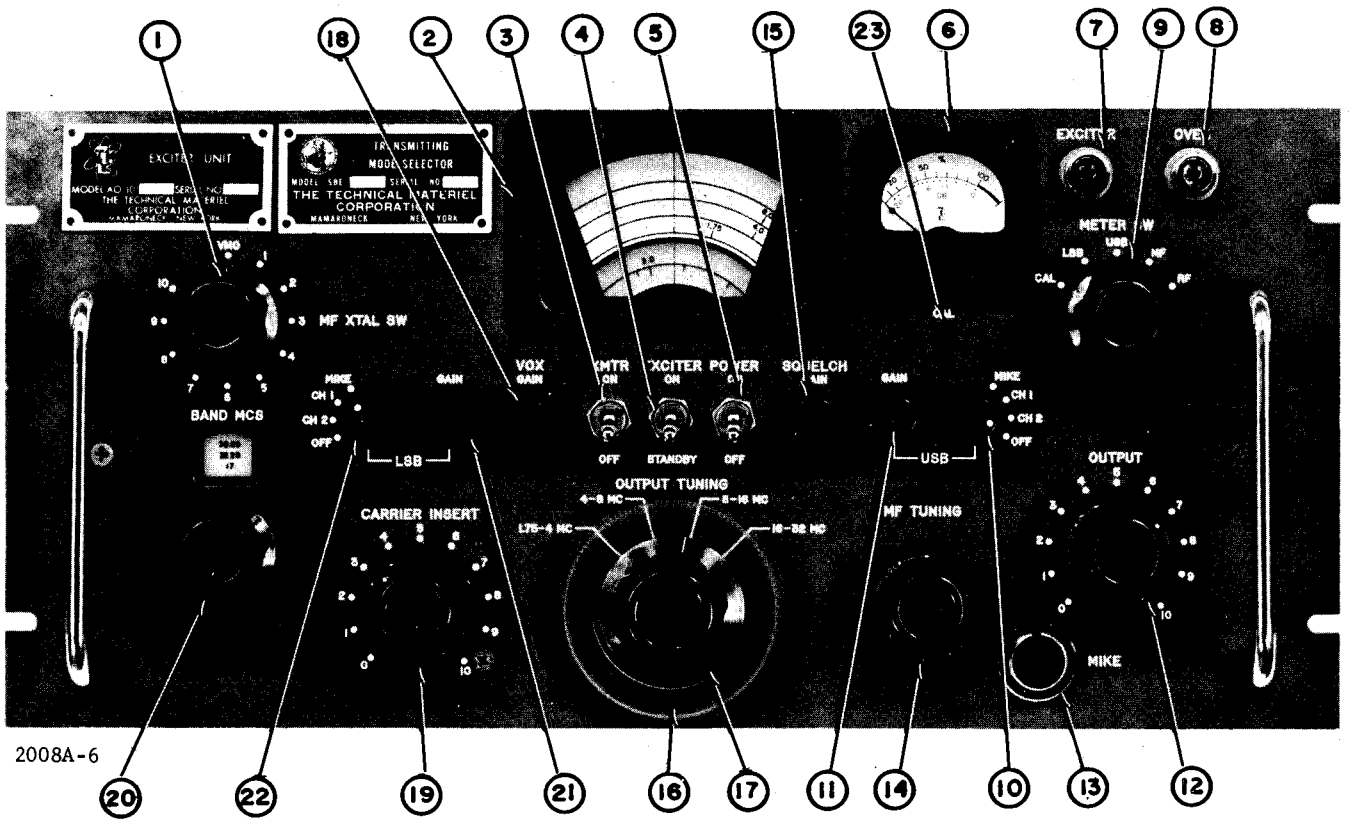


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Figure 3-1. Operating Controls, SBE

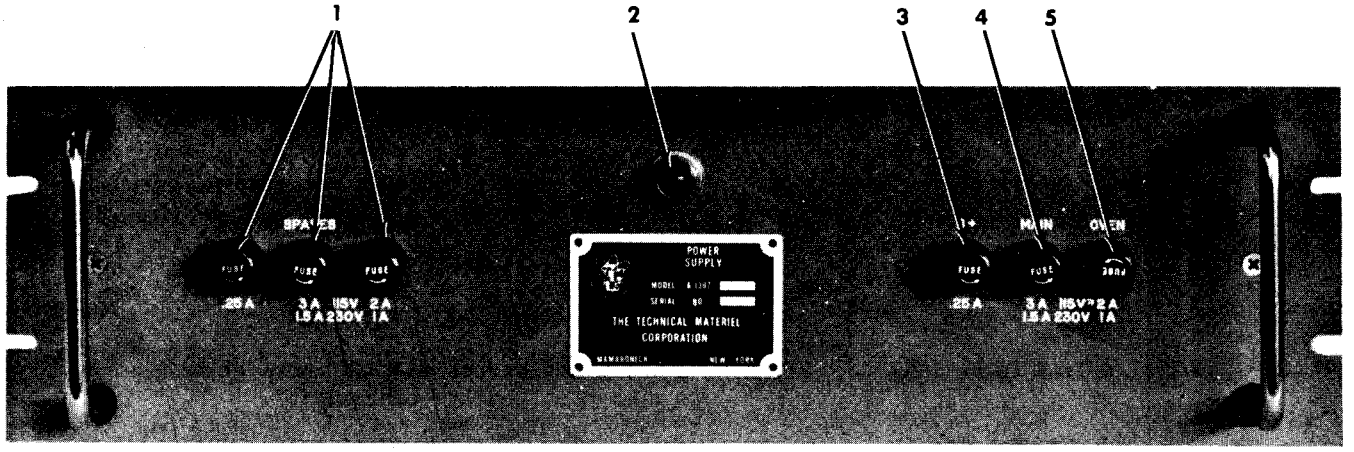

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Figure 3-2. Front Panel, Power Supply, SBE

TABLE 3-1. OPERATING CONTROLS (Cont'd)

ITEM NUMBER (Figure 3-1)	PANEL DESIGNATION	FUNCTION
12	OUTPUT control, R205	Adjusts SBE output power level.
13	MIKE jack, J101	Microphone input (substitute for 600-ohms channel input).
14	MF TUNING, C167 A, B	Selects setting of medium frequency as indicated in lower section of main tuning dial.
15	SQUELCH GAIN control, R129	Used in conjunction with VOX GAIN. (Refer to paragraph 4-6).
16	OUTPUT TUNING vernier capacitor, C181 A, B and C	Disc variable capacitor that adjusts setting of main tuning dial centrally located above knob.
17	OUTPUT TUNING switch, S106	4-position switch that selects output frequency band.
18	VOX GAIN control, R140	Voice-operated exciter circuit gain control.
19	CARRIER INSERT control, R263	Controls level of carrier insertion.
20	BAND MCS switch, S108	Indicates injection frequency range of high-frequency modulator in 2 mc increments. It is controlled by the knob beneath the dial.
21	LSB GAIN control, R169	Selects audio input source for lower sideband channel.
22	LSB switch, S102	Adjusts level of LSB audio input.
23	CAL potentiometer, R135	Screwdriver adjustment to zero meter when METER SW is in CAL position. Balances the conduction of both halves of meter tube V112.

TABLE 3-2. PROTECTIVE FUSES

ITEM NUMBER (Figure 3-2)	PANEL DESIGNATION	FUNCTION
1	SPARE	Spare fuses.
2	Indicator lamp, I401	Glows during operation. Indicates that MAIN fuse is intact and that power is applied.
3	B+ fuse	0.25 ampere protective fuse for B+ circuits.
4	MAIN fuse	3.0 ampere protective fuse for power supply. When 230 volts a-c power is used fuse value is changed to 1.5 ampere.
5	OVEN fuse	2.0 ampere protective fuse for oven. When 230 volts a-c power is used fuse value is changed to 1.0 ampere.

3-2. PRELIMINARY CONSIDERATIONS.

Before attempting to operate the SBE, the following must be considered:

a. Mode of transmission desired.

b. Output frequency desired (crystal selection or use of VMO).

Input circuit controls are as follows:

a. LSB (channels, GAIN). Varies gain of intelligence in LSB.

b. USB (channels, GAIN). Varies gain of intelligence in USB.

c. MIKE. Varies microphone gain.

LSB control places audio channel 1, 2, or MIKE in the lower sideband position; USB control places audio channel 1, 2, or MIKE in the upper sideband position. A microphone connection is made to MIKE connector.

Initially, output frequency requirements are concerned with the following front panel controls: MF XTAL SW (1), BAND MCS (20), and OUTPUT TUNING knob (bandswitch element 17). Subsequently, tuning concerns the following front panel controls: OUTPUT TUNING disc (tuning element 16), MF TUNING (14), OUTPUT (level control 12), and METER SW (9) and its associated meter.

The first consideration is whether the medium frequency 1.75-4 MC is to be supplied by an external VMO or an internal crystal. If by a VMO, the MF XTAL SW is placed in the VMO position; if by a crystal, MF XTAL SW is placed in the position that selects the proper crystal. More information on this phase of operation is given in the discussion below of medium frequency circuit controls.

The output frequency (f_o) desired requires the use of the proper medium frequency (f_{mf}) whether supplied by an external VMO or a crystal. If the desired output frequency (f_o) is between 4.25 and 32.25 mc, adjust the BAND MCS switch (20, figure 3-1) to the frequency range containing the output frequency desired. Located below the desired frequency range on the BAND MCS dial is a number hereafter referred to as the Dial Numeric. This Dial Numeric is used to compute the crystal or VMO frequency (f_x).

This frequency is computed by using the following formula:

$$f_x = (2N - f_o) + 0.250 \text{ mc}.$$

where: f_x = Internal crystal or external VMO frequency.

f_o = output frequency.

N = Dial Numeric (see chart below and figure 3-3).

0.250 mc = Internally generated mixing frequency.

BAND MCS DIAL MARKINGS

(f_o) OUTPUT FREQ. RANGE	(N) DIAL NUMERIC	INJECTION FREQ.
1.75 - 4.25 mc	0	(see note)
4.25 - 6.25 mc	4	8 mc
6.25 - 8.25 mc	5	10 mc
8.25 - 10.25 mc	6	12 mc
10.25 - 12.25 mc	7	14 mc
12.25 - 14.25 mc	8	16 mc
14.25 - 16.25 mc	9	18 mc
16.25 - 18.25 mc	10	20 mc
18.25 - 20.25 mc	11	22 mc
20.25 - 22.25 mc	12	24 mc
22.25 - 24.25 mc	13	26 mc
24.25 - 26.25 mc	14	28 mc
26.25 - 28.25 mc	15	30 mc
28.25 - 30.25 mc	16	32 mc
30.25 - 32.25 mc	17	34 mc

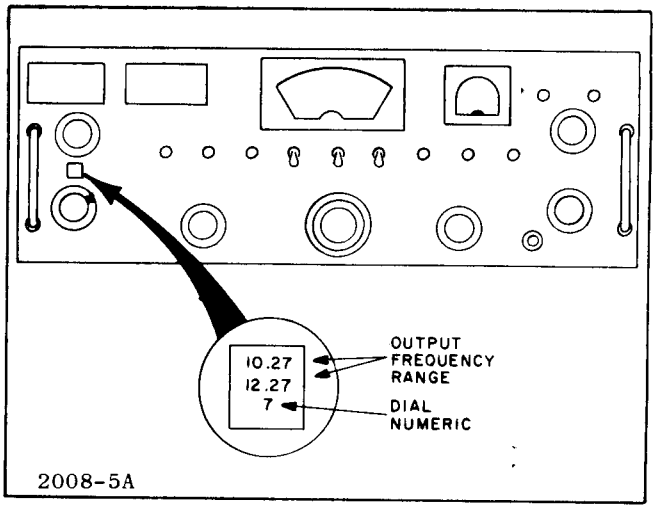

Figure 3-3. Dial Numeric Vs Frequency Range

NOTE

The MF dial, moving in conjunction with the MF TUNING control (item 14, figure 3-1) is calibrated to read 250 mc above the actual MF frequency. Therefore, the MF dial reads the VMO or crystal MF injection frequency resulting in f_x - MF dial reading.

Example:

Suppose an output frequency of 10.5 mc is desired:

$$f_x = 2N - f_o + .250 \text{ mc}$$

in relation to sideband intelligence. The magnitude of the carrier relative to sidebands may be determined by use of a spectrum analyzer.

The medium frequency modulator is adjusted by the CARRIER INSERT (19), MF TUNING (14) and METER SW (9) controls. The medium frequency

STEP	PANEL CALLOUT NO.	OPERATION	PURPOSE
Part I - Tuneup on Carrier (Cont'd).			
9	20	BAND MCS, use correct MF frequency.	Refer to Paragraph 3-2.
10	19	CARRIER INSERT, fully cw.	Provides 100% carrier.
11	9	METER SW, MF position.	In preparation for step 13.
12	16, 17, 2	OUTPUT TUNING switch: knob 17 (coarse setting) for proper band, and disc 16 (vernier setting) for a frequency slightly below the desired output frequency on multi-scale dial 2.	In preparation for step 13.
13	14, 6, 19, 2	MF TUNING knob 14, tune MF. peak SBE's meter 6 reading.	Decrease CARRIER INSERT 19 as necessary to avoid an off-scale reading. The reading on single-scale dial 2 should agree with the frequency of VMO on MF XTAL SW; except when tuning for an operating frequency between 3.75 and 4.25 mc.
14	9	METER SW, RF position.	In preparation for step 15.
15	16, 6	OUTPUT TUNING disc 16, tune RF. Peak SBE's meter 6 reading.	Advance the OUTPUT TUNING vernier switch 17 slightly to peak the reading on the SBE's meter. *NOTE* *Several peaks, due to modulation products, are possible. The correct (lower sideband) peak is the first one encountered as the vernier switch is slightly advanced*
16	12, 19	Adjust OUTPUT knob 12 to control magnitude of the RF output.	Operation of OUTPUT knob 12 controls the magnitude of the RF output. The same is true by operating CARRIER INSERT switch 19.
17		The SBE is now tuned on carrier.	
Part II - Tuneup on SSB with Any Degree of Carrier Insertion:			
18	21, 22	LSB circuit to CH 1, CH 2, or MIKE as required. Set GAIN to mid position.	To place audio channel in lower sideband.
19	10, 11	USB circuit to CH 1, CH 2, or MIKE as required. Set GAIN to mid position.	To place audio channel in upper sideband.

STEP	PANEL CALLOUT NO.	OPERATION	PURPOSE
Part II - Tuneup on SSB with Any Degree of Carrier Insertion (Cont'd).			
20	19	Set CARRIER INSERT to 0.	To suppress carrier 100%. (-55 db)
21	6, 9, 10, 11 21, 22	Set METER SW 9 to USB or LSB. Advance or decrease GAIN control 11 or 21 as required until meter shows a maximum reading of 100 on audio peaks. (Lower peak values are frequently compatible with sufficient RF output as determined by the subsequent setting of OUTPUT control 12).	*CAUTION* *With METER SW 9 in USB, LSB, or RF position, meter peaks must never exceed 100 as intermodulation distortion may become excessive beyond this point.*
22	9	Set METER SW 9 to RF position.	Preparatory to step 23.
23	12, 19	Adjust OUTPUT control 12 for desired level simultaneously with adjusting CARRIER INSERT control 19 for desired degree of carrier insertion.	
24	6, 9, 12, 19	With METER SW 9 in RF position and CARRIER INSERT 19 in 0 position, set OUTPUT control 12 to give meter 6 reading of 90 with one of the audio channels in operation. Now advance CARRIER INSERT control 19 until meter 6 reading becomes 100.	Steps 24 and 25 illustrate the procedure to inject a carrier 20 db down from PEP. Increasing a meter reading of 90 due to audio with no carrier and to 100 with carrier (audio level unchanged) signifies a carrier level of 10% (-20 db) of the combined audio and carrier level.
NOTE *As explained more fully in Section 5, the SBE's meter circuit, as is the case with most VTVM's, has a small amount of waveform error. For this reason, carrier and sideband additions may not be precisely linear.*			
25	12	Decrease OUTPUT control 12 for desired PEP output. Do not change audio and carrier settings (11, 19, and 21).	Decreases audio and carrier proportionately.

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3-4. DOUBLE SIDEBAND WITH ANY DEGREE OF CARRIER INSERTION.

Part I, tuneup on carrier, is the same as part I in paragraph 3-2. After completing part I, proceed as follows: (For convenience, the following steps, 18 through 32, assume that channel 1 is used on both lower and upper sidebands with either 0- or 10-percent carrier insertion. In case channel 2 is used on both lower and upper sidebands with either 0- or 10-percent carrier insertion, substitute CH 2 for CH 1 in the settings of USB 10 and LSB 22 controls.)

STEP	PANEL CALLOUT NO.	OPERATION	PURPOSE
Part II - Tuneup on DSB with Any Degree of Carrier Insertion (Cont'd).			
		NOTE *Step numbering begins with 18 since this part II follows part I of paragraph 3-3.*	
18	21, 22	LSB circuit to CH 1; set GAIN to quarter-scale.	To place desired audio channel in lower sideband.
19	19	CARRIER INSERT, set to 0.	To suppress carrier 100%.
20	10, 11	USB circuit to OFF; set GAIN to quarter-scale.	To cut off desired audio channel in upper sideband.
21	9	Set METER SW to LSB. (On 1.75-4 Mc band set METER SW to USB.)	To measure desired audio channel level in lower sideband.
22	6, 20	Adjust LSB GAIN until the meter shows the following readings on audio peaks: Carrier Insertion Eventually Wanted — Audio Peaks 0 — 50 10% (-20db) — 45	To obtain proper desired audio channel level in lower sideband with or without 10% carrier insertion.
23	22	Set control 22 to OFF.	To cut off desired audio channel in lower sideband.
24	10, 11	USB circuit to CH 1; set GAIN to quarter-scale.	To place desired audio channel in upper sideband.
25	19	CARRIER INSERT, leave on 0.	To suppress carrier 100%.
26	9	Set METER SW to USB. (on 1.75-4 Mc band set METER SW to LSB.)	To measure desired audio channel level in upper sideband.
27	6, 11	Adjust USB GAIN until the meter shows the following readings on audio peaks: Carrier Insertion Eventually Wanted — Audio Peaks 0 — 50 10% (-20db) — 45	To obtain proper desired audio channel level in upper sideband with or without 10% carrier insertion.
28	9	Set METER SW to RF.	To measure audio levels after RF modulation.
29	12, 6	Advance OUTPUT control 12 from 0 until meter 6 reads same as in step 27.	Check that LSB switch is OFF and USB switch is in desired channel.
30	10, 22	Set USB switch to OFF and LSB switch to its desired channel.	Check that METER SW is in RF position.

3-4 DOUBLE SIDEBAND WITH ANY DEGREE OF CARRIER INSERTION (Cont'd).

STEP	PANEL CALLOUT NO.	OPERATION	PURPOSE
Part II - Tuneup on ISB with Any Degree of Carrier Insertion (Cont'd):			
21	9	Set METER SW to LSB (On 1.75-4 Mc band set METER SW to USB.)	To measure desired audio channel level in lower sideband.
22	6, 20	Adjust LSB GAIN until the meter shows the following readings on audio peaks: Carrier Insertion Eventually Wanted — Audio Peaks 0 — 50 10% (-20db) — 45	To obtain proper desired audio channel level in lower sideband with or without 10% carrier insertion.
23	22	Set LSB channel control 22 to OFF.	To cut off desired channel in lower sideband.
24	10, 11	USB circuit to CH 1; set GAIN to quarter-scale.	To place desired audio channel in upper sideband.
25	19	CARRIER INSERT, leave on 0.	To suppress carrier 100% (-55 db).
26	9	Set METER SW 9 to USB. (On 1.75-4 Mc band set METER SW to LSB.)	To measure desired audio channel level in upper sideband.
27	6, 11	Adjust USB GAIN until the meter shows the following readings on audio peaks: Carrier Insertion Eventually Wanted — Audio Peaks 0 — 50 10% (-20db) — 45	To obtain proper desired audio channel level in upper sideband with or without 10% carrier insertion.
28	9	Set METER SW 9 to RF.	To measure audio levels after RF modulation.
29	12, 6	Advance OUTPUT control 12 from 0 until meter 6 reads same as in step 27.	Check that LSB switch is OFF and USB switch is in desired position.
30	10, 22	Set USB switch to OFF and LSB switch to its desired channel.	Check that METER SW is in RF position.
31	6, 21	Note reading on meter 6. Re-adjust LSB GAIN control 21 until meter 6 reads same as in step 22.	

3-5. INDEPENDENT SIDEBAND WITH ANY DEGREE OF CARRIER INSERTION (Cont'd).

STEP	PANEL CALLOUT NO.	OPERATION	PURPOSE
Part II - Tuneup on ISB with Any Degree of Carrier Insertion (Cont'd):			
32	6, 22, 10	Turn controls 22 and 10 to place CH 1 or CH 2 in both sidebands. Meter 6 should now read as follows on peaks: Carrier Insertion Finally Wanted — Audio Peaks 0 — 100 10% (-20db) — 90	
		NOTE *As explained more fully in Section 5, the SBE's meter circuit, as is the case with most VTVM's, has a small amount of waveform error. For this reason, carrier and sideband additions may not be precisely linear.*	
33	19	Set CARRIER INSERT 19 to give desired amount of carrier insertion. For 0 insertion: turn control 19 to 0; peak readings on meter 6 should reach 100. For 10% (-20db) insertion: advance control 19 until peak readings on meter 6 rise from 90 to 100.	

3-6. CONVENTIONAL AM OPERATION.

Part I, tuneup on carrier, is the same as part I in paragraph 3-3. Part II, conventional AM operation (50-percent carrier insertion) is the same as part II in paragraph 3-4 except for the following modifications:

a. Steps 22 and 27 should be modified as follows:

Carrier Insertion Eventually Wanted	Audio Peaks
50% (-6db)	25

b. Step 32 should be modified as follows:

Carrier Insertion Finally Wanted	Audio Peaks
50% (-6db)	50

c. Step 33 should be modified as follows: Set CARRIER INSERT to give desired amount of carrier insertion. For 50% (-6db) insertion: advance control 19 until peak readings on meter 6 rise from 50 to 100.

3-7. FREQUENCY-SHIFT TELEGRAPH OPERATION.

In frequency-shift telegraph operation, the SBE must obtain a frequency-shift signal from any suitable external source, such as a TMC Model XFK, Frequency Shift Exciter or a TMC Model TIS-3, Tone Intelligence Unit. To obtain frequency-shift telegraph operation, perform the following steps:

a. Perform the procedure described in paragraph 3-3, step 1 of this manual.

b. Set the CARRIER INSERT potentiometer (item 19, figure 3-1) to position 10.

c. Set the MF XTAL SW (item 1, figure 3-1) to the VMO position.

d. Connect the frequency shift signal to the SBE VMO connector J104.

3-8. CW TELEGRAPH OPERATION.

Part I, tuneup on carrier, is the same as part I in paragraph 3-3. Part II, CW telegraph operation, is as follows:

a. Remove jumper from pins 2 and 3. (E101 on rear of SBE.)

b. Attach key from pin 3 to ground.

c. Turn LSB and USB switches 22 and 10 to OFF position.

d. Turn CARRIER INSERT 19 to fully cw position.

e. Turn METER SW 9 to RF position.

f. Advance OUTPUT 12 control to drive transmitter with proper SBE output.

3-9. VOX AND SQUELCH CIRCUIT OPERATION.

The VOX and SQUELCH circuits may be used when transmitters are actuated by speech into an associated microphone. In this case, the VOX circuit should be adjusted so that only the intermittent voice peaks actuate the VOX relay which turns on the transmitter. The time constant of the VOX circuit is such that the intermittent voice peaks keep the transmitter turned on so long as there is reasonably strong speech coming into the MIKE. Otherwise, a transmitter is turned on manually or by key-

b. SQUELCH GAIN ADJUSTMENT. - Proceed as follows:

(1) Make connection from the 600-ohm audio output terminals of the station receiver to terminal 13 and ground on terminal board E101 of the SBE.

(2) Advance SQUELCH GAIN 15 until audio from the station receiver no longer trips the VOX circuit.

3-10. OPERATOR'S MAINTENANCE.

The operator should make minor adjustments of tuning controls to verify proper tuning, note general condition of panel switches, observe whether panel indicator lamps light properly, and check the condition of the three panel fuses as well as that of all tubes. All fuses and a power indicator lamps are located on the front panel of the power supply. The locations of all tubes in the SBE are indicated by the tube location diagram action of figure 5-1.

The SBE has triple fuse protection: oven heater, power supply primary, and high voltage. (Since a partial short across the B+ line may not blow the line fuse, this separate high voltage

SECTION 4
PRINCIPLES OF OPERATION

4-1. BLOCK DIAGRAM ANALYSIS.

Refer to figure 4-1. The SBE comprises seven major sections: (1) audio input section, (2) 250-kc oscillator and balanced modulator section, (3) 1.75- to 4-mc MF section, (4) 1.75- to 32-mc HF section, (5) squelch and VOX section, (6) M101 meter section, (7) power-supply section.

The Audio Input Section provides input circuits for two 600-ohm line channels (balanced or unbalanced) and one microphone channel. All three input channels are applied to function switches S101 and S102 (600-ohm line channels via transformers T101 and T102; microphone input via pre-amplifier V101) for routing through a section of the bandswitch (which corrects sideband reversal in the 1.75-4.250 mc range) to upper- or lower-sideband amplifiers V123A and V122A. The amplified outputs of V123A and V122A are transformer coupled via T103 and T104 to audio balanced modulator stages contained in the 250-KC Oscillator and Balanced Modulator Section. Two meter amplifiers (V122B and V123B) and associated rectifier circuits (CR111 and CR112) contained in the Audio Input Section provide power-level indications of incoming audio signals.

NOTE

Although the SBE-8,9, and 10 employ different bandpass filters (refer to technical specifications given in section 1), the principles of operation for each is the same. Therefore, only the SBE-10 is discussed in the following paragraphs.

Audio input signals applied to the balanced modulators (CR115 and T125, CR116 and T120) are beat with the 250-KC output of oscillator V105. The resultant output (reduced carrier with upper and lower sideband intelligence) is amplified and applied to upper and lower sideband filters. LSB filter Z110 passes a small amount of 250-kc carrier and signals in the 250 -6.0 kc frequency range whereas USB filter Z111 passes a small amount of 250-kc carrier and signals in the 250 +6.0 frequency range. The outputs of both filters are applied simultaneously to: (1) amplifiers V128A and V128B; (2) notch filter Z112. The notch filter removes the 250-KC carrier component from the two sideband signals which are then applied to amplifier V126. 250-kc carrier re-insertion is accomplished at V126 through a 90-degree phase shift network thus providing a true AM signal. The amplified output (sideband intelligence) of V126 is transformer coupled to the MF balanced modulator stage contained in the 1.75- to -4 mc Section. The amplified outputs of V128A and V128B are applied to upper- and lower-sideband meter amplifiers for monitoring purposes.

Sideband intelligence (centered at 250 kc) applied to balanced modulator V113 is mixed with a 2- to 4.25-mc injection frequency provided by internal crystals or a variable master oscillator (VMO). The resultant, a sideband signal in the 1.75 to 4.0-mc frequency range, is amplified by V114 and then transformer coupled to Z107 in the 1.75- to 32-mc HF Section. An ALDC input to balanced modulator tube V113 increases d-c grid bias on strong modulation bursts from the associated linear amplifier thus reducing the output level of V113.

The 1.75- to 4-mc signal applied to Z107 is: (1) mixed with the output of HF oscillator V117 to produce a 4- to 32-mc signal which is then applied to r-f amplifiers V118, V119, V120; (2) applied directly to the r-f amplifiers. In the 4- to 32-mc output-frequency range, injection signals from 8- to 34-mc in 2-mc steps are applied to HF oscillator V117 via the BAND MCS switch. When the BAND MCS switch is set at the 1.75- to 4.25-mc position, an 18-mc injection signal is applied to Z107 to prevent intermodulation distortion. The results of this 18-mc injection signal are far removed from the 1.75- to 4.250-mc frequency and are therefore not amplified by the r-f amplifier stages.

The VOX stage employed in the SBE rectifies a portion of the sideband signal from amplifier V126 thus developing a positive d-c voltage that is applied to relay amplifier V127. When audio intelligence is present in the audio channels, relay K101 operates and the SBE is activated.

Squelch (anti-vox) stages allow the SBE to operate within close proximity of an operating receiver. This is accomplished by rectifying a portion of the receiver's output thus developing a negative d-c voltage which is applied to relay amplifier V127. With both VOX and squelch circuits operating, the SBE will be activated only when audio intelligence is applied to the SBE inputs.

Metering stages in the SBE provide monitoring functions for audio input power levels for upper- and lower-sideband channels; for the 1.75- to 4-mc MF power level; and for the 1.75- to 32-mc HF power level.

The SBE power supply provides 6.3 vac, +250 vdc, +125 vdc, +180 vdc, and regulated +150 vdc.

4-2. CIRCUIT ANALYSIS, AUDIO INPUT SECTION.

Refer to figure 7-1. The SBE is provided with three audio inputs (two 600-ohm balanced or unbalanced inputs, and one high-impedance microphone input). The 600-ohm inputs originate from terminal strip E101 and are transformer coupled via T101 and T102 to switches S101 and S102 respectively.

Microphone input signals from J101 are amplified by V101 and are then extended to switches S101 and S102. Depending upon the setting of S101 and S102, the desired input is applied to upper- and lower-sideband gain controls R168 (USB) and R169 (LSB) through a section of the bandswitch (S106) and then to audio amplifiers V122A and V123A of the 250-KC Oscillator and Balanced Modulator Section.

Bandswitch S106 is configured to reverse upper and lower sideband inputs when the SBE is operating in the 1.75- to 4.25-mc range. This reversal compensates for the lack of frequency conversion at high-frequency balanced modulator Z107 (refer to paragraph 4-5).

4-3. CIRCUIT ANALYSIS, 250-KC OSCILLATOR AND MODULATOR SECTION.

Refer to figure 7-1. Audio input signals applied to V122A and V123A are amplified and transformer coupled via T104 and T103 to balanced modulator circuits (CR115 and T125, CR116 and T126). Within the balanced modulators, the audio input frequencies are mixed with a 250-kc signal generated by oscillator Z103. The 250-kc output from Z103 is applied to variable resistors R265 and R266 which are used to balance the input circuits of T125 and T126.

The resultant output of T125 and T126 (double sideband reduced 250-kc carrier) is amplified by V124 and V125 and applied to sideband filter Z110 and Z111. LSB filter Z110 is designed to pass only frequencies from approximately 244 kc to 250 kc; thus, only the sideband below the suppressed 250-kc carrier is passed on to notch filter Z112. USB filter Z111 performs in the same manner as Z110, differing in that it passes frequencies between approximately 250-kc and 256-kc (upper sideband).

The outputs of Z110 and Z111 are applied to: (1) notch filter Z112; (2) meter amplifiers V122B and V123B via V128A and V128B for monitoring purposes.

Notch filter Z112 has considerable loss in the immediate region of 250-kc. However, the upper or lower sidebands pass through the filter; experiencing relatively small loss. The output of notch filter Z112 is amplified by V126 and is transformer coupled by T127 to balanced modulator V113 of the 1.75- to 4-MC MF Section.

Carrier re-insertion is accomplished at V126 by means of a 90-degree phase-shift network (comprising R280 and T128) and a 250-kc CARRIER INSERT control R263. The 250-kc signal level applied to T128 is controlled by R263. The phase-shifted output of T128 is terminated into variable resistor R280 which is adjusted to provide a true 90-degree phase-shifted 250-kc carrier (and consequently a true AM signal) to amplifier V126.

4-4. CIRCUIT ANALYSIS, 1.75- TO 4-mc MF SECTION.

Refer to figure 7-1. Sideband intelligence (centered at 250-kc) applied to balanced modulator V113 is mixed with a 2- to 4.25-mc injection frequency provided by oscillator V115. Oscillator V115 is frequency controlled by either: external variable master oscillator via Jack J104; or internal oven contained crystals. The difference frequency output of balanced modulator V113 is coupled via tuned transformer T109 to MF amplifier V114. The amplified output of V114 is coupled via T110 (tuned transformer) to Z107 of the 1.75- to 32-mc HF Section.

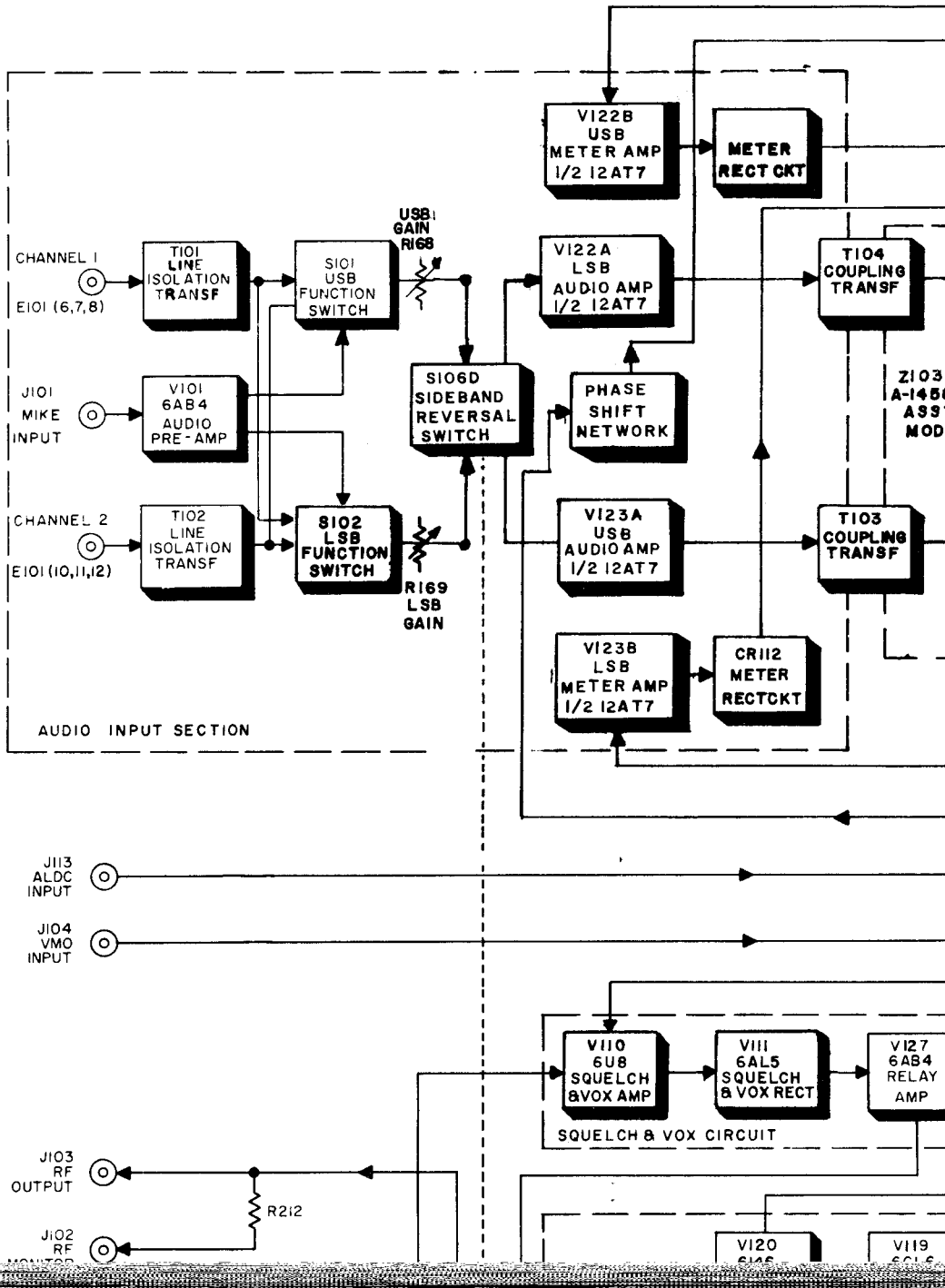
Transformers T109 and T110 are both tuned by ganged capacitor C167. Sections A and B of modulator V113 are balanced by adjusting cathode bias resistor R130.

ALDC input signals applied to modulator tube V113 via Jack J113 increase d-c grid bias on strong modulation bursts from the associated linear amplifier thus reducing the output level of V113. The ALDC input is a varying negative d-c signal with a desirable attack time of 2 milliseconds and a decay time of 100 milliseconds not to exceed -4 vdc.

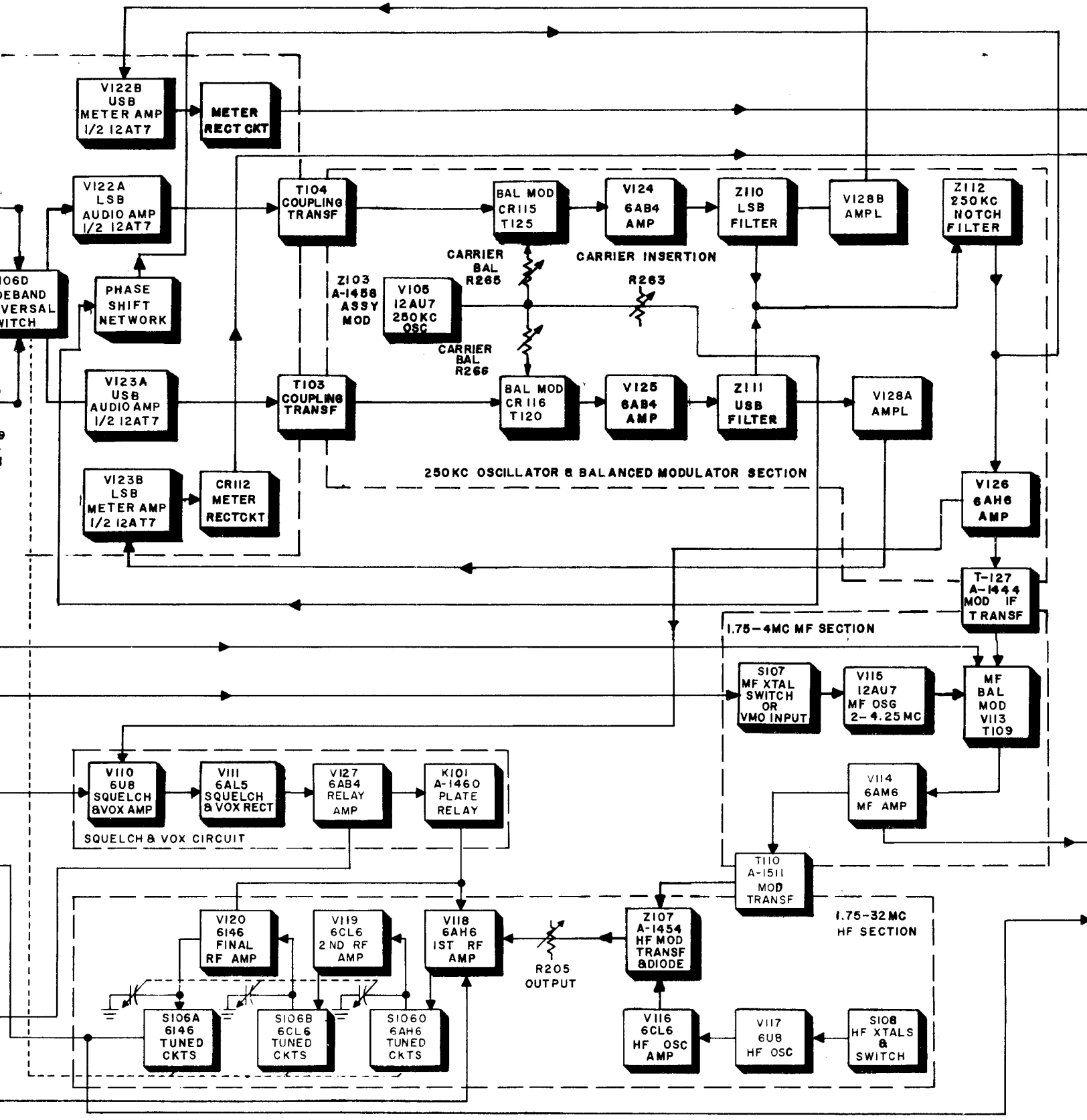
4-5. CIRCUIT ANALYSIS, 1.75- TO 32-mc HF SECTION.

Refer to figure 7-1. The 1.75- to 4-mc sideband signal from transformer T110 in the MF Section is applied to pin 2 of Z107 and to the control grid of first r-f amplifier V118 via front-panel OUTPUT control R205. A high-frequency injection signal (from 8- to 34-mc in 2-mc steps; selected by front-panel BAND MCS switch) is developed by V117, amplified by V116, and coupled via transformer T123 to J110 of Z107 where it is balanced by a variable resistor and capacitor network. The sideband signal applied to pin 2 of Z107 is rectified thus upsetting the balance of the high-frequency injection signal allowing it to mix with the incoming sideband signal. The resultant difference frequency is then applied to r-f amplifier V118.

When operating in the 1.75- to 4-mc frequency range, an 18-mc injection signal is applied to Z107 in order to maintain proper bias level preventing inter-modulation distortion at amplifier V118. The 18-mc injection and the sidebands produced are not passed by the r-f amplifier stages (V118, V119, and V120) which are tuned to 1.75- to 4.25-mc. A sideband reversal switch (part of OUTPUT TUNING bandswitch S106) compensates for the sideband reversal that does not take place


V122B USB METER AMP 1/2 12AT7
METER RECT CKT
USB GAIN R168
CHANNEL 1
E101 (6,7,8)
T101 LINE ISOLATION TRANSF
S101 USB FUNCTION SWITCH
V122A LSB AUDIO AMP 1/2 12AT7
T104 COUPLING TRANSF
J101 MIKE INPUT
V101 6AB4 AUDIO PRE-AMP
S106D SIDEBAND REVERSAL SWITCH
PHASE SHIFT NETWORK
CHANNEL 2
E101 (10,11,12)
T102 LINE ISOLATION TRANSF
S102 LSB FUNCTION SWITCH
R169 LSB GAIN
V123A USB AUDIO AMP 1/2 12AT7
T103 COUPLING TRANSF
V123B LSB METER AMP 1/2 12AT7
CR112 METER RECTCKT
AUDIO INPUT SECTION
J113 ALDC INPUT
J104 VMO INPUT
V110 6U8 SQUELCH &VOX AMP
V111 6AL5 SQUELCH & VOX RECT
V127 6AB4 RELAY AMP
SQUELCH & VOX CIRCUIT
J103 RF OUTPUT
R212
J102 RF
V120
V119

165-166 144


V122B USB METER AMP 1/2 12AT7
METER RECT CKT
V122A LSB AUDIO AMP 1/2 12AT7
T104 COUPLING TRANSF
BAL MOD CR115 T125
V124 6AB4 AMP
Z110 LSB FILTER
V128B AMPL
Z112 250KC NOTCH FILTER
CARRIER BAL R265
CARRIER INSERTION
R263
Z103 A-1458 ASSY MOD
V105 12AU7 250KC OSC
CARRIER BAL R266
PHASE SHIFT NETWORK
V123A USB AUDIO AMP 1/2 12AT7
T103 COUPLING TRANSF
BAL MOD CR116 T120
V125 6AB4 AMP
Z111 USB FILTER
V128A AMPL
250KC OSCILLATOR & BALANCED MODULATOR SECTION
V123B LSB METER AMP 1/2 12AT7
CR112 METER RECTCKT
V126 6AH6 AMP
T-127 A-1444 MOD IF TRANSF
1.75-4MC MF SECTION
S107 MF XTAL SWITCH OR VMO INPUT
V115 12AU7 MF OSC 2-4.25MC
MF BAL MOD V113 T109
V110 6U8 SQUELCH & VOX AMP
V111 6AL5 SQUELCH & VOX RECT
V127 6AB4 RELAY AMP
K101 A-1460 PLATE RELAY
SQUELCH & VOX CIRCUIT
V114 6AM6 MF AMP
T110 A-1511 MOD TRANSF
1.75-32MC HF SECTION
V120 6146 FINAL RF AMP
V119 6CL6 2ND RF AMP
V118 6AH6 1ST RF AMP
R205 OUTPUT
Z107 A-1454 HF MOD TRANSF & DIODE
S106A 6146 TUNED CKTS
S106B 6CL6 TUNED CKTS
S106C 6AH6 TUNED CKTS
V116 6CL6 HF OSC AMP
V117 6U8 HF OSC
S108 HF XTALS & SWITCH

Fi

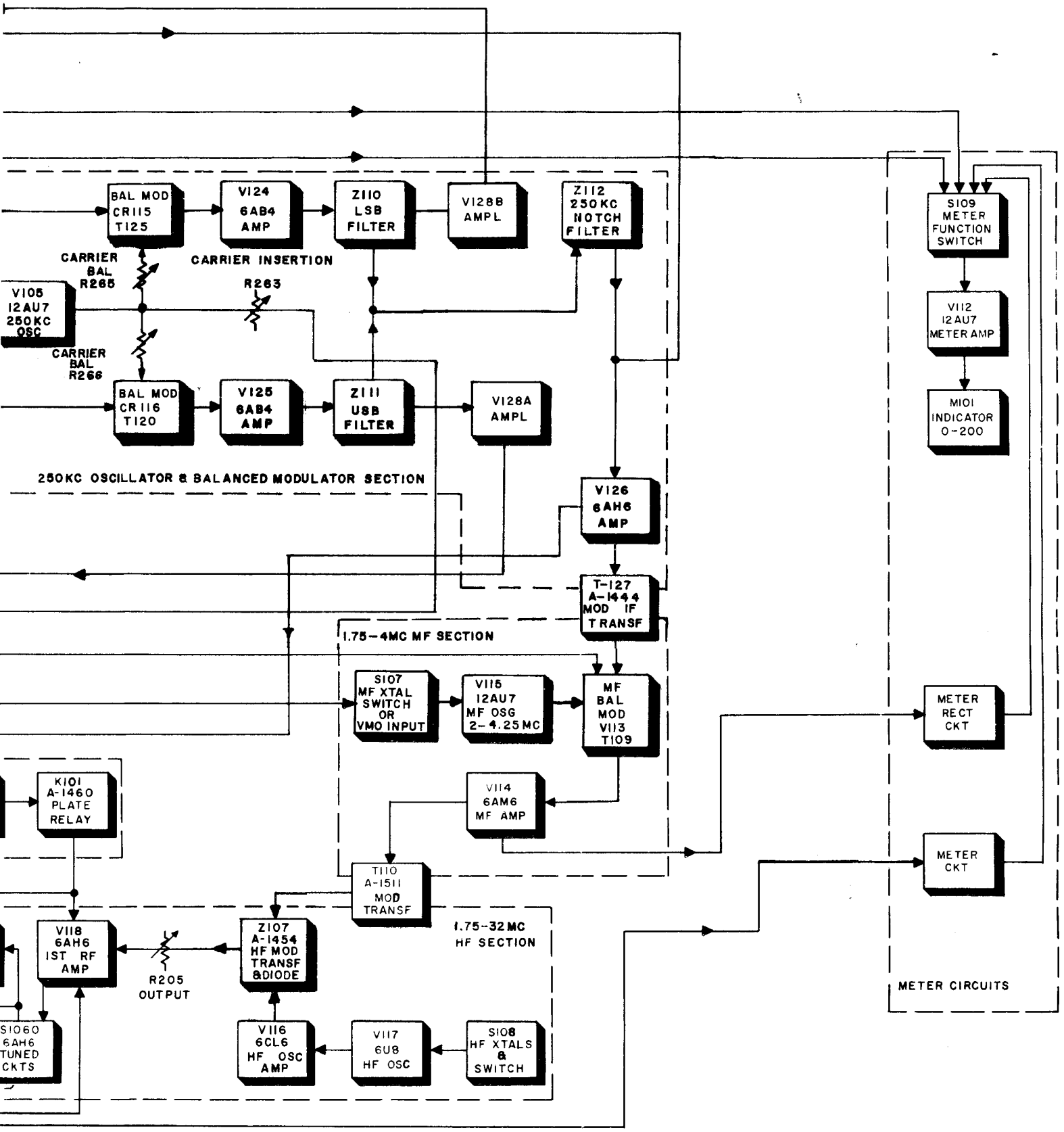


Figure 4-1. Block Diagram, SBE

at the output of Z107.

The r-f taken from R205 (front-panel OUTPUT control) is amplified by the V118, V119, and V120 to the rated 250 milliwatt PEP output of the SBE. These stages are gang-tuned by C181A, C181B, C181C, and bandswitched by S106A, S106B, and S106C to cover the frequency range of 1.75- to 32-mc continuously.

4-6. CIRCUIT ANALYSIS, SQUELCH AND VOX SECTION.

Refer to figure 7-1. A sample of the sideband signal from amplifier V126 is capacitively coupled to the input grid of amplifier V110 (pentode section). The amplified output of V110 is capacitively coupled to one half of rectifier V111, which develops a positive d-c voltage. This positive voltage is applied to the control grid of relay amplifier V127. When intelligence is present in the audio channels, the positive voltage developed at V127 causes V127 to conduct, and relay K101 energizes thus activating the SBE.

A signal from a nearby receiver is applied to the triode section of V110. The output of V110 is capacitively coupled to one half of rectifier V111 which develops a negative d-c voltage. This negative voltage is applied to the grid of relay amplifier V127. With both VOX and squelch circuits operating, the SBE will be activated only when audio intelligence is applied to the SBE inputs.

4-7. CIRCUIT ANALYSIS, METER SECTION.

Refer to figure 7-1. The meter circuit comprises METER SW switch S109, meter M101, and V112 configured as a VTVM circuit. Depending upon the setting of meter switch S109, meter M101 will provide indications as outlined below:

a. USB. - M101 indicates only the USB channel audio level except in the 1.75- to 4-mc band. In this band it indicates the LSB channel audio level.

b. LSB. - M101 indicates only the LSB channel audio level except in the 1.75- to 4-mc band. In this band it indicates the USB channel audio level.

c. MF. - M101 indicates sum total of both sidebands and carrier when used. This meter position is used only to indicate proper tuning of the MF dial; and, therefore, its absolute level has no real meaning.

d. RF. - M101 indicates the sum total of both sidebands and carrier when used.

e. CAL. - Pin 2 of V112 is grounded thus allowing the gain of both triode sections to be equalized by adjustment of R130.

4-8. CIRCUIT ANALYSIS, POWER SUPPLY.

Refer to figure 7-2. The SBE power supply (comprising transformer T401 and T402, rectifier V401, and voltage regulator V402) is a conventional gaseous rectifier with choke-input, pi filter, and a voltage divider network (R401 through R405). Under load conditions, the power supply provides 6.3-volt a-c filament voltage, +250-volt d-c plate voltage, +180-volt d-c plate voltage, +125-volt d-c plate voltage, and +150-volt d-c regulated plate voltage.

SECTION 5
MAINTENANCE

5-1. PREVENTIVE MAINTENANCE.

The SBE has been designed to provide long-term, trouble-free operation under continuous duty conditions. However, in order to prevent failure of the equipment due to corrosion, dust, 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. All accessible covers should be removed and the wiring and all components inspected for dirt, corrosion, charring, discoloring or grease. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease from other parts with any suitable cleaning solution. 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.

NOTE

When using toxic solvents, make certain that adequate ventilation exists. Avoid prolonged or repeated breathing of the vapor. Avoid prolong or repeated contact with skin. Flammable solvents shall not be used on energized 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.

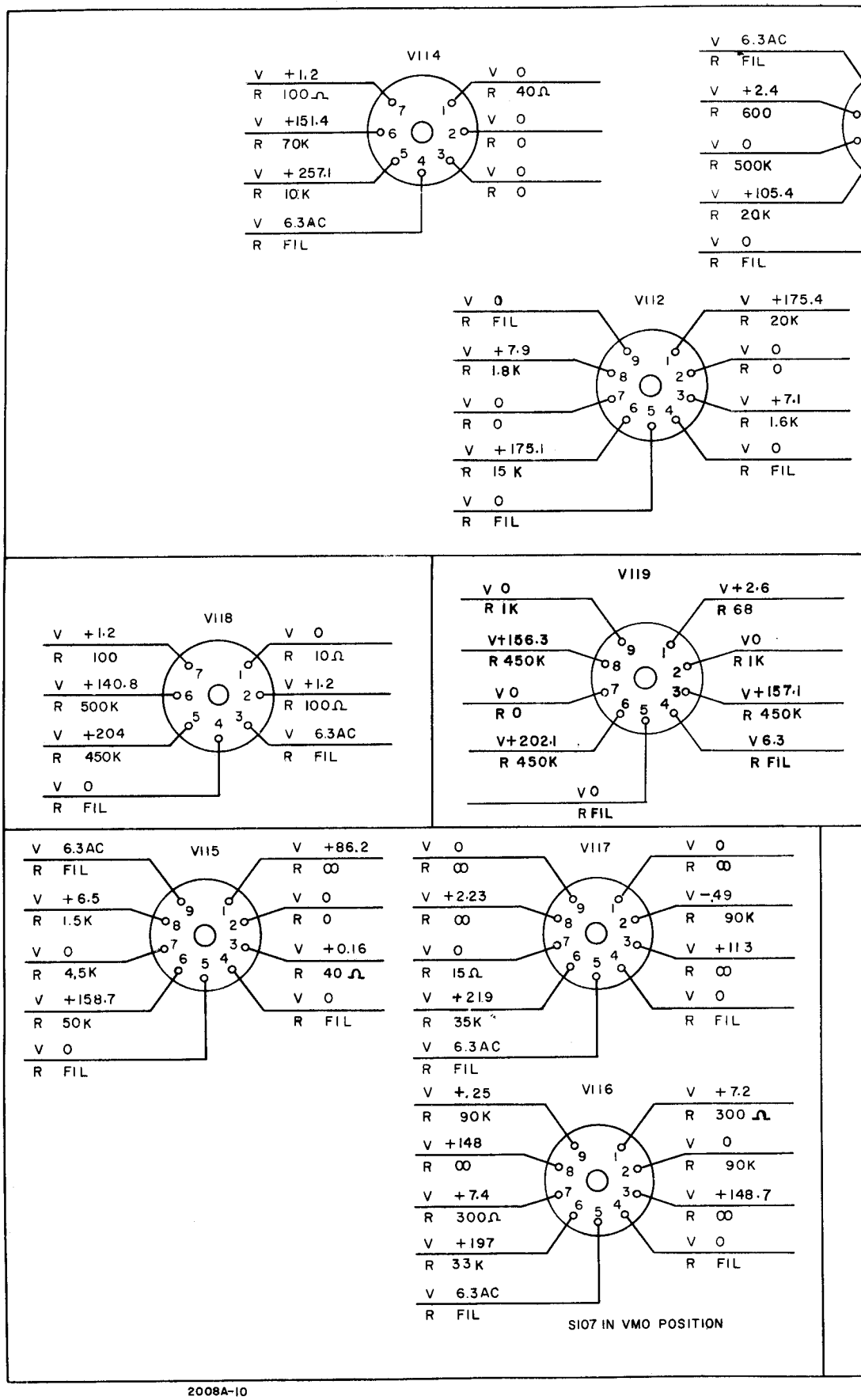
a. GENERAL CONSIDERATIONS. - When a piece of equipment has been working satisfactorily and suddenly fails, the cause of failure may be apparent either because of circumstances occurring at the time of failure or because of symptoms analogous to past failures. In this case, it is necessary to follow a lengthy and orderly course of troubleshooting in order to localize and isolate the faulty part.

A second major point in troubleshooting is to ascertain that all tubes and fuses are in proper working order; also that the equipment receives proper supply voltages. Many times this eliminates further investigation.

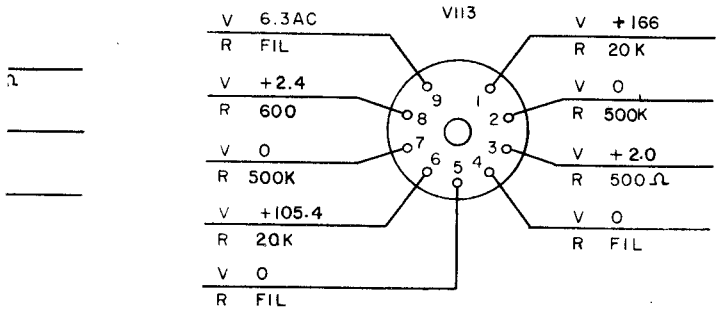
A third major point is to examine the equipment, section by section, for burned-out elements, charring, corrosion, arcing, excessive heat, dirt, dampness, etc. It is important to recognize that defective elements may have become defective due to overloaded operation or to tube and allied circuit component failure.

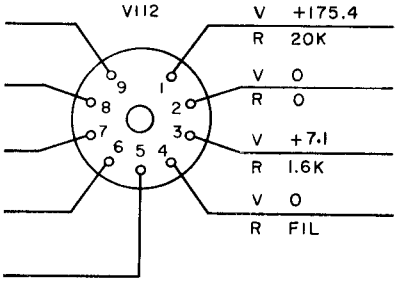
b. TROUBLESHOOTING CHARTS BASED ON OPERATING PROCEDURES. - Refer to Section 3 and to table 5-1. The general purpose of these charts is to localize the source of trouble.

c. VOLTAGE AND RESISTANCE DATA. - Voltage and resistance data is given in figure 5-1. Large deviations from the nominal value should be carefully investigated. When taking voltage and resistance measurements, use the schematic diagrams given in Section 7.

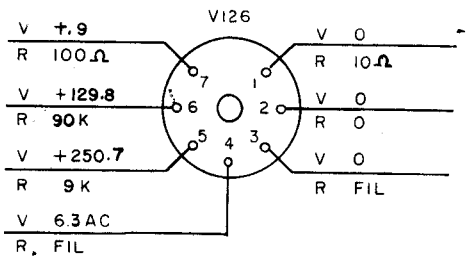

V114
V +1.2
R 100Ω
V +151.4
R 70K
V +257.1
R 10K
V 6.3AC
R FIL
V 0
R 40Ω
V 0
R 0
V 0
R 0
V 6.3AC
R FIL
V +2.4
R 600
V 0
R 500K
V +105.4
R 20K
V 0
R FIL
V 0
R FIL
V +7.9
R 1.8K
V 0
R 0
V +175.1
R 15 K
V 0
R FIL
V112
V +175.4
R 20K
V 0
R 0
V +7.1
R 1.6K
V 0
R FIL
V118
V +1.2
R 100
V +140.8
R 500K
V +204
R 450K
V 0
R FIL
V 0
R 10Ω
V +1.2
R 100Ω
V 6.3AC
R FIL
V119
V 0
R 1K
V+156.3
R 450K
V 0
R 0
V+202.1
R 450K
V 0
R FIL
V+2.6
R 68
V0
R 1K
V+157.1
R 450K
V 6.3
R FIL
V115
V 6.3AC
R FIL
V +6.5
R 1.5K
V 0
R 4,5K
V +158.7
R 50K
V 0
R FIL
V +86.2
R ∞
V 0
R 0
V +0.16
R 40Ω
V 0
R FIL
V117
V 0
R ∞
V +2.23
R ∞
V 0
R 15Ω
V +21.9
R 35K
V 6.3AC
R FIL
V 0
R ∞
V −.49
R 90K
V +113
R ∞
V 0
R FIL
V116
V +.25
R 90K
V +148
R ∞
V +7.4
R 300Ω
V +197
R 33K
V 6.3AC
R FIL
V +7.2
R 300Ω
V 0
R 90K
V +148.7
R ∞
V 0
R FIL
SI07 IN VMO POSITION

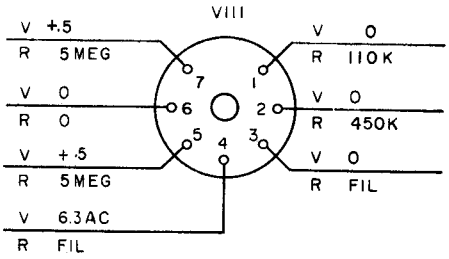
2008A-10

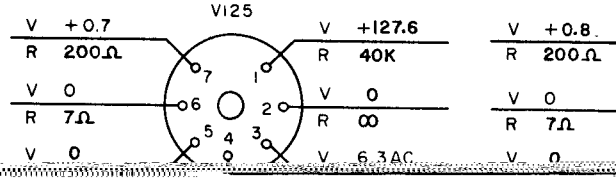

V113
V 6.3AC
R FIL
V +2.4
R 600
V 0
R 500K
V +105.4
R 20K
V 0
R FIL
V +166
R 20K
V 0
R 500K
V +2.0
R 500Ω
V 0
R FIL

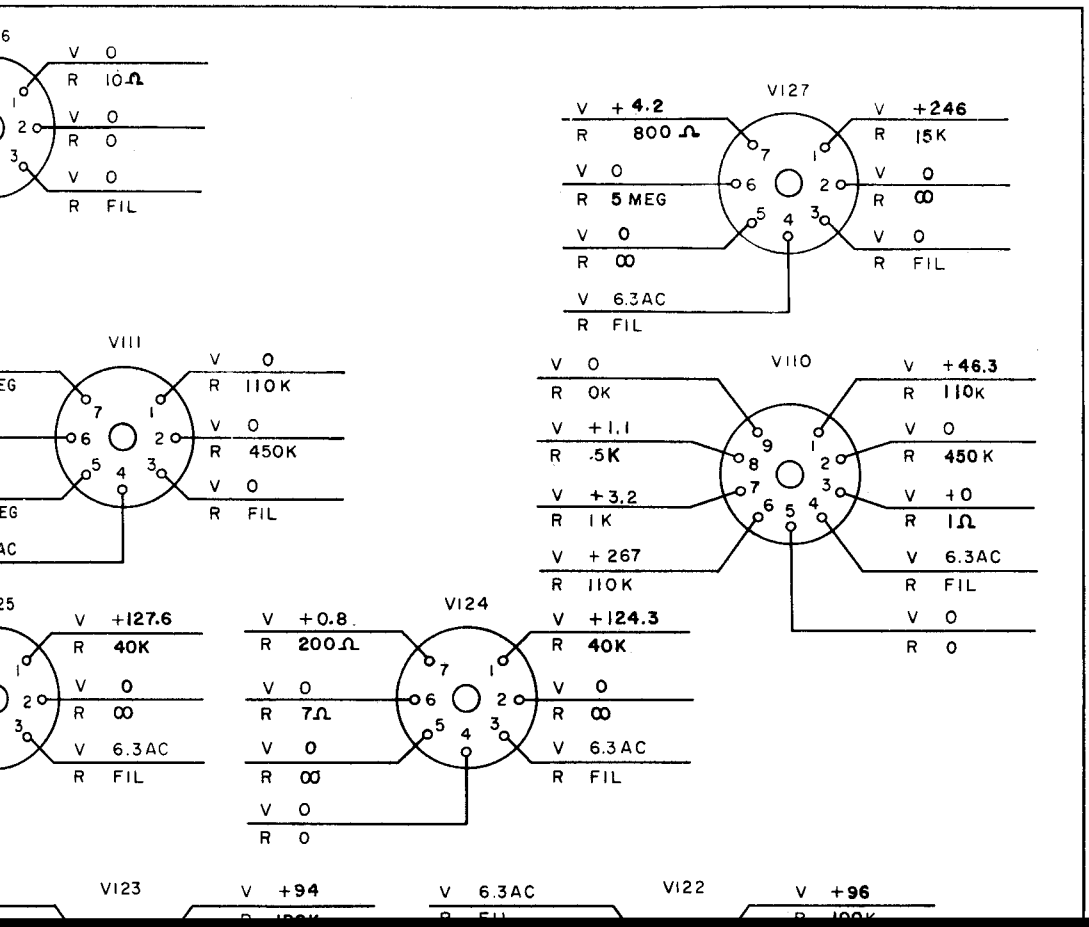

V112
V +175.4
R 20K
V 0
R 0
V +7.1
R 1.6K
V 0
R FIL

V119
V+2.6
V +267.4
R 11K


V126
V +.9
R 100Ω
V +129.8
R 90K
V +250.7
R 9K
V 6.3AC
R FIL
V 0
R 10Ω
V 0
R 0
V 0
R FIL


V111
V +.5
R 5MEG
V 0
R 0
V +.5
R 5MEG
V 6.3AC
R FIL
V 0
R 110K
V 0
R 450K
V 0
R FIL


V125
V +0.7
R 200Ω
V 0
R 7Ω
V 0
V +127.6
R 40K
V 0
R ∞
V 6.3AC
V +0.8
R 200Ω
V 0
R 7Ω
V 0


V 0
R 10Ω
V 0
R 0
V 0
R FIL
V127
V +4.2
R 800Ω
V 0
R 5 MEG
V 0
R ∞
V 6.3AC
R FIL
V +246
R 15K
V 0
R ∞
V 0
R FIL
V111
V 0
R 110K
V 0
R 450K
V 0
R FIL
V110
V 0
R 0K
V +1.1
R .5K
V +3.2
R 1K
V +267
R 110K
V +46.3
R 110K
V 0
R 450K
V +0
R 1Ω
V 6.3AC
R FIL
V 0
R 0
V +127.6
R 40K
V 0
R ∞
V 6.3AC
R FIL
V124
V +0.8
R 200Ω
V 0
R 7Ω
V 0
R ∞
V 0
R 0
V +124.3
R 40K
V 0
R ∞
V 6.3AC
R FIL
V123
V +94
V 6.3AC
V122
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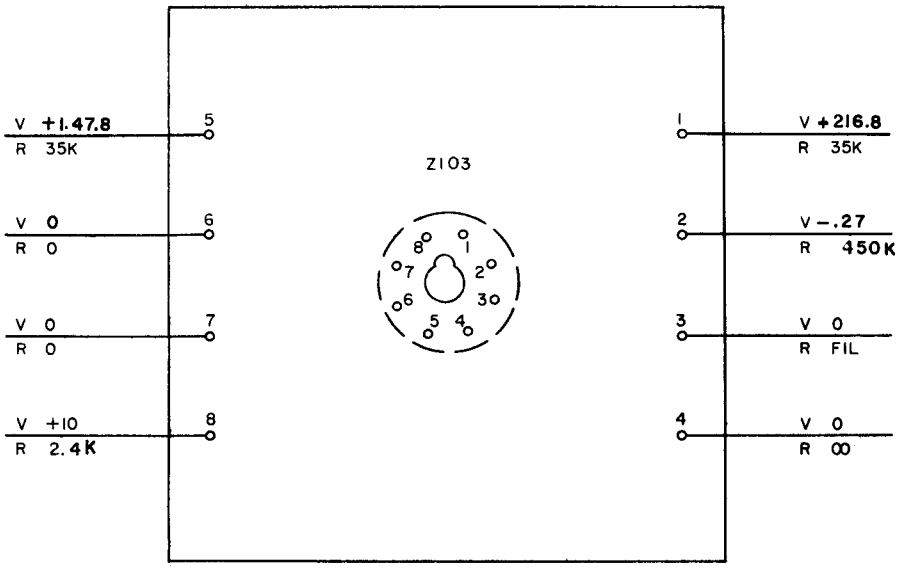
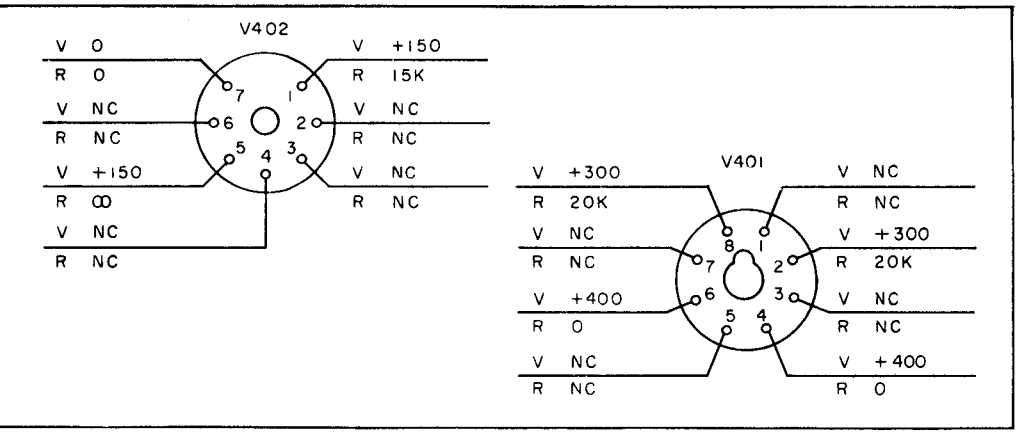
R 0
V +10
R 2.4K
5
6
7
8



SBE-3 POWER SUPPLY



NDITIONS
VOLTAGE MEASUREMENTS
. NO SIGNAL INPUT
2. ALL CONTROLS AT OFF OR MINIMUM.
3. ALL MEASUREMENTS TAKEN WITH A COHU DIGITAL VOLTMETER MODEL 510 AND A TUBE ADAPTER.
4. DIGITAL VOLTMETER IMPEDANCE MINIMUM 1000 MEGOHMS.
5. ALL MEASUREMENTS TAKEN WITH 115 VOLTS A.C. LINE VOLTAGE AND ARE ± 10%

RESISTANCE MEASUREMENTS
1. ALL POWER OFF.
2. POWER PLUGS DISCONNECTED
3. ALL MEASUREMENTS TAKEN WITH RESPECT TO GROUND USING A SIMPSON MODEL 260 AND A TUBE ADAPTER.
4. ALL FRONT PANEL SWITCHES AND CONTROLS AT OFF OR MINIMUM POSITIONS
5. UNLESS OTHERWISE SPECIFIED ALL RESISTANCE VALUES ARE IN OHMS.

Figure 5-1. Voltage and Resistance Diagram

TABLE 5-1. OVERALL TROUBLESHOOTING CHART

STEP	CONTROL OPERATED	NORMAL INDICATION	REMEDY
1	Set POWER switch S103 at ON.	Power supply indicator I103, OVEN indicator lamp I102, dial lamps, and tube filaments should all light.	Set POWER switch S103 at OFF. Check fuses F201 and F402, and power cord. Check incoming power.
2	Set EXCITER switch S105 at ON.	EXCITER indicator lamp I101 should light.	Set POWER switch S103 at OFF. Check fuse F403 and wire connections.
3	Set XMTR switch S104 at ON.	Activates transmitter, eliminates need for VOX, or push-to-talk, through EXCITER switch S105.	Check final plate relay circuit of transmitter.
4	a. Set XMTR switch S104 at OFF. b. Set EXCITER switch S105 at STANDBY. c. Connect a mike to MIKE input jack J101. Start talking directly into mike and at the same time slightly rotate VOX GAIN control R140. d. At conclusion of this step, return XMTR and EXCITER switches to ON.	Transmitter can be operated by VOX or push-to-talk circuits when EXCITER switch S105 is set at STANDBY EXCITER indicator lamp I101 remains lit with normal speech level and goes off with no speech input.	Visually check all wire connections to the XMTR and EXCITER switches, fault may also be in VOX section. If EXCITER indicator lamp does light, set EXCITER switch S105 at ON to test EXCITER lamp; otherwise, fault may be within VOX section. Should the EXCITER indicator lamp light erratically with no direct speech input, SQUELCH GAIN control R129 is not adjusted properly; refer to VOX alignment procedure (paragraphs 5-3 and 5-4).
5	MF TUNING		
	a. Turn METER SW S109 to CAL, and zero meter. b. Turn METER SW to MF. c. Turn MF XTAL SW to VMO or crystal. d. Set MF dial to frequency of VMO or XTAL by use of MF TUNING control. e. Turn USB, LSB, and XMTR switches to OFF. f. Turn CARRIER INSERT control fully CW. g. Adjust MF TUNING control slightly.	Meter indicates zero for step a. In step b as the MF TUNING control is rotated, the meter deflection needle should read maximum.	If meter does not calibrate to zero or the meter does not indicate a reading with METER SW set MF, proceed as follows: Check V112 and R135. Visually check all meter and various control and switch wire connections. If these are normal, probable cause is within MF section. Refer to alignment procedures (paragraphs 5-3 and 5-4).
6	RF TUNING		
	a. Do not alter previous settings of MF TUNING control. b. Turn BAND MCS to frequency range desired.	Maximum meter needle deflection.	Visually check all control wire connections; if these are normal, probable cause is within the RF section. Refer to alignment procedures given in paragraphs 5-3 and 5-4.

TABLE 5-1. OVERALL TROUBLESHOOTING CHART (Cont'd)

STEP	CONTROL OPERATED	NORMAL INDICATION	REMEDY
6 Cont'd	c. Turn OUTPUT TUNING switch to frequency range desired. d. Turn METER SW switch to RF. e. Using OUTPUT TUNING control, tune SBE to output frequency. f. Advance OUTPUT control as required to obtain indication on meter. g. Adjust OUTPUT TUNING control for peak indication on r-f meter.		
7	DOUBLE SIDEBAND (Without Carrier) a. Turn USB switch to desired channel. b. Turn CARRIER INSERT control to 0. c. Turn LSB switch to OFF. Turn METER SW switch to USB. d. Advance USB GAIN control until meter indicates 50%. e. Turn USB switch to OFF. Turn LSB switch to desired channel. f. Turn METER SW switch to LSB. g. Advance LSB GAIN control until meter indicates 50%. h. Turn METER SW switch to RF. i. Advance OUTPUT control until meter indicates 50%. j. Turn LSB switch to OFF. Turn USB switch to position selected in step a. k. Adjust USB GAIN to obtain meter indication of 50%. l. Turn LSB switch to desired channel as selected in step g.	Combined gain for USB and LSB GAIN control settings should be approximately 100% on meter. *NOTE* *The meter circuit within the SBE, as is the case with most VTVM's, has a small amount of waveform error. For this reason, when each sideband is set up independently of the other and when each is added on the meter, the sum of 50% and 50% may be slightly less than 100%. This is due to the presence of a modulated envelope which is generated when 2 or more frequencies are present in the output at the same time.*	If combined meter reading of the USB and LSB differs considerably from 100%, alternately switch USB and LSB switches to OFF; and readjust each channel for a meter indication of 50%. If either channel can not peak to meter indication of 50%, malfunction may be in either or both LSB or USB audio sections. Refer to alignment procedures given in paragraphs 5-3 and 5-4.

5-3. ALIGNMENT PROCEDURES.

Alignment procedures given in this section are continuous and must be performed in the order given. Refer to figures 5-2 and 5-3 for component location.

a. TEST EQUIPMENT REQUIRED. - Table 5-2 lists the test equipment required to align the SBE.

b. PRELIMINARY PROCEDURES.

(1) Attach jumper to terminals 2 and 3 of E101.

(2) With POWER switch set at OFF and power plug disconnected, check oven heaters by measuring resistance between pins D and E of J109. For 115 vac connections, resistance should be 300 ohms ±10%; for 230 vac connections, resistance should be 600 ohms ±10%.

(3) Check ALDC circuitry as follows: from J113 to ground (chassis), resistance measurement should be 470 K ohms ±10%; from J113 to pins 2 and 7 of V113, resistance measurement should be 23 K ohms ±10% in each case.

(4) Ensure that calibration marks of RF and MF dial align with fiducial line on dial window at counterclockwise dial stop.

(5) Connect 70-ohm load to RF OUT jack J103.

(6) Place test crystals in oven as follows:

POSITION	FREQUENCY
1	2.0 mc
2	4.0 mc
3	2.25 mc
4	4.25 mc

(7) Connect exciter unit to power supply, and apply a-c power; oven and dial lamps should light. After brief warm-up period, oven lamp should commence to cycle on and off.

(8) With METER SW switch set at CAL, adjust CAL potentiometer for zero indication on front-panel meter.

c. ALIGNMENT OF 250 KCS OSCILLATOR.

(1) Ensure that preliminary procedures outlined in paragraph 5-3b have been completed.

(2) Using VTVM, check output voltage

TABLE 5-2. TEST EQUIPMENT REQUIRED

QTY.	ITEM	MANUFACTURER AND MODEL
1	Frequency Counter	Hewlett Packard, Model 524-C or equivalent
1	AC Voltmeter	Ballantine, Model 314 or equivalent
1	VTVM	Hewlett Packard, Model 410B or equivalent
1	Audio Generator	Hewlett Packard, Model 200CD or equivalent
1	Oscilloscope	Tektronix, Model 543 or equivalent
1	Spectrum Analyzer	The Technical Materiel Corp., Model PTE or equivalent
1	Resistor, 70 ohm, 2 watt	
1	Resistor, 1 megohm, 1/2 watt	
1	Crystal, 2.000 MC	TMC, Type CR-27A/U*
1	Crystal, 2.250 MC	TMC, Type CR-27A/U*
1	Crystal, 4.000 MC	TMC, Type CR-27A/U*
1	Crystal, 4.250 MC	TMC, Type CR-27A/U*

*These crystals are recommended as a matter of convenience. Any VMO capable of supplying the indi-

of 250-kcs oscillator at pin 8 of Z103; indication should be between .8 and 1.2 volts.

(3) Using frequency counter, check frequency of 250-kcs oscillator at pin 8 of Z103; adjust C120 as required to obtain 250 kcs + 3 cps.

d. ALIGNMENT OF AUDIO INPUT AND BALANCED MODULATOR STAGES.

(1) TUNING T125 AND 250-KCS CARRIER BALANCE, LSB.

(a) Ensure that procedures outlined in paragraphs 5-3b, and 5-3c have been completed.

(b) Turn OUTPUT TUNING bandswitch to 4-8 mc band. Set LSB switch selector at CH 1; set all other channel controls at OFF or minimum position.

(c) Connect AF generator to terminals 6 and 8 of E101, channel 1, for balanced line operation. To minimize unwanted pick up, use twisted shielded pair shield grounded to terminal 7; then connect jumper from terminal 7 to terminal 5.

(d) Adjust AF generator frequency for approximate mid point of audio bandpass (refer to technical specifications given in section 1) at .05 volt output.

(e) Connect VTVM to output terminals of Z110, and adjust LSB GAIN control for 10-db deflection on .1 volt scale. Adjust top and bottom slugs of T125 for maximum deflection.

(f) Connect VTVM across input of Z110. Turn off AF generator, and adjust R265 for minimum deflection on VTVM.

(2) TUNING T126 AND 250-KCS CARRIER BALANCE, USB. - Repeat the above steps (paragraph 5-3d, part 1) for T126, filter Z111, and R266 (carrier balance control).

(3) AUDIO AND SIDEBAND REVERSAL.

(a) MICROPHONE INPUT. - Upon completion of paragraphs (1) and (2) above, proceed as follows:

1. Connect unbalanced output of AF generator in series with 1-megohm resistor to pin 1 of MIKE jack; connect grounded side of AF generator output and to pin 2.

2. Set USB and LSB selector switches at OFF; set CARRIER INSERT control at minimum (fully counterclockwise).

3. Tune AF generator for 1000 cps signal at .05 volt output. Set LSB and METER SW selector switches of SBE at MIKE and LSB respectively. Adjust LSB GAIN control for meter indication of 100%. The 100% meter indication should be obtained before LSB GAIN control reaches maximum position.

4. Using VTVM arranged for 0-1 vac, measure output of LSB filter Z110. Set OUTPUT TUNING bandswitch at 1.75 - 4 mc; output indication should now be transferred from LSB filter Z110 to USB filter Z111.

(b) CHANNEL 1 INPUT. - Upon completion of paragraphs (1), (2), and (3) above, proceed as follows:

1. Using twisted shielded pair, connect balanced output of AF generator to terminals 6 and 8 of E101. Connect shield to terminal 7; connect terminal 7 to terminal 5.

2. Set USB and LSB selector switches at OFF; set CARRIER INSERT control at minimum (fully counterclockwise).

3. Set OUTPUT TUNING bandswitch at any position except 1.75 - 4 mcs.

4. Set LSB selector switch at CH 1, and repeat procedure outlined in steps 3 and 4 above for MICROPHONE INPUT.

(c) CHANNEL 2 INPUT. - Channel 2 input circuitry is checked in a manner similar to that outlined for channel 1. The channel 1 procedure outlined above will apply as written with the following exceptions:

1. The balanced output of the AF generator should be connected to terminals 10 and 12 of E101. Terminal 11 of E101 should be connected to terminal 9.

2. The USB selector switch should be set at CH 1 in step 4. The USB GAIN control should be adjusted for a meter indication of 100%. Voltage measurement should be made first at Z111; when the OUTPUT TUNING bandswitch is set at 1.75 - 4 mc, the output indication will be transferred from Z111 to Z110.

e. ALIGNMENT OF MF BALANCED MODULATOR.

(1) Perform procedures outlined in paragraphs 5-3b, 5-3c and 5-3d.

NOTE

When performing step (2), two frequencies (250-Kc when carrier is inserted, and an MF injection frequency) will appear at the mixer grid of V113.

(2) Connect a variable master oscillator (such as TMC's VOX-5) capable of providing minimum voltages specified in step (3) to VMO input jack J104. When using VOX-5, maintain a .1 indication on output meter.

(3) Connect RF voltmeter at junction of C163 and C164; measure voltages under conditions

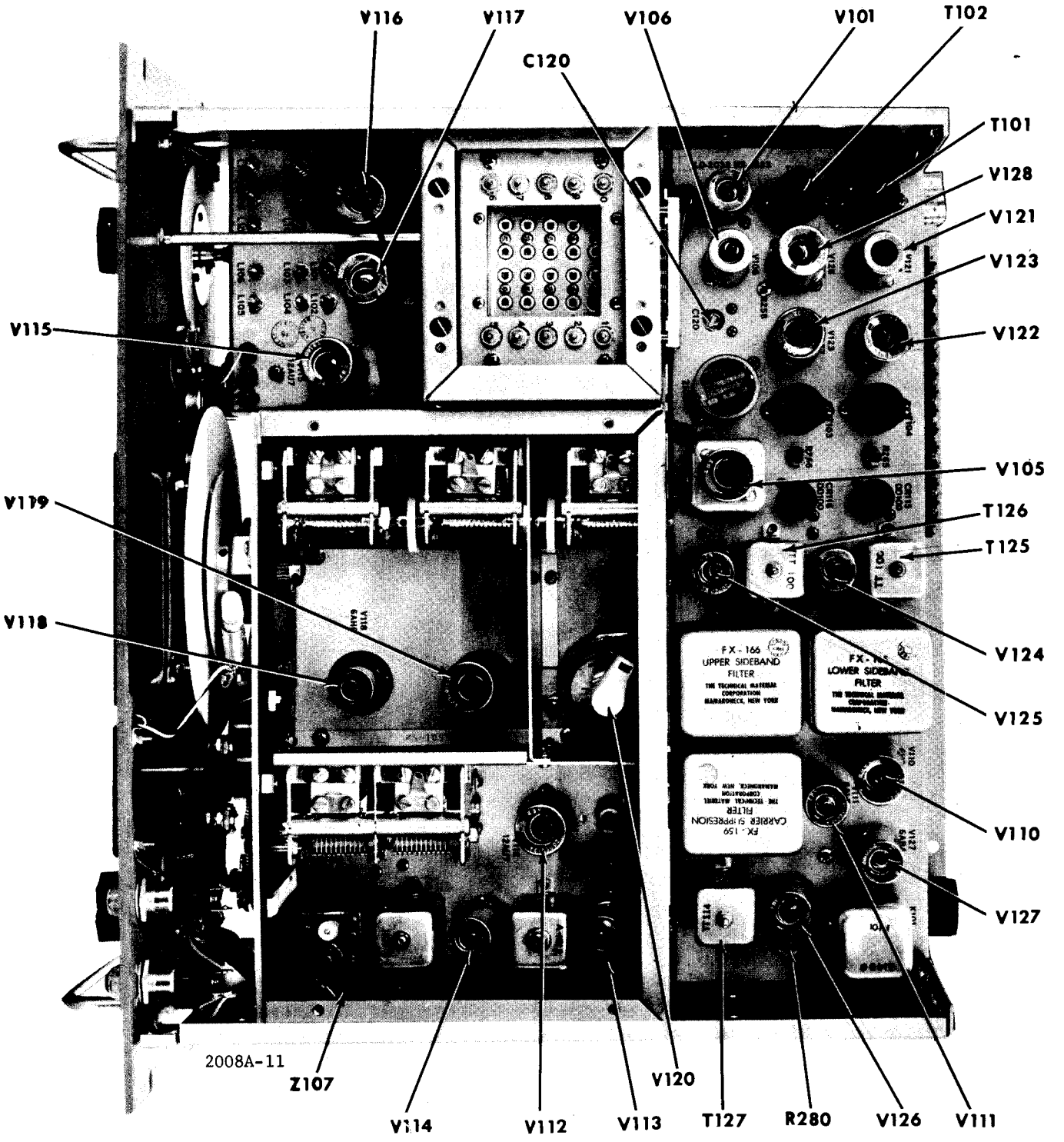


Figure 5-2. Component Locations SBE, Top View

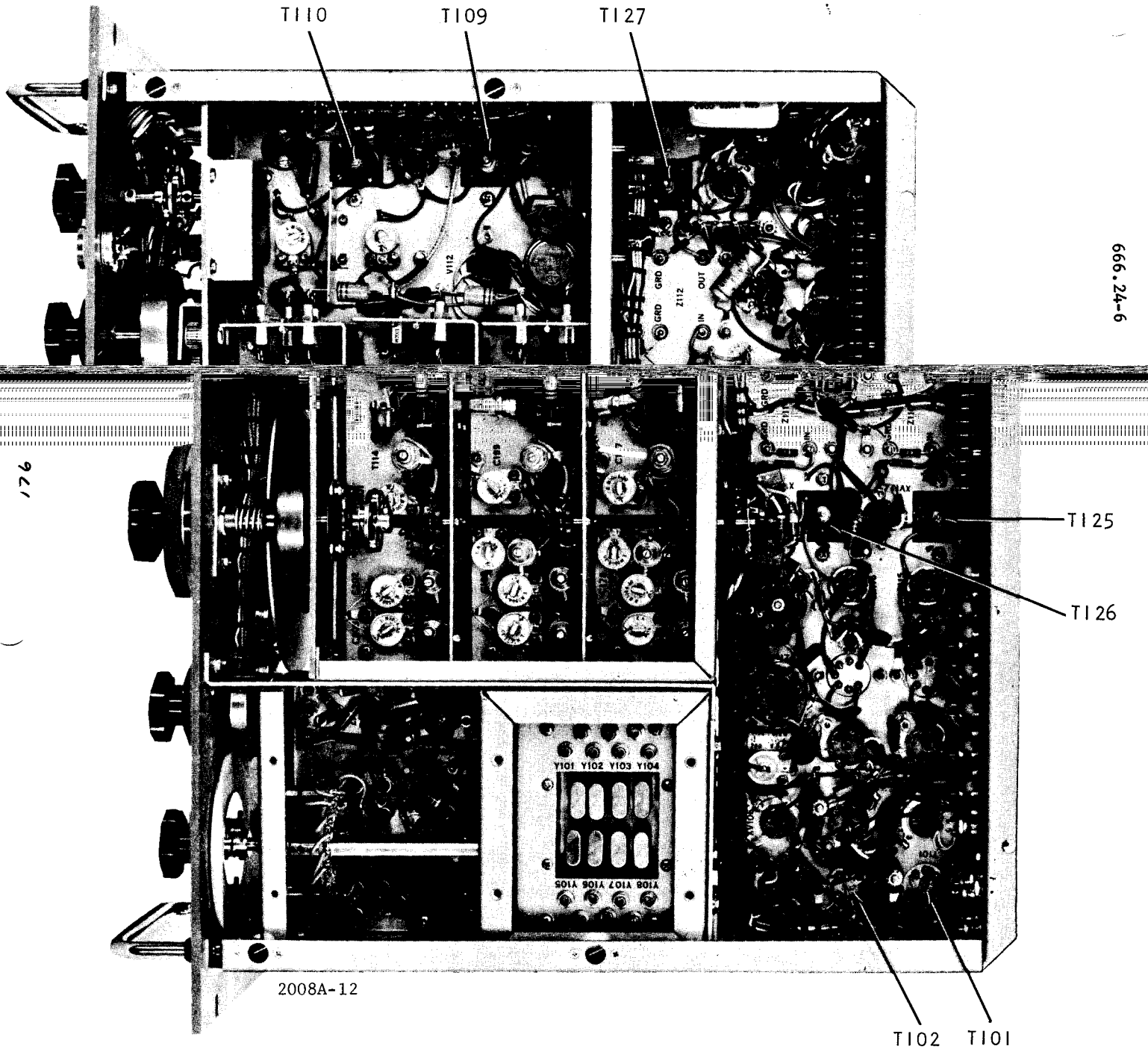


Figure 5-3. Component Locations SBE, Bottom View

indicated below.

MF XTAL SW POSITION	FREQUENCY	MIN. VOLTAGE LIMIT
1	2.0 MC	1.5 V
2	4.0 MC	.6 V
VMO	2.0 MC	1.5 V
VMO	4.0 MC	.6 V

(4) Before aligning MF section, ensure that MF tuning capacitors are fully meshed when calibration mark (to left of 2.0 mc frequency indication on MF dial) aligns with fiducial line.

(5) Remove P107 from J110 of Z107; connect VTVM to pin 2 of Z107. Rotate MF balance control R130 either clockwise or counterclockwise to create unbalanced condition.

NOTE

A variable master oscillator may be used in place of MF crystals (refer to table 5-2) in the following steps.

(6) Set MF XTAL SW switch at 1 (2.000 mc) and adjust MF TUNING control as required to obtain 2.25 mc on MF dial. Tune T109 and T110 for maximum indication on VTVM.

(7) Set MF XTAL SW switch at 2 (4.000 mc) and adjust MF TUNING control as required to obtain 4.25 mc on MF dial. Tune trimmers C140 and C141 for maximum indication on VTVM.

NOTE

The above preliminary alignment insures subsequent selection of the proper mixer product on the MF dial.

(8) Set MF XTAL SW switch at 1 (2.000 mc) and adjust MF TUNING control as required to obtain 2.25 mc on MF dial.

(9) Set CARRIER INSERT control fully counterclockwise. Set METER SW switch at MF, and adjust R130 as required for minimum carrier as indicated on front-panel meter.

(10) Lock R130 and re-connect P107 to J110.

(11) Rotate CARRIER INSERT control fully clockwise. Adjust MF TUNING control for 2.0 mc on MF dial. Tune T109 and T110 for maximum indication on VTVM. Using CARRIER INSERT control, reduce carrier as required to provide sharp tuning indication on VTVM.

(12) Set MF XTAL SW switch at 2 (4.000 mc), and adjust MF TUNING control as required for 4.0 mc on MF dial. Tune trimmers C140 and C141 for maximum indication on VTVM. Using CARRIER INSERT control, reduce carrier as required to provide sharp tuning indication on VTVM.

(13) Repeat steps (11) and (12) above until band is tracked. Lock slugs of T109 and T110.

f. ALIGNMENT OF HF OSCILLATOR AND MULTIPLIER STAGES. - Ensure that procedures outlined in paragraphs 5-3b, 5-3c, 5-3d, and 5-3e have been completed. Proceed as follows:

(1) Remove lead from J108 and connect Amphenol series 27, 50-ohm "T" connector to J108. Connect P105 to one side of "T" connector; connect other side of "T" connector to RF VTVM.

(2) Set all controls except POWER and EXCITER switches at OFF or minimum position.

(3) Adjust L101 through L114 for 2 volts indication on RF VTVM at the corresponding "INJECTION" frequency shown below.

(4) Remove VTVM and substitute frequency counter.

(5) Adjust proper capacitor for correct frequency indication on frequency counter for frequencies shown in "INJECTION" column below.

(6) Repeat steps (c), (d), and (e) above until frequency and output voltages are correct. Reconnect P105 to J108.

NOTE

When adjusting coil slugs L101 through L114, turn slug all the way out and adjust on the first 2 volt peak indication.

BAND MCS DIAL NUMERIC	XTAL F. (MC)	INJECTION F. (MC)	ADJUSTMENTS	
4	8	8	C285	L101
5	10	10	C286	L102
6	12	12	C287	L103
7	14	14	C233	L104
8	8	16	C234	L105
9	18	18	C235	L106
10	10	20	C236	L107
11	11	22	C237	L108
12	12	24	C238	L109
13	13	26	C239	L110
14	14	28	C240	L111
15	10	30	C288	L112
16	8	32	C289	L113
17	17	34	C290	L114

g. ALIGNMENT OF RF AMPLIFIER STAGES.

NOTE

When performing alignment procedures for RF Amplifier stages, a variable master oscillator may be substituted for MF crystals (refer to table 5-2).

(1) PRELIMINARY PROCEDURE. - Ensure that procedures outlined in paragraphs 5-3b, 5-3c, 5-3d, 5-3e, and 5-3f have been completed, and proceed as follows:

(a) Ensure that output tuning capacitors C181A, C181B, and C181C are fully meshed when calibration mark (to left of 1.75 mc frequency indication on RF dial) aligns with fiducial line.

(b) Set controls at positions indicated below.

CONTROL	POSITION
USB selector switch	OFF
LSB selector switch	OFF
MF XTAL SW	1 (2.000 mc)
CARRIER INSERT	Fully CW
METER SW	MF
MF TUNING	As required to obtain 2 mc on MF dial. Continue to adjust MF TUNING control for peak indication on front-panel meter.

(c) Ensure that RF OUTPUT jack J103 is terminated with 70-ohm load; connect RF VTVM across 70-ohm load.

(2) 1.75 - 4 MC BAND ALIGNMENT.

NOTE

During the following alignment procedure, it may be necessary to adjust the OUTPUT control to maintain minimum meter indications.

(a) Ensure that procedures outlined in paragraph (1) above have been completed.

(b) Set controls at positions indicated below.

CONTROL	POSITION
OUTPUT TUNING bandswitch	1.75 - 4 MC
METER SW	RF
BAND MCS	As required to obtain 1.75 - 4 mc band (dial numeric=0; 18 mc hfo crystal position*)

**NOTE*

The 18 mc injection frequency is applied to the balanced modulator to maintain bias on modulator diodes thus preventing intermodulation distortion. The sum and difference frequencies produced by the 18 mc injection frequency will have no effect on circuit operation.

(c) Adjust OUTPUT TUNING control for 1.75 mc on RF dial.

(d) Tune T116 and T120 for maximum indication on VTVM.

(e) Set MF XTAL switch at 4 (4.250 mc); set METER SW switch at MF.

(f) Adjust MF TUNING control for 4.250 mc on MF dial. As required to obtain 2 mc on MF dial. Continue to adjust MF TUNING control for peak indication on front-panel meter.

(g) Set METER SW switch at RF. Set OUTPUT TUNING control at 4.0 mc on RF dial.

(h) Adjust C191 and C179 for maximum indication on VTVM.

(i) Repeat steps (b) through (h) with OUTPUT control adjusted for reduced drive to insure sharp tuning peaks and proper band tracking.

(3) 4 - 8 MC BAND ALIGNMENT.

NOTE

During the following alignment procedure, it may be necessary to adjust the OUTPUT control to maintain minimum meter indications.

(a) Ensure that procedures outlined in paragraphs (1) and (2) above have been completed.

(b) Set controls at positions indicated below.

CONTROL	POSITION
OUTPUT TUNING bandswitch	4 - 8 MC
MF XTAL	4 (4.250 mc)
METER SW	MF

(c) Adjust MF TUNING control for 4.250 mc on MF dial. As required to obtain 2 mc on MF dial. Continue to adjust MF TUNING control for peak indication on front-panel meter.

(d) Set METER SW switch at RF. Set OUTPUT TUNING control at 4 mc on RF dial.

(e) Tune T113, T117 and T121 for maximum indication on VTVM.

(f) Set controls at positions indicated below.

CONTROL	POSITION
CARRIER INSERT	Fully CCW (minimum carrier)
MF XTAL*	VMO
BAND MCS*	As required for 4.25-6.25 mc band (dial numeric=4; 8 mc hfo crystal position).
OUTPUT TUNING control	8 mc on RF dial

NOTE

The internal hfo crystal oscillators are employed as the frequency source for further alignment of the RF bands.

(g) Adjust capacitors C203, C192, and C180 for maximum indication on VTVM.

(h) Repeat steps (b) through (g) with OUTPUT control adjusted for reduced drive to insure sharp tuning peaks and proper band tracking.

(4) 8-16 MC BAND ALIGNMENT.

NOTE

During the following alignment procedure, it may be necessary to adjust the OUTPUT control to maintain minimum meter indications.

(a). Ensure that procedures outlined in paragraphs (1), (2), and (3) above have been completed.

(b) Set controls at positions indicated below.

CONTROL	POSITION
OUTPUT TUNING bandswitch	8 - 16 mc
BAND MCS	As required for 4.25-6.25 mc band (dial numeric=4; 8 hfo crystal position).
OUTPUT TUNING control	8 mc on RF dial

(c) Adjust T115, T119, and T122 for maximum indication on VTVM.

(d) Set controls at positions indicated below.

CONTROL	POSITION
OUTPUT TUNING control	16 mc on RF dial
BAND MCS	As required for 12.25-14.25 mc band (dial numeric=8; 16 mc hfo crystal position).
METER SW	RF

(e) Adjust capacitors C202, C190, and C178 for maximum indication on VTVM.

(f) Repeat steps (b) through (e) with OUTPUT control adjusted for reduced drive to insure sharp tuning peaks and proper band tracking.

(5) 16-32 MC BAND ALIGNMENT.

NOTE

During the following alignment procedure, it may be necessary to adjust the OUTPUT control to maintain minimum meter indications.

(a) Ensure that procedures outlined in paragraphs (1), (2), (3), and (4) above have been completed.

(b) Set controls at positions indicated below.

CONTROL	POSITION
OUTPUT TUNING bandswitch	16-32 mc
METER SW	RF
BAND MCS	As required for 12.25-14.25 mc band (dial numeric=8; 16 mc hfo crystal position).
OUTPUT TUNING control	16 mc on RF dial

(c) Adjust T114, T118, and T112 for maximum indication of VTVM.

(d) Set controls at positions indicated below.

CONTROL	POSITION
OUTPUT TUNING control	32 mc on RF dial
BAND MCS	As required for 28.25-30.25 (dial numeric=16; 32 mc hfo crystal position)

(e) Adjust capacitors C201, C189, C177 for maximum indication on VTVM.

(f) Repeat steps (b) through (e) with OUTPUT control adjusted for reduced drive to ensure sharp tuning peaks and proper band tracking.

(6) ALIGNMENT OF HF CARRIER BALANCE. - Upon completion of RF Alignment procedure outlined in paragraphs (1) through (5) above, proceed as follows.

(a) Set controls at positions indicated below.

CONTROL	POSITION
CARRIER INSERT	Fully CCW (minimum carrier)
METER SW	RF
OUTPUT	5
BAND MCS	As required for 1.75-4.25 mc band (dial numeric=0; 18 mc hfo crystal position*)

NOTE

The 18 mc injection frequency is applied to the balanced modulator to maintain bias on modulator diodes thus preventing intermodulation distortion. The sum and difference frequencies produced by the 18 mc injection frequency will have no effect on circuit operation.

(b) Adjust potentiometer and variable capacitor of Z107 for minimum indication of front-panel meter. Lock potentiometer.

5-4. COMPONENT REPAIR AND REPLACEMENT.

Repair and replacement of SBE components is obvious upon inspection; detailed procedures are therefore not given in this manual. Certain precautions should be observed when replacing fuses and electron tubes (refer to paragraphs a and b below).

a. REPLACEMENT OF ELECTRON TUBES. - When replacing electron tubes, particular attention should be paid to the following:

(1) When withdrawing miniature tubes from their sockets, pull them straight out; do not rock or turn them. If pins of miniature tubes are bent, straighten them with a proper pin straightener before replacing the tube.

(2) Some circuits, for example oscillator circuits, may function better with one tube than with another even though both tubes are new or both tubes measure the same when checked on a tube tester. Replacement of a tube in these circuits may result in subsequent realignment of the circuit.

(3) Tubes should not be replaced or discarded merely because they have been used for some time. Satisfactory operation in a circuit is the final proof of tube quality; the tube in use may work better than a new tube.

b. REPLACEMENT OF FUSES. - All fuses are located on the front panel of the power supply (refer to figure 3-2 and table 3-2).

CAUTION

If a fuse burns out, do not replace it with one of higher rating. If a fuse burns out immediately after replacement, do not replace it a second time until the trouble has been located and corrected.

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

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C101 thru C115	NOT USED	
C116	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 10,000 uuf, GMV; 500 WVDC.	CC100-16
C117	Same as C116.	
C118	CAPACITOR, FIXED, MICA DIELECTRIC: 1000 uuf, ±2%; 500 WVDC. (Part of Z103)	CM20F102G03
C119	NOT USED	
500 WVDC.		
Same as C116.		C121
CAPACITOR, FIXED, MICA DIELECTRIC: 220 uuf, ±2%; 500 WVDC. (Part of Z103)	CM15F221G03	C122
CAPACITOR, FIXED, CERAMIC: 10 uuf, 500 WVDC. (Part of Z103)	CC21SL100D	C123
Same as C116.		C124
Same as C116.		C125
CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1000 uuf, GMV; 500 WVDC.	CC100-29	C126
Same as C116.		C127
Same as C126.		C128
NOT USED		C129
CAPACITOR, FIXED, MYLAR DIELECTRIC: .1 uf, ±10%, 200 WVDC.	CN108C1003K	C130

PARTS LIST (CONT)

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C160	NOT USED	
C161	Same as C116.	
C162	Same as C116.	
C163	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 47 uuf, ±10%; 500 WVDC.	CC21SL470K
C164	Same as C163.	
C165	NOT USED	
C166	Same as C116.	
C167 A, B	CAPACITOR, VARIABLE, AIR DIELECTRIC: 2 sections, 12.5 to 270 uuf, each section.	CB127-1
C168 thru C171	Same as C116.	
C172	NOT USED	
C173	Same as C116.	
C174	Same as C132.	
C175	Same as C126.	
C176	CAPACITOR, FIXED, MICA DIELECTRIC: 100 uuf, ±5%; 500 WVDC.	CM15F101J03
C177	CAPACITOR, VARIABLE, CERAMIC: 4-30 uuf, 500 WVDC, char. C.	CV11C300
C178 thru C180	Same as C177.	
C181A	CAPACITOR, VARIABLE, AIR DIELECTRIC: 12.5 to 270 uuf, each section.	CB137-1

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C181B	CAPACITOR, VARIABLE, AIR DIELECTRIC: 12.5 to 270 uuf, each section.	CB137-2
C181C	CAPACITOR, VARIABLE, AIR DIELECTRIC: 12.5 to 270 uuf, each section.	CB137-3
C182	Same as C118.	
C183	Same as C132.	
C184	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 1000 uuf, ±20%, 500 WVDC.	CK70AW102M
C185 thru C187	Same as C132.	
C188	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf, 50 WVDC.	CE63C500G
C189 thru C192	Same as C177.	
C193	Same as C118.	
C194	Same as C132.	
C195	NOT USED	
C196	Same as C132.	
C197	Same as C116.	
C198 thru C200	Same as C184.	
C201 thru C203	Same as C177.	

TRANSMITTING MODE SELECTOR MODEL SRE-8, 9, 10

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C224 thru C232	Same as C223.	
C233	CAPACITOR, VARIABLE, GLASS DIELECTRIC: 1-60 uuf, 1000 WVDC.	CV115
C234 thru C240	Same as C233.	
C241	CAPACITOR, FIXED, MICA DIELECTRIC: 220 uuf, ±5%; 500 WVDC. (Part of L101)	CM15D221J
C242	CAPACITOR, FIXED, MICA DIELECTRIC: 130 uuf, ±5%; 500 WVDC. (Part of L102)	CM15C131J
C243	CAPACITOR, FIXED, MICA DIELECTRIC: 82 uuf, ±5%; 500 WVDC. (Part of L103)	CM15C820J
C244	CAPACITOR, FIXED, MICA DIELECTRIC: 47 uuf, ±5%; 500 WVDC. (Part of L105)	CM15C470J
C245	CAPACITOR, FIXED, MICA DIELECTRIC: 24 uuf, ±5%; 500 WVDC. (Part of L106)	CM15C240J
C246	Same as C184.	
C247 thru C249	Same as C184.	
C250 thru C252	Same as C116.	
C253	Same as C184.	
C254	Same as C116.	
C255	NOT USED	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C256	CAPACITOR, FIXED, MICA DIELECTRIC: 51 uuf, ±5%; 500 WVDC. (Part of L104)	CM15C510J
C257	Same as C116.	
C258 thru C260	NOT USED	
C261	Same as C130.	
C262 thru C268	Same as C116.	
C269	CAPACITOR, FIXED, MICA DIELECTRIC: 1000 uuf, ±10%; 300 WVDC; button type.	CB21QB102K
C270 thru C273	Same as C269.	
C274 thru C278	Same as C116.	
C279 thru C281	Same as C269.	
C282	CAPACITOR, FIXED, MYLAR DIELECTRIC: .2 uf, ±10%; 200 WVDC.	CN108C2003K
C283	CAPACITOR, FIXED, MICA DIELECTRIC: 1,500 uuf, ±10%; 300 WVDC; button type.	CB21PB152K
C284	Same as C126.	
C285 thru C290	Same as C233.	

PARTS LIST (CONT)

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C291	CAPACITOR, FIXED, MICA DIELECTRIC: 510 uuf, ±5%; 500 WVDC.	CM15F511J
C292	Same as C291.	
C293	CAPACITOR, FIXED, MICA DIELECTRIC: 270 uuf, ±5%; 500 WVDC.	CM15F271J
C294	Same as C293.	
C295	CAPACITOR, FIXED, MICA DIELECTRIC: 130 uuf, ±5%; 500 WVDC.	CM15F131J
C296	Same as C295.	

PARTS LIST (CONT)

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
EV106	SHIELD, ELECTRON TUBE: 7 pin miniature; 2-1/4" high x .930" base dia.	TS102U03
EV107 thru EV109	NOT USED	
EV110	Same as EV105.	
EV111	Same as EV101.	
EV112	Same as EV105.	
EV113	Same as EV105.	
EV114	Same as EV101.	
EV115	Same as EV105.	
EV116	SHIELD, ELECTRON TUBE: 9 pin noval; 2-3/8" high x 1.065" base dia.	TS103U03
EV117	Same as EV105.	
EV118	Same as EV101.	
EV119	Same as EV116.	
EV120	NOT USED	
EV121	Same as EV106.	
EV122	Same as EV105.	
EV123	Same as EV105.	
EV124 thru EV127	Same as EV101.	
EV128	Same as EV105.	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
I101	LAMP, GLOW: neon; 110/125 volts, 1/25 watt; min. bayonet base.	BI100-51
I102	Same as I101.	
I103	LAMP, INCANDESCENT: miniature bayonet base 6-8 volts, 125 amp; frosted lens, T-3-1/4.	BI101-44 (AF)
J101	CONNECTOR, RECEPTACLE, ELECTRICAL: 3 female contacts, chassis type.	JJ133-3
J102	CONNECTOR, RECEPTACLE, ELECTRICAL: 1 round female contact, straight type; series BNC to BNC.	UG625*/U
J103	Same as J102.	
J104	Same as J102.	
J105	CONNECTOR, RECEPTACLE, ELECTRICAL: one male contact, 50 ohm.	JJ154
J106 thru J108	Same as J105.	
J109	CONNECTOR, RECEPTACLE, ELECTRICAL: male.	MS3102A-2027P
J110	Same as J105. (Part of Z107)	
J111	Same as J105.	
J112	NOT USED	
J113	Same as J102.	
K101	RELAY ASSY; solenoid, plug in type, octal base.	A1460
L101	COIL, RADIO FREQUENCY: 8 mc; .95-1.01 uh, Q greater than 115.	CL207

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L102	COIL, RADIO FREQUENCY: 10 mc; .95-1.01 uh, Q greater than 115.	CL208
L103	COIL, RADIO FREQUENCY: 12 mc; .95-1.01 uh, Q greater than 115.	CL209
L104	COIL, RADIO FREQUENCY: 14 mc; .95-1.01 uh, Q greater than 115.	CL210
L105	COIL, RADIO FREQUENCY: 16 mc; .95-1.01 uh, Q greater than 115.	CL211
L106	COIL, RADIO FREQUENCY: 18 mc; .95-1.01 uh, Q greater than 115.	CL212
L107	COIL, RADIO FREQUENCY: 20 mc; .95-1.01 uh, Q greater than 115.	CL213
L108	COIL, RADIO FREQUENCY: 22 mc; .77-.83 uh, Q greater than 115.	CL214
L109	COIL, RADIO FREQUENCY: 24 mc; .67-.73 uh, Q greater than 115.	CL215
L110	COIL, RADIO FREQUENCY: 26 mc; .58-.64 uh, Q greater than 115.	CL216
L111	COIL, RADIO FREQUENCY: 28 mc; .46-.50 uh, Q greater than 115.	CL206
L112	COIL, RADIO FREQUENCY: 30 mc; .40-.45 uh, Q greater than 115.	CL204
L113	COIL, RADIO FREQUENCY: 32-34 mc; .29-.34 uh, Q greater than 115.	CL205
L114	Same as L113.	
L115	COIL, RADIO FREQUENCY: fixed, 10 uh, 75 ma 3 Pi.	CL101-4
L116	COIL, RADIO FREQUENCY: fixed, 2.8 uh.	CL105-3

PARTS LIST (CONT)

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L117	COIL, RADIO FREQUENCY: fixed; 150 uh, 100 ma.	CL140-2
L118	COIL, RADIO FREQUENCY: fixed; 2.5 uh, 100 ma.	CL140-1
L119	Same as L117.	
L120	Same as L117.	
L121	Same as L118.	
L122	Same as L117.	
L123	Same as L118.	
L124	Same as L118.	
L125	COIL, plate peaking.	CL187
L126	COIL, RADIO FREQUENCY: fixed; 128 uh.	CL177
L127	COIL, RADIO FREQUENCY: fixed; 750 uh, 75 ma, 2 Pi.	CL100-5

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
L150	COIL, RADIO FREQUENCY: fixed; molded, 120.0 uh, 20 mc approximate, 3.2 ohms, powdered iron coil form.	CL240-120
L151	COIL, RADIO FREQUENCY: fixed; 5.6 uh, ±10%; DC current 1,560 ma; molded case.	CL270-5.6
L152	COIL, RADIO FREQUENCY: fixed; 3.3 uh, ±10%; DC current rating 530 ma; molded case.	CL270-3.3
L153	COIL, RADIO FREQUENCY: fixed; 0.9 uhy, ±0.05 uhy; operating frequency 25 MCS; solenoid winding, close wound.	CL241
L154	COIL, RADIO FREQUENCY: fixed; 0.68 uh, ±20%; DC current rating 1,870 ma; molded case.	CL270-0.68
M101	METER, D.C.: 0-200 ua; spade type pointer; black phenolic case with matte finish; stud mounted.	MR100-8
P101	CONNECTOR, PLUG, ELECTRICAL: male. (Part of W101)	MS3106B20-27P
P102	CONNECTOR, PLUG, ELECTRICAL: female. (Part of W101)	MS3106B20-27S
P103	CONNECTOR, PLUG, ELECTRICAL: min. coaxial type.	PL154
P104 thru P106	Same as P103.	
P107	CONNECTOR, PLUG, ELECTRICAL: min. coaxial type.	PL155
P108	Same as P103.	
PS101	SUPPRESSOR, PARASITIC	AX164
PS102	SUPPRESSOR, PARASITIC	AX160

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
PS103	SUPPRESSOR, PARASITIC	AX161
R101	RESISTOR, FIXED, COMPOSITION: 560 ohms, ±5%; 1/2 watt.	RC20GF561J
R102	Same as R101.	
R103	RESISTOR, FIXED, COMPOSITION: 470,000 ohms, ±5%; 1/2 watt.	RC20GF474J
R104	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, ±5%; 1/2 watt.	RC20GF104J
R105	RESISTOR, FIXED, COMPOSITION: 1,500 ohms, ±5%; 1/2 watt.	RC20GF152J
R106	NOT USED	
R107	NOT USED	
R108	RESISTOR, FIXED, COMPOSITION: 1,800 ohms, ±5%; 1/2 watt.	RC20GF182J
R109 thru R119	NOT USED	
R120	RESISTOR, FIXED, WIREWOUND: 5,000 ohms, ±5%; 10 watts.	RW109-32
R121 thru R123	NOT USED	
R124	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, ±5%; 1 watt.	RC32GF472J
R125	Same as R104.	
R126	Same as R103.	
R127	Same as R103.	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R128	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, ±5%; 1/2 watt. (Part of Z103)	RC20GF102J
R129	RESISTOR, VARIABLE, COMPOSITION: 5000 ohms, ±10%; 2 watts.	RV4NAYSA-502AYY
R130	RESISTOR, VARIABLE, COMPOSITION: 1,000 ohms, ±10%; 2 watts.	RV4LAYSA-102A
R131	RESISTOR, FIXED, COMPOSITION: 820 ohms, ±5%; 1/2 watt.	RC20GF821J
R132	Same as R104.	
R133	RESISTOR, FIXED, COMPOSITION: 10 meg. ohm, ±5%; 1/2 watt.	RC20GF106J
R134	RESISTOR, FIXED, COMPOSITION: 680,000 ohms, ±5%; 1/2 watt.	RC20GF684J
R135	RESISTOR, VARIABLE, COMPOSITION: 1,000 ohms, ±10%; 2 watts	RV4NAYSA-102AYY
R136	Same as R104.	
R137	Same as R104.	
R138	RESISTOR, FIXED, COMPOSITION: 82,000 ohms, ±5%; 2 watts.	RC42GF823J
R139	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, ±5%; 2 watts.	RC42GF104J
R140	RESISTOR, VARIABLE, COMPOSITION: 100,000 ohms, ±20%; 2 watts.	RV4NAYSA-104AYY
R141	RESISTOR, FIXED, COMPOSITION: 470 ohms, ±5%; 1/2 watt.	RC20GF471J
R142	Same as R128.	
R143	Same as R103.	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R146	RESISTOR, FIXED, COMPOSITION: 2.2 megohms, ±5%; 1/2 watt.	RC20GF225J
R147	Same as R104.	
R148	Same as R133.	
R149	Same as R133.	
R150	NOT USED	
R151	Same as R131.	
R152	Same as R138.	
R153	Same as R134.	
R154	RESISTOR, FIXED, COMPOSITION: 1.5 megohms, ±5%; 1/2 watt.	RC20GF155J
R155	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, ±5%; 1 watt.	RC32GF223J
R156	Same as R155.	
R157	RESISTOR, FIXED, COMPOSITION: 1,200 ohms, ±10%; 1/2 watt.	RC20GF122K
R158	Same as R157.	
R159	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, ±5%; 1 watt.	RC32GF223J
R160	Same as R154.	
R161	Same as R105.	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R162	RESISTOR, FIXED, COMPOSITION: 4,700 ohms, ±5%; 1/2 watt.	RC20GF472J
R163	Same as R134.	
R164 thru R167	NOT USED	
R168	Same as R129.	
R169	Same as R129.	
R170	Same as R105.	
R171 thru R180	NOT USED	
R181	Same as R131.	
R182	Same as R104.	
R183	Same as R133.	
R184	Same as R134.	
R185 thru R190	NOT USED	
R191	RESISTOR, FIXED, COMPOSITION: 1,000 ohms, ±5%; 1 watt.	RC32GF102J
R192	RESISTOR, FIXED, COMPOSITION: 47,000 ohms, ±10%; 1/2 watt.	RC20GF473K
R193	Same as R192.	
R194	NOT USED	
R195	NOT USED	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R196	RESISTOR, FIXED, COMPOSITION: 10,000 ohms, ±5%; 2 watts.	RC42GF103J
R197	RESISTOR, FIXED, COMPOSITION: 68 ohms, ±5%; 1/2 watt.	RC20GF680J
R198	Same as R197.	
R199	RESISTOR, FIXED, COMPOSITION: 39 ohms, ±10%; 1/2 watt.	RC20GF390K
R200	RESISTOR, FIXED, COMPOSITION: 100 ohms, ±5%, 1/2 watt.	RC20GF101J
R201	Same as R197.	
R202	RESISTOR, FIXED, COMPOSITION: 47,000 ohms, ±5%; 1/2 watt.	RC20GF473J
R203	RESISTOR, FIXED, COMPOSITION: 1200 ohms, ±5%; 1 watt.	RC32GF122J
R204	RESISTOR, FIXED, COMPOSITION: 220,000 ohms, ±5%; 1/2 watt.	RC20GF224J
R205	RESISTOR, VARIABLE, COMPOSITION: 5,000 ohms, ±10%; 2 watts.	RV4NAYSD-502C
R206	Same as R200.	
R207	RESISTOR, FIXED, WIREWOUND: 20 watts. (Part of TB101)	RR102-1
R208	Same as R207.	
R209	RESISTOR, FIXED, COMPOSITION: 390,000	RC20GF394J

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R212	Same as R128.	
R213	Same as R103.	
R214	RESISTOR, FIXED, COMPOSITION: 10 ohms, ±10%; 1/2 watt.	RC20GF100K
R215	RESISTOR, FIXED, COMPOSITION: 68,000 ohms, ±10%; 1/2 watt.	RC20GF683K
R216	RESISTOR, FIXED, WIREWOUND: 500 ohms, ±5%; 10 watts.	RW109-19
R217	RESISTOR, FIXED, COMPOSITION: 5,600 ohms, ±10%; 1 watt.	RC32GF562K
R218	Same as R199.	
R219	Same as R197.	
R220	Same as R214.	
R221	NOT USED	
R222	Same as R128.	
R223	RESISTOR, FIXED, COMPOSITION: 33,000 ohms, ±10%; 1/2 watt.	RC20GF333K
R224	Same as R214.	
R225	Same as R200.	
R226	Same as R214.	
R227	RESISTOR, FIXED, COMPOSITION: 2,700 ohms, ±10%; 1/2 watt.	RC20GF272K
R228	RESISTOR, FIXED, COMPOSITION: 330 ohms, ±5%; 1/2 watt.	RC20GF331J
R229	Same as R104.	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R230	RESISTOR, FIXED, COMPOSITION: 2,700 ohms, ±10%; 1 watt. (Part of L125)	RC32GF272J
R231	RESISTOR, FIXED, COMPOSITION: 6,800 ohms, ±10%; 1 watt.	RC32GF682J
R232	Same as R159.	
R233	Same as R104.	
R234	NOT USED	
R235	Same as R104.	
R236	NOT USED	
R237	RESISTOR, FIXED, COMPOSITION: 270 ohms, ±10%; 1/2 watt.	RC20GF271K
R238	RESISTOR, FIXED, COMPOSITION: 560,000 ohms, ±5%; 1/2 watt.	RC20GF564J
R239	Same as R105.	
R240	Non-replaceable item. (Part of T109)	
R241	RESISTOR, FIXED, COMPOSITION: 270 ohms, ±5%; 1/2 watt.	RC20GF271J
R242 thru R244	Same as R241.	
R245	RESISTOR, FIXED, COMPOSITION: 180 ohms, ±5%; 1/2 watt.	RC20GF181J
R246	Same as R245.	
R247	RESISTOR, FIXED, COMPOSITION: 8,200 ohms, ±5%; 1/2 watt.	RC20GF822J
R248	Same as R247.	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R249	RESISTOR, FIXED, COMPOSITION: 18,000 ohms, ±5%; 1/2 watt.	RC20GF183J
R250	Same as R249.	
R251	Same as R247.	
R252	RESISTOR, FIXED, COMPOSITION: 3,900 ohms, ±5%; 1/2 watt.	RC20GF392J
R253	Same as R252.	
R254	RESISTOR, FIXED, COMPOSITION: 11,000 ohms, ±5%; 1/2 watt.	RC20GF113J
R255	Same as R254.	
R256	RESISTOR, FIXED, COMPOSITION: 15,000 ohms, ±5%; 1/2 watt.	RC20GF153J
R257	Same as R256.	
R258	Same as R120.	
R259	Same as R241.	
R260	Same as R241.	
R261	RESISTOR, FIXED, COMPOSITION: 33,000 ohms, ±5%; 1 watt.	RC32GF333J
R262	Same as R261.	
R263	RESISTOR, VARIABLE, WIREWOUND: 250 ohms, ±10%; 2 watts, linear taper.	RA101ASRD-251A
R264	RESISTOR, FIXED, COMPOSITION: 2,200 ohms, ±5%; 1/2 watt.	RC20GF222J
R265	RESISTOR, VARIABLE, COMPOSITION: 250 ohms, ±10%; 1/2 watt; linear taper.	RV106UX8B-251A

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R266	Same as R265.	
R267 thru R272	NOT USED	
R273	Same as R200.	
R274	RESISTOR, FIXED, COMPOSITION: 82,000 ohms, ±5%; 1/2 watt.	RC20GF823J
R275	RESISTOR, FIXED, COMPOSITION: 22,000 ohms, ±5%; 1/2 watt.	RC20GF223J
R276	Same as R105.	
R277	Same as R103.	
R278	RESISTOR, FIXED, COMPOSITION: 220 ohms, ±10%; 2 watts.	RC42GF221K
R279	Same as R128.	
R280	RESISTOR, VARIABLE, COMPOSITION: 2,500	RV10GHX2B

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R288	Same as R284.	
S101	SWITCH, ROTARY: 4 positions, double throw; non-shorting type; glass melamine insulation.	SW181
S102	Same as S101.	
S103	SWITCH, TOGGLE: SPST; solder lug terminals, 110/250 volts AC or DC.	ST103-1-62
S104	Same as S103.	
S105	Same as S103.	
S106A, B, C	WAFER, SWITCH: four positions, shorting type.	WS101
S106D	WAFER, SWITCH: four positions, shorting type.	WS103
S106E	WAFER, SWITCH: 1 section, 4 positions; 30° angle of throw; shorting type contacts, silver plated brass; mycalex wafer insulation.	WS137
S107	SWITCH, ROTARY: 1 section, 11 positions; 30° angle of throw; shorting type contacts, silver plated brass; mycalex wafer insulation.	SW419
S108A, C	SWITCH, ROTARY: 1 section, 15 positions; single pole, shorting type.	WS102
S108B	SWITCH, ROTARY: 1 section, 15 positions; shorting type contacts, silver plated brass; bakelite wafer insulation.	SW413
S109	SWITCH, ROTARY: 5 positions; shorting type, single pole, 30° detent.	SW199
S110	SWITCH, SENSITIVE: bi-metallic; 80° breaking temperature, $\pm 2^{o}$. (Part of TB101)	SS100-3
TB101	HEATER TERMINAL BOARD ASSEMBLY: consists of C222, R206, 207, 208, S110.	A1520

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
T101	TRANSFORMER, AUDIO: pri. imp. 150/600 ohms; sec. imp. 600 ohms CT; 7 terminals.	TF170
T102	Same as T101.	
T103	TRANSFORMER, AUDIO: pri. imp. 20,000 ohms CT; sec. imp. 150/600 ohms; 7 terminals.	TF138
T104	Same as T103.	
T105 thru T108	NOT USED	
T109	TRANSFORMER, RADIO FREQUENCY: 2-4 mc; single tuned.	A1512
T110	TRANSFORMER, RADIO FREQUENCY: 2-4 mc; single tuned.	A1511
T111	Non-replaceable item. (Part of Z107)	
T112	TRANSFORMER, RADIO FREQUENCY: 16-32 mc; slug tuned.	CL189-2
T113	TRANSFORMER, RADIO FREQUENCY: 4-8 mc; slug tuned.	CL163
T114	TRANSFORMER, RADIO FREQUENCY: 16-32 mc; slug tuned.	CL188-2
T115	TRANSFORMER, RADIO FREQUENCY: 8-16 mc; slug tuned.	CL164
T116	TRANSFORMER, RADIO FREQUENCY: 2-4.3 mc; slug tuned.	CL162
T117	Same as T113.	
T118	Same as T114.	
T119	Same as T115.	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
T120	TRANSFORMER, RADIO FREQUENCY: 2-4.3 mc; slug tuned.	CL161
T121	Same as T113.	
T122	TRANSFORMER, RADIO FREQUENCY: 8-16 mc; slug tuned.	CL165
T123	TRANSFORMER, HIGH FREQUENCY: Osc. output; ferrite core.	TF173
T124	TRANSFORMER, HIGH FREQUENCY: VMO input.	TR166
T125	TRANSFORMER, RADIO FREQUENCY:	TT100
T126	Same as T125.	
T127	TRANSFORMER, RADIO FREQUENCY: operating frequency 250 kc.	TT114
T128	TRANSFORMER, PULSE: 4.7 mh, ±20%; 500 VDC; metal tubular case.	TF228K15
V101	TUBE, ELECTRON: RF triode; 7 pin miniature.	6AB4
V102 thru V104	NOT USED	
V105	TUBE, ELECTRON: medium-mu duo-triode, 9 pin miniature. (Part of Z103)	12AU7
V106	TUBE, ELECTRON: voltage regulator; 7 pin miniature.	OA2
V107 thru V109	NOT USED	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
V110	TUBE, ELECTRON: 9 pin miniature.	6U8
V111	TUBE, ELECTRON: duo diode; 7 pin miniature.	6AL5
V112	Same as V105.	
V113A, B	TUBE, ELECTRON: duo triode; 9 pin miniature.	12AT7
V114	TUBE, ELECTRON: sharp cutoff RF pentode; 7 pin miniature.	6AH6
V115	Same as V105.	
V116	TUBE, ELECTRON: power pentode, wide band amp; 9 pin miniature.	6CL6
V117	Same as V110.	
V118	Same as V114.	
V119	Same as V116.	
V120	TUBE, ELECTRON: beam power; large wafer octal base with sleeve.	6146
V121	Same as V106.	
V122A, B	TUBE, ELECTRON: duo triode; 9 pin miniature.	12AT7
V123A, B	Same as V122A, B.	
V124	Same as V101.	
V125	Same as V101.	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
W101	CABLE ASSEMBLY, ELECTRICAL: Power; consists of various size and color of MWC wire, with insulation sleeving; two connectors P101, P102. (For use with standard SBE)	CA346-3-0
W101	CABLE ASSEMBLY, ELECTRICAL: Power; consists of various size and color of MWC wire, with insulation sleeving; two connectors P101, P102. (For use with SBE when part of GPT-10K or SBT-350)	CA346-8-9
W101	CABLE ASSEMBLY, ELECTRICAL: Power; consists of various size and color MWC wire, with insulation sleeving; two connectors P101, P102. (For use with SBE when part of SBT-1K, RAK-9)	CA346-3-9
XCR101 thru XCR114	NOT USED	
XCR115	SOCKET: 7 pin miniature; molded plastic.	TS102P01
XCR116	Same as XCR115.	
XI101	SOCKET, LENS: miniature bayonet; red indicator lens.	TS106-1
XI102	SOCKET, LENS: miniature bayonet; white indicator lens.	TS106-2
XI103	SOCKET, BRACKET: miniature bayonet.	TS107-2
XK101	SOCKET, OCTAL: molded plastic.	TS101P01
XV101	Same as XCR115.	
XV102 thru XV104	NOT USED	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XY101	SOCKET, CRYSTAL: steatite; cadmium plated phosphor bronze.	TS104-1
XY102 thru XY108	Same as XY101.	
XY109	NOT USED	
XY110	NOT USED	
XY111 thru XY120	Same as XY101.	
XY121	SOCKET, CRYSTAL: Non-replaceable item. (Part of Z108)	
XZ103	Same as XK101.	
XZ104	NOT USED	

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Y107	CRYSTAL, UNIT QUARTZ: 13 mc.	CR27/U-13.000P
Y108	CRYSTAL, UNIT QUARTZ: 17 mc.	CR27/U-17.000P
Y109	NOT USED	
Y110	NOT USED	
Y111	SUPPLIED ON CUSTOMERS REQUEST.	
Y112	SUPPLIED ON CUSTOMERS REQUEST.	
Y113	SUPPLIED ON CUSTOMERS REQUEST.	
Y114	SUPPLIED ON CUSTOMERS REQUEST.	
Y115	SUPPLIED ON CUSTOMERS REQUEST.	
Y116	SUPPLIED ON CUSTOMERS REQUEST.	
Y117	SUPPLIED ON CUSTOMERS REQUEST.	
Y118	SUPPLIED ON CUSTOMERS REQUEST.	
Y119	SUPPLIED ON CUSTOMERS REQUEST.	
Y120	SUPPLIED ON CUSTOMERS REQUEST.	
Y121	CRYSTAL, UNIT QUARTZ: 250 kc.	CR47A/U-250.000KC
Z101	NOT USED	
Z102	NOT USED	
Z103	ASSEMBLY: 250 kc oscillator; consists of C118, 121, 122, 123, 124, R125, 126, 128, V105, XV105.	A1458

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Z104 thru Z106	NOT USED	
Z107	NETWORK, HF MODULATOR: resultant frequency 2-32 mc; 3-3/8" lg. x 1-3/16" wide; stud mounted.	NW127
Z108	OVEN, CRYSTAL: 250 Kc.	PO184
Z109	NOT USED	
Z110	FILTER, BANDPASS: lower sideband; operating frequency approx. 3 Kc; carrier frequency 250.000 Kcs; 246.960 to 249.750 Kcs at -1db points; input and output impedance 10K ohms unbalanced	FX241

TRANSMITTING MODE SELECTOR MODEL SBE-8, 9, 10

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Z111 (cont)	FILTER, BANDPASS: upper sideband; operating frequency approx. 6 Kc; carrier frequency 250.00 Kcs; 250.250 to 256.080 Kcs at -1db points; input and output impedance 10K ohms unbalanced. (Model SBE-10)	FX239
Z112	FILTER, CARRIER SUPPRESSION: carrier frequency 250 Kc.	FX159

TRANSMITTING MODE SELECTOR POWER SUPPLY

C401	CAPACITOR, FIXED, ELECTROLYTIC: 80 uf, 450 WVDC; polarized.	CE51C800R
C402	Same as C401.	
C403A, B	CAPACITOR, FIXED, ELECTROLYTIC: dual; 20 uf, 450 WVDC; polarized.	CE52C200R
C404A, B	CAPACITOR, FIXED, CERAMIC DIELECTRIC: 2 x 10,000 uuf, GMV; 1,000 WVDC.	CC100-23
EV401	NOT USED	
EV402	SHIELD, ELECTRON TUBE: 7 pin miniature; 2-1/4 inch high x 0.930 inch base dia.	TS102U03
F401	FUSE, CARTRIDGE: 2 amps; time lag; 1-1/4" long x 1/4" dia.; slow blow. (For 115 V operation)	FU102-2
F401	FUSE, CARTRIDGE: 1 amp; time lag; 1-1/4" long x 1/4" dia.; slow blow. (For 230 V operation)	FU102-1
F402	FUSE, CARTRIDGE: 3 amps; time lag; 1-1/4" lg. x 1/4" dia; slow blow. (For 115V operation)	FU102-3
F402	FUSE, CARTRIDGE: 1-1/2 amps; time lag; 1-1/4" lg. x 1/4" dia; slow blow. (For 230V operation)	FU102-1.5

TRANSMITTING MODE SELECTOR POWER SUPPLY

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
F403	FUSE, CARTRIDGE: 1/4 amp; time lag; 1-1/4" lg. x 1/4" dia; slow blow.	FU102-.250
I401	LAMP, INCANDESCENT: 6-8V; .250 amp; T-3-1/4 clear bulb.	BI101-47
J401	CONNECTOR, RECEPTACLE, ELECTRICAL: two prong; male.	JJ100
J402	CONNECTOR, RECEPTACLE, ELECTRICAL: female; AN pin type. (Part of W402)	MS3102A-2027S
L401	REACTOR, FILTER: 10 hy, 200 ma.	TF144
L402	Same as L401.	
P401	CONNECTOR, PLUG, ELECTRICAL: female; AC, twist lock. (Part of W401)	PL100
P402	CONNECTOR, PLUG, ELECTRICAL: male. (Part of W401)	PL171
R401	RESISTOR, FIXED, COMPOSITION: 15,000 ohms, ±10%; 2 watts.	RC42GF153K
R402	RESISTOR, FIXED, WIREWOUND: 7,500 ohms, 10 watts.	RW109-33
R403	RESISTOR, FIXED, WIREWOUND: 1,000 ohms, 10 watts.	RW109-24
R404	RESISTOR, FIXED, WIREWOUND: 15,000 ohms, 10 watts.	RW109-36
R405	RESISTOR, FIXED, COMPOSITION: 100,000 ohms, ±10%; 1 watt.	RC32GF104K

PARTS LIST (CONT)

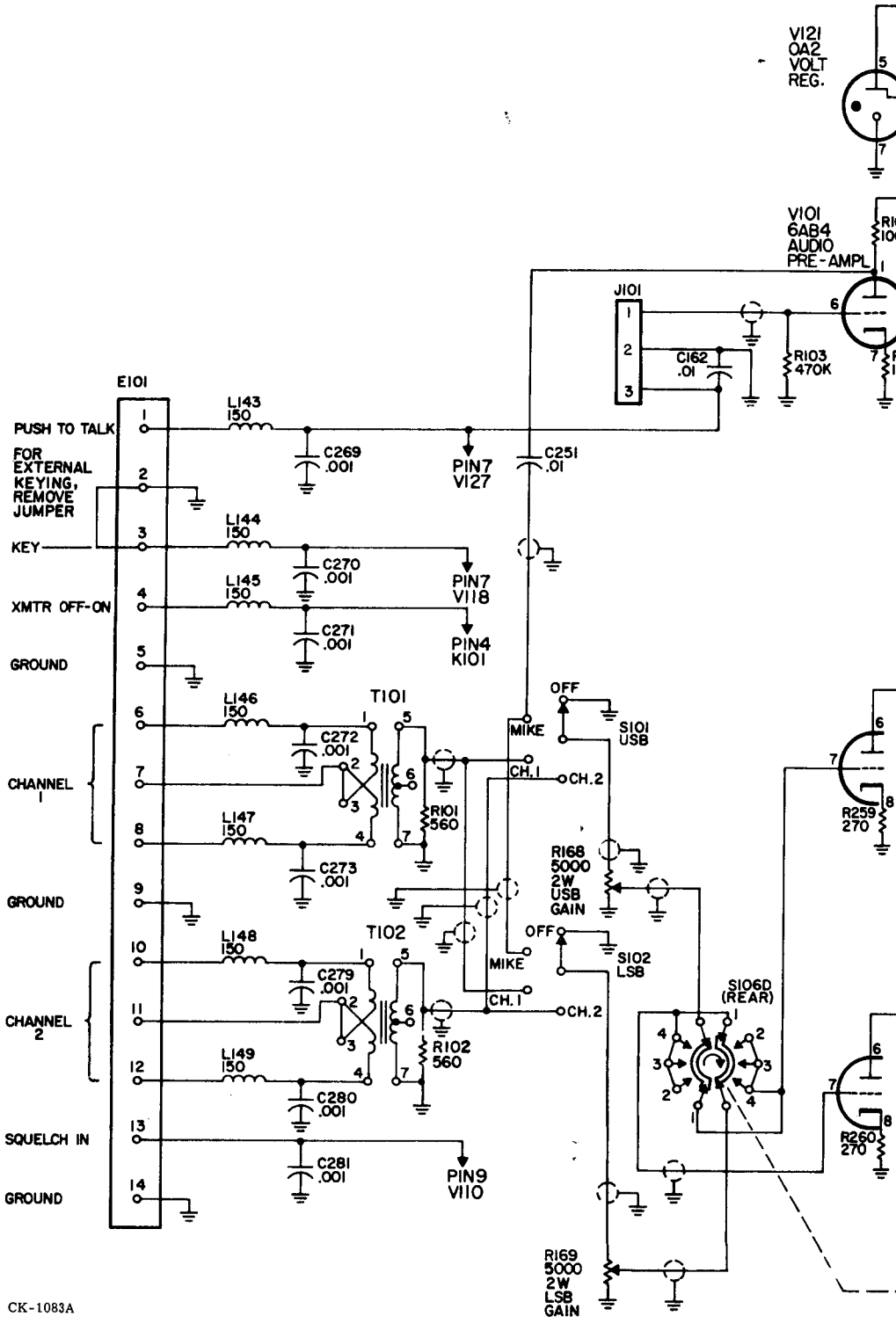
TRANSMITTING MODE SELECTOR POWER SUPPLY

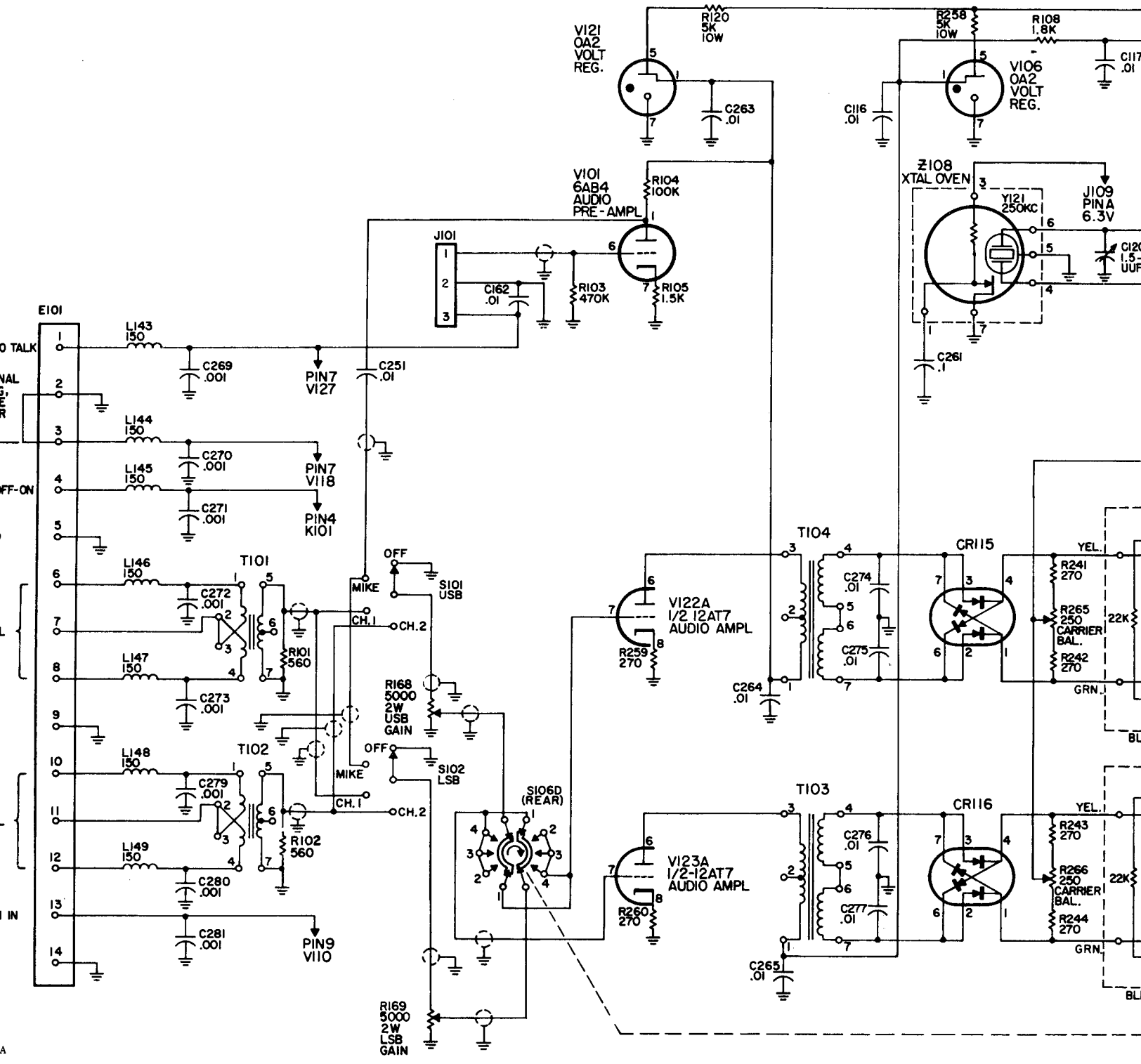
REF SYMBOL	DESCRIPTION	TMC PART NUMBER
V402	TUBE, ELECTRON: voltage regulator.	OA2
W401	CABLE, AC POWER: w/connector, plug, 2 prong. (Consists of P401, P402)	CA103-72
W402	WIRING HARNESS, BRANCHED, ELECTRICAL: consists of various lengths and colors of MWC number 22 wire and 1 connector J402.	CA344
XC401	SOCKET, ELECTRON TUBE: 9 pin oval.	TS101P01
XC402	Same as XC401.	
FH100-1		
TS106-1		
TS102P01		
XF401	FUSEHOLDER: extractor post type for single AGC type fuse.	
XF402	Same as XF401.	
XF403	Same as XF401.	
XI401	SOCKET, INDICATOR: w/red frosted lens.	
XV401	Same as XC401.	
XV402	SOCKET, ELECTRON TUBE: 7 pin miniature.	

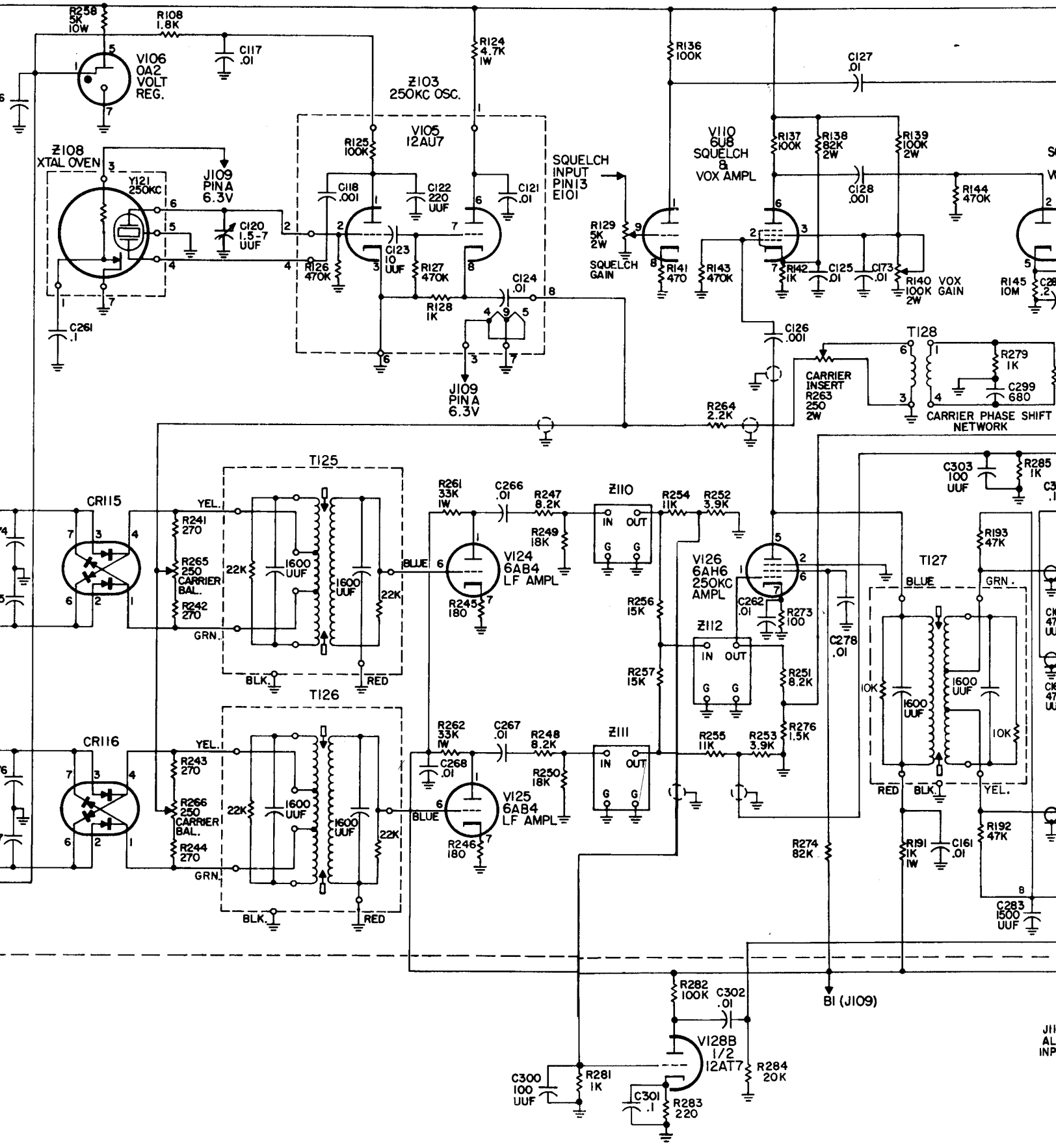
SECTION 7
SCHEMATIC DIAGRAMS

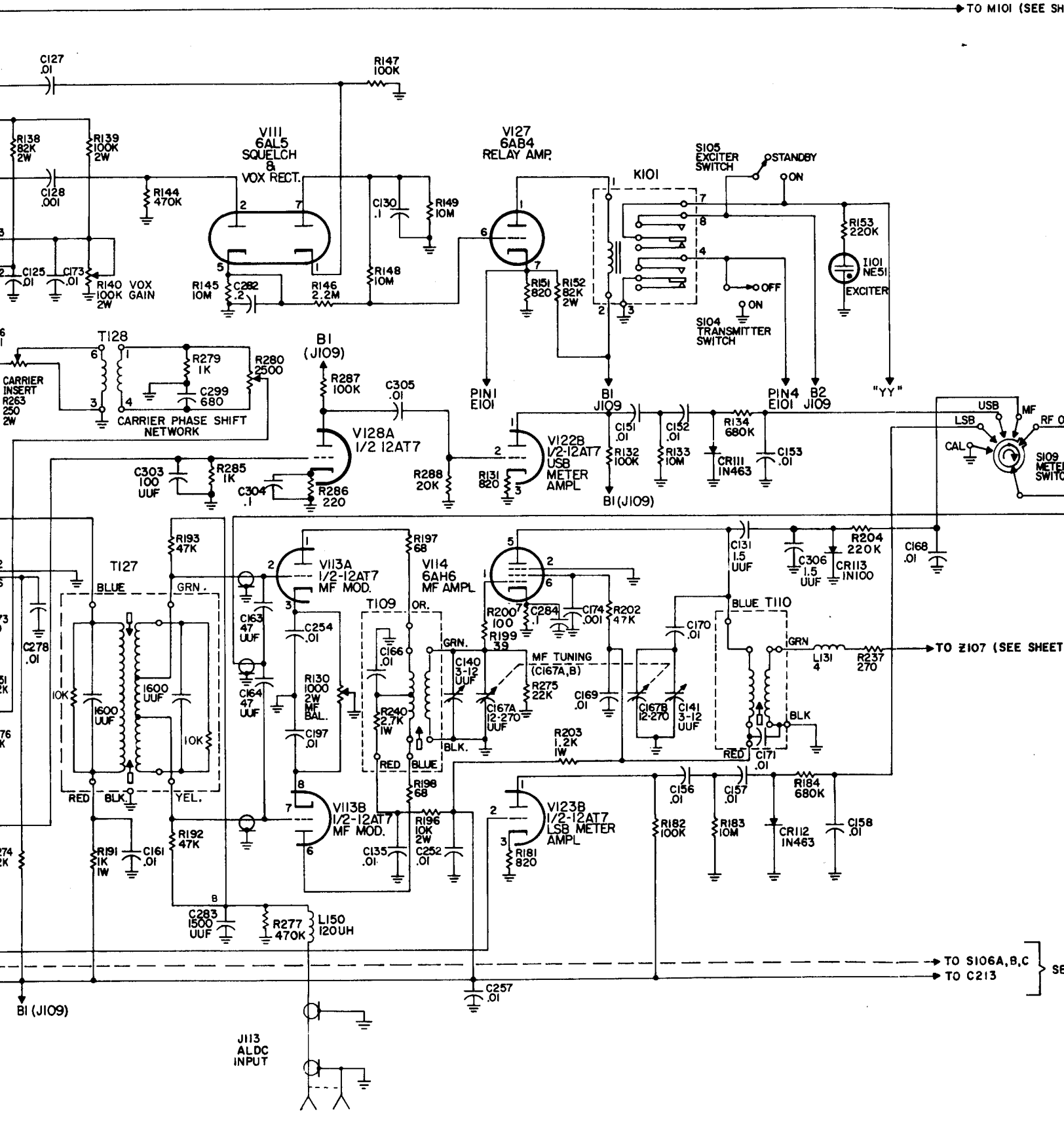
217-218

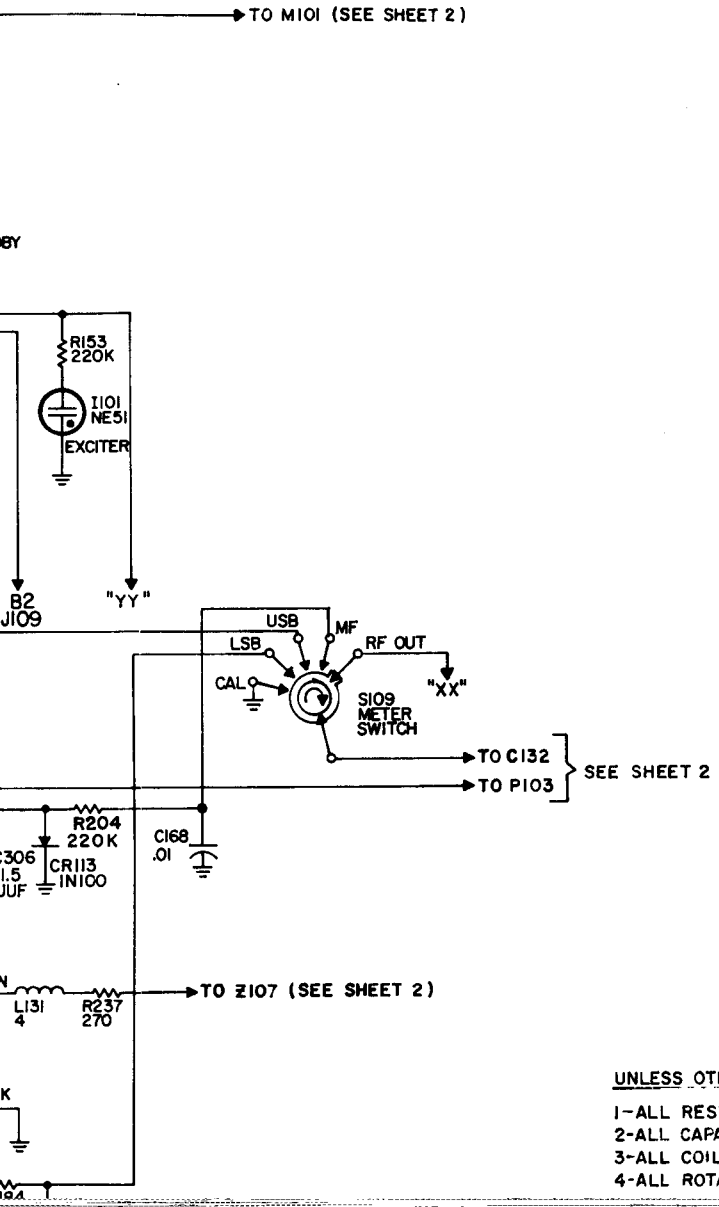
*U.S. GOVERNMENT PRINTING OFFICE:1969 - 393-030/S 5155


V121
0A2
VOLT
REG.
V101
6AB4
AUDIO
PRE-AMPL
J101
C162
.01
R103
470K
E101
PUSH TO TALK
FOR
EXTERNAL
KEYING,
REMOVE
JUMPER
KEY
XMTR OFF-ON
GROUND
CHANNEL
1
GROUND
CHANNEL
2
SQUELCH IN
GROUND
L143
150
L144
150
L145
150
L146
150
L147
150
L148
150
L149
150
C269
.001
C270
.001
C271
.001
C272
.001
C273
.001
C279
.001
C280
.001
C281
.001
C251
.01
PIN7
V127
PIN7
V118
PIN4
K101
PIN9
V110
T101
T102
R101
560
R102
560
MIKE
CH.1
CH.2
OFF
S101
USB
S102
LSB
S106D
(REAR)
R168
5000
2W
USB
GAIN
R169
5000
2W
LSB
GAIN
R259
270
R260
270
CK-1083A


V121
0A2
VOLT
REG.
R120
5K
10W
C263
.01
V106
0A2
VOLT
REG.
R258
5K
10W
R108
1.8K
C116
.01
C117
.01
V101
6AB4
AUDIO
PRE-AMPL
R104
100K
R103
470K
R105
1.5K
C162
.01
J101
Z108
XTAL OVEN
Y121
250KC
J109
PIN A
6.3V
C261
.1
E101
L143
150
C269
.001
PIN7
V127
C251
.01
L144
150
C270
.001
PIN7
V118
L145
150
C271
.001
PIN4
K101
L146
150
C272
.001
T101
R101
560
L147
150
C273
.001
L148
150
C279
.001
T102
R102
560
L149
150
C280
.001
C281
.001
PIN9
V110
OFF
S101
USB
MIKE
CH.1
CH.2
R168
5000
2W
USB
GAIN
OFF
S102
LSB
MIKE
CH.1
CH.2
S106D
(REAR)
R169
5000
2W
LSB
GAIN
T104
V122A
1/2 12AT7
AUDIO AMPL
R259
270
C264
.01
C274
.01
C275
.01
CR115
R241
270
R265
250
CARRIER
BAL.
R242
270
22K
YEL.
GRN.
T103
V123A
1/2-12AT7
AUDIO AMPL
R260
270
C265
.01
C276
.01
C277
.01
CR116
R243
270
R266
250
CARRIER
BAL.
R244
270
22K
YEL.
GRN.

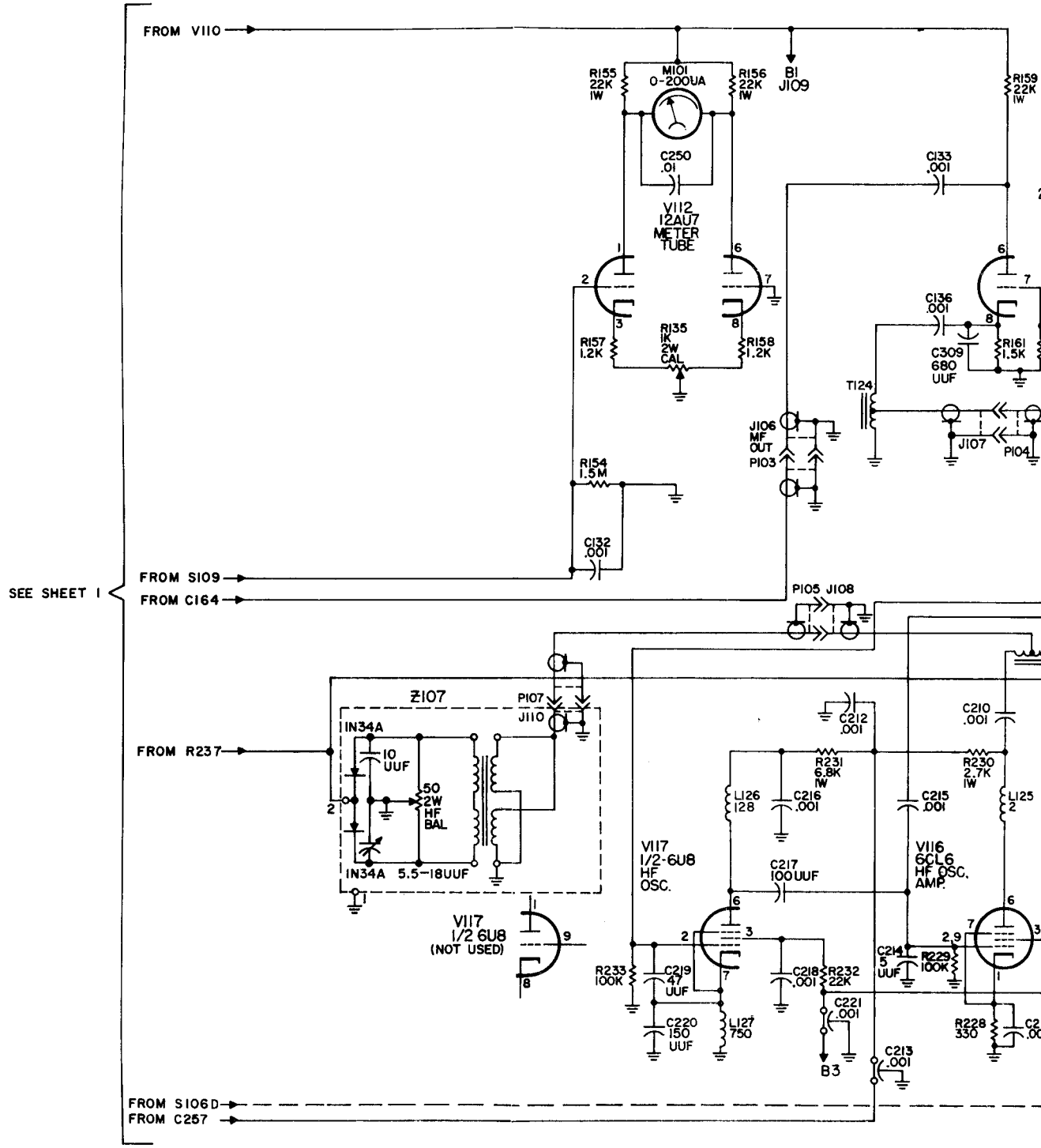

R258 5K 10W
R108 1.8K
C117 .01
V106 0A2 VOLT REG.
R124 4.7K 1W
Z103 250KC OSC.
V105 12AU7
R125 100K
C118 .001
C122 220 UUF
C121 .01
C123 10 UUF
R126 470K
R127 470K
R128 1K
C124 .01
Z108 XTAL OVEN
Y121 250KC
J109 PIN A 6.3V
C120 1.5-7 UUF
C261 .1
J109 PIN A 6.3V
SQUELCH INPUT PIN 13 E101
R129 5K 2W
SQUELCH GAIN
R136 100K
C127 .01
V110 6U8 SQUELCH & VOX AMPL
R137 100K
R138 82K 2W
R139 100K 2W
C128 .001
R144 470K
R141 470
R143 470K
R142 1K
C125 .01
C173 .01
R140 VOX GAIN 100K 2W
R145 10M
C126 .001
T128
CARRIER INSERT R263 250 2W
R279 1K
C299 680
CARRIER PHASE SHIFT NETWORK
R264 2.2K
T125
CR115
R241 270
R265 250 CARRIER BAL.
R242 270
YEL.
GRN.
BLK.
RED
22K
1600 UUF
R261 33K 1W
C266 .01
R247 8.2K
R249 18K
V124 6AB4 LF AMPL
R245 180
BLUE
Z110
IN OUT G G
R254 11K
R252 3.9K
V126 6AH6 250KC AMPL
C262 .01
R273 100
R256 15K
Z112
R257 15K
R251 8.2K
R276 1.5K
C278 .01
T126
CR116
R243 270
R266 250 CARRIER BAL.
R244 270
R262 33K 1W
C267 .01
R248 8.2K
C268 .01
R250 18K
V125 6AB4 LF AMPL
R246 180
Z111
R255 11K
R253 3.9K
T127
R193 47K
R285 1K
C303 100 UUF
10K
R191 1K 1W
C161 .01
R192 47K
C283 1500 UUF
R274 82K
R282 100K
C302 .01
V128B 1/2 12AT7
R284 20K
R281 1K
C300 100 UUF
C301 .1
R283 220
B1 (J109)


TO M101 (SEE SH
C127 .01
R147 100K
R138 82K 2W
R139 100K 2W
C128 .001
R144 470K
C125 .01
C173 .01
R140 VOX 100K GAIN 2W
V111 6AL5 SQUELCH & VOX RECT.
R145 10M
C282 .2
R146 2.2M
C130 .1
R149 10M
R148 10M
V127 6AB4 RELAY AMP.
R151 820
R152 82K 2W
K101
S105 EXCITER SWITCH
STANDBY
ON
OFF
ON
S104 TRANSMITTER SWITCH
R153 220K
I101 NE51 EXCITER
T128
CARRIER INSERT R263 250 2W
R279 1K
C299 680
R280 2500
CARRIER PHASE SHIFT NETWORK
B1 (J109)
R287 100K
C305 .01
V128A 1/2 12AT7
C303 100 UUF
R285 1K
C304 .1
R286 220
R288 20K
V122B 1/2-12AT7 USB METER AMPL
R131 820
PIN1 E101
B1 J109
C151 .01
C152 .01
R132 100K
R133 10M
R134 680K
CR111 IN463
C153 .01
PIN4 E101
B2 J109
"YY"
B1 (J109)
USB
LSB
CAL
MF
S109 METER SWITCH
T127
R193 47K
BLUE
GRN.
C278 .01
10K
1600 UUF
1600 UUF
10K
RED
BLK.
YEL.
R191 1K 1W
C161 .01
R192 47K
V113A 1/2-12AT7 MF MOD.
C163 47 UUF
C164 47 UUF
C254 .01
R130 1000 2W MF BAL.
C197 .01
V113B 1/2-12AT7 MF MOD.
R197 68
T109
OR.
C166 .01
R240 2.7K 1W
RED
BLUE
R198 68
R196 10K 2W
C135 .01
C252 .01
V114 6AH6 MF AMPL
R200 100
R199 39
C284 .1
C174 .001
R202 47K
GRN.
C140 3-12 UUF
MF TUNING (C167A,B)
C167A 12-270 UUF
R275 22K
C169 .01
BLK.
R203 1.2K 1W
V123B 1/2-12AT7 LSB METER AMPL
R181 820
C131 1.5 UUF
C306 1.5 UUF
CR113 IN100
R204 220K
C168 .01
BLUE T110
C170 .01
C167B 12-270
C141 3-12 UUF
GRN
L131 4
R237 270
TO Z107 (SEE SHEET
BLK
RED
C171 .01
C156 .01
C157 .01
R184 680K
R182 100K
R183 10M
CR112 IN463
C158 .01
B
C283 1500 UUF
R277 470K
L150 120UH
TO S106A,B,C
TO C213
SE
C257 .01
B1 (J109)
J113 ALDC INPUT

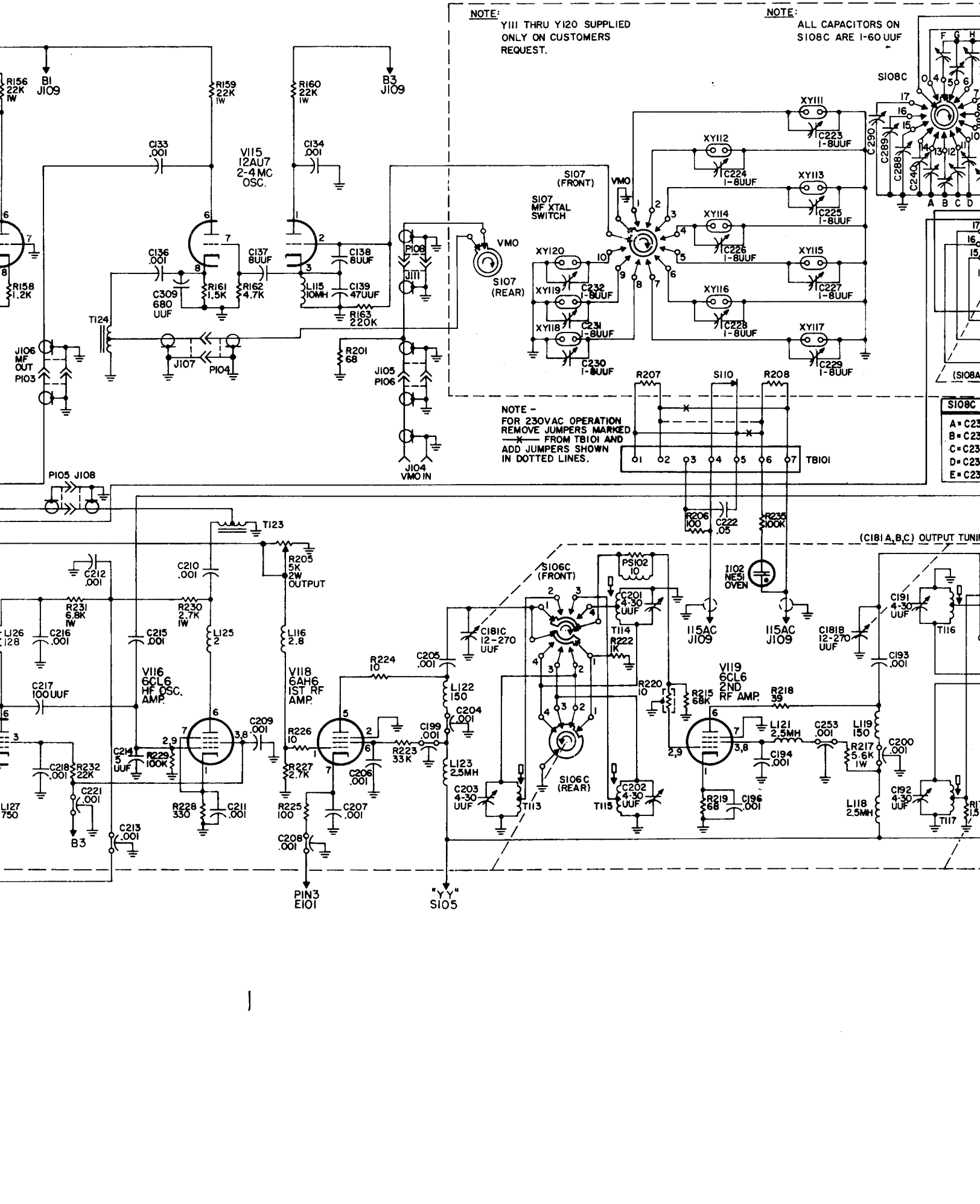


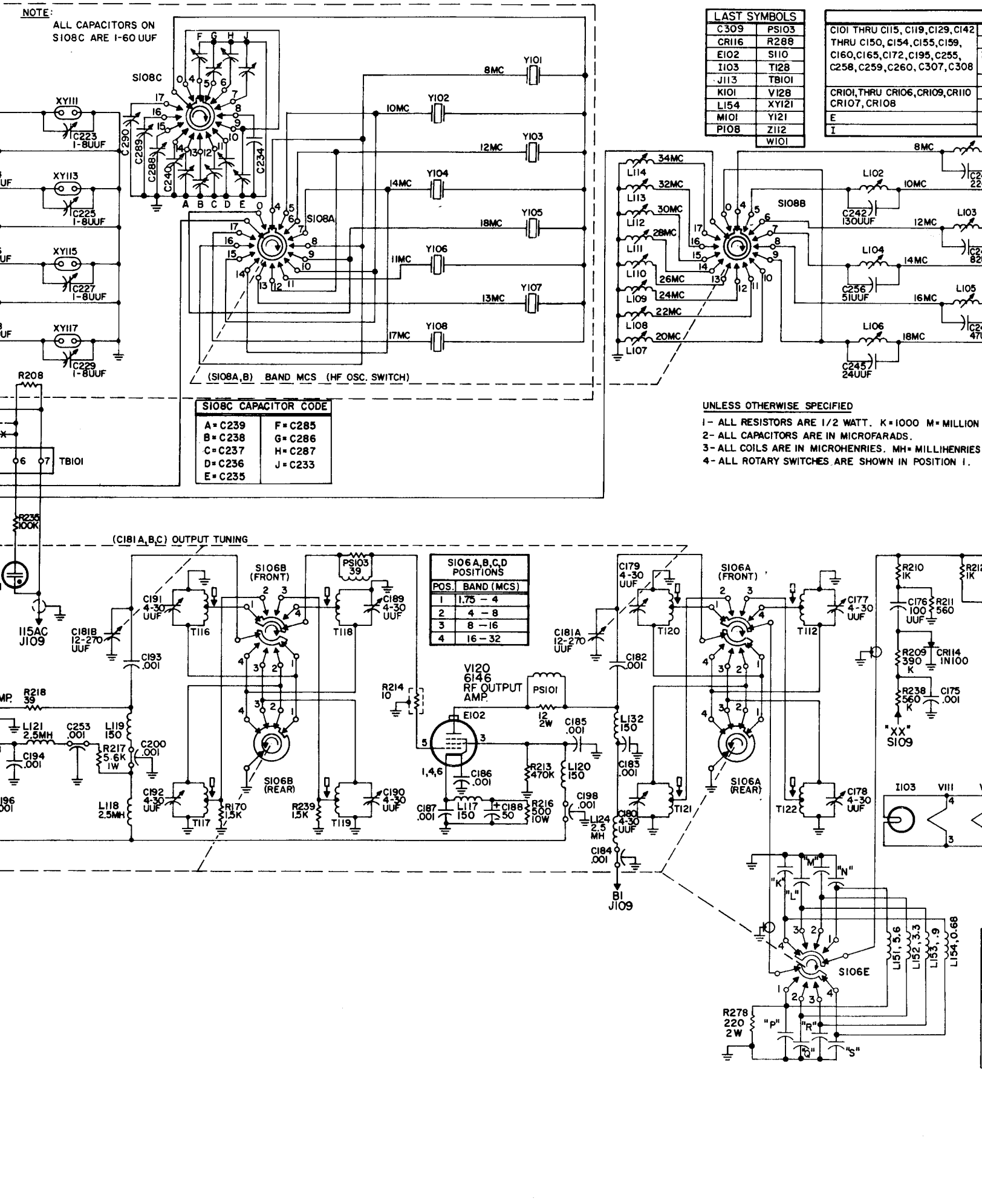
UNLESS OTHERWISE SPECIFIED

1-ALL RESISTORS ARE 1/2 WATT. K=1000 M=MILLION
2-ALL CAPACITORS ARE IN MICROFARADS.
3-ALL COILS ARE IN MICROHENRIES. MH=MILLIHENRIES
4-ALL ROTARY SWITCHES ARE SHOWN IN POSITION 1.


FROM V110
SEE SHEET 1
FROM S109
FROM C164
FROM R237
FROM S106D
FROM C257
M101 0-200UA
R155 22K 1W
R156 22K 1W
B1 J109
R159 22K 1W
C250 .01
V112 12AU7 METER TUBE
C133 .001
R135 1K 2W CAL
R157 1.2K
R158 1.2K
C136 .001
C309 680 UUF
R161 1.5K
T124
J106 MF OUT P103
J107
P104
R154 1.5M
C132 .001
P105 J108
Z107
P107 J110
IN34A
10 UUF
50 2W HF BAL
IN34A 5.5-18UUF
V117 1/2 6U8 (NOT USED)
C212 .001
C210 .001
R231 6.8K 1W
R230 2.7K 1W
L126 128
C216 .001
C215 .001
L125 2
V117 1/2-6U8 HF OSC.
C217 100UUF
V116 6CL6 HF OSC. AMP.
R233 100K
C219 47 UUF
C218 .001
R232 22K
C214 5 UUF
R229 100K
C220 150 UUF
L127 750
C221 .001
B3
C213 .001
R228 330

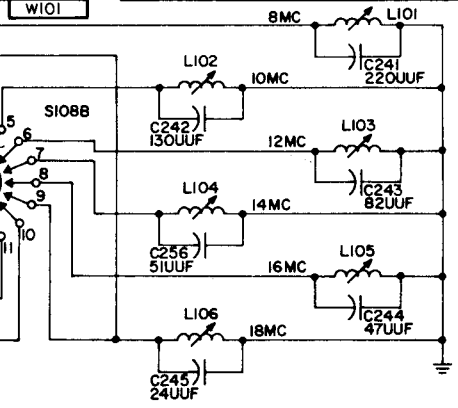
CK-1083A

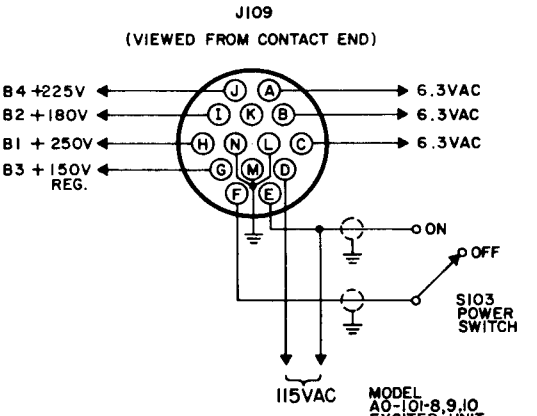

NOTE:
Y111 THRU Y120 SUPPLIED ONLY ON CUSTOMERS REQUEST.
NOTE:
ALL CAPACITORS ON S108C ARE 1-60 UUF
NOTE -
FOR 230VAC OPERATION REMOVE JUMPERS MARKED —X— FROM TB101 AND ADD JUMPERS SHOWN IN DOTTED LINES.
S108C
S107 (FRONT)
S107 (REAR)
S107 MF XTAL SWITCH
S106C (FRONT)
S106C (REAR)
S110
TB101
V115 12AU7 2-4 MC OSC.
V116 6CL6 HF OSC. AMP.
V118 6AH6 1ST RF AMP.
V119 6CL6 2ND RF AMP.
T123
T124
T113
T114
T115
T116
T117
1102 NE51 OVEN
PS102
115AC J109
B1 J109
B3 J109
J104 VMO IN
J105 P106
J106 MF OUT P103
J107 P104
P105 J108
P108 J111
PIN3 E101
"Y Y" S105
(C181A,B,C) OUTPUT TUNI
S108C
A = C23
B = C23
C = C23
D = C23
E = C23

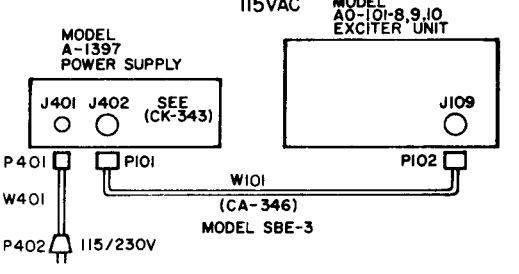

NOTE:
ALL CAPACITORS ON S108C ARE 1-60 UUF
S108C
S108A
S108B
XY111
XY113
XY115
XY117
C223 1-8UUF
C225 1-8UUF
C227 1-8UUF
C229 1-8UUF
C289
C290
C288
C240
C234
Y101 8MC
Y102 10MC
Y103 12MC
Y104 14MC
Y105 18MC
Y106 11MC
Y107 13MC
Y108 17MC
(S108A,B) BAND MCS (HF OSC. SWITCH)
L114 34MC
L113 32MC
L112 30MC
L111 28MC
L110 26MC
L109 24MC
L108 22MC
L107 20MC
L102 10MC
L103 12MC
L104 14MC
L105 16MC
L106 18MC
C242 130UUF
C256 51UUF
C245 24UUF
R208
TB101
R235 100K
S108C CAPACITOR CODE
A = C239
B = C238
C = C237
D = C236
E = C235
F = C285
G = C286
H = C287
J = C233
LAST SYMBOLS
C309
CR116
E102
I103
J113
K101
L154
M101
P108
PS103
R288
S110
T128
TB101
V128
XY121
Y121
Z112
W101
C101 THRU C115, C119, C129, C142 THRU C150, C154, C155, C159, C160, C165, C172, C195, C255, C258, C259, C260, C307, C308
CR101, THRU CR106, CR109, CR110 CR107, CR108
E
I
UNLESS OTHERWISE SPECIFIED
1- ALL RESISTORS ARE 1/2 WATT. K = 1000 M = MILLION
2- ALL CAPACITORS ARE IN MICROFARADS.
3- ALL COILS ARE IN MICROHENRIES. MH = MILLIHENRIES
4- ALL ROTARY SWITCHES ARE SHOWN IN POSITION 1.
(C181A,B,C) OUTPUT TUNING
115AC J109
C181B 12-270 UUF
C191 4-30 UUF
C193 .001
T116
S106B (FRONT)
PS103 39
C189 4-30 UUF
T118
S106A, B, C, D POSITIONS
POS. | BAND (MCS)
1 | 1.75 - 4
2 | 4 - 8
3 | 8 - 16
4 | 16 - 32
R218 39
L121 2.5MH
C253 .001
L119 150
R217 5.6K 1W
C200 (.001)
C194 .001
L118 2.5MH
C192 4-30 UUF
T117
R170 1.5K
S106B (REAR)
R239 1.5K
T119
C190 4-30 UUF
R214 10
V120 6146 RF OUTPUT AMP.
E102
PS101 12 2W
C185 .001
C186 .001
C187 .001
L117 150
C188 50
R213 470K
R216 500 10W
L120 150
C198 .001
L124 2.5 MH
C184 .001
B1 J109
C179 4-30 UUF
C181A 12-270 UUF
C182 .001
T120
S106A (FRONT)
T112
C177 4-30 UUF
L132 150
C183 .001
T121
S106A (REAR)
T122
C178 4-30 UUF
C180 4-30 UUF
R210 1K
C176 100 UUF
R211 560
R209 390 K
CR114 1N100
R238 560 K
C175 .001
"XX" S109
I103
V111
S106E
L151, 5.6
L152, 3.3
L153, .9
L154, 0.68
R278 220 2W
"K"
"L"
"M"
"N"
"P"
"R"
"S"

SYMBOLS
PSI03
R288
SI10
TI28
TBI0I
VI28
XYI2I
YI2I
ZII2
WI0I

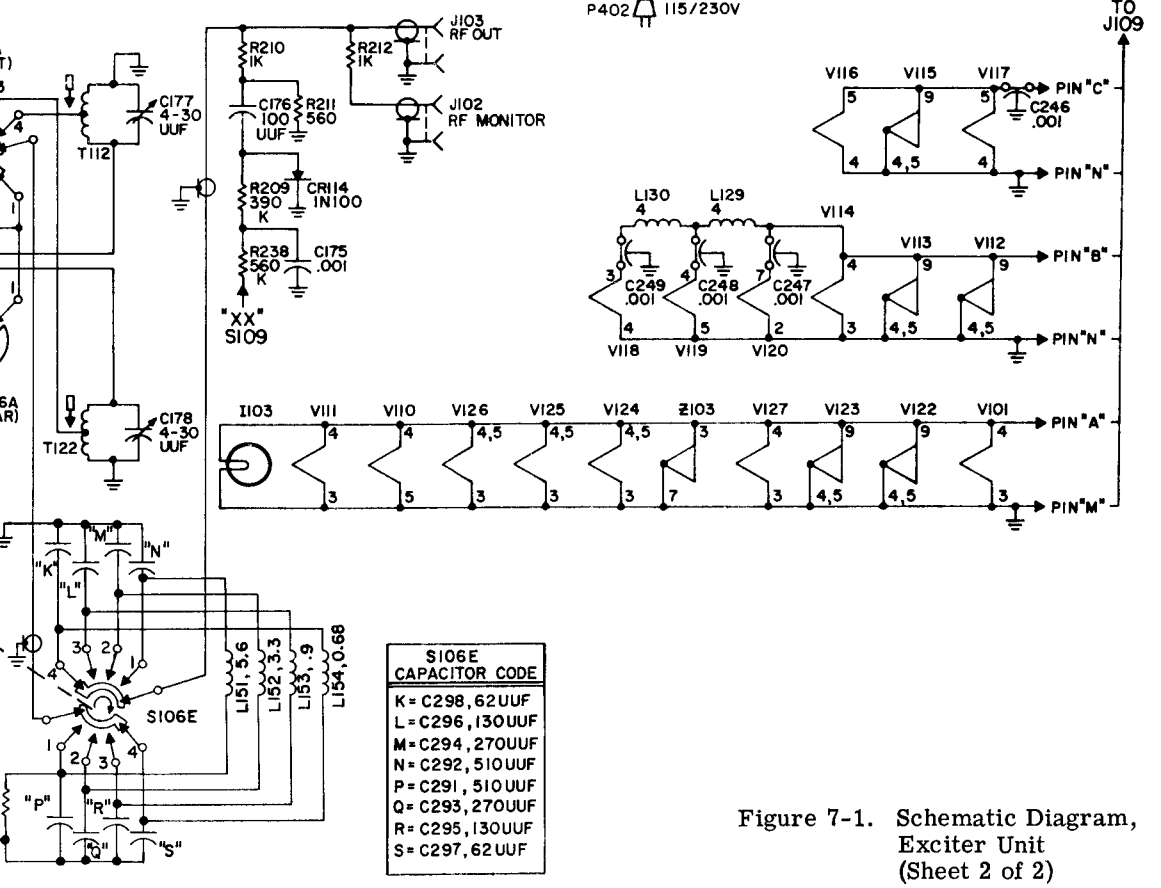
MISSING SYMBOLS			
C101 THRU C115, C119, C129, C142 THRU C150, C154, C155, C159, C160, C165, C172, C195, C255, C258, C259, C260, C307, C308	J112	R185 THRU R190, R194, R195, R221 R234, R236, R267 THRU R272 R150	XY109, XY110
	K		
	LI33 THRU LI42, LI28		Y109, Y110
	M	TI05 THRU TI08, TIII	
CRI0I, THRU CRI06, CRI09, CRI10 CRI07, CRI08	P	TB	
	PS	VI02, VI03, VI04, VI07, VI08, VI09	ZI0I, ZI02, ZI04, ZI05, ZI06, ZI09
E	RI06, RI07, RI09 THRU RII9, RI2I,		
I	RI22, RI23, RI64 THRU RI67 RI7I THRU RI80		







OTHERWISE SPECIFIED
ESISTORS ARE 1/2 WATT. K=1000 M=MILLION
APACITORS ARE IN MICROFARADS.
OILS ARE IN MICROHENRIES. MH=MILLIHENRIES
OTARY SWITCHES ARE SHOWN IN POSITION 1.



SI06E CAPACITOR CODE
K = C298, 62UUF
L = C296, 130UUF
M = C294, 270UUF
N = C292, 510UUF
P = C291, 510UUF
Q = C293, 270UUF
R = C295, 130UUF
S = C297, 62UUF

Figure 7-1. Schematic Diagram, Exciter Unit (Sheet 2 of 2)

R405
100K
1W
3
5
C403-A
=20μf
C403-B
20μf
1